Comment Resolution for Cross-Clause Topics

Matt Brown, Huawei, 802.3ck Editor-in-Chief

Cross-Clause
AC common-mode noise

AC CM noise, fix SCMR measurement method Comment 106

Cl **120F** *SC* **120F.3.1** *P* **239** *L* **13** # **I-106**

Mellitz, Richard Samtec, Inc.

Comment Type **TR** *Comment Status* **D** *AC CM noise*

DER0 for 120F is 1e-5 and DER0 for 163 is 1e-4. The reference to 163.9.2.7 need a reference to adjust for DER0.

SuggestedRemedy

Add a footnote to SCMR(min) to compute V_CMPP to with the distribution range to be between 0.000005 to 0.999995. (1.e. 1e-5).

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The comment correctly points out that the range should be consistent with the target DER0. However, rather than loading the table with another detail footnote, create a new subclause in 120F defining SMCR based on 163.9.2.7 with an exception for the distribution range per the suggested remedy.
Implement the suggested remedy with editorial license.

AC CM noise, separate high/low frequencies Comment 101, 102

Cl **163** *SC* **163.9.2** *P* **203** *L* **43** # I-101

Mellitz, Richard — Samtec, Inc.

Comment Type **TR** *Comment Status* **D** *AC CM noise*

Low frequency CM will not be very dependent on a test fixture. Signal to AC common-mode noise ratio, SCMR (min), is related to the Peak Pulse and used to compensate for test fixture loss. Since the low frequency the loss is very small the tp0v compensation is not correct. As demonstrated in mellitz_3k_adhoc_01_120821 noise originating from a power supply or other low frequency sources can be detrimental.

SuggestedRemedy

Add a new line to table 163-5 called maximum low frequency AC common mode max peak to peak noise (V_CMPP) and set to 30 mV. Create a new section for such indicating the a low pass 4th order Bessel Thomson filter with a 3 dB point of 10 MHz is to be applied to the CM measurement. Additionally in section 163.9.2.7 indicate that the a high pass 4th order Bessel Thomson filter with a 3 dB point of 10 MHz is to be applied to the AC CM measurement and set SCMR (min) to 11.8 dB. See presentation.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The following presentation was reviewed by the task force at a previous ad hoc meeting:
https://www.ieee802.org/3/ck/public/adhoc/jan12_22/mellitz_3ck_adhoc_01_011222.pdf

No concensus whether this proposal should be accepted yet.

For task force discussion.

Cl **120F** *SC* **120F.3.1** *P* **239** *L* **13** # I-102

Mellitz, Richard — Samtec, Inc.

Comment Type **TR** *Comment Status* **D** *AC CM noise*

Low frequency CM will not be very dependent on a test fixture. Signal to AC common-mode noise ratio, SCMR (min), is related to the Peak Pulse and used to compensate for test fixture loss. Since the low frequency the loss is very small the tp0v compensation is not correct. As demonstrated in mellitz_3k_adhoc_01_120821 noise originating from a power supply or other low frequency sources can be detrimental,

SuggestedRemedy

Add a new line to table 120F-1 called maximum low frequency AC common mode max peak to peak noise (V_CMPP) and set to 30 mV. Create a new section for such indicating the a low pass 4th order Bessel Thomson filter with a 3 dB point of 10 MHz is to be applied to the CM measurement. Additionally in section 163.9.2.7 indicate that the a high pass 4th order Bessel Thomson filter with a 3 dB point of 10 MHz is to be applied to the AC CM measurement and set SCMR (min) to 10.7 dB. See presentation.

Proposed Response *Response Status* **W**

PROPOSED REJECT.

The following presentation was reviewed by the task force at a previous ad hoc meeting:
https://www.ieee802.org/3/ck/public/adhoc/jan12_22/mellitz_3ck_adhoc_01_011222.pdf

The comment does not provide sufficient evidence to support the proposed changes in methodology.

For task force discussion.

AC CM noise, add CMPP
Comments 103, 104, 105

Cl 162 SC 162.9.3 P166 L24 # I-103

Mellitz, Richard Samtec, Inc.

Comment Type TR *Comment Status* D *AC CM noise*

RMS is poor indicator for CM mode noise. See CM histograms in mellitz_3k_adhoc_01_120821, mellitz_3ck_01a_0721, and mellitz_3ck_adhoc_01_121620. Clause 163.9.2.7 defines a more meaningful parameter V_CMPP as the peak-to-peak AC common-mode voltage.

SuggestedRemedy

Replace "AC common-mode RMS voltage, v_cmi (max)" with V_CMPP as the peak-to-peak AC common-mode voltage and set to 223 mV. See presentation.

