

Approved Minutes

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces

Task Force

Interim Meeting

January 15-17, 2019

Long Beach, CA, USA

Prepared by Kent Lusted

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IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – January 15, 2019

Prepared by Kent Lusted

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~1:00 p.m., by Beth Kochuparambil, IEEE 802.3ck Task Force Chair.

Beth welcomed attendees.

Introductions were made.

Chair reviewed agenda in http://www.ieee802.org/3/ck/public/19_01/agenda_3ck_01a_0119.pdf

Motion #1:

Move to approve the agenda:

- Moved by: Mike Dudek
- Second by: Liav Ben-Artzi
- Passed by voice without opposition

Chair noted that the November 2018 minutes were posted shortly after the meeting. Chair noted that a typo was found in the original posting. Chair asked if there were any other corrections or modifications to be noted. No one responded.

Motion #2:

Move to approve the November 2018 meeting minutes

- Moved by: Greg McSorley
- Second by: Ed Sayre
- Passed by voice without opposition

Chair reminded participants to observe meeting decorum. Called for members of the press. No one indicated. Photography and recording are not permitted.

Chair reviewed the ground rules for the meeting.

Chair reviewed the IEEE structure.

Chair reviewed the Bylaws and Rules slides in http://www.ieee802.org/3/ck/public/19_01/agenda_3ck_01a_0119.pdf

Chair asked if there was anyone unfamiliar with the Bylaws or Rules. No one responded.

IEEE Patent Policy: Chair reviewed the 4 Patent-related slides contained in the agenda. Chair called for potentially essential patents. No one responded. Chair read the Guidelines for IEEE WG meetings. No one responded.

Chair advised the WG attendees that:

- The IEEE's patent policy is described in Clause 6 of the *IEEE-SA Standards Board Bylaws*;
- Early identification of patent claims which may be essential for the use of standards under development is strongly encouraged;
- There may be Essential Patent Claims of which the IEEE is not aware. Additionally, the IEEE, the WG, nor the WG chair can ensure the accuracy or completeness of any assurance or whether any such assurance is, in fact, of a Patent Claim that is essential for the use of the standard under development.

No one responded.

Chair reviewed the slide with a statement on the participation requirements for IEEE 802 Meetings. Chair noted that by participating in the IEEE 802 meeting, that participants accept these requirements. Chair asked if there were questions about the participation requirements. No one responded.

Chair reviewed the IEEE 802.3 Standards Process.
Chair reviewed the approved project documents.

Reviewed the email reflector and web information for the Task Force in the agenda deck.

Chair reviewed the attendance procedures. Chair reminded participants to sign into the IEEE Meeting Attendance Tool and sign the attendance book.

Goals for the meeting:

- Select nomenclature to use
- Narrow package discussion
- Narrow C2M discussion
- Movement on backplane studies

- Measure consensus on FEC

Chair noted that a liaison letter and attachment was received from OIF on CEI-112G-VSR. See http://www.ieee802.org/3/minutes/jan19/incoming/OIF_to_IEEE_802d3_CEI_112G_Jan_2019.pdf and http://www.ieee802.org/3/private/liaison_docs/OIF/OIF_to_IEEE_802d3_CEI_112G_Jan_2019_att1.pdf Chair asked that Mike Li would review the letter and the draft for the participants.

Chair reviewed the presentation schedule.

Chair reviewed the future meeting dates.

Future Meetings:

- March 2019 Plenary
 - Week of March 11, 2019 - Vancouver, BC, Canada
- May 2019 Interim
 - Week of May 20, 2019 - Salt Lake City, UT, USA
- July 2019 Plenary
 - Week of July 15, 2019 - Vienna, Austria

Anyone interested in hosting a meeting should contact the Chair or Steve Carlson.

Chair reviewed the proposed ad hoc meeting schedule. It was noted that the proposed February 20 ad hoc meeting would overlap with the OIF meeting week.

