

500 m SMF PSM4 Draft text update

Kiyo Hiramoto, Oclaro

John Petrilla, Avago Technologies

Tom Palkert, Luxtera

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Supporters

Hidehiro Toyoda, Hitachi Ltd.

Masashi Kono, Hitachi Ltd.

John Abbott, Corning

Chris Bergey, Luxtera

Dave Brown, Semtech GPG Canada

Mark Bugg, Molex

Patrick Casher, Molex

Doug Coleman, Corning

David Cunningham, Avago
Technologies

Kiyo Hiramoto, Oclaro

Jack Jewell, CommScope

Paul Kolesar, CommScope

Greg LeCheminant, Agilent
Technologies

David Lewis, JDSU

Sharon Lutz, US Conec

Beck Mason, JDSU

Randy Perrie, OneChip Photonics

Rick Pimpinella, Panduit

Scott Sommers, Molex

Steven Swanson, Corning

Andy Weirich, OneChip Photonics

Brian Welch, Luxtera

Scott Kipp, Brocade

Tom Issenhuth, Microsoft

Christophe Metivier, Arista

Oren Sela, Mellanox

David Warren, HP Networking

Rick Rabinovich, Alcatel-Lucent

Kapil Shrikhande, Dell

Introduction

- This presentation provides updates to the PSM4 baseline specification proposal given in [anderson_01_0513_optx](#) for a retimed PMD to address the P802.3bm objective:
Define a 100 Gb/s PHY for operation up to at least 500 m of SMF.
- The data, tables and figures in this presentation are taken directly from the P802.3bm Editor's draft PSM4 Clause 96 provided in P802d3bm-96_PSM4_02.pdf.
- This baseline specification is proposed for adoption by P802.3bm Task Force for fulfilling the 500m SMF objective.

List of updates

- Table 96-6:
 - Change "Optical return loss tolerance (max)" value from 7.94 to 11.9
 - Replace TBD for eye mask coordinates with: $X1 = 0.23$, $X2 = 0.34$, $X3 = 0.43$, $Y1 = 0.26$, $Y2 = 0.36$, $Y3 = 0.4$
- Table 96-7:
 - Delete Receiver 3 dB electrical upper cutoff frequency, each lane (max)"
 - In "Stressed receiver sensitivity (OMA) ..." replace TBD with -7.4
 - Change "Vertical eye closure penalty ..." from 1.8 to 1.2
 - In "Stressed eye jitter ..." replace TBD with $J2 = 0.29$ UI and $J4 = 0.39$ UI
 - Insert a row after Stress eye jitter for Stress eye mask definition { $X1$, $X2$, $X3$, $Y1$, $Y2$, $Y3$ } Hit ratio $5E-5$ hits per sample with values of 0.19, 0.34, 0.5, 0.17 0.32, 0.4. Refer to Figure 86-4 for definition of coordinates.

