Cl **95** *SC* **95.7.2** *P* **111** *L* **35** # i-26

Petrilla, John — Avago Technologies

Comment Type **TR** *Comment Status* **R**

In Table 95-7 the Conditions of stressed receiver sensitivity test do not sufficiently account for instrumentation noise in available test instruments. See petrilla_01_0714 for additional information and details.

SuggestedRemedy

In Table 95-7 change the Conditions of stressed receiver sensitivity test: VECP, J2, J4 and eye mask coordinates as described in petrilla_01_0714 for additional information and details.

Response *Response Status* **U**

REJECT.
It is advisable to warn the reader that instrumentation noise may be signfiicant.
95.8.8.4 already contains the text:

"Care should be taken when characterizing the test signal because excessive noise/jitter in the measurement system will result in an input signal that does not fully stress the receiver under test. Running the receiver tolerance test with a signal that is under-stressed may result in the deployment of non-compliant receivers. Care should be taken to minimize the noise/jitter introduced by the reference O/E, filters and BERT and/or to correct for this noise."

Additions to this text to recommend how far above the noise the signal are invited.

Cl **00** *SC* **0** *P* **110** *L* # i-35

Petrilla, John — Avago Technologies

Comment Type **TR** *Comment Status* **A**

The ability of TDP to adequately predict link margin for MMF links is questionable and, consequently, basing the min OMA requirement on TDP measurements is problematic. Another metric, TxVEC (Tx Vertical Eye Closure), provides a better correlation with link margin and has the advantages of not requiring a reference Tx and being easier and lower cost to implement while capturing all the Tx impairments that TDP captures. For more detail see petrilla_01a_0314 and petrilla_02_0714.

SuggestedRemedy

In Table 95-6, Table 95-8 and Table 95-10 replace 'Transmitter and dispersion penalty' and 'TDP', edit 95.8.1.1 and 95.12.4.4, and replace the subclause 95.8.5 Transmitter and dispersion penalty (TDP) with a new subclause as per the MMF ad hoc recommendation in king_02_0714. If any of the associated values are updated, the updates will be found in petrilla_02_0714.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
Implement changes to replace TDP in Clause 95 as described in
http://www.ieee802.org/3/bm/public/jul14/interim/king_03_0714_optx.pdf
See also comment i-8

A straw poll of the Task Force was taken:
Do you support:
a) making no change to the draft due to this comment
b) making the changes shown in king_02_0714_optx (J. Petrilla's proposal)
c) making the changes shown in king_03_0714_optx (P. Dawe)

a) 0
b) 4
c) 7

Cl **95** *SC* **95.8.8.1** *P* **115** *L* **26** # i-36

Petrilla, John — Avago Technologies

Comment Type **TR** *Comment Status* **R**

The second paragraph of 95.8.8.1 describes setup of the stressed receiver input waveform in conjunction with the block diagram in 95-3 ending with the instruction, "The Gaussian noise generator, the amplitude of the sinusoidal interferers, and the low-pass filter are adjusted so that the VECP, stressed eye J2 Jitter, and stressed eye J4 Jitter specifications given in Table 95-7 are met simultaneously while also passing the stressed receiver eye mask in Table 95-7 according to the methods specified in 95.8.7". Unfortunately, results have not been presented that simultaneously satisfying all conditions is possible. Also, additional consideration should be given to de-embedding reference receiver noise from J2 and J4 jitter versus adjusting J2 and J4 jitter values for the ref. Rx. Consequently, this paragraph should remain open for comments until more experience is accrued and the method can be confirmed.

SuggestedRemedy

Indicate that 95.8.8.1 remains open for comment in draft 3.1.

Response *Response Status* **U**

REJECT.
A contribution which shows that simultaneously satisfying all conditions is not possible together with a proposal for how the paragraph should be modified is requested.

Cl **95** *SC* **95.7.1** *P* **110** *L* **41** # i-46

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

This TDP limit of 5 dB appears to be a "worst bit plus noise" estimate from the spreadsheet; the real TDP will be considerably lower. TDP of 5 is near to a "cliff" (see dawe_01_0513_optx.pdf and dawe_02a_0114_optx.pdf slide 12), is far higher than other TDP limits in 802.3, and is not feasible.

