Further Simulation Results for the Startup Protocol Approved in Montreal

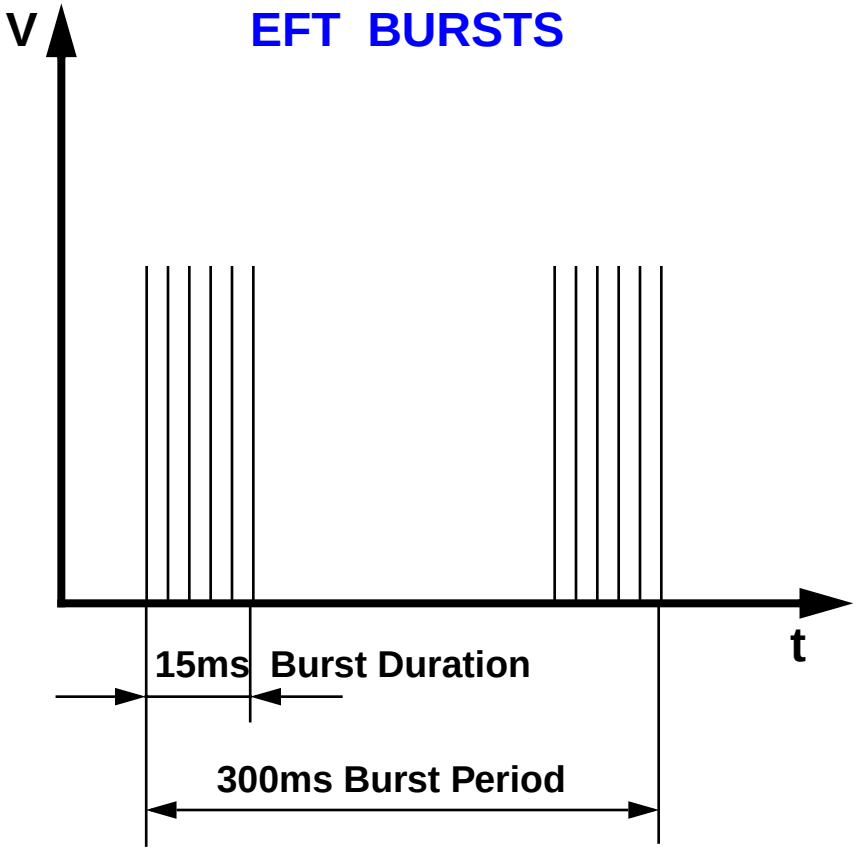
Oscar Agazzi, John Creigh,
Mehdi Hatamian, Henry Samueli

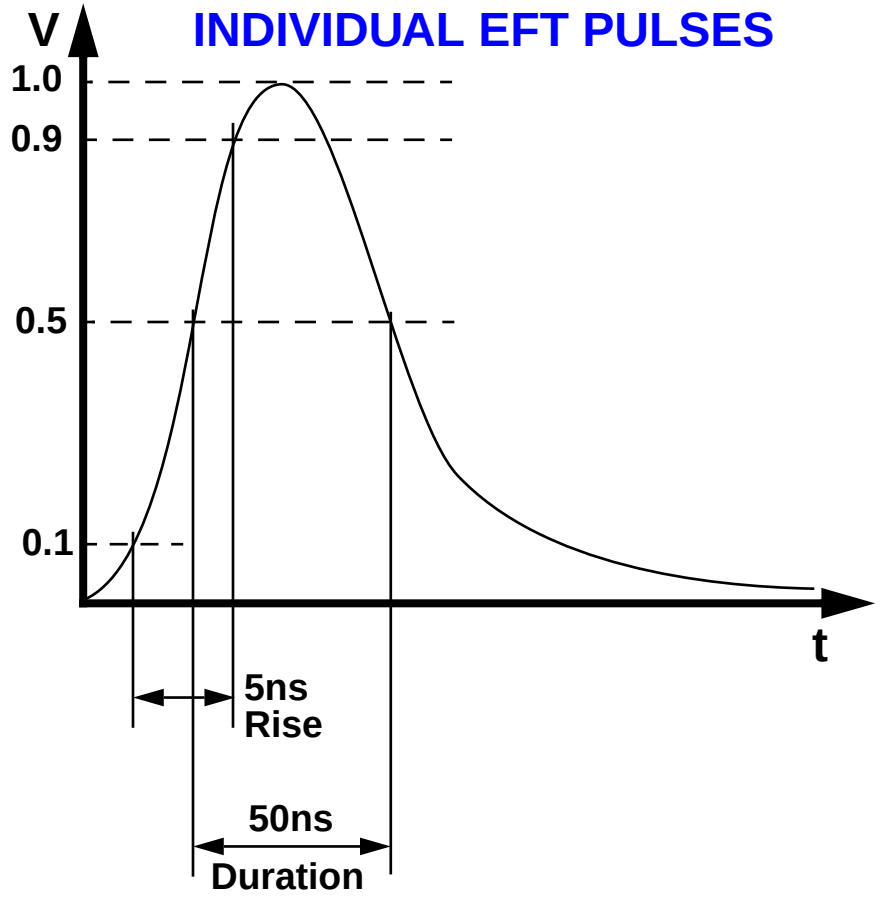
Broadcom Corp.
16251 Laguna Canyon Rd.
Irvine, CA 92618
714-450-8700

