802.3ck D1.3
MTF IL and RL Comments
#122,#22,#178,#123 ,#21 and #269

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Purpose

- Comments #122, #22,#178,#123 and #21
  - Specify MTF ERL requirement
  - MTF RL limit informative
  - Changes to MTF IL normative limit and RL informative limit

CI 162B	SC 162B.1.3.2	P 256	L 41	# 123

Kocsis, Sam   Amphenol

Comment Type   **TR**   Comment Status   **X**
    Add definition of ERL for MTF

SuggestedRemedy
    Copy Table120G-4, change Tfx to "0", use as reference for MTF ERL

Proposed Response   Response Status   **O**

CI 162B	SC 162B.1.3.2	P 256	L 40	# 178

Haser, Alex   Molex

Comment Type   **TR**   Comment Status   **X**
    Current RL mask doesn't accurately capture necessary RL performance

SuggestedRemedy
    Remove RL mask and replace with ERL ; input values and ERL limit TBD

Proposed Response   Response Status   **O**

CI 162B	SC 162B.1.3.1	P 255	L 35	# 21

DiMinico, Christopher   MC Communications

Comment Type   **TR**   Comment Status   **D**   *MTF IL*
    Modify Equation (162B–3) ILMTFMAX > 40 GHz to align with achievable MTF insertion loss

SuggestedRemedy
    See supporting presentation diminico_3ck_1020.pdf

Proposed Response   Response Status   **W**
    PROPOSED ACCEPT IN PRINCIPLE.

    Modify Equation (162B–3) ILMTFMAX > 40 GHz to align with achievable MTF insertion loss
    See slide 11 supporting presentation
    https://www.ieee802.org/3/ck/public/20_10/diminico_3ck_01_1020.pdf
    For task force discussion of cited presentation.

CI 162B	SC 162B.1.3.2	P 256	L 41	# 122

Kocsis, Sam   Amphenol

Comment Type   **TR**   Comment Status   **D**   *MTF RL*
    text says test fixture "shall meet" Eq 162B-6

SuggestedRemedy
    Change to "is recommended to meet and shall meet an ERL of 8dB, see background/consensus presentation

Proposed Response   Response Status   **W**
    PROPOSED ACCEPT IN PRINCIPLE.

    Change 162B.1.3.2 from "shall" to "is recommended".
    Modify equation 162B–6 per comment#22.
    Add subclause for MTF ERL with 8 dB requirement.
    Add Table similar 120G-4 with Tfx to "0" to use as reference for MTF ERL.
    Editorial license.
    For task force discussion of cited presentation.
    [Editor's note: Add presentation URL.]

CI 162B	SC 162B.1.3.2	P 256	L 46	# 22

DiMinico, Christopher   MC Communications

Comment Type   **TR**   Comment Status   **D**   *MTF RL*
    Modify Equation (162B–6) DRL(f) > 40 GHz to align with achievable MTF return loss

SuggestedRemedy
    See supporting presentation diminico_3ck_1020.pdf

Proposed Response   Response Status   **W**
    PROPOSED ACCEPT IN PRINCIPLE.

    Resolve using the response to comment #122.

Suppoters

- **Sam Kocsis - Amphenol**
- **Alex Haser - Molex**
- **Rich Mellitz - Samtec**
- **Jane Lim, Upen Reddy Kareti – Cisco**
- **Nathan Tracy, Bruce Champion, TE**

# Test Fixtures Specifications (#122,#22,#178,#123 and #21)

- RL
  - Specify MTF ERL as requirement
  - MTF RL limit informative
  - Use ERL to assess RL informative limit > 40 GHz
- IL
 - Use C2M EH and VEC to assess IL normative limit > 40 GHz

Annex 162B Test Fixtures

- Test fixtures used separably; MCB for cable assembly/module, HCB for Host.
  - Specified in a mated state (MTF)
- MTF IL, MCB IL, and HCB IL constrained by channel budget.
- All other MTF specifications measurement based.
- **The MTF requirements are not the MDI connector specifications for an implemented design.**

