40/100 Gigabit Ethernet Consortium

Clause 4 MAC Conformance Test Suite Report

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Award Shin
MediaTek Inc.

February 10, 2016
Report Rev. 1.0

Device Information	
Device Under Test (DUT):	MediaTek MT3258
UNH-IOL Device Identification Number:	21438
Hardware Version:	MT3258
Firmware Version:	N/A
Software Version:	N/A
Port Tested:	Port 12 tested, loopback in port 16
Additional Information:	Tests run at 40Gb/s

Results Overview
No failures were observed during the testing process. Please see page 5 for a summary of conformance results observed during the testing process.

Test Tool and Test Suite Information

The following table contains the test tool and test suite versions used during testing:

	Version
Test Tool	Xilinx Leviathon Rev 30
Traffic Generator	Ixia XM2 chassis w/ HSE 40GE QSFP 1-01 blade
Test Suite	Clause 4 Media Access Control (MAC), Version 5.2, March, 2011
UNH-IOL Test Result ID:	22689

Testing Completed by:

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Digitally signed by UNH-IOL
Date: 2016.02.10 10:20:04 -05'00'

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Initialization Information

The following table contains the steps taken to initialize the DUT prior to testing:

Component	Description
Software	Hyperterminal
Initialization Script	./initModule.sh Init_3x40G(2)
Additional Commands	cd /mtk ./InitModule.sh debug ctest mac set mtu 1518 ctest mac set asynlfc 12 03 diag set name ifp_multi_dest entry 1 data name mc_port_list=0x11000 diag set name efp_vlan entry 1 data name ut_port_list=0x11000 diag set name LINK_CTL_0 data raw 0x11000

Revision History

The following table contains a revision history for this report:

Revision	Explanation
1.0	Initial version.

Test Setup

All tests completed were completed using a combination of two test configurations. The first configuration is a Ixia XM2 chassis w/ HSE 40GE QSFP 1-01 blade. The second consists of a PC, Xilinx Leviathan Rev30, and a Ixia XM2 chassis w/ HSE 40GE QSFP 1-01 blade.

