SAS-2 Stateye Analysis of Measured Transmitter

Anthony Sanders
Harvey Newman
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Never stop thinking

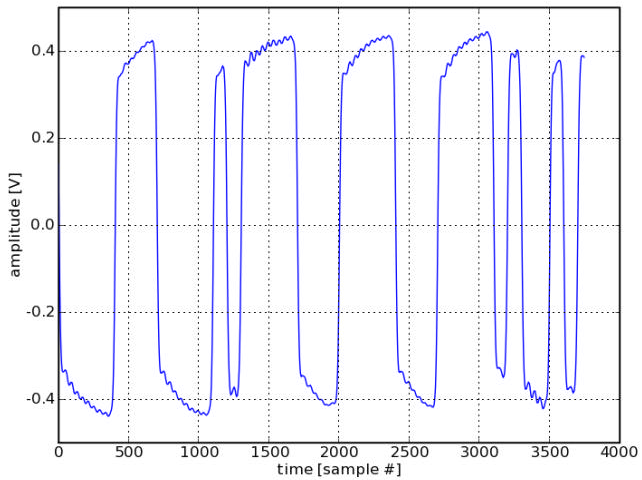
Measurement setup and objective

- 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

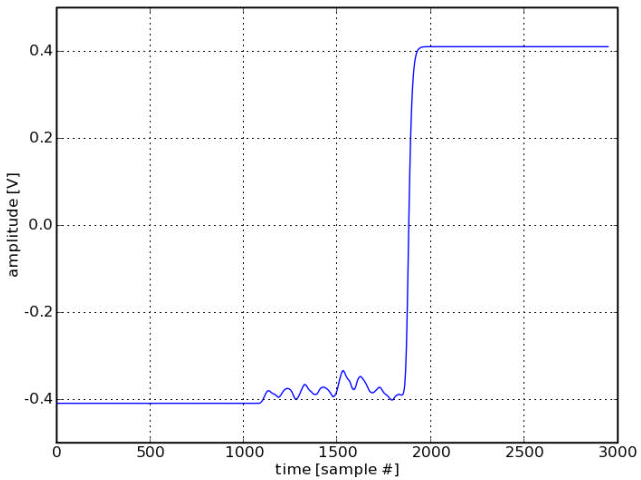
Extraction of Transmitter Measurement into Fundamental Sub-Components

