802.11 MAC/PHY (80211MP)

Bluetooth® Test Suite

- **Revision**: 80211MP.TS.p5
- **Revision Date**: 2020-01-07
- **Group Prepared By**: BTI
- **Feedback Email**: bti-main@bluetooth.org
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7 Test Case Mapping

8 Revision History and Contributors
1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the 802.11 MACPHY. The objective of this Test Suite is to provide a basis for conformance tests for a device or sub-system giving a high probability of air interface interoperability between different manufacturer's implementations. The following revisions are applicable to this document.
2 Normative References

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 dated references, subsequent amendments to or revisions of any of these publications apply to this Bluetooth document only when incorporated in it by amendment or revision. The normative references listed below represent the most current versions as of the date of publication of this document. The most current version of a listed reference should be used unless a specific version is noted in the list.

[1] Bluetooth Test Strategy and Terminology Overview


[3] ICS Proforma for 802.11 PAL


[5] IEEE 802.11-2007 Standard and Amendment 1

[6] UNH-IOL 802.11 Base STA MAC Test Suite v3.2
   http://www.iol.unh.edu/services/testing/wireless/testsuites/

[7] UNH-IOL 802.11 Base AP MAC Test Suite v3.4
   http://www.iol.unh.edu/services/testing/wireless/testsuites/


[9] ICS Proforma for 802.11 MAC/PHY
3 Definitions and Abbreviations

3.1 Definitions
For the purpose of this Bluetooth document, the definitions given in [1], [2], and [5] apply.

Mathematical conventions used in this document comply with the definitions given in [1].

3.2 Abbreviations
For the purpose of this Bluetooth document, the abbreviations found in [1], [2], [5] and the following abbreviations apply:

<table>
<thead>
<tr>
<th>Abbreviation (1st column)</th>
<th>Description (2nd column)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCI</td>
<td>Host Controller Interface</td>
</tr>
<tr>
<td>ICS</td>
<td>Implementation Conformance Statement</td>
</tr>
<tr>
<td>IUT</td>
<td>Implementation Under Test</td>
</tr>
<tr>
<td>LT</td>
<td>Lower Tester</td>
</tr>
<tr>
<td>LT2</td>
<td>Second Lower Tester</td>
</tr>
<tr>
<td>PAL</td>
<td>Protocol Adaption Layer</td>
</tr>
<tr>
<td>PLH</td>
<td>Physical Link Handle</td>
</tr>
<tr>
<td>PLH2</td>
<td>Second Physical Link Handle</td>
</tr>
<tr>
<td>UP</td>
<td>User Priority</td>
</tr>
<tr>
<td>UT</td>
<td>Upper Tester</td>
</tr>
</tbody>
</table>
4 Test Suite Structure (TSS)

4.1 Test Strategy

The test objectives are to verify functionality within the 802.11 MAC and PHY layers and enable interoperability between High Speed 802.11 controllers 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 802.11 Controller 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 Radio, MAC Controller and PAL conforming to the relevant specifications to perform the test cases defined in this Test Suite. For some test cases, it is necessary to stimulate the IUT using HCI primitives. In practice, these primitives could be supported using a Physical HCI or another interface supported by the IUT together with test code. Messages going into or out of this interface must be viewable to the test system as HCI commands and events.

The MAC/PHY 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 cases.

Figure 4.1: Test system architecture
4.2 Test Groups

The test groups are organized into three 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 Valid Behavior (BV) and Invalid Behavior (BI).

4.2.1 Protocol Groups

The protocol group identifies the kind of test for 802.11 Protocol Adaptation Layer test cases:

4.2.1.1 MAC/PHY
- Acknowledgement and Duration (AD)
- Null Data frame processing (ND)
- RTS/CTS signaling (RC)
- Deauthentication (DEAU)
- Defragmentation (DF)
- Authentication Frame Processing (AFP)
- Association Response Processing (ARSP)
- Association Request (AREQ)
- Duplication Detection (DUP)
- CTS-to-Self (CS)
- Multi rate support (MRS)
- General Frame Processing (GFP)
- Disassociation Processing (DAP)
- Recovery and Retry Processing (RT)

4.2.2 Test subgroups

4.2.2.1 Valid Behavior (BV) tests
This sub group provides testing to verify that the IUT reacts in conformity with the Bluetooth® Core Specification, after receipt or exchange of valid Protocol Data Units (PDUs). Valid PDUs and HCI events and commands mean that the exchange of messages and the content of the exchanged messages are considered as valid.

4.2.2.2 Invalid Behavior (BI) tests
This sub group provides testing to verify that the IUT reacts in conformity with the Bluetooth® Core Specification, after receipt of a syntactically or semantically invalid PDU and HCI events and commands.
4.2.3 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.

4.3 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. If this occurs the outcome of the test shall be the Fail Verdict.
5 Test Cases (TC)

5.1 Introduction

5.1.1 Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in [1]. The convention used here is `<spec abbreviation>/<IUT role>/<class>/<feat>/<func>/<subfunc>/<cap>/<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.

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Spec Identifier <code>&lt;spec abbreviation&gt;</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>80211MP</td>
<td>802.11 MACPHY Spec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Feature Identifier <code>&lt;feat&gt;</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Acknowledgement and Duration</td>
</tr>
<tr>
<td>AFP</td>
<td>Authentication Frame Processing</td>
</tr>
<tr>
<td>AREQ</td>
<td>Association Request</td>
</tr>
<tr>
<td>ARSP</td>
<td>Association Response Processing</td>
</tr>
<tr>
<td>CS</td>
<td>CTS-to-Self</td>
</tr>
<tr>
<td>DAP</td>
<td>Disassociation Processing</td>
</tr>
<tr>
<td>DEAU</td>
<td>Deauthentication</td>
</tr>
<tr>
<td>DF</td>
<td>Defragmentation</td>
</tr>
<tr>
<td>DUP</td>
<td>Duplication Detection</td>
</tr>
<tr>
<td>GFP</td>
<td>General Frame Processing</td>
</tr>
<tr>
<td>IEP</td>
<td>Information element processing</td>
</tr>
<tr>
<td>MRS</td>
<td>Multi rate support</td>
</tr>
<tr>
<td>ND</td>
<td>Null Data frame processing</td>
</tr>
<tr>
<td>RC</td>
<td>RTS/CTS signaling</td>
</tr>
<tr>
<td>RT</td>
<td>Recovery and Retry Processing</td>
</tr>
</tbody>
</table>

Table 5.1: 802.11 MP TC Feature Naming Convention
5.1.2 Lower Layer Assumptions

In the MSCs in this document, there are certain 802.11 frames which may occur outside the scope of any particular test. These include, but are not limited to, probe requests, probe responses, data frame retransmissions, and action frames. The presence of these frames shall not be used to affect the Pass or Fail verdict of any test, unless specifically stated as such.

The 802.11 AMP device may support the simultaneous use of multiple protocols. However, this document assumes the IUT is not actively participating in any operations other than those described herein.

5.1.3 Initialization
5.1.4 Preambles

5.1.4.1 Physical Link Initiated by IUT Preamble

Lower Tester

IUT

Upper Tester

IUT is in DISCONNECTED state

HCI Read Local AMP Info

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x1409,
status=0x00, AMP_Status,
Total_Bandwidth,
Max_Guaranteed_Bandwidth,
Min_Latency, Max_PDU_Siz,
Controller_Type, PAL_Capabilities,
AMP_ASSOC_length,
Max_Flush_Timeout,
Best_Effort_Flush_Timeout)

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCI Read Local AMP Assoc
(PLH=LengthsoFar)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140A,
status=0x00, PLH,
AMP_ASSOC_Remaining_Length=0,
AMP_ASSOC_fragment)
802.11 M
AC/PHY (80211MP) / Test Suite

Lower Tester

IUT

Upper Tester

HCI_Create_Physical_Link
(PLH, Link_Key_Length=32, Link_Key_Type=Authenticated Combination Key, Link_Key)

HCI Command Status event
(status=0x00, Num_HCI_Comm Opcode=0x0435)

Write remote AMP ASSOC on IUT

HCI_Write_Remote_AMP_ASSOC
(PLH, LengthSoFar, AMP_ASSOC_Remaining_Length, AMP_ASSOC_fragment)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140A, Status=0x00, PLH)

Network Started by IUT

Beacon
(ssid=AMP-xx-xx-xx-xx-
xx-xx, type=ESS)

HCI Channel Selected event
(PLH)

Read local AMPASSOC on IUT

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCI_Read_Local_AMP_Assoc
(PLH, LengthSoFar)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140B, Status=0x00, PLH, 
AMP_ASSOC_Remaining_Length=0, AMP_ASSOC_fragment)
Write remote AMP ASSOC on Tester

Beacon
(ssid=AMP-xx-xx-xx-xx-xx-xx, type=ESS)

Start Network Activity

Probe Request
(a1=MA_iut, a2=MA_tester, A3=MA_iut, 
SSID=AMP<MA_IUT>, IEEE IEs)

Probe Response
(a1=MA_tester, 
a2=MA_IUT,a3=MA_IUT, IEEE IEs)

Authentication Message 1
(a1=MA_IUT, 
a2=MA_tester,a3=MA_IUT,alg=open 
system(0))

Authentication Message 2
(a1=MA_IUT,a2=MA_tester, 
a3=MA_IUT, status=successful(0))

Association Request
(a1=MA_IUT,s2=MA_tester,a3=MA_IUT, 
SSID=AMP<MA_tester>, IEEE IEs)

Association Response
(a1=MA_tester,a2=MA_IUT, 
a3=MA_IUT, 
RSNA Authentication1
(4ADDR_hdr, AMP LLC, 
EAPOL frame 1))