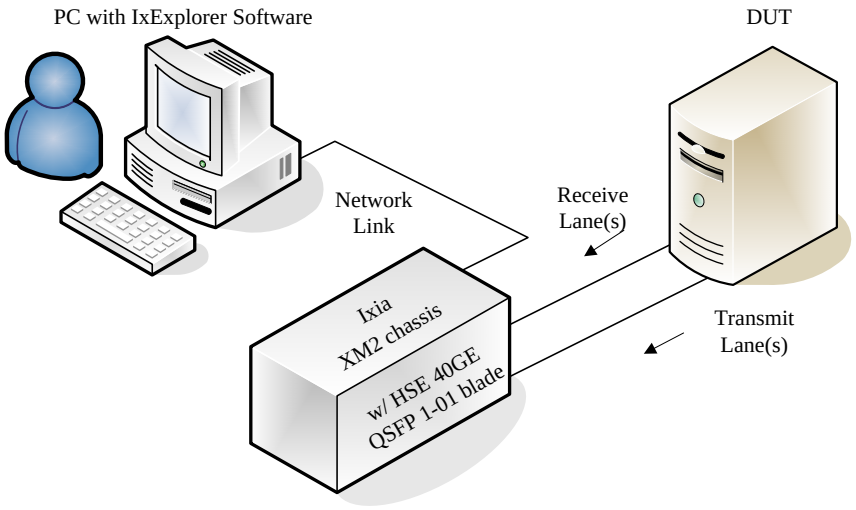

Figure 1 - Test Configuration I

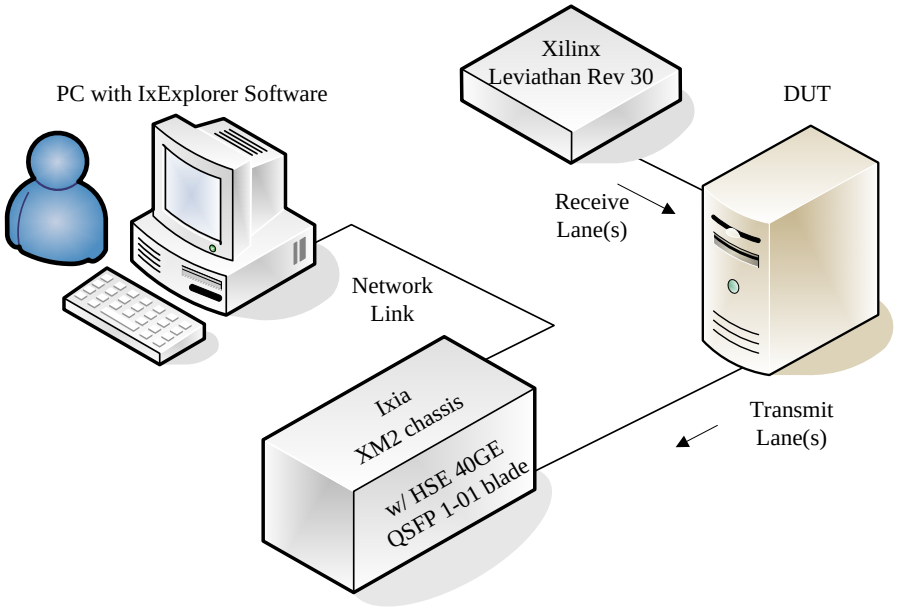

Figure 2 - Test Configuration II

Digital Signature Information

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MD5 Fingerprint: 39 96 A4 8C 02 E0 38 DA F7 AB E1 ED BD E9 B5 F0
SHA-1 Fingerprint: 41 EE 65 F4 8A 6A 3A A6 3D AF 63 F4 78 7D 97 7B 48 49 C9 DD

Result Key

The following table contains possible results and their meanings:

Result	Meaning	Interpretation
PASS	Pass	The Device Under Test (DUT) was observed to exhibit conformant behavior.
PWC	Pass With Comments	The Device Under Test (DUT) was observed to exhibit conformant behavior, however changes were made to the normal test procedure or the behavior observed requires additional comments.
FAIL	Fail	The Device Under Test (DUT) was observed to exhibit non-conformant behavior.
RTC	Refer to Comments	From the observations, a valid pass or fail was not determined. An additional explanation of the situation is included.
Info	Informative	Test is designed for informational purposes only. The results may help ensure the interoperability of the DUT, but are not standards requirements.
Warn	Warning	The DUT was observed to exhibit behavior that is not recommended.
N/A	Not Applicable	This test does not apply to the device type or is not applicable to the testing program selected.
N/S	Not Supported	The Device Under Test (DUT) was not observed to support the necessary functionality required to perform these tests or the requirement is optional and not supported by this device.
N/T	Not Tested	This test was not performed and therefore this is not a complete test report. Please see the comments for additional reasons.
UA	Unavailable	The test was not performed due to limitation of the test tool(s) or interoperable systems, or the test methodology is still under development.

Summarized Results

The following table contains a summary of the results found within this report. Detailed procedures and observed behaviors are included starting on page 7.

Test Number and Label	Parts	Results
4.1.1 – Reception of FCS Errors	a	PASS
	b	PASS
	c	PASS
4.1.2 – Reception of Fragments and Runts	a	PASS
	b	PASS
	c	PASS
	d	PASS
4.1.3 – Reception and Transmission of Oversized Frames	a	PASS
	b	PASS
	c	PASS
	d	PASS
	e	PASS
4.1.4 – Frames with Length Errors	a	PASS
	b	PASS
4.1.5 – Receive Frames with Excess Pad	a	Info
	b	PASS
4.1.6 – Jabber Frame Reception and Recovery	a	PASS
	b	PASS
4.1.7 – Start of Frame Delimiter Error Reception and Recovery	a	PASS
	b	PASS
	c	PASS
4.1.8 – Frames with Alignment Errors	a	N/A
	b	N/A
	c	N/A
4.1.9 – Preamble Error Reception and Recovery	a	PASS
	b	PASS
	c	PASS
	d	PASS
4.2.1 – Transmit Proper SFD and Preamble	a	UA
4.2.2 – Transmission of Minimum interPacketGap	a	UA
	b	N/A
	c	N/A
	d	N/A
4.2.3 – Compute and Transmit Proper CRC	a	PASS
4.2.4 – Receive Variable Preamble	a	PASS
4.2.5 – Receive All Frame Sizes	a	PASS
	b	PASS
	c	PASS
	d	PASS
	e	PASS
4.2.6 – Reception of Minimum interPacketGap	a	PASS
	b	Info
4.2.7 – Compute and Transmit Proper Extension	a	N/A
4.2.8 – Receive Frames with Extension	a	N/A
	b	N/A

GROUP 3: Full Duplex	**N/A**
GROUP 4: Collision Behavior	**N/A**
GROUP 5: Deference Process	**N/A**
GROUP 6: Backoff	**N/A**
GROUP 7: Frame Bursting	**N/A**

GROUP 1: Errors During Reception

4.1.1 – Reception of FCS Errors	Parts	Results
	a	PASS
	b	PASS
	c	PASS

Purpose

To verify that the device under test (DUT) detects frames with frame check sequence (FCS) errors and reports a frameCheckError.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame with an incorrect 32-bit CRC value in the FCS field. The DUT shall detect and discard the frame with an invalid value in the FCS field.
b. The testing station is instructed to transmit a frame with an incorrect 32-bit CRC value in the FCS field. This packet is preceded and followed by a valid packet separated by minimum interPacketGap. The reception of test frames with invalid FCS fields should not affect the reception of the valid frames.
c. The output and statistics of the DUT are observed. If clause 30 is implemented, the DUT should log the occurrence of a CRC error during both Part A and Part B of the testing.

