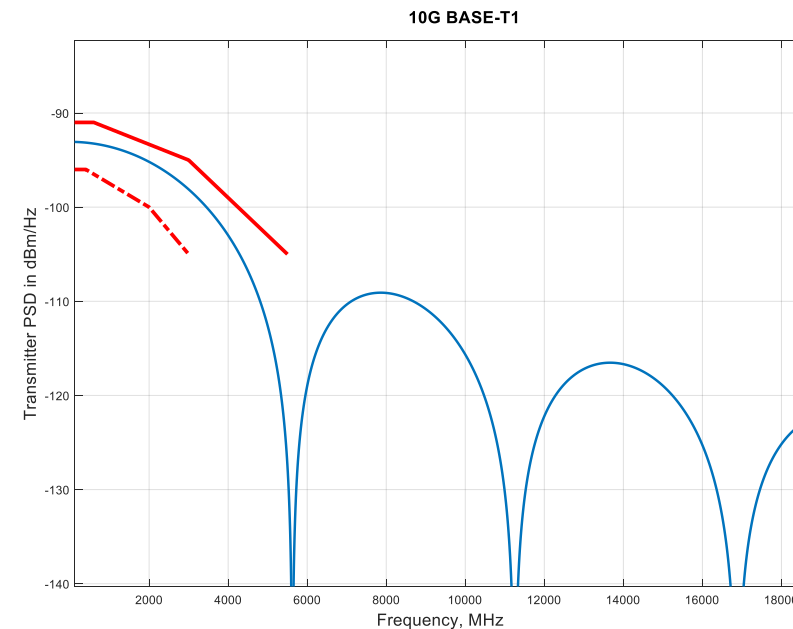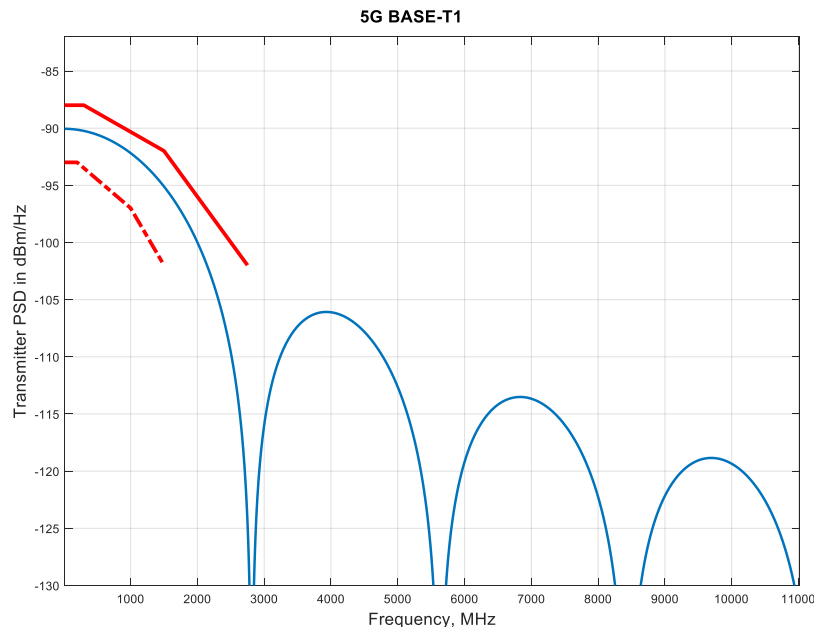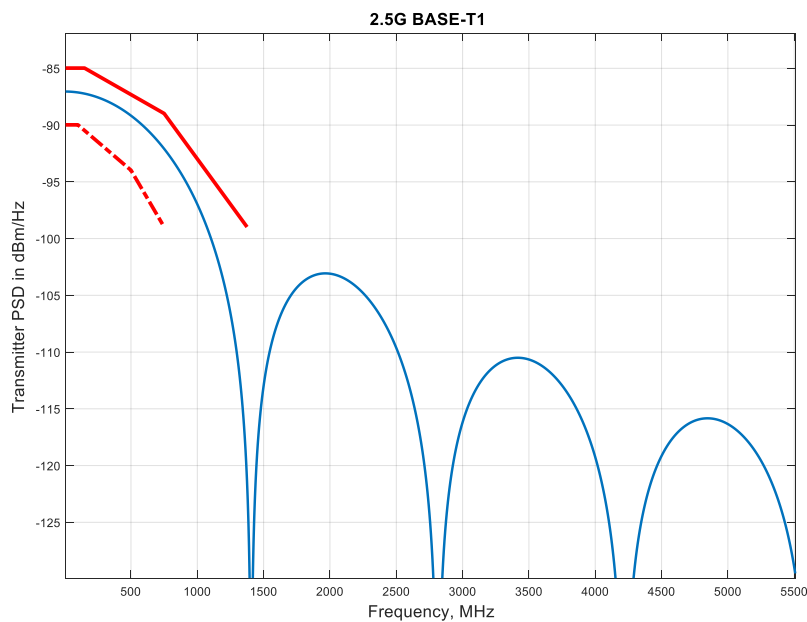# Transmitter PSD Masks