RSNA Authentication2
(4ADDR_hdr, AMP LLC, 
EAPOL frame 2)

RSNA Authentication3
(4ADDR_hdr, AMP LLC, 
EAPOL frame 3)

RSNA Authentication4
(4ADDR_hdr, AMP LLC, 
EAPOL frame 4)

HCI Physical Link Complete event 
(status=0x00, PLH)
### 5.1.4.2 Preamble for establishment of Logical Link initiated by IUT

IUT is in DISCONNECTED state

- **HCI_Read_Local_AMP_Info**
  - **HCI Command Complete event**
    - (Num_HCI_Comm, Opcode=0x1409, status=0x00, AMP_Status, Total_Bandwidth, Max_Guaranteed_Bandwidth, Min_Latency, Max_PDU_Siz, Controller_Type, PAL_Capabilities, AMP_ASSOC_Length, Max_Flush_Timeout, Best_Effort_Flush_Timeout)

- **HCI_Create_Physical_Link**
  - (PLH, Link_Key_Length=32, Link_Key_Type=Authenticated Combination Key, Link_Key)

- **HCI_Command_Status_event**
  - (status=0x00, Num_HCI_Comm, Opcode=0x0435)
Network Started by IUT

Write remote AMP ASSOC on IUT

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCI_Write_Remote_AMP_ASSOC
(PLH, LengthSoFar,
  AMP_ASSOC_Remaining_Length,
  AMP_ASSOC_fragment)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140A,
  Status=0x00, PLH)

Read Local AMP_ASSOC on IUT

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCI_Read_Local_AMP_Assoc
(PLH, LengthSoFar)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140A,
  Status=0x00, PLH,
  AMP_ASSOC_Remaining_Length=0,
  AMP_ASSOC_fragment)

Networks started

Beacon
(ssid=AMP-xx-xx-xx-xx-xx-xx (note 1),
  type=ESS)

Networks started

Beacon
(ssid=AMP-xx-xx-xx-xx-xx-xx (note 1),
  type=ESS)
Probe Request
(a1=MA_iut, a2=MA_tester, A3=MA_iut, SSID=AMP<MA_IUT>, IEEE_IEs)

Probe Response
(a1=MA_tester, a2=MA_iut, a3=MA_IUT, IEEE_IEs)

Authentication Message 1
(a1=MA_IUT, a2=MA_tester, a3=MA_IUT, alg=open system(0))

Authentication Message 2
(a1=MA_IUT, a2=MA_tester, a3=MA_IUT, status=successful(0))

Association Request
(a1=MA_iut, a2=MA_tester, a3=MA_IUT, SSID=AMP<MA_tester>, IEEE_IEs)

Association Response
(a1=MA_tester, a2=MA_iut, a3=MA_IUT,)

RSNA Authentication 1
(4ADDR_hdr, AMP LLC, EAPOL frame 1)

RSNA Authentication 2
(4ADDR_hdr, AMP LLC, EAPOL frame 2)

RSNA Authentication 3
(4ADDR_hdr, AMP LLC, EAPOL frame 3)

RSNA Authentication 4
(4ADDR_hdr, AMP LLC, EAPOL frame 4)

HCI Physical Link Complete event
(status=0x00, PLH)

HCI Create Logical Link
(PLH, TX_BE_FS, RX_BE_FS)

HCI Create Logical Link
(PLH, TX_GU_FS, RX_GU_FS)

HCI Command Status event
(status=0x00, Num_HCI_Comm, Opcode=0x0438)

IUT selects Logical Link Handle and maps Logical Link to Upper Tester

HCI Logical Link Complete event
(status=0x00, PLH, LLH)
5.1.4.3  Preamble for Reading Local AMP Info and Local AMP ASSOC

<table>
<thead>
<tr>
<th>Lower Tester</th>
<th>IUT</th>
<th>Upper Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IUT is in DISCONNECTED state</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI Read Local AMP Info</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI Command Complete event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Num_HCI_Comm, Opcode=0x1409, status=0x00, AMP_Status, Total_Bandwidth, Max_Guaranteed_Bandwidth, Min_Latency, Max_PDU_Siz, Controller_Type, PAL_Capabilities, AMP_Assoc_Length, Max_Flush_Timeout, Best_Effort_Flush_Timeout)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop until AMP_Assoc remaining == AMP_Assoc fragment size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI Read Local AMP_Assoc (PLH, LengthSoFar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI Command Complete event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Num_HCI_Comm, Opcode=0x140A, status=0x00, PLH, AMP_Assoc_Remaining_Length=0, AMP_Assoc_fragment)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1.4.4  Preamble for Establishing 2 Physical Links with a best effort logical link on each

Run 5.1.4.2 using the BE logical link option before this procedure.

When executing the following procedure, the tester uses a different MAC address in the AMP_Assoc and in the address fields of 802.11 headers to that used in preamble 5.1.4.2.
5.1.4.5  Accept Physical Link and create best effort logical link preamble

Lower Tester | IUT | Upper Tester

IUT is in DISCONNECTED state

HCl_Read_Local_AMP_Info

HCl Command Complete event
(Num_HCI_Comm, Opcode=0x1409, status=0x00, AMP_Status, Total_Bandwidth, Max_Guaranteed_Bandwidth, Min_Latency, Max_PDU_Siz, Controller_Type, PAL_Capabilities, AMP_ASSOC_Length, Max_Flush_Timeout, Best_Effort_Flush_Timeout)

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCl_Read_Local_AMP_Assoc
(PLH, LengthSoFar)

HCl Command Complete event
(Num_HCl_Comm, Opcode=0x140A, status=0x00, PLH, AMP_ASSOC_Remaining_Length=0, AMP_ASSOC_fragment)

HCl_Accept_Physical_Link
(PLH, Link_Key_Length=32, Link_Key_Type=Authenticated Combination Key, Link_Key)

HCl Command Status event
(status=0x00, Num_HCI_Comm, Opcode=0x0436)

Write remote AMP ASSOC on IUT

HCl_Write_Remote_AMP_ASSOC
(PLH, LengthSoFar=0, AMP_ASSOC_Remaining_Length, AMP_ASSOC_fragment)

HCl Command Complete event
(Num_HCI_Comm, Opcode=0x140B, Status=0x00, PLH)

Network Started

Beacon
(ssid=AMP-xx-xx-xx-xx-xx (note 1), type=ESS)
Lower Tester

IUT

Upper Tester

Logical Link Accept Timer

 HCI Logical Link Complete event
  (status=0x00, PLH, LLH)

HCI Command Status event
  (status=pending (0x00))

IUT selects Logical Link Handle and maps Logical Link to Upper Tester

HCI_Accept_Logical_Link (PLH, TX_BE_FS, RX_BE_FS)
Probe Request
(a1=MA_iut, a2=MA_tester, A3=MA_iut, SSID=AMP<MA_iut>, IEEE IEs)

Probe Response
(a1=MA_tester, a2=MA_iut, a3=MA_iut, IEEE IEs)

Authentication Message 1
(a1=MA_iut, a2=MA_tester, a3=MA_iut, alg=open system(0))

Authentication Message 2
(a1=MA_iut, a2=MA_tester, a3=MA_iut, status=successful(0))

Association Request
(a1=MA_iut, a2=MA_tester, a3=MA_iut, SSID=AMP<MA_tester>, IEEE IEs)

Association Response
(a1=MA_tester, a2=MA_iut, a3=MA_iut, RSNA Authentication1
(4ADDR_hdr, AMP LLC, EAPOL frame 1)

RSNA Authentication2
(4ADDR_hdr, AMP LLC, EAPOL frame 2)

RSNA Authentication3
(4ADDR_hdr, AMP LLC, EAPOL frame 3)

RSNA Authentication4
(4ADDR_hdr, AMP LLC, EAPOL frame 4)

HCl Physical Link Complete event
(status=0x00, PLH)
5.1.4.6 Discover and create network preamble

Lower Tester  |  IUT  |  Upper Tester

IUT is in DISCONNECTED state

- HCI_Read_Local_AMP_Info
  - HCI Command Complete event
    - (Num_HCI_Comm, Opcode=0x1409, status=0x00, AMP_Status, Total_Bandwidth, Max_Guaranteed_Bandwidth, Min_Latency, Max_PDU_Siz, Controller_Type, PAL_Capabilities, AMP_ASSOC_Length, Max.Flush_Timeout, Best_Effort.Flush_Timeout)

- HCI_Create_Physical_Link
  - (PLH, Link_Key_Length=32, Link_Key_Type=Authenticated Combination Key, Link_Key)

- HCI Command Status event
  - (status=0x00, Num_HCI_Comm, Opcode=0x0435)
Lower Tester | IUT | Upper Tester

- **Write remote AMP ASSOC on IUT**

  - Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size
  - **HCI Write Remote AMP ASSOC** (PLH, LengthSoFar, AMP_ASSOC_Remaining_Length, AMP_ASSOC_Fragment)
  - **HCI Command Complete event**
    - (Num_HCI_Comm, Opcode=0x140A, Status=0x00, PLH)

  - **Network Started by IUT**
  - **Beacon** (ssid=AMP-xx-xx-xx-xx-xx-xx (note 1), type=ESS)

- **Read Local AMP_ASSOC on IUT**

  - Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size
  - **HCI Read Local AMP_Assoc** (PLH, LengthSoFar)
  - **HCI Command Complete event**
    - (Num_HCI_Comm, Opcode=0x140A, Status=0x00, PLH, AMP_ASSOC_Remaining_Length=0, AMP_ASSOC_Fragment)

