## IEEE P802.3ck D3.3 3rd Sponsor recirculation ballot comments

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<th>120G</th>
<th>SC</th>
<th>120G.5.2</th>
<th>P274</th>
<th>L44</th>
<th># R3-7</th>
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<td>NVIDIA</td>
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### Comment: MO gDC values

**Comment Type**: TR

I-209: the range of gDC, gDC2 combinations for TP4 should be a subset of the TP1a ones, because the range of channels is a subset of the TP1a ones.

I-206: The limits for TP4 gDC, gDC2 should not be the same for short and long output modes.

**Suggested Remedy**

Fix. Use values in I-208 and I-209 or choose better values.

**Response Status**: U

REJECT. This comment is a restatement of Draft 3.0 comments I-206, I-208, and I-209. The resolution to these comments is provided in the following file:

https://www.ieee802.org/3/ck/comments/draft3p0/8023ck_D3p0_final_closedcomments_sortedByNumber.pdf

No additional evidence or alternate changes are provided by this new comment.

There is no consensus to make any of the proposed changes.

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### Comment: eye width

**Comment Type**: TR

As comments I-107, I-108, I-115, I-116, I-211, R1-55, R2-17, R2-19, https://ieee802.org/3/ck/public/22_06/dawe_3ck_01a_0622.pdf and https://ieee802.org/3/ck/public/20_10/healey_3ck_01a_1020.pdf discuss, the draft does not ensure adequate eye width because eye width does not correlate well to the weakened definition of VEC in the draft. In experiments we have seen eye widths between 90 mUI and 160 mUI for VEC = 12 dB, even before the effect of reflections shown in https://ieee802.org/3/ck/public/21_09/dudek_3ck_01_0921.pdf slide 7. This is way too much variation, and too low, for a spec limit. There can be a great variety of eyes for only slightly different channels, and unsymmetric eyes are possible (significantly different to left and right) as in dawe_3ck_01a_0622. The draft spec skews the spec to passing signals with bad eye width, which endanger the link BER, while failing usable signals with better eye width.

**Suggested Remedy**

Add ESMW spec limits:
- Host output and module stressed input >= 110 mUI;
- Module output and host stressed input >= 130 mUI.

ESMW is defined around is in the same way that ESMW is defined around Tcmid in 120E. For the stressed input calibration, these are limits not targets.

The reason for host spec being less than module is that almost all the bad stuff is in the host measurement, but not all the host channel and package impairments are in the module measurement, even “far end”. The limits in 120E are host 220 mUI, module near 265 mUI, module far 200 mUI (with a less capable equaliser), so these specs are allowing much worse eyes than 120E, but (if ESMW is added) not totally out of control.

**Response Status**: U

REJECT.

This comment is a restatement of Draft 3.0 comments I-107, I-108, I-115, I-116, I-211 and I-212, Draft 3.1 comment R1-55, and Draft 3.2 comment R2-17. The resolutions to these comments is provided in the following files:

https://www.ieee802.org/3/ck/comments/draft3p0/8023ck_D3p0_final_closedcomments_sortedByNumber.pdf

https://www.ieee802.org/3/ck/comments/draft3p1/8023ck_D3p1_final_closedcomments_sortedByNumber.pdf

https://www.ieee802.org/3/ck/comments/draft3p2/8023ck_D3p2_final_closedcomments_sortedByNumber.pdf

These comments were closed on the basis of no consensus to make the related changes.

The result of straw poll #7 recorded in the response to comment R2-17 (see https://www.ieee802.org/3/ck/comments/draft3p2/8023ck_D3p2_final_closedcomments_sortedByNumber.pdf) indicated consensus to not make these proposed changes.
This new comment provides an alternative suggested remedy, but no new evidence is provided.

There is no consensus to make the proposed changes.

SuggestedRemedy

Tighten the equaliser limits for module output so that modules are tuned consistently across the industry. Because the channel losses in short and long mode testing are significantly different, in Table 20G-11 use separate gDC limits for short and long mode (see other comments). To discourage module implementers from mis-tuning modules so they are optimised significantly beyond the far end, in Table 120G-3, ensure that each near end VEC is 0.5 dB less (better) than its corresponding far end VEC, and the far end EHs are 2 dB less than the corresponding near end EHs. Note other comments that address what these values should be.

Response

REJECT.

The comment provides insufficient evidence evidence that the proposed changes are necessary or improve the interoperability.
The weakest (max, least -ve) gDC + gDC2 is -2 for TP1a, -2 for TP4 near end, -3 for TP4 far end and -10.5 for module stressed input high loss. There is about 10 dB loss difference between short near end and long far end, but 1 dB difference in max gDC + gDC2 which is far too little. It looks like TP4 far end (-9 to -2 in the draft) is out of step, with a much wider range than TP4 near end. TP4 LONG far end should never use this wide range as most of the channel loss is fixed. We should not be encouraging modules to try to do a job the host receiver does better, and we want modules to be set up consistently so that the short/long mode choice means something.

Also, if we include an allowance for host transmitter package loss for the host stressed input test, it would make sense to include the same allowance for far-end module output specs.

**Suggested Remedy**

Impose a max gDC + gDC2 limit of -5 for TP4 long far end, e.g. with gDC, gDC2 ranges in the same style as TP1a:

- Range for gDC2 = 0: -9 to -5
- Range for -1 <= gDC2 < 0: -9 to -4
- Range for -2 <= gDC2 < -1: -9 to -3
- Range for -3 <= gDC2 < -2: -9 to -2

**Response**

REJECT.

