SMF TBDs

Pete Anslow, Ciena

IEEE P802.3bs Task Force, SMF Ad Hoc, 16 February 2016

Introduction

The P802.3bs draft 1.2 contains a number of TBDs and magenta text that must be removed before the draft can proceed to Working Group ballot.

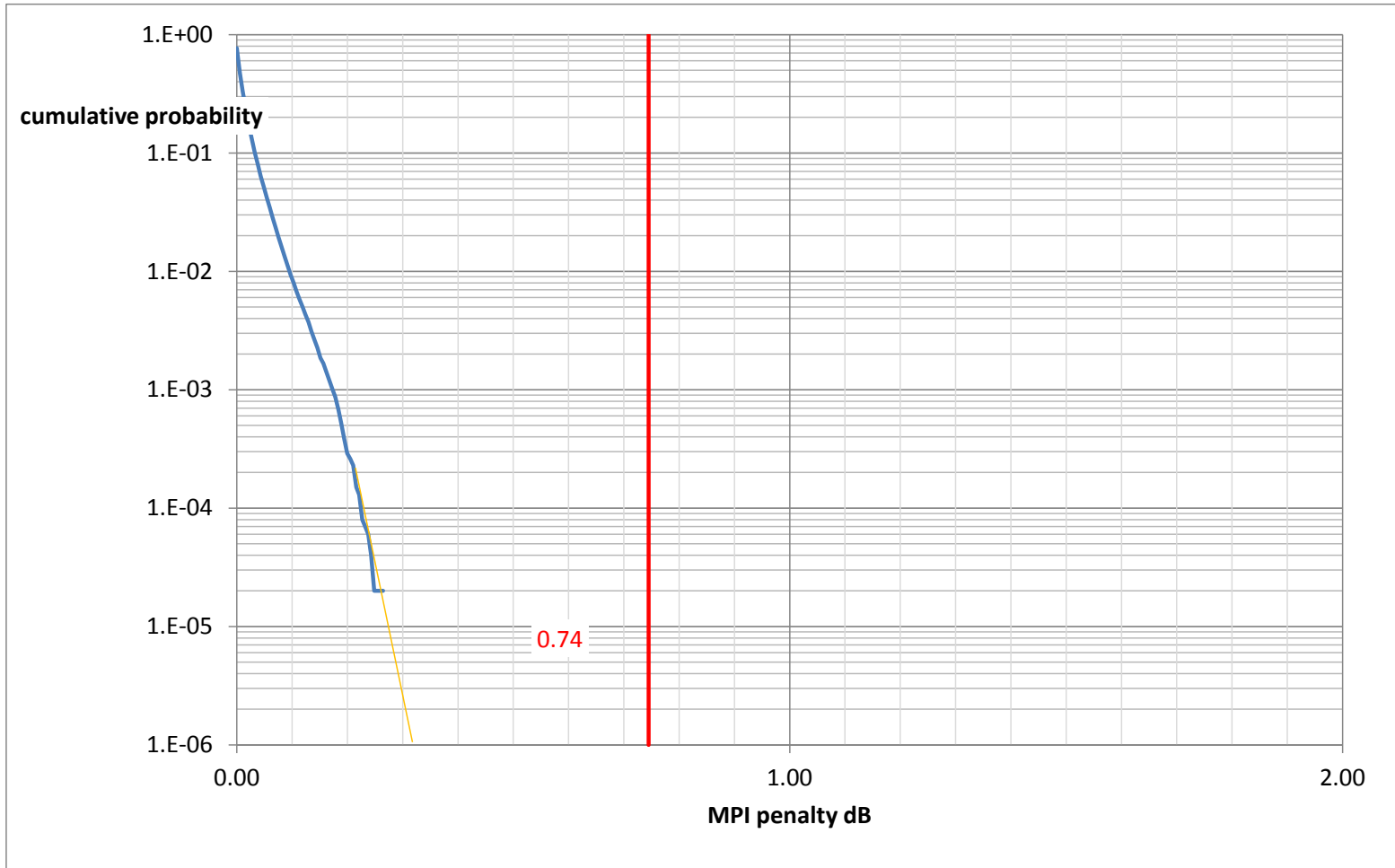This contribution contains proposals for dealing with some of them.

