Comparing 3 ways of measuring crosstalk to simulations presented by Joe Abler

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The 3 ways of measuring crosstalk are: ICR, defined in the spec and 2 integral based measures.

The integral methods use 3 integrals:

$$\text{PowerGain}_{\text{xtalk}} = \int T_b \cdot 10^{-\text{PSXT}/10} \cdot (\text{sinc}(f \cdot T_b))^2 \cdot df$$

$$\text{PowerGain}_{\text{signal}} = \int T_b \cdot 10^{-A(f)/10} \cdot (\text{sinc}(f \cdot T_b))^2 \cdot df$$

$$\text{SlewGain}_{\text{signal}} = \int T_b \cdot 10^{-A(f)/20} \cdot \sin(f \cdot T_b) \cdot \text{sinc}(f \cdot T_b) \cdot df$$

$$\text{Gain1} = 10 \cdot \log\left(\frac{\text{PowerGain}_{\text{signal}}}{\text{PowerGain}_{\text{xtalk}}}\right)$$

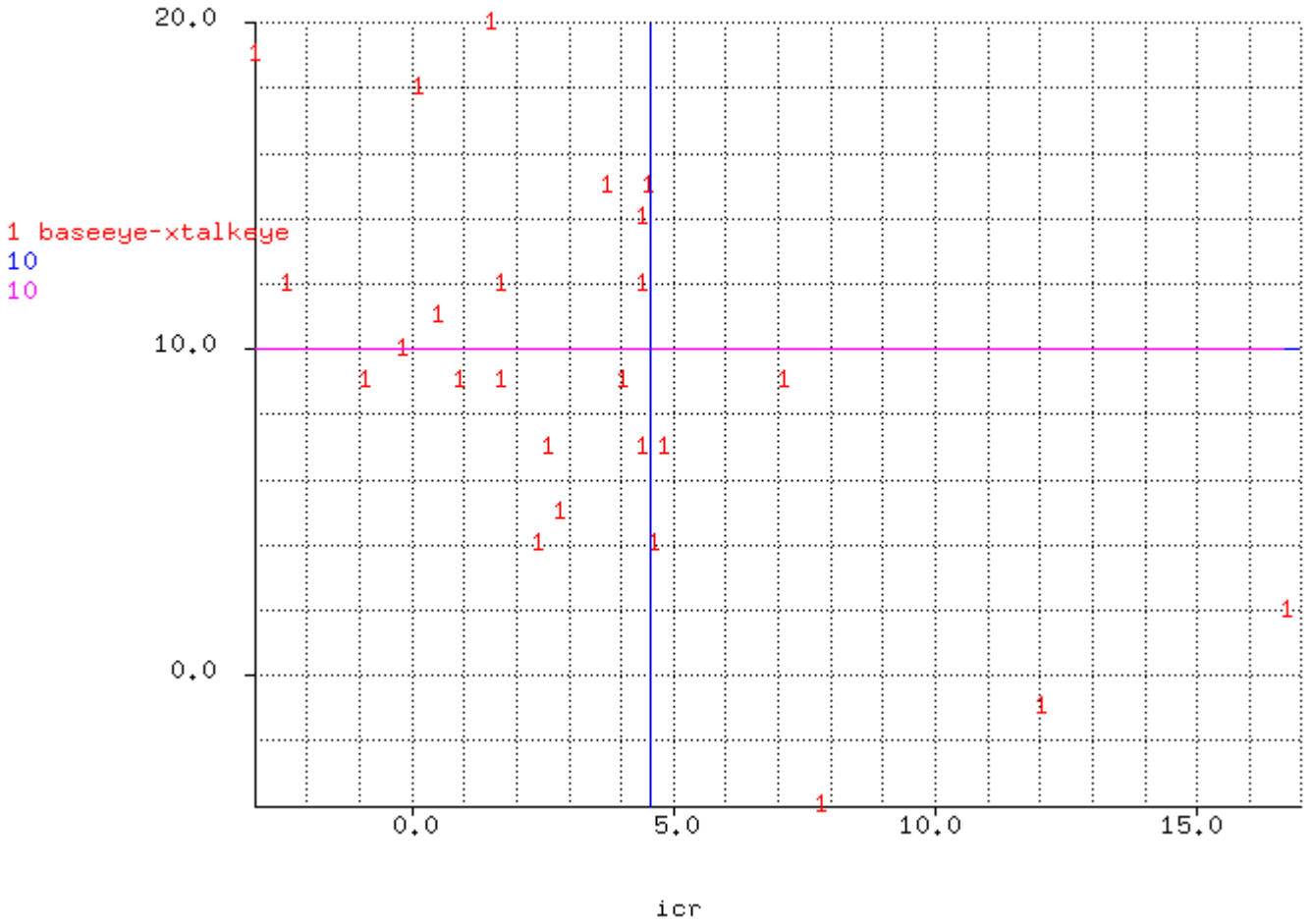
$$\text{Gain2} = 10 \cdot \log\left(\frac{\text{SlewGain}_{\text{signal}}^2}{\text{PowerGain}_{\text{xtalk}}}\right)$$