Observed Behavior and Additional Comments

a. The DUT properly does not reply to frames with CRC errors.
b. The reception of CRC errors did not interfere with the reception of frames with a valid CRC.
c. The DUT was observed to increment the AFRAMECHECKSEQUENCEERRORS field after the reception of a CRC error.

4.1.2 – Reception of Fragments and Runs	Parts	Results
	a	PASS
	b	PASS
	c	PASS
	d	PASS

Purpose

To verify that the device under test (DUT) discards collision fragments and runts.

Procedures and Expected Results

a. The testing station is instructed to transmit undersized fragments and runts. While in full duplex mode, the DUT should discard all fragments and runts less than 64 bytes in length (512 bit times). While in half duplex mode, the DUT should discard all fragments and runts less than slotTime in length (4096 bit times). Due to time limitations only a few fragments and runts are tested.
b. The test station is instructed to send each of the sequences listed below:
   1. 7 octets of preamble
   2. 7 octets of preamble and SFD
   3. 7 octets of preamble, SFD and the MAC address of the DUT
   4. 7 octets of preamble, SFD, the MAC address of the DUT and an arbitrary source address
   5. 6 octets of preamble, SFD, and a 511-byte runt
   6. A 512-byte frame, 12 bytes of extension bits, a 42-byte runt, 12 bytes of extension bits and 64-byte frame
   7. A 42-byte runt, 12 bytes of extension bits and a 511-byte frame (full duplex only)
   8. A 64-byte frame extended to 511 bytes

   The DUT should properly handle each of the sequences (i.e. discard fragments and accept valid frames).
c. The test station is instructed to transmit a 63-Byte PAUSE frame. The DUT should discard any PAUSE frame less than 64 bytes in length.
d. Parts A, B, and C are repeated with each test packet preceded and followed by a valid packet, separated by a minimum interPacketGap (96 bit times). The reception of test frames should not interfere with the reception of valid frames.

Observed Behavior and Additional Comments

a. The DUT properly did not respond to the test frames.
b. The DUT properly did not respond to Test Frames 5-8.
c. The DUT properly did not act upon runt PAUSE frames of lengths 19, 46, and 63 Bytes. Due to test station limitations, the remaining lengths of runt PAUSE frames were not tested.
d. The reception of fragments and runts did not interfere with the reception of valid frames.

4.1.3 – Reception and Transmission of Oversized Frames	Parts	Results
	a	PASS
	b	PASS
	c	PASS
	d	PASS
	e	PASS

Purpose

To verify that the device under test (DUT) is tolerant of frames greater than maxFrameSize and that the DUT does not transmit frames greater than the maximum permitted frame size.

Procedures and Expected Results

a. The testing station is instructed to transmit a 1518-byte untagged frame. The length of the frame is incremented until the DUT is observed to discard or truncate it. The DUT should discard or truncate all untagged frames exceeding maxFrameSizeLimit (1518, 1522, or 2000 bytes). The limit for received MAC frames should be the same for all frame types (basic, tagged, and envelope). If the DUT accepts a frame exceeding 2000 bytes, the CRC value should not be checked, thus oversized frames with CRC errors should be handled in an identical fashion as oversized frames with valid CRC values. In addition, if the DUT was observed to accept both the frame with the valid and the frame with the invalid CRC, the frame size at which this behavior starts is further investigated. It must start at size 1519, 1523, or 2001 and must also be the same as found in all frame types.

b. The testing station is instructed to transmit a 1518-byte VLAN tagged frame. The length of the frame is incremented until the DUT is observed to discard or truncate it. The DUT should discard or truncate all VLAN tagged frames exceeding the maxFrameSizeLimit (1518, 1522, or 2000 bytes). The limit for received MAC frames should be the same for all frame types (basic, tagged, and envelope). If the DUT accepts a frame exceeding 2000 bytes, the CRC value should not be checked, thus oversized frames with CRC errors should be handled in an identical fashion as oversized frames with valid CRC values. In addition, if the DUT was observed to accept both the frame with the valid and the frame with the invalid CRC, the frame size at which this behavior starts is further investigated. It must start at size 1519, 1523, or 2001 and must also be the same as found in all frame types.

