Generic Access Profile (GAP)

*Bluetooth® Test Suite*

- **Revision**: GAP.TS.p38
- **Revision Date**: 2020-01-07
- **Group Prepared By**: BTI
- **Feedback Email**: bti-main@bluetooth.org
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### 4.6 Operational Modes and Procedures for Use on LE Physical Channels

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1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bluetooth Generic Access Profile (GAP).

The objective of this Test Suite is to provide a basis for interoperability for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers' Bluetooth devices.
2 References, Definitions, and Abbreviations

2.1 References

This Bluetooth document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For the purpose of this Bluetooth document, the definitions and abbreviations in [1], [4], and [5] apply.


[2] Profile ICS proforma for Generic Access Profile (GAP)

[3] Core IXIT Proforma for Bluetooth Conformance Test Suites


[6] Core Specification Addendum (CSA) 3

[7] Core Specification Addendum (CSA) 4


[16] Bluetooth Specification Version 5.0 or later Core System Package, Volume 3 Part C, Generic Access Profile (GAP)


[18] Bluetooth Specification Version 5.1 or later Core System Package, Volume 3 Part C, Generic Access Profile (GAP)
### 3 Test Suite Structure (TSS)

#### 3.1 Test Strategy

The test objectives are to verify functionality of the Generic Access Profile for Bluetooth devices and enable interoperability between Bluetooth Hosts supporting Bluetooth on different devices. The testing approach is to cover mandatory and optional requirements in the protocol specification and to match these to the support of the IUT as described in the ICS proforma.

Conformance testing is the appropriate test method to meet these intents. The basis for the test approach is the general concepts and conformance testing principles defined in ISO/IEC 9646-1 and ISO/IEC 9646-2; both are part of the OSI Conformance Testing Methodology and Framework (CTMF).

The conformance test equipment shall provide an implementation of the Bluetooth Controller and the parts of the Host needed to perform the test cases defined in the test suite. For some test cases, it is necessary to stimulate the IUT from an Upper Tester. In practice, this may be implemented as a special test interface, an MMI, or another interface supported by the IUT.

The Generic Access Profile test suite contains Valid Behavior (BV) tests complemented with Invalid Behavior (BI) tests where required. The test coverage mirrored in the test suite structure is the result of a process that started with catalogued specification requirements that were logically grouped and assessed for testability enabling coverage in defined test purposes.

The Generic Access Profile defines three device types based on the supported Core Configurations as defined in [Vol. 0], Part B Section 3.1. The device types are:

- **BR/EDR**
  Devices that support the “Basic Rate” Core Configuration (see [Vol. 0], Part B Section 4.4)

- **LE only**
  Devices that support the “Low Energy” Core Configuration (see [Vol. 0], Part B Section 4.4)

- **BR/EDR/LE**
  Devices that support the “Basic Rate and Low Energy Combined” Core Configuration (see [Vol. 0], Part B Section 4.5)

The test suite structure is a tree with the first level representing the protocol groups that apply to each device type.

**BR/EDR Protocol Groups:**

- Modes.
- Security Aspects.
- Idle mode procedure.
- Establishment procedures.
LE Only Protocol Groups:

- Broadcasting and Observing.
- Discovery Modes and Procedures.
- Connection Modes and Procedures.
- Bonding Modes and Procedures.
- Security Aspects.
- Advertising and Scan response data format.
- Generic Access Profile Characteristics for Low Energy.
- Periodic Advertising Modes and Procedures.

BR/EDR/LE Protocol Groups:

- Modes.
- Idle Mode Procedures.
- Establishment Procedures.
- BR/EDR/LE Security Aspects.

## 3.2 Test Groups

The test suite structure is structured as a tree with a first level defined as GAP representing the protocol groups as applicable to the device type of BR/EDR, LE only, or BR/EDR/LE (Dual Mode).

The test groups are organized in 3 levels. The first level defines the protocol groups representing the protocol services. The second level separates the protocol services in functional modules. The last level in each branch contains the standard ISO subgroups BV and BI.

### 3.2.1 BR/EDR Protocol Groups

#### 3.2.1.1 Modes

This group handles testing of the modes for discoverability, connectability, and pairability, and synchronizability of a Bluetooth device.

#### 3.2.1.2 Security Aspects

This group handles testing of the GAP security aspects.

#### 3.2.1.3 Idle Mode Procedures

This group handles testing of the different Idle mode procedures.

#### 3.2.1.4 Establishment Procedures

This group handles testing of the different establishment procedures as defined in GAP.
3.2.2 LE Only Protocol Groups

3.2.2.1 Broadcasting and Observing
This group handles testing of the broadcasting and observing modes and procedures of a LE-only device.

3.2.2.2 Discovery Modes and Procedures
This group handles testing of the discovery modes and procedures of a LE-only device.

3.2.2.3 Connection Modes and Procedures
This group handles testing of the connection modes and procedures of a LE-only device.

3.2.2.4 Bonding Modes and Procedures
This group handles testing of the bonding modes and procedures of a LE-only device.

3.2.2.5 Security Aspects
This group handles testing of the security aspects for a LE-only device.

3.2.2.6 Advertising and Scan Response Data Format
This group handles testing of the advertising and scan response data format of a LE-only device.

3.2.2.7 Generic Access Profile Characteristics for Low Energy
This group handles testing of the GAP characteristics of a LE-only device.

3.2.2.8 Discovery of Devices with Resolvable Private Address
This group handles testing of the discovery of devices with Resolvable Private Addresses of a LE-only device.

3.2.2.9 Periodic Advertising Modes and Procedures
This group handles testing of the periodic advertising modes and procedures of an LE-only device.

3.2.2.10 Broadcast Isochronous Streaming Modes and Procedures
This group handles testing of the Broadcast Isochronous Streaming modes and procedures of an LE-capable device. The test cases found in this group are based on the Generic Access Profile.

3.2.3 BR/EDR/LE (Dual Mode) Protocol Groups

3.2.3.1 Modes
This group handles testing of the modes for discoverability, connectability, and pairability, and synchronizability of a BR/EDR/LE device.

3.2.3.2 Idle Mode Procedures
This group handles testing of the different Idle mode procedures for a BR/EDR/LE device.

3.2.3.3 Establishment Procedures
This group handles testing of the different establishment procedures for a BR/EDR/LE device.
3.2.3.4 BR/EDR/LE Security Aspects
This group handles testing of the security aspects for a BR/EDR/LE device.

3.2.4 Main Test Groups

3.2.4.1 Valid Behavior (BV) Tests
This sub group provides testing to verify that the IUT reacts in conformity with the Bluetooth standard, after receipt or exchange of valid Protocol Data Units (PDUs). Valid PDUs means that the exchange of messages and the content of the exchanged messages are considered as valid.

3.2.4.2 Invalid Behavior (BI) Tests
This sub group provides testing to verify that the IUT reacts in conformity with the Bluetooth standard, after receipt of a syntactically or semantically invalid PDU.
# 4 Test Cases

## 4.1 Introduction

### 4.1.1 Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in [5]. The convention used here is `<spec abbreviation>/<func>/<subfunc>://<xx><nn><y>`. Bolded ID parts shall appear in the order prescribed. Non-bolded ID parts (if applicable) shall appear between the bolded parts. The order of the non-bolded parts may vary from test suite to test suite, but shall be consistent within each individual test suite.

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<tr>
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<th>Subfunction Identifier &lt;subfunc&gt;</th>
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<td>Authentication</td>
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<td>Acronym</td>
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<tr>
<td>BSM</td>
<td>Broadcast Isochronous Stream Synchronizability Mode</td>
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<td>Synchronization Establishment</td>
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Table 4.1: TC Feature Naming Convention from GAP

### 4.1.2 Conformance

When conformance is claimed, all capabilities indicated as mandatory for this Specification shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the Bluetooth Qualification Program.
The Bluetooth Qualification Program may employ tests to verify implementation robustness. The level of implementation robustness that is verified varies from one Specification to another and may be revised for cause based on interoperability issues found in the market.

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions that is not excluded by the Specification, OR
- That capabilities enabled by the implementations are sustained over durations expected by the use case, OR
- That the implementation gracefully handles any quantity of data expected by the use case, OR
- That in cases where more than one valid interpretation of the Specification exist, the implementation complies with at least one interpretation and gracefully handles other interpretations, OR
- That the implementation is immune to attempted security exploits.

A single execution of each of the required tests is required in order to constitute a pass verdict. However, it is noted that in order to provide a foundation for interoperability, it is necessary that a qualified implementation consistently and repeatedly pass any of the applicable tests.

In any case, where a member finds an issue with the Test Plan Generator, the Test Case as described in the Test Suite, or with the Test System utilized, the Member is required to notify the responsible party via an errata request such that the issue may be addressed.

### 4.1.3 Pass/Fail Verdict Conventions

Each test case has an Expected Outcome section, which outlines all the detailed pass criteria conditions that shall be met by the IUT to merit a Pass Verdict.

The convention in this test suite is that, unless there is a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon one of the pass criteria conditions cannot be met and in case this occurs the outcome of the test shall be the Fail Verdict.
4.2 Preambles

4.2.1 Link Establishment Lower Tester Started (for Generic Authentication)

Figure 4.1: Link Establishment Tester Started (for Generic Authentication)
4.2.2 Inquiry Procedure

IUT is in BB-Standby, Idle mode

Command IUT to enter (General or Limited) discoverable mode

Inquiry: ID packet (GIAC or LIAC)
Inquiry: ID packet (GIAC or LIAC)
Inquiry: ID packet (GIAC or LIAC)

Inquiry response: FHS packet
(Parity bits, LAP, EIR, Undef=0b, SR, Reserved=10b, UAP, NAP, CoD, LT_ADDR, CLK27-2, Page Scan Mode)

Extended inquiry response (EIR data)

Figure 4.2: Inquiry Procedure
### 4.2.3 Paging Procedure

IUT is in BB-Standby, in Idle mode, and a link key is available.

**BB-functionality:**
All used BB-messages are explained in the BB Test Spec.

- **Page request (BB functionality)**
  (ID-packet (slaves DAC))

- **Page request (BB-functionality)**
  (ID-packet (slaves DAC))

- **Page response (BB-functionality)**
  (ID-packet (slaves DAC))

- **FHS-packet (BB-functionality)**

- **FHS-acknowledge (BB-functionality)**
  (ID-packet (slaves DAC))

- **POLL-packet (BB-functionality)**
  DM1, DH1, NULL or AUX1
  (BB-functionality)

- **LMP_features_req** (features)

- **LMP_features_res** (features)

- **LMP_host_connection_req**

- **LMP_accepted**
  (opcode: LMP_host_connection_req)

**Bring IUT in security mode 3**

**Bring IUT in connectable mode**

The IUT sends one of the possible one-slot packets, implementation-dependent IUT.

Paging procedure is performed successfully on BB-Level and link establishment is started.

*Figure 4.3: Paging Procedure*
### 4.2.4 Bring IUT to Link Key Available

IUT is in BB-standby, in Idle mode with any supported security mode and no link key available.

The Lower Tester has to know the BD_ADDR for the IUT before paging is initiated.

**Page request (BB-functionality)**

(ID-packets (slaves DAC))

Pararequest (BB-functionality)

(ID-packets (slaves DAC))

Pararequest (BB-functionality)

(ID-packets (slaves DAC))

FHS-packet (BB-functionality)

FHS-acknowledge (BB-functionality)

(ID-packets (slaves DAC))

POLL-packet (BB-functionality)

DM1, DH1, AUX1 or NULL-packet

(LMP_features_req (features))

LMP_features_res (features)

LMP_host_connection_req

LMP_accepted

(opcode LMP_host_connection_req)

LMP_in_rand

(rand_nr)

LMP_accepted

(opcode LMP_in_rand)

LMP_comb_key

(rand_nr)

LMP_comb_key

(rand_nr)

LMP_unit_key (key)

mutual authentication messages

mutual LMP_Setup_Complete message

LMP_detach

(Reason: Other End Terminated Connection; User Ended Connection)

**BB-functionality:** All used BB-messages are explained in the BB Test Spec.

Paging procedure is performed successfully on BB-level and link establishment is started.

Authentication is initiated by Lower Tester (LMP_Pairing).

Figure 4.4: Bring IUT to Link Key Available
4.2.5 Bring IUT to no_link_key Available (IUT=slave, security mode 3)

**Upper Tester**

- Bring IUT in security mode 3
- Bring IUT in connectable mode
- BB-functionality: All used BB-messages are explained in the BB Test Spec.

**IUT**

- The IUT sends one of the possible one-slot-packet, implementation-dependent by IUT.
- Paging procedure is performed successfully on BB-Level and link establishment is started.

**Lower Tester**

- IUT is in BB-Standy, in Idle mode.
- After reception of this message, the link_key is no longer available.
- After reception of this message, the link_key is no longer available.

**BB-functionality**: All used BB-messages are explained in the BB Test Spec.

**Figure 4.5**: Bring IUT to no_link_key Available (IUT=slave, security mode 3)
4.2.6 Secure Simple Pairing

Figure 4.6: Secure Simple Pairing
4.2.7 GAP Mandatory Characteristics

IUT and Lower Tester are connected.

Figure 4.7: GAP Mandatory Characteristics

4.3 Modes

Test group objectives:

To verify the correct implementation of the modes.

4.3.1 Non-discoverable Mode - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.3.1.1 GAP/MOD/NDIS/BV-01-C [Non-discoverable Mode – Slave]

• Test Purpose

  Verify that the IUT does not respond to inquiry if it is in non-discoverable mode.

  The IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

• Reference

  [1] 4.1.1
• Initial Condition
The IUT is in Baseband state 'Standby' and in Idle mode.

• Test Procedure

**Figure 4.8: GAP/MOD/NDIS/BV-01-C**

The Lower Tester sends for a time [T_{GAP}(103)] inquiry request messages (ID-packets) after the Upper Tester has ordered the IUT to go in non-discoverable mode. Every inquiry train is repeated for N=256 times.

• Test Condition
It must be possible to put the IUT in non-discoverable mode.

• Expected Outcome
Pass Verdict

The IUT does not answer to an inquiry request.

4.3.2 Limited Discoverable Mode - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.3.2.1 GAP/MOD/LDIS/BV-01-C [Limited Discoverable Mode and LIAC – Slave]

• Test Purpose

Verify that the IUT answers to inquiry (LIAC) if it is in limited-discoverable mode.
The IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

- **Reference**
  
  [1] 4.1 (Discoverability Modes)

- **Initial Condition**
  
  The IUT is in Baseband state 'Standby' and in Idle mode.

- **Test Procedure**

  ![Diagram](image)

  **Figure 4.9: GAP/MOD/LDIS/BV-01-C**

  The Lower Tester sends for a time $T_{GAP}(103)$ inquiry request messages (ID-packets) after the Upper Tester has ordered the IUT to go in limited-discoverable mode. Every inquiry train is repeated for $N = 256$ times.

  - **Test Condition**
    
    It must be possible to put the IUT in limited-discoverable mode.

    The IUT shall be able to answer to the inquiry request message if it is in limited discoverable mode. In this test the inquiry procedure uses LIAC sent by the Lower Tester.
• **Expected Outcome**

**Pass Verdict**

The IUT answers to an inquiry request (LIAC) with the FHS-packet. The Inquiry response message is received by the Lower Tester within $T_{GAP}(103)$.

The COD has the bit number 13 set in the Major Service Class part of the Class of Device field.

### 4.3.2.2 GAP/MOD/LDIS/BV-02-C [Limited Discoverable Mode and GIAC – Slave]

• **Test Purpose**

Verify that the IUT answers to inquiry (GIAC) if it is in limited-discoverable mode.

IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

• **Reference**

[1] 4.1

• **Initial Condition**

The IUT is in Baseband state 'Standby' and Idle mode.

• **Test Procedure**

![Diagram of test procedure](image)

**Figure 4.10: GAP/MOD/LDIS/BV-02-C**

The Lower Tester sends for a time $[T_{GAP}(103)]$ inquiry request messages (ID-packets) after the Upper Tester has ordered the IUT to go in limited-discoverable mode. Every inquiry train is repeated for $N=256$ times.
• Test Condition

It must be possible to put the IUT in limited-discoverable mode.

The IUT shall be able to answer to the inquiry request message if it is in limited-discoverable mode. In this test the inquiry procedure uses GIAC sent by the Lower Tester.

• Expected Outcome

Pass Verdict

The IUT answers to an inquiry request (GIAC) with the FHS-packet. The Inquiry response message is received by the Lower Tester within $T_{GAP}(103)$.

The COD has the bit number 13 set in the Major Service Class part of the Class of Device field.

4.3.2.3 GAP/MOD/LDIS/BV-03-C [Limited Discovery Mode Time-out]

• Test Purpose

Verify that the IUT ceases to answer to inquiry after a time-out, if it is in limited-discoverable mode.

The IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

• Reference

[4] 4.1.2

• Initial Condition

The IUT is in Baseband state ‘Standby’ and in Idle mode.
Test Procedure

The Upper Tester orders the IUT to go in limited-discoverable mode. The Lower Tester waits for $T_{\text{GAP}}(104)$ to expire. ($T_{\text{GAP}}(104)$ has a default of 1 minute, but an alternate value may be invoked via IXIT [3].)

After $T_{\text{GAP}}(104)$ has expired, the Lower Tester sends a series of 256 inquiry request messages (ID-packets) with LIAC. Since the IUT has left the Limited Discoverable Mode on the expiration of the timer, it does not respond.

Expected Outcome

Pass Verdict

The IUT does not answer any inquiry request (LIAC) with a FHS-packet.

4.3.3 General Discoverable Mode - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.3.3.1 GAP/MOD/GDIS/BV-01-C [General Discoverable Mode and GIAC – Slave]

Test Purpose

Verify that the IUT answers to inquiry (GIAC) if it is in general-discoverable mode.
The IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

- **Reference**
  [1] 4.1

- **Initial Condition**
  The IUT is in Baseband state 'Standby' and Idle mode.

- **Test Procedure**

  ![Diagram of inquiry procedure]

  **Figure 4.12: GAP/MOD/GDIS/BV-01-C**

  The Lower Tester sends for a time \(T_{GAP}(103)\) inquiry request messages (ID-packets) after the Upper Tester has ordered the IUT to go in general-discoverable mode. Every inquiry train is repeated for \(N=256\) times.

- **Test Condition**
  It must be possible to put the IUT in general-discoverable mode.

  The IUT shall be able to answer to the inquiry request message if it is in general discoverable mode. In this test the inquiry procedure uses GIAC sent by the Lower Tester.
• Expected Outcome

Pass Verdict

The IUT answers to an inquiry request (GIAC) with the FHS-packet. The Inquiry response message is received by the Lower Tester within $T_{\text{GAP}}(103)$.

4.3.3.2 GAP/MOD/GDIS/BV-02-C [General Discoverable Mode and LIAC – Slave]

• Test Purpose

Verify that the IUT in general-discoverable mode does not respond inquiry requests (using LIAC).

The IUT is slave and acceptor and the Lower Tester is master and initiator of the inquiry procedure.

• Reference

[1] 4.1

• Initial Condition

The IUT is in Baseband state 'Standby' and Idle mode.

• Test Procedure

![Diagram]

Figure 4.13: GAP/MOD/GDIS/BV-02-C

The Lower Tester sends for a time [$T_{\text{GAP}}(103)$] inquiry request messages (ID-packets) after the Upper Tester has ordered the IUT to go in general-discoverable mode. Every inquiry train is repeated for $N=256$ times.
• Test Condition
  It must be possible to put the IUT in general-discoverable mode. In this test the inquiry procedure uses LIAC.

• Expected Outcome
  
  Pass Verdict

  The IUT does not answer to an inquiry request (LIAC).

4.3.4 Non-connectable Mode - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.3.4.1 GAP/MOD/NCON/BV-01-C [Non-connectable Mode – Slave]

• Test Purpose
  Verify that the IUT does not respond to paging if it is in non-connectable mode.

  The IUT is slave and acceptor and the Lower Tester is master and initiator of the paging procedure.

• Reference
  [1] 4.3

• Initial Condition
  The IUT is in Baseband state 'Standby' and in Idle mode.
Test Procedure

- IUT is in BB-Standby and Idle mode.
- Bring device in non-connectable mode
- Page request (ID-packet {slaves DAC})
- Verify that the IUT does not answer to a paging request message (ID-Packet) until PageTO while in non-connectable mode.
- The Lower Tester sends for the time max. PageTO paging request messages (ID-packets) after the Upper Tester has ordered the IUT to go in non-connectable mode.

Figure 4.14: GAP/MOD/NCON/BV-01-C

- Test Condition
  The IUT shall be able to answer paging request messages if it is in connectable mode. It must be possible to put the IUT in non-connectable mode. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

- Expected Outcome
  Pass Verdict
  The IUT does not answer to paging requests.

- Notes
  It must be possible to select a certain BD_ADDR or CoD for the Lower Tester if necessary.

4.3.5 Connectable Mode - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.
4.3.5.1 GAP/MOD/CON/BV-01-C [Connectable Mode – Slave]

- **Test Purpose**
  
  Verify that the IUT responds to paging requests if it is in connectable mode.
  
  The IUT is slave and acceptor and the Lower Tester is master and initiator of the paging procedure.

- **Reference**
  
  [1] 4.3

- **Initial Condition**
  
  The IUT is in Baseband state 'Standby' and in Idle mode.

- **Test Procedure**

  ![Diagram of test procedure]

  **Figure 4.15: GAP/MOD/CON/BV-01-C**

  The Lower Tester sends for the time max. PageTO paging request messages (ID-packets) after the Upper Tester has ordered the IUT to go in connectable mode.

  The IUT shall answer to the paging request.
• Test Condition
The IUT shall be able to answer paging request messages if it is in connectable mode. It must be possible to put the IUT in connectable mode if non-connectable mode is supported. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

• Expected Outcome
   Pass Verdict

   The IUT answers to paging request messages with the paging response message (ID-packet) within PageTO.

• Notes
   It must be possible to select a certain BD_ADDR or CoD for the Lower Tester if necessary.

4.3.6 Non-pairable Mode - Slave
Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.3.6.1 GAP/MOD/NPAIR/BV-01-C [Non-pairable Mode, IUT rejects Pairing Procedure]
• Test Purpose
   Verify that the IUT rejects a pairing procedure, if it is in non-pairable mode.

   The IUT is slave and claimant. The Lower Tester is master and verifier of the pairing procedure.

• Reference
   [1] 4.3

• Initial Condition
   The IUT is connected to the Lower Tester, through LMP_host_connection_req and LMP_accepted, and in non-pairable mode. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used.
• Test Procedure

![Test Procedure Diagram]

Figure 4.16: GAP/MOD/NPAIR/BV-01-C

• Test Condition
It must be possible to put the IUT in non-pairable mode.

• Expected Outcome
Pass Verdict

The IUT has sent an "LMP_not_accepted" message with error-reason "pairing not allowed" to the Lower Tester after it has received "LMP_in_rand".

4.3.6.2 GAP/MOD/NPAIR/BV-02-C [Non-bondable Mode, IUT Rejects Pairing Procedure]

• Test Purpose
Verify that the IUT rejects a pairing procedure, if it is in non-bondable mode.

The IUT is slave and claimant. The Lower Tester is master and verifier of the pairing procedure.

• Reference
[1] 4.3

• Initial Condition
The IUT is connected to the Lower Tester, through LMP_host_connection_req and LMP_accepted, and in non-bondable mode. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used.

Lower Tester’s LMP features include:
- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1
Lower Tester's IO capabilities set to "DisplayYesNo".

Lower Tester's Authentication_Requirements set to "MITM protection no required – Dedicated Bonding" (0x02).

**Test Procedure**

- **Lower Tester**
- **IUT**
- **Upper Tester**

IUT connected to Lower Tester and in non-bondable mode

Bring IUT in security mode 4

**Figure 4.17: GAP/MOD/NPAIR/BV-02-C**

- **Test Condition**
  It must be possible to put the IUT in non-bondable mode.

- **Expected Outcome**
  **Pass Verdict**

  The IUT has sent an "LMP_not_accepted_ext" message with error-reason: "pairing not allowed" to the Lower Tester after it has received "LMP_IO_capability_req."

4.3.6.3 GAP/MOD/NPAIR/BV-03-C [Non-bondable Mode, IUT Accepts a Non-bonded Connection]

- **Test Purpose**
  Verify that the IUT accepts a non-bonded connection when it is in non-bondable mode.

  The IUT is slave and claimant. The Lower Tester is master and verifier of the pairing procedure.

- **Reference**
  [1] 4.3

- **Initial Condition**
  The IUT is connected to the Lower Tester, through LMP_host_connection_req and LMP_accepted, and in non-bondable mode. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used.
Lower Tester's LMP features include:
- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1
Lower Tester's IO capabilities are set to “DisplayYesNo”.

Lower Tester's Authentication_Requirements set to "MITM protection no required - non-Bonding" (0x00).

- **Test Procedure**


![Diagram](image)

*Figure 4.18: GAP/MOD/NPAIR/BV-03-C*

- **Test Condition**
  It must be possible to put the IUT in non-bondable mode.

- **Expected Outcome**
  **Pass Verdict**

  The IUT has sent an "LMP_IO_capability_res" message after it has received "LMP_IO_capability_req".

  Simple Pairing Procedure is complete successfully.
4.3.7 Pairing Mode - Slave

4.3.8 Non-synchronizable Mode – Connectionless Slave Broadcaster

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is connectionless slave broadcast transmitter.

4.3.8.1 GAP/MOD/NSYN/BV-01-C [Non-synchronizable Mode, IUT is Connectionless Slave Broadcast Transmitter]

- Test Purpose
  
  Verify that the IUT does not send the synchronization train if it is in non-synchronizable mode. The IUT is the connectionless slave broadcast transmitter and the Lower Tester is the connectionless slave broadcast receiver.

- References

  [7] 4.4.1

- Initial Condition
  
  The IUT is in Baseband state 'Standby' and in Idle mode.

- Test Procedure
  
  The Lower Tester scans for Sync_Scan_Timeout = 10.12 seconds for the synchronization train after the Upper Tester has ordered the IUT to go in non-synchronizable mode.

![Diagram](image-url)
• Test Condition
  It must be possible to put the IUT in non-synchronizable mode. The Lower Tester has to know the BD_ADDR of the IUT.

• Expected Outcome
  Pass Verdict
  The Lower Tester is unable to synchronize to the IUT.

4.3.9 Synchronizable Mode – Connectionless Slave Broadcaster
Test subgroup objectives:
To verify the correct behavior in this mode. The role of the IUT is connectionless slave broadcast transmitter.

4.3.9.1 GAP/MOD/SYN/BV-01-C [Synchronizable Mode – IUT is Connectionless Slave Broadcast Transmitter]
• Test Purpose
  Verify that the IUT transmits the Synchronization Train when it is in Synchronizable mode. The IUT is the connectionless slave broadcast transmitter and the Lower Tester is the connectionless slave broadcast receiver.

• References
  [7] 4.4.2

• Initial Condition
  IUT is in Standby state.

• Test Procedure
  The Upper Tester configures the Synchronization Train on the IUT with Interval = 80 ms, Timeout = 120 seconds, and Service_Data = 0x01.
  The Upper Tester reserves LT_ADDR=1 on the IUT and enables a Connectionless Slave Broadcast on the IUT using the reserved LT_ADDR with Interval = 80 ms.
  The Upper Tester places the IUT in Synchronizable mode.
  The Lower Tester receives the Synchronization Train from the IUT.
- Expected Outcome
  Pass Verdict

  The Lower Tester receives the Synchronization Train from the IUT in accordance with the configuration via the Upper Tester.

4.4 Security Aspects

Test group objectives:

To verify the correct implementation of the modes, behavior and procedures of the IUT.

4.4.1 Generic Authentication Procedure - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.

4.4.1.1 GAP/SEC/AUT/BV-01-C [Generic Authentication Procedure, Link Level Enforced Security – IUT is Slave]

- Test Purpose

  Verify that the IUT performs a correct Generic Authentication procedure ([1] Section 4.3) as follows:

  An LMP_authentication procedure ([1] Figure 10.1 in Section 10.1 LMP-AUTHENTICATION) initiated by IUT fails and afterwards an LMP_pairing procedure ([1] Figure 10.2 in Section 10.2 LMP-PAIRING) initiated by IUT is successfully performed.
The IUT is slave and acceptor of the link establishment and initiator of the Generic Authentication procedure.

- **Reference**
  
  [1] 5.1, 5.2, 10.2

- **Initial Condition**
  
  IUT and Lower Tester are connected through LMP_host_connection_req and LMP_accepted. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used. A link key shall be available.

  The IUT is in security mode 3 and in connectable mode.

- **Test Procedure**

  ![Diagram of test procedure](image)

  **Figure 4.19: GAP/SEC/AUT/BV-01-C**
• Test Condition
  It must be possible to put the IUT in security mode 3 and in connectable mode.

• Expected Outcome
  Pass Verdict
  The IUT sends LMP_setup_complete after finishing the Authentication Procedures.

• Notes
  It must be possible to select a certain BD_ADDR or CoD for the Lower Tester if necessary.

4.4.2 Mode-independent Authentication - Slave

Test subgroup objectives:

To verify the correct behavior in a procedure. The role of the IUT is the acceptor and the slave.

4.4.2.1 GAP/SEC/AUT/BV-02-C [Mode-independent Authentication – Slave]

• Test Purpose
  Verify that if an authentication is initiated by the Lower Tester, the IUT in pairable mode performs authentication independent of the security mode.

  The IUT is slave and acceptor. The Lower Tester is master and initiator of the authentication procedure.

• Reference
  [1] 5.2, 10.2

• Initial Condition
  IUT and Lower Tester are connected through LMP_host_connection_req and LMP_accepted. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used. The IUT may be in any supported security mode.
• Test Procedure

IUT is connected to Lower Tester, pairable, in any security mode.

**ALT 1**

- LMP \_accepted
- (opcode: LMP \_in\_rand)

**PIN Request**

- PIN \_accepted
- (PIN-number)

**PIN Response**

**ALT 2**

- LMP \_accepted
- (opcode: LMP \_in\_rand)

**LMP \_in\_rand**

- (rand\_nr)

**LMP \_accepted**

- Opcode: LMP (in_rand)

**LMP \_comb\_key** (rand\_nr)

**ALT .**

**LMP \_comb\_key** (rand\_nr)

**LMP \_unit\_key** (key)

**mutual authentication messages**

**IUT has no fixed PIN**

**IUT has a fixed PIN**

Figure 4.20: GAP/SEC/AUT/BV-02-C

• Test Condition

It must be possible to put the IUT in connectable mode if non-connectable mode is supported and in pairable mode.

• Expected Outcome

Pass Verdict

After creation of the link key a mutual authentication is performed.

• Notes

It must be possible to select a certain BD_ADDR or CoD for the Lower Tester if necessary.

4.4.3 Security Modes - Slave

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave and acceptor.
4.4.3.1 GAP/SEC/SEM/BV-01-C [Channel Establishment Procedure - Security Mode 1]

- **Test Purpose**
  
  Verify that the IUT in security mode 1 performs a channel establishment procedure.

  The IUT is responder. The Lower Tester is initiator of the channel establishment procedure.

- **Reference**
  
  [1] 5.2

- **Initial Condition**
  
  IUT and Lower Tester are connected through LMP_setup_complete. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used. IUT is in security mode 1.

- **Test Procedure**

  ![Diagram](image)

  **Figure 4.21: GAP/SEC/SEM/BV-01-C**

  A channel establishment shall be performed.

  - **Test Condition**
    
    It must be possible to put the IUT in security mode 1 and in connectable mode if non-connectable mode is supported. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

  - **Expected Outcome**
    
    **Pass Verdict**

    After the link establishment is completed and a channel establishment was initiated by the Lower Tester (with L2CAP_ConnectReq), the IUT sends the L2CAP_ConnectRsp message with the result: "Connection successful" for completion.
• Notes
It must be possible to select a certain BD_ADDR or CoD for the Lower Tester if necessary.

4.4.3.2 GAP/SEC/SEM/BV-02-C [Channel Establishment Procedure – Security Mode 2]

• Test Purpose
Verify that the IUT in security mode 2 performs a channel establishment procedure.

The IUT is responder. The Lower Tester is initiator of the channel establishment procedure.

• Reference
[1] 5.2

• Initial Condition
The IUT is in Baseband state 'Standby' and in Idle mode. The IUT has to be configured such that it will not reject the channel establishment procedure.

• Test Procedure

![Diagram](image)

Figure 4.22: GAP/SEC/SEM/BV-02-C

After the Upper Tester has ordered the IUT to go in connectable mode, the Lower Tester starts the link establishment with paging.

If the link establishment was completed, a channel establishment shall be performed.

• Test Condition
It must be possible to put the IUT in security mode 2 and in connectable mode if non-connectable mode is supported. It must be possible to make sure, that the device will not reject the channel establishment procedure, thus an L2CAP_ConnectRspNeg shall not be sent by the IUT. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.
• Expected Outcome

Pass Verdict

After the link establishment is completed and a channel establishment was initiated by the Lower Tester (with L2CAP_ConnectReq), the IUT sends the L2CAP_ConnectRsp message with the result: "Connection successful" for completion.

• Notes

Recommend to test with connection to protocol/application that requires authentication.

4.4.3.3 GAP/SEC/SEM/BV-03-C [Channel Establishment Procedure – Security Mode 3]

• Test Purpose

Verify that the IUT in security mode 3 performs a channel establishment procedure with authentication.

The IUT is responder. The Lower Tester is initiator of the channel establishment procedure.

• Reference

[1] 5.2

• Initial Condition

IUT and Lower Tester are connected through LMP_host_connection_req and LMP_accepted. The preamble "Link Establishment Lower Tester Started (for Generic Authentication)" may be used for a slave IUT; otherwise a comparable initialization sequence should be used. IUT is in security mode 3.
**Test Procedure**

A channel establishment shall be performed.
• Test Condition
It must be possible to put the IUT in security mode 3 and in connectable mode if non-connectable mode is supported. It must be possible to make sure, that the device will not reject the link establishment procedure. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

• Expected Outcome
 Pass Verdict

After the link establishment is completed and a channel establishment was initiated by the Lower Tester (with L2CAP_ConnectReq), the IUT sends the L2CAP_ConnectRsp message with the result: "Connection successful" for completion.

4.4.3.4 GAP/SEC/SEM/BV-04-C [Security Mode 4 – Responder]

• Test Purpose
Verify that the IUT in security mode 4 performs a channel establishment procedure. The IUT is responder. The Lower Tester is initiator of the channel establishment procedure.

• Reference
[17] 5.2.2

• Initial Condition
The IUT is in Idle mode. The IUT has to be configured such that it will not reject the channel establishment procedure.
• Test Procedure

![Test Procedure Diagram]

Figure 4.24: GAP/SEC/SEM/BV-04-C Security Mode 4 - Slave

After the Upper Tester has ordered the IUT to go in connectable mode and in security mode 4, the Lower Tester starts the link establishment with paging. If the link establishment was completed, a channel establishment shall be performed.

• Test Condition

It must be possible to put the IUT in security mode 4 and in connectable mode if non-connectable mode is supported. It must be possible to make sure, that the device will not reject the channel establishment procedure, thus an L2CAP_ConnectRspNeg shall not be sent by the IUT. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.
• Expected Outcome

Pass Verdict

After the link establishment is completed and a channel establishment was initiated by the Lower Tester (with L2CAP_ConnectReq), the IUT sends the L2CAP_ConnectRsp message with the result: "Connection successful" for completion.

• Notes

Recommend to test with connection to protocol/application that requires authentication.

4.4.3.5 GAP/SEC/SEM/BV-11-C [Secure Connections Only Mode – IUT slave, responder, Lower Tester doesn’t support Secure Connections in Controller]

• Test Purpose

The Lower Tester doesn’t support Secure Connections at the Controller level. Verify that the IUT in Secure Connections Only Mode rejects a request to perform a channel establishment procedure if the service on the IUT requires Security Mode 4, Level 3 on the IUT. The IUT is slave and responder of the channel establishment procedure.

• Reference

[1] 5.2.2

• Initial Condition

The PSM for the service on the IUT that requires Security Mode 4, Level 3 is specified in the IXIT.

Set the Secure Connections (Controller Support) LMP feature bit on the Lower Tester to 0.

IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

ACL connection does not exist between the devices.
• Test Procedure

IUT and Lower Tester are not bonded (Neither IUT nor Lower tester has link keys). ACL connection does not exist between the devices.

Bring IUT in Secure Connections Only Mode

Bring IUT in connectable mode

Establish ACL connection

The IUT is allowed to reject the pairing procedure. If the IUT rejects the pairing procedure then the test case ends there.

Simple Pairing Procedures

Simple Pairing Complete (Authenticated link key)

Encryption LMP messages

L2CAP_ConnectReq

(ID, length, PSM, SCID)

L2CAP_ConnectRsp

(ID, length, DCID, SCID, result=Connection refused-security block, status)

The IUT may optionally disconnect the ACL with error code 0x05

An intermediate L2CAP_ConnectRsp(result pending) is possible

Figure 4.25: GAP/SEC/SEM/BV-11-C

Upper Tester puts the IUT in Secure Connections Only Mode and connectable mode.

Lower Tester creates an ACL connection with the IUT.

Lower Tester performs the Secure Simple Pairing procedure that results in an authenticated link key and enables encryption. The IUT is allowed to reject this pairing procedure. If the IUT rejects the pairing procedure then the test case ends there.

Lower Tester requests establishing a channel to access a service on the IUT that requires Security Mode 4, Level 3.

• Test Condition

It must be possible to put the IUT in Secure Connections Only Mode and in connectable mode.
• Expected Outcome

Pass Verdict

The IUT rejects the pairing procedure OR

The pairing procedure succeeds and the IUT then rejects the Lower Tester’s request to establish a channel to access a service on the IUT that requires Security Mode 4, Level 3 OR

The IUT disconnects the ACL connection with error code 0x05 (Authentication Failure).

• Notes

When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.3.6 GAP/SEC/SEM/BV-12-C [Secure Connections Only Mode – IUT slave, responder, Lower Tester doesn’t support Secure Connections in Host]

• Test Purpose

The Lower Tester doesn’t support Secure Connections at the Host level. Verify that the IUT in Secure Connections Only Mode rejects a channel establishment procedure if the service on the IUT requires Security Mode 4, Level 3. The IUT is slave and responder of the channel establishment procedure.

• Reference

[1] 5.2.2

• Initial Condition

The PSM for the service on the IUT that requires Security Mode 4, Level 3 is specified in the IXIT.

On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

ACL connection does not exist between the devices.
• Test Procedure

Lower Tester

IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).
ACL connection does not exist between the devices.

Bring IUT in Secure Connections Only Mode

Bring IUT in connectable mode

Establish ACL connection

The IUT is allowed to reject the pairing procedure. If the IUT rejects the pairing procedure then the test case ends there.

Simple Pairing Procedures

Simple Pairing Complete (Authenticated link key)

Encryption LMP messages

L2CAP_ConnectReq
(ID, length, PSM, SCID)

L2CAP_ConnectRsp
(ID, length, DCID, SCID, result=Connection refused-security block, status)

The IUT may optionally disconnect the ACL with error code 0x05

An intermediate L2CAP_ConnectRsp (result pending) is possible

Figure 4.26: GAP/SEC/SEM/BV-12-C

Upper Tester puts the IUT in Secure Connections Only Mode and connectable mode.

Lower Tester creates an ACL connection with the IUT.

Lower Tester performs the Secure Simple Pairing procedure that results in an authenticated link key and enables encryption. The IUT is allowed to reject this pairing procedure. If the IUT rejects the pairing procedure then the test case ends there.

Lower Tester requests establishing a channel to access a service on the IUT that requires Security Mode 4, Level 3.
• Test Condition

It must be possible to put the IUT in Secure Connections Only Mode and in connectable mode.

• Expected Outcome

Pass Verdict

The IUT rejects the pairing procedure OR

The pairing procedure succeeds and the IUT then rejects the Lower Tester’s request to establish a channel to access a service on the IUT that requires Security Mode 4, Level 3 OR

The IUT disconnects the ACL connection with error code 0x05 (Authentication Failure).

• Notes

When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.3.7 GAP/SEC/SEM/BV-13-C [Secure Connections Only Mode – IUT slave, responder, Lower Tester supports Secure Connections in Controller and Host]

• Test Purpose

The Lower Tester supports Secure Connections both at the Controller and Host level. Verify that the IUT in Secure Connections Only Mode accepts a request to perform a channel establishment procedure if the service on the IUT requires Security Mode 4, Level 3. The IUT is slave and responder of the channel establishment procedure.

• Reference

[1] 5.2.2

• Initial Condition

The PSM for the service on the IUT that requires Security Mode 4, Level 3 is specified in the IXIT.

Set both the Secure Connections (Controller Support) and the Secure Connections (Host Support) LMP feature bits on the Lower Tester to 1.

IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

ACL connection does not exist between the devices.
- Test Procedure

**Figure 4.27: GAP/SEC/SEM/BV-13-C**

Upper Tester puts the IUT in Secure Connections Only Mode and connectable mode.

Lower Tester creates an ACL connection with the IUT.

Lower Tester performs the Secure Simple Pairing procedure that results in an authenticated link key and enables encryption.

Lower Tester requests establishing a channel to access a service on the IUT that requires Security Mode 4, Level 3.
• Test Condition
  It must be possible to put the IUT in Secure Connections Only Mode and in connectable mode.

• Expected Outcome
  Pass Verdict
  The IUT accepts the Lower Tester’s request to establish a channel to access a service on the IUT that requires Security Mode 4, Level 3 and the channel establishment procedure is successful.

• Notes
  When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.3.8  GAP/SEC/SEM/BV-14-C [IUT slave, responder, not in Secure Connections Only Mode, Lower Tester does not support Secure Connections in Host]

• Test Purpose
  The Lower Tester does not support Secure Connections at the Host level. Verify that the IUT that is not in Secure Connections Only Mode accepts a request to perform a channel establishment procedure if the service on the IUT requires Security Mode 4, Level 3. The IUT is slave and responder of the channel establishment procedure.

• Reference
  [1] 5.2.2

• Initial Condition
  The PSM for the service on the IUT that requires Security Mode 4, Level 3 is specified in the IXIT.

  On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

  ACL connection does not exist between the devices.
• Test Procedure

**Figure 4.28: GAP/SEC/SEM/BV-14-C**

Upper Tester puts the IUT in Security Mode 4 (but not in Secure Connections Only Mode) and connectable mode.

Lower Tester creates an ACL connection with the IUT.

Lower Tester performs the Secure Simple Pairing procedure that results in an authenticated link key and enables encryption.

Lower Tester requests establishing a channel to access a service on the IUT that requires Security Mode 4, Level 3.
• Test Condition
  It must be possible to put the IUT in Security Mode 4 (but not in Secure Connections Only Mode) and in connectable mode.

• Expected Outcome
  Pass Verdict
  The IUT accepts the Lower Tester's request to establish a channel to access a service on the IUT that requires Security Mode 4, Level 3 and the channel establishment procedure is successful.

