TX-PSD for PAM-M for Multi-Gig Automotive PHY and TX-PSD MASK

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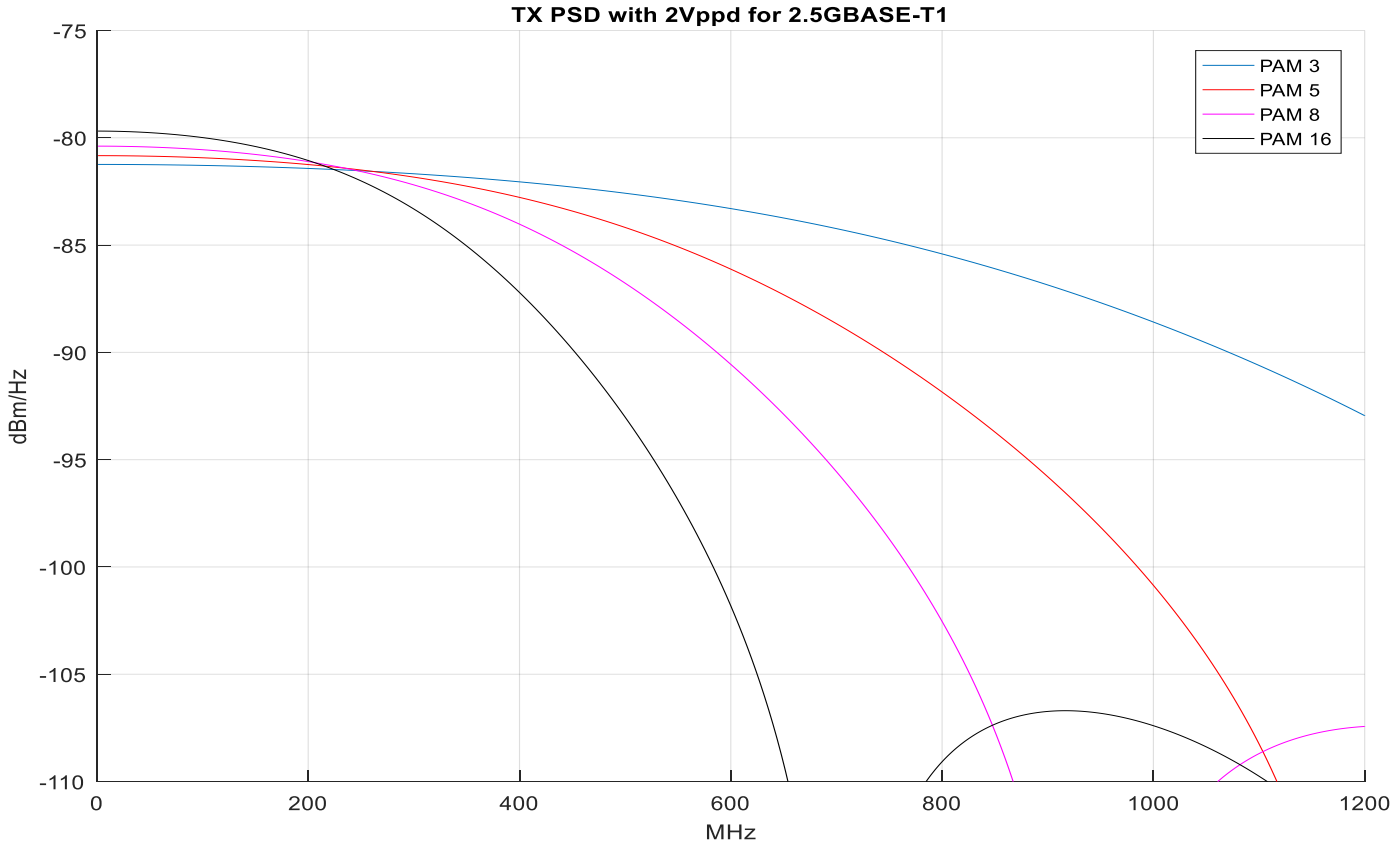
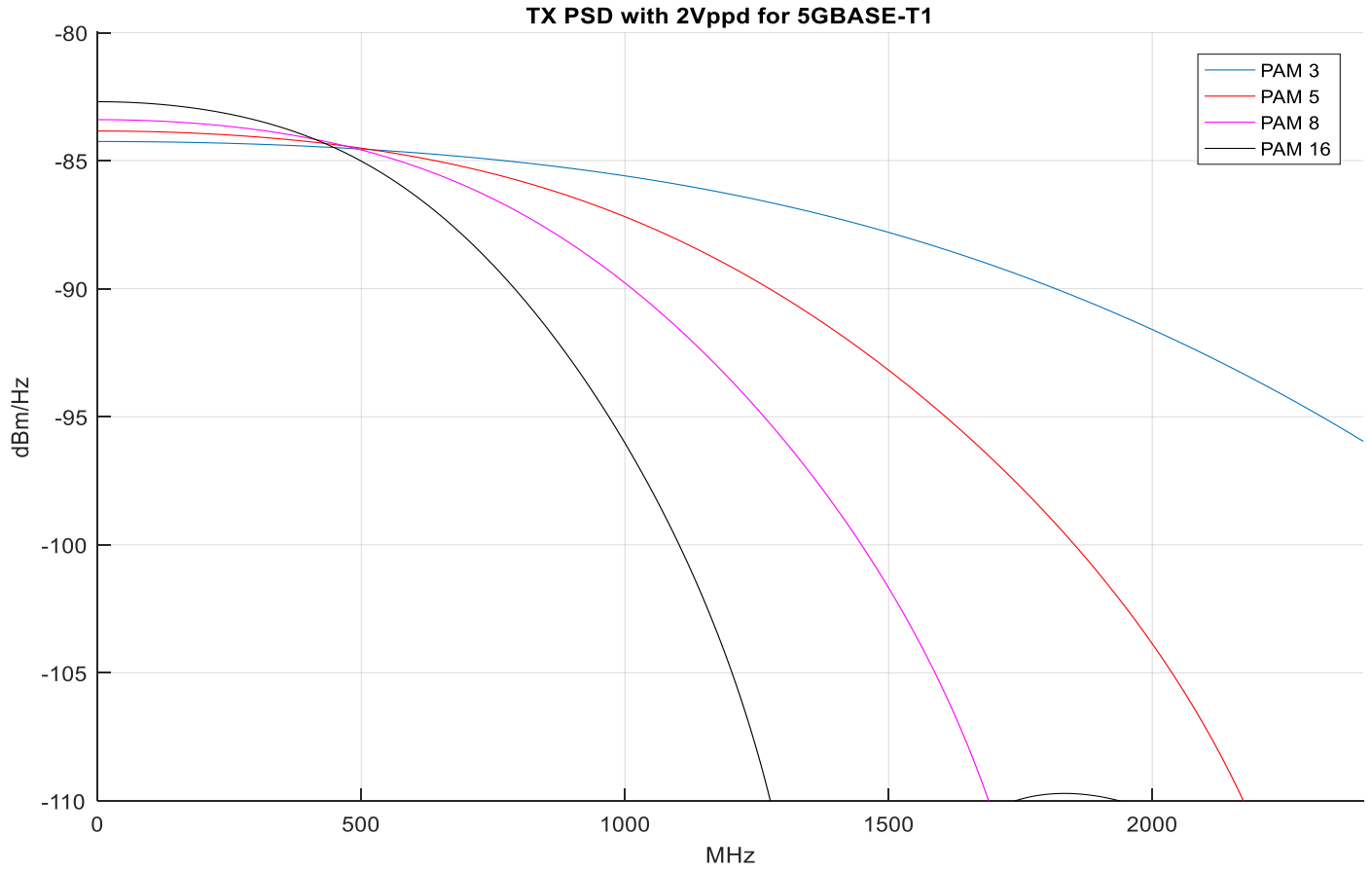
Overview

