Rosenberger

802.3ch link segment alien crosstalk and rejection test

Thomas Müller

14th March 2019

802.3ch link segment alien crosstalk and rejection test

Rosenberger

Status

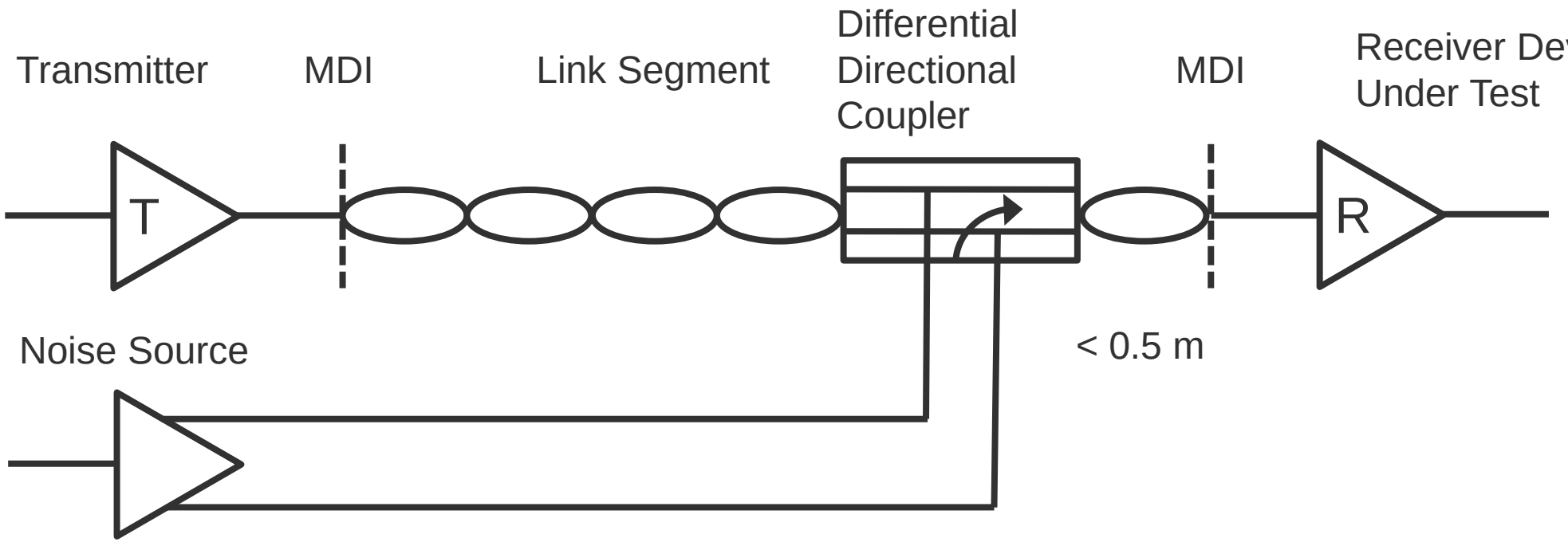
- Using a directional coupler has been adopted during the Vancouver meeting.
- To define a power level for the noise source an acceptable alien crosstalk noise level has to be defined.
- Based on that further definitions of the noise signal and level can be specified.
- According to George Zimmermann, using a NGBASE-T1 PHY as noise source is not recommended.

802.3ch link segment alien crosstalk and rejection test

Rosenberger

Test setup

- Usage of differential directional coupler adopted



802.3ch link segment alien crosstalk and rejection test

Rosenberger

Noise source definition in 802.3bp

- Ahmad Chini has described the process of defining the noise source here in http://www.ieee802.org/3/bp/public/nov15/chini_3bp_01_1115.pdf

- Short summary of the process:
  - Multiply PSD mask by alien crosstalk limit
  - Compensate coupling losses of the directional coupler to define equivalent noise source power

802.3ch link segment alien crosstalk and rejection test

Rosenberger

Remarks on link segment alien crosstalk

- Alien crosstalk limits may be advisable because:
  - If multiple Ethernet signals run within one multiport connector or cable with several differential pairs, crosstalk can be high
  - In this case screening- and coupling attenuation only covers the crosstalk to link segments external to this connector or cable
  - It is needed to perform the noise source for the rejection test

