Rosenberger

802.3ch alien crosstalk rejection

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Status

- Clause 149.5.3.2 is intended to define a specification to verify the receiver's tolerance to alien crosstalk noise.
- In the previous standards 802.3bw and 802.3bp DPI method (direct power injection) as defined in DIN IEC 62132-3 was used to test the receivers using a resistive coupling network.
- With increasing bandwidth of 802.3ch, it becomes increasingly difficult to provide sufficient return loss and power handling capability of the resistive network at the same time.
- Therefore using a directional coupler instead is recommended.

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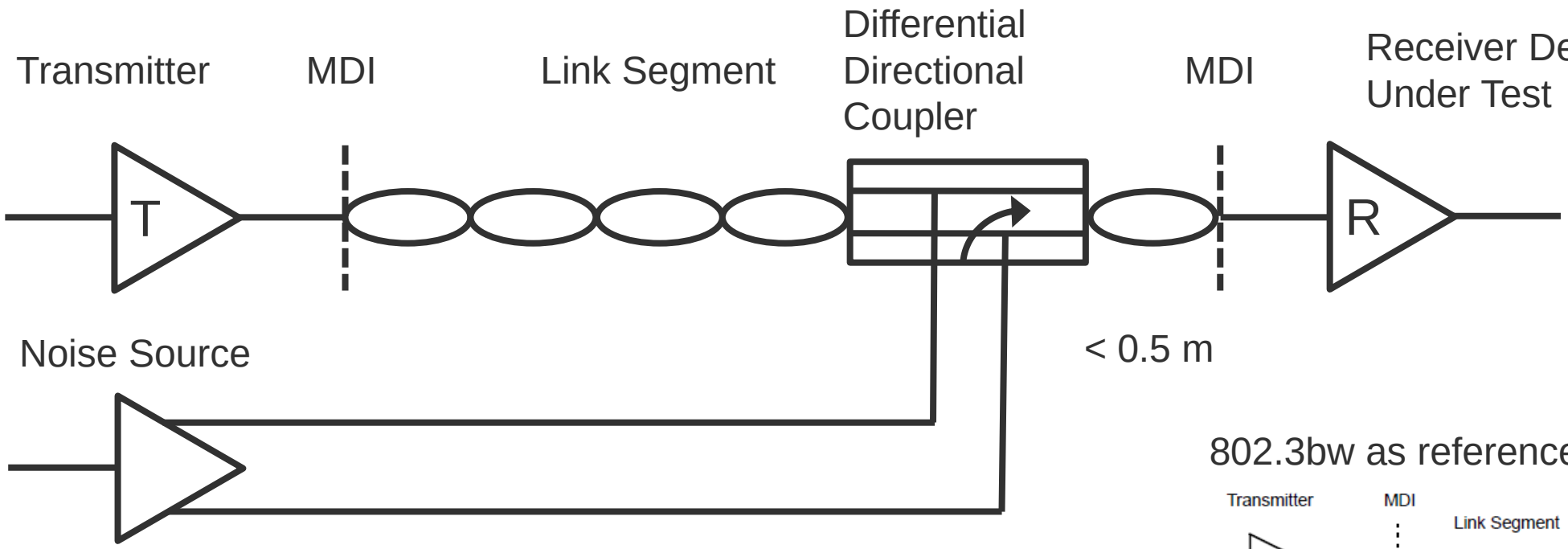
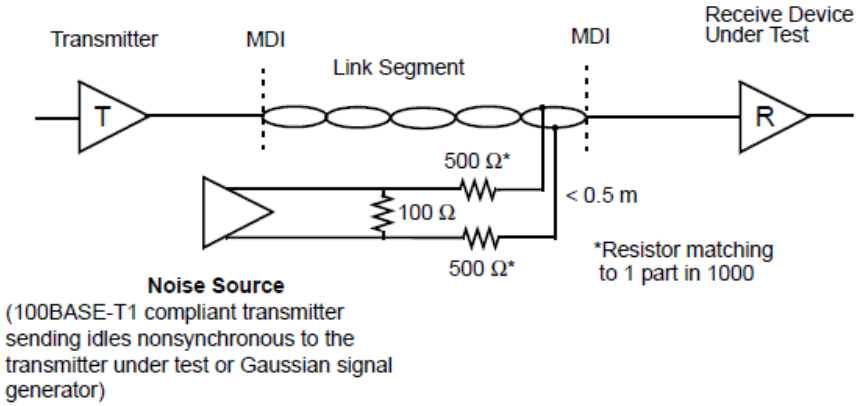
Proposal

