IEEE802.3ap

RX Interference Tolerance Test Results

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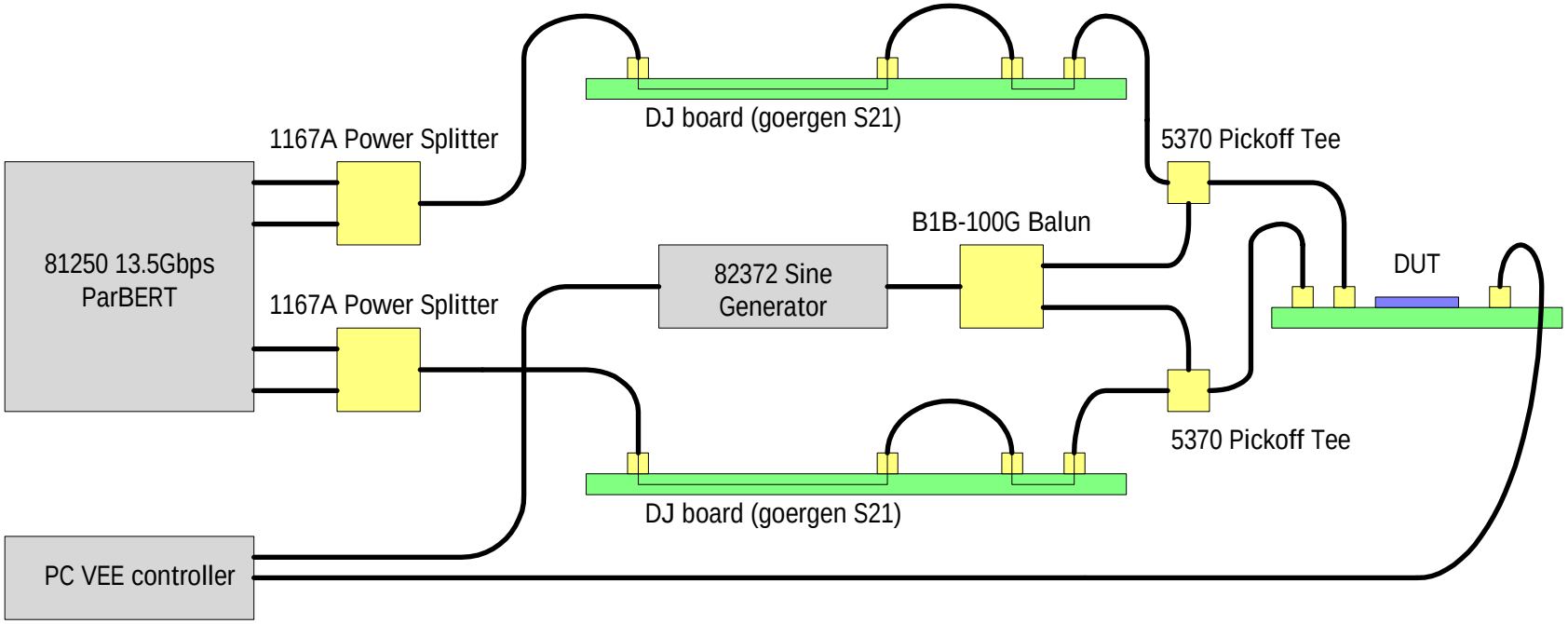
Objective

- To perform Interference Tolerance testing as specified in IEEE802.3ap Draft 0.9 Annex 72A and provide preliminary EO (Extrapolation Offset) and BREIT (Baseline Relative Extrapolated Interference Tolerance) values for 10GBASE-KX, KX4, and KR
- Explain Equipment Setup and Operation for Interference Tolerance Testing
- Review Results
- Review Conclusions and Next Steps

