MDI Mode Conversion Limit for 1000BASE-T1

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Ahmad Chini, Mehmet Tazebay

Broadcom Corporation

Foreword

- Mode conversion limit line was extensively studied in 1000BASE-T1 task force in order to meet certain emission and immunity requirements.

- For link segment, the limit line is already defined in the text of the latest draft D2.1 in sub-clause 97.5.6.1.4.

- The limit for MDI is not reflected in the text of the standard draft D2.1. It is suggested a limit line is established for MDI mode conversion corresponding to component limit line of tazebay_3bp_01a_0913.pdf (page 7).

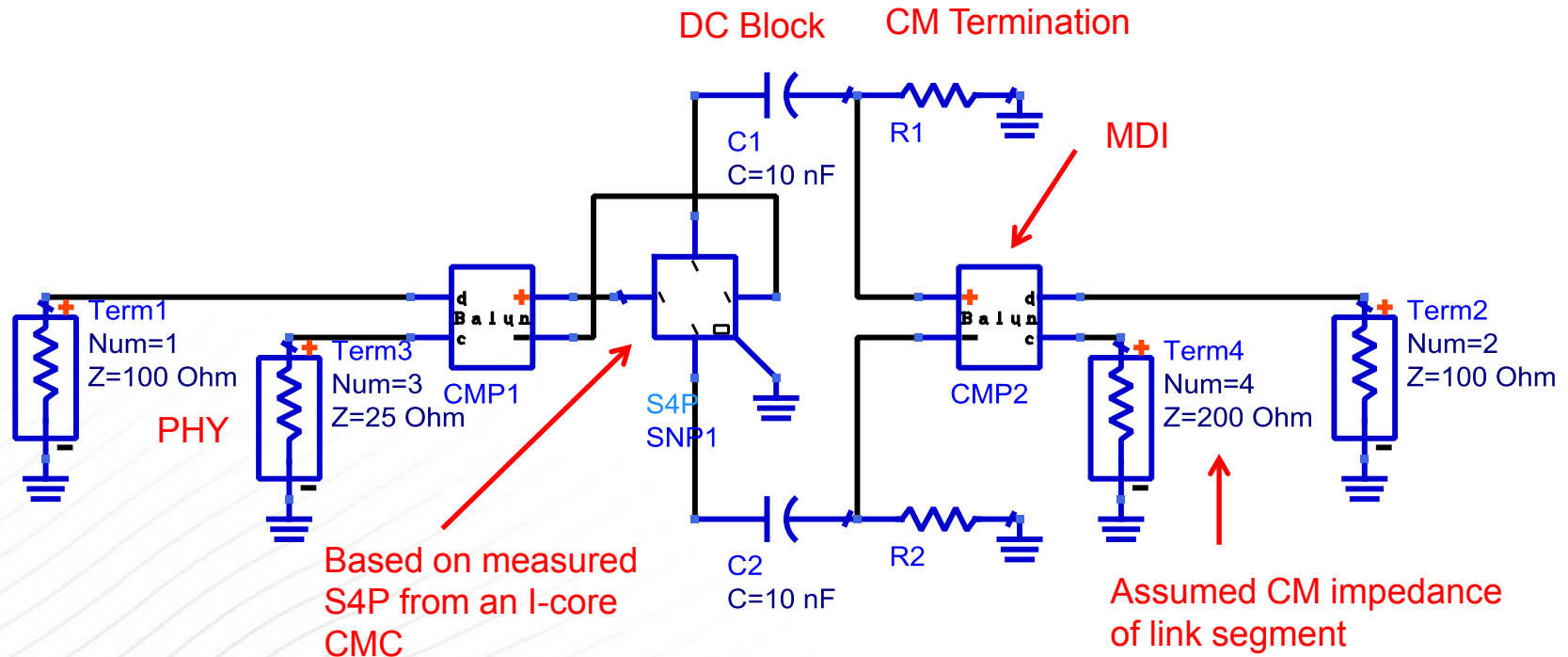# Mode Conversion Limit Line for Component Level