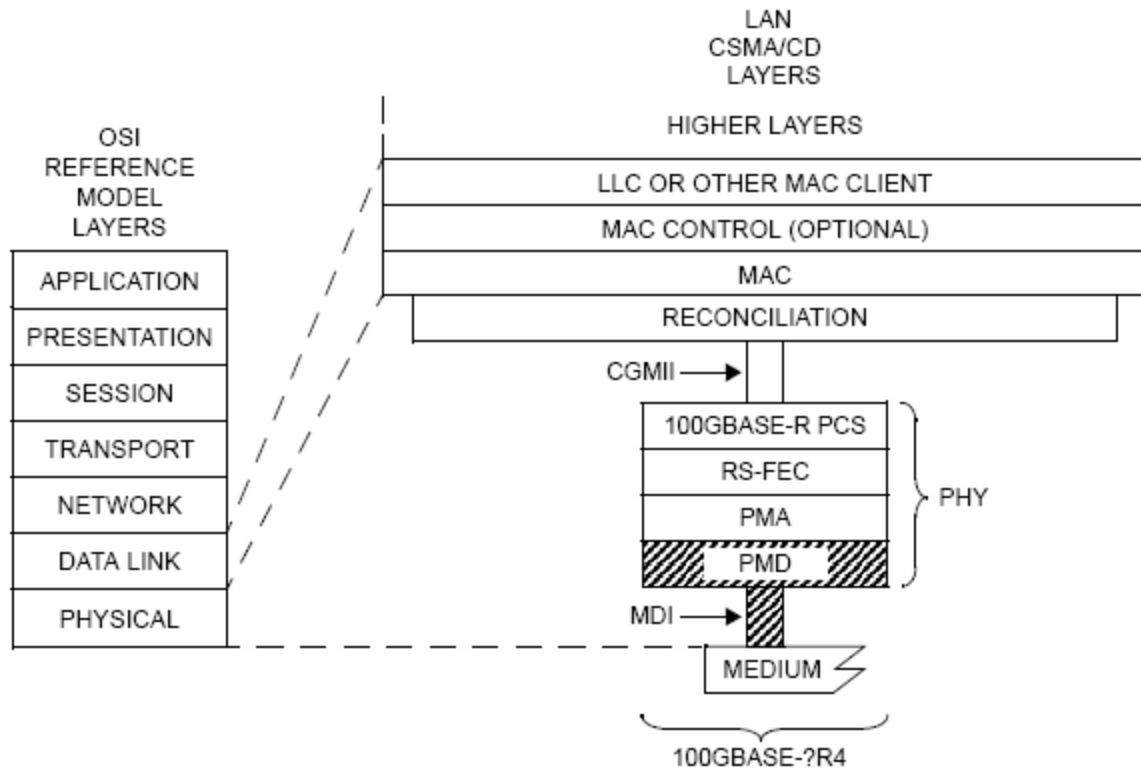
List of Updates cont.

- Table 96-8:
 - Change Power Budget from 7.06, to 7.07
 - Change 0.52 dB/km to 0.514 dB/km.
- Table 96-10:
 - For "Calibration of OMA for receiver tests" and "Vertical eye closure penalty calibration", replace TBDs with 87.8.11

List of updates cont.

- 96.8.5.1:
 - Change TBD to -140 dB/Hz
 - Add item f) Transmitter reflectance less than -50 dB.
- 96.8.5.2:
 - Replace ORL TBD with 11.9 dB
 - Replace DGD TBD with 2.24 dB
- Table 96-12:
 - For DGD-max replace TBD with 2.24 ps
 - Change "Optical return loss (min)" from TBD to 35 dB

PSM4 OSI reference model



CGMII = 100 Gb/s MEDIA INDEPENDENT INTERFACE
 LLC = LOGICAL LINK CONTROL
 MAC = MEDIA ACCESS CONTROL
 MDI = MEDIUM DEPENDENT INTERFACE
 PCS = PHYSICAL CODING SUBLAYER

PHY = PHYSICAL LAYER DEVICE
 PMA = PHYSICAL MEDIUM ATTACHMENT
 PMD = PHYSICAL MEDIUM DEPENDENT
 RS-FEC = REED-SOLOMON FORWARD ERROR CORRECTION
 ?R = PMD FOR SINGLE-MODE FIBER — 500 m

Figure 96-1—100GBASE-?R4 PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 CSMA/CD LAN model

