ETHERNET CONSORTIUM

Interspersing Express Traffic Conformance Test Suite

Version 0.1

Technical Document

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Ethernet Consortia

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MODIFICATION RECORD

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Peter Scruton: Initial Version utilizing UNH-IOL Ethernet MAC test suite and other UNH-IOL documents as template.

REFERENCES

Abbreviated Form	Specification
IEEE Std 802.3™ -2015	IEEE Std 802. 3 ™-2015 (Revision of IEEE Std 802.3-2012), The IEEE Standard for Ethernet, by the LAN/MAN Standards Committee of the IEEE Computer Society, Approved 3 September 2015 by IEEE-SA Standards Board.
IEEE Std 802.3-2015 w/ 802.3br-2016	IEEE Std 802. 3 ™-2015 as amended by IEEE Std 802.3br ™-2016, IEEE Approved Draft Standard for Ethernet Amendment: Specification and Management Parameters for Interspersing Express Traffic

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Robert Noseworthy University of New Hampshire

Peter Scruton University of New Hampshire

INTRODUCTION

Overview
The University of New Hampshire's InterOperability Laboratory (IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. This suite of tests has been developed to help implementers evaluate the functioning of their Clause 99 MAC Merge Sublayer based products. The tests do not determine if a product conforms to the IEEE Std 802.3, nor are they purely interoperability tests. Rather, they provide one method to isolate problems within a MAC device. In addition, a failure observed upon completion of the tests contained in this test suite may indicate a system implementation error and not a MAC error. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other devices. However, combined with satisfactory operation in the IOL's interoperability test bed, these tests provide a reasonable level of confidence that the Device Under Test (DUT) will function well in most environments.

Organization of Tests
The tests contained in this document are organized to simplify the identification of information related to a test and to facilitate in the actual testing process. Each test contains an identification section that describes the test and provides cross-reference information. The discussion section covers background information and specifies why the test is to be performed. Tests are grouped by similar functions and further organized by technology. Each test contains the following information:

Test Number
The Test Number associated with each test follows a simple grouping structure. Listed first is the General Clause of the IEEE Std 802.3 standard that is under test, followed by the Test Group Number, followed by the test's number within the group. This allows for the addition of future tests to the appropriate groups of the test suite without requiring the renumbering of the subsequent tests.

Purpose
The purpose is a brief statement outlining what the test attempts to achieve. The test is written at the functional level.

References
The references section lists cross-references to the IEEE Std 802.3 standards and other documentation that might be helpful in understanding and evaluating the test and results.

Resource Requirements
The requirements section specifies the hardware, and test equipment that will be needed to perform the test. The items contained in this section are special test devices or other facilities, which may not be available on all devices.

Last Modification
This specifies the date of the last modification to this test.

Discussion
The discussion covers the assumptions made in the design or implementation of the test as well as known limitations. Other items specific to the test are covered here.

Test Setup
The setup section describes the configuration of the test environment. Small changes in the configuration should be included in the test procedure.

Procedure
The procedure section of the test description contains the step-by-step instructions for carrying out the test. It provides a cookbook approach to testing, and may be interspersed with observable results.

Observable Results

The observable results section lists specific items that can be examined by the tester to verify that the DUT is operating properly. When multiple values are possible for an observable result, this section provides a short discussion on how to interpret them. The determination of a pass or fail for a certain test is often based on the successful (or unsuccessful) detection of a certain observable result.

Possible Problems

This section contains a description of known issues with the test procedure, which may affect test results in certain situations.

Table of Contents

GROUP 1: Checking for Proper Reception

Scope: The following tests cover MAC Merge operations specific to proper reception of packets.

Overview: These tests are designed to verify that the device under test properly accepts preemptable packets under different conditions where acceptance of the packet is required. The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

Test #99.1.1 – Acceptance of Preemptable Packets with and without Preemption Active

Purpose: To verify that the DUT accepts Preemptable Packets after the DUT has indicated Preemption is active through transmitting an AEC-TLV.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4 (MAC Merge sublayer operation)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving one or more packets containing a single frame and piecing them together [1]. These are passed up to the preemptable MAC as they are received by the MAC Merge Sublayer. The MAC Merge sublayer if present will always be in the position to receive Preemptable Packets [2]. Thus regardless of whether or not Preemption is active or enabled the DUT should receive preemptable frames.

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting Preemptable Frames after Preemption is Active***

A:1. Disconnect and after several or more seconds reconnect the link.
A:2. Cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect.
A:3. Transmit a Preemptable Frame to the DUT which is sent in two or more Preemptable Packets.
A:4. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A4	FAIL	The DUT was not observed to accept the preemptable frame.
A4	PASS	The DUT was observed to accept the preemptable frame.

Part A: ***Accepting Preemptable Frames when Preemption is not Active***

A:1. Disconnect and after several or more seconds reconnect the link.
A:2. Send an AEC-TLV indicating no support, not enabled, and not active.
A:3. Observe the transmissions from the DUT for several seconds.
A:4. Transmit a Preemptable Frame to the DUT which is sent in two or more Preemptable Packets.
A:5. Observe the transmissions from the DUT.

Observable results:

Step	Result	Description
B3	**FAIL**	The DUT was observed to send a Verify Packet.
B3	**FAIL**	The DUT was observed to send an AEC-TLV indicating preemption is active.
B5	**FAIL**	The DUT was observed to not accept the preemptable frame.
B5	**PASS**	The DUT was observed to accept the preemptable frame.

Possible Problems: None

Test #99.1.2 – Accepts all Frame Count and Fragment Count Combinations

Purpose: To verify that the DUT accepts Preemptable Packets with all frame count and fragment count combinations.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. On receive the initial frame count only informs the DUT what frame count it is currently at and if continued what packet is a continuation. Thus it should be insensitive to what the frame count is as long as the packet is complete prior to receiving a new packet with a different frame count. [2] For transmission the Transmit Processing State Diagram indicates that the frame count for transmission starts at 0 then goes to 1, 2, 3, and then continues to repeat this pattern from 0 again.[2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Part A: Accepting Unordered Preemptable Frames (2 packets per frame)***

A:1. Disconnect and after several or more seconds reconnect the link.

A:2. Cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect.

A:3. Transmit a series of 4 complete Preemptable Frames (each broken into five packets (four 304 byte mPackets and one 318 byte mPacket)).

a) The five mPackets of the first frame should have frame count set to 0 and the second through the fifth packets should have fragment counts of 0 (second), 1 (third), 2 (fourth), and 3 (fifth).

b) The five packets of the second frame should have frame count set to 1 and the second through the fifth packets should have fragment counts of 0 (second), 1 (third), 2 (fourth), and 3 (fifth).

c) The five packets of the third frame should have frame count set to 2 and the second through the fifth packets should have fragment counts of 0 (second), 1 (third), 2 (fourth), and 3 (fifth).

d) The five packets of the fourth frame should have frame count set to 3 and the second through the fifth packets should have fragment counts of 0 (second), 1 (third), 2 (fourth), and 3 (fifth).

A:4. While transmitting observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A4	**FAIL**	The DUT was not observed to accept all the preemptable frame.
A4	**PASS**	The DUT was observed to accept all the preemptable frame.

Possible Problems: None

Test #99.1.3 – Non-ordered Frame Counts

Purpose: To verify that the DUT accepts Preemptable Packets with unordered frame counts.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. On receive the initial frame count only informs the DUT what frame count it is currently at and if continued what packet is a continuation. Thus it should be insensitive to what the frame count is as long as the packet is complete prior to receiving a new packet with a different frame count.[2] For transmission the Transmit Processing State Diagram indicates that the frame count for transmission starts at 0 then goes to 1, 2, 3, and then continues to repeat this pattern from 0 again.[2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting Unordered Preemptable Frames (2 packets per frame)***

A:1. Disconnect and after several or more seconds reconnect the link.

A:2. Cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect.