Overview

- **Electric Fast Transient (EFT) pulses and the startup**
- **Simulation results for the Montreal protocol in the presence of EFT pulses**
- **Robustness and flexibility of the Montreal protocol**
- **Conclusions**

EFT Pulses





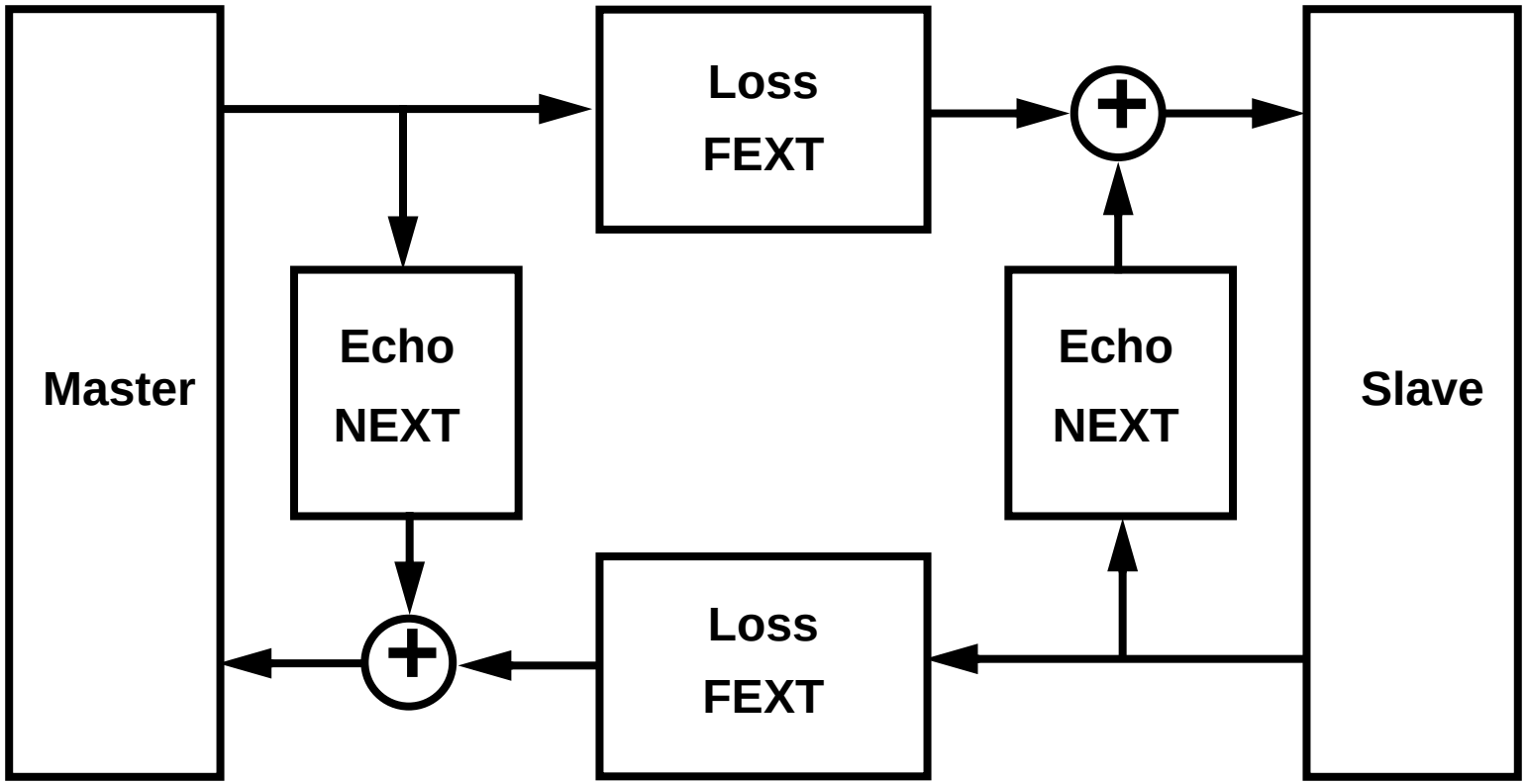
Pulse Repetition Rate 5KHz

EFT Coupling from Power Lines to Data Lines
(A.Hashim and M.Makwinski, 1995)

- **EFT Pulses of up to 2000 Volt are applied to a power line**
- **Pulses coupled into a data line running parallel to the power line over a 100m length in a plastic raceway are measured**
- **Measured pulses on the data line have a peak to peak amplitude of approximately 110mV**
- **Theoretical model predicts up to 150mV**

