NOTES FROM 10GBASE-CX4 Study Group Meeting 3-10,11-03

INTRODUCTION and OVERVIEW

Herb Van Deusen volunteered to be secretary for this meeting

Next planned interim meeting is in May depending on progress at this meeting and acceptance by IEEE of working paper. In the event that the project is approved as an official task force in March, there may be an additional interim meeting in June.

Minutes of the February interim approved by voice affirmation. Notes provided by Peter Bradshaw.

Meeting Objectives were presented.

Dan reviewed the schedule:

- Schedule was revised at the Feb interim meeting.
- Surveyed group on how many people would participate in a meeting in Italy in September as part of rest of 802.3 group. 11 would, 10 wouldn't. This may create a conflict around consolidating task force meetings.

Agenda Review:

Presentations have been added.

Comments will be reviewed.

Dan reviewed IEEE-SA Standards Board bylaws on patents in Standards.

- did not specifically ask if anyone has intellectual property relative to the standard but suggested that a letter be sent to the committee

Dan reviewed inappropriate topics for these meetings

- such as market, litigation or licenses

PROJECT AUTHORIZATION

Scope

- Discussed the use of the word copper in the scope as addressed in a comment by Brad Booth. Put off until Dan can have a discussion with Brad. (Dan later had the discussion and Brad's objection was withdrawn)

Purpose

Five Criteria:

- Has not changed much since December

- Added average number of participants, number of companies and number of study group meetings as requested at last meeting
- Question about cost for copper being 1/10 to 1/20 the cost of optical solution. Must include the complete cost of the link to have these estimates be accurate.

Objectives
- Suggestion made that a statement be prepared by the committee which separates this activity from XAUI. It seems that there were enough apparent differences but Dan will consider generating a statement about this.

PRESENTATIONS

Compliance Mask and System Performance Simulation (Petro Popescu)

- Modeled results for simulation through cable does not include an equalizer
- No jitter assumed in simulations. Added in final summary chart as .35 UI jitter added in circuit before driver.
- Cable assembly model is based on max loss model which is based on 15 meters AWG24 cable with connector and mating header at each end.

Analog Pre-emphasis and the TX template (Clark Foley)

- Clark will provide suitable form of this presentation for the notes.
- Lab measurement done with 25 ps of Dj at transmitter (< .1 UI), no retimer.
- Proposal to modify transmit template to accommodate analog filter.
- Concern that system must be able to receive signal with jitter of .65 UI and still meet requirement
- With 1 Volt p-p launch, output level after cable is around 120 mV with lab measurement
- Concern that compliant signal under proposed criteria will not meet spec at receiver. More work may need to be done to determine if this would be a problem.

Revisiting CX4 Loss Budget (Ze'ev Roth)
- Modeling shows that template may need to be modified to accommodate reflections.
- Question about model at chip around combining capacitance into one lumped element. This was justified by assuming that inductance is zero. Ze'ev estimated actual value to be 2nH.

Loss Budget team update (Steve Dreyer)
- Template is not centered in 560-710 psec region. Simulations results are too close to upper bound of template.
- Package model is included in this analysis with inductance of about 0.4 nH.
- Provided proposed template to address this issue.
- Dan Dove suggested that we combine three presentations for template modifications to come up with a proposal for the working draft. This will be done when during the review of the working draft after the three presenters have had a chance to discuss and come up with a specific proposal.

Transmit Jitter Spec (Steve Dreyer)

- Deterministic jitter was introduced into the input waveform simulation as duty cycle distortion. This can not be equalized out.
- Quite a bit of discussion ensued around the impact of this proposed change. This will be further discussed during the working paper review.
- Arguments were centered around that fact that insufficient data has been presented which validates the number proposed in the spec or the proposed change to a higher allowed value for higher random jitter.
- Dan's comment is that lacking definitive data, it would be better to leave the spec more stringent (limit Rj to .18 UI) now and open it up if additional data can show that loosening the spec will not impact the performance of the link.
- Jeff Cain from Cisco supports leaving the random jitter at 0.18 because it tightens the spec up in an area where they have seen problems with XAUI links in the past.
- Chris DeAndrea will run some simulations which vary the jitter components while keeping the total jitter at a fixed rate to see what effect it will have on the BER.
- Peter Bradshaw feels that jitter due to crosstalk will have much greater impact on the waveform than these jitter components and so feels that relaxing this value is a move in the wrong direction.
- Dan in his role as the chair, feels that in the interest of time in putting together a specification that achieves compliance, advocates leaving the spec where it is. He recommends that if someone can put together a highly convincing data package, this specification could be reconsidered.

Meeting adjourned for lunch at 11:55

Tuesday Afternoon session

Return Loss (Howard Baumer)

- Howard's modeling shows that the current spec for return loss in the receiver and cable assemblies allows adequate margin for both short and long cable assemblies.
- Feels that values of .75 pf input capacitance and 3 nH input inductance for receivers are achievable and were used for this analysis. Increasing these values can cause problems.

Request for Change (John DeAndrea)

- Change requested is to broaden allowable common mode voltage
- Will be discussed in Working Paper Review.
- The intent of spec in this case is to specify maximum DC voltages to the receiver designer. Inrush values may need to be considered separately.

Compliance Channel Update (Chris DiMinico)

- Recommended Return Loss specification is based on models plus some measured values for longer length assemblies. Chris recommends further testing to verify that shorter length assemblies can meet this specification.
- Multi Disturber Near End Crosstalk (MDNEXT) values are based on aggressor signals on either side of the victim line with another disturber line located one connector position

away. This is more than the worst case condition so if the effects of crosstalk seem too objectionable, a reduction in the specified value may be possible to provide some additional margin.