MCB – CR Cable Assembly Test Fixture
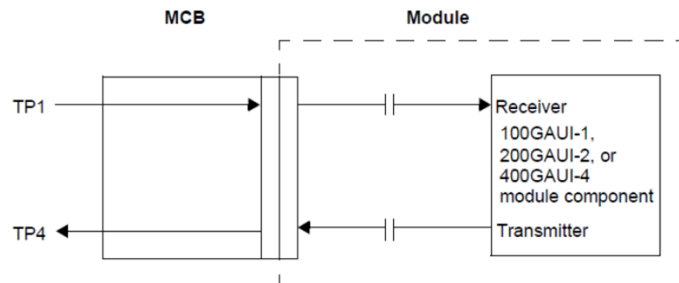Note compliant OSFP and QSFP-DD cable assembles posted
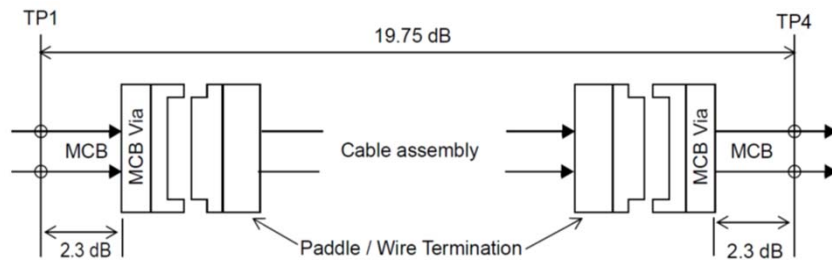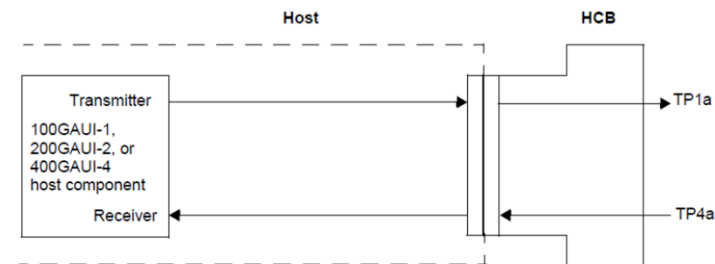
HCB – CR TP2 or TP3 Test Fixture
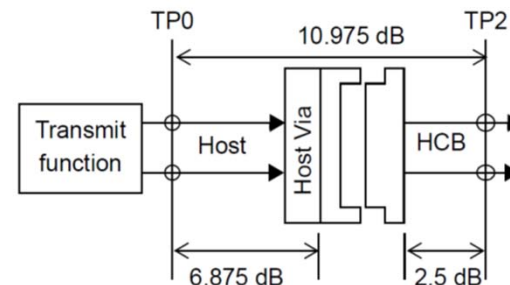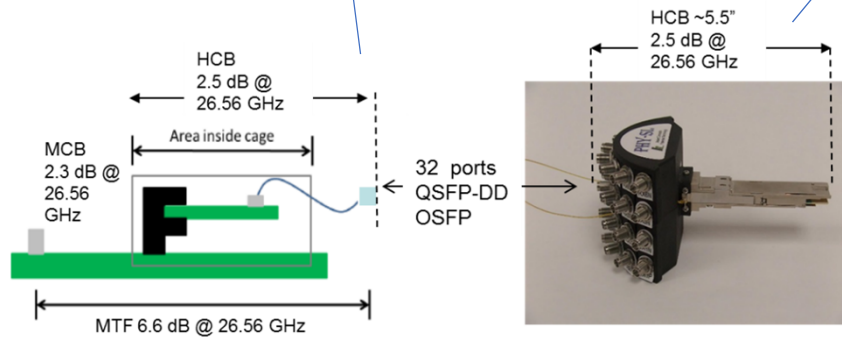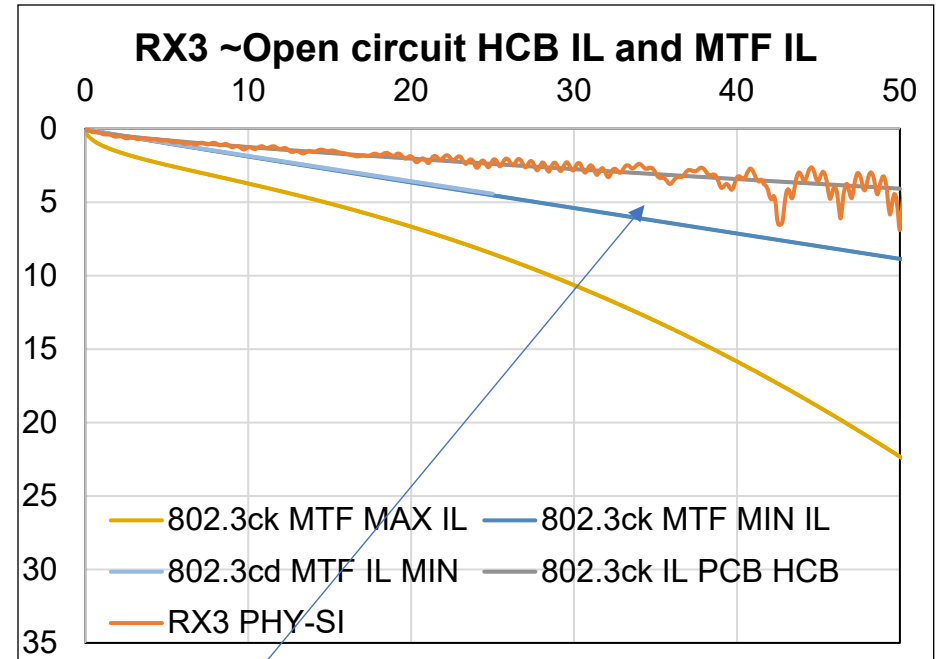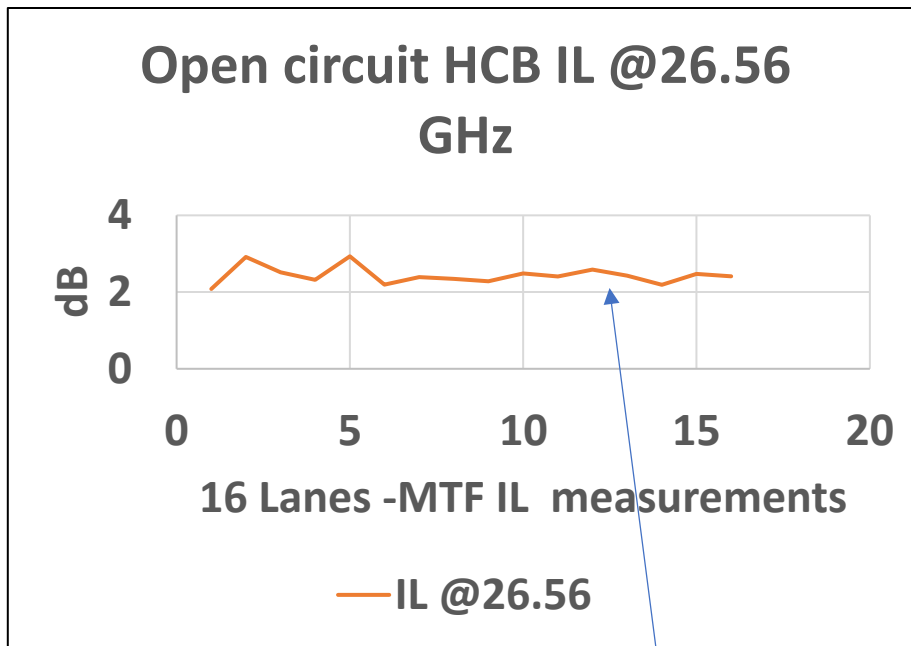
Mated MCB/HCB
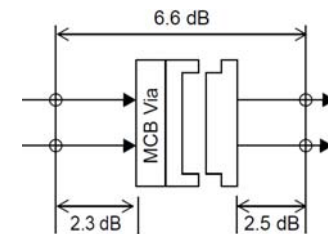
MCB – 120G—Module compliance points

