

RTPGE EMC Limit Lines

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RTPGE EMC-Noise Parameters Review

- ❑ Differential Channel Impairments
- ❑ EMC Channel Transfer Function Modeling
- ❑ EMC Noise & Limit Lines
- ❑ Alien XTALK
- ❑ In-Car Background Noise
- ❑ Impulse Noise
- ❑ Other Noise sources?

Agenda

- ❑ RTPGE EMC Limit Lines
 - Transmit PSD (via **Strip Line** Emissions)
 - RX Immunity (via **BCI** Setup)
 - Connector Measurements (preliminary)
 - Magnetics Measurements (preliminary)

RTPGE EMC Limit Lines for 1-pair UTP

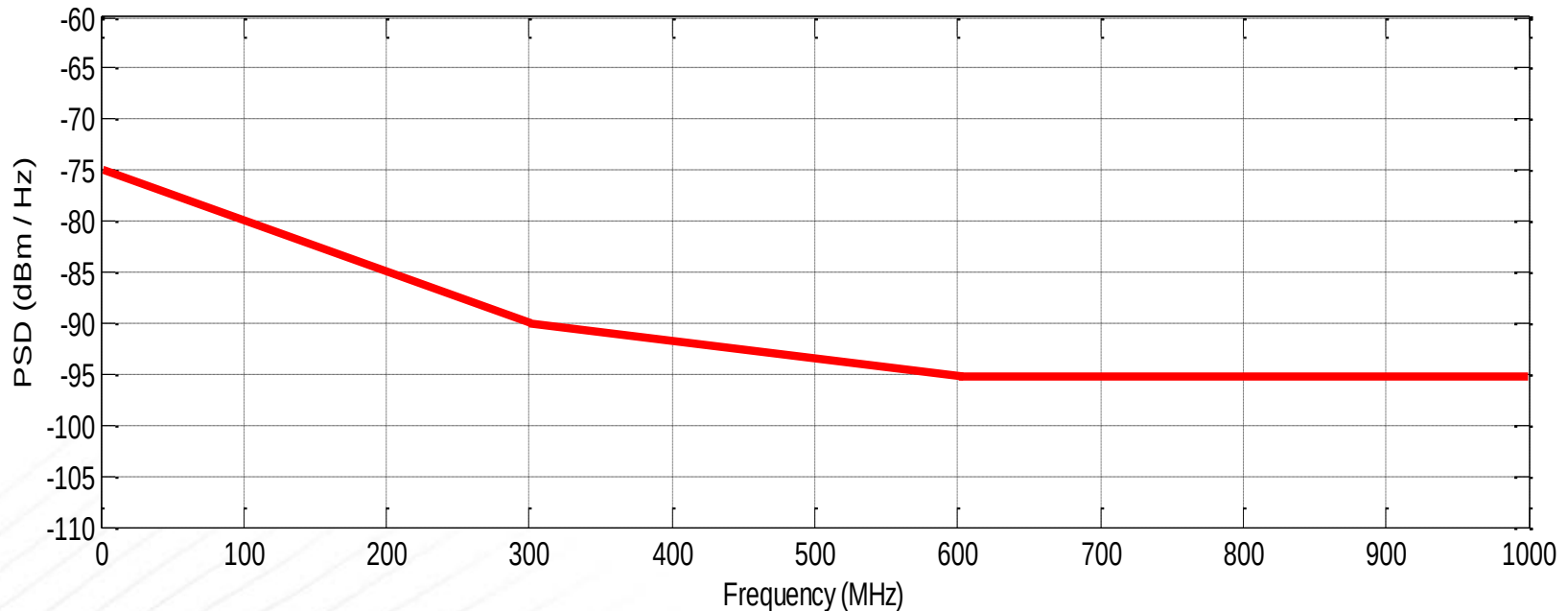
Foreword

- Limit lines are proposed for RTPGE transceiver design over 1-pair UTP cables to satisfy EMC requirements.
- The following assumptions are made;
 1. Single pair UTP cables with gauge 22 are considered in the analysis.
 2. Emission is measured using **Strip Line** method for 2m cables with the limit of 15dBuV peak¹.
 3. Immunity is measured using **BCI** method for 2m cables at 200mA peak level².
 4. Analysis is based on methods (presented earlier) measuring emissions transfer function, mode transfer impedance and S4P.

1- 15dBuV flat limit, 30MHz to 1000MHz is worse than CISPR25 limits.

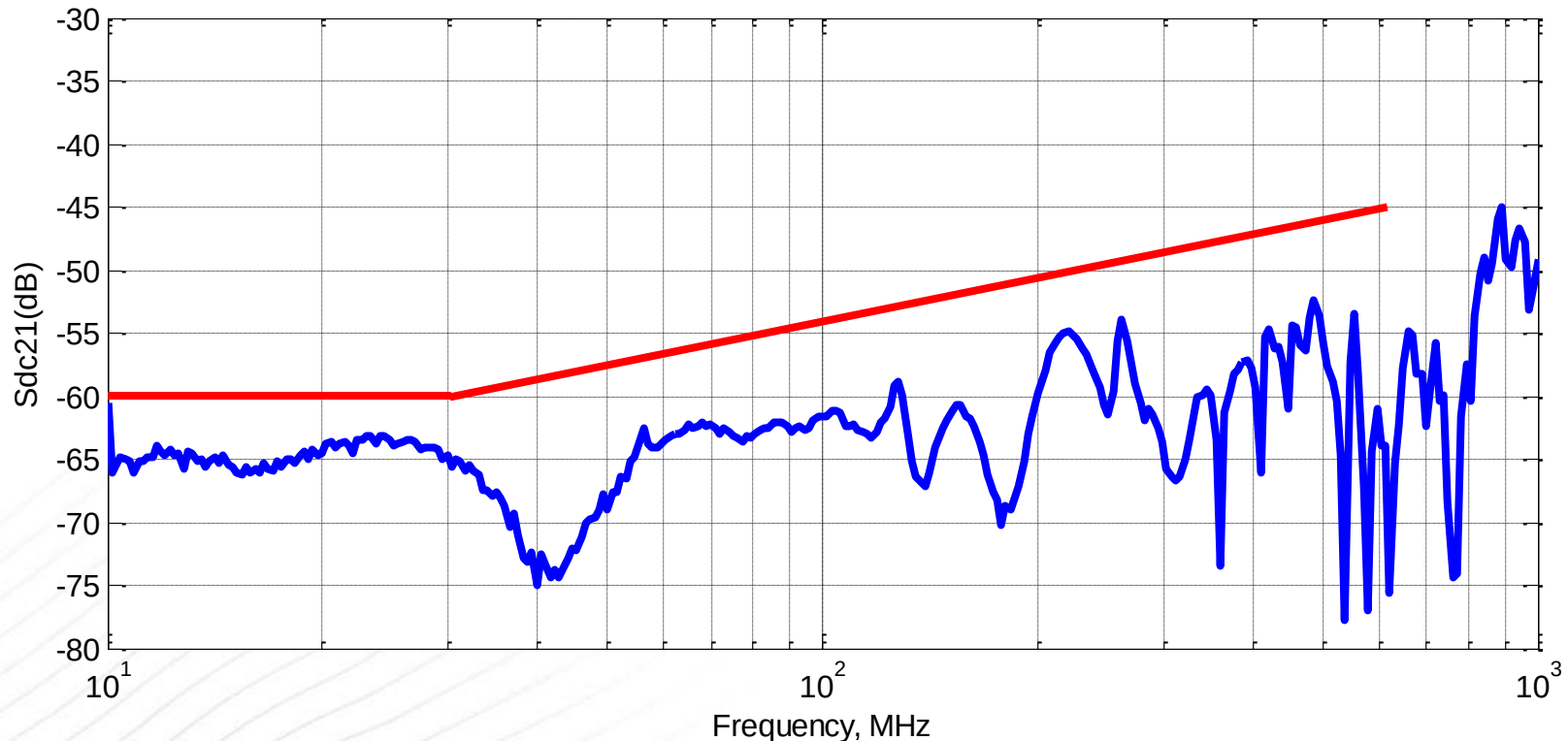
2- 200mA flat noise level, 1MHz to 400MHz is seen worse than some 350mA non-flat noise profiles.

