802.3ck D2.2 Comment Resolution Cross-Clause

Matt Brown, Huawei, P802.3ck Editor-In-Chief
Howard Heck, Intel

162/163/163A TX SNDR/Np, part 1
Comments 23, 50, 55, 68

Cl 162 SC 162.9.3.1.1 P 172 L 8 # 23

Wu, Mau-Lin MediaTek Inc.

Comment Type TR *Comment Status* D *TX Np*

For the linear-fit procedure adopted for TX SNDR calcuation, N_p = 200 shall be adopted, instead of N_p = 29. N_p = 29 was used for SNR_TX calibration in RITT test instead. Related rationale had been disclosed in previous contribution, wu_3ck_adhoc_01b_071421.pdf.

SuggestedRemedy

Change 'N_p = 29' to 'N_p = 200'.

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
Resolve using the response to comment #50.

Cl 162 SC 162.9.3.1.1 P 172 L 8 # 55

Hidaka, Yasuo Credo Semiconductor

Comment Type ER *Comment Status* D *TX Np*

Np for TX SNDR in clause 162.9.3.1.1 was changed from 200 in D2.0 to 29 in D2.1. However, I cannot find any comment on D2.0 to change Np for TX SNDR from 200 to 29. It seems that this was an editorial error to implement the resolution of comment #197 on D2.0 which was closed to change Np for RX ITT from 15 to 29 in clause 162.9.4.3.3. I cannot find a record of consensus to change Np for TX SNDR from 200 to 29 in clause 162.9.3.1.1.
So, I think Np for TX SNDR in clause 162.9.3.1.1 should remain 200.

SuggestedRemedy

Change Np for TX SNDR from 29 back to 200 on line 8 in page 172, clause 162.9.3.1.1.

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
Resolve using the response to comment #50.

Cl 162 SC 162.9.3.1.1 P 172 L 8 # 50

Ran, Adee Cisco

Comment Type TR *Comment Status* D *TX Np*

Following up on unsatisfied comment #29 against D2.1:

The linear fit procedure is defined with Np=29, so the pulse response length is 29. Nv, the number of UIs that are considered for v_f calculation, cannot be higher than Np. In the multiple places that Nv is used, it needs an exception to use Np=200. This does not make sense.

As an example, in 163A.3.2.1 we have "where p(i) and M are defined in 162.9.3.1.1 and Nv is 200". This does not make sense if Np=29.

If 162.9.3.1.1 uses Np=200, this will be the default value, and there will be one exception in the case of SNDR where it should be set to 29. This would result in fewer exceptions.

SuggestedRemedy

1. In 162.9.3.1.1, change Np from 29 to 200.
2. In 162.9.3.3 (Output SNDR), change "with the exceptions that a test system with response as specified in 162.9.3 and the linear fit procedure in 162.9.3.1.1 are used" to "with the exceptions that the test system response is specified in 162.9.3, and the linear fit procedure in 162.9.3.1.1 with Np=29 is used".
3. In 162.9.3.1.2 (Steady-state voltage and linear fit pulse peak) change "The steady-state voltage v_f is defined in 136.9.3.1.2, and is determined from the linear fit pulse calculated by the procedure in 162.9.3.1.1 with the exception that Np and Nv are equal to 200" to "The steady-state voltage v_f is calculated as defined in 136.9.3.1.2 with the exception that Nv=200, and is determined from the linear fit pulse calculated by the procedure in 162.9.3.1.1".
4. In 163A.3.2.1 change "Nv is 200" to "Nv is set by the clause that invokes this method". (it is currently invoked only by 163.9.2.4 (Difference steady state voltage) which states "with Nv = 200").

Proposed Response *Response Status* W

PROPOSED ACCEPT.
[Editor's note: CC: 163, 162, 163A]

162/163/163A TX SNDR/Np, part 2
Comments 23, 50, 55, 68

Cl **163** *SC* **163.9.2** *P* **208** *L* **12** # **68**

Healey, Adam — Broadcom Inc.