- The link segment alien crosstalk should provide some more margin to the measurement results for 5 x 8 m cable bundle presented in mueller_3ch_03_0319.pdf because:
  - Channel may be longer than measured (≤15 m)
  - Inline connectors may contribute additionally
  - Results presented are for high quality connectors and cables:
    there should be some margin left for cost optimization

802.3ch link segment alien crosstalk and rejection test

Rosenberger

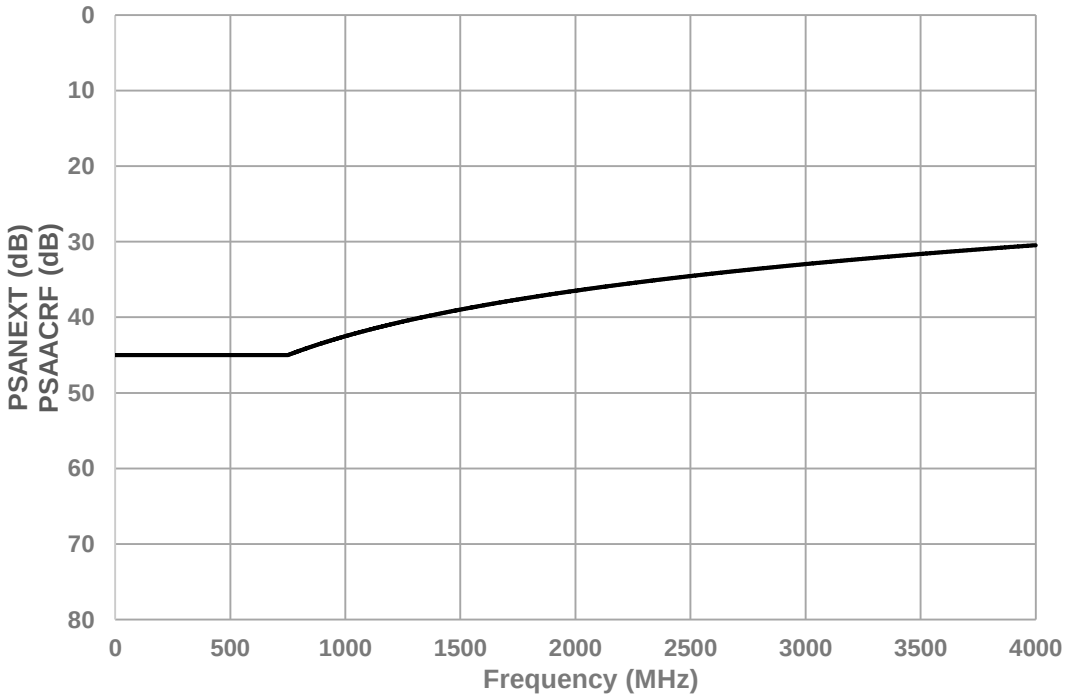
Imaginary alien crosstalk limit for further calculation

- Imaginary alien crosstalk for the link segment based on a typical generic connector design
- Imaginary line equals coupling attenuation limit line relaxed by 25 dB

PSANEXT(f)

$$\text{PSAACRF(f)} \leq \begin{pmatrix} 45 & 1 \leq f < 750\ MHz \\ 25 - 20\log({}^{f}/_{7500}) & 750 \leq f \leq f_{max}\ MHz \end{pmatrix} dB$$