c. The testing station is instructed to transmit a 1518-byte envelope frame. The length of the frame is incremented until the DUT is observed to discard or truncate it. The DUT should discard or truncate all envelope frames exceeding the maxFrameSizeLimit (1518, 1522, or 2000 bytes). The limit for received MAC frames should be the same for all frame types (basic, tagged, and envelope). If the DUT accepts a frame exceeding 2000 bytes, the CRC value should not be checked, thus oversized frames with CRC errors should be handled in an identical fashion as oversized frames with valid CRC values. In addition, if the DUT was observed to accept both the frame with the valid and the frame with the invalid CRC, the frame size at which this behavior starts is further investigated. It must start at size 1519, 1523, or 2001 and must also be the same as found in all frame types.

d. The testing station is instructed to transmit a 1518-byte PAUSE frame. If the DUT is observed to pause, the frame is incremented by one byte and retransmitted until the DUT no longer acts on the PAUSE frame. The DUT may truncate oversized MAC Control frames, however if this truncation occurs, for frames larger than 1518, 1522, or 2000 bytes in length, the MAC should handle frames with invalid CRC values the same as frames with valid CRC values.

e. Parts a through c are repeated with the test frame preceded and followed by a valid frame, each separated by a minimum interPacketGap. The reception of test frames should not interfere with the reception of valid frames.

Observed Behavior and Additional Comments

a. The DUT did not accept untagged frames larger than 1518 bytes in length. Please see the note below.
b. The DUT did not accept tagged frames larger than 1522 bytes in length. Please see the note below.
c. The DUT did not accept Envelope frames larger than 1522 bytes in length. Please see the note below.

<continued on next page>.

d. The DUT did not accept PAUSE frames larger than 64 bytes in length. Please see the note below.
e. All valid ICMP request frames preceding and following the test frames were properly accepted and replied to.

Note: The MAC specifies that there shall be no distinction between frame types (i.e. untagged, tagged, and envelope) for maxFrameSize. Based on the DUT's responses to the frames received, the maximum frame size accepted was observed to be different for the different frame types; while this behavior is invalid at the MAC, it cannot be determined if this behavior was actually a result of the MAC or the MAC client.

4.1.4 – Frames with Length Errors	Parts	Results
	a	PASS
	b	PASS

Purpose

To verify that the device under test (DUT) discards frames where the length value in the Length/Type field is larger than the length of the data field.

Procedures and Expected Results

a. The testing station is instructed to transmit frames with length values greater than the length of the data/pad field. The DUT should discard all test frames with invalid length values.
b. Part a is repeated with the test frames preceded and followed by valid frames, separated by minimum interPacketGap (96 bit times). All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

a. The DUT was observed to not accept frames with length errors.
b. Reception of frames with length errors was not observed to interfere with the reception of valid frames.

4.1.5 – Receive Frames with Excess Pad	Parts	Results
	a	Info
	b	PASS

Purpose

To determine how the device under test (DUT) handles frames with excessive padding.

Procedures and Expected Results

a. The testing station is instructed to transmit frames with excess padding. The IEEE std 802.3-2002 is ambiguous on how a device should handle frames with excess padding. The UNH-IOL recommends that the DUT accept each test frame and reply with a frame that does not contain padding.
b. Part a is repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap (96 bit times). All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

a. The DUT was observed to not accept frames with excess padding.
b. The reception of frames with excess pad was not observed to interfere with the reception of valid frames.

4.1.6 – Jabber Frame Reception and Recovery	Parts	Results
	a	PASS
	b	PASS

Purpose

To verify that the device under test (DUT) is able to withstand and recover from the reception of worst-case jabber transmissions.

Procedures and Expected Results

a. The testing station is instructed to transmit a jabber frame. The DUT should discard the frame.
b. Part a is repeated with the test frame preceded and followed by a valid frame, separated by minimum interPacketGap. All valid frames preceding and following the test frame should be replied to.

Observed Behavior and Additional Comments

a. The DUT was not observed to exhibit any system failures upon reception of the 14,000-byte frame. This was the largest that could be tested due to test station limitations.
b. The reception of the test frames did not interfere with the reception of valid MAC frames.

4.1.7 – Start of Frame Delimiter Error Reception and Recovery	Parts	Results
	a	PASS
	b	PASS
	c	PASS

Purpose

To verify that the device under test (DUT) discards frames which do not contain a valid Start of Frame Delimiter (SFD).