Chair displayed the liaison letter (see: http://www.ieee802.org/3/minutes/jan19/incoming/OIF_to_IEEE_802d3_CEI_112G_Jan_2019.pdf) Mike Li, Tom Palkert, and Mike Dudek provided an overview of the attachment and noted several items. (see: http://www.ieee802.org/3/private/liaison_docs/OIF/OIF_to_IEEE_802d3_CEI_112G_Jan_2019_att1.pdf) Chair asked Mike Li to draft a response for consideration by the Task Force later in the meeting.

Presentation #1:

“Package Discussions Update & Suggested PKG Model Base-Line for 802.3ck COM”, Liav Ben-Artzi

See: http://www.ieee802.org/3/ck/public/19_01/benartsi_3ck_01_0119.pdf

- Two segment model does not currently include the impedance variation for each segment. Further work is needed to determine the values.
- Discussed the package trace length routing of 32mm for a 70x70mm package.
- The Cd=110 fF was not extracted from a real design.

- There was a request to include the C2M interface in the analysis. The module side package may have different parameters, such as for the PTH.

Chair reminded participants to sign the attendance book and sign into the IEEE Meeting Attendance Tool.

Presentation #2:

“Switch Package Physical Design Considerations”, Rob Stone

See: http://www.ieee802.org/3/ck/public/19_01/stone_3ck_01_0119.pdf

- The 4dB target on slide 4 includes the trace loss plus the PTH plus the BGA.
- Discussed some challenges of asymmetric TX and RX traces on interoperability in a specification.

Break at ~2:50 p.m. Resume at ~3:20 p.m.

Presentation #3:

“Assessment of Proposed Reference Package Model”, Howard Heck and Mike Li

See: http://www.ieee802.org/3/ck/public/19_01/heck_3ck_01_0119.pdf

- Noted typo on slide 11: 20dB should be 20mm
- Many questions on of slides 9-10; presenter stated intention was to verify that this package example fits within the proposed baseline, NOT to propose these values.
- Discussed need to include a 20 mm package case

Presentation #4:

“COM Sensitivity Analysis of PKG Model”, Mau-Lin Wu

See: http://www.ieee802.org/3/ck/public/19_01/wu_3ck_01_0119.pdf

- Discussed the sensitivity of Cd and Cp.

Chair summarized some key points from the package discussions. (See: http://www.ieee802.org/3/ck/public/19_01/kochuparambil_3ck_02a_0119.pdf) There was a request to add a 1.2mm PTH case. There was a request for more contributions from silicon vendors on package parameters. The package values are proposed for both backplane/cable as well as C2M; however, it was noted that there was a discussion on the floor with respect to parameter changes for the C2M case. Chair noted an intent to progress forward on the proposed package parameters in order to enable progress on the interfaces.

Presentation #5:

“Nomenclature”, Kent Lusted

See: http://www.ieee802.org/3/ck/public/19_01/lusted_3ck_01_0119.pdf

- Clarifying questions were asked.

Presentation #6:

“COM Updates to Support C2M Investigations”, Rich Mellitz

See: http://www.ieee802.org/3/ck/public/19_01/mellitz_3ck_01_0119.pdf

Chair noted that she intends to pull in the presentation from Ali Ghiasi in order to ease the schedule for Wednesday. She noted that the room currently has audio difficulties that were under debug. She asked if there was opposition to hearing the Ghiasi presentation without audio assistance. No one objected.

Presentation #7:

“C2M Simulation and Methodology”, Ali Ghiasi

See: http://www.ieee802.org/3/ck/public/19_01/ghiasi_3ck_01c_0119.pdf

- The details for the ‘bj’ and ‘ck’ packages were given in the spreadsheets in the presentation.
- It was noted that the COM results are from TP1a.
- Discussed the improvements needed to the connector, as well as the rest of the channel.
- On slide 13, the results shown are with a 5-tap RXFFE reference receiver.
- Chair will post the updated version ‘01c’ with the correction noted by the speaker

Chair asked that participants send straw poll requests to her and Kent.

Chair announced a start time of 8:45 a.m on Wednesday.

Break for the day at ~6:05 p.m.

IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – January 16, 2019

Prepared by Kent Lusted

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~8:50 a.m., by Beth Kochuparambil.

Chair welcomed attendees.

Chair outlined the plans for the day: hear presentations and hold discussions.

