Alien Crosstalk Margin Computation With Backoff

September 2005
Milpitas, CA

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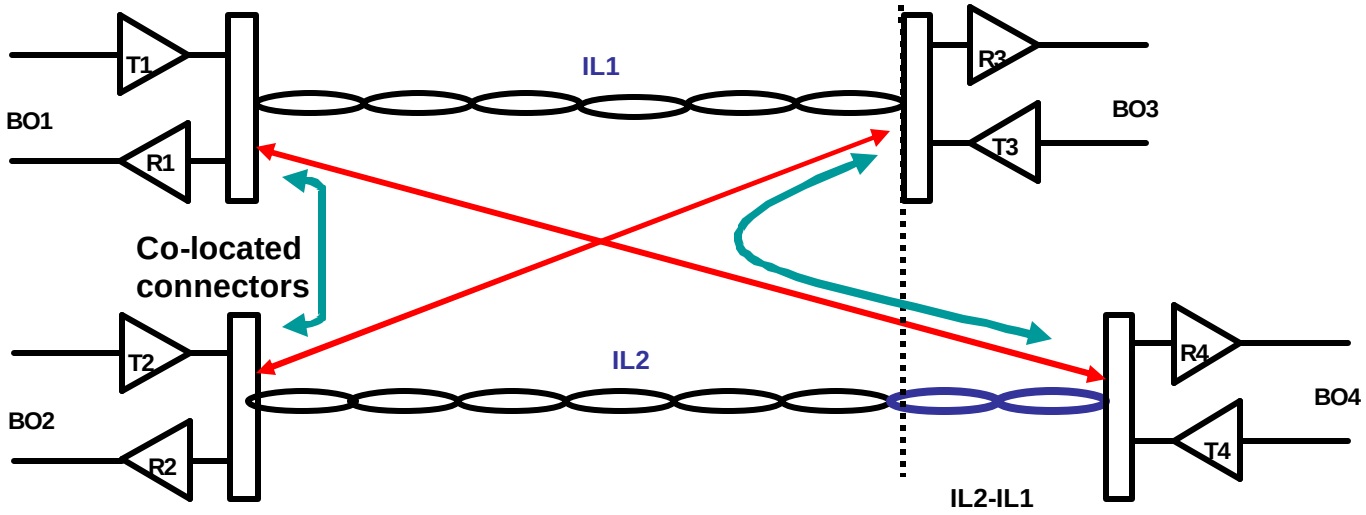
Alien Crosstalk Margin Calculation with Backoff

- **For asymmetrical link segments, where the disturbing cables are in close proximity for only a portion of the disturbed cable length, a backoff factor should be added to the ANEXT and AFEXT of each disturbing pair of a link segment.**

Alien Crosstalk Configuration



	AFEXT	ANEXT	Signal
R1	AFEXT_T4R1+BO4+(IL2-IL1)	ANEXT_T2R1+BO2	IL1+BO3
R2	AFEXT_T3R2+BO3	ANEXT_T1R2+BO1	IL2+BO4
R3	AFEXT_T2R3+BO2	ANEXT_T4R3+BO4+(IL2-IL1)	IL1+BO1
R4	AFEXT_T1R4+BO1+(IL2-IL1)	ANEXT_T3R4+BO3+(IL2-IL1)	IL2+BO2

Where: AFEXT_TnRn = AELFEXTcoupled length+ILcoupled length
Note: Variables are dB loss – i.e., positive values

Principles of Operation

Step 1. Calculate the IL Backoff factor

•An IL backoff is calculated for each of the disturbed and disturbing pairs of a link segment.

- The average measured IL @ 250 MHz "across the pairs" for each disturbed and disturbing link is used to calculate a length to determine power backoff level from the schedule table.

▪Where: L = 2.77 * measured IL @ 250 MHz

•An IL backoff factor is calculated as the difference between the IL backoff of the disturbed and disturbing link segment.