TX PSD and RX EMI Immunity



- There exist single pair UTP cables that pass strip line emission tests with transmit differential signal conforming to the shown PSD limit.
- BCI immunity tests produce differential noise less than 100mVpp using such cables in frequency range of 10MHz to 400MHz.
- In order to allow a wider range of cables, connectors and CMCs, provision for 6dB power back off and noise tolerance at least 6dB should be considered

Mode Conversion Limit Line

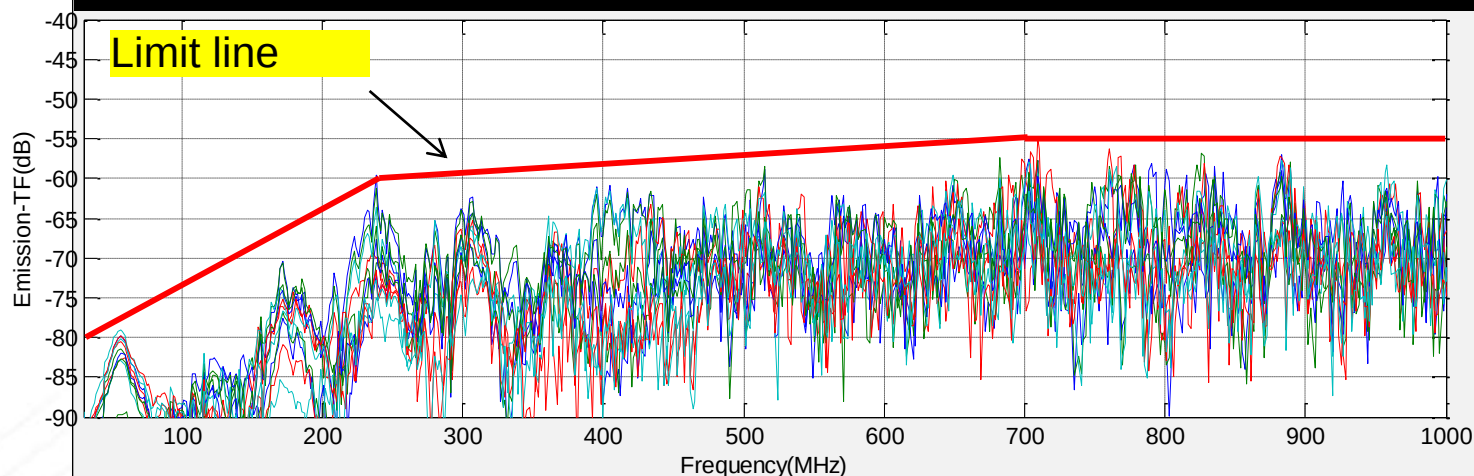


- Mode conversion for 1-pair UTP cable shown is based on measured S4P.
- The limit line shown correlates with the levels suggested for TX PSD and RX BCI immunity levels.
- The same limit can be considered for MDI and inline connectors, CMC and PHY.

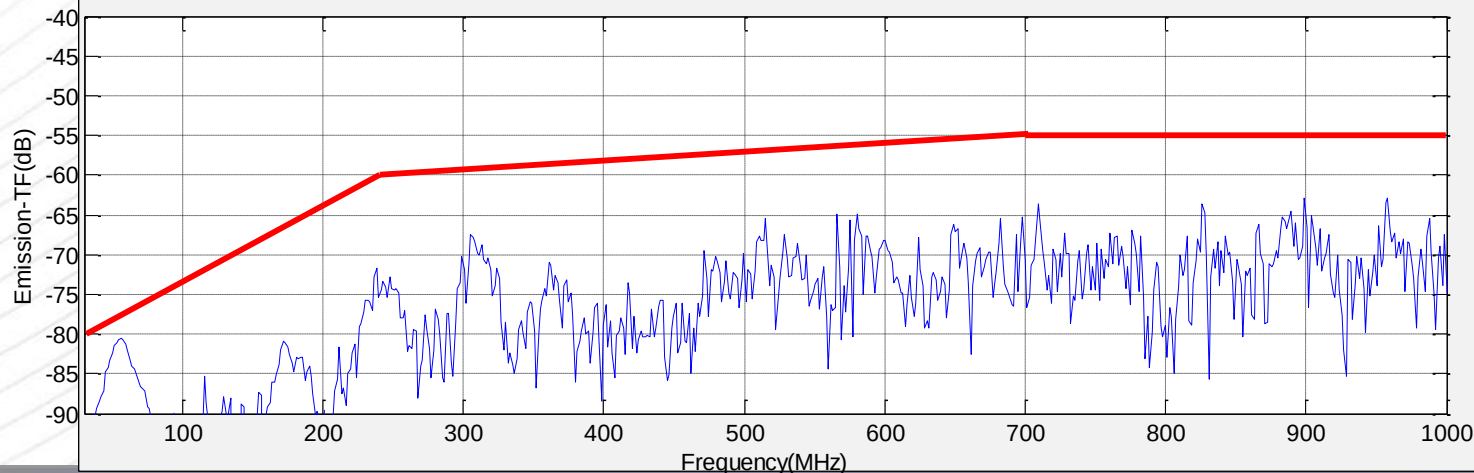
TX PSD Analysis

Emission Transfer Function

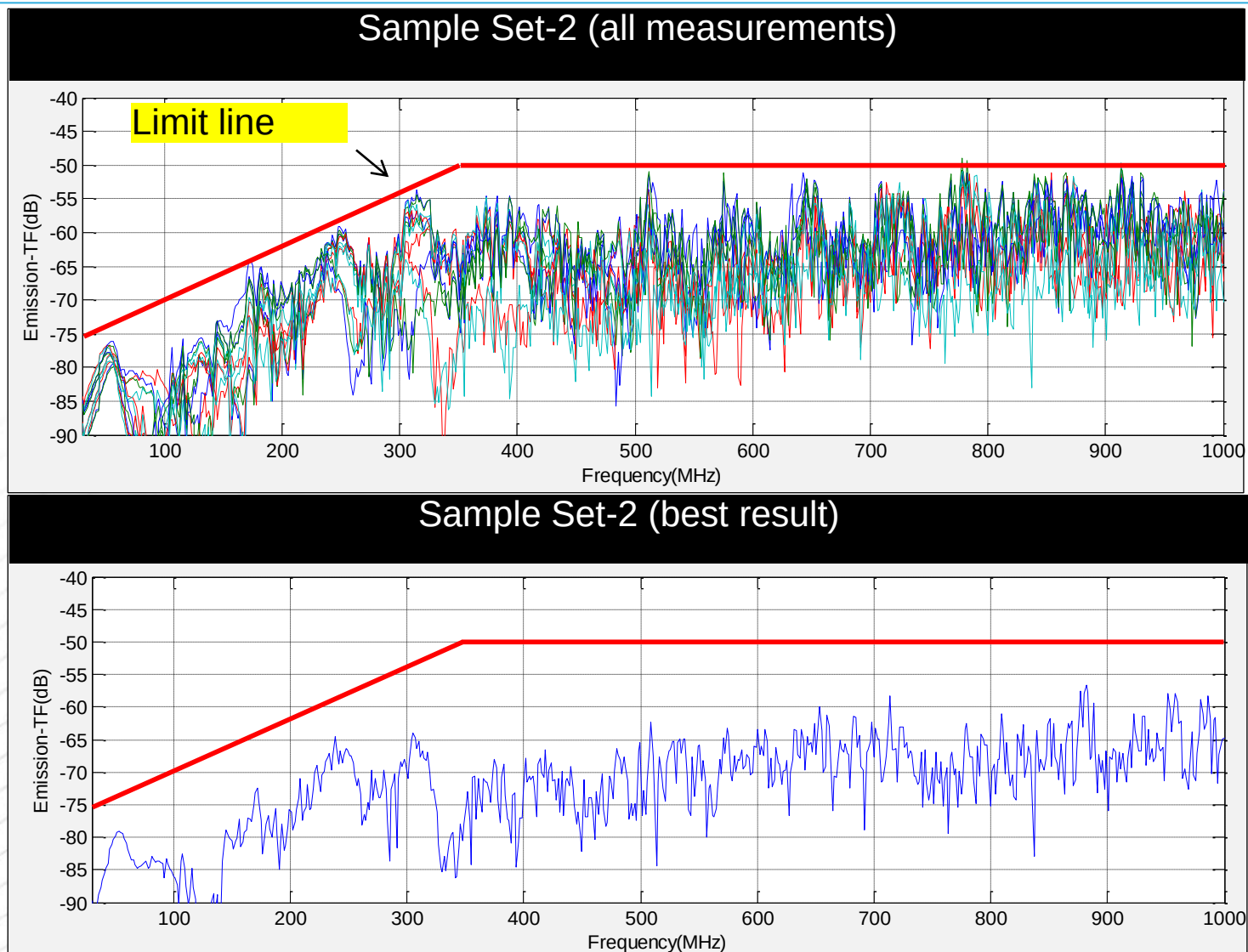
Sample Set-1 (all measurements)



Sample Set-1 (best result)

