

# Example of C2C Channel With Impairments Update A C2C-S IL Recommendation

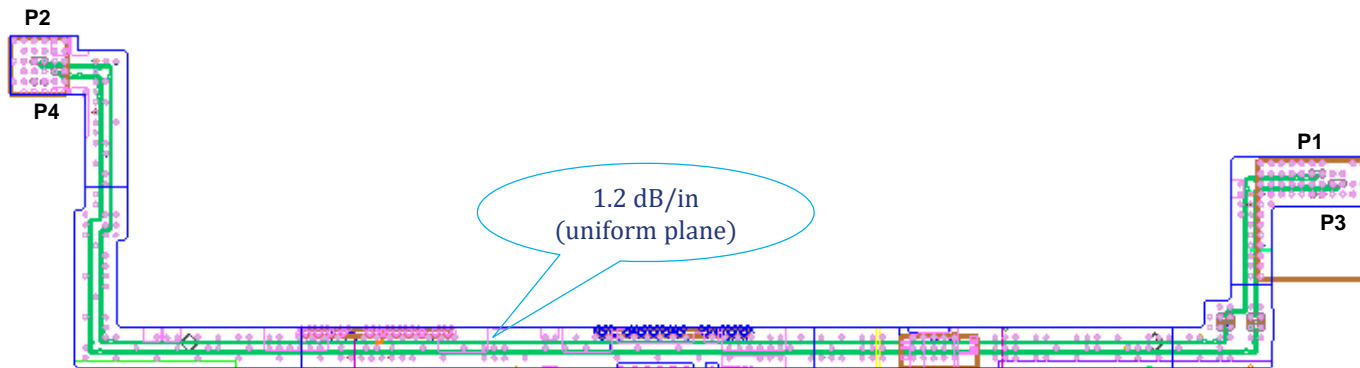
June 21<sup>th</sup>, 2019

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# C2C Channel With Impairments

