

# Electrical Interface Ad-hoc Meeting

- Opening/Agenda
- Observations on CRU Bandwidth
- Open items for Ad Hoc

IEEE P802.3bs 400Gb/s Ethernet Task Force  
14<sup>th</sup> December 2015

# Opening

- The charter of the Electrical Interface Ad hoc is:
  - Address all issues in relation to the electrical interfaces to ensure progress towards a technically complete draft.
    - *Identify issues or omissions in the draft*
    - *Find consensus now, rather than in comment resolution.*
- Next Ad-hoc Meetings
  - Monday 14<sup>th</sup> December 8-10am PDT
  - Monday 21<sup>st</sup> December ?
- Attendees names and affiliations will be taken from the Webex participants list.
  - Please use an e-mail address indicating affiliation when signing in. If you attend via phone only, or if your employer and affiliation are different, please send me an e-mail.

# Patent Policy

- <http://www.ieee802.org/3/patent.html>

# Agenda

Ad-hoc Opening/Agenda	Andre Szczepanek	szczepanek_01_121415_elect
CRU B/W straw poll results and Editors Observations	Andre Szczepanek	szczepanek_01_121415_elect
Open items for the Ad Hoc	Andre Szczepanek	szczepanek_01_121415_elect

# Agenda & Minutes

- Any objections to the Agenda ?
- Any objections to the minutes from the last meeting ?
  - [http://www.ieee802.org/3/bs/public/adhoc/elect/07Dec\\_15/minutes\\_draft\\_07-Dec\\_2015\\_elect.pdf](http://www.ieee802.org/3/bs/public/adhoc/elect/07Dec_15/minutes_draft_07-Dec_2015_elect.pdf)

# CRU Bandwidth Straw Poll Results

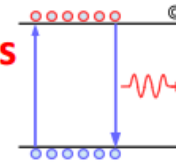
I support:

- |    |   |   |
|----|---|---|
| a) | Keeping CRU Corner Frequency at 10MHz             | 1 |
| b) | Changing CRU Corner Frequency to 4MHz             | 6 |
| c) | Need more information in order to make a decision | 6 |

# Summary of CRU B/W specifications from

[http://www.ieee802.org/3/bs/public/15\\_07/ghiasi\\_3bs\\_01\\_0715.pdf](http://www.ieee802.org/3/bs/public/15_07/ghiasi_3bs_01_0715.pdf)

## TX Jitter Filter and RX Jitter Tolerance for Several IEEE Standards



- ❑ **CL 52, 86A (40G-SR4, 100G-SR4), 83A/B (XLAUI, CAUI-10)**
  - Transmitter output measured with 4 MHz CRU (high pass jitter filter)  $F_{\text{baud}}/2578$
  - Receiver is tested with worst case stress + TX credited low frequency SJ
- ❑ **CL 68 (LRM), CL 72 (10G-KR), CL 85 (40G-CR4/100G-CR10)**
  - Transmitter output measured with 4 MHz CRU (high pass jitter filter)  $F_{\text{baud}}/2578$
  - CL 68 only tested unstress at two points (75 KHz, 5 UI) and (375 KHz, 1 UI)
  - CL 72 interference test require testing receiver with 0.115 UI at  $F_{\text{baud}}/250$
  - CL 85 interference test require testing receiver with 0.115 UI at frequency > 15 MHz
- ❑ **CL 88 (100G-LR4), CL 95 (100G-SR4), CL83D/E (CAUI-4)**
  - Transmitter output measured with 10 MHz CRU (high pass jitter filter)  $F_{\text{baud}}/2578$
  - Receiver is tested with worst case stress + TX credited low frequency SJ
- ❑ **CL 92 (100G-CR4), CL 93 (100G-KR4)**
  - Transmitter output measured with 10 MHz CRU (high pass jitter filter)  $F_{\text{baud}}/2578$
  - CL 92 interference test require testing receiver with 0.115 UI at frequency > 100 MHz and unstress SJ testing at (190 KHz, 5 UI) and (940 KHz, 1 UI)
  - CL 93 tested with 35 dB ISI channel at (190 KHz, 5 UI) and (940 KHz, 1 UI)
- ❑ **CL 94 (100G-KP4)**
  - Transmitter output measured with a CRU having 20 dB/dec low frequency response, 1.6 MHz BW, and 3 dB peaking at 6 MHz, response has peaking to accommodate 2<sup>nd</sup> order loops and potential peaking as result of DSP timing recovery latency
  - Receiver is tested unstress with following SJ components (16 KHz, 5 UI) and (160 KHz, 0.5 UI), jitter tolerance actually does not reflect the intention of 2<sup>nd</sup> order CRU
- ❑ **10G-LRM and 100G-KP4 testing receivers unstress does not guarantee interoperability**
  - 10G-KR and 40G-CR4/100G-CR10 interference tolerance does have an SJ component but does not test against potential SJ allowed by the transmitter.