SuggestedRemedy

Using the improved definition of TDP (see other comments) that includes all penalties:
Change TDP limit from 5 dB to 4.3 dB.
Consequent changes: change OMA-TDP (min) from -8 dB to -7.3 dB;
Change OMA (min) from -7.1 dB to -6.4 dB;
Change Average launch power, each lane (min) from -9.1 dB to -8.4 dB;
In receive specs, change Average receive power, each lane (min) from -11 dB to -10.3 dB;
In receive specs, if we are testing with maximum of all penalties, change Stressed receiver sensitivity (OMA), each lane (max) from -5.6 to -3-1.9 = -4.9 dBm;
In Table 95-8, 100GBASE-SR4 illustrative link power budget, change Power budget (for max TDP) from 8.2 dB to 4.3+1.9 = 6.2 dB (?);
In Table 95-8, change Allocation for penalties (for max TDP) from 6.3 dB to 4.3 dB (?).

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
See response to i-34
The implications of the change to TxVEC on the budget and penalties should be explored in the MMF Ad Hoc.

[Editor's note added after comment resolution completed.
The response to Comment i-34 was:
ACCEPT IN PRINCIPLE.
Overtaken by events. TDP has been replaced by TxVEC. See comment i-35.]

Cl **95** *SC* **95.7.2** *P* **111** *L* **28** # i-48

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

VECP is not a true penalty. It would be possible to use it for the unique case of an SRS signal, but not desirable.

SuggestedRemedy

Replace VECP spec with Signal Penalty (or Transmitter penalty) spec. Here, change "Vertical eye closure penalty (VECP) lane under test 4.2 dB" to "Signal Penalty, lane under test 4.3 dB" (same number as TDP in Table 95-6), modifying footnote d). And see comment against 95.8.8.2.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
See response to i-59

[Editor's note added after comment resolution completed.
The response to Comment i-59 was:
ACCEPT IN PRINCIPLE.
The proposed remedy would leave an incomplete description of the SRS test source set up process. However, it would improve the draft to specify that the SRS test source should be calibrated with the same metric used to determine the transmitter quaility (for example TxVEC).

Now that TDP has been replaced with TxVEC (comment i-35):
Add "TxVEC of stressed eye conformance signal" to Table 95-7 with 'value' cell to be the same as the TxVEC value in Table 95-6.

In 95.8.8.2, item 3), after the fifth indented paragraph, add a sixth indented paragraph:

"The TxVEC of the stressed eye conformance signal should not exceed the value given in Table 95-7, and is measured according to 95.8.5, except that the combination of the O/E and the oscilloscope used to measure the optical waveform has a fourth-order Bessel-Thomson filter response with a bandwidth of 19.34 GHz."

See also comments i-55 i-57 and i-48]

Cl **95** *SC* **95.7.2** *P* **111** *L* **29** # i-50

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

Are the J2 and J4 values correct? TR comment because this action should follow others to be taken at July meeting.

SuggestedRemedy

Review them and revise as necessary, consistent with changes to TDP and VECP. Also the SRS eye mask.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
See response to i-26

[Editor's note added after comment resolution completed.
The response to Comment i-26 was:
REJECT.
It is advisable to warn the reader that instrumentation noise may be signfiicant.
95.8.8.4 already contains the text:

"Care should be taken when characterizing the test signal because excessive noise/jitter in the measurement system will result in an input signal that does not fully stress the receiver under test. Running the receiver tolerance test with a signal that is under-stressed may result in the deployment of non-compliant receivers. Care should be taken to minimize the noise/jitter introduced by the reference O/E, filters and BERT and/or to correct for this noise."

Additions to this text to recommend how far above the noise the signal are invited.]

Cl **95** *SC* **95.8.2** *P* **113** *L* **42** # i-52

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **R**

This "shall" duplicates the one in 95.7.1, which is bad practice. It puts a (repeated) PMD requirement in the definitions section where it doesn't belong. the point about "if measured" applies to any spec; we should not be saying it in most or every subclause as if it were an exception to the rule.

