Power Spectral Density (PSD) and MDI Return Loss for TDD Baseline

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Introduction

- It is well known in automotive industry that PAM2 gives better margin for ingress noise immunity for lower rates and shorter cables.
- There exist cable and connectors in the existing automotive imaging systems' ecosystem which can easily support PAM2 for 2.5Gbps & 5Gbps and PAM4 for 10Gbps.
- Therefore, the following modulation schemes are considered and proposed for 802.3dm project:

Bit Rate	Modulation	Baud Rate	Nyquist BW	Voltage, Vppd
2.5Gbps	PAM2	3Gsps	1.5GHz	0.7V
5Gbps	PAM2	6Gsps	3.0GHz	1.0V
10Gbps	PAM4	6Gsps	3.0GHz	1.0V

Transmitter Power and Power Spectral Density

- The PSD is specified for differential termination of 100Ω.
- For Single ended signaling terminated with 50Ω, PSD is lower by 3dB.

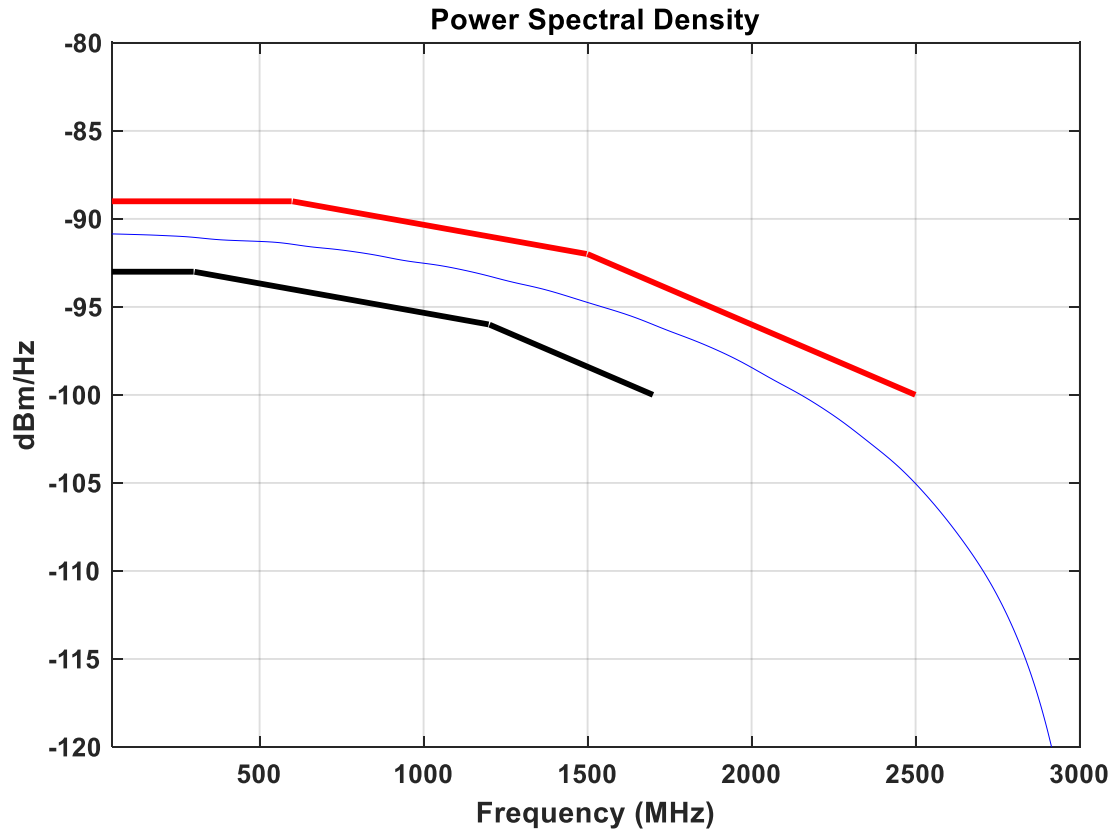
- **For 2.5Gbps operation (PAM2 w/3Gsps):**

Upper PSD MASK in dBm/Hz

-89	40MHz <f < 600MHz
-87-f(MHz)/300	600MHz < f < 1500MHz
-80-f(MHz)/125	1500MHz < f < 2500MHz

Lower PSD Mask in dBm/Hz

-93	40MHz <f < 300MHz
-92-f(MHz)/300	300MHz < f < 1200MHz
-86.4-f(MHz)/125	1200MHz < f < 1750MHz



Transmitter Power and Power Spectral Density (cntd.)