BROADCOM

Simulation Model

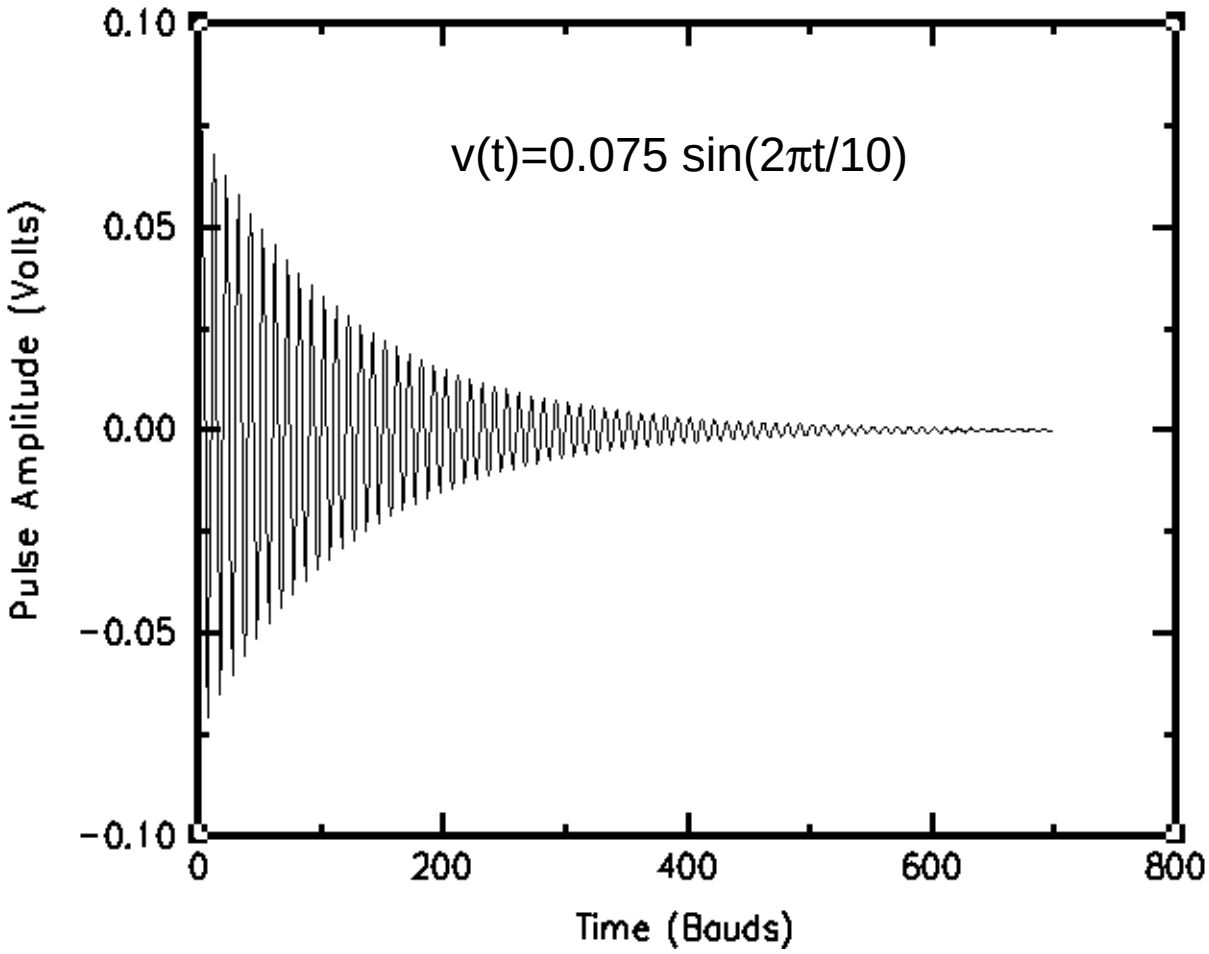


Features of Simulation Environment

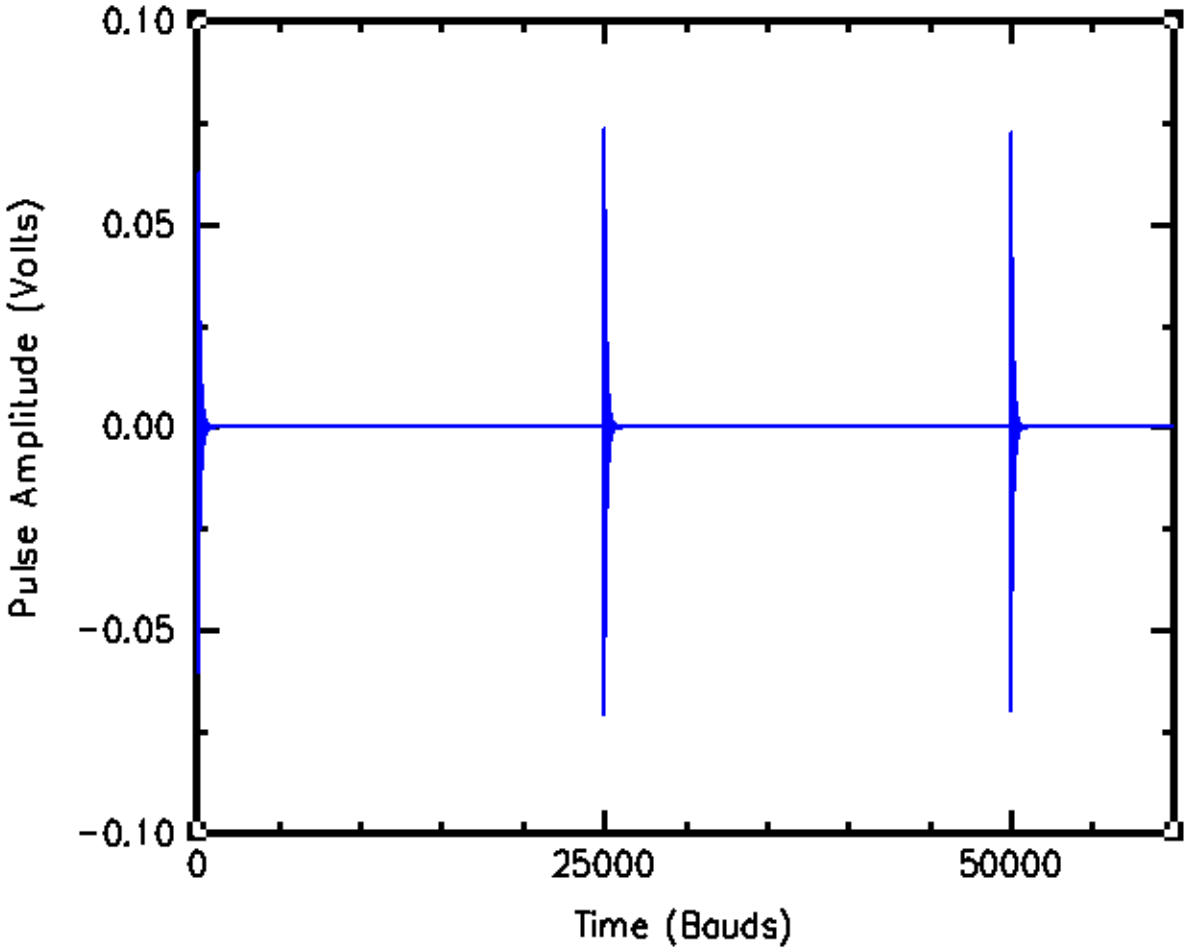
- Complete handshake between Master and Slave is captured
- Fully asynchronous simulation, with 200ppm initial frequency offset between Master and Slave clocks
- All details of adaptive filter convergence and timing recovery (frequency and phase) captured
- PCS and Phy Control fully compliant with current draft (D2.0)
- All startup sequencing is done automatically under PHY_CONTROL
- Signal detector triggers transition from SYNCHRONIZE to Phase I at the Slave