Kadir Dinc
Tom Souvignier
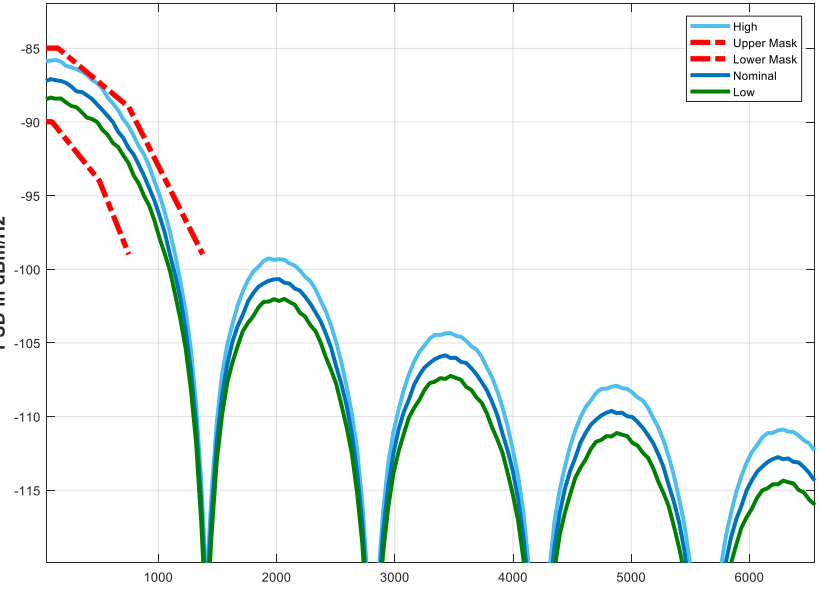**Brett McClellan, Gerrit den Besten**

Analytical: 2.5G, 5G, 10G Transmit Power Spectral Density :Option-1
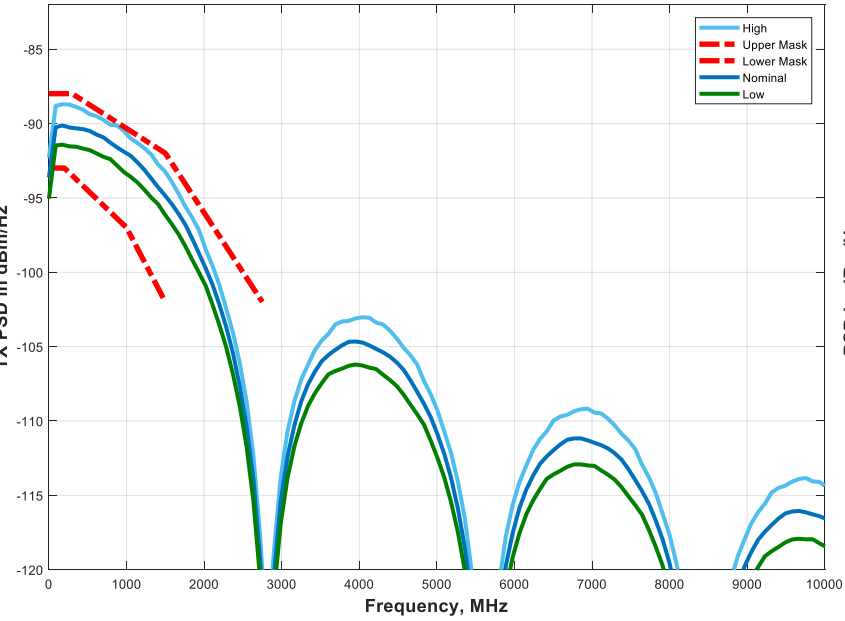

