165.7.1 Link Transmission Parameter and Variable Naming

Chris DiMinico
MC Communications/PHY-SI LLC/Panduit
cdiminico@ieee.org

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Background

- **Recognized need in 802.3ck to align channel/Test Fixture/Cable Assembly/Tx/Rx parameter and variable naming for return loss, conversion loss, and insertion loss.**

    - **https://www.ieee802.org/3/ck/public/21_05/brown_3ck_01a_0521.pdf**

Parameter and variable naming

- **802.3ck - IEEE P802.3ck/D3.0 - 162.11 Cable assembly characteristics**

Description	Variable Name
Differential-mode to differential-mode insertion loss	*ILdd*
Differential-mode to common-mode return loss	*RLcd*
Differential-mode to common-mode insertion loss	*ILcd*
Common-mode to common-mode return loss	*RLcc*

- Note that Channel/Cable Assembly/Mated Test Fixture/TX/RX naming aligned

- **802.3cy - IEEE P802.3cy/D0.4 - 165.7 Link segment characteristics**

Description	Variable Name
Insertion loss	*Insertion loss(f)*
Return loss	*25G_Return_Loss(f)*

Conversion Loss

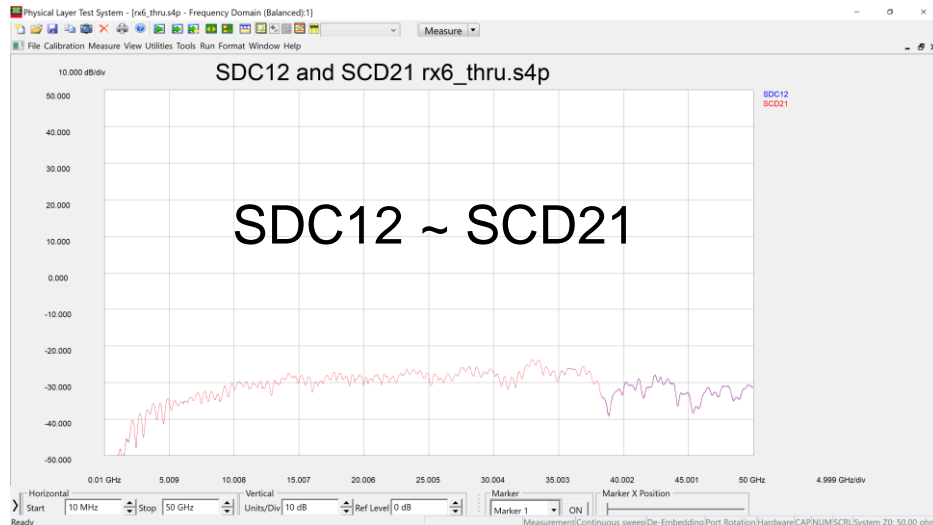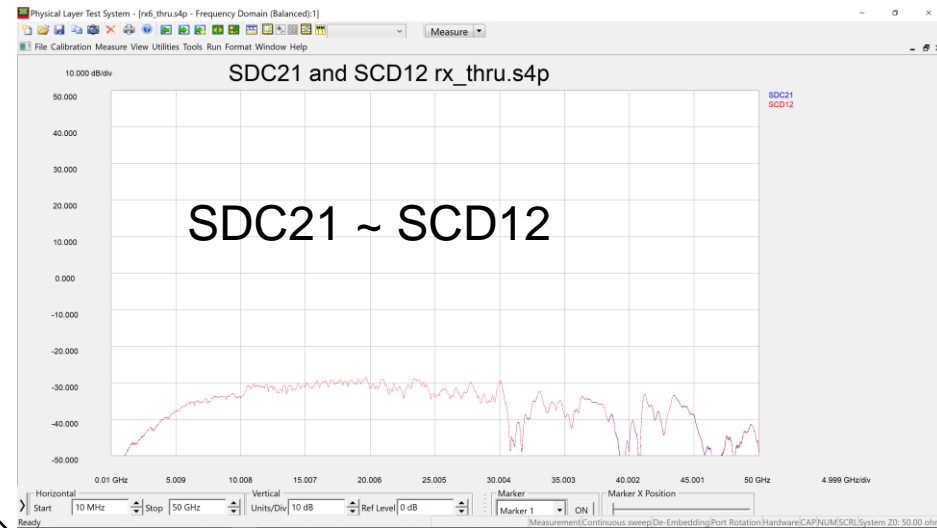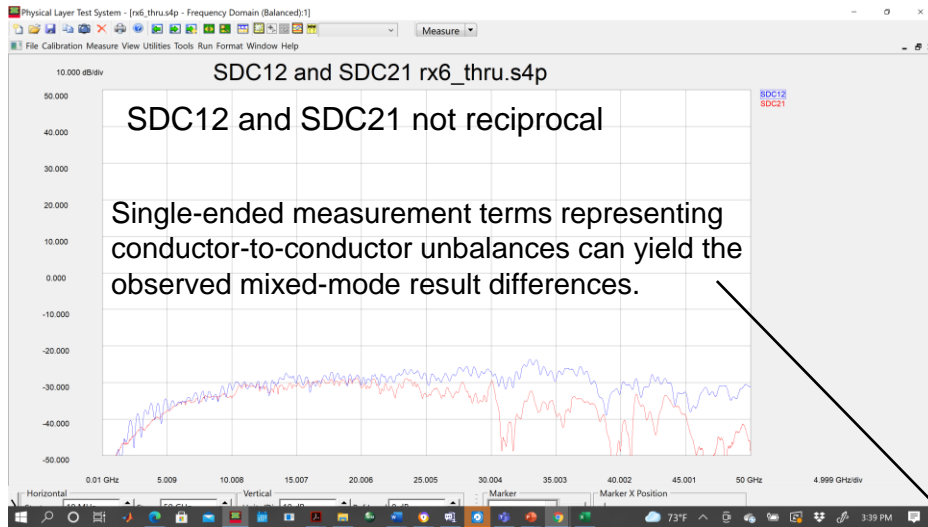- ## IEEE Std 802.3bp-2016 - Link segment characteristics 97.6

