MTF Performance Evaluation

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Related to comments #*232*, 301, 302

ERL – Comment #301

Cl **179B** *SC* **179B.4.3** *P* **908** *L* **24** # 301

Kocsis, Sam Amphenol

Comment Type **T** *Comment Status* **D** *MTF Requirements (E)*

In D2P2, both the s-parameter reference impedance and the ERL reference impeance are now 92.5-ohm differential (46.25-ohm single-ended). The RF connectors used in MTF measurements introduce a significant impact to the computed ERL result, making a limit of 10.3dB very challenging to achieve.

SuggestedRemedy

Change the ERL limit to account for the deltaERL with the RF coax connector, OR allow for a fixed Tfx setting to remove the impact of the RF coax connector. Contribution to follow at the November plenary.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The comment does not include sufficient detail of the problem to be solved..

However, the suggested remedy indicates a planned presentation.
For CRG discussion following review of the presentation.

179B.4.3 Mated test fixtures effective return loss (ERL)

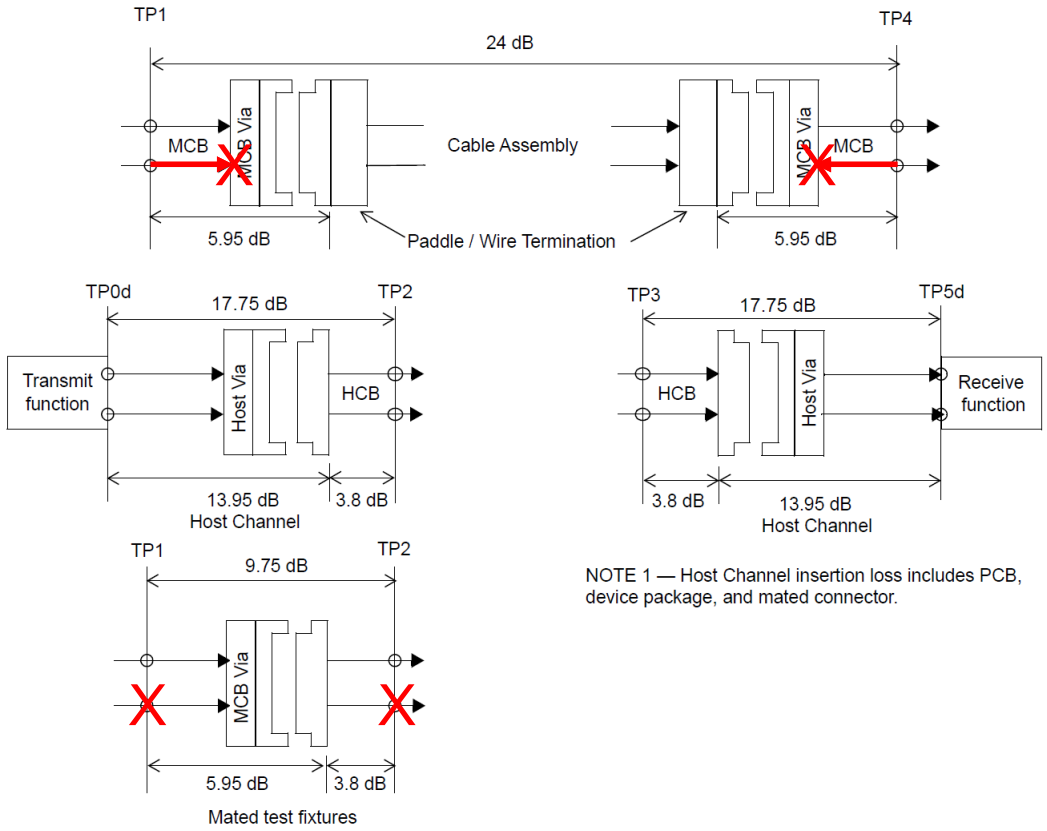
The values of the mated test fixtures ERL are computed using the procedure in 93A.5 with the parameter values in Table 179B–1. Parameters that do not appear in Table 179B–1 take values from Table 179–21.

The reference differential impedance for the mated test fixtures ERL computation shall be 92.5 Ω. The reference differential impedance for the mated test fixtures ERL computation is independent of the reference differential impedance for the s-parameter data, 179B.4.1. The mated test fixtures ERL shall be greater than or equal to 10.3 dB.