BROADCOM

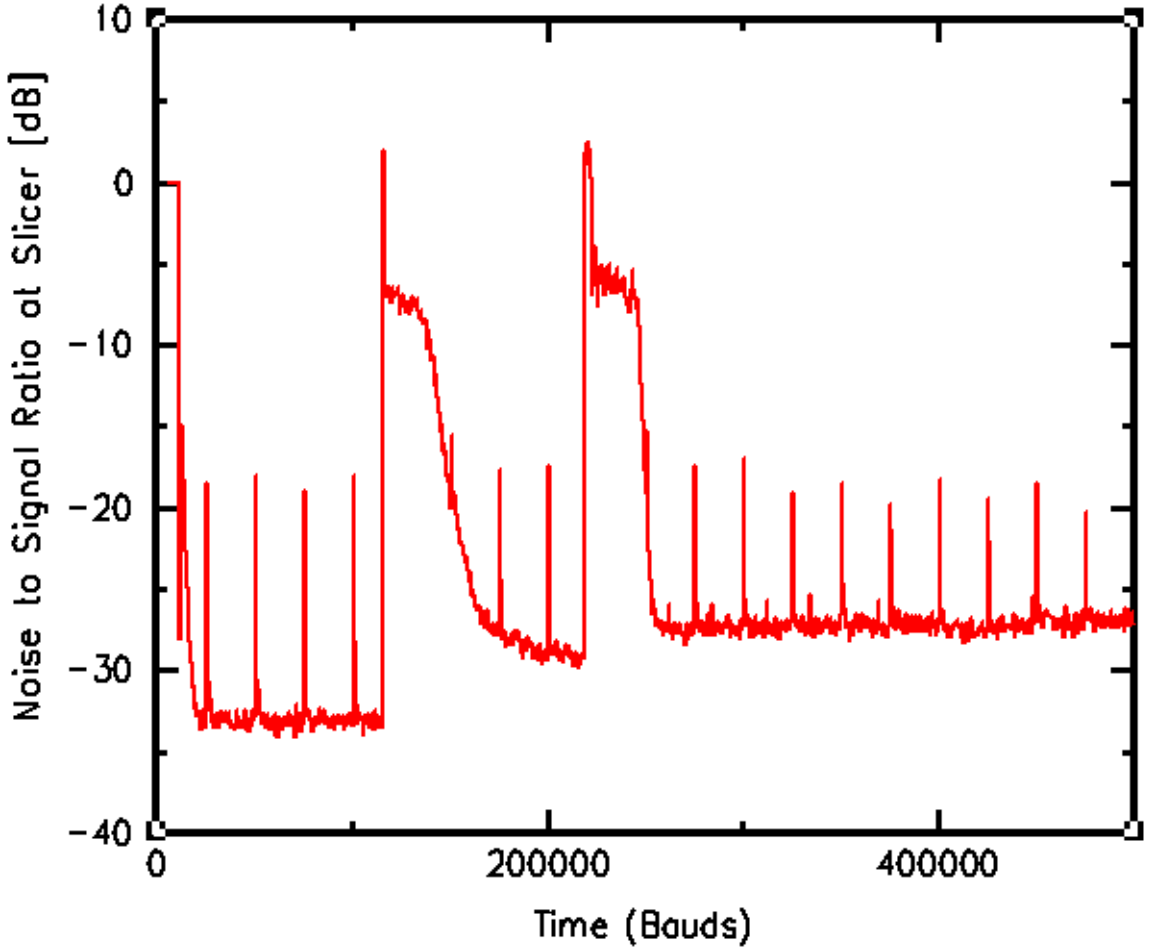
Simulation Model of Noise Pulses on the Data Line