A:3. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The two packets of the first frame should have frame count set to 3.
b) The two packets of the second frame should have frame count set to 2.
c) The two packets of the third frame should have frame count set to 1.
d) The two packets of the fourth frame should have frame count set to 0.
e) The two packets of the fifth frame should have frame count set to 3.

A:4. While transmitting observe the transmissions from the DUT for up to two seconds.

A:5. Repeat Steps A1 and A2

A:6. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The two packets of the first frame should have frame count set to 1.
b) The two packets of the second frame should have frame count set to 2.
c) The two packets of the third frame should have frame count set to 1.

A:7. While transmitting observe the transmissions from the DUT for up to two seconds.

A:8. Repeat Steps A1 and A2

A:9. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The two packets of the first frame should have frame count set to 0.
b) The two packets of the second frame should have frame count set to 3.
c) The two packets of the third frame should have frame count set to 0.
d) The two packets of the fourth frame should have frame count set to 3.

A:10. While transmitting observe the transmissions from the DUT for up to two seconds.

A:11. Repeat Steps A1and A2

A:12. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The two packets of the first frame should have frame count set to 0.
b) The two packets of the second frame should have frame count set to 0.
c) The two packets of the third frame should have frame count set to 0.
d) The two packets of the fourth frame should have frame count set to 0.

A:13. While transmitting observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A4	**FAIL**	The DUT was not observed to accept all the preemptable frame.
A7	**FAIL**	The DUT was not observed to accept all the preemptable frame.
A10	**FAIL**	The DUT was not observed to accept all the preemptable frame.
A13	**FAIL**	The DUT was not observed to accept all the preemptable frame.
A13	**PASS**	The DUT was observed to accept all the preemptable frame.

Part B: ***Accepting Unordered Preemptable Frames (1 packet per frame)***

B:1. Disconnect and after several or more seconds reconnect the link.

B:2. Cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect.

B:3. Transmit a series of complete Preemptable Frames (each frame transmitted in a single packet) to the DUT.

a) The packet of the first frame should have frame count set to 3.
b) The packet of the second frame should have frame count set to 2.
c) The packet of the third frame should have frame count set to 1.
d) The packet of the fourth frame should have frame count set to 0.
e) The packet of the fifth frame should have frame count set to 3.

B:4. While transmitting observe the transmissions from the DUT for up to two seconds.

B:5. Repeat Steps B1 and B2

B:6. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The packet of the first frame should have frame count set to 1.
b) The packet of the second frame should have frame count set to 2.
c) The packet of the third frame should have frame count set to 1.

B:7. While transmitting observe the transmissions from the DUT for up to two seconds.

B:8. Repeat Steps B1 and B2

B:9. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The packet of the first frame should have frame count set to 0.
b) The packet of the second frame should have frame count set to 3.
c) The packet of the third frame should have frame count set to 0.
d) The packet of the fourth frame should have frame count set to 3.

B:10. While transmitting observe the transmissions from the DUT for up to two seconds.

B:11. Repeat Steps B1 and B2

B:12. Transmit a series of complete Preemptable Frames (each broken into two packets which adhere to the declared additional fragment size of the DUT) to the DUT.

a) The packet of the first frame should have frame count set to 0.
b) The packet of the second frame should have frame count set to 0.
c) The packet of the third frame should have frame count set to 0.
d) The packet of the fourth frame should have frame count set to 0.

B:13. While transmitting observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B4	FAIL	The DUT was not observed to accept all the preemptable frame.
B7	FAIL	The DUT was not observed to accept all the preemptable frame.
B10	FAIL	The DUT was not observed to accept all the preemptable frame.
B13	FAIL	The DUT was not observed to accept all the preemptable frame.
B13	PASS	The DUT was observed to accept all the preemptable frame.

Possible Problems: None

Test #99.1.4 – Acceptance of Minimum Sized Fragmented Frame

Purpose: To verify that the DUT accepts minimum sized Preemptable Packets.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. The variable additional fragment size (0-3) communicated from the AEC-TLV is used to inform the link partner of the minimum sized fragment that you support (0 means 64, 1 means 128, 2 means 192, and 3 means 256).

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a Preemptable Frame (2 packets per frame both packets of minimum size)***

A:1. If Preemption is not already Active, cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect, noting the value of additional fragment size in this AEC-TLV.

A:2. Transmit a complete Preemptable Frame broken into two packets both of which are the calculated minimum Preemptable Packet size as declared in the additional fragment size of the AEC-TLV of the DUT, to the DUT.

a) If the additional fragment size is 0 this would be a 124 byte preemptable frame split into a 64 byte mPacket with 60 bytes of frame data plus a 4 byte mCRC and a 64 byte mPacket with 60 bytes of frame data and the 4 bytes with the original CRC.

A:3. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A3	FAIL	The DUT was not observed to accept the preemptable frame.
A3	PASS	The DUT was observed to accept the preemptable frame.

Possible Problems: None

Test #99.1.5 – Acceptance of a Maximally Fractured 1518-Byte Frame

Purpose: To verify that the DUT accepts Preemptable Packets with unordered frame counts.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. The variable additional fragment size (0-3) communicated from the AEC-TLV is used to inform the link partner of the minimum sized fragment that you support (0 means 64, 1 means 128, 2 means 192, and 3 means 256).

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a Maximally Fractured Preemptable Frame without interfering express traffic***

A:1. If Preemption is not already Active, cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect, noting the value of additional fragment size in this AEC-TLV.

A:2. Transmit a valid 1518 byte complete Preemptable Frame broken into as many mPackets as is supported (the minimum size is the calculated minimum Preemptable Packet size as declared in the additional fragment size of the AEC-TLV of the DUT, to the DUT).

a) If the additional fragment size is 0 and the maximum frame size is 1518 bytes this would be 25. One configuration would be twenty-four 64 byte mPackets with 60 bytes of frame data plus a 4 byte mCRC and a 78 byte mPacket with 74 bytes of frame data and the 4 bytes with the original CRC.

A:3. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A3	FAIL	The DUT was not observed to accept the preemptable frame.
A3	PASS	The DUT was observed to accept the preemptable frame.

Part B: ***Accepting a Maximally Fractured Preemptable Frame with interfering express traffic***

B:1. If Preemption is not already Active, cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect, noting the value of additional fragment size in this AEC-TLV.

B:2. Transmit a valid 1518 byte complete Preemptable Frame broken into as many mPackets as is supported (the minimum size is the calculated minimum Preemptable Packet size as declared in the additional fragment size of the AEC-TLV of the DUT, to the DUT). After each of the non-final Preemptable packets transmit an Express Packet.

a) If the additional fragment size is 0 and the maximum frame size is 1518 bytes this would be 25. One configuration would be twenty-four 64 byte mPackets with 60 bytes of frame data plus a 4 byte mCRC and a 78 byte mPacket with 74 bytes of frame data and the 4 bytes with the original CRC.

B:3. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B3	FAIL	The DUT was not observed to accept the preemptable frame.
B3	PASS	The DUT was observed to accept the preemptable frame.

Possible Problems: None

Test #99.1.6 – Acceptance of a Preempted Frame After Long Intervals

Purpose: To verify that the DUT still accepts a Preemptable Frames even if a long interval occurs between Preemptable Packets of that frame.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016 : PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 19, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. Preemptable frames may be delayed by express traffic, respond frames, or the hold signal. Long delays between preemptable packets of a frame should be tolerated.

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Part A: Accepting a 1518-byte Preempted Frame without interfering traffic***

A:1. If Preemption is not already Active, cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect, noting the value of additional fragment size in this AEC-TLV.
A:2. Transmit the first of two segments of a valid 1518 byte complete Preemptable Frame. This first segment should contain 1454 bytes of the frame data plus a 4 byte mCRC. Adjusting this size may be necessary if the declared value of additional fragment size of the DUT is not 0. If it needs to be adjusted, it should be adjusted so the finishing segment is the minimum Preemptable Packet size.
A:3. Wait at least one minute.
A:4. Transmit the last segment.
A:5. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A5	FAIL	The DUT was not observed to accept the preemptable frame.
A5	PASS	The DUT was observed to accept the preemptable frame.

