

Review on 10BASE-T1S Multidrop Emission and Immunity Requirements

Sujan Pandey
NXP Semiconductors

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Problem Statement

- Adopted mode conversion limit proposed in [DiBiaso_Bergner_01c_0917.pdf](#) violates the emission for the TX-PSD mask [beruto_3cg_02a_117.pdf](#) that is being discussed in task force
- Adopted mode conversion limit also violates the immunity
- A common set of parameters for the PHY immunity evaluation

Objectives

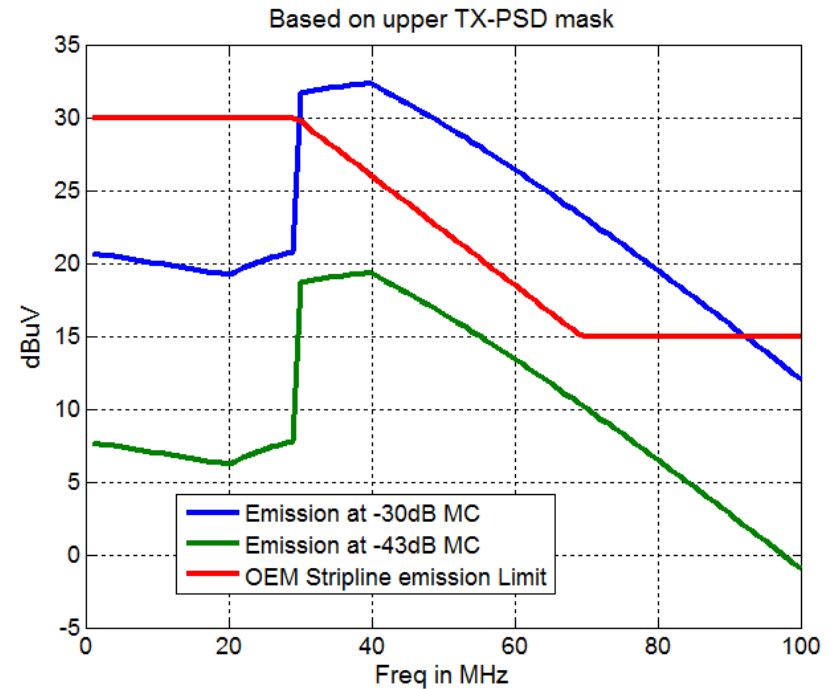
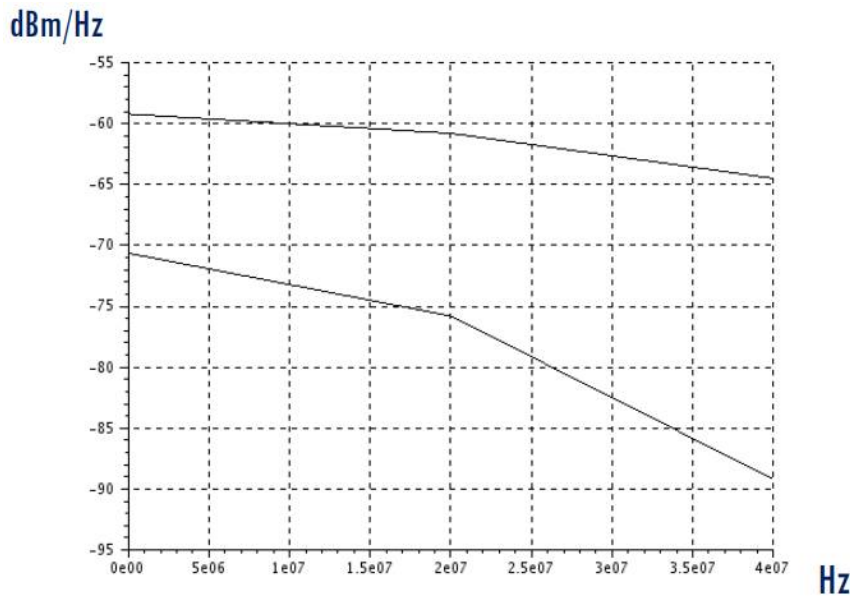
- Needs better than -30dB mode conversion of channel for 10BASE-T1S to meet the automotive EMC requirements
- Agree on a common set of parameters for PHY level immunity check

