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San Antonio, TX
802.3bs Comment Resolution
Optics Track Comment #89

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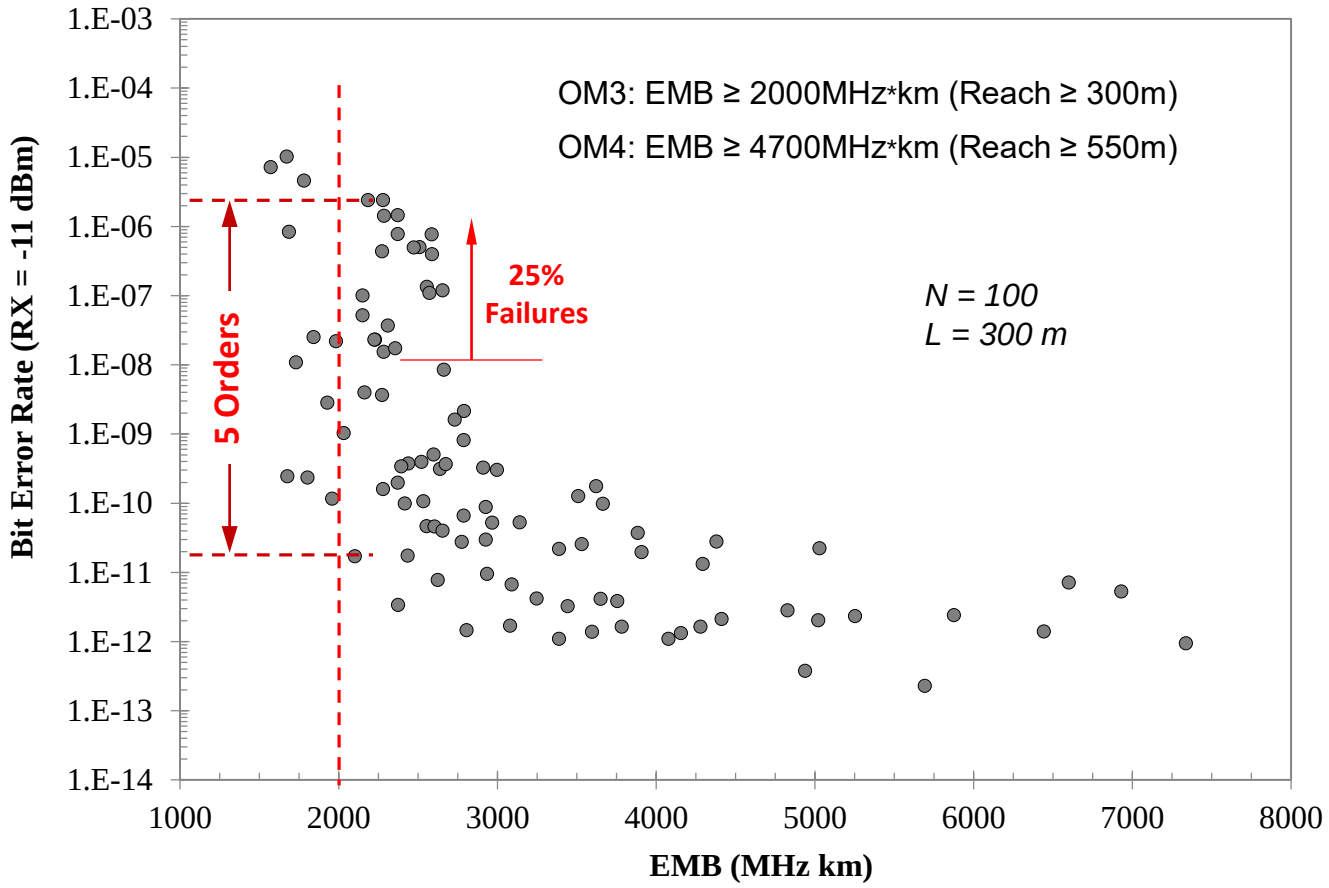
10GBASE-SR System Performance vs. Fiber Bandwidth

- *System Performance (BER) versus Fiber Bandwidth Correlation*
  - *Bit Error Rate Testing*
    - *10GBASE-SR compliant test mainframe*
      - *Identical TX & RX*
      - *Same fiber length, 300 m*
  - *Fiber Samples: OM3 included OM4*
    - *N = 100*
    - *Three fiber manufacturers*
    - *Various cable constructions & bare fiber*