PSM4 Block diagram

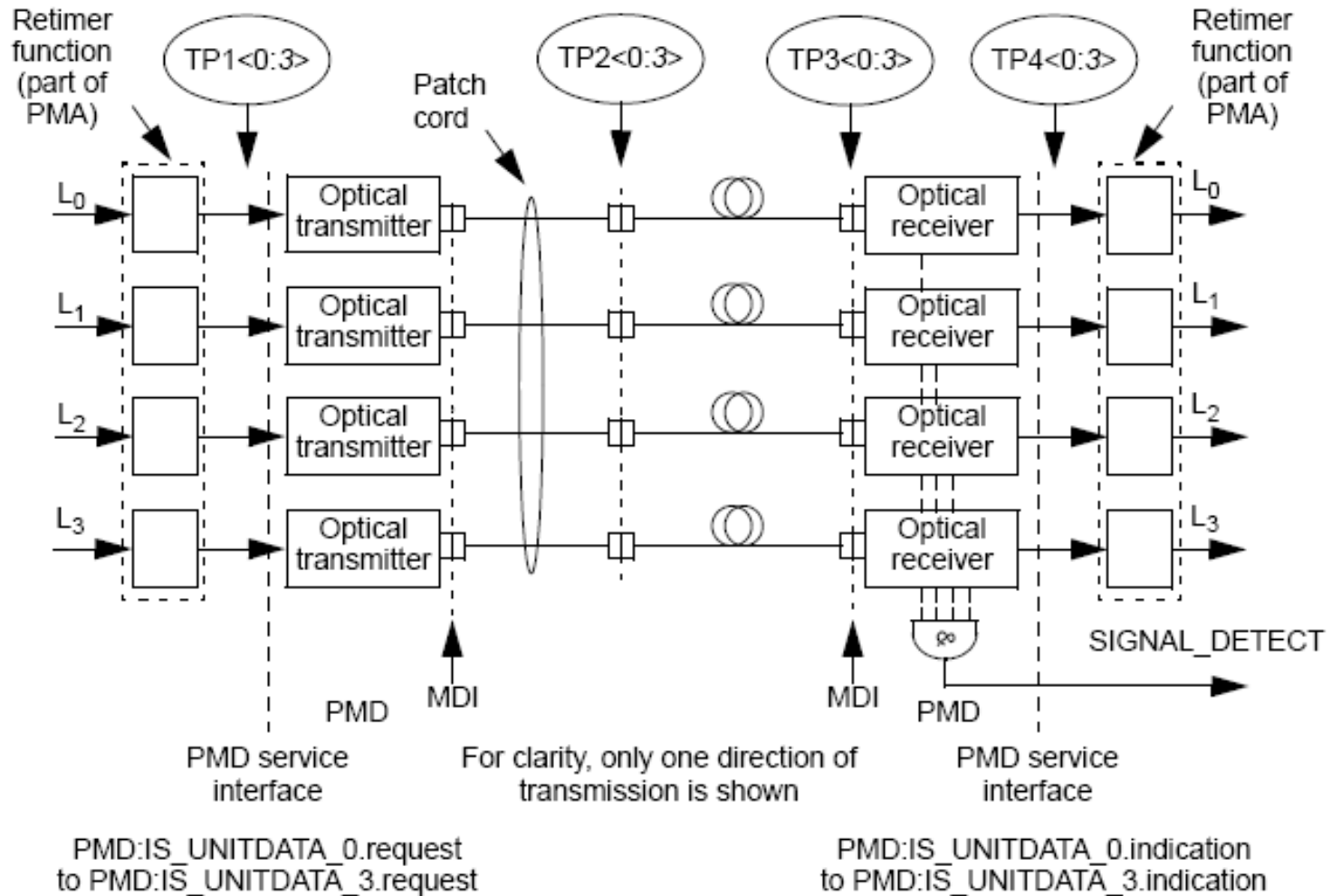


Figure 96-2—Block diagram for 100GBASE-R4 transmit/receive paths

Transmit characteristics

Table 96-6—100GBASE-?R4 transmit characteristics

Description	Value	Unit
Signaling rate, each lane (range)	25.78125 ± 100 ppm	GBd
Lane wavelength (range)	1295 to 1325	nm
Side-mode suppression ratio (SMSR), (min)	30	dB
Total average launch power (max)	8	dBm
Average launch power, each lane (max)	2	dBm
Average launch power, each lane ^a (min)	-9.4	dBm
Optical Modulation Amplitude (OMA), each lane (max)	2.2	dBm
Optical Modulation Amplitude (OMA), each lane (min)	See 96.7.1.1	dBm
Transmitter and dispersion penalty (TDP), each lane (max)	3.8	dB