Part B: ***Accepting a 1518-byte Preempted Frame with interfering traffic***

B:1. If Preemption is not already Active, cause the DUT to enter a mode with Preemption Active such that it transmits an AEC-TLV to that affect, noting the value of additional fragment size in this AEC-TLV.

B:2. Transmit the first of two segments of a valid 1518 byte complete Preemptable Frame. This first segment should contain 1454 bytes of the frame data plus a 4 byte mCRC. Adjusting this size may be necessary if the declared value of additional fragment size of the DUT is not 0. If it needs to be adjusted, it should be adjusted so the finishing segment is the minimum Preemptable Packet size.

B:3. Wait at least one minute while sending a large amount of express frames as well as some verify frames.

B:4. Transmit the last segment.

B:5. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B5	FAIL	The DUT was not observed to accept the preemptable frame.
B5	PASS	The DUT was observed to accept the preemptable frame.

Possible Problems: None

Test #99.1.7 – Acceptance of Preemptable Packets with Odd Number of Bytes

Purpose: To verify that the DUT still accepts a Preemptable Frames even if one or more of the mPackets of that Preemptable Frame have an odd number of bytes.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: The processing of preemptable packets involves receiving a frame with an SMD-S and if it did not contain a complete frame a series of one or more packets containing an SMD-C with the same frame count as the preceding SMD-S containing the rest of the frame. Preemptable frames may be split and should be processed regardless of where the split(s) occurs, so long as the mPackets are of sufficient size.

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a 512-Byte Preempted Frame (split into two mPackets of sizes 259 and 257 bytes)***

A:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. This first segment should contain 255 bytes of the frame data plus a 4 byte mCRC. The second should contain the remaining 257 bytes, including the original CRC.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was not observed to accept the preemptable frame.
A2	PASS	The DUT was observed to accept the preemptable frame.

Part B: ***Accepting a 511-Byte Preempted Frame (split into two mPackets of sizes 257 and 258 bytes)***

B:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 511-Byte complete Preemptable Frame. This first segment should contain 253 bytes of the frame data plus a 4 byte mCRC. The second should contain the remaining 258 bytes, including the original CRC.

B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was not observed to accept the preemptable frame.
B2	PASS	The DUT was observed to accept the preemptable frame.

Part C: ***Accepting a 511-Byte Preempted Frame (split into two mPackets of sizes 258 and 257 bytes)***

C:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 511-Byte complete Preemptable Frame. This first segment should contain 254 bytes of the frame data plus a 4 byte mCRC. The second should contain the remaining 257 bytes, including the original CRC.

C:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
C2	**FAIL**	The DUT was not observed to accept the preemptable frame.
C2	**PASS**	The DUT was observed to accept the preemptable frame.

Possible Problems: None

Test #99.1.8 – Acceptance of Preemptable Packets with Varying Preamble Size

Purpose: To verify that the DUT still accepts a Preemptable Frame without respect to the amount of preamble present.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: The processing of mPackets should be processed regardless of the amount of integer bytes of preamble received. For Preemptable Frames on the initial SMD-S packet it should loop between CHECK_FOR_START and RX_PREAMBLE for as little or as long as is required to receive all Preamble bytes, see Figure 99-6 – Receive Processing State Diagram [2]. Similarly, for continued frames it should loop in the CHECK_FOR_RESUME state [2].

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a Preempted Frame with Short Preamble in Initial mPacket (split into two mPackets of sizes 260 and 256 bytes)***

A:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. This first segment should contain the minimum amount of Preamble supported by the Phy (1 byte for 100BASE-TX, 2 bytes for 1000BASE-T) an SMD-S, 256 bytes of the frame data, plus a 4 byte mCRC. The second should contain the remaining 256 bytes, including the original CRC.

A:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps A1 and A2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was not observed to accept each preemptable frame.
A2	PASS	The DUT was observed to accept each preemptable frame.

Part B: ***Accepting a Preempted Frame with Short Preamble in Final mPacket (split into two mPackets of sizes 260 and 256 bytes)***

B:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. The first segment should contain the first 256 bytes of frame data and a 4 byte mCRC. The second segment should contain the minimum amount of Preamble supported by the Phy (1 byte for 100BASE-TX, 2 bytes for 1000BASE-T), an SMD-C, a frag_count field (set to 0), and 256 bytes of frame data (which includes the original 4 byte CRC).

B:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps B1 and B2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was not observed to accept each preemptable frame.
B2	PASS	The DUT was observed to accept each preemptable frame.

Part C: ***Accepting a Preempted Frame with Long Preamble in Iinitial mPacket (split into two mPackets of sizes 260 and 256 bytes)***

C:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. This first segment should contain 64 bytes of Preamble, an SMD-S, 256 bytes of the frame data, plus a 4 byte mCRC. The second should contain the remaining 256 bytes, including the original CRC.

C:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps C1 and C2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
C2	FAIL	The DUT was not observed to accept each preemptable frame.
C2	PASS	The DUT was observed to accept each preemptable frame.

Part D: ***Accepting a Preempted Frame with Long Preamble in Final mPacket (split into two mPackets of sizes 260 and 256 bytes)***

D:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. The first segment should contain the first 256 bytes of frame data and a 4 byte mCRC. The second segment should contain 64 bytes of preamble, an SMD-C, a frag_count field (set to 0), and 256 bytes of frame data (which includes the original 4 byte CRC).

D:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps D1 and D2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
D2	FAIL	The DUT was not observed to accept each preemptable frame.
D2	PASS	The DUT was observed to accept each preemptable frame.

Possible Problems: None

Test #99.1.9 – Acceptance of Non-Preemptable Packets with Varying Preamble Size

Purpose: To verify that the DUT still accepts Express, Verify and Respond Frames without respect to the amount of preamble present.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.6 (Timers)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[5] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[6] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM13
[7] ANNEX A (informative) Acronym Definitions
[8] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: The processing of mPackets should be processed regardless of the amount of integer bytes of preamble received. For reception of Non-Preemptable Frames the DUT should loop between CHECK_FOR_EXPRESS and EXPRESS_PREAMBLE for as little or as long as is required to receive all Preamble bytes, see Figure 99-7 – Express Filter State Diagram [4].

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting an Express Frame with Short Preamble***

A:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Express Frame. This packet should contain the minimum amount of Preamble supported by the Phy (1 byte for 100BASE-TX, 2 bytes for 1000BASE-T) an SMD-E, and 64 bytes of the frame data (including the original CRC).

A:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps A1 and A2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was not observed to accept the Express frame.
A2	PASS	The DUT was observed to accept the Express frame.

Part B: ***Accepting an Express Frame with Long Preamble***

B:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Express Frame. This packet should contain 64 bytes of Preamble, an SMD-E, and 64 bytes of the frame data (including the original CRC).

B:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps B1 and B2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was not observed to accept the Express frame.
B2	PASS	The DUT was observed to accept the Express frame.

Part C: ***Accepting a Verify Frame with Short Preamble***

C:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Verify Frame. This packet should contain the minimum amount of Preamble supported by the Phy (1 byte for 100BASE-TX, 2 bytes for 1000BASE-T) an SMD-V, 60 bytes of (0x00) and an mCRC.

C:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps C1 and C2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
C2	FAIL	The DUT was not observed transmit a Respond Frame, indicating it did not accept the Verify Frame.
C2	PASS	The DUT was observed to transmit a Respond Frame, indicating it accepted the Verify Frame with minimum-sized preamble.

Part D: ***Accepting a Verify Frame with Long Preamble***

D:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Verify Frame. This packet should contain 64 bytes of Preamble, an SMD-E, 60 bytes of (0x00) and an mCRC.

