

SNDR and SNR_{TX}

(Clause 136)

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Introduction

- 50GBASE CR and KR SNDR limit is so tight that even test equipment appears borderline: not practical
- Currently the SNDR Specs are aligned with the COM SNR_{TX}
- With that, the COM SNR_{TX} is defined at the TX driver output (before the package), while the SNDR is measured after a package and a test fixture
- Relates to comment 51

Summary of spec values

Spec	TX SNDR	COM SNR_TX
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
802.3cd KR	32.5	32.5
802.3bs C2C	31.5	31

The bs and cd limits are much higher than before

Test Equipment Measurement Results

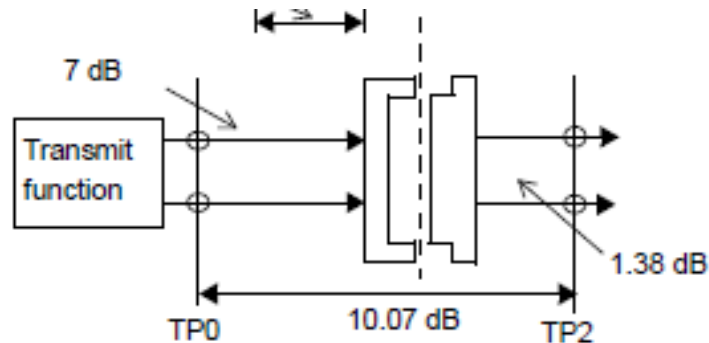
Equipment	TXEQ preset	Vf	Pmax	pmax/ Vf	sigma_e	SNDR [dB]
802.3cd CR spec limit	Presets 1-3	0.34-0.6		0.49		33.3
Vendor A	1	0.591	0.578	0.976	0.0075	37.63
Vendor A	2	0.301	0.437	1.453	0.008	34.68
Vendor A	3	0.303	0.442	1.459	0.0079	34.84
Vendor A + 3dB PCB trace	1	0.6	0.507	0.845	0.0096	34.38
Vendor A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

- 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
- Results after mated compliance boards will be worse than these

*Signal timing and linearity were optimized for the measurement

Correction for Test Fixture

CR TX Test Setup



- $\text{COM SNR}_{\text{TX}}$ is defined at the driver output (before TP0). SNDR is measured at TP2.
- Simulations show up to 4.3 dB degradation in SNDR between TP2 and TP0.
- Proposed mitigation: Reduce the SNDR specs in Clause 136 to 30 dB, while keeping the $\text{COM SNR}_{\text{TX}}$ at its original value.

Conclusions

- 50GBASE CR and KR SNDR (32.5 dB for KR, 33.3 for CR) limits are so tight that even test equipment appears borderline: not practical.
- Currently the SNDR spec is aligned to the SNR_{TX} value in COM. With that, differences between the test points are not considered.
- Proposed change:
Change the SNDR spec in clause 136 to 30 dB.