Measured Transmitter using RT or EQ Scope



Extract Step

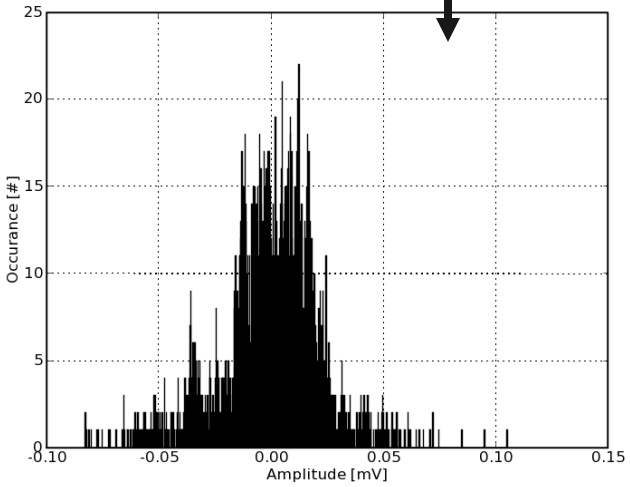
Extracted Step Response



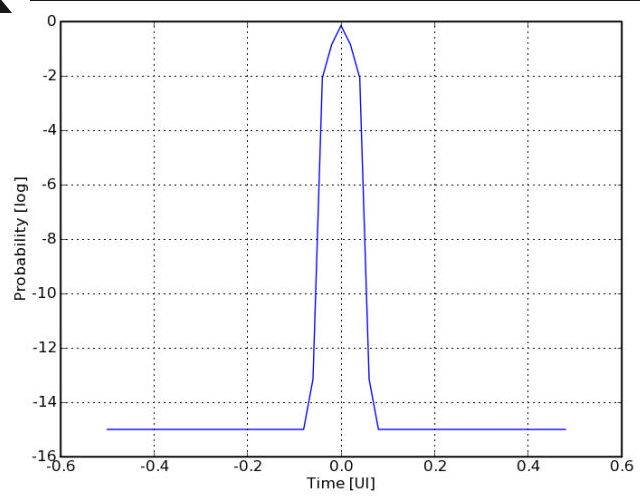
Extract Jitter + PWS

Extract Noise

Extracted Amplitude Noise

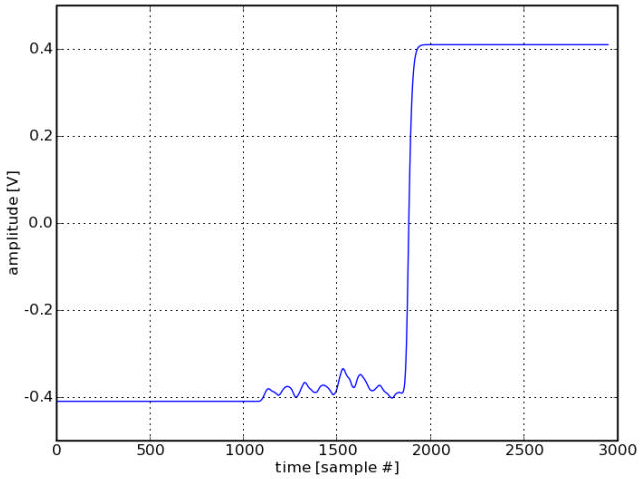


Extracted Exact Jitter Distribution

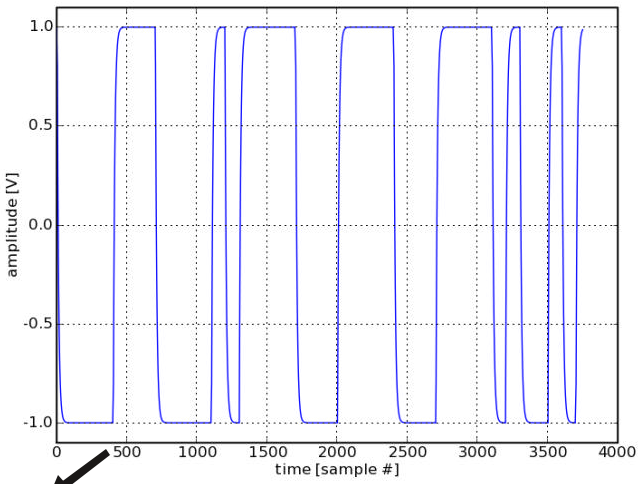


Regeneration of Measured Signal

Extracted Step Response

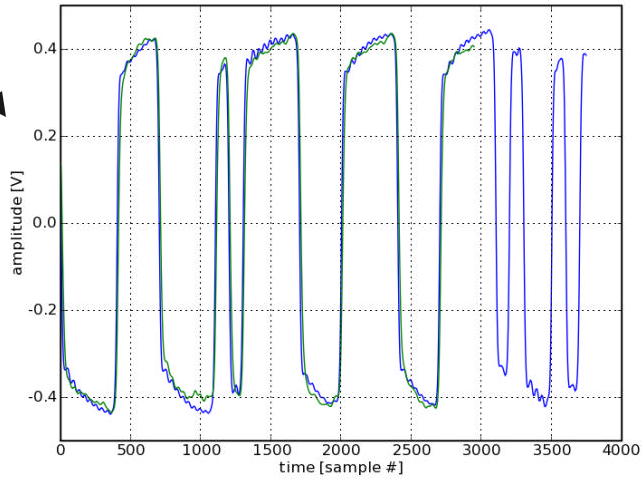


