Gigabit Ethernet Consortium

**Clause 28 Auto-Negotiation Next page Exchange
Test Suite v2.3 Report**

Kinshuk Sharma   Augest 4, 2017
Microsemi   Report Rev. 1.0

Device Information	
Device Under Test (DUT):	Microsemi Polarfire DVP-102-000481-001
UNH-IOL Device Identification Number:	23941
Miscellaneous:	Port 0

Results Overview
No failures were observed during the testing process. Please see page 4 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:

Test Tool	Version
ANEG Main	Version 1.3
Python Board	Rev. 5a
Traffic Generator	Spirent SmartBits 200: SX-7410B, GX-1420B, SmartWindow version: 7.6
Test Suite	Clause 28 Auto-Negotiation Next Page Exchange, Version 2.3, February 2006
UNH-IOL Test Result ID:	27022

Testing Completed by: Review Completed by:

Benjamin Mager   Stephen D. Johnson
bmager@iol.unh.edu   sjohnson@iol.unh.edu

Initialization Information

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

| Component	Description
Software	Flashpro_PolarFire_v1.1 and Softconsole v5.1
Initialization Script	1G_test.stp
Additional Commands	N/A

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 the UNH-IOL created Python Board. This board allows us to view signaling transmitted and received before establishing a link, along with viewing the type of link signaling a device is transmitting. Some of our testing tools can be viewed at: http://www.iol.unh.edu/consortiums/ethernet/tools/aneg/ Some tests required the use of specific Smart Bits cards to establish a link and send packets.
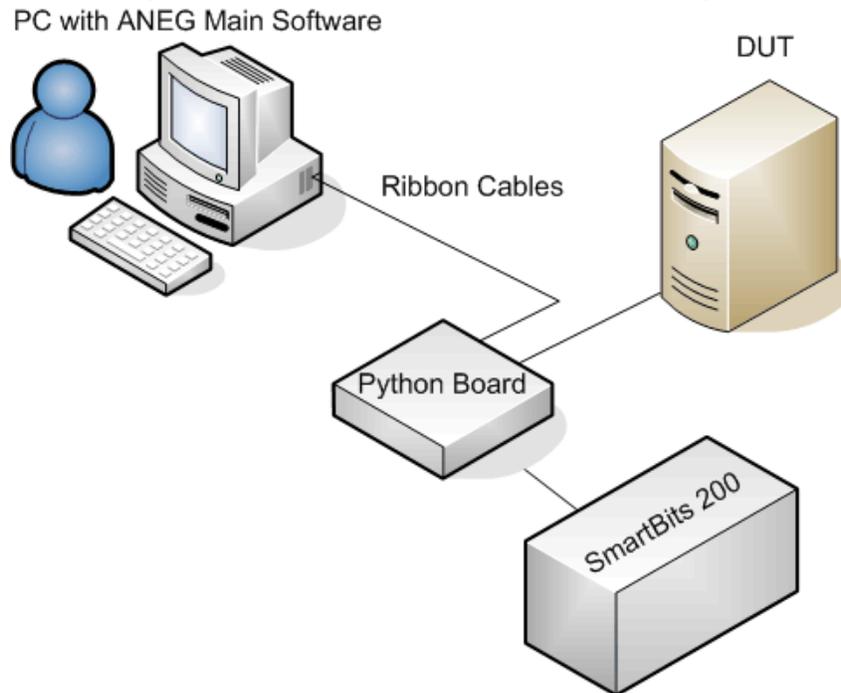
Digital Signature Information

This document was created using an Adobe digital signature. A digital signature helps to ensure the authenticity of the document, but only in this digital format. For information on how to verify this document's integrity proceed to the following site:

http://www.iol.unh.edu/certifyDoc/

If the document status still indicates "Validity of author NOT confirmed", then please contact the UNH-IOL to confirm the document's authenticity. To further validate the certificate integrity, Adobe 6.0 should report the following fingerprint information:

MD5 Fingerprint: 7B 9B 0C 40 55 27 86 C0 F7 4A A3 45 DB F9 40 6E
SHA-1 Fingerprint: 03 59 97 71 28 ED 17 7F 1A 83 C5 D0 1D A8 2B 98 3E 2F 0F E7

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 5.

