# 802.3bp RTPGE Mode Conversion Measurements for Automotive Link Segments

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# Contributors & Supporters

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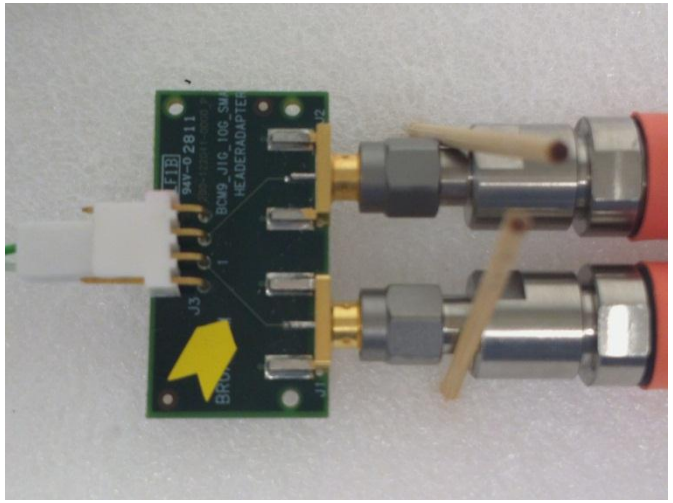
# Overview

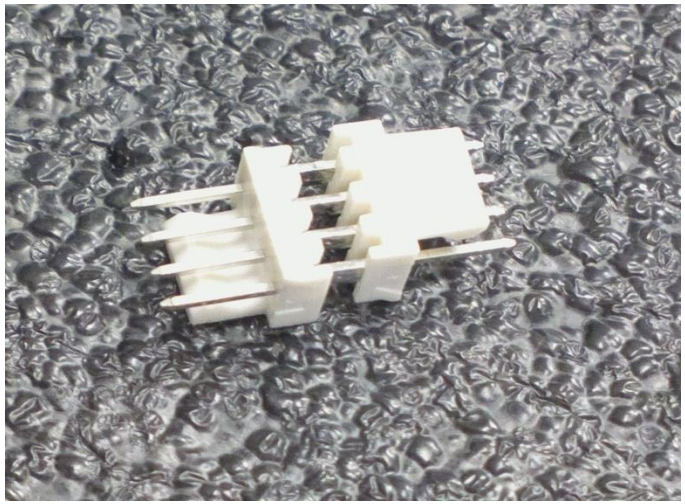
- **System EMC Testing (as previously proposed)**
  - Stripline for emissions testing (using 2m UTP cable)
  - BCI for immunity testing (using 2m UTP cable)
- **Critical parameter for RTPGE utilizing UTP solutions**
  - → Mode conversion limit line which directly defines the emissions and immunity.
  - → The previously proposed value corresponds to the most stringent emission limit line (15dBuV) and BCI immunity level (200mA) using 2m UTP cables as defined by the standard test configurations
  - → Need to derive the mode conversion limit lines for RTPGE link segment (15m w/4-inline connectors)
- **Test Setup**
  - DUT 5cm over a ground plane (commonly used by automotive OEMs)
    - Will provide a consistent CM impedance among different measurements & setups
  - Components' Testing (cables, connectors, magnetics, etc.)
  - Designing good test heads & an accurate calibration is crucial for balance measurements.
  - There are two types of inline connectors considered in this study (#1, #2).