Chair reminded participants to sign the attendance book and into the IEEE Meeting Attendance Tool.

Presentation #8:

“C2M Update - January 2019”, Kent Lusted

See: http://www.ieee802.org/3/ck/public/19_01/lusted_3ck_02a_0119.pdf

- Updated version ‘02a’ with editorial changes. No objection.
- Clarifying questions were asked and answered.

Presentation #9:

“100G C2M Study Results ”, Phil Sun

See: http://www.ieee802.org/3/ck/public/19_01/sun_3ck_01b_0119.pdf

- Updated version ‘01b’ with a typo fix. No objection.
- Discussed the tradeoffs of the different receiver types.
- Discussed the impact of the proposed package model on the results. There was a request for more data showing improvements in the package parameters.
- Discussed the correlation of TP1A VEC to COM on slide 16. There was a request to expand the graph on slide 16 to be 4 graphs, one for each reference receiver.
- It was noted that the difference between channels 1/3/5/7 vs. 2/4/6/8 is the via transition at the BGA.

Break at ~10:05 a.m. Resumed at ~10:20 a.m.

Presentation #10:

“RS(544,514) FEC Performance for C2M 400G and 100G Without Interleaving”, Pete Anslow

See: http://www.ieee802.org/3/ck/public/19_01/anslow_3ck_01_0119.pdf

- Discussed the assumptions in the simulation and the validity in multi-segment link data.
- There was a request for another set of error curves with small b1max and larger t2.
- Discussed the need for or against precoding, depending on the channel.

Presentation #11:

“100GEL C2M Channel Model Study Update”, Toshiyasu Ito

See: http://www.ieee802.org/3/ck/public/19_01/ito_3ck_01a_0119.pdf

- Updated version ‘01a’ with editorial changes. No objection.
- There was a request to investigate the ILD for the QSFP-DD connector.
- The connector module on slide 6 includes the footprint breakout.
- Discussed the reduction on COM for the “new” pads (vs. legacy pads) on the QSFP-DD connector.

Presentation #12:

“Suggested Change in Module Input and Host Input Tests Stressed Eye Calibration”, Steve Sekel

See: http://www.ieee802.org/3/ck/public/19_01/sekel_3ck_01_0119.pdf

- Discussed using an equation for loss at pattern generator output.

Chair summarized some key points from the C2M discussions. (See: http://www.ieee802.org/3/ck/public/19_01/kochuparambil_3ck_02a_0119.pdf) Discussed the pros and cons of the different reference receiver architectures. Discussed tradeoffs between the many components in a channel. Discussed the need to investigate and compare module-side package parameters.

Chair asked for participants to send straw poll requests to her and Kent.

Chair noted that she intends to meet until ~6 p.m.

Chair reminded participants to sign the attendance book and into the IEEE Meeting Attendance Tool.

Break at ~12:05 p.m. Resumed at ~1:15 p.m.

Chair asked for participants to send straw poll requests to her and Kent.

Chair reminded participants to sign the attendance book and into the IEEE Meeting Attendance Tool.

Presentation #13:

“Host Backplane Channel Update”, Howard Heck

See: http://www.ieee802.org/3/ck/public/19_01/heck_3ck_02_0119.pdf

- Updated channels are posted at:
<http://www.ieee802.org/3/ck/public/tools/index.html#tools>
- Chair noted that the affected channels have updated filenames.

Presentation #14:

“Channel Simulations for 112G Backplane Analysis ”, Nathan Tracy

See: http://www.ieee802.org/3/ck/public/19_01/tracy_3ck_01b_0119.pdf

- Updated version ‘01b’ with editorial changes. No objection.
- Discussed the effect of crosstalk on the lower loss channels.
- Discussed ICR impact on COM performance.

Beth passed the chair responsibility to Kent Lusted.

Presentation #15:

“Summary of System Discussion of Backplane Channels”, Beth Kochuparambil

See: http://www.ieee802.org/3/ck/public/19_01/kochuparambil_3ck_01c_0119.pdf

- Updated version ‘01c’ with corrections to links in the presentation. No objection.
- It was noted that the highlighted channels were selected by the contributors for specific consideration and are required to be supported in the specification.