  - **Beacon** (ssid=AMP-xx-xx-xx-xx-xx-xx, type=ESS)

- **Networks started**
Lower Tester

IUT

Upper Tester

Probe Request
(a1=MA_iut, a2=MA_tester, 
A3=MA_iut, 
SSID=AMP<MA_IUT>,IEEE_IEs)

Probe Response
(a1=MA_tester, 
a2=MA_IUT, a3=MA_IUT, IEEE_IEs)
5.1.4.7 Discover and accept network preamble

Lower Tester  IUT  Upper Tester

IUT is in DISCONNECTED state

HCI_Read_Local-AMP_Info

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x1409, status=0x00, AMP_Status, Total_Bandwidth, Max_Guaranteed_Bandwidth, Min_Latency, Max_PDU_Siz, Controller_Type, PALCapabilities, AMP_ASSOC_Length, Max_Flush_Timeout, Best_Effort_Flush_Timeout)

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

HCI_Read_Local-AMP_Assoc
(PLH, LengthSoFar)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140A, status=0x00, PLH, AMP_ASSOC_Remaining_Length=0, AMP_ASSOC_fragment)

HCI_Accept_Physical_Link
(PLH, Link_Key_Len=32, Link_Key_Type=Authenticated Combination Key, Link_Key)

HCI Command Status event
(status=0x00, Num_HCI_Comm, Opcode=0x0436)

Write remote AMP ASSOC on IUT

Network Started

Beacon
(ssid=AMP-xx-xx-xx-xx-xx-xx-xx, note 1, type=ESS)

Loop remaining_length > fragment_length

HCI_Write_Remote-AMP_ASSOC
(PLH, LengthSoFar=0, AMP_ASSOC_Remaining_Length, AMP_ASSOC_fragment)

HCI Command Complete event
(Num_HCI_Comm, Opcode=0x140B, Status=0x00, PLH)
Lower Tester

IUT

Upper Tester

IUT is in DISCONNECTED state

Loop until AMP_ASSOC remaining == AMP_ASSOC fragment size

Network Started

Beacon

(ssid=AMP-xx-xx-xx-xx-xx-xx
(note 1), type=ESS)

Write remote AMP ASSOC on IUT

LOOP remaining_length > fragment_length

Write remote AMP ASSOC on IUT

802.11 MAC/PHY (80211MP) / Test Suite
5.2 Stimulus Frames

Some tests require specialized frame headers or frame content to be used by the LT as stimulus to trigger certain activity (or non-activity) by the IUT. Table 5.2 lists such frames.

<table>
<thead>
<tr>
<th>Frame label</th>
<th>Frame type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame1</td>
<td>MSDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT, Sequence number = N. Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, up to the maximum frame length.</td>
</tr>
<tr>
<td>Frame2</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT, MoreFrag = 1, Sequence number = N, FragmentNumber = 0. Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, to fill a fragment of 750 octets.</td>
</tr>
<tr>
<td>Frame3</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT, MoreFrag = 0, Sequence number = N, FragmentNumber = 1. Payload: Incrementing data 0x00…0xFF, to fill a fragment of 750 octets.</td>
</tr>
<tr>
<td>Frame4</td>
<td>MSDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, up to the maximum frame length. FCS is invalid.</td>
</tr>
<tr>
<td>Frame5</td>
<td>CTS-to-Self</td>
<td>Header: Valid control frame, A1 = MA_LT, duration field set to 32767.</td>
</tr>
<tr>
<td>Frame6</td>
<td>MSDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = (MA_IUT</td>
</tr>
<tr>
<td>Frame label</td>
<td>Frame type</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Frame7</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame control protocol type is 1. Payload: None.</td>
</tr>
<tr>
<td>Frame8</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame control protocol field is 0. Frame control protected bit is 0. Frame control ToDS bit is 0. All other bits in frame control field are set to 1. Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame9</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Payload: None. FCS is invalid.</td>
</tr>
<tr>
<td>Frame10</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, PM, Retry, MoreFrag, Protocol One bits: MoreData, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame11</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, MoreData, PM, MoreFrag, Protocol One bits: Retry, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame12</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, MoreData, PM, Retry, MoreFrag, Protocol One bits: FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame13</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, PM, MoreFrag, Protocol One bits: MoreData, Retry, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame label</td>
<td>Frame type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Frame14</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, PM, Retry, Protocol One bits: MoreData, MoreFrag, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame15</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, MoreData, PM, Protocol One bits: Retry, MoreFrag, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame16</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, MoreData, PM, Retry, Protocol One bits: MoreFrag, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame17</td>
<td>MPDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame type is Data, subtype is Null Data. Frame Control field: Zero bits: Order, Protected, PM, Protocol One bits: MoreData, Retry, MoreFrag, FromDS, ToDS Payload: None. Valid FCS.</td>
</tr>
<tr>
<td>Frame18</td>
<td>MPDU</td>
<td>Header: Deauthentication Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT Frame Control field: 0. Valid FCS</td>
</tr>
<tr>
<td>Frame19</td>
<td>MPDU</td>
<td>Header: Deauthentication Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT Frame Control field: 0. Invalid FCS</td>
</tr>
<tr>
<td>Frame label</td>
<td>Frame type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Frame21     |            | Header: Deauthentication Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
|             |            | Frame Control field: 0.  
|             |            | Valid FCS |
| Frame22     | MSDU       | Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT. Frame Control Protocol Version is 1, Frame type is Data, subtype is Data+CF-ACK  
|             |            | Payload: 255 bytes set to values 0x00 through 0xFF. |
| Frame23     | MPDU       | Header: Control Frame with 2 addresses, A1=MA_IUT, A2=MA_LT, Frame Control Type=01, Subtype=0111 |
| Frame24     | MPDU       | Header: Control Frame with 3 addresses, A1=MA_IUT, A2=MA_LT, A3=MA_IUT, Frame Control Type=01, Subtype=0111 |
| Frame25     | MPDU       | 802.11 Beacon frame with A1=ff:ff:ff:ff:ff:ff, A2=MA_LT, A3=MA_LT, bits 5 through 15 of the Capability Information field set to 1. |
| Frame26     | MPDU       | 802.11 Beacon frame with A1=ff:ff:ff:ff:ff:ff, A2=MA_LT, A3=MA_LT, no supported rates in the Supported Rates and in the Extended Supported Rates information elements. |
| Frame27     | MSDU       | 802.11 QoS data frame (frame control is set to 0x0208). A1 and A3=MA_IUT, A2 and A4=MA_LT.  
|             |            | Payload: 0 bytes |
| Frame28     | MSDU       | 802.11 data frame with FromDS bit set to 0, A1= MA_IUT, A2=MA_LT and A3 field is set to a MAC address that is neither MA_IUT nor MA_LT.  
|             |            | Payload: 500 bytes set to AMP_LLC first and then counting up from 0x00. |
| Frame29     | MSDU       | 802.11 data frame with, A1 and A3=MA_IUT, A2 and A4 =MA_LT. The Order bit in the Frame Control field is set to 1.  
|             |            | Payload: 500 bytes set to AMP_LLC first and then counting up from 0x00. |
| Frame30     | MSDU       | 802.11 data frame with, A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS and FromDS bits are set to 1.  
|             |            | Payload: 60 bytes set to AMP_LLC first and then counting up from 0x00. |
| Frame31     | MPDU       | 802.11 management frame with Subtype in Frame Control field set to 0110.  
<p>|             |            | Payload: 0 Bytes |</p>
<table>
<thead>
<tr>
<th>Frame label</th>
<th>Frame type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame32</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 0110. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame33</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 0111. Payload: 0 Bytes</td>
</tr>
<tr>
<td>Frame34</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 0111. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame35</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1101. Payload: 0 Bytes</td>
</tr>
<tr>
<td>Frame36</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1101. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame37</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1110. Payload: 0 Bytes</td>
</tr>
<tr>
<td>Frame38</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1110. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame39</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1111. Payload: 0 Bytes</td>
</tr>
<tr>
<td>Frame40</td>
<td>MPDU</td>
<td>802.11 management frame with Subtype in Frame Control field set to 1111. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame41</td>
<td>MSDU</td>
<td>802.11 data frame with Subtype in Frame Control field set to 1101. A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS and FromDS bits are set to 1. Payload: 2 Bytes both set to 0</td>
</tr>
<tr>
<td>Frame42</td>
<td>MSDU</td>
<td>802.11 data frame with Subtype in Frame Control field set to 1100. A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS and FromDS bits are set to 1. Payload: 2 Bytes both set to 0</td>
</tr>
<tr>
<td>Frame label</td>
<td>Frame type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Frame43</td>
<td>MPDU</td>
<td>802.11 frame with Type in Frame Control field set to 11 and Subtype in Frame Control field set to one of (0000, 0001, 0010, 0100, 1000, and 1111). Payload: 0 Bytes</td>
</tr>
<tr>
<td>Frame44</td>
<td>MPDU</td>
<td>802.11 frame with Type in Frame Control field set to 11 and Subtype in Frame Control field set to one of (0000, 0001, 0010, 0100, 1000, and 1111). Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame45</td>
<td>MSDU</td>
<td>802.11 data frame A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS and FromDS bits are set to 1. Payload: 2000 Bytes set to AMP_LLC first and then counting up from 0x00.</td>
</tr>
<tr>
<td>Frame46</td>
<td>MSDU</td>
<td>802.11 data frame with Subtype in Frame Control field set to 1000. A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS is set to 0 and FromDS bits is set to 1. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame47</td>
<td>MSDU</td>
<td>802.11 data frame with Subtype in Frame Control field set to 1000. A1 and A3=MA_IUT, A2 and A4 =MA_LT. ToDS is set to 1 and FromDS bits is set to 0. Payload: 255 bytes set to values 0x00 through 0xFF</td>
</tr>
<tr>
<td>Frame48</td>
<td>MPDU</td>
<td>802.11 Probe Request where the SSID information element has a length greater than 32 bytes.</td>
</tr>
<tr>
<td>Frame49</td>
<td>MPDU</td>
<td>802.11 Probe Request where the SSID information element has a length greater than 32 bytes.</td>
</tr>
<tr>
<td>Frame50</td>
<td>MSDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT Payload: 1500 Bytes set to Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, for the rest of the length.</td>
</tr>
<tr>
<td>Frame51</td>
<td>MSDU</td>
<td>Header: Valid 4-address frame, A1 = MA_IUT, A2 = MA_LT Payload: 500 Bytes set to Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, for the rest of the length.</td>
</tr>
<tr>
<td>Frame label</td>
<td>Frame type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Frame53     | MMPDU      | Header: Association Response Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT  
Payload: Capability, Status, AID, Supported Rates, Extended Supported Rates, Reserved IE (254 255 0x00…0xFF), Reserved IE (255 255 0x00…0xFF) |
| Frame54     | MMPDU      | Header: Association Response Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT  
Payload: Capability, Status, AID, Supported Rates, Supported Rates (repeated), Extended Supported Rates |
| Frame55     | MMPDU      | Header: Association Response Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT  
Payload: Capability, Status, AID, Extended Supported Rates |
| Frame56     | MMPDU      | Header: Association Response Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_LT  
Payload: Capability, Status, AID, Supported Rates, Extended Supported Rates (50 9 0x02 0x04 0x0c 0x12 0x18 0x30 0x48 0x60 0x6c) |
| Frame57     | MMPDU      | Header: Association Request Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
Payload: Capability, SSID, Supported Rates, Extended Supported Rates, RSN |
| Frame58     | MMPDU      | Header: Association Request Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
Payload: Capability, SSID, Listen Interval, Supported Rates, Extended Supported Rates, RSN, Reserved IE (254 255 0x00…0xFF), Reserved IE (255 255 0x00…0xFF) |
| Frame59     | MMPDU      | Header: Association Request Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
Payload: Capability, SSID, Listen Interval, Supported Rates, Extended Supported Rates (50 9 0x02 0x04 0x0c 0x12 0x18 0x30 0x48 0x60 0x6c), RSN |
| Frame60     | MMPDU      | Header: Association Request Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
Payload: Capability, SSID, Listen Interval, Supported Rates (4 0), Extended Supported Rates, RSN |
| Frame61     | MMPDU      | Header: Association Request Management Frame, A1 = MA_IUT, A2=MA_LT, A3=MA_IUT  
Payload: Capability, SSID, Listen Interval, Supported Rates (4 0), Extended Supported Rates, RSN  
Invalid FCS |
<table>
<thead>
<tr>
<th>Frame label</th>
<th>Frame type</th>
<th>Description</th>
</tr>
</thead>
</table>
| Frame62     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT} \), \( \text{Retry} = 1 \), Sequence number = \( N \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to the maximum frame length. |
| Frame63     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT} \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to \( 750 \) octets, incrementing data \( 0x00...0xFF \) up to maximum frame length (i.e., the concatenation of the data from Frame 2 and Frame 3) |
| Frame64     | MPDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT} \), \( \text{MoreFrag} = 0 \), Sequence number = \( N \), FragmentNumber = \( 1 \)  
Payload: Decrementing data \( 0xFF..0x00 \), to fill a fragment of \( 750 \) octets |
| Frame65     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT} \), \( \text{Retry} = 1 \), Sequence number = \( N + 1 \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to the maximum frame length. |
| Frame66     | MPDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT} \), \( \text{MoreFrag} = 0 \), \( \text{Retry} = 1 \), Sequence number = \( N \), FragmentNumber = \( 1 \)  
Payload: Incrementing data \( 0x00..0xFF \), to fill a fragment of \( 750 \) octets |
| Frame67     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT2} \), \( \text{Retry} = 1 \), Sequence number = \( N \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to the maximum frame length. |
| Frame68     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT2} \), \( \text{Retry} = 1 \), Sequence number = \( N + 1 \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to the maximum frame length. |
| Frame69     | MSDU       | Header: Valid 4-address frame, \( A1 = \text{MA\_IUT}, A2 = \text{MA\_LT2} \), Sequence number = \( N + 1 \)  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data \( 0x00...0xFF \), up to the maximum frame length. |
<p>| Frame70     | MMPDU      | Header: Disassociation Management Frame, ( A1 = \text{MA_IUT}, A2 = \text{MA_LT}, A3 = \text{MA_IUT} ) |
| Frame71     | MMPDU      | Header: Disassociation Management Frame, ( A1 = \text{MA_IUT}, A2 = \text{MA_LT}, A3 = \text{MA_IUT} ) Invalid FCS |</p>
<table>
<thead>
<tr>
<th>Frame label</th>
<th>Frame type</th>
<th>Description</th>
</tr>
</thead>
</table>
| Frame 72    | MSDU       | Header: A1 = MA_LT, A2 = MA_IUT  
Payload: Valid LLC with PAL SNAP, ACL data header, L2CAP header, incrementing data 0x00…0xFF, up to the maximum frame length. |