# Setup: MDI Jig & Inline Connector #1

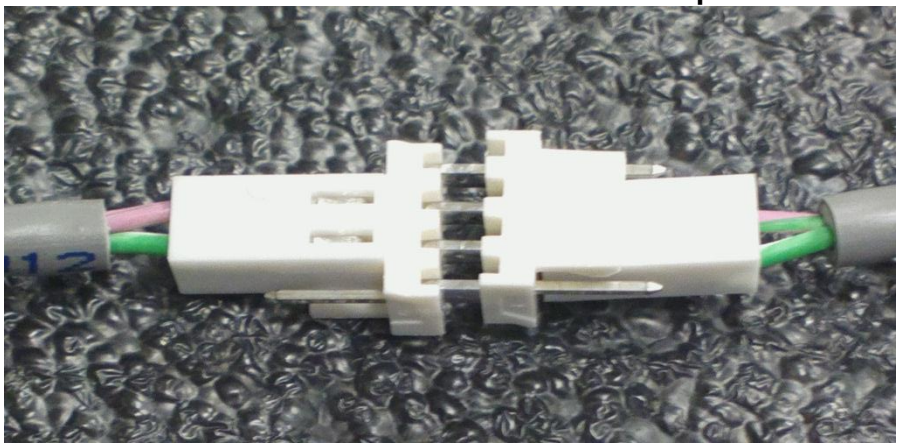
2-pin MDI jig