HCB – 120G—Host compliance points

HCB – Test Methods without MCB

Open circuit HCB IL @26.56 GHz

16 Lanes -MTF IL measurements

— IL @26.56

RX3 ~Open circuit HCB IL and MTF IL

— 802.3ck MTF MAX IL   — 802.3ck MTF MIN IL
— 802.3cd MTF IL MIN   — 802.3ck IL PCB HCB
— RX3 PHY-SI

HCB
2.5 dB @
26.56 GHz

MCB
2.3 dB @
26.56
GHz

Area inside cage

32 ports
QSFP-DD
OSFP

MTF 6.6 dB @ 26.56 GHz

HCB ~5.5"
2.5 dB @
26.56 GHz

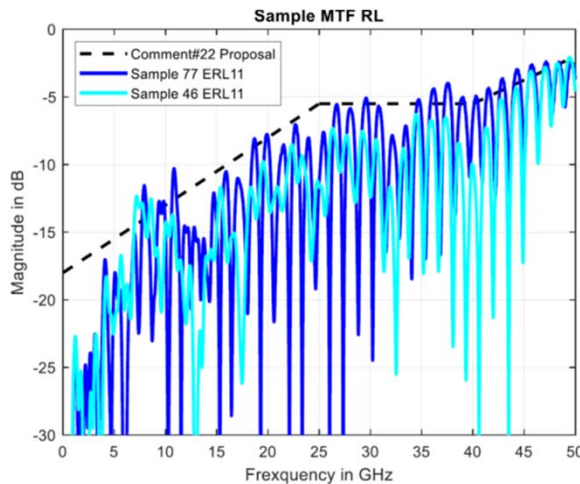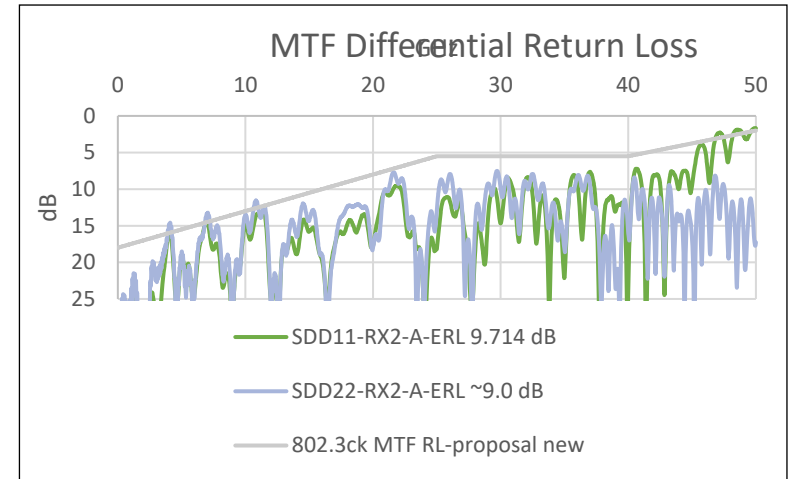# MTF ERL- comment#122,#123,#178

