T10/05-079r0 SAS-1.1 Minimum XR/IR Receiver Signal Level for 3Gb SATA Mode

To: T10 Technical Committee
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Subject: T10/04-079r0 SAS-1.1 Minimum XR/IR Receiver Signal Level for 3Gb SATA Mode

Revision History
Revision 0 (22 February 2005) first revision

Related Documents
sas1r05 - Serial Attached SCSI 1.1 revision 5
03-240r1 - SAS-1.1 Merge IT and IR with XT and XR (Rob Elliott, Hewlett Packard)

Overview
Determine expander/initiator receiver threshold requirements when using SATA II compliant 3Gb devices. If proposed receiver specifications are not feasible, define a lower loss TCTF for use with SATA devices.

Proposed Changes
Modify the minimum XR/IR receiver signal level specified for 3Gb SATA mode.

Supporting Information Only (NOT part of SAS-1.1 proposal):

To evaluate the existing SATA mode receive output level specification, a TCTF test load for IT/XT was constructed. A network analyzer was then used to measure the insertion loss and return loss of the TCTF test load as shown below.

[SAS TCTF Test Load Diagram]

Touchtone files were obtained from the VNA and used in HSpice simulations for the following eye diagrams.
Simulation Results

Simulation results of D10.2, K28.5 and the lone-bit patterns are included below. The transmitter amplitude is set to 400mVpp. Rise/fall time of the transmitter is 136ps.

D10.2 amplitude with no transmitter jitter: 227mV

D10.2 amplitude with 0.37UI transmitter jitter: 190mV
Lone-bit pattern amplitude with no transmitter jitter: 206mV

Lone-bit pattern amplitude with 0.37UI transmitter jitter: 173mV
K28.5 pattern amplitude with no transmitter jitter: 215mV

K28.5 pattern amplitude with 0.37UI transmitter jitter: 179mV
Conclusions:

Based on the above data, a receiver would be required to operate correctly with a signal level below 173mV. A value of 150mV would provide a small margin but a value of 125mV would be a more conservative estimate. Are these values feasible with existing receiver technologies?