Equipment Setup and Procedure



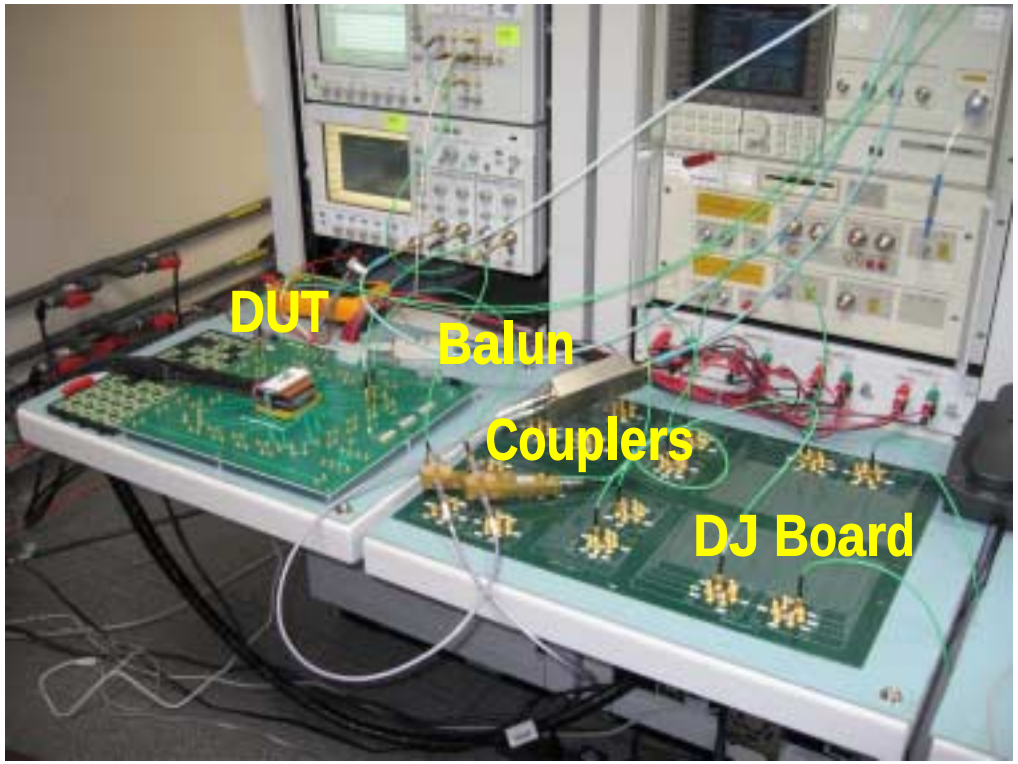
1. Generate TX compliant data pattern (we used 4 channels on a 13.5 Gbps ParBERT)
2. Use DJ board to frequency attenuate signal to Goergen SDD21 line
3. Use pickoff tees to sum in adjustable aggressor sine wave to data pattern
4. Use PC to control aggressor amplitude and monitor BER from DUT BIST

