Power Backoff Schedule Proposal

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Alien Crosstalk in 40GBASE-T

- Use of shielded cable resulted in common alien crosstalk specifications for 40GBASE-T across TIA & ISO
  - Alien NEXT and Alien FEXT (PS-AACRF)
- Alien Crosstalk coupling has been improved by 20 dB relative to Cat 6a/10G
  - This reflects substantial improvements in cabling
- Alien crosstalk at 30m from a 30m cable is >6dB below estimated receiver internal noise
  - PHY power studies typically used power-optimized ~-148 dBm/Hz equivalent noise floors primarily due to front end electronics

Specifications for PSANEXT

- 25 dB improvement over class EA
  - ISO TR, TIA Cat 8 draft, and ISO 11801 ed 3 draft, are aligned on equations for PSANEXT
    - Measurement floors may not be aligned

Class	Frequency MHz	Minimum PSANEXT (dB)
EA	1 ≤ f < 100	80 – 10log(f)
	100 ≤ f < 500	90-15log(f)
FA	1 ≤ f < 100	95-10log(f)
	100 ≤ f < 1000	105-15log(f)
I, II and TIA Cat 8	1 ≤ f < 100	105-10log(f)
	100 ≤ f < 2000*	115-15 log(f)

* ISO Class I and Class II equations are aligned, and as above, but are for further study between 1600 and 2000 MHz

Specifications for AFEXT/AACR-F

- 24 dB improvement over Class EA
  - ISO TR, TIA Cat 8 draft, and ISO 11801 ed 3 draft, are aligned on equations for PSAACR-F

Class	Frequency MHz	Minimum PSAACR-F (dB)
EA	1 ≤ f < 500	77 – 20log(f)
FA	1 ≤ f < 1000	92-20log(f)
I, II and TIA Cat 8	1 ≤ f < 2000*	101-20log(f)

* ISO Class I and Class II equations are aligned, and as above, but are for further study between 1600 and 2000 MHz

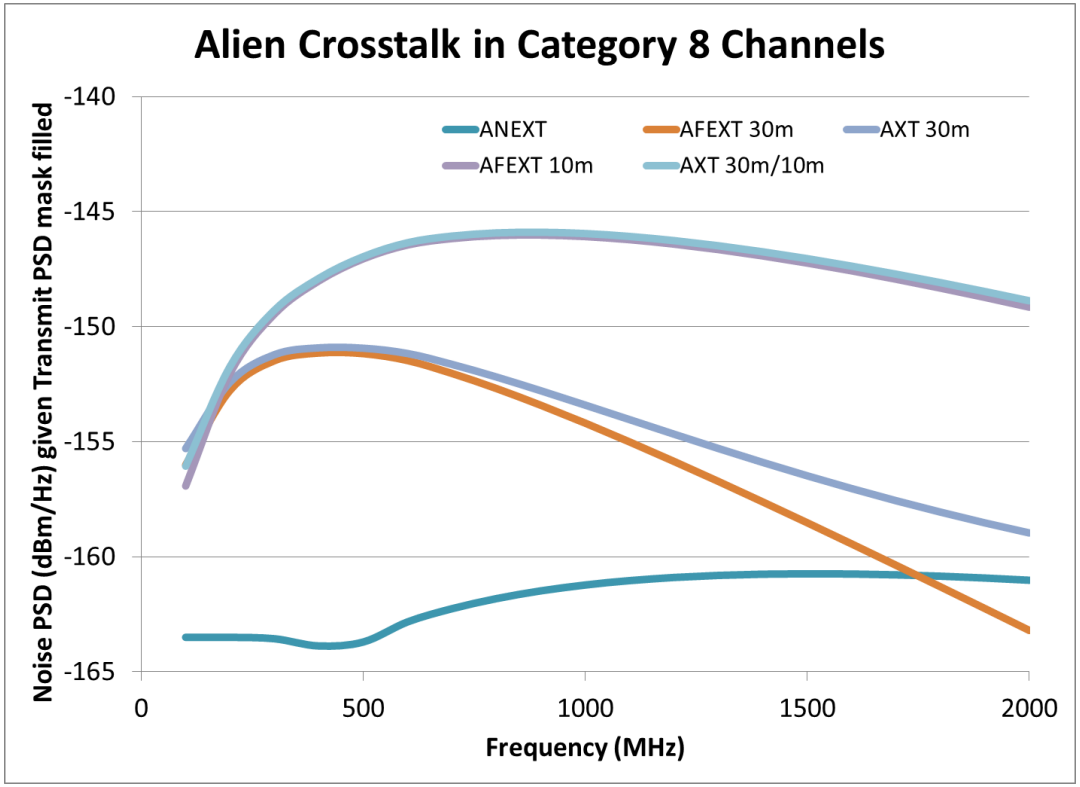
Statements in ISO TR about coupling attenuation levels allowing cabling to “meet these requirements by design” do not change the requirements themselves.