4.4.3.9  GAP/SEC/SEM/BV-15-C [IUT slave, responder, not in Secure Connections Only Mode, Lower Tester does not support Secure Connections in Host, level 4 service]

• Test Purpose
  The Lower Tester does not support Secure Connections at the Host level. Verify that the IUT that is not in Secure Connections Only Mode rejects a request to perform a channel establishment procedure if the service on the IUT requires Security Mode 4, Level 4. The IUT is slave and responder of the channel establishment procedure.

• Reference
  [1] 5.2.2

• Initial Condition
  The PSM for the service on the IUT that requires Security Mode 4, Level 4 is specified in the IXIT.

  On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

  ACL connection does not exist between the devices.
Test Procedure

**Figure 4.29: GAP/SEC/SEM/BV-15-C**

Upper Tester puts the IUT in Security Mode 4 (but not in Secure Connections Only Mode) and connectable mode.

Lower Tester creates an ACL connection with the IUT.

Lower Tester performs the Secure Simple Pairing procedure that results an authenticated link key and enables encryption.

Lower Tester requests establishing a channel to access a service on the IUT that requires Security Mode 4, Level 4.
• Test Condition
  It must be possible to put the IUT in Security Mode 4 (but not in Secure Connections Only Mode) and in connectable mode.

• Expected Outcome
  Pass Verdict
  The Secure Simple Pairing procedure between the IUT and the Lower Tester is successful.
  The IUT rejects the Lower Tester’s request to establish a channel to access a service on the IUT that requires Security Mode 4, Level 4.

4.4.3.10 GAP/SEC/SEM/BV-21-C [LE Security Mode: Mode 1 Level 4, Peripheral – outgoing service level connection]

• Test Purpose
  Verify that the IUT in LE Security Mode 1 Level 4 performing the authentication procedure will achieve a connection operating in LE Security Mode 1 Level 4. The Lower Tester supports LE Secure Connections. The IUT is the Peripheral.

• Reference
  [12] 10.3

• Initial Condition
  The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.

• Test Procedure
  1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
  2. The Upper Tester configures the IUT to advertise (in Peripheral role) for a connection by the Lower Tester (in Central role), and accept link establishment.
  3. The Upper Tester triggers the authentication procedure on the IUT, e.g., by an L2CAP channel establishment or a GATT service request.
  4. The IUT begins LE Secure Connections Phase 1 by sending an SMP Security Request, with the Secure Connections bit set to 1. The Lower Tester responds with an SMP Pairing Request, with the Secure Connections bit set to 1. The IUT answers with SMP Pairing Response, with the Secure Connections bit set to 1.
  5. The Lower Tester and the IUT complete SMP Phase 2 (pairing) and Phase 3 (encryption and key distribution).
Upper Tester
IUT
(Peripheral)
Lower Tester
(Central)
Lower Tester finds IUT
Establishes LE connection

**LE Secure Connections Phase 1**
- SMP Security Req.
  - AuthReq.SC=1
- SMP Pairing Req.
  - AuthReq.SC=1
- SMP Pairing Resp.
  - AuthReq.SC=1

**LE Secure Connections Phase 2:**
Public Key Exchange
Authentication Stages 1 & 2
LE transport encryption

**LE Secure Connections Phase 3:**
Key distribution

**ALT 1**
- GATT service request success
- L2CAP channel establishment success

**ALT 2**
- GATT service request success
- L2CAP channel establishment success

- **Expected Outcome**
  - *Pass verdict*

  The Lower Tester and the IUT complete SMP phases 1, 2, and 3. The resulting connection is encrypted and operating in LE Security Mode 1 Level 4.

- **Notes**
  - It is recommended to test with a service or profile that requires Security Mode 1 level 4.

**4.4.3.11 GAP/SEC/SEM/BV-22-C [LE Security Mode: Mode 1 Level 4, Peripheral – incoming service level connection]**

- **Test Purpose**
  - Verify that the IUT in LE Security Mode 1 Level 4 rejects an L2CAP channel establishment or GATT service request until the authentication procedure has been performed and the connection is operating in LE Security Mode 1 Level 4. The Lower Tester supports LE Secure Connections. The IUT is the Peripheral.
• Reference

[12] 10.3.1

• Initial Condition

The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject a correctly initiated procedure to either establish an L2CAP channel or a GATT service request.

• Test Procedure

1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
2. The Upper Tester configures the IUT to advertise (in Peripheral role) for a connection by the Lower Tester (in Central role), and accept link establishment.
3. The Lower Tester sends either an L2CAP channel establishment or GATT service request to the IUT.
4. The IUT rejects the request for not meeting security requirements.
5. The Lower Tester initiates authenticated LE Secure Connections pairing.
6. The Lower Tester and the IUT complete SMP Phase 1, Phase 2 (pairing) and Phase 3 (encryption and key distribution).
7. The Lower Tester re-initiates the procedure request to the IUT as attempted in step 3.
8. The IUT replies with a successful response.
• Expected Outcome

Pass verdict

The L2CAP channel establishment or GATT service request is rejected before the authentication procedure.

The Lower Tester and the IUT complete SMP phases 1, 2, and 3. The resulting connection is encrypted on LE Security Mode 1 Level 4.

After the authentication procedure, the L2CAP channel establishment or GATT service request is successful.

• Notes

It is recommended to test with a service or profile that requires Security Mode 1 level 4.
4.4.3.12 GAP/SEC/SEM/BV-23-C [Secure Connections Only Mode – Failed Procedure, Peripheral – outgoing service level connection]

- Test Purpose
  Verify that the IUT in Secure Connections Only Mode initiating the authentication procedure will result in a failed procedure when performed toward a peer not supporting LE Secure Connections. The Lower Tester does not support LE Secure Connections. The IUT is the Peripheral.

- Reference
  [12] 10.2.4, 10.3

- Initial Condition
  The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.
  
  The Lower Tester is configured so that it does not support LE Secure Connections.

- Test Procedure
  1. The Upper Tester configures the IUT into Secure Connections Only Mode.
  2. The Upper Tester configures the IUT (in Peripheral role) to send advertising packets to the Lower Tester (in Central role), and complete link establishment with the Lower Tester.
  3. The Upper Tester triggers the authentication procedure on the IUT, e.g., by an L2CAP channel establishment or a GATT service request.
  4. The IUT begins the LE Pairing Procedure Phase 1 by sending an SMP Security Request, with the Secure Connections bit set to 1. The Lower Tester responds with an SMP Pairing Request, with the Secure Connections bit set to 0. The IUT will respond with an SMP Pairing Failed message.
• Expected Outcome

**Pass verdict**

IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.

4.4.3.13 GAP/SEC/SEM/BV-24-C [Secure Connections Only Mode – Failed Procedure, Peripheral – incoming service level connection]

• Test Purpose

Verify that the IUT in Secure Connections Only Mode rejects an L2CAP channel establishment or GATT service request both before and after the authentication procedure when performed toward a peer not supporting LE Secure Connections. The Lower Tester does not support LE Secure Connections. The IUT is the Peripheral.

• Reference

[12] 10.2.4, 10.3.1

• Initial Condition

The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject a correctly initiated procedure to either establish an L2CAP channel or a GATT service request.

The Lower Tester is configured so that it does not support LE Secure Connections.
• **Test Procedure**

1. The Upper Tester configures the IUT into Secure Connections Only Mode.
2. The Upper Tester configures the IUT (in Peripheral role) to send advertising packets to the Lower Tester (in Central role), and complete link establishment with the Lower Tester.
3. The Lower Tester initiates either an L2CAP channel establishment or GATT service request to the IUT.
4. The IUT rejects the request.
5. The Lower Tester initiates authenticated LE Legacy pairing.
6. Alternative 1: the IUT rejects the pairing by sending an SMP Pairing Failed message. Alternative 2: the Lower Tester and the IUT complete LE legacy pairing. The Lower Tester re-initiates the procedure request to the IUT as attempted in step 3. The IUT rejects the request.
• Expected Outcome

Pass verdict

The L2CAP channel establishment or GATT service request is rejected before the authentication procedure.

Alternative 1: IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.

Alternative 2: The IUT and the Lower Tester complete LE legacy pairing and the IUT rejects the initiated procedure request from the Lower Tester with the error code “Insufficient Authentication”.

4.4.3.14 GAP/SEC/SEM/BV-25-C [Secure Connections Only Mode, Slave, Failure, BR/EDR and LE Transports]

• Test Purpose

Verify that the IUT in Secure Connections Only Mode performs either an L2CAP channel establishment or GATT service request procedure over LE and a channel establishment procedure over BR/EDR. The IUT is initiator of the procedure over both LE and BR/EDR. The Lower Tester supports neither LE Secure Connections nor BR/EDR Secure Connections. The procedure fails over both LE and BR/EDR. The IUT is the Peripheral.

• Reference

[12] 10.2.4

• Initial Condition

The IUT supports both LE Secure Connections and BR/EDR Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.

The Lower Tester is configured so that it does not support LE Secure Connections and BR/EDR Secure Connections.

The PSM for the service on the IUT that requires Security Mode 4, Level 3 on BR/EDR is specified in the IXIT.

IUT and Lower Tester are not bonded on BR/EDR (Neither IUT nor Lower Tester has link keys).

BR/EDR ACL connection does not exist between the devices.

• Test Procedure

1. The Upper Tester configures the IUT into Secure Connections Only Mode.
2. The Upper Tester configures the IUT (in Peripheral role) to send advertising packets to the Lower Tester (in Central role), and complete link establishment with the Lower Tester.
3. The IUT begins the LE Pairing Procedure Phase 1 by sending an SMP Security Request, with the Secure Connections bit set to 1. The Lower Tester responds with an SMP Pairing Request, with the Secure Connections bit set to 0. The IUT will respond with an SMP Pairing Failed message.
4. The IUT terminates the LE connection.
5. The Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.
6. The IUT creates an ACL connection with the Lower Tester and may optionally perform the Secure Simple Pairing procedure with the Lower Tester.

- Expected Outcome

  **Pass verdict**

  On the LE transport, the IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.

  On the BR/EDR transport, the IUT rejects the Upper Tester’s request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT.
4.4.3.15 GAP/SEC/SEM/BI-01-C [Security Mode 2, Responder - Invalid Encryption Key Size]

• Test Purpose

Verify that the IUT in Security Mode 2 rejects channel establishment with an invalid encryption key size.

The Lower Tester is initiator of the channel establishment procedure. The IUT is responder.

• Reference

[1] 5.2

• Initial Condition

The Lower Tester is in Security Mode 2 and thus the IUT operates in Security Mode 2 during the connection with the Lower Tester.

The IUT is configured such that it will not reject the channel establishment procedure for any other reasons.

The IUT and Lower Tester are in a connection and have exchanged a link key with the correct level of authentication while pairing in Security Mode 2, either during this connection or in a previous connection with bonding. Link has not yet been encrypted.

The minimum encryption key size supported is defined in the “TSPX_Min_Encryption_Key_Size” IXIT parameter.

• Test Procedure

![Diagram of test procedure]

Figure 4.30: Security Mode 2, Responder - Invalid Key Size
Repeat steps 1–4 for each value of the encryption key size (in step 3) in the range [1, TSPX_Min_Encryption_Key_Size – 1]:

1. Bring the IUT and the Lower Tester into the Initial Condition.
2. The Lower Tester performs a channel establishment procedure for a service requiring Security Mode 2.
3. The IUT triggers link encryption and the Lower Tester requests an encryption key size equal to the value selected for the current iteration. The IUT may accept the key size or may fail the link encryption procedure.
4. The IUT rejects the channel establishment after link encryption has been completed.

- Test Condition

   It must be possible to put the IUT in Security Mode 2 and in connectable mode if non-connectable mode is supported. It must be possible to make sure that the device will not reject the channel establishment procedure, thus an L2CAP_ConnectRspNeg shall not be sent by the IUT. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

- Expected Outcome

   Pass Verdict

   For each requested value of the encryption key size that is less than the minimum supported encryption key size, the IUT rejects the channel establishment over the insufficiently encrypted link. Optionally, the IUT also fails the link encryption procedure.

4.4.3.16 [Security Mode 4, Responder - Invalid Encryption Key Size]

- Test Purpose

   Verify that the IUT in Security Mode 4 rejects channel establishment with an invalid encryption key size.

   The Lower Tester is initiator of the channel establishment procedure. The IUT is responder.

- Reference

   [1] 5.2

- Initial Condition

   The IUT is in Security Mode and Level indicated in the test procedure and is configured such that it will not reject the channel establishment procedure for any other reasons.

   The IUT and Lower Tester are in a connection and have exchanged a link key with the correct level of authentication while pairing in the same Security Mode and Level indicated in the test procedure, either during this connection or in a previous connection with bonding. Link has not yet been encrypted.

   The minimum encryption key size supported is defined in the “TSPX_Min_Encryption_Key_Size” IXIT parameter.
• Test Procedure

Repeat for each value KS smaller than the minimum valid encryption key size

IUT and Lower Tester have established a Link Key in Security Mode 4 Level Y
IUT and Lower Tester are in a connection; link is not encrypted

Perform Link Encryption
(Lower Tester requests encryption key size KS)
[IUT may reject the procedure]

L2CAP_ConnectReq
(Service requiring Security Mode 4 Level Y)

L2CAP_ConnectRsp
(Rejected due to Connection refused – security block)

Figure 4.31: Security Modes 2 and 4, Responder - Invalid Key Size

Repeat steps 1–4 for each value of the encryption key size (in step 3) in the range [1, Min_Key_Size – 1], where Min_Key_Size is indicated in Table 4.2, column Minimum Key Size, for each test case.

1. Bring the IUT and the Lower Tester into the Initial Condition for the Security Mode and Level indicated in Table 4.2, column Security Mode and Level.
2. The Lower Tester and IUT perform link encryption and the Lower Tester requests an encryption key size equal to the value selected for the current iteration. The IUT may accept the key size or may fail the link encryption procedure.
3. The Lower Tester requests a channel establishment for a service requiring the same Security Mode and Level as indicated in step 1.
4. The IUT rejects the channel establishment after link encryption has been completed.
### Test Case Configuration

<table>
<thead>
<tr>
<th>TCID</th>
<th>Security Mode and Level</th>
<th>Minimum Key Size (octets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4.3.16.1 GAP/SEC/SEM/BI-11-C [Security Mode 4 Level 1, Responder - Invalid Encryption Key Size]</td>
<td>Security Mode 4 Level 1</td>
<td>TSPX_Min_Encryption_Key_Size</td>
</tr>
<tr>
<td>4.4.3.16.2 GAP/SEC/SEM/BI-02-C [Security Mode 4 Level 2, Responder - Invalid Encryption Key Size]</td>
<td>Security Mode 4 Level 2</td>
<td>TSPX_Min_Encryption_Key_Size</td>
</tr>
<tr>
<td>4.4.3.16.3 GAP/SEC/SEM/BI-03-C [Security Mode 4 Level 3, Responder - Invalid Encryption Key Size]</td>
<td>Security Mode 4 Level 3</td>
<td>TSPX_Min_Encryption_Key_Size</td>
</tr>
<tr>
<td>4.4.3.16.4 GAP/SEC/SEM/BI-04-C [Security Mode 4 Level 4, Responder - Invalid Encryption Key Size]</td>
<td>Security Model 4 Level 4</td>
<td>16</td>
</tr>
</tbody>
</table>

*Table 4.2: Security Mode 4, Responder - Invalid Encryption Key Size Test Cases*

- **Test Condition**

  It must be possible to put the IUT in the security mode and level under test and in connectable mode if non-connectable mode is supported. It must be possible to make sure that the device will not reject the channel establishment procedure, thus an L2CAP_ConnectRspNeg shall not be sent by the IUT. The Lower Tester has to know the BD_ADDR and the CoD of the IUT.

- **Expected Outcome**

  **Pass Verdict**

  For each requested value of the encryption key size that is less than the minimum required by the security mode and level under test, the IUT rejects the channel establishment over the insufficiently encrypted link. Optionally, the IUT also fails the link encryption procedure.

### 4.4.3.17 GAP/SEC/SEM/BI-05-C [Security Mode 2, Initiator - Invalid Key Size]

- **Test Purpose**

  Verify that the IUT in Security Mode 2 rejects channel establishment with an invalid encryption key size.

  The IUT is initiator of the channel establishment procedure. The Lower Tester is responder.

- **Reference**

  [1] 5.2
• **Initial Condition**

The Lower Tester is in Security Mode 2 and thus the IUT operates in Security Mode 2 during the connection with the Lower Tester.

The IUT and Lower Tester are in a connection and have exchanged a link key with the correct level of authentication while pairing in the same Security Mode and Level indicated in the test procedure, either during this connection or in a previous connection with bonding. Link has not yet been encrypted.

The minimum encryption key size supported is defined in the “TSPX_Min_Encryption_Key_Size” IXIT parameter.

• **Test Procedure**

Repeat for each value KS smaller than the minimum supported encryption key size

IUT and Lower Tester have established a Link Key in Security Mode 2
IUT and Lower Tester are in a connection; link is not encrypted

Perform Link Encryption
(Lower Tester requests encryption key size KS)
[IUT may reject the procedure]

Establish Channel in Security Mode 2

Channel Establishment Failure:
(Rejected due to Connection refused – security block)

---

*Figure 4.32: Security Mode 2, Initiator - Invalid Key Size*

Repeat steps 1–4 for each value of the encryption key size (in step 3) in the range [1, TSPX_Min_Encryption_Key_Size – 1]:

1. Bring the IUT and the Lower Tester into the Initial Condition.
2. The Upper Tester orders the IUT to perform a channel establishment procedure for a service requiring Security Mode 2. The IUT initiates link encryption.
3. In the link encryption phase, the Lower Tester requests an encryption key size equal to the value selected for the current iteration. The IUT may accept the key size or may fail the link encryption procedure.
4. The IUT signals to the Upper Tester that the channel establishment failure after link encryption has been completed.
• Test Condition
  It must be possible to put the IUT in Security Mode 2 and in connectable mode if non-connectable mode is supported.

• Expected Outcome
  Pass Verdict

  For each requested value of the encryption key size that is less than the minimum supported encryption key size, the IUT fails the channel establishment due to the insufficiently encrypted link. Optionally, the IUT also fails the link encryption procedure.

4.4.3.18 [Security Mode 4, Initiator - Invalid Encryption Key Size]

• Test Purpose
  Verify that the IUT in Security Mode 4 rejects channel establishment with an invalid encryption key size.

  The IUT is initiator of the channel establishment procedure. The Lower Tester is responder.

• Reference
  [1] 5.2

• Initial Condition
  The IUT is in Security Mode and Level indicated in the test procedure.

  The IUT and Lower Tester are in a connection and have exchanged a link key with the correct level of authentication while pairing in the same Security Mode and Level indicated in the test procedure, either during this connection or in a previous connection with bonding. Link has not yet been encrypted.

  The minimum encryption key size supported is defined in the “TSPX_Min_Encryption_Key_Size” IXIT parameter.
Test Procedure

1. Bring the IUT and the Lower Tester into the Initial Condition for Security Mode and Level indicated in Table 4.3, column Security Mode and Level.
2. The Upper Tester orders the IUT to perform a channel establishment procedure for a service requiring the same Security Mode and Level as indicated in step 1. The IUT initiates link encryption with the Lower Tester.
3. In the link encryption phase, the Lower Tester requests an encryption key size equal to the value selected for the current iteration. The IUT may accept the key size or may fail the link encryption procedure.
4. The IUT signals to the Upper Tester that the channel establishment failure after link encryption has been completed.

Repeat steps 1–4 for each value of the encryption key size (in step 3) in the range \([1, (\text{Min\_Key\_Size} – 1)]\), where \(\text{Min\_Key\_Size}\) is indicated in Table 4.3, column Minimum Key Size, for each test case.
• Test Case Configuration

<table>
<thead>
<tr>
<th>TCID</th>
<th>Security Mode and Level</th>
<th>Minimum Key Size (octets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4.3.18.1</td>
<td>GAP/SEC/SEM/BI-12-C</td>
<td>Security Mode 4 Level 1</td>
</tr>
<tr>
<td></td>
<td>[Security Mode 4 Level 1, Initiator - Invalid Encryption Key Size]</td>
<td></td>
</tr>
<tr>
<td>4.4.3.18.2</td>
<td>GAP/SEC/SEM/BI-06-C</td>
<td>Security Mode 4 Level 2</td>
</tr>
<tr>
<td></td>
<td>[Security Mode 4 Level 2, Initiator - Invalid Encryption Key Size]</td>
<td></td>
</tr>
<tr>
<td>4.4.3.18.3</td>
<td>GAP/SEC/SEM/BI-07-C</td>
<td>Security Mode 4 Level 3</td>
</tr>
<tr>
<td></td>
<td>[Security Mode 4 Level 3, Initiator - Invalid Encryption Key Size]</td>
<td></td>
</tr>
<tr>
<td>4.4.3.18.4</td>
<td>GAP/SEC/SEM/BI-08-C</td>
<td>Security Mode 4 Level 4</td>
</tr>
<tr>
<td></td>
<td>[Security Mode 4 Level 4, Initiator - Invalid Encryption Key Size]</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3: Security Mode 4, Initiator - Invalid Encryption Key Size Test Cases

• Test Condition

It must be possible to put the IUT in the security mode and level under test and in connectable mode if non-connectable mode is supported.

• Expected Outcome

Pass Verdict

For each requested value of the encryption key size that is less than the minimum required by the security mode and level under test, the IUT fails the channel establishment due to the insufficiently encrypted link. Optionally, the IUT also fails the link encryption procedure.

4.4.3.19 GAP/SEC/SEM/BI-09-C [LE Security Mode 1 Level 4, Peripheral - Invalid Encryption Key Size]

• Test Purpose

Verify that the IUT in LE Security Mode 1 Level 4 as Peripheral fails pairing when receiving an invalid key size.

• Reference

[12] 10.3.2, 10.2.1

• Initial Condition

The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.
Test Procedure

1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
2. The Upper Tester configures the IUT to advertise (in Peripheral role) for a connection by the Lower Tester (in Central role), and to accept link establishment.
3. The Lower Tester initiates pairing by sending an SMP Pairing Request, with the Secure Connections bit set to 1 and Maximum Encryption Key Size set to the value selected for this iteration.
4. The IUT sends to the Lower Tester an SMP Pairing Failed with the Reason set to “Encryption Key Size” (0x06).
5. The Lower Tester terminates the LE connection.

Expected Outcome

Pass verdict

The IUT fails pairing for any key size value less than 16 while in Security Mode 1 Level 4.

4.4.3.20 GAP/SEC/SEM/BI-10-C [LE Security Mode 1 Level 4, Central - Invalid Encryption Key Size]

Test Purpose

Verify that the IUT in LE Security Mode 1 Level 4 as Central fails pairing when receiving an invalid key size.
• Reference
   [12] 10.3.2, 10.2.1

• Initial Condition
   The IUT is in Link Layer ‘Standby’ state.

• Test Procedure

   1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
   2. The Upper Tester configures the IUT to connect to the Lower Tester.
   3. The Upper Tester orders the IUT to initiate pairing, and the IUT sends to the Lower Tester an SMP Pairing Request with the Secure Connections bit set to 1 and Maximum Encryption Key Size set to 16.
   4. The Lower Tester responds with an SMP Pairing Response, with the Secure Connections bit set to 1 and Maximum Encryption Key Size set to the value selected for this iteration.
   5. The IUT sends to the Lower Tester an SMP Pairing Failed with the Reason set to “Encryption Key Size” (0x06) and to report the procedure failure to the Upper Tester.
   6. The Lower Tester terminates the LE connection.

---

Figure 4.35: LE Security Mode 1 Level 4, Central - Invalid Encryption Key Size

Repeat steps 1–6 for all values of the Maximum Encryption Key Size field (in step 4) in the interval [7, 15].

• Expected Outcome
  
  Pass verdict

The IUT fails pairing for any key size value less than 16 while in Security Mode 1 Level 4.

4.4.4 Security Modes - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

4.4.4.1 GAP/SEC/SEM/BV-05-C [Security Mode 4 – Initiator]

• Test Purpose
  
  Verify that the IUT in security mode 4 performs a channel establishment procedure. The Lower Tester is responder. The IUT is initiator of the channel establishment procedure.

• Reference
  
  [17] 5.2.2

• Initial Condition
  
  Write_Authentication_Enable (disabled) on IUT.

  Write_Simple_Pairing_Mode is set (enabled) on the Lower Tester acting as responder.

  No link key is on IUT.
**Test Procedure**

IUT and Lower Tester are not bonded. (Neither IUT nor Lower Tester has link keys) ACL link does not exist between the devices.

- Bring IUT in Security Mode 4
- Initiate action to trigger an L2CAP Connection with tester

**Simple Pairing Complete (Un-Authenticated link key)**

Encryption messages

L2CAP_ConnectReq
(ID, length, PSM, SCID)

L2CAP_ConnectRsp
(ID, length, DCID, SCID, result, status)

**Figure 4.36: GAP/SEC/SEM/BV-05-C**

IUT creates L2CAP connection to the Lower Tester.

Set Authentication Requirements to MITM protection not required and non-bonding on IUT.

Set Authentication Requirements to MITM protection not required and non-bonding on responder.

**Expected Outcome**

**Pass Verdict**

Verify that simple pairing occurs prior to sending the L2CAP_ConnectReq and before the L2CAP_ConnectRsp is received, and results in an unauthenticated link key.

Verify that encryption is enabled.
4.4.4.2 GAP/SEC/SEM/BV-06-C [Security Mode 4 – Initiator]

- Test Purpose
  Verify that simple pairing occurs prior to sending the L2CAP_ConnectReq and before the L2CAP_ConnectRsp is received, and results in an authenticated link key.

- Reference
  [17] 5.2.2

- Initial Condition
  Write_Authentication_Enable (disabled) on IUT.
  Write_Simple_Pairing_Mode is set (enabled) on the Lower Tester acting as responder.
  No link key is on IUT.

- Test Procedure

  ![Test Procedure Diagram]

  **Figure 4.37: GAP/SEC/SEM/BV-06-C**
IUT creates L2CAP connection to Lower Tester.

Set Authentication Requirements to MITM protection not required and non-bonding on IUT.

Set Authentication Requirements to MITM protection required and non-bonding on responder.

- **Expected Outcome**
  
  **Pass Verdict**
  
  Verify that simple pairing occurs prior to sending the L2CAP_ConnectReq and before the L2CAP_ConnectRsp is received, and results in an authenticated link key.

  Verify that encryption is enabled.

**4.4.4.3  GAP/SEC/SEM/BV-07-C [Security Mode 4 – Initiator]**

- **Test Purpose**
  
  Verify that simple pairing occurs before the L2CAP_ConnectReq is sent and results in an authenticated link key.

- **Reference**
  
  [17] 5.2.2

- **Initial Condition**
  
  Write_Authentication_Enable (disabled) on IUT.

  Write_Simple_Pairing_Mode is set (enabled) on the Lower Tester acting as responder.

  Delete link key on IUT.
Test Procedure

IUT and Lower Tester are bonded by Secure Simple Pairing. (i.e. Both IUT and Lower Tester have link keys)
ACL link does not exist between the devices.

Bring IUT in Security Mode 4
Delete the link-key on IUT

Initial condition achieved. IUT does not have link key for the Lower Tester.

Establish ACL link

Secure Simple Pairing Procedure
MITM Protection Not Required, No Bonding on Lower Tester
MITM Protection Required, No Bonding on IUT

Simple Pairing Complete (Authenticated link key)

Encryption messages

L2CAP_ConnectReq
(ID, length, PSM, SCID)
L2CAP_ConnectRsp
(ID, length, DCID, SCID, result, status)

Figure 4.38: GAP/SEC/SEM/BV-07-C

IUT creates L2CAP connection to Lower Tester.

Set Authentication_Requirements to “MITM Protection Required and NoBonding” (0x01) on IUT.

Set Authentication_Requirements to “MITM Protection Not Required No Bonding” (0x00) on the Lower Tester.
• Expected Outcome
  
  Pass Verdict

Verify that simple pairing occurs before the L2CAP_ConnectReq is sent, and results in an authenticated link key.

Verify that encryption is enabled.

4.4.4.4 GAP/SEC/SEM/BV-08-C [Security Mode 4 – Initiator]

• Test Purpose
  
  Verify that authentication succeeds and occurs before the L2CAP Connection request.

• Reference
  
  [17] 5.2.2

• Initial Condition
  
  Write_Authentication_Enable (disabled) on IUT.

  Write_Simple_Pairing_Mode is set (enabled).

  Link key is on IUT and responder.

• Test Procedure

  IUT and Lower Tester are bonded by Secure Simple Pairing. (i.e. Both IUT and Lower Tester have link keys)  
  ACL link does not exist between the devices.

  Bring IUT in Security Mode 4

  Initiate action to trigger an L2CAP Connection with the Lower Tester

  Establish ACL link

  Authentication procedure

  Encryption messages

  L2CAP_ConnectReq

  (ID, length, PSM, SCID)

  L2CAP_ConnectRsp

  (ID, length, DCID, SCID, result, status)

  IUT creates L2CAP connection to the Lower Tester.
• **Expected Outcome**

**Pass Verdict**

Verify that authentication succeeds and occurs before the L2CAP_ConnectReq.

Verify that encryption is enabled.

**4.4.4.5 GAP/SEC/SEM/BV-09-C [Security Mode 4 – Initiator]**

• **Test Purpose**

Verify that a link key can be upgraded from unauthenticated to authenticated.

• **Reference**

[17] 5.2.2

• **Initial Condition**

Write_Authentication_Enable (disabled) on IUT.

Write_Simple_Pairing_Mode is set (enabled) on the Lower Tester acting as responder.

No link key is on IUT.
**Test Procedure**

IUT and Lower Tester are not bonded. (Neither IUT nor Lower Tester has link keys) ACL link does not exist between the devices.

Bring IUT in Security Mode

Initiate action to trigger an L2CAP Connection with the Lower Tester

Establish ACL link

Secure Simple Pairing Procedure
MITM Protection Not Required, No Bonding on Lower Tester
MITM Protection Not Required, No Bonding on IUT

Enabling of Encryption messages

Simple Pairing Complete (Un-authenticated link key)

L2CAP ConnectReq
(ID, length, PSM, SCID)

L2CAP ConnectRsp
(ID, length, DCID, SCID, result, status)

L2CAP ConfigReq
(ID, length, DCID, flags, IUT, options)

L2CAP connection procedures

Initiate action to trigger a second L2CAP connection with the Lower Tester for a service which requires authenticated link key

Secure Simple Pairing Procedure
MITM Protection Required, No Bonding on Lower Tester
MITM Protection Required, No Bonding on IUT

Simple Pairing Complete (Authenticated link key)

Encryption Pause and Resume messages

L2CAP ConnectReq
(ID, length, PSM, SCID)

L2CAP ConnectRsp
(ID, length, DCID, SCID, result, status)

Figure 4.40: GAP/SEC/SEM/BV-09-C
IUT creates L2CAP connection to Lower Tester.

Set Authentication_Requirements to "MITM Protection Not Required – No Bonding" (0x00) on the IUT.

Set Authentication_Requirements to "MITM Protection Not Required - No Bonding" (0x00) on the responder.

IUT initializes a second service to Lower Tester that requires an authenticated link key.

Set Authentication_Requirements to "MITM Protection Required – No Bonding" (0x01) on the IUT.

Set Authentication_Requirements to "MITM Protection Required - No Bonding" (0x01) on the responder.

• Expected Outcome

  **Pass Verdict**

  On initial connection, verify that simple pairing occurs prior to sending the L2CAP_ConnectReq and before the L2CAP_ConnectRsp is received, and results in an unauthenticated link key.

  Verify that encryption is enabled.

  On second service initialization, verify that Simple Pairing occurs before the L2CAP_ConnectReq and results in an authenticated link key.

4.4.4.6 **GAP/SEC/SEM/BV-10-C [Security Mode 4 – Responder]**

• Test Purpose

  Verify that the IUT disconnects the connection if the initiating side sends the L2CAP_ConnectReq without first enabling encryption.

• Reference

  [17] 5.2.2

• Initial Condition

  Write Authentication_Enable (disabled) on IUT.

  Write Simple Pairing Mode is set (enabled) on the Lower Tester acting as responder.

  No link key is on IUT.
• **Test Procedure**

Lower Tester creates L2CAP connection to IUT.

Set Authentication_Requirements to "MITM Protection Not Required No Bonding" (0x00) on IUT.

Set Authentication_Requirements to "MITM Protection Not Required No Bonding" (0x00) on the responder.

Lower Tester sends L2CAP_ConnectReq without performing Simple Pairing and without enabling encrypting.

• **Expected Outcome**

**Pass Verdict**

Based on ALT 1 shown in *Figure 4.41: GAP/SEC/SEM/BV-10-C* the test results in pass when the IUT initiates the Simple Pairing procedure autonomously before the Lower Tester initiates the L2CAP connection.

---

*Figure 4.41: GAP/SEC/SEM/BV-10-C*

Lower Tester creates L2CAP connection to IUT.

Set Authentication_Requirements to "MITM Protection Not Required No Bonding" (0x00) on IUT.

Set Authentication_Requirements to "MITM Protection Not Required No Bonding" (0x00) on the responder.

Lower Tester sends L2CAP_ConnectReq without performing Simple Pairing and without enabling encrypting.

• **Expected Outcome**

**Pass Verdict**

Based on ALT 1 shown in *Figure 4.41: GAP/SEC/SEM/BV-10-C* the test results in pass when the IUT initiates the Simple Pairing procedure autonomously before the Lower Tester initiates the L2CAP connection.
Based on ALT 2 shown in Figure 4.41: GAP/SEC/SEM/BV-10-C the test will result in pass when the IUT rejects the L2CAP connection and disconnects the ACL link with error code authentication failure 0x05.

4.4.4.7 GAP/SEC/SEM/BV-16-C [Secure Connections Only Mode – IUT master, initiator, Lower Tester doesn’t support Secure Connections in Controller]

- **Test Purpose**
  The Lower Tester doesn’t support Secure Connections at the Controller level. Verify that the IUT in Secure Connections Only Mode rejects a request to perform a channel establishment procedure if the service requires Security Mode 4, Level 3 on the IUT. The IUT is master and initiator of the channel establishment procedure.

- **Reference**
  [1] 5.2.2

- **Initial Condition**
  The PSM for the service that requires Security Mode 4, Level 3 on the IUT is specified in the IXIT.
  
  Set the Secure Connections (Controller Support) LMP feature bit on the Lower Tester to 0.
  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).
  ACL connection does not exist between the devices.

- **Test Procedure**

  ![Diagram](Figure 4.42: GAP/SEC/SEM/BV-16-C)

  Upper Tester puts the IUT in Secure Connections Only Mode.
  Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.
IUT creates an ACL connection with the Lower Tester and may optionally perform the Secure Simple Pairing procedure with the Lower Tester.

- Test Condition
  It must be possible to put the IUT in Secure Connections Only Mode.

- Expected Outcome
  Pass Verdict
  The IUT rejects the Upper Tester’s request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT.

- Notes
  When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.4.8 GAP/SEC/SEM/BV-17-C [Secure Connections Only Mode – IUT master, initiator, Lower Tester doesn’t support Secure Connections in Host]

- Test Purpose
  The Lower Tester doesn’t support Secure Connections at the Host level. Verify that the IUT in Secure Connections Only Mode rejects a request to perform a channel establishment procedure if the service requires Security Mode 4, Level 3 on the IUT. The IUT is master and initiator of the channel establishment procedure.

- Reference
  [1] 5.2.2

- Initial Condition
  The PSM for the service that requires Security Mode 4, Level 3 on the IUT is specified in the IXIT.
  
  On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

  ACL connection does not exist between the devices.
• Test Procedure

![Diagram of test procedure]

**Figure 4.43: GAP/SEC/SEM/BV-17-C**

Upper Tester puts the IUT in Secure Connections Only Mode.

Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.

IUT creates an ACL connection with the Lower Tester and may optionally perform the Secure Simple Pairing procedure with the Lower Tester.

• Test Condition

It must be possible to put the IUT in Secure Connections Only Mode.

• Expected Outcome

Pass Verdict

The IUT rejects the Upper Tester’s request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT.

• Notes

When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.4.9 GAP/SEC/SEM/BV-18-C [Secure Connections Only Mode – IUT master, initiator, Lower Tester supports Secure Connections in Controller and Host]

• Test Purpose

The Lower Tester supports Secure Connections both at the Controller and Host level. Verify that the IUT in Secure Connections Only Mode accepts a request to perform a channel establishment procedure if the service requires Security Mode 4, Level 3 on the IUT. The IUT is master and initiator of the channel establishment procedure.
- Reference
  [1] 5.2.2

- Initial Condition
  The PSM for the service that requires Security Mode 4, Level 3 on the IUT is specified in the IXIT.
  
  Set both the Secure Connections (Controller Support) and the Secure Connections (Host Support) LMP feature bits on the Lower Tester to 1.
  
  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).
  
  ACL connection does not exist between the devices.

- Test Procedure

  ![Diagram](image-url)

  **Figure 4.44: GAP/SEC/SEM/BV-18-C**
Upper Tester puts the IUT in Secure Connections Only Mode.

Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.

IUT creates an ACL connection with the Lower Tester.

- Test Condition
  It must be possible to put the IUT in Secure Connections Only Mode.

- Expected Outcome
  Pass Verdict
  The IUT accepts the Upper Tester's request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT and the channel establishment procedure is successful.

- Notes
  When in Secure Connections Only mode, all services (except those allowed to have Security Mode 4, Level 0) require Security Mode 4, Level 4.

4.4.4.10 GAP/SEC/SEM/BV-19-C [IUT master, initiator, not in Secure Connections Only Mode, Lower Tester does not support Secure Connections in Host]

- Test Purpose
  The Lower Tester does not support Secure Connections at the Host level. Verify that the IUT that is not in Secure Connections Only Mode accepts a request to perform a channel establishment procedure if the service requires Security Mode 4, Level 3 on the IUT. The IUT is master and initiator of the channel establishment procedure.

- Reference
  [1] 5.2.2

- Initial Condition
  The PSM for the service that requires Security Mode 4, Level 3 on the IUT is specified in the IXIT.

  On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

  IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

  ACL connection does not exist between the devices.
**Test Procedure**

**IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys). ACL connection does not exist between the devices.**

1. **Establish ACL connection**
2. **Simple Pairing Procedures**
3. **Simple Pairing Complete (Authenticated link key)**
   - **Encryption LMP messages**
   - **L2CAP_ConnectReq** (ID, length, PSM, SCID)
   - **L2CAP_ConnectRsp** (ID, length, DCID, SCID, result=Connection successful, status)

**Figure 4.45: GAP/SEC/SEM/BV-19-C**

Upper Tester puts the IUT in Security Mode 4 (but not in Secure Connections Only Mode).

Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.

IUT creates an ACL connection with the Lower Tester.

**Test Condition**

It must be possible to put the IUT in Security Mode 4 (but not in Secure Connections Only Mode).
• Expected Outcome

Pass Verdict

The IUT accepts the Upper Tester’s request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT and the channel establishment procedure is successful.

4.4.4.11 GAP/SEC/SEM/BV-20-C [IUT master, initiator, not in Secure Connections Only Mode, Lower Tester does not support Secure Connections in Host, level 4 service]

• Test Purpose

The Lower Tester does not support Secure Connections at the Host level. Verify that the IUT that is not in Secure Connections Only Mode rejects a request to perform a channel establishment procedure if the service requires Security Mode 4, Level 4 on the IUT. The IUT is master and initiator of the channel establishment procedure.

• Reference

[1] 5.2.2

• Initial Condition

The PSM for the service that requires Security Mode 4, Level 4 is specified in the IXIT.

On the Lower Tester, set the Secure Connections (Host Support) LMP feature bit to 0 and the Secure Connections (Controller Support) LMP feature bit to 1.

IUT and Lower Tester are not bonded (Neither IUT nor Lower Tester has link keys).

ACL connection does not exist between the devices.

• Test Procedure

![Diagram]

Figure 4.46: GAP/SEC/SEM/BV-20-C
Upper Tester puts the IUT in Security Mode 4 (but not in Secure Connections Only Mode).

Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 4 on the IUT.

IUT creates an ACL connection with the Lower Tester and may optionally perform the Secure Simple Procedure with the Lower Tester.

- **Test Condition**
  It must be possible to put the IUT in Security Mode 4 (but not in Secure Connections Only Mode).

- **Expected Outcome**
  **Pass Verdict**
  The IUT rejects the Upper Tester's request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 4 on the IUT.

4.4.4.12 GAP/SEC/SEM/BV-26-C [LE Security Mode: Mode 1 Level 4, Central – outgoing service level connection]

- **Test Purpose**
  Verify that the IUT in LE Security Mode 1 Level 4 performing the authentication procedure will achieve a LE Security Mode 1 Level 4 connection. The Lower Tester supports LE Secure Connections. The IUT is the Central.

- **Reference**
  [13] 2.3.5.6

- **Initial Condition**
  The IUT supports LE Secure Connections. The IUT is in Link Layer 'Standby' state. The IUT has to be configured such that it will not reject the initiated procedure.

- **Test Procedure**
  1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
  2. The Upper Tester configures the IUT (in Central role) to receive advertising packets from the Lower Tester (in Peripheral role), and complete link establishment with the Lower Tester.
  3. The Upper Tester triggers authentication procedure on the IUT, e.g., by an L2CAP channel establishment or a GATT service request.
  4. The IUT begins LE Secure Connections Phase 1 by sending an SMP Pairing Request, with the Secure Connections bit set to 1. The Lower Tester answers with SMP Pairing Response, with the Secure Connections bit set to 1.
  5. The IUT and the Lower Tester complete SMP Phase 2 (pairing) and Phase 3 (encryption and key distribution).
**Expected Outcome**

**Pass verdict**

The Lower Tester and the IUT complete SMP phases 1, 2, and 3. The resulting connection is encrypted on Security Mode 1 level 4.

The initiated procedure is successful.

**Notes**

It is recommended to test with a service or profile that requires Security Mode 1 level 4.

**4.4.4.13 GAP/SEC/SEM/BV-27-C [LE Security Mode: Mode 1 Level 4, Central – incoming service level connection]**

**Test Purpose**

Verify that the IUT in LE Security Mode 1 Level 4 rejects an L2CAP channel establishment or GATT service request until the authentication procedure has been performed and the connection is on LE Security Mode 1 Level 4. The Lower Tester supports LE Secure Connections. The IUT is the Central.
• Reference

[13] 2.3.5.6

• Initial Condition

The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject a correctly initiated procedure to either establish an L2CAP channel or a GATT service request.

