Minutes of SAS PHY Working Group conference call May 24, 2007 T10/07-258r0

Attendance:

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| Mr. Paul von Stamwitz | AMCC |
| Mr. Jesse Jaramillo | Amphenol |
| Mr. Greg McSorley | Amphenol |
| Mr. Kevin Witt | Dallas Semiconductor |
| Mr. Mickey Felton | EMC |
| Mr. Ramez Rizk | Emulex |
| Mr. Barry Olawsky | Hewlett Packard Co. |
| Mr. Dan Colegrove | HGST |
| Mr. Harvey Newman | Infineon Technologies |
| Dr. Mark Seidel | Intel Corp. |
| Mr. Pankaj Kumar | Intel Corp. |
| Mr. Michael Jenkins | LSI Logic Corp. |
| Mr. Gabriel Romero | LSI Logic Corp. |
| Mr. Galen Fromm | Molex Inc. |
| Mr. Hock Seow | NEC Electronics America, Inc. |
| Mr. Rick Hernandez | PMC-Sierra |
| Mr. Guillaume Fortin | PMC-Sierra |
| Mr. Joseph Chen | Samsung |
| Mr. Alvin Cox | Seagate Technology |
| Mr. Allen Kramer | Seagate Technology |
| Mr. Daniel Smith | Seagate Technology |
| Mr. Benoit Mercier | STMicroelectonics |
| Mr. Larry McMillan | WDC |

22 in attendance

Agenda:

1. Transmitter jitter specification [Kramer]
See comments to reflector from Allen Kramer regarding RJ versus DJ.

We had a long discussion on this topic. Al will post the presentation that was talked through.
Should crosstalk be included in the channel model for the transmitter?
Should a backplane model be included as a test model case or should margin in the budget (opening after the processing) be added to compensate for the shortcomings pointed out in the presentation.
Physical testing of the transmitter device and what equipment capabilities are major concerns. Some indicated that an equipment “plugfest” with real phys and real test equipment would be in order to prove the validity. A recent SATA working group had conducted a similar event; however, only one transmitter device was physically tested. Alvin will check with STA on the possibility of such an event at the July T10 location. Although a sanitized report of multiple transceivers and multiple pieces of test equipment sounds like a good idea, who would compile all the information in a timely manner to have it available for the phy working group to consider?

2. Receiver jitter tolerance [Jenkins]
6G SAS RX Tolerance, Reference RX & Reference TX
http://www.t10.org/ftp/t10/document.07/07-259r0.pdf
Mike presented this proposal that brings up additional questions. He believes that the existing receiver tolerance table can be complimented by notes to provide a suitable requirement. He proposed that TJ at ref RX output is “noncompensable jitter”; however, the nomenclature of getting to this point was under fire. Some terms to be defined include exactly what is meant by the reference receiver output and where the 0.1 UI of sinusoidal jitter is applied. The “two

buckets" approach for jitter seems to be popular; however, there are many concerns as we depart from the traditional specification methodology.
Mike also wants to increase the Vvma to 800mV. This is a big concern based on the effect it would have in other areas of the spec. Although the voltage increase is to insure a 100mV opening, many simulations simple normalize the result. In addition, the 100 mV number was described as a place holder rather than a hard value. We need hard values by the July meeting.

3. SAS-2: Improving a Jitter Definition (07-205)
http://www.t10.org/ftp/t10/document.07/07-205r0.pdf
**Not discussed**
Comments from Bent Hessen-Schmidt, SyntheSys Research, Inc.:

I suggest that we use text equivalent to:

The Reference Clock characteristics are controlled by the resulting JTF (Jitter Transfer Function) characteristics obtained by taking the time difference between the PLL output (the Reference Clock) and the data stream sourced to the PLL. The PLL CLTF -3 dB corner frequency, and other adjustable CLTF parameters such a peaking, are determined by the value required to meet the requirements of the JTF.
The JTF shall have the following characteristics for an encoded D24.3 pattern (1100110011 0011001100). This is the MFTP which is a test pattern that has clock-like characteristics and a transition density of 0.5.
1) The -3 dB corner frequency of the JTF shall be 3 MHz +/-1 MHz.
2) The magnitude peaking of the JTF shall be 3.5 dB maximum.
3) The attenuation at 30 KHz +/-1% shall be 75 dB +/-3 dB.
The JTF -3dB corner frequency and the magnitude peaking requirements shall be measured with sinusoidal PJ applied, with a peak-to-peak amplitude of 0.3 UI +/-10%. The relative attenuation at 30 KHz shall be measured with sinusoidal phase (time) modulation applied, with a peak-to-peak amplitude of 20.8 ns +/-10%.

You will see that we have changed to from 72 db to 75 dB and from 2.1 MHz to 3 MHz and added the word "relative" to the last sentence. Relative should indicate that the 75 dB are with respect to the actual magnitude of jitter on the 30 kHz stimulus. The +/-10% therefore merely sets the starting point and still allows the other vendor. All uncertainties are then included in the +/-3 dB term. Effective tightening of the tolerances can be seen on the residual of the 30 kHz being confined to less than 5.2 ps instead of (7.4 x 1.1 x 1.1 ps = 8.95 ps).

4. SAS-2 Channel StatEye Simulation Results (07-253) [Witt]
http://www.t10.org/ftp/t10/document.07/07-253r0.pdf
Status:
* Galen is to send Harvey a 10-meter Mini SAS cable. Harvey will post data from actual hardware in the near future.
**Galen is "shaking the tree".**
* Harvey will continue to forward StatEye questions to Anthony Saunders to improve the model.
**Waiting for more complete set before posting.**
* Mike Jenkins suggested some settings to help the simulation set-up. Kevin will try.
**Still working on getting results.**

5. SAS-2 6Gbps PHY Electrical Specification
http://www.t10.org/ftp/t10/document.07/07-063r7.pdf
r7: Added transmitter common mode requirements and updated physical receiver test description.
* Review note concerning dBmV.
**Mike has an alternate way to state the note. He will send Alvin the new text.**
* See questions in physical receiver test description.
**Not discussed.**

6. Additional items and updates.
Please review the text concerning SSC. There has been significant discussion on this topic in another standards group that may apply to SAS. See section 5.3.8 of SAS-2r10. A couple of topics of interest:

a) downspreading has no requirement for return to nominal
b) profile discontinuities are not limited.

Next call: May 31, 2007

**No call on June 7.**

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Webex information:
https://seagate.webex.com/seagate
Topic: SAS-2 PHY WG
Date: Thursday
Time: 10:00 am, Central Daylight Time (GMT -05:00, Chicago)
Meeting number: 826 515 680
Meeting password: 6gbpsSAS