- Multi Disturber Equal Level Far End Crosstalk (MDELFEXT) is measured the same way but the arrangement of crosstalk contributors is an actual configuration that could be seen in a system. The "MDELFEXT" will differ from the MDFEXT by the loss of the cable. FEXT must be specified for a fixed cable length in this case a 15 meter or max loss cable.
- Total crosstalk may be modeled by adding the effects of FEXT at the driver to NEXT at the receiver.
- Chris may put together some additional background on crosstalk measurements if it would be helpful to the committee.

Comment Resolutions

- **54.6.7 and 54.6.8 Global and Lane-by-lane transmit disable functions** – Clark Foley. Should the global disable function be mandatory? Committee chose to use lane by lane transmit disable to facillitate the transmit template measurement. A note will be added to the transmit template section to specify that measurement will be made with other lanes turned off (no crosstalk).

Motion: Amend the first paragraph of 54.7.3.6 as follows: The differential output template shall be tested using the low frequency test pattern specified in Annex 48A.2 with all other transmitters disabled. Motion passed 18 Accept 0 Reject 2 Decline

- **54.7.3.6 Test fixture definition**:

Motion:

Add a reference to Figure 54-3 at line 22 of 54.7.3.6 as follows:
… transmitter test fixture as defined in figure 54-3".
Rename 54.7.3.2 to "Fixture Impedance"
Change Figure 54-3: Put box around R & C pairs and characterize as impedance, Z, = 50 ohms.
Modify first paragraph of 54.7.3.2 as follows; "The load shall…. " to "The test fixture impedance shall…"

Motion passed 17 Accept 0 Reject 4 Abstain

- **44.3 and Table 44-2 Round Trip Delay** – Chuck Harrison

Correct editorial oversight and change Table 44-2 to specify 1-meter length of cable.

Motion passed 15 Accept 0 Reject 2 Abstain

- **45.2.1.6.1 PMD Type Encoding (Ahmet Tuncay)**

Register table 45-2 was inadvertently omitted, correct by re-inserting table 45-2

Motion passed 13 Accept 0 Reject 2 Abstain

- **Table 45-2 bit 1.8.9 CX4 Ability (Ahmet Tuncay)**

Postponed a decision on this issue until having direct discussion with Ahmet.

Meeting adjourned at 4:45 PM

Wednesday Morning:

Working Paper Review:

54.6.9 Loopback mode

Agreed to strike reference to 3.0.14 in first paragraph. This is not an issue of technical

54.7.3.1 Test Fixtures

An extraneous “Vabcd” notation was found in the document and needs to be deleted.

Transmit test fixture figure 54-3

Will change according to discussions earlier in the meeting

54.7.3.1 Test Fixture Impedance

The specification of Impedance tolerance through 2 GHz seems too tight but the spec is considered technically complete and changes to this may be made through the comment process.

54.7.3.4 Amplitude and Swing

Will need to relook at specification for common mode voltage through the comment process

54.7.3.5 Amplitude and Swing

Looking for comments for better clarification for this segment. No change for now. Spec is technically complete.

54.7.3.6 Differential Output Template

Corrected some spelling errors. The template will be modified after agreement by parties from Intel, Maxim and Mysticom.

54.7.4.2 Baud Rate Tolerance

Standardize on specified baud rate (to be done at a later date).

54.8.1 Characteristic Impedance

Looking for Comments on whether common mode impedance needs to be added to this part of the specification. Also should frequency range be specified? Most likely, the impedance will be measured with a TDR which does not imply a frequency range. Also, should the circuit board trace pairs be mentioned since they are part of the assembly. This section to be resolved by comments.

54.9.1.1 Connector Specification

Need to get the IEC number for this connector type. Check with Bob Thornton. Number can be inserted later.

54.10.1 Jitter test requirements

Concern raised that these test requirments may require specialized equipment and advanced understanding to implement in production environment. This is acknowledged and expectation would be that suitable methods and equipment will be developed.

Thursday afternoon session - Final Motions approval

Dan would like to reestablish regularly scheduled conference calls to keep the momentum up during the two months between meeting again in May. Steve Dreyer will set up a group to discuss the remaining issues around the loss budget. It is not clear whether the Compliance Channel team needs to have conference calls to fine tune any remaining details about specifying the cable assembly characteristics.

Howard will be sending out a compilation of comments to be distributed for review by the members of the study group.

Motions:

1. Accept the changes to our Working Paper version 3.1 and request editor to create working paper 3.2.
Moved: Steve Dreyer
Second: Shelto van Doorn
Y: 18
N: 0
A: 1

2. Request 802.3 accept 10GBASE-CX$ PAR, Objectives and 5 Criteria and forward to the 802 exec.

Moved: Howard Baumer
Second: Peter Bradshaw

Y: 18
N: 0
A: 0

3. Request 802.3 accept the distribution of Working Paper version 3.1 as fulfilling 802.3 rule 2.8.2. Upon PAR approval:
   a) Convert working paper 3.2 (Incorporating changes to 3.1 agreed to this week) to 802.3ak/D1.0
   b) Release draft 1.0 for working group ballot and necessary recirculation ballots
   c) Authorize 803.3ak task force interim meeting in order to resolve working group ballot and/or re-circulation comments

Moved: Jeff Cain
Second: Ze'ev Roth

Y: 20
N: 0
A: 0

In the event that our PAR is not recognized, Dan will request the following motion:

"Request 802.3 authorize interim meeting, to be noticed as required, in order to work on drafts and address comments"

Last Issue

Dan will send a note out to see how many people plan to attend the next interim meeting in Portsmouth, NH during the week of May 19.