To: T10 Technical Committee  
From: Barry Olawsky, HP (barry.olawsky@hp.com)  
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Subject: T10/05-025r0 SFF8470 Crosstalk Study

Revision History  
Revision 0 (5 January 2005) First revision

Related Documents  
sas1r07 - Serial Attached SCSI 1.1 revision 7  
T10/05-007r0 - SAS-1.1 External Cable Electrical Specification

Overview  
Provide technical data (electrical) to evaluate the feasibility of proposal 05-007r0. Specifically, demonstrate crosstalk summation and provide analysis to support necessary changes.

Reference Information  
Included below
SSF8470 Crosstalk Study

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Topics

- Demonstrate multi-lane SFF8470 near-end crosstalk is additive
- Review crosstalk spec in proposal 05-007r0
- Effects of crosstalk with spectral content above fundamental
- Proposed levels
Multi-Aggressor Crosstalk Assertion

- Near-end inductively coupled crosstalk is additive. At a frequency of interest, crosstalk magnitude at the victim is a summation of the amplitude due to each aggressor. The phase offset of the two aggressors, observed at the victim, is a parameter in the summation.
Near-End Crosstalk Model
Multi-Aggressor Near-End Crosstalk Model
Differential NEXT Test Fixture Setup

D10.2 used. BERT varies phase offset between aggressors.
NEXT at Victim
(Aggressor edge rare of 120ps), UI: 333ps

Aggressor 1: 26mV
Aggressor 2: 22mV
In-phase Summation: 42mV
NEXT at Victim
(Aggressor edge rare of 60ps), UI: 167ps

Aggressor 1: 44mV
Aggressor 2: 45mV
In-phase Summation: 88mV
Multi-Aggressor Crosstalk Amplitude vs. Aggressor Pair Skew, UI: 333ps, ER: 120ps
Multi-Aggressor Crosstalk Amplitude vs. Aggressor Pair Skew, UI: 167ps, ER: 60ps
Summary of Test Results

- Screen captures show additive property of multi-aggressor NEXT using D10.2 pattern at the above documented edge and data rates.
- Amplitude variation with respect to aggressor skew is further evidence of additive property.
Review of 05-007r0

• Proposal specifies NEXT of -30dB (3.2%) for single pair from 10 to 4500MHz.
• Combining crosstalk from different pairs could yield value that is much larger than 5%.
• Previous sample measurements have demonstrated NEXT amplitudes in excess of 3.2% above 2GHz for most samples tested.
Proposed Changes to 05-007r0

• Consider reducing allowable crosstalk at fundamental such that multi-aggressor sum is less than or near 5%

• Crosstalk isolation required above the fundamental may possibly be reduced. Crosstalk of energy at harmonics must be appropriately accounted for in crosstalk budgeting.