

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

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molex[®]

Supporters

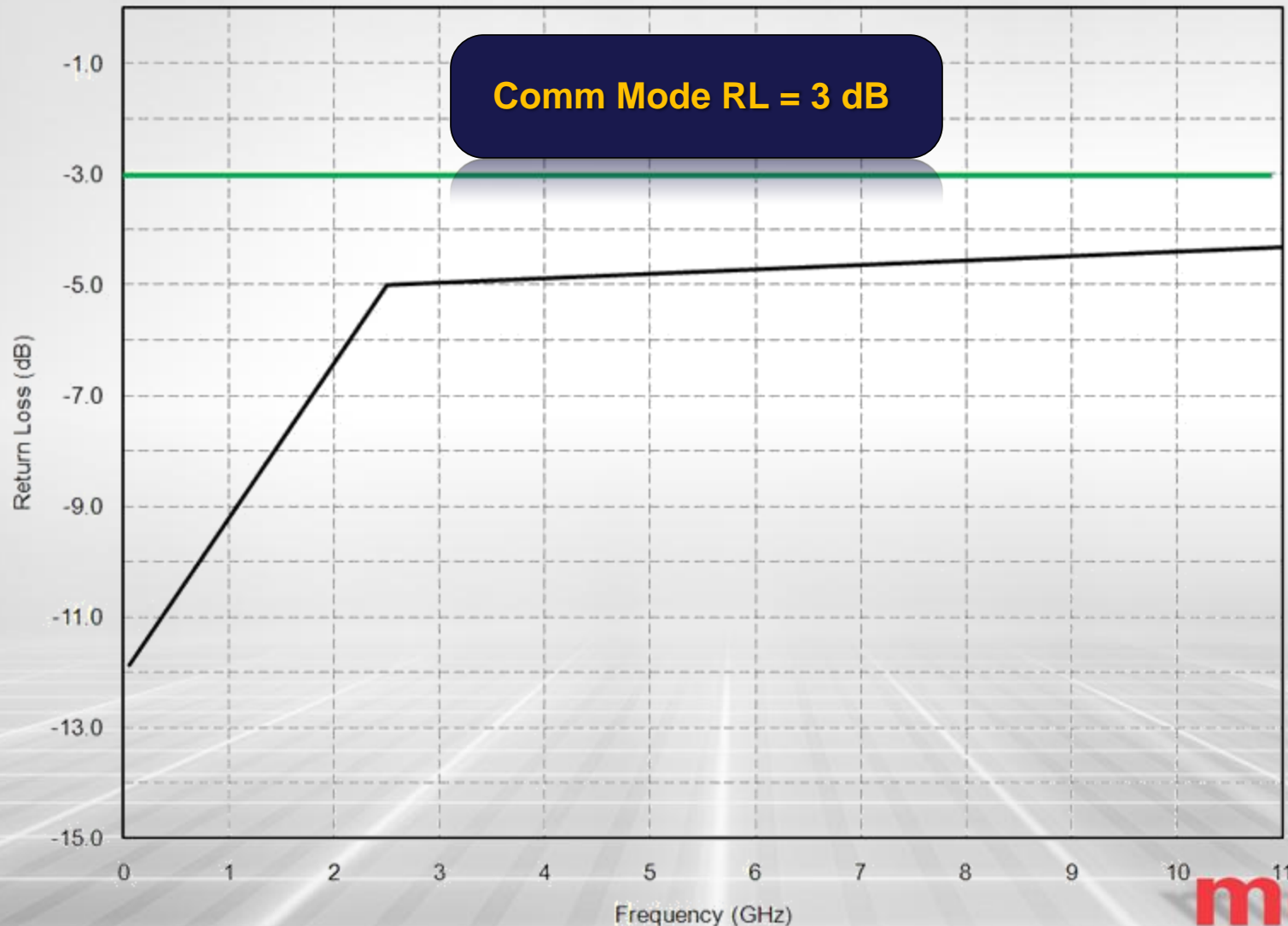
