50m Link Measurements for Gigabit Ethernet over Plastic Optical Fiber

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Agenda

- Objectives
- Used components
- Measurement setup
- Measurement results

Disclaimer

- Technical characteristics provided in this presentation are limited with regards to sample size.
- Variations of e.g. manufacturing processes are not considered.
- Worst case temperature conditions are covered in this presentation.

Objectives

To present laboratory 50m link measurements of a 1Gbps system based on POF across temperature (0, 25, 70°C) of available products for technical feasibility assessment.

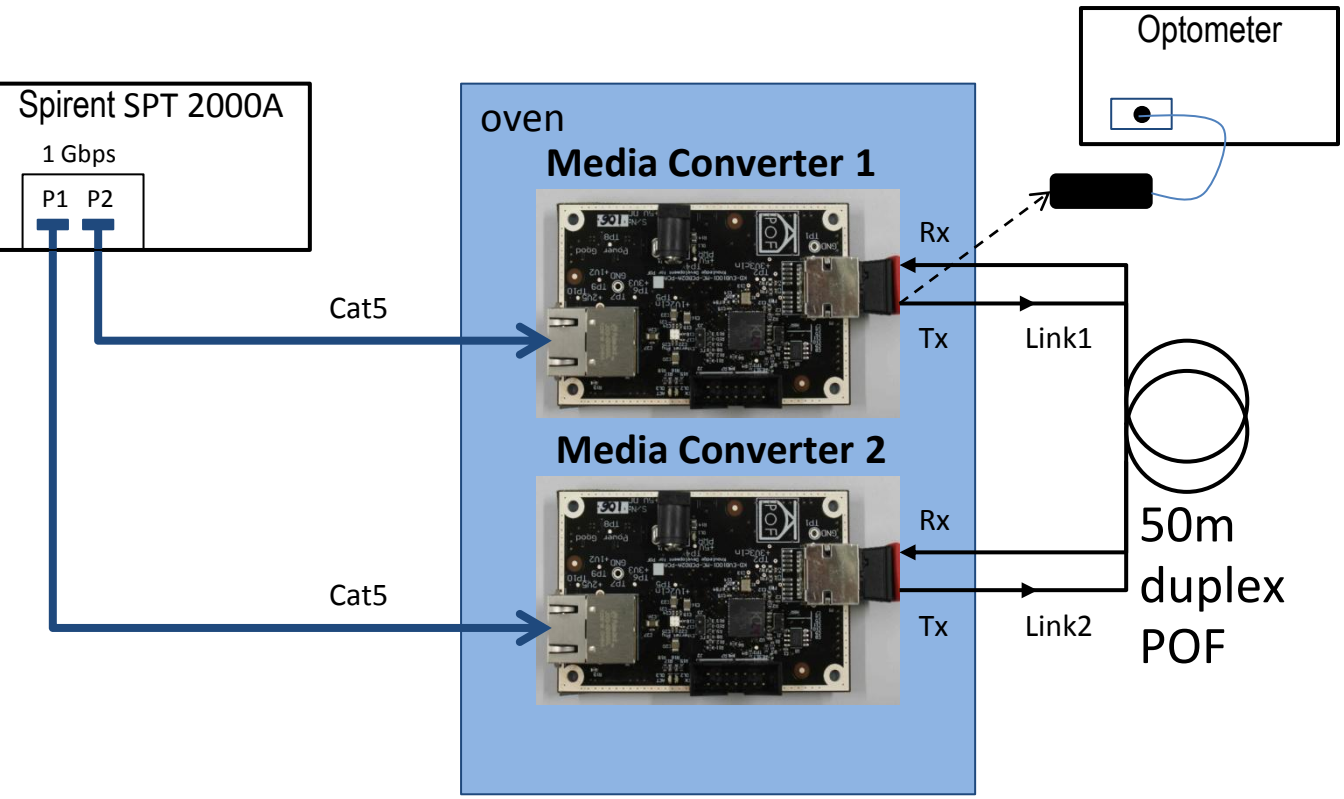
Used components

- Avago Tx with linear driver IC and 650nm LED (same which is used for MOST150 automotive)
- Avago Rx with linear amplifier IC and PD
- Standard step index POF NA 0.5, typical attenuation of 0.19dB/m