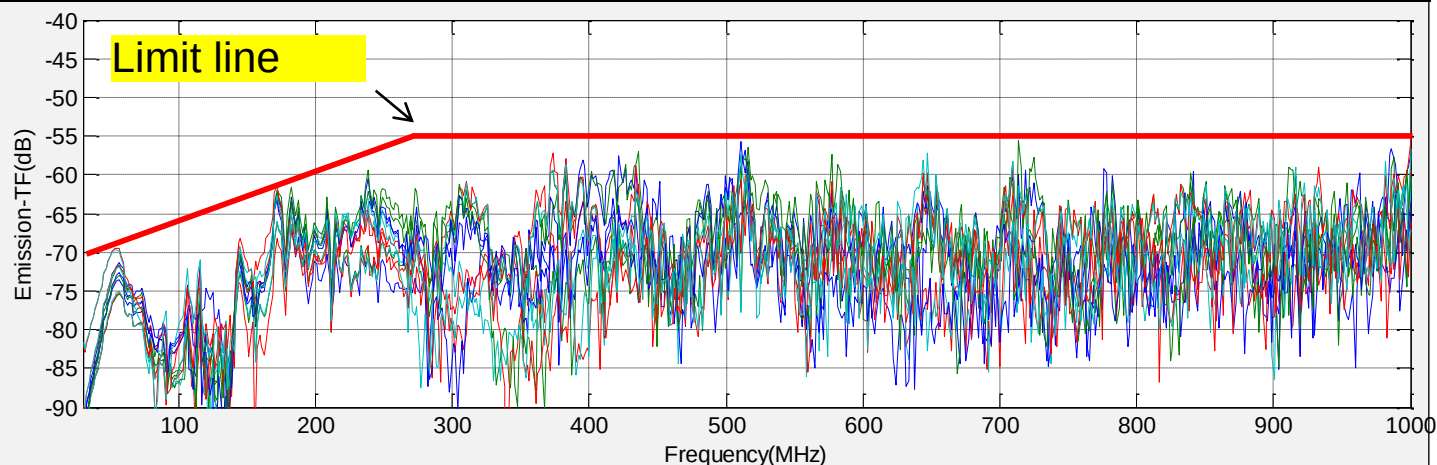


Emission Transfer Function (cntd.)

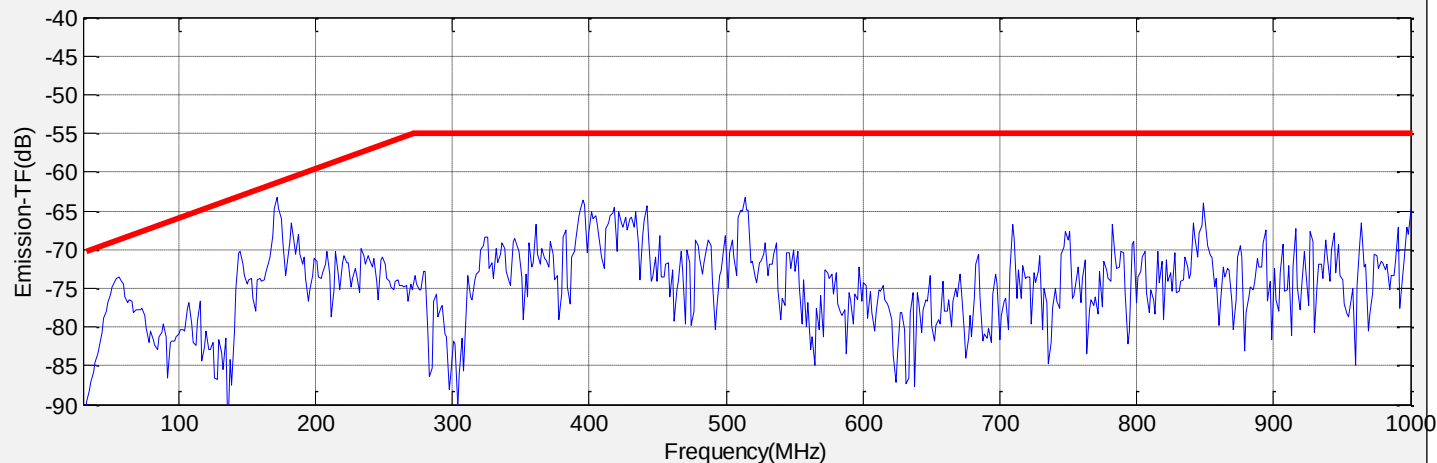


Emission Transfer Function (cntd.)

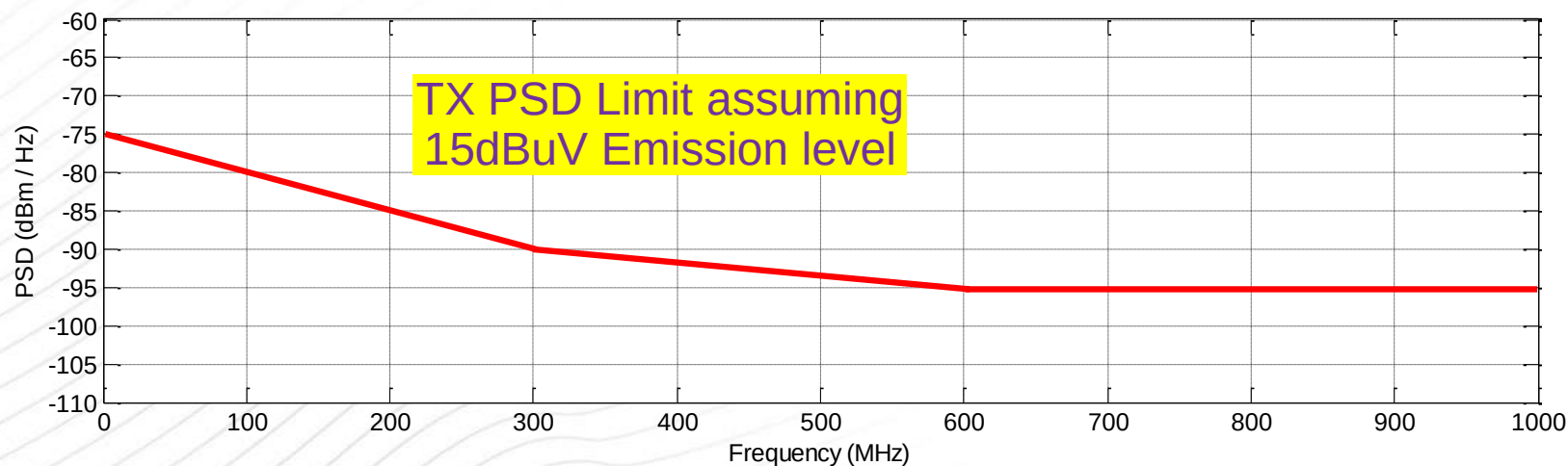
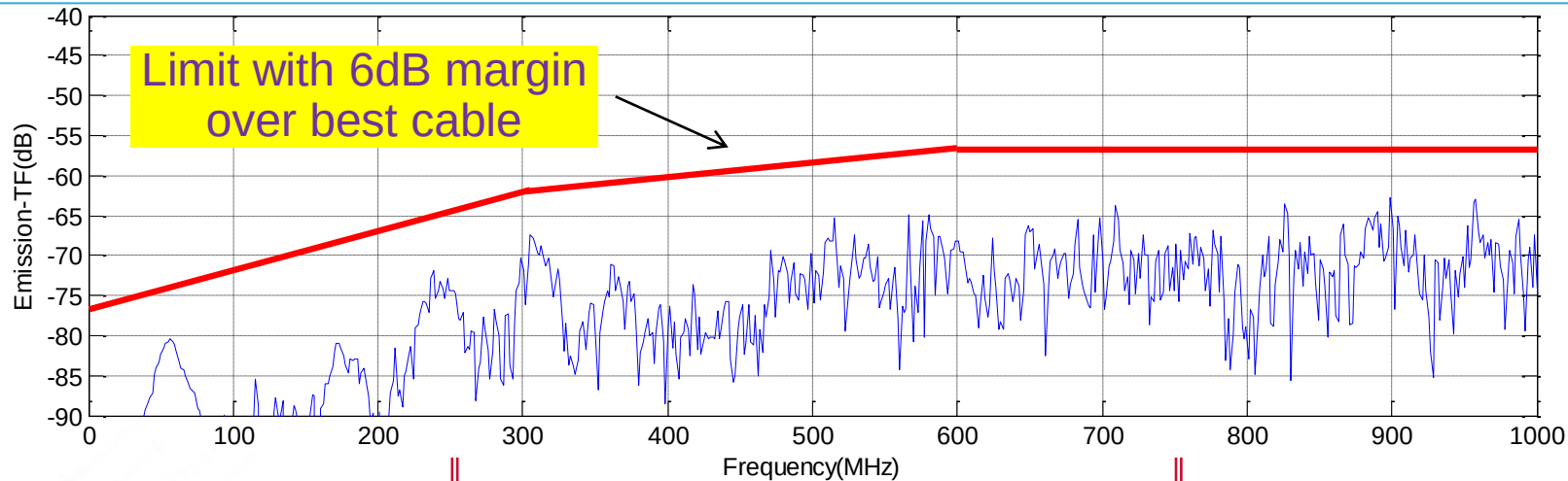
Sample Set-3 (All Measurements)



