P802.3ck C2M AUI Small Group Update

July 2019 Plenary

Kent Lusted, Intel Corporation

C2M Small Group Participants

- Adam Healey, Broadcom
- Ali Ghiasi, Ghiasi-Quantum
- Phil Sun, Credo
- Jane Lim, Cisco
- Karthik Gopalakrishnan, Inphi
- Mike Dudek, Marvell
- Mike Li, Intel
- Ed Frlan, Semtech
- Matt Brown, Independent
- Tom Palkert, MACOM
- Piers Dawe, Mellanox

- Mark Kimber, Semtech
- Nathan Tracy, TE
- Matt Schumacher, TE
- Hsinho Wu, Intel
- Masashi Simanouchi, Intel
- Bruce Champion, TE
- Clint Walker, AlphaWave
- Rich Mellitz, Samtec
- Margaret Johnson, Cadence
- Athos Kasapi, Cadence
- Inho Kim, Marvell

Please let me know if you want to join the offline consensus calls
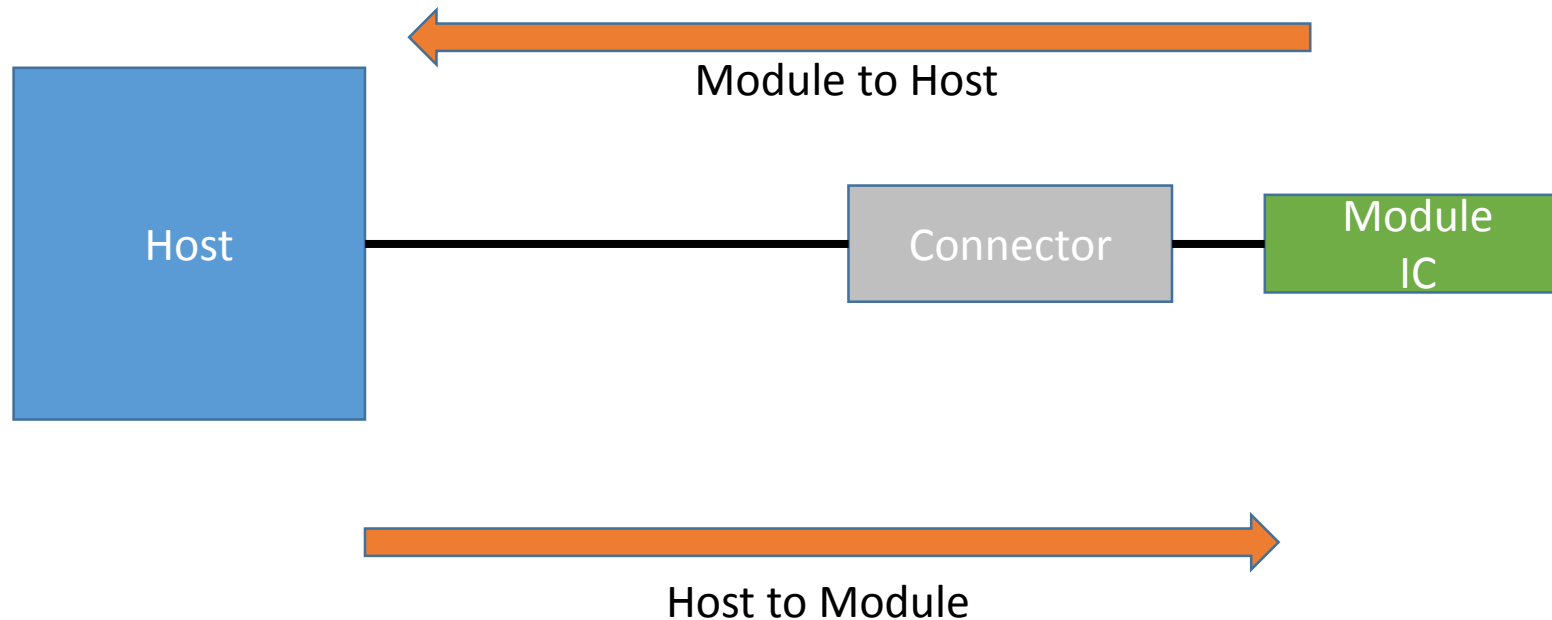
Agenda