Table 179B–1—Mated test fixtures ERL parameter values

Parameter	Symbol	Value	Units
Transition time associated with a pulse	T_r	0.005	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	1600	UI
Equalizer length associated with reflection signal	N_{bx}	0	UI
Time-gated propagation delay	T_{fx}	0	ns
Tukey window flag	tw	1	—
Number of samples per unit interval	M	32	—
Target detector error ratio	DER_0	2×10^{-5}	—
NOTE—The coaxial connectors and transmission lines on the mated test fixtures are not time-gated (by setting T_{fx} to 0) in order to include the entire test fixture.			

ERL – Comment #301



NOTE 1 — Host Channel insertion loss includes PCB, device package, and mated connector.

NOTE 2 — The MCB and HCB ILdd allocations include the coaxial connector (up to the coaxial connector reference plane).

MCB = Module Compliance Board, 179B.3
HCB = Host Compliance Board, 179B.2
MCB Via = transition via to MDI connector on an MCB
Host Via = transition via to MDI connector on a Host Channel
Paddle/Wire Termination = transition structure(s) in a Cable Assembly not present on an HCB

Figure 179A–1—Host-Nominal to Host-Nominal, Cable assembly, and test fixture insertion loss at 53.125 GHz

- ERL computations for MTF and CA have different reference points
- Same fixture Pass CA, but Fail MTF

179.11.3 Cable assembly ERL

The cable assembly ERL at TP1 and at TP4 is defined by the procedure in 93A.5 with the values in Table 179–17 and Table 179–19, with differential reference impedance equal to 92.5 Ω, and with T_{fx} equal to twice the test fixture delay. The test fixture delay is defined as the propagation delay between the coaxial connector on the test fixture and the discontinuity of the MDI connector. T_{fx} is provided by the test fixture provider.

179B.4.3 Mated test fixtures effective return loss (ERL)

The values of the mated test fixtures ERL are computed using the procedure in 93A.5 with the parameter values in Table 179B–1. Parameters that do not appear in Table 179B–1 take values from Table 179–21.

The reference differential impedance for the mated test fixtures ERL computation shall be 92.5 Ω. The reference differential impedance for the mated test fixtures ERL computation is independent of the reference differential impedance for the s-parameter data, 179B.4.1. The mated test fixtures ERL shall be greater than or equal to 10.3 dB.

NOTE—The coaxial connectors and transmission lines on the mated test fixtures are not time-gated (by setting T_{fx} to 0) in order to include the entire test fixture.

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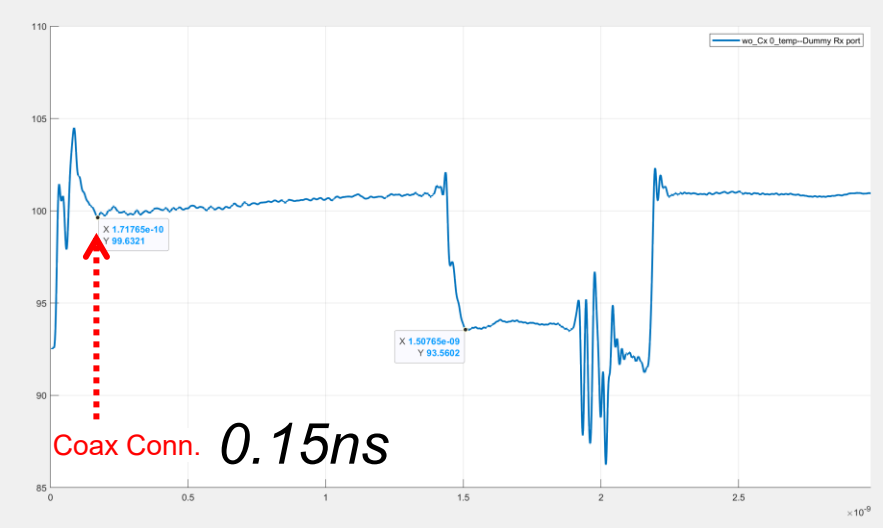
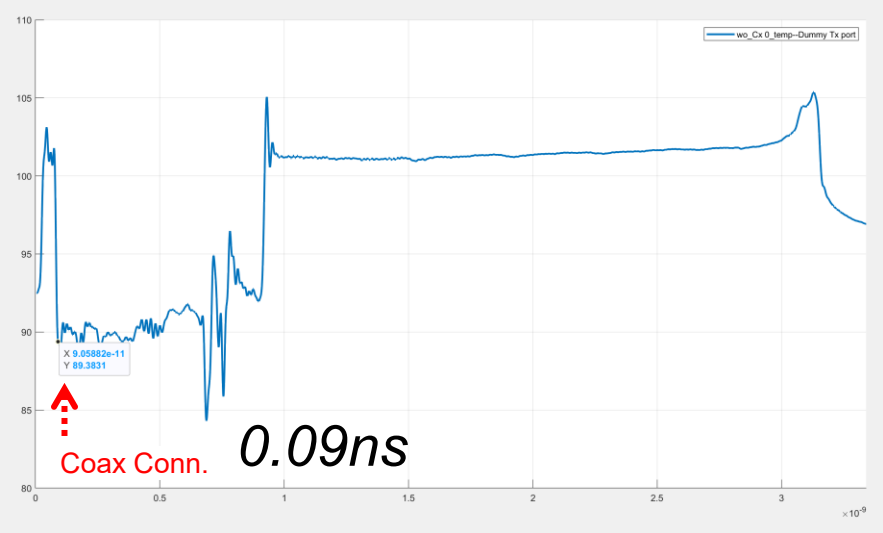