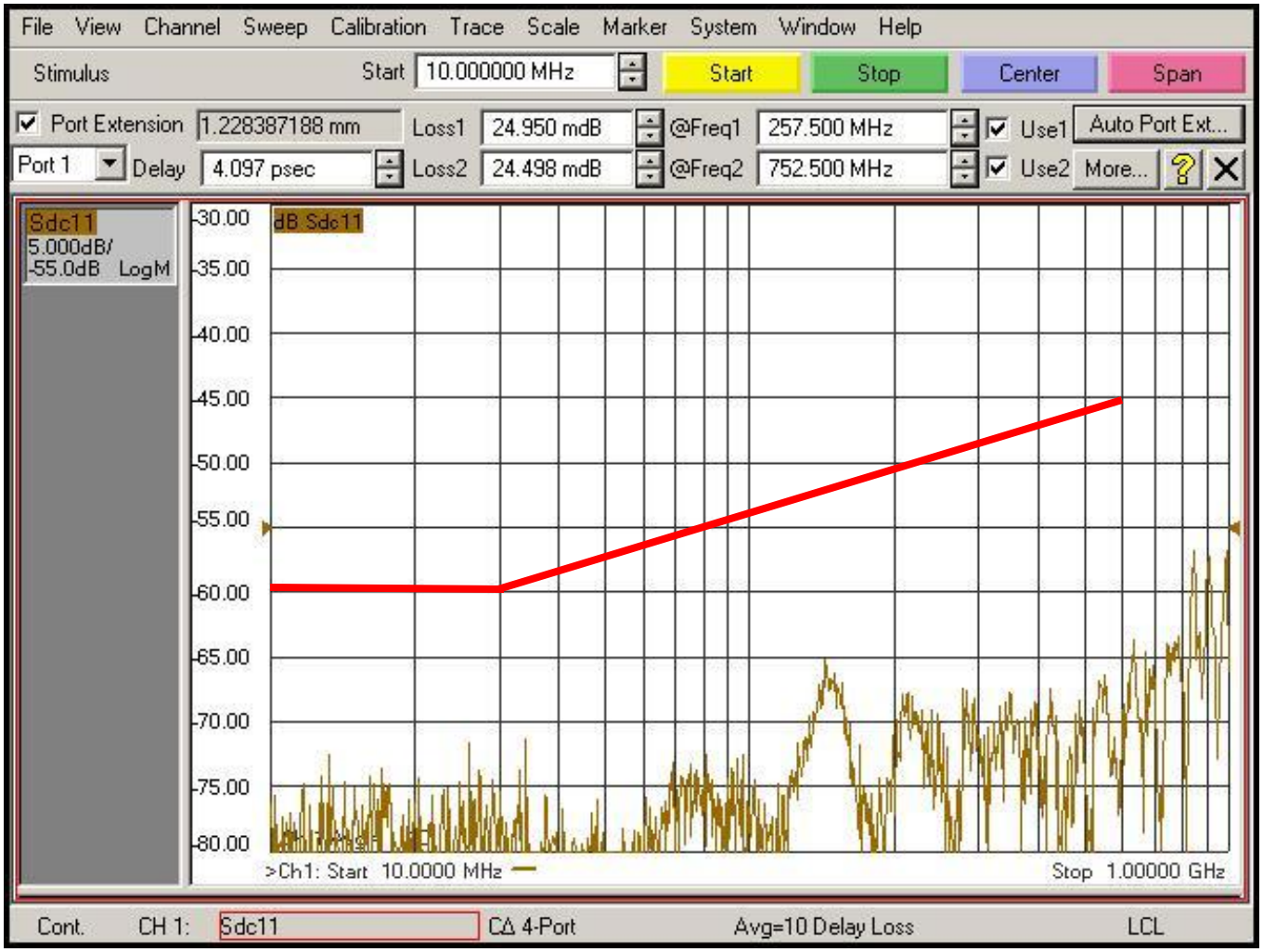
Inline Connector#1



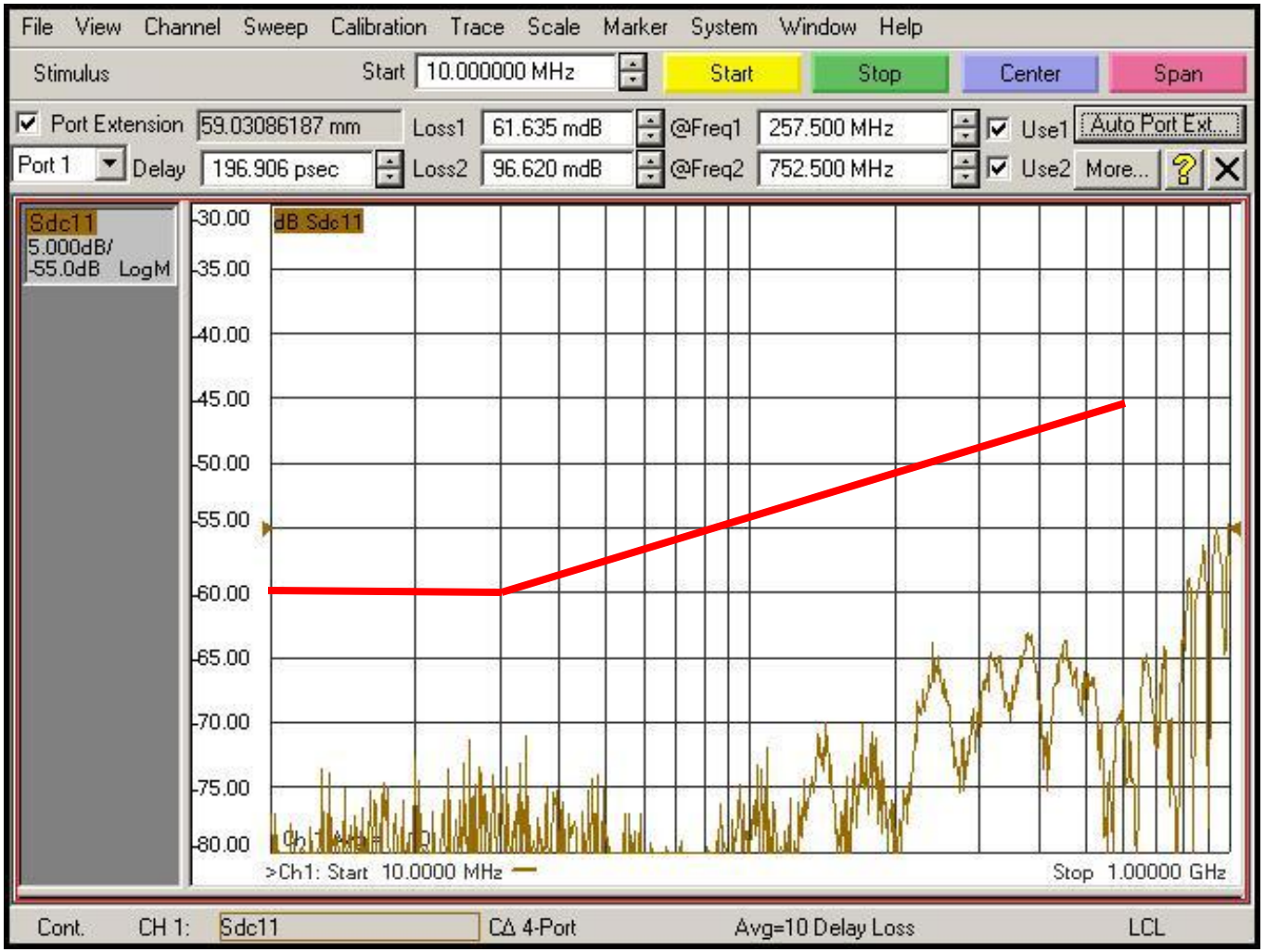
Inline Connector#1 