Proposal for the Transmit PSD and MDI Return Loss

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Introduction

- ► This presentation presents proposal for the PSD mask and MDI Return Loss equations

- ► Transmitter Power Spectral Density
  - Equations in the standard form are proposed for the PSD for 1.0V and 2.0V transmit levels
  - A plot of these equations showing the upper and lower masks
  - A comparison of the 100BASE-T1L PSD mask with the 100BASE-T1 mask, to highlight the differences
  - A plot of the measured PSD of a 100BASE-T1L Idle test pattern against the proposed 100BASE-T1L PSD mask

- ► MDI Return Loss
  - Proposed MDI Return Loss mask and LT Spice Simulation
  - A comparison of MDI Return Loss with previous standards

Transmitter Power Spectral Density and Power Level

▶ Equations for the 1 Vpp transmit signal amplitude:

$$\text{Upper PSD }(f) = \begin{cases} -69.3 - 1.5 \times \dfrac{f-1}{19} & \text{dBm/Hz for } 1 \text{ MHz} \leq f < 20 \text{ MHz} \\ -70.8 - 3.7 \times \dfrac{f-20}{20} & \text{dBm/Hz for } 20 \text{ MHz} \leq f < 40 \text{ MHz} \\ -74.5 - 19 \times \dfrac{f-40}{40} & \text{dBm/Hz for } 40 \text{ MHz} \leq f < 80 \text{ MHz} \\ -93.5 & \text{dBm/Hz for } 80 \text{ MHz} \leq f \leq 250 \text{ MHz} \end{cases} \quad (199\text{--}6)$$

$$\text{Lower PSD }(f) = \begin{cases} -77.9 - 3.9 \times \dfrac{f-5}{15} & \text{dBm/Hz for } 5 \text{ MHz} \leq f < 20 \text{ MHz} \\ -81.8 - 13.4 \times \dfrac{f-20}{20} & \text{dBm/Hz for } 20 \text{ MHz} \leq f \leq 40 \text{ MHz} \end{cases} \quad (199\text{--}7)$$
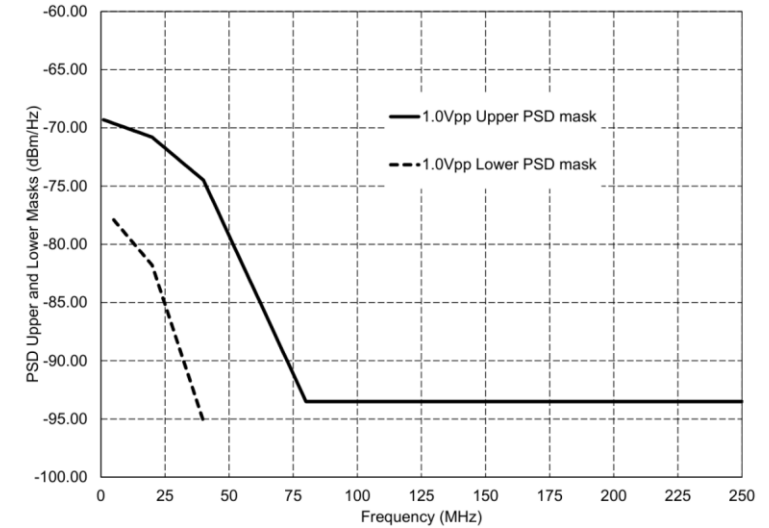
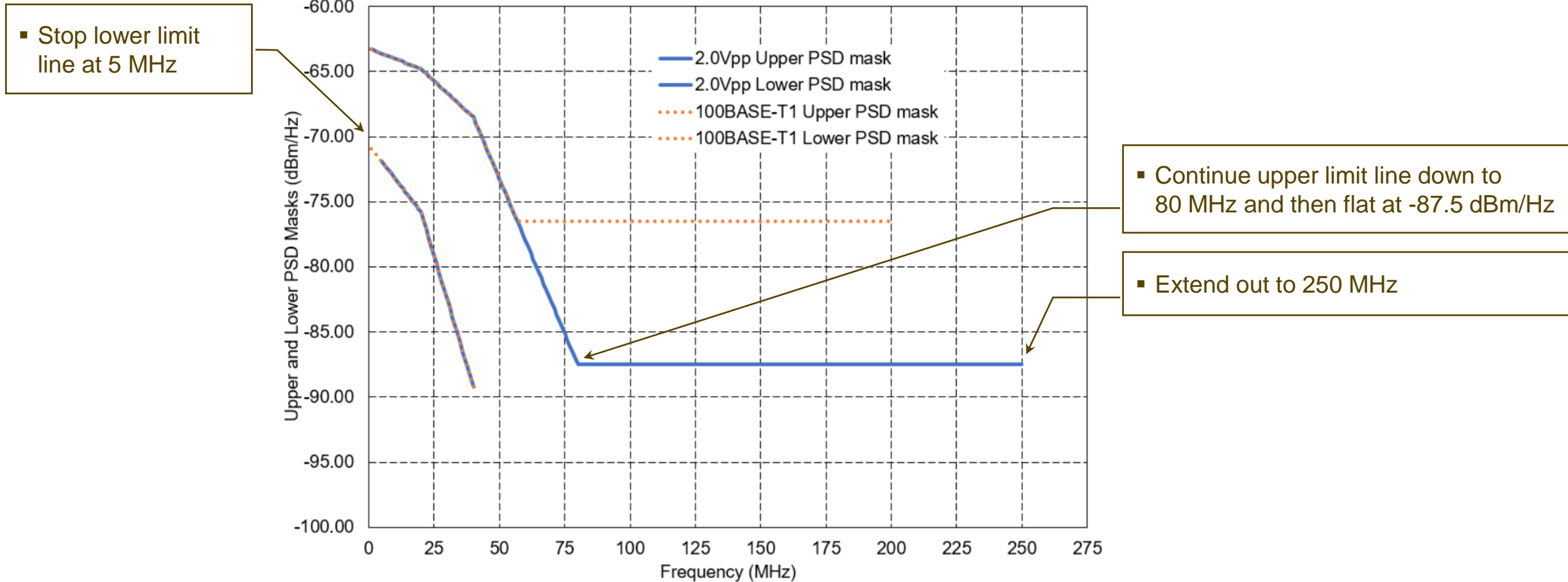▶ Equations for the 2 Vpp transmit signal amplitude:

$$\text{Upper PSD }(f) = \begin{cases} -63.3 - 1.5 \times \dfrac{f-1}{19} & \text{dBm/Hz for } 1 \text{ MHz} \leq f < 20 \text{ MHz} \\ -64.8 - 3.7 \times \dfrac{f-20}{20} & \text{dBm/Hz for } 20 \text{ MHz} \leq f < 40 \text{ MHz} \\ -68.5 - 19 \times \dfrac{f-40}{40} & \text{dBm/Hz for } 40 \text{ MHz} \leq f < 80 \text{ MHz} \\ -87.5 & \text{dBm/Hz for } 80 \text{ MHz} \leq f \leq 250 \text{ MHz} \end{cases} \quad (199\text{--}8)$$

$$\text{Lower PSD }(f) = \begin{cases} -71.9 - 3.9 \times \dfrac{f-5}{15} & \text{dBm/Hz for } 5 \text{ MHz} \leq f < 20 \text{ MHz} \\ -75.8 - 13.4 \times \dfrac{f-20}{20} & \text{dBm/Hz for } 20 \text{ MHz} \leq f \leq 40 \text{ MHz} \end{cases} \quad (199\text{--}9)$$
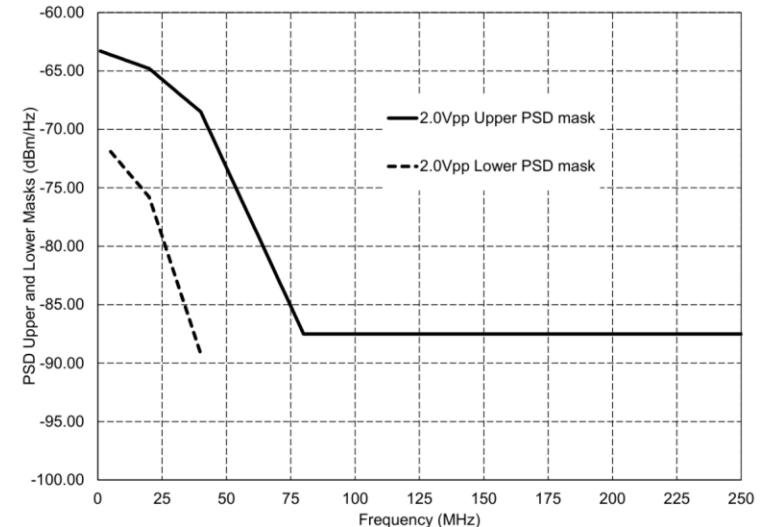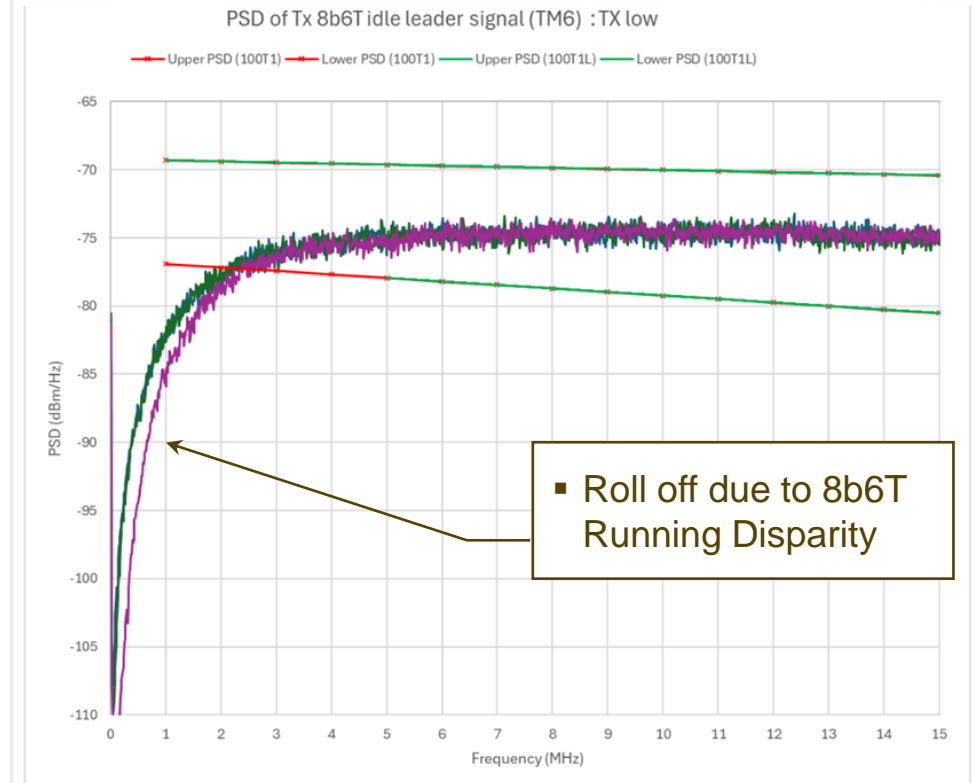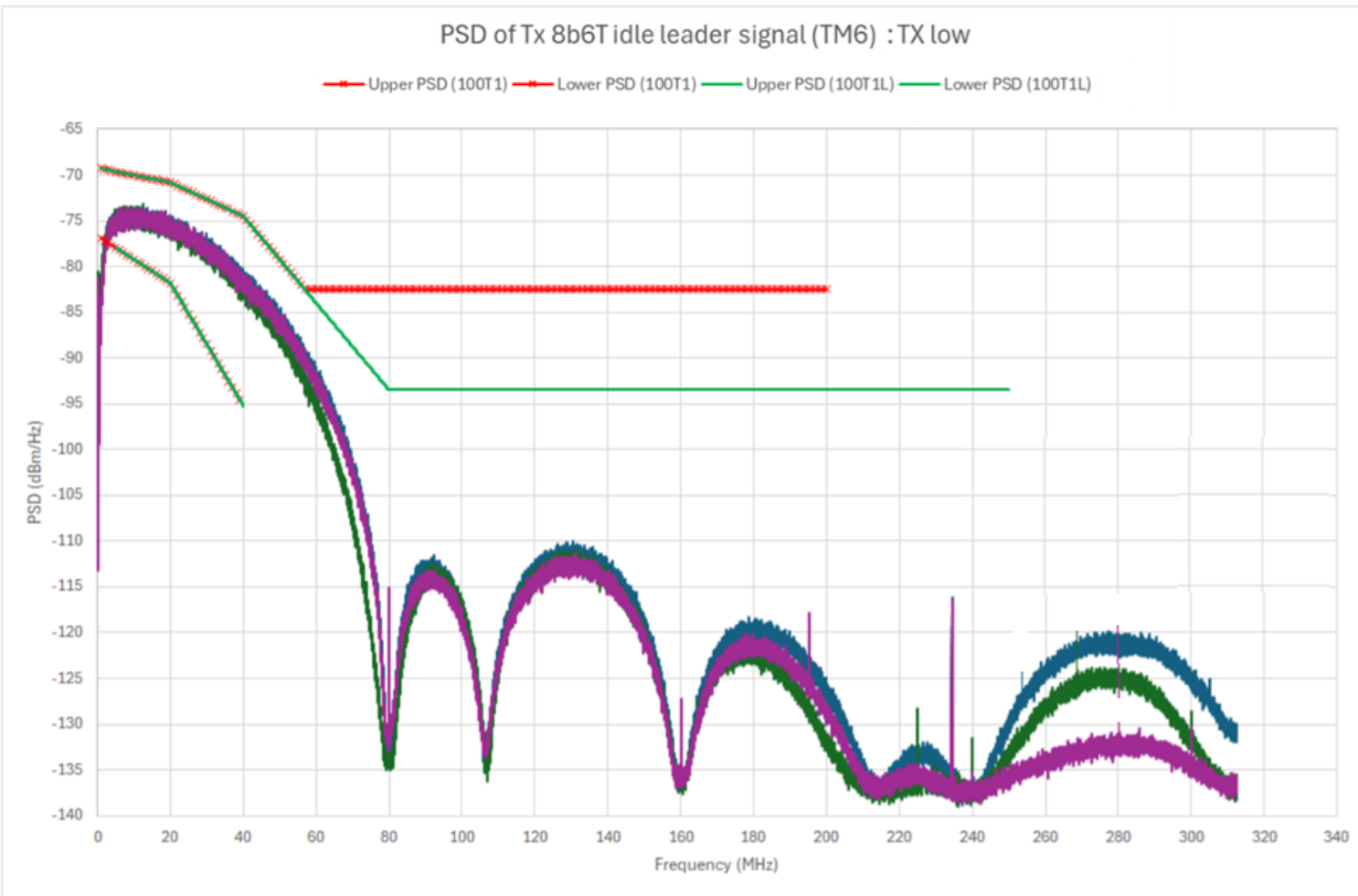
Transmitter PSD – 100BASE-T1L versus 100BASE-T1