- Directional coupler is recommended



2.5GBASE-T1, 5GBASE-T1, 10GBASE-T1 compliant transmitter sending idles nonsynchronous to the transmitter under test

802.3bw as reference



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Noise source definition retrospect

802.3bw as reference

96.5.5.3 Alien crosstalk noise rejection

This specification is provided to verify the DUT's tolerance to alien crosstalk noise using two separate tests. The first test is performed with a noise source consisting of a 100BASE-T1 compliant transmitter sending idle symbols. The level of the noise at the MDI is nominally 100 mV peak-to-peak. The second test is performed with a noise source consisting of a signal generator with Gaussian distribution, bandwith of 50 MHz and magnitude of –85 dBm/Hz. The receive DUT is connected to these noise sources through a resistive network, as shown in Figure 96–26, with a link segment as defined in 96.7. The noise is added at the MDI of the DUT. The BER shall be less than 10^{-10}, and to satisfy this specification the frame error ratio is less than 10^{-7} for 125 octet packets measured at MAC/PLS service interface.

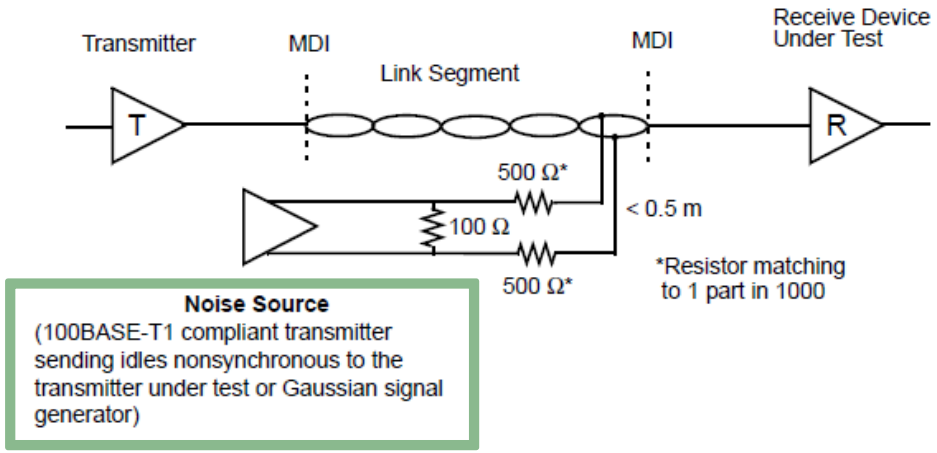

Figure 96–26—Alien crosstalk noise rejection test setup

802.3bp as reference

97.5.4.2 Alien crosstalk noise rejection

This specification is provided to verify the receiver's tolerance to alien crosstalk noise. The test is performed with a noise source consisting of a signal generator with Gaussian distribution, bandwidth of 550 MHz and magnitude of –100 dBm/Hz for devices supporting type A link segments and –110 dBm/Hz for devices supporting type B link segments. The receive DUT is connected to these noise sources through a resistive network, as shown in Figure 97–35, with a link segment as defined in 97.6. The noise is added at the MDI of the DUT. The BER is expected to be less than 10^{-10}, and to satisfy this specification the frame loss ratio is less than 10^{-7} for 125-octet packets measured at MAC/PLS service interface.

