

1. Opening Remarks

Meeting started at 9:01 am

2. Approval of Agenda

Agenda was reviewed and discussion of item 4.2 was moved ahead of 4.1; item 5.1 ahead of 4.3.

3. Attendance

Mr. Frederick Giordiano	Agere Systems
Mr. bernhard laschinsky	Agere Systems
Mr. Paul von Stamwitz	AMCC
Mr. Steve Robalino	Dallas Semiconductor
Mr. Kevin Marks	Dell, Inc.
Mr. Mickey Felton	EMC Corp.
Mr. David Freeman	Finisar
Mr. Elwood Parsons	Foxconn Electronics
Mr. Mike Fitzpatrick	Fujitsu
Mr. Nathan Hastad	General Dynamics
Mr. Rob Elliott	Hewlett Packard Co.
Mr. Barry Olawsky	Hewlett Packard Co.
Dr. Bill Ham	Hewlett Packard Co.
Mr. James Rockrohr	IBM Corp.
Mr. George O. Penokie	IBM Corp.
Mr. Harvey Newman	Infineon Technologies
Mrs. Vicky Duerk	Intel Corp.
Dr. Mark Seidel	Intel Corp.
Mr. Pak Seto	Intel Corp.
Mr. Joel Silverman	Kawasaki Microelectronics Am
Mr. Dennis Moore	KnowledgeTek, Inc.
Mr. Mark Adams	LeCroy Corporation
Mr. David Uddenberg	LSI Logic
Mr. Praveen Viraraghavan	LSI Logic Corp
Mr. Brian Day	LSI Logic Corp.
Mr. Michael Jenkins	LSI Logic Corp.
Mr. David Geddes	Marvell Semiconductor, Inc.
Mr. Paul Wassenberg	Marvell Semiconductor, Inc.
Mr. Galen Fromm	Molex Inc.
Mr. Jay Neer	Molex Inc.
Mr. Hock Seow	NEC Electronics America, Inc
Mr. Rick Hernandez	PMC-Sierra
Mr. Tim Symons	PMC-Sierra
Mr. Alvin Cox	Seagate Technology
Mr. Stephen Finch	STMicroelectronics
Mr. Doug Loree	Toshiba
Mr. Dan Gorenc	TycoElectronics
Ms. Ashlie Fan	TycoElectronics
Mr. Jim Scott	Vitesse Semiconductor
Mr. Kevin Witt	Vitesse Semiconductor

40 People Present

4. Review of documents and proposals

4.1 SAS-2 Spread-spectrum clocking [Elliott]

<http://www.t10.org/ftp/t10/document.06/06-263r5.pdf>

The initial wording in r5 requires SSC capability by the receiver device. The revision done during the meeting included making SSC support optional for both transmitter and receiver on PHYs that do not support SSC, rather than on transmitters only. SSC can be selected on or off with the data transferred during the SNW-3 window being defined. Discussion lead to the conclusion that a system that did not desire to use SSC would never turn it on.

SSC is currently not supported in one direction only per the proposal in the r2 form. This was not considered to be an issue, as allowing it would complicate matters.

SSC is configured with center-spreading and down-spreading. In the teleconferences, it was determined that the down-spreading should be limited to the lower value of center-spreading to help with digital PLL design constraints. The down-spreading is a subset of the center-spreading, thus the design complexity of a drive that must receive center-spreading from a host/expander, but transmit with downspreading is reduced.

Some concerns about the complexity added by implementation were expressed as well as concerns over interoperability if not all SAS-2 receivers shall accept SSC. The complexity issue is a real concern, but the interoperability issue should have minimal implications since SAS 1.1 receivers are not required to be capable of receiving SSC, especially center-spreading.

This proposal was voted on by the working group.

The result: 7 Y/7 N/14 A.

The author asked that this proposal be presented to the plenary for voting. After a clarification discussion later in the day, one of the N voters was willing to vote Y if another vote was taken. We did not vote again and will let the plenary discuss and vote on this proposal. The author believes all technical issues have been resolved with r5 as revised.