See page 7 in tazebay_3bp_01a_0913.pdf
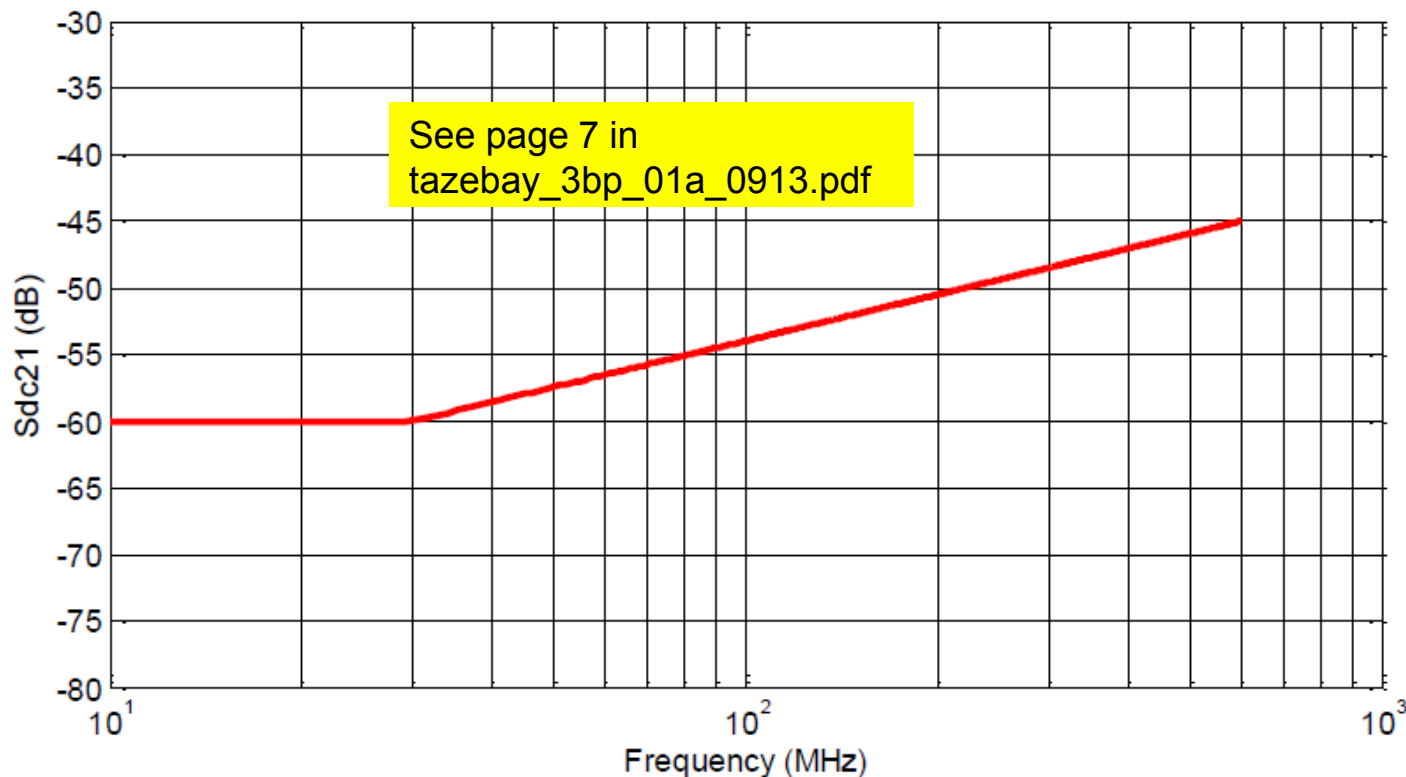
$$-60_{dB} \qquad 10 < f_{MHz} < 30$$