• Test Procedure

1. The Upper Tester configures the IUT into LE Security Mode 1 Level 4.
2. The Upper Tester configures the IUT (in Central role) to receive advertising packets from the Lower Tester (in Peripheral role), and complete link establishment with the Lower Tester.
3. The Lower Tester initiates either an L2CAP channel establishment or GATT service request to the IUT.
4. The IUT rejects the request.
5. The Lower Tester initiates authenticated LE Secure Connections pairing.
6. The Lower Tester and the IUT complete SMP Phase 1, Phase 2 (pairing) and Phase 3 (encryption and key distribution).
7. The Lower Tester re-initiates the procedure with the IUT as attempted in step 3.
8. The IUT replies with the correct channel establishment response.
• Expected Outcome
  
  **Pass verdict**

  The L2CAP channel establishment or GATT service request is rejected before the authentication procedure.
The Lower Tester and the IUT complete SMP phases 1, 2, and 3. The resulting connection is encrypted on Security Mode 1 level 4.

After the authentication procedure, the procedure is successful.

- **Notes**
  
  It is recommended to test with a service or profile that requires Security Mode 1 level 4.

**4.4.4.14 GAP/SEC/SEM/BV-28-C [Secure Connections Only Mode – Failed Procedure, Central – outgoing service level connection]**

- **Test Purpose**
  
  Verify that the IUT in Secure Connections Only Mode initiating the authentication procedure will result in a failed procedure when performed toward a peer not supporting LE Secure Connections. The Lower Tester does not support LE Secure Connections. The IUT is the Central.

- **Reference**
  
  [12] 10.2.4

- **Initial Condition**
  
  The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.

- **Test Procedure**
  
  1. The Upper Tester configures the IUT into Secure Connections Only Mode.
  2. The Upper Tester configures the IUT (in Central role) to receive advertising packets from the Lower Tester (in Peripheral role), and complete link establishment with the Lower Tester.
  3. The Upper Tester triggers authentication procedure on the IUT, e.g., by an L2CAP channel establishment or a GATT service request.
  4. The IUT begins LE Secure Connections Phase 1 by sending an SMP Pairing Request, with the Secure Connections bit set to 1. The Lower Tester responds with an SMP Pairing Response with the Secure Connections bit set to 0. The IUT will respond with an SMP Pairing Failed message.
**Expected Outcome**

*Pass verdict*

IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.

**4.4.4.15 GAP/SEC/SEM/BV-29-C [Secure Connections Only Mode – Failed Procedure, Central – incoming service level connection]**

**Test Purpose**

Verify that the IUT in Secure Connections Only Mode rejects an L2CAP channel establishment or GATT service request procedure both before and after the authentication procedure when performed toward a peer not supporting LE Secure Connections. The Lower Tester does not support LE Secure Connections. The IUT is the Central.

**Reference**

[12] 10.2.4

**Initial Condition**

The IUT supports LE Secure Connections. The IUT is in Link Layer ‘Standby’ state. The IUT has to be configured such that it will not reject the initiated procedure.
The Lower Tester is configured so that it does not support LE Secure Connections.

- **Test Procedure**
  1. The Upper Tester configures the IUT into Secure Connections Only Mode.
  2. The Upper Tester configures the IUT (in Central role) to receive advertising packets from the Lower Tester (in Peripheral role), and complete link establishment with the Lower Tester.
  3. The Lower Tester initiates either an L2CAP channel establishment or GATT service request to the IUT.
  4. The IUT rejects the request.
  5. The Lower Tester initiates authenticated LE Legacy pairing.
  6. Alternative 1: the IUT rejects the pairing by sending an SMP Pairing Failed message.
  7. Alternative 2: the Lower Tester and the IUT complete LE legacy pairing. The Lower Tester re-initiates the request to the IUT as attempted in step 3. The IUT rejects the request.
• Expected Outcome

Pass verdict

The L2CAP channel establishment or GATT service request is rejected before the authentication procedure.

Alternative 1: IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.

Alternative 2: The IUT and the Lower Tester complete LE legacy pairing and the IUT rejects the request from the Lower Tester.

4.4.4.16 GAP/SEC/SEM/BV-30-C [Secure Connections Only Mode, Master, Failure, BR/EDR and LE Transports]

• Test Purpose

Verify that the IUT in Secure Connections Only Mode performs either an L2CAP channel establishment or GATT service procedure over LE and a channel establishment procedure over BR/EDR. The IUT is initiator of the procedure over both LE and BR/EDR. The Lower Tester supports neither LE Secure Connections nor BR/EDR Secure Connections. The procedure fails over both LE and BR/EDR. The IUT is the Central.

• Reference

[12] 10.2.4

• Initial Condition

The IUT supports both LE Secure Connections and BR/EDR Secure Connections. The IUT is in Link Layer 'Standby' state. The IUT has to be configured such that it will not reject the initiated procedure.

The Lower Tester is configured so that it does not support LE Secure Connections and BR/EDR Secure Connections.

The PSM for the service on the IUT that requires Security Mode 4, Level 3 on BR/EDR is specified in the IXIT.

IUT and Lower Tester are not bonded on BR/EDR (Neither IUT nor Lower Tester has link keys).

BR/EDR ACL connection does not exist between the devices.

• Test Procedure

1. The Upper Tester configures the IUT into Secure Connections Only Mode.

2. The Upper Tester configures the IUT (in Central role) to receive advertising packets from the Lower Tester (in Peripheral role), and complete link establishment with the Lower Tester.

3. The IUT begins LE Secure Connections Phase 1 by sending an SMP Pairing Request, with the Secure Connections bit set to 1. The Lower Tester responds with an SMP Pairing Response with the Secure Connections bit set to 0. The IUT will respond with an SMP Pairing Failed message.

4. The IUT terminates the LE connection.
5. The Upper Tester requests the IUT to establish a channel to access a service on the Lower Tester. The service requires Security Mode 4, Level 3 on the IUT.

6. The IUT creates an ACL connection with the Lower Tester and may optionally perform the Secure Simple Pairing procedure with the Lower Tester.

- Expected Outcome
  
  **Pass verdict**
  
  On the LE transport, the IUT sends an SMP Pairing Failed message to the Lower Tester to end SMP Pairing Phase 1.
  
  On the BR/EDR transport, the IUT rejects the Upper Tester’s request to establish a channel to access the service on the Lower Tester when the service requires Security Mode 4, Level 3 on the IUT.
4.4.5 Security Modes – Observer Role

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is the Observer and Acceptor.

4.4.5.1 LE Security Mode 3 – Observer Role, Acceptor

• Test Purpose
  Verify that the IUT in the LE Security Mode 3 with Level as specified in Table 4.4 receives BIS events.

• Reference
  [19] Section 9.2.5, 1.2.2.1, 1.2.2.2

• Initial Condition
  The IUT is in Synchronization State.
  The Lower Tester is in Connectionless Broadcasting State.
  The encryption information is broadcasted as specified in Table 4.4.
Test Procedure

1. Perform test case GAP/BIS/BSM/BV-01-C [Broadcast Isochronous Synchronizability Mode] and the Lower Tester is in the Broadcaster role sending the BIS events, and the IUT is in the Observer role receiving the BIS events. When enabling the BIG, set the Encryption parameter as specified in Table 4.4.

2. The Lower Tester sends a BIS Data PDU to the IUT with the Encryption and Authentication as specified in Table 4.4.

3. The IUT receives the BIS Data PDU and reports the PDU to the Upper Tester. The Lower Tester and the IUT operate on the same security mode and level.

4. After all the subevents in a BIS event end, the Lower Tester sends a BIS Control PDU (e.g., BIG_CHANNEL_MAP_IND) 6 or more times with encryption and authentication as specified in Table 4.4 in the Control subevent.
• Expected Outcome

<table>
<thead>
<tr>
<th>Test Case ID</th>
<th>Security Level</th>
<th>Encryption</th>
<th>Authentication</th>
<th>Initial Condition Encryption Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAP/SEC/SEM/BV-31-C</td>
<td>1</td>
<td>Disabled(0x00)</td>
<td>Disabled</td>
<td>None</td>
</tr>
<tr>
<td>GAP/SEC/SEM/BV-32-C</td>
<td>2</td>
<td>Enabled(0x01)</td>
<td>Disabled</td>
<td>Has been broadcasted in the Encryption Field of the BIGInfo of the periodic advertisement associated with the BIG. The Broadcast_Code has been selected and the GTLK has been exchanged.</td>
</tr>
<tr>
<td>GAP/SEC/SEM/BV-33-C</td>
<td>3</td>
<td>Enabled(0x01)</td>
<td>Enabled</td>
<td>Has been broadcasted in the Encryption Field of the BIGInfo of the periodic advertisement associated with the BIG. The Broadcast_Code has been selected and the GTLK has been exchanged.</td>
</tr>
</tbody>
</table>

Table 4.4: LE Security Mode 3 Observer Role, Acceptor

Pass Verdict

- In step 3, the IUT receives the BIS Data PDU and reports to the Upper Tester. The Lower Tester and the IUT operate on the same security mode and level.
- In step 5, the IUT correctly receives the BIS Control PDU.

4.4.5.2 GAP/SEC/SEM/BI-13-C [LE Security Mode 3 – Observer, Reject Lower Level Security]

• Test Purpose
  Verify that the IUT in the LE Security Mode 3 rejects BIS events with lower level security.

• Reference
  [19] Section 9.2.5, 1.2.2.1, 1.2.2.2

• Initial Condition
  The IUT is in Synchronization State.
  The Lower Tester is in Connectionless Broadcasting State.
  The Broadcast_Code has been selected and the GTLK has been exchanged.
  The encryption information has been broadcasted in the Encryption Field of the BIGInfo of the periodic advertisement associated with the BIG.
• **Test Procedure**

1. Perform test case **GAP/BIS/BSM/BV-01-C [Broadcast Isochronous Synchronizability Mode]** and the Lower Tester is in the Broadcaster role sending the BIS events, and the IUT is in the Observer role receiving the BIS events. When enabling the BIG, set the Encryption parameter to 0x01. The security level of the IUT is set to level 2.

2. The Lower Tester sends a Broadcast Isochronous Data PDU to the IUT without encryption.

3. The IUT rejects the BroadcastIsochronous Data PDU sent from the Lower Tester.

4. The security level of the IUT is set to 3. The Lower Tester sends a Broadcast Isochronous Data PDU to the IUT without encryption.

5. The IUT rejects the Broadcast Isochronous Data PDU sent from the Lower Tester.

6. The Lower Tester sends a Broadcast Isochronous Data PDU to the IUT with encryption with an unauthenticated Broadcast Code.

7. The IUT rejects the Broadcast Isochronous Data PDU sent from the Lower Tester.

• **Expected Outcome**

  **Pass Verdict**

  - In step 3, the IUT rejects the unencrypted Broadcast Isochronous Data PDU sent from the Lower Tester.
  
  - In step 5, the IUT rejects the unencrypted Broadcast Isochronous Data PDU sent from the Lower Tester.
  
  - In step 7, the IUT rejects the encrypted and unauthenticated Broadcast Isochronous Data PDU sent from the Lower Tester.

4.4.6 **Security Modes – Broadcaster Role**

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is Broadcaster and Initiator.

4.4.6.1 **LE Security Mode 3 – Broadcaster Role, Initiator**

• **Test Purpose**

  Verify that the IUT in the LE Security Mode 3 Level as specified in Table 4.5 receives BIS events.

• **Reference**

  [19] Section 9.2.5, 1.2.2.1, 1.2.2.2

• **Initial Condition**

  The IUT is in Connectionless Broadcasting State.

  The Lower Tester is in Synchronization State.

  The encryption information is broadcasted as specified in Table 4.5.
Test Procedure

1. Perform test case GAP/BIS/BBM/BV-01-C [Broadcast Isochronous Stream Broadcasting Mode] and the IUT is in the Broadcaster role sending the BIS events, and the Lower Tester is in the Observer role receiving the BIS events. When enabling the BIG, set the Encryption parameter as specified in Table 4.5.

2. If encryption is enabled as specified in Table 4.5, then the Lower Tester receives the AUX_SYNC_IND PDU of the periodic advertising trains associated to the BIG from step 1 and the encryption information is in the Encryption Field of the BIGInfo field.

3. The Upper Tester orders the IUT to send the Broadcast Isochronous Data PDUs with the Encryption and Authentication as specified in Table 4.5.

4. The Lower Tester receives the Broadcast Isochronous Data PDU with the 32-bit MIC field and encryption as specified in Table 4.5. The Lower Tester and the IUT operate on the same security mode and level.

5. The IUT sends to the Lower Tester a BIG Control PDU with the 32-bit MIC field and encryption as specified in Table 4.5. The Length field value is not 00000000b.
• Expected Outcome

<table>
<thead>
<tr>
<th>Test Case ID</th>
<th>Security Level</th>
<th>Encryption</th>
<th>Authentication</th>
<th>MIC</th>
<th>Initial Condition Encryption Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAP/SEC/SEM/BV-34-C</td>
<td>1</td>
<td>Disabled(0x00)</td>
<td>Disabled</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>GAP/SEC/SEM/BV-35-C</td>
<td>2</td>
<td>Enabled(0x01)</td>
<td>Disabled</td>
<td>32-bit MIC</td>
<td>Has been broadcasted in the Encryption Field of the BIGInfo of the periodic advertisement associated with the BIG</td>
</tr>
<tr>
<td>GAP/SEC/SEM/BV-36-C</td>
<td>3</td>
<td>Enabled(0x01)</td>
<td>Enabled</td>
<td>32-bit MIC</td>
<td>Has been broadcasted in the Encryption Field of the BIGInfo of the periodic advertisement associated with the BIG</td>
</tr>
</tbody>
</table>

Table 4.5: LE Security Mode 3 – Broadcaster Role, Initiator

Pass Verdict

- In step 4, the Lower Tester receives the Broadcast Isochronous Data PDU with the 32-bit MIC field and the payload encrypted as specified in Table 4.5. The IUT and the Lower Tester operate on the same security mode and level.

- In step 5, the Lower Tester receives the BIG Control PDU with the 32-bit MIC field and the payload encrypted as specified in Table 4.5. The Length field value is not 00000000b.

4.5 Idle Mode Procedures

4.5.1 General Inquiry - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

4.5.1.1 GAP/IDLE/GIN/BV-01-C [General Inquiry – IUT is Master]  
• Test Purpose

Verify that if general inquiry is initiated by the IUT, it sends for at least $T_{\text{GAP}}(100)$ inquiry request messages (GIAC).

The IUT is master and initiator and the Lower Tester is slave and acceptor of the general inquiry procedure.
• Reference

[1] 6.1

• Initial Condition

The IUT is in Baseband state 'Standby' and in Idle mode with any supported security mode of the IUT (applicable to security mode 1, 2, or 3).

If the IUT supports general-discoverable mode, the Lower Tester performs inquiry to get the clock offset with respect to the IUT and after the Upper Tester has ordered the IUT to be in general-discoverable mode.

If the IUT does not support general-discoverable mode, the IUT has to be configured to page the Lower Tester in order to get the CLK offset after the Upper Tester has ordered the IUT to be in connectable mode.

• Test Procedure

1. The Upper Tester orders the IUT to initiate general inquiry.
2. The Lower Tester scans for inquiry packets from the IUT to receive a packet within the IUT's repetition of A-train.
3. The Lower Tester monitors the train A during 10 ms. If no inquiry packet is received, the Lower Tester switches to scan train B during 10 ms.
4. Switching trains will continue until first ID packet is received by the Lower Tester. The Lower Tester adjusts its RX window and phase to get the remaining hops.
5. The Lower Tester monitors inquiry packets for 255 times.
6. The Lower Tester immediately starts listening on the other train frequencies. It monitors for 256 times.
7. Steps 5 and 6 are repeated until 10.24 s - 10 ms - 20 ms.
• Test Condition
  It must be possible to initiate general inquiry by the IUT.

• Expected Outcome
  Pass Verdict
  
  The IUT sends at least for $T_{GAP}(100) - 30$ ms inquiry messages (ID-Packet) by using GIAC.

4.5.2 Device Name during General Inquiry

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is slave.

4.5.2.1 GAP/IDLE/DNDIS/BV-01-C [Device Name During General Inquiry – IUT is Slave]

• Test Purpose
  
  Verify that the Lower Tester during general inquiry receives device name from IUT in the reception of extended inquiry response data.

  The Lower Tester is master and initiator and the IUT is slave and acceptor of the general inquiry procedure.

• Reference
  
  [1] 8

• Initial Condition
  
  The IUT is in Baseband state 'Standby' and in Idle mode.
• Test Procedure

The Lower Tester initiates general inquiry.

The Lower Tester receives extended inquiry response data from IUT.

• Test Condition

It must be possible to decode Device Name from EIR data in the Lower Tester.

• Expected Outcome

Pass Verdict

The Lower Tester decodes EIR data and finds IUT’s device name (‘complete’ or ‘shortened’).

4.5.3 Limited Inquiry - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

4.5.3.1 GAP/IDLE/LIN/BV-01-C [Limited Inquiry – IUT is Master]

• Test Purpose

Verify that if limited inquiry is initiated by the IUT, it sends for at least $T_{\text{GAP}(100)}$ inquiry request messages (LIAC).

The IUT is master and initiator and the Lower Tester is slave and acceptor of the limited inquiry procedure.
• Reference

[1] 6.2

• Initial Condition

The IUT is in Baseband state ‘Standby’ and in Idle mode with any supported security mode of the IUT (applicable to security mode 1, 2, or 3).

If the IUT supports general-discoverable mode, the Lower Tester performs inquiry to get the clock offset with respect to the IUT and after the Upper Tester has ordered the IUT to be in general-discoverable mode.

If the IUT does not support general-discoverable mode, the IUT has to be configured to page the Lower Tester in order to get the CLK offset after the Upper Tester has ordered the IUT to be in connectable mode.

• Test Procedure

1. The IUT is ordered (by using the Upper Tester) to initiate limited inquiry.
2. The Lower Tester scans for inquiry packets from the IUT to receive a packet within the IUT’s repetition of A-train.
3. The Lower Tester monitors the train A during 10 ms. If no inquiry packet is received, the Lower Tester switches to scan train B during 10 ms.
4. Switching trains will continue until first ID packet is received by the Lower Tester. The Lower Tester adjusts its RX window and phase to get the remaining hops.
5. The Lower Tester monitors inquiry packets for 255 times.
6. The Lower Tester immediately starts listening on the other train frequencies. It monitors for 256 times.

7. Steps 5 and 6 are repeated until 10.24s - 10ms - 20 ms.

- **Test Condition**
  It must be possible to initiate limited inquiry by IUT.

- **Expected Outcome**
  **Pass Verdict**

  The IUT sends at least for $T_{\text{GAP}}(100)$ - 30 ms inquiry messages (ID-Packet) by using LIAC.

### 4.5.4 Device Discovery - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

#### 4.5.4.1 GAP/IDLE/DED/BV-01-C [Device Discovery and Name Discovery – Secure Simple Pairing Not Supported by IUT]

- **Test Purpose**
  Verify that the IUT that does not support Secure Simple Pairing first performs the inquiry procedure and afterwards it performs the name discovery procedure for one slave if device discovery is required by upper layer of the IUT.

  The IUT is master and initiator of the device discovery procedure. The Lower Tester simulates one slave as acceptor.

- **Reference**
  [1] 6.4

- **Initial Condition**
  The IUT is in Idle mode with any supported security mode of the IUT (applicable to security mode 1, 2, or 3).

  The Lower Tester is discoverable and connectable.
• **Test Procedure**

![Diagram of test procedure]

- **Test Condition**
  The IUT must be able to initiate and perform the device discovery procedure.

- **Expected Outcome**
  **Pass Verdict**
  After inquiry, the IUT performs a successful name request procedure.

**4.5.4.2 GAP/IDLE/DED/BV-02-C [Device Discovery and Name Discovery – Secure Simple Pairing Supported by IUT]**

- **Test Purpose**
  Verify that the IUT which supports Secure Simple Pairing first performs the inquiry procedure and afterwards it performs the name discovery procedure for one slave if device discovery is required by upper layer of the IUT.

- **Reference**
  [1] 6.4
• **Initial Condition**

The IUT is in Idle mode with security mode 4 supported by the IUT.

Lower Tester's LMP features include:

- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1

The Lower Tester is discoverable and connectable.

• **Test Procedure**

```
<table>
<thead>
<tr>
<th>Lower Tester</th>
<th>IUT</th>
<th>Upper Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiry</td>
<td></td>
<td>Inquiry</td>
</tr>
<tr>
<td>(LIAC or GIAC)</td>
<td></td>
<td>(LIAC or GIAC)</td>
</tr>
<tr>
<td>Inquiry Response</td>
<td></td>
<td>Inquiry Response</td>
</tr>
<tr>
<td>Name request</td>
<td></td>
<td>Name request</td>
</tr>
<tr>
<td>Name response</td>
<td></td>
<td>Name response</td>
</tr>
</tbody>
</table>
```

Initiate device discovery

IUT (master) gets the address of the Lower Tester (slave).

Name request procedure is started.

Name request procedure is completed

Verify that the IUT performs a name request after having performed inquiry.

*Figure 4.53: GAP/IDLE/DED/BV-02-C*

• **Test Condition**

The IUT must be able to initiate and perform the device discovery procedure.

• **Expected Outcome**

Pass Verdict

After inquiry, the IUT performs a successful name request procedure.
4.5.5 Bonding - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

Applicable only for IUTs supporting initiation of dedicated bonding and initiation of limited or general inquiry.

4.5.5.1 GAP/IDLE/BON/BV-01-C [Dedicated Bonding Required by the Upper Tester]

• Test Purpose

Verify that, if the bonding procedure is required by upper layer of the IUT with the reason only to create and exchange a link key (dedicated bonding), that it performs the dedicated bonding procedure.

The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• Reference

[1] 6.5

• Initial Condition

The Preamble "Inquiry Procedure" shall be performed.
Test Procedure

Figure 4.54: GAP/IDLE/BON/BV-01-C

After the Preamble, the IUT is ordered by the Upper Tester to initiate the dedicated bonding procedure.

Afterwards, the Dedicated Bonding procedure is performed successfully.
• **Test Condition**

The IUT must be able to trigger the dedicated bonding procedure via the Upper Tester.

• **Expected Outcome**

**Pass Verdict**

After the authentication is completed, the IUT has sent an "LMP_detach" message.

Verify that the resulting link key is a combination key.

### 4.5.5.2 GAP/IDLE/BON/BV-02-C [Bonding - Master]

• **Test Purpose**

Verify that, if the bonding procedure is required by upper layer of the IUT with the reason only to create and exchange a link key (dedicated bonding), that it performs the dedicated bonding procedure.

The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• **Reference**

[1] 6.5

• **Initial Condition**

The Preamble "Inquiry Procedure" shall be performed with supported security mode 1, 2, 3, or 4 of the IUT.

Lower Tester's LMP features include:

- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 0
• Test Procedure

After the Preamble, the IUT is ordered by the Upper Tester to initiate the dedicated bonding procedure.

Afterwards, the Dedicated Bonding procedure is performed successfully.
• Test Condition
  The IUT must be able to trigger the Dedicated Bonding procedure via the Upper Tester.

• Expected Outcome
  Pass Verdict
  After the authentication is completed, the IUT has sent an "LMP_detach" message.
  Verify that the resulting link key is a combination key.

4.5.6 Dedicated Bonding Test Cases

4.5.6.1 GAP/IDLE/BON/BV-03-C [Dedicated Bonding]

• Test Purpose
  Verify that dedicated bonding is performed.
  The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• Reference
  [1] 6.5

• Initial Condition
  The Preamble "Inquiry Procedure" shall be performed with security mode 1, 2, 3, or 4 of the IUT.
  Lower Tester's LMP features include:
    - Feature bit 51 (Secure Simple Pairing) set to 1
    - Feature bit 63 (Extended Features) set to 1
    - Feature bit 64 (Secure Simple Pairing - Host Support) set to 1
  Lower Tester's IO capabilities are set to "DisplayYesNo".
  Lower Tester's Authentication_Requirements set to "MITM protection not required – Dedicated Bonding" (0x02).
- Test Procedure

Figure 4.56: GAP/IDLE/BON/BV-03-C

After the Preamble, the IUT is ordered by the Upper Tester to initiate the dedicated bonding procedure.

Afterwards, the Dedicated Bonding procedure is performed successfully.
• Test Condition
The IUT must be able to trigger the Dedicated Bonding procedure via the Upper Tester.

• Expected Outcome
Pass Verdict

After the authentication is completed, the IUT has sent an "LMP_detach" message.

Verify that the Authentication_Requirements parameter received from the IUT is either:
0x02 (MITM Protection Not Required – Dedicated Bonding)
or
0x03 (MITM Protection Required – Dedicated Bonding).

If the Authentication_Requirements parameter is 0x02, verify that the link key is an unauthenticated combination key. If the Authentication_Requirements parameter is 0x03, verify that the link key is an authenticated combination key.

4.5.6.2 GAP/IDLE/BON/BV-04-C [Dedicated Bonding – Authenticated Link Key]

• Test Purpose
Verify that dedicated bonding is performed.

The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• Reference
[1] 6.5

• Initial Condition
The Preamble "Inquiry Procedure" shall be performed.

Lower Tester’s LMP features include:
- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1

Lower Tester’s IO capabilities are set to “DisplayYesNo”.

Lower Tester’s Authentication_Requirements set to "MITM protection required – Dedicated Bonding" (0x03).
**Test Procedure**

After the Preamble, the IUT is ordered by the Upper Tester to initiate the dedicated bonding procedure.

Afterwards, the Dedicated Bonding procedure is performed successfully.

---

* Bluetooth SIG Proprietary
• Test Condition
The IUT must be able to trigger the Dedicated Bonding procedure via the Upper Tester.

• Expected Outcome
Pass Verdict

After the authentication is completed, the IUT has sent an "LMP_detach" message.

Verify that the Authentication_Requirements parameter received from the IUT is either:
0x02 (MITM Protection Not Required – Dedicated Bonding) or
0x03 (MITM Protection Required – Dedicated Bonding).

Verify that the resulting link key is an authenticated combination key.

4.5.7 General Bonding Test Cases

4.5.7.1 GAP/IDLE/BON/BV-05-C [General Bonding]

• Test Purpose
Verify that general bonding is performed.

The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• Reference
[1] 6.5

• Initial Condition
The Preamble "Inquiry Procedure" shall be performed with security mode 4 of the IUT.

Lower Tester's LMP features include:

- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1

Lower Tester's IO capabilities are set to “DisplayYesNo”.

Lower Tester's Authentication_Requirements set to "MITM protection no required - General Bonding" (0x04).
After the Preamble, the IUT is ordered by the Upper Tester to initiate the general bonding procedure. Afterwards, the General Bonding procedure is performed successfully.
• Test Condition
The IUT must be able to trigger the General Bonding procedure via the Upper Tester.

• Expected Outcome
Pass Verdict

After the authentication is completed, the IUT has sent an "L2CAP_connect_req" message.

Verify that the Authentication_Requirements parameter received from the IUT is either:
0x04 (MITM Protection Not Required – General Bonding) or
0x05 (MITM Protection Required – General Bonding).

If the Authentication_Requirements parameter is 0x04, verify that the link key is an unauthenticated combination key. If the Authentication_Requirements parameter is 0x05, verify that the link key is an authenticated combination key.

4.5.7.2 GAP/IDLE/BON/BV-06-C [General Bonding – Authenticated Link Key]

• Test Purpose
Verify that general bonding is performed.

The IUT is master and initiator of the bonding procedure. The Lower Tester is slave and acceptor.

• Reference
[1] 6.5

• Initial Condition
The Preamble "Inquiry Procedure" shall be performed with security mode 4 of the IUT.

Lower Tester's LMP features include:

- Feature bit 51 (Secure Simple Pairing) set to 1
- Feature bit 63 (Extended Features) set to 1
- Feature bit 64 (Secure Simple Pairing - Host Support) set to 1

Lower Tester's IO capabilities are set to "DisplayYesNo".

Lower Tester's Authentication_Requirements are set to "MITM Protection Required – General Bonding (0x05)."
• Test Procedure

Preamble Inquiry is performed

After the Preamble, the IUT is ordered by the Upper Tester to initiate the general bonding procedure.

Afterwards, the General Bonding procedure is performed successfully.
• Test Condition
  The IUT must be able to trigger the General Bonding procedure via the Upper Tester.

• Expected Outcome
  Pass Verdict

  After the authentication is completed, the IUT has sent an "L2CAP_connect_req" message.

  Verify that the Authentication_Requirements parameter received from the IUT is either:
  0x04 (MITM Protection Not Required – General Bonding) or
  0x05 (MITM Protection Required – General Bonding).

  Verify that the resulting link key is an authenticated combination key.

4.5.8 Link Establishment - Master

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is master and initiator.

4.5.8.1 GAP/EST/LIE/BV-02-C [Link Establishment – Initiator]

• Test Purpose
  Verify that the IUT performs a link establishment procedure, initiated by itself.

  The IUT is master and initiator. The Lower Tester is slave and acceptor of the link establishment procedure.

• Reference
  [1] 7.1

• Initial Condition
  The IUT is in Baseband state 'Standby' and in Idle mode with any supported security mode of the IUT (applicable to security mode 1, 2, 3, or 4).

  The Preamble for “Inquiry Procedure” shall be performed.
• Test Procedure

Preamble Inquiry is performed.

Page request (BB-functionality)
(ID-packet (slaves DAC))

Page request (BB-functionality)
(ID-packet (slaves DAC))

Page request (BB-functionality)
(ID-packet (slaves DAC))

Page response (BB-functionality)
(ID-packet (slaves DAC))

FHS-packet (BB-functionality)

FHS-acknowledge (BB-functionality)
(ID-packet (slaves DAC))

POLL-packet (BB-functionality)

LMP_features_req [features]

LMP_features_res [features]

LMP_host_connection_req

LMP_accepted

LMP_host_connection_complete

Paging procedure is performed successfully on BB-Level and link establishment is started.

If the IUT is in security mode it initiates an authentication procedure and performs optional encryption procedure.

Verify that a mutual LMP_setup_complete occur to accomplish the link establishment initiated by IUT.

Figure 4.60: GAP/EST/LIE/BV-02-C

• Test Condition

The Lower Tester shall behave as being discoverable.

• Expected Outcome

Pass Verdict

For completion of the link establishment a mutual "LMP_setup_complete" occurs.
4.6 Operational Modes and Procedures for Use on LE Physical Channels

4.6.1 Broadcasting and Observing

The test group objective is to verify the correct implementation of the Broadcast Mode and Observation Procedure.

4.6.1.1 Broadcast Mode

The test sub-group objective is to verify the correct implementation of the Broadcast Mode.

4.6.1.1.1 GAP/BROB/BCST/BV-01-C [Broadcast Mode No Scan Response]

- Test Purpose
  
  Verify the IUT in Broadcast Mode that does not implement scan response data; the peer device is Passive Scanning.

- Reference

  [4], [9], [12] 9.1.1

  [15] 1.3

- Initial Condition

  The IUT is in Link Layer state ‘Standby’.

  The advertising data in Broadcast Mode for the IUT is specified in the IXIT [3].

- Test Procedure

  The Lower Tester performs the Observation Procedure using Passive Scanning.

  The Upper Tester orders the IUT to enter Broadcast Mode using the specified advertising data.

- Test Condition

  It must be possible to order IUT to enter Broadcast Mode.
• Expected Outcome

Pass Verdict

The Lower Tester receives non-connectable advertising events sent by the IUT.

The Lower Tester receives the specified advertising data sent from the IUT.

The advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if:
   a. The IUT is a BR/EDR/LE Broadcaster compliant to Core Specification version 4.0, or
   b. The IUT is a Broadcaster compliant to the Core Specification Supplement (CSS)
   Or:

2. Contains the FLAGS AD Type with both the LE Limited Discoverable Flag and the LE General Discoverable Flag set to 0.

• Notes

Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.1.2 GAP/BROB/BCST/BV-02-C [Broadcast Mode Scan Response]

• Test Purpose

Verify the IUT is in Broadcast Mode and implements scan response data; the peer device is Active Scanning.

• Reference

[4] 9.1.1

• Initial Condition

The IUT is in Link Layer state ‘Standby’

The advertising data in Broadcast Mode is specified for the IUT in the IXIT [3].

• Test Procedure

The Lower Tester performs the Observation Procedure using Active Scanning.

The Upper Tester orders the IUT to enter Broadcast Mode using the specified advertising data.
• **Test Condition**
It must be possible to order IUT to enter Broadcast Mode.

• **Expected Outcome**
**Pass Verdict**

The Lower Tester receives scannable advertising events sent by the IUT.

The Lower Tester receives the specified advertising data and scan response data sent from the IUT.

The advertising data or scan response data either does not contains the FLAGS AD Type or contains the FLAGS AD Type but the LE Limited Discoverable Flag and the LE General Discoverable Flag are not set.

• **Notes**
Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.1.3 GAP/BROB/BCST/BV-03-C [Broadcast Mode Resolvable Private Address]

• **Test Purpose**
Verify the IUT in Broadcast Mode using a resolvable private address.

• **Reference**
[4], [9], [12] 9.1.1

[12] 10.7

[14] 1.3.2.3

[15] 1.3
• Initial Condition
The IUT is in Link Layer state ‘Standby’

The advertising data in Broadcast Mode is specified for the IUT in the IXIT [3].

The Device Identity (IRK and Identity Address) used in the Resolvable Private Address Generation Procedure and Resolvable Private Address Resolution Procedure is specified for the IUT in the IXIT. Alternatively, the IUT may use a Device Identity distributed to the Lower Tester prior to executing this test procedure.

• Test Procedure
The Lower Tester performs the Observation Procedure using Passive Scanning.

The IUT generates a resolvable private address using the Resolvable Private Address Generation Procedure.

The Upper Tester orders the IUT to enter Broadcast Mode using the specified advertising data; the IUT advertises using a generated resolvable private address.

• Test Condition
It must be possible to order IUT to enter Broadcast Mode.

• Expected Outcome
Pass Verdict

The Lower Tester receives non-connectable advertising events sent by the IUT.

The Lower Tester receives the specified advertising data sent from the IUT.

The Lower Tester successfully resolves the private address (the private address is associated with the IUT) received in the advertising events using the Resolvable Private Address Resolution Procedure.
The advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if:
   a. The IUT is a BR/EDR/LE Broadcaster compliant to Core Specification version 4.0, or
   b. The IUT is a Broadcaster compliant to the Core Specification Supplement (CSS)

   Or:

2. Contains the FLAGS AD Type with both the LE Limited Discoverable Flag and the LE General Discoverable Flag set to 0.

* Notes
Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.1.4 GAP/BROB/BCST/BV-04-C [Broadcast Mode Non-Resolvable Private Address]

* Test Purpose
Verify the IUT in Broadcast Mode is using a non-resolvable private address.

* Reference
[9], [12] 10.7.3
[15] 1.3

* Initial Condition
The IUT is in Link Layer state ‘Standby’.

The advertising data in Broadcast Mode is specified for the IUT in the IXIT.

TGAP(private_addr_int) for the IUT is specified in the IXIT.

* Test Procedure
The Lower Tester performs the Observation Procedure using Passive Scanning.

The Upper Tester orders the IUT to enter Broadcast Mode using the specified advertising data; the IUT generates a non-resolvable private address using the non-resolvable Private Address Generation Procedure and advertises using the generated non-resolvable private address.
• **Test Condition**
  It must be possible to order IUT to enter Broadcast Mode.

• **Expected Outcome**
  **Pass Verdict**
  The Lower Tester receives non-connectable advertising events sent by the IUT.
  The Lower Tester receives the specified advertising data sent from the IUT that includes the non-resolvable private address.
  The Lower Tester verifies that the IUT changes the non-resolvable private address in the advertiser address of the received advertising events after TGAP(private_addr_int).
  The advertising data either:
  1. Does not contain the FLAGS AD Type; this is applicable if:
     a. The IUT is a BR/EDR/LE Broadcaster compliant to Core Specification version 4.0, or
     b. The IUT is a Broadcaster compliant to the Core Specification Supplement (CSS)
  Or:
  2. Contains the FLAGS AD Type with both the LE Limited Discoverable Flag and the LE General Discoverable Flag set to 0.

• **Notes**
  Since broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.
4.6.1.1.5 GAP/BROB/BCST/BV-05-C [Broadcast Mode Resolvable Private Address, Scan Response]

- **Test Purpose**
  
  Verify that the IUT in Broadcast Mode implements scan response data using a resolvable private address; the Lower Tester is Active Scanning. Lower Tester and IUT are using Resolvable Private Addresses and White List.

- **Reference**

  [12] 9.1.1, 10.7.3

  [15] 1.3

- **Initial Condition**

  The IUT is in Link Layer state ‘Standby’.

  The advertising data in Broadcast Mode is specified for the IUT in the IXIT [3].

  The Device Identity (IRK and Identity Address) for the IUT and the Lower Tester is specified in the IXIT [3].

- **Test Procedure**

  1. The Lower Tester performs the Observation Procedure using Active Scanning.
  2. The Upper Tester adds the device identity of the Lower Tester to the Resolving List.
  3. The Upper Tester orders the IUT to enter Broadcast Mode using the specified advertising and scan response data; the IUT advertises using the generated resolvable private address.
  4. The Lower Tester resolves the address of the IUT and sends a scan request to the IUT.
  5. The IUT resolves the scan request but the Lower Tester is not in the White List, so no scan response is sent.
  6. The Upper Tester orders the IUT to add the Lower Tester’s Identity to the White List, and continue advertising using the generated resolvable private address.
  7. The Lower Tester resolves the address of the IUT and sends a scan request to the IUT.
  8. The IUT resolves the scan request, identifies the Lower Tester on the White List, and sends a scan response.
• **Test Condition**
  It must be possible to order IUT to enter Broadcast Mode, and add the Lower Tester to the White List.

• **Expected Outcome**
  **Pass Verdict**
  The Lower Tester receives scannable advertising events sent by the IUT.
  The Lower Tester receives the specified advertising data sent from the IUT.
  The Lower Tester successfully resolves the private address (the private address is associated with the IUT) received in the advertising events.
  The Lower Tester sends scan requests to the IUT. Before the Lower Tester’s identity address is added to the IUT’s White List, the Lower Tester does not receive any scan response. After adding the Lower Tester’s identity address to the IUT’s White List, the Lower Tester receives the scan responses with the specified scan response data sent from the IUT.
The advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if:
   a. The IUT is a BR/EDR/LE Broadcaster compliant to Core Specification version 4.0, or
   b. The IUT is a Broadcaster compliant to the Core Specification Supplement (CSS)

Or:

2. Contains the FLAGS AD Type with both the LE Limited Discoverable Flag and the LE General Discoverable Flag set to 0.

• Notes
   Since broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.2 Observation Procedure
The test group objective is to verify the correct implementation of the Observation procedure.

4.6.1.2.1 GAP/BROB/OBSV/BV-01-C [Observation Procedure Passive Scanning]
• Test Purpose
  Verify the IUT performing the Observation Procedure using Passive Scanning.

• Reference
  [4] 9.1.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The advertising data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].

• Test Procedure
  The Lower Tester enters Broadcast Mode using the specified advertising data.

  The Upper Tester orders the IUT to perform the Observation procedure using Passive Scanning.
• Test Condition
  It must be possible to order the IUT to perform the Observation procedure.

• Expected Outcome
  Pass Verdict
  The IUT receives the specified advertising data sent from Lower Tester.

• Notes
  Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.2.2 GAP/BROB/OBSV/BV-02-C [Observation Procedure Active Scanning]

• Test Purpose
  Verify the IUT performing the Observation Procedure using Active Scanning.

• Reference
  [4] 9.1.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The advertising data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].
  The scan response data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].

• Test Procedure
  The Lower Tester enters Broadcast Mode using the specified advertising data.
The Upper Tester orders the IUT to perform the Observation procedure using Active Scanning.

- Test Condition
  It must be possible to order the IUT to perform the Observation procedure.

- Expected Outcome
  Pass Verdict
  The IUT receives the specified advertising data and scan response data from Lower Tester.

- Notes
  Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.1.2.3 GAP/BROB/OBSV/BV-05-C [Observation Procedure Active Scanning Non-Resolvable Private Address or Resolvable Private Address]

- Test Purpose
  Verify the IUT can perform the Observation Procedure using Active Scanning and a non-resolvable private address or resolvable private address.

- Reference
  [4] 9.1.2
  [6] 2.2.5

- Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The advertising data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].
  The scan response data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].
• **Test Procedure**

The Lower Tester enters Broadcast Mode using scannable undirected advertising events containing the specified advertising data and responds to scan requests using the specified scan response data.

The Upper Tester orders the IUT to perform the Observation procedure using Active Scanning and a non-resolvable private address or resolvable private address.

```
Lower Tester

Broadcast Mode

IUT

Start Observation Procedure

Advertising Event

Advertising Event

Advertising Report Event

Scan Request

Scan Report Event

Scan Response

Upper Tester
```

• **Test Condition**

It must be possible to order the IUT to perform the Observation procedure.

• **Expected Outcome**

**Pass Verdict**

The IUT receives the specified advertising data and scan response data sent by the Lower Tester.

The Lower Tester receives a non-resolvable private address or a resolvable private address in scan request sent from the IUT.

• **Notes**

Since the broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.
4.6.1.2.4 GAP/BROB/OBSV/BV-06-C [Observation Procedure with Active Scanning, IUT and Peer using Resolvable Private Address]

- **Test Purpose**
  Verify that the IUT can perform the Observation Procedure using Active Scanning when the Lower Tester is using a resolvable private address.

- **Reference**
  
  [9] [12] 9.1.2, 10.7.4

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  The Device Identity (IRK and Identity Address) used by the IUT and Lower Tester is specified in the IXIT [3].

  The advertising and scan response data used in Broadcast Mode is specified for the Lower Tester in the IXIT [3].

- **Test Procedure**
  The Lower Tester generates a resolvable private address using the Resolvable Private Address Generation Procedure.

  The Lower Tester enters Broadcast Mode using the specified advertising data and the generated resolvable private address.

  The Upper Tester orders the IUT to add the Lower Tester’s Identity to the resolving list and White List.

  The Upper Tester orders the IUT to perform the Observation procedure using Active Scanning; the IUT resolves the address received in the advertising events sent by the Lower Tester, and sends a Scan Request.

  The Lower Tester resolves the IUT’s address and send the Scan Response.
• Test Condition
  It must be possible to order the IUT to perform the Observation procedure.

• Expected Outcome
  Pass Verdict
  The IUT successfully resolves the address in the advertising events sent by the Lower Tester.

  The IUT receives the Scan Response data correctly.

• Notes
  Since broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

4.6.2 Discovery Modes and Procedures

4.6.2.1 Non-Discoverable Mode

4.6.2.1.1 GAP/DISC/NONM/BV-01-C [Non-discoverable Mode Non-Connectable Mode]

• Test Purpose
  Verify the IUT in Non-Discoverable Mode and Non-Connectable Mode is not discoverable by a device performing the General Discovery Procedure using Active Scanning.

  The IUT is operating in the Peripheral role.
• Reference
  [4], [9], [12] 9.2.2

  [15] 1.3

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The IUT is in Non-Connectable Mode.

• Test Procedure
  The Lower Tester performs the General Discovery Procedure using Active Scanning.
  The Upper Tester orders IUT to enter Non-Discoverable Mode and Non-Connectable Mode.

• Test Condition
  It must be possible to order IUT to enter Non-Discoverable Mode and Non-Connectable Mode.