Outline

- Emission requirement
- Immunity requirement
- 10BASE-T1S multidrop simulation
- Summary

Emission Requirement

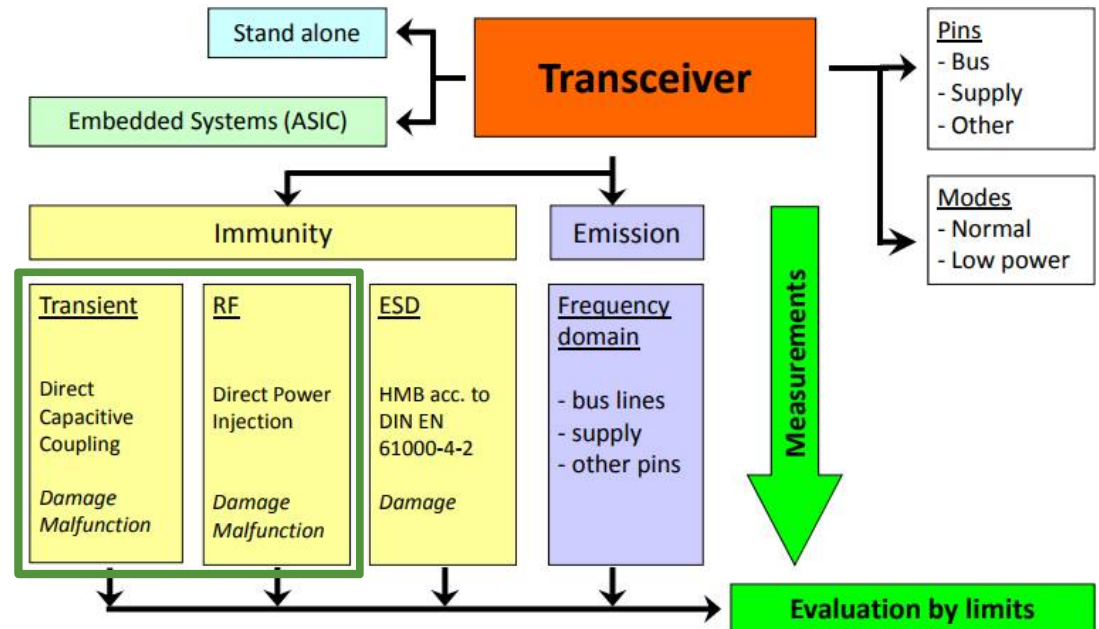
- TX-PSD mask and mode conversion limit is taken from [beruto_3cg_02a_117.pdf](#)
- Stripline emission requirement for automotive from 0.5MHz to 1GHz



Current TX-PSD mask with -30dB mode conversion (MC) does not meet the emission requirement! Needs cable/connector with better mode conversion

Most Relevant Immunity Tests for Automotive

- Direct capacitive coupling (ISO 7637-3)
 - impulse noise
- Bulk current injection (ISO 11452-4) at ECU level
 - DUT of 1m length
 - 1MHz – 400MHz
 - Current = [50mA, 200mA]
- Direct power injection (DPI) at transceiver level
 - 36dBm forward power [bunlon_3bp_01_0713.pdf]
 - 1 MHz – 1 GHz