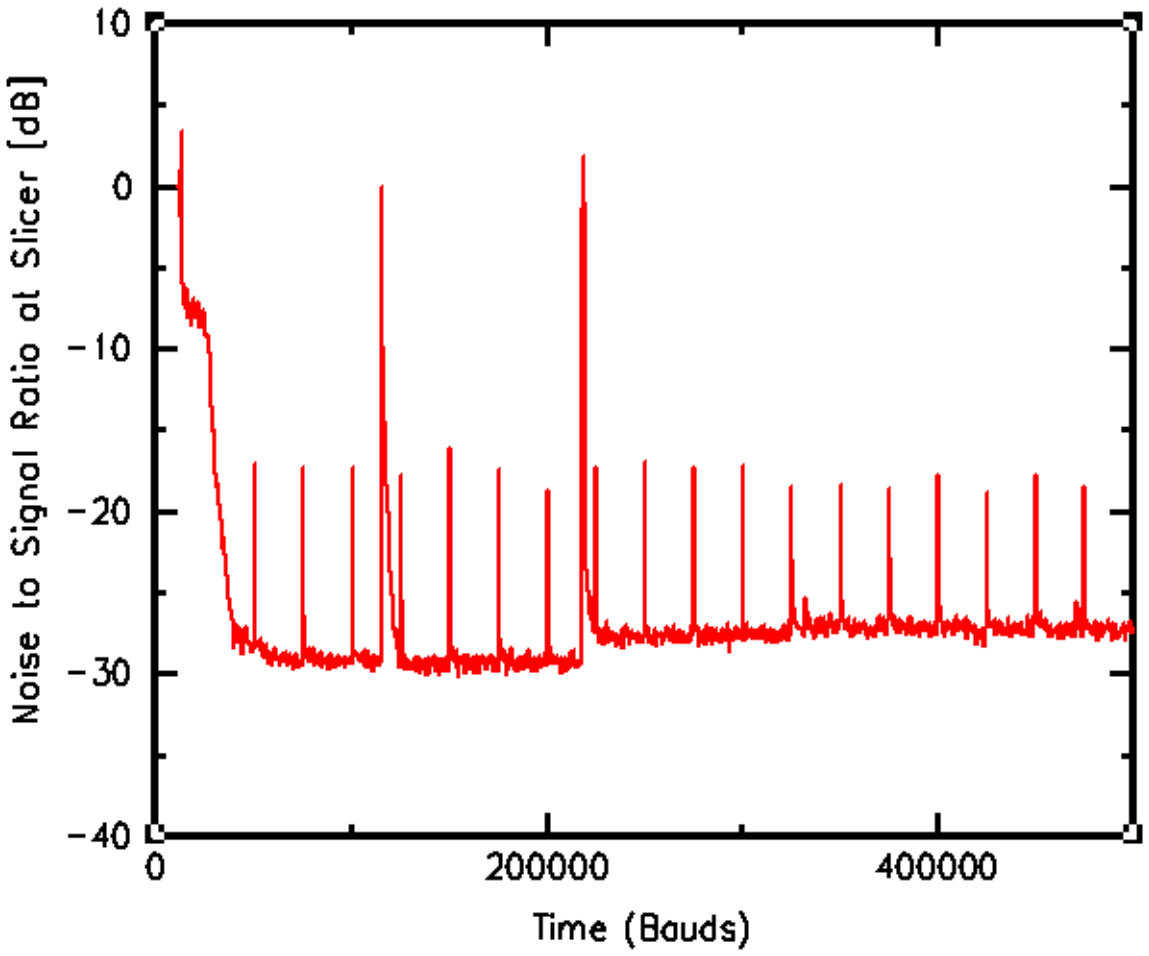
Simulation Model of Noise Pulses on the Data Line



