

Differential-mode to Common-mode and Common-mode to Differential-mode reflection specifications.

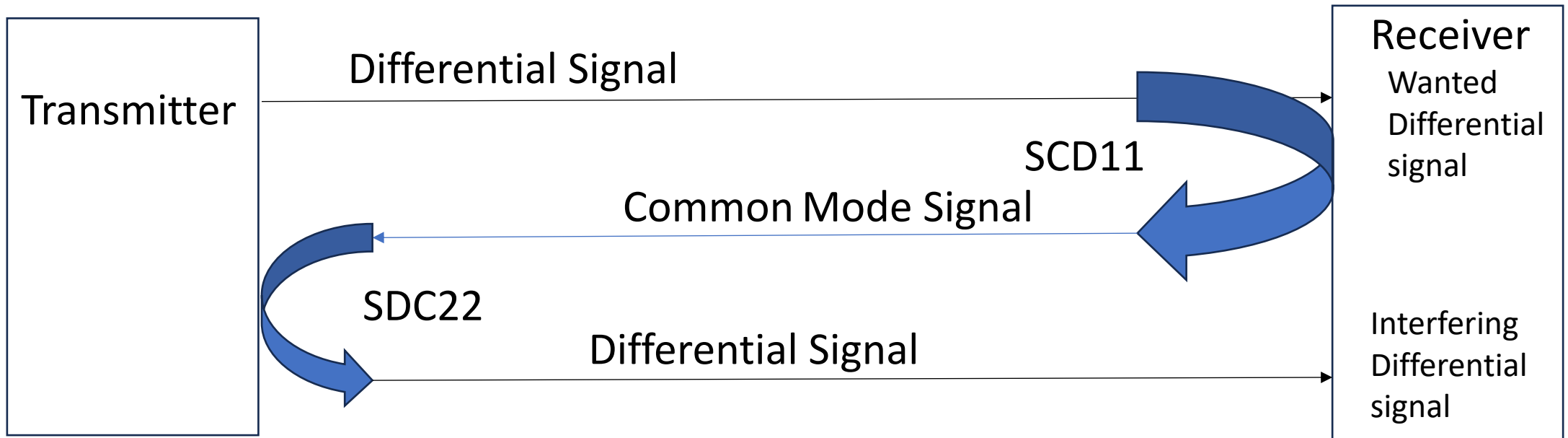
In support of 802.3dj D2.0 comments 492, 493, 494,
802.3dj July 2025. D

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Introduction

- There are various Differential-mode to Common-mode and Common-mode to Differential-mode specifications in the draft.
- This presentation clarifies the need for the specifications and shows where the existing draft is too weak.

Consider the signal flow below.



- The ratio of the wanted differential signal to the interfering differential signal is $SCD11 (Rx) + SDC22 (Tx) + \text{Common-Mode Signal path loss} + \text{Differential-mode Signal path loss}$. This is effectively a signal to noise ratio as it is unlikely that this differential signal will be equalizable.

Situation in 802.3dj D2.0 KR and C2C

- There is no specification for SDC22 for the transmitter. Could be 100%
- No minimum loss is specified for the channel. Could be zero.
- Therefore the effective signal to noise ratio is only SCD11 of the receiver which is inadequate, particularly for C2C

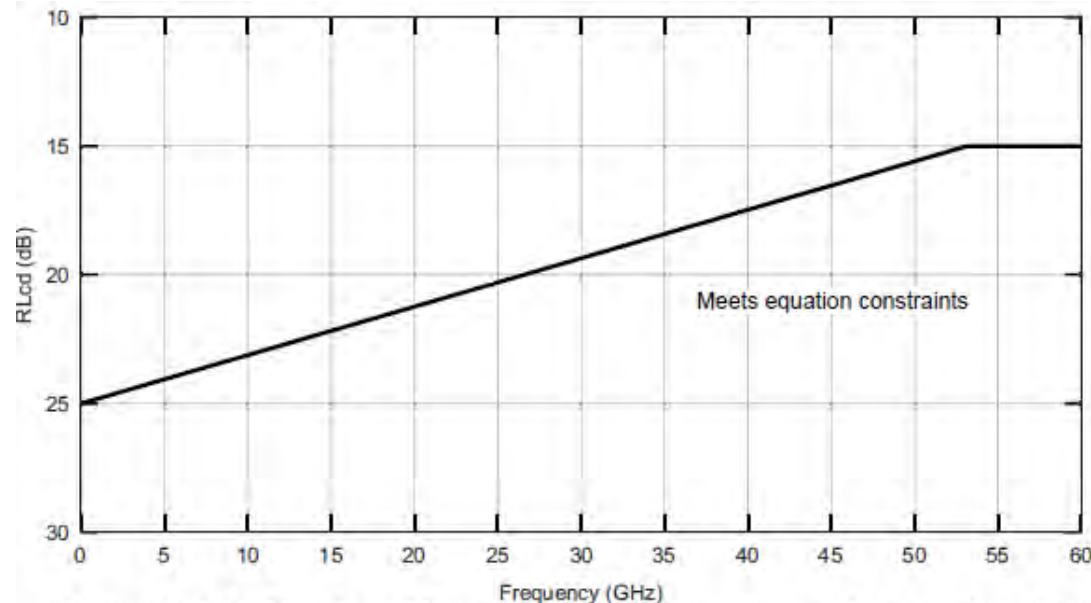


Figure 178-5—Receiver differential-mode to common-mode return loss limit

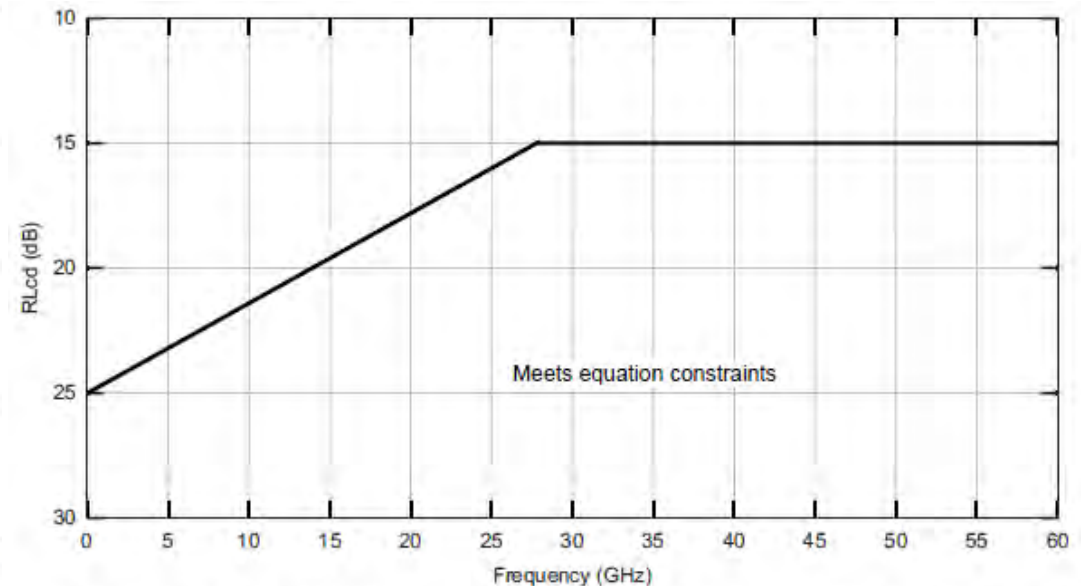


Figure 176C-6—Receiver differential-mode to common-mode return loss limit

Proposed change to KR

- Per Comment # 494. Add a specification to the KR Transmitter for Common-mode to Differential-mode reflection with the same equation as is used for Differential-mode to Common-mode reflection for the Rx.
- Note:- Other comments have suggested adding a minimum loss to the KR channel. This would also help this issue.

Proposed change to C2C

- Comment # 493 proposes to add a specification to the KR Transmitter for Common-mode to Differential-mode reflection with the same equation as is used for Differential mode to common mode reflection in the C2C Rx (176C-1), or with a more stringent specification for both,
- Note:- Other comments have suggested adding a minimum loss to the KR channel. This would also help this issue.
- Recommend that the more stringent specification Equation 178-4 (Figure 178-5) is used unless a significant minimum loss is specified.

Situation in 802.3dj D2.0 C2M

- The module and host have the same specifications for SDC22 of the transmitter and SCD11 of the receivers.
- There is no channel between these points.
- The resulting calculation would be only 16dB SNR at frequencies above 35GHz. In practice it is likely to be better than this as reflections at the MDI connector interface are being double counted.

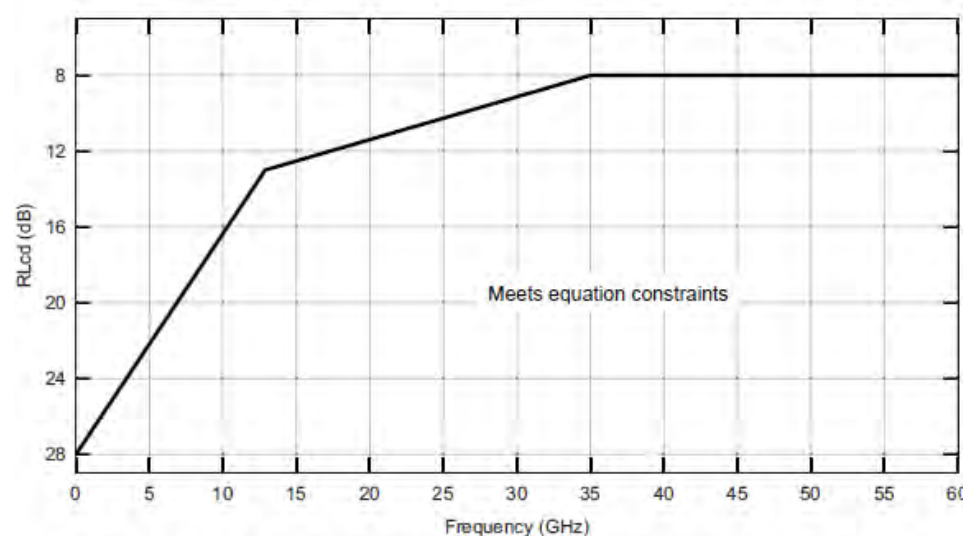


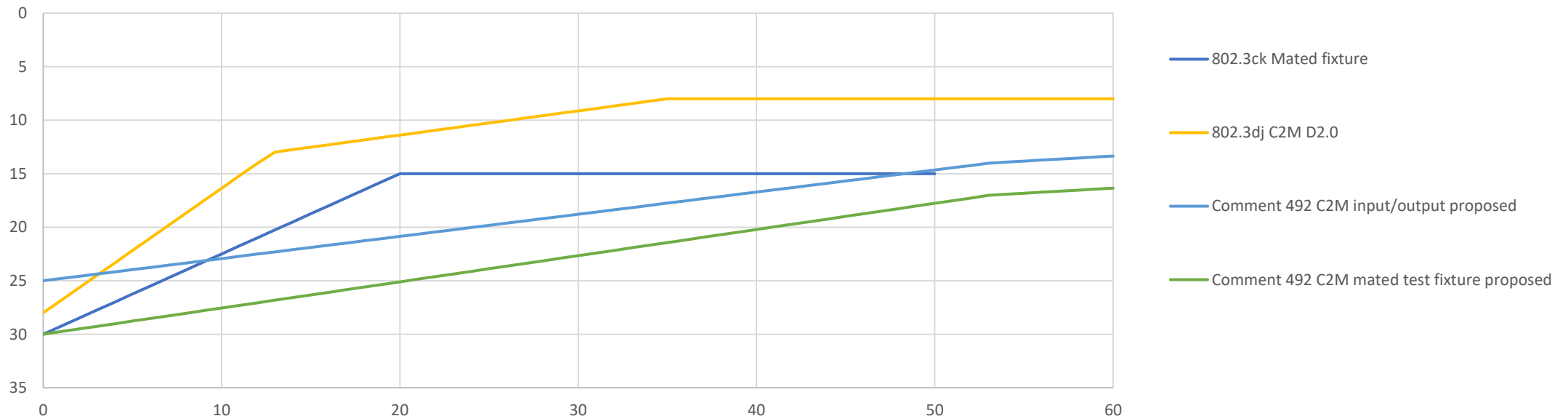
Figure 179-8—Receiver differential-mode to common-mode return loss

