Unapproved Minutes

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

# Task Force

Plenary Meeting
November 11-13, 2019
Waikoloa Village, HI, USA

Prepared by Shawn Nicholl and Kent Lusted

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# IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – November November 11, 2019

*Prepared by Shawn Nicholl*

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~1:05 p.m., by Kent Lusted, IEEE 802.3ck Task Force Vice-Chair.

Kent welcomed attendees.

Chair noted that Task Force Chair Beth Kochuparambil was not in attendance at the meeting. Kent noted that he would be acting in the Chair capacity until Beth's return.

Introductions were made.

Chair reviewed the agenda found in:
http://www.ieee802.org/3/ck/public/19_11/3ck_agenda_01a_1119.pdf

**Motion #1:**

Move to approve the agenda:
- Moved by:  Adee Ran
- Second by:  Thananya Baldwin
- Passed by voice without opposition

Chair noted that the September 2019 minutes were posted shortly after the meeting.   Chair asked if there were any other corrections or modifications to be noted.  No one responded.

**Motion #2:**

Move to approve the September 2019 meeting minutes
- Moved by:  Thananya Baldwin
- Second by:   Kapil Shrikhande
- 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_11/3ck_agenda_01a_1119.pdf

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

Chair read the Guidelines for IEEE WG meetings.   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 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.

Chair reviewed the IEEE SA Copyright Policy slides.  Chair advised participants of the IEEE SA Copyright policy and that any material submitted during standards development is a contribution and shall comply with the Copyright Policy.  Chair asked if there were questions about the copyright policy.  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 list of Task Force Leadership Team.

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

Chair noted that Draft 0.4 is posted in the private area.  Chair noted that the Chief Editor requested that any comments be placed in a marked up PDF and shared with the Chief Editor.

Chair reviewed the attendance procedures.  Chair noted that IMAT is not available for the Monday P802.3ck meeting (since it is available for the 802.3 Working Group meeting) and

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

Chair noted the goals for the meeting:
- Adopt baselines to close out C2M, Copper, and 100G FEC
- Generate Draft 1.0

Chair noted that IEEE 802.3 received a liaison letter from the OIF regarding the progress on 112G-VSR and 112G-LR.  The P802.3ck Task Force was asked to review this letter and based on the review make a recommendation at the IEEE 802.3 closing plenary if there should be a reply, and if so, propose a draft reply.  Chair indicated that the January 802.3 Interim meeting occurs before the next OIF meeting.  The feedback from participants was that the P802.3ck Task Force does not need to generate a response to OIF until the January 2020 Interim meeting. For reference, the letter and attached draft are found at attachment C5 of the following link: http://ieee802.org/3/minutes/nov19/index.html

Chair showed links for the approved project documents.

Chair reviewed the adopted timeline
http://www.ieee802.org/3/ck/P802_3ck_Timeline_18july19.pdf

Chair reviewed the presentation schedule.

Chair reviewed the future meeting dates.

Future Meetings:
- January 2020 Interim
  - Week of January 20, 2020 - Geneva, Switzerland
- March 2020 Plenary
  - Week of March 16, 2020 - Atlanta, GA, USA
- May 2020 Interim
  - Week of May 18, 2020 - Pasadena, CA, USA

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

Chair reviewed the proposed ad hoc meeting schedule.  Chair will announce ad hoc dates over the email reflector.

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

Chair listed several late presentations:
- "Performance Improvements due to FEC Interleaving", Mark Gustlin

- "New chip to module channel simulation and analysis", Nathan Tracy
- "BP OD Channel Analysis", Tom Palkert
- "CR Baseline Proposal Considerations Cable assembly, Host, MTF, and Channel", Chris Diminico
- "100G CR Analysis Cu Cable Channels, OSFP", Sam Kocsis
- "Further Analysis of Synthesized 100G C2M Short Channels", Mark Kimber

Chair asked whether there was opposition to hearing the late presentation.  No one responded.

Chair indicated that those late presentations have been scheduled for time slots when related topic presentations are scheduled (rather than at the end of the schedule).  Chair asked if there were objections.  No one responded.