Kent passed the chair responsibility back to Beth Kochuparambil.

Presentation #16:

“KR/CR Simulation Results with COM Tool 2.57 ”, Phil Sun

See: http://www.ieee802.org/3/ck/public/19_01/sun_3ck_02a_0119.pdf

- Updated version ‘02a’ with editorial changes. No objection.
- Discussed TX resolution assumptions and the implementation considerations.

Break at ~2:45 p.m. Resumed at ~3:05 p.m.

Presentation #17:

“Summary of IEEE 802.3ck Baseline Reference Receivers and Clarification of FFE-based Receiver Models”, Yan Zhuang

See: http://www.ieee802.org/3/ck/public/19_01/zhuang_3ck_01_0119.pdf

- Discussed the differences between the results on slide 11 and slide 12 for a few abnormal channels.
- Discussed the differences in the models on slide 8. The injection point for the jitter was different.
- There was a request to increase the tap count for the FFE results to determine if the abnormal channels would have better performance.

David Law announced that there will be light refreshments in the Catalina room for participants going to the tutorial in the evening.

Presentation #18:

“112Gbps LR COM Investigation”, Mike Li

See: http://www.ieee802.org/3/ck/public/19_01/li_3ck_01_0119.pdf

- Discussed the proposed reference receivers on slide 17 and the complexity of implementation.

Presentation #19:

“What is Important for a Reference Receiver ”, Phil Sun

See: http://www.ieee802.org/3/ck/public/19_01/sun_3ck_03a_0119.pdf

- Updated version ‘03a’ with technical changes. No objection.
- There was a request for participants to confirm that the 3dB threshold for COM is valid for this project.

Chair summarized some key points from the Backplane discussions. (See: http://www.ieee802.org/3/ck/public/19_01/kochuparambil_3ck_02a_0119.pdf) There was much discussion.

Chair reminded participants to sign the attendance book and into the IEEE Meeting Attendance Tool.

Chair noted that she would upload the discussion topics presentation referenced Tuesday and Wednesday to the website to help with offline consensus building.

Presentation #20:

“How to Proceed on 100G C2C-S and C2C-L”, Ali Ghiasi

See: http://www.ieee802.org/3/ck/public/19_01/ghiasi_3ck_02a_0119.pdf

- Updated version '02a' that removes a copyright notice.
- There was a request for C2C channel contributions, with a focus on mezz connectors.

Chair reminded participants to sign the attendance book and into the IEEE Meeting Attendance Tool.

Chair noted that she and Kent are working on straw polls on the topics discussed Tuesday and Wednesday.

Chair reviewed the plans for Thursday: presentations, straw polls, review liaison letter, and conduct closing business.

Chair announced a start time of 8:45 a.m. on Thursday.

Break for the day at ~6:05 p.m.

IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – January 17, 2019

Prepared by Kent Lusted

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~8:55 a.m., by Beth Kochuparambil, IEEE 802.3ck Task Force Chair.

Beth welcomed attendees.

Chair outlined the plans for the day: hear presentations, conduct straw polls, closing business.

Chair noted that there was a late presentation request from Ilya Lyubomirsky. Chair asked if there was opposition to hearing this contribution. No one responded.

Chair summarized the topics for the straw polls.

Chair reminded participants into IMAT and sign the attendance book.

Presentation #21:

“PCS, FEC, and PMA Baseline Proposal”, Mark Gustlin

See: http://www.ieee802.org/3/ck/public/19_01/gustlin_3ck_01_0119.pdf

- Discussed the impact of precoding on module logic.
- It was noted that the perceived need for interleave FEC is dependent on the selected reference receiver.

Presentation #22:

“Further Study on RS(544, 514) FEC - Symbol Interleaving and Bit Muxing”, Xinyuan Wang on behalf of Xiang He

See: http://www.ieee802.org/3/ck/public/19_01/he_3ck_01a_0119.pdf

- Updated version ‘01a’ with some changes. No objection.
- There was a request to extend the analysis to a lower frame loss ratio.

Chair indicated that the meeting planner recently had a milestone birthday and would circulate a sheet for participants that wished to write a note.