› **Nathan Tracy**

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

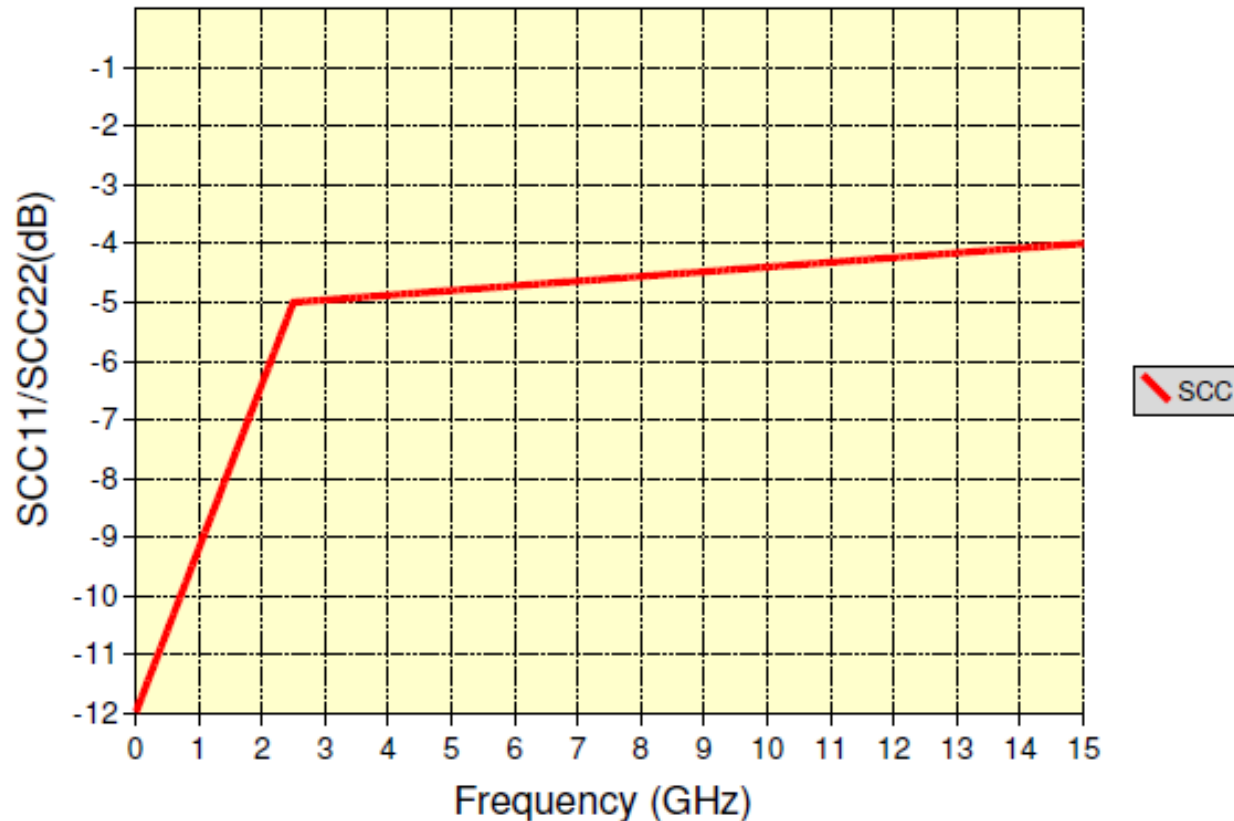
- Replace current common mode RL limit with -3dB (flat)



