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Proposed 6G SAS Phy Specs for EMI Reduction

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Proposed Modified or Additional Specifications to Control EMI

- Differential to Common Mode Conversion (SDC11 & SDC22)
  - Constrains CM voltage generated from differential signal
  - Termed "Impedance Balance" in SATA spec
- TX Common Mode Voltage
  - Convert from single RMS or peak voltage to a limit across frequency spectrum

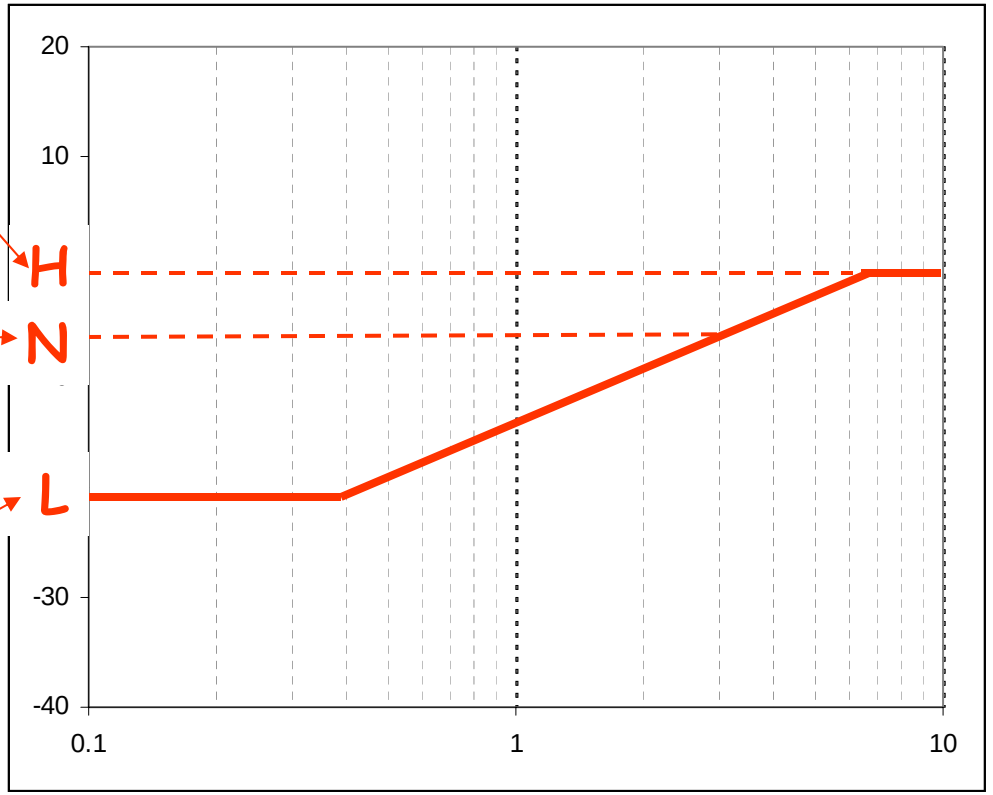
Proposed Format of Specs

Measured Value < max [L, min [H, N + 13.3 log10(F/3GHz)]]
100 MHz < F < 6 GHz

H: Max value (high frequency asymptote)

N: Value at Nyquist frequency (3 GHz)

L: Min value (low frequency asymptote)