Impact of 40G topology & frequency

- 4X of 40GBASE-T frequency increases alien coupling 9 to 12 dB
  - ANEXT: 15log10(f) term increases by 9 dB
  - AACR-F: 20log10(f) term increases by 12dB
- Reduced IL due to shorter 40GBT links increases AFEXT coupling given a fixed AACR-F increases the AFEXT about 11dB
  - 22.5 dB @ 1000MHz for class 1 vs. 33 dB at 250MHz for Class EA
- Alien FEXT dominates overall alien noise
- Near-far problem can bring level to one of concern if there is no PBO

Example Noise PSDs w/o PBO

Average AXT power 30m into 30m = -155.7dBm
Average AXT power 10m into 30m =



- 30m victim channel
  - ANEXT
  - AFEXT from 2 cases
    - 30m aggressor
    - 10m aggressor
- Transmit PSD is proposed scaled PSD mask
  - Represents “not to exceed” mask
  - Actual PSD is on average 2.02dB lower at 0dBm transmit power

Fortunately we know how to solve this

- Clause 55 already has the machinery to solve this, we just need a PBO schedule
  - 2 dB steps
  - Maintain Alien noise level around levels seen on the 30m/30m equal-length arrangement
    - -154 dBm/Hz worst-case level
  - Eliminates the concern
- Cabling standards groups can still work on improving alien crosstalk specifications

2 dB PBO Steps Manage Alien Crosstalk Levels

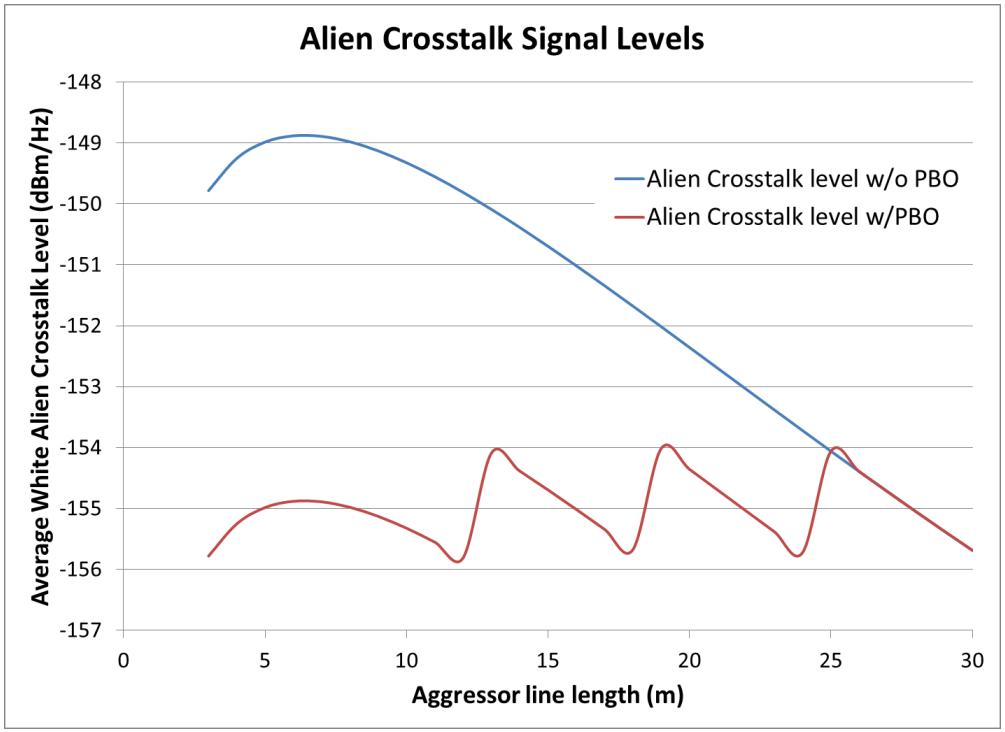
PBO Schedule based on Received Far-end power normalized to MDI (as in Clause 55)

from	to		PBO step
-200	-11.4	dBm	0
-11.4	-9.4	dBm	-2
-9.39	-7.2	dBm	-4
-7.19	P_tmax	dBm	-6