D:2. Observe the transmissions from the DUT for up to two seconds. If more than one speed is supported then steps B1 and B2, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
D2	FAIL	The DUT was not observed transmit a Respond Frame, indicating it did not accept the Verify Frame.
D2	PASS	The DUT was observed to transmit a Respond Frame, indicating it accepted the Verify Frame with minimum-sized preamble.

Part E: ***Accepting a Respond Frame with Short Preamble***

E:1. Disconnect and after several or more seconds reconnect the link.

E:2. Cause the DUT to enter a mode with Preemption Supported.

E:3. Transmit an AEC-TLV indicating Preemption Supported and Enabled.

E:4. After a Verify frame has been transmitted by the DUT, quickly (so as to be completely received prior to 2 * verifyTime (range from 1 – 128 ms, see [2]) * 0.8 (see [3]) cause the DUT to transmit a valid 64 byte Respond Frame.

a) This packet should contain the minimum amount of Preamble supported by the Phy (1 byte for 100BASE-TX, 2 bytes for 1000BASE-T) an SMD-R, 60 bytes of (0x00) and an mCRC.

b) The timing of transmission can also be achieved through continuously sending this Respond frame.

E:5. Observe the transmissions from the DUT for up to two seconds.

a) If neither an AEC-TLV with Preemption Active or a Preemptable Packet is observed attempt to provoke the DUT to a send Preemptable traffic.

E:6. If more than one speed is supported then steps E1 through E5, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
E5	**FAIL**	The DUT transmitted an AEC-TLV with Not Active.
E5	**FAIL**	The DUT transmitted a Preemptable Frame as an Express Frame (indicating Preemption is not Active).
E5	**PASS**	The DUT indicated acceptance of the Respond Frame by either transmitting an AEC-TLV with Active or Preemptable Packets.

Part F: ***Accepting a Respond Frame with Long Preamble***

F:1. Disconnect and after several or more seconds reconnect the link.

F:2. Cause the DUT to enter a mode with Preemption Supported.

F:3. Transmit an AEC-TLV indicating Preemption Supported and Enabled.

F:4. After a Verify frame has been transmitted by the DUT, quickly (so as to be completely received prior to 2 * verifyTime (range from 1 – 128 ms, see [2]) * 0.8 (see [3]) cause the DUT to transmit a valid 64 byte Respond Frame.

a) This packet should contain 64 bytes of Preamble, an SMD-R, 60 bytes of (0x00) and an mCRC.

b) The timing of transmission can also be achieved through continuously sending this Respond frame.

F:5. Observe the transmissions from the DUT for up to two seconds.

a) If neither an AEC-TLV with Preemption Active or a Preemptable Packet is observed attempt to provoke the DUT to a send Preemptable traffic.

F:6. If more than one speed is supported then steps F1 through F5, should be repeated for each speed that supports preemption.

Observable results:

Step	Result	Description
F5	**FAIL**	The DUT transmitted an AEC-TLV with Not Active.
F5	**FAIL**	The DUT transmitted a Preemptable Frame as an Express Frame (indicating Preemption is not Active).
F5	**PASS**	The DUT indicated acceptance of the Respond Frame by either transmitting an AEC-TLV with Active or Preemptable Packets.

Possible Problems: The DUT may not support Verification, in which case verification of Respond Frame acceptance may not be feasible.

Test #99.1.10 – Acceptance of Preemptable Packets after Erred SMD or unexpected SMD-C

Purpose: To verify that the DUT still accepts a Preemptable Frame split into two mPackets if either before the first or between the two mPackets an mPacket with an erred SMD is received, or if an unexpected SMD-C is received prior to the first mPacket of the Preemptable Frame.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: If during or before the reception of Preemptable Packets of a Preemptable Frame an erred SMD is received (does not map to a valid SMD) then this should be ignored without interfering with the reception of valid future mPackets, see Figure 99-6 – Receive Processing State Diagram [2]. If the Erred SMD or an unexpected SMD-C occurs before the first mPacket of a Preemptable Frame the DUT should transition to BAD_FRAG and back to IDLE_RX_PROC awaiting the next frame, see Figure 99-6 – Receive Processing State Diagram [2]. If the Erred SMD occurs between mPackets of a Preemptable Frame then it should transition from CHECK_FOR_RESUME to WAIT_FOR_DV_FALSE and back to WAIT FOR RESUME after the mPacket with the Erred SMD ceases, see Figure 99-6 – Receive Processing State Diagram [2].

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a Preempted Frame with Erred SMD before Initial mPacket (Preempted Frame split into two mPackets of sizes 260 and 256 bytes)***

A:1. With the DUT in a mode with Preemption Active, transmit a 256-Byte mPacket with an SMD set to 0x00. After 96 bit times, transmit the first of two segments of a valid 512 byte complete Preemptable Frame (256-bytes of frame data and 4 byte mCRC). The second should follow 96-bit times later and contain the remaining 256 bytes, including the original CRC.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was not observed to accept each preemptable frame.
A2	PASS	The DUT was not observed to accept each preemptable frame.

Part B: ***Accepting a Preempted Frame with SMD-C0 before Initial mPacket (Preempted Frame split into two mPackets of sizes 260 and 256 bytes)***

B:1. With the DUT in a mode with Preemption Active, transmit a 256-Byte mPacket with SMD-C0. After 96 bit times, transmit the first of two segments of a valid 512 byte complete Preemptable Frame with frame count of 0 (256-bytes of frame data and 4 byte mCRC). The second should follow 96-bit times later and contain the remaining 256 bytes, including the original CRC.

B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was not observed to accept each preemptable frame.
B2	PASS	The DUT was not observed to accept each preemptable frame.

Part C: ***Accepting a Preempted Frame with Erred SMD between mPackets of a Preemptable Frame (Preempted Frame split into two mPackets of sizes 260 and 256 bytes)***

C:1. With the DUT in a mode with Preemption Active, transmit the first of two segments of a valid 512 byte complete Preemptable Frame (256-bytes of frame data and 4 byte mCRC). After 96 bit times transmit a 256-Byte mPacket with SMD of (0x00). After 96 bit times, transmit the second mPacket of the Preemptable Frame which contains the remaining 256 bytes, including the original CRC.

C:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
C2	FAIL	The DUT was not observed to accept each preemptable frame.
C2	PASS	The DUT was not observed to accept each preemptable frame.

Possible Problems: None

Test #99.1.11 – Acceptance of New Preemptable Packet if Previous is Unfinished

Purpose: To verify that the DUT accepts a new Preemptable Frame when previous Preemptable Frame was unfinished if the variable keepSafterD is TRUE [2]. Otherwise the DUT should reject the new Preemptable frame [2].

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[5] ANNEX A (informative) Acronym Definitions
[6] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When the previous Preemptable Frame was unfinished the DUT should accept a new Preemptable Frame if the variable keepSafterD is TRUE [2]. If the variable is not TRUE the DUT should reject the new Preemptable frame [2].

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Accepting a New Preempted Frame when previous is unfinished (Unfinished Preempted Frame has Frame Count 0, and new has Frame Count 1)***

A:1. With the DUT in a mode with Preemption Active, transmit a 256-Byte mPacket with an SMD-S0 and an mCRC in the CRC field. After 96 bit times, transmit a second Preemptable Packet containing a complete 256-byte frame with Frame Count 1.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was not observed to accept the preemptable frame and either keepSafterD is TRUE or Part B was a PASS.
A2	PASS	The DUT was not observed to accept the preemptable frame and keepSafterD is not TRUE.
A2	FAIL	The DUT was observed to accept the preemptable frame and keepSafterD is not TRUE.
A2	PASS	The DUT was observed to accept the preemptable frame and keepSafterD is TRUE.
A2	INFO	The value of keepSafterD was not known.

Part B: ***Accepting a New Preempted Frame when previous is unfinished (Unfinished Preempted Frame has Frame Count 0, and new also has Frame Count 0)***

B:1. With the DUT in a mode with Preemption Active, transmit a 256-Byte mPacket with an SMD-S0 and an mCRC in the CRC field. After 96 bit times, transmit a second Preemptable Packet containing a complete 256-byte frame with Frame Count 0.