- Test Mode 5
- Transmitter output 1V peak to peak differential signal
- 100 Ω termination

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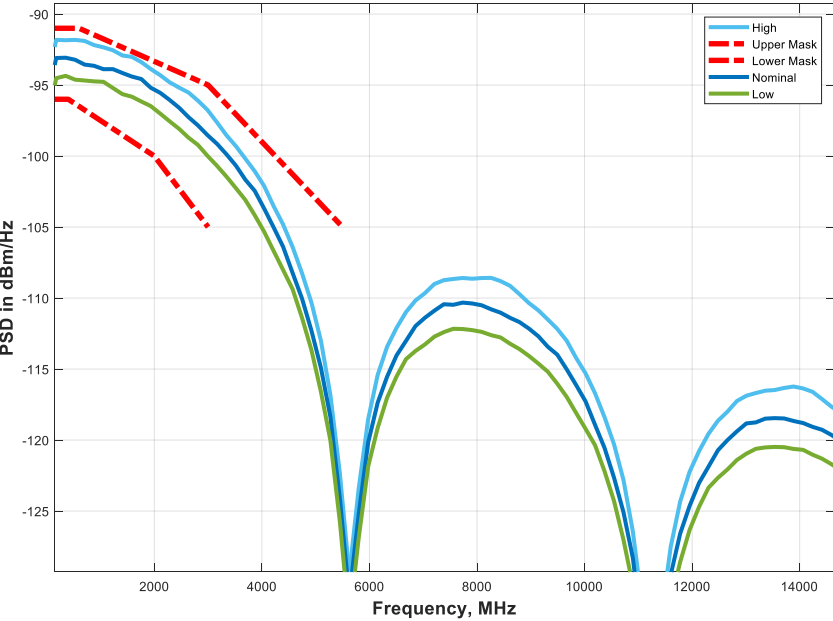
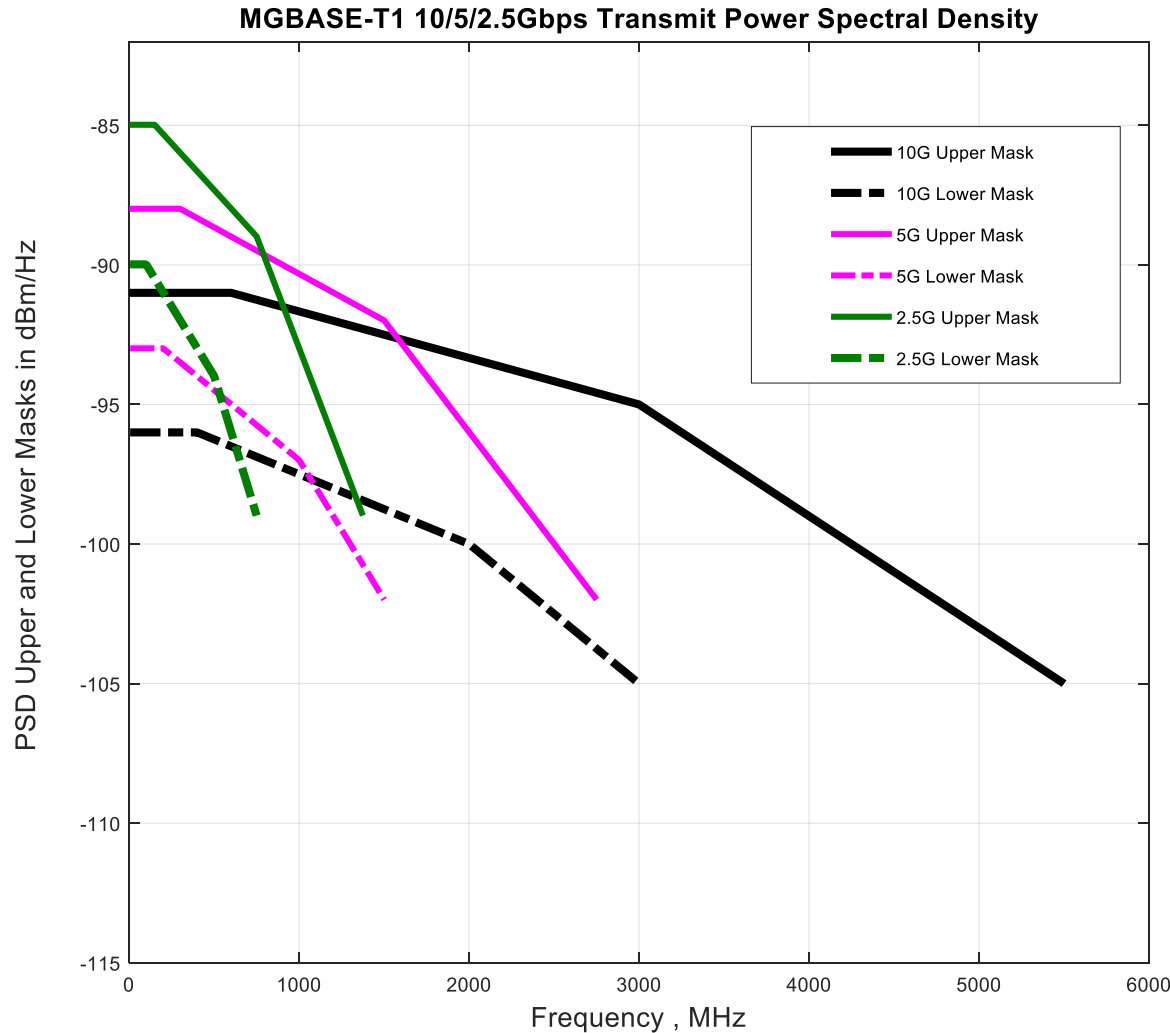# Simulated: 2.5G, 5G, 10G Transmit Power Spectral Density:option-1