## Example Channel with Impairments (Obstacles)

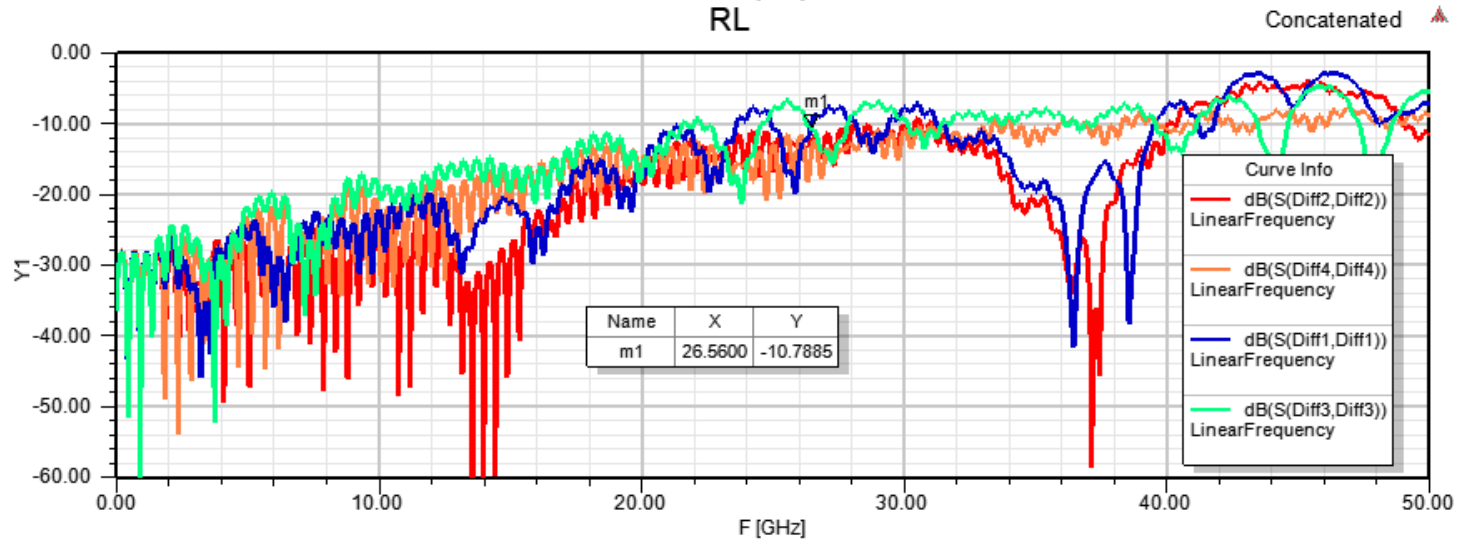
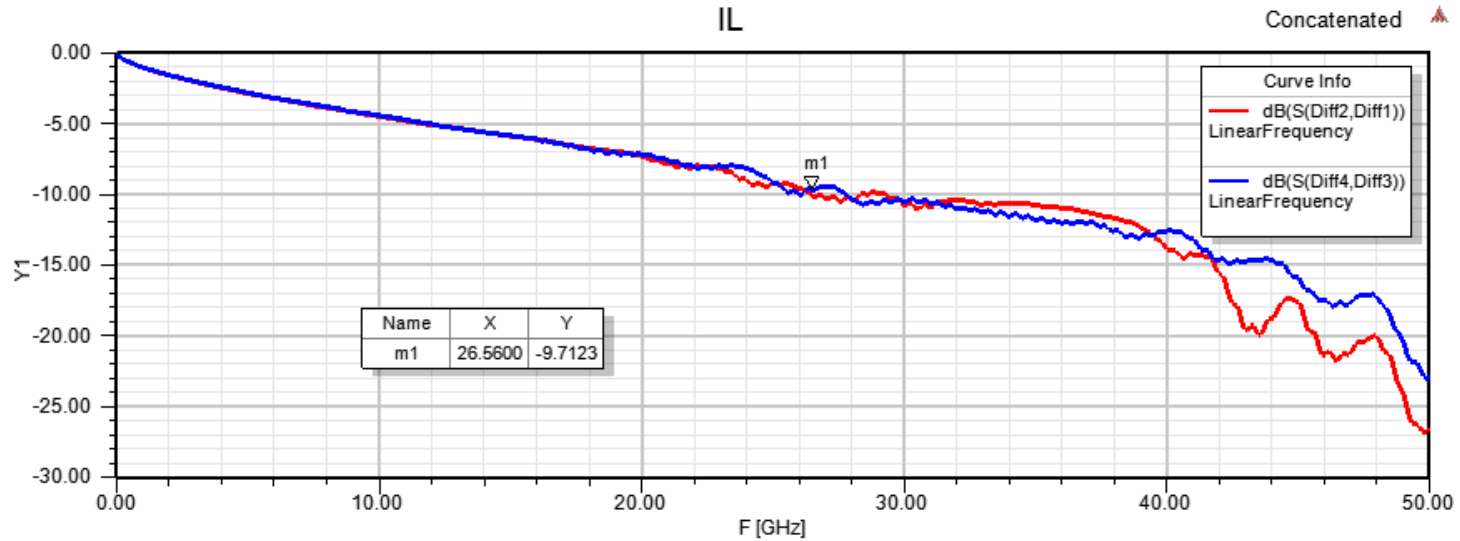
- Two-channel adaptation with AC coupling (~ connector)
- Dielectric similar to Megtron 7 (6.75" long)
- Impairments:
  - Impedance tolerance
    - $Z_{nom} \sim 94$  ohms
  - Long and short via stripline mix
    - 105 mils (0.5 dB/via)
    - 22 mils (0.4 dB/via)
  - Six 90° turns
  - Asymmetric via distribution along the route
  - Routing on grid



