802.3dj D2.1 Comment Resolution Electrical Track

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Introduction

- This slide package was assembled by the 802.3dj editorial team to provide background and detailed resolutions to aid in comment resolution.
- Specifically, these slides are for the various electrical-track comments.

Test points

Comment #216

Test points
Comment #216

Cl **176D** *SC* **176D.7.1** *P* **794** *L* # 216

Brown, Matt — Alphawave Semi

Comment Type **T** *Comment Status* **D** *Test points (E)*

TP0d, TP1d, TP4d, TP5d are undefined in 176D. Also, the COM model includes assumptions above a device (die) and the related package, identifying different loss classes based on the package. Thus there is a conscious recognition of the device and device package in the specifications, though indirect.

SuggestedRemedy

Within this figure (or a new complementary figure) provide illustrations of the device, package, and the interfaces between the device and package, etc., as is done in Figure 178-2, Figure 178-3, and Figure 178-5. As a minimum define TPxd.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The comment identifies a gap in the draft, lack of definition of test points in the figure (in the context of Annex 176D).

The device package is included in the reference model, but is not otherwise specified (e.g. there is no "package class" or "host class" that an implementation has to comply to).
The suggested illustrations based on figures in Clause 178 are not suitable for this annex, since here the channel is not symmetric, and the test points TP0 and TP5 are not used. It is unclear what changes would satisfy this part of the comment. A detailed proposal is encouraged.

Definitions of TP0d, TP1d, TP4d, and TP5d are required. The editor will present suggested changes for CRG discussion.

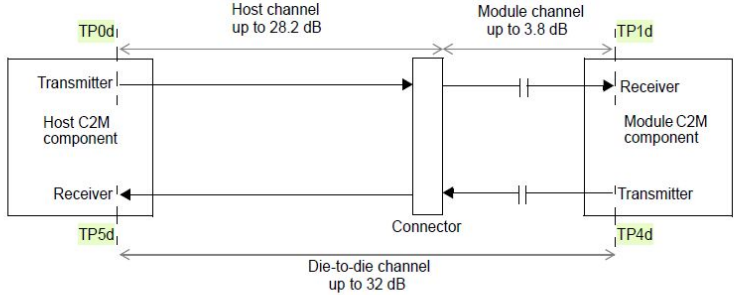
176D.7 Expected channel properties

Unlike the related C2C interface specified in Annex 176C, the channel between the C2M components is not specified from end to end, since it is divided between two entities with different compliance requirements. The C2M components in the host and in the module with their respective portions of the channel are specified by their input and output characteristics at the compliance points specified in 176D.6.1. This subclause describes the expected properties of the channels from TP0d to TP1d and from TP4d to TP5d, as depicted in Figure 176D–6. These test points are typically not accessible in an implemented system.

The content of this subclause is a reference model that may be used for host and module design. It is expected that the normative input and output specifications of host and module in this annex can be met with a variety of implementation approaches.

176D.7.1 Reference insertion loss budget

Figure 176D–6 depicts the reference differential insertion loss (ILdd) values at 53.125 GHz for specific parts of the channel between the C2M components. The insertion loss of the host, module, and die-to-die channels is not expected to be measurable.



NOTE—For loss budgeting purposes, the connector is considered part of the host.

Figure 176D–6—Reference insertion loss budget at 53.125 GHz

The highlighted pieces of text are the only occurrences of these test point names in Annex 176D.

Test points
Comment #216

Note that comment #309 (bucket, accepted) changed the definition of TP0d to use “device-to-package interface” instead of “die bump”.
Proposed change to the text of 176D.7:

Unlike the related C2C interface specified in Annex 176C, the channel between the C2M components is not specified from end to end, since it is divided between two entities with different compliance requirements. The C2M components in the host and in the module with their respective portions of the channel are specified by their input and output characteristics at the compliance points specified in 176D.6.1.¶

This subclause describes the expected properties of the channels from TP0d to TP1d and from TP4d to TP5d, as depicted in Figure 176D–6. TP0d and TP5d represent the host C2M component output and input, respectively, at the device-to-package interface, similar to the definitions of these test points in Table 179–6. TP1d and TP4d represent the module C2M component input and output, respectively, at the device-to-package interface. These test points are typically not accessible in an implemented system.¶

The content of this subclause is a reference model that may be used for host and module design. It is expected that the normative input and output specifications of host and module in this annex can be met with a variety of implementation approaches.¶

Editors’ recommendation: ACCEPT IN PRINCIPLE.
Change the text of 176D.7 as shown on this slide.