2.5GBASE-T1

Output	TX Voltage pp	TX dBm	TX at MDI dBm
High	1.16	2.72	2.57
Nominal	1.00	1.43	1.2
Low	0.86	0.12	-0.1

Output	TX Voltage pp	TX dBm	TX at MDI dBm
High	1.16	2.72	2.47
Nominal	1.00	1.43	1.1
Low	0.86	0.12	-0.2

Output	TX Voltage pp	TX dBm	TX at MDI dBm
High	1.16	2.72	2.18
Nominal	1.00	1.43	0.76
Low	0.86	0.12	-0.54

- 100 Ω load
- Termination resistance variation +/- 20%
- Analog voltage variation +/- 5%

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2.5G, 5G, 10G Transmit Power Spectral Density Masks : Option-1

MGBASE-T1 10/5/2.5Gbps Transmit Power Spectral Density

Upper PSD(f) =
$$\begin{cases} -91 \; - \; K & \text{dBm/Hz} & 0 < f \leq 600*S \\ -90 \; - \; K - \dfrac{f}{600*S} & \text{dBm/Hz} & 600*S < f \leq 3000*S \\ -83 \; - \; K - \dfrac{f}{250*S} & \text{dBm/Hz} & 3000*S < f \leq 5500*S \end{cases}$$

Lower PSD(f) =
$$\begin{cases} -96 \; - \; K & \text{dBm/Hz} & 5 < f \leq \; 400*S \\ -95 \; - \; K - \dfrac{f}{400*S} & \text{dBm/Hz} & 400*S < f \leq 2000*S \\ -90 \; - \; K - \dfrac{f}{200*S} & \text{dBm/Hz} & 2000*S < f \leq 3000*S \end{cases}$$

f in MHz, K = 10*log10(S), and parameter S is used for scaling:

S = 0.25 for 2.5GBASE-T1

S = 0.5   for 5GBASE-T1

S = 1   for 10GBASE-T1

In Test mode 5, the transmit power shall be lower than 3 dBm measured into a 100 Ω and shall be between the upper and lower masks specified in above Equation. When measured with 100 Ohm termination transmit differential signal at MDI shall be less than 1.1V peak-to-peak.

The masks are shown graphically in Fig. 1.

