10 Gigabit Ethernet Consortium
Reconciliation Sublayer Test Suite version 1.2a

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Award Shin
MediaTek Inc.

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Report Rev. 1.0

Enclosed are the results from the Clause 46 Reconciliation Sublayer testing performed on:

Device Under Test (DUT):	MediaTek Inc. MT3258
UNH-IOL Device Identification #:	21438
Port Tested:	QSFP01:1

The test suite referenced in this report is available at the UNH-IOL website:

https://www.iol.unh.edu/sites/default/files/testsuites/10gec/Clause_46_RS_Test_Suite_V1.2a.pdf

The Following Tests Were Either Not Tested Or Have Additional Comments	
46.2.1: Reception of Start control character	This test could not be completed due to the fact that there are no valid blocks defined in Clause 49 to encode a Start control character on any lane other than XGMII lane 0.
46.2.6: De-assertion of DATA_VALID_STATUS: a 46.2.5: Assertion of DATA_VALID_STATUS: f - h	These test cases could not be completed due to the fact that they would cause invalid transitions in the 10GBASE-R PCS Receive State Machine.
46.2.7: Reception of /E/ during DATA_VALID_STATUS	This test could only be completed using a full block of errors within the frame due to the Clause 49 PCS block encoding

For further information please see the detailed test results.

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MD5 Fingerprint: 39 96 A4 8C 02 E0 38 DA F7 AB E1 ED BD E9 B5 F0
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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.

Revision History

The following table contains a revision history for this report:

Revision	Explanation
1.0	Initial version.

Test Setup

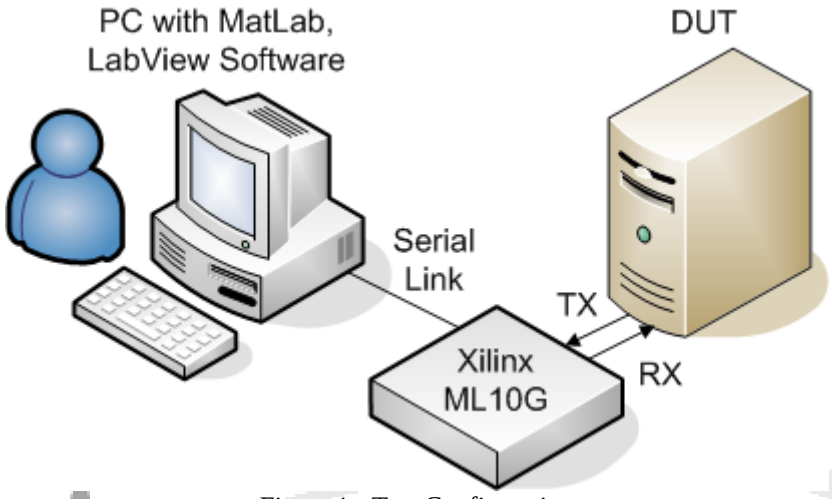

Figure 1 - Test Configuration

Figure 1 above depicts the test setup employed throughout the testing process. The SR interface of the Device Under Test (DUT) was used to provide access to the DUT in all test cases. Control access to the DUT was provided via a serial port interface. The test system consists of the PC and Xilinx ML10G interfaces.

- 10GBASE-R signaling is generated by the "ML10G" Testing Station. This system continuously sends valid 10GBASE-R Idle when not instructed to send a programmable transmit pattern. When the transmit pattern is sent, the ML10G is set to trigger on non-Idle code-blocks.
- Labview software controls the generation of the test vectors and programming of the ML10G. Labview software also controls the downloading and analysis of the signaling captured on the ML10G.
- The 10GBASE-R signaling from the DUT is captured by the ML10G.
- A PC is used for two purposes:
    - via the USB/JTAG interface to download the firmware for the Xilinx ML10G
    - via a Serial port to control transmissions and process the captures from the Xilinx ML10G

Detailed Description of Test Results

Group 1: Transmission

Test # and Label	Part(s)	Result(s)
46.1.1: Start control character creation and alignment	**a**	**PASS**
Comments on Test Procedure		

Purpose: To verify that upon reception of the first byte of preamble from the MAC, the RS replaces the preamble byte with a start control character and aligns it on lane 0.

a. The DUT should reply to all frames with a Start control character aligned to lane 0 and an SFD aligned to lane 3.

Procedure:
1. During the testing progress, received frames were examined by column and the position of the /S/ character was observed.

Comments on Test Results

a. Throughout the testing process the /S/ character was observed to always be in either position 0 or 4 of the 66-bit blocks, which corresponds to XGMII lane 0.