SuggestedRemedy

Change the first sentence of 95.7.1 from:
...shall meet the specifications in Table 95-6 per the definitions in 95.8.
to
...shall meet the specifications in Table 95-6 if measured according to the definitions in 95.8.
and similarly for 95.7.2 100GBASE-SR4 receive optical specifications.
Change "The center wavelength and RMS spectral width of each optical lane shall be within the range given in Table 95-6 if measured per TIA/EIA-455-127-A or IEC 61280-1-3."
to "Center wavelength and RMS spectral width shall be as defined by TIA/EIA-455-127-A or IEC 61280-1-3."
Similarly in 95.8.3 Average optical power, 95.8.4 Optical Modulation Amplitude (OMA), 95.8.6 Extinction ratio, 95.8.7 Transmitter optical waveform (transmit eye), and 95.8.8 Stressed receiver sensitivity.

Response *Response Status* **U**

REJECT.
The format of clause 95 is consistent with other clauses including 52, 86, 87, 88.

Cl **95** *SC* **95.8.5** *P* **114** *L* **41** # i-55

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

Define Signal Penalty as a simplified scope-based TDP, and use this for SRS calibration to get consistency between Tx and Rx specs.
The alternative would be to fix the VECP: find a new "all but" parameter and a new VECP spec for SRS.

SuggestedRemedy

In either a new 95.8.6 or 95.8.5.1,
Define Signal Penalty (or Transmitter Penalty), as TDP with the following differences:
Observation bandwidth of 19.34 GHz not 12.6 GHz;
Noise term M set to zero.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
See response to i-59

[Editor's note added after comment resolution completed.
The response to Comment i-59 was:
ACCEPT IN PRINCIPLE.
The proposed remedy would leave an incomplete description of the SRS test source set up process. However, it would improve the draft to specify that the SRS test source should be calibrated with the same metric used to determine the transmitter quaility (for example TxVEC).

Now that TDP has been replaced with TxVEC (comment i-35):
Add "TxVEC of stressed eye conformance signal" to Table 95-7 with 'value' cell to be the same as the TxVEC value in Table 95-6.

In 95.8.8.2, item 3), after the fifth indented paragraph, add a sixth indented paragraph:

"The TxVEC of the stressed eye conformance signal should not exceed the value given in Table 95-7, and is measured according to 95.8.5, except that the combination of the O/E and the oscilloscope used to measure the optical waveform has a fourth-order Bessel-Thomson filter response with a bandwidth of 19.34 GHz."

See also comments i-55 i-57 and i-48]

Cl **95** *SC* **95.8.8.1** *P* **115** *L* **23** # i-57

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

Having improved TDP so it doesn't need VECP, we can use a similar methodology in SRS so that we don't need VECP at all (see other comments). Then we can remove it from the draft.

SuggestedRemedy

In 95.8.8.1, change "The low-pass filter is used to create ISI-induced vertical eye closure penalty (VECP)." to "The low-pass filter is used to create intersymbol interference.".
Change "so that the VECP, stressed eye J2 Jitter, and stressed eye J4 Jitter specifications given" to "so that the Signal Penalty, stressed eye J2 Jitter, and stressed eye J4 Jitter specifications given".
In 95.8.8.2, change "levels and frequencies of the VECP and jitter components" to "levels and frequencies of the Signal Penalty and jitter components".
Change "The required values of VECP, J2 Jitter and J4 Jitter" to "The required values of Signal Penalty, J2 Jitter and J4 Jitter".
Change "greater than two thirds of the dB value of the VECP should be created by the selection of the appropriate bandwidth for the low-pass filter. Any remaining VECP must be created with sinusoidal interferer 2 or sinusoidal jitter." to "greater than two thirds of the dB value of the Signal Penalty should be created by the selection of the appropriate bandwidth for the low-pass filter. Any remaining Signal Penalty must be created with sinusoidal interferer 2 or sinusoidal jitter.".

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
See response to i-59

[Editor's note added after comment resolution completed.
The response to Comment i-59 was:
ACCEPT IN PRINCIPLE.
The proposed remedy would leave an incomplete description of the SRS test source set up process. However, it would improve the draft to specify that the SRS test source should be calibrated with the same metric used to determine the transmitter quaility (for example TxVEC).

