SAS-2 Stateye Analysis of Measured Transmitter (update)

Anthony Sanders
Harvey Newman
Thursday, Thu 25 Oct 07
T10/07-463r0

Never stop thinking

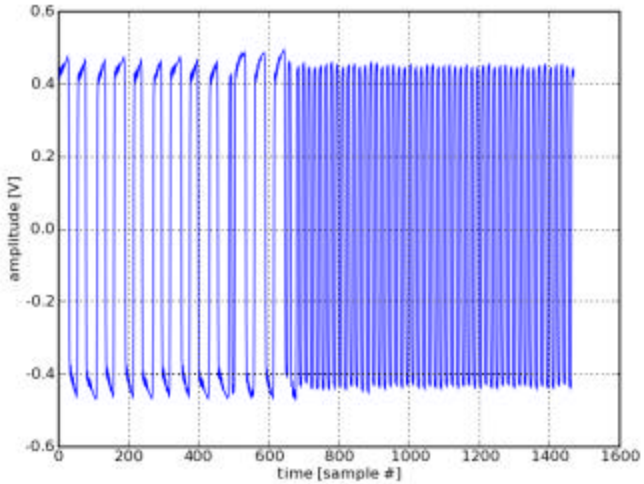
Measurement setup and objective

- Statistical analysis of measured signals.
  - Captured CJTPAT directly from the source.
  - Applied s4p file mathematically to measured source.
  - Channel touchstone file measured using VNA

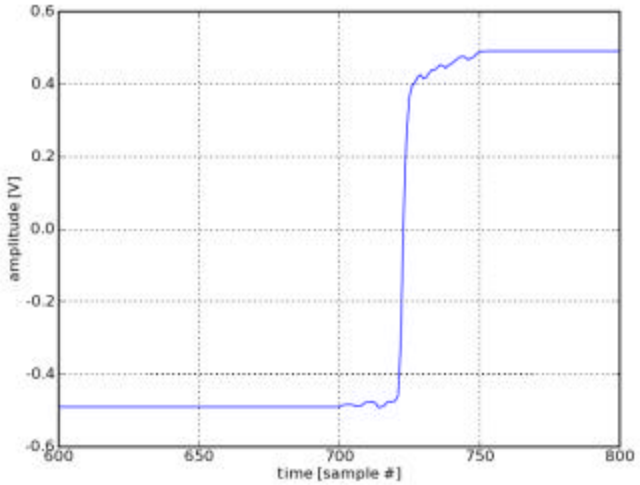
- Objective
  - Demonstrate results for transmitter compliance testing using a statistical analysis

Extraction of Transmitter Measurement into Fundamental Sub-Components

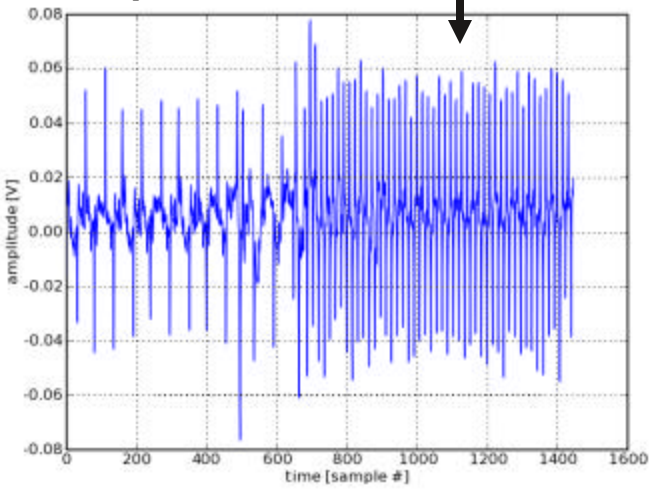
Measured Transmitter using RT or EQ Scope