Procedures and Expected Results

a. The testing station is instructed to send a frame with the SFD replaced by another byte of preamble (bit pattern 10101010). The DUT should discard the frame.
b. The testing station is instructed to send a frame with the SFD replaced by the bit pattern 10011011. The DUT should discard the frame.
c. Parts a and b are repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap (96 bit times). All valid frames preceding and following the test frame should be replied to.

Observed Behavior and Additional Comments

a. The DUT was observed to discard the frame with 8 bytes of preamble and no SFD.
b. The DUT was observed to discard the frame with 7 bytes of preamble and 10011011 in place of a SFD.
c. The reception of the test frames did not interfere with the reception of valid MAC frames.

4.1.8 – Frames with Alignment Errors	Parts	Results
	a	N/A
	b	N/A
	c	N/A

Purpose

To verify that the device under test (DUT) detects and discards frames with alignment errors.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame ending with a valid FCS and a variable amount of extra bits. The DUT should truncate the test frame to the nearest octet and accept it.
b. The testing station is instructed to transmit a frame ending with an invalid FCS and a variable amount of extra bits. The DUT should truncate the test frame to the nearest octet and accept it.
c. Parts a and b are repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap (96 bit times). All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

a. This test is not applicable at 40Gb/s; therefore, it was not performed.
b. This test is not applicable at 40Gb/s; therefore, it was not performed.
c. This test is not applicable at 40Gb/s; therefore, it was not performed.

4.1.9 – Preamble Error Reception and Recovery	Parts	Results
	a	PASS
	b	PASS
	c	PASS
	d	PASS

Purpose

To verify that the device under test (DUT) accepts frames which contain errors with preamble

Procedures and Expected Results

a. The DUT should accept a frame transmitted by the testing station, which has preamble replaced with:
10101010 00000000 00000000 00000000 00000000 00000000 00000000 10101011
b. The DUT should accept a frame transmitted by the testing station, which has preamble replaced with:
10101010 01111111 11111111 11111111 11111111 11111111 11111111 10101011
c. The DUT should accept a frame transmitted by the testing station, which has preamble replaced with:
10101010 10101010 10101010 10101010 10101010 10101000 10101111 10101011
d. Parts a through c are repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap (96 bit times). All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

a. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.
b. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.
c. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.
d. The reception of the test frames did not interfere with the reception of valid MAC frames.

GROUP 2: Encapsulation and Decapsulation

4.2.1 – Transmit Proper SFD and Preamble	Parts	Results
	a	UA

Purpose

To verify that the device under test (DUT) properly encapsulates a frame with preamble and SFD, and that the combination of the two is 7 bytes.

Procedures and Expected Results

a. The DUT is stressed according to ANNEX D. The DUT should always encapsulate frames with a combined 7 bytes of preamble and SFD.

Observed Behavior and Additional Comments

a. This test is currently unavailable at 40 Gb/s speeds.

4.2.2 – Transmission of Minimum interPacketGap	Parts	Results
	a	UA
	b	N/A
	c	N/A
	d	N/A

Purpose

To verify that the device under test (DUT) enforces the minimum interPacketGap spacing of 96 bit times.

Procedures and Expected Results

a. The DUT is placed into full duplex and stressed according to ANNEX D. All frames captured should be separated by at least minimum interPacketGap.
b. The DUT is placed into half duplex and stressed according to ANNEX D. All frames captured should be separated by at least minimum interPacketGap.
c. The DUT is placed into half duplex. The testing station and the DUT are instructed to transmit frames simultaneously resulting in collisions. All packets captured should be separated by at least minimum interPacketGap.
d. The DUT is placed into half duplex. The DUT is sent a sequence of frames such that it attempts to transmit a frame immediately following a received frame or fragment. The DUT should not initiate a new transmission until at least waiting a minimum IPG after the reception of a frame or fragment from the testing station.

Observed Behavior and Additional Comments

a. This test is currently not available at 40 Gb/s speeds.
b. This test was not completed due to the fact that the DUT does not support Half Duplex.
c. This test was not completed due to the fact that the DUT does not support Half Duplex.
d. This test was not completed due to the fact that the DUT does not support Half Duplex.

4.2.3 – Compute and Transmit Proper CRC	Parts	Results
	a	PASS

Purpose

To verify that the device under test (DUT) correctly calculates the CRC-32 value for the frame being transmitted and assigns it to the frame check sequence (FCS) field.

Procedures and Expected Results

a. The testing station is instructed to transmit several frames to the DUT. The CRC value of each captured reply from the DUT should match the value calculated by the testing station.