Test # and Label	Part(s)	Result(s)
46.1.2: Terminate control character creation and alignment	**a, b**	**PASS**
Comments on Test Procedure		

Purpose: To verify that the DUT inserts a Terminate control character at the end of any frames it transmits, and that the Terminate control character can be aligned to any of the 4 lanes.

a. All frames received by the testing station should contain a valid Terminate control character following the last byte of the CRC
b. The terminate control character should be observed on all four lanes.

Procedure:
1. During the testing process, received frames were examined by column and the position of the /T/ character was observed.

Comments on Test Results

a. Throughout the testing process, the DUT was observed to always transmit frames with a valid Terminate control character following the 4 bytes of CRC.
b. Throughout the testing process, the DUT was observed to properly generate frames with Terminate control character aligned on any of the 8 positions in the 66-bit blocks as needed.

Test # and Label	Part(s)	Result(s)
46.1.3 Deficit Idle Count	**a**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly implements Deficit Idle Count.

Procedure:
The testing station sends the following test sequence to the DUT and the responses of the DUT are observed so that the IPG between frames can be measured.

PAUSE frame
64 byte frame
65 byte frame
64 byte frame
65 byte frame
64 byte frame
65 byte frame
64 byte frame
65 byte frame
66 byte frame
66 byte frame
65 byte frame
66 byte frame
66 byte frame
67 byte frame
67 byte frame
67 byte frame
67 byte frame
64 byte frame

Comments on Test Results

a. The DUT was observed to reply to all frames with the proper IFGs as indicated in the Clause 46 RS Test Suite.

Group 2: Reception

Test # and Label	Part(s)	Result(s)
46.2.1: Reception of Start control character	**a, b**	**Not Applicable**

Comments on Test Procedure

Purpose: To verify that the DUT only accepts frames with proper Start control character alignment.

a. The DUT must discard all the frames that are received with start character on a lane other than lane 0.

Procedure:

1. The testing station transmitted a sequence of three ICMP request frames containing 64 bytes, 68 bytes and 72 bytes in size, with a minimum IPG between each frame.
2. The 68-byte frame was modified such that the Start control character (/S/) did not appear in lane 0. This was done one of two ways, either by "shifting" the entire frame (through the CRC and /T/) to the "right", or by shortening the preamble, leaving the SFD properly aligned on lane 3. 6 cases were attempted as described in the table below:

3 Cases: Frame Shifted "right"	R/S/P/P P/P/P/P SFD/D/D/D	R/R/S/P P/P/P/P P/SFD/D/D	R/R/R/S P/P/P/P P/P/SFD/D
3 Cases: Preamble shortened	R/S/P/P P/P/P/SFD	R/R/S/P P/P/P/SFD	R/R/R/S P/P/P/SFD

P = Preamble byte (55), SFD = Start Frame Delimiter (D5), D = Data byte of frame, R = Idle character

3. The transmissions from the DUT were observed in all cases.

Comments on Test Results

a. This test could not be completed due to the fact that there are no valid blocks defined in Clause 49 to encode a Start control character on any lane other than XGMII lane 0. The DUT was observed to accept frames with the /S/ character in position 0 or 4 in the 66-bit block.

b. This test could not be completed due to the fact that there are no valid blocks defined in Clause 49 to encode a Start control character on any lane other than XGMII lane 0.

Test # and Label	Part(s)	Result(s)
46.2.2: Reception of Preamble and SFD	**a**	**PASS**
	b	**Informative**

Comments on Test Procedure

Purpose: To verify if the DUT is insensitive to preamble shrinkage or growth.

a. The DUT should accept all frames containing a properly aligned Start control character in lane 0, 6 bytes of preamble, and an SFD in lane 3.
b. The DUT may accept frames with preamble variations other than listed in part a.

Procedure:
1. A 64-byte ICMP request frame was sent to the DUT with only an /S/ character followed by SFD preceding the frame.
2. Step 1 was repeated inserting additional preamble between the Start Control character and the SFD until the length of the Start, preamble and SFD was 16 bytes long.
3. The output from the DUT was observed in all the cases.

Comments on Test Results

a. The DUT was observed to accept the 64 byte frame containing properly aligned Start control character in XGMII lane 0, 6 bytes of preamble, and an SFD in XGMII lane 3.
b. The DUT was observed to not accept any frames with preamble lengths other than 6 bytes (not counting /S/ or SFD), regardless of the position of the SFD.

Test # and Label	Part(s)	Result(s)
46.2.3: Reception of Terminate Control Character	**a**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT receives frames with Terminate control character in any lane.

a. The DUT should receive frames containing Terminate control character in any lane.