Sample Set-3 (Best measurement)

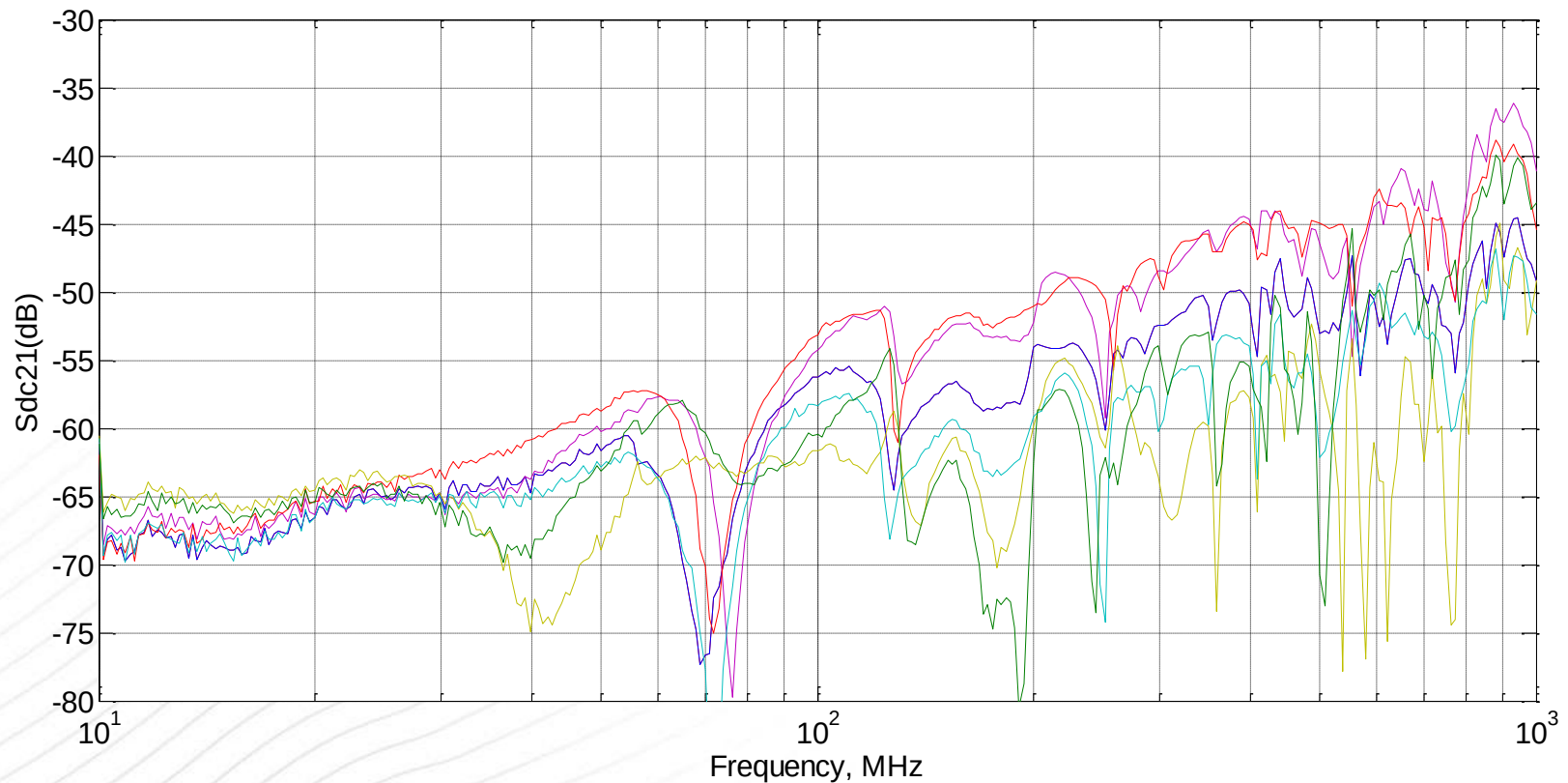


TX PSD Limit Line

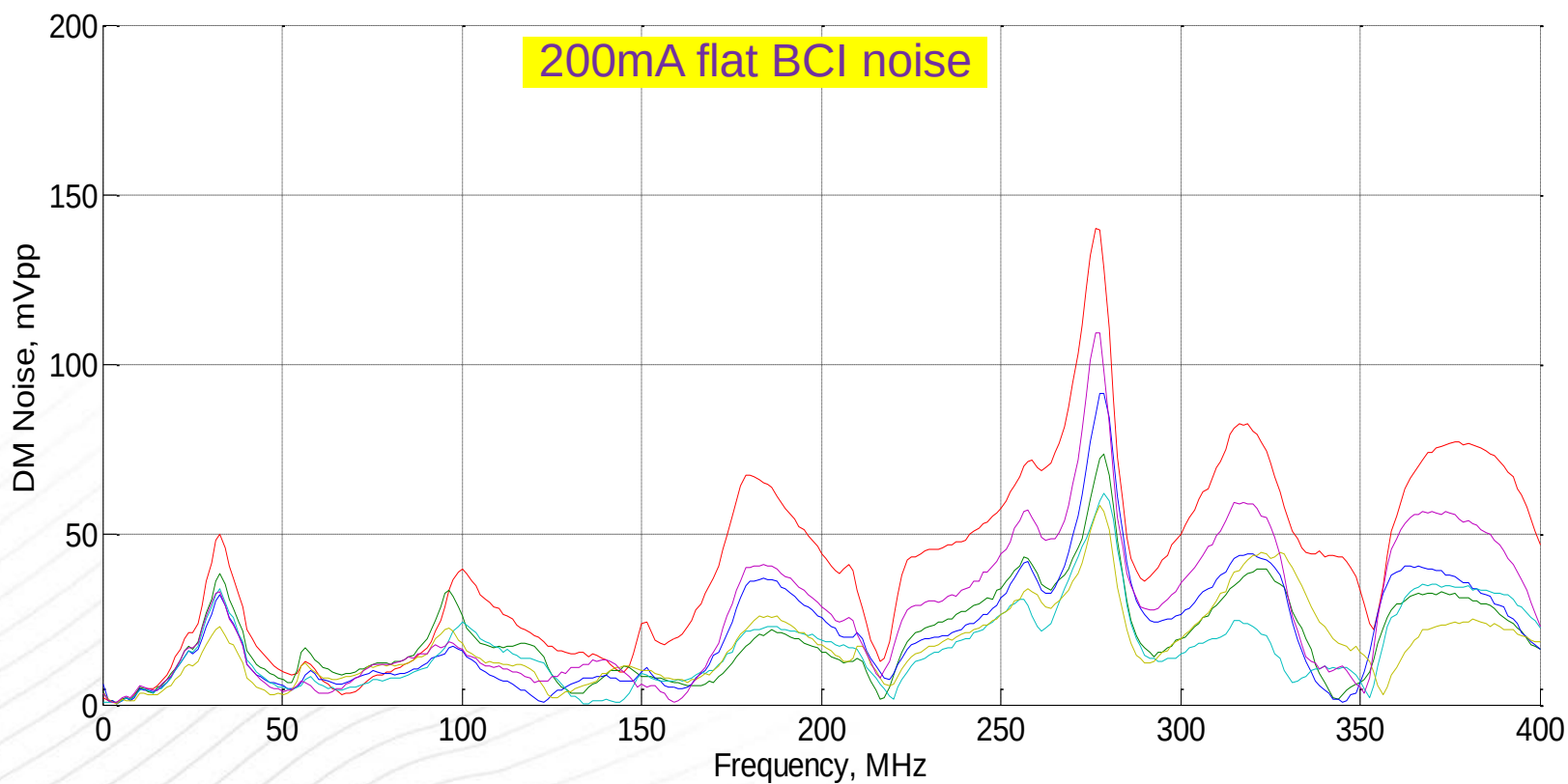


RX EMI Immunity