Observed Behavior and Additional Comments

a. The CRC value of the frame was recomputed by the testing station and compared to the CRC transmitted by the DUT (last four bytes of the frame). The value of the CRC transmitted by the DUT matched the value calculated by the testing station.

4.2.4 – Receive Variable Preamble	Parts	Results
	a	PASS

Purpose

To verify that the device under test (DUT) can receive valid packets with varied amounts of preamble.

Procedures and Expected Results

a. The testing station is instructed to transmit frames with varied amounts of preamble. The DUT should accept all test frames with 6 bytes of preamble and an SFD.

Observed Behavior and Additional Comments

a. The DUT was observed to accept frames with 6 bytes of preamble.

4.2.5 – Receive All Frame Sizes	Parts	Results
	a	PASS
	b	PASS
	c	PASS
	d	PASS
	e	N/A

Purpose

To verify that the device under test (DUT) accepts all valid sized frames.

Procedures and Expected Results

a. The testing station is instructed to transmit untagged frames ranging from minFrameSize (64 bytes) to maxUntaggedFrameSize (1518 bytes). The DUT should accept all valid untagged frames in this range.
b. The testing station is instructed to transmit valid untagged frames with length values ranging from 0x0001 to 0x05DC. If length interpretation is supported, the DUT should accept all valid frames with correct length values in the length/type field.
c. The testing station is instructed to transmit VLAN tagged frames ranging from minFrameSize (64 bytes) to maxUntaggedFrameSize + qTagPrefixSize (1522 bytes). If VLAN tagging is supported, the DUT should accept all valid tagged frames in this range.
d. The testing station is instructed to transmit envelope frames ranging from 64 to 2000 bytes in length. If envelope frames are supported, the DUT should accept all valid envelope frames in this range.
e. The testing station is instructed to transmit valid frames from 64 to 511 bytes in length extended to 512 bytes. The DUT should accept all valid frames extended to 512 bytes.

Observed Behavior and Additional Comments

a. The DUT was observed to receive all untagged frames up to 1518 Bytes.
b. The DUT was observed to receive all 802.2 SNAP frames.
c. The DUT was observed to receive all tagged frames up to 1522 bytes in length.
d. The DUT was observed to receive all envelope frames up to 1522 bytes in length.
e. This test is not applicable to 40Gb/s devices.

4.2.6 – Reception of Minimum interPacketGap	Parts	Results
	a	PASS
	b	Info

Purpose

To determine whether or not the device under test (DUT) is capable of receiving frames separated by a minimum interPacketGap (IPG)

Procedures and Expected Results

a. The testing station is instructed to transmit two frames separated by minimum IPG (96 bit times). The DUT should accept both frames.
b. The testing station is instructed to transmit two frames separated by minimum IPG. The IPG is reduced by one byte and the frames are retransmitted until the DUT fails to reply to one or both frames. The smallest IPG used where the DUT responded to both frames is included.

Observed Behavior and Additional Comments

a. The DUT was observed to accept two frames separated by 96 bit times.
b. The DUT was observed to accept two frames separated by 72 bit times. This was the lowest that could be tested due to test station limitations.

4.2.7 – Compute and Transmit Proper Extension	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) correctly calculates the amount of extension needed while transmitting a frame that is less than slotTime.

Procedures and Expected Results

a. The testing station is instructed to transmit valid frames ranging from 64 to 511 bytes in length extended to slotTime (512 bytes). The response from the DUT should consist of valid frames extended to slotTime.

Observed Behavior and Additional Comments

a. This test is not applicable for devices operating at 40Gb/s.

4.2.8 – Receive Frames with Extension	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) accepts frames with carrier extension.

Procedures and Expected Results

a. The testing station is instructed to send the following frames to the DUT:
   1. 64-byte frame with 448 bytes of extension
   2. 64-byte frame with 1454 bytes of extension
   3. 65-byte frame with 1 byte of extension
   4. 256-byte frame with 256 bytes of extension
   5. 256-byte frame with 1000 bytes of extension
   6. 511-byte frame with 1 byte extension
   7. 512-byte frame with 1006 bytes of extension
   8. 1517-byte frame with 1 byte extension

   The DUT should accept each test frame.

b. Part a is repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap. All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

GROUP 3: Full Duplex

4.3.1 – Does not Defer	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) does not defer to carrier sense while in full duplex mode.

Procedures and Expected Results

a. The testing station is instructed to transmit a valid frame, a variable sized gap, and then a long carrier event. The time it takes for the DUT to respond to the valid frame should be less than the long carrier event.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.3.2 – No Collisions	Parts	Results
	a	N/A

Purpose

To verify that no collisions occur when the device under test (DUT) is in full duplex mode.