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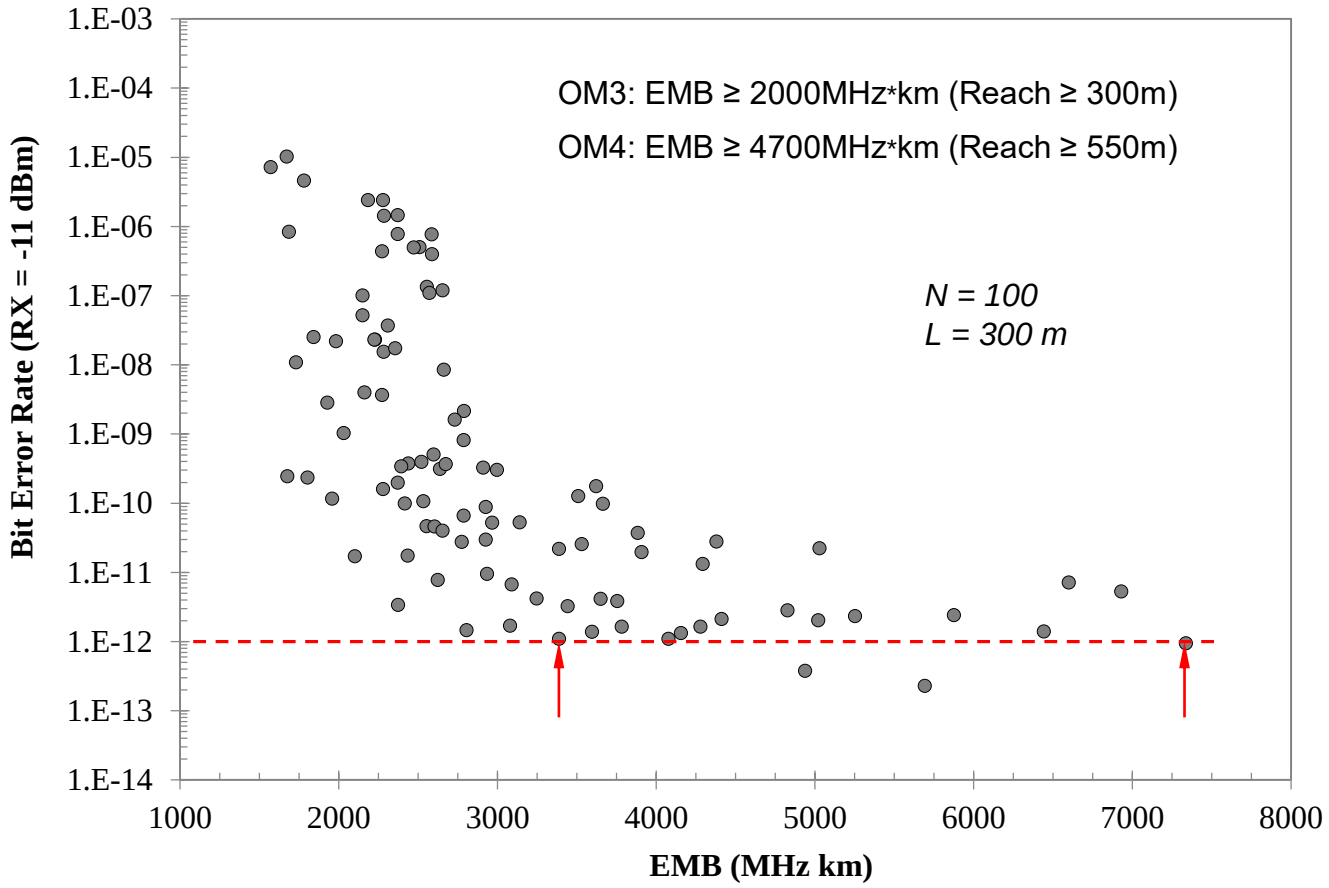
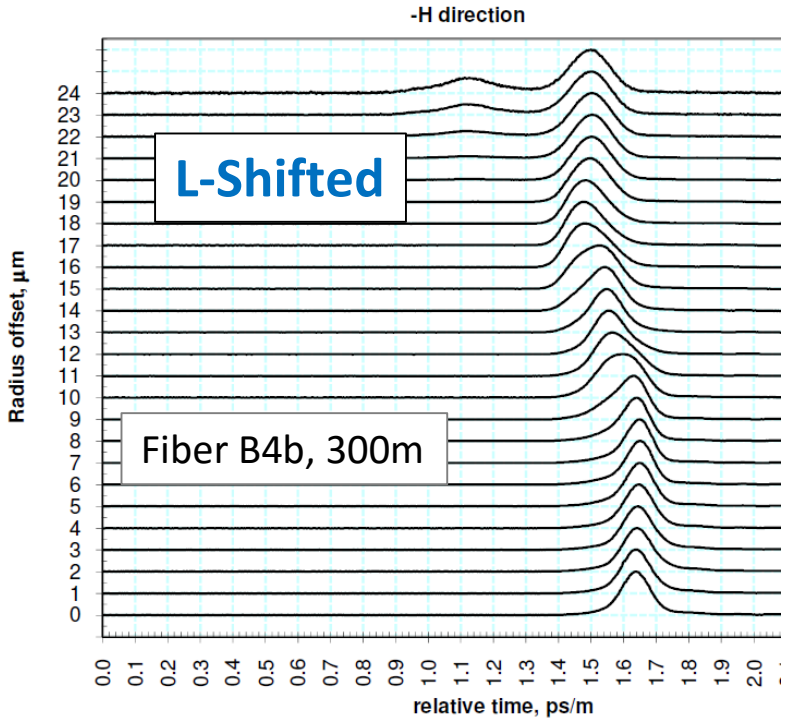
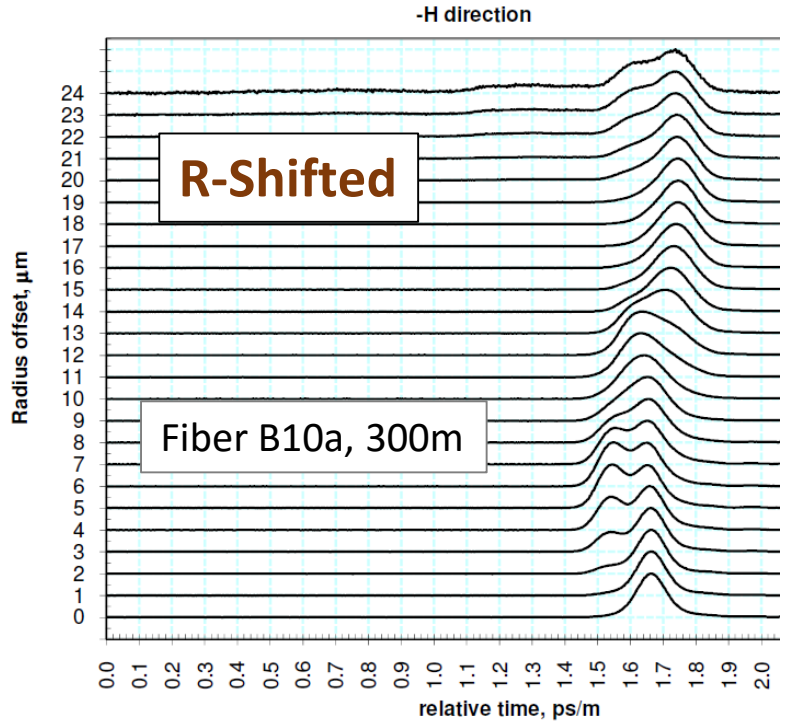