# CRU Bandwidth Observations

1. On any given link Rx and Tx CRU bandwidths should be consistent.
2. ADC+DSP receivers have considerable input delays. This reduces CRU tracking bandwidth
  - hence the ~1.6MHz Tx CRU bandwidth used for KP4
3. Chip-to-Module won't be ADC+DSP (its CTLE only)
  - So it doesn't require a CRU bandwidth change
  - Reducing CRU bandwidth makes Rx easier at the expense of Tx
4. Some Chip-to-Chip implementations may use ADC+DSP
  - But is 4MHz low enough ?
5. There is a potential jitter transfer issue if Rx CRU bandwidth is greater than Tx CRU bandwidth in re-timers or gearboxes
  - This is a system compliance problem not specifically a C2C or C2M issue.
  - It can be addressed by using clean-up (LC) PLLs and jitter removal FIFOs.



# TBDs & Magenta text – 120D (CDAUI-8 C2C)

- No TBD's in 120D !
- **Magenta** values in the COM parameters table

# Items for further work – 120D (CDAUI-8 C2C)

1. Get agreement on consistent set of COM parameter values (and change to black rather than magenta)
  - Rd value of  $55\Omega$  is inconsistent with other values from healey\_3bs\_02\_1115.pdf
2. Jitter measurement methodology (Comment #45)
3. Jitter Tolerance frequencies
  - A straw poll in comment resolution showed a (4 to 2) majority for increasing the number of points to greater than 2
    - Further work on Jitter tolerance frequencies was requested
4. Pre-Coding ?
  - Also affects PMA

# TBDs & Magenta text – 120E (CDAUI-8 C2M)

## TBDs

1. Transition Time
  - At Host output (TP1a)
  - At Module output (TP4)
2. Pattern generator jitter characteristics
  - Total Jitter
  - Random Jitter
  - Max even-odd jitter

## Other Magenta

1. Crosstalk Transition Time “12ps”
2. CRU corner frequency “10MHz”
3. *ESMW* (Eye symmetry Mask Width) “0.25UI”
4. Applied pk-pk sinusoidal jitter “Table 88-13”

## Items for further work – 120E (CDAUI-8 C2M)

1. We have had a couple of presentations indicating improved C2M margin through adding low frequency equalization to the reference CTLE
  - Now need a proposal/comment detailing CTLE changes
    - Better still get consensus here at the ad-hoc and take a consensus comment into Draft 1.1 review
2. ILD of informative channel (Comment #188)
  - Supporting presentation justifying need and proposing changes was requested

# Backup

# Participants, Patents, and Duty to Inform

All participants in this meeting have certain obligations under the IEEE-SA Patent Policy.

- **Participants [Note: Quoted text excerpted from IEEE-SA Standards Board Bylaws subclause 6.2]:**
  - **“Shall inform the IEEE (or cause the IEEE to be informed)” of the identity of each “holder of any potential Essential Patent Claims of which they are personally aware” if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents**
  - **“Should inform the IEEE (or cause the IEEE to be informed)” of the identity of “any other holders of potential Essential Patent Claims” (that is, third parties that are not affiliated with the participant, with the participant’s employer, or with anyone else that the participant is from or otherwise represents)**
- **The above does not apply if the patent claim is already the subject of an Accepted Letter of Assurance that applies to the proposed standard(s) under consideration by this group**
- **Early identification of holders of potential Essential Patent Claims is strongly encouraged**
- **No duty to perform a patent search**

# Patent Related Links

All participants should be familiar with their obligations under the IEEE-SA Policies & Procedures for standards development.

Patent Policy is stated in these sources:

IEEE-SA Standards Boards Bylaws

*<http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6>*

IEEE-SA Standards Board Operations Manual

*<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>*

Material about the patent policy is available at

*<http://standards.ieee.org/about/sasb/patcom/materials.html>*

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at [patcom@ieee.org](mailto:patcom@ieee.org) or visit <http://standards.ieee.org/about/sasb/patcom/index.html>

This slide set is available at  
<https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.ppt>

# Call for Potentially Essential Patents

- If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance:
  - Either speak up now or
  - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible or
  - Cause an LOA to be submitted