Chair indicated an update to the channel contribution from Nathan Tracy.  Updated file is available at http://www.ieee802.org/3/ck/public/tools/c2m/tracy_3ck_02a_1119.zip


**Presentation #1:**

"Chief Editor's Report",   Matt Brown
See:  http://www.ieee802.org/3/ck/public/19_11/brown_3ck_01_1119.pdf
- Presenter reminded participants that Draft 0.4 is available in the Task Force private area
- On slide 6, the reference to "C2C-L" should be "C2C".
- Presenter invited participants to review the draft and to share any feedback with the presenter and the Chair
- Chair thanked editorial team for their work on Draft 0.4.


**Presentation #2:**

"Performance Improvements due to FEC Interleaving on a 100G Link",   Mark Gustlin
See:  http://www.ieee802.org/3/ck/public/19_11/gustlin_3ck_02_1119.pdf
- Discussed some of the difficulties of 100 Gbps/lane on FEC.


**Presentation #3:**

"Performance Improvements due to FEC Interleaving",   Mark Gustlin
See:  http://www.ieee802.org/3/ck/public/19_11/gustlin_3ck_03_1119.pdf
- Discussed the assumptions behind the coding gains on page 7.


**Presentation #4:**

"100GBASE-KR1/CR1 FEC Thoughts",   Mark Gustlin
See:  http://www.ieee802.org/3/ck/public/19_11/gustlin_3ck_01a_1119.pdf
- Discussed the data and the potential indication of error effects besides the DFE

**Strawpoll #1:**

I would support adopting a dual FEC strategy based on gustlin_3ck_01_0719 (but with CL91 as the default FEC and the remaining AN TBD)
Y: 38, N: 1, A: 16

**Motion #3:**

Move to adopt Dual FEC, as per gustlin_3ck_01_0719 as the baseline for the FEC (but with CL91 as the default FEC, and the remaining AN TBD), Clause 82 as the PCS, and Clause 135 as the PMA for 100GBASE-CR1 and 100GBASE-KR1 PHYS.
M: Mark Gustlin
S: David Ofelt
Technical (>=75%)
Y: 48, N: 0, A: 13
Results: Motion Passes!  (2:20pm)

**Presentation #5:**

"Synthesized 2 m QSFP-DD CR Channels: End to End IL 28.5 dB and Cable Assembly and IL 19.75 dB",   Rich Mellitz
See:  http://www.ieee802.org/3/ck/public/19_11/mellitz_3ck_03a_1119.pdf
- Presenter noted that the channels were QSFP-DD, not QSFP as indicated in the title. Updated '03a' version with correction.
- Discussed crosstalk victim assumptions
- Discussed test fixture impedances.
- Discussed sources of noise in the channels.

**Presentation #6:**

"100G CR QSFP-DD End to End Channel Analysis Update (III)",   Jane Lim
See:  http://www.ieee802.org/3/ck/public/19_11/lim_3ck_01a_1119.pdf
- Author noted the channels were QSFP-DD.  Updated version '01a' with title correction
- Presenter noted that improvements were due to connector design and COM parameter changes.
- Chair noted that the channels could be found on the Tools and Channels webpage:
    - http://www.ieee802.org/3/ck/public/tools/cucable/lim_3ck_02_1119.zip
- There was a request to share the tap weights from the COM simulation results.

Break at ~3:05 p.m.  Resumed ~3:35 p.m.

Chair reminded participants to sign the attendance book.

**Presentation #7:**

"QSFP-DD TP1-TP4 Channel Simulations",   Tom Palkert
See:  http://www.ieee802.org/3/ck/public/19_11/palkert_3ck_02a_1119.pdf
- Chair confirmed that the channels have been uploaded to the Task Force website.

