

Update on BTI's for 8x50G PAM4 over 10km SMF

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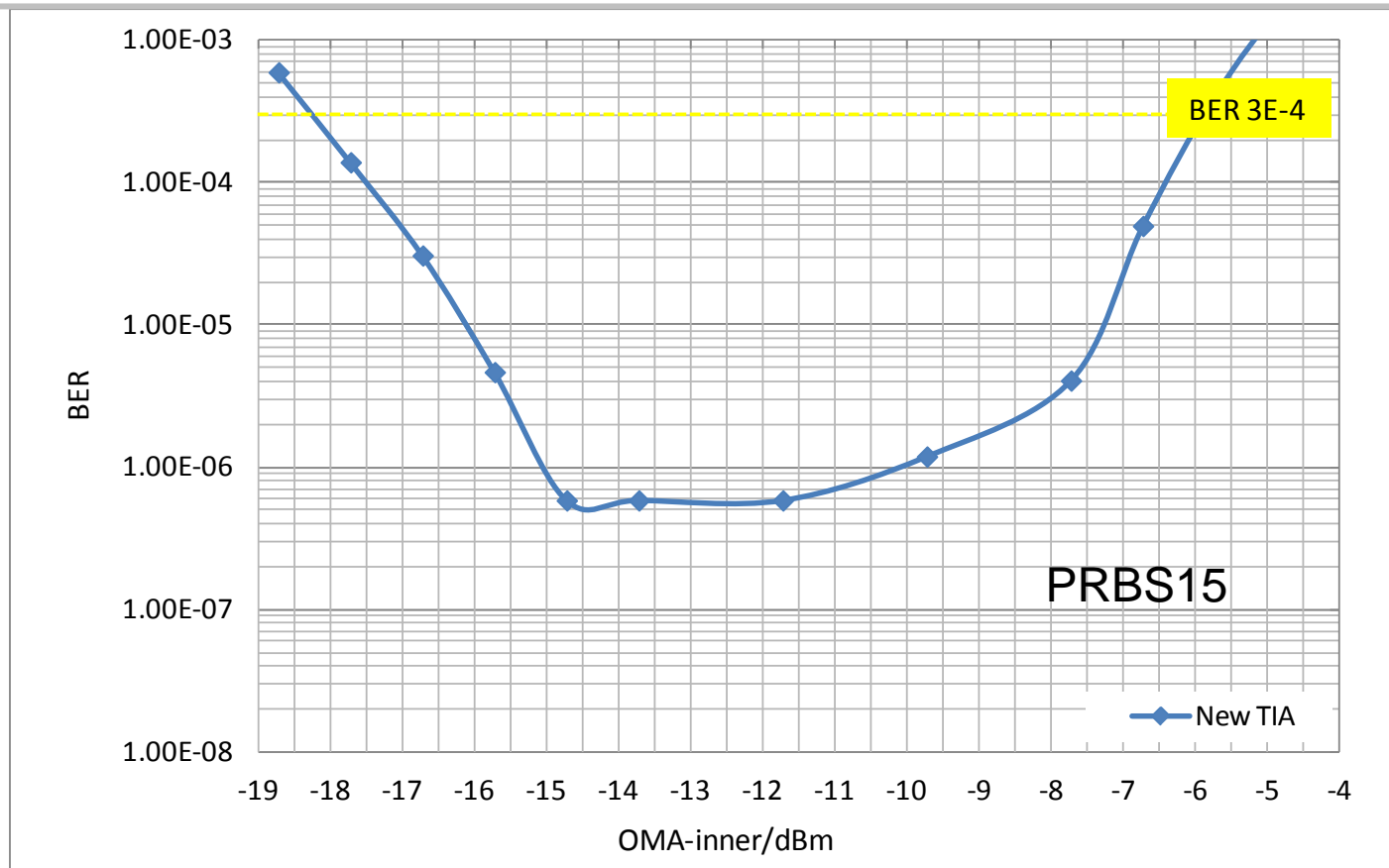
Introduction