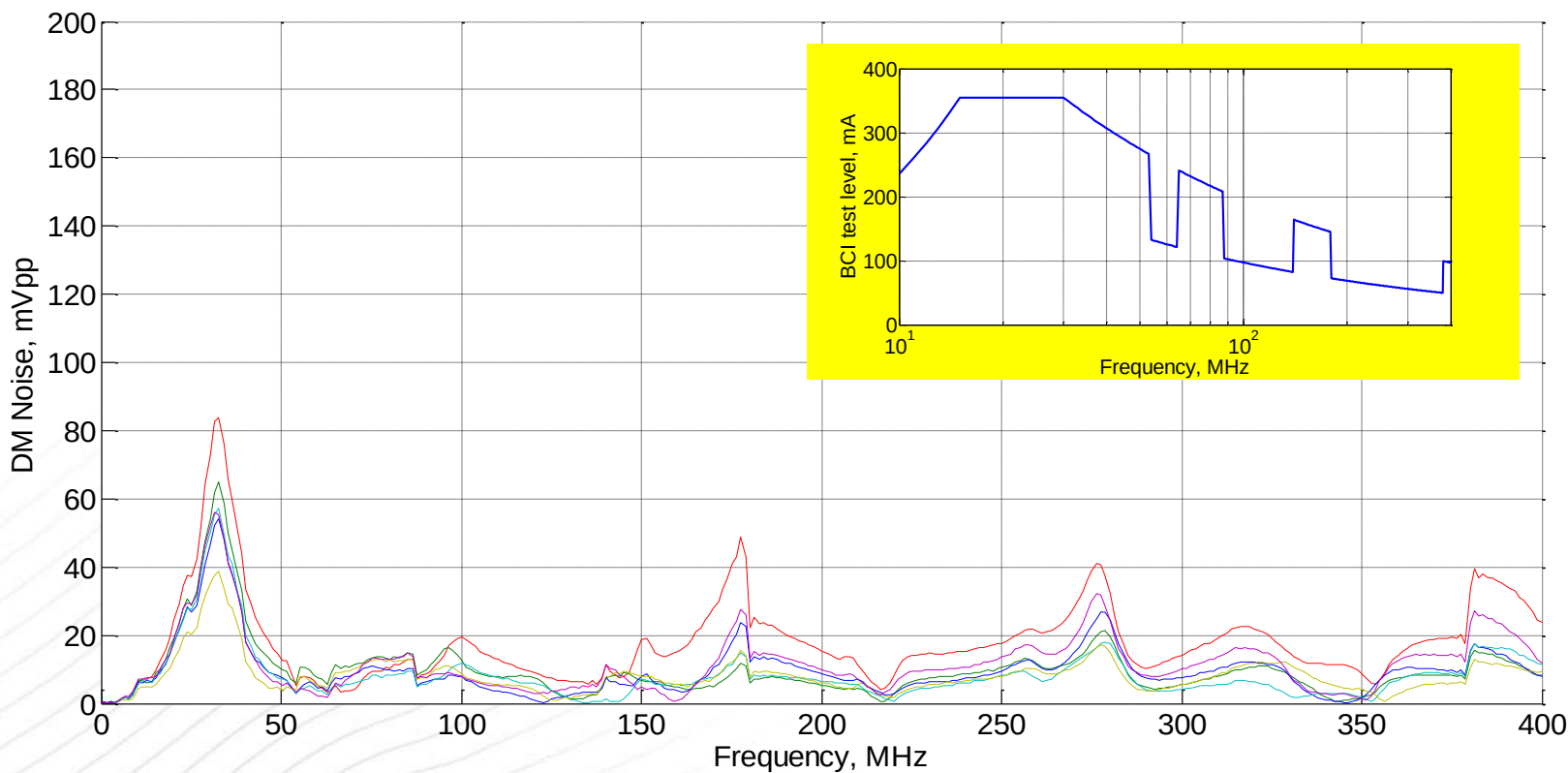
Mode Conversion for Sample Set-1



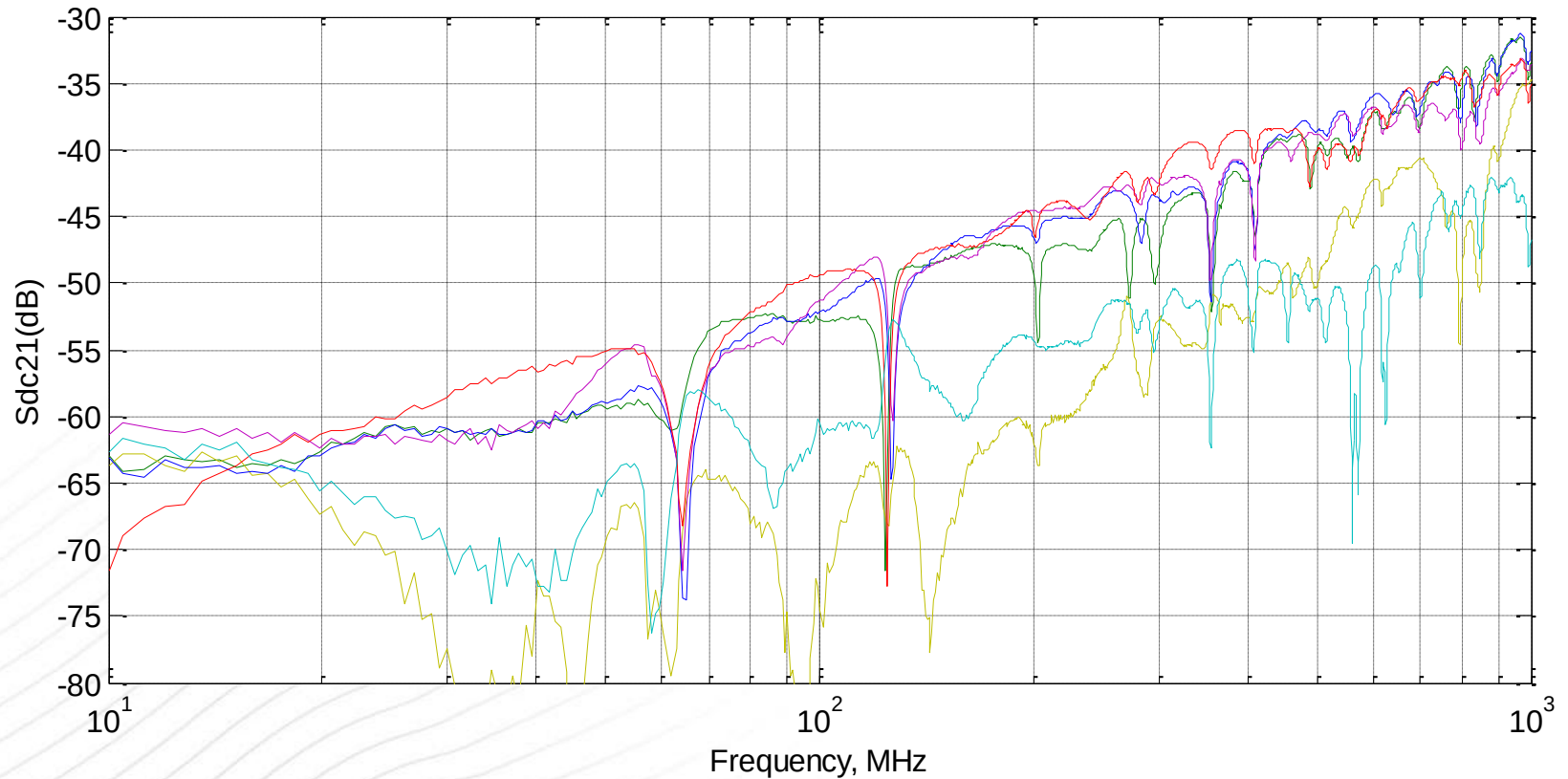
DM Noise for Sample Set-1(OEM Mask-1)