- 97.6.1.4 Differential to common mode conversion - ConversionLoss(f)≥ equation(97–18)

Parameter Name Industry Usage	S-parameter	S-parameter Description	Variable name
Longitudinal conversion loss (LCL)	SDC11/SDC22	common mode to differential mode return loss	ConversionLoss(f)
Transverse conversion loss (TCL)	SCD11/SCD22	differential mode to common mode return loss	ConversionLoss(f)
Longitudinal conversion transmission loss (LCTL)	SDC12/SDC21	common mode to differential mode insertion loss	ConversionLoss(f)
Transverse conversion transmission loss (TCTL)	SCD12/SCD21	differential mode to common mode insertion loss	ConversionLoss(f)

- ## IEEE Std 802.3ch-2020 - 149.7.1 Link transmission parameters

- Conversion Loss(f) not specified

Conversion Loss Reciprocity

SDC12 and SDC21 not reciprocal

Single-ended measurement terms representing conductor-to-conductor unbalances can yield the observed mixed-mode result differences.

SDC21 ~ SCD12

SDC12 ~ SCD21

Source: Curtis Donahue, Rhodes and Swartz

$$Sdc_{21} = \frac{S_{31} + S_{32} - S_{41} - S_{42}}{2} \quad Sdc_{12} = \frac{S_{13} + S_{14} - S_{23} - S_{24}}{2}$$

$$\frac{S_{31} + S_{32} - S_{41} - S_{42}}{2} = \frac{S_{13} + S_{14} - S_{23} - S_{24}}{2}$$

$$S_{32} - S_{41} = S_{14} - S_{23}$$

$$S_{32} + S_{23} = S_{14} + S_{41}$$

$$2 \times S_{32} = 2 \times S_{14}$$

$$S_{32} = S_{14}$$

Need a minimum of two measurements SDC12 and SDC21
SCD12 and SCD21
SDC12 and SCD12
SDC21 and SDC21

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802.3cy Task Force