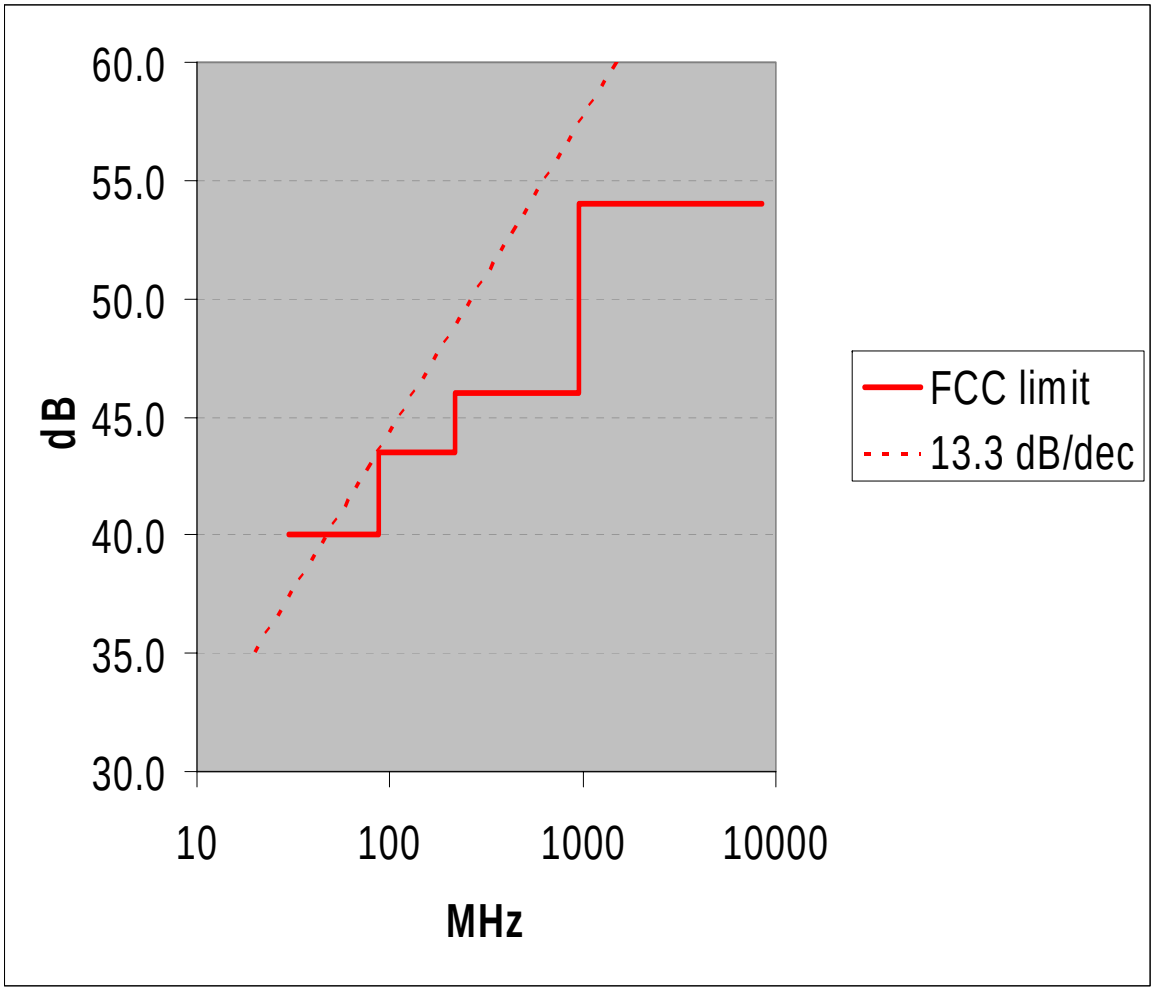


Class B Radiated Emissions Limits

(relative to 1uV/meter)

Mechanism for converting common mode noise into EMI is unknown, but EMI is assumed to be proportional to the noise that causes it.

Hence, limit curve for each parameter (in dB) should reasonably track these Radiated Emission limits.



Formulas from SATA Spec

Differential return loss, common mode return loss, and impedance balance can be measured with a 2-port vector network analyzer. The VNA is connected to the host/device and the S parameters are measured (with a 50 ohm reference impedance). The differential return loss in terms of the mixed mode S parameters as well as the 2-port S parameters is given by

$$RL_{DD11} = -20\log\left|S_{DD11}\right| = -20\log\left|\frac{s_{11}+s_{22}-s_{12}-s_{21}}{2}\right|$$

The common mode return loss is given by

$$RL_{CC11} = -20\log\left|S_{CC11}\right| = -20\log\left|\frac{s_{11}+s_{22}+s_{12}+s_{21}}{2}\right|$$