with 1-pair UTP



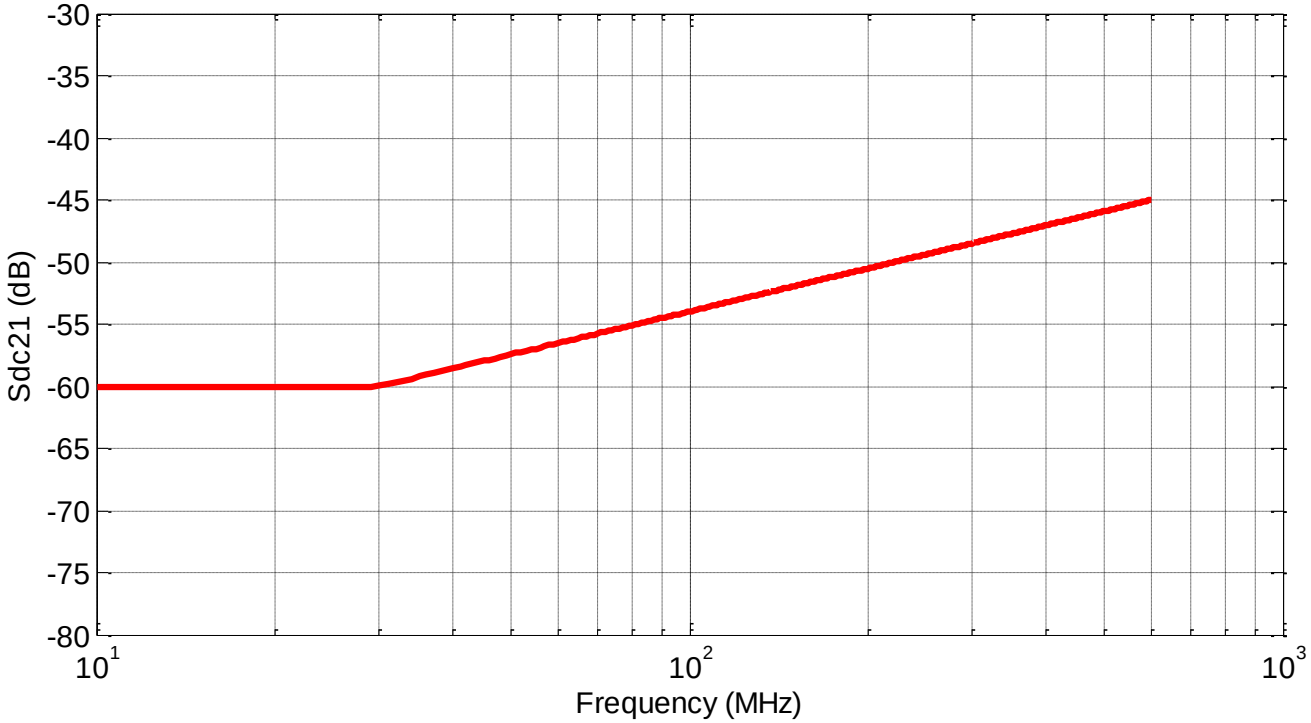
# Calibration (Sdc11 for [VNA + SMA Cables])