**Presentation #8:**

"Choosing an optimum CR Equalizer",   Ali Ghiasi
See:  http://www.ieee802.org/3/ck/public/19_11/ghiasi_3ck_02_1119.pdf
- On slide 7, it was noted that C0 and C1 were capacitor values from the Table 92-12 parameter COM settings spreadsheet
- On slide 9, the total TL includes the loss from the bigger package case.
- On slide 12 for the LIM channel 3a (short package) date, the tap range was noted to be incorrect; This should be RSS(25-40)=0.61%
- On slide 17, discussed and compared the 4 types of equalizers listed on the slide and the impact of the package on the analysis.
- On slide 17, discussed whether KR and CR reference equalizer should be the same.

**Presentation #9:**

"100G CR Analysis Cu Cable Channels, OSFP",   Sam Kocsis
See:  http://www.ieee802.org/3/ck/public/19_11/kocsis_3ck_01a_1119.pdf
- Discussed measurement bandwidths
- Discussed the challenges of measuring low ILD.
- It was noted that there were 7 FEXT and 8 NEXT aggressors.
- Discussed the impact of BGA breakout on channel performance.

**Presentation #10:**

"CR ERLmin Proposal",   Rich Mellitz
See:  http://www.ieee802.org/3/ck/public/19_11/mellitz_3ck_04_1119.pdf
- Discussed the values of N_bx for cable assembly vs. CR host.
- Discussed changing beta_x due to changes in the package loss

**Presentation #11:**

"CR Baseline Proposal Considerations Cable assembly, Host, MTF, and Channel", Chris Diminico
See:  http://www.ieee802.org/3/ck/public/19_11/diminico_3ck_01_1119.pdf
- No questions

**Strawpoll #2:**

I would support the adoption of Slide 5 and Slide 6 of diminico_3ck_01_1119.pdf
Y: 36, N: 0, A: 12

**Motion #4:**

Move to adopt Slide 5 and Slide 6 of diminico_3ck_01_1119.pdf
M: Tom Palkert
S: Chris Diminico
Technical (>=75%)
Y: 43, N: 0, A: 12
Results: Motion Passes! (5:05 pm)

**Presentation #12:**

"A tap weight refinement to the KR (receive) Reference Equalizer Model", Athos Kasapi
See:  http://www.ieee802.org/3/ck/public/19_11/kasapi_3ck_01_1119.pdf
- Discussed whether the RSS_tail_max concept should go into the initial baseline or whether it could be added into the baseline later
- Discussed whether this RSS_tail_max concept is the best way to constrain the system in order to save power.
- Discussed orthogonal background channel use case and its relevance

Chair announced an 8:30 a.m. start time for Tuesday morning.

Break for the day at ~5:55 p.m.

# IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – November 12, 2019

*Prepared by Shawn Nicholl*

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~8:35 a.m., by Kent Lusted.

Chair welcomed attendees.

Chair reviewed the plans for the day.

Chair displayed the timeline and noted the need to consider and adopt baselines by the November meeting to remain on schedule.

Chair indicated a change to the agenda to facilitate C2M discussion during break time today. It included changes to the order of presentations. For the presenters whose slots were moved later in the day, Chair asked each presenter whether the proposed presentation order was okay. All presenters indicated their agreement. Chair displayed the new presentation order for all Task Force attendees to review.

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

**Presentation #13:**

"Baseline Proposal for 100GAUI-1/200GAUI-2/400GAUI-4 C2M Reference Receiver", Junqing (Phil) Sun
See: http://www.ieee802.org/3/ck/public/19_11/sun_3ck_01b_1119.pdf
- Discussed ways to get eye symmetry mask / eye height from DFE output
- Discussed EVEC thresholds values.
- Discussed eye width vs. eye-height parameters.
- Discussed several TBDs in the proposal.

Chair reminded participants to observe decorum.

**Presentation #14:**

"Completing C2M Baseline Proposal TBDs", Ali Ghiasi and Piers Dawe
See: http://www.ieee802.org/3/ck/public/19_11/ghiasi_3ck_01a_1119.pdf
- Discussed whether the proposed reference receiver will pass the channels that have been supplied to the Task Force

- Discussed making some values in the proposal set to TBD.
- On slide 12, discussed whether "sum of the taps" needs to be mentioned in the baseline.