*Table 5.2: Specialized frame headers*
6 MAC-PHY Testing

6.1 Acknowledgement and Duration (AD)
This section describes tests relating to 802.11 acknowledgement and duration fields.

6.1.1 80211MP/AD/BV-01-C Duration field zero

- Test Purpose
  Verify that the IUT generates 802.11 Acknowledgement control frames at the proper time and with the proper contents.

- Reference
  [6] Test 1.1.9

- Initial Condition
  The preamble in Section 5.1.4.2 has been completed.

- Test Procedure

  ![Diagram of test procedure]

- Expected Outcome
  Pass verdict

  An 802.11 Acknowledgement control frame should be generated SIFS after the FCS of Frame1 arrives at the IUT.

  The ACK frame has a Duration field with a value of zero (0).

6.1.2 80211MP/AD/BV-02-C Duration field non-zero

- Test Purpose
  Send a stream of 802.11 fragments to the IUT and ensure the 802.11 Acknowledgement frames are formatted correctly.
• Reference
  [6] Test 1.1.9

• Initial Condition
  The preamble in Section 5.1.4.2 has been completed.

• Test Procedure

  Lower Tester

  IUT

  Upper Tester

  Preamble 5.1.5.2 is completed

  Frame 2

  802.11 Ack with duration of time to transmit rest of the MSDU minus the time to wait the final SIFS and to transmit the final Ack

  Frame 3

  802.11 Ack with duration 0

• Expected Outcome
  Pass verdict

  An 802.11 Acknowledgement control frame is generated SIFS after the FCS of each of the fragments received by the IUT.

  The ACK frame following Frame2 has a non-zero Duration field equal to the time to transmit the data frame, minus the time to transit the ACK frame and to wait for SIFS, with fractional time rounded up to the nearest microsecond.

  The ACK frame following Frame3 has a Duration field set to zero.

6.1.3 80211MP/AD/BV-03-C Large duration value

• Test Purpose
  Send fragments preceded by a CTS-to-self frame with a large duration. Ensure ACK duration fields are correctly set.

• Reference
  [6] Test 1.1.9
• Initial Condition

The preamble in Section 5.1.4.2 has been completed.

• Test Procedure

```
Lower Tester  IUT  Upper Tester
```

The preamble in section 5.1.5.2 is completed

- Frame 2
  - 802.11 Ack with duration of time to transmit rest of the MSDU minus the time to wait the final SIFS and to transmit the final Ack

- Frame 3
  - 802.11 Ack with duration 0

- Frame 5
  - 802.11 Ack with duration 0

- HCI ACL Data packet

- HCI ACL Data packet

- HCI ACL Data packet

• Expected Outcome

**Pass verdict**

The IUT shall generate an ACK frame in response to both fragments.

The first ACK shall contain a duration corresponding to the time until the second ACK should be received. This is the airtime of the data phase of the second fragment, plus SIFS, plus the time to transmit the second ACK.

The second ACK shall contain a duration field of zero.

6.1.4 80211MP/AD/BI-01-C FCS validation

• Test Purpose

Send frames with valid and invalid FCS fields to the IUT and ensure there are no ACK frames sent in response to frames with invalid FCS.

• Reference

[6] Test 1.1.9
• Initial Condition
The preamble in Section 5.1.4.2 has been completed.

• Test Procedure

![Diagram showing test procedure]

• Expected Outcome
Pass verdict

An 802.11 Acknowledgement control frame is generated SIFS after the FCS each time Frame1 is received by the IUT. The ACK frame has a Duration field set to zero.

There are no responses from the IUT to any of the Frame4 frames.

6.1.5 80211MP/AD/BI-02-C Non-authenticated source

• Test Purpose
Send frames using a TA which is not the same TA as the AMP peer.

• Reference
[6] Test 1.1.9

• Initial Condition
The preamble in Section 5.1.4.2 has been completed.
• **Test Procedure**

![Diagram](image)

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

  The IUT shall transmit an ACK frame at a time SIFS after the FCS field of the Frame6 is received. The Duration field shall be zero. The IUT may generate an 802.11 deauthentication and/or 802.11 disassociation frame in response to the unauthenticated link supervision request frame.

### 6.2 Null data frame processing (ND)

This section describes testing related to null data frames.

#### 6.2.1 80211MP/ND/BV-01-C Process properly formatted null data frames

- **Test Purpose**
  
  Verify IUT can properly process null data frames.