Reflection budgets

During the discussion of a previous version of this presentation in anslow_01a_0216_smf there was discussion as to whether the 400GBASE-DR4 reflection budget should be based on 4 x -35 dB reflections rather than 6.
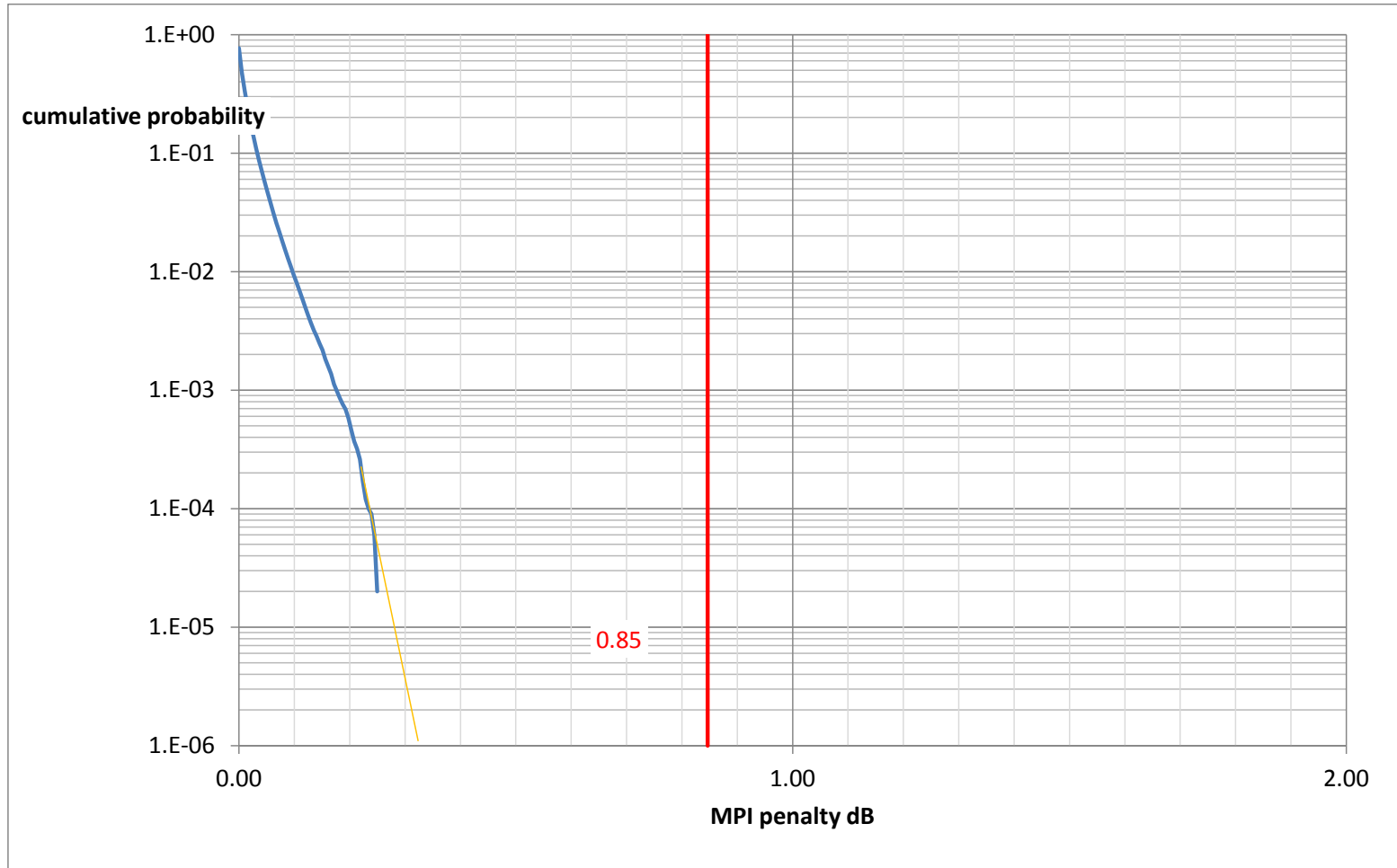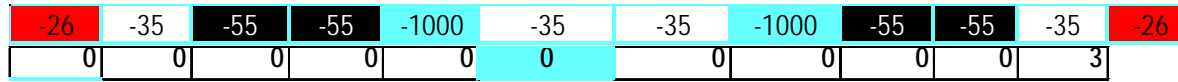
The next two slides show the results of running the spreadsheet in king_02a_0116_smf.7z with 4 x -35 dB reflections and then with 4 x -35 dB + 4 x -55 dB reflections.