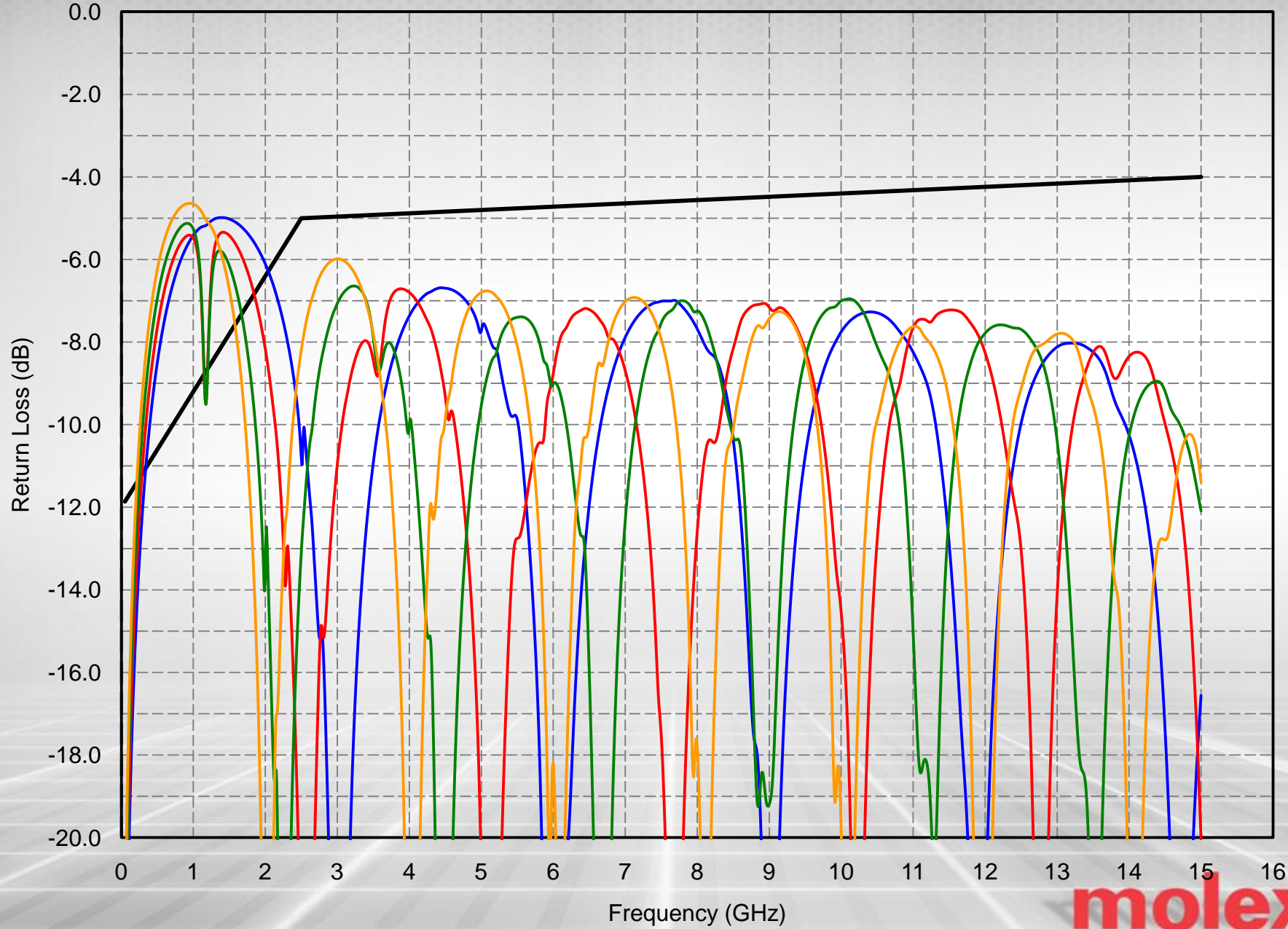
Original ba contribution Jan 09

- The same as SFP+

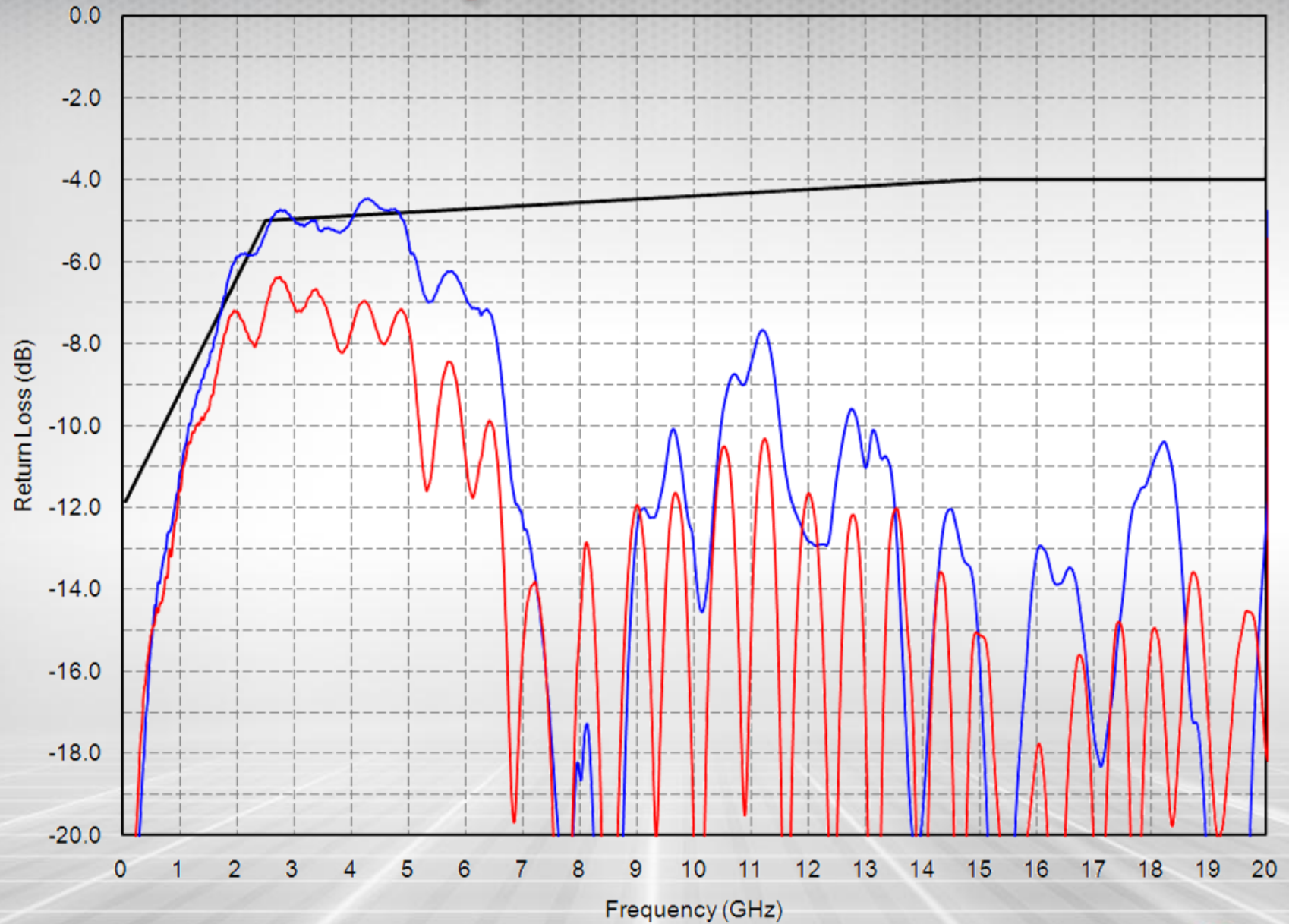
$$\begin{aligned} SCC11(dB) &\leq -12 + 2.8 * f & f \text{ in GHz from 0.01 to 2.5 GHz} \\ SCC22(dB) &\leq -5.2 + 0.08 * f & f \text{ in GHz from 2.5 to 15 GHz} \end{aligned}$$