- ❑ At the last SMF Ad Hoc meeting, 24 February 2015, stassar_02_0215_smf provided an estimation for the availability of test results on BTIs identified at the BS meeting in Atlanta last January.
- ❑ This presentation provides:
 - ❑ A confirmation of the preferred approach for 10km SMF
 - ❑ Improved test results 50G PAM4 receiver sensitivity
 - ❑ Sharing of preliminary results of testing chromatic dispersion penalty for 50G PAM4
 - ❑ Early sharing of considerations on developing a power budget for 50G PAM4 over 10km SMF
- ❑ Not enough time to build consensus and get support
- ❑ Further confirmation needed before May 2015 meeting

Preferred approach for 10km SMF

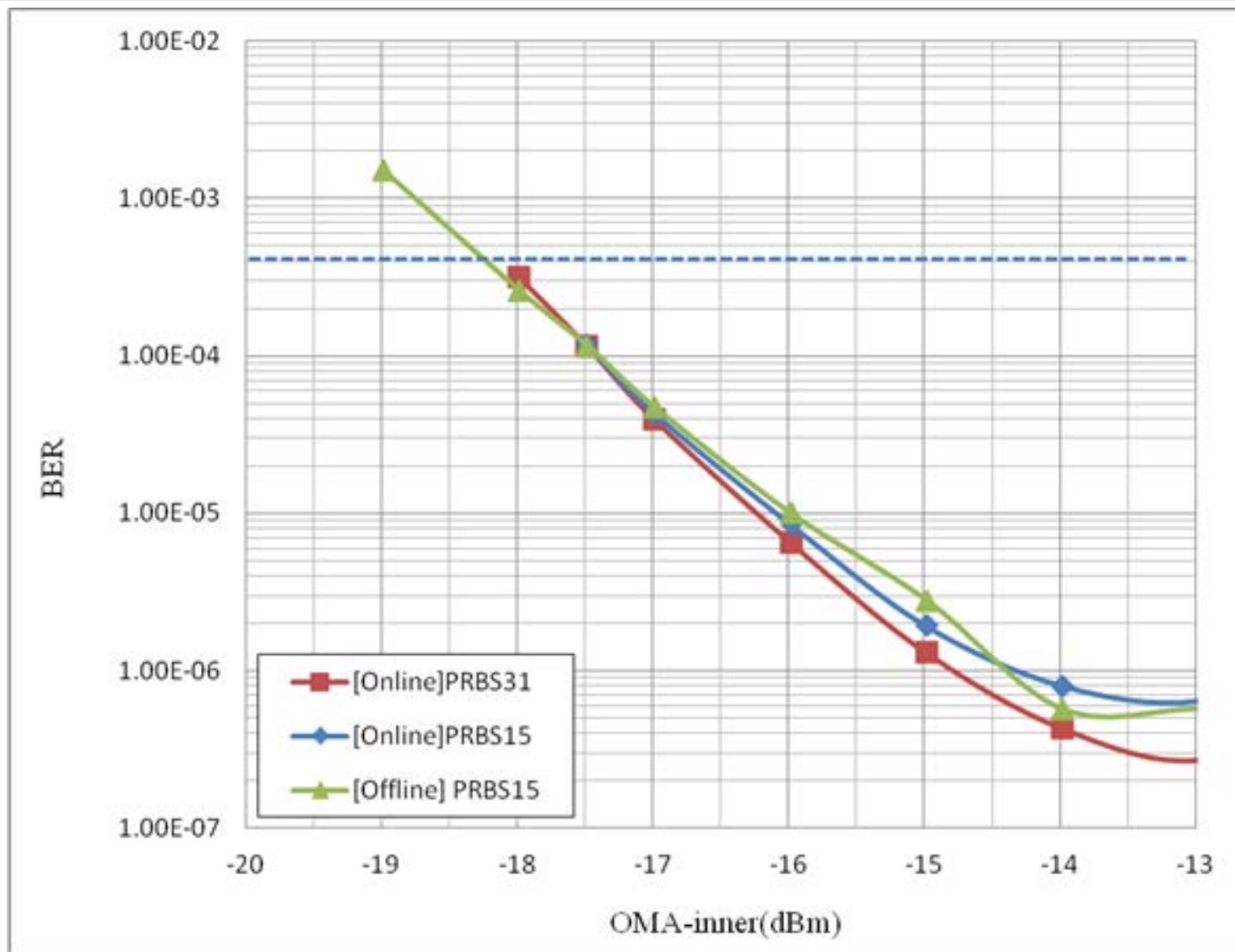
- Aiming to confirm a closed power budget for 50G PAM4 over 10km SMF using the baseline proposed in cole_3bs_02_0115 as a reference
- In the case that developing a closed power budget for 50G PAM4 over 10km SMF by the May 2015 IEEE 802.3 interim meeting is not feasible, then an alternative proposal will be developed.
- On the basis of today's information the preferred alternative approach to address the 10km SMF objective seems to be 50G NRZ.