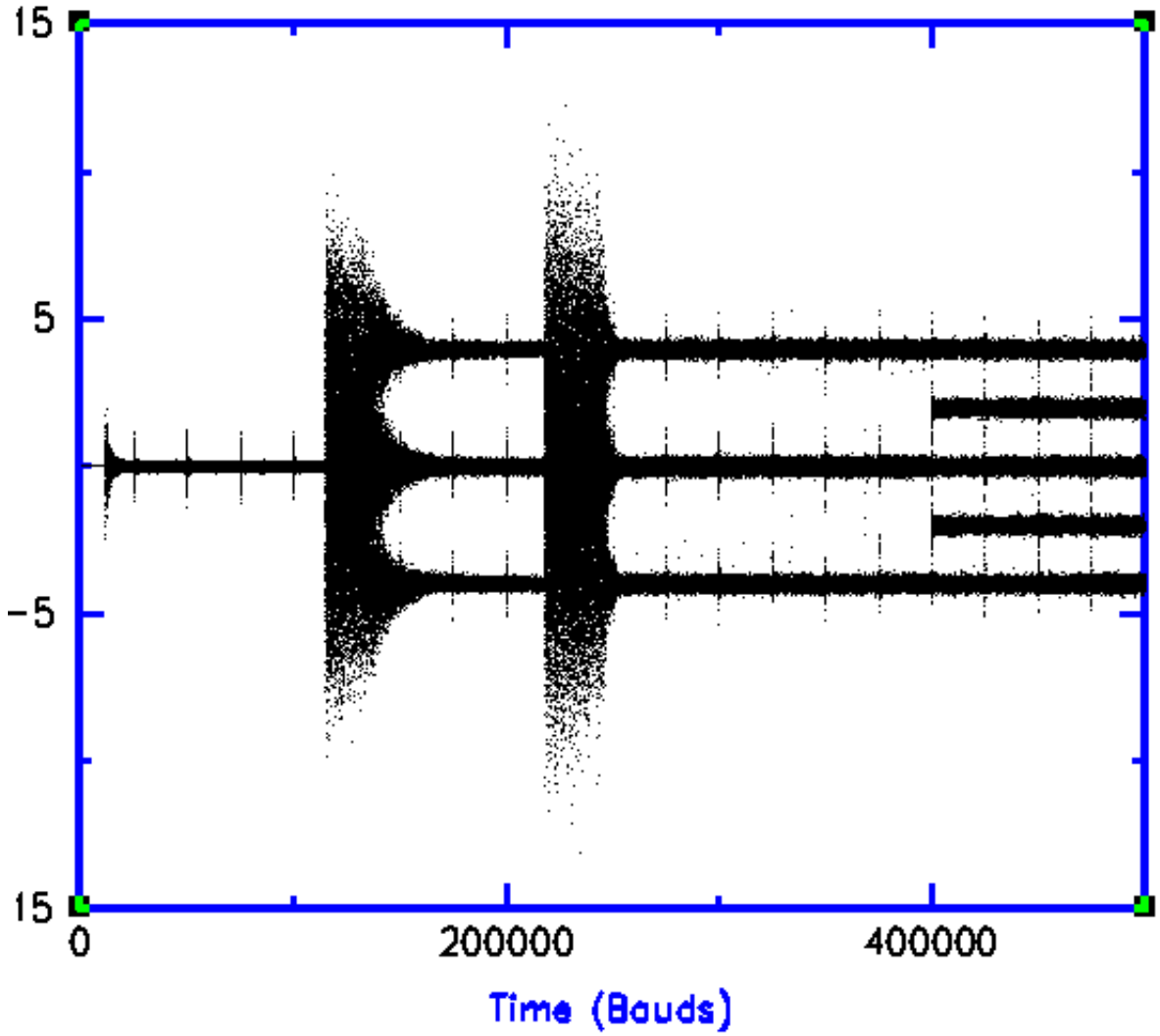
Simulation Results (NSR at Master)