# C2C Channel With Impairments

IL/RL

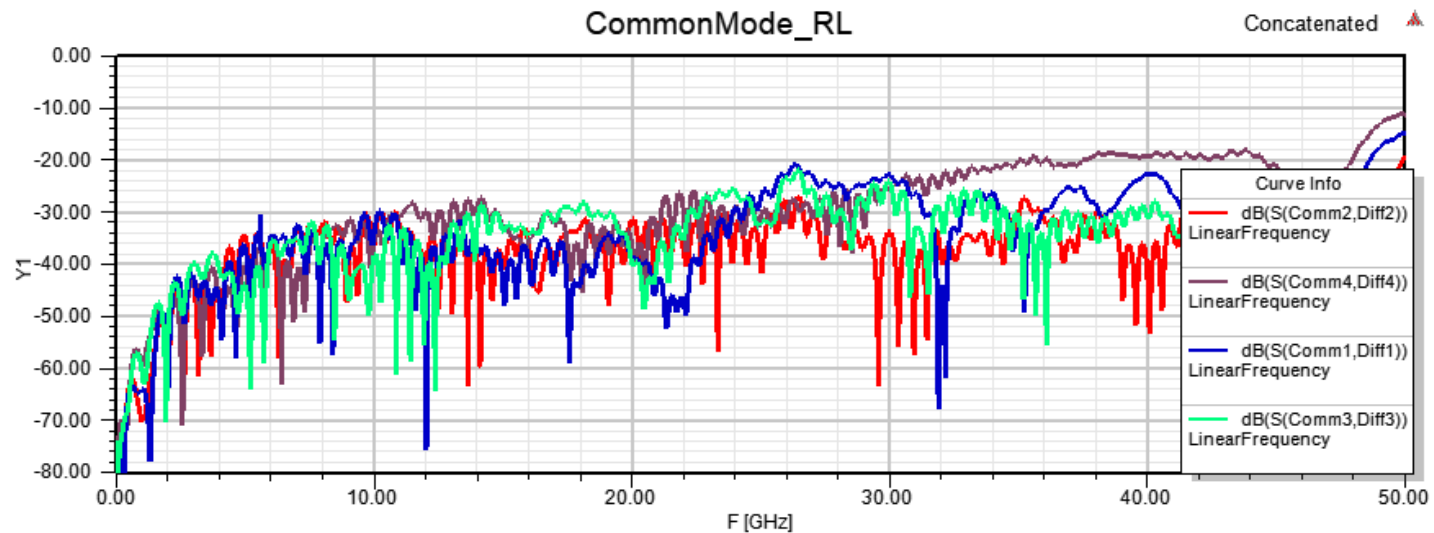
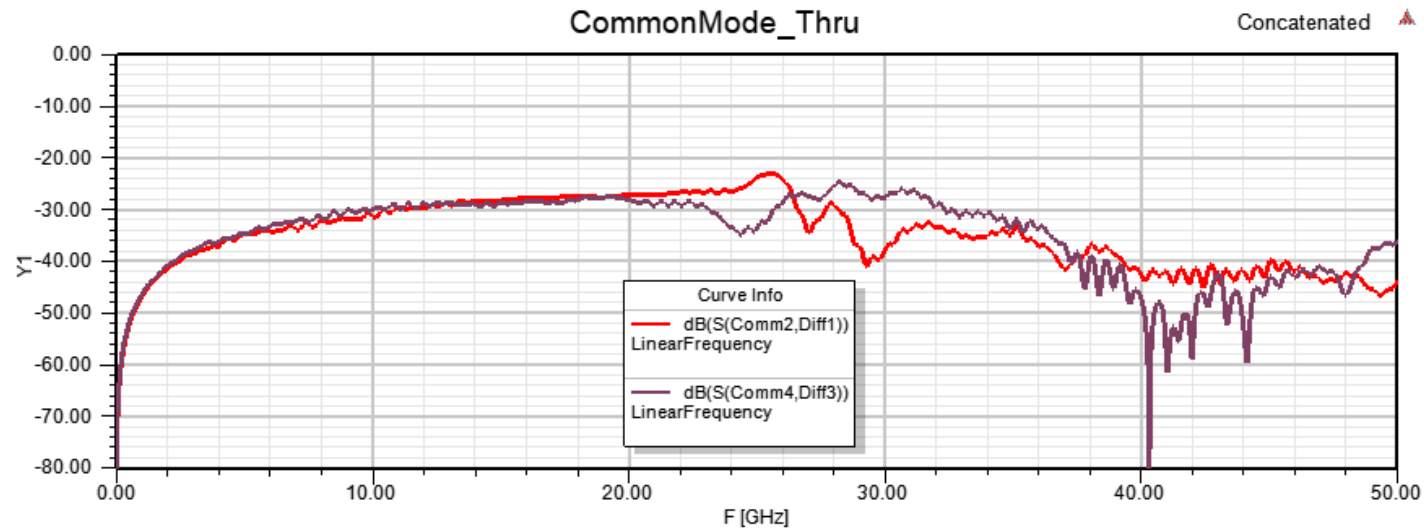
P2 \_\_\_\_\_ P1  
P4 \_\_\_\_\_ P3