I am using data presented in abler_01_0305 and abler_c1_01.

I compared ICR margin, and two gain ratios for 24 channel crosstalk combinations:

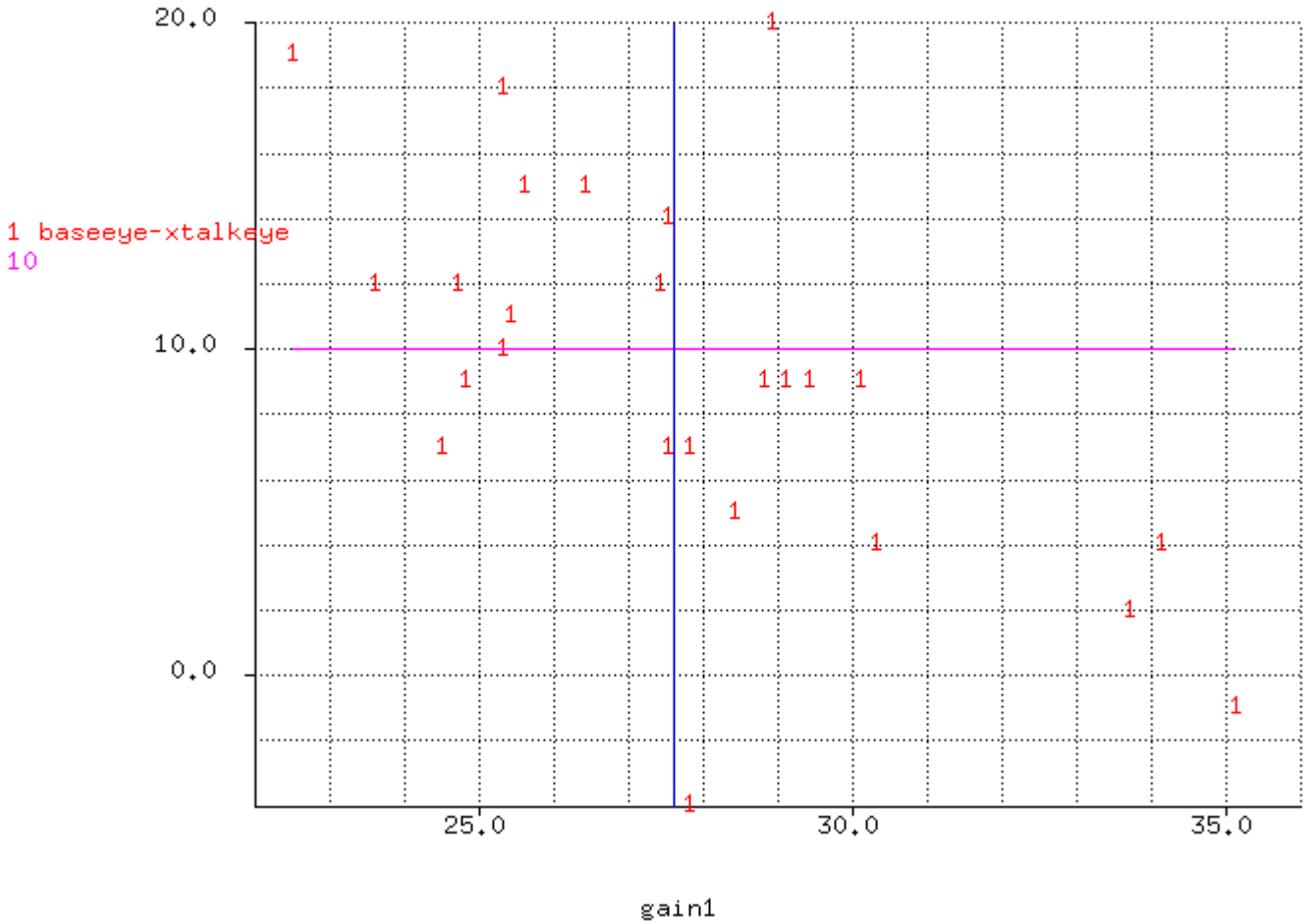
case			Horizontal EYE(%) DCDonly	plusXtalk	ICR margin	gainRatio1	gainRatio2
Tyco	Case	1	24	15	-0.9	28.8	13.3
Tyco	Case	2	23	14	4.0	29.1	13.3
Tyco	Case	3	13	9	4.6	30.3	13.7
Tyco	Case	4	28	21	4.4	27.8	13.5
Tyco	Case	5	29	22	2.6	27.5	15.0
Tyco	Case	6	13	4	7.1	29.4	15.5
Tyco	Case	7	12	16	7.8	27.8	16.0
intel	B	1	16	9	4.8	24.5	13.5
intel	B	12	21	6	4.5	25.6	13.3
intel	B	20	16	1	3.7	26.4	12.9
intel	M	1	12	7	2.8	28.4	16.8
intel	M	20	20	0	1.5	28.9	14.9
intel	M	20_N	20	11	0.9	30.1	16.0
intel	M	20_F	20	21	12.0	35.1	21.1
Molex	IN	j2	14	4	-0.2	25.3	9.9
Molex	IN	j3	19	0	-3.0	22.5	7.1
Molex	IN	j4	12	0	-2.4	23.6	8.1
Molex	IN	j5	25	7	0.1	25.3	9.9
Molex	OUT	j2	26	14	4.4	27.4	12.3
Molex	OUT	j3	24	12	1.7	24.7	9.6
Molex	OUT	j5	25	16	1.7	24.8	9.7
Molex	OUT	j5	30	16	4.4	27.5	12.4
Avago+Intel_T5_next5			21	19	16.7	33.7	18.5
Avago+Tyco_C5N2			21	17	2.4	34.1	18.9
Avago+Molex_IN_FEXTj5h4			21	10	0.5	25.4	10.3