• Expected Outcome
  Pass Verdict
  The Lower Tester receives either no advertising events or non-connectable advertising events from the IUT.

  The advertising data either:

  1. Does not contain the FLAGS AD Type; this is applicable if:
     a. The IUT is a BR/EDR/LE Peripheral compliant to Core Specification version 4.0, or
     b. The IUT is a Peripheral compliant to the Core Specification Supplement (CSS).
Or:

2. Contains the FLAGS AD Type with both the LE Limited Discoverable Flag and the LE General Discoverable Flag set to 0.

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

4.6.2.1.2 GAP/DISC/NONM/BV-02-C [Non-discoverable Mode Undirected Connectable Mode]

• Test Purpose
  Verify the IUT in Non-Discoverable Mode and Undirected Connectable Mode is not discoverable by a device performing the General Discovery Procedure.

  The IUT is operating in the Peripheral role.

• Reference
  [4] 9.2.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The IUT is in Undirected Connectable Mode.

• Test Procedure
  The Lower Tester performs the General Discovery Procedure.

  The Upper Tester orders IUT to enter Non-Discoverable Mode and Undirected Connectable Mode.

• Test Condition
  It must be possible to order IUT to enter Non-Discoverable Mode and Undirected Connectable Mode.
• Expected Outcome

Pass Verdict

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

The advertising data received by the Lower Tester does not contain the Flags AD type with the Limited Discoverable or General Discoverable flags set to 1.

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

4.6.2.2  Limited Discoverable Mode

4.6.2.2.1  GAP/DISC/LIMM/BR-01-C [Limited Discoverable Mode Non-Connectable Mode—BR/EDR/LE]

• Test Purpose

Verify the IUT in Limited Discoverable Mode and the Non-Connectable Mode can be discovered by a device performing the Limited Discovery Procedure.

The IUT is operating in the Peripheral role.

• Reference


[9], [12] 9.2.3, 13.1.1

[15] 1.3

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The IUT is in Non-Connectable Mode.

T_{GAP}(lim_adv_timeout) for the IUT is specified in the IXIT [3].

• Test Procedure

The Upper Tester orders IUT to enter Limited Discoverable Mode and Non-Connectable Mode.
• Test Condition

It must be possible to order IUT to enter Limited Discoverable Mode and Non-Connectable Mode.

• Expected Outcome

Pass Verdict

The Lower Tester receives non-connectable advertising events from the IUT.

The advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if the IUT is a BR/EDR/LE Peripheral compliant to the Core Specification Supplement (CSS)

Or:

2. Contains the FLAGS AD Type as follows:
   • Limited Discoverable flag set to 1
   • General Discoverable flag set to 0
   • BR/EDR Not Supported flag set to 0
   • Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
   • Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

Within $T_{\text{GAP}}(\text{lim}_{-}\text{adv}_{-}\text{timeout})$ from the time the IUT enters Limited Discoverable Mode, if the Lower Tester receives advertising data from the IUT containing the Flags AD type, the General Discoverable Flag is set to 0 and the Limited Discoverable Flag set to 1.
After $T_{\text{GAP}}(\text{lim\_adv\_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester does not receive any advertising data from the IUT containing the Flags AD Type as described:

- Limited Discoverable flag set to 1
- General Discoverable flag set to 0
- BR/EDR Not Supported flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

### 4.6.2.2 GAP/DISC/LIMM/BV-02-C [Limited Discoverable Mode Undirected Connectable Mode– BR/EDR/LE]

**Test Purpose**

Verify the IUT in Limited Discoverable Mode and the Undirected Connectable Mode can be discovered by a device performing the Limited Discovery Procedure.

The IUT is operating in the Peripheral role.

**Reference**


**Initial Condition**

The IUT is in Link Layer state ‘Standby’.

The IUT is in Undirected Connectable Mode.

$T_{\text{GAP}}(\text{lim\_adv\_timeout})$ is specified for the IUT in the IXIT [3].

**Test Procedure**

The Upper Tester orders IUT to enter Limited Discoverable Mode and Undirected Connectable Mode.
• **Test Condition**

It must be possible to order IUT to enter Limited Discoverable Mode and Undirected Connectable Mode.

• **Expected Outcome**

**Pass Verdict**

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

The advertising data received by the Lower Tester contains the Flags AD type as described:

- Limited Discoverable flag set to 1
- General Discoverable flag set to 0
- BR/EDR Not Supported flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

Within $T_{\text{GAP}}(\text{lim_adv_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester receives advertising data from the IUT containing the Flags AD type as described:

- Limited Discoverable flag set to 1
- General Discoverable flag set to 0
- BR/EDR Not Supported flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

After $T_{GAP}(\text{lim}_{\text{adv}}_{\text{timeout}})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester does not receive any advertising data from the IUT containing the Flags AD Type with the Limited Discoverable Flag set to 1.

### 4.6.2.2.3 GAP/DISC/LIMM/BV-03-C [Limited Discoverable Mode Non-Connectable Mode – LE Only]

- **Test Purpose**
  Verify an LE only IUT in Limited Discoverable Mode and the Non-Connectable Mode can be discovered by a device performing the Limited Discovery Procedure.

  The IUT is operating in the Peripheral role.

- **Reference**
  [4], [9], [12] 9.2.3
  [15] 1.3

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  The IUT is in Non-Connectable Mode.

  $T_{GAP}(\text{lim}_{\text{adv}}_{\text{timeout}})$ for the IUT is specified in the IXIT [3].

- **Test Procedure**
  The Upper Tester orders IUT to enter Limited Discoverable Mode and Non-Connectable Mode.
• Test Condition
   It must be possible to order IUT to enter Limited Discoverable Mode and Non-Connectable Mode.

• Expected Outcome
   Pass Verdict
   The Lower Tester receives non-connectable advertising events from the IUT.
   The advertising data either:

   1. Does not contain the FLAGS AD Type; this is applicable if the IUT is a BR/EDR/LE Peripheral compliant to the Core Specification Supplement (CSS).
   Or:

   2. Contains the FLAGS AD Type as follows:
      - Limited Discoverable flag set to 1
      - General Discoverable flag set to 0
      - BR/EDR Not Supported flag set to 1
      - Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
      - Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0
   If the Flags AD Type is present in the advertising data then it only appears once per advertising event.
   The Flags AD Type is not present in any scan response data received.

   Within $T_{GAP}(\text{lim\_adv\_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester receives advertising data from the IUT containing the Flags AD type as described:

   - Limited Discoverable flag set to 1
   - General Discoverable flag set to 0
   - BR/EDR Not Supported flag set to 1
   - Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
   - Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

   After $T_{GAP}(\text{lim\_adv\_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester does not receive any advertising data from the IUT containing the Flags AD Type with the Limited Discoverable Flag set to 1.

4.6.2.2.4 GAP/DISC/LIMM/BV-04-C [Limited Discoverable Mode Undirected Connectable Mode – LE Only]

• Test Purpose
   Verify an LE only IUT in Limited Discoverable Mode and the Undirected Connectable Mode can be discovered by a device performing the Limited Discovery Procedure.

   The IUT is operating in the Peripheral role.
• Reference

[4] 9.2.3

• Initial Condition
The IUT is in Link Layer state ‘Standby’.
The IUT is in Undirected Connectable Mode.

\( T_{\text{GAP}}(\text{lim_adv_timeout}) \) is specified for the IUT in the IXIT [3].

• Test Procedure
The Upper Tester orders IUT to enter Limited Discoverable Mode and Undirected Connectable Mode.

• Test Condition
It must be possible to order IUT to enter Limited Discoverable Mode and Undirected Connectable Mode.

• Expected Outcome
Pass Verdict

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

The advertising data received by the Lower Tester contains the Flags AD type as described:

- Limited Discoverable flag set to 1
- General Discoverable flag set to 0
- BR/EDR Not Supported flag set to 1
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

Within $T_{\text{GAP}}(\text{lim_adv_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester receives advertising data from the IUT containing the Flags AD type as described:

- Limited Discoverable flag set to 1
- General Discoverable flag set to 0
- BR/EDR Not Supported flag set to 1
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

After $T_{\text{GAP}}(\text{lim_adv_timeout})$ from the time the IUT enters Limited Discoverable Mode, the Lower Tester does not receive any advertising data from the IUT containing the Flags AD Type with the Limited Discoverable Flag set to 1.

### 4.6.2.3 General Discoverable Mode

#### 4.6.2.3.1 GAP/DISC/GENM/BV-01-C [General Discoverable Mode Non-Connectable Mode—BR/EDR/LE]

- **Test Purpose**
  
  Verify the IUT in General Discoverable Mode and the Non-Connectable Mode can be discovered by a device performing the General Discovery Procedure.

  The IUT is operating in the Peripheral role.

- **Reference**

  [4] 9.2.4, 13.1.1.2

  [9], [12] 9.2.4, 13.1.1

  [15] 1.3

- **Initial Condition**

  The IUT is in Link Layer state ‘Standby’.

  The IUT is in Non-Connectable Mode.

  The Lower Tester performs the General Discovery Procedure.

- **Test Procedure**

  The Upper Tester orders IUT to enter General Discoverable Mode and Non-Connectable Mode.
• Test Condition
It must be possible to order IUT to enter General Discoverable Mode and Non-Connectable Mode.

• Expected Outcome
Pass Verdict

The Lower Tester receives non-connectable advertising events from the IUT.

The advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if the IUT is a BR/EDR/LE Peripheral compliant to the Core Specification Supplement (CSS).

Or:

2. Contains the FLAGS AD Type as follows:
   - Limited Discoverable flag set to 0
   - General Discoverable flag set to 1
   - BR/EDR Not Supported flag set to 0
   - Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
   - Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

4.6.2.3.2 GAP/DISC/GENM/BV-02-C [General Discoverable Mode Undirected Connectable Mode—BR/EDR/LE]

• Test Purpose
Verify the IUT in General Discoverable Mode and the Undirected Connectable Mode can be discovered by a device performing the General Discovery Procedure.
The IUT is operating in the Peripheral role.

- Reference
  [4] 9.2.4, 13.1.1

- Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The IUT is in Undirected Connectable Mode.
  The Lower Tester performs the General Discovery Procedure.

- Test Procedure
  The Upper Tester orders IUT to enter General Discoverable Mode and Undirected Connectable Mode.

  ![Diagram of test procedure]

- Test Condition
  It must be possible to order IUT to enter General Discoverable Mode and Undirected Connectable Mode.

- Expected Outcome
  **Pass Verdict**
  The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

  The advertising data received by the Lower Tester contains the Flags AD as described:
  - Limited Discoverable flag set to 0
  - General Discoverable flag set to 1
  - BR/EDR Not Supported flag set to 0
  - Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.

4.6.2.3.3 GAP/DISC/GENM/BV-03-C [General Discoverable Mode Non-Connectable Mode – LE Only]

- **Test Purpose**
  
  Verify an LE only IUT in General Discoverable Mode and the Non-Connectable Mode can be discovered by a device performing the General Discovery Procedure.

  The IUT is operating in the Peripheral role.

- **Reference**
  
  [4] 9.2.4, 13.1.1.2
  
  [9], [12] 9.2.4, 13.1.1
  
  [15] 1.3

- **Initial Condition**
  
  The IUT is in Link Layer state ‘Standby’.

  The IUT is in Non-Connectable Mode.

  The Lower Tester performs the General Discovery Procedure.

- **Test Procedure**
  
  The Upper Tester orders IUT to enter General Discoverable Mode and Non-Connectable Mode.
• Test Condition
  It must be possible to order IUT to enter General Discoverable Mode and Non-Connectable Mode.

• Expected Outcome
  **Pass Verdict**
  The Lower Tester receives non-connectable advertising events from the IUT.
  The advertising data either:

  1. Does not contain the FLAGS AD Type; this is applicable if the IUT is a BR/EDR/LE Peripheral compliant to the Core Specification Supplement (CSS).
     Or:

  2. Contains the FLAGS AD Type as follows:
     - Limited Discoverable flag set to 0
     - General Discoverable flag set to 1
     - BR/EDR Not Supported flag set to 1
     - Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
     - Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0
  
    If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

    The Flags AD Type is not present in any scan response data received.

**4.6.2.3.4 GAP/DISC/GENM/BV-04-C [General Discoverable Mode Undirected Connectable Mode – LE Only]**

• Test Purpose
  Verify an LE only IUT in General Discoverable Mode and the Undirected Connectable Mode can be discovered by a device performing the General Discovery Procedure.

  The IUT is operating in the Peripheral role.

• Reference
  [4] 9.2.4

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The IUT is in Undirected Connectable Mode.
  The Lower Tester performs the General Discovery Procedure.
• Test Procedure

The Upper Tester orders IUT to enter General Discoverable Mode and Undirected Connectable Mode.

---

• Test Condition

It must be possible to order IUT to enter General Discoverable Mode and Undirected Connectable Mode.

• Expected Outcome

Pass Verdict

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

The advertising data received by the Lower Tester contains the Flags AD type as described:

- Limited Discoverable flag set to 0
- General Discoverable flag set to 1
- BR/EDR Not Supported flag set to 1
- Simultaneous LE and BR/EDR to Same Device Capable (Controller) flag set to 0
- Simultaneous LE and BR/EDR to Same Device Capable (Host) flag set to 0

If the Flags AD Type is present in the advertising data then it only appears once per advertising event.

The Flags AD Type is not present in any scan response data received.
4.6.2.4 Limited Discovery Procedure

4.6.2.4.1 GAP/DISC/LIMP/BV-01-C [Limited Discovery Procedure Find Limited Discoverable Device]

• Test Purpose
Verify the IUT can perform the Limited Discovery Procedure to find a device in the Limited Discoverable Mode.

The IUT is operating in the Central role.

• Reference
[4] 9.2.5

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

$T_{\text{GAP}}(\text{lim\_disc\_scan\_min})$ for the IUT is specified in the IXIT [3].

• Test Procedure
The Lower Tester enters Limited Discoverable Mode.

The Upper Tester orders IUT to perform the Limited Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the Limited Discovery Procedure.

• Expected Outcome
Pass Verdict

If the IUT is Active Scanning with privacy enabled then the address used in the SCAN_REQ is a non-resolvable private address.

The IUT lists the Lower Tester during the discovery period.
4.6.2.4.2 GAP/DISC/LIMP/BV-02-C [Limited Discovery Procedure Does not find General Discoverable Device]

- **Test Purpose**
  
  Verify the IUT can perform the Limited Discovery Procedure and does not find a device in the General Discoverable Mode.

  The IUT is operating in the Central role.

- **Reference**
  
  [4] 9.2.5

- **Initial Condition**

  The IUT is in Link Layer state ‘Standby’.

  \( T_{\text{GAP}}(\text{gen}_{\text{-disc}_{\text{-scan}_{\text{-min}}}}) \) for the IUT is specified in the IXIT [3].

- **Test Procedure**

  The Lower Tester enters General Discoverable Mode.

  The Upper Tester orders IUT to perform the Limited Discovery Procedure.

- **Test Condition**

  It must be possible to order IUT to perform the Limited Discovery Procedure.

- **Expected Outcome**

  **Pass Verdict**

  If the IUT is Active Scanning with privacy enabled then the address used in the SCAN_REQ is a non-resolvable private address.

  The IUT does not discover the Lower Tester during the discovery period.
• Notes

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.4.3 GAP/DISC/LIMP/BV-03-C [Limited Discovery Procedure Does not find Broadcast device]

• Test Purpose

Verify the IUT can perform the Limited Discovery Procedure and does not find a device in the Broadcast Mode.

The IUT is operating in the Central role.

• Reference

[4] 9.2.5

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

\[ T_{GAP}(\text{lim\_disc\_scan\_min}) \] for the IUT is specified in the IXIT [3].

• Test Procedure

The Lower Tester enters Broadcast Mode.

The Upper Tester orders IUT to perform the Limited Discovery Procedure.

• Test Condition

It must be possible to order IUT to perform the Limited Discovery Procedure.
• Expected Outcome
  Pass Verdict

If the IUT is Active Scanning with privacy enabled then the address used in the SCAN_REQ is a non-resolvable private address.

The IUT does not discover the Lower Tester during the discovery period.

• Notes
  “Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.4.4 GAP/DISC/LIMP/BV-04-C [Limited Discovery Procedure Does not find Undirected Connectable device]

• Test Purpose
  Verify the IUT can perform the Limited Discovery Procedure and does not find a device in the Undirected Connectable Mode.

  The IUT is operating in the Central role.

• Reference
  [4] 9.2.5

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  
  $T_{\text{GAP}(\text{lim}_-\text{disc}_-\text{scan}_-\text{min})}$ for the IUT is specified in the IXIT [3].

• Test Procedure
  The Lower Tester enters Undirected Connectable Mode; the Lower Tester does not include the Flags AD Type in the advertising data with either the General Discoverable Flag or Limited Discoverable Flag set to 1.

  The Upper Tester orders IUT to perform the Limited Discovery Procedure.
• **Test Condition**
  It must be possible to order IUT to perform the Limited Discovery Procedure.

• **Expected Outcome**
  **Pass Verdict**
  The IUT does not discover the Lower Tester during the discovery period.

• **Notes**
  “Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.4.5 GAP/DISC/LIMP/BV-05-C [Limited Discovery Procedure Does not find Directed Connectable device]

• **Test Purpose**
  Verify the IUT can perform the Limited Discovery Procedure and does not find a device in the Directed Connectable Mode.

  The IUT is operating in the Central role.

• **Reference**
  [4] 9.2.5

• **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  $T_{\text{GAP}}(\text{lim\_disc\_scan\_min})$ for the IUT is specified in the IXIT [3].

  The initiator address for the IUT is specified in the IXIT [3].
• Test Procedure
The Upper Tester orders IUT to perform the Limited Discovery Procedure.

The Lower Tester enters Directed Connectable Mode using the specified initiator address for the IUT.

• Test Condition
It must be possible to order IUT to perform the Limited Discovery Procedure.

• Expected Outcome
Pass Verdict
The IUT does not discover the Lower Tester during the discovery period.

• Notes
“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.5 General Discovery Procedure

4.6.2.5.1 GAP/DISC/GENP/BV-01-C [General Discovery Procedure Finding General Discoverable Device]

• Test Purpose
Verify that IUT can perform the General Discovery Procedure and can find a device in the General Discoverable Mode.

The IUT is operating in the Central role.

• Reference
[4] 9.2.6
• Initial Condition
The IUT is in Link Layer state ‘Standby’.

\[ \text{T}_{\text{GAP}}(\text{gen\_disc\_scan\_min}) \text{ for the IUT is specified in the IXIT [3].} \]

• Test Procedure
The Lower Tester enters General Discoverable Mode.

The Upper Tester orders IUT to start the General Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the General Discovery Procedure.

• Expected Outcome
Pass Verdict

The IUT discovers the Lower Tester during the General Discovery Procedure.

4.6.2.5.2 GAP/DISC/GENP/BV-02-C [General Discovery Procedure Finding Limited Discoverable Device]

• Test Purpose
Verify the IUT can perform the General Discovery Procedure and can find devices in the Limited Discoverable Mode.

The IUT is operating in the Central role.

• Reference
[4] 9.2.6
• Initial Condition
The IUT is in Link Layer state ‘Standby’.
$T_{\text{GAP}}(\text{gen\_disc\_scan\_min})$ for the IUT is specified in the IXIT [3].

• Test Procedure
The Lower Tester enters Limited Discoverable Mode.
The Upper Tester orders IUT to start the General Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the General Discovery Procedure.

• Expected Outcome
Pass Verdict
The IUT lists the Lower Tester during the discovery period.

**4.6.2.5.3 GAP/DISC/GENP/BV-03-C [General Discovery Procedure Does not find Broadcast device]**

• Test Purpose
Verify the IUT can perform the General Discovery Procedure and does not find a device in the Broadcast Mode.
The IUT is operating in the Central role.

• Reference
[4] 9.2.6
• **Initial Condition**

The IUT is in Link Layer state ‘Standby’.

\( T_{\text{GAP}}(\text{gen\_disc\_scan\_min}) \) for the IUT is specified in the IXIT [3].

• **Test Procedure**

The Lower Tester enters Broadcast Mode.

The Upper Tester orders IUT to perform the General Discovery Procedure.

[Diagram showing the interaction between Lower Tester, IUT, and Upper Tester]

• **Test Condition**

It must be possible to order IUT to perform the General Discovery Procedure.

• **Expected Outcome**

Pass Verdict

The IUT does not discover the Lower Tester during the discovery period.

• **Notes**

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.5.4 GAP/DISC/GENP/BV-04-C [General Discovery Procedure Does not find Undirected Connectable device]

• **Test Purpose**

Verify the IUT can perform the General Discovery Procedure and does not find a device in the Undirected Connectable Mode.

The IUT is operating in the Central role.
• Reference
[4] 9.2.6

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

\[\text{T}_{\text{GAP}}(\text{gen\_disc\_scan\_min})\] for the IUT is specified in the IXIT [3].

• Test Procedure
The Lower Tester enters Undirected Connectable Mode; the Lower Tester does not include the Flags AD Type in the advertising data with either the General Discoverable Flag or Limited Discoverable Flag set to 1.

The Upper Tester orders IUT to perform the General Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the General Discovery Procedure.

• Expected Outcome
Pass Verdict

The IUT does not discover the Lower Tester during the discovery period.

• Notes
“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.
4.6.2.5.5 GAP/DISC/GENP/BV-05-C [General Discovery Procedure Does not find Directed Connectable device]

• Test Purpose
Verify the IUT can perform the General Discovery Procedure and does not find a device in the Directed Connectable Mode.

The IUT is operating in the Central role.

• Reference
[4] 9.2.6

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

T\textsubscript{GAP}(\text{gen\_disc\_scan\_min}) for the IUT is specified in the IXIT [3].

The initiator address for the IUT is specified in the IXIT [3].

• Test Procedure
The Lower Tester enters Directed Connectable Mode using the specified initiator address for the IUT.

The Upper Tester orders IUT to perform the General Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the General Discovery Procedure.

• Expected Outcome
Pass Verdict

The IUT does not discover the Lower Tester during the discovery period.
• Notes
“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.6.2.6 Name Discovery Procedure

4.6.2.6.1 GAP/IDLE/NAMP/BV-01-C [Name Discovery Procedure GATT Client]

• Test Purpose
Verify the IUT can perform the Name Discovery Procedure and retrieve the device name from a peer device.

The IUT is operating as the GATT client.

• Reference

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.

The Lower Tester and IUT are connected.

The Lower Tester is a GATT server and exposes the Device Name characteristic.

The Device Name Characteristic value for the Lower Tester is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to perform the Name Discovery Procedure.

• Test Condition
It must be possible to order IUT to perform the Name Discovery Procedure.
• Expected Outcome
  Pass Verdict

  The IUT retrieves the specified Device Name from the Lower Tester.

4.6.2.6.2 GAP/IDLE/NAMP/BV-02-C [Name Discovery Procedure GATT Server]

• Test Purpose
  Verify the IUT can support the Name Discovery Procedure and allow a peer device to retrieve the device name.
  
  The IUT is operating as the GATT Server.

• Reference

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.
  The Lower Tester and IUT are connected.
  The IUT is a GATT server and exposes the Device Name characteristic.
  The Device Name Characteristic value for the IUT is specified in the IXIT [3].

• Test Procedure
  The Lower Tester performs the Name Discovery Procedure.

  ![Diagram of Name Discovery Procedure]

  - Name Request
  - Name Response

• Expected Outcome
  Pass Verdict

  The Lower Tester retrieves the specified Device Name from the IUT.
4.6.2.7 Discovery of Devices with Resolvable Private Address

4.6.2.7.1 GAP/DISC/RPA/BV-01-C [Discovery Procedure Find Discoverable Device using Resolvable Private Address]

- **Test Purpose**
  Verify that the IUT can perform any of the Discovery Procedures to find a device in any of the Discoverable Modes, when resolvable private addresses are used.

  The IUT is operating in the Central role.

- **Reference**
  [12] 9.2.5, 10.7, 10.7.2.1

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

  $T_{\text{GAP}}(\text{lim\_disc\_scan\_min})$ and $T_{\text{GAP}}(\text{gen\_disc\_scan\_min})$ for the IUT is specified in the IXIT [3].

- **Test Procedure**
  The Lower Tester generates a resolvable private address using the Resolvable Private Address Generation Procedure.

  The Lower Tester enters Limited Discoverable Mode or General Discoverable Mode.

  The Upper Tester orders the IUT to add the Lower Tester’s Identity to the resolving list.

  The Upper Tester orders the IUT to perform the Limited Discovery Procedure or the General Discovery Procedure.

![Diagram showing the process of discovering devices with resolvable private address](diagram.png)
• Test Condition
  It must be possible to order IUT to perform the Limited Discovery Procedure or the General Discovery Procedure.
  It must be possible to order IUT to add the Lower Tester’s Device Identity to the resolving list.

• Expected Outcome
  Pass Verdict
  The IUT lists the Lower Tester during the discovery period by its identity address.

4.6.3 Connection Modes and Procedures

4.6.3.1 Non-Connectable Mode

4.6.3.1.1 GAP/CONN/NCON/BV-01-C [Non-Connectable Mode]

• Test Purpose
  Verify the IUT in the Non-Connectable Mode does not allow another device performing the Directed Connection Establishment Procedure to connect.
  The IUT is operating in the Broadcaster role or the Peripheral role or the Observer role.

• Reference
  [4] 9.3.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The public/static address for the IUT is specified in the IXIT [3].

• Test Procedure
  The Upper Tester orders IUT to enter Non-Connectable Mode.
  The Lower Tester performs the Direct Connection Establishment Procedure to connect to the IUT; the Lower Tester creates a connection using the specified public/static address for the IUT.
• Test Condition
  It must be possible to order IUT to enter Non-Connectable Mode.

• Expected Outcome
  Pass Verdict
  The Lower Tester receives either no advertising events or non-connectable advertising events from IUT whilst in Non-Connectable Mode.

  For IUT acting in the Broadcaster role, the Lower Tester receives non-connectable advertising events from IUT whilst broadcasting data in Non-Connectable Mode.

  In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

  The Lower Tester fails to establish a connection with the IUT.

4.6.3.1.2 GAP/CONN/NCON/BV-02-C [Non-Connectable Mode General Discoverable Mode]

• Test Purpose
  Verify the IUT in the Non-Connectable Mode and General Discoverable Mode does not allow a connection to be established with another device.

  The IUT is operating in the Peripheral role.

• Reference
  [4] 9.3.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The public/static address of the IUT is specified in the IXIT [3].
• Test Procedure

The Upper Tester orders the IUT to enter General Discoverable Mode.

The Upper Tester orders the IUT to enter Non-Connectable Mode.

The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates a connection using the specified public/static address.

• Test Condition

It must be possible to order IUT to enter Non-Connectable Mode.

• Expected Outcome

Pass Verdict

The Lower Tester receives non-connectable advertising events from IUT whilst in Non-Connectable Mode and General Discoverable Mode.

In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

The Lower Tester fails to establish a connection with the IUT.

4.6.3.1.3 GAP/CONN/NCON/BV-03-C [Non-Connectable Mode Limited Discoverable Mode]

• Test Purpose

Verify the IUT in the Non-Connectable Mode and Limited Discoverable Mode does not allow a connection to be established with another device.

The IUT is operating in the Peripheral role.

• Reference

[4] 9.3.2
• **Initial Condition**

The IUT is in Link Layer state ‘Standby’.

The public/static address of the IUT is specified in the IXIT [3].

• **Test Procedure**

The Upper Tester orders the IUT to enter Limited Discoverable Mode.

The Upper Tester orders the IUT to enter Non-Connectable Mode.

The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates a connection using the specified public/static address for the IUT.

• **Test Condition**

It must be possible to order IUT to enter Non-Connectable Mode.

• **Expected Outcome**

**Pass Verdict**

The Lower Tester receives non-connectable advertising events from IUT whilst in Non-Connectable Mode and Limited Discoverable Mode.

In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

The Lower Tester fails to establish a connection with the IUT.
4.6.3.2 Directed Connectable Mode

4.6.3.2.1 GAP/CONN/DCON/BV-01-C [Directed Connectable Mode]

- Test Purpose
  Verify the IUT in the Directed Connectable Mode can connect with another device performing the General Connection Establishment Procedure.

  The IUT is operating in the Peripheral role.

- Reference
  [4] 9.3.3

- Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The public/static address of the IUT is specified in the IXIT [3].

  The public/static address of the Lower Tester is specified in the IXIT [3].

- Test Procedure
  The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates the connection using the received advertiser address.

  The Upper Tester orders IUT to enter Direct Connectable Mode; the IUT sets the advertiser’s address to the public/static address of the IUT and sets the initiator address to the public/static address of the Lower Tester.

  The Lower Tester or the IUT terminates the connection.

- Test Condition
  It must be possible to order IUT to enter Direct Connectable Mode.
• Expected Outcome

Pass Verdict

The Lower Tester receives connectable directed advertising events from IUT during the period that the IUT is in Directed Connectable Mode.

In each connectable directed advertising event received the advertiser address is set to the public/static address of the IUT and the initiator address is set to the public/static address of the Lower Tester.

The Lower Tester establishes a connection with the IUT using the received advertiser address.

The Lower Tester or IUT successfully terminates the connection.

4.6.3.2.2 GAP/CONN/DCON/BV-04-C [Directed Connectable Mode, Privacy, Resolvable Private Address, Central Address Resolution]

• Test Purpose

Verify that the IUT in the Directed Connectable Mode using a Resolvable Private Address can connect with another device using a Resolvable Private Address performing the General Connection Establishment Procedure when the other device indicates support for Central Address Resolution.

The IUT is operating in the Peripheral role.

• Reference

[12] 9.3.3, 12.4

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The IUT is in Privacy mode.

The Lower Tester exposes the Central Address Resolution characteristic which is set to 1.

\( T_{\text{GAP}( \text{private\_addr\_int} )} \) for the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure

1. The Upper Tester orders the IUT to add the Lower Tester's Device Identity to the resolving list.
2. The Upper Tester orders the IUT to enter General Connectable Mode.
3. The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates the connection using the received advertiser address.
4. When connected, the IUT optionally reads the value of the Central Address Resolution characteristic.
5. The Lower Tester or the IUT terminates the connection.
6. The Upper Tester orders the IUT to enter Direct Connectable Mode targeting the Lower Tester by its identity address.
7. The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; upon receiving the directed advertisement, the Lower Tester resolves the initiator and advertiser address, and set the advertiser address equivalent to the resolved advertiser address when creating the connection to the IUT.

8. After the connection establishment, either the Lower Tester or the IUT should terminate the connection.

- Test Condition
  It must be possible to order the IUT to enter Direct Connectable Mode.

- Expected Outcome
  **Pass Verdict**
  In each connectable directed advertising event received by the Lower Tester the advertiser address is set to the a resolvable private address for the IUT and the initiator address is set to a generated resolvable private address based on the device identity of the Lower Tester.

The Lower Tester establishes a connection with the IUT using the initiator address and advertiser address from the advertisement.
4.6.3.2.3 GAP/CONN/DCON/BV-05-C [Directed Connectable Mode, Privacy, Resolvable Private Address, Central Address Resolution not supported]

• Test Purpose
   Verify that the IUT does not initiate the Directed Connectable Mode using a Resolvable Private Address, towards another privacy enabled device, which does not indicate support for Central Address Resolution.

   The IUT is operating in the Peripheral role.

• Reference
   [12] 9.3.3, 12.4

• Initial Condition
   The IUT is in Link Layer state ‘Standby’.

   The IUT is in Privacy mode.

   The Lower Tester may expose the Central Address Resolution characteristic. If present it shall be set to 0.

   \( T_{GAP}(\text{private_addr_int}) \) for the IUT is specified in the IXIT [3].

   The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

   The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
   1. The Upper Tester orders the IUT to add the Lower Testers Identity to the resolving list.
   2. The Upper Tester orders the IUT to enter General Connectable Mode.
   3. The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates the connection using the received advertiser address.
   4. When connected, the IUT optionally reads the value of the Central Address Resolution characteristic of the Lower Tester.
   5. The Lower Tester or the IUT terminates the connection.
   6. The Upper Tester orders the IUT to enter Direct Connectable Mode targeting the Lower Tester by its identity address.
   7. The IUT refuses the order. The IUT might enter another connectable mode and establish the connection this way.
**Test Condition**

It must be possible to order the IUT to enter Direct Connectable Mode.

**Expected Outcome**

**Pass Verdict**

The Lower Tester does not establish a connection with the IUT based on directed advertisement.

### 4.6.3.3 Undirected Connectable Mode

#### 4.6.3.3.1 GAP/CONN/UCON/BV-01-C [Undirected Connectable Mode Non-Discoverable Mode]

**Test Purpose**

Verify the IUT in Undirected Connectable Mode can connect with another device performing the General Connection Establishment Procedure.

The IUT is operating in the Peripheral role.

**Reference**

[4] 9.3.4
• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The public/static address of the IUT is specified in the IXIT \[3\].

• Test Procedure

The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates a connection using the advertiser’s address in the received advertising events from the IUT.

The Upper Tester orders IUT to enter Undirected Connectable Mode and Non-Discoverable Mode; the IUT sets the advertiser address to the public/static address of the IUT.

• Test Condition

It must be possible to order IUT to enter Undirected Connectable Mode.

• Expected Outcome

Pass Verdict

The IUT sends either connectable and scannable undirected advertising events or connectable undirected advertising events.

In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

The Lower Tester establishes a connection with IUT.
4.6.3.3.2 GAP/CONN/UCON/BV-02-C [Undirected Connectable Mode General Discoverable Mode]

- **Test Purpose**
  Verify the IUT in Undirected Connectable Mode and General Discoverable Mode can connect with another device performing the General Connection Establishment Procedure.

  The IUT is operating in the Peripheral role.

- **Reference**
  [4] 9.3.4

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’

  The public/static address for the IUT is specified in the IXIT [3].

- **Test Procedure**
  The Upper Tester orders IUT to enter Undirected Connectable Mode and General Discoverable Mode; the IUT sets the advertiser address to the specified public/static address for the IUT.

  The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT.

- **Test Condition**
  It must be possible to order IUT to enter Undirected Connectable Mode.

- **Expected Outcome**
  **Pass Verdict**

  The IUT sends either connectable and scannable undirected advertising events or connectable undirected advertising events.
In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

The Lower Tester establishes a connection with IUT.

4.6.3.3.3 GAP/CONN/UCON/BV-03-C [Undirected Connectable Mode Limited Discoverable Mode]

• Test Purpose
Verify the IUT in Undirected Connectable Mode and Limited Discoverable Mode can connect with another device performing the General Connection Establishment Procedure.

The IUT is operating in the Peripheral role.

• Reference
[4] 9.3.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The public/static address for the IUT is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to enter Limited Discoverable Mode and Undirected Connectable Mode; the IUT sets the advertiser address to the public/static address for the IUT.

The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT.

• Test Condition
It must be possible to order IUT to enter Undirected Connectable Mode.
• Expected Outcome
  Pass Verdict

The IUT sends either connectable and scannable undirected advertising events or connectable undirected advertising events.

In each advertising event received the advertiser address is set to the specified public/static address for the IUT.

The Lower Tester establishes a connection with IUT.

4.6.3.3.4 GAP/CONN/UCON/BV-06-C [Undirected Connectable Mode Resolvable Private Address]

• Test Purpose
  Verify the IUT in the Undirected Connectable Mode using Resolvable Private Address can connect with another device performing the General Connection Establishment Procedure.

  The IUT is operating in the Peripheral role.

• Reference
  [9] [12] 9.3.4, 10.7.1

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The IUT is in Privacy mode.

  \( T_{\text{GAP}}(\text{private_addr_int}) \) for the IUT is specified in the IXIT [3].

  The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

  The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
  The Upper Tester orders IUT to enter Undirected Connectable Mode using private addresses. The IUT changes the advertiser address to a new and unique resolvable address every \( T_{\text{GAP}}(\text{private_addr_int}) \). The Lower Tester verifies that the resolvable private address changes at least once after \( T_{\text{GAP}}(\text{private_addr_int}) \).

  The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates the connection using the received resolvable private address from the IUT.

  After the connection establishment, either the Lower Tester or the IUT should terminate the connection.

• Test Condition
  It must be possible to order IUT to enter Undirected Connectable Mode.
• Expected Outcome

Pass Verdict

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from the IUT.

In each advertising event received the advertiser address is set to a valid resolvable private address.

The Lower Tester is able to resolve and confirm the identity of the IUT from the received private address.

The Lower Tester verifies that the IUT changes the resolvable private address in the advertiser address of the received advertising events after \( T_{\text{GAP}}(\text{private_addr_int}) \).

The Lower Tester establishes a connection with the IUT using the received advertiser address.

4.6.3.4 Auto Connection Establishment Procedure

4.6.3.4.1 GAP/CONN/ACEP/BV-01-C [Auto Connection Establishment Procedure Directed Connectable Mode]

• Test Purpose

Verify the IUT can perform the Auto Connection Establishment Procedure to connect to another device in the Directed Connectable Mode.

The IUT is operating in the Central role.

• Reference

[4] 9.3.5

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The public/static address of the Lower Tester is specified in the IXIT [3].

The public/static address of the IUT is specified in the IXIT [3].

• Test Procedure

The Upper Tester orders IUT to perform the Auto Connection Establishment Procedure using the specified public/static address of the Lower Tester.

The Lower Tester sets the advertiser address to the specified public/static address of the Lower Tester.

The Lower Tester sets the initiator address to the specified public/static address of the IUT.

The Lower Tester enters the Directed Connectable Mode.
4.6.3.4.2 GAP/CONN/ACEP/BV-03-C [Auto Connection Establishment Procedure Directed Connectable Mode, Resolvable Private Address, Central Address Resolution]

- Test Purpose
  Verify the IUT using Resolvable Private Address can perform the Auto Connection Establishment Procedure to connect to another device in the Directed Connectable Mode that is using Resolvable Private Addresses.

  The IUT is operating in the Central role.

- Reference
  [12] 9.3.5, 10.7.2.1, 10.7.2.2, 12.4

- Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The IUT exposes the Central Address Resolution Characteristic set to 1.

  The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

  The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].
4.6.3.4.3 GAP/CONN/ACEP/BV-04-C [Auto Connection Establishment Procedure Undirected Connectable Mode, Resolvable Private Address]
The IUT is operating in the Central role.

- **Reference**
  
  [12] 9.3.5, 10.7.2.1, 10.7.2.2, 12.4

- **Initial Condition**
  
  The IUT is in Link Layer state ‘Standby’.

  The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

  The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

- **Test Procedure**
  
  The Upper Tester orders the IUT to add the Lower Testers Identity to the resolving list and White List.

  The Upper Tester orders the IUT to perform the Auto Connection Establishment Procedure using resolvable private address.

  The Lower Tester enters the Undirected Connectable Mode using the device identity for the Lower Tester.

  Upon receiving the undirected advertisement, the IUT resolves the address and sends a connect request to the Lower Tester.

  After the connection establishment, either the Lower Tester or the IUT should terminate the connection.

- **Test Condition**
  
  It must be possible to order the IUT to perform the Auto Connection Establishment Procedure.
• Expected Outcome

Pass Verdict

The IUT uses a resolvable private address as the initiator address and advertiser address present in the undirected advertisement in the connection request.

The IUT autonomously establishes a connection with the Lower Tester.

4.6.3.5 General Connection Establishment Procedure

4.6.3.5.1 GAP/CONN/GCEP/BV-01-C [General Connection Establishment Procedure Directed Connectable Mode]

• Test Purpose

Verify the IUT can perform the General Connection Establishment Procedure to connect to another device in the Directed Connectable Mode.

The IUT is operating in the Central role.

• Reference

[4] 9.3.6

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The Lower Tester has Privacy disabled; the Lower Tester does not expose the Privacy Flag characteristic; the Lower Tester does not expose the Reconnection Address characteristic.

The public/static address of the Lower Tester is specified in the IXIT [3].

The public/static address of the IUT is specified in the IXIT [3].

• Test Procedure

The Upper Tester orders the IUT to perform the General Connection Establishment Procedure; the IUT uses the specified public/static address of the Lower Tester.

The Lower Tester sets the advertiser address to the public/static address of the Lower Tester.

The Lower Tester sets the initiator address to the public/static address of the IUT.

The Lower Tester enters the Directed Connectable Mode.
• Test Condition
  It must be possible to order IUT to perform the General Connection Establishment Procedure.

• Expected Outcome
  Pass Verdict

  The IUT receives the connectable directed advertising events from the Lower Tester.

  If the IUT is Active Scanning with privacy enabled then the address used in the SCAN_REQ is a non-resolvable private address.

  If the IUT has privacy enabled then the address used in the connection request is a non-resolvable private address.

  The IUT establishes a connection with the Lower Tester.

4.6.3.5.2 GAP/CONN/GCEP/BV-02-C [General Connection Establishment Procedure Undirected Connectable Mode]

• Test Purpose
  Verify the IUT can perform the General Connection Establishment Procedure to connect to another device in the Undirected Connectable Mode.

  The IUT is operating in the Central role.

• Reference
  [4] 9.3.6

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

  The Lower Tester has Privacy disabled; the Lower Tester does not expose the Privacy Flag characteristic; the Lower Tester does not expose the Reconnection Address characteristic.
The public/static address of the Lower Tester is specified in the IXIT [3].

The public/static address of the IUT is specified in the IXIT [3].

- **Test Procedure**
  
  The Upper Tester orders the IUT to perform the General Connection Establishment Procedure; the IUT uses the specified public/static address of the Lower Tester.

  The Lower Tester sets the advertiser address to the public/static address of the Lower Tester.

  The Lower Tester enters the Undirected Connectable Mode.

  ![Diagram](image)

- **Test Condition**

  It must be possible to order IUT to perform the General Connection Establishment Procedure.

- **Expected Outcome**

  Pass Verdict

  The IUT receives the connectable and scannable undirected advertising events or connectable undirected advertising events from the Lower Tester.

  The IUT establishes a connection with the Lower Tester.

4.6.3.5.3 GAP/CONN/GCEP/BV-05-C [General Connection Establishment Procedure Directed Connectable Mode, Resolvable Private Address, Central Address Resolution]

- **Test Purpose**

  Verify the IUT using a Resolvable Private Address can perform the General Connection Establishment Procedure to connect to another device in the Directed Connectable Mode using Resolvable Private Address.

  The IUT is operating in the Central role.
• Reference

[12] 9.3.6. 10.7.2.1, 10.7.2.2, 12.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The IUT exposes the Central Address Resolution Characteristic set to 1.

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to add the Lower Testers Identity to the resolving list.

The Upper Tester orders the IUT to perform the General Connection Establishment Procedure using resolvable private address.

The Lower Tester enters the Directed Connectable Mode using the device identities for the IUT and Lower Tester.

Upon receiving the directed advertisement, the IUT resolves the addresses and sends a connect request to the Lower Tester.

After the connection establishment, either the Lower Tester or the IUT should terminate the connection.