More Transmit characteristics

Table 96–6—100GBASE-R4 transmit characteristics (*continued*)

Description	Value	Unit
Average launch power of OFF transmitter, each lane (max)	–30	dBm
Extinction ratio (min)	3.5	dB
Optical return loss tolerance (max)	11.9	dB
Transmitter reflectance ^b (max)	–12	dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.23, 0.34, 0.43, 0.26, 0.36, 0.4}	

^aAverage launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

^bTransmitter reflectance is defined looking into the transmitter.

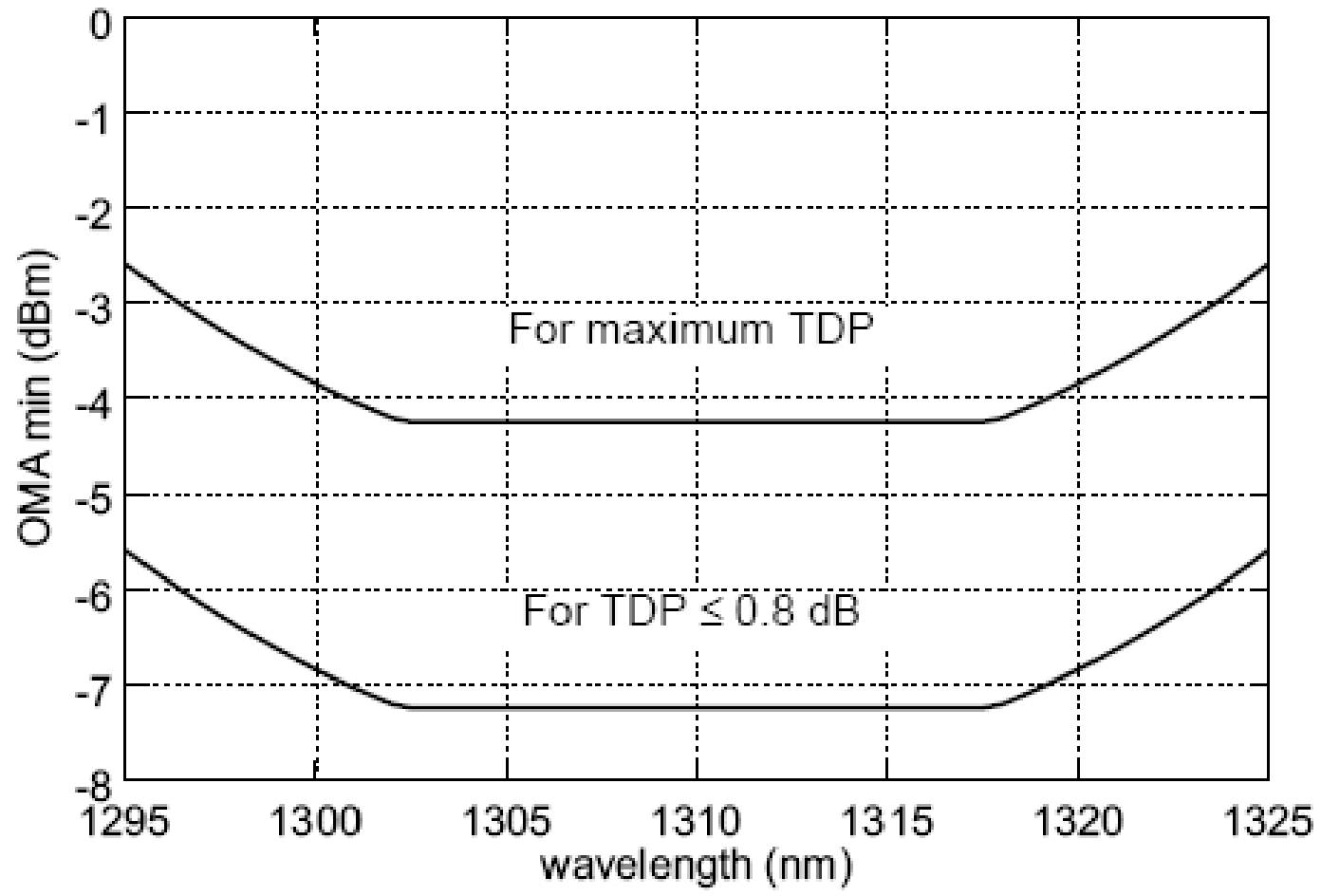


Figure 96-3—Transmitter minimum OMA

Table 96–7—100GBASE-?R4 receive characteristics

Description	Value	Unit
Signaling rate, each lane (range)	25.78125 ± 100 ppm	GBd
Lane wavelengths (range)	1295 to 1325	nm
Damage threshold ^a (min)	3	dBm
Average receive power, each lane (max)	2	dBm
Average receive power, each lane ^b (min)	–12.66	dBm
Receive power, each lane (OMA) (max)	2.2	dBm
Receiver reflectance (max)	–12	dB
Receiver sensitivity (OMA), each lane ^c (max)	See 96.7.2.1	dBm
Stressed receiver sensitivity (OMA), each lane ^d (max)	–7.4	dBm
Conditions of stressed receiver sensitivity test:		
Vertical eye closure penalty, ^e each lane	1.2	dB
Stressed eye J2 Jitter, ^e each lane	0.29	UI
Stressed eye J4 Jitter, ^e each lane	0.39	UI
Stressed eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.19, 0.34, 0.5, 0.17, 0.32, 0.4}	