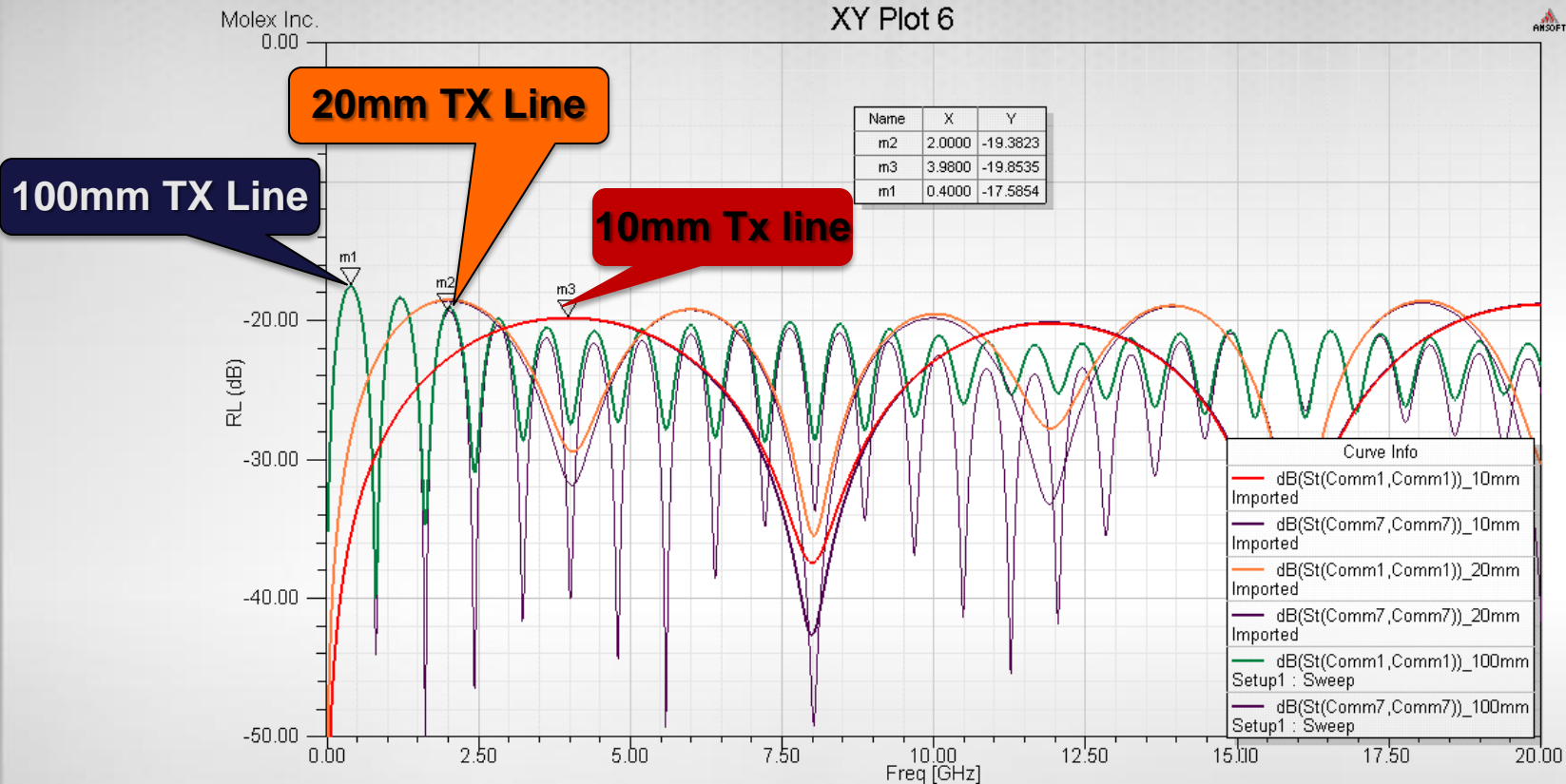
CM return loss of CR10/SR10 MCB-HCB



CM return loss of QSFP25 MCB-HCB



Length of Txline Effects



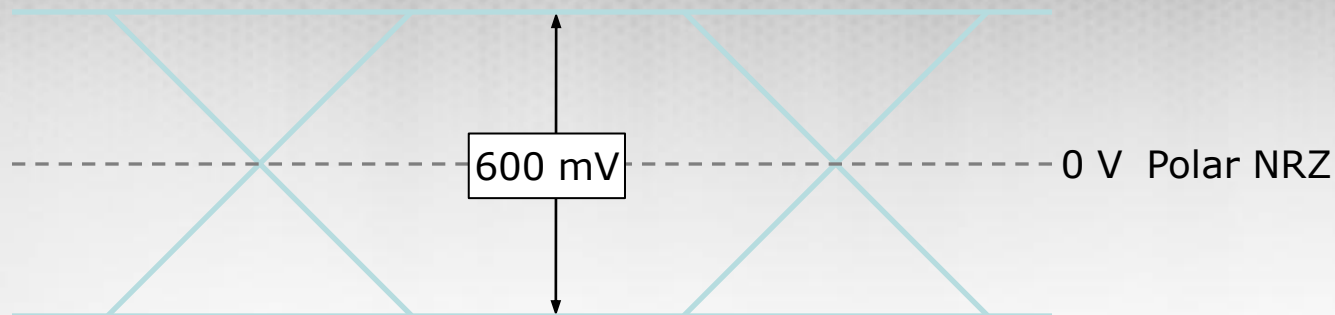
**RL is a channel length,
impedance mismatch and frequency dependent entity
The knee frequency happens at 1/8 wavelength**

What is the common mode spectra?

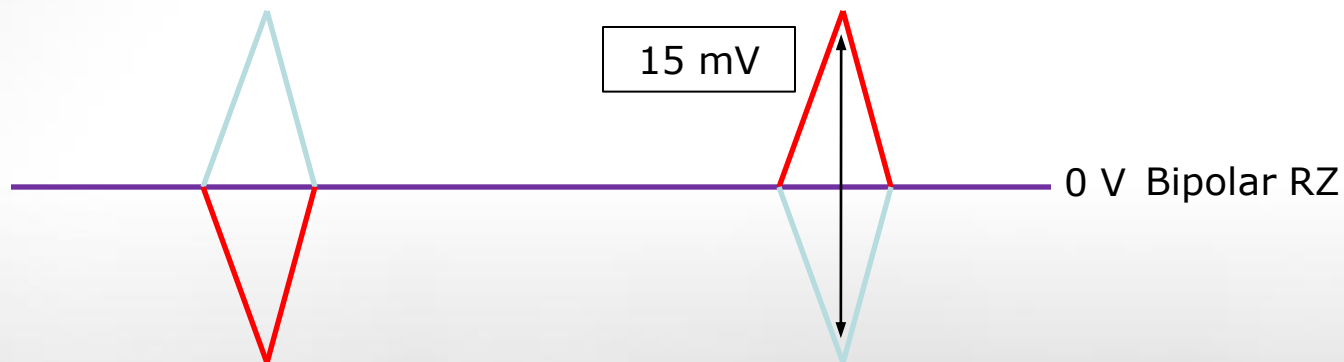
› Where is the common mode energy?