- **Reference**
  
  [6] Test case 1.1.2

  [7] Test case 1.1.2

- **Initial Condition**
  
  The preamble in Section 5.1.4.1 has been completed.
• Test Procedure

lower Tester

IUT

upper Tester

The preamble in section 5.1.5.1 is completed.

Frame 11

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 12

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 13

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 14

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 15

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 16

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.

Frame 17

802.11 Ack transmitted within SIFS of FCS of data frame.
Duration is 0.
• Expected Outcome
  
  *Pass verdict*

  The IUT shall transmit an ACK frame in response to each of the stimulus frames.

6.2.2 80211MP/ND/BI-01-C Reject improperly formatted null data frames

• Test Purpose
  
  Verify IUT ignores improperly formed null data frames.

• Reference
  
  [6] Test case 1.1.2
  
  [7] Test case 1.1.2

• Initial Condition
  
  The preamble in Section 5.1.4.1 has been completed.

• Test Procedure

  Lower Tester  
  
  IUT  
  
  Upper Tester

  The preamble in section 5.1.5.1 is completed

  Frame 7

  Frame 9

• Expected Outcome
  
  *Pass verdict*

  The IUT shall not transmit an ACK frame in response to any of the stimulus frames.
6.3 RTS/CTS signaling (RC)
This section describes testing related to RTS/CTS signaling and proper duration values therein.

6.3.1 80211MP/RC/BV-01-C RTS/CTS with proper duration in CTS

- **Test Purpose**
  Verify IUT is able to receive and respond to RTS/CTS protected frames, regardless of whether it uses RTS/CTS signaling for its own data frames.

- **References**
  [6] Test 1.2.2

- **Initial Condition**
  The preamble in Section 5.1.4.1 has been completed.

- **Test Procedure**

  ![Diagram showing test procedure](image)

- **Expected Outcome**
  **Pass verdict**
  Verify Frame1 is indicated to the UT.
6.4 Defragmentation Tests (DF)

6.4.1 80211MP/DF/BV-01-C Receive fragmented frames

- Test Purpose
  Verify IUT defragments received fragmented frames correctly

- Reference
  [6], Test 1.1.10
  [7] Test 1.1.10

- Initial Condition
  The preamble in Section 5.1.5.5 has been completed.

- Test Procedure

  Frame1 is defined in Table 5.2. Note 1: After the MSDU has been transmitted at a given fragment size, increment the fragment size by 100 bytes and repeat until the fragment size is greater than or equal to the total length of Frame1.

- Expected Outcome
  Pass verdict

  On reception of each complete MSDU an ACL data packet is sent from the IUT to the UT.

  The frame received by the UT contains the same content as was sent by the LT, after the 802.11 and PAL headers have been removed and an ACL header added.
6.5 Authentication Frame Processing (AFP)

6.5.1 80211MP/AFP/BI-01-C authentication frames with failure status code

- Test Purpose
  Verify that the IUT handles authentication request frames and responds appropriately.

- Reference
  [6] Test 1.1.4

- Initial Condition
  The preamble in 5.1.4.6 has been completed.

- Test Procedure

1. The 802.11 traffic shall be monitored by a sniffer.
2. Repeat test with Status code 1,8,12 and 256.

- Expected Outcome
  Pass verdict

  IUT does not respond with Association frame and Physical link between IUT and LT is not established. Verify that IUT does not cause a “blue screen” or hang.

6.5.2 80211MP/AFP/BI-02-C Authentication Frame Processing – invalid transaction sequence number

- Test Purpose
  Verify that the IUT handles receipt of authentication frames with invalid transaction sequence number and does not have a system failure.

- Reference
  [6] Test 1.1.4
• **Initial Condition**
  The preamble in 5.1.4.7 has been completed.

• **Test Procedure**

  ![Diagram](image)

  The 802.11 traffic shall be monitored by a sniffer.

• **Expected Outcome**
  **Pass verdict**
  IUT does not respond with Association frame and Physical link between IUT and TS is not established. Verify that IUT does not cause a "blue screen" or hang.

6.5.3 **80211MP/AFP/BI-03-C authentication frames with invalid algorithm number**

• **Test Purpose**
  Verify that the IUT handles authentication request frames and responds appropriately.

• **Reference**
  [6] Test 1.1.4

• **Initial Condition**
  The preamble in 5.1.4.7 has been completed.
• Test Procedure

Lower Tester  IUT  Upper Tester

The preamble in 5.1.5.7 is completed

AUTH (Algo = "Open system", seq=1)
ACK

AUTH (Algo > 2, seq=2, status=0)
ACK

DUT does not send Association Frames, Physical Link is not established

The 802.11 traffic shall be monitored by a sniffer.

• Expected Outcome

Pass verdict

IUT does not respond with Association frame and Physical link between IUT and TS is not established. Verify that IUT does not cause a "blue screen" or hang.

6.6 Association Response testing (ARSP)
Tests the processing of association responses.

6.6.1 80211MP/ARSP/BI-01-C Association responses with status values other than successful

• Test Purpose

Verify IUT is able to correctly process association responses with status values other than "successful".

• Reference

[6] Test 1.1.5

• Initial Condition

The preamble in 5.1.4.7 has been completed.
• Test Procedure

The preamble in 5.1.5.7 is completed.

IUT attempts to associate. LT responds with Frame 52 defined in Table 5.2.

Repeat test with Status code 1, 12 and 256.

• Expected Outcome

Pass verdict

The IUT sends an HCI Physical Link Complete event with failure status (i.e. a non-zero HCI error code).

6.6.2 80211MP/ARSP/BI-02-C Unrecognized payload of Association Response frames

• Test Purpose

Verify IUT is able to correctly process association responses containing unrecognized information elements.

• Reference

[6] Test 1.1.5

• Initial Condition

The preamble in 5.1.4.7 has been completed.
IUT attempts to associate. LT responds with Frame 53 defined in Table 5.2.

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

  An HCI Physical Link Complete event with status of 0x00 shall be sent to the UT from the IUT.

6.6.3 80211MP/ARSP/BI-03-C Duplicate valid info elements in Assoc Response

- **Test Purpose**
  
  Verify IUT is able to correctly process association responses with duplicate valid information elements.

- **Reference**
  
  [6] Test 1.1.5

- **Initial Condition**
  
  The preamble in 5.1.4.7 has been completed.
• Test Procedure

![Diagram]

IUT attempts to associate. LT responds with Frame 54 defined in Table 5.2.

• Expected Outcome
Pass verdict

An HCI Physical Link Complete event with status of 0x00 shall be sent to the UT from the IUT.

6.6.4 80211MP/ARSP/BI-04-C Missing supported rates IE in Association Response

• Test Purpose
Verify IUT is able to correctly process association responses with a missing supported rates information element.

• Reference
[6] Test 1.1.5

• Initial Condition
The preamble in 5.1.4.7 has been completed.
IUT attempts to associate. LT responds with Frame 55 defined in Table 5.2.

• Expected Outcome

Pass verdict

An HCI Physical Link Complete event with status of 0x00 shall be sent to the UT from the IUT.

6.6.5 80211MP/ARSP/BI-05-C Association response with more than eight rates in the supported rates IE

• Test Purpose

Verify IUT is able to handle association responses with more than eight rates in the supported rates information element.

• Reference

[6] Test 1.1.5

• Initial Condition

The preamble in 5.1.4.7 has been completed.
• **Test Procedure**

The preamble in 5.1.5.7 is completed.

IUT attempts to associate. LT responds with Frame 56 defined in Table 5.2.

• **Expected Outcome**

**Pass verdict**

An HCI Physical Link Complete event with status of 0x00 shall be sent to the UT from the IUT.

### 6.7 Association Request Processing (AREQ)

#### 6.7.1 80211MP/AREQ/BV-01-C Association request processing

• **Test Purpose**

Verify IUT properly handles received association request frames and generates association responses properly.

• **Reference**

[7] Test 1.1.5

• **Initial Condition**

The preamble in 5.1.4.6 has been completed.
IUT attempts to associate. LT responds with Frame 57 defined in Table 5.2.

Repeat test with listen interval 2, 3, 4, and 5.

• Expected Outcome

  Pass verdict

  IUT sends association response with status code of 0 (success).

### 6.7.2 80211MP/AREQ/BV-02-C Generate association responses

• Test Purpose

  Verify IUT properly handles received association request frames and generates association responses properly.

• Reference

  [7], Test 1.1.5

• Initial Condition

  The preamble in 5.1.4.6 has been completed.
**Test Procedure**

![Diagram of Test Procedure]

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

The preamble in 5.1.5.6 is completed.

**Authentication Message 1**
\( (a_1 = MA_{IUT}, a_2 = MA_{tester}, a_3 = MA_{IUT}, \text{alg} = \text{open system}(0)) \)

**Authentication Message 2**
\( (a_1 = MA_{tester}, a_2 = MA_{IUT}, a_3 = MA_{IUT}, \text{status} = \text{successful}(0)) \)

**Frame 57**

**Association Response**
\( (a_1 = MA_{tester}, a_2 = MA_{IUT}, a_3 = MA_{IUT}, \text{status} = \text{successful}(0)) \)

LT attempts to associate by sending Frame 58 defined in Table 5.2.

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

  IUT sends association response with status code of 0 (success).

**6.7.3 80211MP/AREQ/BV-03-C Assoc request with more than eight rates in supported rates IE**

- **Test Purpose**
  
  Verify IUT properly handles received association request frames and generates association responses properly.

- **Reference**
  
  [7], Test 1.1.5

- **Initial Condition**
  
  The preamble in 5.1.4.6 has been completed.
• Test Procedure

![Diagram showing the exchange of packets between Lower Tester, IUT, and Upper Tester.]