Mode Conversion

Comments #253-259, 261-268

CC Mode Conversion
Comment #253-254, 256-259, 261-262, 264-268

C#	SC	Comp	Spec	Description
253	178.9.2	TX	RLcc, RLdc	Add new appendix for modal ERL/modal RL. Replace Tx RLcc, RLdc w/ modal ERL (cc, cd, dc).
254	178.9.3	RX	RLcd	Replace with modal ERL (cc, cd, dc), remove 178.9.3.7.
256	178.1	Chan	RLcd	Replace with modal ERL (cc, cd, dc), remove 178.10.5.
257	179.9.4	TX	RLcc, RLdc	Replace with modal ERL (cc, cd, dc), remove 179.9.4.8, 179.9.4.9.
258	179.9.5	RX	RLcd	Replace with modal ERL (cc, cd, dc), remove 179.9.5.6.
259	179.11	CA	RLcd, RLcc	Replace with modal ERL (cc, cd, dc), remove 179.11.4, 179.11.6.
261	176C.6.3	TX	RLdc	Replace withmodal ERL (cc, cd, dc), remove 176C.6.3.7.
262	176C.6.4	RX	RLcd	Replace with modal ERL (cc, cd, dc), remove 176C.6.4.4.
264	176C.7	Chan	RLcd	Replace with modal ERL (cc, cd, dc) , remove 176C.7.4.
265	176D.6.4	Host TX	RLcc, RLdc	Replace with modal ERL (cc, cd, dc), remove 176D.8.3.
266	176D.6.5	Module TX	RLcc, RLdc	Replace with modal ERL (cc, cd, dc), remove 176D.8.3.
267	176D.6.6	Host RX	RLcd	Replace with modal ERL (cc, cd, dc), remove 176D.8.3.
268	176D.6.7	Module RX	RLcd	Replacewith modal ERL (cc, cd, dc), remove 176D.8.3.

CC Mode Conversion
Comment #253-254, 256-259, 261-262, 264-268

Cl 178 SC 178.9.2 P 375 L 36 # 253

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Common-mode to common-mode return loss, RLcc (min) mask
and link performance, as small excursions beyond the mask may show negligible impact.
See: Table 178–6

SuggestedRemedy

Add an appendix titled "Modal ERL and Modal Return Loss" to provide a performance-based alternative to frequency-domain masks.
Modal Return Losses from Single-Ended S-Parameters:
Modal return losses can be derived from a 2-port single-ended S-parameter measurement taken at a test point. The modal components are calculated using the following formulas:
Differential-to-Differential (DD): SDD_11 = RL_DD = (S11 - S12 - S21 + S22) / 2
Common-to-Common (CC): SCC_11 = RL_CC = (S11 + S12 + S21 + S22) / 2
Common-to-Differential (CD): SCD_11 = RL_CD = (S11 - S12 + S21 - S22) / 2
Differential-to-Common (DC): SDC_11 = RL_DC = (S11 + S12 - S21 - S22) / 2
Modal ERL Computation:
The modal Effective Return Loss values—ERL_CC, ERL_CD, and ERL_DC—measured at the test point are computed using the procedure described in IEEE 802.3 Clause 93A.5.
The following substitutions and parameters apply:
Replace the scalar return loss term S_ii with the respective modal return loss (RL_CC, RL_CD, RL_DC).
* Use the single-ended reference impedance specified in the referring section or annex (typically 46.25 ohms).
* Set the fixture delay (Tfx) equal to twice the delay from TP0 to TP0v.
* For further details and derivations, refer to the presentation:
https://www.ieee802.org/3/dj/public/adhoc/electrical/25_0828/mellitz_3dj_01_adhoc_250828.pdf
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Remove row for "Common-mode to common-mode return loss, RLcc (min)" and remove section: 178.9.2.7 Transmitter common-mode to differential-mode return loss
Add 3 rows to Table 178–6
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
There are similar comments suggesting multiple changes in the draft.
The suggested specifications were mentioned in the ad hoc presentation <https://www.ieee802.org/3/dj/public/adhoc/electrical/25_0828/mellitz_3dj_adhoc_01a_250828.pdf> but a proposal for their definitions was not included.
Even if the definitions were provided, it has not been demonstrated that the suggested values are appropriate (feasible and correlated with system performance).
The suggested remedy does not provide sufficient detail to implement.

Cl 178 SC 178.9.3 P 380 L 13 # 254

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 178–9

SuggestedRemedy

Remove row for "Differential-mode to common-mode return loss, RLcd" and remove section: 178.9.3.7 Receiver differential-mode to common-mode return loss
Add 3 rows to Table 178–9
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 178 SC 178.10 P 384 L 40 # 256

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 178–11

SuggestedRemedy

Remove row for "Differential-mode to common-mode return loss, RLcd" and remove section: 178.10.5 Channel mode conversion insertion loss
Add 3 rows to Table 178–9
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 179 SC 179.9.4 P 408 L 31 # 257

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *Mode conversion (E)*

There appears to be little connection between the
Common-mode to common-mode return loss, RLcc(min)" and "Common-mode to differential-mode return loss, RLdc (min) masks
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 179–7

SuggestedRemedy

Remove rows for
Common-mode to common-mode return loss, RLcc(min)
Common-mode to differential-mode return loss, RLdc (min)
Remove sections
179.9.4.8 Common-mode to common-mode return loss
179.9.4.9 Common-mode to differential-mode return loss
Add 3 rows to Table 179–7
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253..