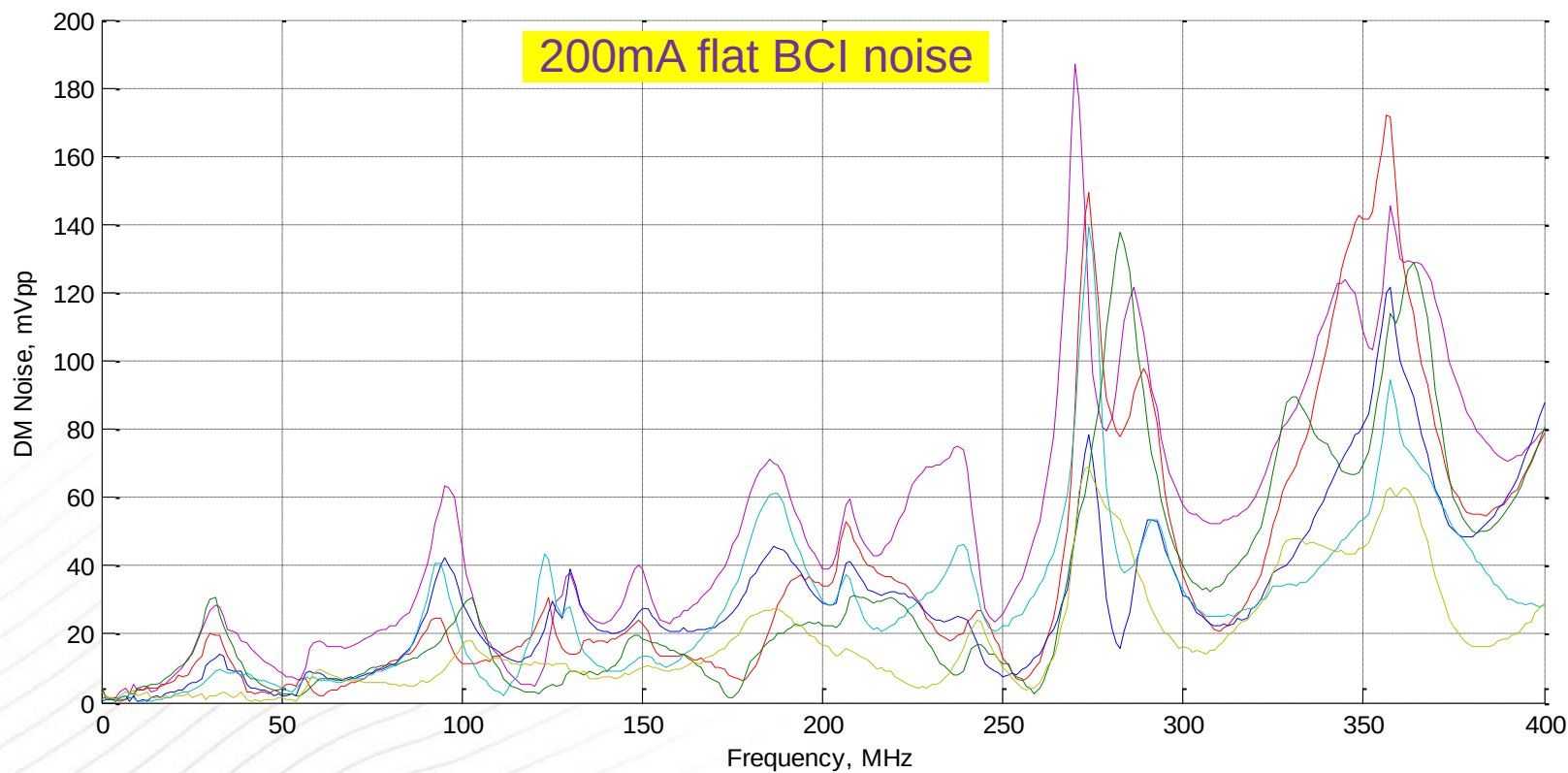
DM Noise for Sample Set-1 (OEM Mask-2)



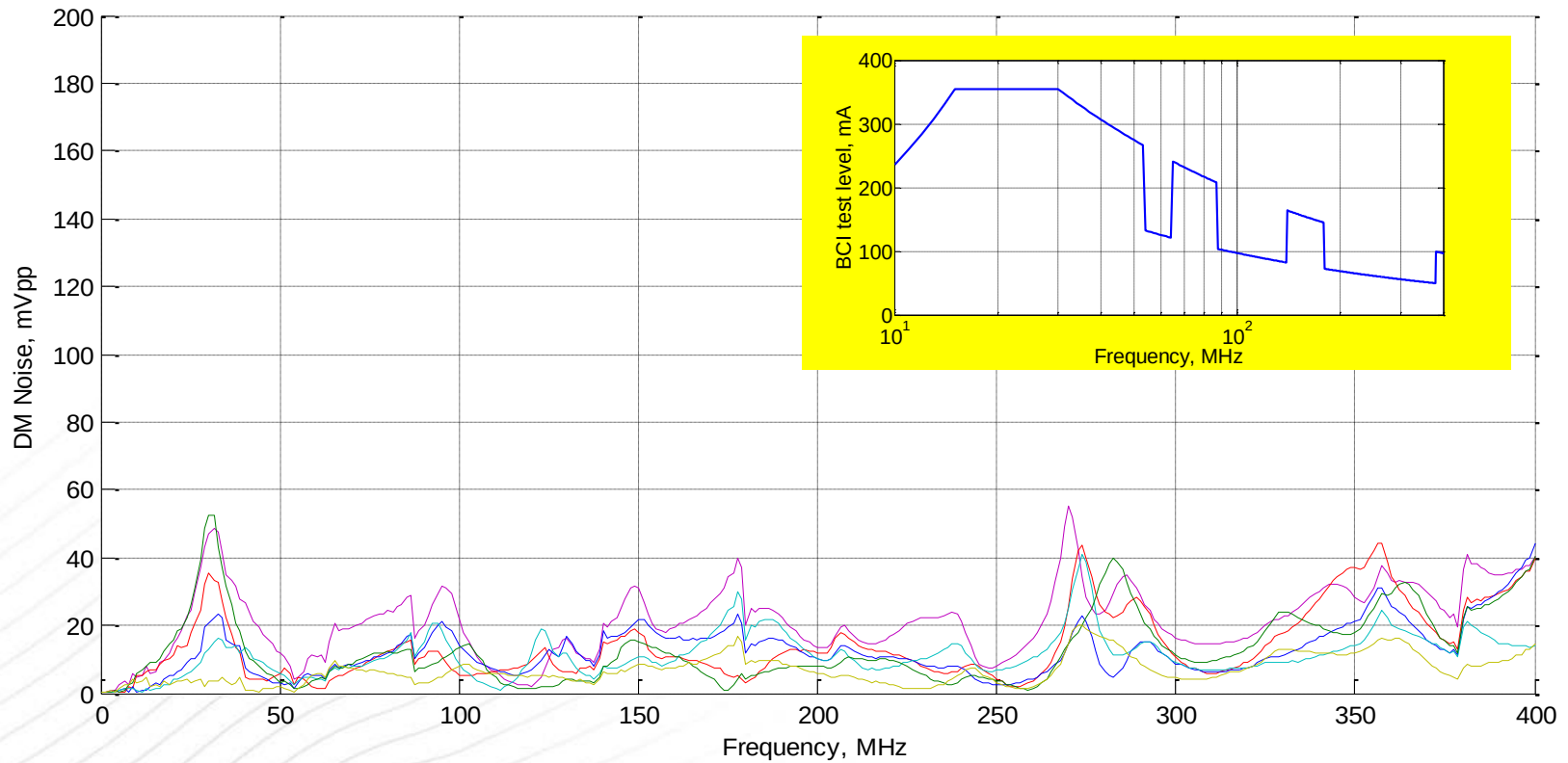
Mode Conversion for Sample Set-2



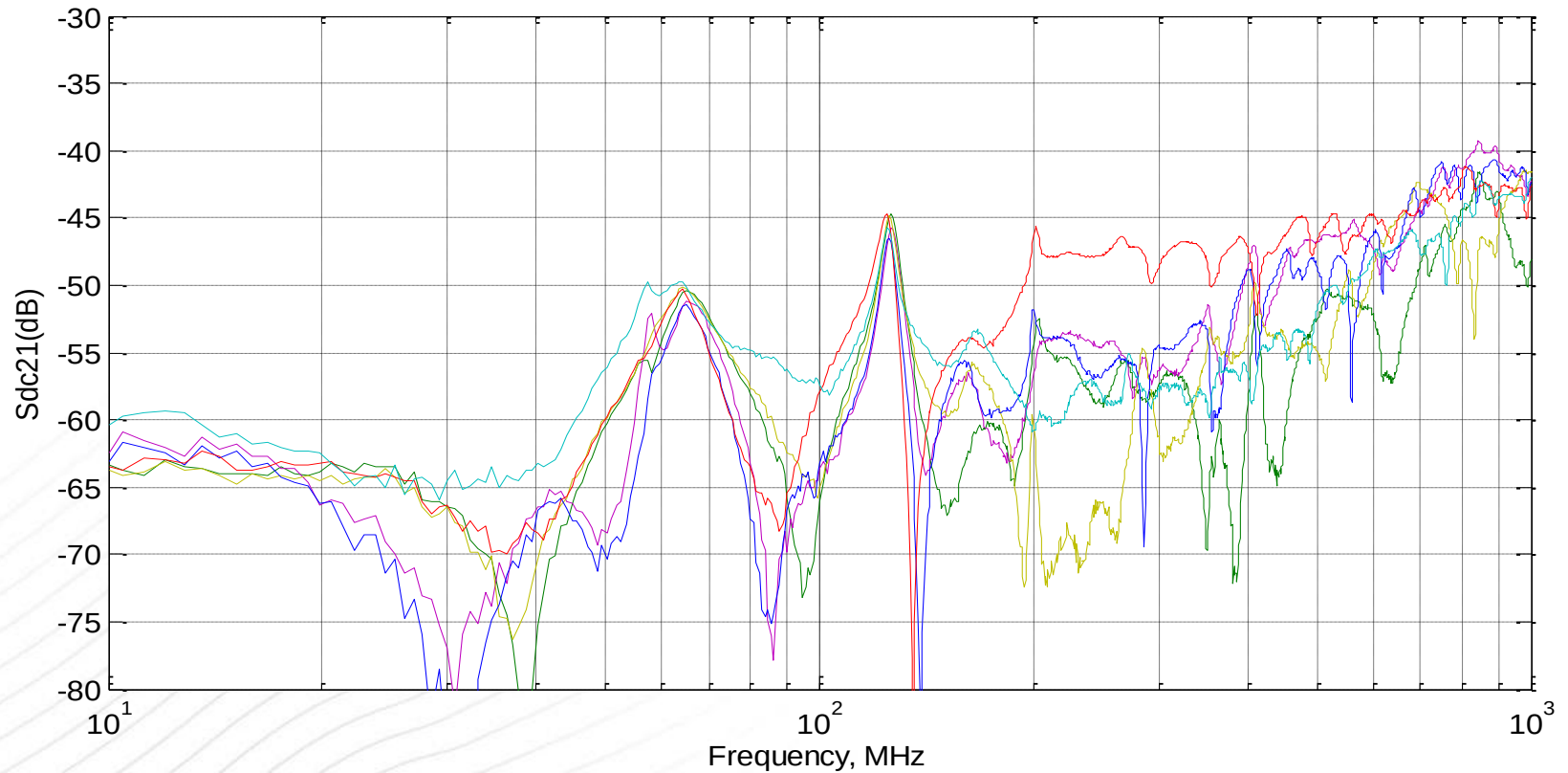
DM Noise for Sample Set-2 (OEM Mask-1)