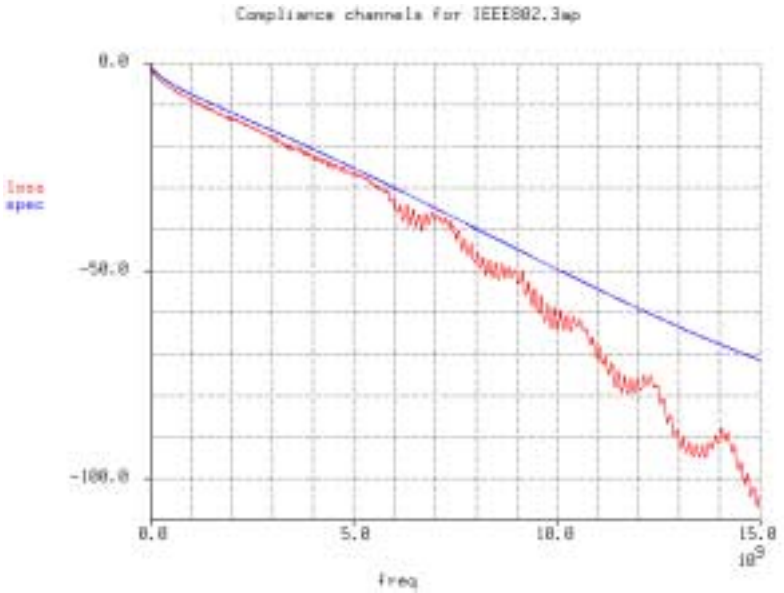
Equipment Setup

Complete Interference Tolerance Test Bench Station

Equipment Setup

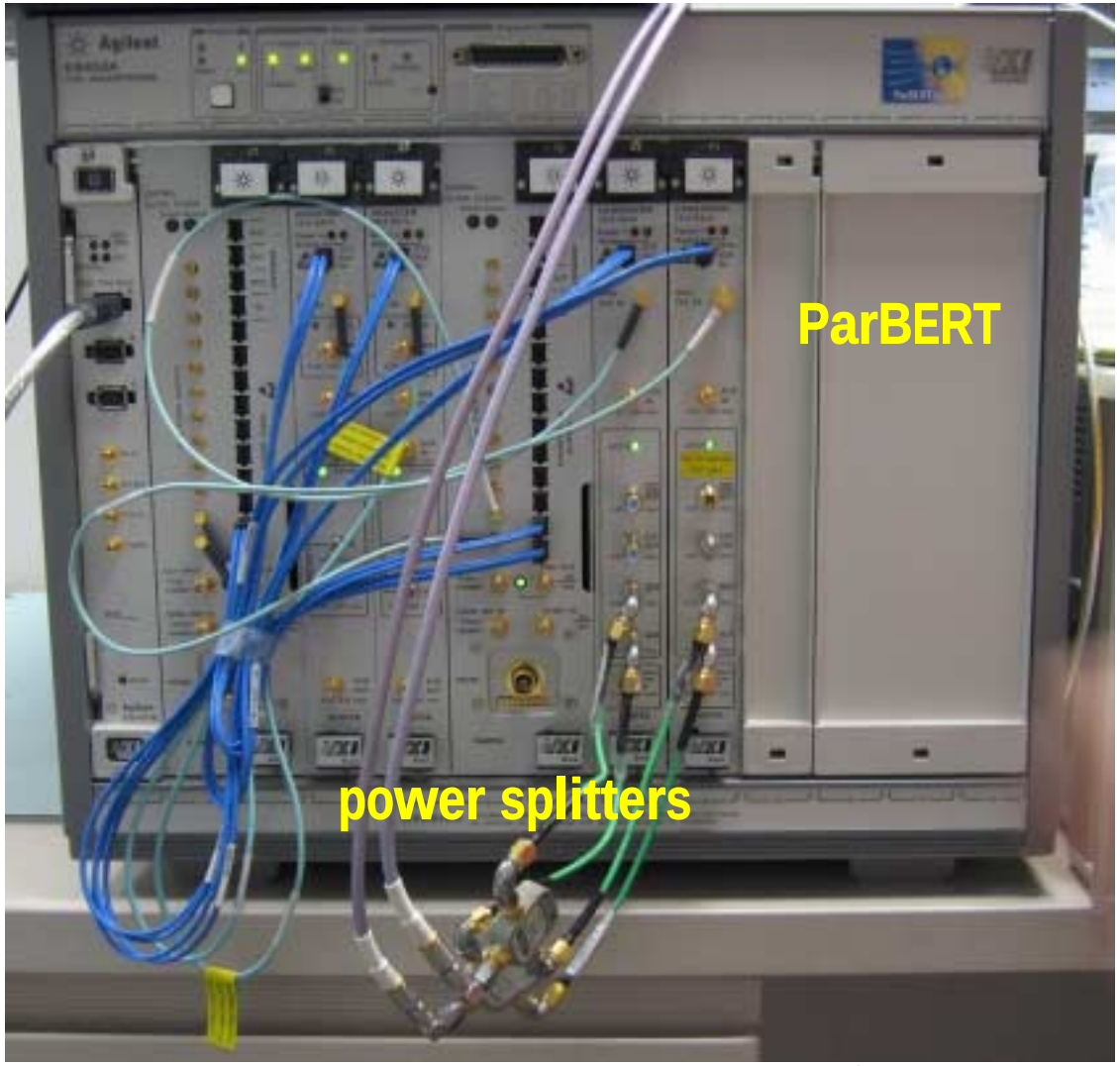
Boards, Baluns, Couplers, Cables

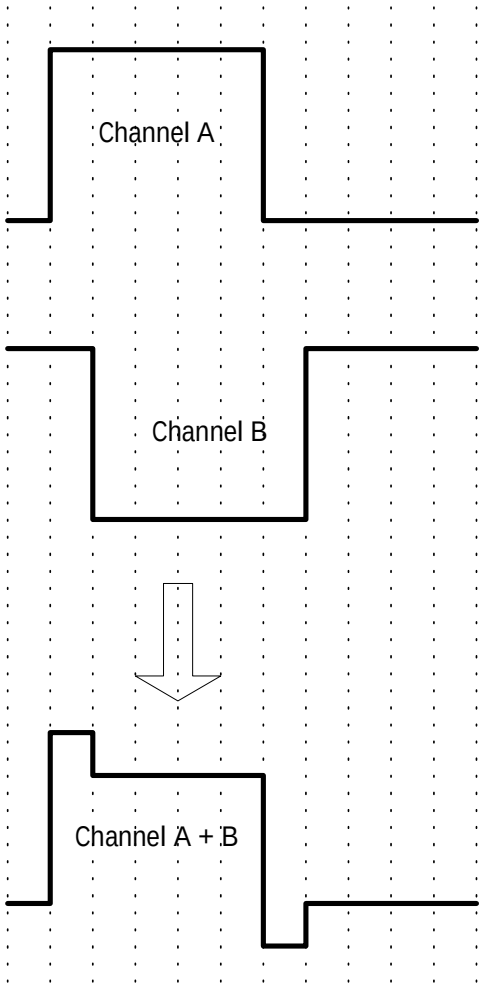




Equipment Setup continued