CC Mode Conversion
Comment #253-254, 256-259, 261-262, 264-268

Cl 179 SC 179.9.5 P 418 L 44 # 258

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *Mode conversion (E)*

There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 179–11

SuggestedRemedy

Remove row for
" Differential-mode to common-mode return loss, RLcd (min)
Remove section
179.9.5.6 Receiver differential-mode to common-mode return loss
Add 3 rows to Table 179–11
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176C SC 176C.7 P 777 L 17 # 264

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176C-6

SuggestedRemedy

In table 176C-6 Remove row for "Differential-mode to common-mode return loss, RLcd"
and remove section: 176C.7.4 Channel differential-mode to common-mode return loss
Add 3 rows to Table 176C-6
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176C SC 176C.6.3 P 770 L 31 # 261

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Common-mode to differential-mode return loss, RLdc mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176C–2

SuggestedRemedy

Remove row for
Common-mode to differential-mode return loss, RLdc (min)
Remove sections
176C.6.3.7 Transmitter common-mode to differential-mode return loss
Add 3 rows to Table 176C-2
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176C SC 176C.6.4 P 773 L 13 # 262

Mellitz, Richard Samtec

Comment Type TR *Comment Status* D *mode conversion (E)*

There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176C-4

SuggestedRemedy

Remove row for in table 176C-4: "Differential-mode to common-mode return loss, RLcd"
and remove section: 176C.6.4.4 Receiver differential-mode to common-mode return loss
Add 3 rows to Table 176C-4
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response *Response Status* W

PROPOSED REJECT.
Resolve using the response to comment #253.

CC Mode Conversion
Comment #253-254, 256-259, 261-262, 264-268

Cl 176D SC 176D.6.4 P791 L12 # 265
Mellitz, Richard Samtec
Comment Type TR Comment Status D Mode conversion (E)
There appears to be little connection between the
Common-mode to common-mode return loss, RLcc(min)" and "Common-mode to differential-mode return loss, RLdc (min) masks
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176D-2

SuggestedRemedy
Remove rows for
Common-mode to common-mode return loss, RLcc(min)
Common-mode to differential-mode return loss, RLdc (min)
Remove section
176D.8.3 Return loss specifications
Add 3 rows to 176D-2
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response Response Status W
PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176D SC 176D.6.5 P792 L25 # 266
Mellitz, Richard Samtec
Comment Type TR Comment Status D Mode conversion (E)
There appears to be little connection between the
Common-mode to common-mode return loss, RLcc(min)" and "Common-mode to differential-mode return loss, RLdc (min) masks
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176D-3

SuggestedRemedy
Common-mode to common-mode return loss, RLcc(min)
Common-mode to differential-mode return loss, RLdc (min)
Remove section
176D.8.3 Return loss specifications
Add 3 rows to 176D-3
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response Response Status W
PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176D SC 176D.6.6 P793 L16 # 267
Mellitz, Richard Samtec
Comment Type TR Comment Status D Mode conversion (E)
There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176D-4

SuggestedRemedy
Remove row for
" Differential-mode to common-mode return loss, RLcd (min)
Remove section
176D.8.3 Return loss specifications
Add 3 rows to Table 176D-4
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response Response Status W
PROPOSED REJECT.
Resolve using the response to comment #253.

Cl 176D SC 176D.6.7 P793 L47 # 268
Mellitz, Richard Samtec
Comment Type TR Comment Status D Mode conversion (E)
There appears to be little connection between the
Differential-mode to common-mode return loss, RLcd mask
and link performance, as small excursions beyond the mask may show negligible impact.
See Table 176D-5

SuggestedRemedy
Remove row for
" Differential-mode to common-mode return loss, RLcd (min)
Remove section
176D.8.3 Return loss specifications
Add 3 rows to Table 176D-5
ERL_CC(min) = 5 dB
ERL_CD(min) = 20 dB
ERL_DC(min) = 20 dB
Reference: " Modal ERL and modal Return Loss" appendix

Proposed Response Response Status W
PROPOSED REJECT.
Resolve using the response to comment #253.

Editors' recommendation for 253-254, 256-259, 261-262, and 264-268:
REJECT.

- There are numerous comments suggesting adding a set of "modal ERL" specifications in multiple places in the draft.
- The suggested specifications were mentioned in mellitz_3dj_adhoc_01a_250828, but a proposal for their definitions was not included.
- It as not been demonstrated that the values suggested in the comments are appropriate (feasible and correlated with system performance).
- The suggested remedy does not provide sufficient detail to implement.

CC Mode Conversion
Comments #255, 260, 263

C#	SC	Comp	Spec	Description
255	178.10	Chan	ILcd, ILdc	Replace with SCMR_DC_CH and SCMR_CD_CH.
260	179.11	Chan	ILcd, ILdc	Replace with SCMR_DC_CH (in addition to existing SCMR_CH).
263	176C.7	Chan	ILcd, ILdc	Replace with SCMR_CH & SCMR_DC_CH.

Cl **178** *SC* **178.10** *P* **384** *L* **42** # 255

Mellitz, Richard — Samtec

Comment Type **TR** *Comment Status* **D** *mode conversion (E)*

In Table 178–11, the rows labeled:
Differential-mode to common-mode insertion loss (ILcd) and
Common-mode to differential-mode insertion loss (ILdc)
appear to describe a impairments already captured by the SCMR_CH metric. Both are like SNR as the delta is like an SNR.
In addition, there appears to be little connection between the ILcd and ILdc masks and link performance, as small excursions beyond the mask may show negligible impact.