Chair reminded participants to sign the attendance book and to sign into the IEEE Meeting Attendance Tool.

Presentation #23:

“Latency Concerns on Interleaved FEC for 100G-KR/CR”, Ilya Lyubomirsky

See: http://www.ieee802.org/3/ck/public/19_01/lyubomirsky_3ck_01a_0119.pdf

- Updated version ‘01a’. No objection
- Discussed the error propagation effects in the various receiver architectures.
- Discussed the latency tradeoffs.

Break at ~10:30 a.m. Resumed at ~10:50 a.m.

Presentation #24:

“Baseline for CGMII Extender, CGMII Extender Sublayer”, Shawn Nicholl

See: http://www.ieee802.org/3/ck/public/19_01/nicholl_3ck_01_0119.pdf

- Clarifying questions were asked and answered.

Chair summarized some key points from the FEC discussions. (See: http://www.ieee802.org/3/ck/public/19_01/kochuparambil_3ck_02a_0119.pdf) There was some discussion.

Chair discussed the overlap of the P802.3ck Task Force with other IEEE 802.3 Task Forces. The Task Force leadership teams try to minimize the overlap, when possible. Chair asked for feedback on which projects could overlap. Chair displayed a list of the P802.3cm, P802.3cn, P802.3ct, 100Glambda, and P802.3cg projects. She asked for a show of hands to help guide the decision. More people indicated a preference to minimize meeting overlap with the 100Glambda Study Group than any other. The second highest count was P802.3ct.

Chair displayed the proposed liaison response to OIF from Mike Li. Changes were made and saved as http://www.ieee802.org/3/ck/public/19_01/IEEE_802d3_to_OIF_3ck_0119_draft.pdf

Motion #3:

Move that:

- the Task Force approve the text in IEEE_802d3_to_OIF_3ck_0119_draft.pdf with editorial license granted to the Chair (or his appointed agent) as a liaison to OIF

M: Mike Li

S: Brian Holden

Procedural (>50%)

Results: passes by voice without opposition

Attendance straw polls.

I will attend the IEEE 802.3ck meetings at the March Plenary in Vancouver, BC, Canada (week of March 11, 2019)

Y: 58 , M: 13

I will attend the IEEE 802.3ck meetings at the May interim in Salt Lake City, UT, USA (week of May 20, 2019)

Y: 50 , M: 26

Before the discussion on straw poll #1, Chair noted that she will direct the editorial team to use the majority outcome of straw poll #1 as the nomenclature in the draft.

Straw Poll #1:

For the single lane copper cable and backplane PHYs, I support the nomenclature of:

A: 100GBASE-CR and 100GBASE-KR

B: 100GBASE-CR1 and 100GBASE-KR1

A: 12 , B: 51

Chair stated that the editorial team would use the nomenclature of “100GBASE-CR1 and 100GBASE-KR1” in the draft.

Chair previewed the straw polls for the package, backplane and C2M topics.

Break at ~11:50 a.m. Resumed at ~1:10 p.m.

Straw poll #2

I would support using the following reference package model for the development of KR/CR/C2M-hostside COM baseline proposals:

- Slide 8 of benartsi_3ck_01_0119
- with Cd changed to TBD

Yes: 41 No: 0 Abstain: 13

Straw Poll #3:

I would support a Cd value of:

A. 110 fF

B. 130 fF

C. Need more information

A: 2 , B: 1 , C: 45

Straw Poll #4

I believe a reference RX for the specification must be

- A. agnostic to the implemented RX architecture and sets a minimum performance required of a receiver
- B. the predominant industry RX architecture

A: 43 B: 4

During the discussion of straw poll #5, the Chair noted that option D was added for that participants wanting a channel tested against both the DFE-only and the 1-tap + FFE-heavy reference receivers (and that the channel must pass both cases). Chair advised participants that want two or more architectures studied at this time to vote for option E “need more info”.