The impedance balance is given by

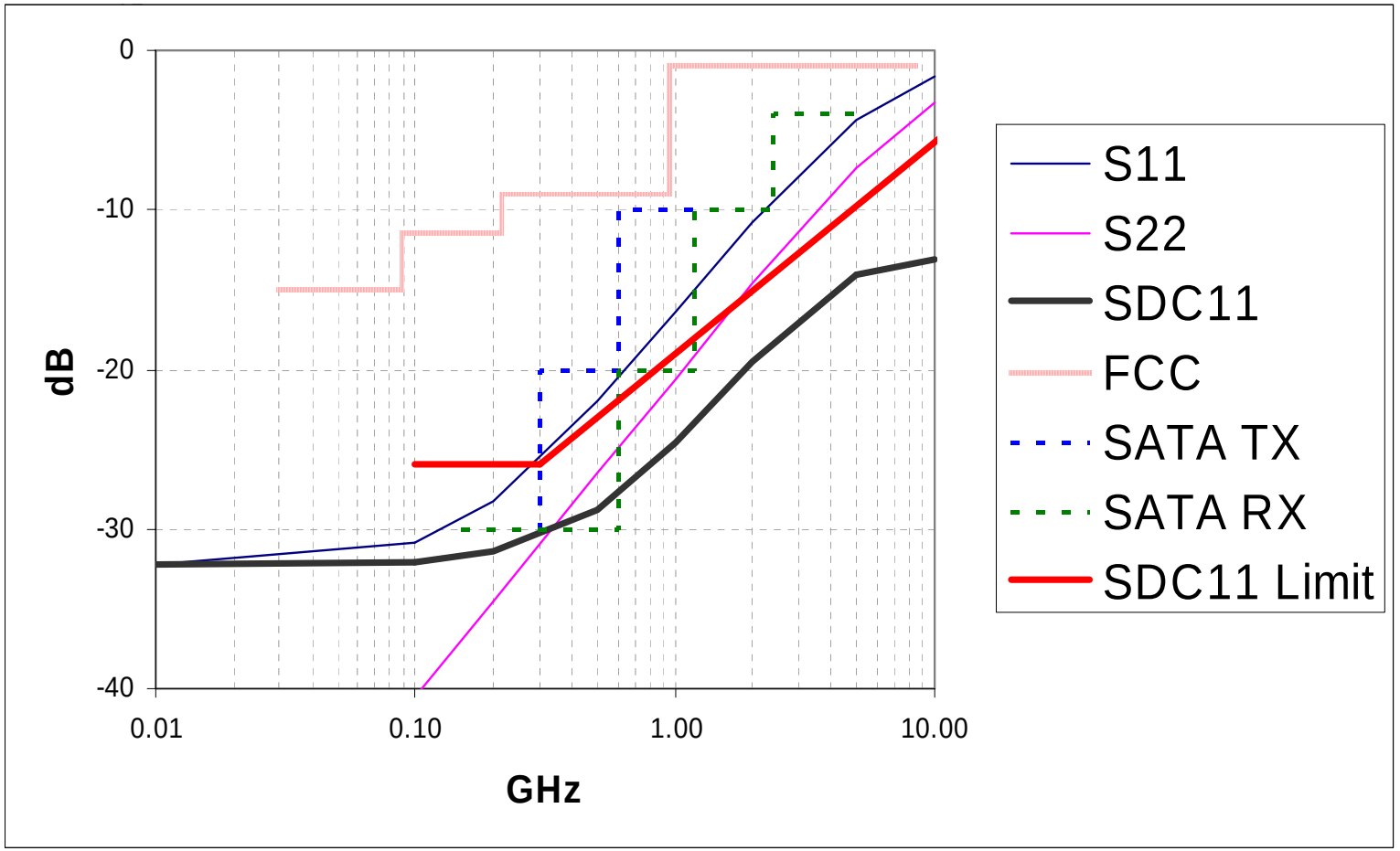
$$RL_{DC11} = -20\log\left|S_{DC11}\right| = -20\log\left|\frac{s_{22}-s_{11}+s_{12}-s_{21}}{2}\right|$$

where the mixed mode S parameters are measured with a 4-port VNA, or alternatively the 2-port S parameters are measured with a 2-port VNA.

Proposed SDC11, SDC22 Limit

(L = -26dB, N = -12.7dB)

TOLp	0.05	Cp:	0.94 pF
TOLn	0	Cn:	0.6 pF
Zo:	0.05 kOhm		



Proposed TX CM Voltage Limit
(L = 12.7 dBmV, N = 26 dBmV)