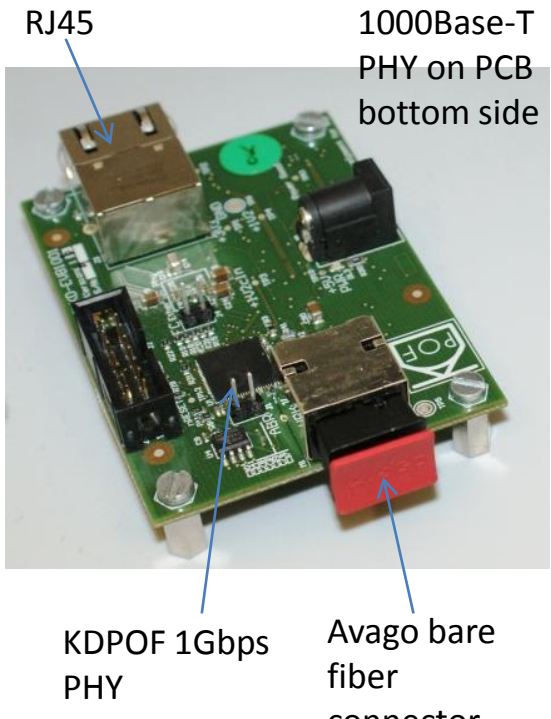
- Gigabit Phy TRX from KDPOF with following characterisitics/properties:

  - Full duplex 1Gbps at GMII interface
  - Coded modulation based on Multi-Level Coset Code of 3 levels
  - 16-PAM baseband modulation built on 7bits/2D RZ^2 QAM modulation
  - Symbol rate = 312.5 MSps
  - Spectral efficiency = 3.3145 bits/s/Hz/dim
  - Component codes of 1st and 2nd MLCC levels based on shortened BCH codes over Galois field of GF(2^11)
  - MLCC net coding gain = 6.7 dB at BER = 10^-12
  - Linearizer based on low cost adaptive Volterra filtering implemented in the receiver
  - Channel equalization based on adaptive Tomlinson-Harashima Precoding for ISI compensation plus noise whitening

Measurement setup (1/2)



Used Media Converter



Test Parameters:

Spirent: 100% Payload, Fs = 1518

duration = 30 min.

Temperatures: 0°C, 25°C, 70°C

Test Criteria:

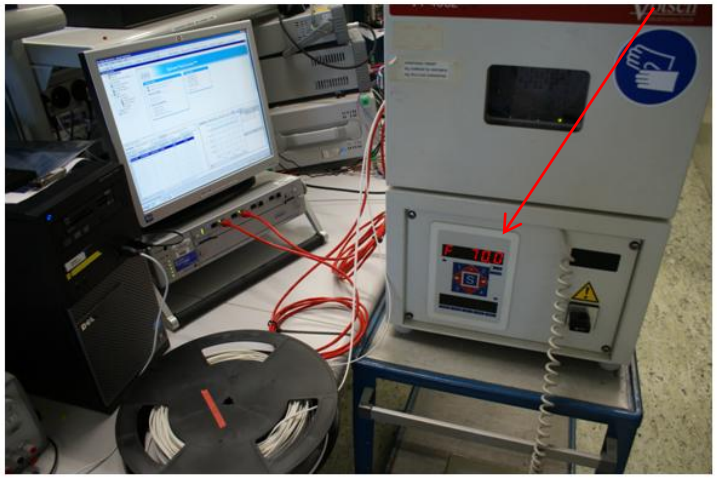
100% throughput

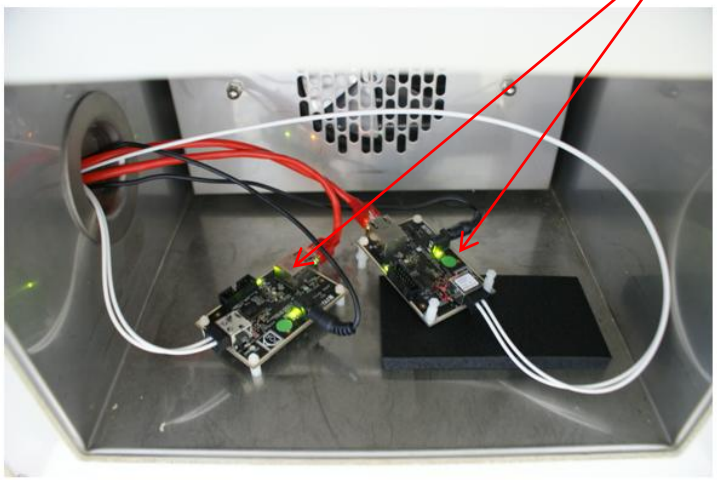
0% frame losses

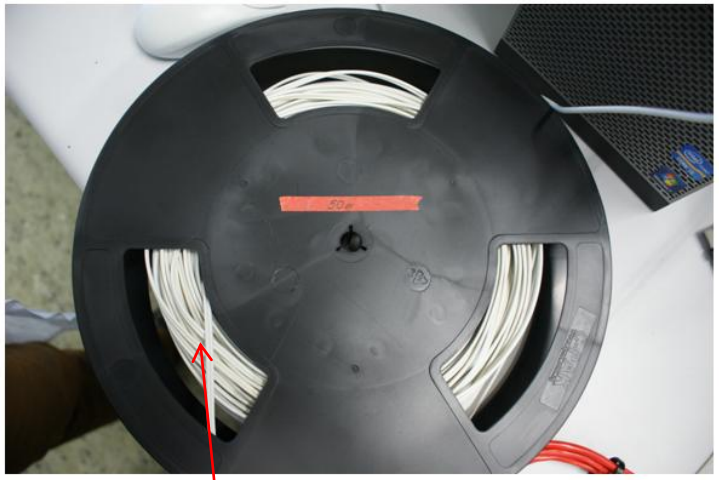
Measurement Setup (2/2)