B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was not observed to accept the preemptable frame and either keepSafterD is TRUE or Part A was a PASS.
B2	PASS	The DUT was not observed to accept the preemptable frame and keepSafterD is not TRUE.
B2	FAIL	The DUT was observed to accept the preemptable frame and keepSafterD is not TRUE.
B2	PASS	The DUT was observed to accept the preemptable frame and keepSafterD is TRUE.
B2	INFO	The value of keepSafterD was not known.

Possible Problems: None

GROUP 2: Checking for Proper Rejection

Scope: The following tests cover MAC Merge operations specific to properly rejecting packets.

Overview: These tests are designed to verify that the device under test properly discards packets with errors. The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

Test #99.2.1 – Reject Undersized Frames

Purpose: To verify that the DUT rejects undersized mPackets.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 4.2.9 (Procedure ReceiveLinkMgmt)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 4A.2.9 (Procedure ReceiveLinkMgmt)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.1 (Introduction)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[5] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[6] ANNEX A (informative) Acronym Definitions
[7] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: Above the MAC Merge Sublayer are two MAC instances, the eMAC and pMAC.[3] Regardless of whether these MACs follow Clause 4 or Annex 4A, Procedure ReceiveLinkMgmt rejects frames under 64 bytes in length.[1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting an undersized Preemptable Frame (63 byte)***

A:1. With the DUT in a mode with Preemption Active, transmit a complete 63-byte Preemptable Frame in a single mPacket.
A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the preemptable frame.
A2	PASS	The DUT was not observed to accept the preemptable frame.

Part B: ***Rejecting an undersized Express Frame (63 byte)***

B:1. With the DUT in a mode with Preemption Active, transmit a 63-byte Express Frame.
B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was observed to accept the Express Frame.
B2	PASS	The DUT was not observed to accept the Express Frame.

Possible Problems: None

Test #99.2.2 – Reject non-zero Initial Fragment Count

Purpose: To verify that the DUT rejects an initial continued Preemptable Frame where the fragment count is not 0.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When receiving the mPacket that contains the initial continuation of a Preemptable Frame the fragment count must be 0.[1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting a 512-Byte Preempted Frame (split into two mPackets of sizes 260 and 256 bytes) where the second mPacket has a fragment count of 1)***

A:1. With the DUT in a mode with Preemption Active, transmit two segments of a valid 512 byte complete Preemptable Frame. This first segment should contain 256 bytes of the frame data plus a 4 byte mCRC. The second should contain the remaining 256 bytes, including the original CRC, however the fragment count should be set to 1.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the preemptable frame.
A2	PASS	The DUT was observed to not accept the preemptable frame.

Possible Problems: None

Test #99.2.3 – Reject Out of Order Fragment Counts

Purpose: To verify that the DUT rejects a continued Preemptable Frame where the fragment counts of the mPackets making up that frame are not sequential.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When receiving the mPacket that contains the initial continuation of a Preemptable Frame the fragment count must start at 0 and subsequent continuations must be sequential (1,2,3,0,1, …).[1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting a 1024-Byte Preempted Frame fragmented into 4 mPackets with out of order fragment counts***

A:1. With the DUT in a mode with Preemption Active, transmit a 1024-Byte Preempted Frame split into four mPackets of sizes 260, 260, 260, and 256 bytes (where the second mPacket has a fragment count of 0 and the third has a fragment count of 2 and the fourth has a fragment count of 1) and the frame data is sent across the first, then second, then third, and then fourth.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the preemptable frame.
A2	PASS	The DUT was observed to not accept the preemptable frame.

Part B: ***Rejecting a 1280-Byte Preempted Frame fragmented with 5 mPackets with out of order fragment counts***

B:1. With the DUT in a mode with Preemption Active, transmit a 1280-Byte Preempted Frame split into four mPackets of sizes 260, 260, 260, 260, and 256 bytes (where the second mPacket has a fragment count of 0 and the third has a fragment count of 2 and the fourth has a fragment count of 1 and the fifth has a fragment count of 3) and the frame data is sent across the first, then second, then fourth, then third, and then fifth.

B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was observed to accept the preemptable frame.
B2	PASS	The DUT was observed to not accept the preemptable frame.

Possible Problems: None

Test #99.2.4 – Reject Initial Preemptable Packet with SMD-C

Purpose: To verify that the DUT rejects an initial continued Preemptable Frame where the fragment count is not 0.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When receiving the mPacket that contains the initial mPacket of a Preemptable Frame the SMD must be an SMD-S.[1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting a 256-Byte Preempted Frame contained in a single mPacket with SMD as and SMD-C0.***

A:1. With the DUT in a mode with Preemption Active, transmit a complete Preemptable Frame in a 256 byte mPacket. However instead of setting the SMD to an SMD-S value set it to SMD-C0.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the preemptable frame.
A2	PASS	The DUT was observed to not accept the preemptable frame.

Possible Problems: None

Test #99.2.5 – Reject Frame with Incorrect SMD-C frame count

Purpose: To verify that the DUT rejects an mPacket with an incorrect SMD-C frame count.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4. (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When receiving an mPacket that contains the continuation of a Preemptable Frame the Frame Count must match. [1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting a 512-Byte Preempted Frame contained in two mPackets where the Frame Count does not match.***

A:1. With the DUT in a mode with Preemption Active, transmit a complete Preemptable Frame segmented into two mPackets the first as a 260 byte mPacket with SMD as SMD-0 and the second as a 256 byte mPacket with SMD as SMD-C1 and fragment count of 0.

A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the preemptable frame.
A2	PASS	The DUT was observed to not accept the preemptable frame.

Possible Problems: None

Test #99.2.6 – Reject Frame with Incorrect value in CRC field

Purpose: To verify that the DUT rejects an mPacket with an incorrect SMD-C frame count.

References:

[1] I IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[5] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.6 (Timers)
[6] ANNEX A (informative) Acronym Definitions
[7] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: When receiving an mPacket the CRC field for an Express Frame and final CRC field for a Preemptable Frame must be a CRC. [1][2] For Verify, Respond, and mPackets containing a Preemptable Frame that is unfinished the CRC field should contain an mCRC. [1][2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting an Express Frame with improper CRC***

A:1. With the DUT in a mode with Preemption Active, transmit a valid 64-byte Express Frame. This packet should instead of the normal CRC have an incorrect CRC value.
A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the Express frame.
A2	PASS	The DUT was observed to not accept the Express frame.

Part B: ***Rejecting an Express Frame with mCRC***

B:1. With the DUT in a mode with Preemption Active, transmit a valid 64-byte Express Frame. This packet should instead of the normal CRC have an mCRC value.
B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was observed to accept the Express frame.
B2	PASS	The DUT was observed to not accept the Express frame.

Part C: ***Rejecting a Preemptable Frame with improper CRC***

C:1. With the DUT in a mode with Preemption Active, transmit a valid 256 byte Preemptable Frame contained in a single mPacket where the CRC is invalid, but not equal to an mCRC.

C:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
C2	FAIL	The DUT was observed to accept the Express frame.
C2	PASS	The DUT was observed to not accept the Express frame.

Part D: ***Rejecting an mPacket of a Preemptable Frame with inverted mCRC***

D:1. With the DUT in a mode with Preemption Active, transmit a valid 512 byte Preemptable Frame segmented into two mPackets. This first mPacket should instead of the mCRC have an inverted mCRC value.

D:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
D2	FAIL	The DUT was observed to accept the Preemptable frame.
D2	PASS	The DUT was observed to not accept the Preemptable frame.

Part E: ***Rejecting a Verify Frame with a CRC instead of the mCRC***

E:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Verify Frame. This packet should contain a CRC value in the CRC field instead of an mCRC.

E:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
E2	FAIL	The DUT was observed to transmit a Respond Frame indicating it accepted the Verify Frame.
E2	PASS	The DUT was not observed to transmit a Respond Frame, indicating it rejected the Verify Frame.