f *is the frequency in MHz;* $1 \leq f \leq f_{max}$

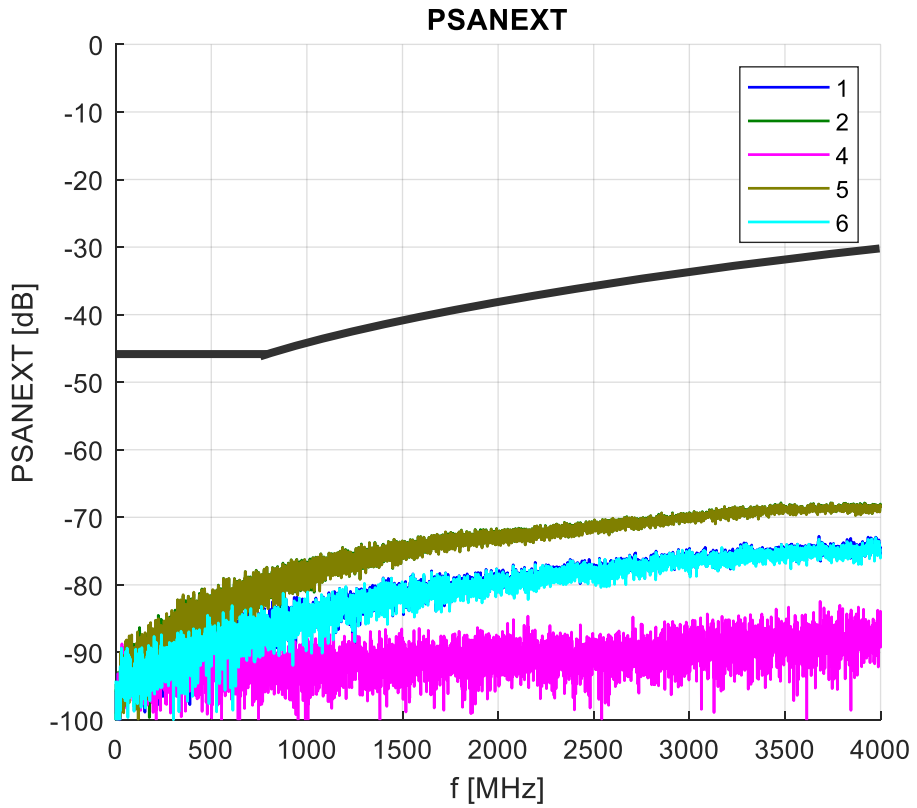


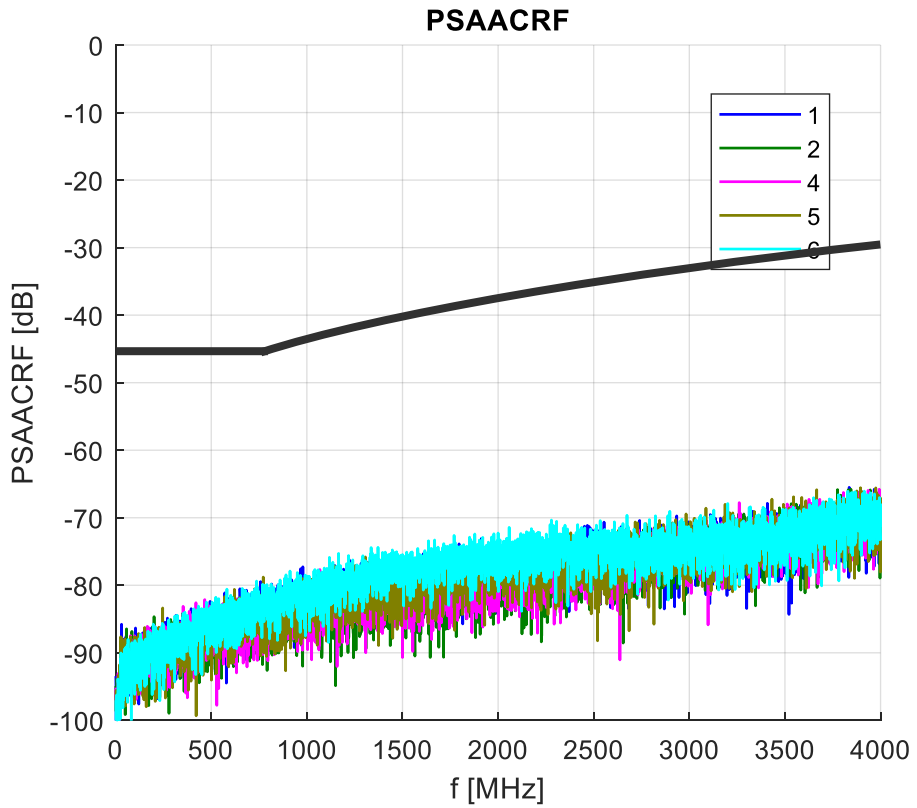
802.3ch link segment alien crosstalk and rejection test

Rosenberger

Comparison of measurement results against imaginary alien crosstalk limit

- Imaginary alien crosstalk limit provides margin against the actual measurement result