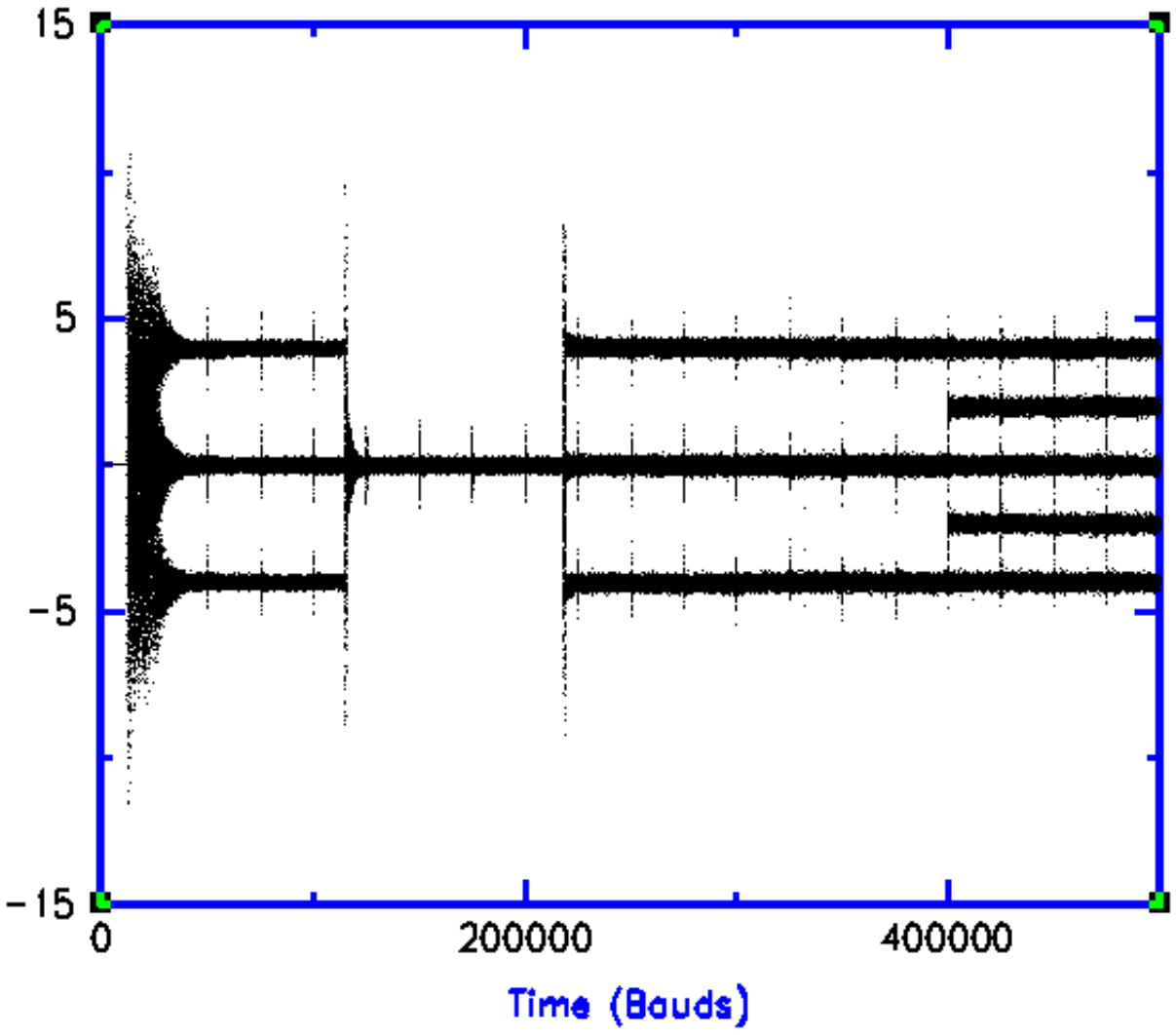
Simulation Results (NSR at Slave)



Simulation Results (Eye at Master)



Simulation Results (Eye at Slave)



Robustness of the Montreal Protocol

- Our simulation results show the extraordinary robustness of the Montreal protocol
- We have also shown the extraordinary robustness of the Signal Detector
- Some have claimed that the blind startup is more robust because it can recover from noise events during the TRAINING state by doing multiple retries of the adaptive filter convergence
- However retries are also possible in all phases of the Montreal protocol (including a complete blind start in Phase 3 (TRAINING state)!!!)
- In addition, the clean separation of the adaptive filter convergence operations in the Montreal protocol makes convergence much more reliable

BROADCOM

Flexibility of the Montreal Protocol

- **Proponents of the Blind Startup can still implement it within the framework of the Montreal protocol in at least two ways:**
  - Using the BYPASS feature in Autonegotiation
  - Going through the normal sequence, but delaying all receiver convergence until Phase 3, where a complete Blind Start can be implemented

- **Since the standard does not mandate any particular implementation, individual implementers can use all retry and recovery mechanisms they wish in all phases of the Montreal protocol, including Phase 3 (TRAINING state)**