ParBERT Pattern Generation

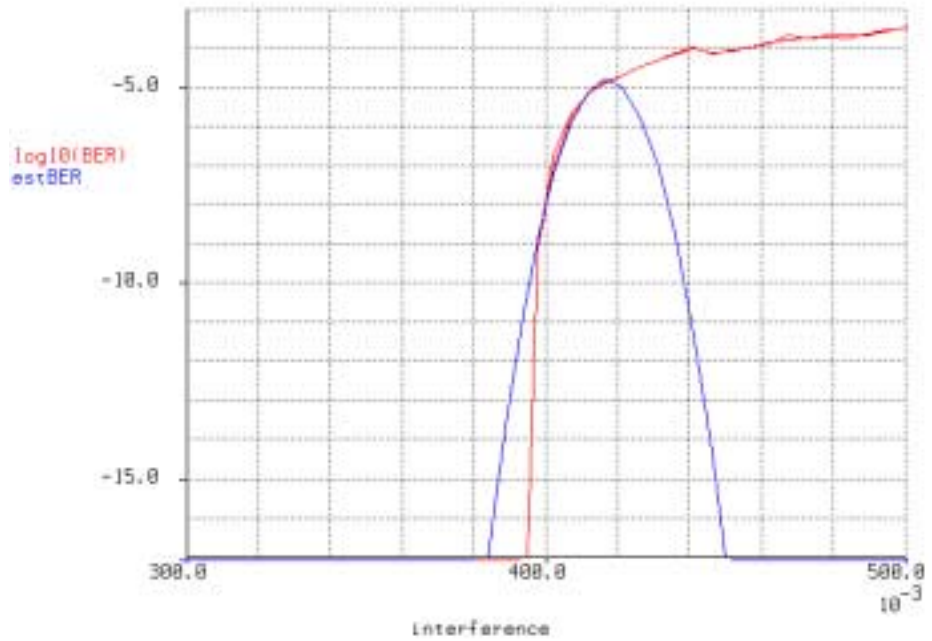




Interference Tolerance BER Measurements

10GBASE-KX (1.25Gbps serial data)

- Board Attenuation: Goergen SDD21 equivalent traces
- Sine Aggressor Frequency: 625MHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm

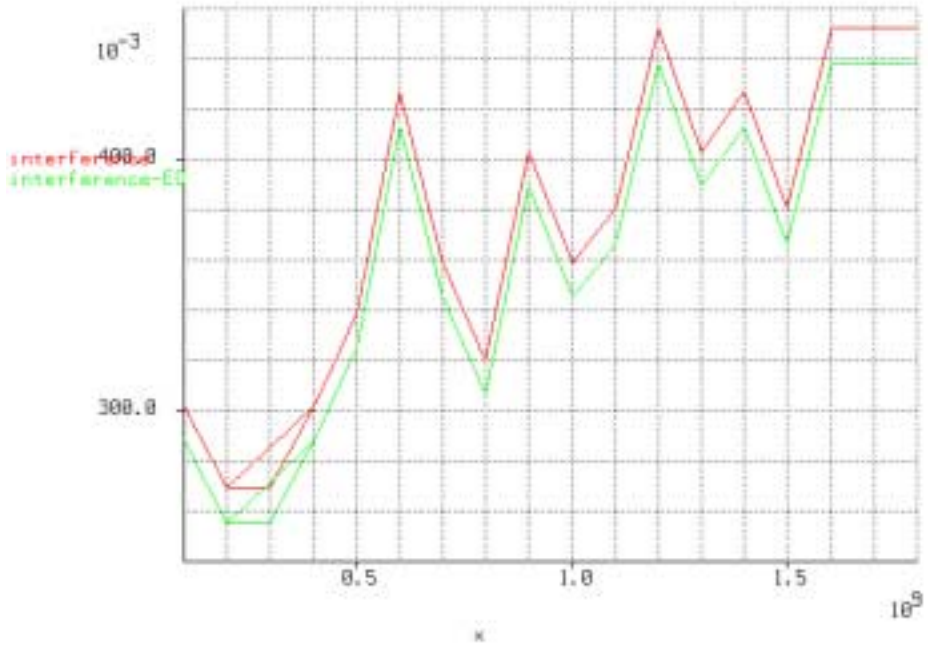


Extrapolation Offset (EO) at BER=1E-17: **13.7mVpp**

Interference Tolerance Measurements

10GBASE-KX (1.25Gbps serial data)

- Board Attenuation: Goergen SDD21 equivalent traces
- Sine Aggressor Frequency Sweep: 100MHz to 1.875GHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm



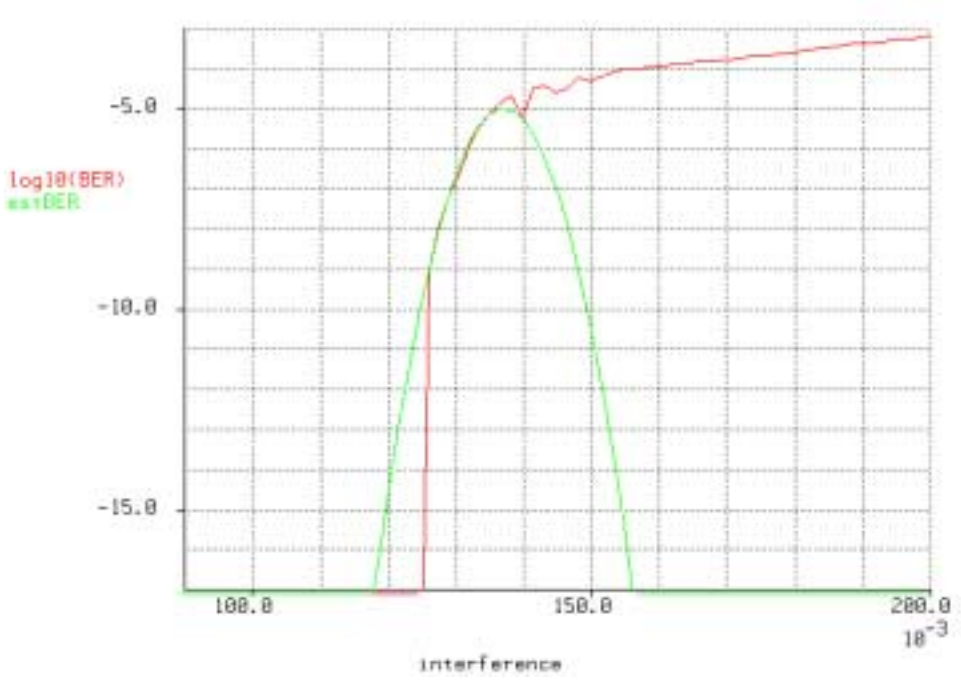
Measured Interference Tolerance = **270mVpp**

Baseline Relative Extrapolated Interference Tolerance (BREIT) = **255mVpp**

Interference Tolerance BER Measurements

10GBASE-KX4 (3.125Gbps serial data by 4 lanes)