Chair reminded participants to observe decorum.

Break at ~10:40 a.m.  Resumed at ~11:00 a.m.

Chair asked the participants for their individual thoughts and captured the inputs in the document "List of items from participants needed to complete IEEE 802.3ck C2M reference receiver baseline Proposals".  See:
http://www.ieee802.org/3/ck/public/19_11/lusted_3ck_01_1119.pdf

Chair reminded participants that the Task Force is driving towards generation of Draft 1.0 out of this meeting.

**Presentation #15:**

"Comparison of CTLE+DFE vs TDECQ/FFE Reference Receivers for 802.3ck TP1a/TP4 Compliance of Chip to Module Electrical Interface", Mike Li
See:  http://www.ieee802.org/3/ck/public/19_11/li_3ck_01_1119.pdf
- Discussion about the use of COM, internal simulators, 3rd party tools
- Discussion on the choice of reference receivers

**Presentation #16:**

"C2M simulation with proposed reference receiver", Junqing (Phil) Sun
See:  http://www.ieee802.org/3/ck/public/19_11/sun_3ck_02_1119.pdf
- Slide 7: Discussion about "Channel ID 14" (tracy long-barrel via) and its impact on the chart
- Slide 3: Discussion about whether the diagram is consistent with the equations
- On slides 18 and 19: it was clarificated that left-side CTLE optimized for DFE; right-side CTLE optimized for FFE.
- On slide 12 it was requested to note that EVEC was introduced to represent the receiver implementation noise.
- Discussed the CTLE optimization method.

Break at ~12:25 p.m.  Resumed ~1:10pm

Chair informed the participants of the plan for the rest of the day.  Chair reminded the participants to observe decorum.

**Presentation #17:**

"RX Reference Receiver Power requirements", Tom Palkert
See:  http://www.ieee802.org/3/ck/public/19_11/palkert_3ck_03a_1119.pdf

- On slide 6, author clarified that DR-8 is not defined in IEEE, but is akin to 2 x 100GBASE-DR4
- On slide 6, it was noted that Andy Bechtolsheim from Arista provided the information.

**Presentation #18:**

"RX Reference Receiver", Tom Palkert
See: http://www.ieee802.org/3/ck/public/19_11/palkert_3ck_01a_1119.pdf
- On Slide 7: Discussion about whether the Task Force should keep analyzing the channels listed on this slide
- On slide 9: Clarification that vias were not included when results were run on the setup
- On slide 23: it was suggested to use Insertion Loss rather than mm, since board materials have an impact.

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

**Presentation #19:**

"C2M Link Analysis at Host and Module Output", Ali Ghiasi
See: http://www.ieee802.org/3/ck/public/19_11/ghiasi_3ck_03_1119.pdf
- Slide 14, the second sub-bullet was incorrect: [0.04, -0.18, 072, -0.04] is missing a decimal ; it should be [0.04, -0.18, 0.72, -0.04] ;
- Discussed the performance differences reported between the two different reference receiver proposals.

**Presentation #20:**

"Comparison of C2M performance at TP1a with whole channel performance", Mike Dudek
See: http://www.ieee802.org/3/ck/public/19_11/dudek_3ck_01_1119.pdf
- Slide 12: Clarification that this is the DFE for the module receiver
- Discussed potentially including ERL and b_max/Vf parameters into this analysis
- It was noted that the host trace length was swept from 0-400mm
- On slide 3: it was noted that crosstalk was not included. Previous results showed that crosstalk had little impact on COM, but its inclusion increases simulation time.

Break at ~3:20 p.m. ; Resumed at ~3:35 p.m.

**Presentation #21:**

"New chip to module channel simulation and analysis", Nathan Tracy
See: http://www.ieee802.org/3/ck/public/19_11/tracy_3ck_01_1119.pdf
- On Slide 3, discussed the via structure and its impact on the microstrip length
- Discussed the changes to the connector ; Confirmed that there are changes between the 50G and 100G connector.