- Specify MTF ERL with 9 dB requirement
- Use MTF ERL Parameters Table Below

Parameter	Symbol	Value	Units
Transition time associated with a pulse	T_r	0.01	ns
Incremental available signal loss factor	β_x	0	GHz
Permitted reflection from a transmission line external to the device under test	ρ_x	0.618	—
Length of the reflection signal	N	400	UI
Equalizer length associated with reflection signal	N_{bx}	0	UI
Twice the propagation delay associated with the test fixture	T_{fx}	0	ns
Tukey window flag	tw	1	—

config_com_ieee8023_93a=3ck_d1p3_120g_C2M_tp1a_09_01_20

TDR_W_TXPKG	0	

MTF Differential Return Loss

- SDD11-RX2-A-ERL 9.714 dB
- SDD22-RX2-A-ERL ~9.0 dB
- 802.3ck MTF RL-proposal new
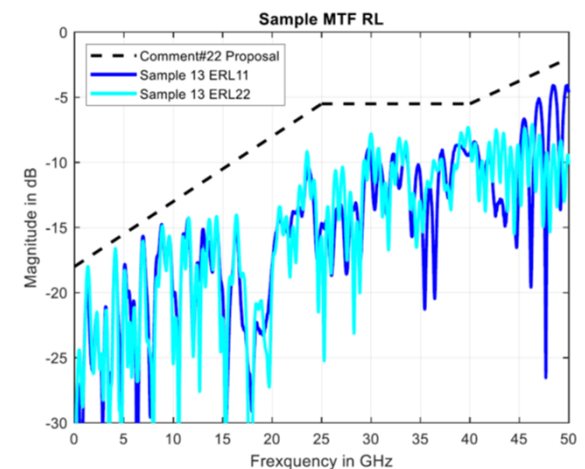

Shown difference between
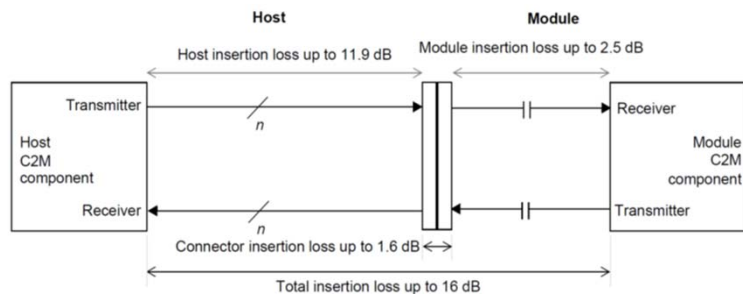ERL ~7dB and ERL ~8dB
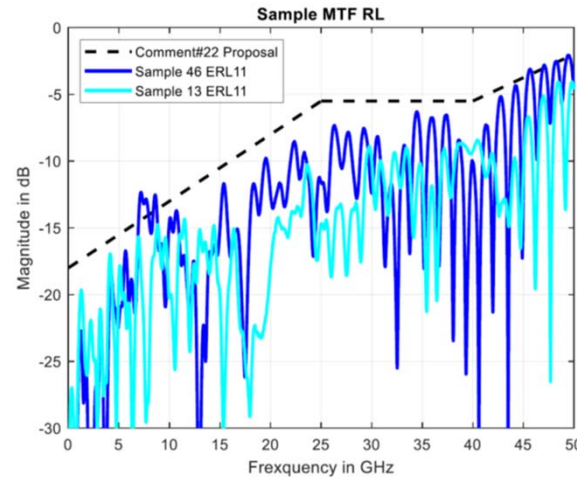
Shown difference between
ERL ~8dB and ERL ~10dB

The difference caused by the
limit line violation >45GHz is ~0.2dB ERL

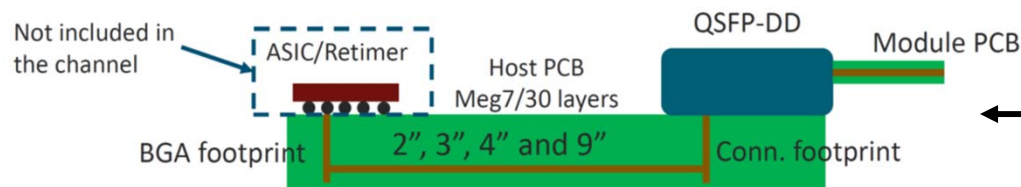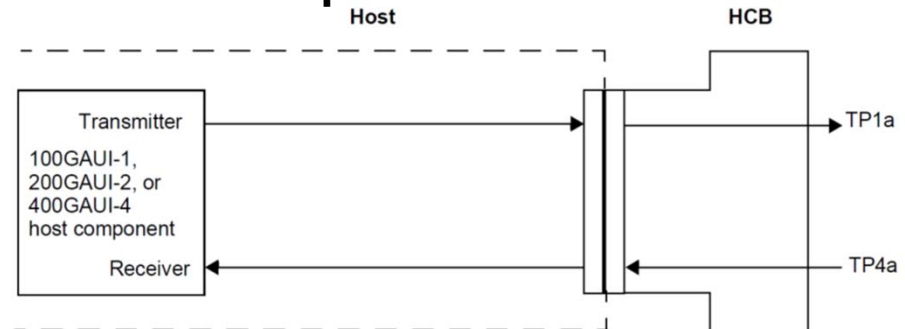*https://www.ieee802.org/3/ck/public/20_10/kocsis_3ck_02b_1020.pdf*