Now that TDP has been replaced with TxVEC (comment i-35):
Add "TxVEC of stressed eye conformance signal" to Table 95-7 with 'value' cell to be the same as the TxVEC value in Table 95-6.

In 95.8.8.2, item 3), after the fifth indented paragraph, add a sixth indented paragraph:

"The TxVEC of the stressed eye conformance signal should not exceed the value given in Table 95-7, and is measured according to 95.8.5, except that the combination of the O/E and the oscilloscope used to measure the optical waveform has a fourth-order Bessel-Thomson filter response with a bandwidth of 19.34 GHz."

See also comments i-55 i-57 and i-48]

Cl **95** *SC* **95.8.8.2** *P* **116** *L* **48** # i-59

Dawe, Piers J G — Mellanox Technologie

Comment Type **TR** *Comment Status* **A**

The definition of VECP in 87.8.11.2 is for a non-FEC PMD and causes inaccuracy for this PMD. After improving the TDP method so it doesn't rely on VECP and includes all penalties, we can then use a variant of the improved TDP method to calibrate the stressed eye and make the Tx and Rx specs consistent.

SuggestedRemedy

As the improved TDP includes all penalties, replace all references to VECP with references to Signal Penalty (based on TDP as defined in 95.8.8 and its subclauses - see another comment).
Change:
The primary parameters of the conformance test signal are vertical eye closure penalty (VECP), stressed eye J2 Jitter and stressed eye J4 Jitter. VECP is measured at the time center of the eye, half way between the normalized times of 0 and 1 on the unit interval (UI) scale as determined by the eye crossing means. VECP is given by Equation (87-1), and illustrated in Figure 87-4 (see 87.8.11.2).
to:
The primary parameters of the conformance test signal are Signal Penalty, stressed eye J2 Jitter and stressed eye J4 Jitter. Signal Penalty is defined in 95.8.new (or 95.8.5.1).
See other comments for associated changes.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
The proposed remedy would leave an incomplete description of the SRS test source set up process. However, it would improve the draft to specify that the SRS test source should be calibrated with the same metric used to determine the transmitter quaility (for example TxVEC).

Now that TDP has been replaced with TxVEC (comment i-35):
Add "TxVEC of stressed eye conformance signal" to Table 95-7 with 'value' cell to be the same as the TxVEC value in Table 95-6.

In 95.8.8.2, item 3), after the fifth indented paragraph, add a sixth indented paragraph:

"The TxVEC of the stressed eye conformance signal should not exceed the value given in Table 95-7, and is measured according to 95.8.5, except that the combination of the O/E and the oscilloscope used to measure the optical waveform has a fourth-order Bessel-Thomson filter response with a bandwidth of 19.34 GHz."

See also comments i-55 i-57 and i-48

Cl **83E** *SC* **83E.3.3.3.1** *P* **177** *L* **9** # i-99

Dudek, Michael
QLogic Corporation

Comment Type **TR** *Comment Status* **A**

It is extremely unlikely that a vertical eye closure penalty of 4.5 to 5.5dB will be achievable with this test set up. A pattern generator with 9.5ps risetime and 0.28UI total jitter won't have this eye closure after equalization and there are no additional knobs to adjust.

SuggestedRemedy

Either delete the requirement for the Vertical eye closure penalty and reduce the Max vertical eye closure output from the module in table 83E-3 (suggested new value 3dB) or delete the 9.5ps risetime from the pattern generator and change the sentence to say "The pattern generator risetime should be set such that the host input test signal has a vertical eye closure in the range of 4.5 dB to 5.5 dB with a target value
of 5 dB.

Response *Response Status* **U**

ACCEPT IN PRINCIPLE.
Delete:
The target pattern generator 20% to 80% transition in the host stressed input test is 9.5 ps.

Notes:
- modifying the rise/fall time on a pattern generator may not be seen as a trivial request

With loss of mated compliance boards and cables ~5dB, and crosstalk, it has been demonstrated that ~4.5dB is possible from a BERT. This is also a target specification.
See:
http://www.ieee802.org/3/bm/public/cuadhoc/meetings/may30_13/misek_01_0530_caui.pdf