TBDs, TBCs, and comments needed against clause 95 D1p1

29th August 2013 (post ad hoc meeting)

8th August, Rev 2, corrected 'Average receive power (min)' equation on slide 3

29th August, Rev 3, added notes on MMF ad hoc discussion of ER and peak power related comments

Compiled by jonathan king

TBCs in Table 95-6

Table 95–6—100GBASE-SR4 transmit characteristics

Description	Value	Unit
Signaling rate, each lane (range)	25.78125 ± 100 ppm	GBd
Lane wavelength (range)	840 to 860	nm
RMS spectral width[a]	0.6	nm
Average launch power, each lane (max)	2.4	dBm
Average launch power, each lane (min)	–9.1 TBC	dBm
Optical Modulation Amplitude (OMA), each lane (max)	3	dBm
Optical Modulation Amplitude (OMA), each lane (min)	–7.1 TBC	dBm
Launch power in OMA minus TDP (min)	–8 TBC	dBm
Transmitter and dispersion penalty (TDP), each lane (max)	5 TBC	dB

Average launch power, each lane (min) = OMA (min) – 2 dBm *

Optical Modulation Amplitude (OMA) each lane (min) = Launch power in OMA minus TDP (min) + 0.9 dB *

Launch power in OMA minus TDP (min) = –3 – TDP dBm *

TDP = 5 dB TBC

- **Finalizing TDP will finalize all Tx values in magenta.**

** These values formulae agreed in the MMF ad hoc (Dec 13th, 2012)*

TBCs in Table 95-7

Table 95–7—100GBASE-SR4 receive characteristics

Description	Value	Unit
Signaling rate, each lane (range)	25.78125 ± 100 ppm	GBd
Lane wavelengths (range)	840 to 860	nm
Damage threshold[a] (min)	3.4	dBm
Average receive power, each lane (max)	2.4	dBm
Average receive power, each lane[b] (min)	–11 TBC	dBm
Receive power, each lane (OMA) (max	3	dBm
Receiver reflectance (max)	–12	dB
Stressed receiver sensitivity (OMA), each lane[c] (max)	–5.6	dBm

Average receive power (min) = average launch power (min) – channel IL dBm

= –9.1 – 1.9 = –11.0 dBm

- **Finalizing TDP will finalize the value in magenta**

Receiver jitter tolerance

Table 95–7—100GBASE-SR4 receive characteristics

Description	Value	Unit
Receiver jitter tolerance in OMA, each lane (max)[e]	TBD	dBm
Conditions of receiver jitter tolerance test:		
Jitter frequency and peak-to-peak amplitude	(190, 5)	kHz, UI
Jitter frequency and peak-to-peak amplitude	(940, 1)	kHz, UI
OMA of each aggressor lane	3	dBm

- Proposal: same value as for SRS, -5.6 dBm

  Discussed, with no objections made, during MMF ad hoc 1st August 2013.

  A comment will be submitted against D1p1 to change the TBD to -5.6

Link Budget

Table 95–8—100GBASE-SR4 illustrative link power budget

Parameter	OM3	OM4	Unit
Effective modal bandwidth at 850 nm[a]	2000	4700	MHz.km
Power budget (for max TDP)	8.2 TBC		dB
Operating distance	0.5 to 70	0.5 to 100	m
Channel insertion loss[b]	1.8	1.9	dB
Allocation for penalties[c] (for max TDP)	6.3 TBC		dB
Additional insertion loss allowed	0.1	0	dB

Power Budget

(Tx_OMA @ max TDP) – (Rx sensitivity (unstressed, Q=3.89)) = –3 – (–11.2) = 8.2 dB

Allocation for penalties

(Tx_OMA @ max TDP) – (Rx sensitivity (unstressed, Q=3.89)) - (channel IL) = –3 – (–11.2) - (1.9) = 6.3 dB

- **Finalizing TDP will finalize the values in magenta.**

SRS test definition and exceptions:

95.8.8 Stressed receiver sensitivity

Stressed receiver sensitivity shall be within the limits given in Table 95–7 if measured using the method defined by 52.9.9 with the conformance test signal at TP3 and with the following exceptions:

a) The reference test procedure for a single lane is defined in 52.9.9. See 95.8.1.1 for multilane considerations.