Cabled-based Fixture



PCB-based Fixture

- The issue persists for multiple implementation styles
- A T_{fx} of 0.15ns should fully remove effects of coaxial connector

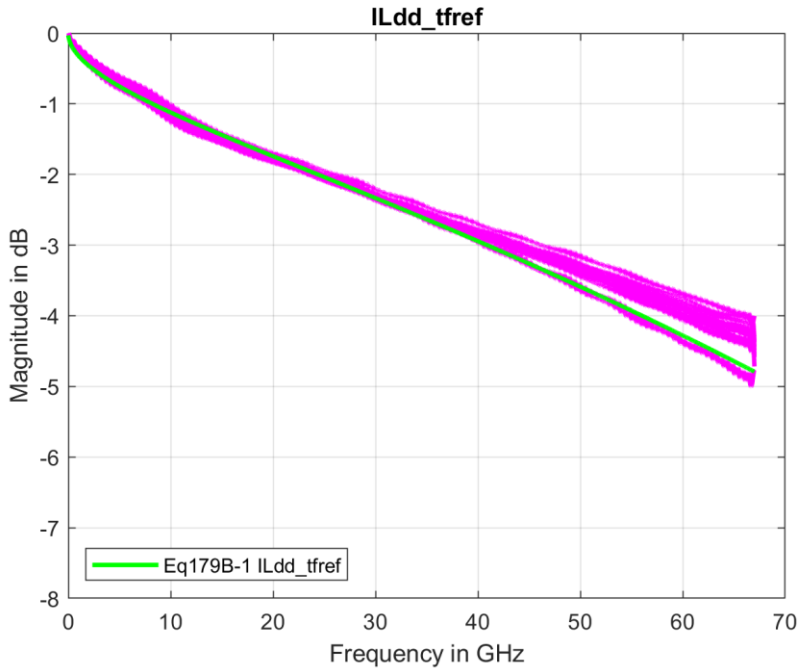
ERL – Comment #301

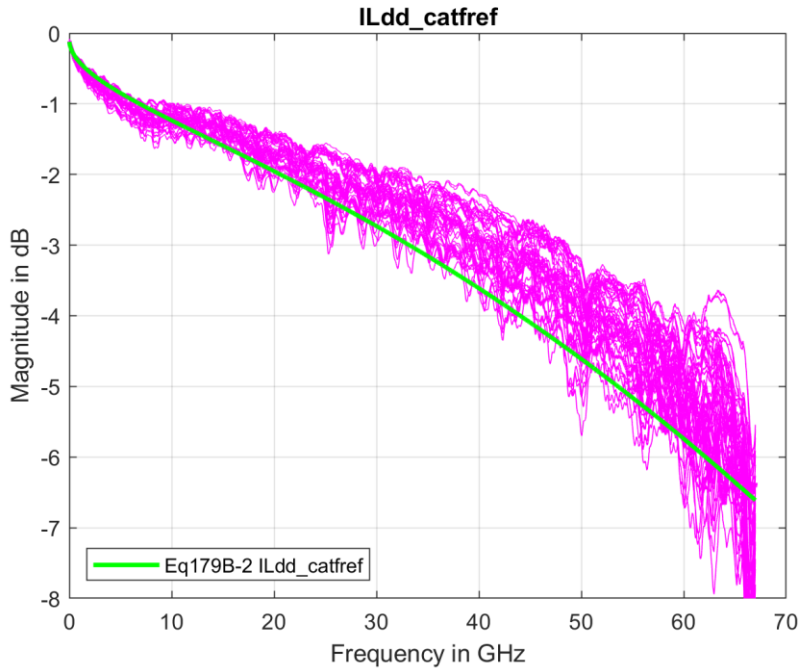
179B.3.1 Cable assembly test fixture insertion loss

The cable assembly test fixture reference insertion loss is defined as the insertion loss between the reference plane of the coaxial connector and the mating point of the MDI connector. The reference insertion loss is defined by Equation (179B–2) and illustrated by Figure 179B–1. 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.

- Issue #1 – It is not clear how the effects of differences between the insertion loss of an actual fixture and the reference insertion loss are to be accounted for

ERL – Comment #301





TP2 or TP3 Fixture “HCB”

Sample Delta IL = ~0.5dB

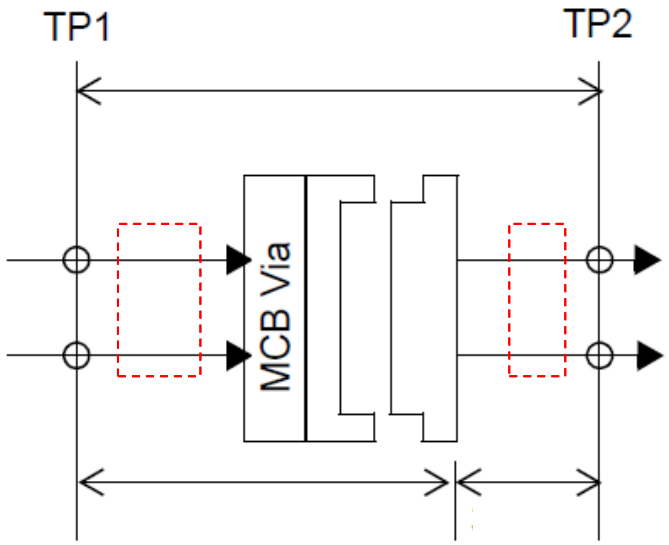
Ildd_tfref obtained by open circuit HCB measurement described in [kocsis_3dj_01_2509]

CA Test Fixture “MCB”

