Performance vs. Complexity and Line Code Proposal

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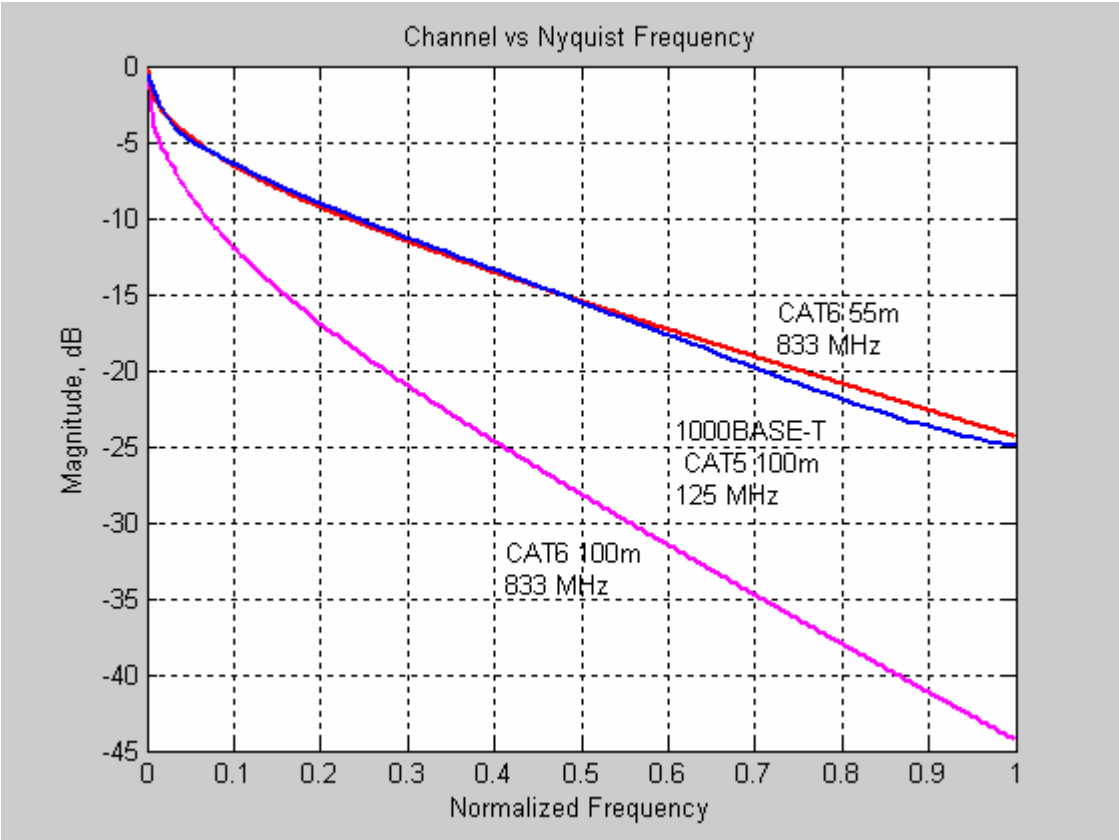
Channel Loss Comparison

Normalized with Nyquist Frequency



55m of CAT6 has the same loss at these target freq.s as 100m of CAT6 running at 1GBT signaling rates.

Must run several times faster but it is doable.

20dB Gap between 55m and 100m. This forces an IC implementation towards two different transceiver designs in terms of

Power and Latency.

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Complexity Estimation

	FIR OP/Baud	FEC	AFE	Estimation	
				Power	Latency
55m CAT6	400	RS	8bit	3~4W (90um)	~560ns
100m CAT7	1100	Advanced Coding + TH Pre-Coding or DFSE	10bit	10~12W (90um)	Several Micro-Seconds

