



University of New Hampshire
**InterOperability
Laboratory**

DSL & G.fast TESTING PROPOSAL

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ABOUT THE UNH-IOL

Since 1988, we have enabled multi-vendor interoperability, conformance testing and developed custom testing solutions while preparing students for careers within the computer and engineering industries. Over the years we have grown steadily into one of the premier independent labs for new technologies, allowing us to become a thought leader within the data and networking world. For more information, visit iol.unh.edu.

We are fully owned by the University of New Hampshire, the lab receives 100% of its funding from commercial companies in exchange for professional and testing services. Testing services include areas such as Ethernet, xDSL, Storage, Wireless, and Internet Protocol (including IPv6).

MEMBERSHIP BENEFITS

We offer collaborative test programs representing industry leaders in network equipment, test equipment, industry forums and service providers for the mutual benefit of all participants. By bringing together the key players of networking technologies, we provide services to industries that are critical to driving multi-vendor interoperability and increasing user confidence.

Why join the UNH-IOL?

- Increased confidence in your product
- Save money by reducing time to market
- Use industry recognized test reports for sales and certifications
- Access to custom test equipment and software saving you time and money
- Ability to shape our road-map to better serve industry needs
- Ability to test to multiple standards against globally recognized products all in one lab
- Attend annual group testing events at our state of the art, 28,000 square foot facility

PROPOSED PROCESS

Since 1998 we have been testing DSL technologies to ensure interoperability and standards conformance. The process that has been used by companies to achieve their DSL testing results is stated below.

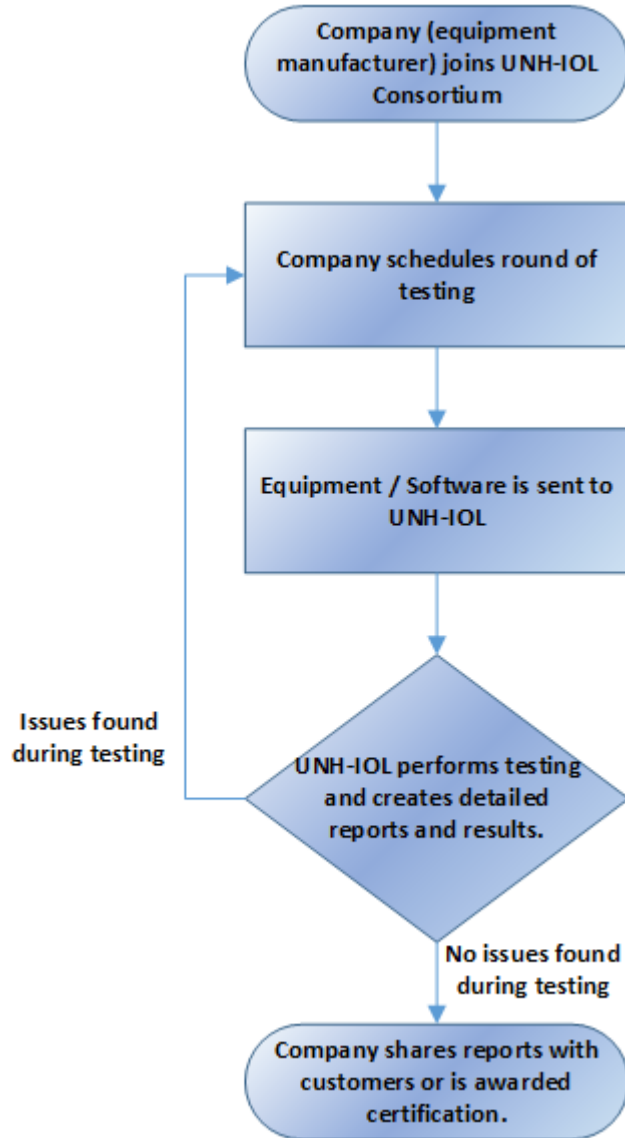



Figure 1: UNH-IOL General Testing Process

SAMPLE TEST REPORT

When your products are tested at the UNH-IOL, you will receive a detailed report of the results. Our attention to detail, thorough procedures, and dedication to accuracy have made our reports a trusted source of third party validation and product analysis. Reports are available from our private, members only website. All formal reports are provided in a protected, not editable PSD format. A sample report format is illustrated below:



University of New Hampshire
InterOperability Laboratory

DSL Consortium
Broadband Forum TR-115 Report

UNH-IOL —121 Technology Drive, Suite 2—Durham, NH 03824—+1-603-862-2911
 Consortium Manager Lincoln Lavioie lavioie@iol.unh.edu +1-603-874-2755
 Tester Jane Doe jdoe@iol.net 555-5555
 Report Author Jane Doe jdoe@iol.net 555-5555
 Report Reviewed by Lincoln Lavioie lavioie@iol.net +1-603-874-2755

Revision 1.0

DSL.Tech
Hollywood Hills
California
DSL.Tech@DSL.net
555-5555

Mr. DSL:

Enclosed are the results from the Broadband Forum's VTU-68. The testing was performed according to Version which may be downloaded from the following address:
<http://www.broadband-forum.org/te>
<http://www.broadband-forum.org/technical/>
<http://www.broadband-forum.org/technical/s>

If you have any questions about the test procedures jane@dsl.net, or by phone at 555-5555.