# C2C Channel With Impairments

## Common Mode Conversion

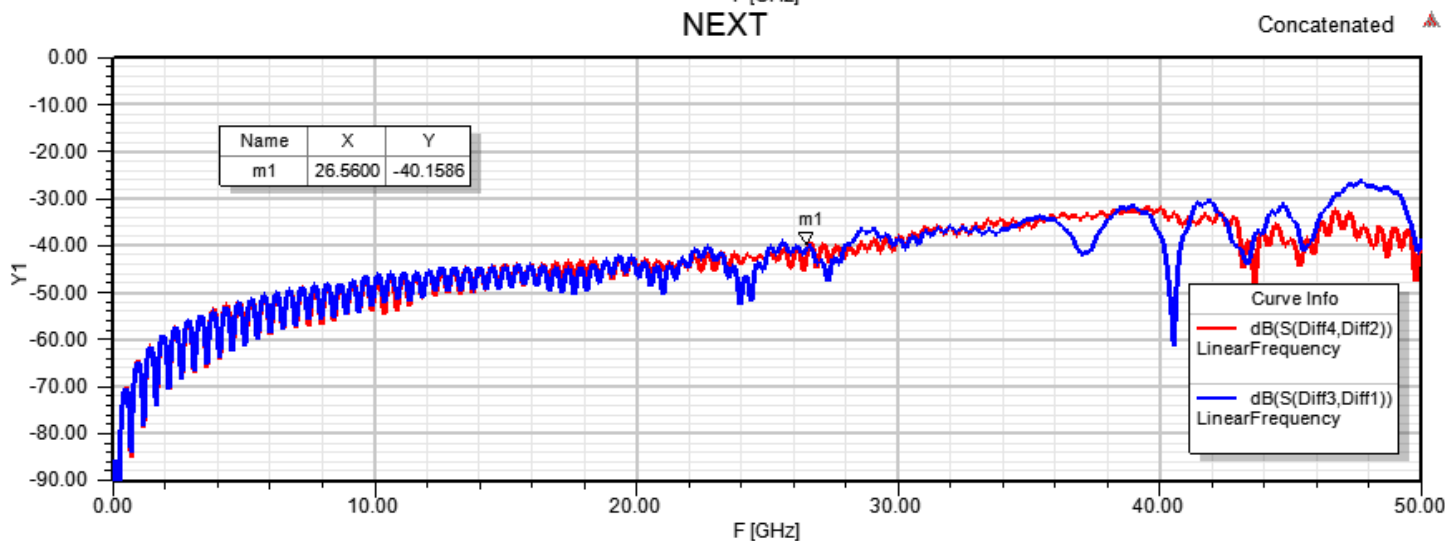
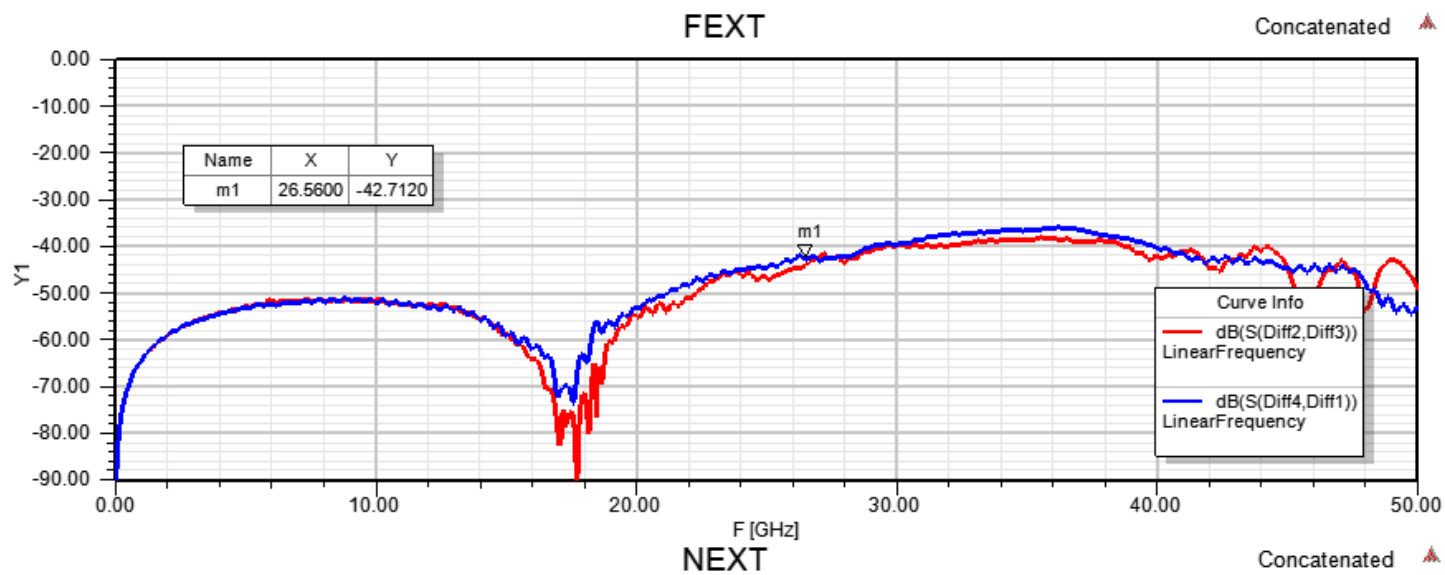
P2 \_\_\_\_\_ P1  
P4 \_\_\_\_\_ P3