Example of the Effect of Modal-Chromatic Dispersion

Samples: B4 and B10 *(Supplier B fibers w/same EMB, ~2400MHz*km)*



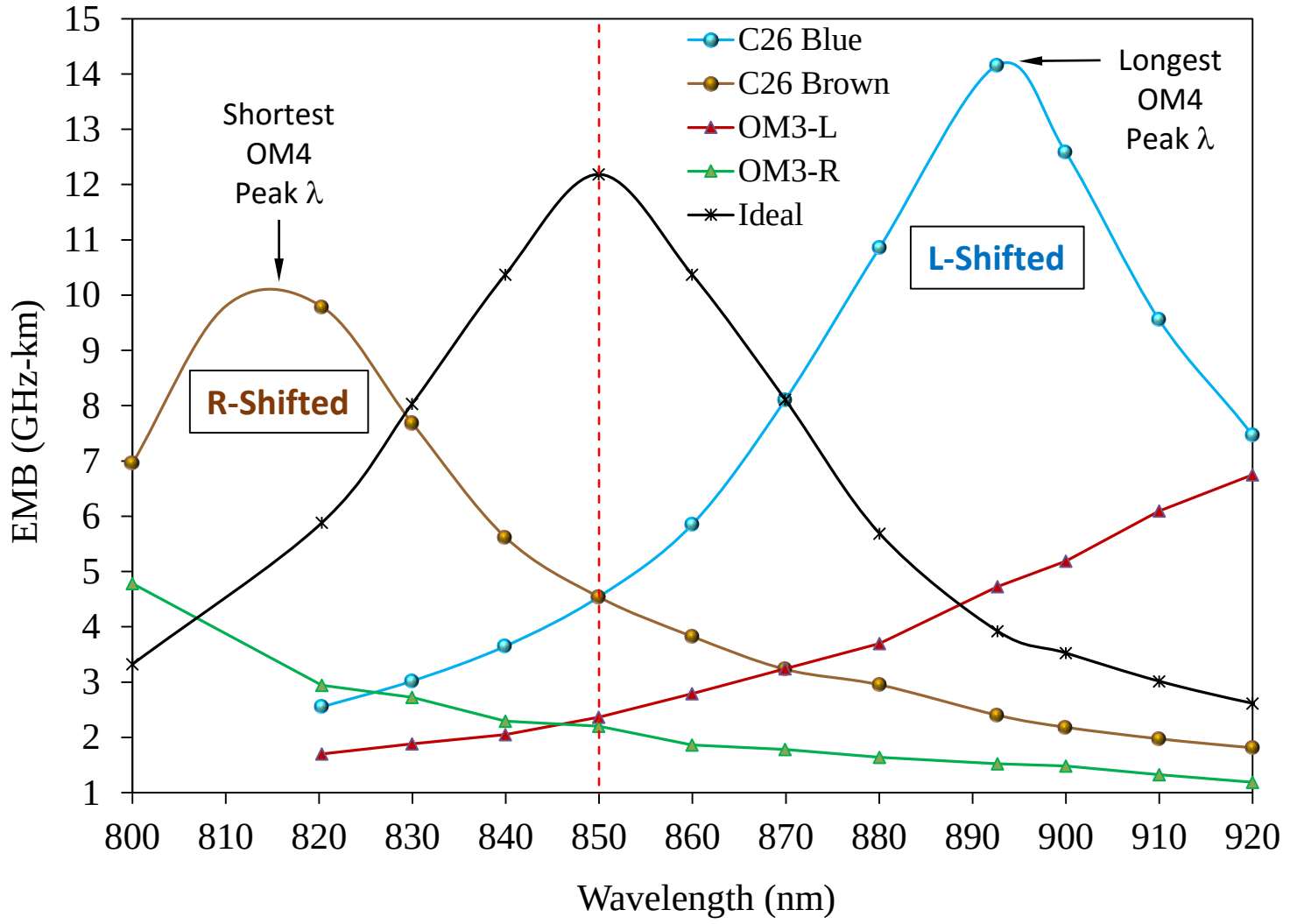


Numerical results	B4a DMD & EMBc test			FOTP220	Gaussian
	DMDouter	DMDinner	DMDsliding	EMB	EMB
-H	0.213	0.202	0.181	2364	2454
+H	0.196	0.196	0.174	2428	2504
-V	0.197	0.196	0.186	2408	2494
+V	0.222	0.208	0.181	2295	2381
mean:	0.207	0.201	0.181	2374	2458
SD:	0.013	0.006	0.005	59	56

Numerical results	B10a DMD & EMBc test			FOTP220	Gaussian
	DMDouter	DMDinner	DMDsliding	EMB	EMB
-H	0.240	0.240	0.216	2380	2482
+H	0.238	0.236	0.212	2390	2442
-V	0.257	0.249	0.216	2230	2234
+V	0.247	0.238	0.190	2426	2545
mean:	0.245	0.240	0.209	2357	2426
SD:	0.009	0.006	0.013	86	135