- Channels are found on the [Tools and Channels] webpage:
  - http://www.ieee802.org/3/ck/public/tools/c2m/tracy_3ck_02a_1119.zip

**Presentation #22:**

"Further Analysis of Synthesized 100G C2M Short Channels", Mark Kimber
See: http://www.ieee802.org/3/ck/public/19_11/kimber_3ck_01_1119.pdf
- Slide 3: Confirmed that crosstalk was not added
- On slide 8, it was noted that the blue curve included equalization
- Slide 19: Discussion that the contributed channel stub length was 7mm

**Strawpoll #3:**

I am ready to make a decision on the C2M reference receiver at this meeting:
Y: 57, N: 1

Room Count: 72

**Strawpoll #4:**

At this time, I would support a C2M reference receiver architectural direction that aligns with:
A: DFE4 (i.e. sun_3ck_01b_1119)
B: RXFFE5 (i.e. ghiasi_3ck_01a_1119)
C: Either one is ok for me
{Choose one}
A: 37,  B: 13,  C: 13

**Strawpoll #5:**

I would support adopting the DFE4 (i.e. sun_3ck_01b_1119) architecture as the direction of the C2M reference receiver.
Y: 44,  N: 9,  A: 9

**Motion #5:**

Move to adopt the DFE4 architecture (e.g. sun_3ck_01b_1119) as the C2M reference receiver.
M: Mike Dudek
S: Rich Mellitz
Technical (>=75%)
Y: 51, N: 8, A: 4
Results: Motion Passes! (5:33 pm)

Chair reminded participants of the 8:00 a.m. start time on Wednesday.

Break for the day at ~5:36 p.m.

# IEEE P802.3ck 100 Gb/s Electrical Lane Task Force – November November 13, 2019

*Prepared by Shawn Nicholl*

IEEE P802.3ck 100 Gb/s, 200 Gb/s and 400 Gb/s Electrical Interfaces Task Force meeting convened at ~8:05 a.m. by Kent Lusted.

Chair welcomed attendees.

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

Chair indicated that there is a late presentation request from Chris Diminico regarding mated test fixtures.  Chair asked if there were any objections.  No one responded.

Also, Chair also noted a late presentation request from Athos Kasapi regarding tap weights and related to CR.  Chair asked if there were any objections.  No one responded.

Chair reviewed the plans for the day.

**Presentation #23:**

"C2M TP1a VEC and ERL Test Specs", Mau-Lin Wu
See:  http://www.ieee802.org/3/ck/public/19_11/wu_3ck_01a_1119.pdf
- Discussed assumptions of the module package.
- Discussion about the impact of using 1mV of noise.
- Discussed the use of EVEC and ECOM in the analysis
- Slide 11: Discussion about the method for calculating T_fx.

**Strawpoll #6:**

I would support the adoption of slides 5, 7, 8, 12 of sun_3ck_01b_1119 as a C2M baseline, with the following exceptions:
- Slide 8: change the word optimal to setting
- Slide 12: add "with the f_max specification TBD"
Y: 40,  N: 0,  A: 10

**Motion #6:**

Move to adopt slides 5, 7, 8, 12 of sun_3ck_01b_1119 as a C2M baseline, with the following exceptions:
- Slide 8: change the word optimal to setting

- Slide 12: add "with the f_max specification TBD"

M: Phil Sun
S: Ali Ghiasi
Technical (>=75%)
Y: 49,  N: 0,  A: 5
Results: Motion Passes! (9:14 a.m.)

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

**Presentation #24:**

"Study of KR ERL test spec", Mau-Lin Wu
See:  http://www.ieee802.org/3/ck/public/19_11/wu_3ck_02a_1119.pdf
- Discussion of channels that were close to 3dB COM, as that is the space that is most relevant to ERL.

