

Date: April 23, 2008
 To: T10 Technical Committee
 From: Alvin Cox (alvin.cox@seagate.com)
 Subject: SAS-2 letter ballot comment updates for transmitter and receiver tables

Abstract: The attached information is a result of discussions concerning letter ballot comments on SAS-2 related to the 6Gbps transmitter device, reference transmitter, and physical receiver testing.

Table 61 — Transmitter device signal output characteristics for 6 Gbps applications at IT and CT (unless otherwise noted)

Signal characteristic	Units	Min	Nominal	Max
Peak to peak voltage if SATA is not supported ^a	mV(p-p)	850		1 200
Transmitter device off voltage ^b	mV(p-p)			50
Maximum Withstanding voltage (non-operational)	mV(p-p)	2 000	2000	
Minimum Rise/fall time ^c	UI (ps)	0,25 (41,666..)		0,41 (68,333..)
Reference Diff Impedance ^g	Ohm		100	
Reference Common Mode Impedance ^g	Ohm		25	
Common mode voltage limit (rms) ^d	mV			30
Random Jitter (RJ) ^e	UI (ps)			0,15 (25)
Half of maximum jitter (i.e., X1 in figure 114) ^f	UI (ps)			0,30 (50)
Minimum eye opening (i.e., 2 x Z1 in figure 114) ^f	mV(p-p)	400 84		

a See 5.3.6.5.5 for measurement method. Value measured is V_{pk-pk} .
b The transmitter device off voltage is the maximum A.C. voltage measured at compliance points IT and CT when the transmitter is unpowered or transmitting D.C. idle (e.g., during idle time of an OOB signal).
c Rise/fall times are measured from 20% to 80% of the transition with a repeating 0101b pattern (see table 218 in 10.2.9.1) on the physical link.
d Broadband (total) rms Common Mode Voltage limit. For additional limits on spectral content, see Figure 118 and Table yyy.
e RJ = 14 times the random jitter 1 sigma value, based on a BER of 10^{-12} . Test performed with a repeating 0101b pattern (see table 218 in 10.2.9.1) on the physical link. If the transmitter device supports SSC, this measurement shall be performed with SSC enabled and SSC disabled. For simulations based on a BER of 10^{-15} , the RJ specified is 17 times the 1 sigma value.
f This value is obtained by simulation. It represents the resulting signal output within the reference receiver (see 5.3.7.4.3) after equalization, when the transmitter device output signal of CJTPAT is transmitted through the reference transmitter test load (see 5.3.2.5).
g For transmitter device S-parameters characteristics, see 5.3.6.5.2.

Table 65 — Reference transmitter device characteristics at IT and CT

Characteristic	Units	Value
Peak to peak voltage ^a	mV(p-p)	1 000 ^b 850
Transmitter equalization ^a	dB	2
Maximum rise/fall time ^{e-b}	UI (ps)	0,41 (68,333..)
RJ	UI (ps)	0,15 (25)
DJ BUJ ^c	UI (ps)	0,15 (25) 0,10 (16,666..)

a See 5.3.6.5.5 for measurement method. Value measured is V_{pk-pk} .
 b ~~This is a higher value than the minimum required transmitter voltage defined in table 61 (see 5.3.6.5.1).~~
 b Rise/fall times are measured from 20 % to 80 % of the transition with a repeating 01b or 10b pattern (e.g., D10.2 or D21.5)(see table 235 in 10.2.9.2).
 c Bounded uncorrelated jitter (BUJ) is the part of the deterministic jitter not aligned in time with the data signal being measured. Specifically, this excludes ISI and DCD. See MJSQ.