DR4 4 x -35 dB

-26	-35	-1000	-1000	-1000	-35	-35	-1000	-1000	-1000	-35	-26
0	0	0	0	0	0	0	0	0	0	0	3

DR4 4 x -35 dB, 4 x -55 dB

-26	-35	-55	-55	-1000	-35	-35	-1000	-55	-55	-35	-26
0	0	0	0	0	0	0	0	0	0	0	3

Reflection budget straw man 400GBASE-DR4

Parameter	D1.1	Straw man	Unit
Table 122-6			
Average launch power, each lane (min)	-1.9	-2.2	dBm
Outer Optical Modulation Amplitude (OMAouter), each lane (min)	0.2	-0.1	dBm
Launch power in OMAouter minus TDP, each lane (min)	-0.8	-1.1	dBm
Optical return loss tolerance (max)	TBD	17.8	dB
Transmitter reflectance (max)	-20	-26	dB
Table 122-7			
Average receive power, each lane (min)	-4.9	-5.2	dBm
Receiver reflectance (max)	-26	-26	dB
Receiver sensitivity (OMAinner), each lane (max)	-9.1	-9.2	dBm
Table 122-8			
Power budget (for max TDP)	6	5.8	dB
Maximum discrete reflectance	-35	-35	dB
Allocation for penalties (for maximum TDP)	3	2.8	dB
Table 122-11			
Optical return loss	TBD	17.8	dB
Table 122-12			
[Channel] Optical return loss (min)	TBD	29	dB
122.11.2.2			
maximum discrete reflectance	-35	-35	dB
Max number of -35 dB reflections		4	

Reflection budget straw man 400GBASE-FR8

Parameter	D1.1	Straw man	Unit
Table 123-7			
Average launch power, each lane (min)	-3		dBm
Outer Optical Modulation Amplitude (OMAouter), each lane (min)	0		dBm
Launch power in OMAouter minus TDP, each lane (min)	-1		dBm
Optical return loss tolerance (max)	TBD	15.5	dB
Transmitter reflectance (max)	TBD	-26	dB
Table 123-8			
Average receive power, each lane (min)	-7		dBm
Receiver reflectance (max)	TBD	-26	dB
Receiver sensitivity (OMAinner), each lane (max)	-9.8		dBm
Table 123-9			
Power budget (for maximum TDP)	6.2	6.8	dB
Maximum discrete reflectance	TBD	-35	dB
Allocation for penalties (for maximum TDP)	2.2	2.8	dB
Table 123-12			
100GBASE-FR8 Optical return loss	20	15.5	dB
Table 123-13			
[Channel] Optical return loss (min)	21	27	dB
123.11.2.2			
maximum discrete reflectance	26	-35	dB
Max number of -35 dB reflections		6	