**Attendance Straw Polls**

I will attend the IEEE 802.3ck meetings at the  January interim in Geneva, Switzerland (week of January 20, 2020)
Y: 30, M: 14

I will attend the IEEE 802.3ck meetings at the  March Plenary in Atlanta, GA,  USA (week of March 16, 2020)
Y: 42, M: 10

During the attendance straw poll, it was noted that the January interim is the week leading into Chinese New Year (January 25, 2020).   There was discussion about whether it is known in advance whether the meeting schedule could accommodate the holiday.  The Chair noted that the exact schedule was not known until a week or so before the meeting.

Break at ~9:50 a.m.  Resumed at ~10:25 a.m.

**Presentation #25:**

"BP OD Channel Analysis", Tom Palkert
See:  http://www.ieee802.org/3/ck/public/19_11/palkert_3ck_04a_1119.pdf
- Confirmation that these are perfect traces at 90 ohm and that breakout, vias were included
- Channels are found on the Tools and Channels webpage:
  - http://www.ieee802.org/3/ck/public/tools/backplane/palkert_BP_channel_201911 06.zip
- Confirmation that these results were simulation not measured

- There was a request for results related to a shorter line card / split the loss midway between the line card and the orthogonal BP
- There was a request to show a comparison between state-of-the-are 50G connector versus the connector found in this presentation
- There was a request to see results for Megatron7 for use case of retimer

**Presentation #26:**

"Example Implementation of the KR/CR tap weight restrictions", Athos Kasapi
See: http://www.ieee802.org/3/ck/public/19_11/kasapi_3ck_02_1119.pdf
- Slide 4: discussed the formula details.
- Discussed if the proposal should be applied to both CR and KR interfaces.

During above presentation, there was a request to see one slide of the previous Kasapi presentation (http://www.ieee802.org/3/ck/public/19_11/kasapi_3ck_01_1119.pdf).  Chair asked whether there were any objections.  No one responded.

**Strawpoll #7:**

For the backplane interface, I would support setting RSS_tail_max limits per kasapi_3ck_01_1119 slide 18.
Y: 43, N: 0, Need More Information: 1

**Motion #7:**

Move to adopt for the backplane and copper interfaces, setting RSS_tail_max limits per kasapi_3ck_01_1119 slide 18, using the method described in kasapi_3ck_02_1119.
M: Athos Kasapi
S: Adee Ran
Technical (>=75%)

**Motion #8:**

Move to table Motion #7 until after the copper cable reference receiver discussion.
M: Mike Dudek
S: Mike Li
Procedural (> 50%)
Y: 28, N: 3, A: 7
Results: Motion Passes! (11:08am)

**Motion #9:**

Move to direct the editorial team to generate D1.0 for Task Force review with editorial license based upon the adopted baseline proposals.
M: Matt Brown
S: Mike Dudek

Technical (>=75%)
Y: 55, N: 1, A: 0
Results: Motion Passes! (11:14am)


**Motion #10:**

Move to adopt the structure of Annex 136A with TBDs, adopted figures in
diminico_3ck_01_1119.pdf, and the references below.
- In subclause 162A.2 Transmitter characteristics at TP0 change reference from 137.9.2 to 163.9.3.
- In subclause 162A.3 Receiver characteristics at TP5 change reference from 137.9.3 to 163.9.4
- The recommended equations for maximum and minimum printed circuit board trace insertion losses are specified in TBD and TBD, respectively.

M: Chris Diminico
S: Upen Reddy Kareti
Technical (>=75%)
Y: 52, N: 0, A: 2
Results: Motion Passes! (11:30am)


**Motion #11:**

Move to adopt the CR reference receiver to be the same as the KR reference receiver.
M: Ali Ghiasi
S: Upen Reddy Kareti
Technical (>=75%)


**Motion #12:**

Move to amend Motion #11 to read:
- Move to adopt the CR reference receiver to be the same as the KR reference receiver with the exception that the floating tap parameters are TBD.