► The following compares the 100BASE-T1L PSD mask with 100BASE-T1

- Stop lower limit line at 5 MHz

- Continue upper limit line down to 80 MHz and then flat at -87.5 dBm/Hz

- Extend out to 250 MHz

# PSD of 100BASE-T1L Idle Test Pattern

► The following is a plot of the PSD of a 1.0V 100BASE-T1L Idle test pattern

PSD of Tx 8b6T idle leader signal (TM6) : TX low

■ Roll off due to 8b6T Running Disparity
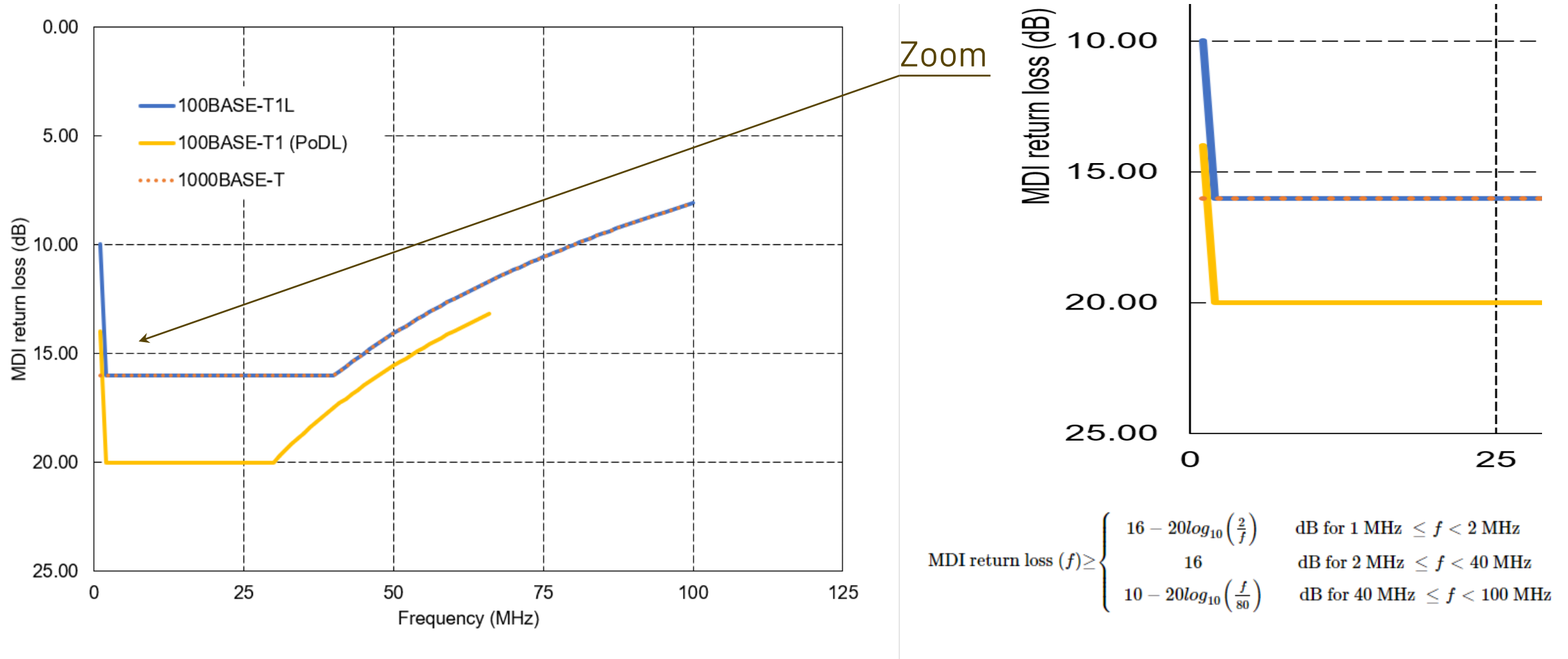
MDI Return Loss – LT Spice Simulation

► Propose Return Loss limits based on simulation

- We have simulated the transmit and receive external components including a 350 µH transformer and 470 µH CMC
- And we have included two 20 µH power coupling inductors (40 µH differential)
- The simulation incorporates the effects of parasitics
- More details to be presented at the July Plenary

► Lower power coupling inductor values may be considered for PoDL

- At present, we do not have a separate Return Loss equation for the case where a Clause 104 PI is encompassed within the MDI
- Further work is required to decide if this is needed