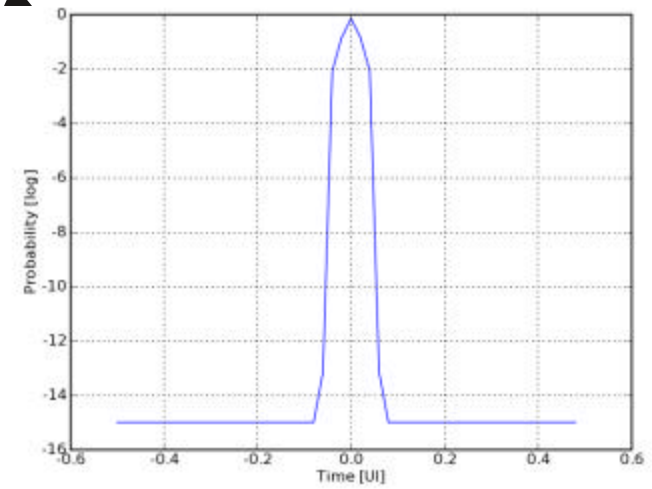
Extracted Step Response



Extracted Amplitude Noise

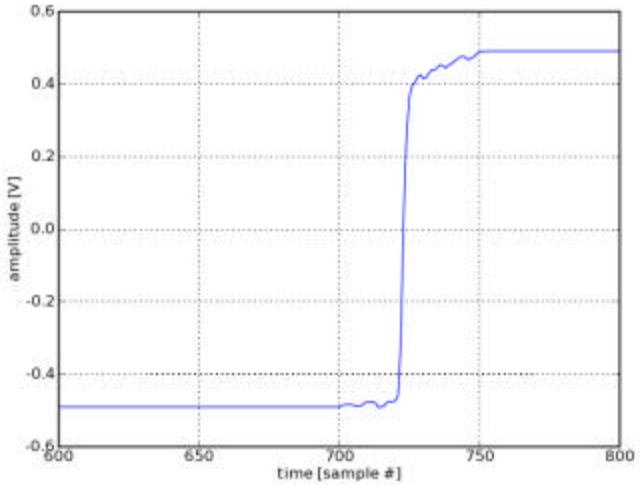


Extracted Exact Jitter Distribution

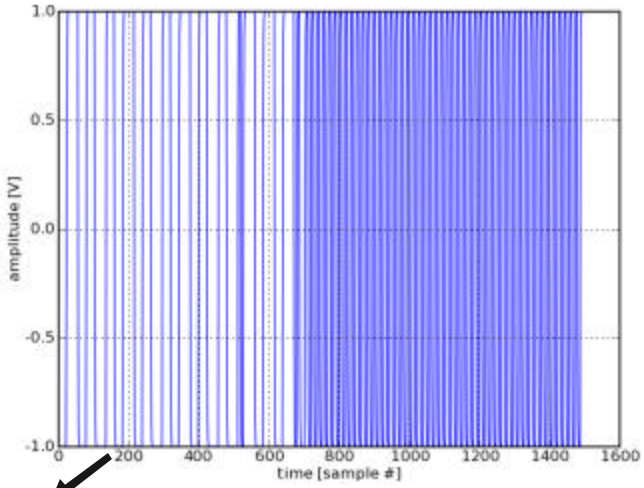


Regeneration of Measured Signal

Extracted Step Response

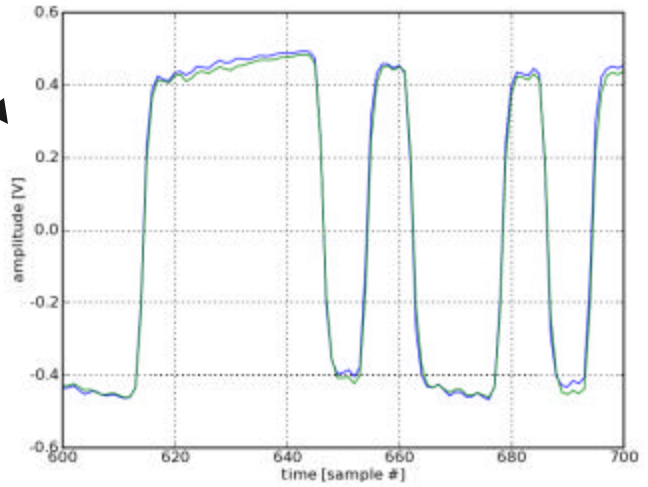


Derived Stimulus



convolution

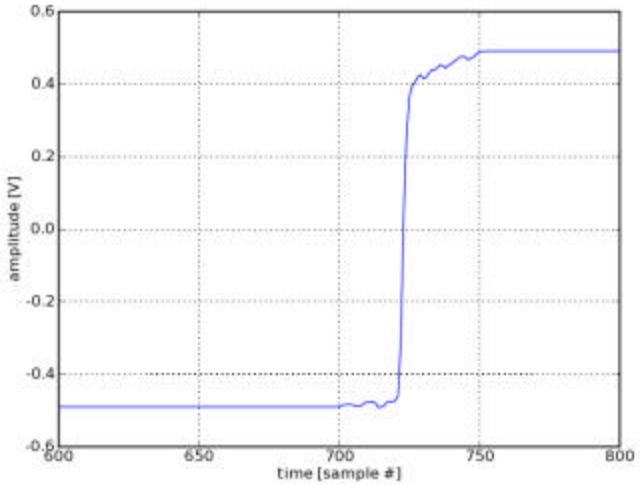
Regenerated signal



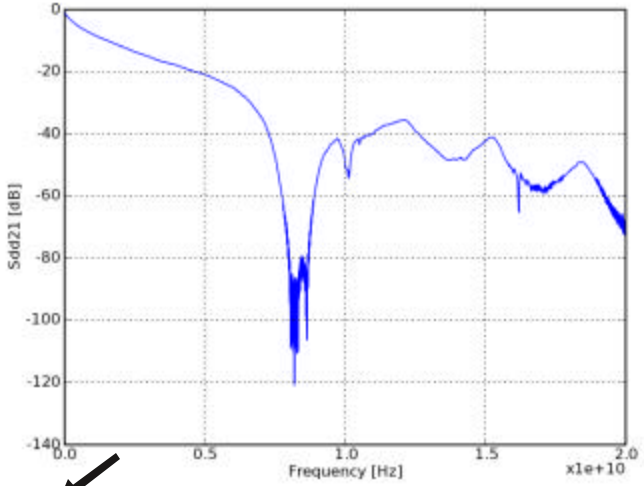
- By using the extracted step response and the derived binary data stream, a comparison can be made between the measured signal (blue, bottom right) and the regenerated signal (green, bottom right)
- Good correlation can be seen, the main deviation being due to amplitude noise at the transmitter

