Simulation Results for the Startup Protocol Approved in Montreal

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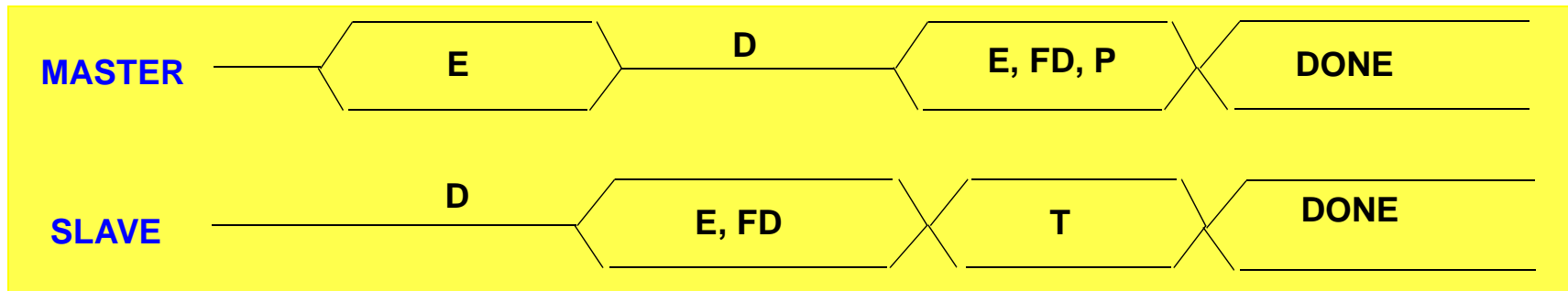16251 Laguna Canyon Rd.
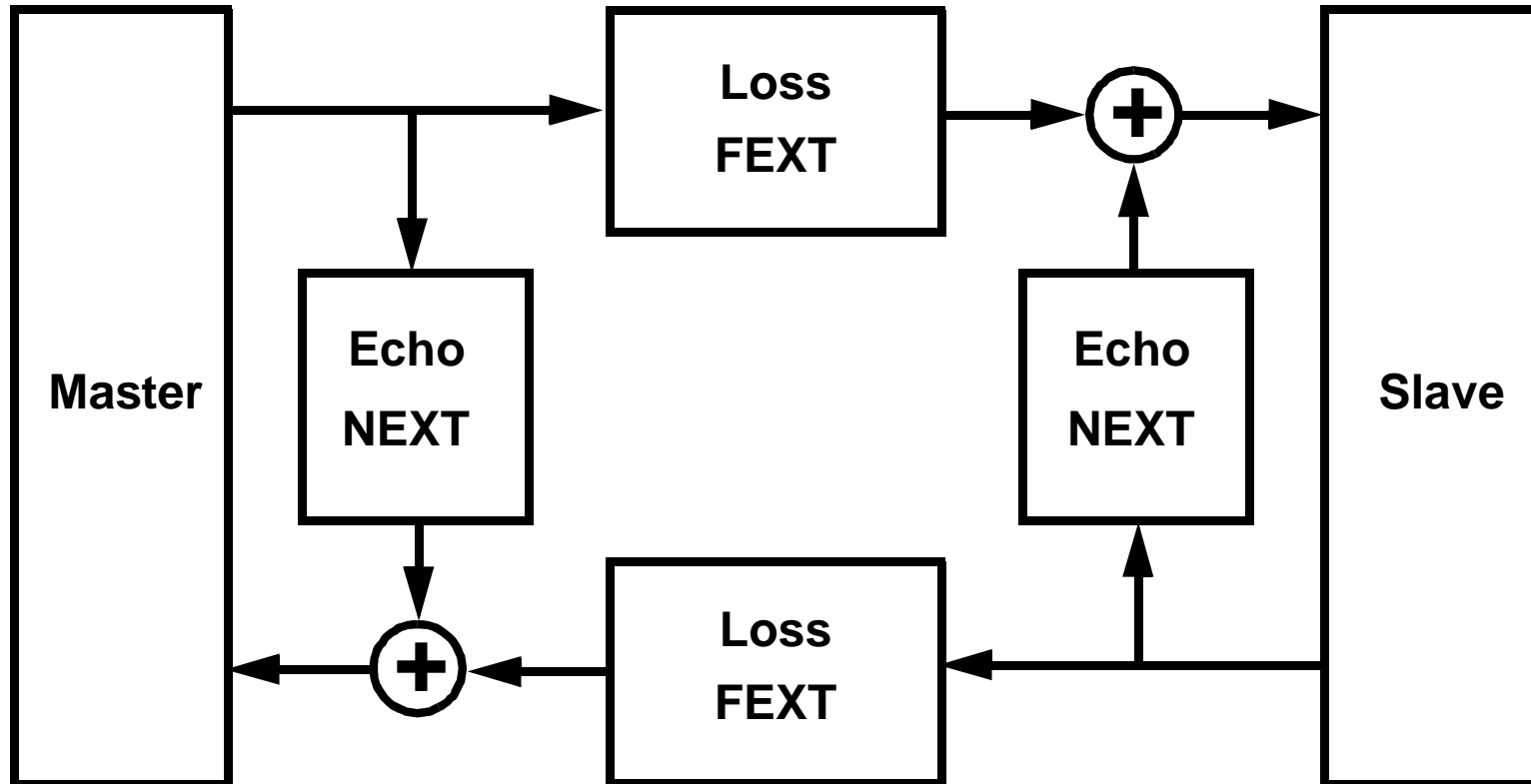Irvine, CA 92618
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Simplified Timing Diagram