# Calibration Cntd. (Sdc11 for [VNA + SMA Cables + MDI Jig])



# Mode Conversion Limit Line for Component Level

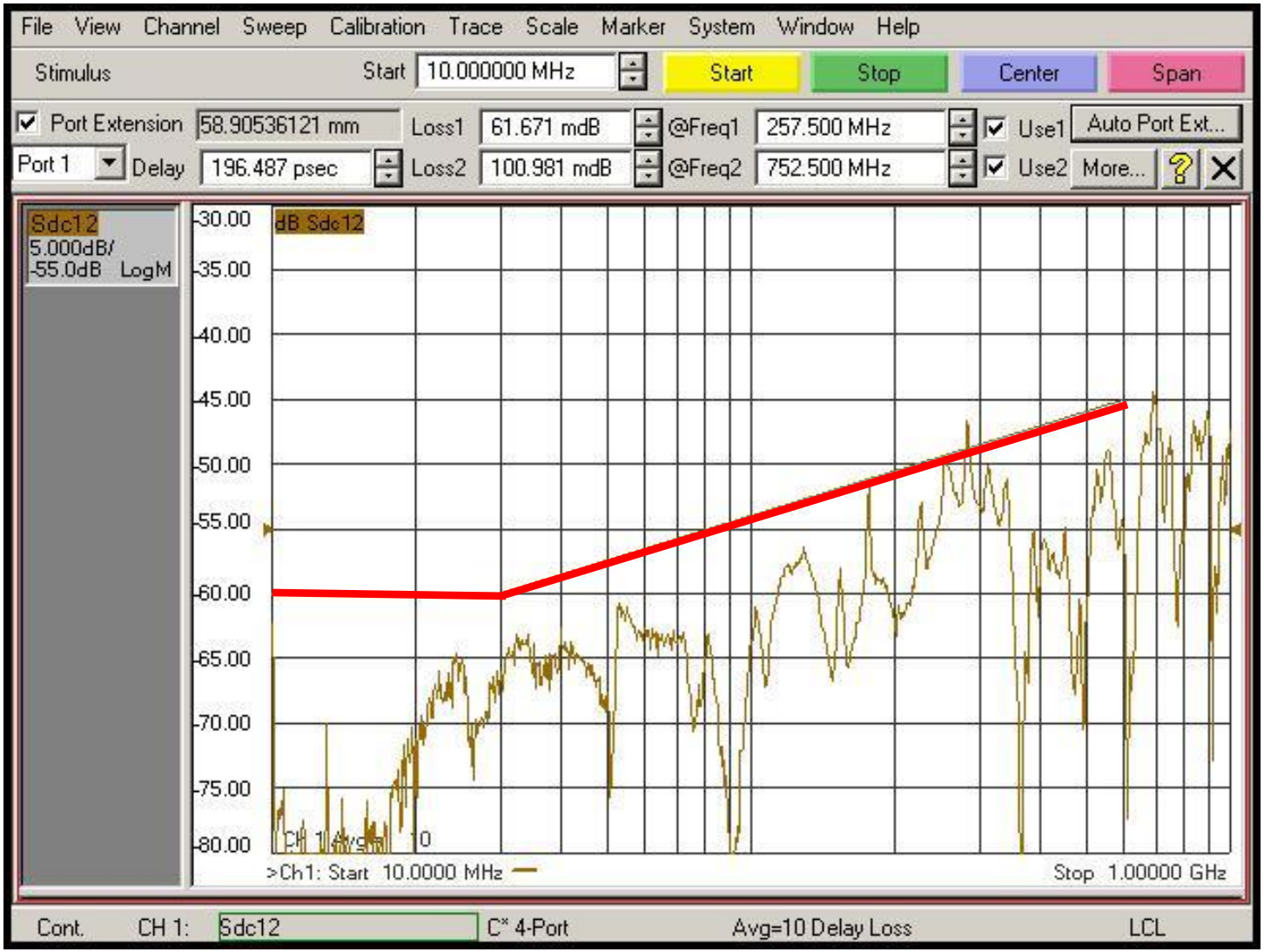



| | |
|---|---|
| $-60_{dB}$ | $10 < f_{MHz} < 30$ |
| $[\,5 \log_n (f_{MHz}) - 77\,]_{dB}$ | $30 < f_{MHz} < 600$ |