- Board Attenuation: Goergen SDD21 equivalent traces
- Sine Aggressor Frequency: 1.5625GHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm

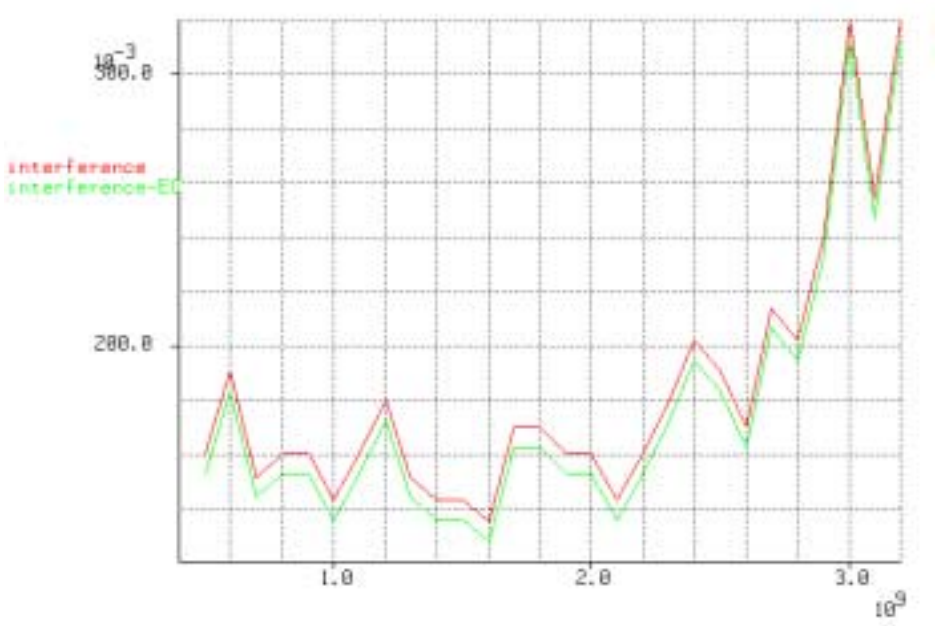


Extrapolation Offset (EO) at BER=1E-17: **7.4mVpp**

Interference Tolerance Measurements

10GBASE-KX4 (3.125Gbps serial data by 4 lanes)

- Board Attenuation: Goergen SDD21 equivalent traces
- Sine Aggressor Frequency Sweep: 500MHz to 3.125GHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm



Measured Interference Tolerance = **135mVpp**

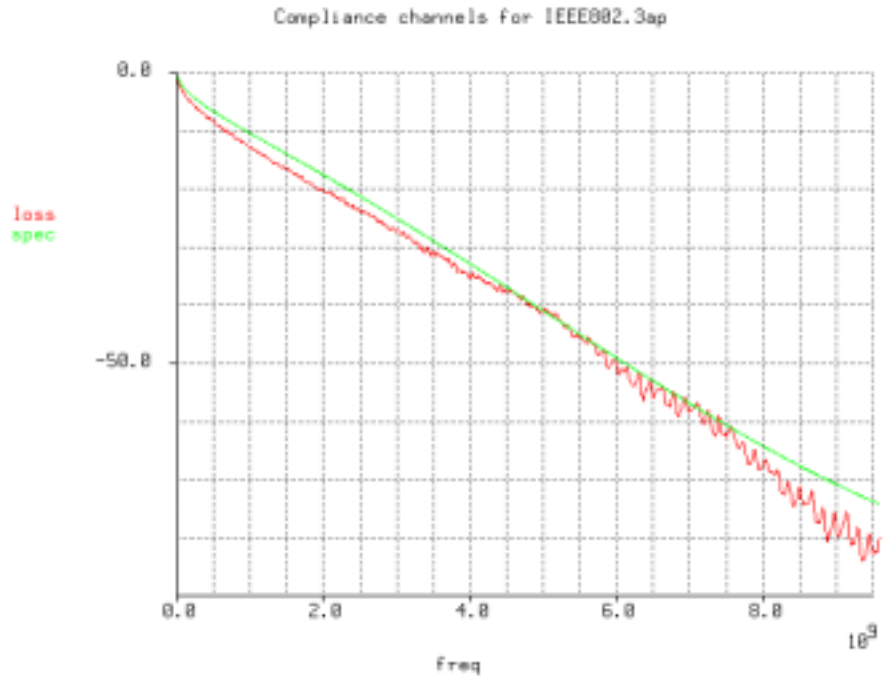
Baseline Relative Extrapolated Interference Tolerance (BREIT) = **130mVpp**