E = Echo/NEXT Canceller Convergence
D = DFE/Timing Convergence
FD = Freeze DFE
P   = Adjust Phase
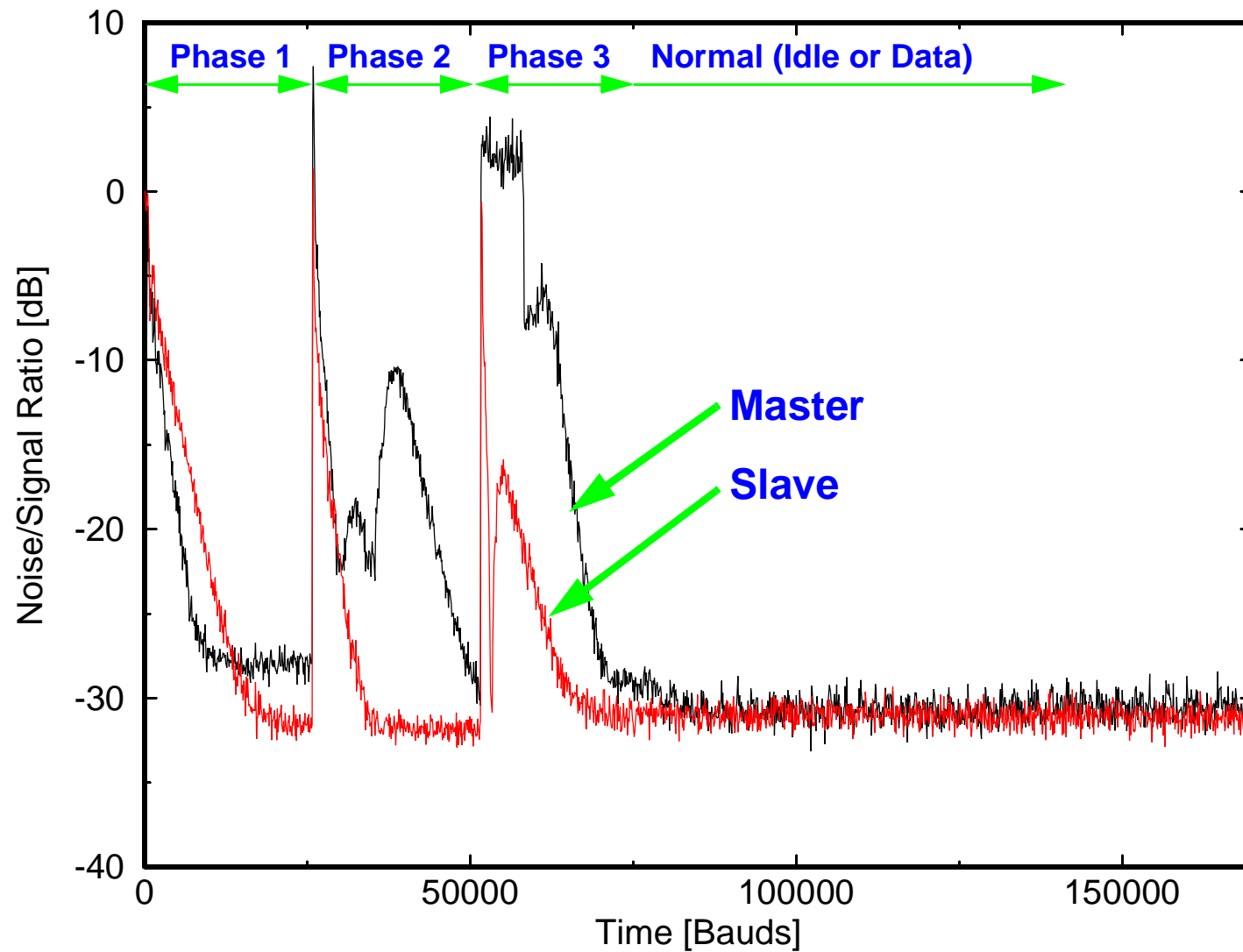T = Acquire Timing (Frequency/Phase)