Straw Poll #5:

At this time, I would support a backplane reference receiver direction of

- A. DFE-only
- B. 1-tap DFE + FFE-heavy
- C. FFE-lite + DFE
- D. both the DFE-only and the 1tap DFE + FFE-heavy
- E. Need more info

{pick one}

A: 19 B: 0 C: 2 D: 10 E: 9

With respect to Straw Poll #6, Kent Lusted noted that the term “multi-tap” means more than one tap and that the data presented by the C2M small group used a 4-tap DFE.

Straw Poll #6:

I would support continuing the evaluation of the multi-tap DFE with limited tap weights as a C2M reference receiver candidate.

Y: 21, N: 5, A: 24

Room count: 62

Chair noted that she will be pushing participants towards baseline proposals and plans to debate the baselines in March. Next meeting is March 2019 in Vancouver, BC, Canada on the week of March 11, 2019.

Chair announced 3 ad hocs scheduled for February 6, February 13 and March 6. It was noted that OFC occurred on March 6. Chair asked for a show of hands of people having conflict with OFC; most of the room indicated. Chair asked for a show of hands of people attending OIF; some of the room indicated. Chair announced that the March 6 ad hoc would be moved to February 27.

Motion #4:

Move to adjourn.

M: Adee Ran

S: Mike Dudek

Procedural (>50%)

Passes by voice without opposition.

Meeting adjourned at ~3:30 p.m.

Attendees

Last Name	First Name	Employer	Affiliation	Tuesday (1/15/2019)	Wednesday (1/16/2019)	Thursday (1/17/2019)
Afshar	Alex	Dust Photonics	Dust Photonics	x	x	
Anslow	Pete	Ciena Corporation	Ciena Corporation		x	x
Baca	Rich	Microsoft	Microsoft		x	
Balasubramanian	Venugopal	Marvell	Marvell	x	x	x
Ben Artsi	Liav	Marvell Semiconductor	Marvell Semiconductor	x	x	x
Braun	Ralf-Peter	Deutsche Telekom	Deutsche Telekom		x	x
Brooks	Paul	Viavi Solutions	Viavi Solutions		x	x
Brown	Matt	MACOM	MACOM	x	x	x
Butter	Adrian	Avera Semiconductor	Avera Semiconductor	x	x	x
Carlson	Craig	Marvell	Marvell	x	x	x
Cates	Ron	Marvell	Marvell	x		
Chang	Frank	Source Photonics	Source Photonics	x	x	
Chang	Jacky	HPE	HPE	x	x	x

Chen	C. C. David	Applied Optoelectronics	Applied Optoelectronics	x		x
Chen	Henry	Broadcom	Broadcom	x	x	
Choudhury	G. Mabud	OFS	OFS	x	x	x
Dawe	Piers	Mellanox	Mellanox	x	x	x
Dawson	Fred	Chemours	Chemours	x		
Djahanshahi	Hormoz	microsemi	microsemi	x	x	x
Dudek	Mike	Marvell Technologies	Marvell Technologies	x	x	x
Farjad	Ramin	Aquantia	Aquantia			x
Fazlollahi	Amir	Futurewei	Huawei			x
Filip	Jan	Maxim Integrated	Maxim Integrated	x	x	
Ghiasi	Ali	Ghiasi Quantum, Huawei	Ghiasi Quantum, Huawei	x	x	x
Gorshe	Steve	microsemi	Microchip			x
Gustlin	Mark	Cisco	Cisco	x	x	
Hasharom	Kobi	Dust Photonics	Dust Photonics	x		
Healey	Adam	Broadcom Inc	Broadcom Inc	x	x	x
Heck	Howard	Intel	Intel	x	x	x

Hess	Dave	Corddata	Corddata	x	x	
Hiroaki	Kukita	Yamaichi Electronics	Yamaichi Electronics	x	x	x
Holden	Brian	Kandou Bus	Kandou Bus	x	x	x
Horner	Rita	Synopsys	Synopsys	x	x	x
Huth	Karl	Rockley Photonics	Rockley Photonics	x	x	
Irwin	Scott	MoSys	MoSys	x	x	x
Isono	Hideki	Fujitsu	Fujitsu	x	x	x
Issenhuth	Tom	Huawei	Huawei			x
Ito	Toshiyasu	Yamaichi Electronics	Yamaichi Electronics	x	x	x
Johnston	Margaret	Cadence	Cadence	x	x	x
Jones	Chad	Cisco	Cisco	x	x	x
Kahrs	Devin	Tektronix	Tektronix	x	x	x
Kao	Chien-Ping	Intel	Intel	x	x	x
Kim	Inho	Marvell	Marvell	x	x	x
Kimber	Mark	Semtech	Semtech	x	x	x
Klempa	Mike	UNH-IOL	UNH-IOL	x	x	x