LR8 6 x -35 dB, 4 x -55 dB, -35 Tx, Rx

-35	-35	-55	-55	-35	-35	-35	-35	-55	-55	-35	-35
0	0	0	0	0	0	0	0	0	0	6.3	
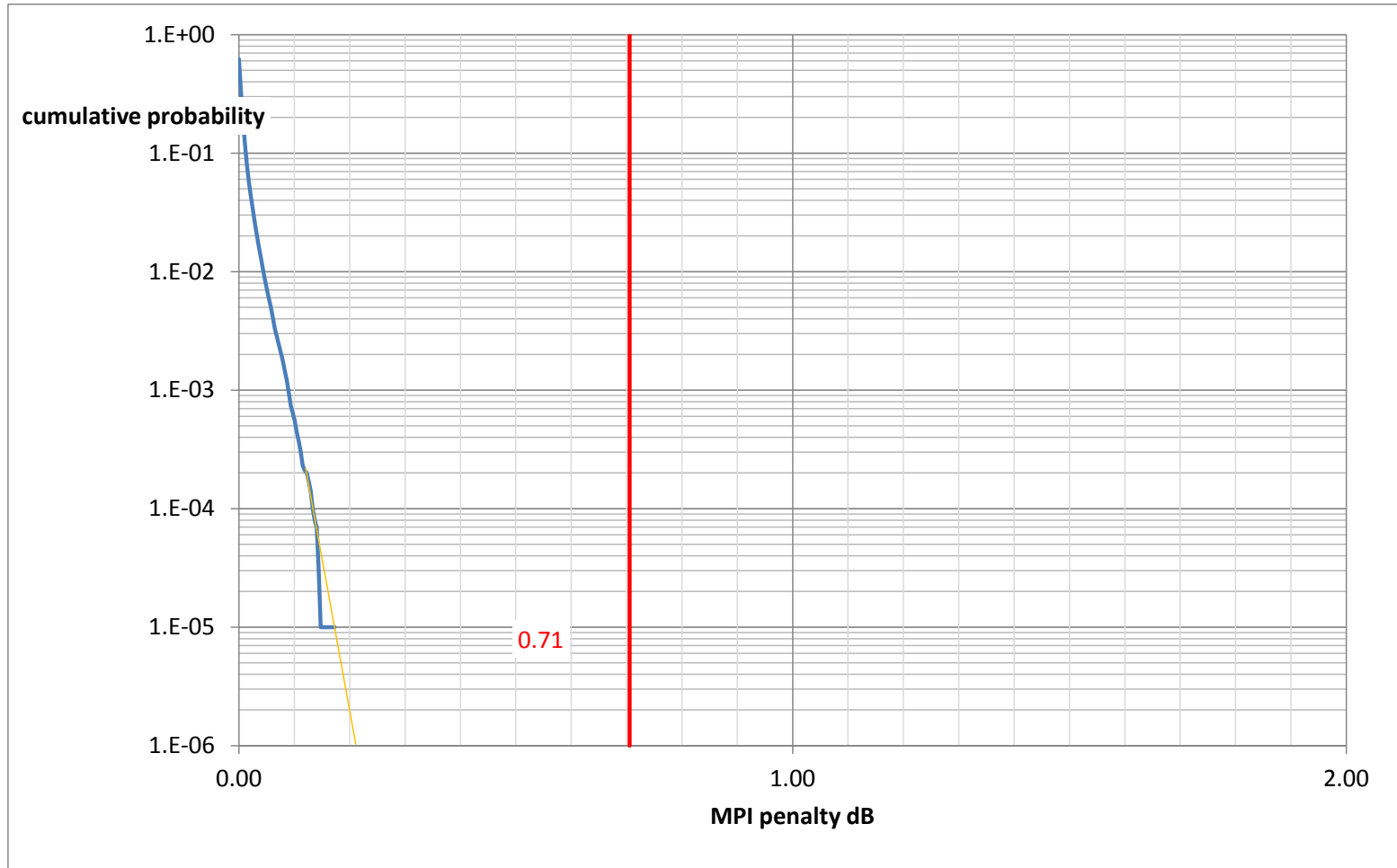
Reflection budget straw man 400GBASE-LR8