Fig.1 Transmitter Upper and Lower Masks

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Transmitter PSD Masks : Option - 2

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Analytical: 2.5G, 5G, 10G Transmit Power Spectral Density :Option-2
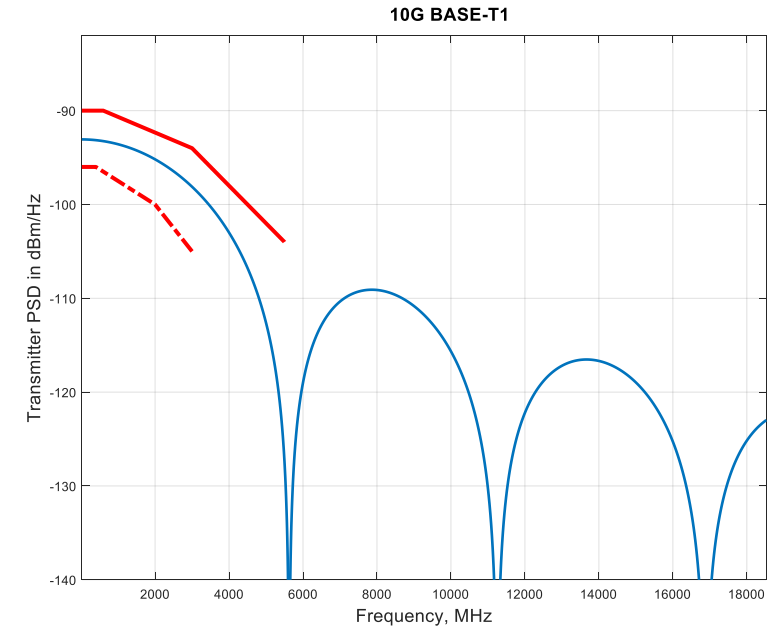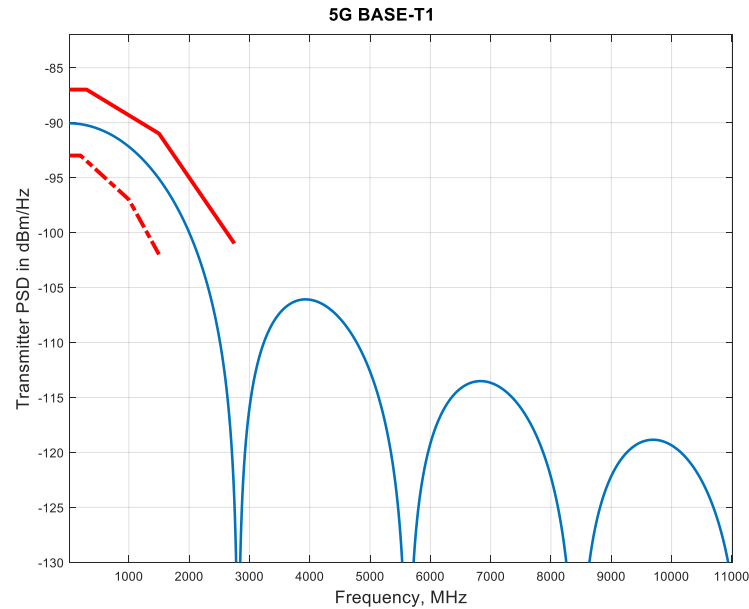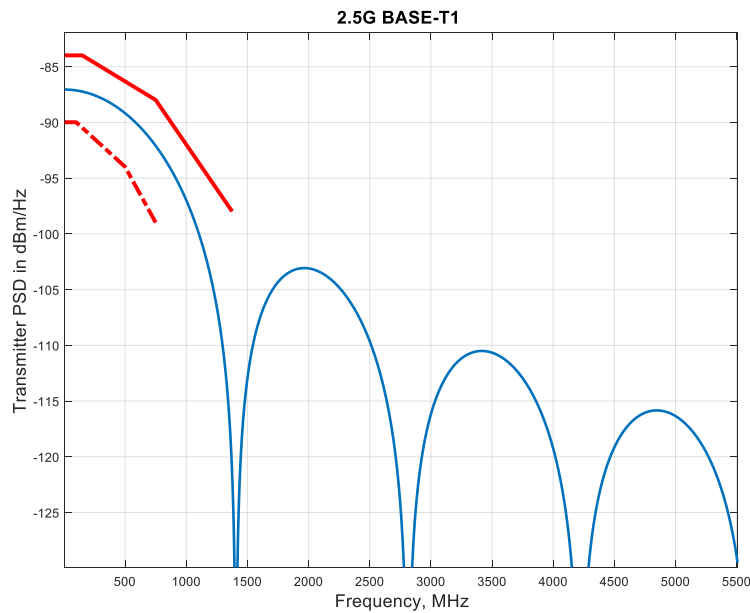
- Test Mode 5 Option-2 Mask
- Transmitter output 1V peak to peak differential signal
- 100 Ω termination