Proposed Response *Response Status* W

PROPOSED REJECT.
For task force discussion.

Cl 120G SC 120G.3.1 P258 L13 # I-104

Mellitz, Richard Samtec, Inc.

Comment Type TR *Comment Status* D *AC CM noise*

RMS is poor indicator for CM mode noise. See CM histograms in mellitz_3k_adhoc_01_120821, mellitz_3ck_01a_0721, and mellitz_3ck_adhoc_01_121620. Clause 163.9.2.7 defines a more meaningful parameter V_CMPP as the peak-to-peak AC common-mode voltage.

SuggestedRemedy

Replace "AC common-mode output voltage (max, RMS)" with V_CMPP as the peak-to-peak AC common-mode voltage and set to 213 mV but define the distribution range to be between 0.000005 to 0.999995. (1.e. 1e-5) See presentation.

Proposed Response *Response Status* W

PROPOSED REJECT.
Pending task force review of the cited presentation.

Cl 120G SC 120G.3.2 P261 L7 # I-105

Mellitz, Richard Samtec, Inc.

Comment Type TR *Comment Status* D *AC CM noise*

RMS is poor indicator for CM mode noise. See CM histograms in mellitz_3k_adhoc_01_120821, mellitz_3ck_01a_0721, and mellitz_3ck_adhoc_01_121620. Clause 163.9.2.7 defines a more meaningful parameter V_CMPP as the peak-to-peak AC common-mode voltage.

SuggestedRemedy

Replace "AC common-mode output voltage (max, RMS)" with V_CMPP as the peak-to-peak AC common-mode voltage and set to 213 mV but define the distribution range to be between 0.000005 to 0.999995. (1.e. 1e-5). See presentation

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
It seems sensible that the AC CM noise for C2M should be constrained in the same way as for C2M.
Implement the suggested remedy with editorial license.
For task force discussion.

AC CM noise, reduce RMS
Comments 110, 111

Cl 120G SC 120G.3.2 P260 L6 # I-110

Ghiasi, Ali — Ghiasi Quantum LLC,Marvell Semiconductor, Inc.

Comment Type TR *Comment Status* D *AC CM noise*

AC common mode at TP1a which include the channel is specified as 25 mV but also AC common mode for module output which doesn't include the channel specified as 25 mV. Need allocation for the channel!

SuggestedRemedy

Please reduce the AC common mode at TP4 to 20 mV RMS

Proposed Response *Response Status* W

PROPOSED REJECT.
The comment does not provide sufficient justification for the proposed changes.
For task force discussion.
Resolve comment #110 and #111 together.

Cl 120G SC 120G.3.3 P264 L6 # I-111

Ghiasi, Ali — Ghiasi Quantum LLC,Marvell Semiconductor, Inc.

Comment Type TR *Comment Status* D *AC CM noise*

AC common mode at TP1a which include the channel is specified as 25 mV but also AC common mode for module output which doesn't include the channel specified as 25 mV. Need allocation for the channel!

SuggestedRemedy

Please reduce the AC common mode at TP4 to 20 mV RMS

Proposed Response *Response Status* W

PROPOSED REJECT.
The comment does not provide sufficient justification for the proposed changes.
For task force discussion.
Resolve comment #110 and #111 together.

AC CM noise – 162

Table 162–10—Summary of transmitter specifications at TP2

Parameter	Subclause reference	Value	Units
Signaling rate, each lane (range)		53.125 ± 50 ppm[a]	GBd
Differential pk-pk voltage with Tx disabled (max)[b]	93.8.1.3	30	mV
DC common-mode voltage (max)[b]	93.8.1.3	1.9	V
AC common-mode RMS voltage, v_{cmr} (max)[b]	93.8.1.3	30	mV
Differential pk-pk voltage, v_{df} (max)[b]	93.8.1.3	1200	mV
Effective return loss, ERL (min)	162.9.3.5	7.3	dB

Proposals

Comment # i-103 (mellitz)
Specify as peak to peak voltage, V_{CCMP}
Based on 163.9.2.7
V_{CCMP} (max) = 223 mV

AC CM noise – 163

Table 163–5—Summary of transmitter specifications at TP0v

Parameter	Reference	Value	Units
Signaling rate, each lane (range)		53.125 ± 50 ppm[a]	GBd
Differential pk-pk voltage (max)[b] Transmitter disabled Transmitter enabled	93.8.1.3	 30 1200	 mV mV
DC common-mode voltage (max)[b]	93.8.1.3	1	V
DC common-mode voltage (min)[b]	93.8.1.3	0.2	V
Signal to AC common-mode noise ratio, *SCMR* (min)	163.9.2.7	16	dB
Difference effective return loss, *dERL* (min)	163.9.2.2	-3	dB