Sample Delta IL = ~1.0dB

Ildd_catfref obtained by MTF-HCB calculation

Summary – ERL, Comment #301

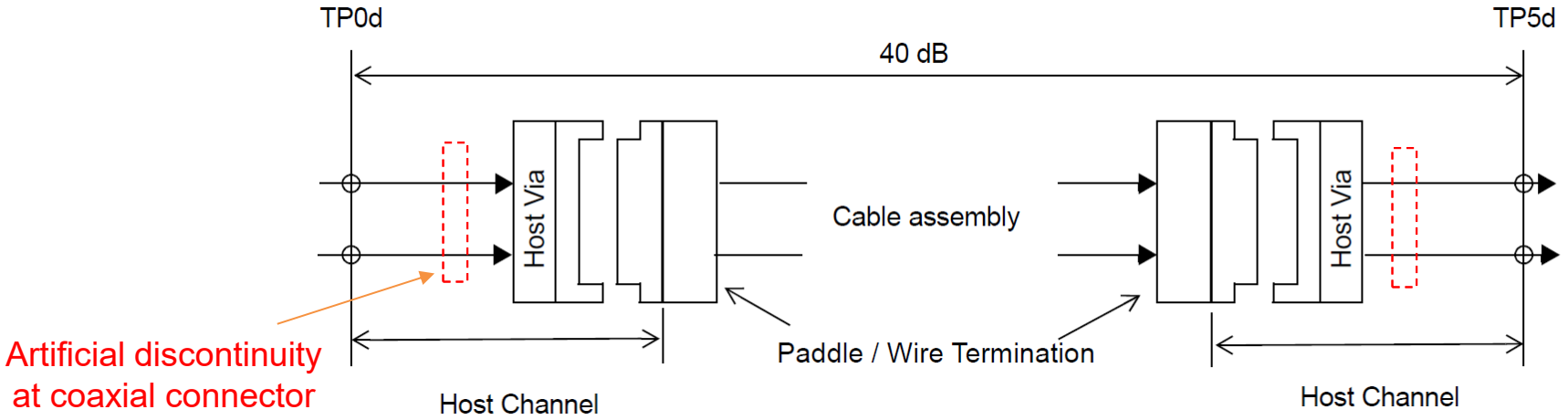


Mated test fixtures

- If we are to remove/add insertion loss/delay to the test fixture measurements, it is difficult to do so while maintaining the defined reference planes
- De-embedding algorithms exist to support removal of the coaxial connector
- Removing the coaxial connector from the reference plane would make apply models more consistent

Summary – ERL, Comment #301

- ERL results typically do not correlate with COM results
- Different ERL reference planes makes interpretation of results difficult
- Propose to allow a T_{fx} of 0.15ns in Table 179B-1 (for MTF)
- Consider interest in enabling de-embedding for future Draft



RLcc – Comment #302

Cl **179B** *SC* **179B.4.6** *P* **910** *L* **9** # 302

Kocsis, Sam Amphenol