MDI Return Loss – LT Spice Simulation
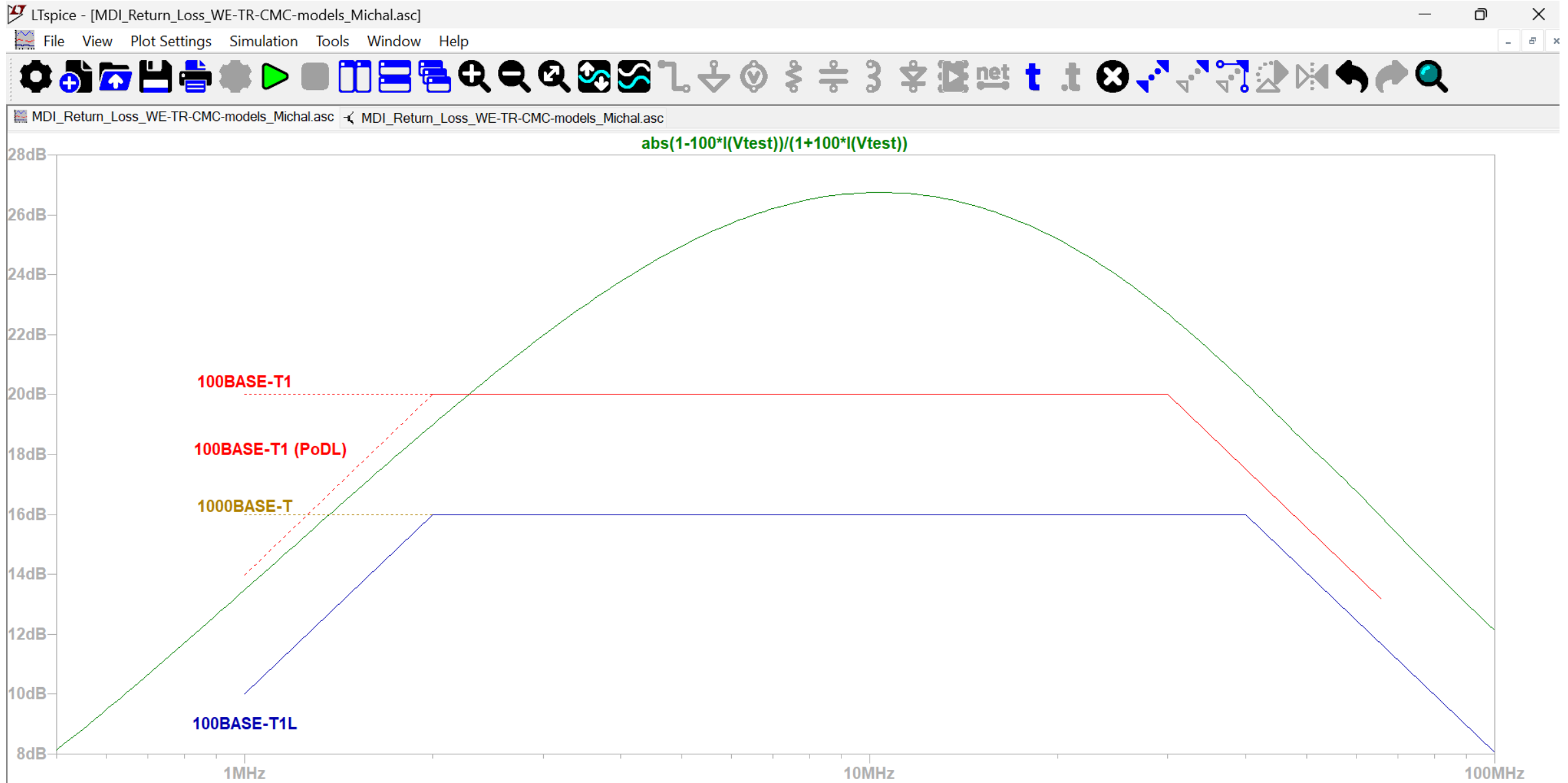
MDI Return Loss Comparison with Previous Standards

► Proposed mask for the MDI Return Loss compared with previous standards

$$\text{MDI return loss } (f) \geq \begin{cases} 16 - 20log_{10}\left(\frac{2}{f}\right) & \text{dB for 1 MHz } \leq f < 2 \text{ MHz} \\ 16 & \text{dB for 2 MHz } \leq f < 40 \text{ MHz} \\ 10 - 20log_{10}\left(\frac{f}{80}\right) & \text{dB for 40 MHz } \leq f < 100 \text{ MHz} \end{cases}$$

Questions ?