•Where: IL backoff factor= IL_BOF = IL backoff of disturbing link – IL backoff of disturbed link

• The IL backoff factor (IL_BOF) is added to the ANEXT and AFEXT of each disturbing pair

Principles of Operation

- **The IL backoff factor (IL_BOF) is added to the ANEXT and AFEXT of each of the disturbing pairs of a link segment for each disturbed pair N=1,2,3,4.**

$$PSANEXT_N(f) = -10 \times log10 \sum_{i=1}^{n} 10^{\frac{-\left(AN\_PR(f)_i + IL\_BOF_i\right)}{10}}$$

$$PSAFEXT_N(f) = -10 \times log10 \sum_{i=1}^{n} 10^{\frac{-\left(AF\_PR(f)_i + IL\_BOF_i\right)}{10}}$$

Individual-Pair Margin Calculation:

Step 1. XW(f) is calculated for each of the 4-pairs

Let XW(f) = - 10*log10(10^(-0.1*AN(f))+10^(-0.1*AF(f)))+
10*log10(10^(-0.1*(AN_IPL(f)+2.5))+10^(-0.1*(AF_IPL(f))))

Let XXn(f)= (10*log10(10^(-0.1*AN(f)) + 10^(-0.1*AF(f))))

Where:

AN(f) = measured PSANEXT Loss adjusted for POB in dB from f=10 MHz to f=400 MHz
AF(f) = measured PSAFEXT Loss adjusted for POB in dB from f=10 MHz to f=400 MHz
XXn(f) = power sum of AN(f) and AF(f) for pair n n=(1,2,3,4)

AN_IPL(f)= Individual-pair limit line for PSANEXT as specified in 802.3an D2.3 equation 55-23 utilizing the measured insertion loss of the individual-pair.
***Note: The 2.5 dB is the PSANEXT allowance for the peak-to-average difference across frequency**

AF_IPL(f) = Individual-pair limit line for PSAFEXT calculated from the PSAELFEXT equation specified in 802.3an D2.3 55.29 utilizing the measured insertion loss of the individual-pair.

Individual-Pair Margin Calculation:

Step 2. Calculate average value "across frequency" of XW(f)

Take the average value "across frequency" of XW(f) from 10 to 400 MHz, for each individual-pair of the 4-pair cabling, let these be XW1, XW2, XW3, XW4.

Let Yinp = min (XW1, XW2, XW3, XW4).

If Yinp < 0 then the cabling fails the "individual-pair" test and you can stop here.

Average Margin Calculation:

Step 3. Calculate XA(f)

Let XA(f) = -(SUM(XXn(f))/4) + 10*log10(10^(-0.1*AN_AVGL(f))
+ 10^(-0.1*AF_AVGL(f)))

Where:

XXn(f)= (10*log10(10^(-0.1*AN(f)) + 10^(-0.1*AF(f))))

AN_AVGL(f)= Average limit line for PSANEXT as specified in 802.3an D2.3 equation 55-25 where the coefficient for the equation is the minimum of the individual-pair PSANEXT coefficients.

AN_AVGL(f)=(min(PSANEXT_coefficients)+3.5)-10*LOG(fMHz)/100) 1=fMHz=100
=(min(PSANEXT_coefficients)+3.5)-15*LOG(fMHz)/100) 100<fMHz=500

*****Note: The 3.5 dB is the PSANEXT allowance for the peak-to-average difference across frequency and the average across the 4-pairs**

Average Margin Calculation:

AF_AVGL(f)= Average limit line for PSAFEXT obtained by adding the measured IL from the pair with the minimum AELFEXT coefficient to the PSAELFEXT limit specified in 802.3an D2.3 equation 55-31 where the coefficient for the equation is the minimum of the individual-pair PSAELFEXT coefficients.

AF_AVGL(f) = (min(PSAELFEXT_coefficients)+4) -20*LOG(fMHz)/100)+ (measured IL of pair with minimum PSAELFEXT coefficient)

<u>Step 4. Calculate average value “across frequency” of XA(f)</u>

Let Yavg = the average value “across frequency” of XA(f) from 10 to 400 MHz

The margin of the cabling to the “average” test is Yavg dB. The cabling fails this test if Yavg < 0.

Alien crosstalk margin calculation

The link segment margin calculation is defined by the equation:

YL = min (Yinp, Yavg)
YL > 0 is required for a pass

<u>Where:</u>

Yinp is the average value “across frequency” of XW(f) from 10 to 400 MHz.

Yavg the average value “across frequency” of XA(f) from 10 to 400 MHz.

Both Yinp and Yavg must be > 0 for the cabling to pass.

The link segment margin is YL = min(Yinp,Yavg)