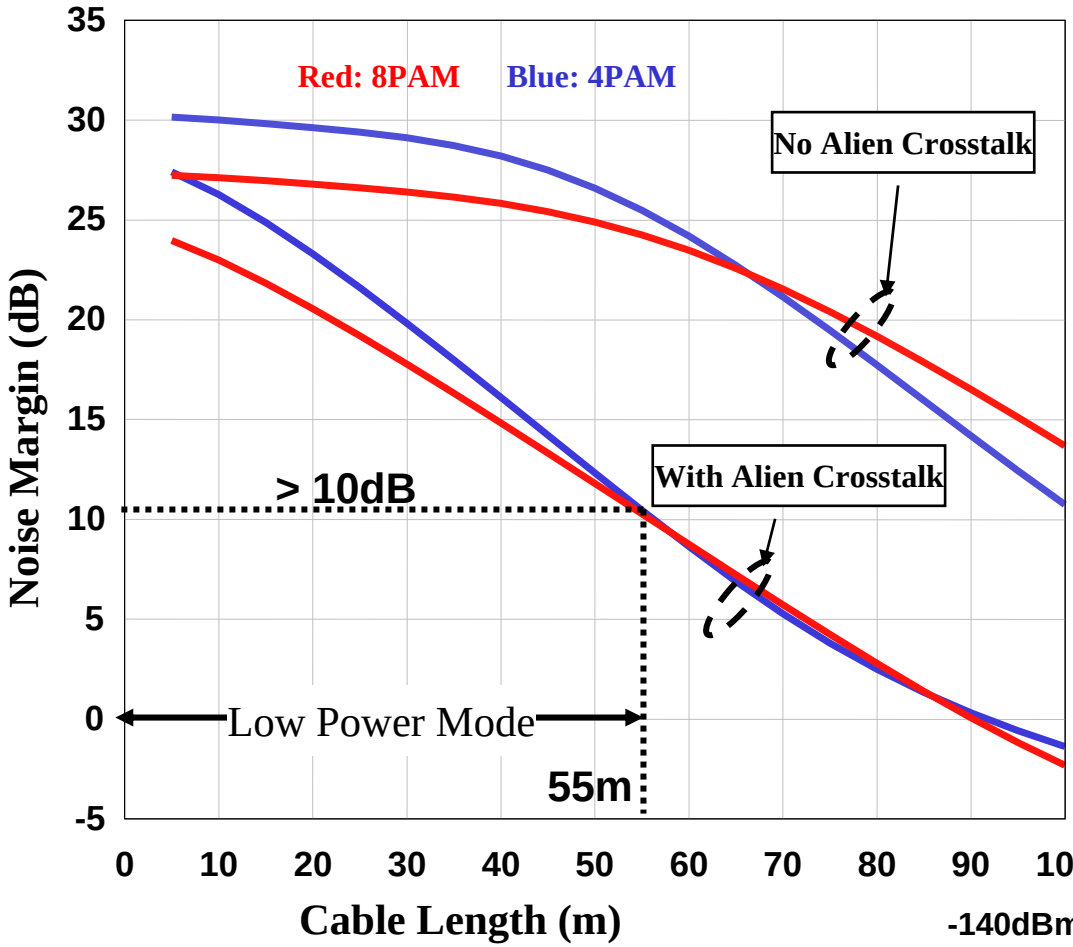
→ Low Power Mode

→ Full Power Mode

Power/Latency are a strong function of the performance objectives at 55m and 100m.

Noise Margin Comparison, 8PAM and 4PAM

6dB Coding Gain Assumed, BER=10**(-12)



Results

1. 4PAM is the better solution for cable shorter than 60~70m w and w/o Alien
2. Greater than 10dB margin can be achieved with simple DFE structure with full Alien Cross-talk Noise.
3. 8PAM is better solution only when
   - Alien mitigation is possible and
   - Longer Cable