Kochuparambil	Beth	Cisco	Cisco	x	x	x
Kountz	Dennis	Chemours	Chemours	x		
Lambrecht	Frank	Gigamon Inc	Gigamon Inc	x	x	x
LeCheminant	Greg	Keysight Technologies	Keysight Technologies		x	x
Li	Mike	Intel	Intel	x	x	x
Lim	Jane	Cisco	Cisco	x	x	x
Liu	Hai-Feng	Intel	Intel	x	x	x
Lusted	Kent	Intel	Intel	x	x	x
Lyubumirsky	Ilya	Inphi	Inphi		x	x
Malicoat	David	Senko/Aquantia	Senko/Aquantia	x	x	x
Marris	Arthur	Cadence	Cadence	x	x	x
McMillan	Larry	Western Digital	Western Digital	x	x	x
McSorley	Greg	Amphenol	Amphenol	x	x	x
Mellitz	Richard	Samtec	Samtec	x	x	x
Muller	Shimon	Axalume	Axalume	x	x	
Nakamoto	Edward	Spirent Communications	Spirent Communications	x	x	x

Nicholl	Gary	Cisco	Cisco			x
Nicholl	Shawn	Xilinx	Xilinx		x	x
Nishimura	Takeshi	Yamaichi Electronics	Yamaichi Electronics	x	x	x
Ofelt	David	Juniper Networks	Juniper Networks	x	x	x
Palkert	Tom	Molex - MACOM	Molex - MACOM	x	x	x
Pham	Phong	US Conec	US Conec	x	x	x
Quan	Mingyan	Huawei	Huawei		x	x
Rabinovich	Rick	Keysight Technologies	Keysight Technologies	x	x	x
Ran	Adee	Intel	Intel	x	x	x
Remein	Duane	Huawei	Huawei			x
Rotolo	Salvatore	ST Microelectronics	ST Microelectronics		x	x
Sayre	Edward	Samtec	Samtec	x	x	x
Sekel	Steve	Keysight Technologies	Keysight Technologies	x	x	x
Shrikhande	Kapil	Innovium	Innovium	x	x	x
Shuai	Jialong	Huawei	Huawei	x	x	x
Slavick	Jeff	Broadcom Limited	Broadcom Limited	x	x	x

Sommers	Scott	Molex	Molex	x	x	x
Sprague	Ted	Infinera	Infinera	x	x	
Stassar	Peter	Huawei	Huawei			x
Stone	Rob	Broadcom	Broadcom	x	x	x
Sun	Phil	Credo	Credo	x	x	x
Swanson	Steve	Corning	Corning	x		x
Takahara	Tomoo	Fujitsu Laboratories	Fujitsu Laboratories			x
Takefman	Mike	Inphi	Inphi	x	x	x
Toyserkani	Pirooz	Cisco	Cisco	x	x	x
Tracy	Nathan	TE Connectivity	TE Connectivity	x		
Twombly	Jeff	Credo	Credo		x	
Umnov	Alexander	Corning	Corning	x	x	
Wang	Xinyaun	Huawei	Huawei	x		x
Welch	Brian	Luxtera	Luxtera	x	x	x
Wu	Mau-Lin	MediaTek	MediaTek	x	x	x

Wu	Peter	Marvell	Marvell	x	x	x
Wu	Wendy	Cadence	Cadence	x	x	x
Young	James	CommScope	CommScope	x		
Zambell	Andrew	Amphenol	Amphenol	x	x	x
Zerna	Conrad	Frauerhofer IIS	Frauerhofer IIS		x	x
Zhuang	Yan	Huawei	Huawei	x	x	
Zivny	Pavel	Tektronix	Tektronix		x	