

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 be 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 settings 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