- TX PSD for PAM-M signals are investigated for 2.5G/5G and10GBASE-T1 cases
  - With 2Vppd and 1Vppd transmit level
  - TX filtering added to shape at higher frequency band
  - 12.5 percent overhead added at Baud rate for bits mapping and coding
  - Further Pulse shaping can be added with partial response filter
- TX-PSD topic was addressed earlier and a TX-PSD MASK has been given
  - http://www.ieee802.org/3/ch/public/nov17/pandey_3ch_01_1117.pdf
  - http://www.ieee802.org/3/ch/public/jan18/pandey_3ch_01_0118.pdf
  - With the coupling attenuation transfer function reported, the proposed MASK needs to be modified

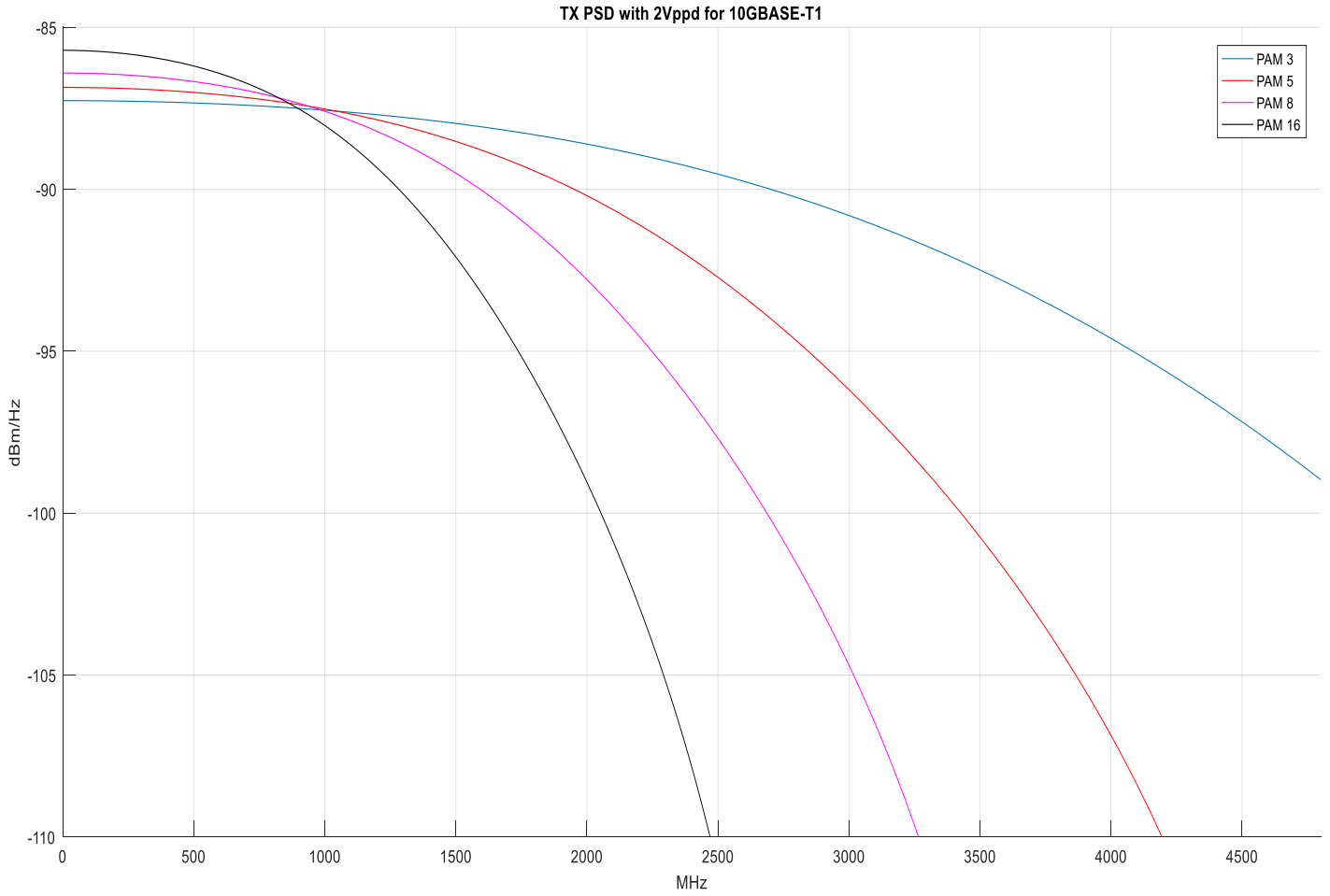
TX-PSD at 2.5GBASE-T1



TX-PSD at 5GBASE-T1



TX-PSD at 10GBASE-T1



TX-PSD MASK based on emission

- CISPR 25 provides emission limits for peak, quasi peak and average emissions.
- However, almost every OEM has its own limit for peak level emissions.
- In this presentation, based on a known OEM limit, a peak level of 15dBuV was chosen in the frequency range of up to 1GHz as emission limit.
- 10-15dB margin needs to be added to cover Peak to Average
- TX PSD Mask based on Emissions:
  - **TX MASK (dBuV) = Emission Limit (<=15dBuV) – Emission Transfer Function Mask (dB)***
  - **TX MASK (dBuV) = Emission Limit (<=15dBuV) – coupling attenuation(dB) (STP)**
  - **Using the balanced attenuation may be too conservative.**