SuggestedRemedy

Remove the following rows from Table 178–11:
Differential-mode to common-mode insertion loss (ILcd)
Common-mode to differential-mode insertion loss (ILdc)
Add SCMR_DC_CH to Clause 179.11.8 “Channel signal to common-mode ratio”
Replace references to CD with DC to align with the updated SCMR terminology and COM implementation.
Add the following row to Table 178–11:
SCMR_DC_CH (min) = 20 dB
Reference Supporting Material:
See presentation: mellitz_COM_01_250819.pdf
This document outlines the COM implementation updates for SCMR_DC and SCMR_CD, including frequency-domain and time-domain computations, and supports the proposed simplification and consolidation of mode conversion metrics.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Resolve using the response to comment #253.

Cl **179** *SC* **179.11** *P* **425** *L* **33** # 260

Mellitz, Richard — Samtec

Comment Type **TR** *Comment Status* **D** *Mode conversion (E)*

In table 179-14 the rows:
Mode conversion insertion loss
Are referring to same impairment as SCMR_CH
In Table 179-14, the rows are labelled:
Mode conversion insertion loss appears to describe a impairments already captured by the SCMR_CH metric. Both are like SNR as the delta is like an SNR.
In addition, there appears to be little connection between the ILcd and ILdc masks and link performance, as small excursions beyond the mask may show negligible impact.

SuggestedRemedy

In table 179-14
Remove rows for:
Mode conversion insertion loss
Remove section:
179.11.5 Mode conversion insertion loss
add
SCMR_DC_CH to table
In table 179-14: add rows for:
SCMR_DC_CH (min) = 20 dB

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The new SCMR_CH limits differential to common mode conversion, so it can replace the "ILcd-ILdd" mask.
A modified specification would be required to replace the "ILdc-to-ILdd" mask.
The minimum value of SCMR_CH is still under discussion (e.g., comment #317). It is not clear that there is consensus for making the suggested change.
For CRG discussion.

Cl **176C** *SC* **176C.7** *P* **777** *L* **18** # 263

Mellitz, Richard — Samtec

Comment Type **TR** *Comment Status* **D** *mode conversion (E)*

In Table 176C–6, the rows labeled:
Differential-mode to common-mode insertion loss (ILcd) and
Common-mode to differential-mode insertion loss (ILdc)
appear to describe a impairments already captured by the SCMR_CH metric. Both are like SNR as the delta is like an SNR.
In addition, there appears to be little connection between the ILcd and ILdc masks and link performance, as small excursions beyond the mask may show negligible impact.

SuggestedRemedy

In Table 176C–6: Remove rows for:
Differential-mode to common-mode insertion loss, ILcd
Common-mode to differential-mode insertion loss, ILdc
add row
SCMR_CH (min) = 20 dB
SCMR_DC_CH (min) = 20 dB

Proposed Response *Response Status* **W**

PROPOSED REJECT.
Resolve using the response to comment #253.

CC Mode Conversion
Comments #255, 260, 263

These comments suggest

1. Extending the SCMR_CH specification to KR/C2C channels
2. Adding SCMR_CH_DC.
3. Removing the existing frequency-domain mode conversion masks, which are replaced by SCMR_CH.

Note that SCMR_CH_DC is not defined explicitly, but it may be assumed that its definition is similar to the current SCMR_CH but with conversion in the opposite direction; Nomenclature?

No justification has been provided for specifying SCMR_CH_DC (the common-mode input to a channel is limited by transmitter specifications).

Editors' recommendation for 255, 260, 263:
ACCEPT IN PRINCIPLE.

- Add SCMR_CH specifications in clause 178 and annex 176C, with the same definition and limit as in clause 179 (considering resolution of other comments).
- Remove the ILcd and ILdc related subclauses and specifications in 178, 179, and 176C.
- Do not add SCMR_CH_DC.

Update impacted areas as necessary, with editorial license.

COM P_QC

Comment #392

COM P_QC
Comment #392

Cl **178** *SC* **178.10.1** *P* **387** *L* **30** # 392

Ran, Adee — Cisco Systems

Comment Type **TR** *Comment Status* **D** *COM P_QC (E)*

Using 2*DER0 as the quantization clip probability does not represent realistic implementations. In practice clipping noise is typically caused by low-frequency events and thus creates correlated errors. Having correlated errors at a probability of 2*DER0 would be devastating for the RS-FEC. In addition, the clipping noise is not accounted for in the COM calculations - this is only justified if the probability of clipping events is much smaller than the COM quantile.
The clipping probability determines the peak-to-peak of the quantized signal. For other "peak to peak" specifications we use a probability of 1e-7 (see 176D.8.1).

SuggestedRemedy

Change the value of P_QC from 2*DER0 to 1e-7 in all COM tables (clauses 178 and 179, annexes 176C and 176D).

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Pending CRG discussion, implement the suggeted remedy in 178, 179, 176C and 176D.

10^{-7} (proposed)

Quantization clip probability	P_{qc}	$2 \times DER_0$	

$2 \times DER_0$:
Table 178-13: 4×10^{-4}
Table 179-19: 4×10^{-4}
Table 176C-8: 1.34×10^{-5}
Table 176D-7: 4×10^{-5}

Editors' recommendation: ACCEPT IN PRINCIPLE.
Implement the suggested remedy in 178, 179, 176C, 176D.