Procedures and Expected Results

a. The testing station and the DUT are instructed to transmit frames simultaneously. The DUT should not detect and enforce collisions.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.3.3 – No Extension	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) does not add extension to valid frames that are less than slotTime when in full duplex mode.

Procedures and Expected Results

a. The DUT is stressed according to ANNEX D. The response captured by the testing station should not contain carrier extension.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.3.4 – No Bursting	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT), while in full duplex mode, does not go into burst mode when it has acquired the medium and there are still frames to send.

Procedures and Expected Results

a. The DUT is stressed according to ANNEX D. The testing station should receive 5 replies separated by at least one minimum IPG. This IPG should not consist of carrier extension.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

GROUP 4: Collision Behavior

4.4.1 – Collisions During Preamble and SFD within slotTime	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of preamble and SFD while within slotTime.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame while the DUT is transmitting preamble and SFD. The DUT should detect the collision, complete transmission of preamble and SFD, and transmit a 32-bit jam pattern. The jam pattern should not intentionally equal the 32-bit CRC value for the collision fragment.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should retransmit the frame involved in the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.2 – Collisions After the Reception of SFD within slotTime	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of data while within slotTime.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame while the DUT is transmitting frame data within slotTime. The DUT should detect the collision, cease transmission of data and transmit a 32-bit jam pattern.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should retransmit the frame involved in the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.3 – Collisions in Data Outside of slotTime while Not Bursting	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of data outside of slotTime while not in burst mode.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame while the DUT is transmitting frame data outside of slotTime. The DUT should detect the collision, cease the transmission of data and transmit a 32-bit jam pattern.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should not retransmit the frame involved in the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.4 – Collisions During Extension within slotTime	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) detects and enforces collisions that occur during carrier extension within slotTime.

Procedures and Expected Results

a. The testing station is instructed to transmit a frame while the DUT is transmitting carrier extension within slotTime. The DUT should detect the collision, cease transmission of data and transmit a 32-bit jam pattern consisting of extension error bits.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should retransmit the frame involved in the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.5 – Collisions During Preamble and SFD Outside of slotTime	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) detects and enforces collisions that occur during the transmission of preamble and SFD outside of slotTime (in burst mode).

Procedures and Expected Results

a. The DUT is instructed to transmit a burst of packets. The testing station is then instructed to transmit a frame or fragment causing a collision during the transmission of preamble outside of slotTime by the DUT. The DUT should detect the late collision, cease transmission of data and transmit a 32-bit jam pattern.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should cease transmitting in burst mode and should not attempt to retransmit the frame involved with the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.6 – Collisions During Data Outside of slotTime	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) detects and enforces collisions that occur during the transmission of data outside of slotTime and within a burst.

Procedures and Expected Results

a. The DUT is instructed to transmit a burst of frames. The testing station is then instructed to transmit a frame or fragment causing a collision during the transmission of data outside of slotTime by the DUT. The DUT should detect the late collision, cease transmission of data and transmit a 32-bit jam pattern.
b. The testing station is instructed to monitor the medium for any retransmission attempts from the DUT. The DUT should cease transmitting in burst mode and should not attempt to retransmit the frame involved with the collision.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.4.7 – Collisions During IPG within a Burst	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) detects and enforces collisions that occur in the interPacket spacing between packets in a burst.

Procedures and Expected Results

a. The DUT is instructed to transmit a burst of frames. The testing station is then instructed to transmit a frame or fragment causing a collision during the transmission of IPG by the DUT. The DUT should detect the late collision, cease transmission of data and transmit a 32-bit jam pattern.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

GROUP 5: Deference Process

4.5.1 – Defer to Carrier Sense while Frame Waiting	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) defers to the carrier sense signal when it has a frame waiting to be sent.

Procedures and Expected Results

a. The testing station is instructed to transmit a valid frame, a variable sized gap, and then a long carrier event. The time it takes for the DUT to respond to the valid frame should be greater than the length of the carrier event plus the length of the valid frame and the gap.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.5.2 – Deference After Collision	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) continues to observe the deference process when it attempts to retransmit after a collision, which occurred within slotTime.

Procedures and Expected Results

a. The testing station is instructed transmit a long carrier event while the DUT is transmitting a frame causing a collision within slotTime. This process is repeated with long carrier events of varying lengths. The time between the reception of the collision fragment and the DUT's retransmission attempt should be dependent on the length of the long carrier event.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.5.3 – InterPacketGapPart 1 Timing	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) observes the 2/3 rule for interPacketGap.