Comment Type **TR** *Comment Status* **D** *MTF Requirements (E)*

The extrapolation of common-mode to common-mode return loss requirements for the MTF based on KR/CR/C2M common-mode to differential-mode may have been too aggressive. Channels with fixtures that "pass" KR/CR/C2M requirements, still fail the MTF requirements.

SuggestedRemedy

Change Equation 179B-7 and Figure 179B-4 to be compatible with test fixtures used in KR/CR/C2M compliance settings. And extend the frequency mask to 67GHz. Contribution to follow at the November plenary.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
The comment does not include sufficient detail of the problem to be solved..

However, the suggested remedy indicates a planned presentation.
For CRG discussion following review of the presentation.

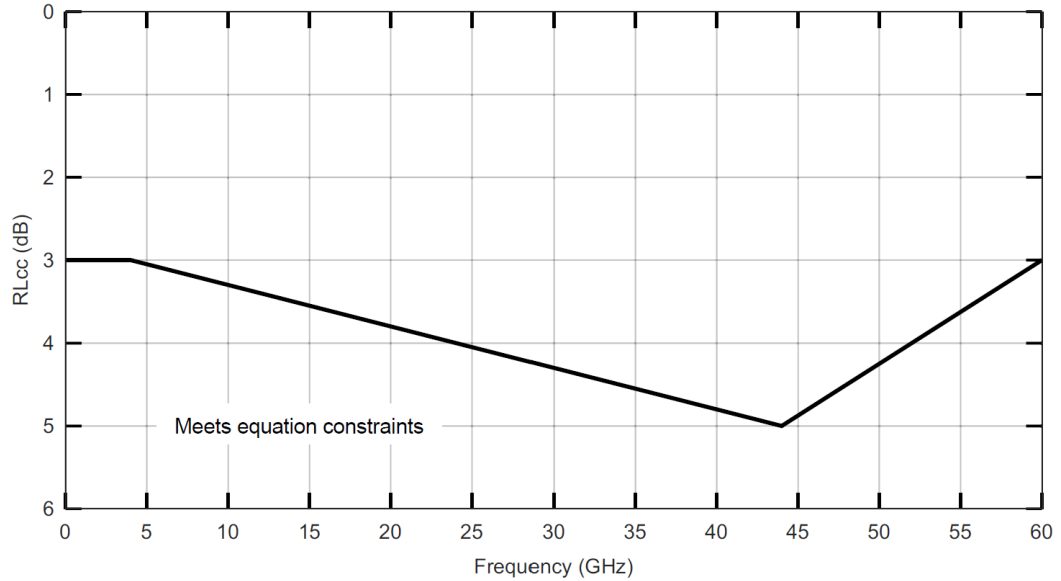


Figure 179B–4—Mated test fixtures common-mode to common-mode return loss requirements