Table 72 — Stressed receiver sensitivity test characteristics

Characteristic	Units	Minimum	Typical Nominal	Maximum	Reference
Tx data pattern	CJTPAT				Annex A
Tx peak to peak voltage ^g	mV(p-p)		850	800	5.3.6.5.1
Tx minimum rise/fall time	UI	0.24 0,25(41.666.. ps)			5.3.6.5.1
Transmitter equalization ^g	dB		2	2	5.3.6.5.5
Tx RJ ^g	UI	0.15 (25 ps) 0.135 (22,5 ps)	0.150 (25 ps)	0.165 (27,5 ps)	5.3.6.5.1
Tx bounded uncorrelated jitter BUJ ^d	UI	0.000-22 (0.036 ps)-0,09	0,10	0,11	
Link dispersion penalty	dB	13			5.3.7.4.4.8
D24.3 delivered eye opening (Z4) (i.e., 2 x Z1 in figure 114) ^{b c f g}	mV(p-p)	75 200	215	95 230	5.3.5.4
D24.3 delivered eye opening (X1)^b	UI	0,15			5.3.5.4
NEXT offset frequency ^{b e}	ppm	20 2500			
Total crosstalk amplitude ^{e b c}	mV _{rms}	4			

- a Link dispersion penalty is the WDP of the delivered signal computed with Palloc = 15.4 dB.
 b This ~~specification value~~ pertains to the delivered signal at IR or CR during the receiver device compliance test. All adjacent phys in the receiver device shall be active with representative traffic with their maximum amplitude and maximum frequency of operation. Additional pseudo-random crosstalk shall be added, if needed, to meet the total crosstalk amplitude specification.
 c Observed with a histogram of at least 1 000 ~~hits~~ samples.
 d Bounded uncorrelated jitter (BUJ) is the part of the deterministic jitter not aligned in time with the data signal being measured. Specifically, this excludes ISI and DCD. See MJSQ.
 e An SSC modulated source may be used instead of fixed offset frequency crosstalk.
 f Based on the centroid of the vertical histogram at 1 and 0 crossing (see Figure xxx)
 g Nominal values represent target settings for configuration of the test setup. If minimum and maximum values are also included, the test setup value shall be within this range (i.e., a range is required when using physical implementation), however, these ranges shall not be used as corner test conditions required for specification compliance.

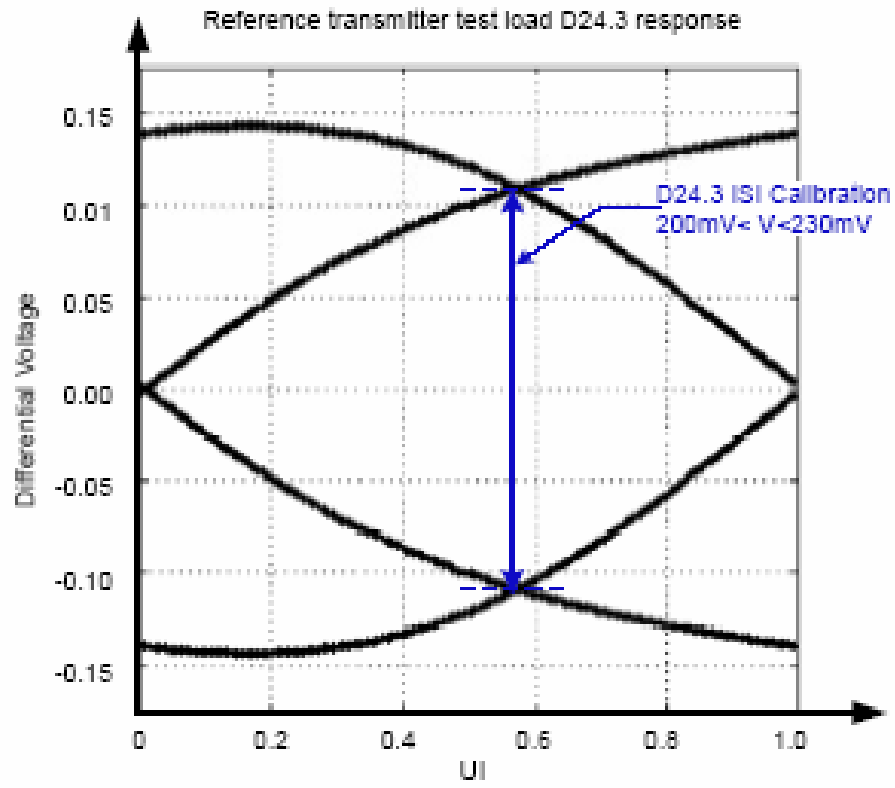


Figure xxx – Delivered eye opening