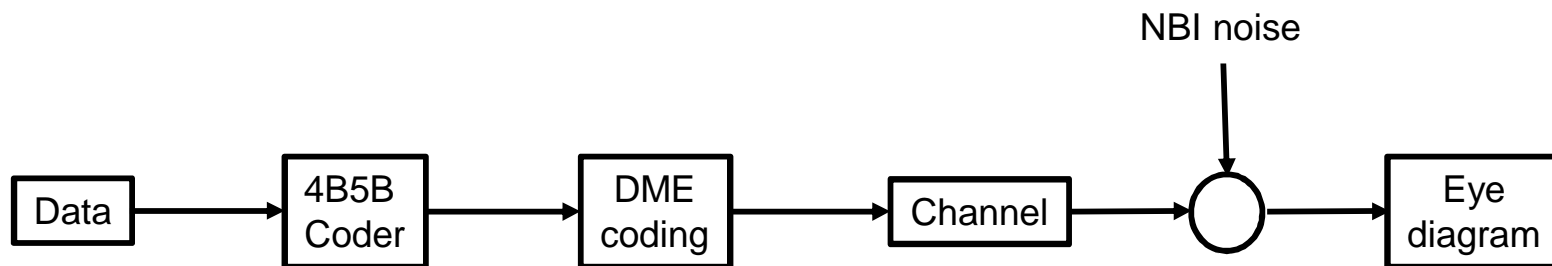
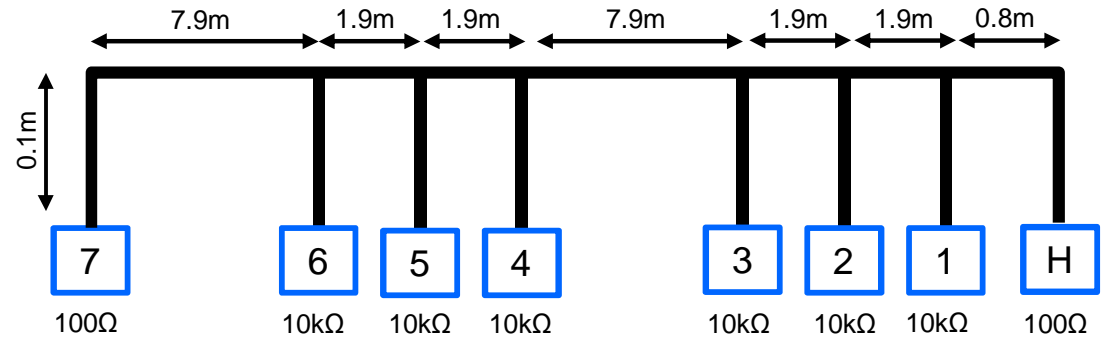
source: Stefan Buntz [buntz_01_0512.pdf]

Stefan Buntz, Daimler AG, "Technical feasibility: How to ensure EMC by measurement", May 2014.
 Renault S. A. S., "Review of Main Automotive EMC Test Requirements Relevant to RTPGE" July, 2013.