-140dBm/Hz IC Noise

10dBm Power

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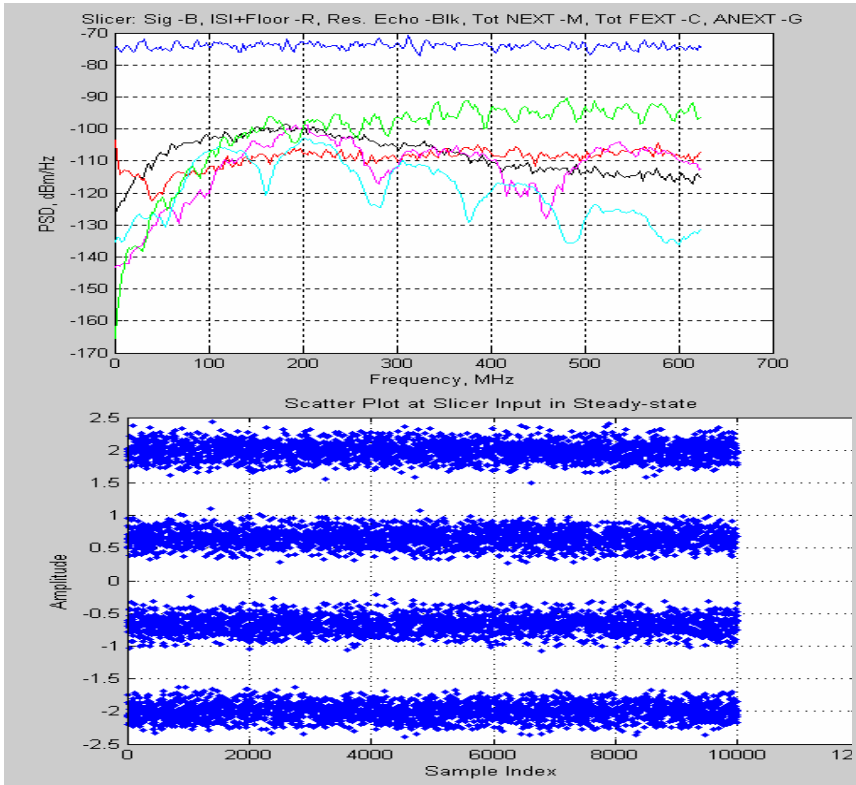
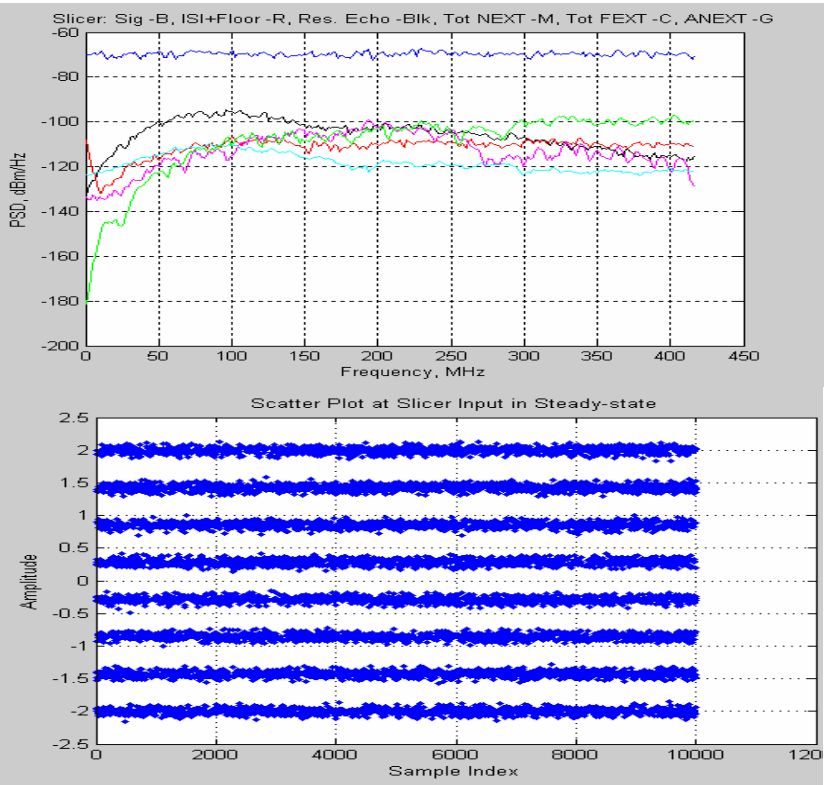
Behavioral Simulation for 55m, CAT6

