

## IEEE 802.3 100G Electrical Lane Study Group Ad Hoc meeting – February 26, 2018

Prepared by Beth Kochuparambil and Adee Ran.

### Proposed Agenda:

- Approval of the Agenda
- Approval of Previous Ad Hoc Minutes – Feb 12
- IEEE Patent Policy reminder:
  - <https://development.standards.ieee.org/myproject/Public/mytools/mob/preparslides.pdf>
- IEEE Participation Requirements reminder
- Study Group Update, Beth Kochuparambil
- Channel Model Simulations for 112Gbps Backplane Applications – Geoff Zhang
- FEC Schemes for 100G Electrical Link – Phil Sun
- Using Chiplets to Lower Package Loss – Brian Holden
- 100GEL C2M Channel Estimate – Jane Lim
- 100G Passive Copper Cable link budget analysis – Alex Haser
- TBD/Budget Discussion

Presentations posted at: <http://www.ieee802.org/3/100GEL/public/adhoc/index.html>

Meeting began at ~8:01 a.m. Pacific by Beth Kochuparambil, Study Group Chair.

Meeting began with the agenda presentation:

[http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/agenda\\_180226a\\_100GEL\\_adhoc.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/agenda_180226a_100GEL_adhoc.pdf)

The ad hoc chair reminded participants to indicate full names and employer/affiliation correctly for the meeting minutes. Beth reminded participants to mute lines when not speaking and reviewed the steps to unmute. Chair announced that given the full agenda, questions should be held until the end of the presentation and limited to clarifying questions. Offline discussion will be a necessity.

Showed the links to the IEEE 802.3 100G/s per lane electrical Study Group ad hoc page and the email reflector.

Presented the proposed agenda and asked if there was objection as written. The agenda was approved by the ad hoc.

Chair noted that the minutes from the previous meeting were recently posted to the ad hoc web page.

Reminded participants of the IEEE patent policy. Chair asked if anyone was unfamiliar with the IEEE patent policy. No one responded.

Reminded participants of the IEEE Participation Requirements and showed the slide with the Participation requirements. Chair asked if anyone was unfamiliar with the IEEE Participation Requirements. No one responded.

## Agenda Items

### Study Group Update – Beth Kochuparambil

- Reviewed the logistics for the March plenary. 100GEL will meet Wednesday 10:30am-6pm and Thursday 8:00am-noon of plenary week.
- Presentations should be focused on completing TBDs in objectives and substantiating the PAR and CSD.
- Presentations are due Wednesday, February 28, 5pm PST.
- Currently 3 TBDs for each Ethernet rate in our objectives.
- Chair showed cartoon of budget breakdown seen in offline conversations. This is the focus for today's call and next week.

### Presentation #1:

"Channel Model Simulations for 112Gbps Backplane Applications", Geoff Zhang

See: [http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/zhang\\_100GEL\\_adhoc\\_01\\_022618.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/zhang_100GEL_adhoc_01_022618.pdf)

- Clarifying questions regarding TX/RX equalization and termination and aggressor equalization were asked and answered.
- Brief discussion about package assumptions.
- Brief discussion about Crosstalk profiles in both channel groups affecting the results.

Allowed a few extra minutes to finish the que. Chair announced that we may push over time to still hold our discussion at the end.

### Presentation #2:

"FEC Schemes for 100G Electrical Link", Phil Sun

See: [http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/sun\\_100GEL\\_adhoc\\_01a\\_022618.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/sun_100GEL_adhoc_01a_022618.pdf)

- Discussion followed around differentiation from the interleaving that we currently use in .3bs or .3cd.
- The differentiation between BER and DER was pointed out.

### Presentation #3:

"Using Chiplets to Lower Package Loss", Brian Holden

See: [http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/holden\\_100GEL\\_adhoc\\_01\\_022618.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/holden_100GEL_adhoc_01_022618.pdf)

- Discussion followed about the feasibility of integrating multiple chiplets on an MCM in terms of yield and power.

Chair asked that given the similar nature of the following two presentations that questions be limited to clarification and then the floor will be opened for discussion following both presentations.