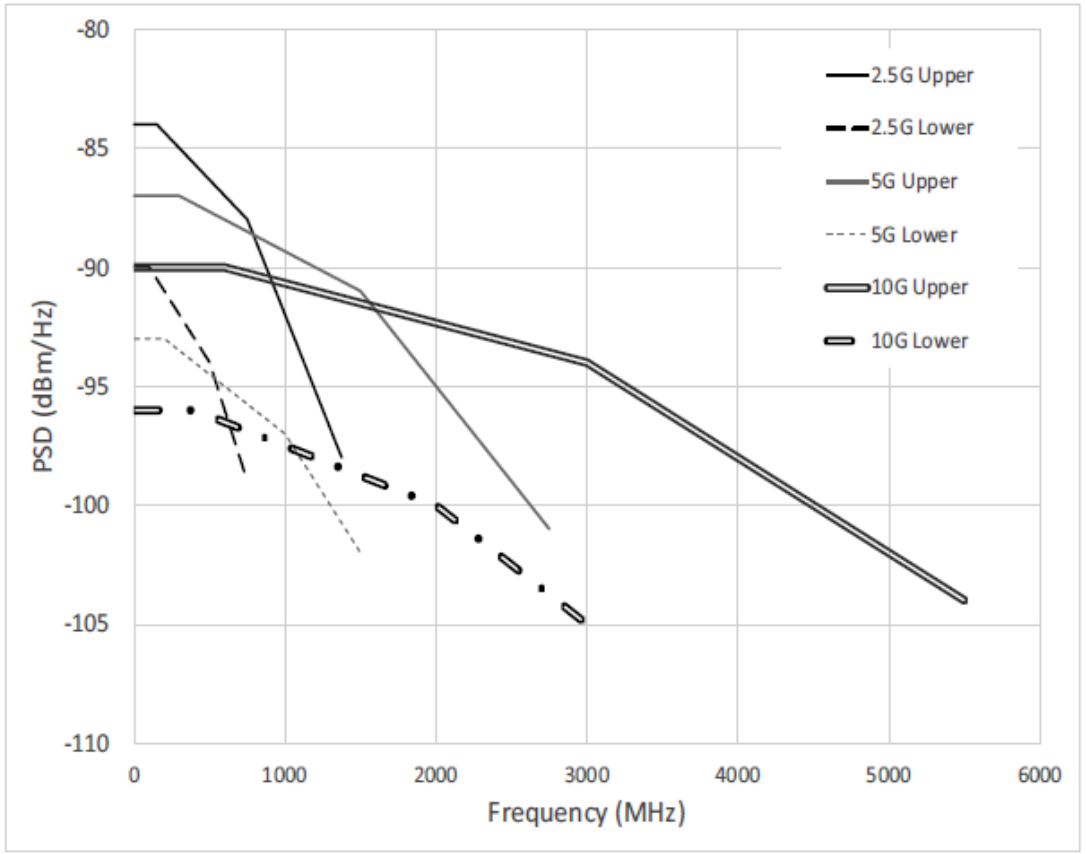


limit line manually added

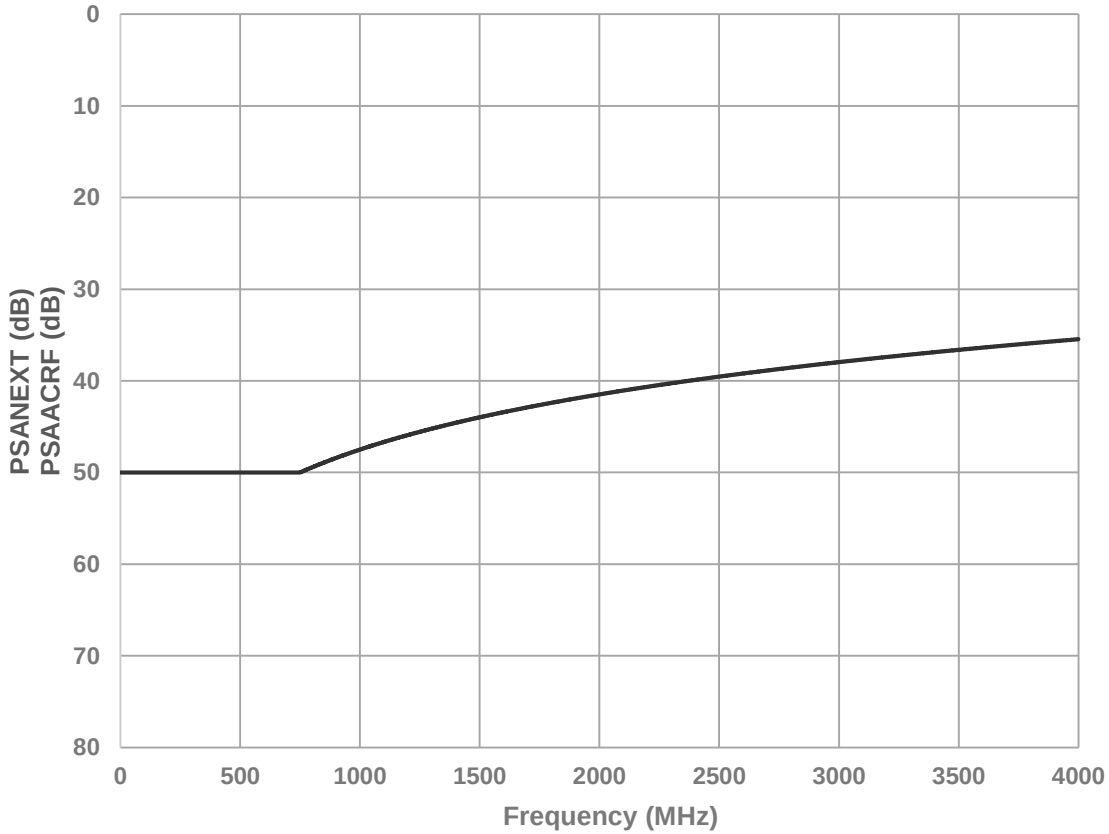
802.3ch link segment alien crosstalk and rejection test

