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To: T10 Serial Attached SCSI PHY Working Group
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Subject: Proposed additions to SAS driver and receiver electrical characteristics

Introduction

This is a proposal to add common mode specifications to define differential signal balance, to define common mode transients during mode changes and hot plug events, and to define a receiver common mode tolerance (i.e., rejection) requirement. Table number and other references in this proposal are to SAS-r01. [Revision 1 of this proposal corrects a minor "cut-and-paste" error in the note in table 15.](#)

Table 14. General interface characteristics

Add the following rows to Table 14 to include maximum AC coupling capacitor value and limits on common mode transients during mode change events. This, combined with the impedance specifications, should define the design requirements for the hot-plug / mode change transient stress problem. Also add a Receiver common mode tolerance spec.

Characteristic	Units	1,5 Gbps	3,0 Gbps
.....			
AC Coupling Capacitor ^c	nF	12 max	12 max
Transmitter common mode transients ^d	V	+/- 2 max	+/- 2 max
Receiver common mode transients ^d	V	+/- 2 max	+/- 2 max
Receiver AC common mode voltage tolerance V _{cm} ^e	mV p-p	150 min	150 min
Receiver AC common mode frequency tolerance range F _{cm} ^e	MHz	2 - 200	2 - 200

Notes:

.....

^c Coupling capacitor value for AC coupled transmit and receive pairs.

^d Maximum common mode transient measured at the transmitter and receiver connector pins into an open circuit load during all power states and transitions. Test conditions shall include system power supply ramping at the fastest possible power ramp (up and down).

^e Receivers must tolerate sinusoidal common mode noise components within the frequency range F_{cm} and of peak-to-peak amplitude V_{cm}.

Table 15. Transmitted signal characteristics at Tx compliance points and optional Tx compliance points

Add the following to the Dt, Ct, Xt, and It rows for a specification for common mode signal component (balance of the differential signal) at the transmitter output.

Compliance Point	Signal Characteristic	Units	SATA 1.0	1.5 Gbps	3.0 Gbps
.....					
	Max common mode signal component ^e	mV(p-p)	N/A	100	100
.....					
Notes:					
.....					
^e Maximum peak-peak amplitude of the common mode signal at the receiver -transmitter connector during data transitions.					

Table 16. Delivered signal characteristics at Rx compliance points

Add the following to the Dr, Cr, Xr, and Ir rows for a specification for common mode signal component (balance of the differential signal) at the transmitter output.

Compliance Point	Signal Characteristic	Units	SATA 1.0	1.5 Gbps	3.0 Gbps
.....					
	Max common mode signal component ^e	mV(p-p)	N/A	150	150
.....					
Notes:					
.....					
^e Maximum peak-peak amplitude of the common mode signal at the receiver connector during data transitions.					

5.7.12 Receiver characteristics

Add a common mode rejection requirement in the third paragraph:

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Additionally the receiver shall also operate within the BER objective when the signal at a receiving phy has the additional sinusoidal jitter present that is specified in the Table 18 [and the common mode signal V_{cm} over frequency range F_{cm} as is specified in Table 14](#). Jitter tolerance figures are given in 5.7.4.4 for all interoperability points in a TxRx connection. The figures given assume that any external interference occurs prior to the point at which the test is applied. When testing the jitter tolerance capability of a receiver the additional 0,1 UI of sinusoidal jitter may be reduced by an amount proportional to the actual externally induced interference between the application point of the test and the input to the receiving phy. The addition of additional jitter reduces the eye opening in both voltage and time; see the Jitter tolerance masks in 5.7.8.