Sincerely,
Jane Doe

Reviewed By:
Lincoln Lavioie

Broadband Forum TR-115 (TR115) v. 2.0
DSL.Tech VTU-68 (IOL ID: 00001)

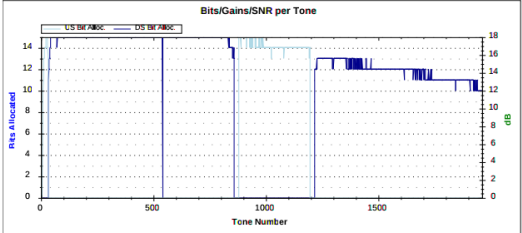
Test Summary

Test Number	Test Name	Result
Section 5 – Physical Layer Tests		
5.1	Interleaving Delay Test	PASS
5.2	Impulse Noise Protection Test	PASS
5.4.1	Bitswap Test	PASS
5.4.2	Wideband Bitswap Test	PASS
5.4.3	Seamless Rate Adaptation Test	
5.5	Loop Diagnostic Mode Test	
5.6	VTU-R Inventory Test	
5.7.1	PSD Mask Test	
5.7.2	Total ATP Test	
5.7.3	RFI Notch Configuration Test	
5.7.4	Downstream Power Back-off Test	
5.7.5	Upstream Power Back-off Test	
5.8	Longitudinal Conversion Loss Test	
5.10	Dying Gasp Test	
Section 6 – System Level Tests		
6.1	64/65-Octet Encapsulation Far-End PTM-TC Performance Test	
Section 7 – Testing Configuration Parameters and Performance Monitoring Counters		
7.1	Configuration Parameter MINSNRM	
7.2	Configuration Parameter TARSNRM	
7.3	Configuration Parameter PSDMASK	
7.4	Configuration Parameter VDSL2-CARMASK	
7.5	Configuration Parameter MAXNOMATP	
7.6	Performance Monitoring Counters for Code Violations	
7.7	Performance Monitoring Counter for SES	
7.8	Performance Monitoring Counter for Unavailable Seco	
7.9	Performance Monitoring Counters for Full initialization	

Broadband Forum TR-115 (TR115) v. 2.0
DSL.Tech VTU-68 (IOL ID: 00001)

Figure 1: Bitswap Upstream Interleaved Profile US0

Before Bitswap:



After Bitswap:

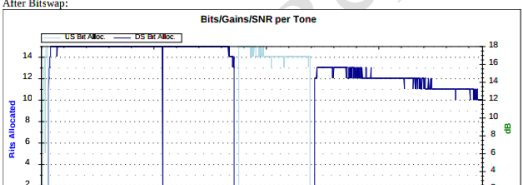


Figure 2: UNH-IOL Sample Report

All reports are certified in digital format to ensure that your report is genuine and uncompromised. Testing with us gives you the confidence and peace of mind you want and that your customers demand.

MEMBERSHIP DETAILS

The DSL & G.fast testing groups offer multiple membership and pay-per-testing options, to help member companies engage with the groups in the most cost effective and efficient ways, while still providing the highest quality testing services.

Option 1: DSL Testing Membership	Annual Fees
<ul style="list-style-type: none"> VDSL2, ADSL2/2plus, and ADSL performance testing, including BBF TR-067, TR-100, TR-114 test plans 	
<ul style="list-style-type: none"> VDSL2 & ADSL2/2plus functionality testing, including BBF TR-105 and TR-115 test plans 	
<ul style="list-style-type: none"> Bonded system testing, including the BBF TR-273 test plan 	
<ul style="list-style-type: none"> Calix Compatible Testing, required to join their online partner program 	
<ul style="list-style-type: none"> Custom testing, based on member's requirements or test plans 	
<ul style="list-style-type: none"> Schedule one test slot per membership on a first come first serve basis. (See Proposed Process) 	
<ul style="list-style-type: none"> Support for testing of several products, tested throughout the membership year 	
<ul style="list-style-type: none"> Free regression testing 	
<ul style="list-style-type: none"> Participation in all DSL focused plugfests hosted by the UNH-IOL, including VDSL2 G.vector events 	
<ul style="list-style-type: none"> Overtime options for expedited testing (subject to additional fees) 	
DSL MEMBERSHIP TOTAL	\$22,000.00 USD