Derived Stimulus



convolution

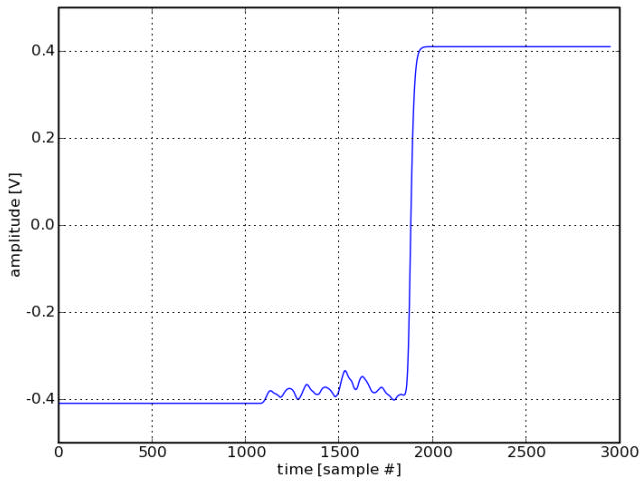
Regenerated signal



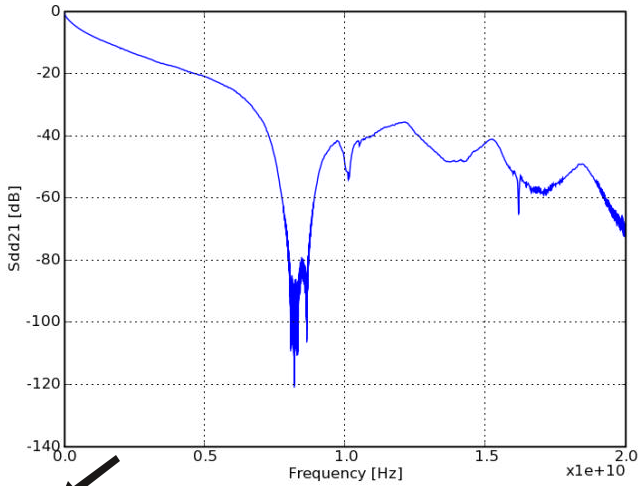
- By using the extracted step response and the derived binary data stream, a comparison can be made between the measured signal (blue, bottom right) and the regenerated signal (green, bottom right)
- Good correlation can be seen, and further improvement can be expected through iterative edge correct of the stimulus