Signal Characteristics

Differential Mode Signal



Common Mode Signal (from skew)



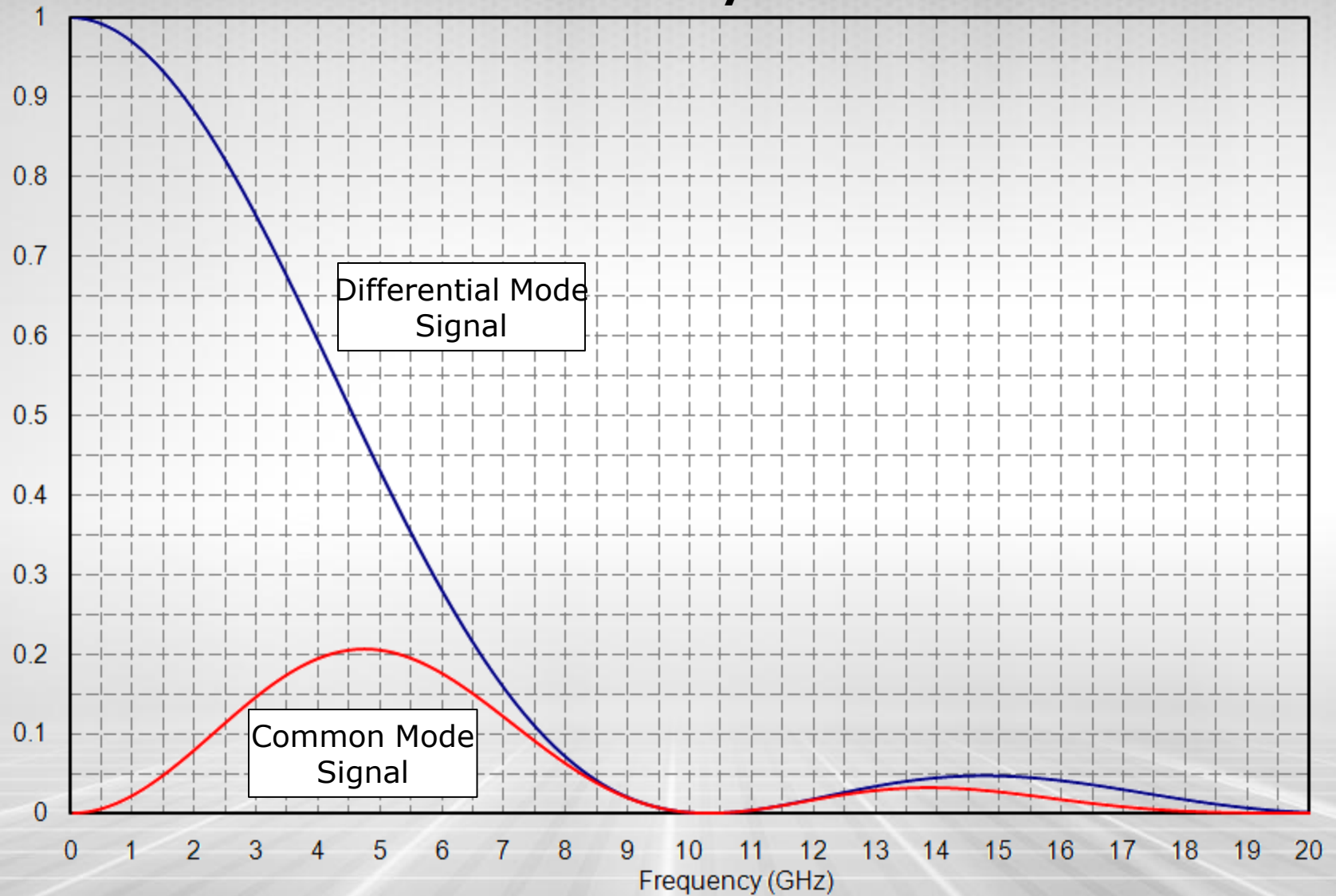
PSD of Polar NRZ

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

PSD of Bipolar RZ

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

Power Spectral Density



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