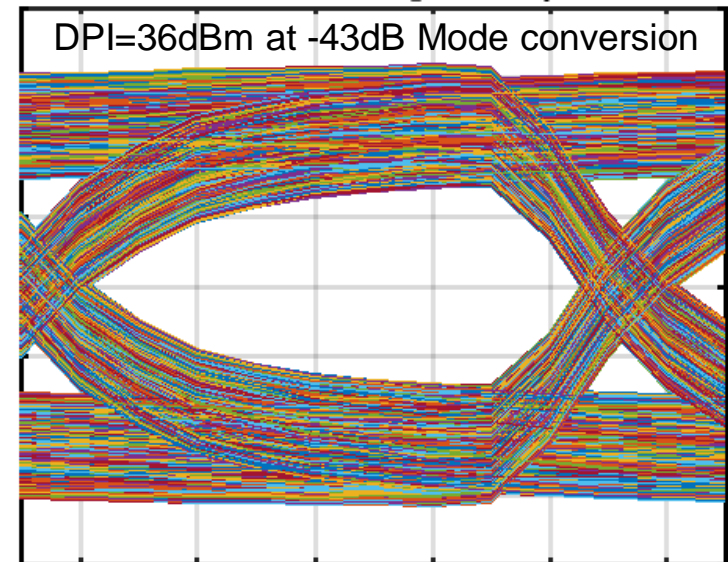
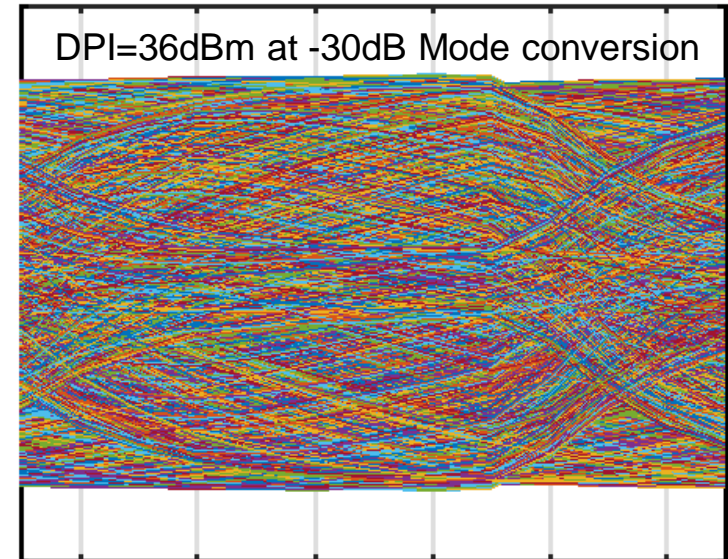
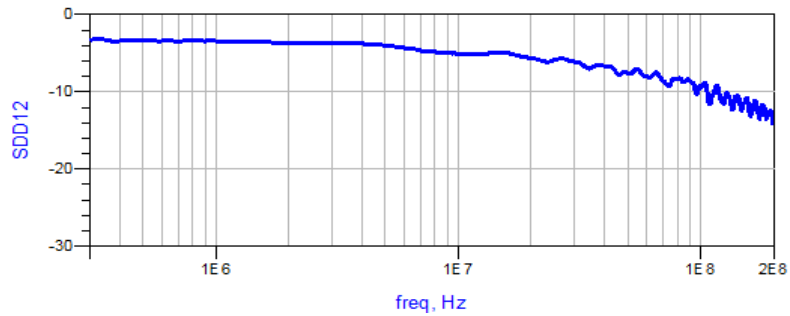
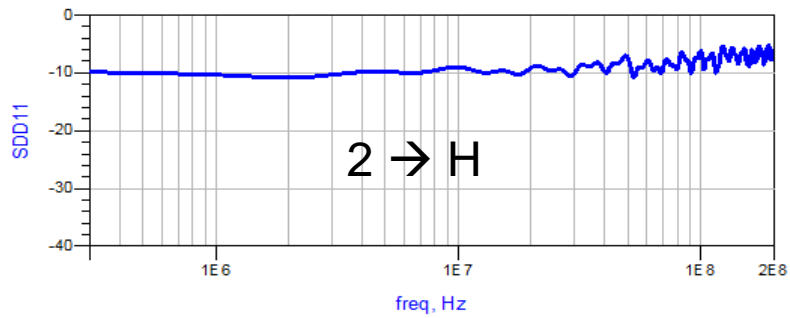
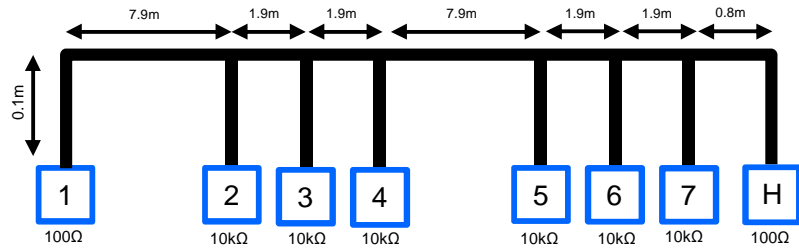
10BASE-T1 Multidrop PHY Simulation

- Transmitter
 - 4B5B encoder
 - 1Vpp DME line coding
- Receiver
 - Slicer
 - 4B5B decoder
- Channel 100BASE-T1 cable
 - Passive linear topology
 - 25m with 8 nodes [buntz_10SPE_05b_0329.pdf]



25m Network with 8 Nodes

- Direct power injection (DPI) = 36dBm



Summary

- Channel with -30dB mode conversion limit violates automotive emission as well as immunity requirements
- Immunity test parameters such as BCI and impulse noises limit need to be agreed for the further simulation
- Recommendations
 - Adopt new mode conversion limit better than -30dB mode conversion
 - Need to agree on BCI limit and impulse noise for immunity limit



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