

UNH InterOperability Lab 10 Gigabit Ethernet Consortium

**Our Experience, Insight,
and Lessons Learned**

**Presented by Bob Noseworthy
10GEC Manager**



10GEC THE 10 GIGABIT ETHERNET CONSORTIUM

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About the IOL / 10GEC

- **IOL:**
 - **Over 14 years experience**
 - **100% Industry funded by >330 Memberships**
 - **14 Technology Focused Consortia**
- **10GEC:**
 - **11 Members and growing**
 - **Testing 10GE Equipment since July'01**
 - **Involved with all 10GEA Hotstages & Tradeshows**
 - **Active with Standards effort since 1st meeting**

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What about Bob (About the speaker)

- **7 years experience at IOL**
- **M.S. Electrical Engineering**
- **Developed / performed testing for Ethernet from 10Megabit through 10Gigabit**
- **Involved in IEEE802.3 since 1st meeting of HSSG for Gigabit Ethernet**
- **FEA, GEA, and 10GEA involvement**

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Experience / Insight

Dave Dobbins of Telecom Ottawa said it best

- “Things We’ve Learned”
 - **Don’t assume anything**
 - **Test, test, test, then test again**
 - **Proprietary isn’t good**

(quoted with permission)

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Experience / Insight

- A green light might guarantee you
 - 100Mbps, 1000Mbps, or even 10Gbps
- But what's the BER? (Bit Error Ratio)
- Spec for 10GE is 1×10^{-12} BER
 - 1 error every 1.66 minutes

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“Don’t assume anything”

- **Products that seem to work today, may not work with future products.**
 - **History points to early solutions which later proved to be flawed / non-compliant to standard / non-interoperable**
 - **Fortunately today, multiple independently developed interoperable 10GE components exist**
- **The Price of InterOperability is Eternal Vigilance**
 - **Only by detailed testing can future problems be averted**
 - **Clear, Strong and Supported Standards are essential**

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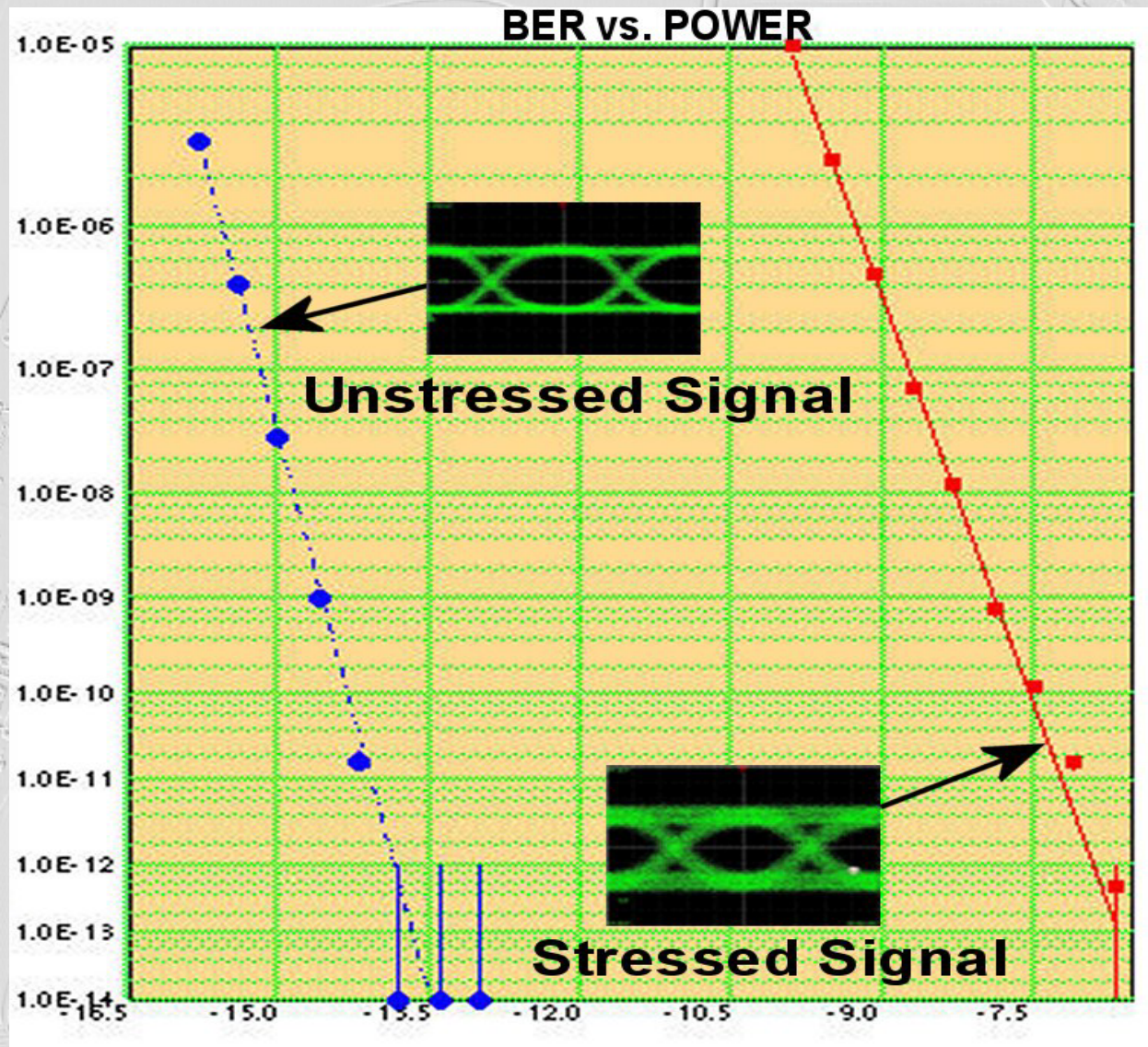
“Test, test, test, then test again”