- Issue #1 – This is the only mask in 179B that doesn't extend to 67GHz
- Issue #2 – The mask may be overly constraining for the use cases

RLcc – Comment #302

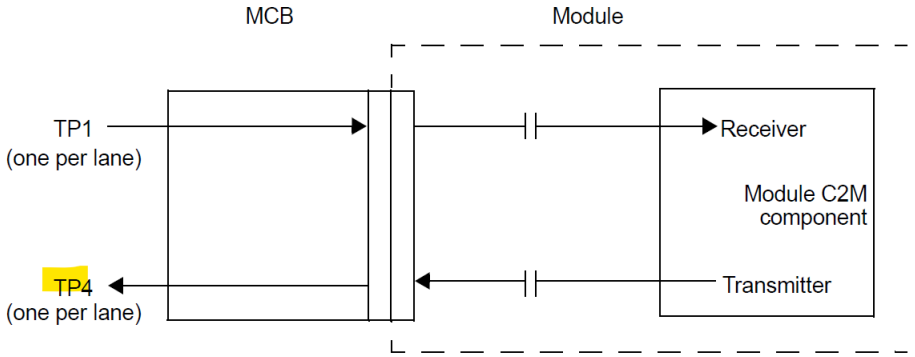


Figure 176D–5—Module compliance points

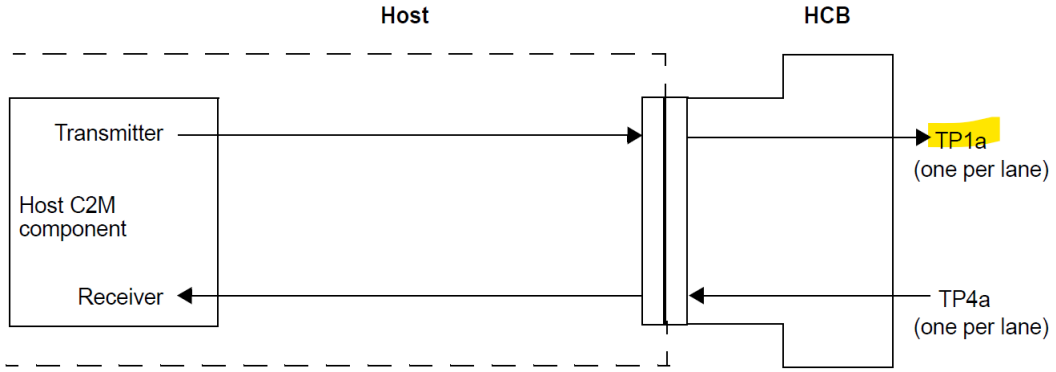
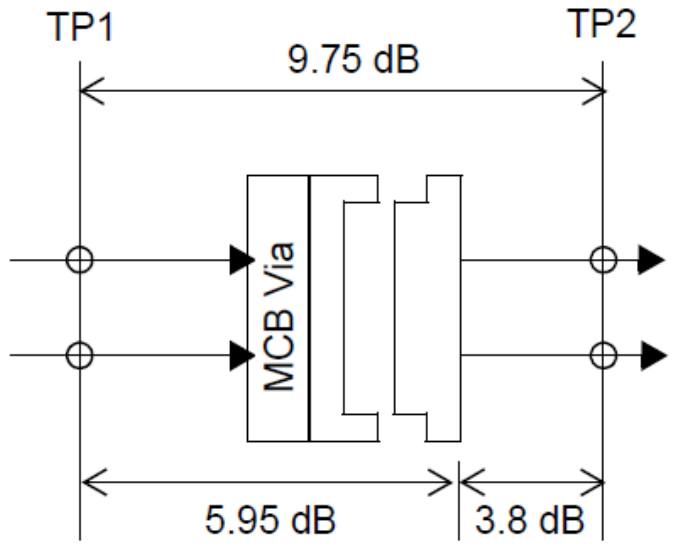