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Proposed change to CM

- Per Comment # 492.
 - Change the specifications for these mixed mode reflections to 25-22(f/106.25) from 0.05 to 53.12 GHz and 19-10(f/106.25) from 53.12 to 67 GHz. This is the 802.3ck output common-mode to differential-mode reflection scaled in frequency.
 - Change the specification for the mated test fixture to 30-26(f/106.25) from 0.05 to 53.12 GHz and 22-10(f/106.25) from 53.12 to 67 GHz

802.3dj D2.0 Comment 492 Differential-mode to Common-mode specifications



Situation in 802.3dj D2.0 CR (No comment)

- Both SDC22 for the transmitter and SCD11 for the Rx are specified with same equation values and the same as C2M (see below).
- Differential minimum loss is specified for the channel as 16dB at Nyquist.(common mode is likely to be greater).
- Therefore the effective signal to noise ratio at Nyquist is 48dB. It is worse at lower frequencies (due to lower loss) but probably OK.

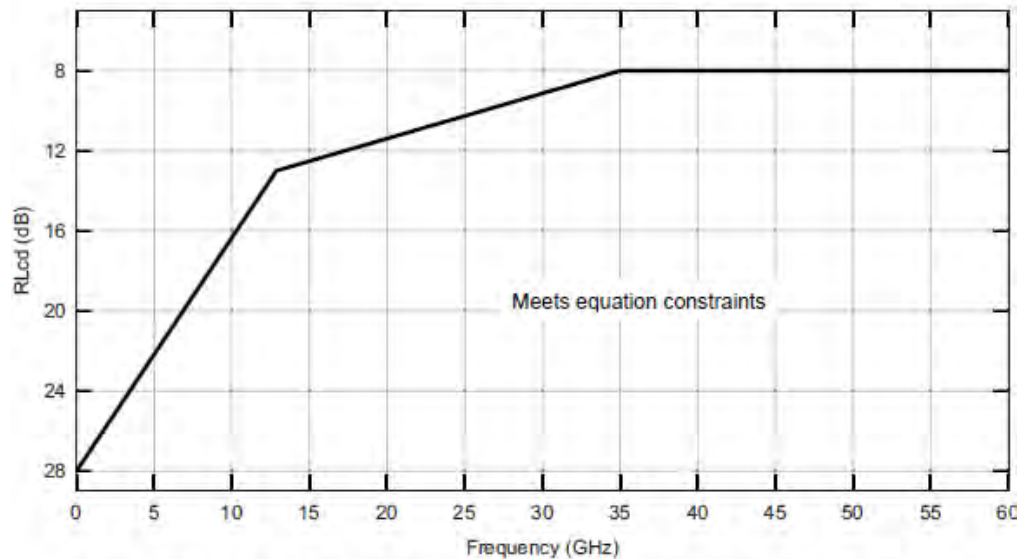


Figure 179-8—Receiver differential-mode to common-mode return loss

Situation in 802.3dj D2.0 CR (No comment cont.)

- The previous slide however looked at the situation from Tx to Rx. There is a much more serious issue at the interfaces between the Tx and the Cable (and the Rx and the Cable) where there is no loss to reduce the effect
- The Cable Differential-mode to Common-mode return loss is the same weak specification as shown in Figure 179-8.
- The resulting calculation would be the same as C2M. Only 16dB SNR at frequencies above 35GHz, although in practice likely to be better as reflections at the MDI connector interface are being double counted.
- Recommend to change the equations for Tx Common-mode to differential return loss, Rx differential-mode to common-mode return loss and cable differential-mode to common-mode return loss to the same equation as proposed for C2M

Backup

802.3ck Common-mode to differential-mode and differential mode to common mode specifications