Test Number and Label	Parts	Results
28.1.1 – Next Page Bit	a	PASS
	b	PASS
	c	PASS
28.1.2 – Transmitted Toggle Bit Value	a	PASS
	b	PASS
28.1.3 – Null Message Page Generation	a	PASS
	b	Info
28.2.1 – Next Page Wait State	a	N/S
	b	PASS
28.2.2 – Next Page Exchange Restart	a	PASS
28.2.3 – Next Page Consistency Match	a	PASS
28.2.4 – Reception of Toggle Bit	a	PASS
28.2.5 – Reception of rx_link_code_word[NP]=0	a	PASS
28.2.6 – Priority Resolution Function	a	PASS

GROUP 1: NEXT PAGE TRANSMISSION

Test # and Label	Part(s)	Result(s)
28.1.1 – Next Page Bit	a	PASS
	b	PASS
	c	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test makes proper use of the Next Page bit throughout the Next Page exchange process.

a. The DUT should keep the NP bit set until the second to last Next Page that it desires to send. The last desired Next Page and all subsequent Null Message Pages should have NP set to 0.
b. When the DUT and the link partner desire to exchange the same number of Next Pages, the DUT should keep the NP bit set in all but the last Next Page sent.
c. When the DUT desires to send more Next Pages than its link partner, the DUT should still keep the NP bit set in all but the last Next Page sent.

Comments on Test Results

a. The DUT kept the Next Page bit set for the first two Next Pages Transmitted. The third page transmitted has NP=0, and the last two pages transmitted were Null Message Pages with NP=0. Thus, the DUT desired to transmit 3 Next Pages.
b. When sent only three Next Pages (1st two with NP=1, 3rd with NP=0), the NP bit sent by the DUT was set in all but the last Next Page.
c. When sent only Null Message Pages with NP=0, the NP bit sent by the DUT was set in all but the last Next Page.

Test # and Label	Part(s)	Result(s)
28.1.2 – Transmitted Toggle Bit Value	a	PASS
	b	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test properly alternates values of 0 and 1 in the Toggle bit position (bit D11) of its Next Pages, and checks to see if its received Next Pages follow this pattern.

a. The value of the Toggle bit in the first Next Page should have the opposite value of bit D11 in the DUT's link code word.
b. The value of the Toggle bit of the Next Page transmitted by the DUT should always take the opposite value of the Toggle bit of the previous Next Page (if the previous value was a 0, it should be a 1, and vice versa).

Comments on Test Results

a. The value of the Toggle bit in the first Next Page transmitted by the DUT was always the opposite of bit D11 in the received Base Page.
b. The DUT properly alternated transmission of pages with the Toggle bit set to 1 and 0.

Test # and Label	Part(s)	Result(s)
28.1.3 – Null Message Page Generation	a	PASS
	b	Info

Expected Results and Procedural Comments

Purpose: To verify that the device under test transmits proper Null Message Pages if it completes sending Message and Unformatted Pages before its link partner.

a. When the link partner desires to send 2 more Next Pages than the DUT, the DUT should transmit validly formed Null Message Pages.
b. INFORMATIVE: When the link partner desires to send the same number of Next Pages as the DUT, the DUT need not terminate the Next Page exchange by transmitting a Null Message Page.

Comments on Test Results

a. Following the last desired Next Page transmission (when the DUT set NP=0), the DUT properly exchanged 2 Null Message Pages (6001 & 6801), ceasing Next Page transmission when the last page exchanged with the link partner had NP=0.
b. The DUT did not transmit a Null Message Page when the link partner sent the same number of Next Pages as the DUT.

GROUP 2: NEXT PAGE RECEPTION

Test # and Label	Part(s)	Result(s)
28.2.1 – Next Page Wait State	a	N/S
	b	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test enters the NEXT PAGE WAIT state when both a device and its link partner desire a Next Page exchange to occur and mr_next_page_loaded=true.

a. While in the COMPLETE ACKNOWLEDGE state, the DUT is sent enough Next Pages with proper Toggle and ACK bit values that would normally cause the DUT to engage in a valid Next Page exchange. Since mr_next_page_loaded is never set to true, the DUT should not enter NEXT PAGE WAIT and remain in the COMPLETE ACKNOWLEDGE state transmitting its initial Base Page with the Acknowledge bit set.
b. While in the NEXT PAGE WAIT state, the DUT is sent enough Next Pages, all with proper Toggle and ACK bit values, in order to put it through the COMPLETE ACKNOWLEDGE state. The DUT should enter the NEXT PAGE WAIT state, begin transmitting its first Next Page, and complete a valid Next Page exchange.

Comments on Test Results

a. The setting / resetting of the mr_next_page_loaded variable was not controllable; therefore, this test could not be performed.
b. The DUT was observed to properly enter the NEXT PAGE WAIT state and begin transmitting its first Next Page.