Range of EMB peak wavelengths for OM4 fibers

EMB wavelength dependence – Supplier C, same cable

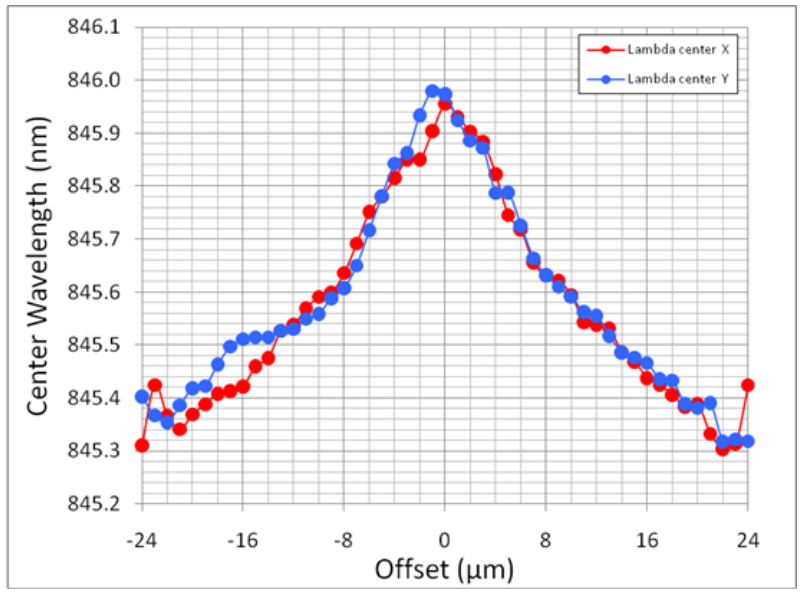


BER Test Results – JDSU-032 Transceiver

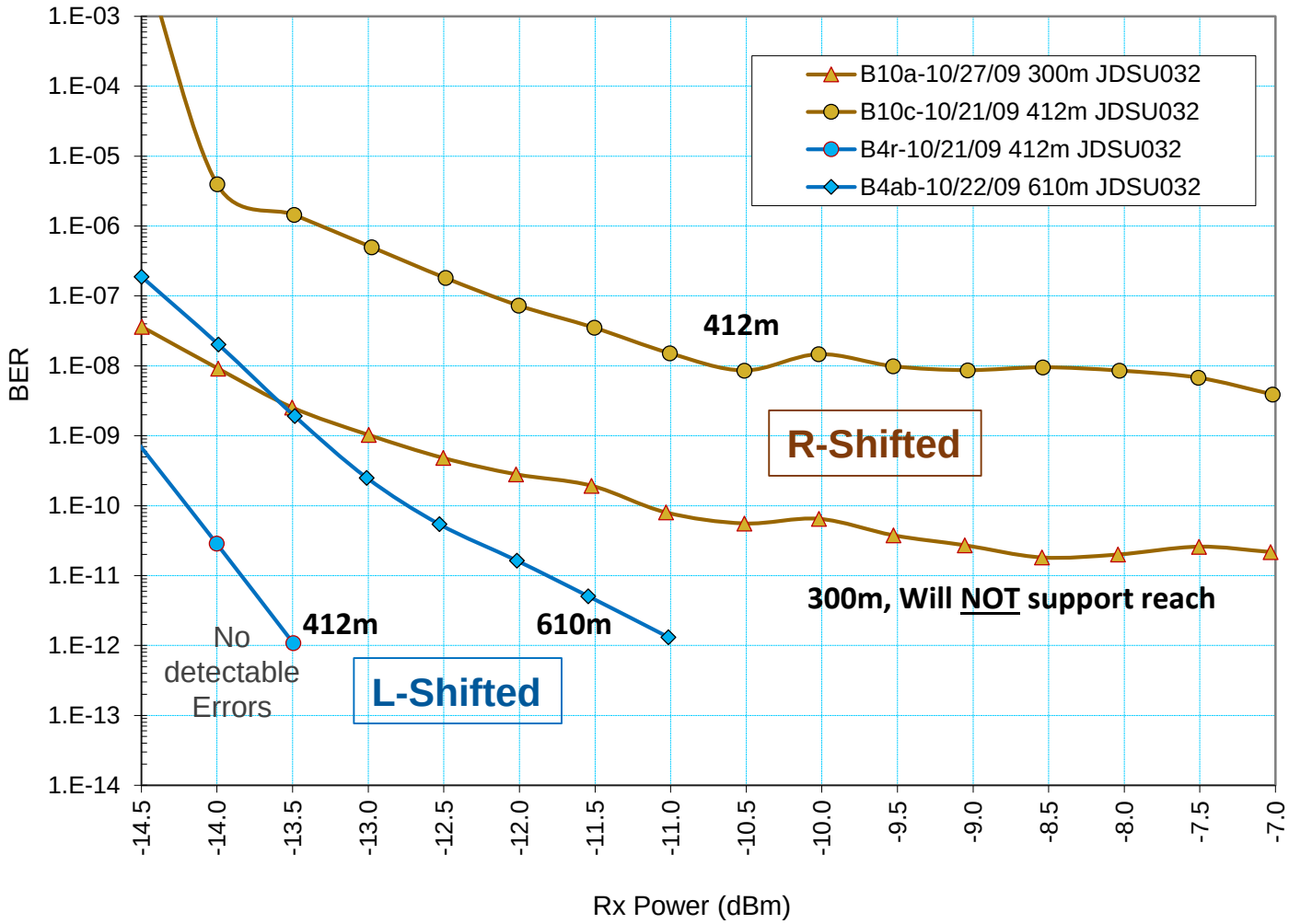
BERT Transceiver:

$\Delta\lambda$ (nm) = 0.45 nm

$\Delta\lambda_c$ (nm) = 0.72 nm



B4 (LS) & B10 (RS), JDSU032 Tx, 2/14/09-10/26/09



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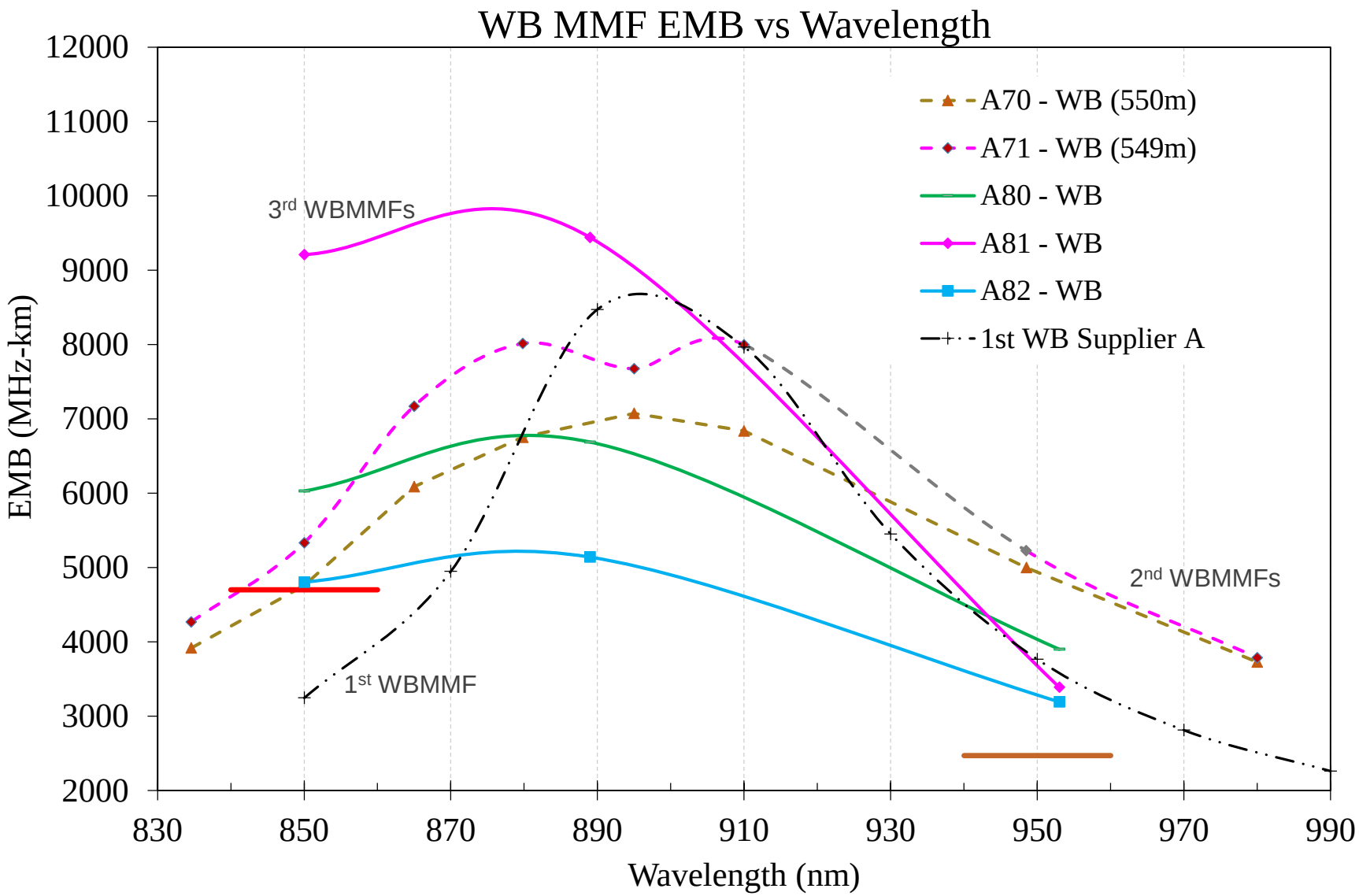
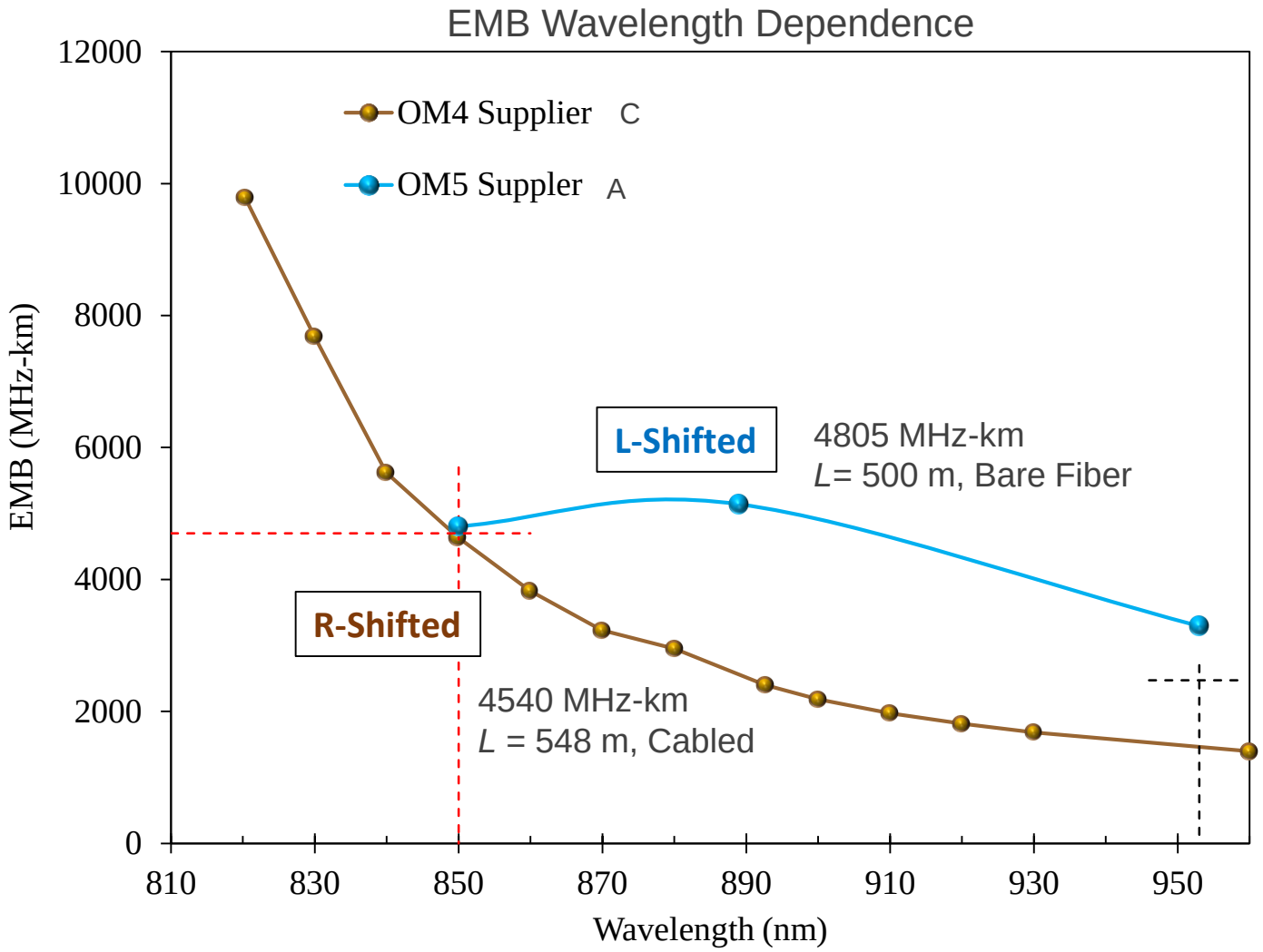
Supplier A WBMMF (OM5) 2015-2016