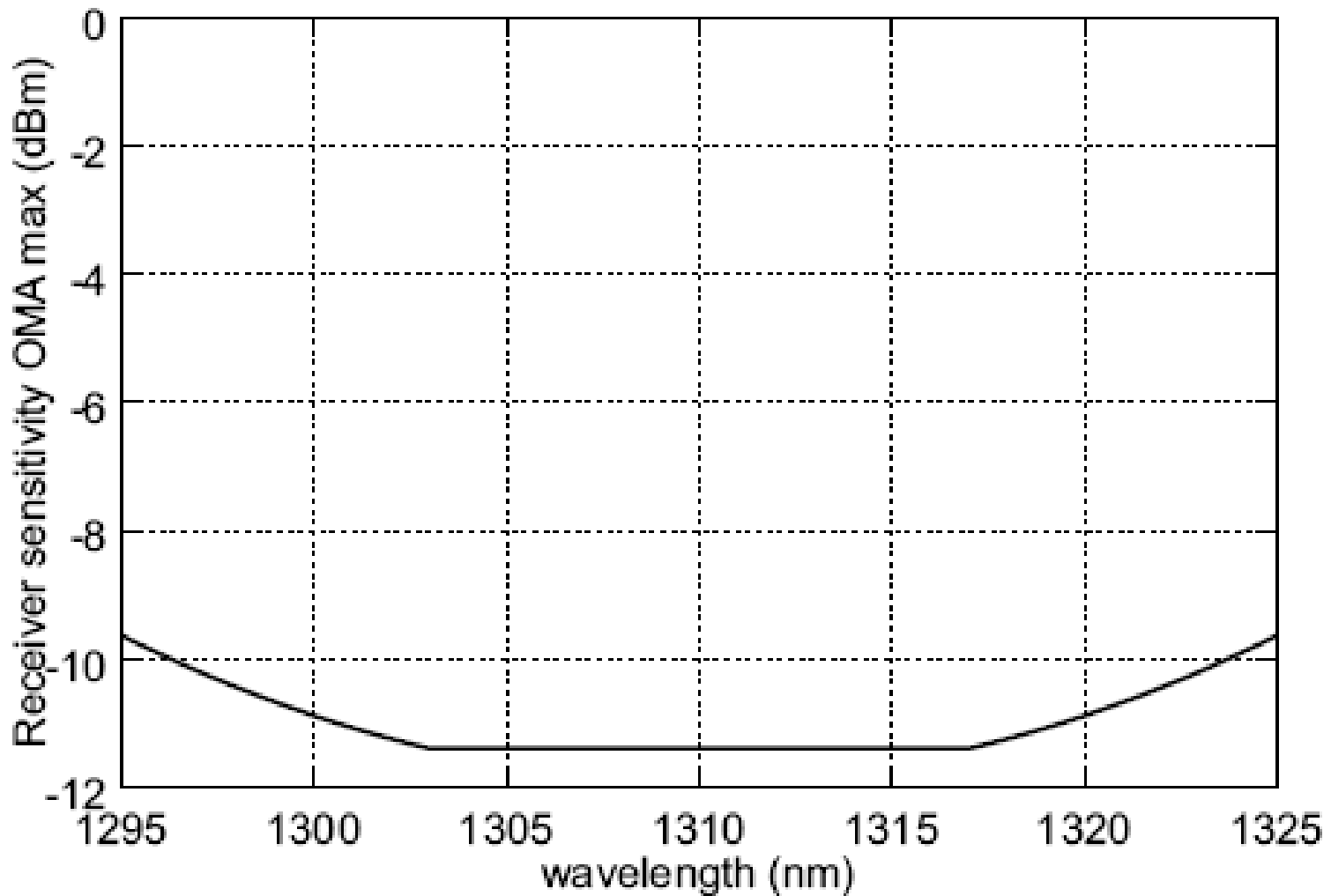


Figure 96-4—Receiver sensitivity

PSM4 link power budget

Table 96–8—100GBASE-R4 illustrative link power budget

Parameter	Value	Unit
Power budget (for max TDP)	7.07	dB
Operating distance	500	m
Channel insertion loss ^a	3.26	dB
Maximum discrete reflectance	-35	dB
Allocation for penalties ^b (for max TDP)	3.8	dB
Additional insertion loss allowed	0	dB

^aThe channel insertion loss is calculated using the maximum distance specified in Table 96–5 and cabled optical fiber attenuation of 0.514 dB/km at 1295 nm plus an allocation for connection and splice loss given in 96.11.2.1.

^bLink penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

Fiber specs

Table 96–12—Fiber optic cabling (channel) characteristics for 100GBASE-?R4

Description	Value	Unit
Operating distance (max)	500	m
Channel insertion loss ^{a, b} (max)	3.26	dB
Channel insertion loss (min)	0	dB
Positive dispersion ^b (max)	1.2	ps/nm
Negative dispersion ^b (min)	-1.4	ps/nm
DGD_max ^c	2.24	ps
Optical return loss (min)	35	dB

Optical fiber and cable characteristics

Table 96–13—Optical fiber and cable characteristics

Description	Value	Unit
Nominal fiber specification wavelength	1310	nm
Cabled optical fiber attenuation (max)	0.5 ^a	dB/km
Zero dispersion wavelength (λ_0)	$1300 \leq \lambda_0 \leq 1324$	nm
Dispersion slope (max) (S_0)	0.093	ps/nm ² km

^aThe 0.5 dB/km attenuation is provided for Outside Plant cable as defined in ANSI/TIA 568-C.3.

Summary & Next Steps

- An updated PSM4 draft specification for the 500 m SMF objective 100GBASE-R4 has been presented.
- [8023bm-96_PSM4_02.pdf](#) is proposed for adoption by P802.3bm Task Force for fulfilling the 500 m SMF objective.



End of Presentation
Thanks!