Cable Qualification for 5G and 2.5G: Fine Adjustments

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Cable Qualification Procedure

- Clause 126.7.3.1 in draft 2.0 defines a procedure to qualify cable plants for operation in 5G and 2.5G speeds

- It is based on the calculation of Salz SNR given the measurements for insertion loss and alien crosstalk channels

- The cable is considered qualified for 5G and 2.5G operation when the calculated SNR is above the target of 32 dB
  - The target SNR is chosen such that there is enough margin to account for implementation loss, the potential imbalance in Tx power between aggressors and victim, etc.

Limitations

- Only alien crosstalk is considered in SNR calculations
  - All other impairments are budgeted for as a constant margin in the target SNR

- One single target SNR is considered across all cable lengths and for both 5G and 2.5G. However, in reality
  - more alien crosstalk can be tolerated on shorter cables
  - 2.5G is more tolerant to alien crosstalk

- The calculated Salz SNR may artificially be too high when the PSD of aggressors has a null within the receiver bandwith of the victim (e.g. 1G aggressor with 5G victim)

Solution – changes to the draft

1. In the expression for PSD of noise, include an additive constant PSD term to account for all other sources of impairment

    - 5G: **-135 dBm/Hz**
    - 2.5G: **-129 dBm/Hz**

$$N(f) = 10log_{10}\left(\mathbf{10^{other\_noise\_sources/10}} + \sum\left(10^{ANEXT/10} + 10^{AFEXT/10}\right)\right)$$

2. Lower the overall target SNR from 32 dB to **28 dB** to account for the new additive noise term

Effective Alien Crosstalk Budget

- With the proposed change the SNR requirement for alien crosstalk remains at 32 dB at limit line in 5G operation but approaches 28 dB over shorter cables

- Lab test results correlate well with the new criterion

SNR budget for alien crosstalk
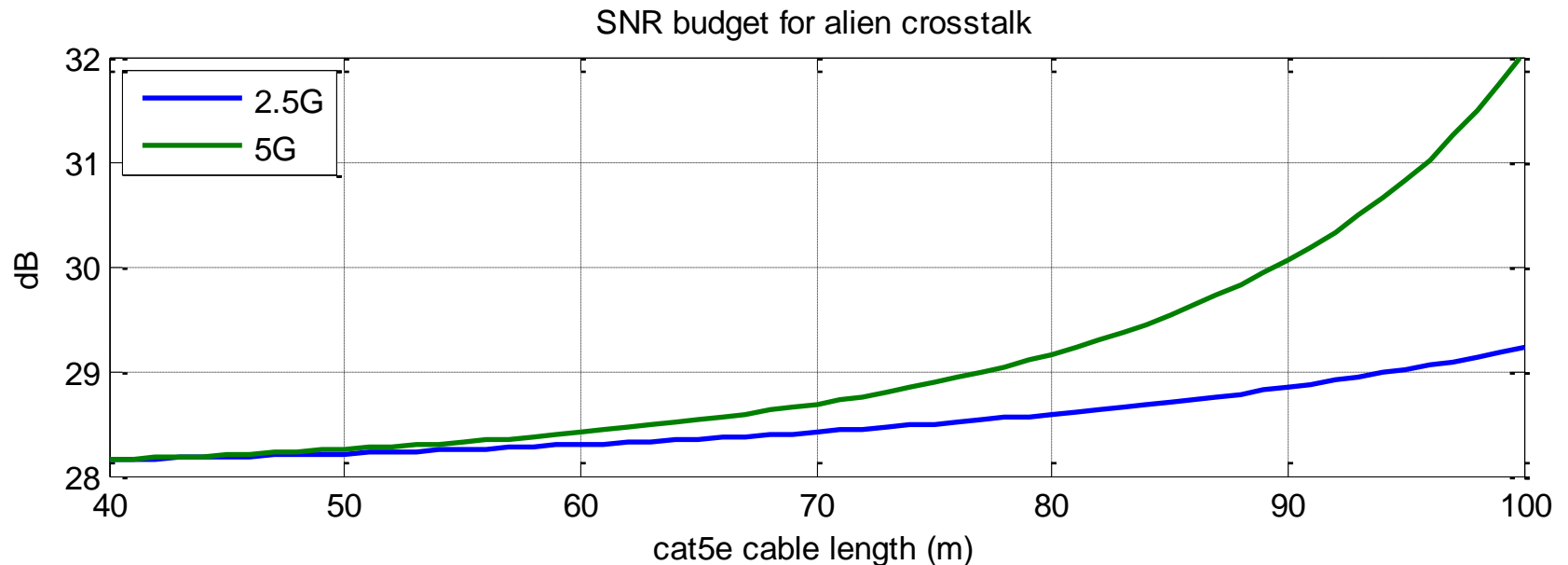
Alien Crosstalk Rejection Test

- Clause 126.5.4 defines a receiver sensitivity test given an injected white noise

- Test is defined over limit line of 100m with the PSD of injected noise at a level that provides 32 dB of Salz SNR
  - 5G: -137 dBm/Hz
  - 2.5G: -127 dBm/Hz

- With the proposed criterion, the target SNR for 5G remains at 32 dB but it drops to around 29 dB for 2.5G

  → PSD of injected white noise for 2.5G: **-125 dBm/Hz**