Oven Temperature (e.g. 70°C)

Media Converter







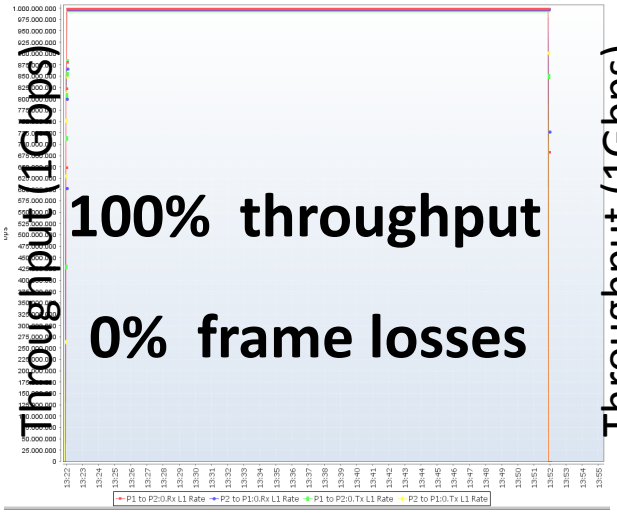
50m Duplex POF

Counted frame losses

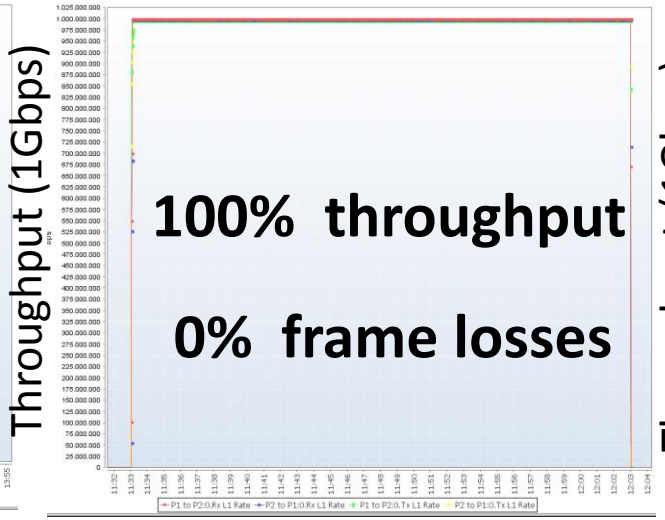
Measurement Results (1/3)