Procedure:
1. The testing station was instructed to send 4 valid ICMP request frames, 64 to 67 bytes in length, to the DUT.
2. Transmissions and statistics of the DUT were monitored.

Comments on Test Results

a. The DUT was observed to be insensitive to the reception of frames with Terminate control characters on any lane.

Test # and Label	Part(s)	Result(s)
46.2.4: Receive IFG Tolerance	**a**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT can properly receive frames with an Inter Frame Gap (IFG) between 5 and 12 bytes in length.

a. The DUT should receive frames with IFG between 5 and 12 bytes in length.

Procedure:
1. Three ICMP request frames were sent to the DUT, with an IFG of 1 byte between the first two frames and a valid 12 Byte IFG between the last two frames.
2. Step 1 was repeated, altering the IFG between the first and second until all values between 1 and 12 bytes were attempted
3. The transmissions from the DUT were observed in all the cases.

Comments on Test Results

a. For an IFG between 5 and 12 bytes the DUT properly responded to all 3 frames.

Note, for any conformant device, IFG's of 1, 2 or 3 bytes correspond to a violation of the PCS check_end function and should result in the frame immediately prior to the IFG to be corrupted (and thus reported as an FCS error). An IFG of 4 bytes should not satisfy the requirements to assert DATA_VALID_STATUS (Refer to test 46.2.5), and should discard the second frame.

Test # and Label	Part(s)	Result(s)
46.2.5: Assertion of DATA_VALID_STATUS	**a - e**	**PASS**
	f - h	**Not Applicable**

Comments on Test Procedure

Purpose: To verify that the DUT accepts only frames that are preceded by a full column of Idle or a sequence ordered set before the Start column.

The DUT sets the DATA_VALID_STATUS to DATA_VALID if the column preceding the Start column is a sequence ordered set or a column of IDLE otherwise the DATA_VALID_STATUS is set to DATA_NOT_VALID.

Procedure:

1. The testing station transmitted a 64 byte ICMP request, 12 bytes of Idle, the pattern described in Test Case a, a 68 byte ICMP request, 12 bytes of Idle, and a 72 byte ICMP request.
2. Step 1 was repeated for all the Test Cases listed in the table below.

Label	Description
Test Case a	A full column of IDLE.
Test Case b	A sequence ordered set corresponding to Local Fault. – 10:2D|00|00|00|00|0|00|00|01|
Test Case c	A sequence ordered set corresponding to Remote Fault. – 10:2D|00|00|00|00|0|00|00|02|
Test Case d	A sequence ordered set corresponding to a Reserved value. 10:2D|00|00|00|00|0|00|00|00|
Test Case e	A column containing Terminate control character.
Test Case f	A column containing Start control character -- S/D21.2/D21.2/D21.2
Test Case g	A column containing an Error control character. E/E/E/E
Test Case h	A column containing Data code groups. D21.2/D21.2/D21.2/D21.2

Comments on Test Results

a. The DUT was observed to properly receive all three frames.
b. The DUT was observed to properly receive all three frames.
c. The DUT was observed to properly receive all three frames.
d. The DUT was observed to properly receive all three frames.
e. The DUT was observed to properly discard the 68-byte frame and reply to the 64 and 72 byte frames.
f. This test case could not be completed due to the fact that it would cause an invalid transition in the 10GBASE-R PCS Receive State Machine.
g. This test case could not be completed due to the fact that it would cause an invalid transition in the 10GBASE-R PCS Receive State Machine.
h. This test case could not be completed due to the fact that it would cause an invalid transition in the 10GBASE-R PCS Receive State Machine.

Test # and Label	Part(s)	Result(s)
46.2.6: De-assertion of DATA_VALID_STATUS	**a**	**Not Applicable**
	b	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly discards frames when DATA_VALID_STATUS changes from DATA_VALID to DATA_NOT_VALID before the reception of a Terminate control character when receiving a frame.

a. The DUT should discard frames when DATA_NOT_VALID is set for a control character other than Terminate.
b. The DUT should accept frames when DATA_NOT_VALID is set for a Terminate control character.