KR RX JTOL

Comment #302-305, 385-386

KR RX JTOL
Comment #302-305, 385-386

Cl 178 SC 178.9.3.5 P383 L14 # 302

Healey, Adam Broadcom, Inc.

Comment Type TR Comment Status D JTOL (E)

The list of exceptions does not appear to be correct. The first major bullet "The test channel COM, calculated per the method in 178.9.3.4.2, is at least 3 dB" is not an exception. It is part of the test procedure defined in 178.9.3.4. The first sub-bullet "For the COM parameter calibration described in 93C.2 item 7)" refers to the Annex 93A-based calibration procedure which has been replaced by the procedure defined in 178.9.3.4. It is unclear why this reference is here. In the second sub-bullet, the text about substitution of J4u03 for J4u does not apply since the procedure defined in 178.9.3.4.2 is based on J4u03. The only exception seems to be that the transmitter output is measured with the added sinusoidal jitter.

SuggestedRemedy

Remove the bulleted list from 178.9.3.5. Replace the last sentence of the first paragraph with the following. "The test procedure is the same as the one described in 178.9.3.4 with the exception that trasmitter output is measured with the jitter frequency and amplitude set according to Case G from Table 179–13". Note that the case used for calibration is the subject of a separate comment.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Implement the combined suggested remedies of this comment and comments #385 and #386, with editorial license.

Cl 178 SC 178.9.3.5 P383 L20 # 303

Healey, Adam Broadcom, Inc.

Comment Type TR Comment Status D JTOL (E)

It is stated that jitter is measured for Case F using the additive noise obtained from calibration using Case G. This seems like a convoluted calibration procedure and the benefit of it is not clear.

SuggestedRemedy

Simplify the exception to be "the transmitter output is measured with the jitter frequency and amplitude set according to Case G from Table 179–13."

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Implement the suggested remedy with editorial license.

Cl 178 SC 178.9.3.5 P383 L10 # 304

Healey, Adam Broadcom, Inc.

Comment Type TR Comment Status D JTOL (E)

Figure 93-12 does not include broadband noise injection and therefore does not represent the specified jitter tolerance test setup. It is unclear why there are references to Annex 93A, 93C, and 120D.

SuggestedRemedy

Add a new figure to 178.9.3.5 that illustrates a test setup with both jitter and noise injection. Replace the second sentence of the first paragraph of 178.9.3.5 with a reference to this new figure.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Implement the suggested remedy with editorial license.

Cl 178 SC 178.9.3.5 P383 L14 # 305

Healey, Adam Broadcom, Inc.

Comment Type TR Comment Status D JTOL (E)

178.9.3.4.1, which is incorporated into this test procedure by reference, states that the "transmitter meets the requirements stated in 178.9.2…". It should be made clear that the transmitter still needs to meet the requirements stated in 178.9.2 when the added jitter from Table 179-13 is included.

SuggestedRemedy

Add a statement to 178.9.3.5 that the transmitter meets the requirements in 178.9.3.4.1 with the added jitter from Table 179-13 included.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Implement the suggested remedy with editorial license.

Cl 178 SC 178.9.3.5 P383 L17 # 385

Ran, Adee Cisco Systems

Comment Type E Comment Status D JTOL (E)

The dashed list format should be:
— The test channel COM <…>
— For the COM parameter calibration described in 93C.2 item 7): (same level)
[2nd level] — Additive noise is calibrated with jitter specified in case G from Table 179-13.
[2nd level] — Both JRMS and J4u03 are measured with the additive noise and the jitter of case G. [see other comment]
[2nd level] — J4u is substituted by the measured value of J4u03.

SuggestedRemedy

Change per comment, with editorial license.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Resolve using the response to comment #302.

Cl 178 SC 178.9.3.5 P383 L20 # 386

Ran, Adee Cisco Systems

Comment Type TR Comment Status D JTOL (E)

"Case F" used for jitter was intended to be the highest frequency case, should have been changed to case G when we added an extra case.
Also in 176C.6.4.6.

SuggestedRemedy

Change "Case F" to "Case G" in both subclauses. Change the phrasing is necessary with editorial license.

Proposed Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.
Resolve using the response to comment #303.

178.9.3.5 Receiver jitter tolerance

Receiver jitter tolerance is verified for each pair of jitter frequency and peak-to-peak amplitude values listed in Table 179–13. The test setup shown in Figure 93–12, or its equivalent, is used. TP0v (TP5v) replaces TP0a (TP5a) in Annex 93A, Annex 93C, and Annex 120D. The test channel meets the insertion loss requirement for Test 2 in Table 178–10. The synthesizer frequency is set to the specified jitter frequency and the synthesizer output amplitude is adjusted until the specified peak-to-peak jitter amplitude for that frequency is measured at TP0v. The test procedure is the same as the one described in 178.9.3.4, with the following exceptions:

— The test channel COM, calculated per the method in 178.9.3.4.2, is at least 3 dB.
—For the COM parameter calibration described in 93C.2 item 7),
—J4u is substituted by $J4u_{03}$, and both J_{RMS} and $J4u_{03}$ are measured with the jitter frequency and amplitude set according to Case F from Table 179–13 and with additive noise obtained by calibration for case G from Table 179–13.

The receiver under test shall meet the block error ratio in Table 178–10 for each case in Table 179–13.