4PAM 1.25G baud



8PAM 833M baud



Margin w/o FEC

BER=10(-12)**

0.2dB **0dB**

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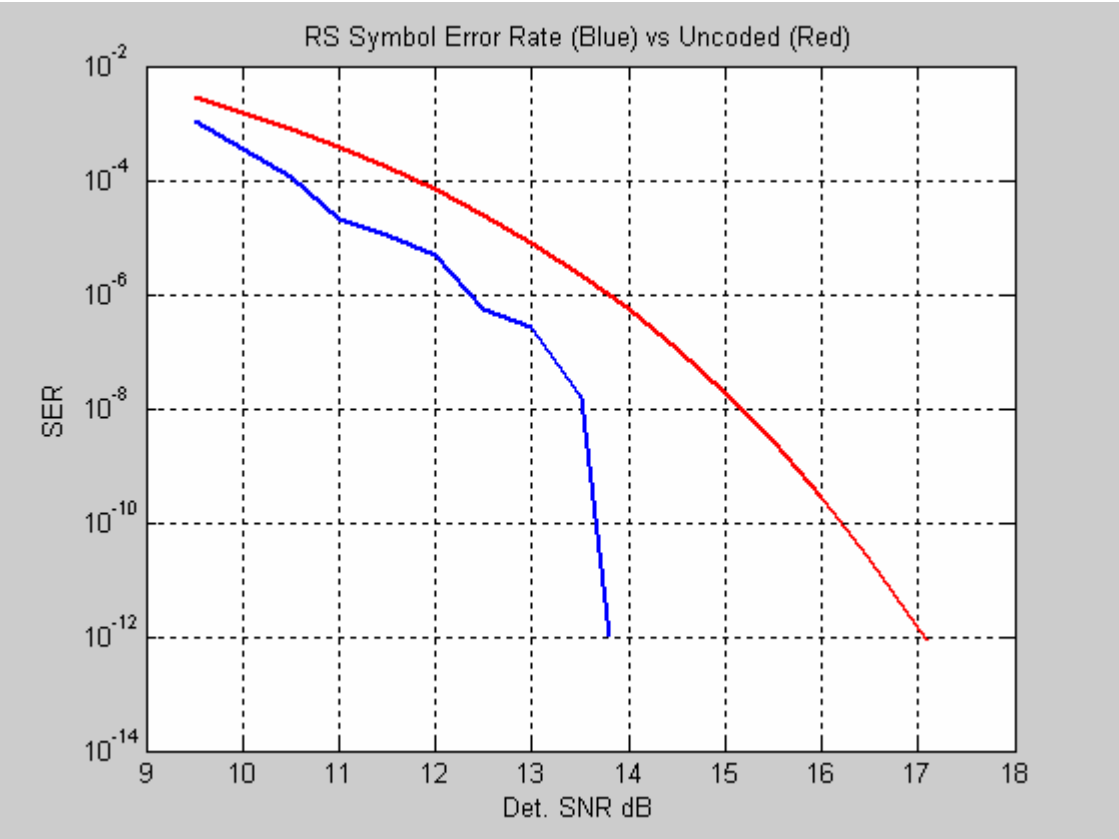
Coding Gain of RS 55m Cable, CAT6



3~4dB coding gain is confirmed with 55m cable with behavioral simulation.

A combination of the proved RS (255,239, T=8) and the proper EQL/DFE is enough for the Low-Power Mode.

Applicable for both 4PAM and 8PAM.

Summary and Proposal

- **Power/Latency vs. Performance Trade-Off was investigated.**

[Low Power Mode] 55m on CAT6, No Alien mitigation is Necessary : 3~4W, 560nsec of latency

[Full Power Mode] 100m on CAT6 with Alien mitigation or CAT7 : 10~12W, Several micro seconds of latency

- **PAM4 vs. PAM8**

PAM-4 is a better solution for the Low Power Mode

(Allows higher coding gain with the latency constraint)

PAM-8 will be a Full Power solution only when Alien Mitigation is possible or used over high grade cable.

Proposal for LOW POWER MODE

- **4PAM with proper RS**
- **1.25Gbaud x 7% Overhead**
- **No additional FEC, No Pre-coding**

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