Receiver Step Response Generation

Extracted Step Response

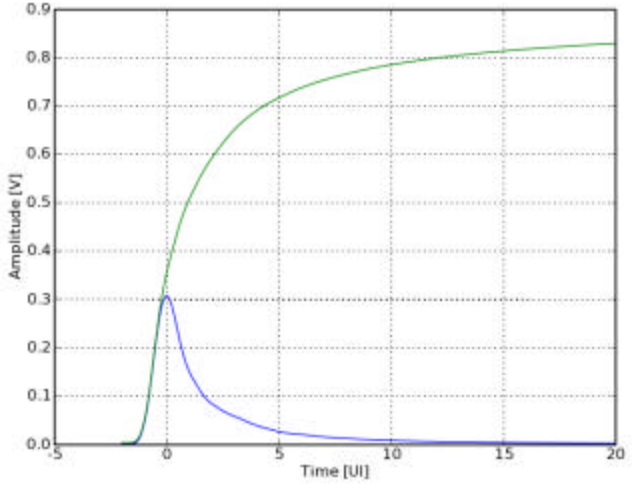


Channel Model



convolution

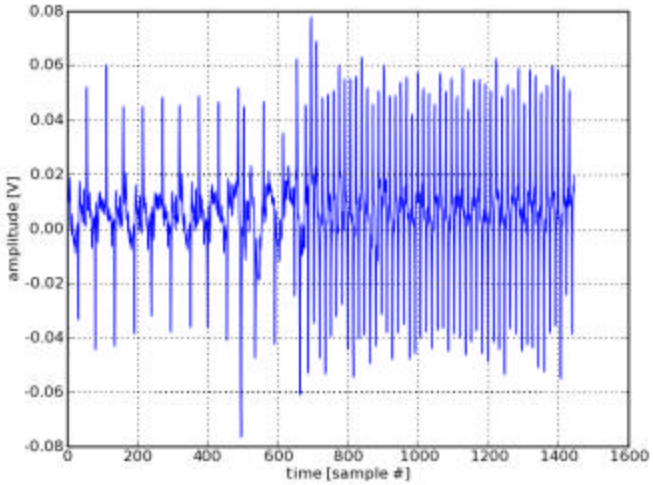
Derived Step Response at end of Channel



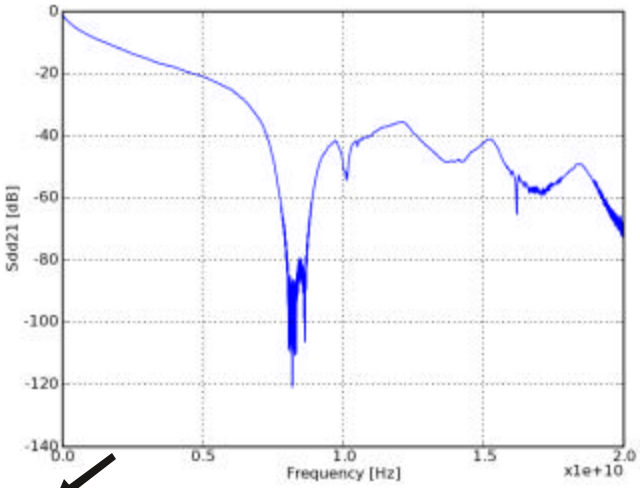
- Using the VNA measured 10m cable response the step response at the end of a cable can be derived
- The resulting step response is then used as basis for the Statistical Analysis

