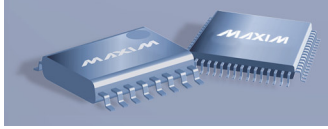
Reference Receiver Solutions for SAS-2 Compliance Testing

08-330r2

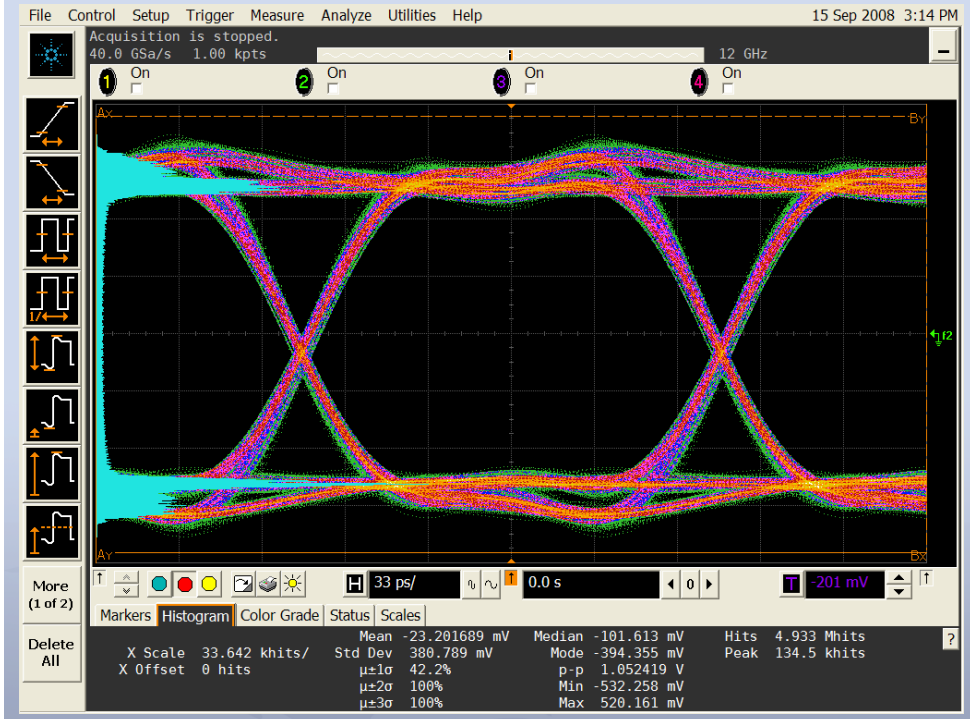
Kevin Witt

9-23-08

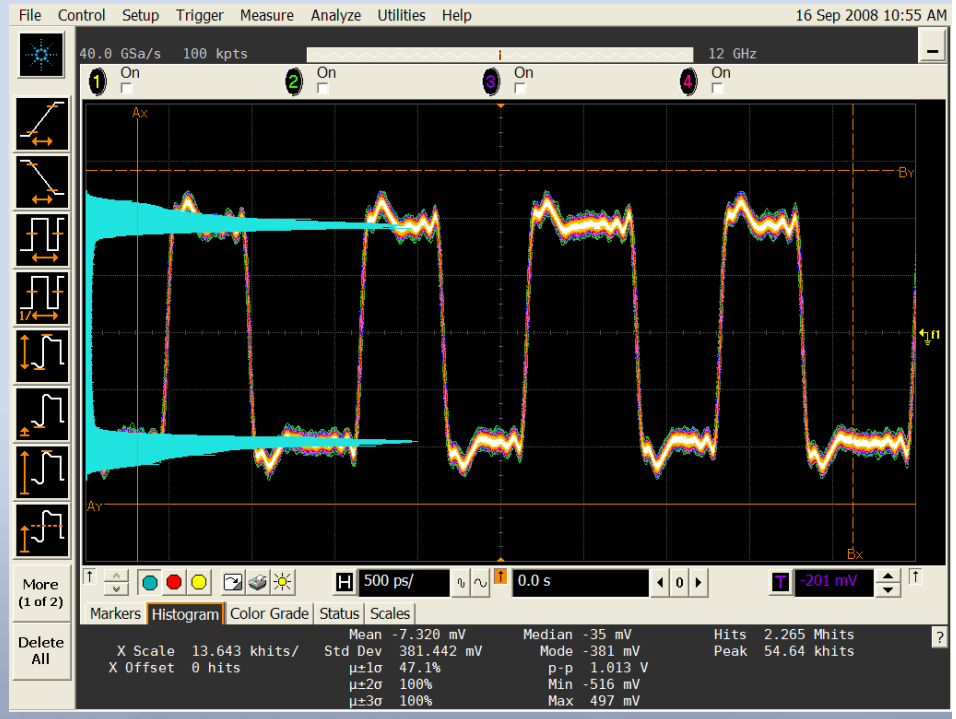


PG w/ DE Box

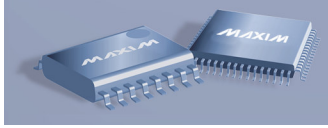