# C2C Channel With Impairments

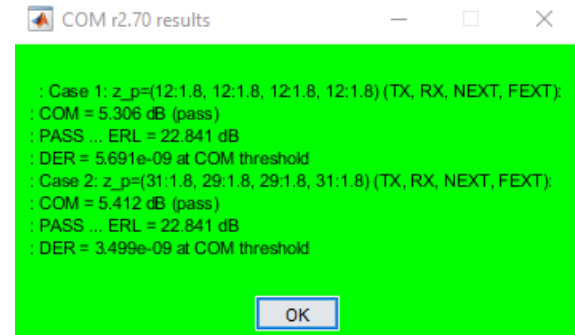
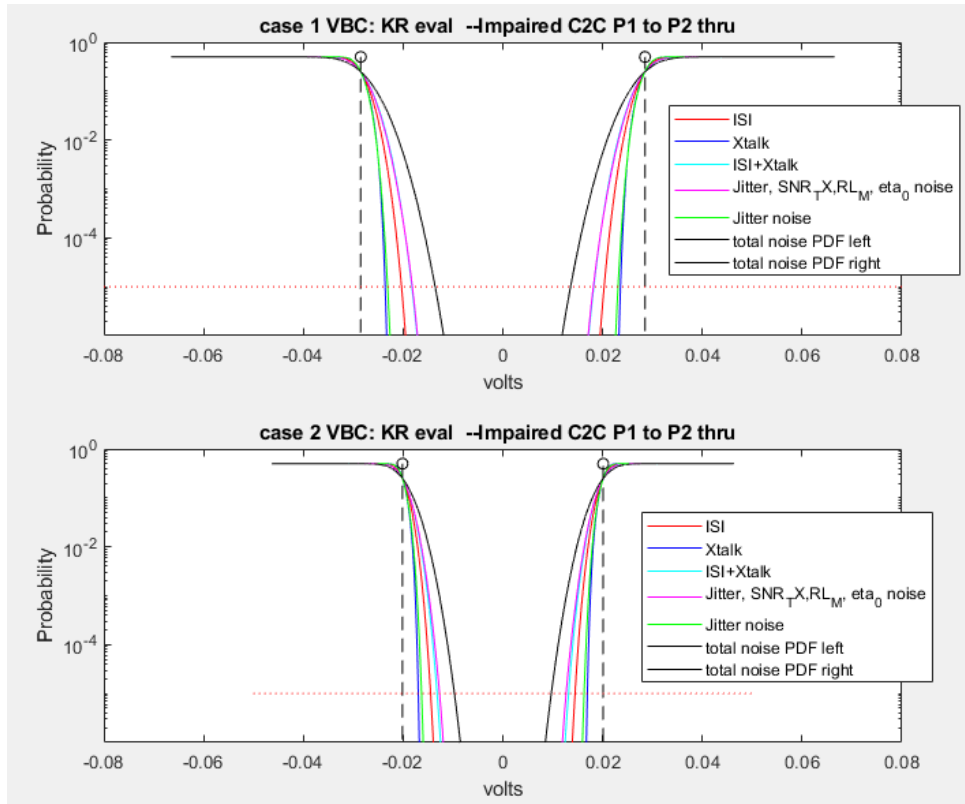
## FEXT/NEXT