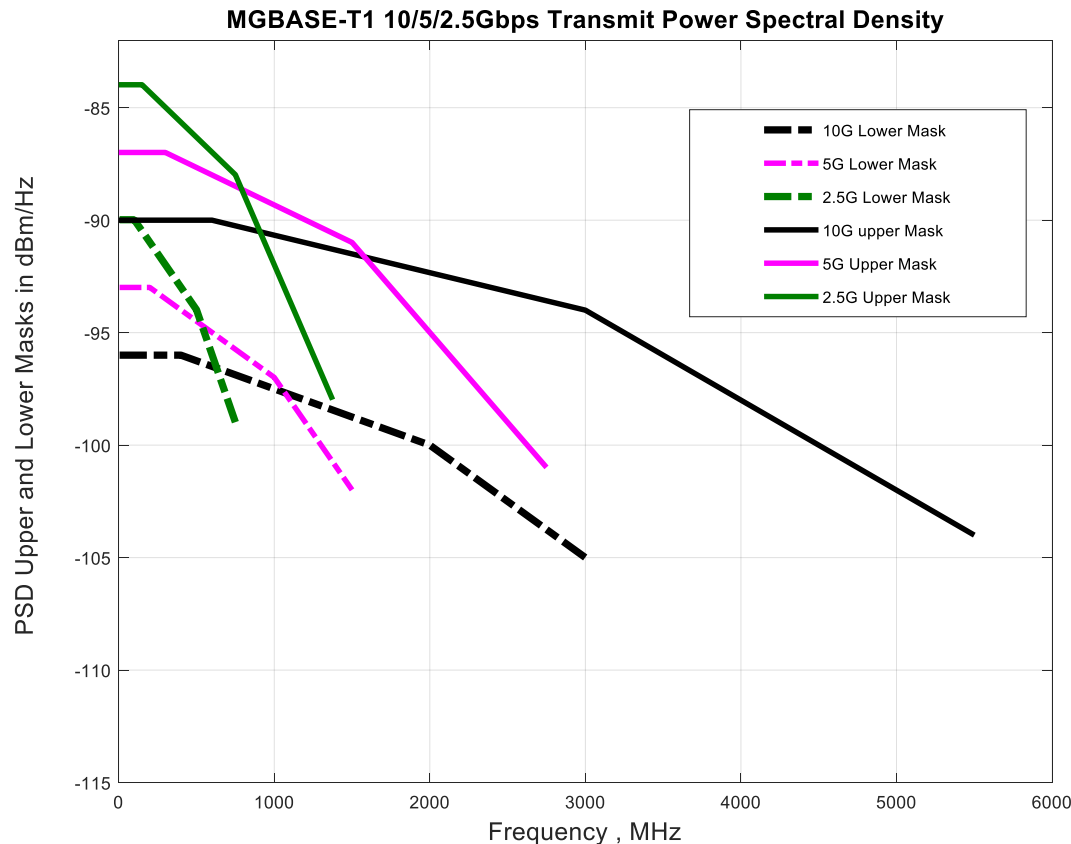# 2.5G, 5G, 10G Transmit Power Spectral Density Masks : Option-2