Figure 176D–4—Host compliance points



MTF Requirement TP1-TP2

RLcc – Comment #302

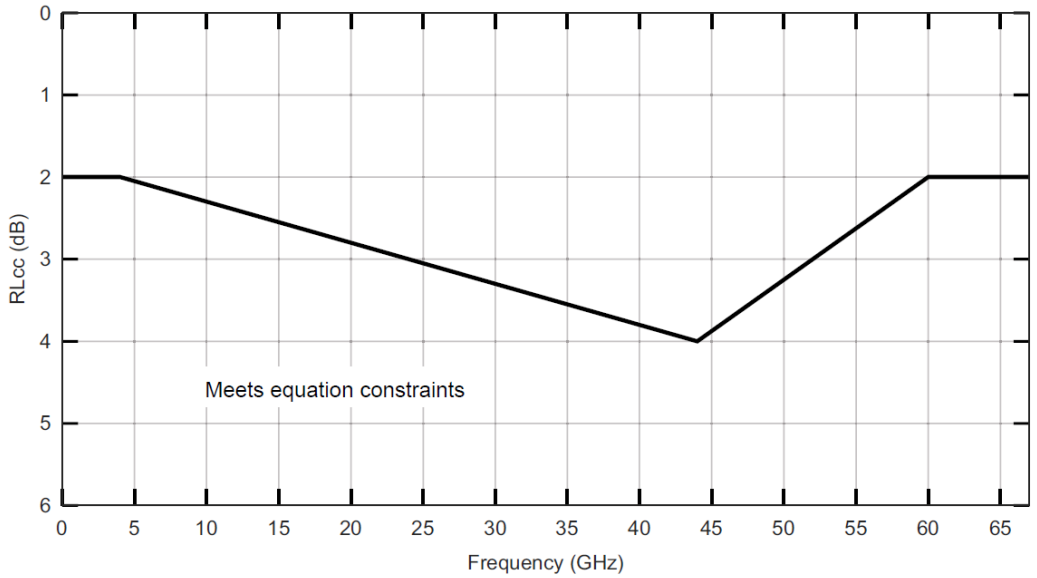


Figure 179–4—Transmitter common-mode to common-mode return loss

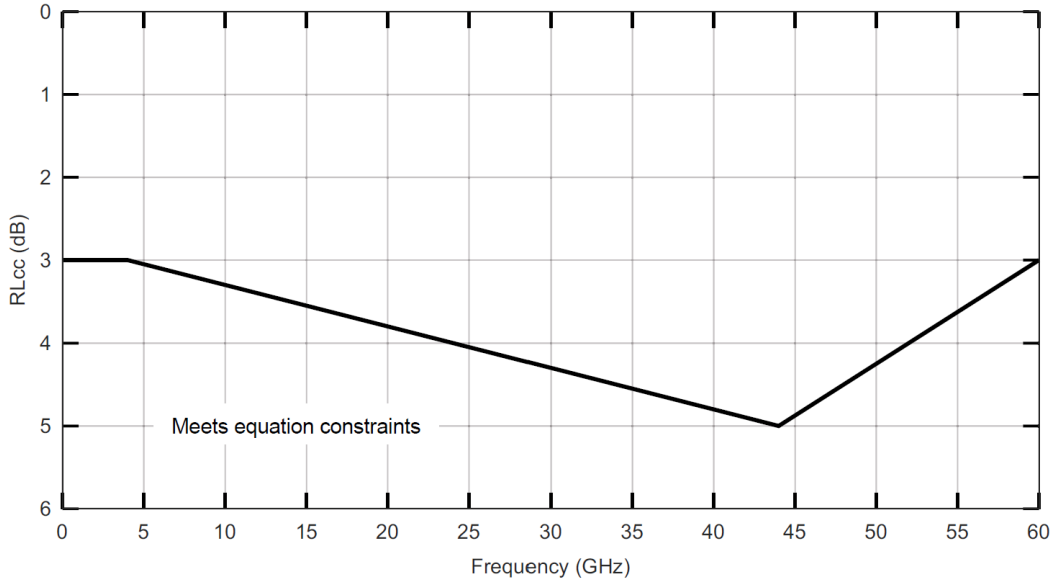


Figure 179B–4—Mated test fixtures common-mode to common-mode return loss requirements