Interference Tolerance Measurements

10GBASE-KR approximation attempt (6.25Gbps serial data)

- Board Attenuation: Traces cascaded to mimic 5GHz Goergen attenuation at 3GHz (see plot below)
- Sine Aggressor Frequency: 3.125GHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm

No reason to create BER extrapolation because of too low interference tolerance amplitude....see next page

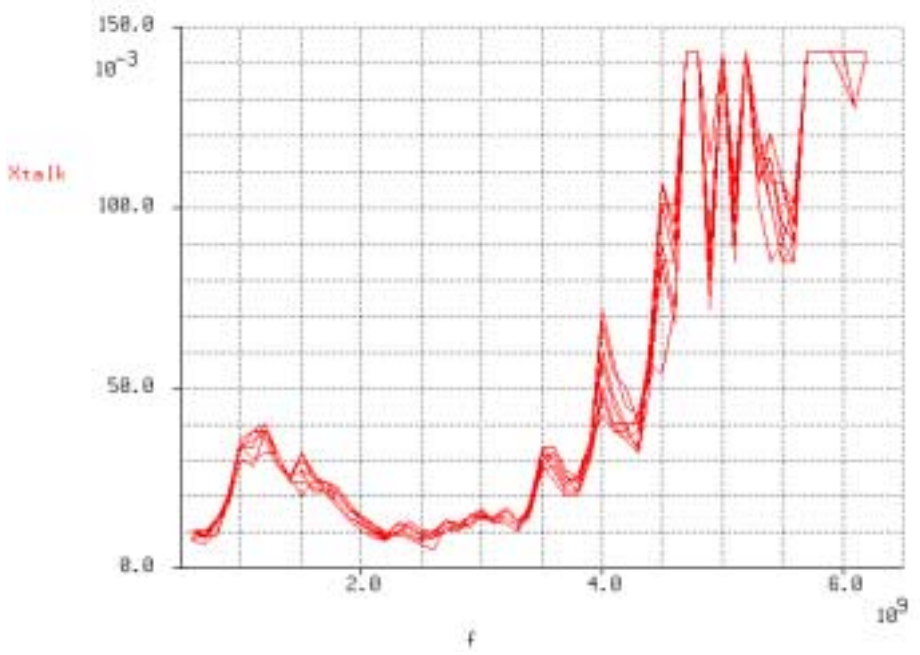


Extrapolation Offset (EO) at BER=1E-17: **N/A**

Interference Tolerance Measurements

10GBASE-KR approximation attempt (6.25Gbps serial data)

- Board Attenuation: Traces cascaded to mimic 5GHz Goergen attenuation (-26dB) at 3GHz
- Sine Aggressor Frequency Sweep: 600MHz to 6.3GHz
- Sine Aggressor Amplitude Sweep: -15dBm to 15dBm



Measured Interference Tolerance = **15mV**

Baseline Relative Extrapolated Interference Tolerance (BREIT) = **N/A**

Results Summary Table

Port type	F_start	F_end	EO	Int Tol	BREIT
1.25	100M	1.875G	13.7mVpp	270mVpp	255mVpp
3.125	500M	3.125G	7.4mVpp	135mVpp	130mVpp
6.25	600M	6.25G	TBD	15mVpp	TBD
10.3125	1000M	10.3125G	TBD	TBD	TBD

Conclusions

- Test method provides good metric to closely couple RX and channel performance requirements
- Test times are relatively fast (~10 minutes for both BER and Int Tol)
- Repeatability was good.
- EO and BREIT limits established for KX and KX4
- Sine wave generator became unleveled at higher frequencies and amplitudes partially due to pickoff tee return loss. Possibly purchase dual output sine wave generator.
- KR limits still TBD. Possibly measure Int Tol and BER on Virtex2 ProX