Updated test results 50G PAM4 receiver sensitivity



- Receiver sensitivity (OMA-inner): -18.3dBm @ BER = 3×10^{-4}
- $R = 0.85$ A/W; spectral noise density 15 pA/rt(Hz);
- 9 taps FFE (offline); LFC 50 KHz (Typical)~100 KHz;

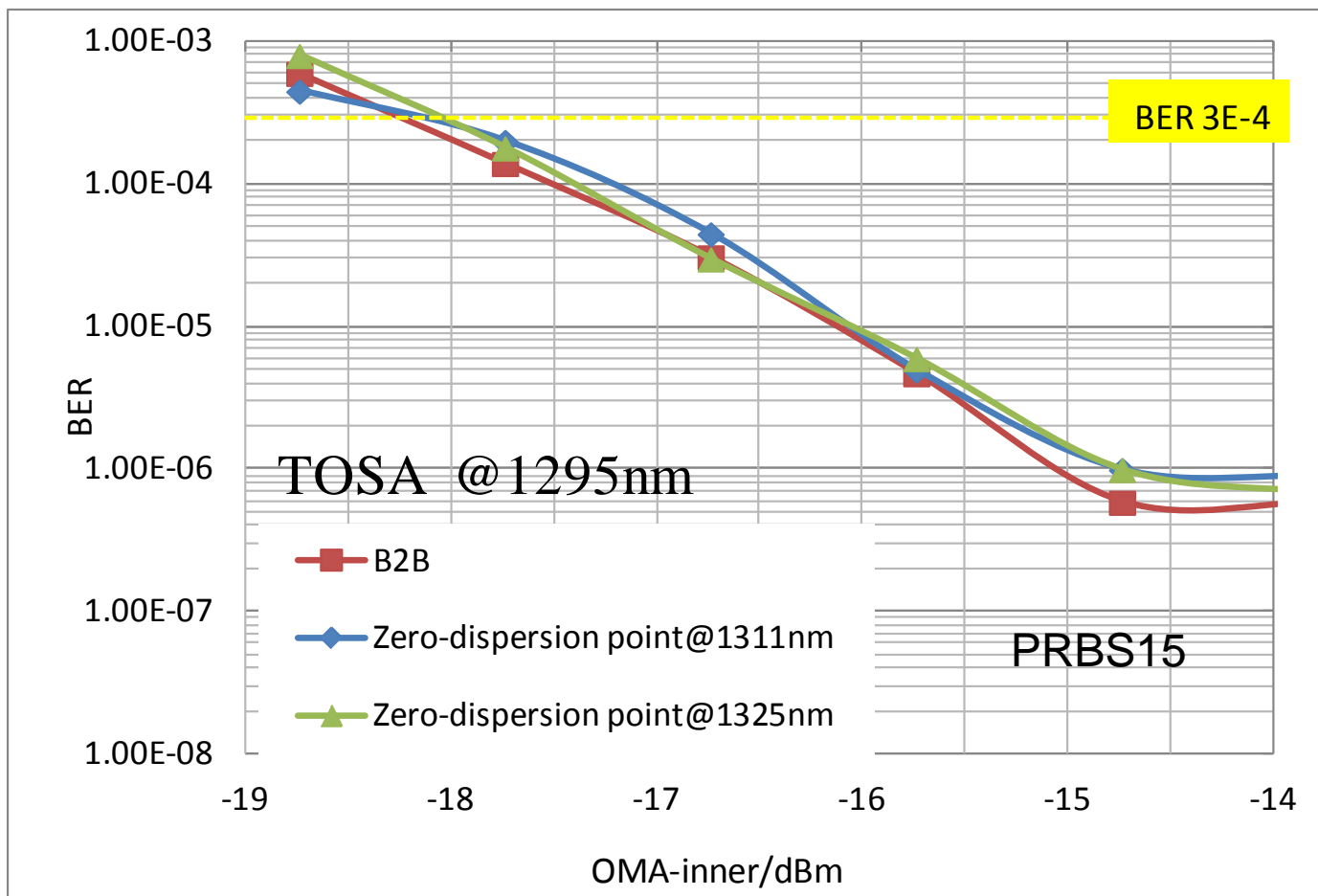
Further updated test results 50G PAM4 receiver sensitivity