MGBASE-T1 10/5/2.5Gbps Transmit Power Spectral Density

Fig 1. Transmitter Upper and Lower Masks

$$\text{Upper PSD}(f) = \begin{cases} -90 - K & \text{dBm/Hz} & 0 < f \le 600*S \\ -89 - K - \dfrac{f}{600*S} & \text{dBm/Hz} & 600*S < f \le 3000*S \\ -82 - K - \dfrac{f}{250*S} & \text{dBm/Hz} & 3000*S < f \le 5500*S \end{cases}$$

$$\text{Lower PSD}(f) = \begin{cases} -96 - K & \text{dBm/Hz} & 5 < f \le 400*S \\ -95 - K - \dfrac{f}{400*S} & \text{dBm/Hz} & 400*S < f \le 2000*S \\ -90 - K - \dfrac{f}{200*S} & \text{dBm/Hz} & 2000*S < f \le 3000*S \end{cases}$$

f in MHz, K = 10*log10(S), and parameter S is used for scaling:

S = 0.25 for 2.5GBASE-T1

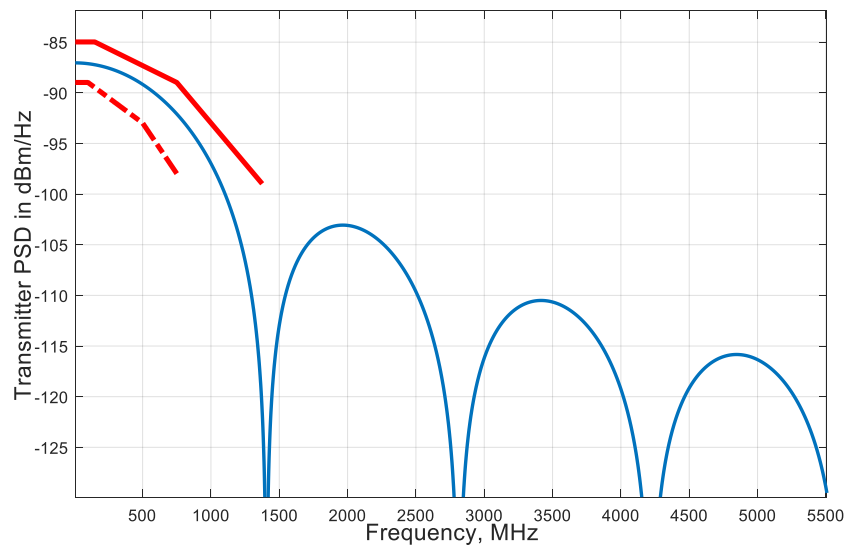S = 0.5   for 5GBASE-T1

S = 1   for 10GBASE-T1

In Test mode 5, the transmit power shall be lower than 4 dBm measured into a 100 Ω and shall be between the upper and lower masks specified in above Equation. When measured with 100 Ohm termination transmit differential signal at MDI shall be less than 1.3 V peak-to-peak.

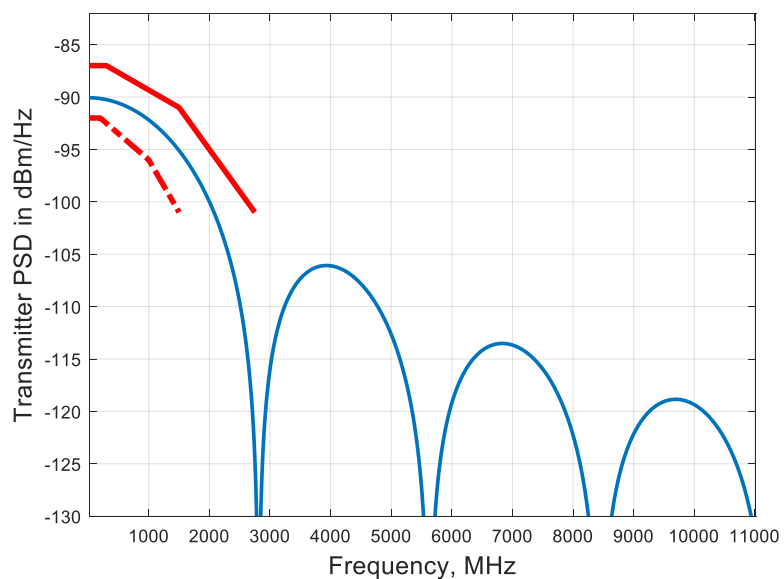The masks are shown graphically in Fig.1

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Transmitter PSD Masks : Option - 3