Procedure:
1. A 64 byte ICMP request was sent to the DUT, which was followed by 68 byte ICMP request with the Terminate control character replaced by an Idle control character, followed by a 72 byte ICMP request.
2. Step 1 was repeated with the Terminate control character replaced with an ordered set and a Start control character.
3. Step 1 was repeated with a 68 byte ICMP request that has the terminate column followed by S/D/D/D, T/K/K/K, D/D/D/D, and E/E/E/E.
4. The DUT's counters and transmissions were observed in all the cases

Comments on Test Results

a. This test case could not be completed due to the fact that it would cause an invalid transition in the 10GBASE-R PCS Receive State Machine.
b. The DUT properly responded to all three frames when the Terminate control character was followed by S/D/D/D or O/D/D/D. The remaining patterns could not be tested due to the fact that they would cause invalid transitions in the 10GBASE-R PCS Receive State Machine.

Test # and Label	Part(s)	Result(s)
46.2.7: Reception of /E/ during DATA_VALID_STATUS	**a-d**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly discards frames that are received with errors and increments its CRC error counters.

a-d. The DUT should discard frames received with errors and increment the error counters.

Procedure:

1. A 64 byte ICMP request frame was sent to the DUT, which was followed by a 68 byte ICMP request test frame with an /E/ placed at different points in the frame following the table below, followed by a 72 byte echo request frame.
2. The DUT's counters and transmissions were observed in all the cases.

Label	Description
Test Case a	/S/**E**/H55/H55... valid frame
Test Case b	/S/H55/H55/H55/H55/H55/H55/**E**... valid frame, (/E/ replacing SFD)
Test Case c	a valid 67 byte frame with an /**E**/ replacing one octet before the /T/
Test Case d	a valid 67 byte frame with an /**E**/ replacing the /T/ in lane 3

3. The DUT's MAC counters were observed.

Comments on Test Results

Test Cases a-d:
This test could only be completed using a full block of errors within the frame due to the Clause 49 PCS block encoding, the DUT was observed to properly discard the frame.

Group 3: Fault

Test # and Label	Part(s)	Result(s)
46.3.1: Continuous Reception of Fault Sequences	**a - c**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly reacts upon the continuous reception of either Local Fault or Remote Fault ordered_sets.

a. Upon reception of the Local Fault Sequences, the DUT should cease transmission of frames and commence continuous transmission of Remote Fault Sequences.
b. Upon reception of the Remote Fault sequences, the DUT should cease transmission of the frames and commence continuous transmission of Idle.
c. Upon reception of the reserved sequences, the DUT should not cease transmission of the frames.

Procedure:
1. ICMP requests and fault sequences (RF, LF, and Reserved fault) were continuously sent to the DUT
2. Transmissions from the DUT were monitored

Comments on Test Results

a. The DUT properly ceased frame transmission and sent Remote Fault upon reception of continuous Local Faults from the testing station.
b. The DUT properly ceased frame transmission and sent Idle upon reception of continuous Remote Faults from the testing station.
c. The DUT did not inhibit frame transmissions and continuously sent frames upon reception of continuous Reserved ordered sets from the testing station. Reserved ordered sets of 10:2D|00|00|00|00|0|00|00|00|and 10:2D|00|00|00|00|0|00|00|03| were sent.

Test # and Label	Part(s)	Result(s)
46.3.2: Reception of identical fault_sequences	**a - c**	**PASS**

Comments on Test Procedure

Purpose: To determine the number of identical fault_sequences that the DUT needs to receive before acknowledging the reception of Local or Remote fault.

a. Upon reception of n Local Fault Sequences where n is greater than 3, the DUT should cease transmission of the frames and commence continuous transmission of Remote Fault Sequences.
b. Upon reception of n Remote Fault sequences, where n is greater than 3, the DUT should cease transmission of the frames and commence continuous transmission of Idle.
c. Upon reception of n Reserved sequences, regardless of the value of n, the DUT should not cease transmission of the frames.

Procedure:
1. The DUT was instructed to transmit frames continuously.
2. The testing station was instructed to inject 1 local fault ordered sets in the stream to the DUT.
3. The number of ordered sets in part 2 was increased until the DUT interrupted the linerate transmission of frames and this count was noted as *n*.
4. Parts 1 – 3 were repeated with remote fault ordered sets.
5. The above test was repeated with *n* reserved ordered sets.
6. The transmissions from the DUT were observed in all the cases.

Comments on Test Results

a. The DUT continued to properly transmit frames when only 1-3 Local Faults were received from the testing station. The DUT properly ceased frame transmission and sent Remote Fault upon reception of 4 Local Faults from the testing station
b. The DUT continued to properly transmit frames when only 1-3 Remote Faults were received from the testing station. The DUT properly ceased frame transmission and sent Idle upon reception of 4 Remote Faults from the testing station.
c. The DUT did not cease transmission of frames upon reception of Reserved Sequences (10:2D|00|00|00|00|0|00|00|00|) from the testing station.