With regards to the voting of r5 as revised (this is not an exhaustive list):

"No" issues include:

- All SAS-2 receivers previously had been required to tolerate SSC and the new optional definition for SSC no longer requires this.
- There are other ways to pass EMI testing without using SSC.
- The way SSC is being proposed allows 3Gbps devices to now have SSC enabled if they support SAS-2 features. This is optional, but the concern was voiced that it may become required for 1.5 and 3 Gbps rate devices since optional has a tendency to become mandatory in practice.
- SATA had problems in implementation due to some non-compliant host receivers.
- PHYs need to receive one SSC type while transmit another SSC type (drive required to receive center-spreading while transmit down-spreading).

"Yes" issues include:

- SSC is being used successfully by other standards.
- 3 Gbps emissions are worse than 1.5 Gbps and will get even harder to deal with at 6 Gbps.
- Data has shown that SSC can significantly reduce emissions: 06-064 SAS-2 SSC Investigation (Barry Olawsky, HP)
- Minimum number of SSC types has been determined to provide backwards compatibility with SAS 1.1.
- The SSC proposal is technically complete.

4.2 SAS-2 SNW-3 bit definitions [Elliott]

<http://www.t10.org/ftp/t10/document.06/06-363r2.pdf>

Review of the document was limited pending the outcome of the SSC proposal.

The term "final SNW" was determined to apply to legacy rather than SAS-2. "Training SNW" was substituted for cases where SNW-3 has had successful completion. Make sure that support means "transmitter".

Cover the "drive shut down SSC option" in a note. This subject was discussed on the July 27, 2006 teleconference:

"If one port of a drive negotiated SSC on and the other port negotiates SSC off, the drive is allowed to shut SSC off on both ports provided there is a graceful method to shut if off. (Priority to SSC OFF)"

No vote was taken on this proposal until the status of SSC is final. SSC has a significant impact on the content of this proposal concerning the PHY capability and priority lists.

4.3 SAS-2 Modifications to the SAS Speed Negotiation [Wassal]

<http://www.t10.org/ftp/t10/document.06/06-324r2.pdf>

Extensive changes made to this proposal. Rob Elliott captured comments and will provide them to the editor for updating of the proposal.

5. New Business

5.1 SAS-2 Reference Transmitter and Receiver Specification Proposal (06-419) [Witt]

<http://www.t10.org/ftp/t10/document.06/06-419r0.pdf>

Defines how de-emphasis is measured for the simulations in this proposal. Concern voiced that the de-emphasis measurement definition doesn't locate the peak in the correct position. It is dependent on rise and fall times. Maximum rise time needs to be no greater than .41 UI and the minimum rise time needs to be smaller.

Also looks at deterministic jitter relationship to de-emphasis.

Initial reference transmitter table does not include numbers for differential and common mode return loss. Differential RL suggested being similar to 10G Base-KR and the common mode RL similar, but -6dB and TBD frequency dependency.

Differential impedance plus differential return loss should not both be in the reference receiver table. Suggested dropping differential impedance requirement (as is being done in another similar standard).

Need to add jitter tolerance.

Minimum number of taps should be 3 based on existing data and recommendation of 4 +/- 1 tap.

Minimum values need to be used for the reference values.

Kevin asked for suggestions as he has provided the initial pass at defining a reference transmitter and receiver.

6. Review of Recommendations to Plenary

SAS-2 Spread-spectrum clocking (06-263)[Elliott] r5 as revised

Vote was 7 Y/7 N/14 A

(See 4.1 above for details.)

7. Meeting Schedule

Weekly Thursday conference calls to remain at 10 am CDT.

Next conference call September 21, 2006

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<https://seagate.webex.com/seagate>

Topic: SAS-2 PHY WG

Date: Thursday, Sept 21, 2006

Time: 10:00 am, Central Daylight Time (GMT -05:00, Chicago)

Meeting number: 826 515 680

Meeting password: 6gbpsSAS

8. The meeting was adjourned at 5:53 pm.