Scatter diagram of loss in horizontal eye due to crosstalk vs ICR margin



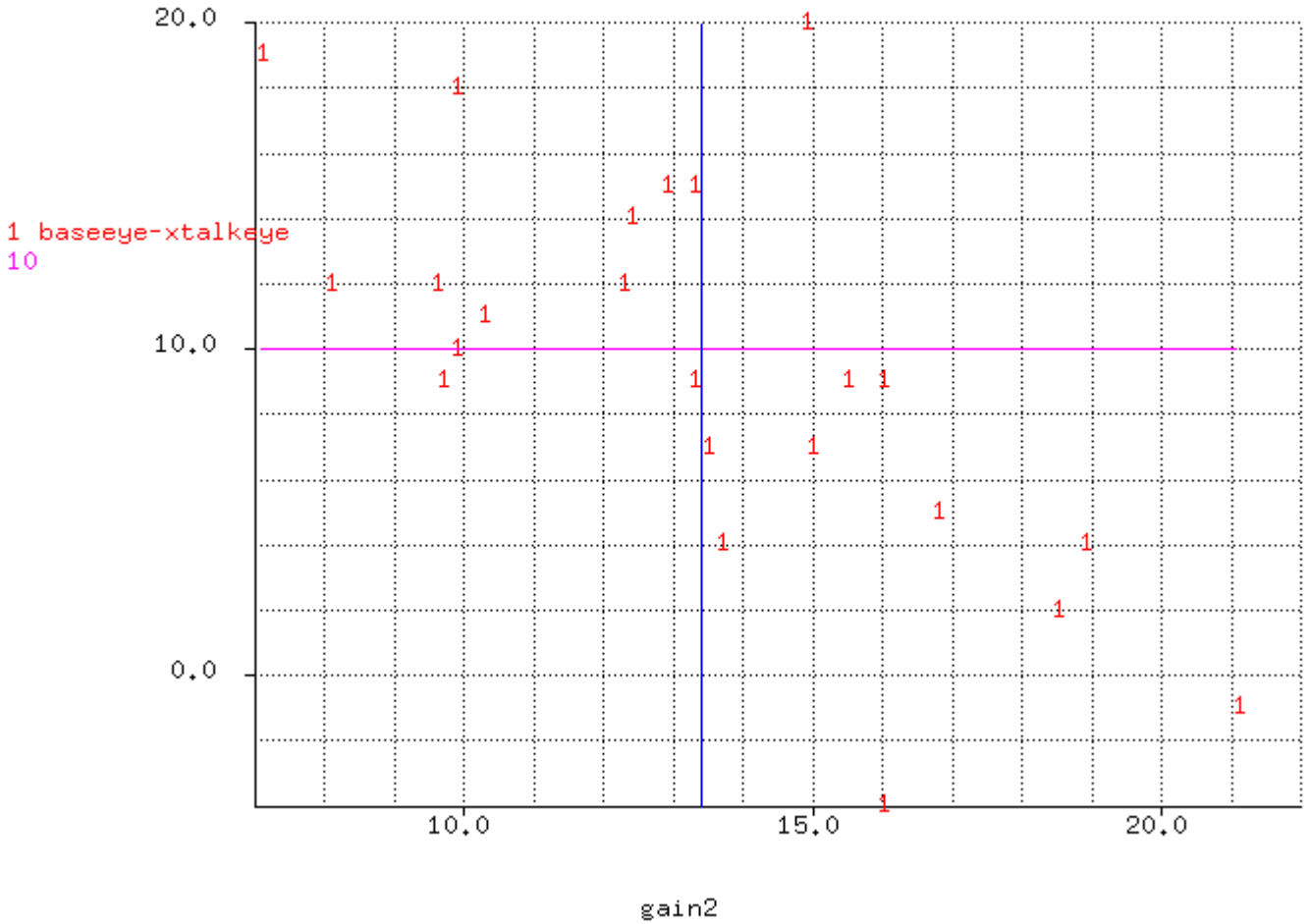
Crossed lines represent a potential specification at 10% EYE closure due to crosstalk, and a corresponding ICR spec, 4.6dB higher that current spec.

Scatter diagram of loss in horizontal eye due to crosstalk vs power gain ratio (gain1)



Crossed lines represent a potential specification at 10% EYE closure due to crosstalk, and a corresponding Gain1 spec, of 27.6dB.

Scatter diagram of loss in horizontal eye due to crosstalk vs slew gain (Gain2)



Crossed lines represent a potential specification at 10% EYE closure due to crosstalk, and a corresponding Gain2 spec, of 13.3dB.

The two “gain ratio” based measures fail many fewer potentially good channels than the ICR based measure. This is at the expense of passing one spectacularly bad channel. This is peters_01_0605_M20 which generally exhibits strange behavior in simulation and I think is safe to ignore as a simulation error.