M: Piers Dawe
S: Zvi Rechtman
Procedural (> 50%)
Y: 3, N: 24, A: 13
Results: Motion fails (11:46am)


**Motion #11:**

Move to adopt the CR reference receiver to be the same as the KR reference receiver.
M: Ali Ghiasi
S: Upen Reddy Kareti
Technical (>=75%)
Y: 40, N: 0, A: 6

Results: Motion passes! (11:48am)

Chair noted that a decision on the CR reference receiver had been made with motion #11 and that motion #7 could now be taken from the table.  Chair ruled that no motion to remove from the table would necessary because the condition of motion #8 had been met.  Chair asked if there was objection.  No one responded.

**Motion #7:**

Move to adopt for the backplane and copper interfaces, setting RSS_tail_max limits per kasapi_3ck_01_1119 slide 18, using the method described in kasapi_3ck_02_1119.
M: Athos Kasapi
S: Adee Ran
Technical (>=75%)
Y: 41, N: 0, A: 3
Results: Motion Passes! (11:51am)

**Motion #13:**

Move to adopt changing B_max(2) to 0.3 for the backplane and copper reference receivers, leaving B_max(3-n) unchanged.
M: Upen Reddy Kareti
S: Ali Ghiasi
Technical (>=75%)
Y: 26, N: 0, A: 17
Results: Motion Passes! (11:57am)

**Motion #14:**

Move to adjourn:
- Moved by:  Mike Dudek
- Second by: Adee Ran
- Passed by voice without opposition

Meeting ended at ~12:00 p.m.

# Attendees

| Last Name | First Name | Employer | Affiliation | 11/11/19 | 11/12/19 | 11/13/19 |
|---|---|---|---|---|---|---|
| Aekins | Robert | Legrand | Legrand | x | | |
| Baden | Eric | Broadcom | Broadcom | x | | |
| Balan | Vishnu | nVidia Corp | nVidia Corp | x | x | x |
| Baldwin | Thananya | Keysight Technologies | Keysight Technologies | x | x | x |
| Brooks | Paul | Viavi Solutions | Viavi Solutions | x | x | x |
| Brown | Matt | Huawei | Huawei | x | x | x |
| Calvin | John | Keysight Technologies | Keysight Technologies | x | x | x |
| Chalupsky | David | Intel | Intel | x | | |
| Chang | Frank | Source Photonics | Source Photonics | x | x | |
| Chen | C. C. David | Applied Optoelectronics | Applied Optoelectronics | | x | x |
| Chuang | Keng Hua | HPE | HPE | x | x | x |
| Dawe | Piers | Mellanox | Mellanox | x | x | x |
| DiMinico | Christopher | MC Communications/Panduit | MC Communications/Panduit | x | | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dudek | Mike | Marvell Technologies | Marvell Technologies | x | x | x |
| Estes | Dave | Spirent Communications | Spirent Communications | x | x | x |
| Ewen | John | Marvell | Marvell | x | x | x |
| Froelich | Dan | Tektronix | Tektronix | x | x | x |
| Ghiasi | Ali | Ghiasi Quantum | Ghiasi Quantum, Inphi | x | x | |
| Gilb | James | GA-ASI, USD, Gilb Consulting | GA-ASI, USD, Gilb Consulting | x | | |
| Gustlin | Mark | Cisco | Cisco | x | x | x |
| He | Xiang | Huawei | Huawei | x | x | |
| Healey | Adam | Broadcom Inc | Broadcom Inc | x | x | x |
| Heck | Howard | Intel | Intel | x | x | x |
| Hegde | Raj | Broadcom | Broadcom | x | x | x |
| Hiroaki | Kukita | Yamaichi Electronics | Yamaichi Electronics | x | x | x |
| Horner | Rita | Synopsys | Synopsys | x | x | x |
| Ingham | Jonathan | Broadcom | Broadcom | x | | |
| Kareti | Upen Reddy | Cisco | Cisco | x | x | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kasapi | Athos | Cadence | Cadence | x | x | x |
| Kim | Kihong | Hirose | Hirose | x | x | |
| Kimber | Mark | Semtech | Semtech | | x | x |
| Kinningham | Alan | I-Pex | I-Pex | x | x | x |
| Kocsis | Sam | Amphenol | Amphenol | x | | |
| Lambrecht | Frank | Gigamon Inc | Gigamon Inc | x | x | |
| Lapak | Jeff | UNH-IOL | UNH-IOL | x | | x |
| Levin | Alex | Microsoft | Microsoft | x | x | x |
| Li | Mike | Intel | Intel | x | x | |
| Lim | Jane | Cisco | Cisco | x | x | x |
| Lingle, Jr. | Robert | OFS | OFS | | x | |
| Liu | Alex | MediaTek | MediaTek | | | x |
| Lusted | Kent | Intel | Intel | x | x | x |
| Lyubumirsky | Ilya | Inphi | Inphi | x | x | |
| Maki | Jeffery | Juniper Networks | Juniper Networks | | x | |
| Malicoat | David | Malicoat Networking Solutions | Senko | x | x | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| McSorley | Greg | Amphenol | Amphenol | x | x | |
| Mellitz | Richard | Samtec | Samtec | x | x | x |
| Murphy | Sean | Texas Instruments | Texas Instruments | x | x | x |
| Nadolny | Jim | Samtec | Samtec | | | x |
| Nagata | Megumi | Fujitsu | Fujitsu | x | x | x |
| Nakamoto | Edward | Spirent Communications | Spirent Communications | x | x | x |
| Nicholl | Shawn | Xilinx | Xilinx | x | x | x |
| Ofelt | David | Juniper Networks | Juniper Networks | x | x | x |
| Palkert | Tom | Molex - MACOM | Molex - MACOM | x | x | x |
| Parthasarathy | Vasu | Broadcom | Broadcom | x | x | |
| Pepper | Gerald | Keysight Technologies | Keysight Technologies | x | x | x |
| Pozzebon | Dino | Microchip | Microchip | x | x | x |
| Rabinovich | Rick | Keysight Technologies | Keysight Technologies | x | x | x |
| Ramesh | Sridhar | Maxlinear | Maxlinear | x | x | x |
| Ran | Adee | Intel | Intel | x | x | x |
| Rechtman | Zvi | Mellanox | Mellanox | x | x | x |