The preamble in 5.1.5.6 is completed.

Authentication Message 1
(a1=MA_IUT, a2=MA_tester, a3=MA_IUT, alg=open system(0))

Authentication Message 2
(a1=MA_tester, a2=MA_IUT, a3=MA_IUT, status=successful(0))

Frame 59

Association Response
(a1=MA_tester, a2=MA_IUT, a3=MA_IUT, status=successful(0))

LT attempts to associate by sending Frame 59 defined in Table 5.2.

• Expected Outcome

Pass verdict

IUT sends association response with status code of 0 (success).

6.7.4 80211MP/AREQ/BI-01-C Assoc request with no rates in supported rates IE

• Test Purpose

Verify IUT properly handles received association request frames with no rates encoded in supported rates information element and generates association responses properly.

• Reference

[7], Test 1.1.5

• Initial Condition

The preamble in 5.1.4.6 has been completed.
• Test Procedure

LT attempts to associate by sending Frame 60 defined in Table 5.2.

• Expected Outcome

Pass verdict

IUT sends association response with status code indicating failure.

6.7.5  **80211MP/AREQ/BI-02-C Assoc request with invalid FCS**

• Test Purpose

Verify IUT ignores erroneous association requests.

• Reference

[7] Test 1.1.5

• Initial Condition

The preamble in 5.1.4.6 has been completed.
802.11 M
AC/PHY (80211MP)
Test
Suite

• Test Procedure

Lower Tester  IUT  Upper Tester

The preamble in 5.1.5.6 is completed.

Authentication Message 1
(a1=MA_IUT,a2=MA_tester,
a3=MA_IUT,alg=open system(0))

Authentication Message 2
(a1=MA_tester,a2=MA_IUT,
a3=MA_IUT, status=successful(0))

Frame 61

• Expected Outcome

Pass verdict

IUT does not ACK frame and does not send association response.

6.8 Duplicate Frame processing (DUP)

6.8.1 80211MP/DUP/BV-01-C Filtering of retried frames

• Test Purpose
Verify IUT properly detects and filters duplicate frames.

• Reference
[6] Test 1.1.11

• Initial Condition
The preamble in 5.1.4.5 has been completed.
• **Test Procedure**

![Diagram](image)

The preamble in 5.1.5.5 is completed.

LT sends Frame 1 followed by Frame 62.

• **Expected Outcome**

**Pass verdict**

IUT ACKs Frame 1.

IUT indicates received Frame 1 to UT.

IUT ACKs Frame 62.

IUT does not indicate received Frame 62 to UT.

**6.8.2 80211MP/DUP/BV-02-C Process fragments from two sets**

• **Test Purpose**

Verify IUT properly detects and filters incomplete frame fragments.

• **Reference**

[6] Test 1.1.11

• **Initial Condition**

The preamble in 5.1.4.5 has been completed.
• **Test Procedure**

LT sends Frame 2 followed by Frame 3 followed by Frame 64.

• **Expected Outcome**
  
  Pass verdict

  IUT ACKs Frame 2.

  IUT does not indicate received Frame 2 to UT.

  IUT ACKs Frame 3.

  IUT indicates received defragmented Frame 63 to UT.

  IUT ACKs Frame 64.

  IUT does not indicate received Frame 64 (or any MSDU) to UT.

**6.8.3 80211MP/DUP/BV-03-C Wrap of sequence number field**

• **Test Purpose**

  Verify IUT correctly receives subsequent frames with retry bit set.

• **Reference**

  [6] Test 1.1.11

• **Initial Condition**

  The preamble in 5.1.4.5 has been completed.
**Test Procedure**

- LT sends Frame 1 followed by Frame 65.

**Expected Outcome**

**Pass verdict**

1. IUT ACKs Frame 1.
2. IUT indicates received Frame 1 to UT.
3. UT ACKs Frame 65.
4. IUT indicates received Frame 65 to UT.

**6.8.4 80211MP/DUP/BV-04-C Processing of independent, identical frames**

- **Test Purpose**
  
  Verify IUT properly processes two consecutive frames with same sequence number and no retry bit set.

- **Reference**
  
  [6] Test 1.1.11

- **Initial Condition**
  
  The preamble in 5.1.4.5 has been completed.
• Test Procedure

LT sends Frame 1 twice.

• Expected Outcome

Pass verdict

1. IUT ACKs Frame 1.
2. UT indicates received Frame 1 to UT.
3. UT ACKs the second instance of Frame 1.
4. UT indicates received Frame 1 to UT.

6.8.5 80211MP/DUP/BV-05-C Process fragments with retry bit set

• Test Purpose

Verify IUT properly receives retransmissions of missing MPDUs.

• Reference

[6] Test 1.1.11

• Initial Condition

The preamble in 5.1.4.5 has been completed.
• Test Procedure

LT sends Frame 2 followed by Frame 66.

• Expected Outcome

Pass verdict

1. IUT ACKs Frame 2.
2. IUT does not indicate received Frame 2 to UT.
3. IUT ACKs Frame 66.
4. IUT indicates received defragmented Frame 63 to UT.

6.8.6 80211MP/DUP/BV-06-C MSDUs with distinct TA fields

• Test Purpose

Verify IUT properly handles sequence numbers in distinct traffic streams.

• Reference


• Initial Condition

The preamble in Section 5.1.4.4 has been completed.
• **Test Procedure**

![Diagram](image)

The preamble in 5.1.5.4 is completed.

Frame 1

ACK

Frame 67

ACK

HCI ACL Data Packet (PLH1)

HCI ACL Data Packet (PLH2)

Upper Tester

IUT

Lower Tester

LT sends Frame 1 followed by Frame 67.

• **Expected Outcome**

**Pass verdict**

1. IUT ACKs Frame 1.
2. IUT indicates received Frame 1 to UT.
3. IUT ACKs Frame 67.
4. IUT indicates received Frame 67 to UT.

6.8.7 **80211MP/DUP/BV-07-C MSDUs with different TA and sequence number field and retry bit**

• **Test Purpose**

Verify IUT properly handles sequence numbers and retry bit in distinct traffic streams.

• **Reference**


• **Initial Condition**

The preamble in 5.1.4.4 has been completed.
• **Test Procedure**

![Diagram showing the sequence of events involving Lower Tester (LT), IUT, and Upper Tester (UT).]

LT sends Frame 1 followed by Frame 68.

• **Expected Outcome**

  Pass verdict

  1. IUT ACKs Frame 1.
  2. UT indicates received Frame 1 to UT.
  3. UT ACKs Frame 68.
  4. UT indicates received Frame 68 to UT.

6.9 **CTS to Self (CS)**

6.9.1 **80211MP/CS/BV-01-C CTS-to-self Recognition**

• **Test Purpose**

  Verify that the IUT will delay transmission of data frames based on CTS-to-Self frame reception.

• **Reference**


• **Initial Condition**

  The preamble in Section 5.1.5.4 has been completed.
• Test Procedure

The preamble in section 5.1.5.2 is completed.

The AMP HCI ACL Data Packets shall be sent to the IUT at a rate much greater than CTS-to-Self Duration, in order to queue frames during the blackout period.

The 802.11 traffic shall be monitored by a sniffer with a good timing precision. The transmission of the CTS-to-Self packet from the LT will be noted using the sniffer's time base. The transmission of the next 802.11 packet from the IUT will be noted using the sniffer's time base.

• Expected Outcome

Pass verdict

Using an 802.11 packet sniffer check that the IUT does not transmit an 802.11 Data Frame within 32ms duration after the sniffer records the transmission of the CTS-to-self frame by the LT.

6.10 Multi-rate support (MRS)

6.10.1 80211MP/MRS/BV-01-C Multi-rate support

• Test Purpose

Verify that the IUT correctly receives all PHY-mandatory and supported rates.

• Reference

[6] Test 1.2.4

• Initial Condition

The preamble in Section 5.1.4.2 has been completed.
**Test Procedure**

1. Mandatory rates are 1, 2, 5.5, 11, 6, 12, and 24 Mbps.
2. Supported rates for the implementation are given in the PAL ICS.
3. The 802.11 traffic shall be monitored by a sniffer.

**Expected Outcome**

Pass verdict

1. IUT should ACK all packets received at mandatory and supported rates.
2. IUT should indicate to HCI the ACL Data frame to the upper tester that a packet was received.

### 6.11 General Data Frame Processing (GFP)

Verify that the IUT responds as expected in the following test cases.

#### 6.11.1 80211MP/GFP/BI-01-C: IUT receives an 802.11 data frame with invalid Protocol Version

**Test Purpose**

Verify that the IUT receives an 802.11 MSDU with a Frame Control field Protocol Version greater than 0 and does not transmit an ACK in response.

**References**

[6], Test 1.1.1 Part a

**Initial Condition**

The preamble in 5.1.4.5 has been completed.
• **Test Procedure**

```
<table>
<thead>
<tr>
<th>Lower Tester</th>
<th>IUT</th>
<th>Upper Tester</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

- The preamble in 5.1.5.5 has been completed
- IUT does not respond with an ACK
- Wait for 1 second

```
<table>
<thead>
<tr>
<th>Frame 1</th>
<th>Frame 22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

- ACK
- HCI ACL Data Packet

• **Expected Outcome**

**Pass verdict**

In response to Frame 22, the IUT shall not respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

**6.11.2 80211MP/GFP/BI-02-C: IUT receives an 802.11 control frame of reserved subtype, one with and one without an address-3 field**

• **Test Purpose**

Verify that the IUT receives an 802.11 control frame with a subtype field in the Frame Control field set to a reserved value and does not generate an ACK in response.