http://www.ieee802.org/3/bp/public/jan13/tazebay_3bp_01a_0113.pdf

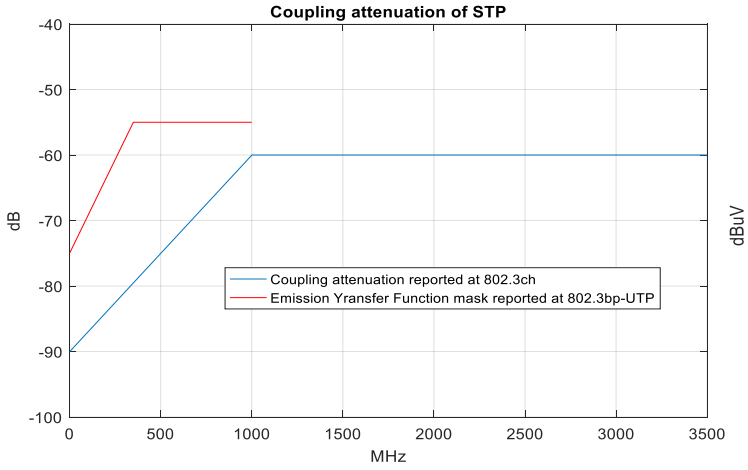
TX-PSD MASK

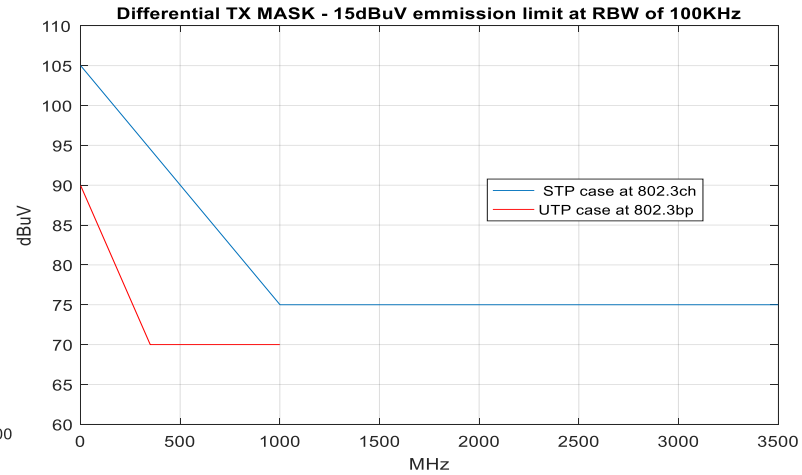
Coupling attenuation mask drawn from measurements reported in:

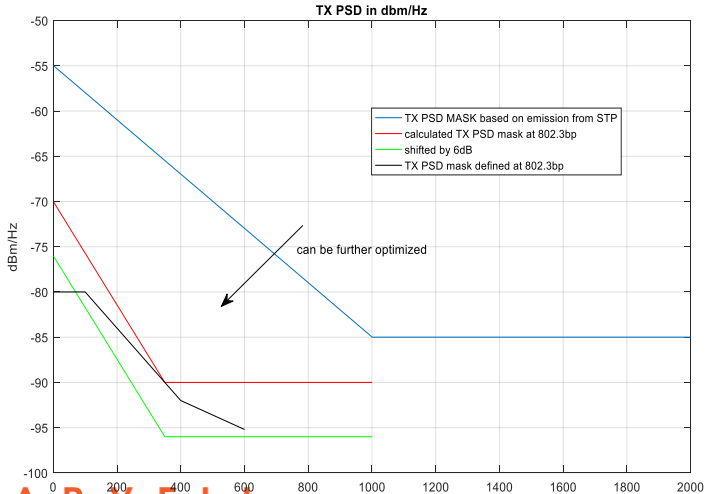
http://www.ieee802.org/3/ch/public/nov17/mueller_3ch_01_1117.pdf
http://www.ieee802.org/3/ch/public/nov17/DiBiaso_Bergner_3ch_01_1117.pdf
http://www.ieee802.org/3/bp/public/jan13/tazebay_3bp_01a_0113.pdf