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

# Analysis of MDI Mode conversion in ADS

Mode Conversion measured on 25Ω CM impedance
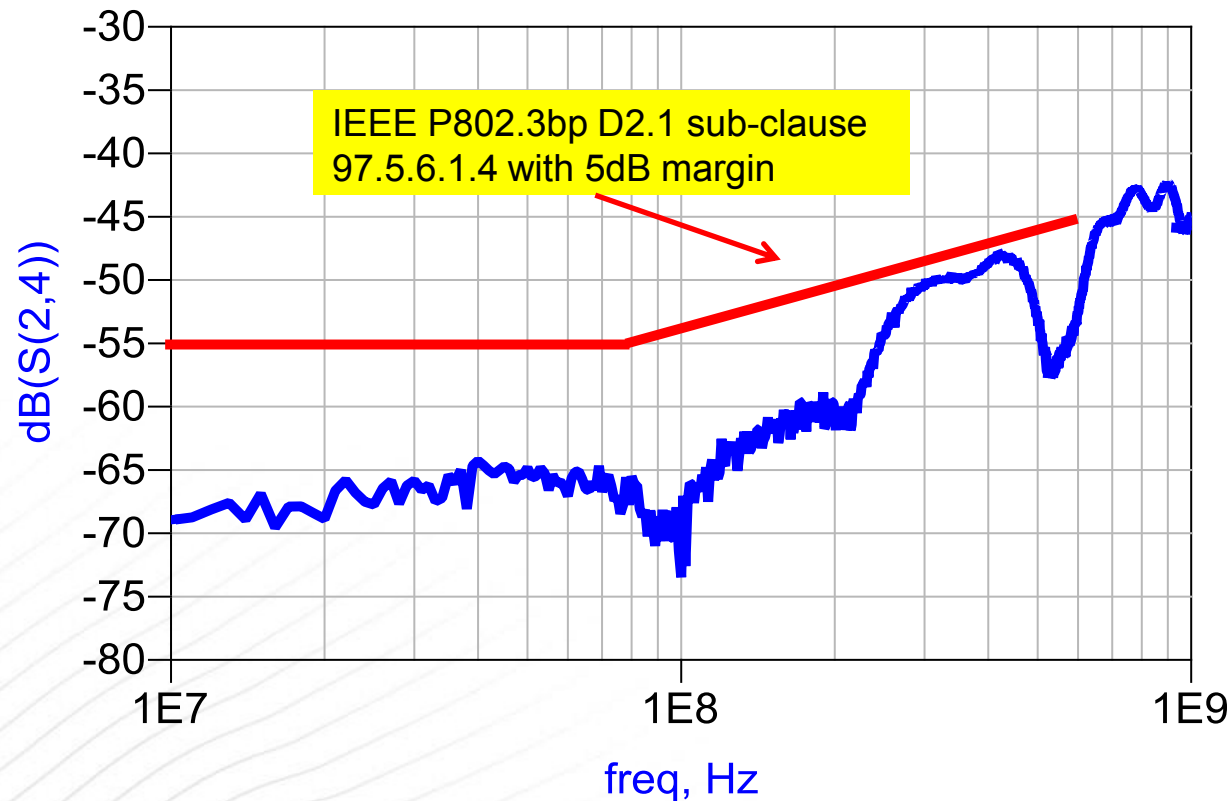
- The red limit line assumed above matches component level mode conversion suggested in tazebay_3bp_01a_0913.pdf for frequencies above 80MHz and relaxed by 5dB for frequencies below 80MHz.

Mode Conversion measured on 200Ω CM impedance

IEEE P802.3bp D2.1 sub-clause 97.5.6.1.4 with 5dB margin
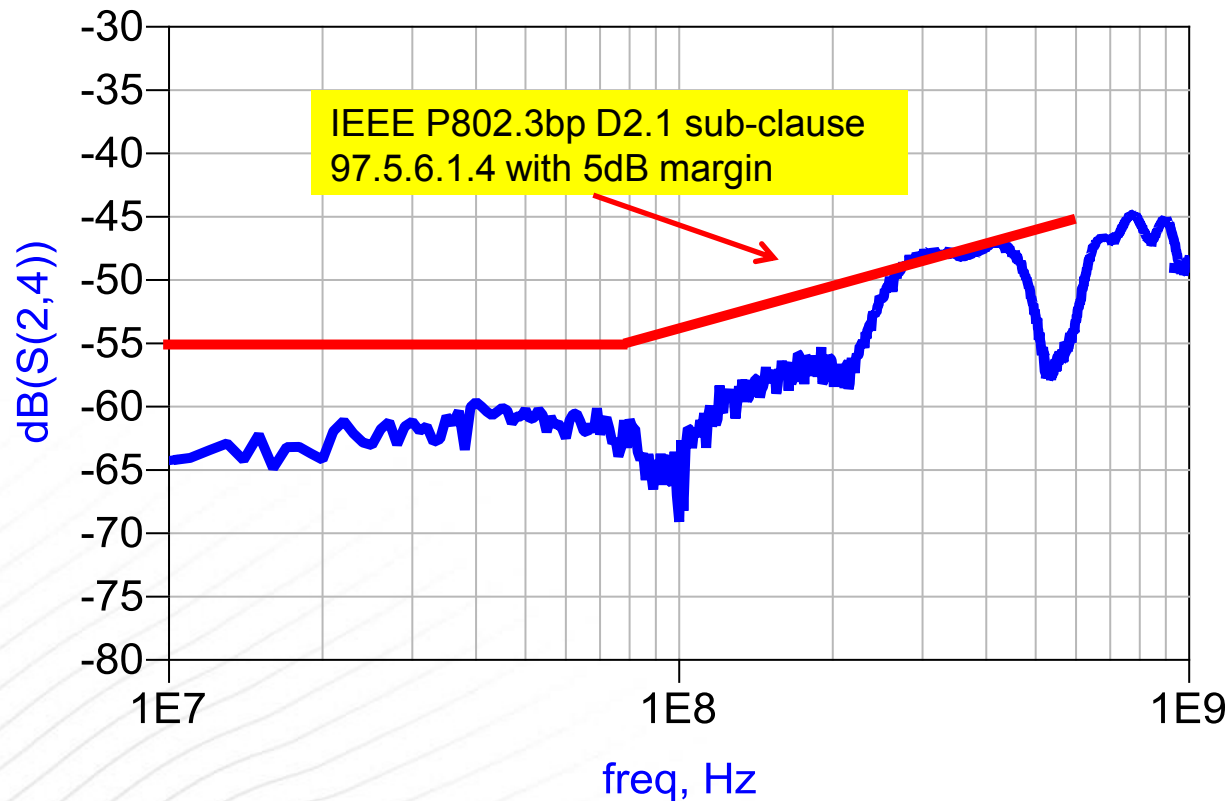
- Mode conversion is worse when measured on 200Ω CM termination compared to the case of 25Ω standard termination.