Part F: ***Rejecting a Verify Frame with an inverted mCRC***

F:1. With the DUT in a mode with Preemption Active, transmit a valid 64 byte Verify Frame. This packet should contain an inverted mCRC value in the CRC field instead of an mCRC.

F:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
F2	FAIL	The DUT was observed to transmit a Respond Frame indicating it accepted the Verify Frame.
F2	PASS	The DUT was not observed to transmit a Respond Frame, indicating it rejected the Verify Frame.

Part G: ***Rejecting a Respond Frame with CRC instead of the mCRC***

G:1. Disconnect and after several or more seconds reconnect the link.

G:2. Cause the DUT to enter a mode with Preemption Supported.

G:3. Transmit an AEC-TLV indicating Preemption Supported and Enabled.

G:4. After a Verify frame has been transmitted by the DUT, quickly (so as to be completely received prior to 2 * verifyTime (range from 1 – 128 ms, see [4]) * 0.8 (see [5]) send to the DUT 64-byte Respond Frame(s) that are valid other than as noted below:

a) This packet should contain a CRC (rather than an mCRC).

b) The timing of transmission can also be achieved through continuously sending this Respond frame.

G:5. Observe the transmissions from the DUT for up to two seconds.

a) If neither an AEC-TLV with Preemption Active or a Preemptable Packet is observed attempt to provoke the DUT to a send Preemptable traffic.

Observable results:

Step	Result	Description
G5	PASS	The DUT transmitted an AEC-TLV with Not Active and any Preemptable Frames are sent as an Express Frame (indicating Preemption is not Active).
G5	FAIL	The DUT indicated acceptance of the Respond Frame by either transmitting an AEC-TLV with Active or Preemptable Packets.

Part H: ***Rejecting a Respond Frame with inverted mCRC instead of the mCRC***

H:1. Disconnect and after several or more seconds reconnect the link.

H:2. Cause the DUT to enter a mode with Preemption Supported.

H:3. Transmit an AEC-TLV indicating Preemption Supported and Enabled.

H:4. After a Verify frame has been transmitted by the DUT, quickly (so as to be completely received prior to 2 * verifyTime (range from 1 – 128 ms, see [4]) * 0.8 (see [5]) send to the DUT 64-byte Respond Frame(s) that are valid other than as noted below:

a) This packet should contain an inverted mCRC.

b) The timing of transmission can also be achieved through continuously sending this Respond frame.

H:5. Observe the transmissions from the DUT for up to two seconds.

a) If neither an AEC-TLV with Preemption Active or a Preemptable Packet is observed attempt to provoke the DUT to a send Preemptable traffic.

Observable results:

Step	Result	Description
H5	PASS	The DUT transmitted an AEC-TLV with Not Active and any Preemptable Frames are sent as an Express Frame (indicating Preemption is not Active).
H5	FAIL	The DUT indicated acceptance of the Respond Frame by either transmitting an AEC-TLV with Active or Preemptable Packets.

Possible Problems: The DUT may not support Verification, in which case verification of Respond Frame acceptance may not be feasible.

Test #99.2.7 – Rejection of mPackets with Erred SMD

Purpose: To verify that the DUT rejects mPackets with an undefined value in the SMD field.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM11
[4] ANNEX A (informative) Acronym Definitions
[5] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: An mPacket with an undefined value in the SMD field should be discarded. [2]

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

Part A: ***Rejecting an Express Frame with Erred SMD (0xAB)***

A:1. With the DUT in a mode with Preemption Active, transmit an Express Frame with an SMD set to 0xAB.
A:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A2	FAIL	The DUT was observed to accept the Express Frame.
A2	PASS	The DUT was not observed to accept the Express Frame.

Part B: ***Rejecting an Express Frame with Erred SMD (0x9B)***

B:1. With the DUT in a mode with Preemption Active, transmit an Express Frame with an SMD set to 0x9B.
B:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
B2	FAIL	The DUT was observed to accept the Express Frame.
B2	PASS	The DUT was not observed to accept the Express Frame.

Part C: ***Rejecting an Express Frame with Erred SMD (0x55)***

C:1. With the DUT in a mode with Preemption Active, transmit an Express Frame with an SMD set to 0x55.
C:2. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
C2	FAIL	The DUT was observed to accept the Express Frame.
C2	PASS	The DUT was not observed to accept the Express Frame.

Possible Problems: None

GROUP 3: Transmission

Scope: The following tests cover MAC Merge operations specific to properly transmitting packets.

Overview: These tests are designed to verify that the device under test properly transmits packets. The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

Test #99.3.1 – Proper Transmission of Express Frames

Purpose: To verify that the DUT properly transmits Express Frames.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM9
[5] ANNEX A (informative) Acronym Definitions
[6] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 27, 2016

Discussion: Any frame transmitted with an SFD-E (0xD5) should be considered an Express Frame. Such frames should have valid CRCs.

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium. If the DUT is not already in a mode with Preemption Active, then:

a) Transmit an AEC-TLV indicating Preemption Supported and Enabled.
b) Respond to any received Verify Frame (If detection of Verify frames is not supported by the testing station, this can be emulated by transmitting a Respond Frame every millisecond for 100ms)

Test Procedure:

Part A: ***Proper transmission of Express Frame***

A:1. Ensure the DUT is in a mode with Preemption Active.
  a) Send a Verify Frame to the DUT. If a Respond Frame is not observed, repeat the Test Setup.
A:2. By any DUT supported mechanism, cause the DUT to transmit Express Frames.
  a) If a Bridge, this may require an additional test station sending priority tagged frames considered Express Frames by the DUT.
  b) If an Endstation, this may require the DUT to support a mode to force transmission of Express Frames, or for the test station to emulate a compatible link partner (eg: 1722.1 and MSRP).
A:3. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A1	FAIL	The DUT was not observed to transmit a Respond Frame.
A3	FAIL	The DUT was not observed to transmit any Express Frames.
A3	FAIL	The DUT was observed to transmit any frame with an SFD-E but with an mCRC.
A3	PASS	The DUT was observed to transmit valid Express Frames.

Possible Problems: None

Test #99.3.2 – Proper Transmission of Preemptable Frames

Purpose: To verify that the DUT properly transmits Preemptable Frames.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM9
[5] ANNEX A (informative) Acronym Definitions
[6] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT. Multiple test stations may be required if the DUT is a bridge.

Last Modification: August 27, 2016

Discussion: Any frame transmitted with an SFD-S should be considered the beginning of a preemptable frame (or a complete preemptable frame). Any frame transmitted with an SFD-C should be considered the continuation of a previously preempted frame. To identify the

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium. If the DUT is not already in a mode with Preemption Active, then:

a) Transmit an AEC-TLV indicating Preemption Supported and Enabled.
b) Respond to any received Verify Frame (If detection of Verify frames is not supported by the testing station, this can be emulated by transmitting a Respond Frame every millisecond for 100ms)

Test Procedure:

Part A: ***Proper transmission of Preemptable Frames***

A:1. Ensure the DUT is in a mode with Preemption Active.
   a) Send a Verify Frame to the DUT. If a Respond Frame is not observed, repeat the Test Setup.

A:2. By any DUT supported mechanism, cause the DUT to transmit preempted preemptable frames (eg: cause Express Frames to be sent with preemptable traffic).
   a) If a Bridge, this may require additional test stations sending priority tagged frames considered Express Frames by the DUT into one ingress port, and preemptable traffic into a second ingress port.
   b) If an Endstation, this may require the DUT to support a mode to force transmission of Express Frames, or for the test station to emulate a compatible link partner (eg: 1722.1 and MSRP).

A:3. Observe the transmissions from the DUT for up to two seconds.