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

- Transmitter fully compliant with current draft (D1.1) of the PCS

- All startup sequencing is done automatically under PHY_CONTROL

- LOC_REC_STATUS=RNOK triggers transitions from Phase I to Phase II at the Slave, and from Phase II to Phase III at the Master

- Signal detector triggers transitions from Phase I to Phase II at the Master and Phase II to Phase III at the Slave

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Simulation Results (NSR vs Time)

Simulation Results (Phase of M&S)
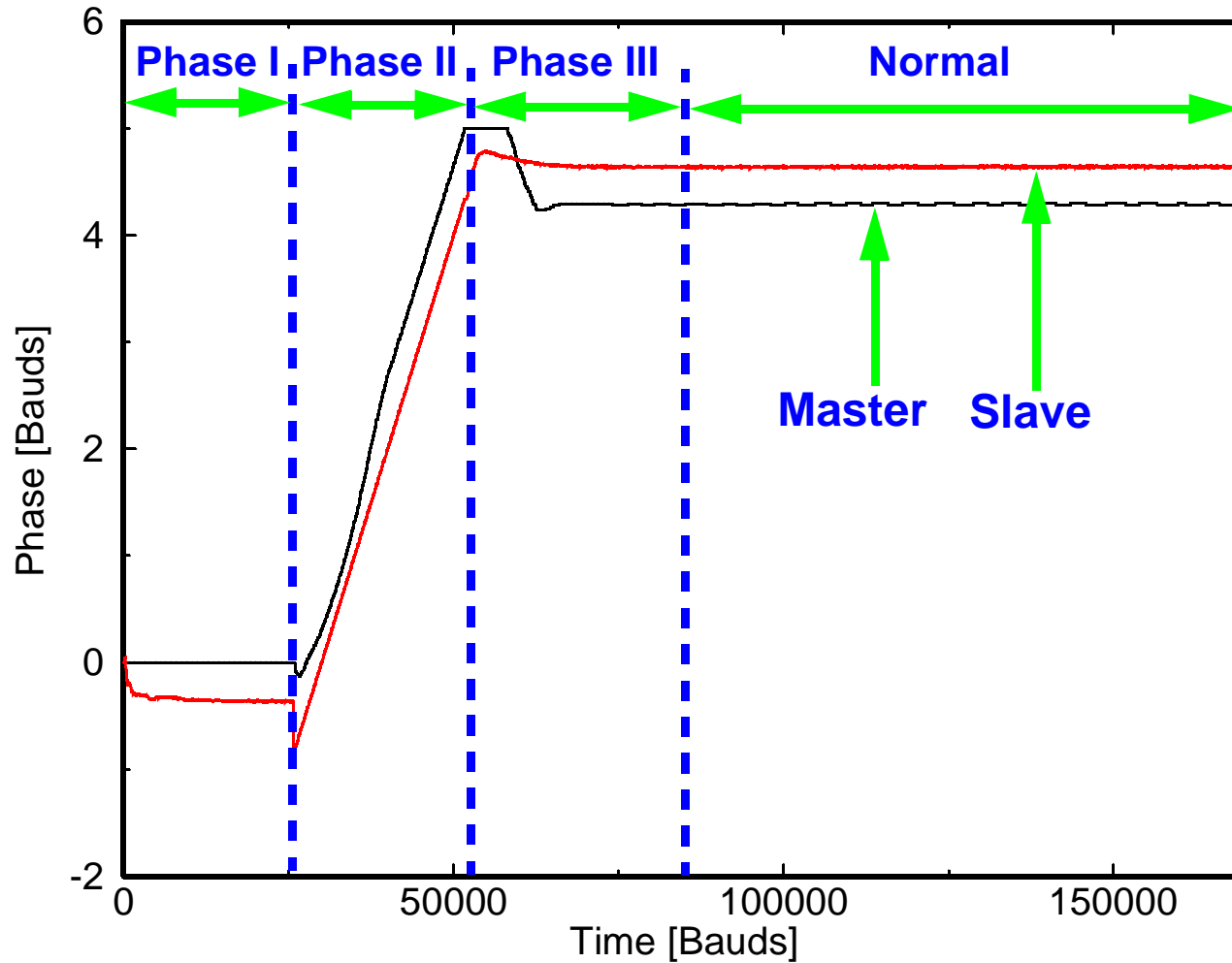
Concerns Raised About This Protocol