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Chip to Module Configuration

- com_ieee8023_93a_295
- config_com_ieee8023_93a=3ck_d1p3_120g_C2M_tp1a_09_01_20

Chip to Module

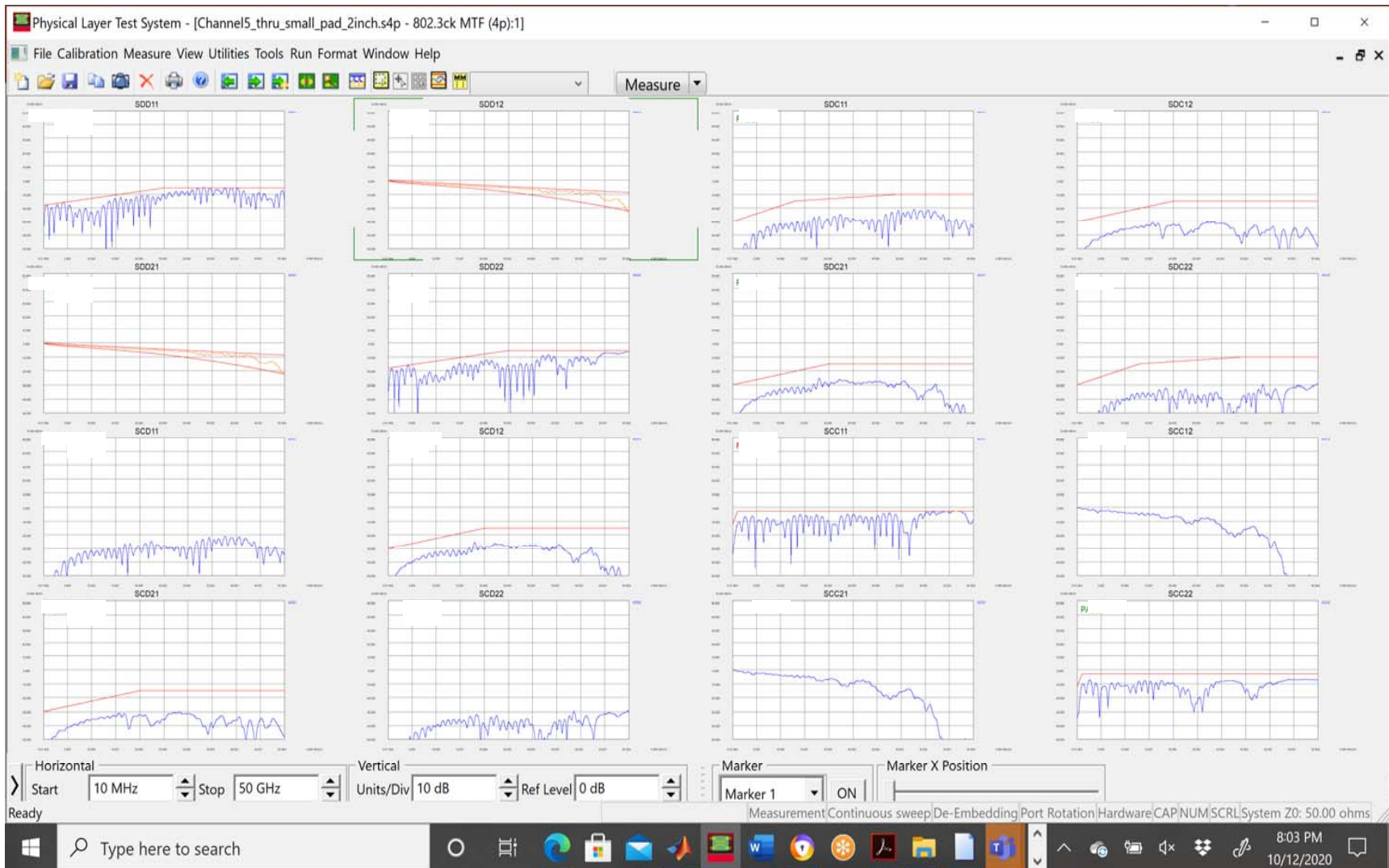Host insertion loss up to 11.9 dB
Module insertion loss up to 2.5 dB

Host · Module

Transmitter · Receiver
Host C2M component
n
Module C2M component
Receiver · Transmitter
n
Connector insertion loss up to 1.6 dB
Total insertion loss up to 16 dB

Host Compliance Points

Host · HCB

Transmitter
100GAUI-1, 200GAUI-2, or 400GAUI-4 host component
Receiver
TP1a
TP4a

Not included in the channel
ASIC/Retimer
Host PCB Meg7/30 layers
QSFP-DD
Module PCB
BGA footprint
2", 3", 4" and 9"
Conn. footprint