Mode Conversion measured on 200Ω CM impedance and 1% CM termination mismatch
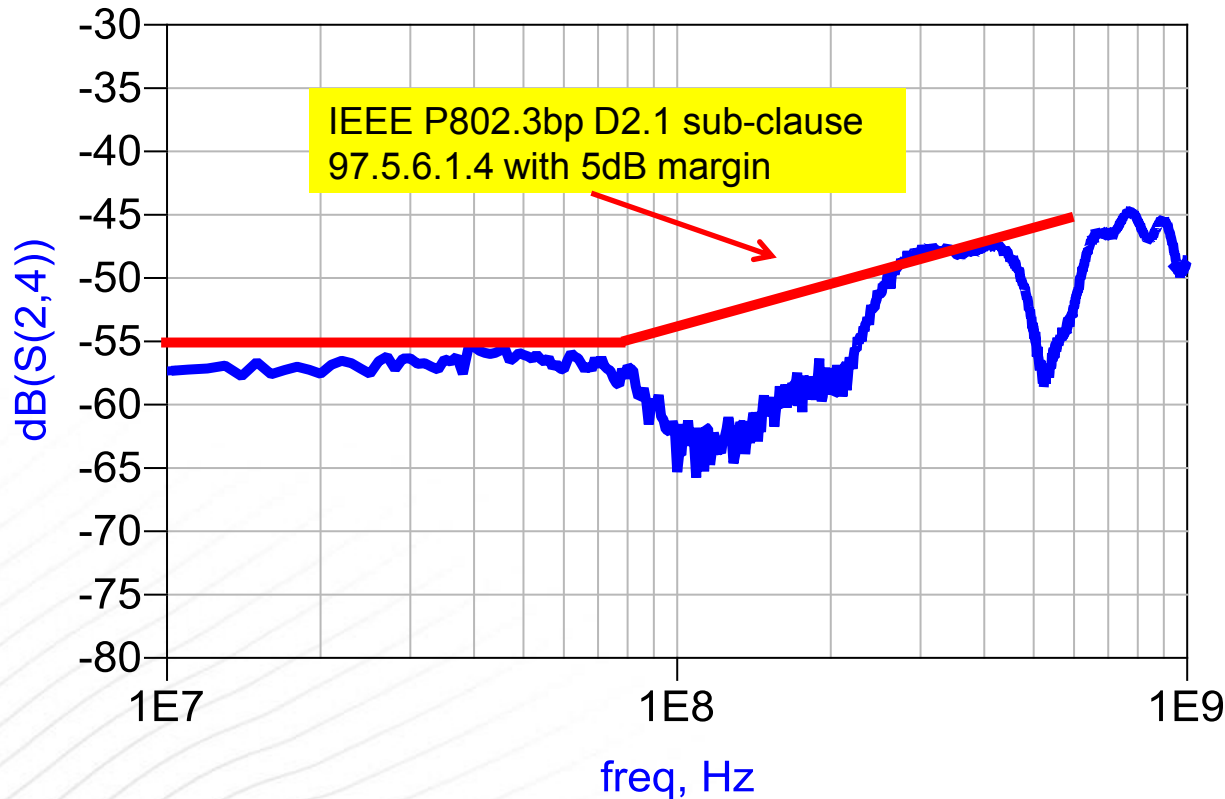
- Mode conversion when measured on 200Ω CM termination and with1% error in CM termination between the two wires.