Parameter	D1.1	Straw man	Unit
Table 123-7			
Average launch power, each lane (min)	-2.5		dBm
Outer Optical Modulation Amplitude (OMAouter), each lane (min)	0.5		dBm
Launch power in OMAouter minus TDP, each lane (min)	-0.5		dBm
Optical return loss tolerance (max)	TBD	15.5	dB
Transmitter reflectance (max)	TBD	-26	dB
Table 123-8			
Average receive power, each lane (min)	-8.8		dBm
Receiver reflectance (max)	TBD	-26	dB
Receiver sensitivity (OMAinner), each lane (max)	-11.6		dBm
Table 123-9			
Power budget (for maximum TDP)	8.7	9.2	dB
Maximum discrete reflectance	TBD	-35	dB
Allocation for penalties (for maximum TDP)	2.4	2.9	dB
Table 123-12			
100GBASE-LR8 Optical return loss	20	15.5	dB
Table 123-13			
[Channel] Optical return loss (min)	21	27	dB
123.11.2.2			
maximum discrete reflectance	-26	-35	dB
Max number of -35 dB reflections		6	

Delay

All three PMD's have:

Delay constraints: 8192 bit times (16 pause_quanta or 20.48 ns)

As the maximum delay time includes the delay through 2 m of fiber after the MDI (which is ~10 ns), this allows PMD implementations that are not module based to have an internal spool of fiber of up to about 2 m before the MDI.

The Chief editor intends to enter comments against D1.2 to turn these values black

Skew and Skew Variation

All three PMD's have:

Skew constraints: SP2 43 ns, SP3 54 ns, SP4 134 ns, SP5 145 ns

Skew Variation: SP2 0.4 ns, SP3 0.6 ns, SP4 3.4 ns, SP5 3.6 ns

This translates to:

Max Skew increase across PMD Tx or Rx: 11 ns

Max Skew increase across optical channel: 80 ns

Max Skew Variation increase across PMD Tx or Rx: 200 ps

Max Skew Variation increase across optical channel: 2.8 ns

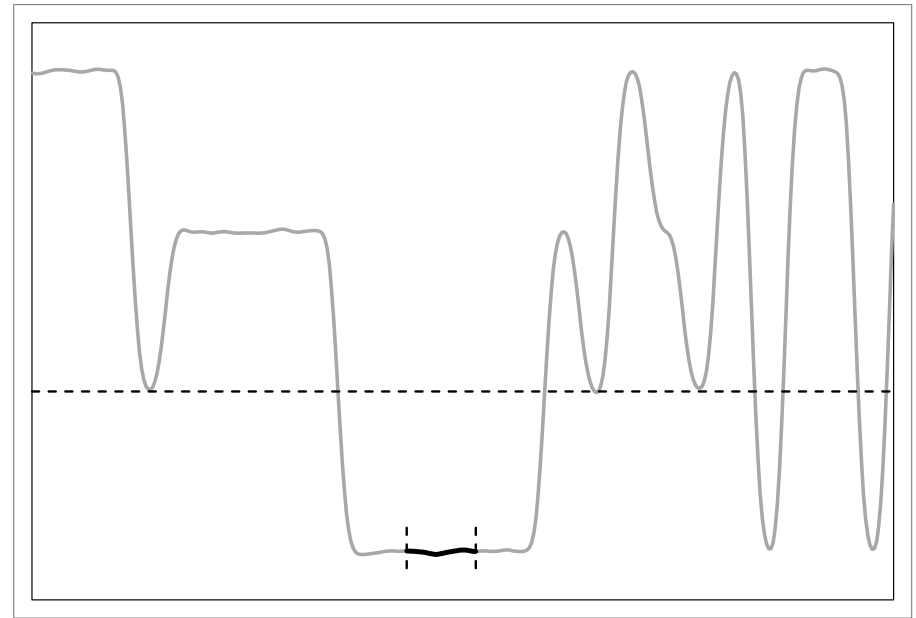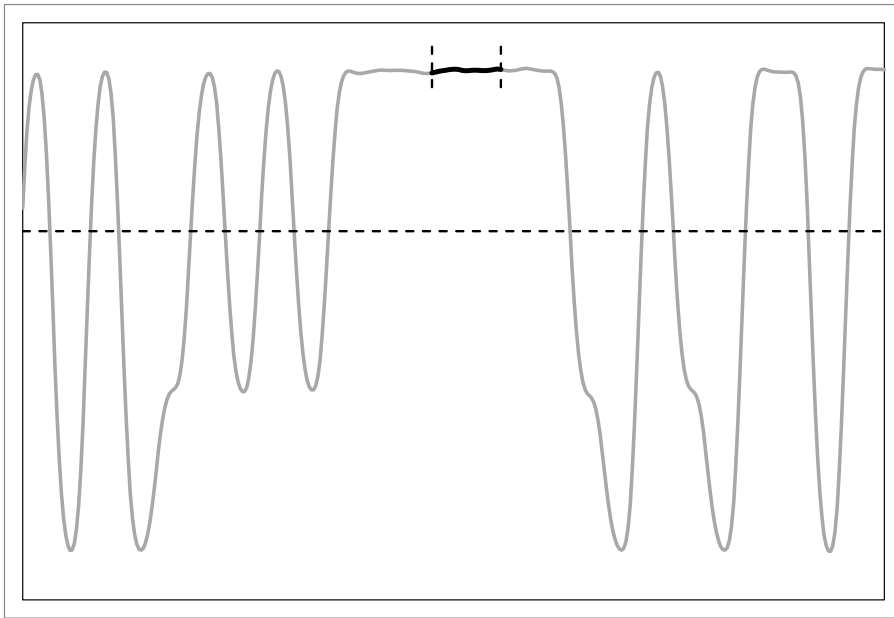Presentation on Skew for the P802.3ba project:

http://www.ieee802.org/3/ba/public/jul08/giannakopoulos_01_0708.pdf

An updated version of the spreadsheet used in P802.3bs:

anslow_02_0216_smf.xls

OMA and ER definitions

The OMA and ER definitions are proposed to be based on the PRBS13Q pattern run of 7 threes and run of 6 zeros:

TDEC and eye mask

[palkert_3bs_01_0116](#) associated with comment #87 against D1.1 is a starting point for the definition of a PAM4 TDEC test.

More contributions on this topic are needed

Is a separate eye mask required?

Stressed receiver sensitivity

How should the stressed signal be generated?

How should the amount of stress in each sub-eye be controlled?

Contributions on this topic are needed

400GBASE-DR4

	D1.2	Straw	Units
Position of Tx and Rx lanes at MDI specified in	TBD	122.11.3	
Skew measurement CDR bandwidth	TBD	2?	MHz
Test patterns			
• Square wave location	TBD	remove	
TDEC			
• Max mean DGD of test channel	2.24		ps
Channel			
• DGD_max	2.24		ps
MDI			
• Performance level	D/3	D/3	

Note: 2.24 ps is based on scaling 10 ps and 10 km for 10GBASE-LR in Table 52-24 to 0.5 km using a square root with distance

400GBASE-FR8

	D1.2	Straw	Units
Skew measurement CDR bandwidth	10	2?	MHz
Transmitter			
• Difference in power between lanes (OMA)	TBD		dB
Receiver			
• Difference in power between lanes (OMA)	TBD		dB
Link budget			
• Channel insertion loss calculation method	TBD	2x0.5 + 2	
Test patterns			
• Square wave location	TBD	remove	

400GBASE-LR8

	D1.2	Straw	Units
Skew measurement CDR bandwidth	10	2?	MHz

Transmitter

• Difference in power between lanes (OMA)	TBD		dB

Receiver

• Difference in power between lanes (OMA)	TBD		dB

Link budget

- Channel insertion loss calculation method   TBD   <mark>remove</mark>
   (Loss at 1273 nm is 0.46 dB/km, so 10x0.46 + 1.7 = 6.3 dB)

- Test patterns

- Square wave location   TBD   <mark>remove</mark>

Thanks!