Option 2: G.fast Testing Membership	Annual Fees
<ul style="list-style-type: none"> G.fast certification testing, according to BBF G.fast Certification Program according to the ID-337 test plan ¹ 	
<ul style="list-style-type: none"> G.fast interoperability testing² 	
<ul style="list-style-type: none"> Custom testing, based on member's requirements or test plans 	
<ul style="list-style-type: none"> Schedule one test slot per membership on a first come first serve basis. (See Proposed Process) 	
<ul style="list-style-type: none"> Support for testing of several products, tested throughout the membership year 	
<ul style="list-style-type: none"> Free regression testing 	

¹ The Broadband Forum is currently in the process of creating the G.fast Certification Program, its associated test plans, and testing process. The UNH-IOL has been selected as the official certification laboratory for this program and is working directly with the forum to launch this program as quickly as possible. The Expect launch is by the end of 2016.

² Basic interoperability testing is available to consortium members interested in preparing their implementation for certification testing.

• Participation in all G.fast focused plugfests hosted by the UNH-IOL	
• Overtime options for expedited testing (subject to additional fees)	
G.FAST MEMBERSHIP TOTAL	\$22,000.00 USD

Option 3: Joint DSL & G.fast Testing Membership	Annual Fees
• All benefits listed above of DSL Membership ³	
• All benefits listed above of G.fast Membership ⁴	
DSL & G.FAST MEMBERSHIP TOTAL	\$36,000.00 USD

Option 4: DSL & G.fast Pay per Test Fees	Fees (Note 1)
• BBF TR-067 ADSL Performance Tests - Annex A North American Loops	\$2,000.00 USD
• BBF TR-067 ADSL Performance Tests - Annex A European Loops	\$2,000.00 USD
• BBF TR-067 ADSL Performance Tests - Annex B	\$2,000.00 USD
• BBF TR-100 ADSL2/2plus Performance Tests - Annex A North American Loops	\$2,000.00 USD
• BBF TR-100 ADSL2/2plus Performance Tests - Annex A European Loops	\$2,000.00 USD
• BBF TR-100 ADSL2/2plus Performance Tests - Annex B	\$2,000.00 USD
• BBF TR-100 ADSL2/2plus Performance Tests - Annex J	\$1,500.00 USD
• BBF TR-105 ADSL2/2plus Functionality Tests	\$6,000.00 USD
• BBF TR-114 VDSL2 Performance Tests - Annex A	\$2,000.00 USD
• BBF TR-114 VDSL2 Performance Tests - Annex B	\$2,000.00 USD
• BBF TR-115 VDSL2 Functionality Tests	\$6,000.00 USD
• BBF TR-127 Dynamic Testing of Splitters and In-line Filters with xDSL Transceivers	\$4,000.00 USD
• BBF TR-273 Testing of Bonded, Multi-Pair xDSL Systems	\$5,000.00 USD
• Rate vs. Reach Interoperability Test	\$2,500.00 USD
• Bonded Rate vs. Reach Interoperability Test	\$2,500.00 USD
• On-line Reconfiguration (OLR) Interoperability Test	\$3,000.00 USD

³ Fee includes the cost of one round of testing, which may be limited to a single combination of devices for interoperability / performance tests.

⁴ Fee includes the cost of one round of testing, which may be limited to a single combination of devices for interoperability / performance tests.

• Calix Partner Testing	\$6,000.00 USD
• BBF G.fast Certification Testing	TBD

USAGE AGREEMENT AND CHARTERS

Each members agrees to abide by at least two documents when participating in testing. The UNH-IOL Usage Agreement, which provides basic governance of the UNH-IOL operations, non-disclosure, use of results, etc. The Consortium Charter defines the specific requirements of each consortium, its area of focus, scheduling policies, and other technology specific aspects.

- <https://www.iol.unh.edu/sites/default/files/charters/unh-iol-usage-agreement.pdf>
- <https://www.iol.unh.edu/sites/default/files/charters/dsl-charter.pdf>
- <https://www.iol.unh.edu/sites/default/files/charters/gfast-charter.pdf>

SUMMARY

The UNH-IOL will provide your company the highest level of service while testing in our neutral environment as well as access to one of the largest test beds in industry. Selection by your company will significantly reduce costs to alternative testing efforts as well as reduce time to market. Please let us know if you have any further questions regarding this testing proposal or any of our services.

CONTACT INFORMATION

For additional information, please contact:

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Mobile: +1-603-674-2755