Mode Conversion from a different manufacturer
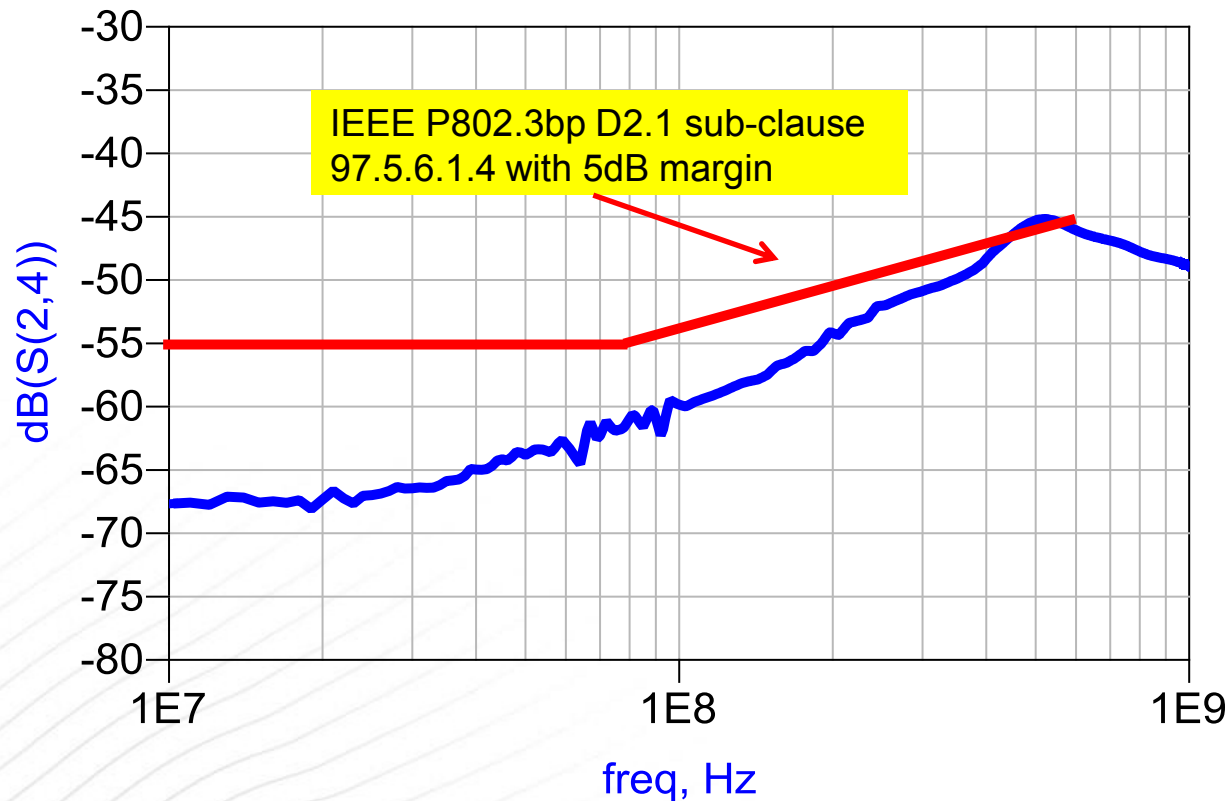
- Sample CMC data is from a different manufacturer
- Mode conversion when measured on 200Ω CM termination and with 1% error in CM termination between the two wires.

Summary

- For a robust UTP operation, an MDI mode conversion limit line is necessary.

- A limit line is suggested for MDI mode conversion in 1000BASE-T1 type A link segment.

- The limit has 5dB margin over the link segment limit line of sub-clause 97.5.6.1.4 in IEEE P802.3bp D2.1.

- Early samples of CMC designed for 1000BASE-T1 are marginal for the suggested mode conversion limit line.

- Request is made to manufacturers and the work is in progress for improved and consistent mode conversion performance.