| Riani | Jamal | Inphi | Inphi | x | x | x |
|---|---|---|---|---|---|---|
| Sekel | Steve | Keysight Technologies | Keysight Technologies | x | x | x |
| Shrikhande | Kapil | Innovium | Innovium | x | x | x |
| Sommers | Scott | Molex | Molex | x | x | x |
| Sprague | Ted | Infinera | Infinera | x | x | |
| Stone | Rob | Broadcom | Broadcom | x | x | x |
| Summers | Robert | Maxim Integrated | Maxim Integrated | x | x | |
| Sun | Phil | Credo | Credo | x | | |
| Takefman | Mike | Inphi | Inphi | x | x | x |
| Tooyserkani | Pirooz | Cisco | Cisco | x | x | |
| Tracy | Nathan | TE Connectivity | TE Connectivity | x | x | x |
| Tran | Viet | Keysight Technologies | Keysight Technologies | x | x | x |
| Twombly | Jeff | Credo | Credo | x | x | x |
| Ulrichs | Ed | Source Photonics | Source Photonics | x | x | |
| Venugopal | Prasad | Arista | Arista | x | x | x |

| Walker | Clint | AlphaWave IP | AlphaWave IP | x | x | x |
|---|---|---|---|---|---|---|
| Wang | Roy | HPE | HPE | x | | |
| Wang | Zhi | MediaTek | MediaTek | | | x |
| Weaver | James | Arista | Arista | x | x | x |
| Welch | Brian | Cisco | Cisco | | x | |
| Wu | Mau-Lin | MediaTek | MediaTek | x | x | x |
| Yam | Julius | Semtech | Semtech | x | x | |
| Zhang | Geoffrey | Xilinx | Xilinx | | x | x |
| Zhang | Kevin | Renesas | Renesas | x | x | |
| Zhuang | Yan | Huawei | Huawei | x | x | x |
| Zivny | Pavel | Tektronix | Tektronix | x | x | |