Minimally compliant OM5 & OM3+ Samples at 850 nm

EMB = 4805 MHz·km v. 4540 MHz·km



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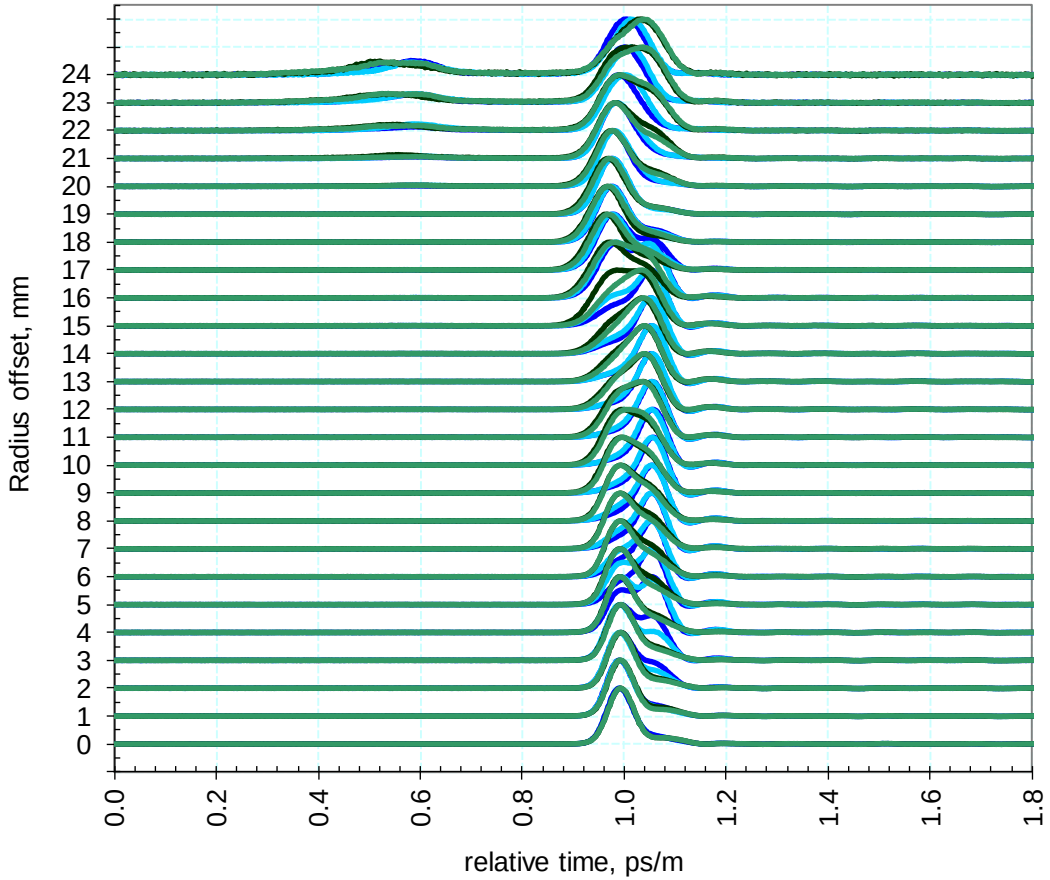
Supplier A Minimally Compliant Sample A82 DMD