• **Reference**

[6], Test 1.1.1 Part a

• **Initial Condition:**

The preamble in 5.1.4.5 has been completed.
• Test Procedure

The preamble in 5.1.5.5 has been completed.

Frame 23
IUT does not respond with an ACK

Wait for 1 second

Frame 1
ACK

HCI ACL Data Packet

Frame 24
IUT does not respond with an ACK

Wait for 1 second

Frame 1
ACK

HCI ACL Data Packet

• Expected Outcome

Pass verdict

In response to Frame 23, the IUT shall not respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends the first Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

In response to Frame 24, the IUT shall not respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends the second Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.3 80211MP/GFP/BI-03-C: IUT receives an 802.11 Beacon with no supported rates in Supported Rates/Extended Supported Rates IE (invalid beacon frame)

• Test Purpose

Verify that the IUT receives an invalid 802.11 beacon while already connected, and is subsequently able to successfully receive data.

• Reference

[6], Test 1.1.1 Part a

• Initial Conditions:

The preamble in 5.1.4.5 has been completed.
• **Test Procedure**

![Diagram showing the test procedure]

- Lower Tester
- IUT
- Upper Tester

The preamble in 5.1.5.5 has been completed

Frame 26

Wait for 1 second

Frame 1

ACK

HCI ACL Data Packet

- **Expected Outcome**

  **Pass verdict**

  There shall be no HCI ACL Data Packet indication at the UT corresponding to Frame 26.

  After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

  **6.11.4 80211MP/GFP/BI-05-C: IUT receives 802.11 Management and Data frames from the LT where Subtype field is set to a reserved value.**

  • **Test Purpose**

    Verify that the IUT receives the reserved frame from the LT and responds back with an acknowledgement.

  • **Reference**

    [6] Test 1.1.1 Part b

  • **Initial Condition:**

    The preamble in Section 5.1.4.5 has been completed.

  • **Test Procedure**

    For each frame, Frame 31 through Frame 34 and Frame 37 through Frame 41,

    1. Send the frame from the LT.
    2. Observe the medium.
    3. The LT waits for a second.
    4. The LT sends Frame 1 to IUT.
    5. Observe the medium.
• Expected Outcome

Pass verdict

In response to each of the stimulus frames (Frame 31 through Frame 34 and Frame 37 through Frame 41), the IUT shall respond with an ACK. There shall not be a corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.5 80211MP/GFP/BI-06-C: IUT receives reserved 802.11 frames from the LT

• Test Purpose

Verify that the IUT receives reserved 802.11 frames from the LT and continues to function without system failure. The IUT may or may not respond with an acknowledgement.

• Reference

[6] Test 1.1.1 Part C

• Initial Condition

The preamble in Section 5.1.4.5 has been completed.
• Test Procedure

The preamble in section 5.1.5.5 has been completed

Wait for 1 second

Frame 1

ACK

HCI ACL Data Packet

Loop frame = Frame-43 through Frame-44

• Expected Outcome

Pass verdict

In response to each of the stimulus frames (Frame 43 and Frame 44), the IUT may respond with an ACK. There shall not be corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.6 80211MP/GFP/BI-07-C: IUT receives a Probe Request from the LT, where the Probe Request includes an SSID element with a length that is greater than 32-bytes

• Test Purpose

Verify that the IUT can receive a malformed Probe Request from the LT and continue to function without system failure.

• Reference

[7] Test 1.1.1 Part b

• Initial Condition

The preamble in Section 5.1.4.2 has been completed.

• Test Procedure

1. Send Frame 49 from the LT.
2. Observe the medium.
3. The LT waits for a second then LT sends Frame 1 to IUT.
4. Observe the medium.
• Expected Outcome

Pass verdict

In response to Frame 49, the IUT shall respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.7 80211MP/GFP/BV-01-C: IUT receives an 802.11 Beacon with bits 5 through 15 set to 1 in the Capability Information field

• Test Purpose

Verify that the IUT receives an 802.11 beacon and does not respond with an ACK.

• Reference

[6] Test 1.1.1 Part a

• Initial Conditions:

The preamble in Section 5.1.4.5 has been completed.
• Test Procedure

![Diagram showing the flow of testing](image)

The preamble in section 5.1.5.5 has been completed.

Frame 25

The preamble in section 5.1.5.5 has been completed

Frame 1

ACK

IUT does not respond with an ACK

IUT

Wait for 1 second

Frame 1

ACK

HCI ACL Data Packet

• Expected Outcome

Pass verdict

In response to Frame 25, the IUT shall not respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.8 80211MP/GFP/BV-02-C: IUT receives an 802.11 data frame where the Subtype in Frame Control set to 0x08 and the frame has a zero byte payload

• Test Purpose

Verify that the IUT receives an 802.11 QoS data frame and responds with an ACK.

• Reference

[6] Test 1.1.1 Part b

• Initial Condition

The preamble in Section 5.1.4.5 has been completed.
• **Test Procedure**

![Diagram of test procedure]

- **Expected Outcome**

  **Pass verdict**

  In response to Frame 27, the IUT shall respond with an ACK. There shall be no corresponding HCI ACL Data Packet indication at the UT.

  After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

- **Reference**

  [6] Test 1.1.1 Part b

- **Initial Condition**

  The preamble in Section 5.1.4.5 has been completed.
• **Test Procedure**

```
<table>
<thead>
<tr>
<th>Lower Tester</th>
<th>IUT</th>
<th>Upper Tester</th>
</tr>
</thead>
</table>
```

The preamble in section 5.1.5.5 has been completed.

- Frame 29
- ACK
- HCI ACL Data Packet

Wait for 1 second

- Frame 1
- ACK
- HCI ACL Data Packet

- Expected Outcome

**Pass verdict**

In response to Frame 29, the IUT shall respond with an ACK, there shall be a corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

**6.11.10 80211MP/GFP/BV-04-C: IUT receives an 802.11 data frame from the LT with a payload length less than 64 bytes**

• **Test Purpose**

Verify that the IUT receives the 802.11 data frame from the LT and responds with an acknowledgement. In addition verify that the UT receives a corresponding HCI ACL Data Packet indication.

• **Reference**

[6] Test 1.1.1 Part b

• **Initial Condition**

The preamble in Section 5.1.4.5 has been completed.
• Test Procedure

The preamble in section 5.1.5.5 has been completed

Frame 30
ACK

HCI ACL Data Packet
Wait for 1 second

Frame 1
ACK

HCI ACL Data Packet

• Expected Outcome

Pass verdict

In response to Frame 30, the IUT shall respond with an ACK, there shall be a corresponding HCI ACL Data Packet indication at the UT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

6.11.11 80211MP/GFP/BV-05-C: IUT receives an 802.11 data packet from the LT with a payload larger than the fragmentation threshold.

• Test Purpose

Verify that the IUT can receive fragments of an 802.11 data frame with a payload larger than the fragmentation threshold and acknowledge each received fragment(s).

• Reference

[6] Test 1.1.1 Part b

• Initial Condition

The preamble in Section 5.1.4.5 has been completed.
• **Test Procedure**

The preamble in section 5.1.5.5 has been completed.

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

Frame 45
ACK
HCI ACL Data Packet
Wait for 1 second
Frame 1
ACK
HCI ACL Data Packet

• **Expected Outcome**

**Pass verdict**

In response to each fragment of the stimulus Frame 45, the IUT shall respond with an ACK. There shall be one HCI ACL Data Packet indication at the UT, when all the fragments corresponding to Frame 45 are received by the IUT.

After the one second wait, when the LT sends Frame 1 to the IUT, the IUT shall respond with an ACK. In addition, there shall be an HCI ACL Data Packet indication at the UT.

### 6.12 Deauthentication tests (DEAU)

#### 6.12.1 80211MP/DEAU/BV-01-C Acceptor Receives Deauthentication with selected reason codes

• **Test Purpose**

Verify that the IUT destroys logical and physical links when a deauthentication frame is received with any reason code.

• **References**

[6] Test 1.1.3 Part a

• **Initial Condition**

The preamble in Section 5.1.4.5 has been completed.
• **Test Procedure**

The LT sends an 802.11 deauthentication frame to the IUT.

The above procedure is repeated for each reason code in the set {0, 1, 2, 3, 6, 7, 13, 14, 15, 17, 18, 20, 23, 24, 36, 37, 38, 39, 45} inserted into the deauthentication frame.

• **Expected Outcome**

  **Pass verdict**

  For each iteration of the test, verify the following:

  On reception of Frame18 the IUT sends an HCI_DISCONNECTION_LOGICAL_LINK event and an HCI_DISCONNECTION_PHYSICAL_LINK event to the UT.

### 6.12.2 80211MP/DEAU/BV-02-C Acceptor Receives Deauthentication sent to broadcast address

• **Test Purpose**

  Verify that the IUT accepts and tears down the Physical link when it receives a deauthentication frame sent to the broadcast MAC address.

• **References**

  [6] Test 1.1.1 Part b

• **Initial Condition**

  The preamble specified in 5.1.4.5 has been completed.
Test Procedure

- Expected Outcome
  
  **Pass verdict**
  
  On reception of the deauthentication frame the IUT sends a **HCI_DISCONNECTION_LOGICAL_LINK** event and a **HCI_DISCONNECTION_PHYSICAL_LINK** event to the UT.

6.12.3 80211MP/DEAU/BV-03-C Link Initiator Receives Deauthentication

- Test Purpose
  
  Verify that the IUT as initiator accepts and tears down the Physical link when it receives a deauthentication frame.