Note stripline trace launch expected ERL >30.
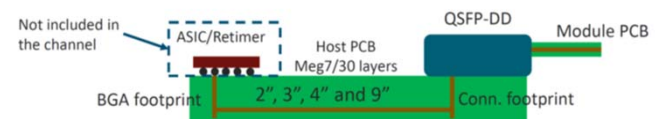
6.6 dB
MCB Via
2.3 dB · 2.5 dB
Mated cable assembly and test point test fixture
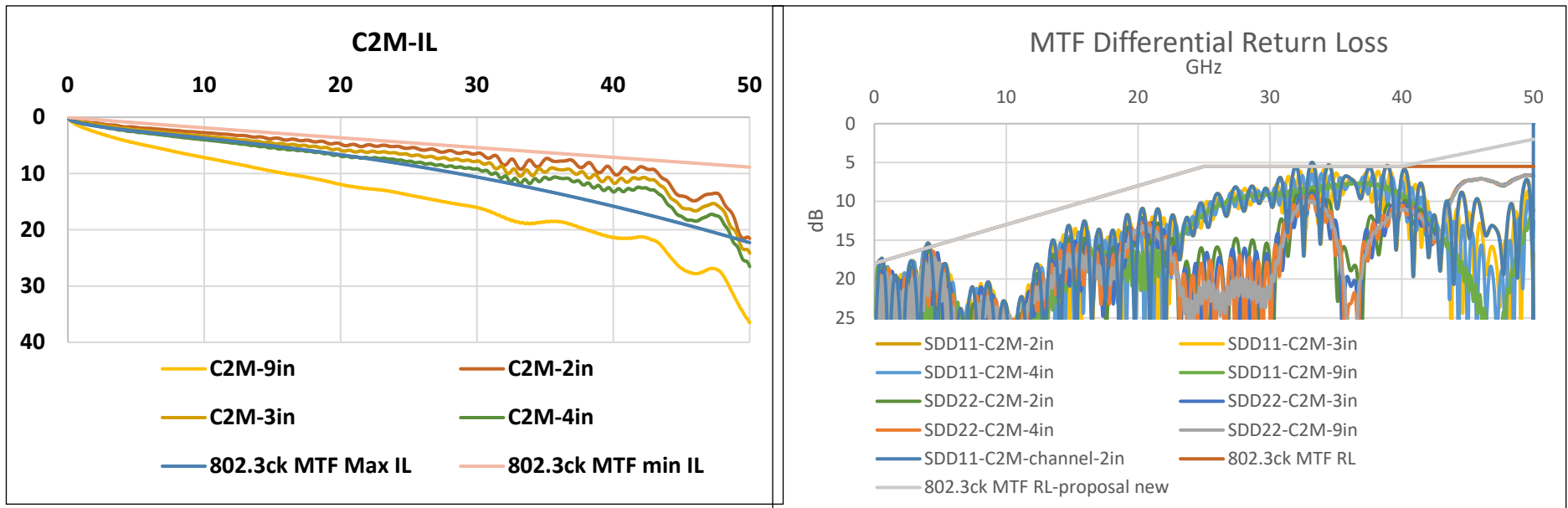
C2M measurements – MTF limits

- C2M Channel5_thru_small_pad_2inch.s4p
 Note stripline trace launch expected ERL >30.

802.3ck Task Force
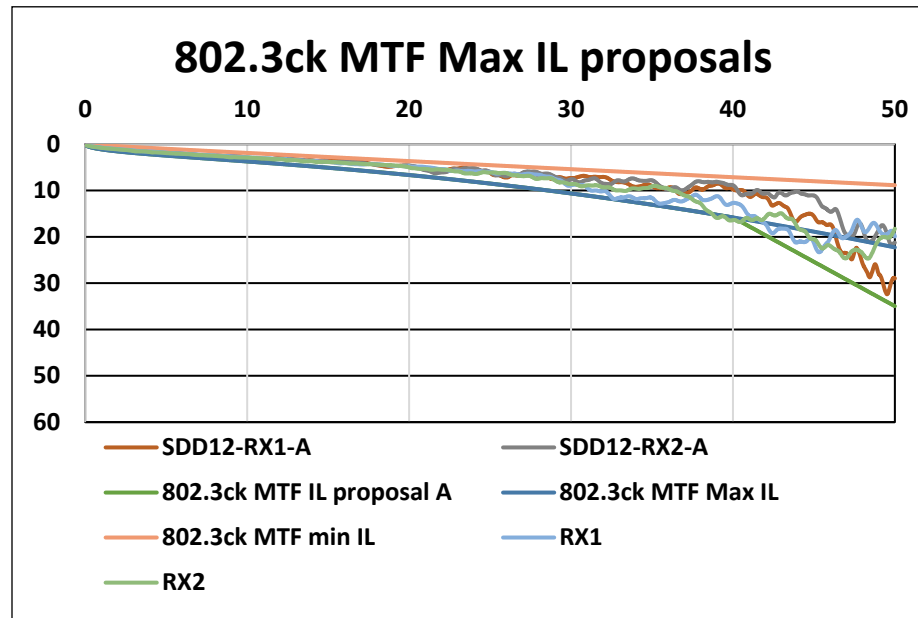
9

C2M measurements – MTF limits-EH-VEC-ERL

C2M-Topology/COM setting	VEC (dB)	EH (mV)	ERL 22 (dB)	ERL 11 (dB)
C2M-2in - TDR PKG ON	8.117	32.232	8.976	9.138
C2M-3in - TDR PKG ON	8.164	30.721	9.484	9.507
C2M-4in - TDR PKG ON	7.747	26.753	9.951	9.805
C2M-9in - TDR PKG ON	7.817	15.169	11.379	10.912
C2M-Topology/COM setting	VEC (dB)	EH (mV)	ERL 22 (dB)	ERL 11 (dB)
C2M-2in - TDR PKG OFF	8.177	32.232	11.305	9.139
C2M-3in - TDR PKG OFF	8.164	30.721	11.424	9.507
C2M-4in - TDR PKG OFF	7.747	26.753	11.548	9.805
C2M-9in - TDR PKG OFF	7.817	15.169	11.9651	10.912

Note stripline trace launch expected ERL >30.

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MTF IL proposal- comment#21

802.3ck MTF Max IL proposals

Legend:
- SDD12-RX1-A
- SDD12-RX2-A
- 802.3ck MTF IL proposal A
- 802.3ck MTF Max IL
- 802.3ck MTF min IL
- RX1
- RX2

MTF IL proposal A = $1.185*SQRT(f)-0.072*f+0.007*f^2$ $0.01\ GHz \le f < 40\ GHz$

MTF IL proposal A = $1.915*f-60.78$ $40\ GHz \le f \le 50\ GHz$

RX1-TDR PKG OFF
VEC = 7.975 dB
EH = 33.915 mV
ERL = 11.172 dB (11.318 dB, 11.172 dB)
RX2-TDR PKG OFF
VEC = 7.840 dB
EH = 32.138 mV
ERL = 10.710 dB (10.912 dB, 10.710 dB)

RX1-A TDR OFF
VEC = 8.496 dB
EH = 32.737 mV
ERL = 8.336 dB (9.218 dB, 8.336 dB)
RX2-A TDR OFF
VEC = 8.378 dB
EH = 31.549 mV
ERL = 9.069 dB (9.714 dB, 9.069 dB)

C2M-Topology/COM setting	VEC (dB)	EH (mV)
C2M-2in - TDR PKG OFF	8.177	32.232
C2M-3in - TDR PKG OFF	8.164	30.721
C2M-4in - TDR PKG OFF	7.747	26.753
C2M-9in - TDR PKG OFF	7.817	15.169

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MTF RL comment#22

MTF Differential Return Loss
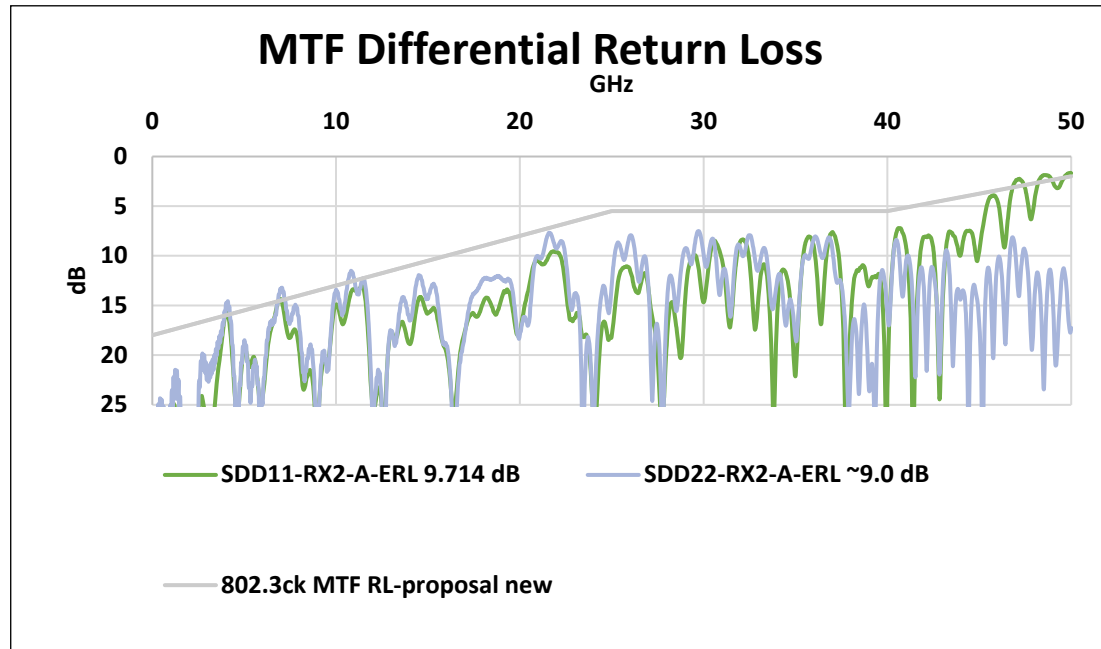
-       **MTF RL limit informative**
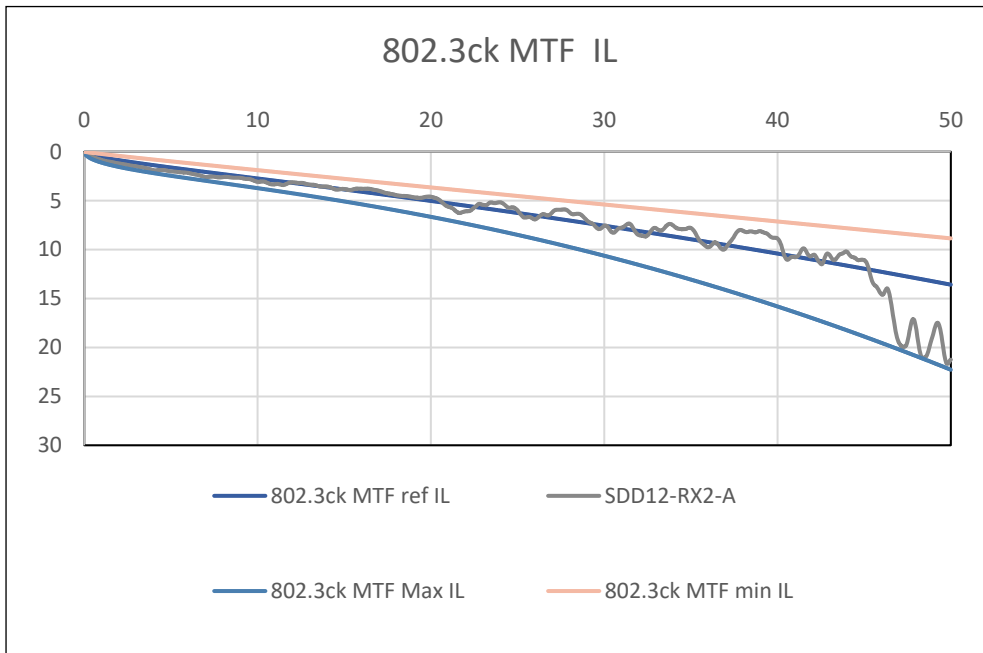-   **Change RL limit > 40 GHz**

PROPOSAL: Differential Return Loss =

$18-0.5*f_{GHz}$ $0.05 \text{ GHz} \leq f_{GHz} < 25 \text{ GHz}$

5.5 $25 \text{ GHz} \leq f_{GHz} < 40 \text{ GHz}$

$-.35*(f_{GHz} -40)+5.5$ $40 \text{ GHz} \leq f_{GHz} \leq 50 \text{ GHz}$

802.3ck MTF IL

Legend:
- 802.3ck MTF ref IL
- SDD12-RX2-A
- 802.3ck MTF Max IL
- 802.3ck MTF min IL

162B.1.2.1 Cable assembly test fixture insertion loss
The cable assembly test fixture printed circuit board and test point insertion loss values determined using Equation (162B–2) shall be used as the reference test fixture insertion loss. <u>The effects of differences between the insertion loss of an actual test fixture and the reference insertion loss are to be accounted for in the measurements.</u>

The reference insertion loss of the mated test fixture is determined using Equation (162B–5).

$$IL_{MatedTF}(f) = 0.9502(0.471\sqrt{f} + 0.1194f + 0.002f^2) \qquad (162B-5)$$

for 0.01 GHz $\leq f \leq$ 50 GHz

where

$IL_{MatedTF}(f)$ is the reference insertion loss of the mated test fixture insertion loss in dB at frequency f

f is the frequency in GHz

Proposed response: AIP
Change upper frequency EQ: 162B-5 to 30 GHz. Plot MTF reference IL Figure 162B-3.

CI **162B**	SC **162B.1.3.1**	P **256**	L **12**	# 269

Dawe, Piers   Nvidia

Comment Type   **E**   Comment Status **D**   MTF IL

Figure 162B-3, Mated test fixtures insertion loss, shows the maximum and minimum IL but not the reference IL.

SuggestedRemedy

Please show the reference insertion loss of the mated test fixture also, on the same graph.

Proposed Response   Response Status **W**

PROPOSED REJECT.

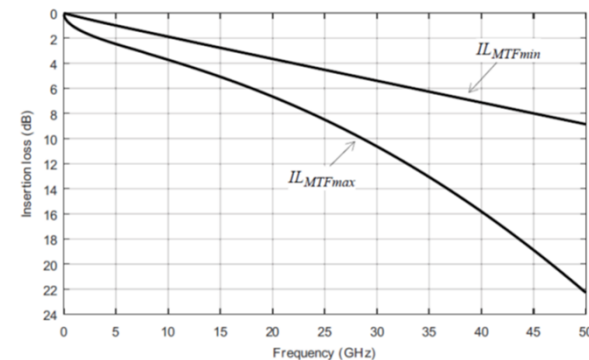The reference IL does not include ILD and therefore not representative of MTF IL i.e, as a reference over frequency.

Figure 162B–3—Mated test fixtures insertion loss