• Test Condition
It must be possible to order the IUT to perform the General Connection Establishment Procedure.
• Expected Outcome

Pass Verdict

The IUT receives the connectable directed advertising events from the Lower Tester.

The IUT is able to resolve and confirm the identity of the Lower Tester from the received resolvable private address.

The IUT uses a resolvable private address as the initiator address and the advertiser address present in the directed advertisement as the advertiser address in the connection request.

The IUT establishes a connection with the Lower Tester.

4.6.3.5.4 GAP/CONN/GCEP/BV-06-C [General Connection Establishment Procedure Undirected Connectable Mode, Resolvable Private Address]

• Test Purpose

Verify that the IUT using Resolvable Private Address can perform the General Connection Establishment Procedure to connect to another device in the Undirected Connectable Mode using Resolvable Private Address.

The IUT is operating in the Central role.

• Reference

[12] 9.3.6, 10.7.2.1, 10.7.2.2, 12.4

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure

The Upper Tester orders the IUT to add the Lower Tester’s Identity to the resolving list.

The Upper Tester orders the IUT to perform the General Connection Establishment Procedure using resolvable private address.

The Lower Tester enters the Undirected Connectable Mode using the device identity for the Lower Tester.

Upon receiving the undirected advertisement, the IUT resolves the address and sends a connect request to the Lower Tester.

After the connection establishment, either the Lower Tester or the IUT should terminate the connection.
**Test Condition**

It must be possible to order the IUT to perform the General Connection Establishment Procedure.

**Expected Outcome**

*Pass Verdict*

The IUT receives the connectable and scannable undirected advertising events or connectable undirected advertising events from the Lower Tester.

The IUT is able to resolve and confirm the identity of the Lower Tester from the received resolvable private address.

The IUT uses a resolvable private address as the initiator address and advertiser address present in the undirected advertisement in the connection request.

The IUT establishes a connection with the Lower Tester.

### 4.6.3.6 Selective Connection Establishment Procedure

#### 4.6.3.6.1 GAP/CONN/SCEP/BV-01-C [Selective Connection Establishment Procedure Directed Connectable Mode]

**Test Purpose**

Verify the IUT can perform the Selective Connection Establishment Procedure to connect to another device in the Directed Connectable Mode.

The IUT is operating in the Central role.

**Reference**

[4] 9.3.7

**Initial Condition**

The IUT is in Link Layer state ‘Standby’.
The Lower Tester has Privacy disabled; the Lower Tester exposes the Privacy Flag characteristic and is set to 0; the Lower Tester does not expose the Reconnection Address characteristic.

The public/static address of the Lower Tester is specified in the IXIT [3].

The public/static address of the IUT is specified in the IXIT [3].

- Test Procedure

The Upper Tester orders the IUT to perform the Selective Connection Establishment Procedure using the specified public/static address of the Lower Tester.

The Lower Tester sets the advertiser address to the specified public/static address of the Lower Tester.

The Lower Tester sets the initiator address to the specified public/static address of the IUT.

The Lower Tester enters the Directed Connectable Mode.

- Test Condition

It must be possible to order IUT to perform the Selective Connection Establishment Procedure.

- Expected Outcome

Pass Verdict

The IUT host receives advertising event reports sent from the Lower Tester and any other devices in the whitelist; the IUT does not receive advertising event reports from any other devices.

The IUT establishes a connection with the Lower Tester.
4.6.3.6.2 GAP/CONN/SCEP/BV-03-C [Selective Connection Establishment Procedure Directed Connectable Mode, Resolvable Private Address, Central Address Resolution]

• Test Purpose
Verify that the IUT using a Resolvable Private Address can perform the Selective Connection Establishment Procedure to connect to another device in the Directed Connectable Mode using Resolvable Private Address.

The IUT is operating in the Central role.

• Reference
[12] 9.3.7, 10.7.2.1, 10.7.2.2, 12.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The IUT exposes the Central Address Resolution Characteristic set to 1.

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to add the Lower Tester’s Device Identity to the resolving list and White List.

The Upper Tester orders the IUT to perform the Selective Connection Establishment Procedure using the device identity of the Lower Tester.

The Lower Tester enters the Directed Connectable Mode using the device identities for the IUT and Lower Tester.

Upon receiving the directed advertisement, the IUT resolves the addresses and sends a connect request to the Lower Tester.

After the connection establishment, either the Lower Tester or the IUT should terminate the connection.
• Test Condition
It must be possible to order the IUT to perform the Selective Connection Establishment Procedure.

• Expected Outcome
Pass Verdict
The IUT’s advertising reports includes the Lower Tester.
The IUT is able to resolve and confirm the identity of the Lower Tester from the received resolvable private address.
The IUT uses a resolvable private address as the initiator address and the advertiser address present in the directed advertisement as the advertiser address in the connection request.
The IUT establishes a connection with the Lower Tester.

4.6.3.7 Directed Connection Establishment Procedure

4.6.3.7.1 GAP/CONN/DCEP/BV-01-C [Directed Connection Establishment Procedure Directed Connectable Mode]
• Test Purpose
Verify the IUT can perform the Direct Connection Establishment Procedure to connect to another device in the Directed Connectable Mode.
The IUT is operating in the Central role.

• Reference
[4] 9.3.8

• Initial Condition
The IUT is in Link Layer state ‘Standby’.
The IUT has the address of the peer device.

- **Test Procedure**
  The Upper Tester orders the IUT to perform the Directed Connection Establishment Procedure using the static address, public address or non-resolvable private address of the Lower Tester.

  The Lower Tester sets the advertiser address to the static address, public address or non-resolvable private address of the Lower Tester.

  The Lower Tester sets the initiator address to the static address, public address or non-resolvable private address of the IUT.

  The Lower Tester enters the Directed Connectable Mode.

  ![Diagram of Directed Connection Establishment Procedure]

- **Test Condition**
  It must be possible to order IUT to perform the Directed Connection Establishment Procedure.

- **Expected Outcome**
  **Pass Verdict**

  If the IUT has privacy enabled then the address used in the connection request is a static address, public address, non-resolvable private address, or resolvable private address.

  The IUT establishes a connection with the Lower Tester.

4.6.3.7.2 GAP/CONN/DCEP/BV-03-C [Directed Connection Establishment Procedure Undirected Connectable Mode]

- **Test Purpose**
  Verify the IUT can perform the Direct Connection Establishment Procedure to connect to another device in the Undirected Connectable Mode.

  The IUT is operating in the Central role.
• Reference

[4] 9.3.8

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure
The Upper Tester orders IUT to perform the Directed Connection Establishment Procedure using the static address, public address, non-resolvable private address, or resolvable private address of the Lower Tester.

The Lower Tester sets the advertiser address to the static address, public address, non-resolvable private address, resolvable private address of the Lower Tester.

The Lower Tester sets the initiator address to the static address, public address or non-resolvable private address of the IUT.

The Lower Tester enters the Undirected Connectable Mode.

• Test Condition
It must be possible to order IUT to perform the Directed Connection Establishment Procedure.

• Expected Outcome
**Pass Verdict**

If the IUT has privacy enabled then the address used in the connection request is a static address, public address, non-resolvable private address, or resolvable private address.

The IUT establishes a connection with the Lower Tester.
4.6.3.7.3 GAP/CONN/DCEP/BV-05-C [Directed Connection Establishment Procedure Directed Connectable Mode, Resolvable Private Address, Central Address Resolution]

• Test Purpose
Verify that the IUT using Resolvable Private Address can perform the Directed Connection Establishment Procedure to connect to another device in the Directed Connectable Mode that is using a Resolvable Private Address.

The IUT is operating in the Central role.

• Reference
[12] 9.3.8, 10.7.2.1, 10.7.2.2, 12.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The IUT exposes the Central Address Resolution Characteristic set to 1.

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to add the Lower Testers Identity to the resolving list.

The Upper Tester orders the IUT to perform the Directed Connection Establishment Procedure using resolvable private address.

The Lower Tester enters the Directed Connectable Mode using the device identities for the IUT and Lower Tester.

Upon receiving the directed advertisement, the IUT resolves the addresses and sends a connect request to the Lower Tester.

After the connection establishment, either the Lower Tester or the IUT should terminate the connection.
• Test Condition
It must be possible to order the IUT to perform the Directed Connection Establishment Procedure.

• Expected Outcome
Pass Verdict
The IUT receives the connectable directed advertising events from the Lower Tester.

The IUT is able to resolve and confirm the identity of the Lower Tester from the received resolvable private address.

The IUT uses the advertiser address present in the directed advertisement as the advertiser address and a resolvable private address as the initiator address in the connection request.

The IUT establishes a connection with the Lower Tester.

4.6.3.7.4 GAP/CONN/DCEP/BV-06-C [Directed Connection Establishment Procedure Undirected Connectable Mode, Resolvable Private Address]

• Test Purpose
Verify that the IUT using Resolvable Private Address can perform the Directed Connection Establishment Procedure to connect to another device in the Undirected Connectable Mode that is using Resolvable Private Address.

The IUT is operating in the Central role.

• Reference
[12] 9.3.8, 10.7.2.1, 10.7.2.2
• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The Device Identity (IRK and Identity Address) of the IUT is specified in the IXIT [3].

The Device Identity (IRK and Identity Address) of the Lower Tester is specified in the IXIT [3].

• Test Procedure
The Upper Tester orders the IUT to add the Lower Testers Identity to the resolving list.

The Upper Tester orders the IUT to perform the Directed Connection Establishment Procedure using resolvable private address.

The Lower Tester enters the Undirected Connectable Mode using the device identities for the Lower Tester.

Upon receiving the undirected advertisement, the IUT resolves the address and sends a connect request to the Lower Tester.

After the connection establishment, either the Lower Tester or the IUT should terminate the connection.

• Test Condition
It must be possible to order the IUT to perform the Directed Connection Establishment Procedure.

• Expected Outcome
Pass Verdict

The IUT receives the connectable and scannable undirected advertising events or connectable undirected advertising events from the Lower Tester.
The IUT is able to resolve and confirm the identity of the Lower Tester from the received resolvable private address.

The IUT uses a resolvable private address as the initiator address and advertiser address present in the undirected advertisement in the connection request.

The IUT establishes a connection with the Lower Tester.

### 4.6.3.8 Connection Parameter Update Procedure

#### 4.6.3.8.1 GAP/CONN/CPUP/BV-01-C [Connection Parameter Update Procedure Valid Parameters Peripheral Initiator]

- **Test Purpose**
  
  Verify the IUT can perform the Connection Parameter Update Procedure using valid parameters for the peer device; the peer device accepts the updated connection parameters.

  The IUT is operating in the Peripheral role and is the initiator performing the Connection Parameter Update Procedure; the Lower Tester is operating in the Central role and is the responder.

- **Reference**
  
  [4] 9.3.9

- **Initial Condition**
  
  IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]:

  - TSPX_LE_scan_interval
    - TSPX_LE_scan_window
    - TSPX_initiator_filter_policy
    - TSPX_peer_address_type
    - TSPX_peer_address
    - TSPX_own_address_type
    - TSPX_conn_interval_min
    - TSPX_conn_interval_max
    - TSPX_conn_latency
    - TSPX_supervision_timeout
    - TSPX_minimum_ce_length
    - TSPX_maximum_ce_length

  The valid connection update parameters for the IUT are specified in the following IXIT [3]:

  - TSPX_conn_update_int_min
    - TSPX_conn_update_int_max
    - TSPX_conn_update_slave_latency
The TSPX_conn_update_supervision_timeout \( T_{\text{GAP}}(\text{conn\_param\_timeout}) \) for the IUT is specified in the IXIT [3].

- **Test Procedure**
  The Upper Tester orders the IUT to perform the Connection Parameter Update Procedure using the specified valid connection update parameters.

  The Lower Tester accepts the updated connection parameters and sends the appropriate L2CAP connection parameter update response within the specified \( T_{\text{GAP}}(\text{conn\_param\_timeout}) \).

- **Test Condition**
  It must be possible to order the IUT to perform the Connection Parameter Update Procedure.

- **Expected Outcome**
  **Pass Verdict**
  The Lower Tester receives an L2CAP connection parameter update request command with the specified update connection parameters sent by the IUT.

  The IUT host receives an indication from the IUT controller that the connection parameters have been updated.

- **Notes**
  The Lower Tester should be capable of using any connection parameters within the valid ranges.

**4.6.3.8.2 GAP/CONN/CPUP/BV-02-C [Connection Parameter Update Procedure Valid Parameters Timeout Peripheral Initiator]**

- **Test Purpose**
  Verify the IUT can perform the Connection Parameter Update Procedure using valid parameters for the peer device; the peer device fails to respond in a timely manner.
The IUT is operating in the Peripheral role and is the initiator performing the Connection Parameter Update Procedure; the Lower Tester is operating in the Central role and is the responder.

- Reference
  [4] 9.3.9

- Initial Condition
  IUT and Lower Tester are connected using the default connection parameters specified in the IXIT [3]:
  - TSPX_LE_scan_interval
  - TSPX_LE_scan_window
  - TSPX_initiator_filter_policy
  - TSPX_peer_address_type
  - TSPX_peer_address
  - TSPX_own_address_type
  - TSPX_conn_interval_min
  - TSPX_conn_interval_max
  - TSPX_conn_latency
  - TSPX_supervision_timeout
  - TSPX_minimum_ce_length
  - TSPX_maximum_ce_length
  The valid connection update parameters for the Lower Tester are specified in the following IXIT [3]:
  - TSPX_conn_update_int_min
  - TSPX_conn_update_int_max
  - TSPX_conn_update_slave_latency
  RTX timer is set to maximum allowed initial value.

- Test Procedure
  The Upper Tester orders the IUT to perform the Connection Parameter Update Procedure using the specified valid connection update parameters.

  The Lower Tester does not send the appropriate L2CAP connection parameter update response within the specified RTX timeout.
**Test Condition**

It must be possible to order the IUT to perform the Connection Parameter Update Procedure.

**Expected Outcome**

Pass Verdict

The IUT transmits a correctly formatted L2CAP Connection Parameter Update Request to the Lower Tester, containing valid connection update parameters matching those received from the Upper Tester.

After RTX timer expires, the IUT either:

1. IUT resends the L2CAP Connection Parameter Update Request command.
2. IUT disconnects the connection at the Link Layer.
3. IUT ignores the error case and continues without disconnecting or resending.

**Notes**

The Lower Tester should be capable of using any connection parameters within the valid ranges but in this test case does not respond to the connection parameter update request sent by the IUT.

**4.6.3.8.3 GAP/CONN/CPUP/BV-03-C [Connection Parameter Update Procedure Invalid Parameters Peripheral Initiator]**

**Test Purpose**

Verify the IUT can perform the Connection Parameter Update Procedure using invalid parameters for the peer device; the peer device rejects the updated connection parameters.

The IUT is operating in the Peripheral role and is the initiator performing the Connection Parameter Update Procedure; the Lower Tester is operating in the Central role and is the responder.

**Reference**

[4] 9.3.9
• Initial Condition

IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]:

- TSPX_LE_scan_interval
- TSPX_LE_scan_window
- TSPX_initiator_filter_policy
- TSPX_peer_address_type
- TSPX_peer_address
- TSPX_own_address_type
- TSPX_conn_interval_min
- TSPX_conn_interval_max
- TSPX_conn_latency
- TSPX_supervision_timeout
- TSPX_minimum_ce_length
- TSPX_maximum_ce_length

The invalid connection update parameters for the Lower Tester are specified in the following IXIT [3]:

- TSPX_conn_update_int_min
- TSPX_conn_update_int_max
- TSPX_conn_update_slave_latency
- TSPX_conn_update_supervision_timeout

T_{GAP}(conn_param_timeout) for the IUT is specified in the IXIT.

• Test Procedure

The Upper Tester orders the IUT to perform the Connection Parameter Update Procedure using the specified invalid connection update parameters.

The Lower Tester rejects the updated connection parameters and sends the appropriate L2CAP connection parameter update response within the specified T_{GAP}(conn_param_timeout).
• Test Condition
  It must be possible to order the IUT to perform the Connection Parameter Update Procedure.

• Expected Outcome
  **Pass Verdict**

  The Lower Tester receives an L2CAP connection parameter update request command with the specified update connection parameters sent by the IUT.

  The IUT host does not receive an indication from the IUT controller that the connection parameters have been updated.

• Notes
  The Lower Tester should be capable of using any connection parameters within the valid ranges but in this test case rejects the update connection parameters request sent by the IUT.

4.6.3.8.4 GAP/CONN/CPUP/BV-04-C [Connection Parameter Update Procedure Valid Parameters Central Responder]

• Test Purpose
  Verify the IUT accepts the connection parameter update request from a peer device performing the Connection Parameter Update Procedure using valid parameters for the IUT.

  The Lower Tester is operating in the Peripheral role and is the initiator performing the Connection Parameter Update Procedure; the IUT is operating in the Central role and is the responder.

• Reference
  [4] 9.3.9
• Initial Condition

IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]:

- TSPX_LE_scan_interval
- TSPX_LE_scan_window
- TSPX_initiator_filter_policy
- TSPX_peer_address_type
- TSPX_peer_address
- TSPX_own_address_type
- TSPX_conn_interval_min
- TSPX_conn_interval_max
- TSPX_conn_latency
- TSPX_supervision_timeout
- TSPX_minimum_ce_length
- TSPX_maximum_ce_length

The valid connection update parameters for the IUT are specified in the following IXIT [3]:

- TSPX_conn_update_int_min
- TSPX_conn_update_int_max
- TSPX_conn_update_slave_latency
- TSPX_conn_update_supervision_timeout

• Test Procedure

The Lower Tester performs the Connection Parameter Update Procedure using the specified valid connection update parameters.
• Expected Outcome
  
  **Pass Verdict**

  The Lower Tester receives an L2CAP connection parameter update response within $T_{\text{GAP}}(\text{conn\_param\_timeout})$ after sending the L2CAP connection parameter update request.

  The L2CAP connection parameter update response result code is set to “parameters accepted”.

  The IUT uses the new connection parameters after the Lower Tester receives the L2CAP connection parameter update response.

• Notes
  
  The Lower Tester should be capable of using any connection parameters within the valid ranges.

4.6.3.8.5 GAP/CONN/CPUP/BV-05-C [Connection Parameter Update Procedure Invalid Parameters Central Responder]

• Test Purpose
  
  Verify the IUT rejects the connection parameter update request from a peer device performing the Connection Parameter Update Procedure using invalid connection parameters for the IUT.

  The Lower Tester is operating in the Peripheral role and is the initiator performing the Connection Parameter Update Procedure and the IUT is operating in the Central role and is the responder.

• Reference
  
  [4] 9.3.9

• Initial Condition
  
  IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]:

  - TSPX_LE_scan_interval
  - TSPX_LE_scan_window
  - TSPX_initiator_filter_policy
  - TSPX_peer_address_type
  - TSPX_peer_address
  - TSPX_own_address_type
  - TSPX_conn_interval_min
  - TSPX_conn_interval_max
  - TSPX_conn_latency
  - TSPX_supervision_timeout
  - TSPX_minimum_ce_length
  - TSPX_maximum_ce_length
The invalid connection update parameters for the IUT are specified in the following IXIT [3]:

- TSPX_conn_update_int_min
- TSPX_conn_update_int_max
- TSPX_conn_update_slave_latency
- TSPX_conn_update_supervision_timeout

**Test Procedure**

The Lower Tester performs the Connection Parameter Update Procedure using the specified invalid connection update parameters.

**Expected Outcome**

**Pass Verdict**

The Lower Tester receives an L2CAP connection parameter update response within $T_{\text{GAP}}(\text{conn\_param\_timeout})$ after sending the L2CAP connection parameter update request.

The L2CAP connection parameter update response result code is set to “request rejected”.

The IUT continues to use the default connection parameters after the Lower Tester receives the L2CAP connection parameter update response.

**Notes**

The Lower Tester should be capable of using any connection parameters within the valid ranges.

**4.6.3.8.6 GAP/CONN/CPUP/BV-06-C [Connection Parameter Update Procedure Valid Parameters Central Initiator]**

**Test Purpose**

Verify the IUT can perform the Connection Parameter Update Procedure using valid parameters for the peer device; the peer device accepts the updated connection parameters.

The IUT is operating in the Central role and is the initiator performing the Connection Parameter Update Procedure and the Lower Tester is operating in the Peripheral role and is the responder.
• Reference

[4] 9.3.9

• Initial Condition

IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]:

- TSPX_LE_scan_interval
- TSPX_LE_scan_window
- TSPX_initiator_filter_policy
- TSPX_peer_address_type
- TSPX_peer_address
- TSPX_own_address_type
- TSPX_conn_interval_min
- TSPX_conn_interval_max
- TSPX_conn_latency
- TSPX_supervision_timeout
- TSPX_minimum_ce_length
- TSPX_maximum_ce_length

The valid connection update parameters for the Lower Tester are specified in the following IXIT [3]:

- TSPX_conn_update_int_min
- TSPX_conn_update_int_max
- TSPX_conn_update_slave_latency
- TSPX_conn_update_supervision_timeout

• Test Procedure

The Upper Tester orders the IUT to perform the Connection Parameter Update Procedure using the specified valid connection update parameters.

The Lower Tester expects the IUT to initiate either the Link Layer Connection Update procedure or the Connection Parameters Request Link Layer control procedure.

The Lower Tester accepts the updated connection parameters and completes the Link Layer procedure initiated by the IUT.
• Test Condition

It must be possible to order the IUT to perform the Connection Parameter Update Procedure.

• Expected Outcome

Pass Verdict

The Lower Tester receives the L2CAP connection parameter update response sent by the IUT in either the Link Layer Connection Update procedure or the Connection Parameters Request Link Layer control procedure.

The IUT and the Lower Tester use the new parameters and the link shall not be dropped due to Link Supervision Timeout.

• Notes

The Lower Tester should be capable of using any connection parameters within the valid ranges.

4.6.3.8.7 GAP/CONN/CPUP/BV-08-C [Connection Parameter Update Procedure Valid Parameters Peripheral Responder – LL Connection Parameters Request]

• Test Purpose

Verify the IUT accepts the connection parameter update request from a peer device performing the Connection Parameter Update Procedure using valid parameters for the IUT when both the IUT and the peer device support the Link Layer Connection Parameters Request control procedure.

The Lower Tester is operating in the Central role and is the initiator performing the Connection Parameter Update Procedure; the IUT is operating in the Peripheral role and is the responder.

• Reference

[4] 9.3.9
• Initial Condition

IUT and Lower Tester are connected using the default connection parameters specified in the following IXIT [3]

- TSPX_LE_scan_interval
- TSPX_LE_scan_window
- TSPX_initiator_filter_policy
- TSPX_peer_address_type
- TSPX_peer_address
- TSPX_own_address_type
- TSPX_conn_interval_min
- TSPX_conn_interval_max
- TSPX_conn_latency
- TSPX_supervision_timeout
- TSPX_minimum_ce_length
- TSPX_maximum_ce_length

The valid connection update parameters for the IUT are specified in the following IXIT [3]:

- TSPX_conn_update_int_min
- TSPX_conn_update_int_max
- TSPX_conn_update_slave_latency
- TSPX_conn_update_supervision_timeout

• Test Procedure

The Lower Tester initiates the Connection Parameters Request Link Layer Control Procedure, sending the specified valid connection update parameters to the IUT.

The Lower Tester expects the IUT to accept the connection update parameters.

The Lower Tester completes the Connection Parameters Request Link Layer Control Procedure.

The Lower Tester expects the IUT to maintain the connection with the new parameters.
4.6.3.9 Terminate Connection Procedure

4.6.3.9.1 GAP/CONN/TERM/BV-01-C [Terminate Connection Procedure]

• Test Purpose
  Verify the IUT can perform the Terminate Connection Procedure.

  The IUT is Central or Peripheral and the Lower Tester is Peripheral or Central respectively.

• Reference
  [4] 9.3.8

• Initial Condition
  IUT and the Lower Tester are connected.

  The IUT is the Role as specified in the TSPX_gap_iut_role IXIT entry.
• **Test Procedure**

The Upper Tester orders the IUT to perform the Terminate Connection Procedure.

- **Test Condition**
  It must be possible to order the IUT to perform the Terminate Connection Procedure.

- **Expected Outcome**
  **Pass Verdict**

  IUT performs the Link Layer Termination Procedure and disconnects from the Lower Tester.

4.6.3.10 Random Device Address

4.6.3.10.1 GAP/CONN/PRDA/BV-01-C [Respond to Private Random Device Address after Bonding – Peripheral role]

• **Test Purpose**

  Verify that the IUT can properly respond to connections after bonding when Private Random Addresses are used by the Lower Tester.

  IUT is the responder and is in Peripheral role.

  IUT supports security manager pairing, and is in bondable mode.

  After the bonding has completed, authentication procedure shall be performed to assure that bonding information is stored properly and that Private Resolvable Addresses are accepted across connections.

• **Reference**

  [4] 10.8
• **Initial Condition**

Physical link is established between the IUT and Lower Tester. Lower Tester uses a Resolvable Private Address as its Device Address.

After the connection is established, Lower Tester initiates pairing with Bonding Flags set to “Bonding”.

The pairing procedure is completed successfully between Lower Tester and IUT.

The Lower Tester shall distribute its own IRK to the IUT.

• **Test Procedure**

Lower Tester disconnects the physical link with IUT.

The Lower Tester establishes connection with IUT. The Lower Tester uses a new Resolvable Private Address as its own Device Address for the connection establishment procedure. The Lower Tester may continue to try to establish connection for 30 seconds.

Lower Tester performs authentication procedure.

Repeat Test Procedure twice.

• **Test Condition**

Lower Tester shall distribute its IRK.

Lower Tester shall generate Resolvable Private Addresses between new connections.
• Expected Outcome
   Pass Verdict

   IUT reconnects with the Lower Tester and authentication is successful.

4.6.3.10.2 GAP/CONN/PRDA/BV-02-C [Respond to Private Random Device Address after Bonding – Central role]

• Test Purpose
   Verify that the IUT can properly respond to connections after bonding when Private Random Addresses are used by the Lower Tester.

   IUT is the initiator and is in Central role.

   IUT supports security manager pairing, and is in bondable mode.

   After the bonding has completed, authentication procedure shall be performed to assure that bonding information is stored properly and that Private Resolvable Addresses are accepted across connections.

• Reference
   [4] 10.8

• Initial Condition
   Physical link is established between IUT and Lower Tester. The Lower Tester uses a Resolvable Private Address as its Device Address.

   After the connection is established, the Lower Tester initiates security request with Bonding Flags set to “Bonding”.

   IUT initiates pairing procedure.

   The pairing procedure is completed successfully between the Lower Tester and IUT.

   The Lower Tester shall distribute its own IRK to the IUT.

• Test Procedure
   Lower Tester disconnects the physical link with the IUT.

   IUT establishes connection with the Lower Tester; the Lower Tester uses a new Resolvable Private Address as part of the connection establishment procedure.

   The Lower Tester performs the authentication procedure.

   Repeat Test Procedure twice.
4.6.4 Bonding Modes and Procedures

4.6.4.1 Non-bondable Mode

4.6.4.1.1 GAP/BOND/NBON/BV-01-C [Non-bondable Mode – Central as Responder]

• Test Purpose
  Verify that the IUT does not store bonding information after pairing while in non-bondable mode.

  Lower Tester is the initiator. The Lower Tester shall send security request to invoke the pairing procedure.

  IUT supports security manager pairing, but is in non-bondable mode.

  The pairing is performed as unauthenticated pairing (Just Works).

  The bonding shall be performed twice to make sure pairing is invoked both times.
IUT is the Central and Lower Tester is the Peripheral.

- Reference
  [4] 9.4.2

- Initial Condition
  Physical link is established by either directed or undirected connectable mode.
  IUT and Lower Tester are not bonded before.

- Test Procedure
  After the connection is established, Lower Tester initiates security request with Bonding_Flags set to "No Bonding".
  IUT responds to security request with pairing procedure.
  The pairing procedure is completed successfully between Lower Tester and IUT.
  Lower Tester disconnects the physical link with IUT.
  IUT establishes connection with Lower Tester again.
  Lower Tester re-initiates security request and verifies that pairing procedure is invoked and completed successfully.

- Test Condition
  IUT supports security manager pairing.

- Expected Outcome
  **Pass Verdict**
  Pairing is successful each time.
  Authentication is invoked each time.

4.6.4.1.2 GAP/BOND/NBON/BV-02-C [Non-bondable Mode – Central as Initiator]

- Test Purpose
  Verify that the IUT does not store bonding information after pairing while in non-bondable mode.
  IUT is the initiator. The Upper Tester shall request the authentication.
  IUT initiates the pairing procedure with bonding flag = “no bonding”.
  The pairing is performed as unauthenticated pairing (Just Works).
  The bonding shall be performed twice to make sure pairing is invoked both times.
  IUT is the Central and Lower Tester is the Peripheral.
• Reference

[4] 9.4.2

• Initial Condition
Physical link is established by either directed or undirected connectable mode.

IUT and Lower Tester are not bonded before.

• Test Procedure
After the connection is established, Upper Tester requests authentication with Bonding_Flags set to “No Bonding”.

IUT initiates pairing procedure.

The pairing procedure is completed successfully between Lower Tester and IUT.

Lower Tester disconnects the physical link with IUT.

The IUT establishes a connection with the Lower Tester again.

Upper Tester re-initiates authentication and the pairing procedure is invoked and completed successfully.
• Test Condition
  IUT supports security manager pairing.

• Expected Outcome
  
  **Pass Verdict**

  Pairing is successful each time.
  Authentication is invoked each time.

4.6.4.1.3 GAP/BOND/NBON/BV-03-C [Non-bondable Mode – Peripheral asResponder]

• Test Purpose
  Verify that the IUT does not exchange bonding information after pairing while in non-bondable mode.

  Lower Tester is the initiator. The Lower Tester shall require authentication to invoke the pairing procedure.

  IUT supports security manager pairing, but is in non-bondable mode.

  The pairing is performed as unauthenticated pairing (Just Works).

  Both initiator and responder key distribution field shall be set to 0 and bonding flag is set to “no bonding”.

  The IUT is Peripheral.

• Reference
  [4] 9.4.2

• Initial Condition
  Physical link is established by either directed or undirected connectable mode.

  IUT and Lower Tester are not bonded before.

• Test Procedure
  After the connection is established, the Lower Tester initiates pairing with Bonding_Flags set to “No Bonding” and both "Initiator Key Distribution = 0" and "Responder Key Distribution = 0".

  IUT sends a pairing response with Bonding_Flags = “No Bonding” and both "Initiator Key Distribution = 0" and "Responder Key Distribution = 0".

  The pairing procedure is completed successfully between the Lower Tester and IUT.

  Lower Tester disconnects the physical link with IUT.
**4.6.4.2 Bondable Mode** GAP/BOND/BON/BV-01-C [Initiate Bonding – Peripheral Role]

- **Test Purpose**
  
  Verify that the IUT can properly initiate the bonding procedure and store bonding information after pairing while in bondable mode as Peripheral role.

  IUT is the initiator and is in Peripheral role.

  IUT supports security manager pairing, and is in bondable mode.

  If IUT supports LE security mode 1 then pairing may be performed as unauthenticated pairing.

  If IUT supports LE security mode 2 then pairing shall be performed as authenticated pairing.
After the bonding, either data signing or encryption shall be performed to assure that bonding information is stored properly.

- **Reference**
  
  [4] 9.4.3 and 9.4.4

- **Initial Condition**

  Physical link is established by either directed or undirected connectable mode.

  IUT and Lower Tester are not bonded before.

- **Test Procedure**

  After the connection is established, IUT initiates security request with Bonding_Flags set to "Bonding".

  IUT initiates bonding by sending “security request” to the Lower Tester.

  The pairing procedure is completed successfully between the Lower Tester and IUT.

  If IUT supports LE security mode 1, then LTK shall be distributed from the IUT.

  If the IUT supports the generation of resolvable private addresses and generates a resolvable private address for its local address, it shall send Identity Information with SMP, including a valid IRK.

  If the IUT does not generate a resolvable private address for its own address and it sends Identity Information with SMP, it shall send an all-zero IRK.

  If IUT supports LE security mode 2, then CSRK shall be distributed.

  Lower Tester disconnects the physical link with IUT.

  Lower Tester establishes a connection with the IUT again.

  If the IUT supports security mode 1, then the Lower Tester starts the encryption procedure with the previously distributed LTK from the IUT.

  If the IUT supports security mode 2, then the IUT shall send signed data with the previously distributed CSRK.
• Test Condition
  IUT supports LE security mode 1 or 2.

• Expected Outcome
  **Pass Verdict**

  If IUT supports LE security mode 1, then encryption shall be done successfully.

  If IUT supports LE security mode 2, then data signing shall be done successfully.

4.6.4.2.2 GAP/BOND/BON/BV-02-C [Initiate Bonding – Central Role]

• Test Purpose
  Verify that the IUT can properly initiate bonding procedure and store bonding information after pairing while in bondable mode as Central role.

  IUT is the initiator and is in Central role.

  IUT supports security manager pairing, and is in bondable mode.

  If IUT supports LE security mode 1 then pairing may be performed as unauthenticated pairing.

  If IUT supports LE security mode 2 then pairing shall be performed as authenticated pairing.

  After the bonding, either data signing or encryption shall be performed to assure that bonding information is stored properly.
• Reference
  [4] 9.4.3, 9.4.4

• Initial Condition
  Physical link is established by either directed or undirected connectable mode.
  IUT and Lower Tester are not bonded before.

• Test Procedure
  After the connection is established, IUT initiates pairing with Bonding_Flags set to “Bonding”.
  The pairing procedure is completed successfully between the Lower Tester and IUT.
  If the IUT supports LE security mode 1, then LTK shall be distributed from the Lower Tester.
  If the IUT supports the generation of resolvable private addresses and generates a resolvable private address for its local address, it shall send Identity Information with SMP, including a valid IRK.
  If the IUT does not generate a resolvable private address for its own address and it sends Identity Information with SMP, it shall send an all-zero IRK.
  If the IUT supports LE security mode 2, then CSRK shall be distributed.
  Lower Tester disconnects the physical link with the IUT.
  Lower Tester establishes connection with the IUT again.
  If the IUT supports security mode 1, then the IUT starts the encryption procedure with the previously distributed LTK from the Lower Tester.
  If the IUT supports security mode 2, then the IUT shall send signed data with the previously distributed CSRK.
• Test Condition
  IUT supports LE security mode 1 or 2.

• Expected Outcome
  Pass Verdict
  If the IUT supports LE security mode 1, then encryption shall be done successfully.
  If the IUT supports LE security mode 2, then data signing shall be done successfully.

4.6.4.2.3 GAP/BOND/BON/BV-03-C [Respond to Bonding – Peripheral Role]

• Test Purpose
  Verify that the IUT can properly respond to bonding and store bonding information after pairing while in bondable mode as Peripheral role.

  IUT is the responder and is in Peripheral role.

  IUT supports security manager pairing, and is in bondable mode.

  If the IUT supports LE security mode 1, then pairing may be performed as unauthenticated pairing.

  If the IUT supports LE security mode 2, then pairing shall be performed as authenticated pairing.
After the bonding, either data signing or encryption shall be performed to assure that bonding information is stored properly.

- **Reference**
  
  [4] 9.4.3, 9.4.4

- **Initial Condition**

  Physical link is established by either directed or undirected connectable mode.

  IUT and Lower Tester are not bonded before.

- **Test Procedure**

  After the connection is established, the Lower Tester initiates pairing with Bonding Flags set to “Bonding”.

  The pairing procedure is completed successfully between the Lower Tester and IUT.

  If the IUT supports LE security mode 1, then the LTK shall be distributed from the IUT.

  If the IUT supports the generation of resolvable private addresses and generates a resolvable private address for its local address, it shall send Identity Information with SMP, including a valid IRK.

  If the IUT does not generate a resolvable private address for its own address and it sends Identity Information with SMP, it shall send an all-zero IRK.

  If the IUT supports LE security mode 2, then the CSRK shall be distributed.

  Lower Tester disconnects the physical link with the IUT.

  Lower Tester establishes the connection with the IUT again.

  If the IUT supports security mode 1, then the Lower Tester starts the encryption procedure with the previously distributed LTK from the IUT.

  If the IUT supports security mode 2, then the IUT shall send signed data with the previously distributed CSRK.
• Test Condition
IUT supports LE security mode 1 or 2.

• Expected Outcome
Pass Verdict
If the IUT supports LE security mode 1, then encryption shall be done successfully.
If the IUT supports LE security mode 2, then data signing shall be done successfully.

4.6.4.2.4 GAP/BOND/BON/BV-04-C [Respond to Bonding – Central Role]
• Test Purpose
Verify that the IUT can properly respond to bonding and store bonding information after pairing while in bondable mode as Central role.

IUT is the responder and is in Central role.

IUT supports security manager pairing, and is in bondable mode.
If the IUT supports LE security mode 1, then pairing may be performed as unauthenticated pairing.
If the IUT supports LE security mode 2, then pairing shall be performed as authenticated pairing.
After the bonding, either data signing or encryption shall be performed to assure that bonding information is stored properly.

- Reference
  [4] 9.4.3, 9.4.4

- Initial Condition
  Physical link is established by either directed or undirected connectable mode.

  IUT and Lower Tester are not bonded before.

- Test Procedure
  After the connection is established, Lower Tester initiates security request with Bonding_Flag set to “Bonding”.

  IUT initiates the pairing procedure.

  The pairing procedure is completed successfully between the Lower Tester and IUT.

  If the IUT supports LE security mode 1, then LTK shall be distributed from the Lower Tester.

  If the IUT supports the generation of resolvable private addresses and generates a resolvable private address for its local address, it shall send Identity Information with SMP, including a valid IRK.

  If the IUT does not generate a resolvable private address for its own address and it sends Identity Information with SMP, it shall send an all-zero IRK.

  If the IUT supports LE security mode 2, then CSRK shall be distributed.

  Lower Tester disconnects the physical link with the IUT.

  IUT establishes the connection with the Lower Tester again.

  If the IUT supports security mode 1, then the IUT starts the encryption procedure with the previously distributed LTK from the Lower Tester.

  If the IUT supports security mode 2, then the Lower Tester shall send signed data with the previously distributed CSRK.
4.6.5 Security

The test group objective is to verify the correct implementation of the security procedure in various LE security modes, [4] Section 10.

4.6.5.1 Authentication Procedure

4.6.5.1.1 GAP/SEC/AUT/BV-11-C [Service Response – Insufficient Authentication, Peripheral]

• Test Purpose

Verify that the IUT properly rejects the service request when there is no sufficient bonding and then completes service correctly with the Lower Tester as Central role.

The IUT is operating in the Peripheral role.
The Lower Tester is operating in the Central role.

- **Reference**
  
  [4] 10.3

- **Initial Condition**
  
  **Physical link is established by either directed or undirected connectable mode.**
  
  No previous bond or insufficient bond exists between the IUT and Lower Tester.
  
  **Upper Tester of the IUT is either a GATT profile or a higher layer protocol.**

- **Test Procedure**
  
  **Lower Tester initiates a service request to IUT.**
  
  Upper Tester of the IUT detects either there was no bonding or bonding with insufficient security level.
  
  Upper Tester of the IUT rejects the service request with error code “Insufficient Authentication”.
  
  **Lower Tester initiates unauthenticated pairing.**
  
  Authentication is completed successfully and key information is exchanged properly.
  
  If the IUT supports LE security mode 1, then the Lower Tester shall initiate encryption and send service request again.
  
  If the IUT supports LE security mode 2, then the Lower Tester shall send signed service request with previously distributed CSRK.
  
  IUT replies with correct service response.
• Expected Outcome

Pass Verdict

Authentication completes successfully.

Service response is properly sent by IUT.

4.6.5.1.2 GAP/SEC/AUT/BV-12-C [Service Response – Insufficient Authentication, Central]

• Test Purpose

Verify that the IUT properly rejects the service request when there is no sufficient bonding and then completes service correctly with the Lower Tester as Peripheral role.

The IUT is operating in the Central role.

The Lower Tester is operating in the Peripheral role.

• Reference

[4] 10.3

• Initial Condition

Physical link is established by either directed or undirected connectable mode.

No previous bond or insufficient bond exists between the IUT and Lower Tester.

Upper Tester of the IUT is either a GATT profile or a higher layer protocol.
• Test Procedure

Lower Tester initiates a service request to IUT.

Upper Tester of the IUT detects either there was no bonding or bonding with insufficient security level.

Upper Tester of the IUT rejects the service request with error code “Insufficient Authentication”.

Lower Tester initiates pairing.

Pairing is completed successfully and key information is exchanged properly.

If the IUT supports LE security mode 1, then the Lower Tester shall initiate encryption and send service request again.

If the IUT supports LE security mode 2, then the Lower Tester shall send signed service request with previously distributed CSRK.

IUT replies with correct service response.

• Expected Outcome

Pass Verdict

Authentication completes successfully.

Service response is properly sent by the IUT.
4.6.5.1.3 GAP/SEC/AUT/BV-13-C [Service Response – Insufficient Authentication, Central]

- **Test Purpose**
  Verify that the IUT properly rejects the service request when there is insufficient authentication and then completes service correctly with the Lower Tester as Peripheral role.

  The IUT is operating in the Central role.

  The Lower Tester is operating in the Peripheral role.

  IUT is capable of supporting LE security mode 1 level 3 (authenticated paring).

  Either Test Procedure A or B may be used.

- **Reference**
  [4] 10.3, 10.6

- **Initial Condition**
  Physical link is established by either directed or undirected connectable mode.

  Previous bond exists between the IUT and Lower Tester with unauthenticated pairing.

  Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

- **Test Procedure A**
  Lower Tester initiates encryption by sending “security request” on the link with MITM = 0.

  IUT initiates and completes the encryption of the link.

  Lower Tester initiates a service request to the IUT.

  Upper Tester of the IUT detects the bonding has insufficient security level.

  Upper Tester of the IUT rejects the service request with error code “Insufficient Authentication.”

  Lower Tester initiates higher level bonding by sending “security request” on the link with MITM = 1.

  IUT initiates pairing with MITM = 1 and then encrypts the link.

  Lower Tester sends service request again.

  IUT replies with correct service response.
• Test Procedure B

IUT initiates encryption with previously unauthenticated bonding info.

IUT initiates and completes the encryption of the link.

IUT initiates a service request to the Lower Tester.

Lower Tester detects the bonding has insufficient security level.

Lower Tester rejects the service request with error code “Insufficient Authentication.”

IUT initiates pairing with MITM = 1 and then encrypts the link.

IUT sends service request again.

Lower Tester replies with correct service response.
• Expected Outcome
  
  **Pass Verdict**
  
  Authentication completes successfully.

  Service response is properly sent by IUT.

  **4.6.5.1.4 GAP/SEC/AUT/BV-14-C [Service Response – Insufficient Authentication, Peripheral]**

  • Test Purpose

  Verify that the IUT properly rejects the service request when there is insufficient authentication and then completes service correctly with the Lower Tester as Central role.

  IUT is capable of supporting LE security mode 1 level 3 (authenticated pairing).

  The IUT is operating in the Peripheral role.