OM5

A82 DMD at 850 nm

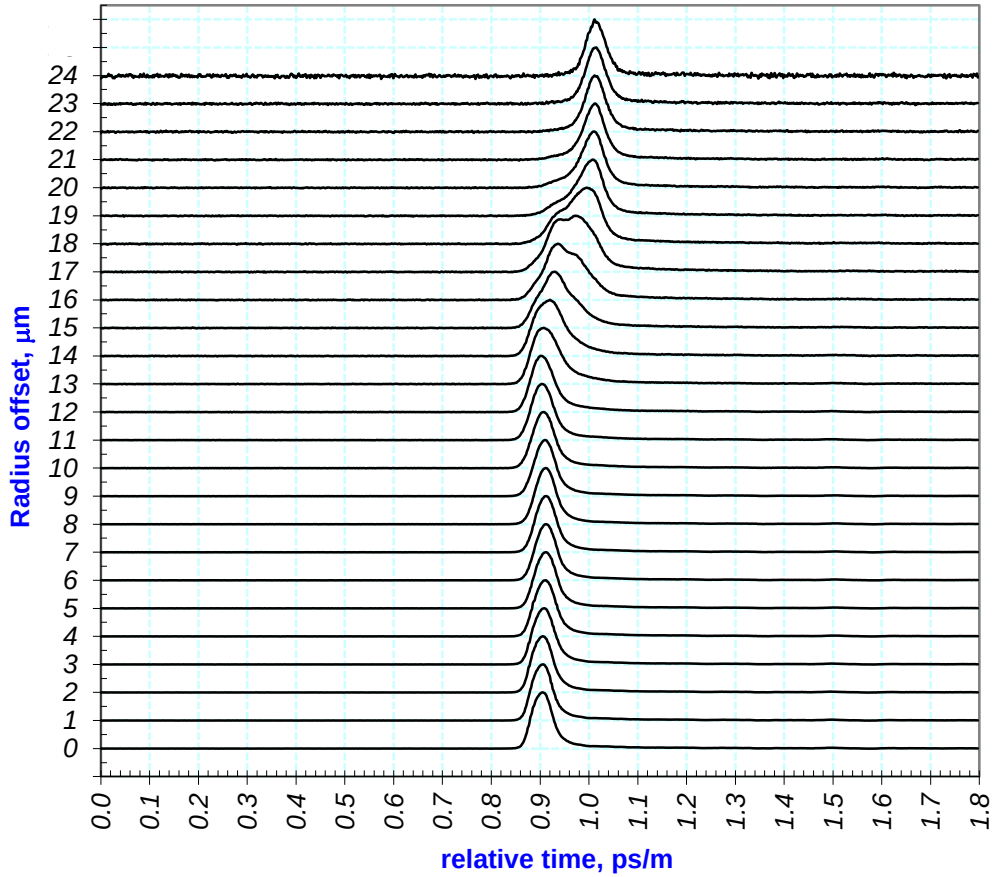
-H direction



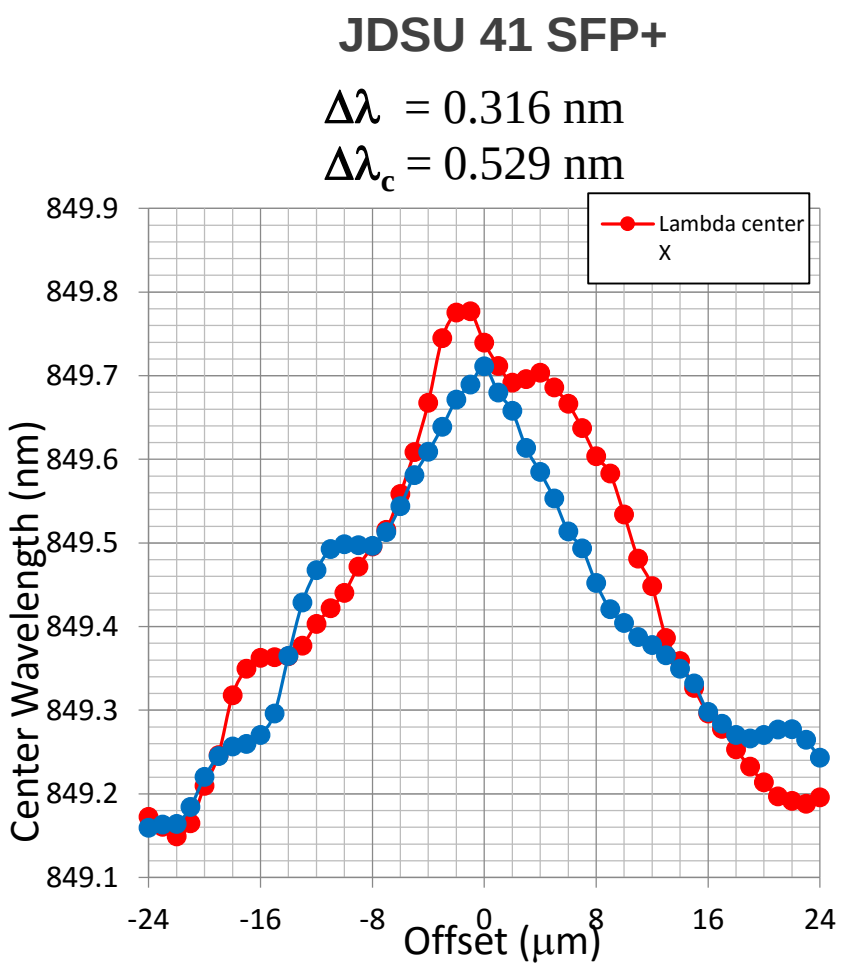
OM3+

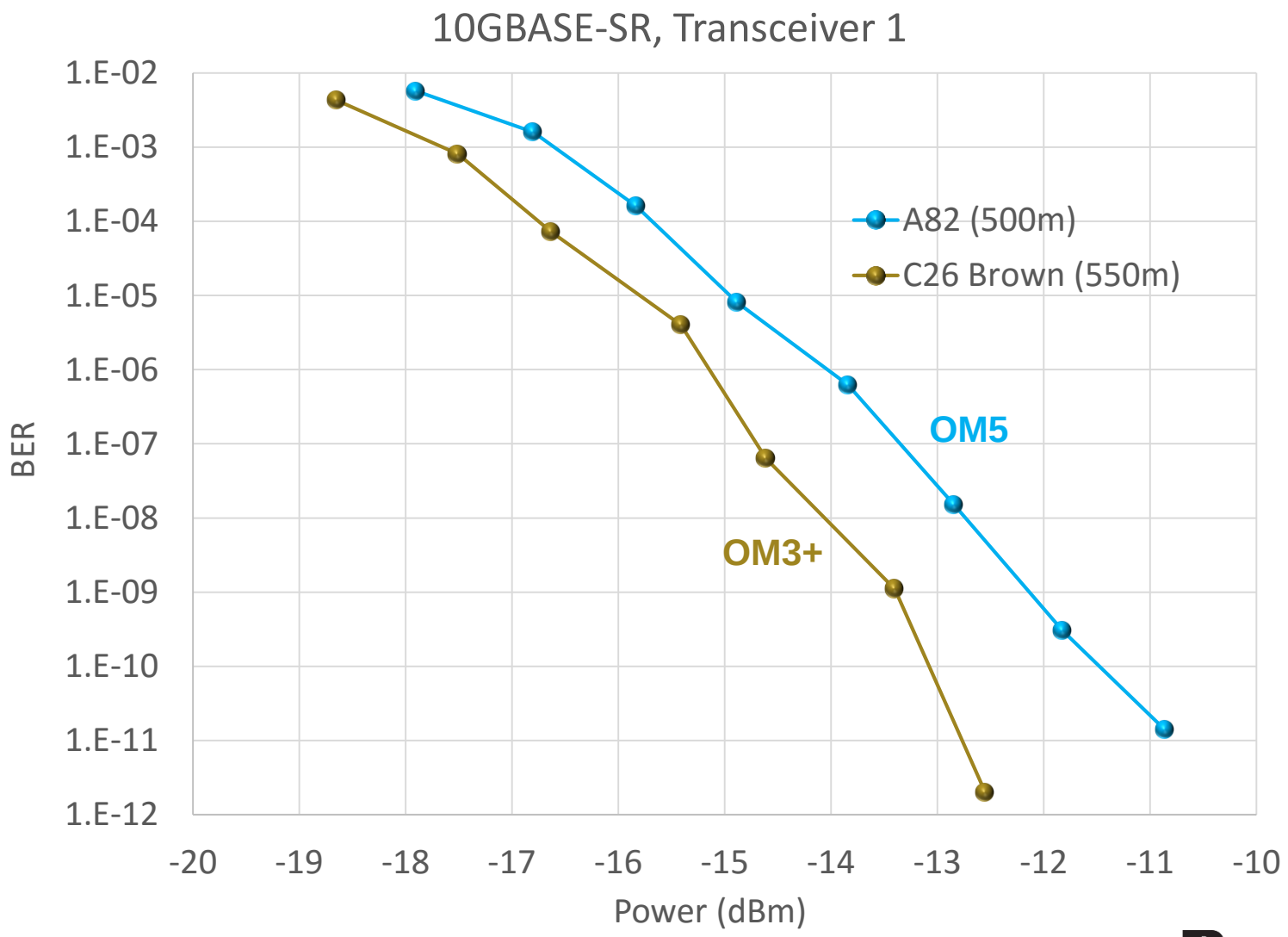
C26 Brown DMD at 850 nm

-H direction



BER Test Results Minimally Compliant OM4 v Supplier A OM5





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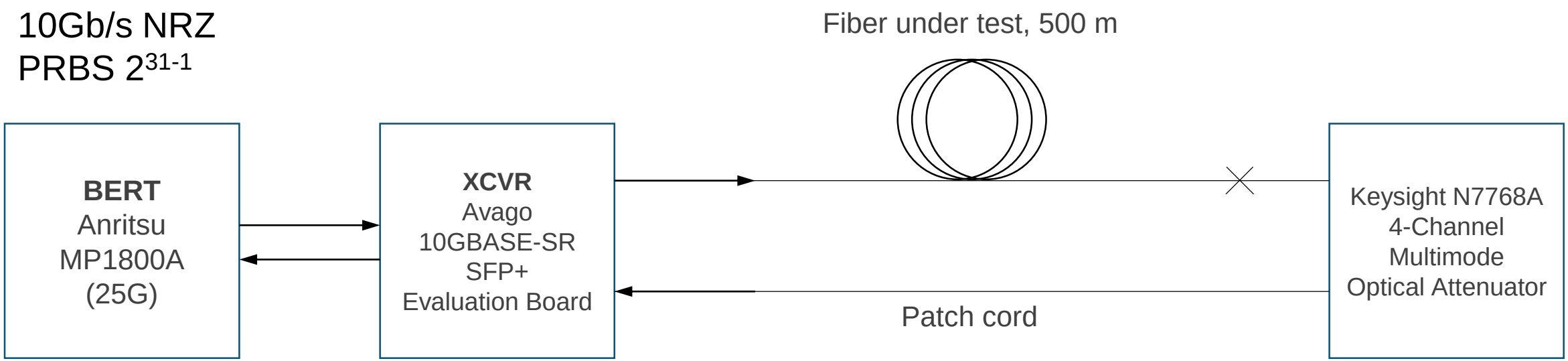
Conclusions

- The channel performance and reach for OM5 is untested at this time
- Inclusion of OM5 in 802.3bs will certify a minimum reach of 100 m
- Inclusion will also require a review of the reaches for OM3 and OM4
- It is premature to include OM5 in 802.3bs

10GBASE-SR BER Test Setup



Ixia Ethernet Traffic Analyzers:

- 100GBASE-SR: XGS2 100Gb/s IP Performance Tester (frame errors)
- 40GBASE-SR: Optiaxia XM2 40Gb/s IP Performance Tester (BER & frame errors)