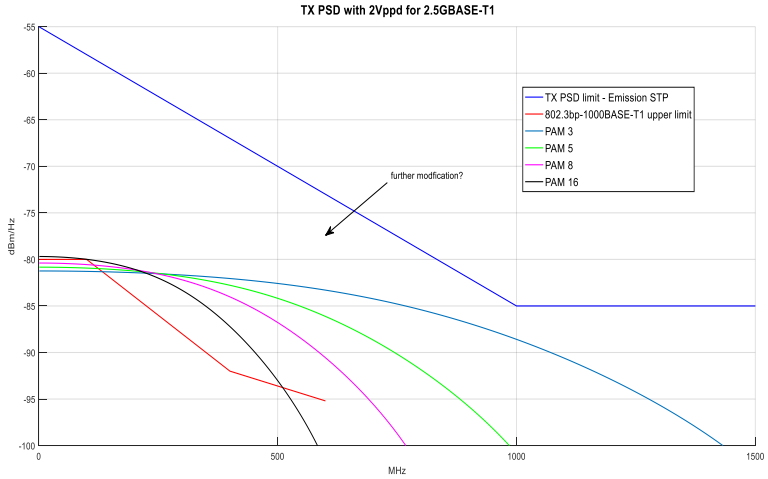
Coupling attenuation mask

TX transmit level with 15dBuv emission limit

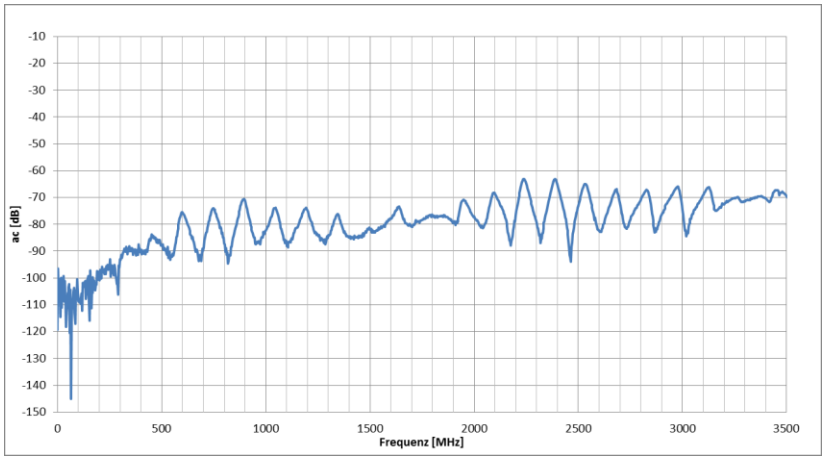






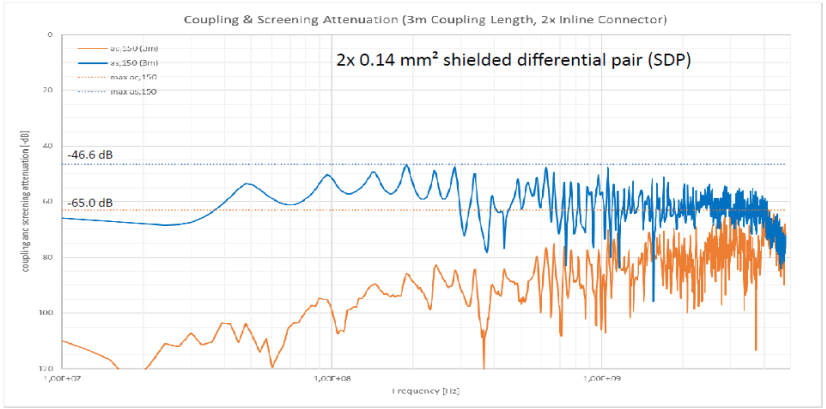


Reported Coupling attenuations:



http://www.ieee802.org/3/ch/public/nov17/mueller_3ch_01_1117.pdf/page 8 on STP

3m Coupling Length Test Results



http://www.ieee802.org/3/ch/public/nov17/DiBiaso_Bergner_3ch_01_1117.pdf/page6 on SDP

Conclusions:

- With coupling attenuation for STP/SDP presented earlier in 802.3ch meetings, for all speeds, 2Vppd should be used for transmit differential signal 2.5BASE-T1 and higher speeds.
- Coupling attenuation for STP/SDP is expected to be specified at task force
- TX-PSD MASK can be defined with margin for emission for STP assuming the quoted coupling attenuation performance.