1. The meeting was opened at 9:00 am.

2. Attendance:
Mr. William Lynn  Adaptec, Inc.
Mr. Rick Hernandez  Agilent Technologies
Ms. Pat Thaler    Agilent Technologies
Dr. Sagar KenKare  Broadcom Corp.
Mr. Clement Yuen  Broadcom Corp.
Mr. Doug Cole    Dallas Semiconductor
Mr. Kevin Marks   Dell, Inc.
Mr. Douglas Wagner FCI
Mr. Elwood Parsons Foxconn Electronics
Mr. Mike Fitzpatrick  Fujitsu
Mr. Nathan Hastad  General Dynamics
Mr. Rob Elliott  Hewlett Packard Co.
Dr. William Ham    Hewlett Packard Co.
Mr. Barry Olawsky  Hewlett Packard Co.
Mr. Dan Colegrove  Hitachi Global Storage Tech.
Mr. James Rockrohr IBM
Mr. George O. Penokie  IBM / Tivoli Systems
Mr. Harvey Newman  Infineon Technologies
Mr. Michael Jenkins  LSI Logic Corp.
Mr. Martin Czekalski Maxtor Corp.
Mr. Eric Kvamme  Maxtor Corp.
Mr. Ed Cady  Meritec
Mr. Galen Fromm  Molex Inc.
Mr. Jay Neer  Molex Inc.
Mr. Alvin Cox  Seagate Technology
Mr. Gerald Houlder  Seagate Technology
Mr. William Martin  Sierra Logic, Inc.
Mr. Robert Kando  Texas Instruments
Mr. Dan Gorenc  TycoElectronics
Mr. Kevin Witt  Vitesse
Mr. Jeff Williams  Xiotech Corp.

31 People Present

3. Agenda

3.1 T10/05-341r0  Updated Test and Simulation Results in Support of SAS-2  [Kevin Witt]
http://www.t10.org/ftp/t10/document.05/05-341r0.pdf
Objective is to define the external cable environment to determine equalization requirements. Equalization and/or pre-emphasis can open the eye with 10 meter cables. Concern about using 10-meter cable in legacy implementations (probably won't work at 3Gbps with existing systems). Internal examples with backplanes and midplanes has significantly different loss characteristics due to connectors and PCB performance.

3.2 T10/05-352r0  External Link Amplitude Budget (SAS-2) [Yuriy Greshishchev]
http://www.t10.org/ftp/t10/document.05/05-352r0.pdf
Pre-emphasis alone will not permit a 10-meter cable (based on SAS 1.1 specification).
7-meter cable needs a 1000mV pk-pk launch amplitude with pre-emphasis. Crosstalk budget for cable may need to be reduced. Need to understand feasibility.

3.3. SATA concerns for 6Gbps
Compatibility with previous generations operating at lower speeds
Voltage level (current SATA 3G 400/700 launch amplitude)
  Majority is .5-meter cable (max 1 meter cable)
  Cost structure is critical
  Targeted for 6dB loss channel @ 4.5G
  Power needs to minimized
  Support for mobile applications (probably not 6G anytime soon)
Does SATA need a higher voltage (and higher cost/lower volume) product to work with SAS?
Pre-emphasis/equalization may be required at 6Gbps.
Spread spectrum is anticipated to stay as optional.
SATA OOB may use low cost reference clock. SAS is okay with this.
Full channel or connector based? Interoperability points should be at connector.
SATA received signal measurement is made prior to the mated connector pair.
SATA considering received signal specification (currently only receiver tolerance)
BIST FIS and 2 dword test patterns – nice for commonality if SAS 2 will support.
Is intersection only at internal or also external? Either?

3.4. Internal versus external

3.4.1.  T10/05-3xxr0 Meritec/Xilinx presentation  Ed Cady
(To be posted)

3.4.2.  General discussion
Focus on wide cables first (both internal and external)
10 meters of external cable desired.
What needs to change in the SAS spec to get a 10-meter external cable at 6Gbps?
Crosstalk budget for cable may need to be reduced.
Concerned about equalization issues if both in IC’s and cable.
How can equalization be set?
Is it required on both ends?
Use an adaptive equalization scheme with training patterns?
Can channel/cable specification include an active component or passive equalization and still be compliant?

Cable parameter measurements needed for transceiver modeling and cable specification refinement:

Length of external cable ranges from 12” to 10 meters, internal from 3” to 1 meter – need cable characteristics (S4P files – see T11/05-346v1) http://www.t11.org/ftp/t11/member/incoming/05-346v1.pdf for multiple lengths so that transmitter and receiver requirements can be defined.
Testing to include mated connector pairs on both ends.
Post data by Oct 14, 2005.
Include test set up in report.
Max length, short length and something between desired.
50MHz – 20GHz, 10MHz step size.
Preferred format for export is magnitude and phase.
Input ports 1 and 3, output ports 2 and 4 (1 → 2, 3 → 4)

Cable testing: Molex, HP, Meritec/Xilinx, Amphenol, Infineon (3rd party internal cable testing).
Simulations: PMC Sierra, Infineon, Vitesse
LSIL: TCTF model.

3.5. PHY specification elements discussion for next meeting:

3.5.1. Add compliant channel specification as in CEI?
   - How complicated are reference transmitter and reference receiver? (How many taps, etc.)
   - Drop BER statement or modify to include reference to channel characteristics?
   - Interoperability points at connectors?
   - Use TCTF instead?

3.5.2. Transmitter specification:
   - 1200mV pk-pk max including pre-emphasis goal?
   - Minimum transmit voltage
   - Rise and fall time requirements
   - Return loss
   - Jitter

3.5.3. Receiver specification:
   - Input voltage
   - Return loss
   - Jitter tolerance
   - Noise floor or SNR?

3.5.4. Equalization
   - Is training required?
   - How is receiver equalization set?
   - Does pre-emphasis also need to be set?
   - How should these interact?
   - Do the setting made for 6Gbps work for 3 and 1.5 Gbps signals?

3.5.5. Spread spectrum clocking?

4. Recommendations for plenary
   - None.

5. Meeting schedule
   - Next meeting: Tuesday, November 8, 2005  Austin, TX

6. Adjournment
   - The meeting was adjourned at 5:05 pm