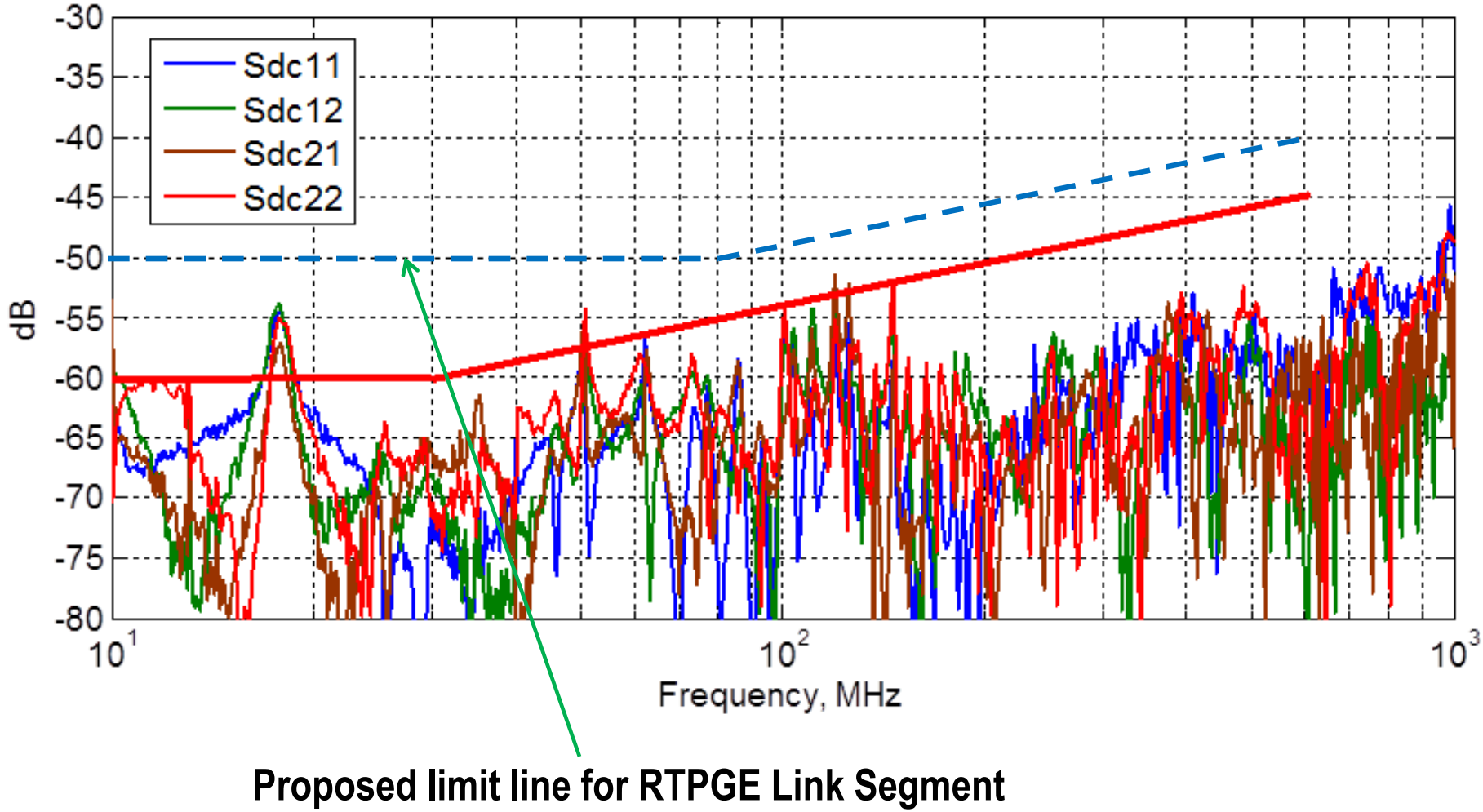
# Sdc21 for 2m UTP

# Sdc21 for 2m UTP w/1-inline#2

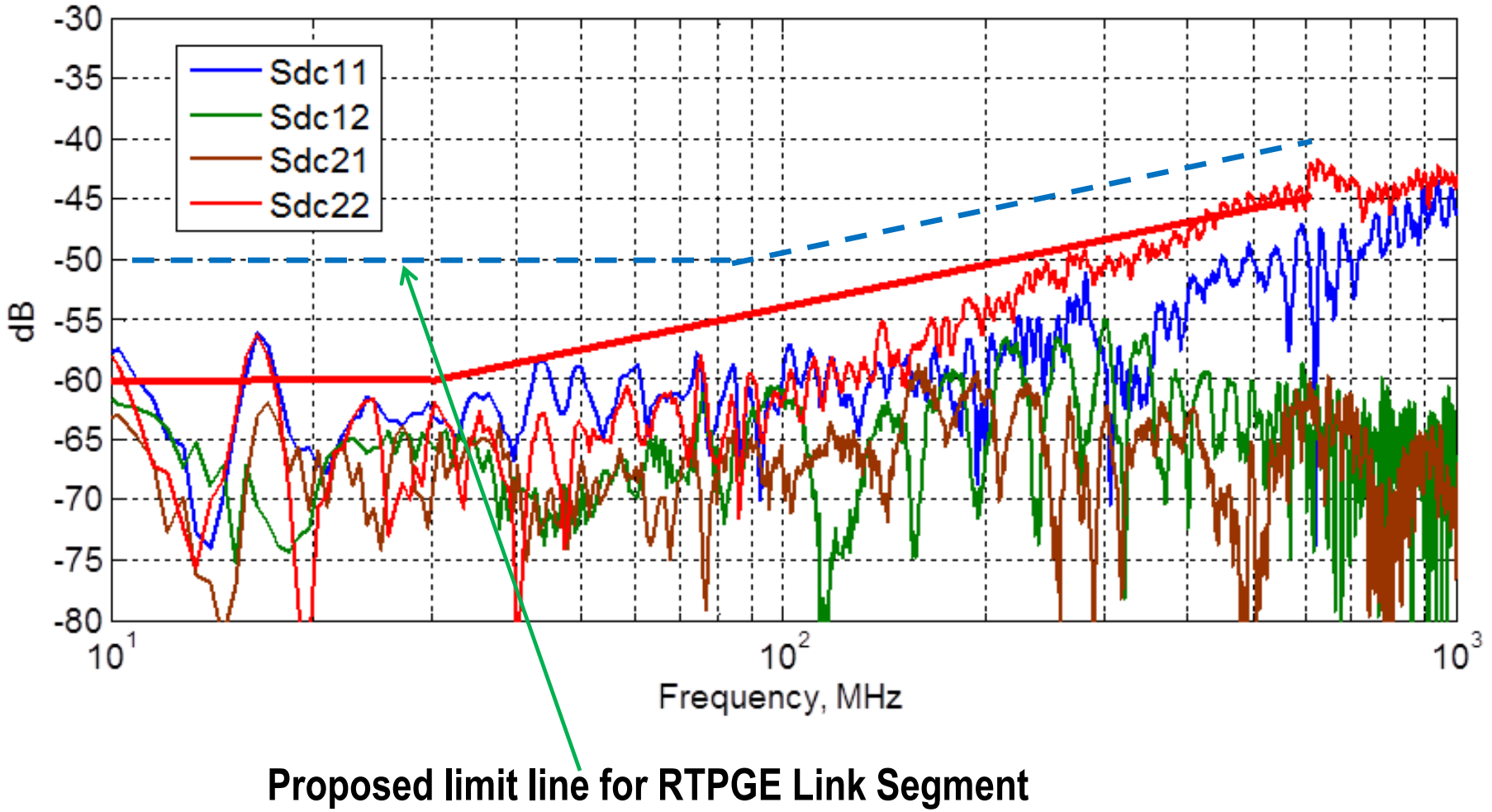
# Sdc21 for 4m UTP w/2-inline#2



# 15m UTP