Minutes of SAS PHY working group meeting July 12, 2005 05-281r0

1. The meeting was opened at 9:10 am.

2. Attendance:

Ms. Pat Thaler	Agilent Technologies
Dr. Ichiro Fujimori	Broadcom Corp.
Mr. Paul Griffith	Broadcom Corp.
Mr. Sagar KenKare	Broadcom Corp.
Mr. James A. Lott, Jr.	Dallas Semiconductor
Mr. Kevin Marks	Dell, Inc.
Mr. Greg McSorley	EMC
Mr. Douglas Wagner	FCI
Mr. David Freeman	Finisar
Mr. Elwood Parsons	Foxconn Electronics
Mr. Mike Fitzpatrick	Fujitsu
Mr. Rob Elliott	Hewlett Packard Co.
Dr. William Ham	Hewlett Packard Co.
Mr. Barry Olawsky	Hewlett Packard Co.
Mr. Zane Daggett	Hitachi Cable Manchester
Mr. Hitoshi (Todd) Horita	Hitachi Cable Manchester
Mr. George O. Penokie	IBM / Tivoli Systems
Mr. Schelto van Doorn	Intel Corp.
Mr. Mark Seidel	Intel Corp.
Mr. Michael Micheletti	LeCroy
Mr. Andy Roy	LeCroy
Mr. Joe Breher	Lingua Data
Mr. Michael Jenkins	LSI Logic Corp.
Mr. William Petty	LSI Logic Corp.
Mr. Martin Czekalski	Maxtor Corp.
Mr. Richard Uber	Maxtor Corp.
Mr. Michael Hopgood	Nvidia Corp.
Mr. Yuriy Greshishchev	PMC-Sierra
Mr. Tim Symons	PMC-Sierra
Mr. Greg Elkins	QLogic Corp.
Mr. Henry Kuo	QLogic Corp.
Mr. Alvin Cox	Seagate Technology
Mr. Allen Kramer	Seagate Technology
Mr. Robert Kando	Texas Instruments
Ms. Ashlie Fan	TycoElectronics
Mr. Dan Gorenc	TycoElectronics
Mr. Ron Mathews	UNISYS Corporation
Mr. Phillip Roberts	Vitesse Semiconductor
Mr. Kevin Witt	Vitesse Semiconductor

39 People Present

3. SAS PHY WG agenda:

3.1. SAS 1.1 letter ballot comment resolution:

3.1.1. Mini internal and external cable electrical specifications

Galen presented test data from cables and connectors.
http://www.t10.org/ftp/t10/document.05/05-267r0.pdf
Barry presented a new proposal to resolve letter ballot issues (remove TBD's) - 05-251r0
Defines NEXT and FEXT
Total max NEXT of 5% (-26dB) for each RX pair.
Unanimous approval by working group.

3.1.2. External cable insertion loss (issues with -16dB)

Reference 5.3.3 and add fix frequency range to be from 50 MHz to 3,0 GHz per applicable TCTF regarding TxRx segment performance requirements.

3.1.3. Significant digits in TCTF equations

Barry to change low loss equations to 1 decimal place and change 3.75 and 1.35 per the new results to one decimal place.
Unanimous approval by working group.

3.2. OOB speed concerns

Discussed PMC proposal reviewed at the working group meeting in Houston concerning limiting the transmission frequency of the OOB signal to aid the design of detect circuitry. With extent product performing OOB at 3Gbps under certain conditions and a limit already implemente at 1.5 Gbps for PHY's supporting attachment of SATA, a limit of 3Gbps was considered acceptable for future revisions of the SAS specification. Mark Seidel to draft a SAS 2.0 proposal to limit to 3Gbps max.

3.3. 6Gbps specification discussion

3.3.1. T10/05-263r1 (Steve Gorshe)

DFE Error Burst Analysis: Considerations for SAS 2.0
http://www.t10.org/ftp/t10/document.05/05-263r1.pdf

3.3.2. 05-276r0 (Barry Olawsky)

SAS-2 Internal Channel Modeling
http://www.t10.org/ftp/t10/document.05/05-276r0.pdf

3.3.3. General discussion:

3.3.3.1. Signaling level concerns

Max 1200 pk-pk diff voltage @ 6Gbps?
- Common value used in other specifications.
- Power concerns with higher levels.
- EMI concerns with higher levels.

Pre-emphasis/de-emphasis considerations (40%+ may be required?)
Backwards compatibility with 1600 mV pk-pk diff (1.5 and 3Gbps)
Backplane loss vs external cable loss

Internal versus external specification?
Support for at least 1 previous generation is needed and 2 is highly preferred.
SATA compatibility

3.3.3.2. Eye opening?

Closed eye possible at receiver
Other specs define transmitter and receiver or transmitter and transmission path characteristics.

StatEye
Which version?
Impact to specification?
Is it normative?
Good simulation tool. Could be normative in specification as a function for opening a closed eye. Similar to the single pole high-pass frequency-weighting function that progressively attenuates jitter at 20 dB/decade below a frequency of ((bit rate) / 1 667) already called out in the SAS 1.1 spec.

3.3.3.3. External cable length requirements

How long is needed?
What type is feasible?
Plan to use mini-SAS connector system?
Transmission delay times and protocol expectations – a workable problem
Need a definition of usage model (length)

3.3.3.4. BER of 10^{-12} versus 10^{-15}

Systems expect error-free operation
Current product much better than BER of 10^{-12}
Concern that higher speeds will move closer to BER of 10^{-12} limit.
Verification test time was previous reason for BER of 10^{-12}
New speed is only 2x faster
Drive cannot provide sustained data rate of 6Gbps.
Added expense to design for high confidence level like current BER of 10^{-12}.

3.3.4. Conclusion

Need clear definition of usage models to continue 6Gbps work.
10-meter external cable?
Multiple TxRx segments for internal applications?
BER requirements?
Until the usage models are defined, the system requirements cannot be determined.

(STA has formed a task group to cover these issues.)

4. Recommendations for plenary

No proposals were voted on.
Three remaining letter ballot comments were resolved.

5. Adjournment

The meeting was adjourned at 4:35 pm.