

# SNDR and SNR\_ISI

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# Introduction

- 50GBASE CR and KR SNR\_ISI limit is so tight that even test equipment appears borderline: not practical
- Similar problem with SNDR
- Relates to comments 139 and 140

# Summary of spec values

Spec	TX SNDR	COM SNR_TX	SNR_ISI
802.3bj CR4	26	27	
802.3bj KR4	27	27	
802.3bm C2C	27	27	
802.3by CR	26	CA-N: 28.4 CA-S: 27 CA-L: 27	
802.3by KR	27	27	
802.3cd CR	33.3	32.5	36.8
802.3cd KR	32.5	32.5	43
802.3bs C2C	31.5	31	34.8

The bs and cd limits are much higher than before

# Test Equipment Measurement Results

Equipment	TXEQ preset	Vf	Pmax	pmax/ Vf	sigma_e	SNDR [dB]	SNR_ISI [dB]
802.3cd spec limit	Presets 1-3	0.34-0.6		CR: 0.49 KR: 0.75		CR: 33.3 KR: 32.5	CR: 36.8 KR: 43
Vendor A	1	0.591	0.578	0.976	0.0075	37.63	38.82
Vendor A	2	0.301	0.437	1.453	0.008	34.68	39.01
Vendor A	3	0.303	0.442	1.459	0.0079	34.84	38.87
Vendor A + 3dB PCB trace	1	0.6	0.507	0.845	0.0096	34.38	35.09
Vendor A + 3dB PCB trace	2	0.273	0.374	1.37	0.0085	32.75	36.49
Vendor A + 3dB PCB trace	3	0.2632	0.3549	1.028291	0.0086	32.25	35.82
Vendor B	1	0.601	0.553	0.92	0.0116	33.57	32.57

- Spec allows c(-1) range of [-0.25,0] (Preset 3) and c(1) range of [-0.25,0] (Preset 2). Is SNDR to be met for all equalization settings?
- SNDR limit very close to test equipment results, especially for equalized TX
- SNR\_ISI limit still close to or above test equipment results
- Results after mated compliance boards will be worse than these

# Possible Solutions

- Change SNDR min value from 31.5 dB to 29 (28.5) dB
- Changes to COM RX
  - Increase the DFE length from 10 to 16
  - Increase the max DFE tap weights –  $b_{\max}[1]$  from 0.7 to 0.9;  $b_{\max}[2...N]$  from 0.2 to 0.4
- COM Package model
  - Change  $C_d$  to 160 fF (D2.0 comments 164, 165)
- Or...
- Reduce the COM limit for the channel from 3 dB to 2.5 dB
- Or accept that the channels have to be better
- What else?

# Results (For KRn)

Tested on channels in [zambell 110216 3cd adhoc-v2.pdf](#) Link 6 and Cavium 30 dB backplane channels ([http://ieee802.org/3/cd/public/channel/Cavium Backplane Channels.pdf](http://ieee802.org/3/cd/public/channel/Cavium_Backplane_Channels.pdf)) . Channels description in backup slides.

Calculation steps (cumulative):

Step No.	Change
0	Original cd 2.0 KR COM
1	Change SNR_TX from 32.5 dB to 29 dB
2	<ul style="list-style-type: none"><li>• Change Nb from 10 to 14</li><li>• Change b_max[1] from 0.7 to 0.9</li><li>• Change b_max[2...N] from 0.2 to 0.4</li><li>• Change Cd from 180 fF to 160 fF</li></ul>

# Results

		Initial settings		Step 1: Change SNR_TX from 32.5 dB to 29 dB		Step 2: <ul style="list-style-type: none"> <li>• Change Nb from 10 to 14</li> <li>• Change b_max[1] from 0.7 to 0.9</li> <li>• Change b_max[2...N] from 0.2 to 0.4</li> <li>• Change Cd from 180 fF to 160 fF</li> </ul>	
Channel	IL [dB]	Case 1 COM	Case 2 COM	Case 1 COM	Case 2 COM	Case 1 COM	Case 2 COM
Amphenol Link 6	30.1	3.401	2.987	2.592	2.236	2.757	2.372
Cavium HighZ	30.8	4.041	3.185	3.123	2.418	3.248	2.569
Cavium HighZ_Nom_HighZ	30.8	4.11	3.198	3.185	2.43	3.324	2.522
						Reducing the COM limit for the channel from 3 dB to 2.5 dB seems be more effective than step 2, and simpler	

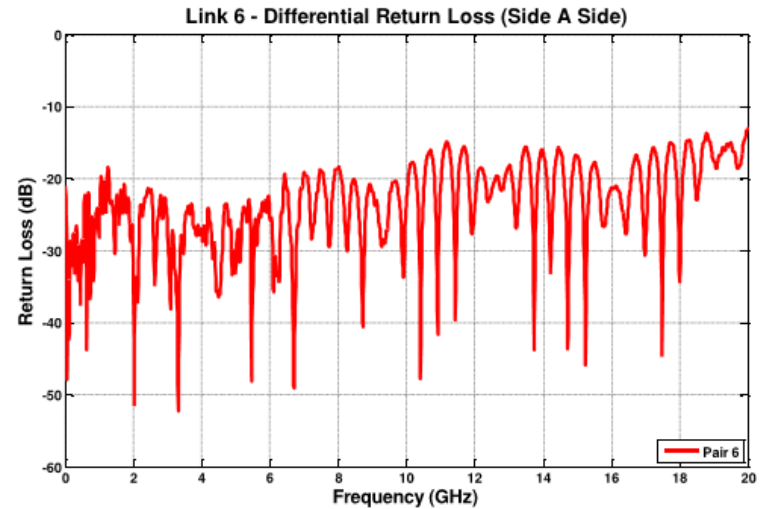
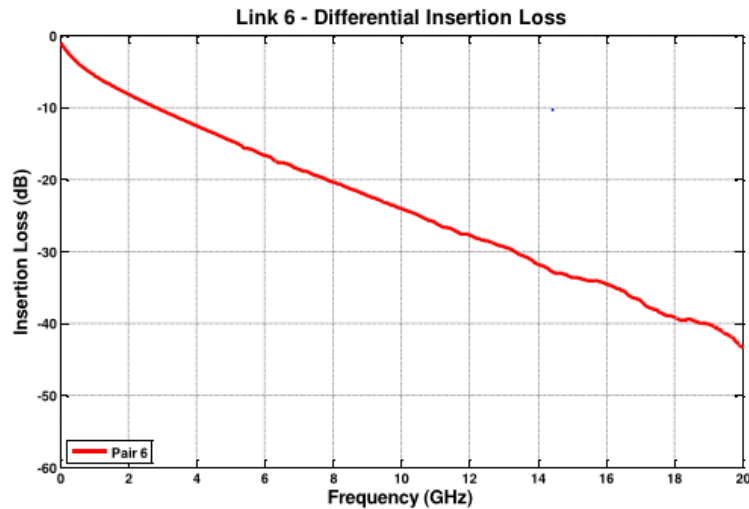
# Conclusions

- 50GBASE CR and KR SNDR (31.5 dB) and SNR\_ISI (34.8 dB) limits are so tight that even test equipment appears borderline: not practical
- Proposed limits: SNDR = 29 (28.5) dB; SNR\_ISI = 32 (?) dB
- Minor changes to the COM reference RX and package (Cd) are not sufficient to enable the proposed practical values.
- More work has to be done.



# Backup

# Tested channels (Amphenol)



# Tested channels (Cavium)