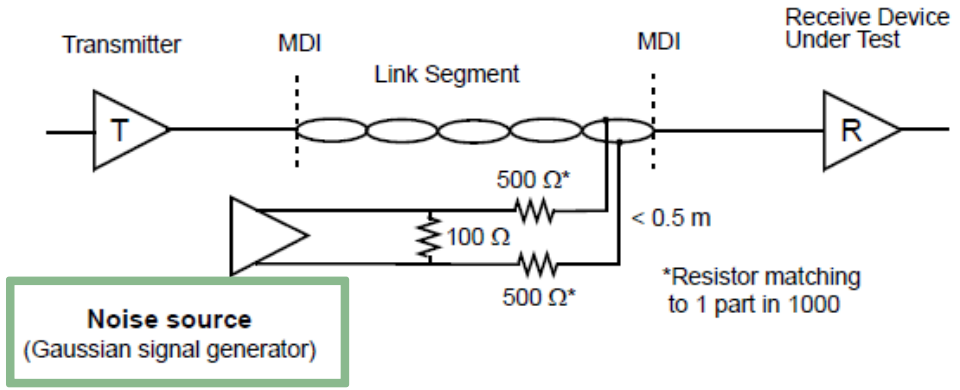

Figure 97–35—Alien crosstalk noise rejection test setup

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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