Comment Type **TR** *Comment Status* **D** *TX SNDR (CC)*

The reference for the SNDR specification is 162.9.3.3 which specifies Np to be 29. Reflections from the test fixture can easily have a round-trip delay exceeding 25 (29-1-Dp) UI which will degrade the SNDR measurement. However, such reflections have no relationship to the quality of the transmitter under test. Also, the introduction of the ISI_RES specification in Draft 2.2 limits intersymbol interference and makes it unnecessary to consider it again in the SNDR measurement. The purpose of SNDR, as the name suggests, is to limit noise and distortion. Prior specifications have used and Np value of 200 to avoid including intersymbol interference in the result.

SuggestedRemedy

Change Np for the Clause 163 SNDR specification to 200.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
162.9.3.3 points to linear fit procedure in 162.9.3.1.1. Comments #23, #50, #55 suggest to change Np from 29 to 200 in 162.9.3.1.1
Resolve together with comments #23, #50, #55
[Editor's note: CC: 163, 162, 163A]
[Editor's note: Changed page from 207 to 208.]

162/163/163A TX SNDR/Np, part 3
Comments 23, 50, 55, 68

162.9.3.1.1, p. 172

200

Compute the linear fit pulse response $p(k)$ and linear fit error $e(k)$, k=1 to $M \times N_p$, from the captured waveform, as specified in 85.8.3.3.5, with N_p ~~=29~~ and $D_p = 4$, where the aligned symbols $x(n)$ are assigned normalized amplitudes −1, −*ES*, *ES*, and 1 to represent the PAM4 symbol values 0, 1, 2, and 3 respectively. *ES* is defined as (|*ES1*| + |*ES2*|)/2 where *ES1* and *ES2* are calculated according to 120D.3.1.2.

162.9.3, p. 174

The transmitter SNDR is defined by the measurement method described in 120D.3.1.6 with the exceptions that ~~a test system with response as specified in 162.9.3 and the linear fit procedure in 162.9.3.1.1 are used~~.

the test system response is specified in 162.9.3, and the linear fit procedure in 162.9.3.1.1 with N_p=29 is used

162.9.2.1.3, p. 173

~~The steady-state voltage v_f is defined in 136.9.3.1.2, and is determined from the linear fit pulse calculated by the procedure in 162.9.3.1.1 with the exception that N_p and N_v are equal to 200. The steady-state voltage shall meet the requirements specified in Table 162–10.~~

The steady-state voltage v_f is calculated as defined in 136.9.3.1.2 with the exception that N_v=200, and is determined from the linear fit pulse calculated by the procedure in 162.9.3.1.

162/163/163A TX SNDR/Np, part 4
Comments 23, 50, 55, 68

163A.3.2.1, p. 323

The measured linear fit pulse peak, $v_{peak}^{(meas)}$, and steady-state voltage, $v_f^{(meas)}$, are calculated from a linear fit pulse response, *p(k)*, obtained from measurement at TP0v with the transmit equalizer set to preset 1 (no equalization) using the method in 163A.3.1.1. $v_{peak}^{(meas)}$ is the peak value of *p(k)*. $v_f^{(meas)}$ is defined by Equation (163A–7) where *p(i)* and *M* are defined in 162.9.3.1.1 and ~~N_v is 200~~.

Nv is set by the clause that invokes this method.

162/163/93A/120G HO AC CM voltage, part 1
63, 60, 61, 62, 64, 59

Cl 93A SC 93A P 237 L 44 # 59

Mellitz, Richardd Samtec

Comment Type TR *Comment Status* D *HO AC CM voltage (CC)*

Common mode measurements are not well enough defined to precisely specify CM voltage at TP0v, TP1a, TP4 and TP2. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Add section "93A.6 Common Mode measurements". See presentation

Proposed Response *Response Status* W

PROPOSED REJECT.
The proposed solution was discussed in
https://www.ieee802.org/3/ck/public/adhoc/sept08_21/mellitz_3ck_adhoc_01_090821.pdf.
Resolve in conjunction with comments 63, 60, 61,62, 64.
For task force review.

Cl 163 SC 163.9.2 P 207 L 43 # 64

Mellitz, Richardd Samtec

Comment Type TR *Comment Status* D *HO AC CM voltage (CC)*

Common mode measurements are not well enough defined to precisely specify CM voltage at TP0v. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Remove item "AC common-mode RMS output voltage (max)"

Proposed Response *Response Status* W

PROPOSED REJECT.
The comment does not provide sufficient evidence for the proposed change.
Resolve in conjunction with comments 63, 60, 61,62, 59.
For task force review.