- The PSD is specified for differential termination of 100Ω.
- For Single ended signaling terminated with 50Ω, PSD is lower by 3dB.

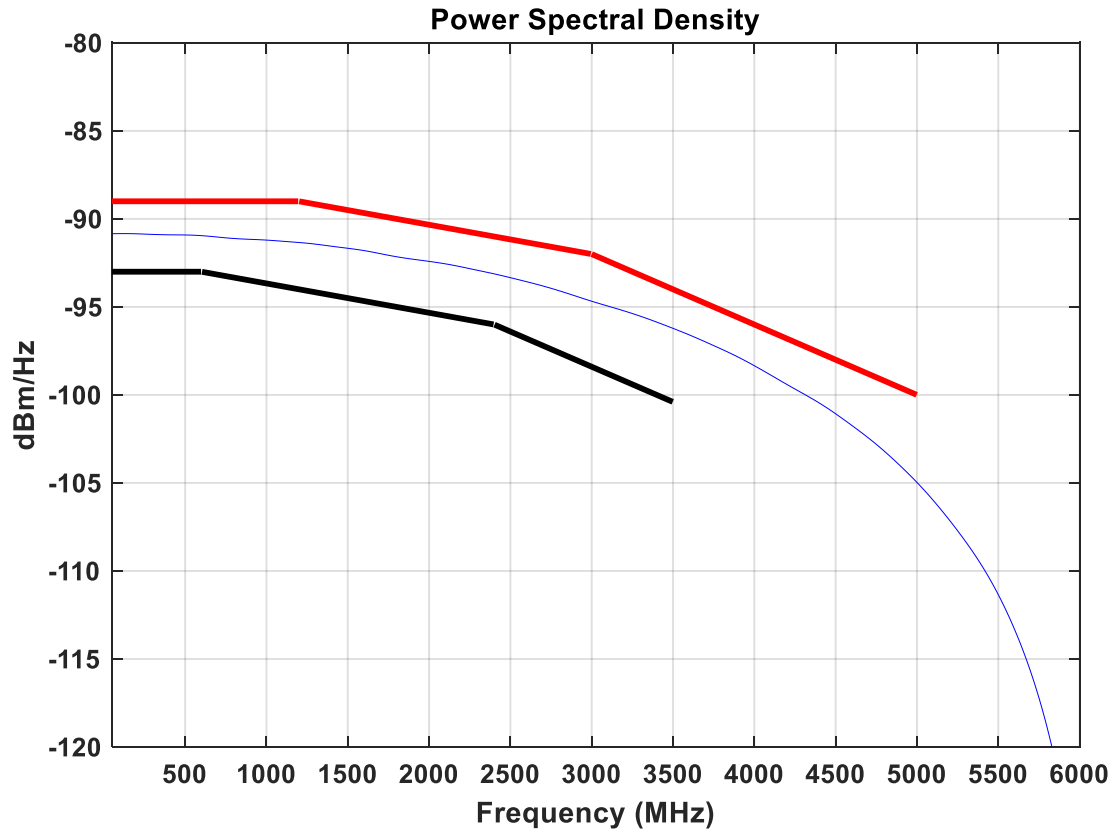
- **For 5Gbps operation (PAM2 w/6Gsps):**

Upper PSD MASK in dBm/Hz

-89	40MHz <f < 1200MHz
-87-f(MHz)/600	1200MHz < f < 3000MHz
-80-f(MHz)/250	3000MHz < f < 5000MHz

Lower PSD Mask in dBm/Hz

-93	40 <f < 600MHz
-92-f(MHz)/600	600MHz < f < 2400MHz
-86.4-f(MHz)/250	2400MHz < f < 3500MHz



Transmitter Power and Power Spectral Density (cntd.)

- The PSD is specified for differential termination of 100Ω.
- For Single ended signaling terminated with 50Ω, PSD is lower by 3dB.

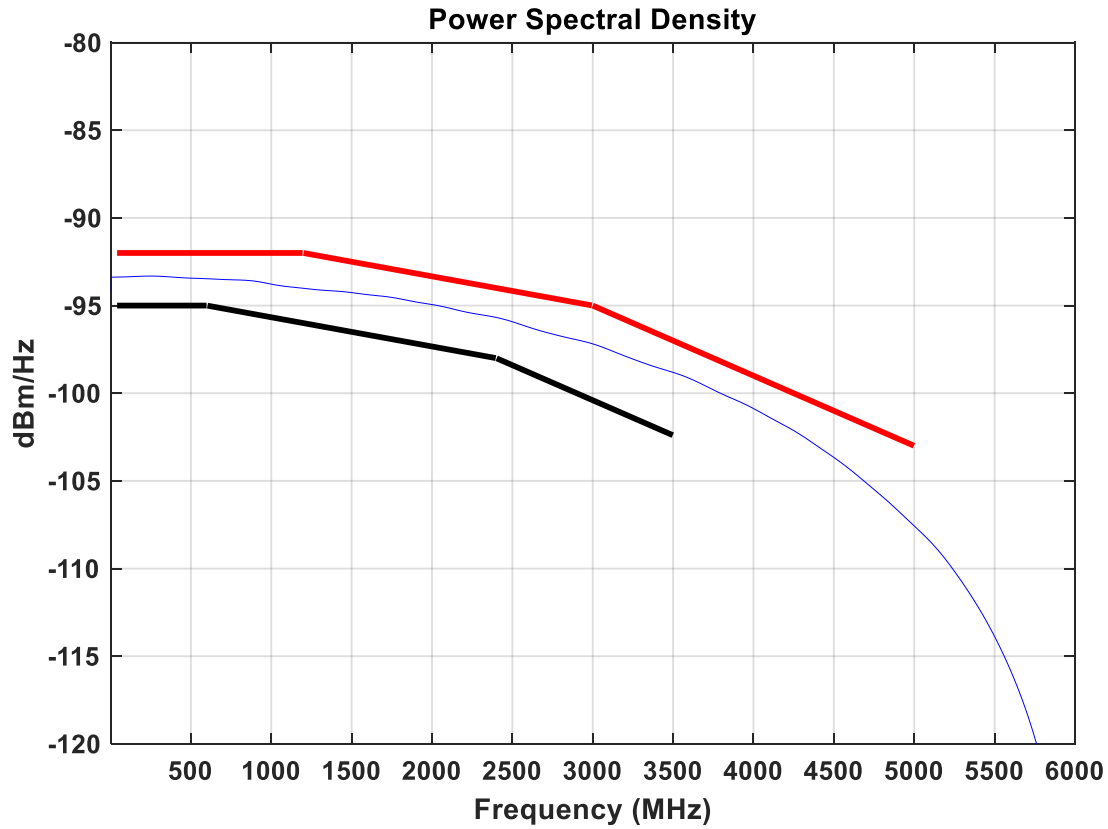
- **For 10Gbps operation (PAM4 w/6Gsps):**

Upper PSD MASK in dBm/Hz

-92	40MHz <f < 1200MHz
-90-f(MHz)/600	1200MHz < f < 3000MHz
-83-f(MHz)/250	3000MHz < f < 5000MHz

Lower PSD Mask in dBm/Hz

-95	40MHz <f < 600MHz
-94-f(MHz)/600	600MHz < f < 2400MHz
-88.4 –f(MHz)/250	2400MHz < f < 3500MHz



