Cl **68** *SC* **69.9.3** *P* **54** *L* **22** # 30

Kolesar, Paul

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

The benchmarking of the OM2 Monte Carlo results against the spread sheet link model for 10GBASE-LX4 and 1000BASE-LX10 by John Ewen at the September 2005 interim showed equivalence at the 85 percentile level causing the OM2 MC model to appear very pessimistic. However, it is likely that the more sophisticated MC model is more accurate with respect to link percentile than the spread sheet. One explanation is that the MC simulation has uncovered a problem with the launch specification of the 50um OSL patch cord. The OSL patch cord specification allows offsets between 10 and 16 um (13 +/- 3 um). These values are disproportionately low when scaled by core diameter relative to those of the 62.5um OSL patch cord that has an offset range between 17 and 23 um. The equivalent offset range for the 50 um cord when scaled by core size is 13.6 to 18.4 um (16 +/- 2.4 um). The effect of launching at offsets in the low end of the present spec is that low order modes will carry a larger fraction of the signal, and hence impart more of their mode delay characteristics to the signal. These modes delays are the least controlled by the fibers OFL bandwidth measurement and can give rise to lower link percentile. The effect of varying the OSL offset should be explored to find the optimal specification. If found to be sub-optimal, adjust the 50um OSL spec to be optimal.

SuggestedRemedy

Investigate the link percentile as a function of OSL offset for OM2. If the present specification is found to be sub-optimal, specify the optimal range. For example, add the following sentence. The optical center offset between the SMF and 50 um fiber shall be 13.6 < Offset < 18.4 um.

Proposed Response *Response Status* **U**

REJECT.

Yes: 23
No: 1
Abstain: 8

Possible new patch cord spec recommendation would be for a patch cord that is different from the existing one.

Network equipment vendors have consistently given the IEEE802.3aq committee feedback that they will not support another MCP specification. On this basis this committee has already rejected proposals for new MCP specifications for example a proposed centre launch SMF patch cord was not added to the specification.

A summary of the modelling that was completed to define the MCP for Gigabit can be found in: A Statistical Analysis of Conditioned Launch for Gigabit Ethernet Links Using Multimode Fiber: JOURNAL OF LIGHTWAVE TECHNOLOGY, VOL. 17, NO. 9, SEPTEMBER 1999, pp 1532-1541.

This shows that there was significant modelling done, including yield studies, for the 50MMF case and the IEEE 802.3 MCP specification was based on that modelling (see figure 8 for example).

The committee has not seen sufficient evidence of significant improvement in system performance, made possible by the proposed change, to justify delaying the completion of the standard.

Cl **68** *SC* **68.6.6** *P* **40** *L* **21** # 50

Abbott, John

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

Symmetric Stressors: Draft 2.3 contains a significant modification to TWDP, enabling penalties for finite equalizers & allowing a basis for review of the stressors. The current stressor set does not adequately mirror the typical pulses from offset launches, which tend to reflect a local alpha error and to be unimodal, near-symmetric, and somewhat Gaussian - pulses which for a given bandwidth have a high PIE-D (PIE-D and PIE(12,5) are nearly equal) and are relatively hard to equalize. The current set of stressors is approximately equivalent to offset BWs on 220m of 700MHz.km and hence are not a worst-case estimate of the installed OM1 base.

Worst-case OM1 fibers are characterized by center perturbations large enough that a center pulse cannot be equalized (an adequate 220 LRM Center Launch pulse cannot be guaranteed or specified by an OFL BW spec of 500MHz.km) ; for these fibers the constraint of 700MHz.km will result in a higher failure rate than typically seen in MM systems in the past. 1000BASE-LX required only 500MHz.km for 550m operation (and had excess margin, actually requiring only

SuggestedRemedy

271MHz.km for 300m); LX-4 requires only 500MHz.km for 300m operation. Thus the 700MHz.km requirement tied to the current stressors is a significantly higher bar for the same OM1 fiber.
~REMEDY: Add a 4th stressor A1=A4 = 0.11; A2=A3= 0.39; This has PIE-D = 4.42, PIE(12,5)=4.48. See presentation abbott_1_1005.pdf Note that although the PIE-D level is higher, there is no additional PIE(12,5) ""penalty"" as with split pulses.

The stressor set should include an additional symmetric stressor, either with A1=A4 and A2=A3, or A1=0, A2=A4 (i.e. a 2-pulse symmetric stressor or a 1-pulse symmetric stressor) which is consistent with an offset BW of approximately 625-650MHz.km (PIE-D = PIE(12,5) = 4.4 to 4.6dB). Two sequences of stressors were constructed varying the relative level of (A1&A4) vs (A2&A3), or (A2&A4) vs A3, and the above recommendation gives a pulse representative of worst case fibers.

If the task force finds a 4th stressor is too burdensome for TP3, this stressor could appear in an informative annex. Or this stressor could replace one of the others. For purposes of TP2 testing, it could be incorporated in the TWDP code without difficulty.

Proposed Response *Response Status* **U**

REJECT.
The commenter is suggesting a fourth stressor. The committee believes that the exisiting post-cursor and pre-cursor stressors adequately test for this kind of response.

Cl **68** *SC* **68.5.3** *P* **36** *L* **25** # 51

Abbott, John

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

Referring to Piers Dawe comment 66 in draft 2.2, 9/2005 meeting in Nashua. Piers has identified a potential problem with the split symmetric stressor, because the frequency response is sensitive to the weights.

Piers suggests changing the stressor so that it is less sensitive.

The concern I have is that Piers has identified a specific stressor which can be used for a dynamic test relevant to other parts of this standard. His experience proves that such a test is necessary, and he provides us with a stressor which can be used. At the very least his information should be appended to the informative section about dynamic effects. The test appears to be to take the split symmetric stressor and change the relative weights from A2=0.513 A4=0.487 to A2=0.487 A4=0.513 over a range of frequencies.

Again, a problem with the implementation of LRM in real systems where the modal weights can vary, has been seen experimentally. This supplements similar experimental data previously presented to the task force.

SuggestedRemedy

Take the Piers Dawe comment 66 in draft 2.2 and use it as the basis of a normative dynamic test.

If this remedy is rejected, the author recommends the information be documented in an informative annex, highlighting the problem.

Proposed Response *Response Status* **U**

REJECT.
The committee has repeatedly rejected proposals for a normative dynamic test.
The document already includes an informative note regarding dynamic behaviour.
Yes: 16
No: 5
Abstain: 8
Passes