163.9.2.7 Signal to AC common-mode noise ratio

Signal to AC common-mode noise ratio is calculated using Equation (163–2). The procedure in 162.9.3.1.1 is used to determine the differential-mode linear fit pulse response p(k). The peak-to-peak AC common-mode voltage is defined as the AC common-mode voltage (see 93.8.1.3) range measured at TP0v that includes all except 10^{-4} of the measured distribution, from 0.00005 to 0.99995 of the cumulative distribution. The signal to AC common-mode noise ratio shall meet the specification for SCMR (min) in Table 163–11.

$$SCMR = 20\log_{10}\left(\frac{p_{max}}{V_{CMPP}}\right) \quad (163\text{–}2)$$

where

$SCMR$	is the signal to AC common-mode ratio in dB
p_{max}	is the maximum value of the differential-mode linear fit pulse response $p(k)$
V_{CMPP}	is the peak-to-peak AC common-mode voltage

Several comments in bucket #2 propose to fix the table reference.

Proposals

Comment # i-101 (mellitz)
Split into low-frequency (LF, below 10 MHz) and high-frequency (HF, above 10 MHz) components.
Specify LF as peak to peak voltage, V_{CCMP}
Specify HF as ratio, SCMR
Based on 163.9.2.7
V_{CCMP} (max) = 30 mV
SCMR (min) = 11.8 dB

AC CM noise – 120F

Table 120F–1—Transmitter electrical characteristics at TP0v

Parameter	Reference	Value	Units
Signaling rate, each lane (range)		53.125 ± 50 ppm[a]	GBd
Differential peak-to-peak output voltage[b] (max) Transmitter disabled Transmitter enabled	93.8.1.3	 35 1200	 mV mV
Common-mode voltage[b] (max)	93.8.1.3	1	V
Common-mode voltage[b] (min)	93.8.1.3	0.2	V
Signal to AC common-mode noise ratio, *SCMR* (min)	163.9.2.7	16	dB
Difference effective return loss, *dERL* (min)	120F.3.1.1	-3	dB
Common-mode to common-mode return loss, *RLcc* (min)	162.9.3.6	2	dB

163.9.2.7 Signal to AC common-mode noise ratio

Signal to AC common-mode noise ratio is calculated using Equation (163–2). The procedure in 162.9.3.1.1 is used to determine the differential-mode linear fit pulse response p(k). The peak-to-peak AC common-mode voltage is defined as the AC common-mode voltage (see 93.8.1.3) range measured at TP0v that includes all except 10^{-4} of the measured distribution, from 0.00005 to 0.99995 of the cumulative distribution. The signal to AC common-mode noise ratio shall meet the specification for SCMR (min) in Table 163–11.

$$SCMR = 20\log_{10}\left(\frac{p_{max}}{V_{CMPP}}\right) \quad (163\text{–}2)$$

where

SCMR	is the signal to AC common-mode ratio in dB
p_{max}	is the maximum value of the differential-mode linear fit pulse response $p(k)$
V_{CMPP}	is the peak-to-peak AC common-mode voltage

Distribution range assuming DER target of 10^{-4}. Okay for 163, but incorrect for 120F.

Proposals

Comment # i-102 (mellitz)
Same as for comment i-101 for Clause 163 except:
SCMR (min) = 10.7 dB

Comment # i-106 (mellitz)
For C2M, change SCMR to include all but 10^{-5} (rather than 10^{-4}) of the distribution.

AC CM noise – 120G.3.2

Table 120G–3—Module output characteristics at TP4

Parameter	Reference	Value	Units
Signaling rate, each lane (nominal)		53.125[a]	GBd
AC common-mode output voltage (max, RMS)	120G.5.1	25	mV
Differential peak-to-peak output voltage (max) Short mode Long mode	120G.5.1	 600 845	 mV mV
Eye height (min)	120G.3.2.2	15	mV
Vertical eye closure, VEC (max)	120G.3.2.2	12	dB
Common-mode to differential-mode return loss, *RLdc* (min)	120G.3.1.1	Equation (120G–1)	dB
Effective return loss, ERL (min)	120G.3.2.3	8.5	dB
Differential termination mismatch (max)	120G.3.1.3	10	%
Transition time (min)	120G.3.1.4	8.5	ps
DC common-mode voltage tolerance (range) Upper limit Lower limit	120G.3.2.4	 2.85 -0.35	 V V

[a]The signaling rate range is derived from the PMD receiver input.