CA Requirement TP1-TP4

C2M Requirement @TP1a/TP4

MTF Requirement TP1-TP2

Equation Options – RLcc, Comment #302

$$RLcc(f) \geq \begin{cases} 3 & 0.05 \leq f < 4 \\ 3 + \frac{2}{40}(f-4) & 4 \leq f < 44 \\ 5 + \frac{2}{16}(44-f) & 44 \leq f < 60 \\ 3 & 60 \leq f \leq 67 \end{cases}$$

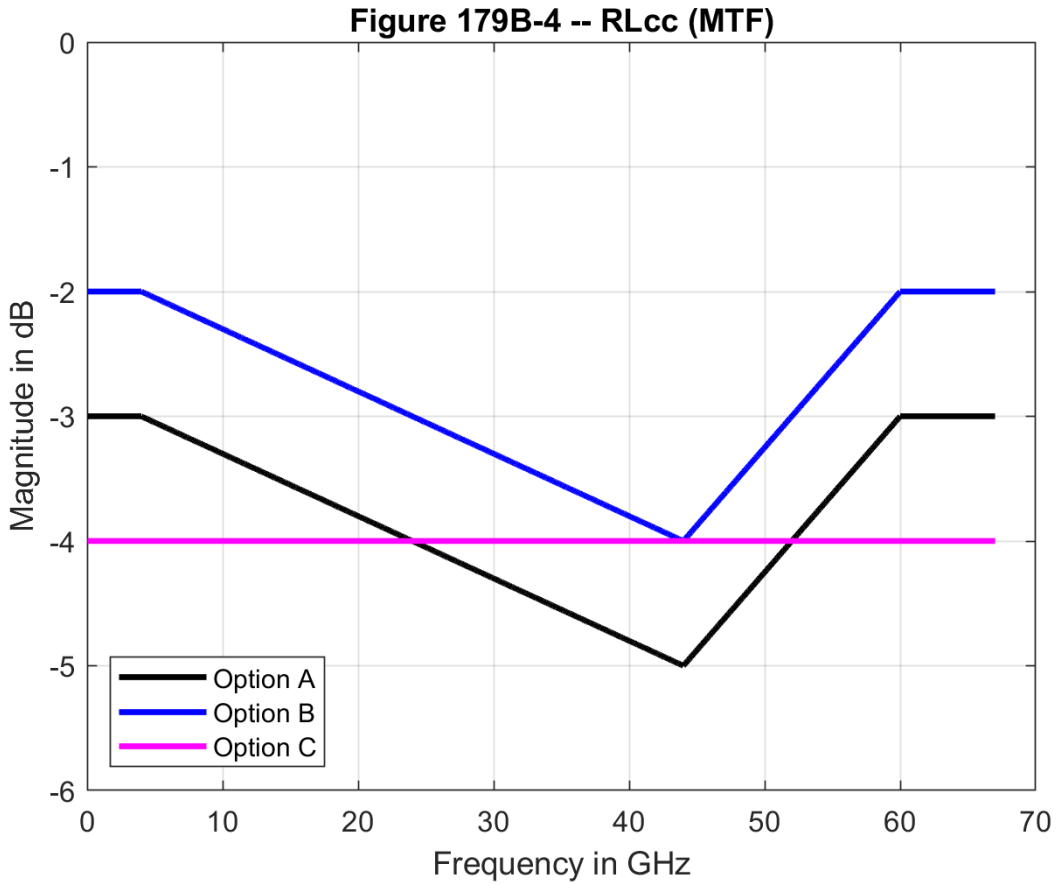
Option A

$$RLcc(f) \geq \begin{cases} 2 & 0.05 \leq f < 4 \\ 2 + \frac{2}{40}(f-4) & 4 \leq f < 44 \\ 4 + \frac{2}{16}(44-f) & 44 \leq f < 60 \\ 2 & 60 \leq f \leq 67 \end{cases}$$

Option B

$$RLcc(f) \geq 4 \quad 0.05 \leq f < 67$$

Option C



Summary – RLcc, Comment #302

- Mask needs to be extended to 67GHz
- The observed compliance issue primarily exists on TP1 measurements
- The MCB allocation was reduced by 1dB (assumed with Comment #232)
- Propose to separate RLcc mask for TP1 and TP2 (e.g. Option B/A)

  OR
- Relax mask to match Equation 179-12 (e.g. Option B or Option C)

  OR
- ~~Transition to Modal ERL requirement~~