Cl 162 SC 162.9.3 P 170 L 24 # 62

Mellitz, Richardd Samtec

Comment Type TR *Comment Status* D *HO AC CM voltage (CC)*

Common mode measurements are not well enough defined to precisely specify CM voltage at TP2. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Replace item "AC common-mode RMS output voltage (max)"
With "Peak fitted AC common mode (max) Pmax_ccm" using a value of 50 mV

Proposed Response *Response Status* W

PROPOSED REJECT.
The proposed solution requires consideration by the task force.
Resolve in conjunction with comments 63, 60, 61, 64, 59.
For task force review.

Cl 120F SC 120F.3.1 P 242 L 13 # 63

Mellitz, Richardd Samtec

Comment Type TR *Comment Status* D *HO AC CM voltage (CC)*

Common mode measurements are not well enough defined to precisely specify CM voltage at TP0v. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Remove item "AC common-mode RMS output voltage (max)"

Proposed Response *Response Status* W

PROPOSED REJECT.
The proposed solution requires consideration by the task force.
Resolve in conjunction with comments 60, 61,62, 64, 59.
For task force review

162/163/93A/120G HO AC CM voltage, part 2
63, 60, 61, 62, 64, 59

Cl 120G SC 120G.3.1 P 261 L 13 # 60

Mellitz, Richardd Samtec

Comment Type TR Comment Status D HO AC CM voltage (CC)

Common mode measurements are not well enough defined to precisely specify CM voltage at TP1a. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Replace item "AC common-mode RMS output voltage (max)""Uncorrelated AC common mode SNR (min),
With "Peak fitted AC common mode (max) Pmax_ccm" using a value of 50 mV

Proposed Response Response Status W

PROPOSED REJECT.
The proposed solution requires consideration by the task force.
Resolve in conjunction with comments 63, 61,62, 64, 59.
For task force review.
[Editor's note: Changed page from 161 to 261.]

Cl 120G SC 120G.3.2.1 P 264 L 6 # 61

Mellitz, Richardd Samtec

Comment Type TR Comment Status D HO AC CM voltage (CC)

Common mode measurements are not well enough defined to precisely specify CM voltage at TP4. In addition, all aspects of a common mode voltage may not be detrimental as illustrated in mellitz_3ck_adhoc_01_090821.

SuggestedRemedy

Replace item "AC common-mode RMS output voltage (max)"
With "Peak fitted AC common mode (max) Pmax_ccm" using a value of 50 mV

Proposed Response Response Status W

PROPOSED REJECT.
The proposed solution requires consideration by the task force.
Resolve in conjunction with comments 63, 60,62, 64, 59.
For task force review.

162/163/93A/120G HO AC CM voltage, part 3
63, 60, 61, 62, 64, 59

Related presentations:
- https://www.ieee802.org/3/ck/public/21_09/mellitz_3ck_01_0921.pdf
- https://www.ieee802.org/3/ck/public/adhoc/sept08_21/mellitz_3ck_adhoc_01_090821.pdf

Annex 93A (comment #59)
- define new subclause with methods for CM parameters
  - “peak fitted AC CM voltage (max) pmax_cm”
  - “SNR ucm”
- methods in mellitz_3ck_adhoc_01_090821, mellitz_3ck_01_0921

162.9.3 Transmitter Characteristics [CR] (comment #62)
120G.3.1 Host output Characteristics [C2M] (comment #60)
120G.3.2 Module output characteristics [C2M] (comment #61)
- delete “AC common-mode output voltage (max, RMS)”
- add “peak fitted AC common-mode voltage (max) pmax_cm”, value 50 mV

163.9.2 Transmitter Characteristics [KR] (comment #64)
120F.3.1 Transmitter electrical characteristics [C2C] (comment #63)
- delete “AC common-mode output voltage (max, RMS)”

For all… (mellitz_3ck_01_0921)
- add new parameter “SNR_ucm (min)”, value 28 dB

162*/163*/120F/120G IL terminology Comment 92

Cl 162 SC 162.8.1 P 165 L 48 # 92

Dawe, Piers Nvidia

Comment Type E *Comment Status* D *IL terminology (CC)*

"differential-mode to differential-mode insertion loss" is unnecessarily wordy; everyone understands just "insertion loss" to mean differential-mode to differential-mode if they know it's a system or component that uses differential signalling, which is made plain above. Similarly for return loss. It would be disruptive and unnecessary to go through the many clauses in the base document for this, although the terminology and notation for mixed-mode and common-mode losses may be worth retrofitting.