w/4-inline#2 (setup1)

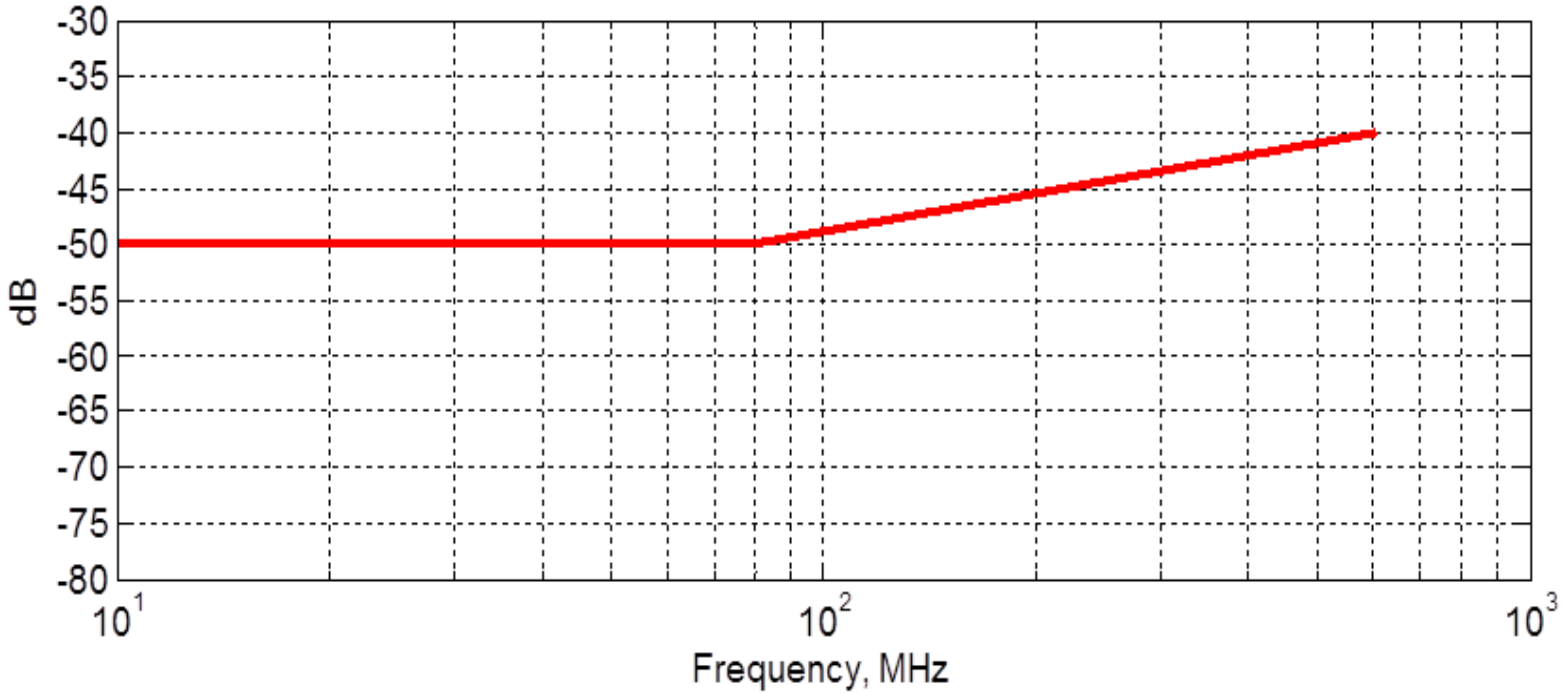


# 15m UTP w/4-inline#1 (setup2)



# Baseline Proposal for Mode Conversion

- **The mode conversion limit line is proposed for a 15m UTP link segment with 4-inline connectors**




| | |
|---|---|
| $-\ 50_{dB}$ | $10 < f_{MHz} < 80$ |
| $[\ 5\ \log_n (\ f_{MHz}\ ) - 72\ ]_{dB}$ | $80 < f_{MHz} < 600$ |