- **IEEE 802.3ae Clause 52**
 - Defines the 10GE Serial Optical Physical Layer
 - 43pages, 26 devoted to T&M (60.5%)
- **Excerpt from 52.9.10.3:**
 - (The Stressed Receiver Conformance Test does) guarantee that a receiver meeting the requirements of this test will operate with the worst-case optical input.



Stressed Eye Test Results

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“Proprietary isn’t good”

- **Need for verification at all networking layers:**
 - **Media**
 - **Physical Layer Signaling**
 - **Channel Coding (XAUI PCS / 64B/66B PCS)**
 - **Media Independent Interface Testing**
 - **XGMII, XGXS (XAUI), Xenpak, XPAC, etc**
 - **Local / Remote Fault Handling**
 - **Media Access Control (MAC)**
 - **MAC Control (Flow Control / PAUSE)**

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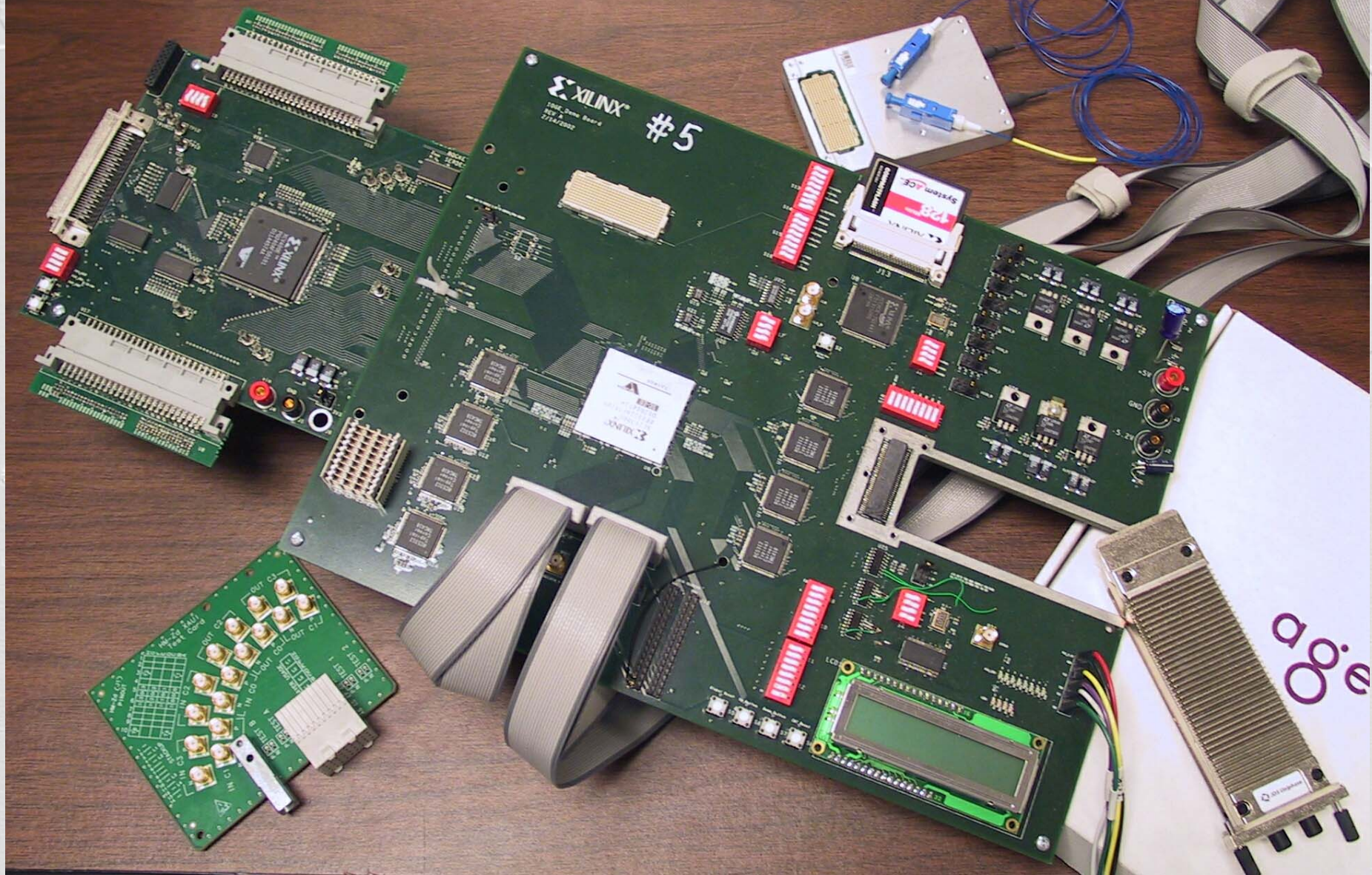
Experience / Insight

- **To perform these tests, a multitude of products exist from:**
 - Agilent, Circulant, IneoQuest, Ixia, Lecroy, Spirent, Tektronix, Wavecrest & others
- **In our experience, a niche set of knowledge intensive tests requiring custom tools are needed**
 - Working with Xilinx to develop tools to enable XAUI PCS, 64B/66B PCS, & RS/Fault testing

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Lessons Learned

- **Do not assume anything –**
 - Obtaining/exceeding the BER spec on the physical channel/signaling is *the* significant challenge of 10GE
- **For 10GE to work in the enterprise LAN**
 - Multi-vendor ports across std. defined distances must ‘plug-and-play’ (not an engineered links)
- **LAN User’s mindset with 10GE must be respectful**
 - Exhibit great fiber care / management / cleaning
 - ER/EW links can literally burn the end of a dirty fiber

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Lessons Learned

- **Proprietary isn't good –**
 - **Make sure your user needs are reflected through yourselves or your vendor's representation in the Standardization process**
 - **OAM being defined now (within EFM effort)**
- **Remote / Local Fault – simple and easy (this isn't Auto-Negotiation)**

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Lessons Learned

- **Test, test, test, then test again**
 - The need never ceases – IOL still tests 10Base-T!
- **Next UNH IOL 10GEC Group Test Period is a multi-week event in January 2003.**

For info:

– www.iol.unh.edu/consortiums/10gec

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