

Proposed Changes to *Receiver  
Device Physical Testing Section*  
in SAS 2 Draft Specification

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# Table 72 in Section 5.3.7.4.4.1

Figure 131 shows the block diagram of the stressed receiver sensitivity test.

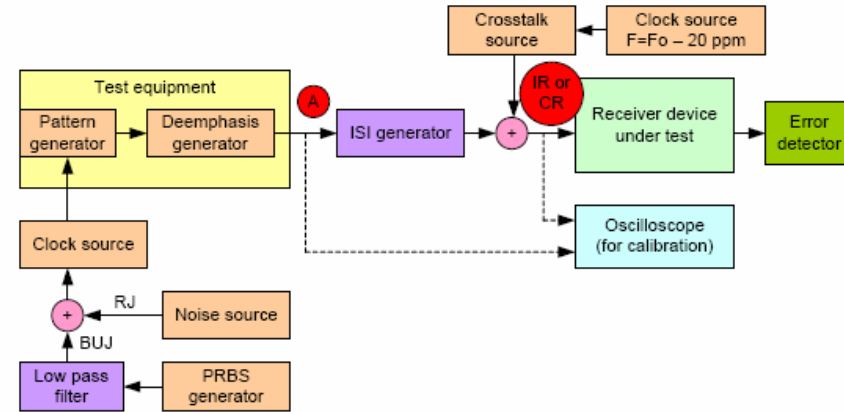


Figure 131 — Stressed receiver sensitivity test block diagram

The receiver device under test demonstrates its ability to compensate for channel intersymbol interference (ISI) representative of the SAS-2 reference channel while subjected to the budgeted jitter and cross talk sources.

Table 72 defines the characteristics of the signal at point A in figure 131.

Table 72 — Stressed receiver sensitivity test characteristics

Characteristic	Units	Minimum	Typical	Maximum	Reference
Tx data pattern		CJTPAT			Annex A
Tx peak to peak voltage	mV(P-P)			800	5.3.6.5.1
Tx minimum rise/fall time	UI	0.24 (41.6 ps)			5.3.6.5.1
Transmitter equalization	dB			2	5.3.6.5.5
Tx RJ	UI	0.15 (25 ps)			5.3.6.5.1
Tx bounded uncorrelated jitter	UI	0.000 22 (0.036 ps)			
Link dispersion penalty <sup>a b</sup>	dB	13			5.3.7.4.4.8
D24.3 delivered eye opening (Z1) <sup>b</sup>	mV	75		95	5.3.5.4
D24.3 delivered eye opening (X1) <sup>b</sup>	UI	0.15			5.3.5.4
NEXT offset frequency <sup>b</sup>	ppm	20			
Total crosstalk amplitude <sup>b c</sup>	mV <sub>rms</sub>	4			

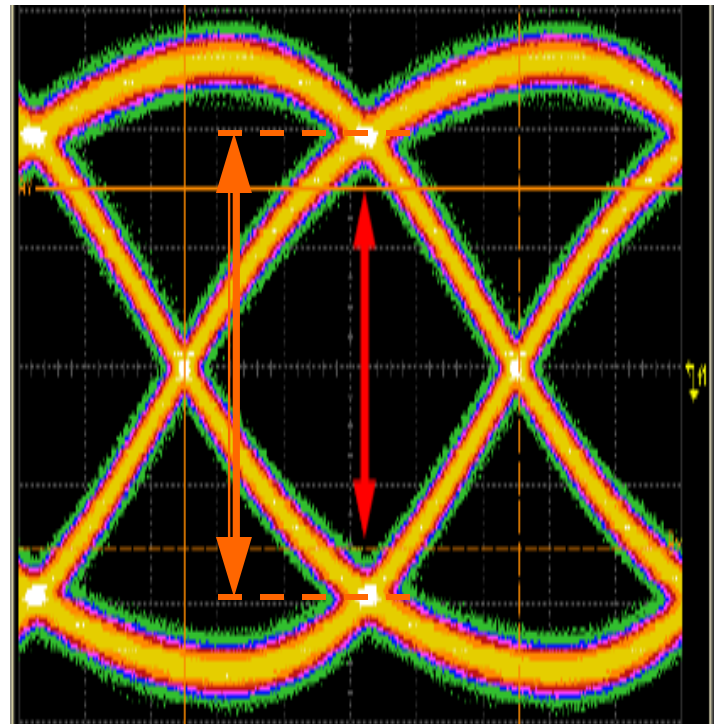
<sup>a</sup> Link dispersion penalty is the WDP of the delivered signal computed with Palloc = 15.4 dB.  
<sup>b</sup> This specification pertains to the delivered signal at IR or CR during the receiver device compliance test. All adjacent phys in the receiver device shall be active with representative 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.  
<sup>c</sup> Observed with a histogram of at least 1 000 hits.

# Tx Bounded Uncorrelated Jitter

- Value in draft is impossibly small
  - 0.00022 UI is possibly the result of unintentional Excel percent formatting
- Value in 8G Fibre Channel is 0.035 UI (~20% of TX DJ budget)
- Propose 0.022 UI for 6G SAS

# D24.3 Delivered Eye Opening (Z1)

- More repeatable to measure to center of trace
  - Use vertical histogram
- For 800mVpp, 2dB launch, simulation yields  $Z1 = 101\text{mV}$



# Consistency of Ref Tx -> Ref Channel -> Ref Rx

Amp (mVpp)	Deemph (dB)	DFE taps	BUJ (DJ) (UI)	pattern	Vert Rx eye (mVpp)	Horiz Rx eye (UI)
800	2	3	0.15	random	22	0.18
800	2	5	.015	8B10B	100	0.42
800	2	3	0.14	random	24	0.19
800	2	3	0.0	random	34	0.32
800	2	3	0.0	8B10B	80	0.49
800	2	4	0.0	8B10B	98	0.54
850	2	4	0.15	8B10B	98	0.40
850	2	4	0.022	8B10B	108	0.53
<b>850</b>	<b>2</b>	<b>3</b>	<b>0.022</b>	<b>8B10B</b>	<b>88</b>	<b>0.48</b>

Note:  $RJ = 0.15UI/14$  in all cases

# Recommendations

- Change Ref Tx (Table 65) & Tx peak-to-peak voltage (Table 72) to 850 mVpp
- Change Tx bounded uncorrelated jitter (Table 72) to 0.022 UI
- Change D24.3 delivered eye opening (Z1) (Table 72) to 100mV (min) & 115mV (max)
  - Measured at center of trace
  - Simulated value is 107mV for 850mVpp launch with 2 dB de-emphasis

# Softer Recommendations...

- Change  $DJ$  in Table 65 to  $BUJ$  with a value of  $0.022 UI$
- Change value for "*Minimum eye opening (i.e.,  $2 \times Z1$  in figure 119)*" in Table 61 from  $100\text{mVpp}$  to  $88\text{mVpp}$
- Change value of Transmitter equalization in Table 72 from  $2\text{dB (max)}$  to  $2\text{dB (nom)}$  with appropriate max and min values

...and absolutely...

- Let's do this budgeting *earlier* in the development of the SAS 3 Phy specs