- 1000mV pk-pk
- 2.2dB DE



PRBS-7



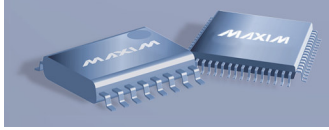
D30.3
w/ pattern
trigger



Averaging Example

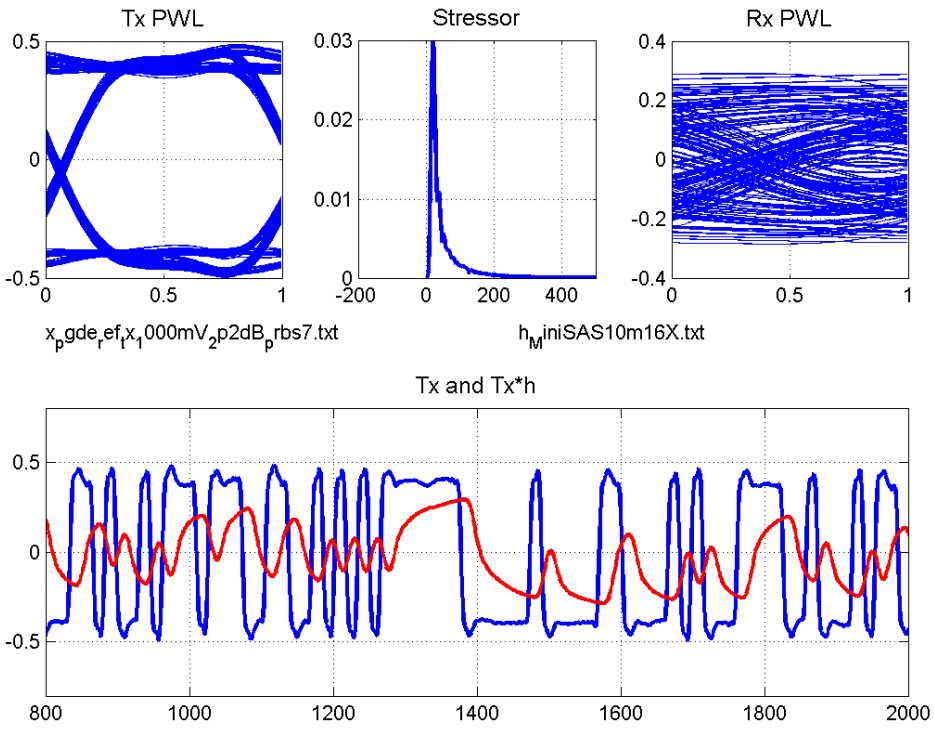
- **Measure the average of the differential signal with a pattern trigger**
- **RJ is virtually eliminated**