Receiver Noise Generation

Extracted Amplitude Noise

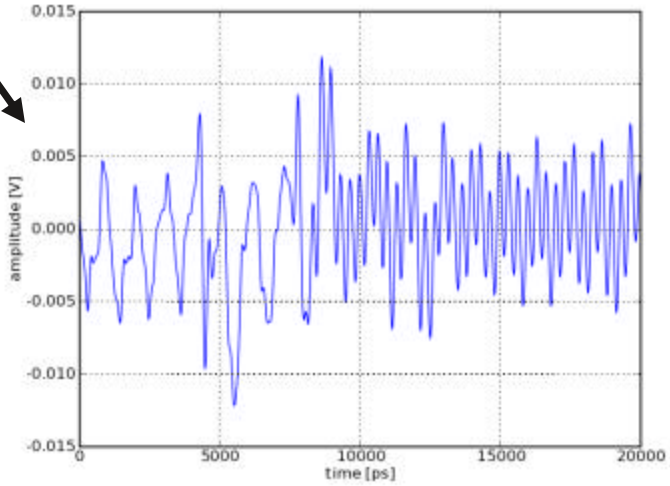


Channel Model



convolution

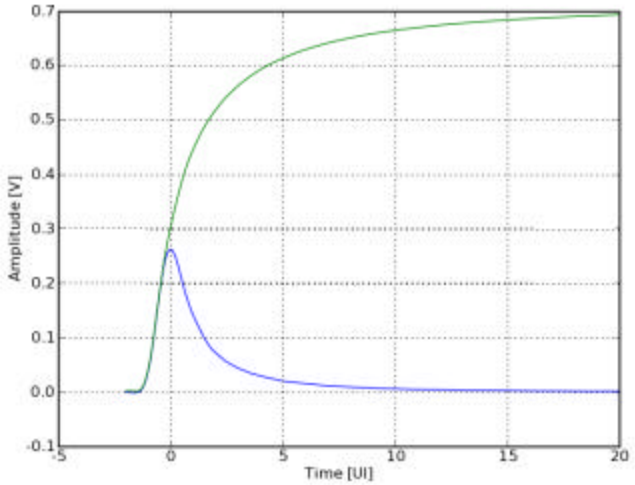
Filtered Extracted Amplitude Noise



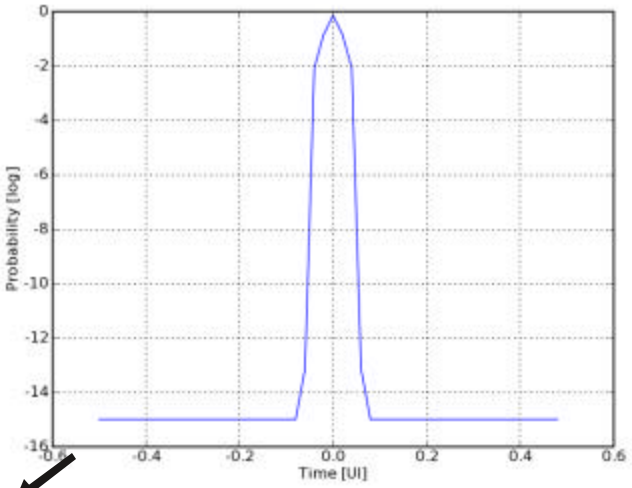
- Using the VNA measured 10m cable response the step response at the end of a cable can be derived
- The resulting noise is then used as basis for the Statistical Analysis