Dispersion requirements for 8x50G PAM4 over 10km SMF

- Presented in stassar_01_0215_smf at 2 February 2015 SMF Ad Hoc
- Proposed λ range as in Cole_3bs_02_0115: 1272.55 – 1310.19nm
- Worst case positive dispersion (1310.19nm): +0.94 ps/nm.km
 - **Worst case positive dispersion 10km (1310.19nm) nm: +9.4 ps/nm**
- Worst case negative dispersion (1272.55nm): -5.08 ps/nm.km
 - **Worst case negative dispersion 10km (1272.55nm): -50.8 ps/nm**
- Aiming to establish an appropriate value for TDP

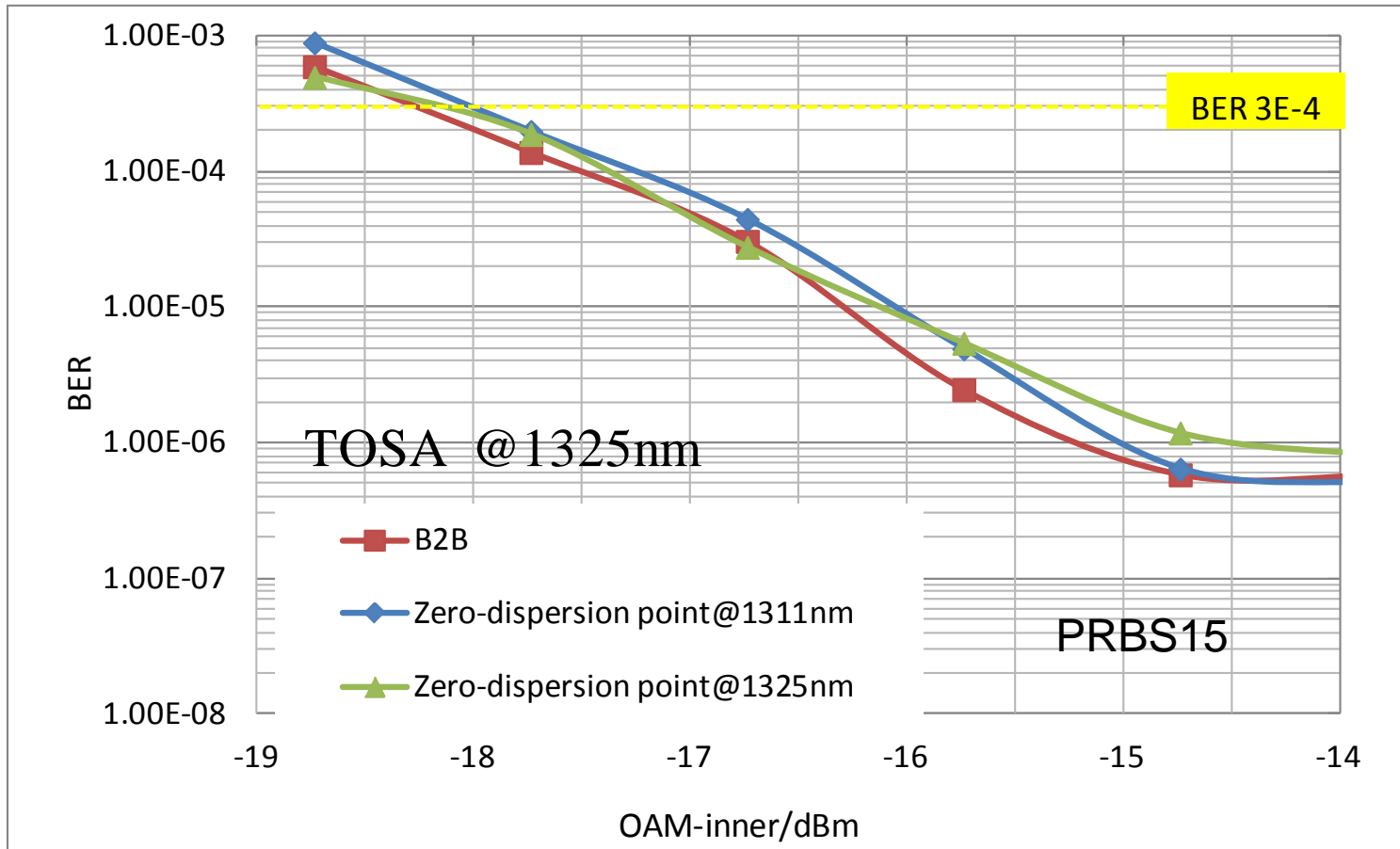
Preliminary results testing chromatic dispersion penalty