b) The sinusoidal amplitude interferer is replaced by a Gaussian noise generator.

c) The fourth-order Bessel-Thomson filter is replaced by a low-pass filter and a limiter followed by a fourth-order Bessel-Thomson filter.

d) The sinusoidal jitter is at a fixed 100 MHz frequency and between 0 and 0.05 UI peak-to-peak amplitude.

e) The Gaussian noise generator, the amplitude of the sinusoidal jitter, and the Bessel-Thomson filter are adjusted so that the VECP, J2 Jitter and J4 Jitter specifications given in Table 95–7 are simultaneously met (the random noise effects such as RIN, random clock jitter do not need to be minimized).

Add text to introduce 'stressed receiver eye mask' test

f) The pattern for the received compliance signal is specified in Table 95–10.

g) The interface BER of the PMD receiver is the average of the BER of all receive lanes while stressed and at the specified receive OMA.

- Need text here which introduces the use of the stressed receiver eye mask, and reference a test method.
  - Editors were given editorial license to add the SRS test source eye mask coordinates and reference text. Proposed text for review on next slide.
  - The new text is included in D1p1

Proposed text to introduce stressed receiver eye mask test

- Modify note ‘e’ to:
- The Gaussian noise generator, the amplitude of the sinusoidal jitter, and the Bessel-Thomson filter are adjusted so that the VECP, J2 Jitter and J4 Jitter specifications given in Table 95–7 are simultaneously met while also passing the stressed receiver eye mask in Table 95-7 according to the methods specified in 95.8.7 (the random noise effects such as RIN, random clock jitter do not need to be minimized).

The proposed new text (above, in magenta) was reviewed, edited and agreed in the MMF ad hoc, 1st August 2013 . The new text is included in D1p1.

Receive jitter tolerance

- A comment against D1p1 will be needed to modify item ‘h’ so it refers to the BER defined in 95.1.1:

h ~~The interface BER of the PMD receiver is the average of the BER of all receive lanes when stressed.~~

The average of the BERs of all receive lanes while stressed (and at the specified receive OMA) is required to be less than the BER specified in 95.1.1.

The proposed new text (above, in magenta) was reviewed and agreed in the MMF ad hoc, 8th August 2013 .

Table 95-6

- A comment is needed against D1p1 to insert a note to Table 95-6, to the spec line 'Optical Modulation Amplitude (OMA) each lane (min)' which says the min OMA must be respected even if TDP is <0.9 dB.

Proposed text (also used in clauses 86, 87, 88) :

- [b] Even if the TDP < 0.9 dB, the OMA (min) must exceed this value.

- *Ed note: The note attached to 'encircled flux' will become note 'c'*

The proposed text (above, in magenta) was reviewed and agreed in the MMF ad hoc, 8th August 2013 .

Comments 66 and 130: ER spec for high ISI Tx

- ER spec was discussed in the MMF ad hoc, 29th August 2013.
- The consensus was to keep the ER spec with the current definition (ie reject comment 130) but adopt a lower ER spec value; between 2 dB and 2.5 dB was accepted to be about right
  - Allows VCSELs with high ISI to be operated within their 'sweet spot' range, but does not leave receivers vulnerable to optical inputs with high optical pedestals and relatively small OMA. It is anticipated that the ER value will be discussed and finalized in the York meeting.

Ed note: The content of this slide was extracted from 29th August MMF ad hoc meeting minutes.

Comment 129: Optical peak power spec proposal

- Comment 129 was discussed in the MMF ad hoc, 29th August 2013.
- There is no peak power spec in D1.1
- There was no agreement to add a peak power spec to D1.2.
- However, it was agreed that the need for, and the limit set by, a peak power spec was worth further study.
  - It was noted that with suitable power calibration, the peak power could be measured at the same time as Tx eye mask, and that the right spec value need not burden transmitter set up. It was generally agreed that a spec value that did not impinge on the transmitter average power and OMA specs would be more acceptable, i.e. it just limits overshoot at highest transmitter output.

Ed note: The content of this slide was extracted from 29th August MMF ad hoc meeting minutes.