PSD masks for further calculation

PSD masks



imaginary alien crosstalk limit

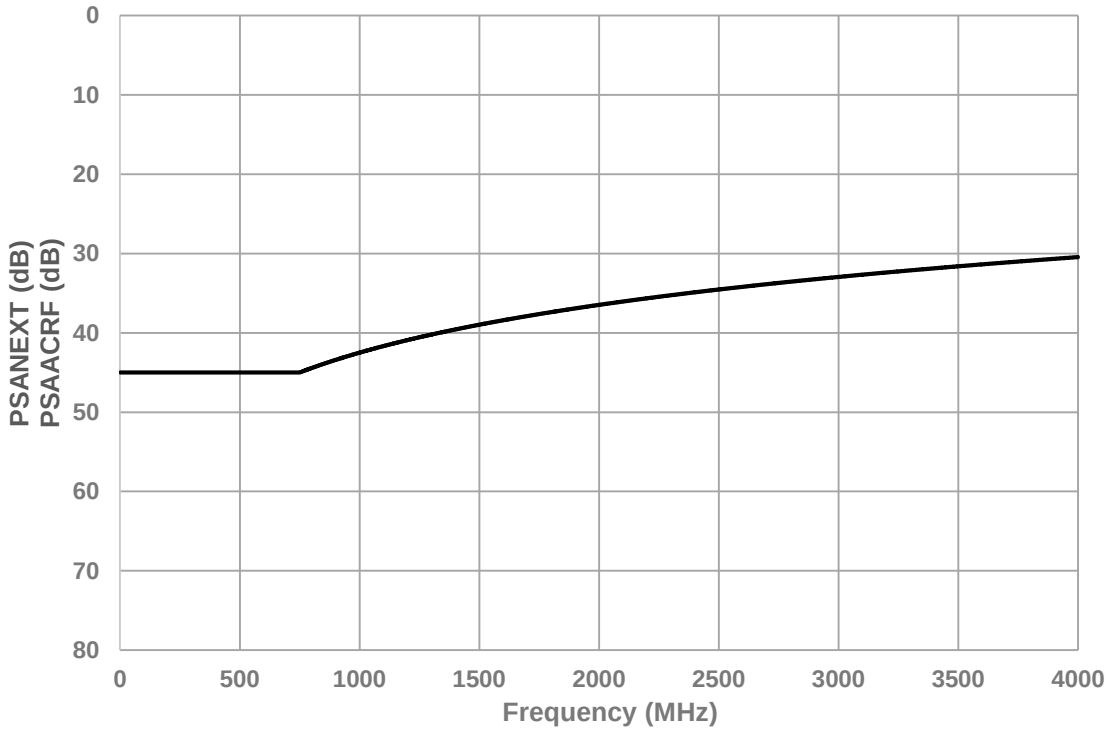


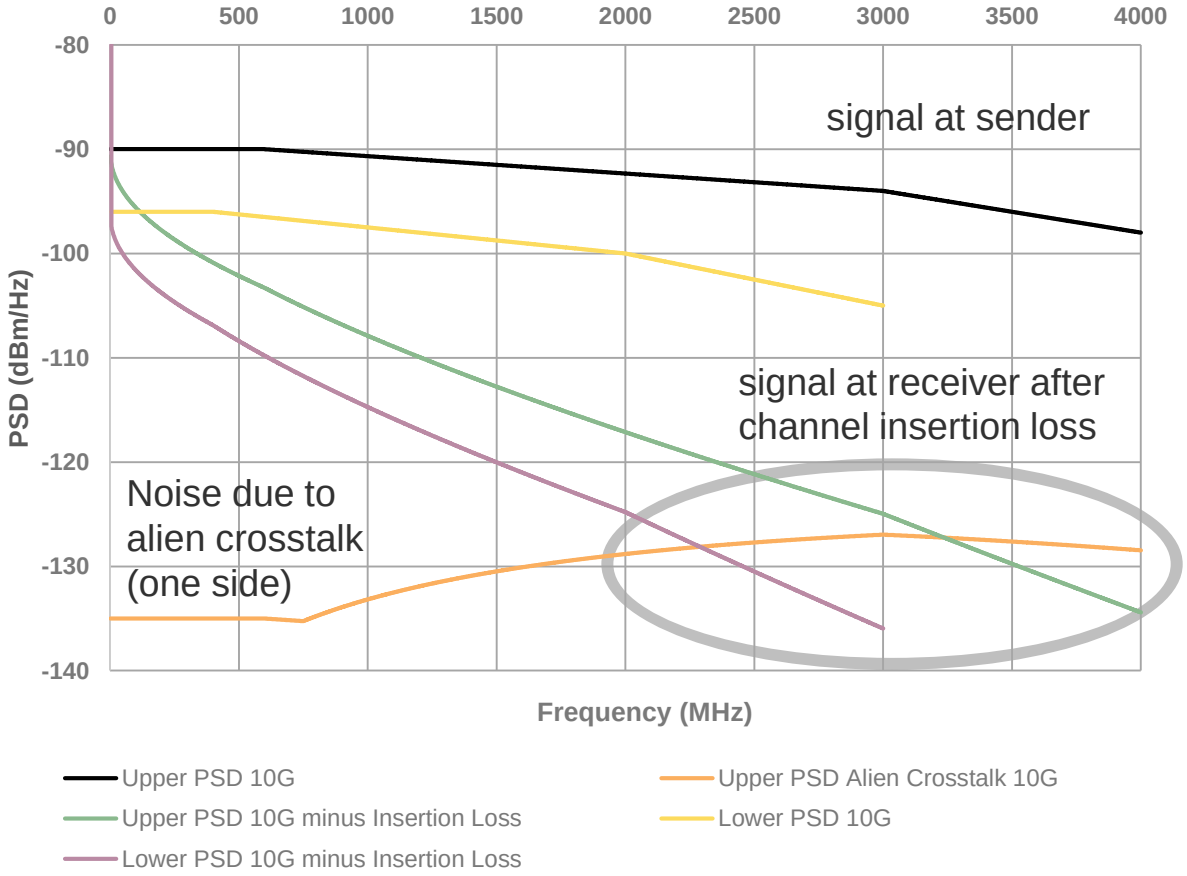
802.3ch link segment alien crosstalk and rejection test

Rosenberger

Summary

- Based on the imaginary alien crosstalk limit, the alien crosstalk might be higher than the received signal after link segment insertion loss at some frequencies.





802.3ch link segment alien crosstalk and rejection test

Rosenberger

Summary

- A proper SNR calculation should be performed by someone who knows how to do this in a professional way.
- Further input from the PHY vendors is need on an acceptable level of alien crosstalk noise for the link segment.
- Link segment alien crosstalk limit should provide additional margin to the results presented.
- Further definitions of the noise signal is needed.