MTF Measurement Methods

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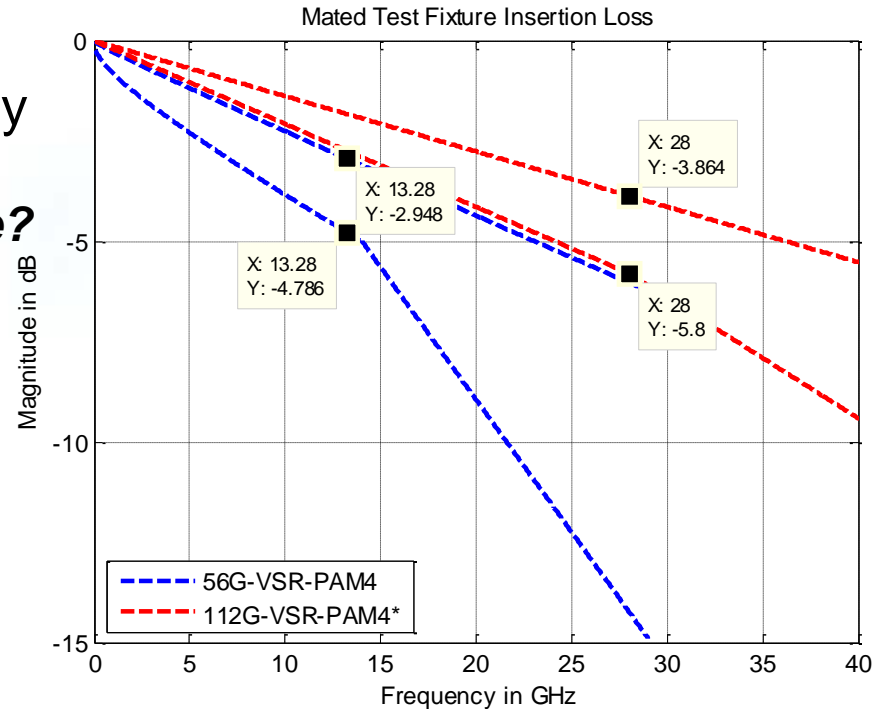
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Conservation Law

Signal In = $\quad$ **Insertion Loss** $\quad$ **+** $\quad$ **Return Loss** $\quad$ **+** $\quad$ **Mode Conversion** $\quad$ **+** $\quad$ **Crosstalk** $\quad$ **+** $\quad$ **Radiated Loss** $\quad$ **= Signal Out**

- Signal Out can be expressed as the sum of the measureable effects upon Signal In

- Insertion Loss is the dominant factor

- Variations in the other parameters contribute to the allowable Deviation of the Insertion Loss (ILD)
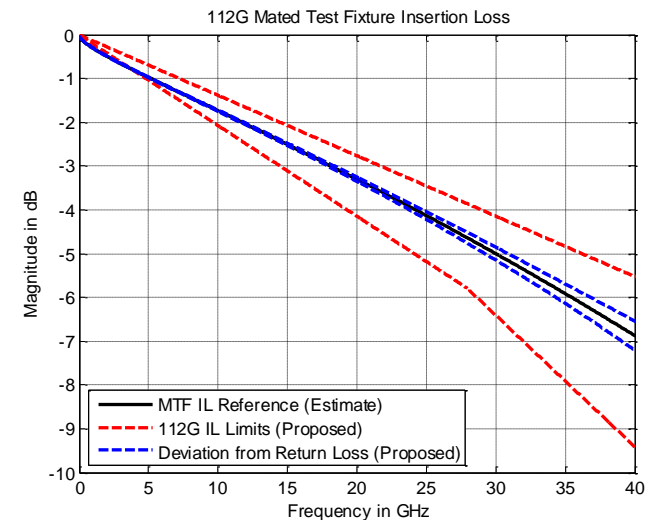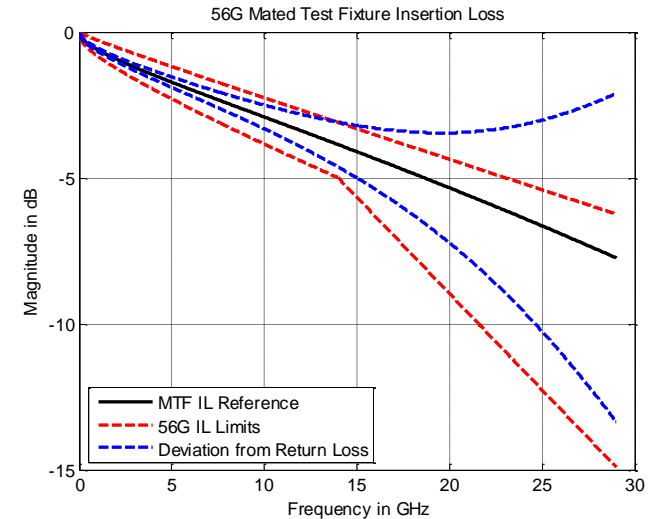
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Mated Test Fixture Insertion Loss

