Common Mode RL for 40GBase-CR4/SR4 and 100GBase-CR10/SR10

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Summary

Proposal: Modify the common mode return loss spec for clauses 85, 86.

Why: To support backwards compatibility of future 100G CR4 and SR4 variants and accommodate CR10/SR10 connectors
Proposed Change: Common Mode RL Limit

- Replace current common mode RL limit with -3dB (flat)

Comm Mode RL = 3 dB
The same as SFP+

\[
\begin{align*}
SCC11(\text{dB}) & \leq -12 + 2.8 \times f \\
SCC22(\text{dB}) & \leq -5.2 + 0.08 \times f
\end{align*}
\]

f in GHz from 0.01 to 2.5 GHz
f in GHz from 2.5 to 15 GHz
CM return loss of CR10/SR10 MCB-HCB

![Graph showing CM return loss vs frequency for CR10/SR10 MCB-HCB.](image-url)
CM return loss of QSFP25 MCB-HCB

Frequency (GHz)

Return Loss (dB)
RL is a channel length, impedance mismatch and frequency dependent entity. The knee frequency happens at 1/8 wavelength.
What is the common mode spectra?

Where is the common mode energy?
Differential Mode Signal

Common Mode Signal (from skew)

600 mV

15 mV

PSD of Polar NRZ

$$S_3(f) = V^2 T \left( \frac{\sin \pi f T}{\pi f T} \right)^2$$

PSD of Bipolar RZ

$$S_4(f) = \frac{V^2 T}{4} \left( \frac{\sin \pi f T/2}{\pi f T/2} \right)^2 \sin^2(\pi f T)$$

0 V Polar NRZ

0 V Bipolar RZ
Recommendations

› Change the common mode RL specification for SR4/10, CR4/10 to 3dB based on:
  – CR10 connector performance measurements
  – New QSFP25+ connector performance measurements
  – Common mode power spectrum
  – Lack of Common mode return loss impact on EMI