Proposals

Comment # i-110 (ghiasi)
Reduce to 20 mV.

Comment # i-105 (mellitz)
Specify as peak to peak voltage, V_{CCMP}
Excludes all but 1E-5 of distribution
V_{CCMP} (max) = 213 mV

AC CM noise – 120G.3.3

Table 120G–7—Host input characteristics

Parameter	Reference	Test point	Value	Units
Signaling rate, each lane (range)	120G.3.3.1	TP4a	53.125 ± 100 ppm	GBd
Differential peak-to-peak input voltage tolerance (min) for short mode for long mode	120G.5.1	TP4	 600 845	mV
AC common-mode RMS voltage tolerance (min)	120G.3.3.2	TP4	25	mV
Differential-mode to common-mode return loss, *RLcd* (min)	120G.3.3.3	TP4a	Equation (120G–2)	dB
Effective return loss, ERL (min)	120G.3.3.4	TP4a	7.3	dB
Host stressed input tolerance	120G.3.3.5	TP4	See 120G.3.3.5	
Differential termination mismatch (max)	120G.3.1.3	TP4a	10	%
Common-mode voltage[a] Min Max	120G.5.1	TP4a	 –0.3 2.8	V

[a]Generated by host, referred to host ground.

Proposals

Comment # i-111 (ghiasi)
Reduce to 20 mV.
(follows proposal in i-110)

Implicitly would follow i-105 if that were adopted.

Cross-Clause Shared Ground

162/163/120F/102G Shared Ground, part 1 Comments 55, 61, 66, 67

Cl 162 SC 162.11 P181 L11 # I-55

Ran, Adee Cisco Systems, Inc.

Comment Type TR *Comment Status* D *ground connection*

The text says "For 100GBASE-CR1, 200GBASE-CR2, and 400GBASE-CR4, the lanes are AC-coupled. The AC-coupling shall be within the cable assembly". It can be questioned which contacts are AC-coupled in the cable. Figure 162–2 shows signal shields and link shield in addition to the differential pairs, and there is no distinction, so can the shields also be AC-coupled? Are they even required to be connected on both ends?

My understanding is that in practice the shields are DC-coupled and provide a ground connection between both ends. This has importance in preventing the ground voltage from bouncing at either end and creating unexpected common-mode differences between Tx and Rx pairs (because common-mode voltage is referenced to ground).

This should be stated explicitly. The suggested remedy is to add it to 162.11 which seems to be a convenient place, but other places or phrasing are possible. It may be required to add some specifications to the MDI as well.

SuggestedRemedy

Insert a paragraph after the one starting with the quoted text (lines 11-16) with the following text:
"The signal shield and link shield are connected to the corresponding contacts in the MDI plug connectors on both ends of the cable assembly".

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
Insert a paragraph after the one starting with the quoted text (lines 11-16) with the following text: The signal shields are connected to the corresponding contacts in the MDI plug connectors on both ends of the cable assembly.".
Resolve 55, 61, 66, and 67 together.

Cl 163 SC 163.8.1 P202 L5 # I-61

Ran, Adee Cisco Systems, Inc.

Comment Type TR *Comment Status* D *ground connection*

The link block diagram does not show a ground connection, and there is no requirement anywhere in clause 163 that the PMDs on both ends of the link have a common ground connection.

If there is no common ground, or ground connection is poor, the Tx common-mode specifications may become meaningless, because the common-mode voltage on each device is defined with different grounds.

SuggestedRemedy

Add a ground connection between the PMDs to the diagram.

Add a sentence below the diagram stating that the specifications in this clause only apply to systems with shared ground between the two PMDs.

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
Proposed changes to the figure is cumbersome and may imply a particular implementation.
New text pointing out the common ground is sufficient.
Add text that a common ground is expected with editorial license.
For task force discussion.
Resolve 55, 61, 66, and 67 together.

162/163/120F/102G Shared Ground, part 2 Comments 55, 61, 66, 67

Cl 120F SC 120F.1 P238 L2 # I-66

Ran, Adee Cisco Systems, Inc.

Comment Type TR *Comment Status* D *ground connection*

The link block diagram does not show a ground connection, and there is no requirement anywhere in annex 120F that the devices on both ends of the link have a common ground connection.

If there is no common ground, or ground connection is poor, the Tx common-mode specifications may become meaningless, because the common-mode voltage on each device is defined with different grounds.

If a ground connection is added in this figure, it should also be noted that each arrow represents a differential pair, or alternatively draw two lines in each direction, as done in Figure 163-2.

SuggestedRemedy

Add an additional line in each direction to represent a differential pair, and add a ground connection between the devices to the diagram.

Change the paragraph on P237 L40-42, inserting a sentence about the ground connection, as follows:

"The 100GAUI-1, 200GAUI-2, or 400GAUI-4 C2C bidirectional link is described in terms of a C2C transmitter, a C2C channel, and a C2C receiver, which have a shared ground connection. Figure 120F–2 depicts a typical C2C application."

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.
Proposed changes to the figure is cumbersome and may imply a particular implementation.
New text pointing out the common ground is sufficient.
Add text that a common ground is expected with editorial license.
For task force discussion.
Resolve 55, 61, 66, and 67 together.

Cl 120G SC 120G.1 P256 L16 # I-67

Ran, Adee Cisco Systems, Inc.

Comment Type TR *Comment Status* D *ground connection*

The link block diagram does not show a ground connection, and there is no requirement anywhere in annex 120G that the devices on both ends of the link have a common ground connection.

If there is no common ground, or ground connection is poor, the output common-mode specifications and input common-mod tolerance may become meaningless, because the common-mode voltage on each device is defined with different grounds.

If a ground connection is added in this figure, it should also be noted that each arrow represents a differential pair, or alternatively draw two lines in each direction, as done in Figure 163-2.

SuggestedRemedy

Add an additional line in each direction to represent a differential pair, and add a ground connection between the devices to the diagram.

Change the first sentence in the paragraph on P256 L7-14, inserting a sentence about the ground connection, as follows:

"The C2M link is described in terms of a host C2M component, a C2M channel with associated differential-mode to differential-mode insertion loss (ILdd), and a module C2M component, which have a shared ground connection."

Proposed Response *Response Status* W

PROPOSED ACCEPT IN PRINCIPLE.

Proposed changes to the figure is cumbersome and may imply a particular implementation.
New text pointing out the common ground is sufficient.

Add text that a shared ground is expected with editorial license.

For task force discussion.
Resolve 55, 61, 66, and 67 together.

162/163/120F/102G Shared Ground, part 3
Comments 55, 61, 66, 67

Comment	Clause	Change
i-66	120F	In 120F.1 add a new sentence as follows: The 100GAUI-1, 200GAUI-2, or 400GAUI-4 C2C bidirectional link is described in terms of a C2C transmitter, a C2C channel, and a C2C receiver. Figure 120F–2 depicts a typical C2C application. The C2C components at both ends of the link have connected ground references.
i-67	120G	In 120G.1 add a new sentence as follows: The C2M link is described in terms of a host C2M component, a C2M channel with associated differential-mode to differential-mode insertion loss (ILdd), and a module C2M component. The host C2M component and module C2M component have connected ground references. Figure 120G-2 depicts…
i-55	162	In 162.8.1 add 3 new sentences as follows: One direction of a 100GBASE-CR1, 200GBASE-CR2, or 400GBASE-CR4 link is shown in Figure 162–2. The PMDs on both ends of the link have connected ground references. Each differential pair in the cable is separately shielded as illustrated in Figure 162–2. The signal shields are connected to ground contacts in the MDI plug connectors on both ends of the cable assembly.
i-61	163	In 163.8.1, add a new sentence as follows: One direction of a 100GBASE-KR1, 200GBASE-KR2, or 400GBASE-KR4 link is shown in Figure 163–2. The PMDs on both ends of the link have connected ground references.

Cross-Clause
lLdd terminology

ILdd terminology
Comment 168

Cl **162**	*SC* **162.8.1**	*P* **161**	*L* **48**	# I-168

Dawe, Piers J G — NVIDIA

Comment Type **E** *Comment Status* **D** *ILdd terminology*

"differential-mode to differential-mode insertion loss" is wordy and 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. The base document doesn't use this term, and uses "differential-mode insertion loss" only twice, in figures 128-4 and 130-4. But it does use "differential insertion loss" and "differential output return loss" many times, and unqualified "insertion loss" very many times.

SuggestedRemedy

Change "differential-mode to differential-mode" when an adjective to "differential-mode" (correct and unambiguous), "differential" (unambiguous, matches base document) or to nothing, throughout the document.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The recently adopted wordy phrases are necessary for clearly identifying the conversion and common-mode insertion losses. Differential insertion loss is commonly used in practice for ILdd. Change all instance of "differential-mode to differential-mode insertion loss" to "differential insertion loss" or just "insertion loss".
For task force discussion.

Under construction.