Test # and Label	Part(s)	Result(s)
28.2.2 – Next Page Exchange Restart	a	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test enters the TRANSMIT DISABLE state from the NEXT PAGE WAIT state if flp_receive_idle becomes true.

a. The DUT is sent 4 FLPs without the Acknowledge bit set followed by 8 FLPs with the Acknowledge bit set, such that the DUT begins sending its first Next Page. The DUT is then sent 4 FLPs containing a Next Page. The DUT should enter the TRANSMIT DISABLE state upon expiry of the nlp_max_timer.

Comments on Test Results

a. The DUT was observed to properly cease transmission for approximately break_link_timer and restart Auto-Negotiation.

Test # and Label	Part(s)	Result(s)
28.2.3 – Next Page Consistency Match	a	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test performs a consistency match test on received Next Pages.

a. The DUT is sent a series of FLPs with the NP bit set to put it through the COMPLETE ACKNOWLEDGE state. Immediately following, the DUT is sent 3 Next Pages without the Acknowledge bit set, and 3 Next Pages containing different abilities with the Acknowledge bit set. The DUT should cease transmission of FLPs once the inconsistent FLPs have been received.

Comments on Test Results

a. The DUT properly detected consistency_match=false and terminated transmission of FLPs, even if an FLP was being transmitted.

Test # and Label	Part(s)	Result(s)
28.2.4 – Reception of Toggle Bit	a	PASS

Expected Results and Procedural Comments

Purpose: To verify that the device under test properly checks to see if its received Next Pages alternate the value of the Toggle bit, and that the DUT does not accept pages that have not alternated the Toggle bit.

a. The DUT is sent a series of FLPs with the NP bit set to put it through the COMPLETE ACKNOWLEDGE state. A series of Next Pages are then sent with the Toggle bit set to the proper value followed by the same Next Pages with the Acknowledge bit set to again put the DUT through COMPLETE ACKNOWLEDGE. The second series of Next Pages (including those with the Acknowledge bit set) that are sent to the DUT have the same value of the Toggle bit as the previous page. A third series of Next Pages are then sent that have the Toggle bit set to the correct value. The DUT should not leave the NEXT PAGE WAIT state on reception of the second series of Next Pages, but should accept the last page and continue with the Next Page exchange.

Comments on Test Results

a. The DUT properly received only those pages which had the correct value for the Toggle bit. The DUT properly remained in the NEXT PAGE WAIT state for the second series of Next Pages.

Test # and Label	Part(s)	Result(s)
28.2.5 – Reception of rx_link_code_word[NP]=0	a	PASS
Expected Results and Procedural Comments		

Purpose: To verify that the DUT will properly complete a Next Page exchange when rx_link_code_word[NP]=0 while tx_link_code_word[NP]=0 in the ACKNOWLEDGE DETECT state.

a. The DUT is sent a series of FLPs with the NP bit set to put it through the COMPLETE ACKNOWLEDGE state. This transmission is followed by a series of Next Pages with the Next Page bit set to one, until the DUT has no more pages to send and sets its Next Page bit to zero. There will be a time in the Next Page exchange in which the DUT is receiving pages with the NP bit set to one and is transmitting Null Message Pages with the NP bit set to zero. When the DUT has entered the COMPLETE ACKNOWLEDGE state, the NP bit is set to zero in the transmitted FLP so that the DUT receives the new page while still in the COMPLETE ACKNOWLEDGE state. The DUT should not complete the Next Page exchange, and should enter NEXT PAGE WAIT.

Comments on Test Results

a. The DUT properly entered NEXT PAGE WAIT and continued the Next Page exchange.

Test # and Label	Part(s)	Result(s)
28.2.6 – Priority Resolution Function	a	PASS
Expected Results and Procedural Comments		

Purpose: To verify that the device under test properly configures the highest common denominator (HCD) technology for the transmitted technologies in a link code word after a Next Page exchange has occurred.

a. In every case, the DUT should resolve the highest priority possible based on the priority resolution function for the technologies advertised. Note, the only test scenario conducted was advertising 1000BASE-T full duplex to the DUT. Once negotiation was complete, the device was then provided a stream of frames. The device was then verified to be in full duplex mode by guaranteeing that the DUT is transmitting a frame while simultaneously receiving a frame.

Comments on Test Results

a. In every case, the DUT was observed to resolve the highest priority possible based on the priority resolution function for the technologies advertised.