P2 \_\_\_\_\_ P1  
 P4 \_\_\_\_\_ P3



# C2C Channel With Impairments

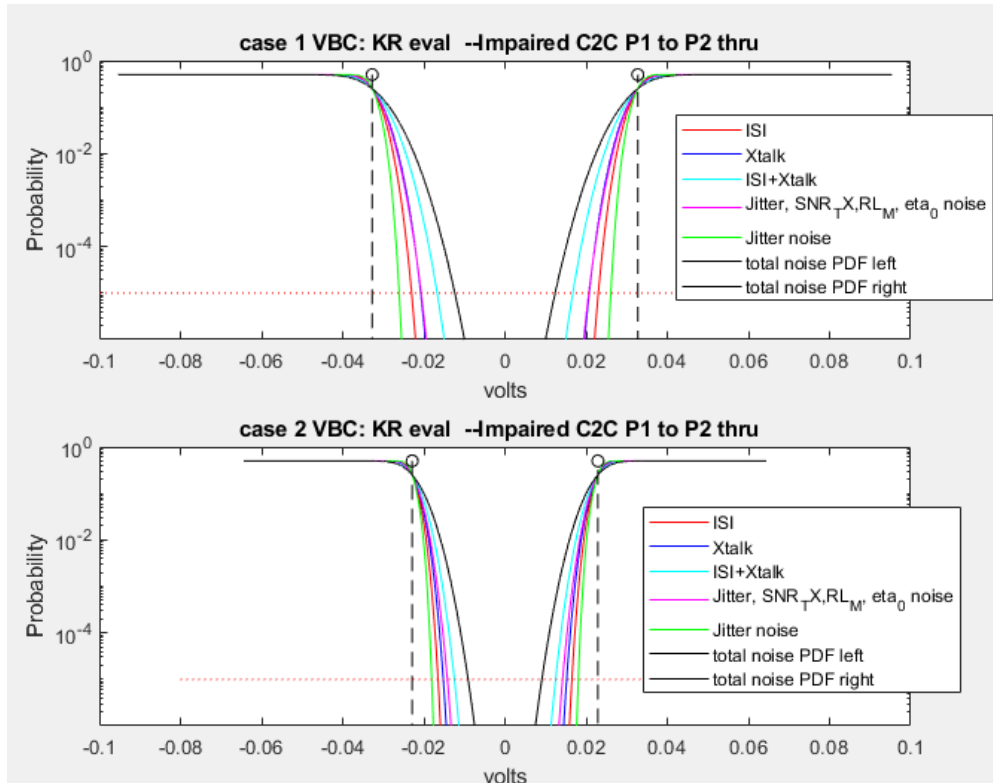
## COM C2C rev. 2.7 Results



1 FEXT, 1 NEXT

# C2C Channel With Impairments

## COM C2C rev. 2.7 Results



COM r2.70 results

```
: Case 1: z_p=(12:1.8, 12:1.8, 12:1.8, 12:1.8) (TX, RX, NEXT, FEXT):  
: COM = 3.805 dB (pass)  
: PASS ... ERL = 22.841 dB  
: DER = 1.282e-06 at COM threshold  
: Case 2: z_p=(31:1.8, 29:1.8, 29:1.8, 31:1.8) (TX, RX, NEXT, FEXT):  
: COM = 4.085 dB (pass)  
: PASS ... ERL = 22.841 dB  
: DER = 5.729e-07 at COM threshold
```

OK

3 FEXT, 4 NEXT

# C2C Channel With Impairments

## C2C Insertion Loss Budget

**Table 25 SFI Host Interconnect Budget**

<i>Parameter</i>	<i>Symbol</i>	<i>Conditions</i>	<i>Min</i>	<i>Max</i>	<i>Units</i>
Channel Transfer Including Connector measured with Host Compliance Board (see <a href="#">Appendix C</a> )	SDD21	at 5.5 GHz, see 1	-6.5	-2.25	dB
→ Penalty for reflections and other impairments			-2.5		dB
Total Channel Link Budget When Measured with HCB			-9.0	-2.25	dB
1.SFI channel response (SDD21) is defined from chip pads to compliance point B or C.					

\* Source: SFF-8431 - Rev4.1



# C2C Channel With Impairments

## Summary and Recommendation

### Summary:

IL @ Nyquist in a uniform plane = 1.2 dB/in => IL = 1.2 dB/in x 6.75 in = 8.1 dB ≈ 8 dB

Total insertion loss including (RL and CM conversion) ≈ 10dB

Reflections, common mode conversion Impairments = 2 dB

Other impairments (manufacturing, glass weave, material imperfections, etc.) = 2 dB

Total penalty for impairments = **4 dB**

### Running the numbers:

C2C-S Candidate Objectives:

a) 16 dB => ~ 10 inch (250 mm) reach including one connector

$$\text{IL} = 1.2 \text{ dB/in} \times 10 \text{ in} + 4 \text{ dB} = 16 \text{ dB}$$

b) 20 dB => ~ 12 inch (300 mm) reach including one connector

$$\text{IL} = 1.2 \text{ dB/in} \times 12 \text{ in} + 4 \text{ dB} = 18.4 \text{ dB}$$

### Recommendation:

Single C2C IL to be 20 dB for a 300 mm reach.

- Rounding to higher number is 19 dB
- Consistent with C2C (28 Gb/s, 56 Gb/s PAM4)

# Q & A