SuggestedRemedy

Change "differential-mode to differential-mode insertion loss" to "insertion loss", change "differential-mode to differential-mode return loss" to "return loss" throughout the document.

Proposed Response *Response Status* W

PROPOSED REJECT.
The changes were made after task force discussion acceptance of D2.1 Comment #13.
The resolution was to:
"Implement the parameter names and variables names provided in slide 15 of the following presentation:
https://www.ieee802.org/3/ck/public/21_07/brown_3ck_01a_0721.pdf"
Resolution to comments against the new revision (802.3dc) has resulted in terminology different to what was recently adopted in 802.3ck D2.2. To minimize churn in 802.3ck, it would be best to defer this topic until after the next draft of 802.3dc is published.
For task force discussion.
[Editor's note: CC: many]

brown_3ck_01a_0521 slide 9
Parameter and option 2 accepted per D2.0 comment #61.

120F/120G/162B return loss variable names (part 4)
Comments 61, 62, 63, 65, 66

Parameter	Candidate variable names: Option 1 (per comments)	Option 2 (type is lower case)	Option 3 (all upper case)
differential RL	return_loss	RLdd	RLDD
common-mode to common-mode RL	return_loss	RLcc	RLCC
common-mode to differential RL	return_loss	RLdc	RLDC
differential to common-mode RL	return_loss	RLcd	RLCD

IEEE P802.3ck Task Force, May 2021 9

brown_3ck_01a_0721 slide 15
Accepted per D2.1 comment #13.

162/162A/162B/163/120F/120G IL terminology, part 2
116, 13, 14

- Based on ad hoc conversation, there was some preference for the changes to the proposed terminology as shown below.
- The table below also provides derivation from mixed mode s-parameters for reference.

Parameter name	Variable name	Derivation (dB)
Differential-mode to differential mode insertion loss	*ILdd*	-20*log10(SDD21(f))
Common-mode to common-mode insertion loss	*ILcc*	-20*log10(SCC21(f))
Common-mode to differential-mode ~~conversion~~insertion loss	*ILdc*	-20*log10(SCD21(f))
Differential-mode to common-mode ~~conversion~~insertion loss	*ILcd*	-20*log10(SCD21(f))

IEEE P802.3ck Task Force, May 2021 15

162/163 COM DFE bgmax/min Comment 90

Cl 162 SC 162.11.7 P 191 L 39 # 90

Dawe, Piers Nvidia

Comment Type **TR** *Comment Status* **D** *COM DFE bgmax/min (CC)*

The normalized DFE coefficient minimum limit bbmin for taps 3 to 12 is -0.03. It doesn't make sense that taps 13 to 40 could be worse, -0.05. I know of only example channel with a tap like this. Remember, these are reference receiver limits not hard cable or channel limits anyway; a cable or channel can go beyond a tap limit if it makes up the COM another way, e.g. with acceptable crosstalk. In the case of Bch2_b2p5_7_t, reducing |bmaxg| from 0.05 to 0.03 increases COM by less than 0.1 dB, and the channel still passes comfortably. In this example, there were no taps that would be affected by reducing +ve bgmax from 0.05 to 0.03; one -ve tap was limited.