KR RX JTOL
C#302-305, 385-386

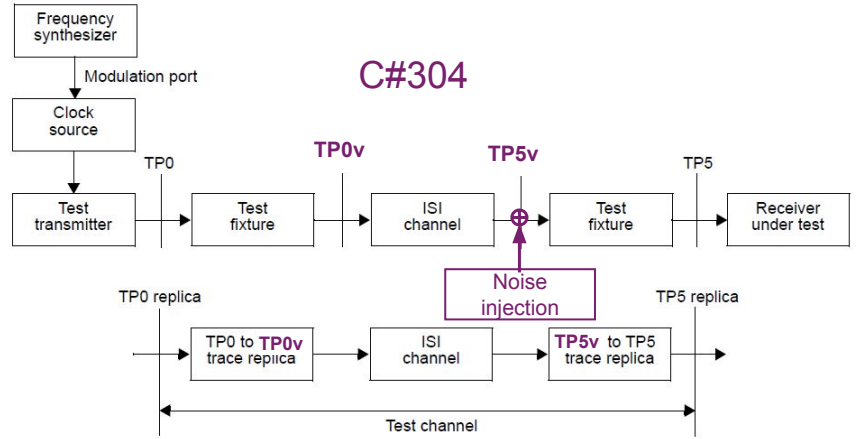
Proposed text and new figure (178-6)

Receiver jitter tolerance is verified for each pair of jitter frequency and peak-to-peak amplitude values listed in Table 179–13. The test setup shown in Figure ~~93–12~~ 178-6, or its equivalent, is used. ~~TP0v (TP5v) replaces TP0a (TP5a) in Figure 93-12, Annex 93A, Annex 93C, and Annex 120D~~. The test channel meets the insertion loss requirement for Test 2 in Table 178–10. The synthesizer frequency is set to the specified jitter frequency and the synthesizer output amplitude is adjusted until the specified peak-to-peak jitter amplitude for that frequency is measured at TP0v. ~~The test procedure is the same as the one described in 178.9.3.4, with the following exceptions:~~ The test procedure is the same as the one described in 178.9.3.4 with the exception that transmitter output is measured with the jitter frequency and amplitude set according to Case G from Table 179–13. The transmitter meets the requirements in 178.9.3.4.1with the added jitter from Table 179-13 included.

304

302 ,303

305



C#304

~~Figure 93–12— Jitter tolerance test setup~~

Figure 178-6

Editorial team recommendation: ACCEPT IN PRINCIPLE.
Implement the changes on this slide with editorial license..

KR/C2C Topics

Comments #272, 273, 440

KR Test Fixture IL Comment #272

Cl **178** *SC* **178.9.2.1.1** *P* **376** *L* **39** # 272

Kutscher, Noam — Marvell

Comment Type **T** *Comment Status* **D** *KR test fixture IL (E)*

Test fixture IL range of 3.4dB - 4.4dB cannot be met with high radix device.

SuggestedRemedy

Correct the value to be between 3.4dB to 8.5dB.
Reasoning for the new range: Simple Loss Calculation–
a. ~1.5' escaping, assuming 1.5dB/inch = ~1.8dB
b. 2 X Via = ~2dB
c. PCB- 3inch - ~3.6dB
d. SMA = ~0.5dB
Total estimated loss ~7.9dB → change to 8.5dB.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The values in D2.1 were established by the resolution to comment #65 against D1.2, in which is was noted that a tighter IL range is ncessary to ensure consistent ERL measurement results. Refer to <https://ieee802.org/3/dj/public/24_11/ran_3dj_01a_2411.pdf#page=28>.
The suggested remedy seems to be based on a large package, but it suggests a wide range that goes against a previously adopted comment.
For CRG discussion.

KR MTF IL/ILD Comments 65, 189, 190

Cl **178** *SC* **178.9.2.1.1** *P* **323** *L* **35** # 189

Mellitz, Richard — Samtec

Comment Type **TR** *Comment Status* **D** *TF IL, delay*

The insertion loss and the delay for the test fixture needs to be tightly controlled to minimize the variability. That is because there will be load variability in the measurement equipment. The idea should be to add enough loss so as not to significantly signal degrade the signal but dampen the effects of test equipment load variability.

SuggestedRemedy

Change to:
The insertion loss of the test fixture shall be between 4 dB and 5 dB at 53.125 GHz. With a delay between 500 and 650 ps. (based on 1.2 dB /inch and 150 ps /inch and e_r approximately 3.2)

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Resolve using the response to comment #65.

Cl **178** *SC* **178.9.2.1.1** *P* **323** *L* **36** # 190

Mellitz, Richard — Samtec

Comment Type **TR** *Comment Status* **D** *TF ILdd*

The fixture frequency content needs to extend beyond the Nyquist rate. S-parameter measurements are required for this test fixture for ERL. This fixture is also required for s-parameter measurements when computing COM for receiver compliance. A transition time of 5 ps is used for ERL computation and is trending to around 4 ps for COM. A frequency range needs to be chosen to minimize the Gibbs Phenomena. There can be significant error due to this for ERL or COM computation. Filtering can help, however, there is still an error. Consider the data has a sinc response, the loss difference of between 53 GHz and 85 GHz with a BT filter is about 10 dB which is just about amount of filtering need to minimize this error. The loss difference between 53 GHz and 67 GHz is about 4 dB which is likely to start showing this error.

SuggestedRemedy

Change to:
The magnitude of the insertion loss deviation of the test fixture shall be less than or equal to 0.2 dB from 0.05 GHz to 85 GHz. Insertion loss deviation is calculated as specified in 93A.4, where TI is 0.005 ns, and fb and fr values are taken from Table 178–12.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Resolve using the response to comment #65.

November 2024

Cl **178** *SC* **178.9.2.1.1** *P* **323** *L* **35** # 65

Ran, Adee — Cisco Systems, Inc.

Comment Type **TR** *Comment Status* **D** *TF IL, ILdd*

TP0 to TP0v test fixture specifications has multiple TBDs.

As initial values, we can use the values from clause 163 scaled by a factor of 2.

SuggestedRemedy

Use:
ILdd between 3.4 dB and 10 dB at 53.125 GHz
ILD magnitude up to 0.4 dB from 0.05 GHz to 53.125 GHz
Tt is 0.005 ns

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
The comment addresses an open TBD and the comment and the suggested remedy are reasonable, but consensus is not obvious.
Comments #189 and #190 suggest a different ILdd range, different frequency range for ILD, and additional restrictions.
For CRG discussion.

51.325 or 85 | 3.4-10 or 4-5 | 0.4 or 0.2 | 0.05

178.9.2.1.1 Test fixture insertion loss

The insertion loss of the test fixture shall be between TBD dB and TBD dB at 53.125 GHz. The magnitude of the insertion loss deviation of the test fixture shall be less than or equal to TBD dB from TBD GHz to 53.125 GHz. Insertion loss deviation is calculated as specified in 93A.4, where T_t is TBD ns, and f_b and f_r values are taken from Table 178–12.

5

Editor's note (to be removed by D2.0, or if values are adopted):
Test fixture insertion loss and insertion loss parameters and requirements were left to be determined in the adopted baseline proposal. Contributions in this area are encouraged.

Editors recommendation: ACCEPT IN PRINCIPLE
The comments address TBD items in D1.2.

IEEE P802.3dj Task Force 28

ran_01_2411

8.5 dB proposed

178.9.2.1.1 Test fixture insertion loss

The insertion loss of the test fixture shall be between 3.4 dB and 4.4 dB at 53.125 GHz. The magnitude of the insertion loss deviation of the test fixture shall be less than or equal to 0.2 dB from 0.05 GHz to 67 GHz. Insertion loss deviation is calculated as specified in 93A.4, where T_t is 0.005 ns, and f_b and f_r values are taken from Table 178–12.

Editorial team recommendation: choose between the following options

1. Change the IL range from 3.4-4.4 dB to 3.4-8.5 dB (per suggested remedy).
2. Change the IL range from 3.4-4.4 dB to 7.5-8.5 dB.
3. Reject, if no consensus.

KR/C2C minimum IL test channel Comments #273, 440

Cl **176C** *SC* **176C.6.4.5.3** *P* **776** *L* **19** # 273

Kutscher, Noam — Marvell

Comment Type **T** *Comment Status* **D** *RX test channel IL (E)*

A nominal 10dB low-loss ITOL IL value cannot be achieved with a high-radix device.

SuggestedRemedy

Correct the value to 15dB.
Reasoning for the new range: Simple Loss Calculation–
a. ~1.5' escaping = ~1.8dB
b. 2 X Via = ~2dB
c. PCB- 3inch = ~3.6dB
d. SMA = ~0.5dB
e. Coupler = 3dB
f. Cable to ISI PCB ~30cm = ~2dB
Total estimated loss ~12.9dB → change to 15dB.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The values in D2.1 were established by the response to C#553 against D1.3. See <https://www.ieee802.org/3/dj/comments/D1p3/8023dj_D1p3_comments_final_id.pdf#page=131> and the referenced <https://ieee802.org/3/dj/public/25_01/heck_3dj_01b_2501.pdf#page=11>, which is based on contributed channels.
Another comment, #440, suggests a much lower minimum IL for the amplitude tolerance test.
For CRG discussion.

Cl **176C** *SC* **176C.6.4.2** *P* **773** *L* **28** # 440

Dudek, Mike — Marvell

Comment Type **TR** *Comment Status* **D** *RX test channel IL (E)*

This comment is related to unsatisfied comment #535 to D2.0. Inserting the the minimum channel loss from the KR interference tolerance test (14.5dB) between the Tx and Rx does not adequately test the overload for C2C where much lower minimum losses are expected. (The minimum loss is presently not specified for C2C. Assuming that the pattern generator used in the overload test has a similar loss to a minimum loss real package the loss should be equal to the minimum loss in the C2C link. 2dB allowing for a minimum trace length of approx 2 inches with low loss materials seems reasonable.

SuggestedRemedy

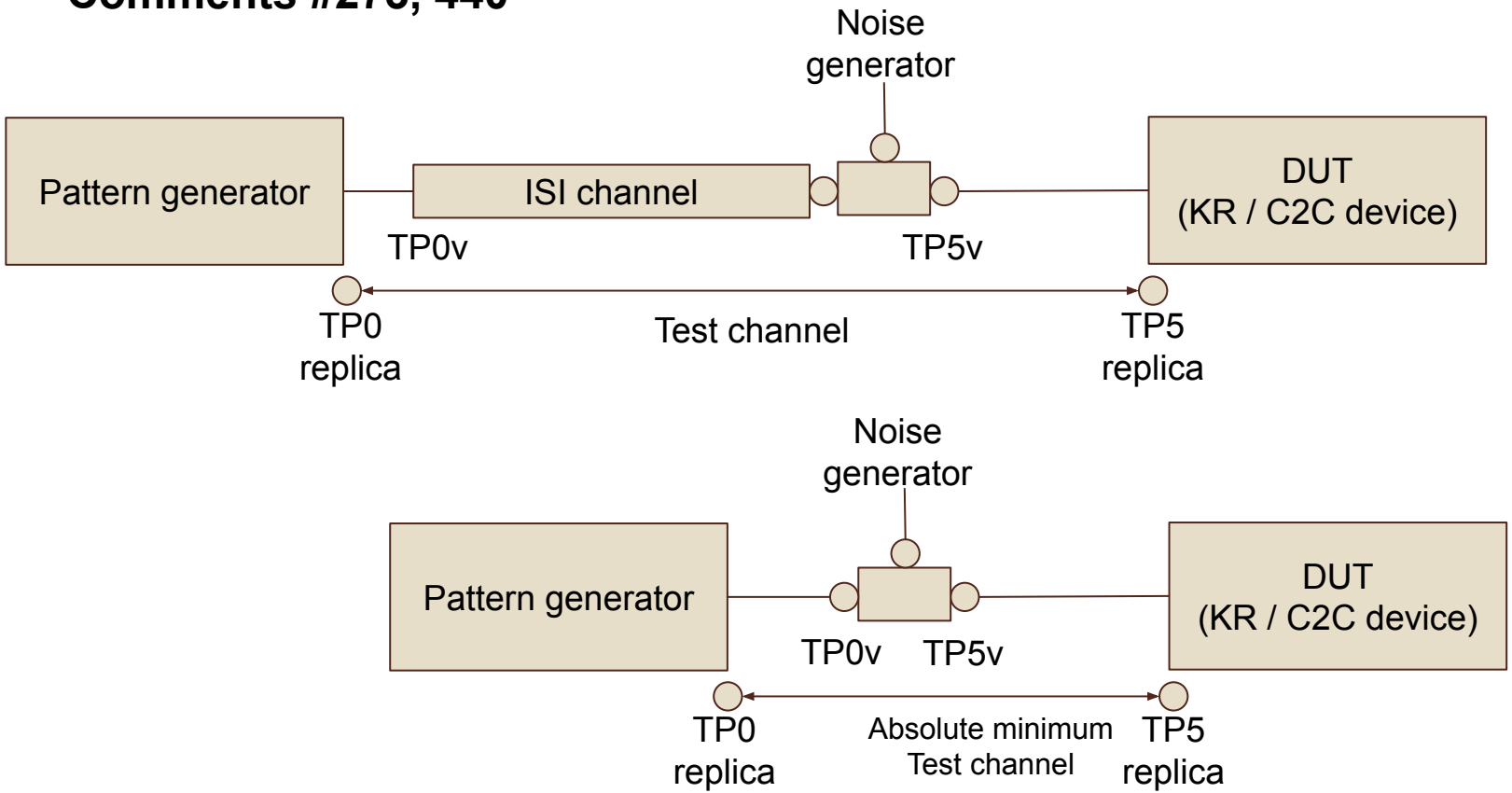
Change "using a channel with the minimum insertion loss specified in 178.9.3.4" to "using a channel with the recommended minimum insertion loss specified in 176C.7.2. Add another paragraph to 176C.7.2. "The recommended minimum insertion loss for the channel between TP0 and TP5 is 2dB."

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Align the minimum channel loss with that used for RX ITOL testing (9.5 dB - 10.5 dB) by changing the reference in the first paragraph of from 178.9.3.4 to Table 176C-5.

Both comments address the minimum IL test channel - for “Test 1” in ITOL, and for ATOL.
They suggest somewhat different numbers: 15 dB vs. 2 dB.
Reasoning is for a large device in one comment and for a small device in the another.
There are no corresponding comments against clause 178.

KR/C2C minimum IL test channel
Comments #273, 440



KR/C2C minimum IL test channel
Comments #273, 440

The minimum channel a DUT can be tested with is a direct connection to TP5v (ATOL) or the noise coupler input (ITOL).

(Assuming the transmitter is an instrument-grade generator; if it's a compliant device then there is an additional TP0d-TP0v channel)

If the test fixture (TP5v-TP5) IL specification is changed to ~8 dB then this could constitute a reasonable minimum for KR or C2C links.

It is a natural way to test receivers.

It is also approximately the midpoint between the two proposed values.

Editorial team recommendation: choose between the following options

1. Change the IL minimum for ITOL to 15 dB (per #273)
    - with/without a corresponding change to ATOL
2. Change the IL minimum for ATOL to 2 dB (per #440)
    - with/without a corresponding change to ITOL
3. Change both tests such that the test channel does not include an ISI channel (so the transmitter is connected to TP5v, possibly with a noise coupler in between).
4. Reject, if no consensus.