Stateye analysis with arbitrary FIR/DFE equalisation

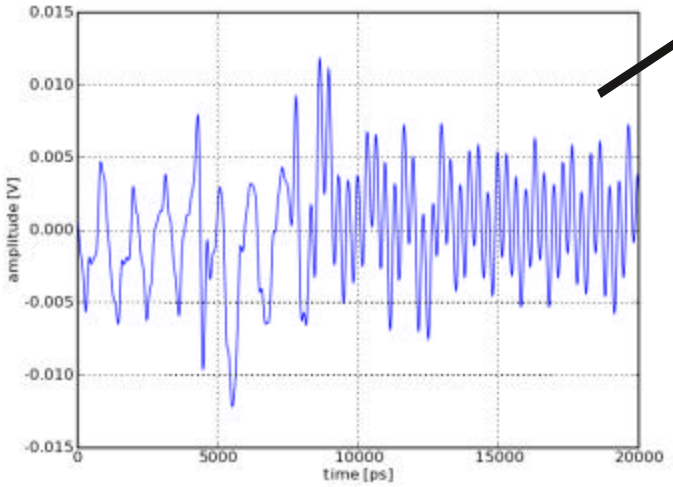
Derived Step Response at end of Channel



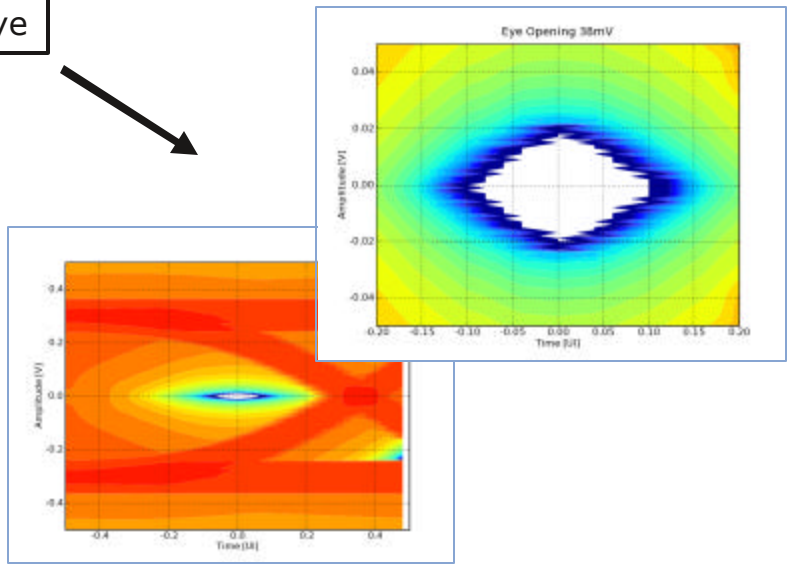
Extracted Exact Jitter Distribution



Filtered Extracted Amplitude Noise

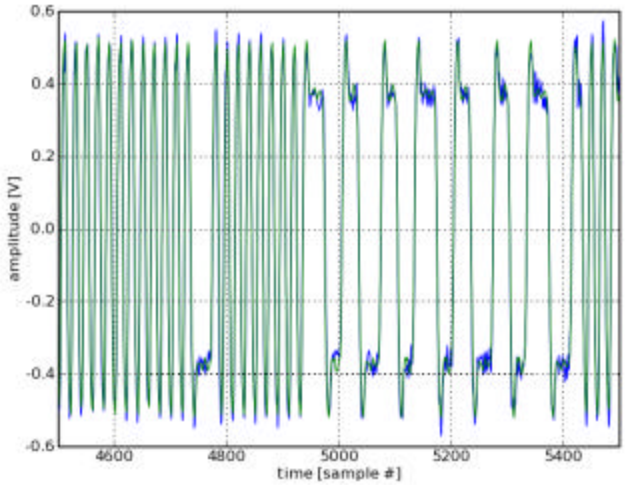


Stateye

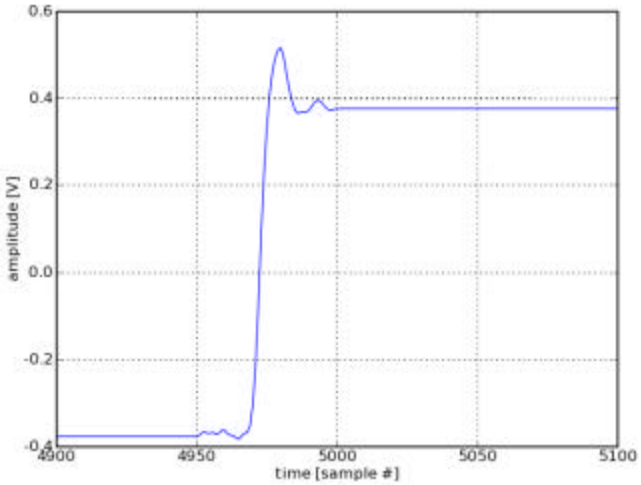


Compliant Measured 6G Transmitter (3 tap DFE, DJ=0.10UIpp, RJ=0.01UIrms, PWS=0.05UI, 8b10b coding)

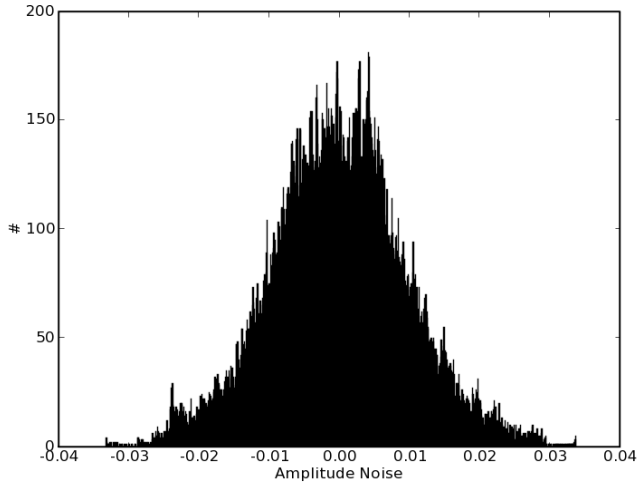
Measured & Regenerated signal

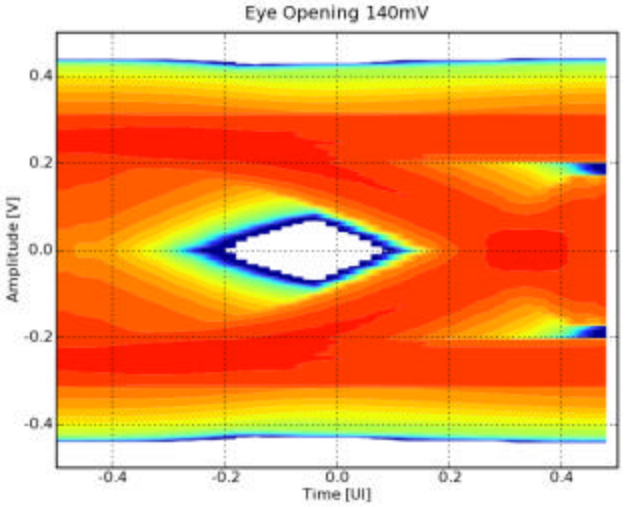


Extracted Step Response



Filtered Extracted Amplitude Noise





Summary

- Breakdown of transmitter signal into well understood fundamentals (step, amplitude noise, jitter, pulse width modulation) is proving successful
- A full statistical analysis of the channel is highlighting degradations present in the channel and transmitter

Outlook for face to face

- Present final silicon cross correlation
- Propose receiver and transmitter electrical characteristics for standard based on 6Gbps silicon measurement
- Present final proposal for transmitter, channel and receiver compliance methodology
- Report on engagement of Edotronik for development of GUI and API to measurement equipment