- Reference
  
  [6] Test 1.1.3

- Initial Condition
  
  The preamble specified in 5.1.4.2 has been completed.
• **Test Procedure**

  ![Diagram](image)

  The LT sends a Frame 21 to the IUT with the Reason code = 1

  - **Expected Outcome**

    **Pass verdict**

    On reception of the deauthentication frame the IUT sends a HCI_DISCONNECTION_LOGICAL_LINK event and HCI_DISCONNECTION_PHYSICAL_LINK event to the UT.

  **6.12.4 80211MP/DEAU/BI-01-C Reject Deauthentication with invalid FCS**

  - **Test Purpose**

    Verify that the IUT ignores and does not acknowledge an 802.11 deauthentication frame with an invalid FCS.

  - **Reference**

    [6] Test 1.1.3 Part c

  - **Initial Condition**

    The preamble specified in 5.1.4.5 has been completed.
• Test Procedure

![Diagram showing the test procedure involving Lower Tester, IUT, and Upper Tester. The diagram includes labeled arrows for Frame 19, Wait for 1 second, No Ack sent in response to Frame 19, Frame 1, ACK, HCI ACL Data packet, and completed preamble.

• Expected Outcome

Pass verdict

On reception of Frame 19 the IUT does not send an 802.11 ACK to the LT within 1 second.

On reception of Frame 1, the IUT sends an 802.11 ACK to the LT and sends an ACL data packet to the UT.

6.12.5 80211MP/DEAU/BI-02-C Acceptor Receives Deauthentication with reserved reason

• Test Purpose

Verify that the IUT destroys logical and physical links when a deauthentication frame is received with an invalid reason.

• Reference

[6] Test 1.1.3 Part a

• Initial Condition

The preamble specified in 5.1.4.5 has been completed.
• Test Procedure

The LT sends Frame18 to the IUT with a reason code of 0.

• Expected Outcome

Pass verdict

After reception of Frame 18 the IUT sends a HCI_DISCONNECTION_LOGICAL_LINK event and HCI_DISCONNECTION_PHYSICAL_LINK event to the UT.

6.13 Disassociation Processing (DAP)

6.13.1 80211MP/DAP/BV-01-C IUT receives a valid disassociation frame

• Test Purpose

Verify that the IUT receives a disassociation from the LT and stops transmitting data frames to the LT.

• Reference

[6] Test 1.1.6 Part A

• Initial Condition

The preamble specified in 5.1.4.2 has been completed.

• Test Procedure

The LT shall send a set of disassociation frames to the IUT, with one of the set of reason codes listed below.

Observe the medium.
The above procedure is repeated for each reason code in the set \( \{4, 8, 10, 11, 34, 255\} \).

- **Expected Outcome**

  **Pass verdict**

  The IUT shall not indicate any ACL data frames to the UT, irrespective of the reason code received in the disassociation frame from the LT, after the disassociation frame is received.

  The IUT generates a Disconnection Logical Link Complete event for each logical link and a Disconnection Physical Link Complete event.

**6.13.2 80211MP/DAP/BI-01-C IUT receives a Disassociation frame with incorrect FCS**

- **Test Purpose**

  Verify that the IUT receives a disassociation frame from the LT with an invalid FCS and ignores it.

- **Reference**

  [6] Test 1.1.6 Part a

- **Initial Condition**

  The preamble specified in 5.1.4.2 has been completed.

- **Test Procedure**

  The LT sends a disassociation frame with an invalid FCS to the IUT.

  UT sends an ACL data frame after invalid disassociation frame is sent and IUT is able to send it to the LT.

  Observe the medium.
The preamble specified in 5.1.5.2 has been completed
Frame 71
The logical link remains active and the IUT can transmit 802.11 data frames to the LT

- Expected Outcome
  - Pass verdict
  - The IUT shall ignore the received disassociation frame with invalid FCS.
  - The IUT is able to send ACL data frames after the invalid disassociation frame is received.
  - The IUT shall not generate a disconnection event to the UT.

6.14 Recovery Procedure and Retransmit Limits (RT)

6.14.1 80211MP/RT/BV-01-C: IUT Retransmit RTS frame dot11ShortRetryLimit times

- Test Purpose
  - Verify that the IUT retransmits an RTS frame at least once when the LT does not respond with a corresponding CTS frame.

- Reference
  - [6] Test 1.2.1

- Initial Condition
  - The preamble specified in 5.1.4.2 has been completed.

- Test Procedure
  - The UT sends Frame 1.
  - The LT does not respond to the RTS frame(s) it receives from the IUT.
  - Observe the medium.
802.11 M
AC/PHY (80211MP) / Test Suite

The preamble specified in 5.1.5.2 has been completed

RTS
HCI ACL DATA packet
RTS
IUT Upper Tester

• Expected Outcome
Pass verdict

The IUT shall retransmit the RTS frame at least once.

The IUT shall not transmit Frame 1 because no CTS is received.

6.14.2 80211MP/RT/BV-02-C Retransmit unacknowledged long data frame

• Test Purpose
Verify that the IUT retransmits an unacknowledged 802.11 data frame at least once.

• Reference
[6] Test 1.2.1 Part b

• Initial Condition
The preamble in Section 5.1.4.5 has been completed.

• Test Procedure
The UT sends ACL_HCI DATA Packet to the IUT.

When the IUT sends an 802.11 RTS to the LT, the LT responds with an 802.11 CTS frame.

When the IUT sends Frame 1 to the LT, the LT does not respond with an 802.11 ACK frame.

Observe the medium.
The preamble in section 5.1.5.5 has been completed

- Expected Outcome
  
  **Pass verdict**
  
  The IUT shall perform an 802.11 RTS/CTS handshake with the LT.
  
  The IUT shall retransmit Frame 1 at least once.

**6.14.3 80211MP/RT/BV-03-C: IUT retransmits unacknowledged short data frame**

- Test Purpose
  
  Verify that the IUT retransmits an unacknowledged short 802.11 data frame at least once.

- Reference
  
  [6] Test 1.2.1 Part c

- Initial Condition
  
  The preamble in Section 5.1.4.5 has been completed.

  The LT shall send an Activity Report indicating no interference in order that the IUT may turn off RTS signaling.

- Test Procedure
  
  1. UT sends Frame 1 to IUT.
  2. The LT does not respond with an 802.11 ACK to Frame 1 it received from the IUT.
  3. Observe the medium.
• Expected Outcome

Pass verdict

The IUT shall retransmit Frame 1 at least once.
# 7 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 the 802.11 MAC/PHY (80211MP) [9]. 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature</th>
<th>Test Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11 MP1/1</td>
<td>Acknowledgement and Duration</td>
<td>80211MP/AD/BV-01-C</td>
</tr>
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<td></td>
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<tr>
<td>802.11 MP 1/2</td>
<td>Null data frame processing</td>
<td>80211MP/ND/BI-01-C</td>
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<td>RTS/CTS signaling</td>
<td>80211MP/RC/BV-01-C</td>
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<td>Defragmentation Tests</td>
<td>80211MP/DF/BV-01-C</td>
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| 802.11 MP 1/7 | Association Request Processing (AREQ) | 80211MP/AREQ/BV-01-C  
80211MP/AREQ/BV-02-C  
80211MP/AREQ/BV-03-C  
80211MP/AREQ/BI-01-C  
80211MP/AREQ/BI-02-C |
| 802.11 MP 1/8 | Duplicate Frame processing             | 80211MP/DUP/BV-01-C  
80211MP/DUP/BV-02-C  
80211MP/DUP/BV-03-C  
80211MP/DUP/BV-04-C  
80211MP/DUP/BV-05-C  
80211MP/DUP/BV-06-C  
80211MP/DUP/BV-07-C |
| 802.11 MP 1/9 | CTS to Self (CS)                       | 80211MP/CS/BV-01-C                                                     |
| 802.11 MP 1/10 | Multi-rate support (MRS)               | 80211MP/MRS/BV-01-C                                                     |
| 802.11 MP 1/11 | General Data Frame Processing (GFP)    | 80211MP/GFP/BI-01-C  
80211MP/GFP/BI-02-C  
80211MP/GFP/BI-03-C  
80211MP/GFP/BI-04-C  
80211MP/GFP/BI-05-C  
80211MP/GFP/BI-06-C  
80211MP/GFP/BI-07-C |
| 802.11 MP 1/12 | De-authentication tests (DEAU)         | 80211MP/DEAU/BV-01-C  
80211MP/DEAU/BV-02-C  
80211MP/DEAU/BV-03-C  
80211MP/DEAU/BI-01-C  
80211MP/DEAU/BI-02-C |
| 802.11 MP 1/13 | Disassociation Processing              | 80211MP/DAP/BV-01-C  
80211MP/DAP/BI-01-C                                                     |
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*Table 7.1: Test Case Mapping*
## 8 Revision History and Contributors

### Revision History

<table>
<thead>
<tr>
<th>Publication Number</th>
<th>Revision History</th>
<th>Date</th>
<th>Comments</th>
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### Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kevin Hayes (editor)</td>
<td>Atheros</td>
</tr>
<tr>
<td>Jimmy Salame</td>
<td>Bluetooth SIG</td>
</tr>
<tr>
<td>Name</td>
<td>Company</td>
</tr>
<tr>
<td>-------------------</td>
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</tr>
<tr>
<td>Ray Hayes</td>
<td>Broadcom</td>
</tr>
<tr>
<td>Nick Jackson</td>
<td>CSR</td>
</tr>
<tr>
<td>Ganesh Venkatsan</td>
<td>Intel</td>
</tr>
<tr>
<td>Raja Banarjea</td>
<td>Marvell</td>
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