2 Test points with negative dispersion

Thanks to Corning for making characterized fibers available

Preliminary results testing chromatic dispersion penalty



1 Test point with positive dispersion

Thanks to Corning for making characterized fibers available

Details test results

- “Red” test fiber: WZD = 1311.2nm, slope = 0.089ps/nm².km, L = 12.2km
 - D = -17.9ps/nm @ 1295nm; D = +14.7ps/nm @ 1325nm
- “Blue” test fiber: WZD = 1325.5nm, slope = 0.085ps/nm².km, L = 12.07km
 - D = -32.4ps/nm @ 1295nm; D = -15.0ps/nm @ 1325nm
- Chromatic dispersion penalties:
 - ~-0.2 dB @ -32.4ps/nm
 - ~0.1 dB @ -15.0ps/nm
 - Negligible @ +14.7ps/nm
- Future:
 - Testing at -50ps/nm
 - Testing at lower BER levels
 - Reconfirm all results

Considerations on power budget for 50G PAM4 over 10km

Parameter	cole_3bs_02_0115	Remark	Possible alternative
FEC	KP4		Same
Operating BER	$2 \cdot 10^{-4}$	Set for KP4 pre-FEC threshold	$3 \cdot 10^{-4}$
Max Tx OMA-outer	+4dBm		+4dBm
(Max Tx P_{av} / channel)	(+4.2dBm)	Given by safety limits	(Same)
Min Tx OMA-outer	-1.0dBm		+0.1dBm
Min Tx OMA-inner	-6.0dBm		-4.7dBm
Min Tx OMA-inner – TDP	-7.0dBm		-5.7dBm
ER min	4.5dB		Same
TDP (max)	2dB		Same
MPI-Penalty	NA	Add separate penalty	1dB
Distance	10km		Same
Channel loss	7dB	2. Reduce to relax Rx	6.3dB
Max Rx OMA-inner	-14dBm	1. Tight spec, relax	-13dBm

Further thoughts / questions for discussion

- ❑ How would we be able to close 50G PAM4 budget for 10km SMF
- ❑ Use recent test results
- ❑ Relax some values
- ❑ Is a channel loss of 6.3dB sufficient?
- ❑ Current results are EML based, so also allowing MZ
- ❑ Need to study if we can or need to include DML transmitters
- ❑ Numbers need confirmation by additional testing and evaluation
- ❑ Solicit feedback and potential support

Q & A

Thank you