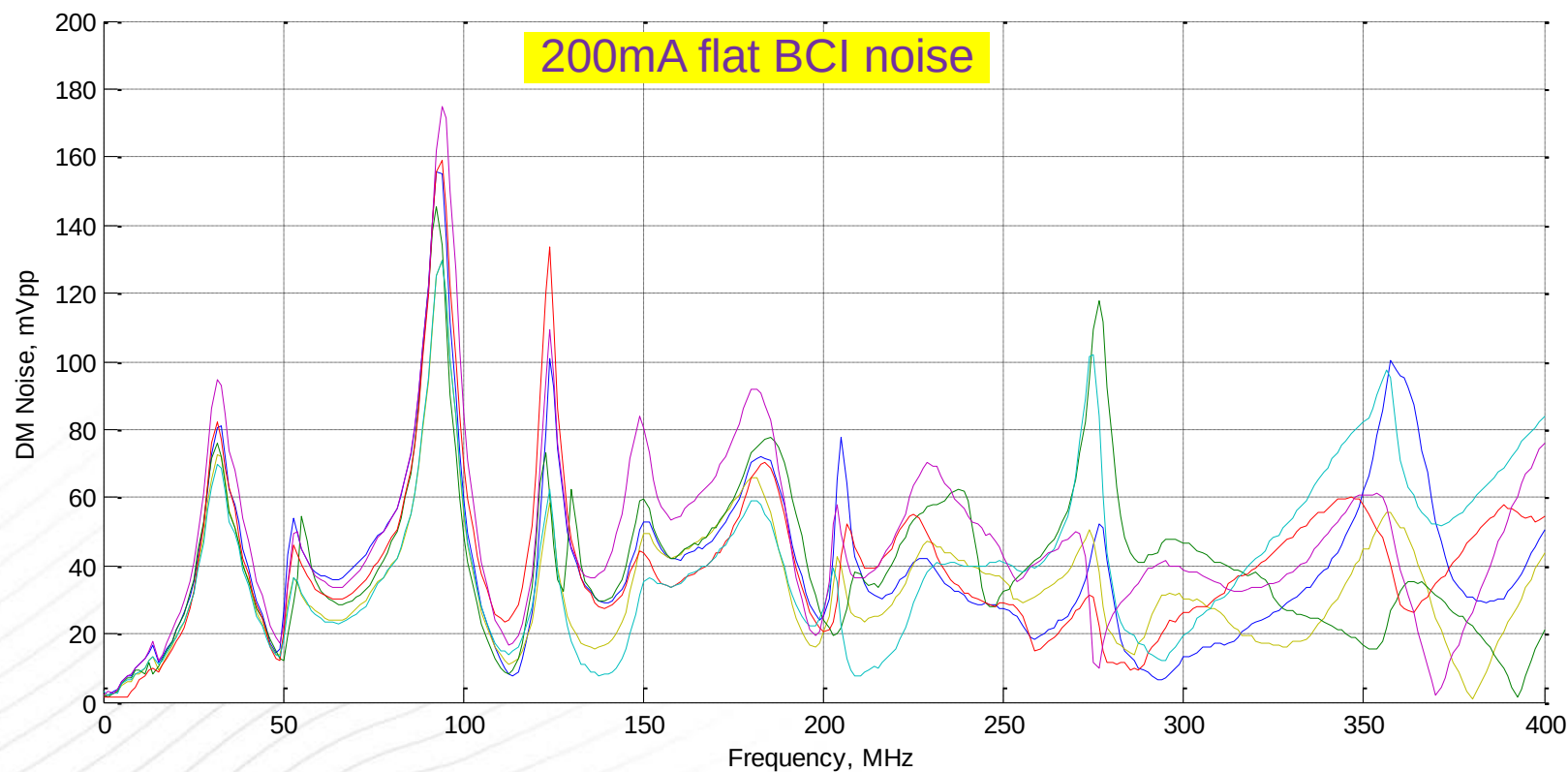
DM Noise for Sample Set-2 (OEM Mask-2)



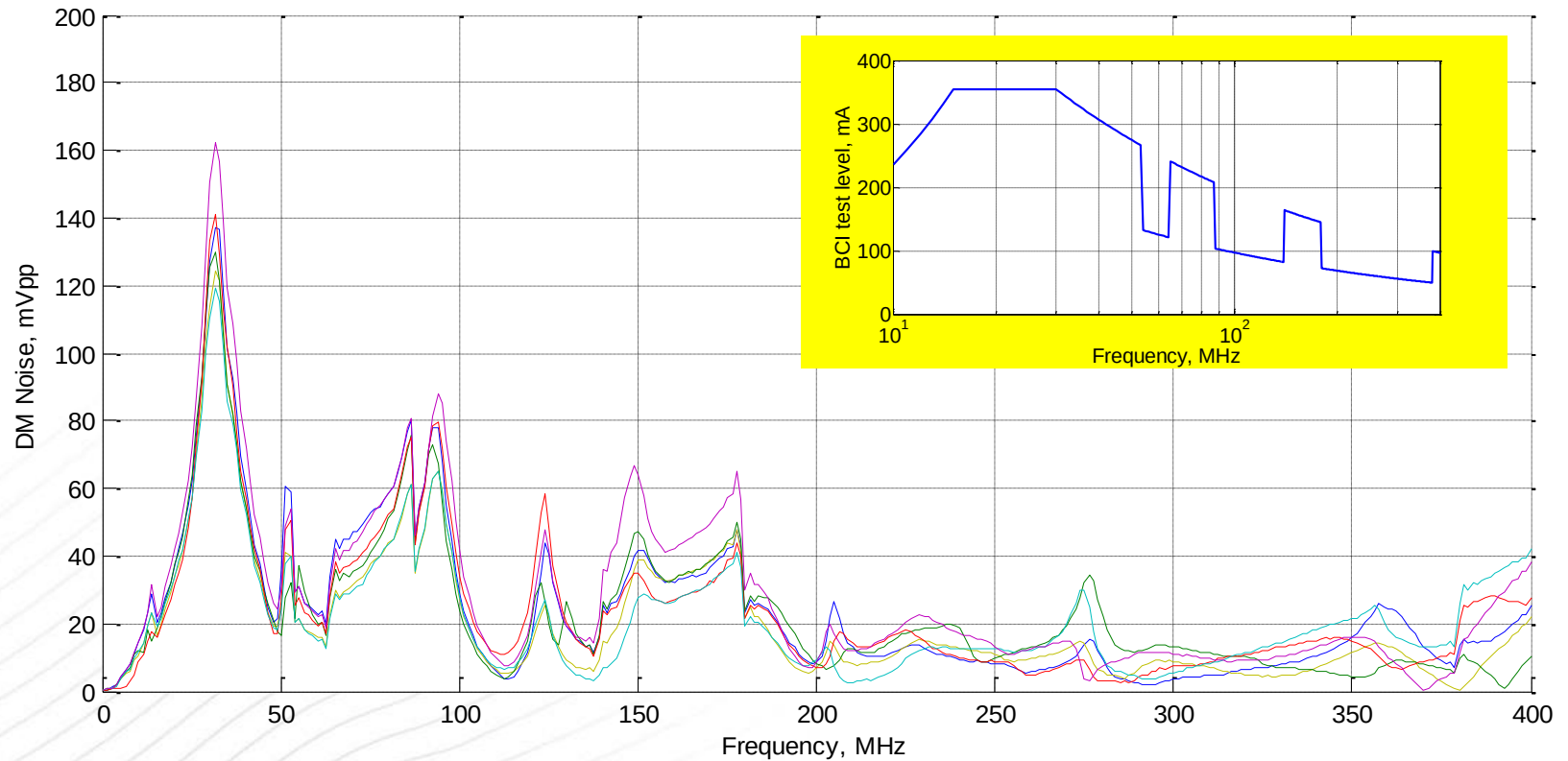
Mode Conversion for Sample Set-3



DM Noise for Sample Set-3 (OEM Mask-1)