### Presentation #4:

"100GEL C2M Channel Estimate", Jane Lim

See: [http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/lim\\_100GEL\\_adhoc\\_01\\_022618.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/lim_100GEL_adhoc_01_022618.pdf)

- Discussion followed about the loss budget allocation and test fixture feasibility.

- A request was made to make the s-parameter data available.

**Presentation #5:**

“2m Passive Copper Cable Feasibility at 112G”, Alex Haser

See: [http://www.ieee802.org/3/100GEL/public/adhoc/feb26\\_18/haser\\_100GEL\\_adhoc\\_01\\_022618.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/feb26_18/haser_100GEL_adhoc_01_022618.pdf)

- No questions brought forward.

**TBD/Budget Discussion**

Chair again placed the budget breakdown cartoon up for discussion (slide 10 of agenda deck).

Values suggested, in today’s meeting, for TBDs are 30 dB or 28 dB. Can we move forward with either of these?

The above losses are ball to ball. Large package loss at ~28 GHz is 5 dB at best. 10 dB with 2 packages. Can this work?

Is asymmetric budget needed?

Chipelets can be used to reduce the package trace lengths.

Discussion about feasibility of low host PCB loss budget for copper cable and will it burden optical links.

Discussion about manufacturability and interoperability.

Should we defined backplane objective in terms of length instead of loss (as in the 10G era)?

There are several possible implementations of "backplane".

Chair thanks contributors and participants for a very productive meeting.

The ad hoc meeting ended at 10:07 a.m. Pacific.

## List of attendees (captured from Webex tool)

Adee Ran	Intel
Adrian Butter	Global Foundries
Alex Haser	Molex
Ali Ghiasi	GhiasiQuantum LLC
Andre Szczepanek	HSZ Consulting
Andy Zambell	Amphenol
Arthur Marris	Cadence
Arturo Pachon	TE Connectivity
Beth Kochuparambil	Cisco
Brian Holden	Kandou
Bruce Champion	TE Connectivity
Burrell Best	Samtec
Dale Murray	Lightcounting
Dave Lewis	Lumentum
David Malicoat	Senko
David Ofelt	Juniper
David Piehler	Dell EMC
Ed sayre	Samtech
Fernando DeBerardinis	eSilicon
Gary Nicholl	Cisco
Geoff Thompson	GraCaSI S.A./Ind
Geoff Zhang	Xilinx
George Zimmerman	ADI, APL Group, Aquantia, BMW, Cisco Systems, Commscope
Greg LeCheminant	Keysight
Henry Chen	Broadcom
Hormoz Djahanshahi	Microsemi
Howard Heck	Intel
Hsinho Wu	Intel
Jacky Chang	HPE
Jacov Brener	Marvell
James Fife	Etopus
Jane Lim	Cisco
John Calvin	Vital Technical marketing
John Ewen	Globalfoundries
Ken Jackson	Sumitomo
Kumaran Krishnasamy	Broadcom
Lavi Koch	Mellanox
Marco Mazzini	Cisco
Mark Gustlin	Xilinx
Mark Kimber	Samtech
Mark Nowell	Cisco
Martin Langhammer	Intel
Martin White	Cavium

Masashi Shimanouchi	Intel
Matt Brown	Macom
Mau-Lin Wu	Mediatek
Megha Shanbhag	TE Connectivity
Mike Dudek	Cavium
Nathan Tracy	TE Connectivity
Paul Kolesar	CommScope
Phil Sun	Credo
Piers Dawe	Mellanox
Pirooz Toyserkani	Cisco
Rajmohan Hegde	Broadcom
Ramin Farjadrad	Aquantia
Rich Mellitz	Samtec
Rick Pimpinella	Panduit
Rick Rabinovich	Keysight
Rita Horner	Synopsys
Rob Stone	Broadcom
Scott Kipp	Broadcom
Scott Sommers	Molex
Takeshi Nishimura	Yamaichi Electronics, USA
Ted Sprague	Infinera
Tom Palkert	Molex/Macom
Toshiaki Sakai	Socionext
Upen Kareti	Cisco
Vittal Balasubramanian	Innovium
Will Miller?	Wilder Tech
Yasuo Hidaka	Independent
Zvi Rechtman	Mellanox