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Analytical: 2.5G, 5G, 10G Transmit Power Spectral Density :Option- 3

- Test Mode 5
- Transmitter output 1V peak to peak differential signal
- 100 Ω termination

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MGBASE-T1 10/5/2.5Gbps Transmit Power Spectral Density

Fig.1 Transmitter Upper and Lower Masks

$$\text{Upper PSD(f)} = \begin{cases} -91 - K & \text{dBm/Hz} & 0 < f \le 600*S \\ -90 - K - \dfrac{f}{600*S} & \text{dBm/Hz} & 600*S < f \le 3000*S \\ -83 - K - \dfrac{f}{250*S} & \text{dBm/Hz} & 3000*S < f \le 5500*S \end{cases}$$

$$\text{Lower PSD(f)} = \begin{cases} -95 - K & \text{dBm/Hz} & 5 < f \le 400*S \\ -94 - K - \dfrac{f}{400*S} & \text{dBm/Hz} & 400*S < f \le 2000*S \\ -89 - K - \dfrac{f}{200*S} & \text{dBm/Hz} & 2000*S < f \le 3000*S \end{cases}$$
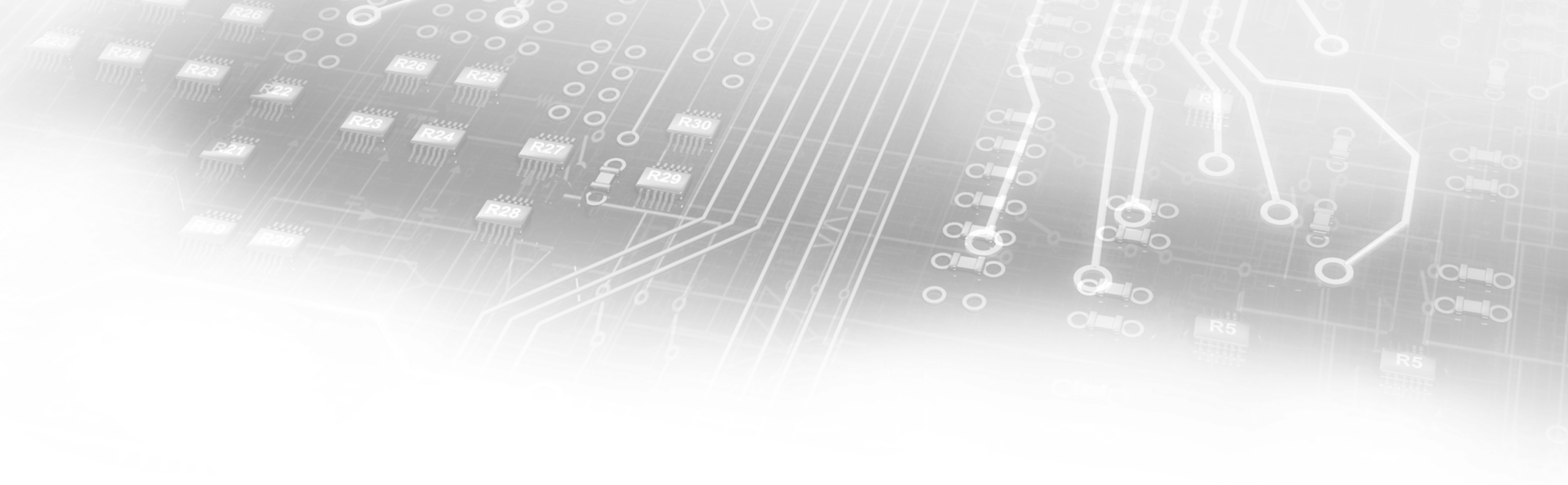
f in MHz, K = 10*log10(S), and parameter S is used for scaling:

S = 0.25 for 2.5GBASE-T1

S = 0.5   for 5GBASE-T1

S = 1   for 10GBASE-T1

In Test mode 5, the transmit power shall be lower than 3 dBm measured into a 100 Ω and shall be between the upper and lower masks specified in above Equation. When measured with 100 Ohm termination transmit differential signal at MDI shall be less than 1.1V peak-to-peak.

The masks are shown graphically in Fig. 1.

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THANK YOU

IEEE 802.3ch Task Force – November 2018