SuggestedRemedy

Change bgmax 0.05 to bbgmax 0.05, bbgmin -0.03. Also in 163.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This is a restatement of comment #95 against D2.1 which was rejected by the task force de to insufficient supporting evidence. Some new information on the analysis of one channel is provided, but this is insufficient evidence to support the proposed changes.
[Editor's note: CC: 162, 163]

Table 162–19—COM parameter values

Parameter	Symbol	Value	Units
DFE maximum span including floating taps	N_f	40	UI
Normalized coefficient magnitude limit for DFE floating taps	b_{gmax}	0.05	
DFE floating tap tail root-sum-of-squares limit	σ_{tmax}	0.02	

Draft 2.1 comment #95

Cl 162 SC 162.11.7 P 183 L 39 # 95

Dawe, Piers Nvidia

Comment Type TR *Comment Status* R *COM bbgmax*

The normalized DFE coefficient minimum limit bbmin for taps 3 to 12 is -0.03. It doesn't make sense that taps 13 to 40 could be worse, -0.05. If I have understood the data correctly, the example channels we have don't need this. (Remember, these are reference receiver limits not hard cable or channel limits anyway; a cable or channel can go beyond a tap limit if it makes up the COM another way, e.g. with acceptable crosstalk.)

SuggestedRemedy

Change bgmax 0.05 to bbgmax 0.05, bbgmax -0.03. Also in 163.

Response *Response Status* U

REJECT.

This comment does not apply to the substantive changes between IEEE P802.3ck D2.1 and D2.0 or the unsatisfied negative comments from the initial ballot.
Hence it is not within the scope of the recirculation ballot.

The following presentation showed that some backplane channels had floating tap coefficient values of <-0.03.
https://www.ieee802.org/3/ck/public/19_09/heck_3ck_01_0919.pdf
The comment does not provide an assessment of the impact to those channels.
[Editor's note: CC: 162, 163]

162/163 COM DFE RSS Comment 91

Cl **162** SC **162.11.7** P **191** L **38** # 91

Dawe, Piers — Nvidia

Comment Type **TR** *Comment Status* **D** *COM DFE RSS (CC)*

The spec allows a cable to have its COM calculated with 9 taps in the range 13 to 24 clipped at +/-0.05 - which means that the channel's pulse response could be worse than +/-0.05 for all these 9 taps. That's a very bad cable! and not likely to get made: there won't be that many reflections in the same area. (Remember, these are reference receiver limits not hard cable limits anyway; a cable can go beyond a tap limit if it makes up the COM another way, e.g. with acceptable crosstalk.)
We don't need to provide all the receiver power and complexity to cope with unreasonably bad cables.

SuggestedRemedy

Use another DFE root-sum-of-squares limit for positions 13-24. A limit of 0.045 works well with Bch2_b2p5_7_t. Similarly in 163.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This is a restatement of comment #96 against D2.1 which was rejected by the task force due to incomplete remedy and insufficient analysis. This new comment provides some new, but unstantiated information.
[Editor's note: CC: 162,163]

Table 162–19—COM parameter values

Parameter	Symbol	Value	Units
DFE maximum span including floating taps	N_f	40	UI
Normalized coefficient magnitude limit for DFE floating taps	b_{gmax}	0.05	
DFE floating tap tail root-sum-of-squares limit	σ_{tmax}	0.02	
DFE floating tap tail starting position	N_{te}	25	

Draft 2.1 comment #96

Cl **162** SC **162.11.7** P **183** L **40** # 96

Dawe, Piers — Nvidia

Comment Type **TR** *Comment Status* **R** *COM DFE RSS*

The spec allows a cable (not even the whole channel) to have its COM calculated with 9 taps in the range 13 to 24 clipped at +/-0.05 - which means that the channel's pulse response could be worse than +/-0.05 for all these 9 taps. That's a very bad cable! and not likely to get made: there won't be that many reflections in the same area. (Remember, these are reference receiver limits not hard cable limits anyway; a cable can go beyond a tap limit if it makes up the COM another way, e.g. with acceptable crosstalk.)
We don't need to provide all the receiver power and complexity to cope with unreasonably bad cables.

SuggestedRemedy

Use another DFE root-sum-of-squares limit for positions 13-24. Similarly in 163, but as 163 specifies the complete channel while 162 uses clean synthetic host traces, the limit should be higher.

Response *Response Status* **U**

REJECT.

This comment does not apply to the substantive changes between IEEE P802.3ck D2.1 and D2.0 or the unsatisfied negative comments from the initial ballot.
Hence it is not within the scope of the recirculation ballot.

The suggested remedy is not complete nor has sufficient analysis been provided.