  The Lower Tester is operating in the Central role.

• Reference

  [4] 10.3, 10.6
• Initial Condition
  Physical link is established by either directed or undirected connectable mode.

  Previous bond exists between the IUT and Lower Tester with unauthenticated pairing.

  Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure
  Lower Tester initiates and completes the encryption on the link.

  Lower Tester initiates a service request to IUT.

  Upper Tester of the IUT detects the bonding has insufficient security level.

  Upper Tester of the IUT rejects the service request with error code “Insufficient Authentication”.

  Lower Tester initiates pairing MITM = 1 and then encrypts the link again.

  Lower Tester sends service request again.

  IUT replies with correct service response.
• Expected Outcome
  
  Pass Verdict

  Authentication completes successfully.

  Service response is properly sent by IUT.

4.6.5.1.5 GAP/SEC/AUT/BV-17-C [Correct Pairing after Insufficient Authentication – Central Role]

• Test Purpose

  Verify that the IUT can pair with a device whose IO capabilities do not allow an authenticated pairing, after a service request has been denied with the error response "Insufficient Authentication".

  IUT is the SM initiator, GATT client and is in Central role.

  IUT supports security manager pairing.

• Reference

  [6] 10.3

• Initial Condition

  Whether the IUT starts the pairing procedure before issuing any service request is specified in the IXIT [3].

  The IUT security policy of whether or not it mandates MITM is specified in the IXIT [3].

  Physical link is established between IUT and Lower Tester.

  IUT and Lower Tester have not previously bonded.

• Test Procedure

  1. If the IUT starts the pairing procedure before issuing any service request is recorded in the IXIT, proceed to step 5.
  2. The IUT performs a service request which will be denied by the Lower Tester with the error code "Insufficient Authentication".
  3. The IUT initiates a pairing procedure. The authentication requirement field should only be set to MITM if the IUT mandates MITM or if it allows security level downgrade during pairing; i.e., proceeding with the pairing procedure even though the request for MITM protection could not be met.
  4. The Lower Tester sets its IO capabilities to "NoInputNoOutput" and the authentication requirements field to zero in pairing phase 1.
  5. If the IUT has stated that it mandates MITM in the IXIT, the pairing procedure will fail; otherwise, the pairing will succeed, and the link will now be encrypted with an unauthenticated STK. The IUT completes the previous ordered service request with a success.
**Expected Outcome**

**Pass Verdict**

If the IUT has stated that it mandates MITM in the IXIT, the pairing procedure will fail; otherwise, the IUT will successfully complete an unauthenticated pairing with the Lower Tester and perform the service request.

### 4.6.5.1.6 GAP/SEC/AUT/BV-18-C [Correct Pairing after Insufficient Authentication – Peripheral Role]

**Test Purpose**

Verify that the IUT can pair with a device whose IO capabilities do not allow an authenticated pairing, after a service request has been denied with the error response “Insufficient Authentication”.

IUT is the SM responder, GATT Client and is in Peripheral role.

IUT supports security manager pairing.
• Reference
   [6] 10.3

• Initial Condition
  Whether the IUT starts the pairing procedure before issuing any service request is specified in the IXIT [3].

  The IUT’s security policy of whether or not it mandates MITM is specified in the IXIT [3].

  Physical link is established between the IUT and Lower Tester.

  IUT and Lower Tester have not previously bonded.

• Test Procedure
  1. If the IUT starts the pairing procedure before issuing any service request is recorded in the IXIT, proceed to step 5.
  2. The IUT performs a service request which will be denied by the Lower Tester with the error code “Insufficient Authentication”.
  3. The IUT sends a security request to initiate the pairing procedure. The authentication requirement field should only be set to MITM if the IUT mandates MITM or if it allows security level downgrade during pairing; i.e., proceeding with the pairing procedure even though the request for MITM protection could not be met.
  4. The Lower Tester sets its IO capabilities to “NoInputNoOutput” and mimics the authentication requirements field from the security request in pairing phase 1.
  5. If the IUT has stated that it mandates MITM in the IXIT, the pairing procedure will fail; otherwise, the pairing will succeed, and the link will now be encrypted with an unauthenticated STK. The IUT completes the previous ordered service request with a success.
4.6.5.1.7 GAP/SEC/AUT/BV-19-C [Service Response Insufficient Authentication – Central Role]

- **Expected Outcome**
  
  **Pass Verdict**

  If the IUT has stated that it mandates MITM in the IXIT, the pairing procedure will fail; otherwise, the IUT will successfully complete an unauthenticated pairing with the Lower Tester and perform the service request.

- **Test Purpose**
  
  Verify that the IUT when bonded with a peer device tests the bond when receiving the error response “Insufficient Authentication”, if link is unencrypted, before eventually removing the bond to perform a new pairing.

IUT is the SM initiator, GATT Client and is in Central role.

IUT supports security manager bonding.
• Reference
[6] 10.3

• Initial Condition
Whether the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3].

Physical link is established between IUT and Lower Tester.

IUT and Lower Tester are bonded before the connection and service discovery has been performed. The Lower Tester’s LTK has been distributed.

Lower Tester has not stored the LTK from the IUT, which will result in the “Insufficient Authentication” error in step 2.

• Test Procedure
1. If the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3], go to step 4.
2. The IUT performs a service request which is rejected by the Lower Tester with the error code “Insufficient Authentication”.
3. The IUT encrypts the link using a new long term key.
4. The IUT completes the previous ordered service request with a success.
• Expected Outcome
  Pass Verdict

On receiving the error response “Insufficient Authentication” the IUT encrypts the link a new LTK.

4.6.5.1.8 GAP/SEC/AUT/BV-20-C [Service response Insufficient Authentication – Peripheral Role]

• Test Purpose
  Verify that the IUT when bonded with a peer device tests the bond when receiving the error response “Insufficient Authentication”, if link is unencrypted, before eventually removing the bond to perform a new pairing.

IUT is the SM responder, GATT Client and is in Peripheral role.

IUT supports security manager bonding.

• Reference
  [6] 10.3

• Initial Condition
  Whether the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3].

Physical link is established between the IUT and Lower Tester.

IUT and Lower Tester are bonded before the connection and service discovery has been performed. The IUT’s LTK has been distributed.

Lower Tester has not stored the LTK from the IUT, which will result in the “Insufficient Authentication” error in step 2.

• Test Procedure
  1. If the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT, go to step 4.
  2. The IUT performs a service request which is rejected by the Lower Tester with the error code “Insufficient Authentication”.
  3. The IUT sends a Security Request to request the link to be encrypted. The Lower Tester initiates the encryption using the previously distributed LTK.
  4. The IUT completes the previous ordered service request with a success.
• Expected Outcome

Pass Verdict

On receiving the error response “Insufficient Authentication” the IUT encrypts the link a new prior distributed LTK.

### 4.6.5.1.9 GAP/SEC/AUT/BV-21-C [Lost Bond – Initiator Role]

• Test Purpose

Verify that the IUT will inform the upper layer about a lost bond, if the link is refused to be encrypted with the LTK distributed during the prior pairing procedure.

IUT is the SM initiator, GATT Client and is in Central role.

IUT supports security manager bonding.

• Reference

[6] 10.3

• Initial Condition

IUT and Lower Tester are bonded during a prior connection, and the Lower Tester’s LTK has been distributed.

The Lower Tester has removed its bond with the IUT prior to the IUT connecting.

Physical link is established between the IUT and Lower Tester.
• Test Procedure
1. The IUT is bonded with the Lower Tester. It challenges the bond by (re)-encrypting the link with the distributed LTK.
2. The bond has been removed on the Lower Tester. The Lower Tester responds “PIN or Key Missing” to the encryption request.
3. The IUT informs the upper layer that the bond has been lost.

• Test Condition
The LTK is distributed as part of the bonding procedure.

• Expected Outcome
Pass Verdict
On receiving the error response “PIN or Key Missing” the IUT informed the upper layer that the bond has been lost.

4.6.5.1.10 GAP/SEC/AUT/BV-22-C [Lost Bond – Responder Role]
• Test Purpose
Verify that the IUT will inform the upper layer about a lost bond, if the peer refuses to encrypt the link with the LTK distributed during the prior pairing procedure.

IUT is the SM responder, GATT Client and is in Peripheral role.

IUT supports security manager bonding.

• Reference
[6] 10.3
• **Initial Condition**

IUT and Lower Tester were bonded during a prior connection, and the IUT’s LTK has been distributed.

The Lower Tester has removed its bond with the IUT prior to the IUT connecting.

Physical link is established between IUT and Lower Tester.

• **Test Procedure**

1. The IUT is bonded with the Lower Tester. It challenges the bond by sending a security request to enable encryption.
2. The bond has been removed on the Lower Tester. The Lower Tester initiates a pairing procedure.
3. The IUT informs the upper layer that the bond has been lost.

• **Test Condition**

The LTK is distributed as part of the bonding procedure.

• **Expected Outcome**

**Pass Verdict**

On receiving a pairing request as a successor to the security request, the IUT informed the upper layer that the bond has been lost.

4.6.5.1.11 **GAP/SEC/AUT/BV-23-C [Service Response – Insufficient Encryption, Peripheral]**

• **Test Purpose**

Verify that the IUT properly rejects the service request when the required pairing has occurred and encryption is required (LE security mode 1) if encryption is not enabled and then completes service correctly with the Lower Tester acting as Central role.

The IUT is operating in the Peripheral role.

The Lower Tester is operating in the Central role.
• Reference

[4] 10.3

• Initial Condition

Whether the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3].

Physical link is established by either directed or undirected connectable mode.

Previous bond exists between the IUT and Lower Tester with authenticated pairing.

Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure

1. If the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3], go to step 4.
2. If the link is not encrypted, the Lower Tester initiates a service request to the IUT.
3. If IUT detects that no LTK is available then IUT rejects the service request with error code “Insufficient Authentication”. If IUT detects LTK is available and link is unencrypted then IUT rejects the service request with error code “Insufficient Encryption”.
4. Lower Tester initiates encryption and sends service request again.
5. Link encryption is completed successfully.
6. IUT replies with correct service response.

• Expected Outcome

Pass Verdict

Encryption setup completes successfully.

Service response is properly sent by IUT after step 6.
4.6.5.1.12 GAP/SEC/AUT/BV-24-C [Service Response – Insufficient Encryption, Central]

• Test Purpose

Verify that the IUT properly rejects the service request when the required pairing has occurred and encryption is required (LE security mode 1) if encryption is not enabled and then completes service correctly with the Lower Tester acting as Peripheral role.

The IUT is the SM initiator, GATT Server, and is operating in the Central role.

The Lower Tester is operating in the Peripheral role.

• Reference

[4] 10.3

• Initial Condition

Whether the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3].

Physical link is established by either directed or undirected connectable mode.

Previous bond exists between the IUT and Lower Tester with authenticated pairing.

Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure

1. If the IUT starts the encryption procedure with bonded devices before issuing any service request is specified in the IXIT [3], go to step 5.

2. If the link is not encrypted, the Lower Tester initiates a service request to the IUT.

3. IUT detects that the link is not encrypted.

4. IUT rejects the service. If IUT detects that no LTK is available then IUT rejects the service request with error code "Insufficient Authentication". If IUT detects LTK is available and link is unencrypted then IUT rejects the service request with error code "Insufficient Encryption".

5. Lower Tester initiates encryption and sends service request again.

6. Link encryption is completed successfully.

7. IUT replies with correct service response.
4.6.5.2 Connection Based Data Signing

The test group objective is to verify the correct implementation of the GAP data signing procedure.

4.6.5.2.1 GAP/SEC/CSIGN/BV-01-C [Connection Based Signing – Sender]

- **Test Purpose**
  
  Verify the IUT can properly sign the data when LE security mode 2 is required.
  
  Verify the IUT sends data that is properly signed using the Connection Signature Resolving Key (CSRK) previously distributed to the Lower Tester.
  
  The Lower Tester receives the signed data from IUT and verifies the MAC and SignCounter are correct.

- **Reference**
  
  [4] 10.4
• Initial Condition
The IUT is the Role as specified in the TSPX_gap_iut_role IXIT entry.

A dedicated bonding was performed and a CSRK was distributed from IUT to Lower Tester.

Physical link is established between the IUT and Lower Tester.

Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure
Upper Tester of the IUT requests the IUT to send a service request signed with previously distributed CSRK.

Lower Tester receives the signed service request and verifies the MAC and SignCounter.

Lower Tester accepts the service request from the IUT.

• Expected Outcome
Pass Verdict

Lower Tester receives the signed service request and verifies the MAC and SignCounter are correct.

4.6.5.2.2 GAP/SEC/CSSIGN/BV-02-C [Connection Based Signing – Receiver]

• Test Purpose
Verify the IUT can properly verify the MAC and SignCounter when LE security mode 2 is required.

Verify the IUT can properly verify the MAC and SignCounter from the Lower Tester.

The data is signed using the Connection Signature Resolving Key (CSRK) previously distributed from the Lower Tester.
• Reference

[4] 10.4

• Initial Condition
The IUT is the Role as specified in the TSPX_gap_iut_role IXIT entry.

A dedicated bonding was performed and a CSRK was distributed from the Lower Tester to IUT.

Physical link is established between IUT and Lower Tester.

Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure
Lower Tester sends a service request signed with previously distributed CSRK to IUT.

IUT receives the signed service request and verifies the MAC and SignCounter.

IUT forwards the service request to the Upper Tester.

Upper Tester accepts the service request.

Upper Tester sends the proper service response to the Lower Tester.

• Expected Outcome
Pass Verdict

Upper Tester receives a correct service request.
4.6.5.2.3 GAP/SEC/CSIGN/BI-01-C [Connection Based Signing – Receiver – Invalid Signing]

• Test Purpose
  Verify the IUT can detect an invalid signed service request from the Lower Tester and reject it.

  The data is signed with an incorrect CSRK.

• Reference
  [4] 10.4

• Initial Condition
  The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.

  A dedicated bonding was performed and a CSRK was distributed from the Lower Tester to IUT.

  Physical link is established between the IUT and Lower Tester.

  Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure
  Lower Tester sends a service request signed with incorrect CSRK to IUT.

  IUT receives the signed service request and detects invalid MAC.

  IUT silently discards the service request.

• Expected Outcome
  Pass Verdict

  The IUT receives signed data from the Lower Tester.

  The IUT detects the signed data has incorrect CSRK.
IUT ignores the received signed data.

IUT does not forward the received signed data to the Upper Tester.

If this is a service request, Lower Tester shall not receive any service response or shall receive an error response from the IUT.

4.6.5.2.4 GAP/SEC/CSIGN/BI-02-C [Connection Based Signing – Receive Invalid SignCounter]

• Test Purpose
  Verify the IUT can detect an invalid signed service request from the Lower Tester and reject it.
  The data is signed with invalid SignCounter.

• Reference
  [4] 10.4

• Initial Condition
  The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.
  A dedicated bonding was performed and a CSRK was distributed from the Lower Tester to IUT.
  Physical link is established between the IUT and Lower Tester.
  Upper Tester of the IUT is either a GATT profile or a higher layer protocol.

• Test Procedure
  Lower Tester sends a service request with SignCounter = 0 to IUT.
  IUT receives the signed service request and properly forwards it to the Upper Tester.
  Lower Tester sends a service request with SignCounter = 1 to IUT.
  IUT receives the signed service request and properly forwards it to the Upper Tester.
  Lower Tester sends a service request with SignCounter = 0 to IUT.
  IUT receives the signed service request and silently discards it.
• Test Condition
It must be possible to order IUT to receive signed data.

• Expected Outcome
Pass Verdict
IUT does not forward the last received signed data with incorrect SignCounter value to the Upper Tester.

4.6.5.2.5 GAP/SEC/CSIGN/BI-03-C [Connection based signing – Receive, No Bonding, as Peripheral]

• Test Purpose
Verify the IUT properly discards the message when receiving a "signed write command" with no bonding info when LE security mode 2 level 1 is required.

The data is signed with a CSRK that was distributed with either unauthenticated or authenticated bonding. After bonding, the IUT’s bonding information was removed by the Upper Tester.
IUT’s bonding information can be removed by the Upper Tester.

• Reference
[4] 10.4

• Initial Condition
An unauthenticated or authenticated bonding was performed and a CSRK was distributed from the Lower Tester to IUT.
IUT’s bonding information was removed by the Upper Tester.
The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.
Physical link is established between the IUT and Lower Tester.

Upper Tester of the IUT has a pre-defined characteristic attribute value handle that supports signed write command with security request of LE security mode 2, level 1.

- **Test Procedure**
  1. Lower Tester sends a “signed write command” with distributed CSRK to IUT.
  2. IUT receives the “signed write command” but detects that there is no bonding information of the Lower Tester.
  3. IUT discards the “signed write command”.
  4. IUT does not try to re-establish bonding.

- **Expected Outcome**
  **Pass Verdict**

  The Upper Tester does not receive the “signed write” command.

4.6.5.2.6 GAP/SEC/CSIGN/BI-04-C [Connection Based Signing – Receive, Insufficient Authentication, as Peripheral]

- **Test Purpose**

  Verify the IUT properly discards a signed data write with insufficient security level when LE security mode 2 level 2 is required.

  The data is signed with a CSRK that was distributed with unauthenticated bonding.

- **Reference**

  [4] 10.4

- **Initial Condition**

  An unauthenticated bonding was performed and a CSRK was distributed from the Lower Tester to IUT.

  Physical link is established between the IUT and Lower Tester.

  The IUT is in the Role specified in the TSPX_gap_iut_role IXIT entry.
Upper Tester of the IUT has a pre-defined characteristic attribute value handle that supports signed write command with security request of LE security mode 2, level 2.

- **Test Procedure**
  Lower Tester sends a “signed write command” with distributed CSRK to the IUT.

  IUT receives the “signed write command” but detects that there is insufficient authentication level of the bonding information of the Lower Tester.

  IUT discards the “signed write command”.

- **Expected Outcome**
  **Pass Verdict**

  The Upper Tester does not receive the “signed write command.”

### 4.6.5.3 Privacy
Verify IUT compliance to the privacy feature.

#### 4.6.5.3.1 GAP/PRIV/CONN/BV-10-C [Peripheral Privacy]
- **Test Purpose**
  Verify the IUT in the Undirected Connectable Mode supporting the Privacy feature can connect with another device performing the General Connection Establishment Procedure.

  The IUT is operating in the Peripheral role.

- **Reference**
  [9] 10.7.1

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  The IUT has Privacy feature enabled.
TGAP(private_addr_int) for the IUT is specified in the IXIT [3].

The IUT and Lower Tester have performed the bonding procedures and distributed their respective IRKs.

- Test Procedure
  The Upper Tester orders IUT to enter Undirected Connectable Mode; the IUT sets the advertiser's address to a resolvable private address based on the IRK distributed during the bonding procedure.

  The IUT changes the advertiser address to a new and unique resolvable address every TGAP(private_addr_int).

  The Lower Tester verifies that the resolvable private address changes at least once after TGAP(private_addr_int).

  The Lower Tester performs the General Connection Establishment Procedure to connect to the IUT; the Lower Tester creates the connection using the received resolvable private address from the IUT and sets the initiator's address to an RPA value based on the IRK of the Lower Tester.

  The Lower Tester or the IUT terminates the connection.

• Test Condition
  It must be possible to order IUT to enter Undirected Connectable Mode.

• Expected Outcome
  Pass Verdict

  The Lower Tester receives connectable undirected advertising events from IUT during the period that the IUT has privacy enabled and is in Undirected Connectable Mode.
In each connectable undirected advertising event received, the advertiser address is set to a valid resolvable private address.

The Lower Tester is able to resolve and confirm the identity of the IUT from the received resolvable private address.

The Lower Tester verifies that the IUT changes the resolvable private address in the advertiser address of the received advertising events after TGAP(private_addr_int).

The Lower Tester establishes a connection with the IUT using the received advertiser address.

The Lower Tester or IUT successfully terminates the connection.

4.6.5.3.2 GAP/PRIV/CONN/BV-11-C [Central Privacy]

- **Test Purpose**
  Verify the IUT supporting the Privacy feature and performing the General Connection Establishment procedure can connect with another device supporting the Privacy feature in the Undirected Connectable Mode.

  The IUT is operating in the Central role.

- **Reference**
  [9] 10.7.2

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

  The IUT has Privacy feature enabled.

  The support for accepting Public or Static addresses is specified in the IXIT [3].

  The IUT and Lower Tester have performed the bonding procedures and distributed their respective IRKs.

- **Test Procedure**
  The Lower Tester enters Undirected Connectable Mode; the Lower Tester sets the advertisers address to an RPA value based on the IRK of the Lower Tester.

  The Upper Tester orders the IUT to perform the General Connection Establishment procedure; the IUT sets the initiator’s address to a resolvable private address based on the IRK of the IUT.

  A connection is established.

  The Lower Tester or the IUT terminates the connection.

  The Lower Tester enters Undirected Connectable Mode; the Lower Tester sets the advertiser's address to a resolvable private address based on a random number that is not its IRK.

  The Upper Tester orders the IUT to perform the General Connection Establishment procedure.
- **Test Condition**
  It must be possible to order IUT to perform the General Connection Establishment procedure.

- **Expected Outcome**
  **Pass Verdict**
  The Lower Tester receives a connection request from the IUT during the period that the IUT has privacy enabled and is performing the General Connection Establishment procedure.

  In each connection request packet received by the Lower Tester, the initiator's address is set to a valid resolvable private address.

  The Lower Tester is able to resolve and confirm the identity of the IUT from the received resolvable private address.

  The Lower Tester verifies that the IUT changes its (InitA field) resolvable private address in the connection request packet.

  The Lower Tester establishes a connection with the IUT.

  The Lower Tester or IUT successfully terminates the connection.

  The IUT does not perform the Connection Establishment procedure when the Lower Tester uses a resolvable private address based on an incorrect IRK.
• Notes
Since the IUT, when receiving advertisement packets with incorrect RPAs, should not initiate the connection establishment procedure, multiple undirected connectable advertisement packets should be sent to verify compliance.

4.6.6 Advertising and Scan Response Data Format
The test group objective is to verify the correct implementation of the advertising and scan response data format.

4.6.6.1 GAP/ADV/BV-01-C [AD Type – Service UUID]
• Test Purpose
Verify the IUT sends valid Service UUID AD Type in advertising and scan response data.

The IUT is Broadcaster or Peripheral.
The Lower Tester is Observer or Central.

• Reference
[4] 11.1.1
[7] [10] 1.1

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure
The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.
The Lower Tester enters Active Scanning.

• Test Condition
It must be possible to order the IUT to start advertising.
• Expected Outcome

Pass Verdict

The advertising or scan response data contains the Service UUID AD Type for 16 bit or 128 bit UUIDs with a list of associated Service UUIDs.

• Notes

It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.2 GAP/ADV/BV-02-C [AD Type - Local Name]

• Test Purpose

Verify the IUT sends valid Local Name AD Type in advertising and scan response data.

The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

• Reference

[4] 11.1.2

[7] [10] 1.2

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

• Test Procedure

The Upper Tester orders the IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

The Lower Tester enters Active Scanning.

The Lower Tester reads the name from the Device Name Characteristic on the IUT.

• Test Condition

It must be possible to order IUT to enter advertising state.
• **Expected Outcome**

**Pass Verdict**

The advertising and scan response data contains one instance of the Local Name AD Type with an associated name.

The Lower Tester reads the complete name from the Device Name Characteristic on the IUT.

• **Notes**

It is optional to include any of the AD Types in advertising and scan response data.

### 4.6.6.3 GAP/ADV/BV-03-C [AD Type – Flags]

• **Test Purpose**

Verify the behavior of the IUT with respect to the Flags AD Type in advertising data.

The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

• **Reference**

[4] 11.1.3

[7], [10] 1.3

• **Initial Condition**

The IUT is in Link Layer state ‘Standby’.

• **Test Procedure**

The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

The Lower Tester enters Active Scanning.

• **Test Condition**

It must be possible to order IUT to enter advertising state.

• **Expected Outcome**

**Pass Verdict**

If the advertising packet is connectable, the advertising data contains one instance of the Flags AD Type with an associated octet containing the flags.

If the advertising packet is non-connectable, the advertising data either:

1. Does not contain the FLAGS AD Type; this is applicable if:
   a. The IUT is a BR/EDR/LE Broadcaster compliant to Core Specification version 4.0, or
b. The IUT is a Broadcaster compliant to the Core Specification Supplement (CSS), or
c. The IUT is a Peripheral compliant to the Core Specification Supplement (CSS)

OR:

2. Contains the FLAGS AD Type.
Reserved bits are not used.

• Notes
It is optional to include any of the AD Types in advertising and scan response data.

No 0x00 octets are included after the last non-zero octet in the Flags AD Type if it is contained in the advertising data.

4.6.6.4 GAP/ADV/BV-04-C [AD Type – Manufacturer Specific Data]

• Test Purpose
Verify the IUT sends valid Manufacturer Specific Data AD Type in advertising and scan response data.

The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

• Reference
[4] 11.1.4
[7] [10] 1.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure
The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

The Lower Tester enters Active Scanning.
• Test Condition
   It must be possible to order IUT to enter advertising state.

• Expected Outcome
   Pass Verdict
   The advertising or scan response data contains the Manufacturer Specific Data AD Type with the first 2 octets containing the Company Identifier Code followed by additional manufacturer specific data.

• Notes
   It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.5 GAP/ADV/BV-05-C [AD Type – TX Power Level]

• Test Purpose
   Verify the IUT sends valid TX Power AD Type in advertising and scan response data.
   The IUT is Broadcaster or Peripheral.
   The Lower Tester is Observer or Central.

• Reference
   [4] 11.1.5
   [7] [10] 1.5

• Initial Condition
   The IUT is in Link Layer state ‘Standby’.

• Test Procedure
   The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.
   The Lower Tester enters Active Scanning.

   ![Diagram](image-url)
• Test Condition
  It must be possible to order IUT to enter advertising state.

• Expected Outcome
  **Pass Verdict**

  The advertising or scan response data contains the TX Power Level AD Type with 1 octet containing the TX power level.

• Notes
  It is optional to include any of the AD Types in advertising and scan response data.

### 4.6.6.6 GAP/ADV/BV-08-C [AD Type – Slave Connection Interval Range]

• Test Purpose
  Verify the IUT sends valid Slave Connection Interval Range AD Type in advertising and scan response data.

  The IUT is Broadcaster or Peripheral.

  The Lower Tester is Observer or Central.

• Reference
  [4] 11.1.8

  [7] [10] 1.9

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure
  The Upper Tester orders the IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

  The Lower Tester enters Active Scanning.

  ![Diagram showing the relationship between Lower Tester, IUT, and Upper Tester in advertising and scanning processes.](image)
• Test Condition
  It must be possible to order IUT to enter advertising state.

• Expected Outcome
  Pass Verdict

  The advertising or scan response data contains the Slave Connection Interval Range AD Type with the first 2 octets containing the minimum value for the connection interval and the second 2 octets containing the maximum value for the connection interval.

• Notes
  It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.7  GAP/ADV/BV-09-C [AD Type - Service Solicitation]

• Test Purpose
  Verify the IUT sends valid Service Solicitation AD Type in advertising and scan response data.

  The IUT is Broadcaster or Peripheral.
  The Lower Tester is Observer or Central.

• Reference
  [4] 11.1.9
  [7] [10] 1.10

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure
  The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

  The Lower Tester enters Active Scanning.
• Test Condition
  It must be possible to order IUT to enter advertising state.

• Expected Outcome
  Pass Verdict

  The advertising or scan response data contains the Service Solicitation AD Type for 16 bit, 32 bit or 128 bit UUIDs with a list of associated Service UUIDs.

• Notes
  It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.8 GAP/ADV/BV-10-C [AD Type – Service Data]

• Test Purpose
  Verify the IUT sends valid Service Data AD Type in advertising and scan response data.

  The IUT is Broadcaster or Peripheral.

  The Lower Tester is Observer or Central.

• Reference
  [4] 11.1.10

  [7] [10] 1.11

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure
  The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

  The Lower Tester enters Active Scanning.

  ![State Diagram]

  - Start Active Scanning
  - Advertising Event (Service Data)
  - Start Advertising
• Test Condition
  It must be possible to order IUT to enter advertising state.

• Expected Outcome
  Pass Verdict
  The advertising or scan response data contains the Service Data AD Type for one of the following:
  - With the first 2 octets containing the 16 bit Service UUID followed by additional service data; or
  - With the first 4 octets containing the 32 bit Service UUID followed by additional service data; or
  - With the first 16 octets containing the 128 bit Service UUID followed by additional service data.

• Notes
  It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.9 GAP/ADV/BV-11-C [AD Type – Appearance]

• Test Purpose
  Verify the IUT sends valid Appearance Data AD Type in advertising and scan response data.
  The IUT is Broadcaster or Peripheral.
  The Lower Tester is Observer or Central.

• Reference
  [4] 12.2
  [10] 1.12

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure
  The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.
  The Lower Tester enters Active Scanning.
• **Test Condition**
  It must be possible to order IUT to enter advertising state.

• **Expected Outcome**
  **Pass Verdict**
  The advertising or scan response data contains the Appearance Data AD Type.

• **Notes**
  It is optional to include any of the AD Types in advertising and scan response data.

### 4.6.6.10 GAP/ADV/BV-12-C [AD Type – Public Target Address]

• **Test Purpose**
  Verify the IUT sends valid Public Target Address AD Type in advertising and scan response data.
  The IUT is Broadcaster or Peripheral.
  The Lower Tester is Observer or Central.

• **Reference**
  [4] 10.8
  [10] 1.13

• **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

• **Test Procedure**
  The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.
  The Lower Tester enters Active Scanning.
**Test Condition**

It must be possible to order IUT to enter advertising state.

**Expected Outcome**

Pass Verdict

The advertising or scan response data contains the Public Target Address AD Type which contains 6 octets of data for each Public Device Address, with the lower 3 octets of each 6 octet multiple representing the company_assigned field and the upper 3 octets of each 6 octet multiple representing the company_id field.

**Notes**

It is optional to include any of the AD Types in advertising and scan response data.

### 4.6.6.11 GAP/ADV/BV-13-C [AD Type – Random Target Address]

**Test Purpose**

Verify the IUT sends valid Random Target Address AD Type in advertising and scan response data.

The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

**Reference**

[4] 10.8

[10] 1.14


**Initial Condition**

The IUT is in Link Layer state ‘Standby’.

**Test Procedure**

The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.
The Lower Tester enters Active Scanning.

- **Test Condition**
  It must be possible to order IUT to enter advertising state.

- **Expected Outcome**
  **Pass Verdict**

  The advertising or scan response data contains the Random Target Address AD Type which contains 6 octets of data for each Random Device Address, with one of the following:

  1. If the Random Device Address is a static address, the 2 most significant bits of the 6 octets are set to 1 (one), and:
     - The remaining 46 bits of the 6 octets are not all set to 1, and:
     - The remaining 46 bits of the 6 octets are not all set to 0.

  2. If the Random Device Address is a non-resolvable private address, the 2 most significant bits of the 6 octets are set to 0 (zero), and:
     - The remaining 46 bits of the 6 octets are not all set to 1, and:
     - The remaining 46 bits of the 6 octets are not all set to 0.

  3. If the Random Device Address is a resolvable private address, the 2 most significant bits of the 6 octets are set to 0 (zero), and 1 (one) respectively and:
     - The remaining 46 bits of the 6 octets are not all set to 1, and:
     - The remaining 46 bits of the 6 octets are not all set to 0.

- **Notes**
  It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.12 GAP/ADV/BV-14-C [AD Type – Advertising Interval]

- **Test Purpose**
  Verify the IUT sends valid Advertising Interval AD Type in advertising and scan response data.
The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

• Reference
  
  [4] 10.8
  
  [10] 1.15
  
  [11] 4.2.2.2

• Initial Condition
  
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure
  
  The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

  The Lower Tester enters Active Scanning.

  ![Diagram showing test procedure]

• Test Condition
  
  It must be possible to order IUT to enter advertising state.

• Expected Outcome
  
  Pass Verdict

  The advertising or scan response data contains the Advertising Interval AD Type which contains 2 octets of data.

• Notes
  
  It is optional to include any of the AD Types in advertising and scan response data.

4.6.6.13 GAP/ADV/BV-17-C [Ad Type – URI]

• Test Purpose
  
  Verify the IUT sends a valid URI AD Type in advertising and, if supported, scan response data.
The IUT is Broadcaster or Peripheral.

The Lower Tester is Observer or Central.

• Reference
[15] 1.18

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure
The Upper Tester orders IUT to start advertising; the IUT enters broadcast mode or a discoverable mode.

The Lower Tester enters Active Scanning.

• Test Condition
It must be possible to order IUT to enter the advertising state.

• Expected Outcome
Pass Verdict

The advertising data and scan response (if included) data contains the URI AD Type which contains a correctly formatted UTF-8 string representing the URI.

If no URI scheme is in use, or if the URI scheme in use is not defined as either a provisional or permanent scheme, the Advertising Data and, if included, Scan Response Data shall contain the Unicode code point U+0001, represented in UTF-8 as 1 (hexadecimal 0x01) in its first octet of data.

If a URI scheme is in use, and the URI scheme in use is defined as either a provisional or permanent scheme, the Advertising Data and, if included, Scan Response Data contains a hexadecimal-formatted UTF-8 representation of the Unicode code point representing the URI scheme as defined in the IXIT [3] in its first octet of data. The remainder of the Advertising Data contains the remainder of the URI, correctly formatted as defined in the IXIT [3].
• Notes

It is optional to also include any of the other AD Types in advertising and scan response data.

4.6.7 **Generic Access Profile Characteristics**

The test group objective is to verify the correct implementation of the GAP characteristics.

4.6.7.1 **GAP Attributes**

4.6.7.1.1 **GAP/GAT/BV-04-C [Peripheral Preferred Connection Parameters Characteristic]**

• **Test Purpose**

Verify that the IUT properly implements GAP ‘Peripheral Preferred Connection Parameters’ Characteristic.

Lower Tester is a GATT client. Upper Tester is a GATT server that has implemented the GATT service discovery procedures.

The IUT is in Peripheral role.

• **Reference**

[4] 12.5 (GAP Peripheral Preferred Connection Parameters)

[9] 12.3 (GAP Peripheral Preferred Connection Parameters)

• **Initial Condition**

Physical link is established between the IUT and Lower Tester.

IUT and Lower Tester are connected.

• **Test Procedure**

After the connection is established, the Lower Tester performs a GATT service discovery for the GAP Peripheral Preferred Connection Parameters.

The Lower Tester verifies the Peripheral Preferred Connection Parameters attribute is returned properly by the IUT.

The Lower Tester establishes connection with the IUT via the Peripheral preferred connection parameters.
Lower Tester and Lower Tester are connected.

Lower Tester disconnects
Lower Tester establishes link with IUT

• Test Condition
Upper Tester is present for the GATT process.

• Expected Outcome
Pass Verdict

The Lower Tester receives the preferred connection parameters attribute properly from the IUT.

The Lower Tester is able to establish a physical link with the IUT via the updated preferred connection parameters.

4.6.7.1.2 GAP/GAT/BV-05-C [Writeable Device Name]

• Test Purpose
Verify that an IUT can support a writeable Device Name characteristic.

• Reference
**Initial Condition**

Physical link is established between the IUT and Lower Tester.

The Lower Tester knows the handle for the Device Name, and the current Device Name value, after executing the procedure defined in Section 4.2.7 GAP Mandatory Characteristics.

The characteristic declaration includes the Write and/or Write Without Response characteristic properties value (0x04 and/or 0x08).

**Test Procedure**

The Lower Tester writes a new value to the Device Name characteristic that is different from the known current value.

The Lower Tester then reads back the Device Name characteristic to determine if the new value was correctly accepted by the IUT.

**Expected Outcome**

**Pass Verdict**

ALT 1: The IUT accepts the write request to the Device Name characteristic with a write response and the subsequently reported Device Name characteristic in the read response matches that new value.

ALT 2: The IUT accepts the write request to the Device Name characteristic and the subsequently reported Device Name characteristic in the read response matches that new value.
4.6.7.1.3 GAP/GAT/BV-06-C [Writeable Appearance]

- **Test Purpose**
  Verify that an IUT can support a writeable Appearance characteristic.

- **Reference**

- **Initial Condition**
  Physical link is established between the IUT and Lower Tester.
  IUT and Lower Tester are connected.
  The Lower Tester knows the handle for the Appearance, and the current Appearance value, after executing the procedure defined in Section 4.2.7 GAP Mandatory Characteristics.
  The characteristic declaration includes the Write and/or Write Without Response characteristic properties value (0x04 and/or 0x08).

- **Test Procedure**
  The Lower Tester writes a new value to the Appearance characteristic that is different from the known current value.
  The Lower Tester then reads back the Appearance characteristic to determine if the new value was correctly accepted by the IUT.
• Expected Outcome

Pass Verdict

ALT 1: The IUT accepts the write request to the Appearance characteristic with a write response and the subsequently reported Appearance characteristic in the read response matches that new value.

ALT 2: The IUT accepts the write request to the Appearance characteristic and the subsequently reported Appearance characteristic in the read response matches that new value.

4.6.8 Periodic Advertising Modes and Procedures

4.6.8.1 Periodic Advertising Synchronizability Mode

4.6.8.1.1 GAP/PADV/PASM/BV-01-C [Periodic Advertising Synchronizability Mode – Broadcaster Role]

• Test Purpose

Verify the IUT in Periodic Advertising Synchronizability Mode in the Broadcaster Role; the Lower Tester, acting in the Observer Role, performs the Periodic Advertising Synchronization Establishment Procedure using extended advertising events, without listening for periodic advertising data.

• Reference

[16] 9.5.2

• Initial Condition

The IUT is in Link Layer state ‘Standby’.

• Test Procedure

1. The Upper Tester orders the IUT to enter Periodic Advertising Synchronizability Mode.

2. The Lower Tester performs the Periodic Advertising Synchronization Establishment Procedure without listening for periodic advertising data and receives periodic advertising synchronization information.
• Test Condition
  It is possible to order IUT to enter Periodic Advertising Synchronizability Mode.

• Expected Outcome
  Pass Verdict
  The Lower Tester receives periodic advertising synchronization information sent by the IUT.
  The IUT stays in periodic advertising synchronizability mode for at minimum one extended advertising event.

• Notes
  Since the periodic advertising synchronization information transmission is not a reliable transmission method, multiple periodic advertising synchronization information packets may need to be sent to verify compliance.

4.6.8.2 Periodic Advertising Mode

4.6.8.2.1 GAP/PADV/PAM/BV-01-C [Periodic Advertising Mode – Broadcaster Role]

• Test Purpose
  Verify the IUT in Periodic Advertising Mode in the Broadcaster Role; the Lower Tester, acting in the Observer Role, synchronizes and listens for periodic advertising.

• Reference
  [16] 9.5.2

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
  The periodic advertising data in Periodic Advertising Mode for the IUT is specified in the IXIT [3].
  The Lower Tester has synchronization information for the IUT’s periodic advertising.
• Test Procedure

![Diagram of test procedure]

**Figure 4.62: GAP/PADV/PAM/BV-01-C [Periodic Advertising Mode – Broadcaster Role]**

1. The Upper Tester orders the IUT to enter Periodic Advertising Mode using the specified periodic advertising data.
2. The Lower Tester synchronizes and receives periodic advertising events.

• Test Condition

It is possible to order IUT to enter Periodic Advertising Mode.

• Expected Outcome

**Pass Verdict**

The Lower Tester receives periodic advertising events sent by the IUT.

The Lower Tester receives the specified periodic advertising data sent by the IUT.

• Notes

Since the periodic advertising is not a reliable transmission method, multiple periodic advertising packets may need to be sent to verify compliance.

### 4.6.8.3 Periodic Advertising Synchronization Establishment Procedure

#### 4.6.8.3.1 GAP/PADV/PASE/BV-01-C [Periodic Synchronization Establishment Procedure Using Extended Advertising Events Without Listening for Periodic Advertising – Observer Role]

• Test Purpose

Verify the IUT acting in the Observer role performing the Periodic Synchronization Establishment Procedure using extended advertising events, choosing not to listen for periodic advertising events.

• Reference

[16] 9.5.3
• Initial Condition
  The IUT is in Link Layer state ‘Standby’.

• Test Procedure

  1. The Lower Tester enters Periodic Advertising Synchronizability Mode and begins transmitting periodic advertising synchronization information.
  2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
  3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure without listening for periodic advertising events.
  4. The Upper Tester receives periodic advertising synchronization information from the IUT.
  5. The Upper Tester does not receive periodic advertising reports from the IUT.

• Test Condition
  It is possible to order the IUT to perform the Periodic Advertising Synchronization Establishment Procedure.

• Expected Outcome

  Pass Verdict

  The IUT receives the periodic advertising synchronization information sent from Lower Tester and reports it to the Upper Tester.

  The IUT does not report periodic advertising events to the Upper Tester.
• Notes
Since the periodic advertising synchronization information transmission is not a reliable transmission method, multiple periodic advertising synchronization information packets may need to be sent to verify compliance.

4.6.8.3.2 GAP/PADV/PASE/BV-02-C [Periodic Synchronization Establishment Procedure Using Extended Advertising Events Listening for Periodic Advertising – Observer Role]

• Test Purpose
Verify the IUT acting in the Observer role performing the Periodic Synchronization Establishment Procedure using extended advertising events, choosing to listen for periodic advertising events.

• Reference
[16] 9.5.3

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

The periodic advertising data in Periodic Advertising Mode for the Lower Tester is specified in the IXIT [3].

• Test Procedure

Figure 4.64: GAP/PADV/PASE/BV-02-C [Periodic Synchronization Establishment Procedure Using Extended Advertising Events Listening for Periodic Advertising – Observer Role]
1. The Lower Tester enters Periodic Advertising Synchronizability Mode and begins transmitting periodic advertising synchronization information.
2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
3. The UpperTester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure, choosing to listen for periodic advertising events.
4. The Upper Tester receives periodic advertising synchronization information from the IUT.
5. The Upper Tester receives periodic advertising reports with periodic advertising data from the IUT.

• Test Condition
  It is possible to order the IUT to perform the Periodic Advertising Synchronization Establishment Procedure.

• Expected Outcome
  **Pass Verdict**
  The IUT receives the periodic advertising synchronization information sent from the Lower Tester and reports it to the Upper Tester.

  The IUT synchronizes and receives the periodic advertising events from the Lower Tester and reports the periodic advertising events and the periodic advertising data to the Upper Tester.

• Notes
  Since the periodic advertising synchronization information transmission is not a reliable transmission method, multiple periodic advertising synchronization information packets may need to be sent to verify compliance.

  Since the periodic advertising is not a reliable transmission method, multiple periodic advertising packets may need to be sent to verify compliance.

4.6.8.3.3 GAP/PADV/PASE/BV-03-C [Periodic Synchronization Establishment Procedure Over an LE Connection Without Listening for Periodic Advertising – Peripheral Role]

• Test Purpose
  Verify the IUT performing the Periodic Synchronization Establishment Procedure over an LE connection, choosing not to listen for periodic advertising events in the Peripheral Role.

• Reference
  [18] Section 9.5.3

• Initial Condition
  The IUT is in Link Layer state ‘Standby’.
**Test Procedure**

1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Peripheral role.
2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure over the LE connection, without listening for periodic advertising events.
4. The Lower Tester executes the Periodic Advertising Synchronization Transfer Procedure over the LE connection.
5. The Upper Tester receives periodic advertising synchronization information from the IUT.
6. The Upper Tester does not receive periodic advertising reports from the IUT.
7. Terminate the connection between the IUT and the Lower Tester.

**Expected Outcome**

**Pass Verdict**

The IUT receives the periodic advertising synchronization information sent from Lower Tester and reports it to the Upper Tester.

The IUT does not report periodic advertising events to the Upper Tester.
4.6.8.3.4 GAP/PADV/PASE/BV-04-C [Periodic Synchronization Establishment Procedure Over an LE Connection Listening for Periodic Advertising – Peripheral Role]

• Test Purpose
Verify the IUT performing the Periodic Synchronization Establishment Procedure over an LE connection, chooses to listen for periodic advertising events in the Peripheral Role.

• Reference
[18] Section 9.5.3

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure

![Diagram of test procedure]

Figure 4.66: GAP/PADV/PASE/BV-04-C [Periodic Synchronization Establishment Procedure Over an LE Connection Listening for Periodic Advertising – Peripheral Role]

1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Peripheral role.
2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure over the LE connection, without listening for periodic advertising events.
4. The Lower Tester executes the Periodic Advertising Synchronization Transfer Procedure over the AE connection.
5. The Upper Tester receives periodic advertising synchronization information from the IUT.
6. The Upper Tester receives periodic advertising reports with periodic advertising data from the IUT.
7. Terminate the connection between the IUT and the Lower Tester.

- Expected Outcome
  
  **Pass Verdict**
  
  The IUT receives the periodic advertising synchronization information sent from the Lower Tester and reports it to the Upper Tester.

  The IUT synchronizes and receives the periodic advertising events from the Lower Tester and reports the periodic advertising events and the periodic advertising data to the Upper Tester.

- Notes
  
  Since the periodic advertising is not a reliable transmission method, multiple periodic advertising packets may need to be sent for reliable test results.

**4.6.8.3.5 GAP/PADV/PASE/BV-05-C [Periodic Synchronization Establishment Procedure Over an LE Connection Without Listening for Periodic Advertising – Central Role]**

- Test Purpose
  
  Verify the IUT performing the Periodic Synchronization Establishment Procedure over an LE connection, choosing not to listen for periodic advertising events in the Central Role.

- Reference
  
  [18] Section 9.5.3

- Initial Condition
  
  The IUT is in Link Layer state ‘Standby’.
• Test Procedure

1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Central role.
2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure over the LE connection, without listening for periodic advertising events.
4. The Lower Tester executes the Periodic Advertising Synchronization Transfer Procedure over the LE connection.
5. The Upper Tester receives periodic advertising synchronization information from the IUT, but no periodic advertising reports.
6. Terminate the connection between the IUT and the Lower Tester.

• Expected Outcome

Pass Verdict

The IUT receives the periodic advertising synchronization information sent from Lower Tester and reports it to the Upper Tester.

The IUT does not report periodic advertising events to the Upper Tester.
4.6.8.3.6 GAP/PADV/PASE/BV-06-C [Periodic Synchronization Establishment Procedure Over an LE Connection Listening for Periodic Advertising – Central Role]

- **Test Purpose**
  Verify the IUT performing the Periodic Synchronization Establishment Procedure over an LE connection, chooses to listen for periodic advertising events in the Central Role.

- **Reference**
  [18] Section 9.5.3

- **Initial Condition**
  The IUT is in Link Layer state ‘Standby’.

- **Test Procedure**

  ![Diagram](image)

  **Figure 4.68**: GAP/PADV/PASE/BV-06-C [Periodic Synchronization Establishment Procedure Over an LE Connection Listening for Periodic Advertising – Central Role]

  1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Central role.
  2. The Lower Tester enters Periodic Advertising Mode and begins transmitting periodic advertising events.
  3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Establishment Procedure over the LE connection, without listening for periodic advertising events.
4. The Lower Tester executes the Periodic Advertising Synchronization Transfer Procedure over the LE connection.
5. The Upper Tester receives periodic advertising synchronization information from the IUT.
6. The Upper Tester receives periodic advertising reports with periodic advertising data from the IUT.
7. Terminate the connection between the IUT and the Lower Tester.

• Expected Outcome
  
  Pass Verdict
  
  The IUT receives the periodic advertising synchronization information sent from the Lower Tester and reports it to the Upper Tester.
  
  The IUT synchronizes and receives the periodic advertising events from the Lower Tester and reports the periodic advertising events and the periodic advertising data to the Upper Tester.

• Notes
  
  Since the periodic advertising is not a reliable transmission method, multiple periodic advertising packets may need to be sent to obtain reliable test results.

4.6.8.4 Periodic Advertising Synchronization Transfer Procedure

4.6.8.4.1 GAP/PADV/PAST/BV-01-C [Periodic Advertising Synchronization Transfer Procedure – Peripheral Role]

• Test Purpose
  
  Verify the IUT performing the Periodic Advertising Synchronization Transfer Procedure in the Central Role; the Lower Tester, acting in the Peripheral Role, performs the Periodic Advertising Synchronization Establishment Procedure over an LE connection.

• Reference
  
  [18] Section 9.5.4

• Initial Condition
  
  The IUT is in Link Layer state ‘Standby’.
• Test Procedure

1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Peripheral role.
2. The Lower Tester performs the Periodic Advertising Synchronization Establishment Procedure over the LE connection.
3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Transfer Procedure.
4. The Lower Tester receives periodic advertising synchronization information from the IUT.
5. Terminate the connection between the IUT and the Lower Tester.

• Expected Outcome

Pass Verdict

The Lower Tester receives periodic advertising synchronization information sent by the IUT.

4.6.8.4.2 GAP/PADV/PAST/BV-02-C [Periodic Advertising Synchronization Transfer Procedure – Central Role]

• Test Purpose

Verify the IUT performing the Periodic Advertising Synchronization Transfer Procedure in the Central Role; the Lower Tester, acting in the Peripheral Role, performs the Periodic Advertising Synchronization Establishment Procedure over an LE connection.
• Reference
[18] Section 9.5.4

• Initial Condition
The IUT is in Link Layer state ‘Standby’.

• Test Procedure

![Diagram of test procedure]

**Figure 4.70: GAP/PADV/PAST/BV-02-C [Periodic Advertising Synchronization Transfer Procedure – Central Role]**

1. The Upper Tester configures the IUT to connect with the Lower Tester on the LE 1M PHY, and the Lower Tester connects with the IUT on the LE 1M PHY, with the IUT in the Central role.
2. The Lower Tester performs the Periodic Advertising Synchronization Establishment Procedure over the LE connection.
3. The Upper Tester orders the IUT to perform the Periodic Advertising Synchronization Transfer Procedure.
4. The Lower Tester receives periodic advertising synchronization information from the IUT.
5. Terminate the connection between the IUT and the Lower Tester.

• Expected Outcome
**Pass Verdict**

The Lower Tester receives periodic advertising synchronization information sent by the IUT.
4.6.9 Broadcast Isochronous Streaming Modes and Procedures

4.6.9.1 Broadcast Isochronous Synchronizability mode

4.6.9.1.1 GAP/BIS/BSM/BV-01-C [Broadcast Isochronous Synchronizability Mode]

- **Test Purpose**
  Verify the IUT in the Broadcast Isochronous Synchronizability Mode performs the Broadcast Isochronous Synchronization Establishment Procedure.

- **Reference**
  [19] Section 8.6.1

- **Initial Condition**
  The IUT is in Synchronization State.
  The Lower Tester is in Broadcasting State.

- **Test Procedure**

  ![Diagram of test procedure]

  **Figure 4.71: GAP/BIS/BSM/BV-01-C [Broadcast Isochronous Synchronizability Mode]**

  1. The Lower Tester establishes a BIG with a single BIS and begins sending periodic advertising trains with BIGInfo in the ACAD field of AUX_SYNC_IND PDU.
  2. The Upper Tester orders the IUT to synchronize to the Lower Tester’s BIG.
  3. The IUT shall synchronize to the BIG.
  4. The Upper Tester shall enable ISO data.
  5. The Upper Tester expects the IUT to begin providing isochronous data from the single BIS from the Lower Tester.
• Expected Outcome
  Pass Verdict
  - The IUT synchronizes with the Lower Tester.
  - The Upper Tester receives the Broadcast Isochronous Stream data sent by the Lower Tester.

4.6.9.2 BroadcastIsochronous Broadcasting Mode

4.6.9.2.1 GAP/BIS/BBM/BV-01-C [Broadcast Isochronous Stream Broadcasting Mode]

• Test Purpose
  Verify the IUT in Broadcast Isochronous Stream Broadcasting Mode; the peer device synchronizes and listens for isochronous data payloads.

• Reference
  [19] Section 8.6.2

• Initial Condition
  The IUT is in Broadcasting State.
  The Lower Tester is in Synchronization State.

• Test Procedure

![Diagram of test procedure]

*Figure 4.72: GAP/BIS/BBM/BV-01-C [Broadcast Isochronous Stream Broadcasting Mode]*

1. The Upper Tester instructs the IUT to create a BIG.
2. The Lower Tester receives periodic advertising packets from the IUT containing BIGInfo.
3. The Upper Tester enables ISO data on the IUT.
4. The Upper Tester begins sending data to the IUT.
5. The Lower Tester receives BIS Data Packets from the IUT.

- Expected Outcome
  Pass Verdict
  - The IUT sends isochronous data payloads in Broadcast Isochronous Stream subevents.

**4.7 BR/EDR/LE Operation Modes and Procedures**

The test group objective is to verify the correct implementation of the BR/EDR/LE devices (devices which support LE and BR/EDR together).

**4.7.1 Non-Connectable Mode**

**4.7.1.1 GAP/DM/NCON/BV-01-C [BR/EDR/LE Non-Connectable Mode]**

- Test Purpose
  Verify that the IUT can properly handle the non-connectable mode in both BR/EDR and LE physical channels.

  This test case is only valid for a BR/EDR/LE device that supports Peripheral role.

- Reference
  [4] 13.1.2.1

- Initial Condition
  The IUT is in Link Layer 'Standby' state.

- Test Procedure
  The Upper Tester orders the IUT to enter non-connectable mode.

  For BR/EDR, this means paging scan is disabled on IUT.

  The Lower Tester verifies the device is non-connectable in BR/EDR using the BR/EDR connection procedure.

  The Lower Tester verifies the device is non-connectable in LE using GAP/CONN/NCON/BV-01-C [Non-Connectable Mode] to GAP/CONN/NCON/BV-03-C [Non-Connectable Mode Limited Discoverable Mode] depending on the IUT capability.
**Test Condition**

It must be possible to order the IUT to enter non-connectable mode.

**Expected Outcome**

Pass Verdict

IUT passes correspondent non-connectable mode test cases for LE and BR/EDR.

### 4.7.2 Connectable Mode

#### 4.7.2.1 GAP/DM/CON/BV-01-C [BR/EDR/LE Connectable Mode]

**Test Purpose**

Verify that the IUT can properly handle the connectable mode in both BR/EDR.

**Reference**

[4] 13.1.2.2

**Initial Condition**

The IUT is in Link Layer ‘Standby’ state.

**Test Procedure**

The Upper Tester orders the IUT to enter connectable mode.
For BR/EDR, this means page scan is enabled.

The Lower Tester verifies the IUT can be connected in BR/EDR using the corresponding connection procedure.

For this test case, IUT only has to complete the corresponding test case for connectable mode as a BR/EDR device.

- **Test Condition**
  It must be possible to order the IUT to enter connectable mode.

- **Expected Outcome**
  **Pass Verdict**
  The Lower Tester finds the IUT is connectable using the BR/EDR procedure.

### 4.7.3 Non-Bondable Mode

#### 4.7.3.1 GAP/DM/NBON/BV-01-C [BR/EDR/LE Non-Bondable Mode]

- **Test Purpose**
  Verify that the IUT is non-bondable in both BR/EDR and LE.

  The Lower Tester is a BR/EDR/LE Peripheral device.
The IUT is a BR/EDR/LE Central Device.

- Reference
  [4] 13.1.3.2

- Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

- Test Procedure
  The Upper Tester orders the IUT to enter non-bondable mode.

  The Lower Tester verifies the device is non-bondable in BR/EDR with the corresponding test case procedure:

  1. The Lower Tester connects to the IUT (GAP/MOD/NPAIR/BV-02-C).
  2. The Lower Tester performs the BR/EDR Dedicated Bonding.
  3. The IUT responds with LMP_not_accepted Pairing Not Allowed (0x18).
  4. The Lower Tester has to advertise itself as LE-only, Peripheral role for the LE “non-bondable” testing part.

  The Lower Tester verifies the device is non-bondable in LE using

  1. GAP/BOND/NBON/BV-01-C [Non-bondable Mode – Central as Responder], followed by
  2. GAP/BOND/NBON/BV-02-C [Non-bondable Mode – Central as Initiator]
• Test Condition
  It must be possible to order IUT to enter non-bondable mode.

• Expected Outcome
  Pass Verdict
  The Lower Tester verifies the IUT supports non-bondable mode correctly for both BR/EDR and LE procedures.

4.7.4 Bondable Mode

4.7.4.1 GAP/DM/BON/BV-01-C [BR/EDR/LE Bondable Mode]

• Test Purpose
  Verify that the IUT can properly handle the bonding procedure in both BR/EDR and LE as Central role.

• Reference

• Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
  The Upper Tester orders IUT to enter bondable mode.
  The Lower Tester verifies the device is bondable in BR/EDR using the corresponding test case procedure.
  The Lower Tester has to advertise itself as LE-only, Peripheral role for the LE “bondable” testing part.
  The Lower Tester verifies the device is bondable in LE using corresponding test case procedures in GAP/BOND/BON/ test group.
• **Test Condition**
  It must be possible to order IUT to enter bondable mode.

• **Expected Outcome**
  **Pass Verdict**
  The Lower Tester finds the IUT is bondable using both BR/EDR and LE procedures.

### 4.7.5 General Discovery Procedure

#### 4.7.5.1 GAP/DM/GIN/BV-01-C [BR/EDR/LE General Discovery - Finding General Discoverable Devices]

• **Test Purpose**
  Verify that the IUT performing the General Discovery Procedure can discover a BR/EDR/LE device in the General Discovery Mode over both BR/EDR and LE.

  Verify that the IUT performing the General Discovery Procedure can discover a BR/EDR/LE device in the Limited Discovery Mode over both BR/EDR and LE.

  The IUT is a BR/EDR/LE device as the master and initiator over BR/EDR and in the Central Role over LE.

  The Lower Tester is a BR/EDR/LE device operating as the slave and acceptor over BR/EDR and in the Peripheral Role over LE.
• Reference

[4] 13.2.1

• Initial Condition
The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
The Lower Tester enters General Discoverable mode; the Lower Tester interleaves General Discoverable Mode over BR/EDR and LE.

The Upper Tester orders the IUT to perform the General Discovery Procedure; the IUT verifies that it can discover the Lower Tester over both BR/EDR and LE.

The Lower Tester enters Limited Discoverable mode; the Lower Tester interleaves Limited Discoverable Mode over BR/EDR and LE.

The Upper Tester orders IUT to perform the General Discovery Procedure; the IUT verifies that it can discover the Lower Tester over both BR/EDR and LE.

• Test Condition
It must be possible for the Upper Tester to order the IUT to start general discovery.
• Expected Outcome

Pass Verdict

The IUT discovers the Lower Tester when the Lower Tester is operating in General Discoverable Mode and the IUT is performing the General Discovery Procedure over BR/EDR and LE; the advertising data received from the Lower Tester includes the Flags AD Type with the Limited Discoverable flag set to 0 and the General Discoverable flag set to 1.

The IUT discovers the Lower Tester when the Lower Tester is operating in Limited Discoverable Mode and the IUT is performing the General Discovery Procedure over BR/EDR and LE; the advertising data received from the Lower Tester includes the Flags AD Type with the Limited Discoverable flag set to 1 and the General Discoverable flag set to 0.

• Notes

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.7.6 Limited Discovery Procedure

4.7.6.1 GAP/DM/LIN/BV-01-C [BR/EDR/LE Limited Discovery - Find Limited Discoverable Devices]

• Test Purpose

Verify that the IUT performing the Limited Discovery Procedure can discover a BR/EDR/LE device in the Limited Discoverable Mode over both BR/EDR and LE.

Verify that the IUT performing the Limited Discovery Procedure does not discover a BR/EDR/LE device in the General Discoverable Mode over both BR/EDR and LE.

The IUT is a BR/EDR/LE device performing the Limited Discovery Procedure as the master and initiator over BR/EDR and in the Central Role over LE.

The Lower Tester is a BR/EDR/LE device operating as the slave and acceptor over BR/EDR and in the Peripheral Role over LE.

• Reference

[4] 13.2.2

• Initial Condition

The IUT is in Link Layer ‘Standby’ state.

• Test Procedure

The Lower Tester enters Limited Discoverable mode; the Lower Tester interleaves Limited Discoverable Mode over BR/EDR and LE.

The Upper Tester orders the IUT to perform the Limited Discovery Procedure; the IUT verifies that it can discover the Lower Tester over both BR/EDR and LE.
The Lower Tester enters General Discoverable mode; the Lower Tester interleaves General Discoverable Mode over BR/EDR and LE.

The Upper Tester orders the IUT to perform the Limited Discovery Procedure; the IUT verifies that it does not discover the Lower Tester over both BR/EDR and LE.

- **Test Condition**
  It must be possible for the Upper Tester to order the IUT to start limited discovery.

- **Expected Outcome**
  **Pass Verdict**
  The IUT discovers the Lower Tester when the Lower Tester is operating in Limited Discoverable Mode and the IUT is performing the Limited Discovery Procedure over BR/EDR and LE; the advertising data received from the Lower Tester includes the Flags AD Type with the Limited Discoverable flag set to 1 and the General Discoverable flag set to 0.

  The IUT does not discover the Lower Tester when the Lower Tester is operating in General Discoverable Mode and the IUT is performing the Limited Discovery Procedure over BR/EDR and LE; the advertising data received from the Lower Tester includes the Flags AD Type with the Limited Discoverable flag set to 0 and the General Discoverable flag set to 1.
• Notes
“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test Pass Verdict in any received advertising data.

4.7.7 Name Discovery Procedure

4.7.7.1 GAP/DM/NAD/BV-01-C [BR/EDR/LE Name Discovery]

• Test Purpose
Verify that the IUT can properly perform the name discovery procedure for both BR/EDR and LE devices as a Central role.

The IUT is a BR/EDR/LE device.
The Lower Tester is a BR/EDR/LE device.

• Reference
[4] 6.3, 13.2.4

• Initial Condition
The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
The Lower Tester is a BR/EDR/LE device.
The Upper Tester orders the IUT to do Name Discovery of Lower Tester on BR/EDR link as defined in Section 6.3 of [4], which is the BR/EDR standard procedure of HCI command “remote name request.”

The IUT properly discovers the device name of the Lower Tester.

BR/EDR device name discovery “Remote Name Request”

IUT properly discovers the device name of the Lower Tester
• Test Condition
  It must be possible to order IUT to start name discovery.

• Expected Outcome
  **Pass Verdict**

  Device name is discovered correctly and passed up to the Upper Tester for verification.

• Notes
  The IUT first performs Device Capability Discovery procedure.

4.7.7.2 GAP/DM/NAD/BV-02-C [LE Name Discovery]

• Test Purpose
  Verify that the IUT can properly perform the name discovery procedure for LE devices.

  The IUT is a BR/EDR/LE device.

  The Lower Tester is an LE-only Peripheral device.

• Reference

• Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
  The Upper Tester orders the IUT to do a Name Discovery of the Lower Tester on LE link as defined in Section 9.2.7 of [4], which could be through the GATT profile to access GAP characteristics of “device name.”

[Diagram of test procedure]

IUT properly discovers the device name of the Lower Tester
GATT Profile access to LT’s device name characteristic

Lower Tester
IUT
Upper Tester

Name Discovery

IUT properly discovers the device name of the Lower Tester
• Test Condition
  It must be possible to order the IUT start name discovery.

• Expected Outcome
  Pass Verdict
  Device name is discovered correctly and passed up to the Upper Tester for verification.

4.7.8 Link Establishment Procedure

4.7.8.1 GAP/DM/LEP/BV-01-C [BR/EDR/LE and BR/EDR/LE Link Establishment – BR/EDR Transport]

• Test Purpose
  Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device using the BR/EDR Transport.

  The IUT is a BR/EDR/LE Peripheral device.

  The Lower Tester is a BR/EDR/LE Central device.

• Reference
  [4] 13.3.1
  [9] 13.1

• Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
  The Upper Tester orders the IUT to enter General Discoverable Mode and Connectable Mode; the IUT is a BR/EDR/LE Peripheral compliant device.

  The Lower Tester performs the General Discovery Procedure to discover the IUT; the Lower Tester is a BR/EDR/LE Central compliant device.

  The Lower Tester performs the Link Establishment Procedure to connect to the IUT.

  When connected the Lower Tester or the IUT terminates the connection.
• Expected Outcome

Pass Verdict

The Lower Tester discovers the IUT over BR/EDR.

The Lower Tester verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

The Lower Tester discovers the IUT over LE.

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from IUT during the period that the IUT is in General Discoverable Mode and Connectable Mode.

In each advertising event received the advertiser address is set to address of the IUT. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

The Lower Tester establishes a BR/EDR connection with the IUT using the received BR/EDR address.

The Lower Tester or IUT successfully terminates the connection.

• Notes

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.
4.7.8.2 GAP/DM/LEP/BV-02-C [BR/EDR/LE and BR/EDR-only Link Establishment]

- **Test Purpose**
  Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR-only device.

  The IUT is a BR/EDR/LE Peripheral device.

  The Lower Tester is a BR/EDR-only device.

- **Reference**
  
  [4] 13.3.1
  
  [9] 13.1

- **Initial Condition**
  The IUT is in Link Layer ‘Standby’ state.

- **Test Procedure**
  The Upper Tester orders the IUT to enter General Discoverable Mode and Connectable Mode; the IUT is a BR/EDR/LE Peripheral compliant device.

  The Lower Tester performs the General Discovery Procedure to discover the IUT; the Lower Tester is a BR/EDR-only compliant device.

  The Lower Tester performs the Link Establishment Procedure to connect to the IUT.

  When connected the Lower Tester or the IUT terminates the connection.
• Expected Outcome
  
Pass Verdict
  
The Lower Tester discovers the IUT over BR.

The Lower Tester verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features of the IUT.

The Lower Tester establishes a BR/EDR connection with the IUT using the received BR/EDR address.

The Lower Tester or IUT successfully terminates the connection.

• Notes

  “Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test pass verdict in any received advertising data.

4.7.8.3  GAP/DM/LEP/BV-04-C [BR/EDR/LE Link Establishment IUT is Central]

• Test Purpose

Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device.

Both the IUT and the Lower Tester are BR/EDR/LE devices.

• Reference

[4] 13.3.1

• Initial Condition

The IUT is in Link Layer ‘Standby’ state.

• Test Procedure

The Lower Tester enters General Discoverable Mode and Connectable Mode; the Lower Tester is a BR/EDR/LE Peripheral compliant device.

The Upper Tester orders the IUT to perform the General Discovery Procedure to discover the Lower Tester; the IUT is a BR/EDR/LE Central compliant device.

The Upper Tester orders the IUT to perform the Link Establishment Procedure to connect to the Lower Tester.

When connected the Lower Tester or the IUT terminates the connection.
• Test Condition
  It must be possible to order the IUT to start the link establishment procedure.

• Expected Outcome
  **Pass Verdict**

  The IUT discovers the Lower Tester over BR.

  The IUT verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

  The IUT discovers the Lower Tester over LE.

  The IUT receives either connectable and scannable undirected advertising events or connectable undirected advertising events from Lower Tester during the period that the Lower Tester is in General Discoverable Mode and Connectable Mode.

  In each advertising event received the advertiser address is set to address of the Lower Tester. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

  The IUT establishes a BR/EDR connection with the Lower Tester using the received BR/EDR address.

  The Lower Tester or IUT successfully terminates the connection.

4.7.8.4  GAP/DM/LEP/BV-05-C [BR/EDR/LE and BR/EDR Link Establishment IUT is BR/EDR/LE]

• Test Purpose
  Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR-only device.
The IUT is a BR/EDR/LE device.

The Lower Tester is a BR/EDR-only device.

- **Reference**
  - [4] 13.3.1
  - [9] 13.1

- **Initial Condition**
The IUT is in Link Layer ‘Standby’ state.

- **Test Procedure**
The Lower Tester enters General Discoverable Mode and Connectable Mode; the Lower Tester is a BR/EDR-only Peripheral device.

The Upper Tester orders the IUT to perform the General Discovery Procedure to discover the Lower Tester; the IUT is a BR/EDR/LE Central compliant device.

The Upper Tester orders the IUT to perform the Link Establishment Procedure to connect to the Lower Tester.

When connected the Lower Tester or the IUT terminates the connection.

- **Test Condition**
  It must be possible to order the IUT to start the link establishment procedure.
• Expected Outcome

Pass Verdict

The IUT discovers the Lower Tester over BR/EDR.

The IUT verifies that the LE Supported (Controller) bit is set to 0 and the LE Supported (Host) bit is set to 0 in the LMP features of the Lower Tester.

The IUT establishes a BR/EDR connection with the Lower Tester using the received BR/EDR address.

The Lower Tester or IUT successfully terminates the connection.

4.7.8.5 GAP/DM/LEP/BV-06-C [BR/EDR/LE and LE Link Establishment IUT is BR/EDR/LE]

• Test Purpose

Verify IUT compliance to the Link Establishment Procedure to connect with an LE-only device.

The IUT is a BR/EDR/LE* device.

The Lower Tester is an LE-only* device.

*LE GAP role is defined as required in the Test Procedure.

• Reference

[4] 13.3.1

[9] 13.1

• Initial Condition

The IUT is in Link Layer ‘Standby’ state.

• Test Procedure

The Lower Tester enters General Discoverable Mode and Undirected Connectable Mode over LE; the Lower Tester is a LE-Only Peripheral compliant device.

The Upper Tester orders the IUT to perform the General Discovery Procedure to discover the Lower Tester; the IUT is a BR/EDR/LE Central compliant device.

The Upper Tester orders the IUT to perform the Connection Establishment Procedure to connect to the Lower Tester.

When connected the Lower Tester or the IUT terminates the connection.
• Test Condition

It must be possible to order the IUT to start the link establishment procedure.

• Expected Outcome

Pass Verdict

The IUT receives either connectable and scannable undirected advertising events or connectable undirected advertising events from Lower Tester during the period that the Lower Tester is in General Discoverable Mode and Undirected Connectable Mode.

In each advertising event received the advertiser address is set to address of the Lower Tester. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 1. The Flags AD Type is not present in any scan response data received.

The IUT establishes a connection with the Lower Tester using the received advertiser address.

The Lower Tester or IUT successfully terminates the connection.

4.7.8.6 GAP/DM/LEP/BV-07-C [BR/EDR/LE and BR/EDR/LE Link Establishment IUT is Peripheral – LE Transport]

• Test Purpose

Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device using the LE transport.

Both the IUT and Lower Tester are BR/EDR/LE devices.

• Reference

[9] 13.1
• Initial Condition
The IUT is in Link Layer ‘Standby’ state.

• Test Procedure
The Upper Tester orders the IUT to enter General Discoverable Mode and Connectable Mode on the LE transport; the IUT is a BR/EDR/LE Peripheral compliant device.

The Lower Tester performs the General Discovery Procedure on the LE transport to discover the IUT; the Lower Tester is a BR/EDR/LE Central compliant device.

The Lower Tester performs the Link Establishment Procedure on the LE transport to connect to the IUT.

The Lower Tester or the IUT terminates the connection.

• Expected Outcome
Pass Verdict

The Lower Tester discovers the IUT over BR.

The Lower Tester verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

The Lower Tester discovers the IUT over LE.

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from IUT during the period that the IUT is in General Discoverable Mode and Connectable Mode.
In each advertising event received the advertiser address is set to address of the IUT. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

The Lower Tester establishes an LE connection with the IUT using the received LE address.

The Lower Tester or IUT successfully terminates the connection.

- Notes
  “Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test Pass Verdict in any received advertising data.

4.7.8.7  GAP/DM/LEP/BV-08-C [BR/EDR/LE and BR/EDR/LE Link Establishment IUT is Peripheral/BR Slave– LE and BR/EDR Transports]

- Test Purpose
  Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device using the BR/EDR and LE transports simultaneously.

  Both the IUT and Lower Tester are BR/EDR/LE* devices.

- Reference
  [9] 13.1.1

- Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

  Lower Tester is using the same address on the LE and BR/EDR transports.

- Test Procedure
  The Upper Tester orders the IUT to enter General Discoverable Mode and Connectable Mode on both the LE and BR/EDR transports; the IUT is a BR/EDR/LE Peripheral compliant device.

  The Lower Tester performs the General Discovery Procedure on both the LE and BR/EDR transports to discover the IUT; the Lower Tester is a BR/EDR/LE Central compliant device.

  The Lower Tester performs the Link Establishment Procedure to connect to the IUT on both the LE and BR/EDR transports.

  When connected on both transports the Lower Tester or the IUT terminates the connections.

  Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.
• **Test Condition**

It must be possible to order the IUT to start the link establishment procedure on both transports.

• **Expected Outcome**

**Pass Verdict**

The Lower Tester discovers the IUT over BR.

The Lower Tester verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

The Lower Tester discovers the IUT over LE.

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from IUT during the period that the IUT is in General Discoverable Mode and Connectable Mode.

In each advertising event received the advertiser address is set to address of the IUT. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

The Lower Tester establishes an LE connection with the IUT using the received LE address.
The Lower Tester establishes a BR/EDR connection with the IUT using the received BR/EDR address.

The Lower Tester or IUT successfully terminates the connections.

Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.

• Notes

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test Pass Verdict in any received advertising data.

4.7.8.8 GAP/DM/LEP/BV-09-C [BR/EDR/LE and BR/EDR/LE Link Establishment IUT is Central/BR Master -- LE and BR/EDR Transports]

• Test Purpose

Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device on the BR/EDR and LE transports simultaneously.

Both the IUT and the Lower Tester are BR/EDR/LE devices.

• Reference

[9] 13.1.1

• Initial Condition

The IUT is in Link Layer ‘Standby’ state.

Lower Tester is using the same address on the LE and BR/EDR transports.

• Test Procedure

The Lower Tester enters General Discoverable Mode and Connectable Mode on both the LE and BR/EDR transports; the Lower Tester is a BR/EDR/LE Peripheral compliant device.

The Upper Tester orders the IUT to perform the General Discovery Procedure on both the LE and BR/EDR transports to discover the Lower Tester; the IUT is a BR/EDR/LE Central compliant device.

The Upper Tester orders the IUT to perform the Link Establishment Procedure to connect to the Lower Tester on both the LE and BR/EDR transports.

When connected on both transports the Lower Tester or the IUT terminates the connections.

Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.
• Test Condition
It must be possible to order the IUT to start the link establishment procedure on both transports.

• Expected Outcome
Pass Verdict

The IUT discovers the Lower Tester over BR.

The IUT verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

The IUT discovers the Lower Tester over LE.

The IUT receives either connectable and scannable undirected advertising events or connectable undirected advertising events from Lower Tester during the period that the Lower Tester is in General Discoverable Mode and Connectable Mode.

In each advertising event received the advertiser address is set to address of the Lower Tester. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

The IUT establishes an LE connection with the Lower Tester using the received LE address.

The IUT establishes a BR/EDR connection with the Lower Tester using the received BR/EDR address.
The Lower Tester or IUT successfully terminates the connections.

Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.

4.7.8.9 GAP/DM/LEP/BV-10-C [BR/EDR/LE and BR/EDR/LE Link Establishment IUT is Peripheral/BR Master– LE and BR/EDR Transports]

- Test Purpose
  Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device using the BR/EDR and LE transports simultaneously.

  The IUT is a BR/EDR/LE device.

  The Lower Tester is a BR/EDR/LE device.

- Reference
  [9] 13.1.1

- Initial Condition
  The IUT is in Link Layer ‘Standby’ state.

  Lower Tester is using the same address on the LE and BR/EDR transports.

- Test Procedure
  The Upper Tester orders the IUT to enter General Discoverable Mode and Connectable Mode on the LE transport. The Upper Tester orders the IUT to perform the General Discovery Procedure on the BR/EDR transport. The IUT is a BR/EDR/LE Peripheral compliant device.

  The Lower Tester performs the General Discovery Procedure on the LE transport to discover the IUT and enters the General Discoverable Mode on the BR/EDR transport. The Lower Tester is a BR/EDR/LE Central compliant device.

  The Lower Tester performs the Link Establishment Procedure on the LE transport to connect to the IUT.

  The Upper Tester orders the IUT to perform the Link Establishment Procedure on the BR/EDR transport to connect to the Lower Tester.

  When connected on both transports the Lower Tester or the IUT terminates the connections.

  Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.
Lower Tester
LE General Discovery Procedure
BR/EDR General Discoverable Mode
Discovers IUT on LE transport
Discovers Lower Tester on BR/EDR transport
LE Link Establishment Procedure
LE connection establishment
LE Connection complete

IUT
Enter LE General Discoverable and Connectable Mode
Perform BR/EDR General Discovery Procedure

Upper Tester

• Expected Outcome

Pass Verdict

The IUT discovers the Lower Tester over BR.

The Lower Tester verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

The Lower Tester discovers the IUT over LE.

The Lower Tester receives either connectable and scannable undirected advertising events or connectable undirected advertising events from IUT during the period that the IUT is in General Discoverable Mode and Connectable Mode.

In each advertising event received the advertiser address is set to address of the IUT. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.
The IUT establishes a BR/EDR connection with the Lower Tester using the received BR/EDR address.

The Lower Tester establishes an LE connection with the IUT using the received LE address.

The Lower Tester or IUT successfully terminates the connections.

Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.

• Notes

“Discover” in the context of the test text means to report to the application layer and/or verify that the Flags AD type presence and setting according to the test Pass Verdict in any received advertising data.

4.7.8.10 GAP/DM/LEP/BV-11-C [BR/EDR/LE and BR/EDR/LE Link Establishment IUT is Central/BR Slave -- LE and BR/EDR Transports]

• Test Purpose

Verify IUT compliance to the Link Establishment Procedure to connect with a BR/EDR/LE device on the BR/EDR and LE transports simultaneously.

Both the IUT and the Lower Tester are BR/EDR/LE devices.

• Reference

[9] 13.1.1

• Initial Condition

The IUT is in Link Layer ‘Standby’ state.

The Lower Tester is using the same address on the LE and BR/EDR transports.

• Test Procedure

The Lower Tester enters General Discoverable Mode and Connectable Mode on the LE transport. The Lower Tester performs the General Discovery Procedure on the BR/EDR transport. The Lower Tester is a BR/EDR/LE Peripheral compliant device.

The Upper Tester orders the IUT to perform the General Discovery Procedure on the LE physical transport to discover the Lower Tester and enters the General Discoverable mode on the BR/EDR transport. The IUT is a BR/EDR/LE Central compliant device.

The Upper Tester orders the IUT to perform the Link Establishment Procedure on the LE physical transport to connect to the Lower Tester.

The Lower Tester performs the Link Establishment Procedure on the BR/EDR transport to connect to the IUT.

The Lower Tester or the IUT terminates the connection.
Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.

- Test Condition
  It must be possible to order the IUT to start the link establishment procedure.

- Expected Outcome
  Pass Verdict

  The Lower Tester discovers the IUT over BR.

  The IUT verifies that the LE Supported (Controller) bit is set to 1 and the LE Supported (Host) bit is set to 1 in the LMP features.

  The IUT discovers the Lower Tester over LE.
The IUT receives either connectable and scannable undirected advertising events or connectable undirected advertising events from Lower Tester during the period that the Lower Tester is in General Discoverable Mode and Connectable Mode.

In each advertising event received the advertiser address is set to address of the Lower Tester. The Flags AD Type is present only once in the advertising data, the General Discoverable flag is set to 1, the Limited Discoverable flag is set to 0 and the BR/EDR Not Supported flag is set to 0. The Flags AD Type is not present in any scan response data received.

The IUT establishes an LE connection with the Lower Tester using the received LE address.

The Lower Tester establishes a BR/EDR connection with the IUT using the received BR/EDR address.

The Lower Tester or IUT successfully terminates the connections.

Note: The order used for the discovery sequence and connection establishment sequence is implementation specific.

4.7.8.11 GAP/DM/LEP/BV-12-C [Generate BR/EDR Link Key from LE LTK, as Initiator]

- Test Purpose
  Verify that the LTK generated on the LE transport as an initiator can be used to generate the Link Key for the BR/EDR transport in a BR/EDR/LE device, when BR/EDR Secure Connections is supported by both devices. The IUT is the Central device.

- Reference
  [12] 14.1

- Initial Condition
  The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The IUT has discovered and connected to the Lower Tester.

- Test Procedure
  1. The IUT initiates LE Secure Connections Pairing with the Lower Tester. They complete Pairing phase one (negotiation) and phase two (pairing).
  2. The state of Link Key bits in the Key Distribution/Generation Fields tells the devices to continue with BR/EDR Link Key derivation.
  3. The IUT terminates the LE connection.
  4. The IUT performs the BR/EDR Link Establishment procedure and encrypts the link using the derived BR/EDR Link Key.
**Expected Outcome**

Pass verdict

LE Secure Connections Pairing is complete, with an LE encrypted link, and BR/EDR Link Key of identical strength as the LTK has been derived and can be used to encrypt the BR/EDR link. The IUT does not initiate pairing on the BR/EDR transport.

**Notes**

This test procedure requires Secure Connections pairing to occur first on the LE transport.

### 4.7.8.12 GAP/DM/LEP/BV-13-C [Upgrade of BR/EDR Link Key Regenerates LTK]

**Test Purpose**

Verify that after cross-transport key derivation, upgrading the BR/EDR Link Key causes the LTK to be regenerated. The IUT is the Central device.

**Reference**

[12] 14.1
• Initial Condition

The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The IUT has discovered and connected to the Lower Tester.

• Test Procedure

1. The IUT initiates unauthenticated LE Secure Connections Pairing with the Lower Tester. They complete Pairing phase one (negotiation) and phase two (pairing).
2. The state of Link Key bit in the Key Distribution/Generation Fields tells the devices to continue with BR/EDR Link Key derivation.
3. The IUT terminates the LE connection.
4. The IUT performs the BR/EDR Link Establishment procedure and encrypts the link using the derived BR/EDR Link Key.
5. The IUT upgrades the security level of the BR/EDR Link Key from unauthenticated to authenticated.
6. The IUT performs SMP over BR/EDR.
7. The IUT terminates the BR/EDR connection.
8. The IUT creates an LE connection with the Lower Tester and encrypts the link using the LTK derived from the authenticated BR/EDR Link Key.
**Expected Outcome**

**Pass verdict**

LE Secure Connections Pairing is complete, with an LE encrypted link, and BR/EDR Link Key of identical strength as the LTK has been derived and can be used to encrypt the BR/EDR link. The IUT does not initiate pairing on the BR/EDR transport. The BR/EDR Link Key can be upgraded from...
unauthenticated to authenticated. The LE link can be encrypted using the LTK derived from the authenticated BR/EDR Link Key.

4.7.8.13 GAP/DM/LEP/BV-14-C [Generate BR/EDR Link Key from LE LTK, as Responder]

- **Test Purpose**
  Verify that the LTK generated on the LE transport as a responder can be used to generate the Link Key for the BR/EDR transport in a BR/EDR/LE device, on a device that supports BR/EDR Secure Connections. The IUT is the Peripheral device.

- **Reference**
  [12] 14.1

- **Initial Condition**
  The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The IUT has been discovered and is connected to by the Lower Tester.

- **Test Procedure**
  1. The Lower Tester initiates LE Secure Connections Pairing with the IUT. They complete Pairing phase one (negotiation) and phase 2 (pairing).
  2. The state of Link Key bits in the Key Distribution/Generation Fields tells the devices to continue with BR/EDR Link Key derivation.
  3. The Lower Tester terminates the LE connection.
  4. The Upper Tester puts the IUT in connectable mode on the BR/EDR transport.
  5. The Lower Tester establishes a BR/EDR link with the IUT and encrypts the link with the derived BR/EDR Link Key.
Lower Tester (initiator)  IUT (responder)  Upper Tester

Lower Tester finds the IUT  Establishes LE connection

LE Secure Connections Phase 1
Indicate BR/EDR Link Key Generation

SMP Pairing Req.
AuthReq.SC=1
InitKeyDist.LinkKey=1

SMP Pairing Resp.
AuthReq.SC=1
RespKeyDist.LinkKey=1

LE Secure Connections Phase 2:
Public Key Exchange
Authentication Stages 1 & 2
LE transport encryption

Derive BR Link Key
Derive BR Link Key

Terminate LE connection
Bring IUT in connectable mode

Encryption messages (AES-CCM)

• Expected Outcome
Pass verdict

LE Secure Connections Pairing is complete, with an LE encrypted link, and Link Key of identical strength as the LTK has been derived and can be used to encrypt the BR/EDR link. The IUT does not initiate pairing on the BR/EDR transport.

4.7.8.14 GAP/DM/LEP/BV-15-C [Generate BR/EDR Link Key from LE LTK, as Initiator]

• Test Purpose
Verify that the LTK generated on the LE transport as an initiator can be used to generate the Link Key for the BR/EDR transport in a BR/EDR/LE device which supports BR/EDR Secure Simple Pairing but not BR/EDR Secure Connections. The IUT is the Central device.

• Reference
[12] 14.1
• Initial Condition
The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with LE Secure Connections capabilities but only Secure Simple Pairing for BR/EDR. The IUT has discovered and connected to the Lower Tester.

• Test Procedure
1. The IUT initiates LE Secure Connections Pairing with the Lower Tester. They complete Pairing phase one (negotiation) and phase 2 (pairing).
2. The state of Link Key bits in the Key Distribution/Generation Fields tells the devices to continue with BR/EDR Link Key derivation.
3. The IUT terminates the LE connection.
4. The IUT performs the BR/EDR Link Establishment procedure and encrypts the link using the derived BR/EDR Link Key.
• Expected Outcome

Pass verdict

LE Secure Connections Pairing is complete, with an LE encrypted link, and Link Key of identical strength as the LTK has been derived and can be used to encrypt the BR/EDR link. The IUT does not initiate pairing on the BR/EDR transport.

4.7.8.15 GAP/DM/LEP/BV-16-C [Generate BR/EDR Link Key from LE LTK, as Responder]

• Test Purpose

Verify that the LTK generated on the LE transport as a responder can be used to generate the Link Key for the BR/EDR transport in a BR/EDR/LE device which supports BR/EDR Secure Simple Pairing but not BR/EDR Secure Connections. The IUT is the Peripheral device.

• Reference

[12] 14.1

• Initial Condition

The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with LE Secure Connections capabilities but only Secure Simple Pairing for BR/EDR. The IUT has been discovered and is connected to by the Lower Tester.

• Test Procedure

1. The Lower Tester initiates LE Secure Connections Pairing with the IUT. They complete Pairing phase one (negotiation) and phase 2 (pairing).
2. The state of Link Key bits in the Key Distribution/Generation Fields tells the devices to continue with BR/EDR Link Key derivation.
3. The Lower Tester terminates the LE connection.
4. The Upper Tester puts the IUT in connectable mode on the BR/EDR transport.
5. The Lower Tester establishes a BR/EDR link with the IUT and encrypts the link with the derived BR/EDR Link Key.
**Expected Outcome**

*Pass verdict*

LE Secure Connections Pairing is complete, with an LE encrypted link, and Link Key of identical strength as the LTK has been derived and can be used to encrypt the BR/EDR link. The IUT does not initiate pairing on the BR/EDR transport.

4.7.8.16 GAP/DM/LEP/BV-17-C [Generate LE LTK from BR/EDR Link Key, as Initiator]

*Test Purpose*

Verify that the Link Key generated on the BR/EDR transport as an initiator can be used to generate the LTK for the LE transport in a BR/EDR/LE device. The IUT is the Central device.

*Reference*

[12] 14.1
• Initial Condition

The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The IUT has discovered and connected to the Lower Tester.

• Test Procedure

1. The IUT initiates BR/EDR Secure Connections Pairing with the Lower Tester. They complete Pairing phases for public key exchange, authentication, key generation and encryption of the BR/EDR link.
2. The IUT then sends an SMP Pairing Request to the Lower Tester on the encrypted BR/EDR link. The Lower Tester replies with an SMP Pairing Response. The two devices derive the LTK, and optionally generate and distribute additional keys.
3. The IUT terminates the BR/EDR connection.
4. The IUT connects to the Lower Tester on the LE transport and encrypts the link with the derived LTK.
• Expected Outcome

Pass verdict

BR/EDR Secure Connections Pairing is complete, with a BR/EDR encrypted link, the LE LTK of identical strength as the BR/EDR Link Key has been derived, other keys such as the IRK and CSRK have been optionally distributed. The LE LTK can be used to encrypt the LE connection. The IUT does not initiate pairing on the LE transport.

4.7.8.17 GAP/DM/LEP/BV-18-C [Upgrade of LTK Regenerates BR/EDR Link Key]

• Test Purpose

Verify that after cross-transport key derivation, upgrading the LTK causes the BR/EDR Lin Key to be regenerated. The IUT is the Central device.

• Reference

[12] 14.1

• Initial Condition

The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The IUT has discovered and connected to the Lower Tester.

• Test Procedure

1. The IUT initiates unauthenticated BR/EDR Secure Connections Pairing with the Lower Tester. They complete Pairing phases for public key exchange, authentication, key generation and encryption of the BR/EDR link.
2. The IUT then sends an SMP Pairing Request to the Lower Tester on the encrypted BR/EDR link. The Lower Tester replies with an SMP Pairing Response. The two devices derive the LTK, and optionally generate and distribute additional keys.
3. The IUT terminates the BR/EDR connection.
4. The IUT connects to the Lower Tester on the LE transport and encrypts the link with the derived LTK.
5. The IUT upgrades the security level of the LTK from unauthenticated to authenticated.
6. The IUT terminates the LE connection.
7. The IUT creates BR/EDR connection with the Lower Tester and encrypts the link using the BR/EDR Link Key derived from the authenticated LTK.
**Generic Access Profile (GAP) / Test Suite**

**Expected Outcome**

**Pass verdict**

BR/EDR Secure Connections Pairing is complete, with a BR/EDR encrypted link, the LE LTK of identical strength as the BR/EDR Link Key has been derived, other keys such as the IRK and CSRK have been optionally distributed. The LE LTK can be used to encrypt the LE connection. The IUT does not initiate pairing on the LE transport. The LTK can be upgraded from unauthenticated to authenticated. The BR/EDR link can be encrypted using the Link Key derived from the authenticated LTK.
4.7.8.18 GAP/DM/LEP/BV-19-C [Generate LE LTK from BR/EDR Link Key, as Responder]

- **Test Purpose**
  Verify that the Link Key generated on the BR/EDR transport as a responder can be used to generate the LTK for the LE transport in a BR/EDR/LE device. The IUT is the Peripheral device.

- **Reference**
  [12] 14.1

- **Initial Condition**
  The IUT supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester also supports BR/EDR/LE with Secure Connections capabilities on both transports. The Lower Tester has discovered and connected with the IUT over BR/EDR.

- **Test Procedure**
  1. The Lower Tester initiates BR/EDR Secure Connections Pairing with the IUT. They complete Pairing phases for public key exchange, authentication, key generation and encryption of the BR/EDR link.
  2. The Lower Tester then sends an SMP Pairing Request on the encrypted BR/EDR link. The IUT replies with an SMP Pairing Response. The two devices derive the LTK and optionally generate and distribute other keys.
  3. The Lower Tester terminates the BR/EDR connection.
  4. The Upper Tester puts the IUT in connectable mode on the LE transport.
  5. The Lower Tester establishes an LE link with the IUT and encrypts the link with the derived LE LTK.
**4.7.8.19 GAP/DM/LEP/BI-01-C [Do not Generate LE LTK from BR/EDR P-192 Link Key, as Initiator]**

- **Test Purpose**
  
  Verify that the P-192 Link Key generated on the BR/EDR transport as an initiator is not used to generate the LTK for the LE transport in a BR/EDR/LE device when either the IUT or the Lower Tester or both do not support BR/EDR Secure Connections. The IUT is the Central device.

- **Reference**

  [12] 2.3.5.7, 2.4.2.5.
• Initial Condition

The IUT supports LE Secure Connections and may or may not support BR/EDR Secure Connections. The Lower Tester supports LE Secure Connections but not BR/EDR Secure Connections. The IUT has discovered and connected to the Lower Tester.

• Test Procedure

1. The IUT initiates BR/EDR Secure Simple Pairing with the Lower Tester. They complete Pairing phases for public key exchange, authentication, key generation and encryption of the BR/EDR link.
2. The IUT terminates the BR/EDR connection.
3. The IUT connects to the Lower Tester on the LE transport.
4. The IUT initiates LE Secure Connections Pairing with the Lower Tester. They complete Pairing phase one (negotiation) and phase 2 (pairing).
• Expected Outcome

Pass verdict

BR/EDR Secure Simple Pairing is complete, with a BR/EDR encrypted link.

The IUT does not initiate LE Secure Connections Pairing on the BR/EDR transport.

The IUT and the Lower Tester successfully complete LE Secure Connections Pairing on the LE transport.

4.7.8.20 GAP/DM/LEP/BI-02-C [Do not Generate LE LTK from P-192 BR/EDR Link Key, as Responder]

• Test Purpose

Verify that the P-192 Link Key generated on the BR/EDR transport as a responder is not used to generate the LTK for the LE transport in a BR/EDR/LE device. The IUT is the Peripheral device.

• Reference

[12] 2.3.5.7, 2.4.2.5; optional: section 2.4.2.1

• Initial Condition

The IUT supports LE Secure Connections. The IUT may or may not support BR/EDR Secure Connections. The Lower Tester support LE Secure Connections but not BR/EDR Secure Connections. The Lower Tester has discovered and connected with the IUT over BR/EDR.

• Test Procedure

1. The Lower Tester initiates BR/EDR Secure Simple Pairing with the IUT. They complete Pairing phases for public key exchange, authentication, key generation and encryption of the BR/EDR link.
2. The Lower Tester then sends an SMP Pairing Request on the encrypted BR/EDR link. The IUT responds with an SMP Pairing Failed with reason code ‘Cross Transport Key Derivation/Generation not allowed’ (0x0E).
3. The Lower Tester terminates the BR/EDR connection.
4. The Upper Tester puts the IUT in connectable mode on the LE transport.
5. The Lower Tester connects to the IUT on the LE transport.
6. The Lower Tester initiates LE Secure Connections Pairing with the IUT. They complete Pairing phase one (negotiation) and phase 2 (pairing).
• Expected Outcome

Pass verdict

BR/EDR Secure Simple Pairing is complete, with a BR/EDR encrypted link.

The IUT rejects the Lower Tester’s request LE Secure Connections Pairing on the BR/EDR transport.

The IUT and the Lower Tester successfully complete LE Secure Connections Pairing on the LE transport.
4.7.9 Synchronization Establishment – Receiver

Test subgroup objectives:

To verify the correct behavior in this mode. The role of the IUT is broadcast receiver.

4.7.9.1 GAP/EST/SYNE/BV-01-C [Synchronization Establishment Procedure, IUT is Receiver]

- Test Purpose
  Verify that the IUT performs a synchronization establishment procedure initiated by itself. The IUT is the connectionless slave broadcast receiver and the Lower Tester is the connectionless slave broadcast transmitter.

- References
  [7] 7.5

- Initial Condition
  IUT is in Standby state.
  Lower Tester is transmitting Synchronization Train with Interval = 80 ms.

- Test Procedure
  Receive Synchronization Train on the IUT from the Lower Tester.
• Expected Outcome
  
  Pass Verdict
  
  The IUT receives the Synchronization Train from the Lower Tester.
5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific capabilities in the ICS. Profiles, protocols and services may define multiple roles, and it is possible that a product may implement more than one role. The product shall be tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

**Item:** contains an y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for GAP [2]. If the item is defined with Protocol, Profile or Service abbreviation before y/x, the table and feature number referenced are defined in the abbreviated ICS proforma document.

**Feature:** recommended to be the primary feature defined in the ICS being tested or may be the test case name.

**Test Case(s):** the applicable test case identifiers required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

For purpose and structure of the ICS/IXIT proforma and instructions for completing the ICS/IXIT proforma refer to the Bluetooth ICS and IXIT proforma document.

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<td>GAP/MOD/NDIS/BV-01-C</td>
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<td>GAP 1/2</td>
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<td>GAP/MOD/LDIS/BV-01-C</td>
</tr>
<tr>
<td>GAP 1/2</td>
<td>Verify that the IUT answers to inquiry (GIAC) if it is in limited-discoverable mode.</td>
<td>GAP/MOD/LDIS/BV-02-C</td>
</tr>
<tr>
<td>GAP 1/2</td>
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<tr>
<td>GAP 1/3</td>
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</tr>
<tr>
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<td>GAP/MOD/GDIS/BV-02-C</td>
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<td>GAP 1/5 AND GAP 1/6 AND GAP 4/2</td>
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<td>GAP/IDLE/GIN/BV-01-C</td>
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<tr>
<td>GAP 3/2</td>
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<tr>
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<tr>
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**LE Parameters**

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<td>Discovery and Connection Procedures – Central Role</td>
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<td>GAP 38/3 AND GAP 45/2</td>
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<td>GAP 35/9 AND GAP 41/2a AND GAP 2/11</td>
<td>Generate BR/EDR Link Key from LE LTK, as initiator</td>
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*Table 5.1: Test Case Mapping*
**Revision History and Contributors**

### Revision History

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<td>D5r3</td>
<td>2003-11-05</td>
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<td>11</td>
<td>D10R00, 1.2.1, 1.2.2</td>
<td>2004-03-03, 2004-03-25</td>
<td>Re-partitioned to match Main Specification Volume/Part partitioning. TSE 511, 515, 516, and 517 incorporated Editorial changes</td>
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<td>1.2.3r1</td>
<td>2005-01-04</td>
<td>Changed document numbering.</td>
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<td>Incorporate TSE 657 for Figure 5.5 and TP/SEC/AUT/BV-01-C MSC, Figure 5.14.</td>
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<td>1.2.3</td>
<td>2005-01-13</td>
<td>Release after review.</td>
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<td>1.2.4r1</td>
<td>2005-03-12</td>
<td>Changed the way TSE 657 was incorporated for ESR02: Errata Service Release to Specification Versions 1.1, 1.2, and Profiles which added an additional Figure 5.5 in paragraph 5.2.4 and added an additional Test Procedure MSC (Figure 5.14) to test case TP/SEC/AUT/BV-01-C.</td>
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<td>2005-08-23</td>
<td>TSE 760(v1.2)/TSE 803 (v2.0): Changes to TP/MOD/LDIS/[BV-01</td>
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<td>1.2.5r1</td>
<td>2005-09-20</td>
<td>Corrected TSE 794: to [GAP 41/ AND (GAP 3/1 or GAP 3/2)]</td>
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<td>Modified Section 5.2.1, Fig. 5.1 for Simple Pairing</td>
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<td>Added TC TP/SEC/SEM/BV-04-C for Simple Pairing</td>
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<td>Added MSC for Security mode 4 to TP/IDLE/BOV/BV-01-C</td>
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<td>Modified text for TP/EST/LIE/BV-01-C, TP/EST/LIE/BV-02-C, and TP/EST/CHE/BV-01-C</td>
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<td>Changed TCMT for TP/IDLE/BOV/BV-01-C, TP/EST/LIE/BV-01-C, TP/EST/LIE/BV-02-C, TP/EST/CHE/BV-01-C</td>
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<td>--Section 5.3, updated Figure 5.2</td>
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<td>--TP/IDLE/BON/BV-01-C, changed Pass Verdict</td>
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<td>--New Section 5.5.2 with new test case TP/IDLE/DNDIS/BV-01-C</td>
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| 15                  | 2.1.E.1          | 2007-Jun-07| Prepare for publication |

<p>|                     |                               | TSE 2246 for TP/SEC/SEM/BV-10-C |
|                     |                               | TSE 2237 for TP/SEC/AUT/BV-01-C |
|                     |                               | TSE 2282 TP/MOD/NPAIR/BV-02-C and TP/MOD/NPAIR/BV-03-C: update MSCs |
|                     |                               | TSE 2329 TP/SEC/SEM/BV-04-C: update MSCs |
|                     |                               | TSE 2330 TP/SEC/SEM/BV-04-C: update MSCs |
|                     |                               | TSE 2331 TP/SEC/SEM/BV-05-C: update test purpose |
|                     |                               | TSE 2411: add preamble to Section 5.2. for TP/SEC/SEM/BV-07-C, TP/SEC/SEM/BV-08-C |
|                     |                               | TSE 2412: TP/SEC/SEM/BV-09-C |</p>
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<td>2008-April</td>
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|                    | 2.1.E.3r0-1      | 2008-May 2008 October | TSE 2532: TP/SEC/SEM-BV-03-C: fix graphic  
TSE 2332; TP/MOD/NPAIR/BV-03-C,  
TP/SEC/SEM/BV-05-C, TP/SEC/SEM/BV-06-C,  
TP/SEC/SEM/BV-07-C, TP/SEC/SEM/BV-09-C  
TSE 2477: TP/SEC/SEM/BV-04-C: MSC  
TSE 2494; TP/SEC/SEM/BV-09-C, TCMT  
TSE 2546 TP/IDLE/DED/BV-01-C,  
TP/IDLE/BON/BV-01-C, TP/EST/LIE/BV-02-C,  
TP/IDLE/DED/BV-02-C, TP/IDLE/BON/BV-02-C,  
TP/IDLE/BON/BV-03-C, TP/IDLE/BON/BV-04-C,  
TP/IDLE/BON/BV-05-C, TP/IDLE/BON/BV-06-C: Update preamble  
TSE 2631: TP/SEC/SEM/BV-06-C,  
TP/SEC/SEM/BV-07-C: TCMT  
TSE 2633: TP/SEC/SEM/BV-10-C: update MSC  
TSE 2638: TP/IDLE/BON/BV-04-C, TP/IDLE/BON/BV-06-C: TCMT  
TSE 2656: TP/IDLE/BON/BV-01-C,TP/IDLE/BON/BV-02-C: TCMT |
| 17                 | 2.1.E.3          | 2008 December | Prepare for publication.                                                                                                               |
| 18                 | 2.1.E.4r0        | March 2010    | TSE 2675: TP/SEC/AUT/BV-01-C: MSC and test proc.  
TSE 2944: TP/IDLE/BON/BV-03-C,  
TP/IDLE/BON/BV-04-C; Initial Conditions  
TSE 2989: TP/SEC/SEM/BV-09-C  
TSE 3012: TP/SEC/SEM/BV-05-C: TCMT update  
TSE 3284: TP/IDLE/BON/BV-05-C,  
TP/IDLE/BON/BV-06-C Initial Conditions |
| 19                 | 4.0.0d10-4.0.0d23a | 11-06-10-08-07-10 | Document merge between GAP.TS/2.1.E.4r0 and LE specific GAP TS called 0.9d9 dated 2010-06-10  
Editorial changes New sub group 5.4.4 introduced  
Added TP/SEC/CSIGN/BI-03-C and  
TP/SEC/CSIGN/BI-04-C  
Update to Test Procedure in TP/CONN/DCON/BV-03-C  
Addressing review comments by adjusted intimal conditions in TP/DISC/GENM/BV-01-C,  
TP/DISC/GENM/BV-02-C, TP/DISC/LIMM/BV-02-C  
Addressed review comments, text clarifications to match IOP testing performed. |
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<td>Change &quot;discoverable&quot; to &quot;scannable&quot; to align with latest core spec change when referring to advertising events.</td>
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<td>Modified test cases TO/SEC/AUT/BV-13-C and BV-14-C more specific and correct the MSC where data signing shall not be mentioned.</td>
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<td>Added SM dependencies in TCMT for TP/BOND/NBON/BV-01-C, TP/BOND/NBON/BV-02-C, TP/BOND/NBON/BV-03-C, TP/ADV/BV-06-C and TP/ADV/BV-07-C</td>
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<td>Align TCMT with ICS compliance to BR/EDR/LE Central and Peripheral devices</td>
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<td>Formatting, prepare for publication. Republished as 4.0.0a</td>
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<td>4.0.1r0 to 4.0.1r5</td>
<td>11 October 2010 to 22 June 2011</td>
<td>TSE 3785: Errata on Mapping table for TP/GAT/BV-02-C and TP/GAT/BV-03-C</td>
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<td>TSE 3914: TP/GAT/BV-02-C, TP/GAT/BV-03-C, TP/GAT/BV-04-C: Change test purpose and MSCs</td>
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<td>TSE 3837: See entry 4.0.0d23. The last six rows of the TCMT table were entered as two separate tables in d21 and were not included in a copy/paste into d22.</td>
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<td>TSE 4325: TP/SEC/CSIGN/BI-03-C, TP/SEC/CSIGN/BI-04-C Rewrite without security</td>
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<td>Accepted reviewer’s comments, updated graphic for TP/SEC/AUT/BV-12-C, and made cover page date current.</td>
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<td>TSE 4624: TP/PRIV/CONN/BV-02-C: Fix reference</td>
<td>TSE 4625: TP/PRIV/CONN/BV-02-C: Fix test procedure</td>
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<td>TSE 4626: TP/PRIV/CONN/BV-03-C: Change Initial condition</td>
<td>TSE 4650: TP/DISC/LIMM/BV-01-C, TP/DISC/GENM/BV-01-C, TP/CONN/NCON/BV-02-C, TP/CONN/NCON/BV-03-C: Pass verdict addition</td>
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<td>TSE 4660: TP/DM/BON/BV-01-C TMCT change</td>
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<td>TSE 4740: TP/SEC/SEM/BV-01 through 09-C: Change Master/Slave to Initiator/Responder; TP/SEC/SEM/BV-10-C: Change Master to Responder and revise TCMT for Verify disconnection without encryption.</td>
<td>TSE 4746: TP/CONN/DCON/BV-02-C:Update Initial condition and Test procedure</td>
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<td>TSE 4879: Delete TP/MOD/PAIR/BV-01-C, TP/IDLE/NAD/BV-01-C</td>
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<td>Add new test cases for CSA3: TP/CONN/PRDA/BV-01-C and TP/CONN/PRDA/BV-02-C. TSE 4611: New test case TP/GAT/BV-08-C</td>
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<td>TSE 4620: TP/BROB/OBSV/BV-03-C: Revise initial condition</td>
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<td>TSE: 4890: Remove TP/EST/CHE/BV-02-C, and all references including deleting the line in the TCMT.</td>
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<td>TSE 4889: Remove TP/EST/CHE/BV-01-C and TP/EST/CHE/BV-01-C, and all references to them, including their lines in the TCMT.</td>
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<td>TSE 4786: Split TP/DM/NAD/BV-01 into two test cases, added TP/DM/NAD/BV-02-C and added TP/DM/NAD/BV-02-C to the TCMT.</td>
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<td>TSE 4966: Added normative reference [6], added new test case TP/BROB/OBSV/BV-05-C to Operational Modes and Procedures on LE Physical Channels, added TP/BROB/OBSV/BV-05-C to the TCMT.</td>
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<td>TSE 4873: Changes to test case TP/ADV/BV-06-C and TP/ADV/BV-07-C.</td>
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<td>Updated Table of Contents to include Heading 4.</td>
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<td>Fixed incorrect numbering for all Heading 5.</td>
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<td>TSE 4896: Added 6 new test cases for GAP Authentication and Lost Bond CR, and added to TCMT.</td>
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<td>- Reference for TP/SEC/AUT/BV-17-C should be 12 instead of 10.</td>
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<td>- Removed the statement, “IUT supports security mode 1 level 3” for the following test cases:</td>
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<td>4.0.4r4, 4.0.4r5</td>
<td>2012-11-29,</td>
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<td>Per BQRB review included an additional reference in section 5.6.6, Advertising and Scan Response Data Format, to include the CSS document.</td>
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<td>Added [13] Core Specification Supplement (CSS) v2, Part A</td>
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<td>Added reference to [13] to all test cases in section 5.6.6.</td>
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<td>Connectionless Broadcast Review:</td>
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<td>Synchronizable and Non-Synchronizable Modes moved from section 5.4 to 5.3</td>
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<td>Synchronization Establishment moved from 5.4 to 5.7.</td>
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<td>Edited Normative Reference 13 (CSS v2 per previous revision history) and added [7] CSA4 and cross-references to CSA4 in the applicable test cases.</td>
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<td>Removed sections only populated with N/A for Test Conditions and Notes.</td>
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<td>Revised the Test Condition for TP/MOD/SYN/BV-01-C.</td>
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<td>TP/SEC/AUT/BV-23-C (Service Response – insufficient encryption, peripheral)</td>
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<td>TP/SEC/AUT/BV-24-C (Service Response – insufficient encryption, central)</td>
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<td>Updated mapping for TP/SEC/AUT/BV-16-C to add “AND NOT GAP 0a/1”</td>
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<td>Added TP/SEC/AUT/BV-24-C mapping, “(GAP 5/4 OR GAP 38/4) AND GAP 35/3 AND GAP 0a/1”</td>
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<td>Updated mapping for TP/SEC/AUT/BV-15-C to add “AND NOT GAP 0a/1”</td>
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<td>Added TP/SEC/AUT/BV-24-C mapping, “GAP 5/3 AND GAP 25/3 AND GAP 25/7 AND GAP 0a/1”</td>
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<td>TSE 4988: Updated Test Procedure for TP/CONN/DCEP/BV-01-C and changed all text that says “an unresolvable” to “non-resolvable” in TP/CONN/DCEP/BV-02-C for consistency.</td>
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<td>TSE 5015: Updated the initial condition and pass and fail verdicts of TP/CONN/CPUP/BV-02-C.</td>
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<td>TSE 5113: Updated initial condition in TP/CONN/UCON/BV-05-C.</td>
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<td>TSE 5120: Updated initial conditions of TP/CONN/DCEP/BV-02-C and TP/CONN/SCEP/BV-02-C to replace “unresolvable” with “non-resolvable” to maintain consistency in the document.</td>
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<td>- Update of language to match BTI approved wording (example, fail verdicts)</td>
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<td>- Removal of Test Subgroup Objectives</td>
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<td>Updated pictures to Visio graphics where commented.</td>
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| 4.1.0r05           |                  | 2013-09-26 | TSE 5293: Updated Security Mode 4 test cases, TP/SEC/SEM/BV-07-C, TP/SEC/SEM/BV-09-C, and TP/SEC/SEM/BV-10-C, test procedures to say "Authentication Requirements" instead of "IO Capabilities"  
TSE 5279: Updated sentence in Test Procedure to read "IUT establishes connection with the Lower Tester again" in TP/BOND/NBON/BV-02-C.  
TSE 5349: Update to MSCs for TP/CONN/NCON/BV-01-C, TP/CONN/NCON/BV-02-C, TP/CONN/NCON/BV-03-C, TP/CONN/PRDA/BV-01-C, and TP/CONN/PRDA/BV-02-C. |
| 4.1.0r06           |                  | 2013-10-04 | LE Dual Mode Topology CR  
Updated test TP/DM/LEP/BV-01-C for 4.1 – IUT is connectable and discoverable over BR/EDR and LE  
Updated test TP/DM/LEP/BV-04-C for 4.1  
Removed test TP/DM/LEP/BV-03-C  
| 4.1.0r07           |                  | 2013-10-16 | LE Link Layer Topology CR |
| 4.1.0r08           |                  | 2013-10-22 | Correction of CR implementation, removal of TP/DM/LEP/BV-03-C via the DM Topology CR was missed initially. |
| 4.1.0r10           |                  | 2013-10-28 | Additional Comment from Mayank in the TCMT |
| 4.1.0r11           |                  | 2013-10-31 | Amended TCMT to align with GAP.ICS 4.1.0r12, including removing redundant pre-requisites where possible, and tying support of BR/EDR/LE Peripheral role connection-related test cases to support of connectable modes.  
Added 6 new test cases for CSSv4 AD Types:  
| 4.1.0r13           |                  | 2013-11-07 | Chris: deleted EST/CHE/BV-01-C from the TCMT, fixed selection expressions for DM/LEP/BV-01-C and CONN/SCEP/BV-02-C respectively |
| 4.1.0r14           |                  | 2013-11-08 | Review by Miles  
Chris: Updated TCMT for TP/SEC/AUT/BV-17-C through TP/SEC/AUT/BV-24-C. |
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<td>Revision of TCMT entries for TP/SEC/AUT/BV-17-C through TP/SEC/AUT/BV-24-C.</td>
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<td>TSE 5422: Updated TCMT mapping for TP/BROB/OBSV/BV-04-C and TP/BROB/OBSV/BV-05-C.</td>
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<td>TSE 5498: Added &quot;AND GAP 0/3&quot; to TCMT mapping for TP/DM/NAD/BV-01-C</td>
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<td>TSE 5477: Updated TCMT mapping for TP/DM/LEP/BV-09-C and TP/DM/LEP/BV-11-C.</td>
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<td>TSE 5455: Updated Pass Verdict # 1 for TP/ADV/BV-13-C</td>
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<td>TSE 5553: Updated TCMT for TP/DM/NAD/BV-02-C.</td>
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<td>TSE 5536: Updated Initial Condition of TP/SEC/AUT/BV-16-C.</td>
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<td>TSE 5456: Updated pass verdict and TCMT mapping for TP/BROB/OBSV/BV-03-C and TP/BROB/OBSV/BV-05-C.</td>
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<td>TSE 5470: Updated TCMT mapping for TP/BOND/BON/BV-01-C and TP/BOND/BON/BV-03-C.</td>
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<td>TSE 5544: Updated mapping for TP/DISC/LIMM/BV-01-C to include GAP 22/2.</td>
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<td>TSE 5535: Updated TCMT mapping for TP/DM/LEP/BV-01-C and TP/DM/LEP/BV-04-C to add &quot;AND GAP 0a/3&quot; for 4.1 mapping.</td>
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<td>TSE 5596: Updated TCMT mapping for TP/CONN/PRDA/BV-01-C and TP/CONN/PRDA/BV-02-C.</td>
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<td>TSE 5770: Editorial correction to test description for TP/BROB/BCST/BV-02-C. Add new row for the TCMT for TP/BROB/BCST/BV-02-C and map to GAP 6/2 AND GAP 8/2.</td>
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<td>TSE 5795: Corrected the order of Lower Tester and IUT in Pass Verdicts for TP/BROB/OBSV/BV-03-C, TP/BROB/OBSV/BV-05-C.</td>
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<td>TSE 5933: Updated TCMT mapping for TP/IDLE/NAMP/BV-01-C and TP/IDLE/NAMP/BV-02-C.</td>
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<td>Integrated Section 6 of Core_LE_Secure_Connections.TS.CR.R16 &amp; 1.1 – 1.2 of Core_Enhanced_Privacy_1_2.TS.CR.R05</td>
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<td>TSE 6080: Corrected Pass verdicts in TP/CONN/DCEP/BV-01-C, TP/CONN/DCEP/BV-03-C, and TP/CONN/DCEP/BV-04-C. Updated TCMT for TP/CONN/DCEP/BV-04-C.</td>
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<td>TSE 5934: Revised test procedure in TP/SEC/AUT/BV-12-C</td>
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<td>TSE 6161: Added BR/EDR discovery step to TP/DM/LEP/BV-11-C.</td>
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<td>TSE 6230: Revised TCMT mapping for TP/SEC/SEM/BV-25-C and 30-C to require Secure Connections Only Mode.</td>
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<td>TSE 6272: Deleted unresolved &quot;if&quot; in Pass verdicts of TP/DISC/LIMM/BV-02-C, 03-C, and 04-C</td>
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<td>TSE 6233: Corrected typo in TCMT entry for TP/CONN/SCEP/BV-03-C</td>
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<td>TSE 6253: Corrected Test Procedure step numbering in TP/DM/LEP/BV-19-C</td>
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<td>TSE 6298: Corrected typo in TCMT entry for TP/BROB/OBSV/BV-03-C</td>
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<td>TSE 6385: Corrected Test Procedure step error in TP/DM/LEP/BV-02-C</td>
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<td>CSSv6 changes reviewed by Magnus Sommansson and Chris Church.</td>
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<td>TSE 6681: Revised initial conditions for TP/BROB/BCST/BV-03-C. TSE 6490: Corrected steps 6 and 7 in MSC for TP/DM/LEP/BV-18-C. TSE 6387: Removed Security Mode 4 from MSC for TP/SEC/AUT/BV-01-C; added title for TP/SEC/AUT/BV-01-C; and added test condition to initial conditions for TP/SEC/AUT/BV-01-C. TSE 6600: Removed TP/ADV/BV-06-C and TP/ADV/BV-07-C. TSE 6715: Updated MSC in TP/BOND/NBON/BV-03-C to correct pairing message details from IUT to Lower Tester. TSE 6169 &amp; 6323: Updated TCMT and references to resolve Core Privacy feature issues.</td>
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<td>TSE 6778: Corrected test case mapping from TSE 6169 for TP/BROB/OBSV/BV-06-C, TP/CONN/DCEP/BV-05-C, TP/CONN/DCEP/BV-06-C.</td>
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<td>TSE 6862: Added parentheses to Item for Test Case Mapping for TP/DM/LEP/BV-06-C.</td>
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<td>TSE 6978: Corrected &quot;Undirected&quot; to &quot;Directed&quot; in Test Condition for test cases TP/CONN/DCEP/BV-03-C and TP/CONN/DCEP/BV-04-C.</td>
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<td>TSE 6955: Updated Figure 4.2 (Inquiry Procedure) MSC. Added new section (Figure 4.3 Paging Procedure) and MSC. Global edit. Updated all Section 4 figure caption numbers (Figure 4.3 – 4.51). Added heading title and updated &quot;Inquiry Procedure&quot; hyperlink in Initial Condition for test cases TP/IDLE/BON/BV-01-C, TP/IDLE/BON/BV-02-C, TP/IDLE/BON/BV-03-C, TP/IDLE/BON/BV-04-C, TP/IDLE/BON/BV-05-C, TP/IDLE/BON/BV-06-C, TP/EST/LIE/BV-02-C.</td>
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<td>2016-10-03</td>
<td>Issue 7732: Added two new references to References section. Added new LE Only Protocol Group to Test Strategy section. Added new Identifier and Function Identifier to TP Naming Conventions section. Added three new Identifiers and Subfunction Identifiers to TP Naming Conventions section. Added new section “Periodic Advertising Modes and Procedures” and four new test cases: TP/PADV/PASM/BV-01-C, TP/PADV/PAM/BV-01-C, TP/PADV/PASE/BV-01-C, and TP/PADV/PASE/BV-02-C. Added references for four new test cases to TCMT.</td>
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<td>TSE 7240: Updated test procedure and replaced MSC in TP/SEC/AUT/BV-11-C to correct authentication references. Replaced MSC in TP/SEC/AUT/BV-12-C. TSE 7570: Updated tests TP/BOND/BON/BV-01-C through 04-C for device/network privacy (erratum 6356). TSE 7324: Updated first paragraph of test case TP/CONN/CPUP/BV-03-C.</td>
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<td>2016-12-15</td>
<td>TSE 8263: Corrected test case mapping for 25 test cases requiring inclusion of Core Specification 5.0 support (GAP 0a/5). Approved by BTI and re-issued for TCRL 2016-2 publication.</td>
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<td>2017-03-28</td>
<td>TSE 8356: Updated the Test Procedure about the Lower Tester for GAP/CONN/CPUP/BV-06-C, GAP/CONN/CPUP/BV-08-C. Updated the Pass Verdict for GAP/CONN/CPUP/BV-06-C, GAP/CONN/CPUP/BV-08-C. Removed TP/CONN/CPUP/BV-07-C since it is covered by GAP/CONN/CPUP/BV-01-C. Removed TP/CONN/CPUP/BV-09-C since it is covered by GAP/CONN/CPUP/BV-04-C. Removed TP/CONN/CPUP/BV-07-C from TCMT. Removed TP/CONN/CPUP/BV-09-C from TCMT.</td>
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<td>TSE 8360: Updated GAP/IDLE/DED/BV-01-C: Added &quot;[Device Discovery and Name Discovery – Secure Simple Pairing Not Supported by IUT]&quot; to heading, added “that does not support Secure Simple Pairing” to introduction, modified the initial condition, and updated MSC (Figure 4.43). Updated GAP/IDLE/DED/BV-02-C: Added &quot;[Device Discovery and Name Discovery – Secure Simple Pairing Supported by IUT]&quot; to heading, added “which supports Secure Simple Pairing” to introduction, modified the initial condition and updated MSC (Figure 4.44). Corrected TCMT for GAP/IDLE/DED/BV-01-C and GAP/IDLE/DED/BV-02-C and updated the descriptions.</td>
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<td>TSE 8359: Added reference [25] to test spec references section. Changes made to GAP/SEC/SEM/BV-04-C: Updated reference section to “[25] Section 5.2.2”, modified the initial condition, and updated MSC (Figure 4.23). Changes made to GAP/SEC/SEM/BV-05-C: Updated reference section to “[25] Section 5.2.2”, updated MSC (Figure 4.29), modified the test procedure and pass verdict. Changes made to GAP/SEC/SEM/BV-06-C: Modified introduction, test procedure, and pass verdict, updated reference section to “[25] Section 5.2.2”, and updated MSC Figure (4.30). Changes made to GAP/SEC/SEM/BV-07-C: Modified introduction, updated reference section to “[25] Section 5.2.2”, and updated MSC Figure (4.31). Changes made to GAP/SEC/SEM/BV-08-C: Modified introduction, updated reference section to “[25] Section 5.2.2”, and updated MSC Figure (4.32). Changes made to GAP/SEC/SEM/BV-09-C: Modified introduction and pass verdict, updated reference section to “[25] Section 5.2.2”, and updated MSC Figure (4.33). Changes made to GAP/SEC/SEM/BV-10-C: Modified the introduction and pass verdict, updated reference section to “[25] Section 5.2.2”, and updated MSC Figure (4.34).</td>
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<td>Converted to new Test Case ID conventions as defined in TSTO v4.1.</td>
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<td>TSE 9047: Clarifies advertising event type in the test procedure of GAP/BROB/OBSV/BV-05-C and revises the MSC.</td>
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<td>TSE 9665: Changed MSC values for SC bit to 0 in GAP/DM/LEP/BV-13-C and 17-C - ...19-C which previously incorrectly showed SC bit =1.</td>
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<td>TSE 9912: Revised GAP/ADV/BV-03-C expected outcome.</td>
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<td>2018-02-16 – 2018-04-12</td>
<td>TSE 10182 (rating 2): Revised mapping to include NOT (GAP 0a/3 OR GAP 0a/4 OR GAP 0a/5) for GAP/CONN/ACEP/BV-02-C in TCMT. TSE 10381 (rating 3): Editorial revisions to GAP/GAT/BV-04-C reference and MSC.</td>
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<td>5.0.4r00-r05</td>
<td>2018-07-20 - 2018-11-13</td>
<td>Incorporated Core_PAST_CLE_TEST_CR_r05: Modified test case description, Test Purpose, and figure caption for GAP/PADV/PASM/BV-01-C, GAP/PADV/PAM/BV-01-C, GAP/PADV/PASE/BV-01-C, GAP/PADV/PASE/BV-02-C. Added 6 new test cases to TS and TCMT GAP/PADV/PASE/BV-03-C - 06-C; GAP/PADV/PAST/BV-01-C, 02-C. Incorporated Core Minor Enhancements Batch 1 Test CRr10-clean: Modified Pass Verdict for GAP/PADV/PASM/BV-01-C. TSE 10425 (rating 3): Updated test purpose, initial condition, test procedure, MSC, and pass verdict for test cases GAP/SEC/AUT/BV-23-C and 24-C. TSE 10874 (rating 2): In TCMT, added GATT 1/1 to test cases GAP/SEC/AUT/BV-17-C and 19-C. TSE 10875 (rating 2): In TCMT, added GAP 11/2 to test case GAP/BROB/BCST/BV-05-C. TSE 10883 (rating 2): In TCMT, added GAP 17/4 to test case GAP/BROB/OBSV/BV-06-C. TSE 11113 (rating 4): Added new test case GAP/PRIV/CONN/BI-01-C; updated TCMT with new test case. TSE 10585 (rating 3): Pass verdict for test case GAP/PADV/PASM/BV-01-C has already been updated per Core Minor Enhancements Batch 1 Test CRr10-clean. Replaced [X] values with actual values. Added new reference for Bluetooth Core Specification version 5.1. Updated Madrid styles - changed light grey text to black text.</td>
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<td>5.1.0r00-r01</td>
<td>2018-11-13 - 2018-12-07</td>
<td>Updated revision number from 5.0.4 to 5.1.0 to align with the adoption of Core Specification version 5.1. Updated test case mapping for 26 test cases to be inclusive of new Core Spec version 5.1 (GAP 0a/6).</td>
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<td>36</td>
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<td>2018-12-07</td>
<td>Approved by BTI. Prepared for TCRL 2018-2 publication.</td>
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<td>5.1.1r00–r08</td>
<td>2019-04-09 – 2019-07-18</td>
<td>TSE 11417 (rating 3): Modified test step, replaced MSC and updated Pass Verdict for test cases GAP/CONN/DCON/BV-04-C and -05-C. TSE 10916 (rating 3): Updated Test Purpose, Reference, Test Procedure steps, MSC, and Pass verdict as appropriate for test cases</td>
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<td>GAP/SEC/SEM/BV-21-C – -24-C and -26-C – -29-C; updated TCMT accordingly. Incorporated changes associated with Key Negotiation specification erratum 11838: Added new sections to the “Security Modes - Slave” section with test cases for Invalid Encryption Key Size in Security Mode 2, Security Mode 4, and LE Security Mode 1 for devices operating over BR/EDR transport (new test cases GAP/SEC/SEM/BL-01-C – -12-C). Incorporated changes associated with Key Negotiation specification erratum 11838: Updated to indicate if the IUT enforces a minimum encryption key size of 56 bits; that has a range of 7–16 octets (updated sections GAP/SEC/SEM/BI-01-C (initial condition, MSC, test procedure, and pass verdict); section containing test cases GAP/SEC/SEM/BI-11-C and -02-C – -04-C (initial condition, MSC, test procedure, and minimum key sizes in test case table); test case GAP/SEC/SEM/BI-05-C (initial condition, MSC, test procedure, and pass verdict); section containing test cases GAP/SEC/SEM/BI-12-C and -06-C – -08-C (initial condition, MSC, test procedure, and minimum key sizes in test case table); test case GAP/SEC/SEM/BI-09-C (MSC). Updated TCMT.</td>
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<td>37</td>
<td>5.1.1</td>
<td>2019-08-01</td>
<td>Approved by BTI. Prepared for TCRL 2019-1 publication.</td>
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<td>Isochronous Broadcasting Mode&quot;, and 4.6.9.2.1 for new test case GAP/BIS/BBM/BV-01-C; updated TCMT accordingly; updated references section with new Core Specification.</td>
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<td>TSE 12354 (rating 4): Deleted test cases GAP/ADV/BV-15-C and -16-C to eliminate tests that require the IUT to advertise with data types that are not allowed in AD or SRD per CSS 8. Updated TCMT accordingly.</td>
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<td>TSE 11639 (rating 1): Removed test case GAP/PRIV/CONN/BI-01-C and updated the TCMT accordingly.</td>
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<td>TSE 12447 (rating 2): Updated Pass Verdict for test cases GAP/CONN/ACEP/BV-02-C – 04-C; GAP/CONN/GCEP/BV-01-C, -03-C – 06-C; GAP/CONN/SCEP/BV-02-C, -03-C; GAP/CONN/DCEP/BV-01-C, – 06-C.</td>
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<td>TSE 12754 (rating 2): Deleted test cases GAP/BROB/OBSV/BV-03-C and -04-C; GAP/GAT/BV-01-C - -03-C, -07-C and -08-C; GAP/CONN/DCON/BV-02-C and -03-C; GAP/CONN/UCON/BV-04-C and -05-C; GAP/SEC/AUT/BV-15-C and -16-C; GAP/PRIV/CONN/BV-01-C - -09-C; GAP/CONN/ACEP/BV-02-C; GAP/CONN/GCEP/BV-03-C and -04-C; GAP/CONN/SCEP/BV-02-C; and GAP/CONN/DCEP/BV-02-C and -04-C and updated TCMT accordingly. Subsequent CR added a preamble section for “GAP Mandatory Characteristics” and fixed links in test cases GAP/GAT/BV-05-C and -06-C to address procedures previously cross-referenced to in TCs deleted as part of this TSE.</td>
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<td>TSE 12731 (rating 1): Updated initial condition of test cases GAP/IDLE/NAMP/BV-01-C and -02-C; GAP/CONN/TERM/BV-01-C; GAP/SEC/CSIGN/BV-01-C and -02-C; GAP/SEC/CSIGN/BI-01-C – 04-C (GAP/GAT/BV-01-C deleted as part of TSE 12754).</td>
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<td>TSE 12927 (rating 1): Globally fixed &quot;Lower/Upper Tester expects&quot; types of wording to &quot;Lower/Upper Tester receives&quot; types of wording where appropriate.</td>
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<td>Integration review feedback: Resolved .X and Milan references with real numbers.</td>
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### Publication Number | Revision History | Date   | Comments                                                                 |
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