Maximum Alien level is

-154dBm/Hz

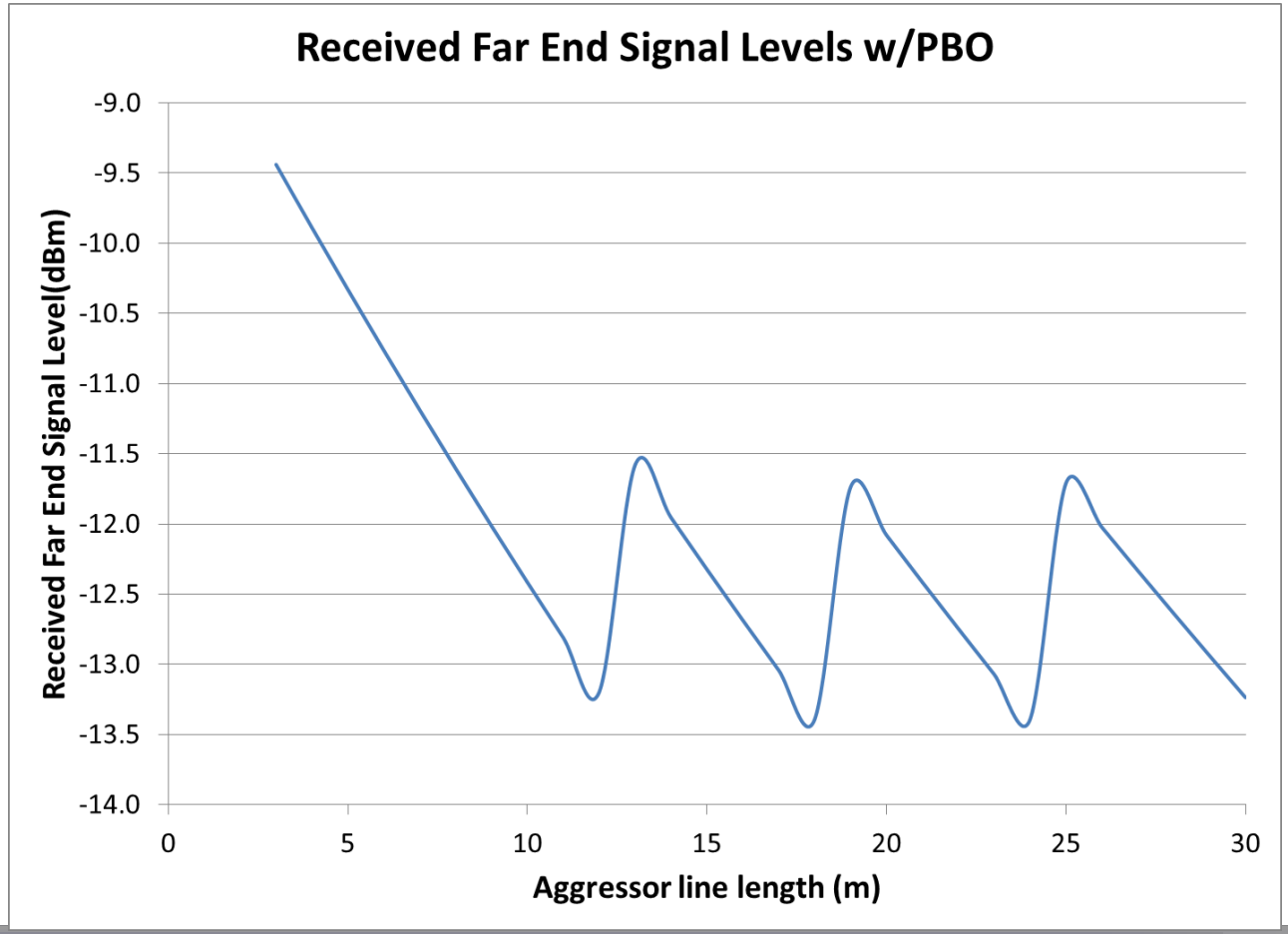
Within 1.6dB of 30m/30m level



Received Signal Power Maintained

- PBO schedule maintains received signal power level, indicating SNR margin is not adversely impacted

Minimum RX signal power is -0.2 dB less than 30m RX signal power



Proposals

- Proposal 1: Adopt PBO schedule on slide 9 of zimmerman_3bq_03_0714.pdf as power backoff schedule, in subclause 98.4.3.1 to replace Table 55-11 as source.
- Proposal 2: Adopt subclause 55.5.4.4 Alien Crosstalk Noise Rejection as 98.5.4.4, modifying the level to -154 dBm/Hz and upper frequency to 2000 MHz