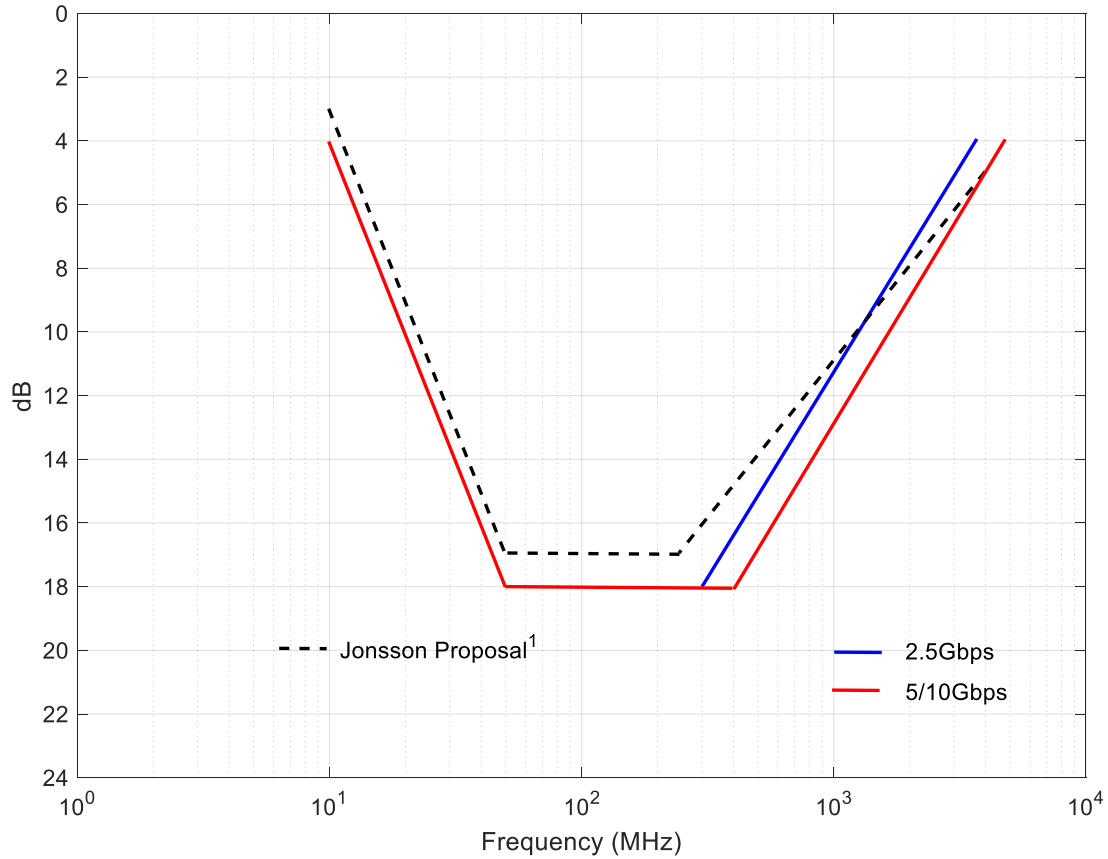
MDI Return Loss

- **For 2.5Gbps, MDI Return Loss is proposed as:**

$MDI\_RL =$	$(f \text{ in } MHz)$
$18-20*LOG10(50/f)$	$\ldots 10MHz < f \leq 50MHz$
18	$\ldots 50MHz < f \leq 300MHz$
$18-13*LOG10(f/300)$	$\ldots 300MHz < f \leq 3750MHz$

- **For 5/10Gbps, MDI Return Loss is proposed as:**

$MDI\_RL =$	$(f \text{ in } MHz)$
$18-20*LOG10(50/f)$	$\ldots 10MHz < f \leq 50MHz$
18	$\ldots 50MHz < f \leq 400MHz$
$18-13*LOG10(f/400)$	$\ldots 400MHz < f \leq 5000MHz$



- MDI RL is tentatively defined and needs to be verified for performance once channel spec is finalized.

1. https://www.ieee802.org/3/dm/public/adhoc/101024/jonsson_3dm_02_10_10_24.pdf

Thank you!