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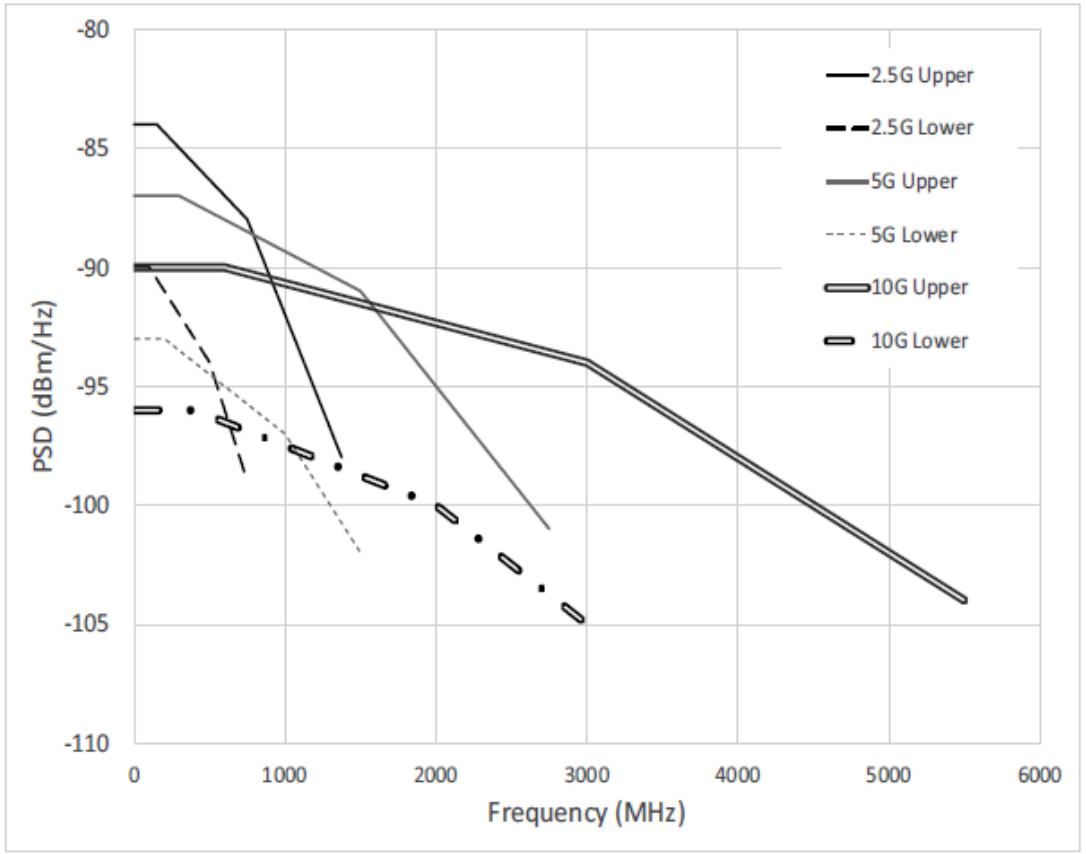
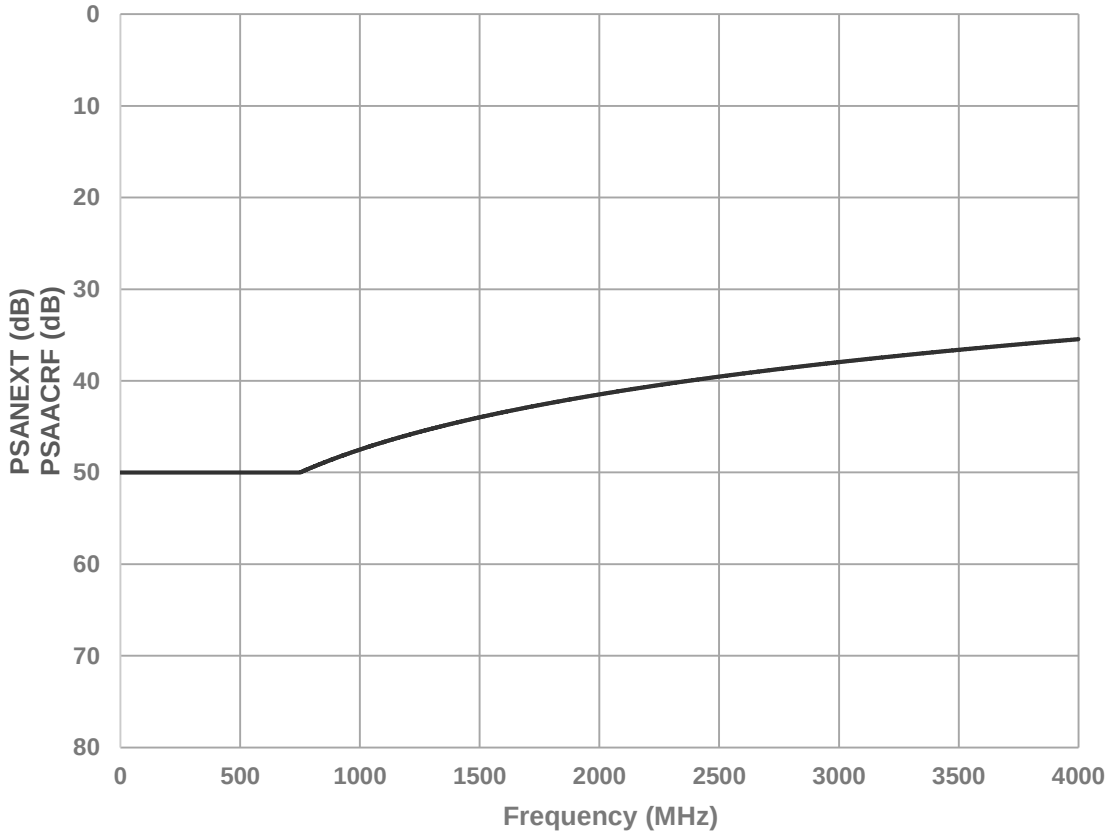
Noise source definition in 802.3bp

- 20 dB coupling losses

PSD masks



imaginary alien crosstalk limit



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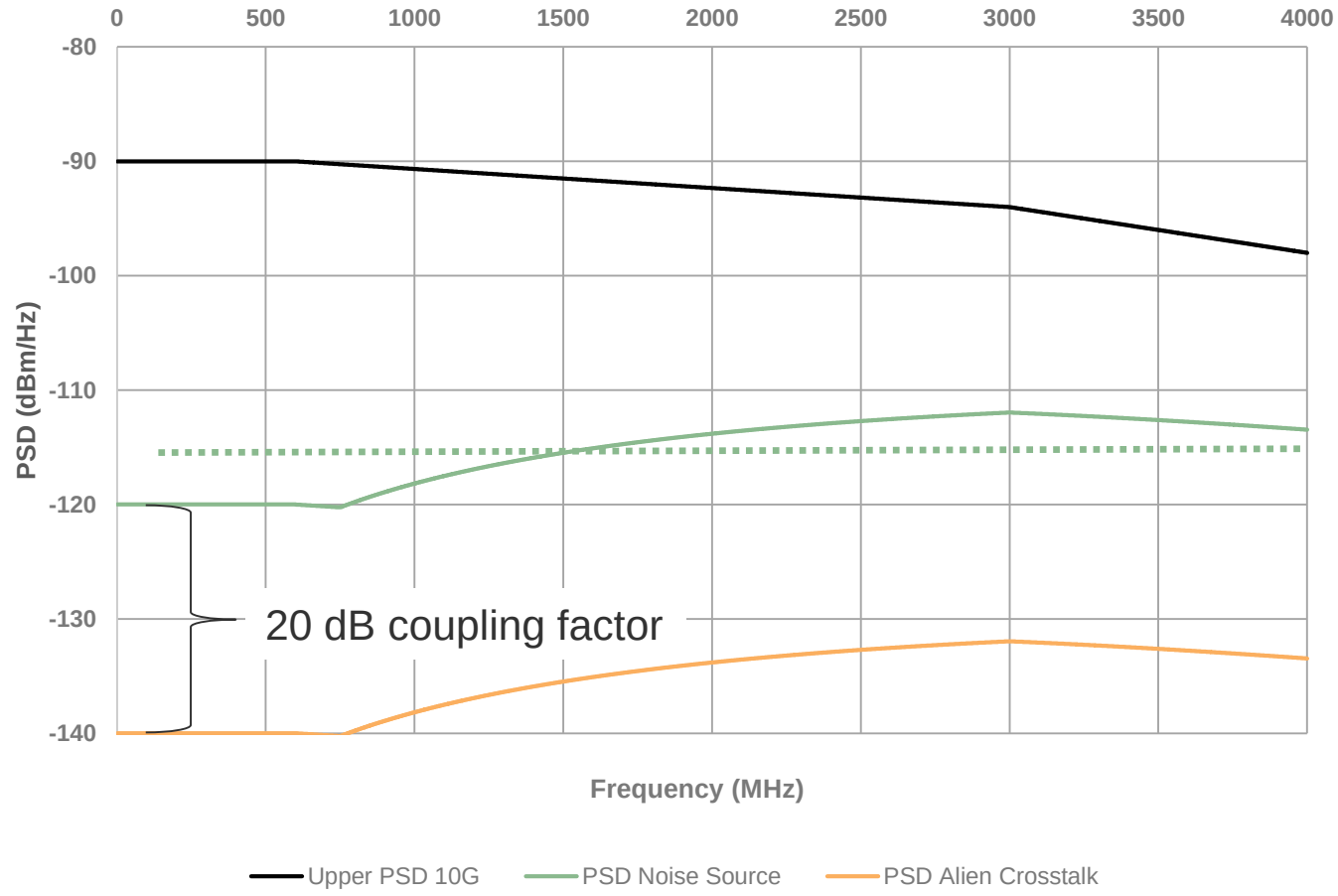
Noise source definition in 802.3bp

- Assuming 20 dB coupling factor

PSD mask

Equivalent broadband noise source ~115 dBm/Hz

PSD mask multiplied by imaginary crosstalk limit



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Summary

- A differential directional coupler should be used instead of a resistive coupling network.
- Getting a broadband noise source might be difficult. Using a NGBASE-T1 compliant PHY as noise source might be more practical.
- Further definitions of the noise signal, level and target BER need to be specified.