- *Concern 1:* **"The master Timing Convergence has to be done in the presence of echo while the slave is also trying to acquire the timing (frequency and phase) in the presence of echo"** (Ramin Nobakht, Mon, 17 Nov 1997 23:40:42 PST)

- *Answer 1.1:*
  - The slave *does not* have to acquire timing (frequency and phase) in the presence of echo, because the echo canceller has been trained in the previous step (Step 2).
  - Timing *does* have to be acquired by the slave in Step 3, but this is done under very favorable conditions since the DFE and Echo Canceller have already been trained. This poses no special problems.

- *Answer 1.2:*
  - It is true that the master phase acquisition has to be done in the presence of echo, but this also happens in the alternative proposed by Ramin, so nothing is gained by reversing the roles of master and slave.

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- *Concern 2:* **"The Master is not guaranteed to be able to achieve DFE/FFE/ timing acquisition (in Phase II) before going to Echo/Next acquisition (in Phase III). The maximum that is guaranteed is DFE/FFE coefficients acquisition, but with wrong timing" (Jaime Kardontchik, Thu, 20 Nov 1997 09:01:53 PST).**

- *Answer 2.1:*
    - The simulations we presented show that the fact that the Master has to acquire timing (frequency and phase) from the Slave while converging its DFE during Phase II is not a problem.
    - In fact, this cannot be a problem since all protocols under consideration have to do this anyway at the Slave.
    - Note that Jaime's algorithm does not avoid this joint DFE/timing convergence, it merely moves it to Phase I.
    - This does not justify any changes to the protocol voted in Montreal.

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Concerns Raised About This Protocol

- *Concern 3:* "The Slave could achieve DFE/FFE/timing acquisition (in Phase I) and then proceed to Echo/Next acquisition (in Phase II) ONLY IF IT CAN FREEZE ITS RECEIVER PLL DURING THE WHOLE DURATION OF PHASE II (1msec? 2msec?)" (Jaime Kardontchik, Thu, 20 Nov 1997 09:01:53 PST).

- *Answer 3.1:*

  - The protocol approved in Montreal does not require any PLL freeze of any kind. The Slave acquires timing information during Phase I, but then deletes this information and transmits using a free-running local clock during Phase II. Then, at the beginning of Phase III, it must reacquire timing. No PLL freeze is required at all.

  - As in our response to *Concern 1*, we must point out that *Slave timing reacquisition in Phase III is not a problem, since it is done under very favorable conditions (the DFE and EC have already converged, so Slave timing acquisition in Phase III is even easier than in Phase I).*

  - Our simulation results confirm that there is no problem with this acquisition, so no modification of the Montreal vote is required.

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Conclusions

- Simulation results show that the protocol approved in Montreal does not have any fundamental problems and is workable.

- The alternative protocols proposed after the Montreal meeting are unnecessary modifications of a decision already made.

- 802.3ab should not spend any more time on startup protocols and should focus on finalizing the standard.

- Additional discussion on startup protocols is counterproductive and could result in major delays of the standard.

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