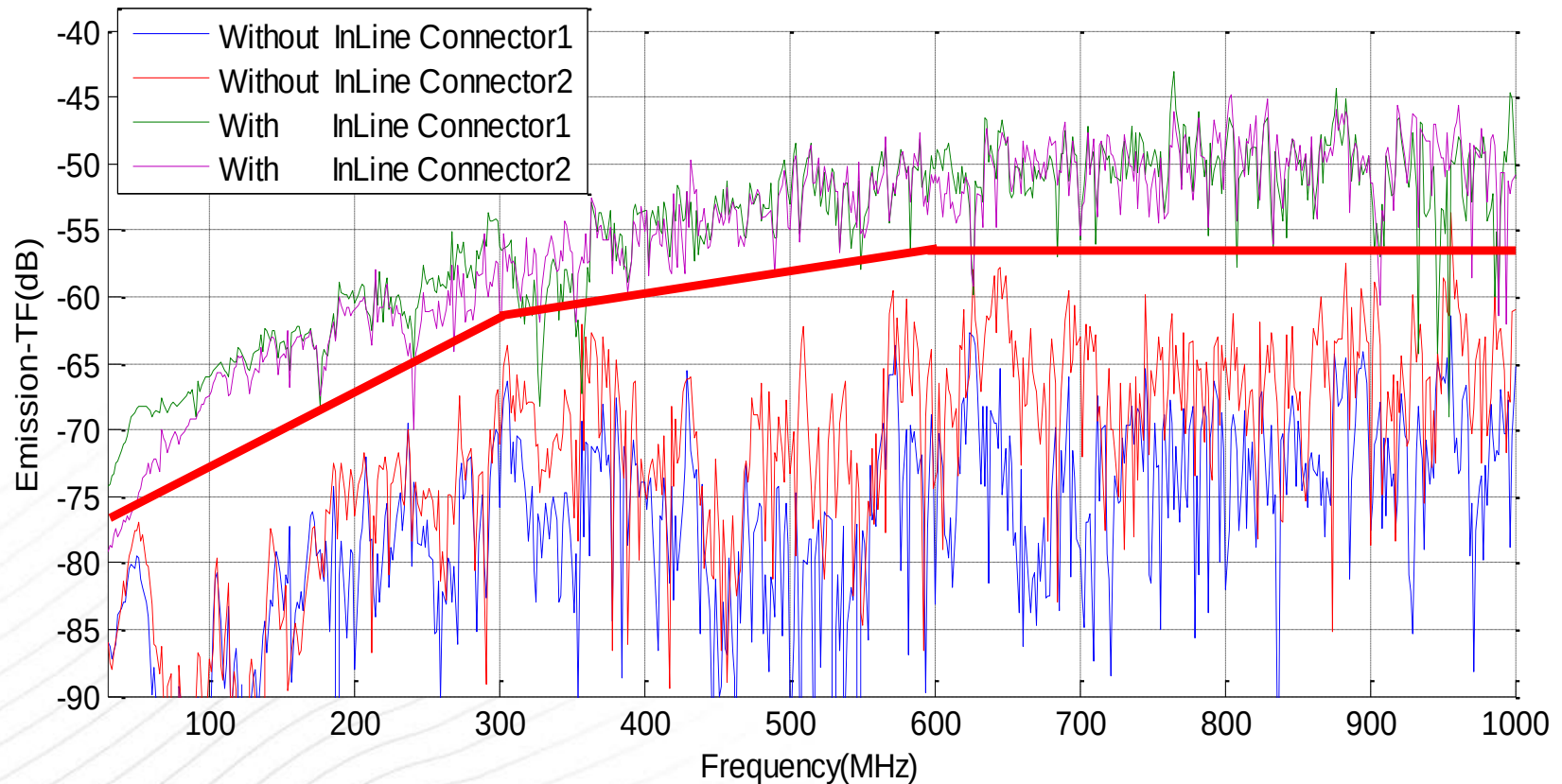
DM Noise for Sample Set-3 (OEM Mask-2)



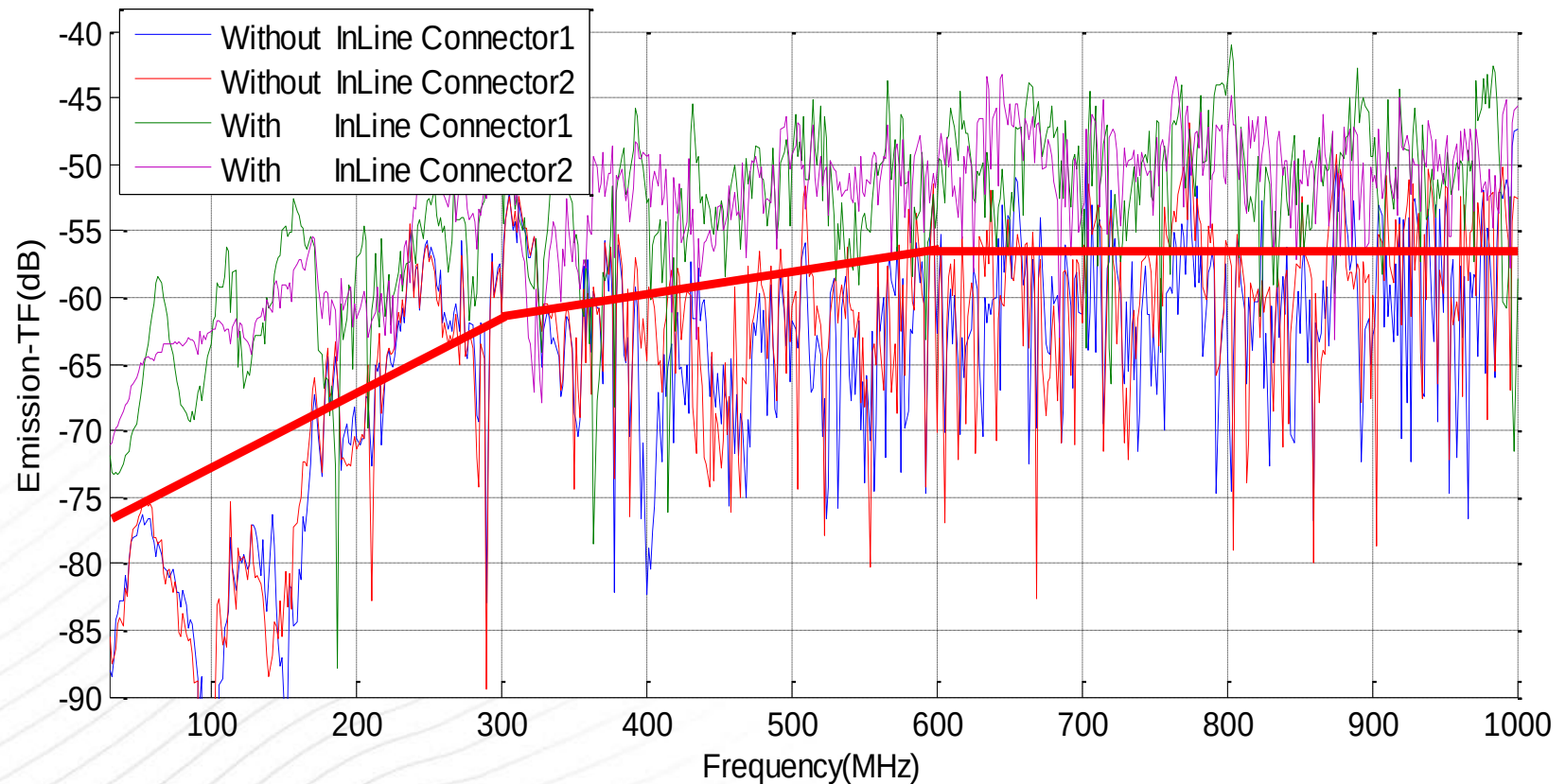
How about the connectors?



Emission Transfer Function for Sample Set-1



Emission Transfer Function for Sample Set-2



How about the magnetics?

Mode Conversion for Sample CMCs