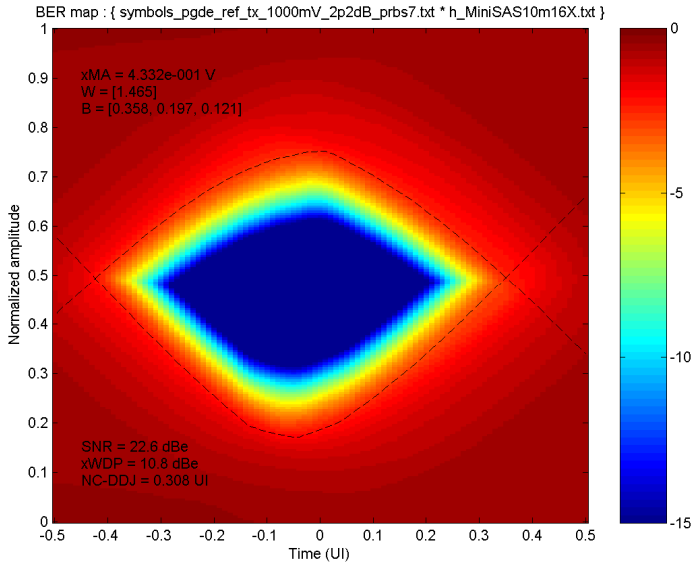
D30.3
1024 Averages w/ pattern trigger



Tx Compliance
SASWDP

- **PG-DE: PRBS-7 : 1024 Averages, 256 Symbols**

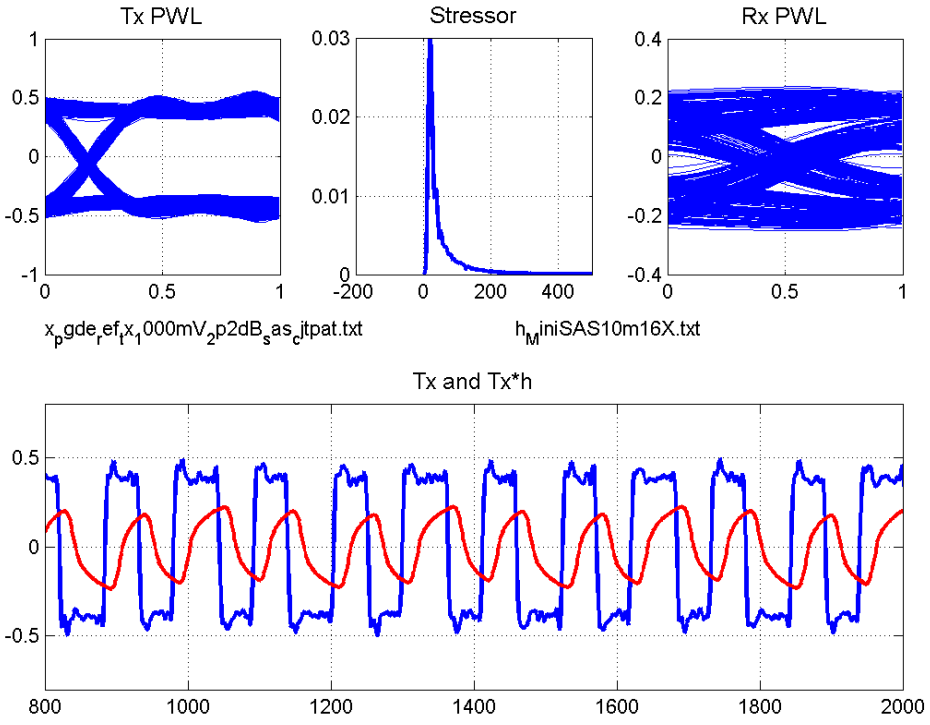


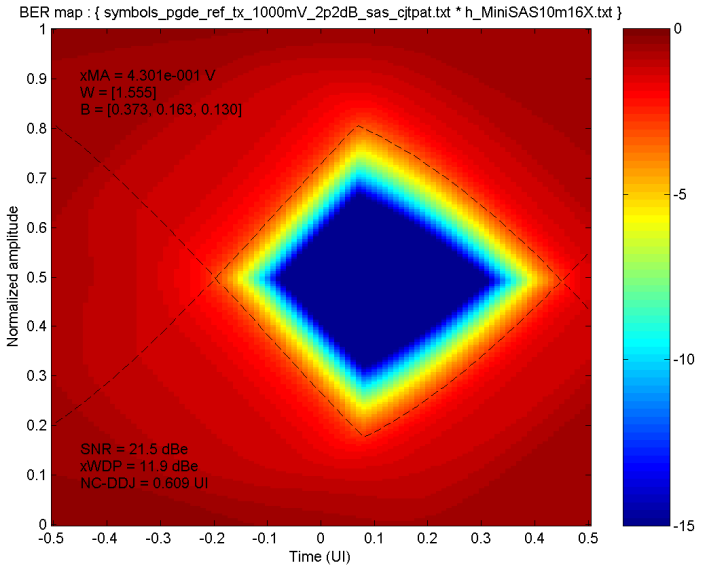


xWDP = 10.8 dBe
NC-DDJ =0.306

Tx Compliance
SASWDP

- **PG-DE: SASCJTPAT : 1024 Averages, 9680 Symbols**



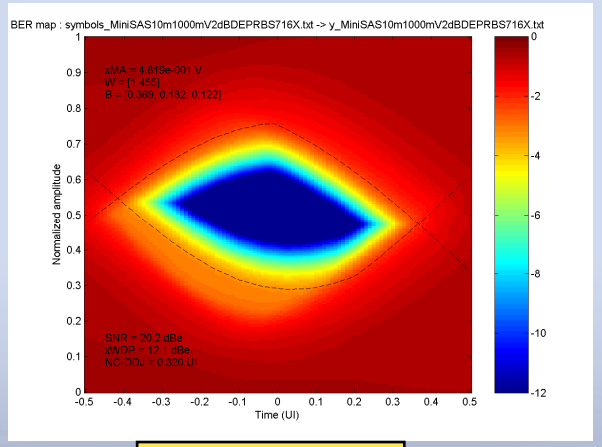


xWDP = 11.9 dBe
NC-DDJ =0.609

Correlation Runs

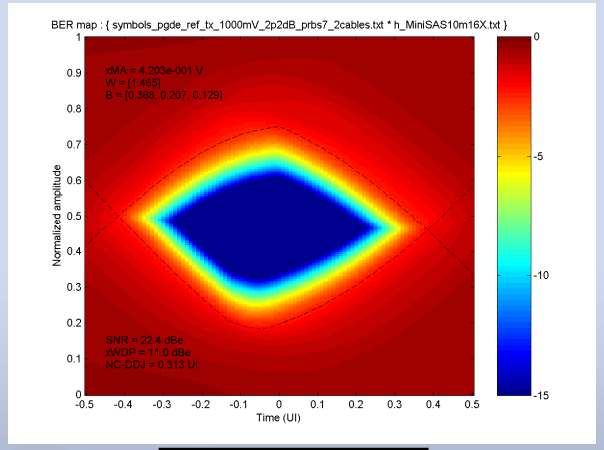
- **PRBS-7**

Synthesized Waveforms
SASWDP(TX_est*h_est)



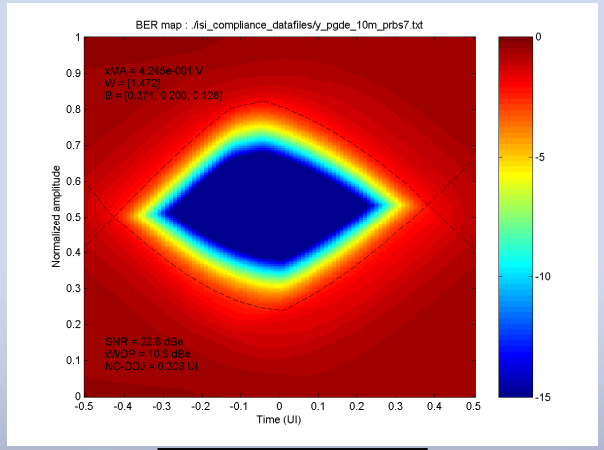
xWDP = 12.1
NC-DDJ =0.320

Tx Compliance Test (#1)
SASWDP(TX_lab*h_est)

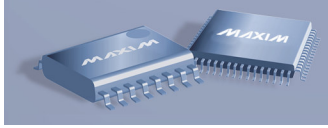


xWDP = 11.0
NC-DDJ =0.313

ISI Gen Compliance
SASWDP(RX_lab)

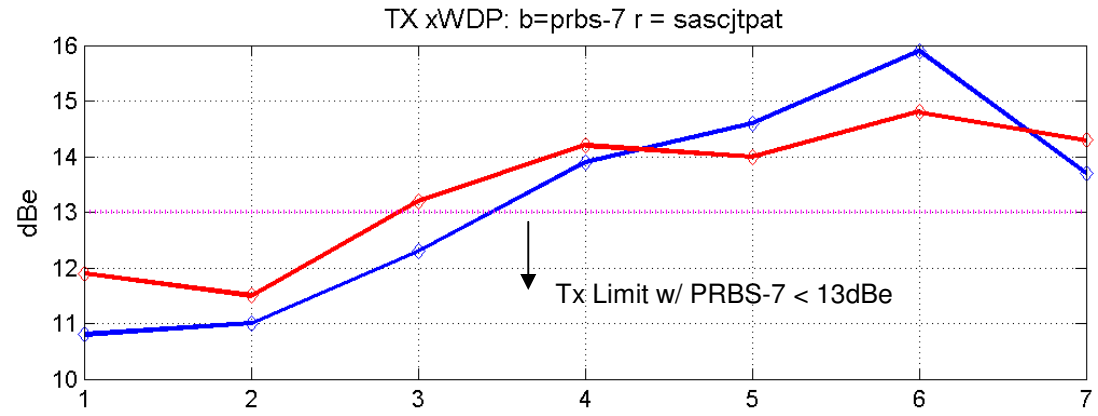


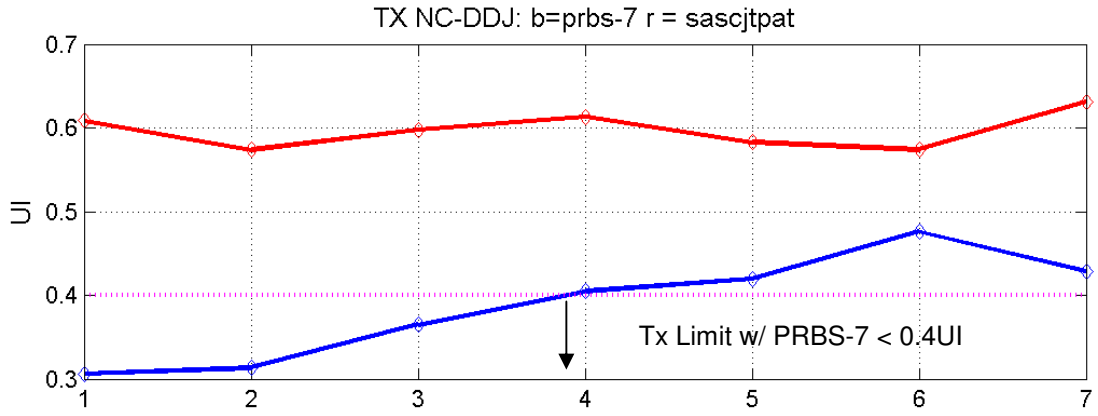
xWDP = 10.6
NC-DDJ =0.306



Summary of Tx Compliance Test Results

Test	
1.	PG-DE (1 Cable)
2.	PG-DE (2 Cables)
3.	PG-DE (2 Cables) + 2” FR-4
4.	PG-DE (2 Cables) + 4” FR-4
5.	PG-DE (2 Cables) + 6” FR-4
6.	PG-DE (2 Cables) + 8” FR-4
7.	PG-DE (2 Cables) + 8” FR-4 and re-optimized DE





Proposed Changes for Tx Compliance Comment Resolution

Changes

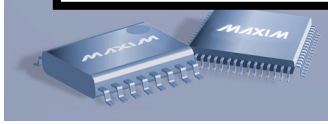
1. Remove eye opening specification
2. Add a maximum 13 dBe xWDP
3. Add a maximum 0.4 UI NC-DDJ
4. Change Pattern to zero seed scrambler output (like PRBS-7) (TBC)
5. Add data collection note (h):
   - Collected with zero length test load (5.4.2.2)
   - Sufficient number of averages to minimize RJ
   - Pattern length (256 bits)
6. Add Post Processing Note (i)
   - Convolve with impulse response of transmitter test load (5.4.2.5)
   - Extract Data bits
   - Process with SASWDP code
7. Add Appendices for SASWDP code
8. Add Appendices for Impulse response
9. ?

Table 61 — Transmitter device signal output characteristics for 6 Gbps at IT and CT

Signal characteristic	Units	Minimum	Nominal	Maximum
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
Withstanding voltage (non-operational)	mV(P-P)	2 000		
Rise/fall time [c]	UI	0.25 (41.6 ps)		
Reference differential impedance [d]	ohm		100	
Reference common mode impedance [d]	ohm		25	
Common mode voltage limit (rms) [e]	mV			30
Random jitter (RJ) [f]	UI			0.15 (25 ps)
Half of maximum jitter (i.e., X1 in figure 123) [g]				
Minimum eye opening (i.e., 2 × Z1 in figure 123) [g]				

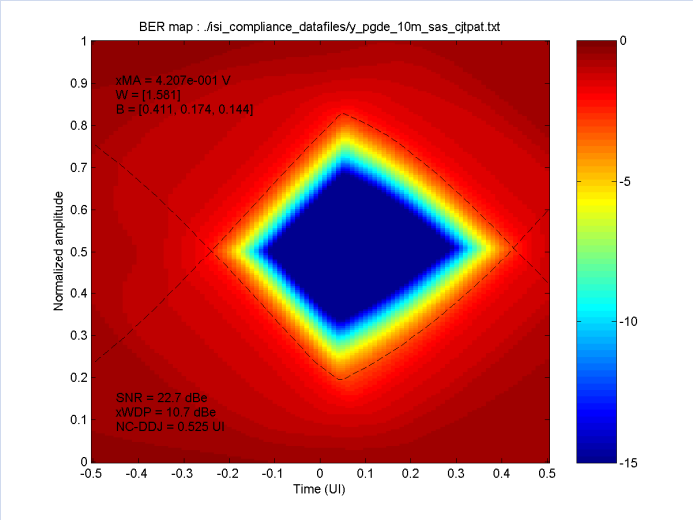
[a] See 5.4.6.5.5 for measurement method.
[b] The transmitter device off voltage is the maximum A.C. voltage measured at compliance points IT and CT when the transmitter is unpowered or transmitting D.C. idle (e.g., during idle time of an OOB signal).
[c] Rise/fall times are measured from 20 % to 80 % of the transition with a repeating 01b or 10b pattern (e.g., D10.2 or D21.5)(see table 238 in 10.2.9.2) on the physical link.
[d] For transmitter device S-parameters characteristics, see 5.4.6.5.2.
[e] This is a broadband limit. For additional limits on spectral content, see figure 127 and table 62.
[f] RJ is 14 times the RJ 1 sigma value, based on a BER of 10^{-12}. This test shall be performed with a repeating 01b or 10b pattern (e.g., D10.2 or D21.5)(see table 238 in 10.2.9.2) on the physical link. If the transmitter device supports SSC, then this measurement shall be performed with both SSC enabled and SSC disabled. For simulations based on a BER of 10^{-15}, the RJ specified is 17 times the RJ 1 sigma value.
[g] This value is obtained by simulation. It represents the resulting signal output within the reference receiver device (see 5.4.7.4.3) after equalization, when the transmitter device output signal of [redacted] is transmitted through the reference transmitter test load (see 5.4.2.5).

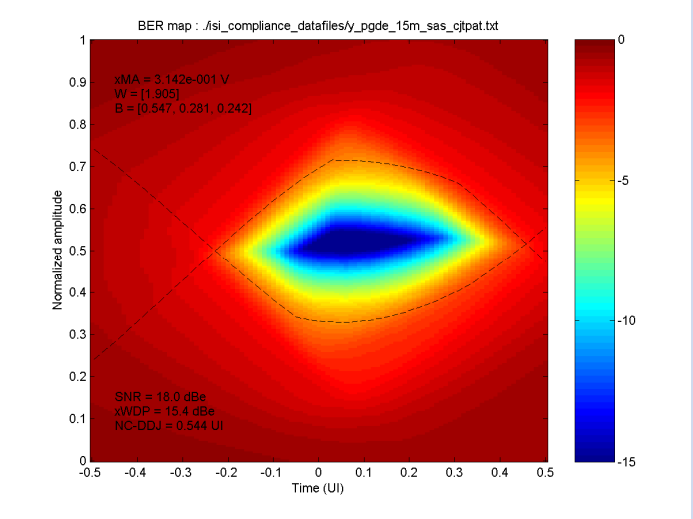
Editor's Note 1: The simulation referred to in note g) will probably be done with SASWDP rather than StatEye. See 08-345 and 08-330.



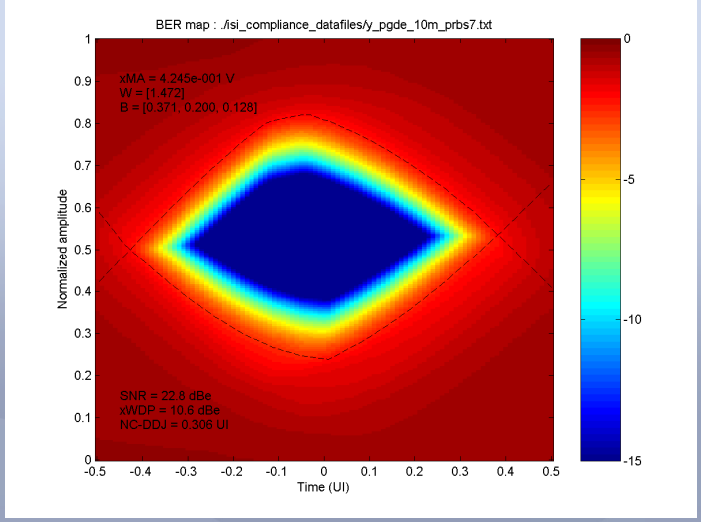
Stressed Receiver Device Compliance test Calibration Examples
10m & 15m PG/DE

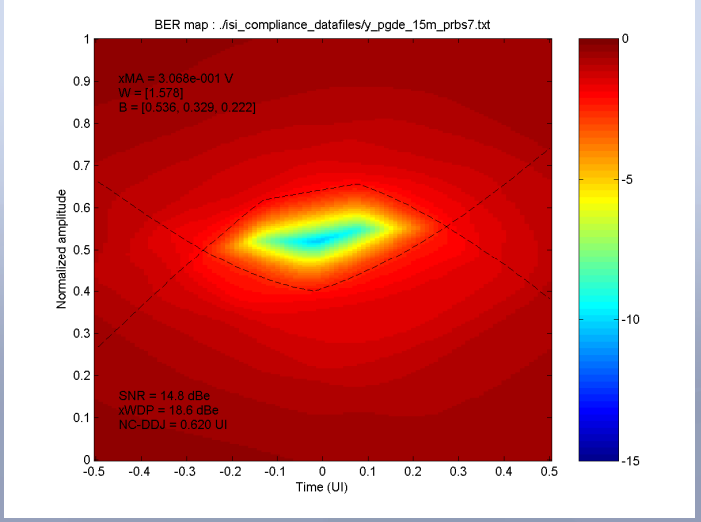
10m

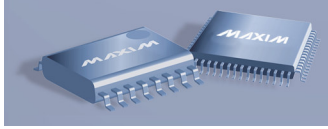




15m



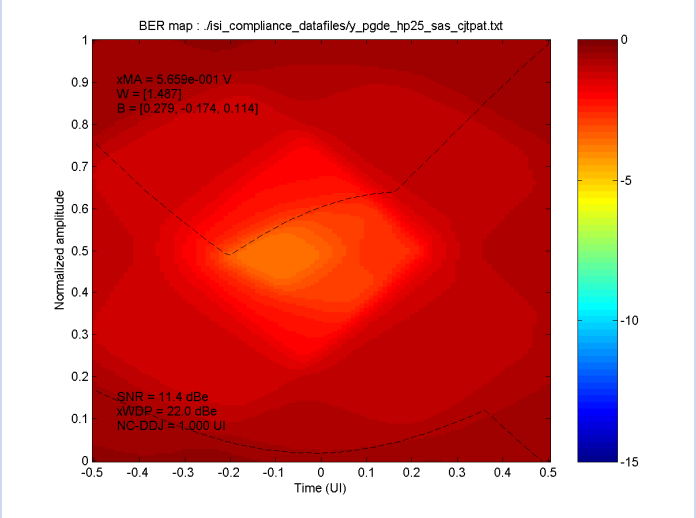




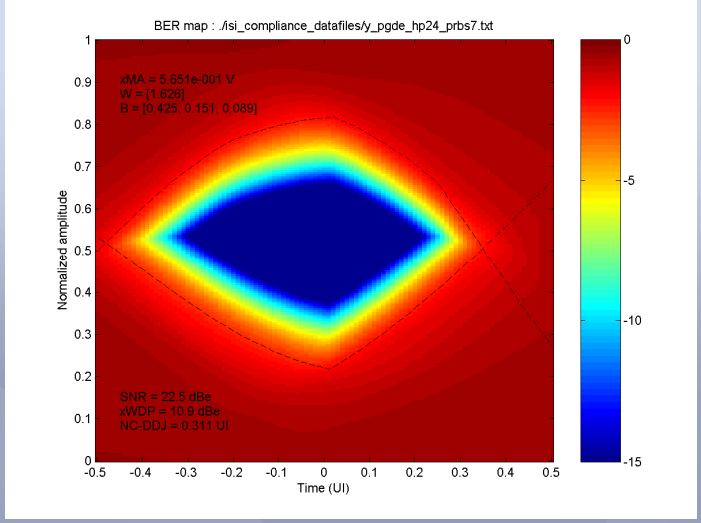
Stressed Receiver Device Compliance Test Calibration Examples
10m & 15m PG/DE

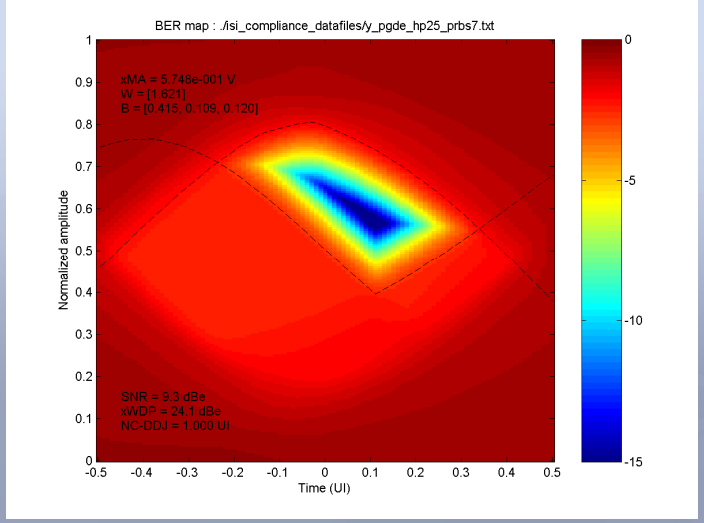
Code error

HP24



HP25

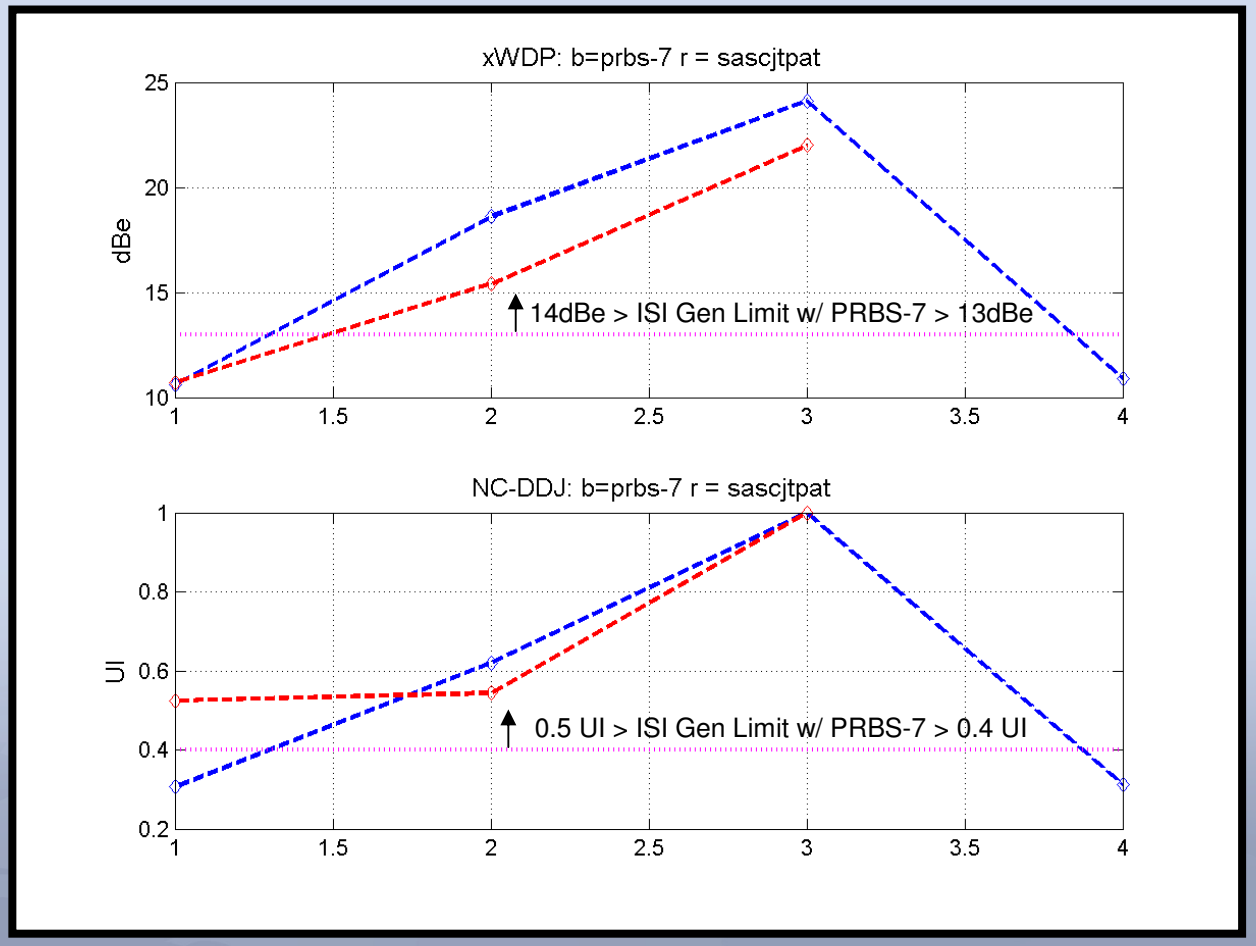




Summary of Stressed Receiver Device Compliance Test Calibration Examples

Test

1. **PG-DE (2 Cables) + 10m MiniSAS**
2. **PG-DE (2 Cables) + 15m MiniSAS**
3. **PG-DE (2 Cables) + HP25**
4. **PG-DE (2 Cables) + HP24**



MORE DATA NEEDED

Summary

- Dry run of SASWDP based Tx compliance test results presented
- Changes proposed to results Table 61 comments
- Early look at ISI calibration results provided