There is some agreement with the direction of the proposal but further analysis is required to determine appropriate values.
This simple scalable method gives VEC results 0.5 to 1 dB more optimistic than the unweighted rectangular mask. It can remain as the EH and VEC limits are revised in the light of experience.

Response
REJECT.

Straw polls #8 and #9 indicate strong consensus to continue with a weighted window approach. Straw polls #10 and #11 indicate strong consensus to continue with the currently specified weighting function.

There is no consensus to make the proposed changes to the draft.

Straw poll #8 (chicago rules)
Straw poll #9 (choose one)
I support the following direction of the eye opening specification method:
A. weighted window per Draft 3.0 (as is or with some improvements)
B. revert to uniform weighted window per D2.1 (D3.0 comment #212)
C. 10pt mask per D3.0 comment #211
#8 A: 31 B: 12 C: 6
#9 A: 27 B: 5 C: 1
Note: Straw poll #8 and #9 are the same question and answers except #8 is chicago rules (pick any) and #9 is choose one.

Straw poll #10 (chicago rules)
Straw poll #11 (choose one)
To address eye width issues expressed, I support the following method to modify the weighted window:
A. no change
B. "wider" weighting mask (e.g., larger sigma, alternate distribution shape)
C. add jitter specification
D. add eye width specification (i.e., per D3.0 comments 107, 108, 115, 116)
#10 A: 26 B: 15 C: 9 D:9
#11 A: 19 B: 5 C: 3 D: 4
Note: Straw poll #10 and #11 are the same question and answers except #10 is chicago rules (pick any) and #11 is choose one.
The Gaussian weighting has the effect of destroying the histogram width, allowing bad fast eyes to pass, while failing less bad slow eyes. It gives the false impression that the histogram width still applies. With a weighting standard deviation of 0.02 UI, the eye height is measured at around +/-0.035 UI rather than the +/-0.05 UI with the unweighted histogram - depending on eye shape. Compare 120E with ESMW of 0.2 or 0.22 UI, and TDECQ with histograms extending twice as wide, to +/-0.07 UI. This weighting is equivalent to relaxing the VEC spec by 1.5 to 2 dB - but it depends on the eye shape, it weakens the spec most for the worst-shaped eyes, which is bad. It applies a worse BER criterion than the 1e-5 intended.

**Suggested Remedy**

Remove the Gaussian weighting and set the eye height and VEC limits (which need revision anyway) appropriately. ghiasi_3ck_01_0721, which was not given the presentation time it deserved, says that the minimum eye height in particular needs to be reduced for TP1 and TP4 far end.

**Response**

REJECT.

There is no consensus to make the proposed changes.

For details, see the response to comment i-211.

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As noted, this weighting function skews the spec to passing signals with relatively bad eye width, whether from jitter or other cause, which endanger the link BER, while failing signals with usable VEC and eye height and better eye width.

**Suggested Remedy**

Pick one of the proposed solutions and fix the problem. Notice that the apparent VEC and EH numbers are likely to change in step.

**Response**

REJECT.

This comment is a restatement of D3.0 comments i-211 and i-212 recorded in the following comment report: https://www.ieee802.org/3/ck/comments/draft3p0/8023ck_D3p0_final_closedcomments_sortedByNumber.pdf

No further evidence nor any alternate remedies are provided.

Straw poll #11 (recorded in the response to comment i-211) indicated consensus to make no changes to the measurement method.
As we know, this Gaussian "weighting" function de-weights the sides of the histogram, allowing worse eye width (jitter) than otherwise. As healey_3ck_01a_1020 shows, for the same VEC, ESMW varies across channels by at least 130 mUI, plus more for driver output edge rate. As e.g. dudek_3ck_01_0921 slide 7 shows, there can be a great variety of eyes for only slightly different channels. It turns out that unsymmetric eyes are possible (significantly different to left and right) - see presentation. The draft spec skews the spec to passing signals with relatively bad eye width, which endanger the link BER, while failing signals with usable VEC and eye height and better eye width.

We need better control of eye width, as has been pointed out in D3.0 comments I-107, I-108, I-115, I-116, I-211 and R1-55, with two clear alternative remedies proposed: the 10-sided mask or explicit ESMW limits.

Suggested Remedy

Add ESMW spec limits:
Host output and module stressed input >=120 mUI;
Module output and host stressed input >= 130 mUI.
ESMW is defined around ts in the same way that ESMW is defined around Tcmid in 120E.

The reason for host spec being less than module is that almost all the bad stuff is in the host measurement, but not all the host channel and package impairments are in the module measurement, even "far end".
The limits in 120E are host 0.22 UI, module near 0.265 UI, module far 0.2 UI (with a less capable equalizer), so these specs are allowing much worse eyes than 120E, but not totally out of control.

REJECT.

This comment is a restatement of Draft 3.0 comments I-107, I-108, I-115, I-116, I-211 and I-212, and Draft 3.1 comment R1-55. The resolution to these comments is provided in the following files:
https://www.ieee802.org/3/ck/comments/draft3p0/8023ck_D3p0_final_closedcomments_sortedByNumber.pdf
https://www.ieee802.org/3/ck/comments/draft3p1/8023ck_D3p1_final_closedcomments_sortedByNumber.pdf

These comments were closed on the basis of no consensus to make the related changes.
The result of straw poll #11 recorded in the response to comment I-211 (see https://www.ieee802.org/3/ck/comments/draft3p0/8023ck_D3p0_final_closedcomments_sortedByNumber.pdf) indicated consensus to not make these proposed changes.

The following related presentation was reviewed by the task force: