T10/05-079r1 SAS-1.1 Minimum XR/IR Receiver Signal Level for 3Gb SATA Mode

To: T10 Technical Committee
From: Barry Olawsky, HP (barry.olawsky@hp.com)
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Subject: T10/04-079r1 SAS-1.1 Minimum XR/IR Receiver Signal Level for 3Gb SATA Mode

**Revision History**
Revision 0 (22 February 2005) first revision
Revision 1 (23 February 2005) add suggested number to replace TBDs

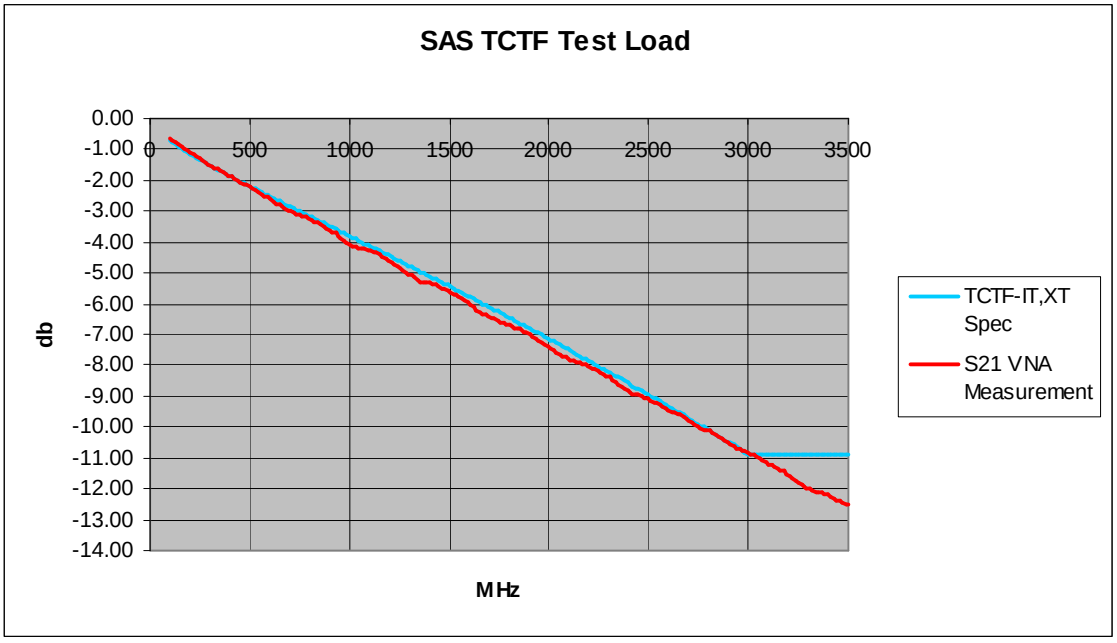
**Related Documents**
sas1r05 - Serial Attached SCSI 1.1 revision 5
03-240r1 - SAS-1.1 Merge IT and IR with XT and XR (Rob Elliott, Hewlett Packard)

**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. Change TBD SATA 3Gb column to 125mV in tables 33 and 35.

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

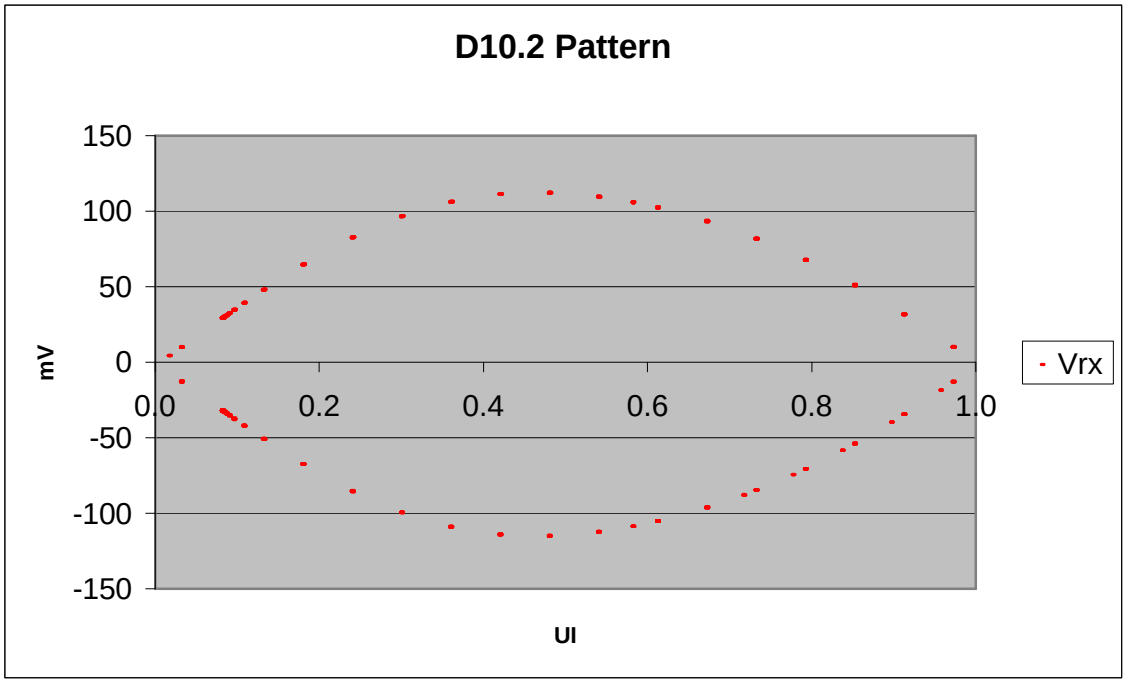
To evaluate the existing SATA mode receive output level specification, a TCTF test load for IT/XT was constructed. A network analyzer was then used to measure the insertion loss and return loss of the TCTF test load as shown below.



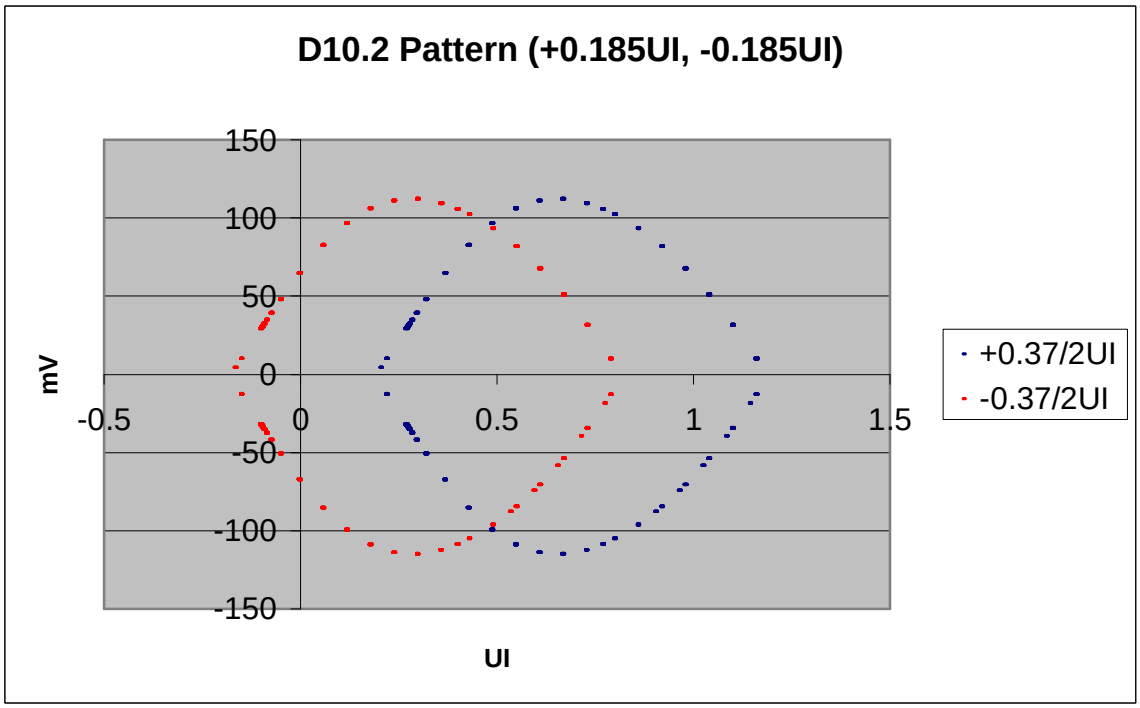

Touchtone files were obtained from the VNA and used in HSpice simulations for the following eye diagrams.

**Simulation Results**

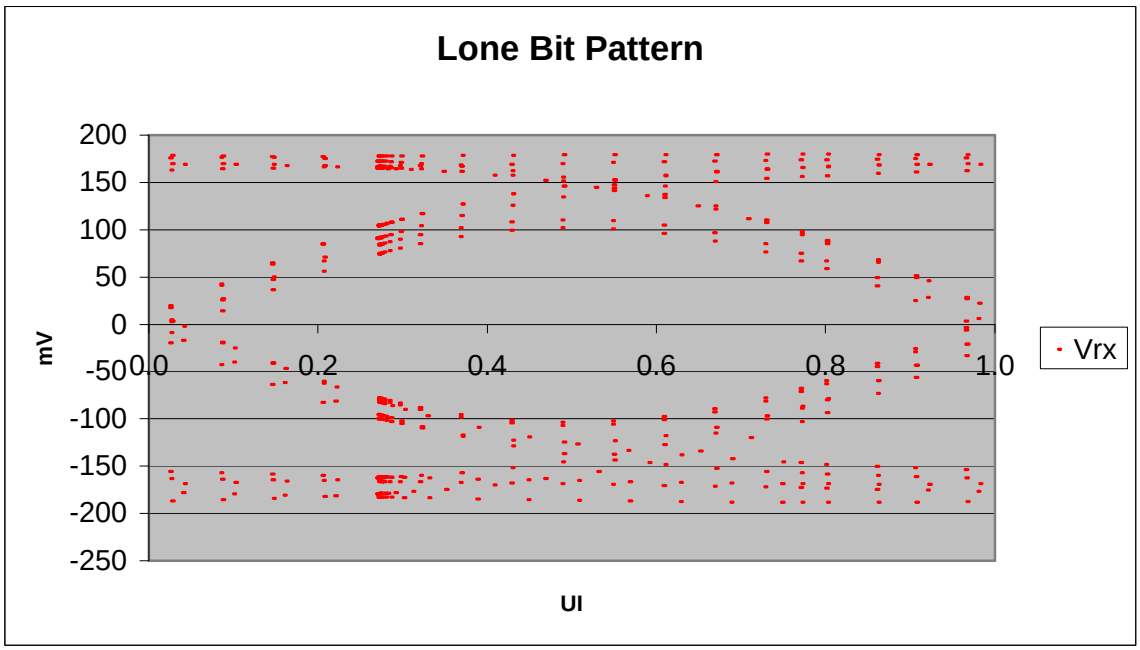
Simulation results of D10.2, K28.5 and the lone-bit patterns are included below. The transmitter amplitude is set to 400mVpp. Rise/fall time of the transmitter is 136ps.



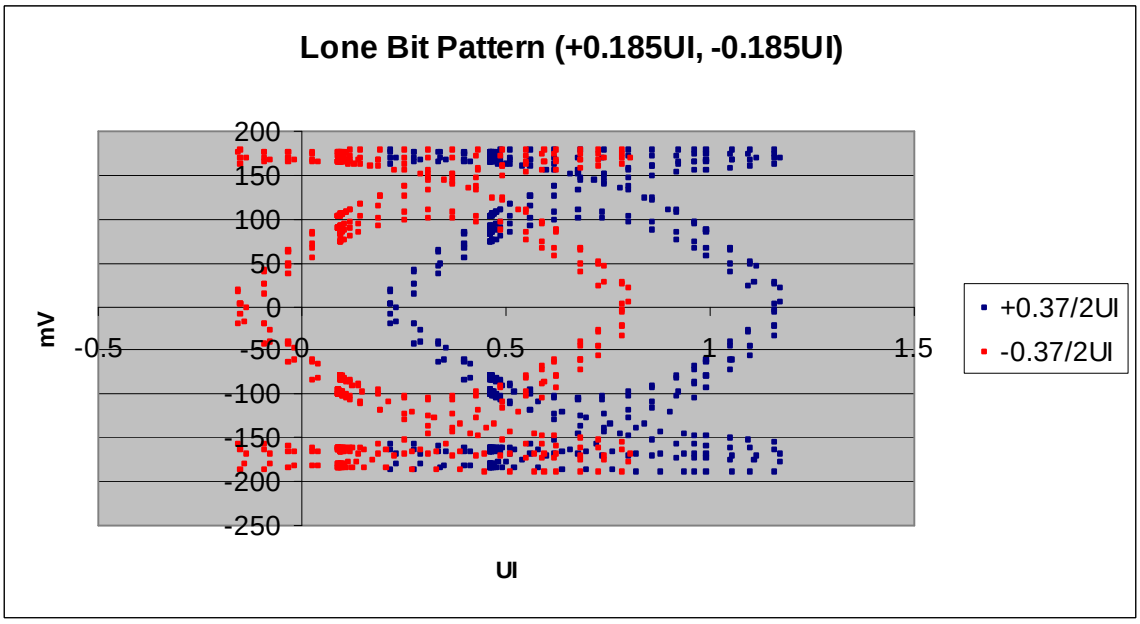

D10.2 amplitude with no transmitter jitter: 227mV



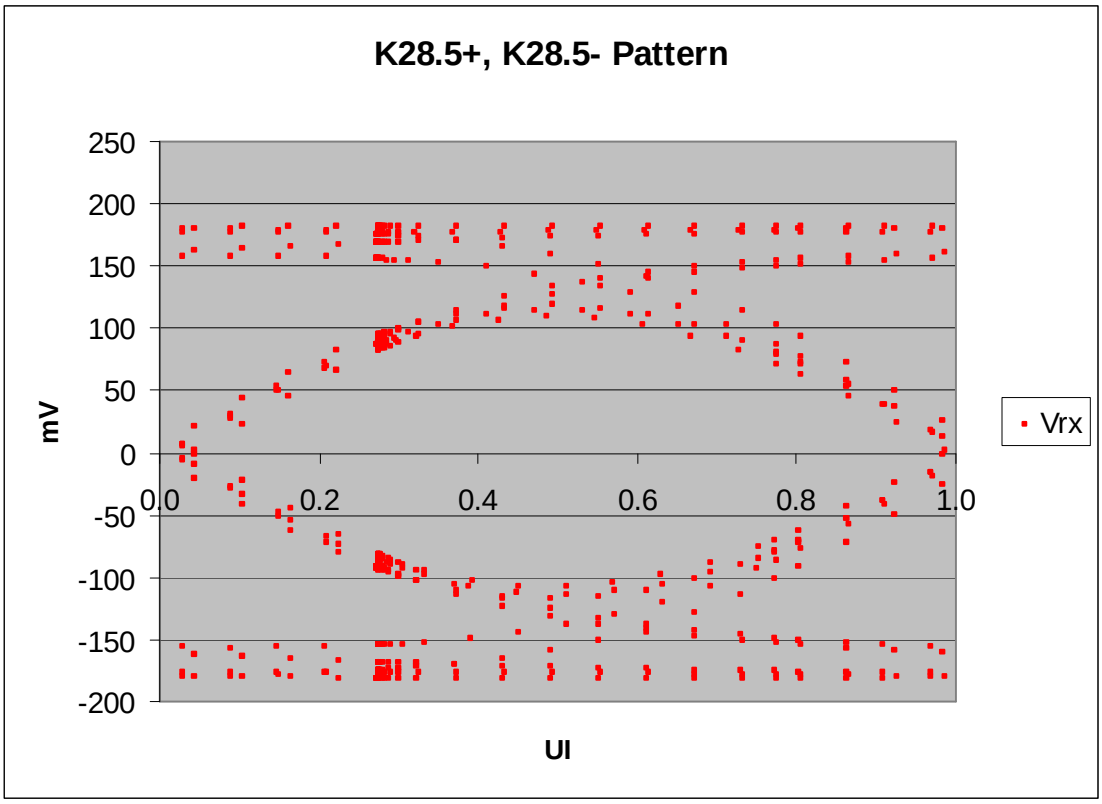

D10.2 amplitude with 0.37UI transmitter jitter: 190mv



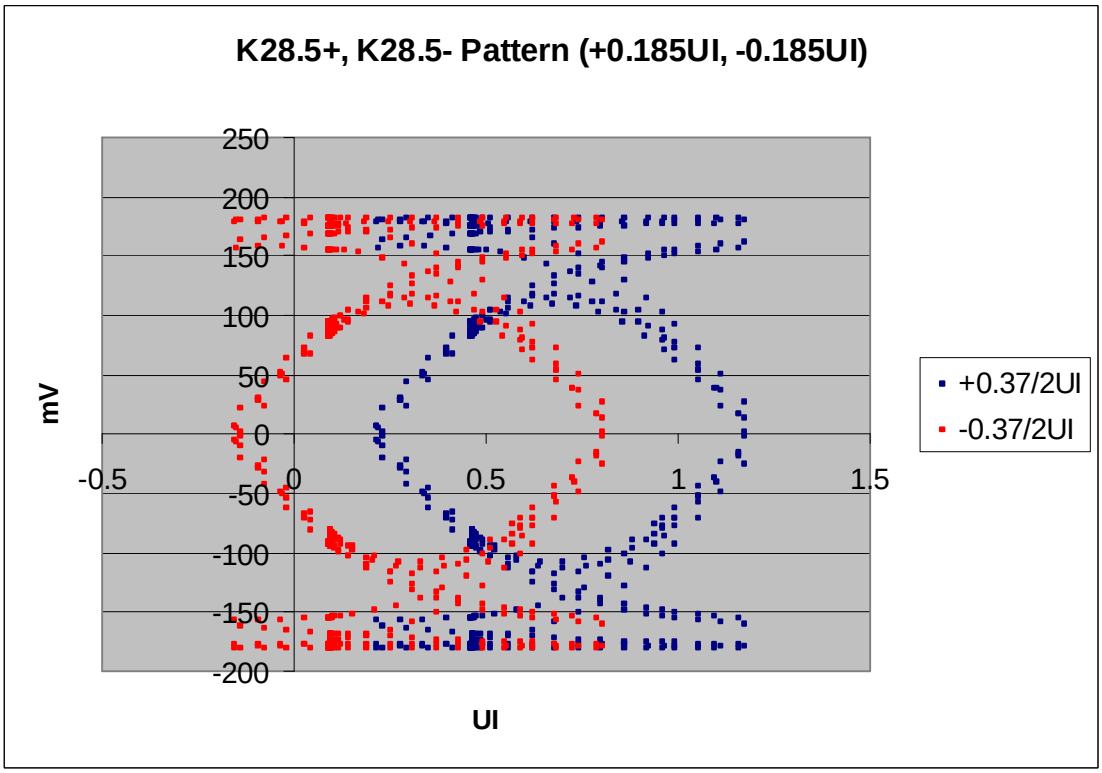

Lone-bit pattern amplitude with no transmitter jitter: 206mV




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?