Throughput results over temperature of 50m link

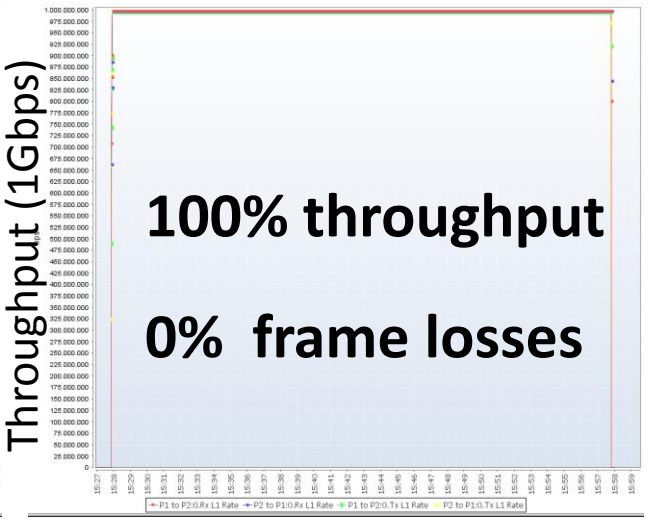
0°C



25°C



70°C

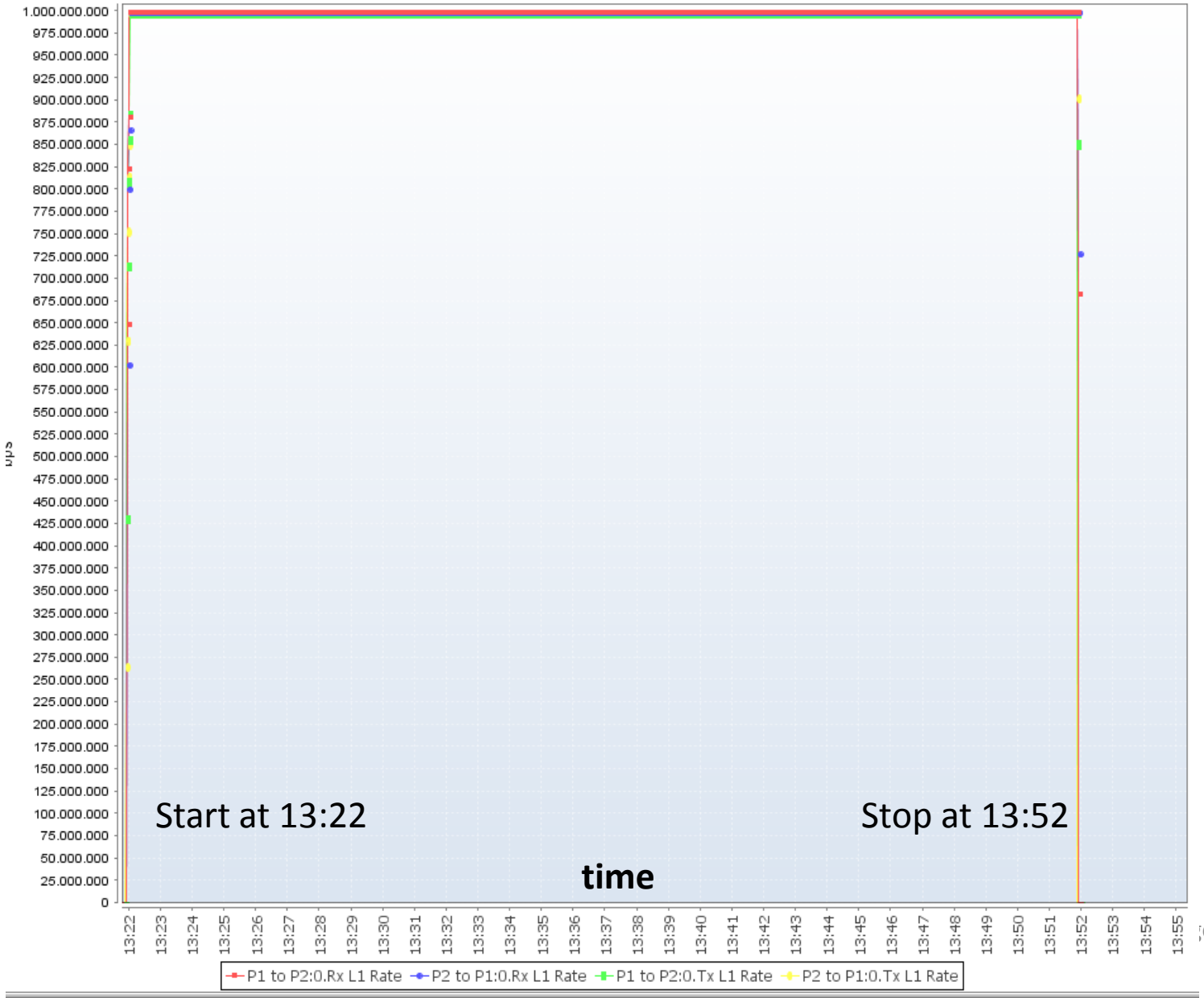


=> No frame losses across temperature of 50m POF link.

	Temperature [°C]	0	25	70
Tx-Link1	LOP@SP2	-2.2	-3.2	-4.4
	LOP@SP3(50m)	-12.5	-13.0	-14.1
Tx-Link2	LOP@SP2	-1.8	-2.4	-4.1
	LOP@SP3(50m)	-12.3	-12.3	-14.2

Measurement Results (2/3)

Details of Throughput graph



Measurement Results (3/3)

The following table shows the accumulated bits over the measured time of 1800s (30min) for both Links. The port numbers are the used slots defined by the Spirent Software and the green and blue colored bits highlight the transmitted and received bits of each link separately.

Temperature (°C)	0		25		70	
Parameters	Total Tx Count (bits)	Total Rx Count (bits)	Total Tx Count (bits)	Total Rx Count (bits)	Total Tx Count (bits)	Total Rx Count (bits)
Port //1/1	1773338891920	1773427314384	1774398069312	1774486271184	1773746300832	1773833045424
Port //1/2	1773427314384	1773338891920	1774486271184	1774398069312	1773833045424	1773746300832

Info: Link 1 / Link 2

The table testifiys that each transmitted bit was properly received by its counterpart-receiver.

No bit errors after 30 min at each temperature (0, 25, 70° C)

=> tests have shown that BER is smaller than 10^{-12} for ambient and worst case temperatures for 50m link distance