Receiver Step Response Generation

Extracted Step Response

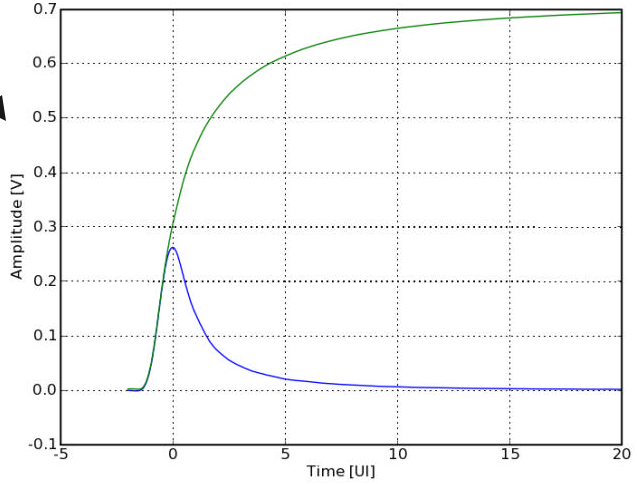


Channel Model



convolution

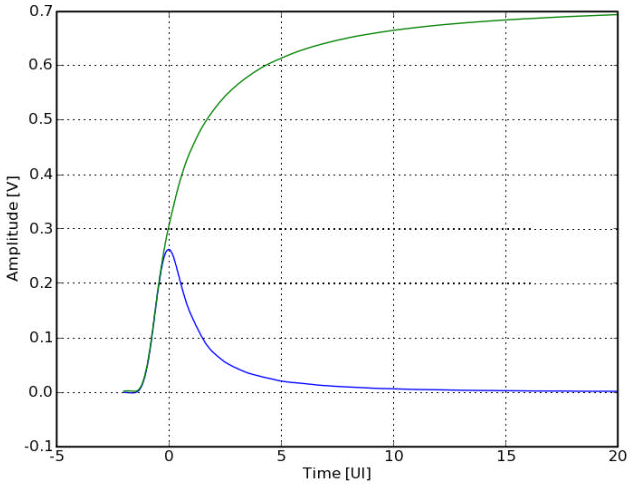
Derived Step Response at end of Channel



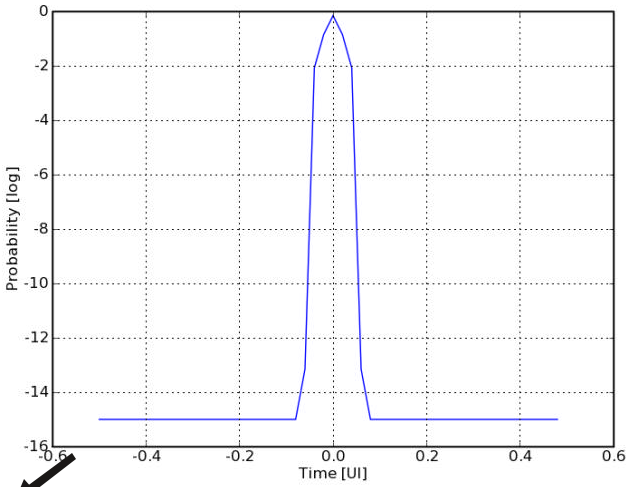
- Using the VNA measured 10m cable response the step response at the end of a cable can be derived
- The resulting step response is then used as basis for the Statistical Analysis

Stateye analysis with arbitrary FIR/DFE equalization

Derived Step Response at end of Channel

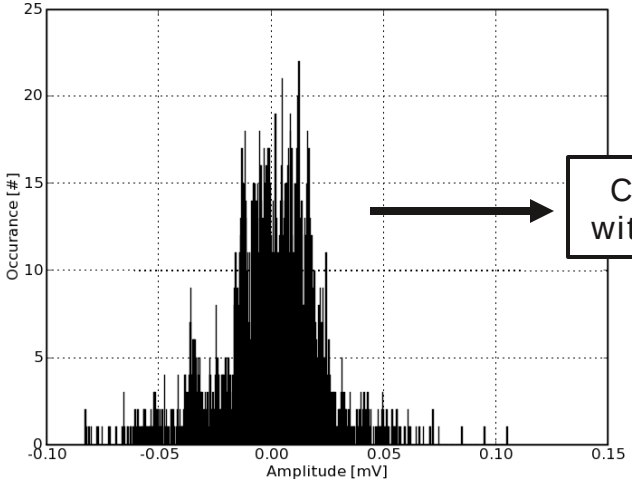


Extracted Exact Jitter Distribution

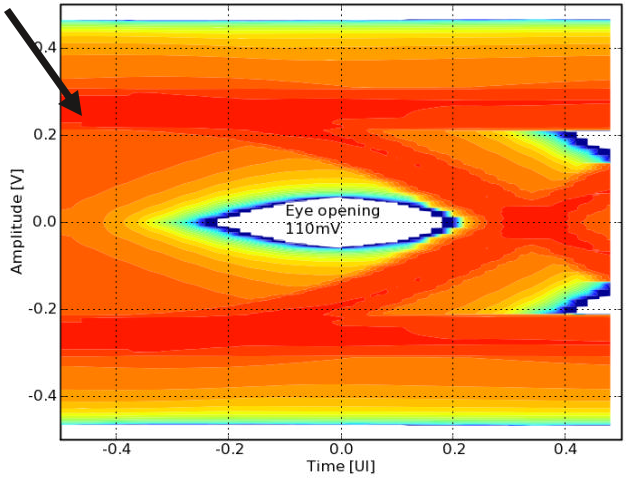


Stateye

Extracted Amplitude Noise



Convolved with Channel



Summary

- Stateye v5 allows direct entry of transmitter measurements by breaking down the transmitter signal into its fundamental component
  - A Deterministic Step Response(s)
  - Statistical Timing Jitter
  - Statistical Amplitude Noise
  - Statistical Pulse Width Modulation
- Using Stateye a full statistical analysis of the channel reveals any signal integrity issues for compliance in less than 3 minutes
- Stateye inputs and outputs are based on well understood physical phenomena, adopted by other standards groups
- Further silicon cross correlation is ongoing and will be presented at the face to face
- Multiple pieces of test equipment can be used for data collection
- Same tools can be used to calibrate receiver compliance signals or test channel compliance