Observable results:

Step	Result	Description
A1	FAIL	The DUT was not observed to transmit a Respond Frame.
A3	FAIL	Any preemptable frame is observed to be sent with an SMD-S, but the SMD-S is not +1 (modulo 4) from the last observed SMD-S value from the DUT.
A3	FAIL	Any observed mPacket meets the following condition: The first mPacket with an SMD-C sent after an mPacket with SMD-S does not have a frag_count of 0 (zero).
A3	FAIL	Any observed mPacket meets the following condition: Consecutively received mPackets with the same SMD-C do not have frag_count values incrementing by +1 (modulo 4).
A3	FAIL	Any observed mPacket meets the following condition: Consecutively received mPackets with an SMD-C following an mPacket with an SMD-S do not have matching frame_cnt (txFrame) values. (eg: SMD-S2 followed by any mPacket with SMD-C other than SMD-C2)
A3	PASS	The DUT was observed to transmit valid preempted preemptable frames.

Possible Problems: None

Test #99.3.3 – Non-Segmentable Preemptable Frames

Purpose: To verify that the DUT does not segment a Preemptable Frame when doing so would result in an mPacket that is too small.

References:

[1] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.5 (Receive Processing)
[2] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.7 (State Diagrams)
[3] IEEE Std 802.3-2015 w/ 802.3br-2016: subclause 99.4.7.3 (Variables)
[4] IEEE Std 802.3-2015 w/ 802.3br-2016: PICS Item MM9
[5] ANNEX A (informative) Acronym Definitions
[6] ANNEX B (informative) Definitions of Certain Key Words

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 22, 2016

Discussion: In … <TBD>

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium and transmit a valid frame to the DUT to ensure that the DUT is functioning properly.

Test Procedure:

***Part A:* <*TBD*>**

A1. <TBD>

Observable results:

Step	Result	Description
A2	FAIL	<TBD>
A2	PASS	<TBD>

Possible Problems: None

GROUP 4: Transmission of the Verify Frame

Scope: The following tests cover MAC Merge operations specific to proper transmission of the Verify Frame.

Overview: These tests are designed to verify that the DUT properly transmits the Verify Frame as well as looking at whether this frame is transmitted at the appropriate time(s). The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

Test #99.4.1 – Proper Transmission of Verify Frames

Purpose: To verify that the DUT properly transmits Verify Frames.

References:

<TBD>

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 27, 2016

Discussion: <TBD>

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium. If possible, configure the DUT to set disableVerify to FALSE.

Test Procedure:

Part A: ***Verify_timer_done***

A:1. Disconnect the DUT from the test station, wait 2 seconds, and reconnect the DUT to the test station.

A:2. Transmit an AEC-TLV indicating Preemption Supported and Enabled

A:3. Wait 2 seconds.

a) Observe transmissions from the DUT.

Observable results:

Step	Result	Description
A	**N/A**	The DUT only supports disableVerify set to TRUE.
A2	**FAIL**	The DUT was not observed to transmit a Verify Frame.
A2	**FAIL**	The DUT was not observed to transmit multiple Verify Frames.
A2	**FAIL**	If verifyTime is unknown: The DUT was not observed to transmit multiple Verify Frames separated by 0.8ms to a maximum of 153.6ms if verifyTime is known: The DUT was not observed to transmit multiple Verify Frames separated by the known verifyTime +/- 20% -- eg: default verifyTime is 10ms, hence for default values, the acceptable range is only 8ms to 12ms.
A2	**PASS**	The DUT was observed to transmit validly spaced Verify Frames.

Part B: ***verifyLimit***

B:1. Disconnect the DUT from the test station, wait 2 seconds, and reconnect the DUT to the test station.

B:2. Transmit an AEC-TLV indicating Preemption Supported and Enabled

B:3. Wait 2 seconds.

a) Observe transmissions from the DUT.

Observable results:

Step	Result	Description
B	**N/A**	The DUT only supports disableVerify set to TRUE.
B2	**FAIL**	The DUT was not observed to transmit a Verify Frame.
B2	**FAIL**	The DUT was not observed to transmit exactly three(3) Verify Frames.
B2	**PASS**	The DUT was observed to transmit three(3) Verify Frames.

Possible Problems: None

Test #99.4.2 – Proper Transmission of Verify Frame after Link Fail

Purpose: To verify that the DUT properly resumes transmission of Verify Frames after a link fail event.

References:

<TBD>

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 27, 2016

Discussion: <TBD>

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium. If possible, configure the DUT to set disableVerify to FALSE. If the DUT is not already in a mode with Preemption Active, then:

Transmit an AEC-TLV indicating Preemption Supported and Enabled.
Respond to any received Verify Frame (If detection of Verify frames is not supported by the testing station, this can be emulated by transmitting a Respond Frame every millisecond for 100ms)

Test Procedure:

Part A: ***Reset on link_fail***

A:1. Ensure the DUT is in a mode with Preemption Active.
   a) Send a Verify Frame to the DUT. If a Respond Frame is not observed, repeat the Test Setup.
A:2. Disconnect the link to the DUT.
A:3. Wait 2 seconds.
A:4. Reconnect the link to the DUT.
A:5. Transmit an AEC-TLV indicating Preemption Supported and Enabled
A:6. Wait two seconds.
   a) Observe the transmissions from the DUT.

Observable results:

Step	Result	Description
A	**N/A**	The DUT only supports disableVerify set to TRUE.
A1	**FAIL**	The DUT was not observed to transmit a Respond Frame.
A6	**FAIL**	The DUT was observed not observed to transmit a Verify Frame.
A6	**PASS**	The DUT was observed to transmit a Verify Frame.

Possible Problems: None

Test #99.4.3 – Verify Transmission Inhibited if no TLV or not supported

Purpose: To verify that the DUT properly withholds transmission of Verify Frames if no AEC-TLVs are received.

References:

<TBD>

Resource Requirements: A testing station capable of transmitting and receiving arbitrary packets and capable of monitoring traffic from the DUT.

Last Modification: August 27, 2016

Discussion: <TBD>

Test Setup: Connect the device under test (DUT) to the testing station with the appropriate medium. If possible, configure the DUT to set disableVerify to FALSE.

Test Procedure:

Part A: ***No AEC-TLV sent to DUT***

A:1. Disconnect the DUT from the test station, wait 2 seconds, and reconnect the DUT to the test station.

A:2. Wait 2 seconds.

a) Observe transmissions from the DUT.

Observable results:

Step	Result	Description
A	**N/A**	The DUT only supports disableVerify set to TRUE.
A2	**FAIL**	The DUT was not observed to transmit an AED-TLV.
A2	**FAIL**	The DUT was observed to transmit a Verify Frame.
A2	**PASS**	The DUT was not observed to transmit a Verify Frame.

Part B: ***AEC-TLV does not indicate support for Preemption***

B:1. Disconnect the DUT from the test station, wait 2 seconds, and reconnect the DUT to the test station.

B:2. Transmit an AEC-TLV indicating Preemption capability (bit 0) is not supported (set to 0).

B:3. Wait 2 seconds.

a) Observe transmissions from the DUT.

Observable results:

Step	Result	Description
B	**N/A**	The DUT only supports disableVerify set to TRUE.
B3	**FAIL**	The DUT was not observed to transmit an AED-TLV.
B3	**FAIL**	The DUT was observed to transmit a Verify Frame.
B3	**PASS**	The DUT was not observed to transmit a Verify Frame.

Possible Problems: None

GROUP 5: Checking for Respond Frame Transmission

Scope: The following tests cover MAC Merge operations specific to properly transmitting Respond frames.

Overview: These tests are designed to verify that the DUT properly responds to both normally formed Verify frames and acceptable variations and responds with a properly formatted Respond frame. The timing of the response should not be delayed by either other un-started preemptable frames or whether the port is currently paused. The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

GROUP 6: Preemption Capabilities as Communicated through LLDP

Scope: The following tests cover proper handling of the Additional Ethernet Capabilities TLV.