Procedures and Expected Results

a. The testing station is instructed to transmit a valid frame, a minimum IPG, followed by two carrier events separated by one byte of idle. The gap between the two carrier events is increased by one byte and the sequence is retransmitted until a collision event is observed. The smallest IPG required for a collision to occur must not be larger than 2/3 of interPacketGap (96 bit times).

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

GROUP 6: Backoff

4.6.1 – Retransmission Attempt Limit	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) allows a maximum of 15 attempts for retransmission after a collision.

Procedures and Expected Results

a. The DUT is instructed to transmit a frame. The testing station is then instructed to repeatedly transmit fragments causing collisions every time the DUT attempts to transmit the frame. The DUT should cease attempting to retransmit the frame after a total of 16 transmission attempts.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.6.2 – Truncated Binary Exponential BackOff Test	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT), correctly calculates the time to wait before attempting retransmission.

Procedures and Expected Results

a. The DUT is instructed to transmit a frame. The testing station is then instructed to repeatedly transmit fragments causing collisions every time the DUT attempts to transmit the frame. The backOff times after each collision are recorded. This process is repeated until a sufficient number of samples have been acquired. The combined average backOff time for each backOff attempt should not be more aggressive than the expected average for that attempt.
b. Part A is repeated.The number of slotTimes of delay before the n^{th} retransmission attempt should be a uniformly distributed random number in the range of $[0, 2^k - 1]$ where k=min(n,10).

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

GROUP 7: Frame Bursting

4.7.1 – Interframe Fill	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT), when in half duplex mode at 1000Mb/s, transmits extension in the interpacket spacing interval when in burst mode.

Procedures and Expected Results

a. The DUT is instructed to transmit a burst of packets. The initial frame in the burst should be at least 512 bytes in length, or extended to 512 bytes. Each packet in the burst should be separated by at least 96 carrier extension bits (not including any carrier extension bits transmitted as part of the initial packet).

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.7.2 – Burst Limit	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) when if half duplex mode at 1000Mb/s enforces the burstLimit of 64Kb (65536 bits).

Procedures and Expected Results

a. The testing station is instructed to transmit five 1518 byte frames, then a 480 + 'n' byte frame and the maximum supported MAC frame size for the device. The initial value of 'n' is 0. The DUT should reply to all of the frames in burst mode. The value 'n' is incremented by 1 and the test burst is retransmitted until the last frame is observed to be transmitted outside of the burst.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.

4.7.3 – Receive Frame Bursts	Parts	Results
	a	N/A
	b	N/A

Purpose

To verify that the device under test (DUT) accepts frame bursts while in full duplex mode.

Procedures and Expected Results

a. The testing station is instructed to send the following frame bursts:
   1. 512 byte frame, 12 bytes of extension bits, and a 64 byte frame
   2. 64 byte frame with 448 bytes of extension, 12 bytes of extension bits, and a 64 byte frame
   3. 64 byte frame, 12 bytes of extension bits, and a 64 byte frame
   4. Five 1518 byte frames, 482 byte frame and another 1518 byte frame (each separated by 12 bytes of extension bits)

   The DUT should accept each frame in the tested frame bursts.

b. Part a is repeated with the test frames preceded and followed by a valid frame, separated by minimum interPacketGap. All valid frames preceding and following the test frames should be replied to.

Observed Behavior and Additional Comments

These tests are not applicable for devices operating at 40Gb/s.

4.7.4 – Reception of Bursts with an Initial Frame Less than slotTime	Parts	Results
	a	N/A

Purpose

To verify that the device under test (DUT) detects and properly responds to the reception of fragments during a burst .

Procedures and Expected Results

a. The testing station is instructed to send the following frame sequences:
   1. A 500 byte frame, 12 bytes of extension, and a 64 byte frame.
   2. A 501 byte frame, 12 bytes of extension, and a 64 byte frame.
   3. A 511 byte frame, 12 bytes of extension, and a 64 byte frame.
   4. A 64 byte frame, 448 bytes of extension, and a 64 byte frame.
   5. A 64 byte frame, 449 bytes of extension, and a 64 byte frame.
   6. A 64 byte frame, 459 bytes of extension, and a 64 byte frame.
   7. A 64 byte frame, a 435 byte frame, and a 64 byte frame each separated by 12 bytes of extension.
   8. A 64 byte frame, a 436 byte frame, and a 64 byte frame each separated by 12 bytes of extension.
   9. A 46 byte frame, a 512 byte frame, and a 64 byte frame each separated by 12 bytes of extension.
   10. Eight 64 byte frames each separated by 12 bytes of extension.

   The DUT should accept each frame in the tested frame sequences.

Observed Behavior and Additional Comments

This test is not applicable for devices operating at 40Gb/s.