Test # and Label	Part(s)	Result(s)
46.3.3: Reception of non-identical fault sequences	**a-i**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly resets the seq_cnt variable to 0 upon reception of non-identical ordered_sets.

Procedure:
1. The DUT was instructed to transmit frames continuously.
2. The Fault Sequences identified in the table below are sent to the DUT. If 4 consecutive identical Fault sequences are received, these frame transmissions should be momentarily interrupted. Receipt of reserved sequences should not interfere with the detection of 4 consecutive identical fault sequences, provided col_cnt is not violated
3. Transmissions from the DUT are observed at the time the Fault Sequences are being sent.

Comments on Test Results

Test Part	Fault Sequences sent by the Testing Station	Response of the DUT
a	3LF+ 3RF + 1LF	DUT did not cease normal frame transmission
b	3LF + 4RF + 1LF	DUT inhibited frame transmission and transmitted idle sequences.
c	3RF + 3LF + 1RF	DUT did not cease normal frame transmission.
d	3RF + 4LF + 1RF	DUT inhibited frame transmission and transmitted Remote fault ordered sets.
e	3LF + 3 RsvdOS + 1LF RsvdOS = 10:2D|00|00|00|00|0|00|00|00|	DUT inhibited frame transmission and transmitted Remote fault ordered sets.
e	3LF + 4 RsvdOS + 1LF RsvdOS = 10:2D|00|00|00|00|0|00|00|00|	DUT inhibited frame transmission and transmitted Remote fault ordered sets.
f	3RF + 3 RsvdOS + 1RF RsvdOS = 10:2D|00|00|00|00|0|00|00|00|	DUT inhibited frame transmission and transmitted idle sequences.
f	3RF + 4 RsvdOS + 1RF RsvdOS = 10:2D|00|00|00|00|0|00|00|00|	DUT inhibited frame transmission and transmitted idle sequences.
g	4x (LF + RF)	DUT did not cease normal frame transmission.
h	4x (LF + 10:2D|00|00|00|00|0|00|00|00|)	DUT inhibited frame transmission and transmitted Remote fault ordered sets.
i	4x (RF + 10:2D|00|00|00|00|0|00|00|00|)	DUT inhibited frame transmission and transmitted idle sequences.

Test # and Label	Part(s)	Result(s)
46.3.4: Setting of col_cnt	**a-d**	**PASS**

Comments on Test Procedure

Purpose: To verify that the DUT properly uses the col_cnt variable.

Procedure:

1. The DUT was instructed to transmit frames continuously.
2. The Fault Sequences identified in the table below are sent to the DUT. If 4 consecutive identical Fault sequences are received each within 128 columns, frame transmissions should be momentarily interrupted. If a Fault Sequence has been detected, and 128 columns are received without receiving a new Fault Sequence, then the current fault state should be cleared, and frame transmission from the DUT may resume

#	Continuous Test Sequence Pattern	One-shot Test Sequence Pattern
a	64 byte frames with minimum IPG	1LF, 127 ||I||, 1LF, 127 ||I||, 1LF, 127 ||I||, 1LF, 127 ||I||
b	64 byte frames with minimum IPG	1LF, 128 ||I||, 1LF, 128 ||I||, 1LF, 128 ||I||, 1LF, 128 ||I||
a	64 byte frames with minimum IPG	1RF, 127 ||I||, 1RF, 127 ||I||, 1RF, 127 ||I||, 1RF, 127 ||I||
b	64 byte frames with minimum IPG	1RF, 128 ||I||, 1RF, 128 ||I||, 1RF, 128 ||I||, 1RF, 128 ||I||
c	19 ||I||, LF	108 ||I||
d	20 ||I||, LF	108 ||I||
c	19 ||I||, RF	108 ||I||
d	20 ||I||, RF	108 ||I||

LF=Local Fault Sequence RF=Remote Fault Sequence ||I||=A column of valid idle

Note: For error-free operation, the one-shot sequence is transmitted when the looping sequence is at its end. Upon completion of the one-shot, the testing station resumes transmission at the beginning of the loop.

3. Transmissions from the DUT are observed at the time the Fault Sequences are being sent

Comments on Test Results

a. The DUT properly interrupts frame transmission.
b. The DUT properly does not interrupt transmission.
c. The DUT properly inhibited frame transmission and was not observed to resume frame transmission after the 127 ||I|| sequence was received.
d. The DUT inhibited frame transmission, until the one-shot test pattern was sent resulting in the receipt of a 128 ||I|| by the DUT. Upon reception of 128 ||I||, the DUT was observed to resume frame transmission.