- The focus of the C2M channel reach has been heavily focused on Insertion Loss only
  - *Is IL the main driver for 100GEL/112G performance?*

- Other standards have looked at more than reference IL at this point

- Published presentations to this working group have shown that ILD, Return Loss, or Crosstalk may be more impactful on performance

Mated Test Fixture Insertion Loss

X: 28
Y: -3.864

X: 13.28
Y: -2.948

X: 13.28
Y: -4.786

X: 28
Y: -5.8

Magnitude in dB

- - - 56G-VSR-PAM4
- - - 112G-VSR-PAM4*
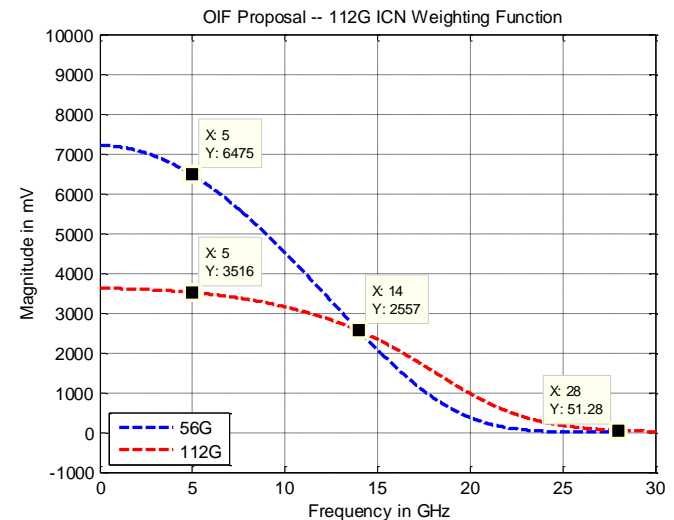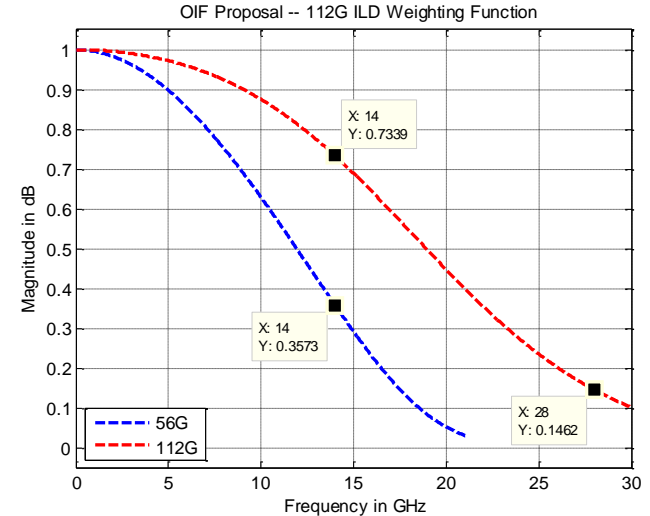
Frequency in GHz

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Defining Return Loss and ILD

- Insertion Loss Deviation is dominated by Return Loss

- Deviation due to Return Loss can be approximated using the equation $|1-S_{dd}11|^2$

- The 56G requirement demonstrates the correlation of this relationship

- For 112G it would make sense to require lower ILD, but it may not be possible to improve the RL
  - *It may be more practical to allow more IL and less ILD*

56G Mated Test Fixture Insertion Loss

- MTF IL Reference
- 56G IL Limits
- Deviation from Return Loss

112G Mated Test Fixture Insertion Loss

- MTF IL Reference (Estimate)
- 112G IL Limits (Proposed)
- Deviation from Return Loss (Proposed)

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Calculated Metrics – ILD and ICN

- Increasing the bandwidth of the current ILD weighting function by ~2x increases the scaling factor, which should be reflected in the ILD RMS requirement

- Increasing the bandwidth of the current ICN weighting function by ~2x redistributes the significance of noise <14GHz and places more weight on noise 25-40GHz

- We should be cautious to ensure that the 112G requirements also guarantee that the 56G requirements are satisfied

OIF Proposal -- 112G ILD Weighting Function

X: 14
Y: 0.7339

X: 14
Y: 0.3573

X: 28
Y: 0.1462

- - - 56G
- - - 112G

Magnitude in dB

Frequency in GHz

OIF Proposal -- 112G ICN Weighting Function

X: 5
Y: 6475

X: 5
Y: 3516

X: 14
Y: 2557

X: 28
Y: 51.28

- - - 56G
- - - 112G

Magnitude in mV

Frequency in GHz

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Measurement Methods

- Recommend to calculate all of the requirements around a practical reference target before confirming the IL requirement

- Historical presentations have shown a practical MTF reference target to be between -6dB and -6.5dB (at 26.56GHz)

- Request to collect measurements to observe the 100GEL tolerance for ILD, Return Loss and Crosstalk

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