Overview: These tests are designed to verify that the DUT properly communicates and accepts Preemption Capability through LLDP. The Link Layer Discovery Protocol functions explored are defined in Clause 79 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

GROUP 7: Transmission Precedence and Timing

Scope: The following tests cover MAC Merge operations specific to timing tolerance of preempting as well as properly following precedence order of transmission.

Overview: These tests are designed to verify that the device under test properly adheres to transmission precedence. In addition this tests the ability of the DUT to adhere to timing requirements for preempting and holding preemptable traffic. The MAC Merge functions explored are defined in Clause 99 of IEEE Std 802.3™ -2015 as amended by IEEE Std 802.3br™-2016.

ANNEX A (informative) Acronym Definitions

Acronym Definitions

AEC-TLV	Additional Ethernet Capability TLV. An AEC-TLV is sent in an LLDP and communicates four things about the device sending it: preemption capability support (supported or not supported), preemption capability status (enabled or not enabled), preemption capability active (active or not active), and additional fragment size (0, 1, 2, or 3). (IEEE Std 802.3 ™ -2015 as amended by IEEE Std 802.3br ™-2016 subclause 79.3.7.2)
CRC	cyclic redundancy check (IEEE Std 802.3 ™ -2015 subclause 1.5)
DA	Destination Address (IEEE Std 802.3 ™ -2015 subclause 1.5)
DTE	data terminal equipment (IEEE Std 802.3 ™ -2015 subclause 1.5)
DUT	Device Under Test
eMAC	Express Media Access Control (IEEE Std 802.3 ™ -2015 subclause 1.5 as amended by IEEE Std 802.3br ™-2016)
FCS	Frame Check Sequence (IEEE Std 802.3 ™ -2015 subclause 1.5)
GMII	Gigabit Media Independent Interface (IEEE Std 802.3 ™ -2015 subclause 1.5)
IPG	interpacket gap (IEEE Std 802.3 ™ -2015 subclause 1.5)
LLC	logical link control (IEEE Std 802.3 ™ -2015 subclause 1.5)
LLDP	Link Layer Discovery Protocol (IEEE Std 802.1AB-2009 clause 4)
MAC	medium access control (IEEE Std 802.3 ™ -2015 subclause 1.5)
mCRC	A 32-bit value calculated similarly to the normal CRC value except the final step of the CRC is to complement all bits, while the mCRC final step complements only the bits in the last two bytes. Thus only the first two bytes will differ between the two. (IEEE Std 802.3 ™ -2015 subclause 3.2.9 and 99.3.6 as amended by IEEE Std 802.3br ™-2016)
MDI	medium dependent interface (IEEE Std 802.3 ™ -2015 subclause 1.5)
MII	media independent interface (IEEE Std 802.3 ™ -2015 subclause 1.5)
MMSI	MAC Merge service interface (IEEE Std 802.3 ™ -2015 subclause 1.5 as amended by IEEE Std 802.3br ™-2016)
PHY	Physical Layer entity (IEEE Std 802.3 ™ -2015 subclause 1.5)
PICS	protocol implementation conformance statement (IEEE Std 802.3 ™ -2015 subclause 1.5)
PLS	physical signaling sublayer (IEEE Std 802.3 ™ -2015 subclause 1.5)

PMA	physical medium attachment (IEEE Std 802.3™ -2015 subclause 1.5)
pMAC	Preemptable Media Access Control (IEEE Std 802.3™ -2015 subclause 1.5 as amended by IEEE Std 802.3br™-2016)
PMD	physical medium dependent (IEEE Std 802.3™ -2015 subclause 1.5)
RS	reconciliation sublayer (IEEE Std 802.3™ -2015 subclause 1.5)
SA	source address (IEEE Std 802.3™ -2015 subclause 1.5)
SFD	start-of-frame delimiter (IEEE Std 802.3™ -2015 subclause 1.5)
SMD	Start mPacket Delimiter (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)
SMD-C	The SMD field has one of the four values indicating continuation: SMD-C0, SMD-C1, SMD-C2, or SMD-C3. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)
SMD-C0	An SMD with value 0x61 indicating the mPacket contains the continuation of the preemptable frame, with frame count of 0. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.5 as amended by IEEE Std 802.3br™-2016)
SMD-C1	An SMD with value 0x52 indicating the mPacket contains the continuation of the preemptable frame, with frame count of 1. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.5 as amended by IEEE Std 802.3br™-2016)
SMD-C2	An SMD with value 0x9E indicating the mPacket contains the continuation of the preemptable frame, with frame count of 2. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.5 as amended by IEEE Std 802.3br™-2016)
SMD-C3	An SMD with value 0x2A indicating the mPacket contains the continuation of the preemptable frame, with frame count of 3. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.5 as amended by IEEE Std 802.3br™-2016)
SMD-E	An SMD with value 0xD5 indicating the mPacket contains an express packet. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4 as amended by IEEE Std 802.3br™-2016)
SMD-R	An SMD with value 0x19 indicating the mPacket contains a respond packet. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.3 as amended by IEEE Std 802.3br™-2016)
SMD-S	The SMD field has one of the four values indicating the start of a preemptable packet: SMD-S0, SMD-S1, SMD-S2, or SMD-S3. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)
SMD-S0	An SMD with value 0xE6 indicating the mPacket contains the start of a preemptable frame, with frame count of 0. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)
SMD-S1	An SMD with value 0x4C indicating the mPacket contains the start of a preemptable frame, with

frame count of 1. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)

SMD-S2 — An SMD with value 0x7F indicating the mPacket contains the start of a preemptable frame, with frame count of 2. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)

SMD-S3 — An SMD with value 0xB3 indicating the mPacket contains the start of a preemptable frame, with frame count of 3. (IEEE Std 802.3™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br™-2016)

SMD-V — An SMD with value 0x07 indicating the mPacket contains a verify packet. (IEEE Std 802.3™ -2015 subclauses 99.3.3 and 99.4.3 as amended by IEEE Std 802.3br™-2016)

UCT — unconditional transition (IEEE Std 802.3™ -2015 subclause 1.5)

ANNEX B (informative) Definitions of Certain Key Words

Definitions

Express Frame	A frame being sent from or destined to a eMAC. (IEEE Std 802.3 ™ -2015 subclauses 99.3.3, 99.3.6, and 99.4 as amended by IEEE Std 802.3br ™-2016)
Express Packet	An mPacket containing SMD-E (0xD5) in the SMD field and a CRC-32 value in the CRC field. This contains a frame being sent from or destined to an eMAC. All fields match a normal packet and thus it is indistinguishable from a normal packet. (IEEE Std 802.3 ™ -2015 subclauses 99.3.3, 99.3.6, and 99.4 as amended by IEEE Std 802.3br ™-2016)
mData	Start mPacket Delimiter (IEEE Std 802.3 ™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br ™-2016)
mPacket	This is short for MAC Merge Packet and is used to describe any packet coming into the MAC Merge Sublayer. (IEEE Std 802.3 ™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br ™-2016)
Preemptable Frame	A frame being sent from or destined to a pMAC. (IEEE Std 802.3 ™ -2015 subclauses 99.3.3, 99.3.6, and 99.4 as amended by IEEE Std 802.3br ™-2016)
Preemptable Packet	An mPacket containing an SMD-S or an SMD-C in the SMD field. The CRC field indicates either a CRC-32 value to indicate the current frame is complete or an mCRC value to indicate the frame is to be continued at a later time. This packet contains an entire or partial frame being sent from or destined to a pMAC. (IEEE Std 802.3 ™ -2015 subclauses 99.3.3, 99.3.6, and 99.4 as amended by IEEE Std 802.3br ™-2016)
SMD	Start mPacket Delimiter (IEEE Std 802.3 ™ -2015 subclause 99.3.3 as amended by IEEE Std 802.3br ™-2016)
Verify Packet	An mPacket containing SMD-V (0x07) in the SMD field and an mCRC value in the CRC field. (IEEE Std 802.3 ™ -2015 subclauses 99.3.3 and 99.4.3 as amended by IEEE Std 802.3br ™-2016)