- Updates
- Summaries
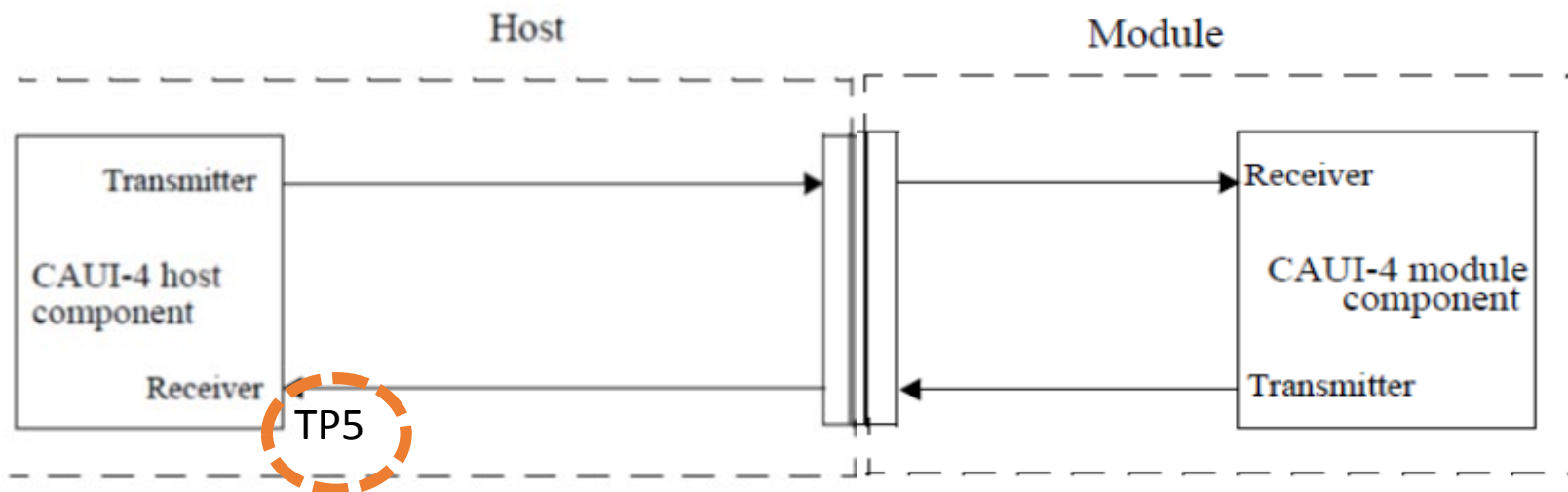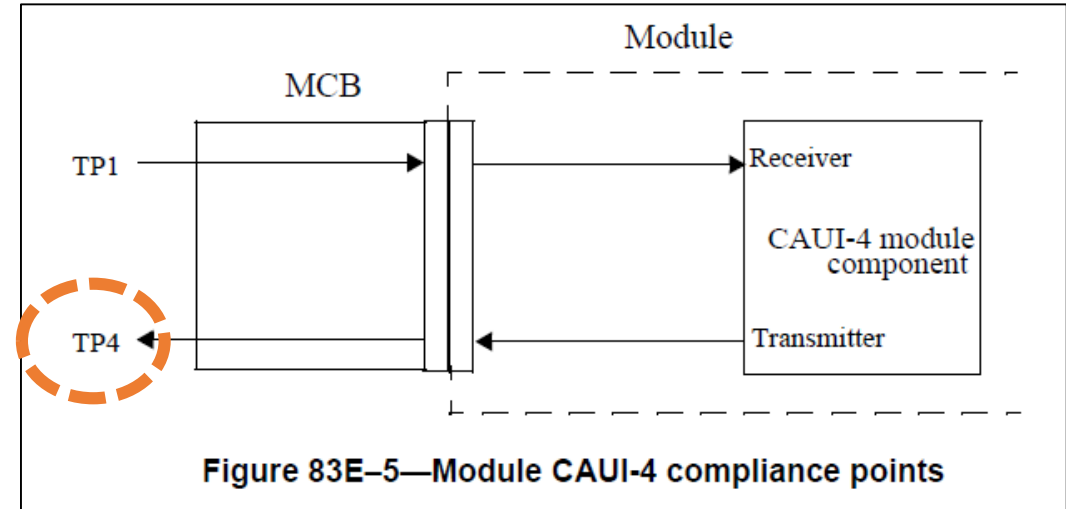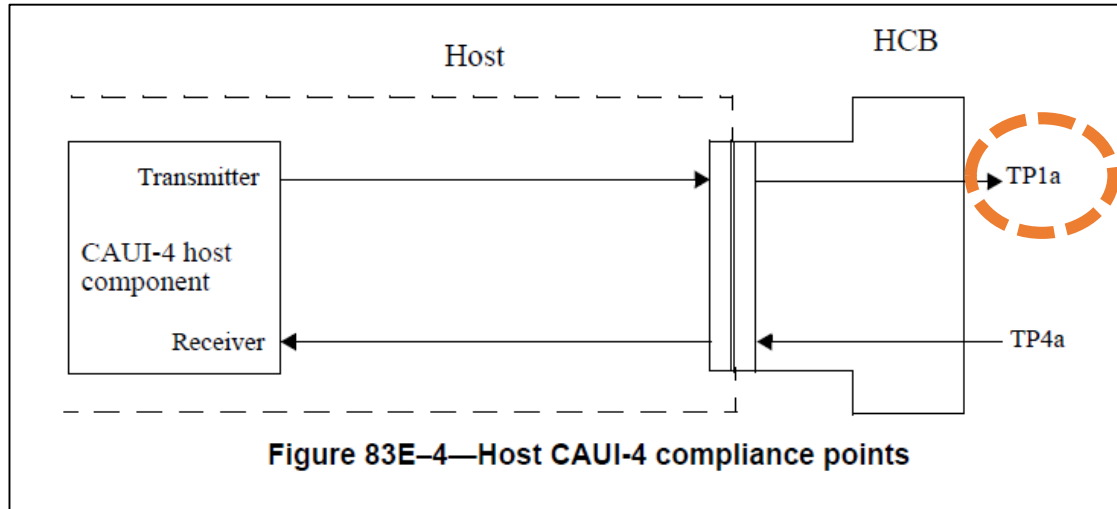- Next steps

July 2019 Goals for C2M AUI

- Primary Goal:
  - Select the C2M specification parameters, including the TP1a and TP4 reference receiver model

C2M AUI High Level Block Diagram

- Two directions to consider

C2M Reference Points (TP1a, TP4, TP5)

Figure 83E–4—Host CAUI-4 compliance points

Figure 83E–5—Module CAUI-4 compliance points

Overview of C2M Small Group Work Items

Higher priority

- Channel qualification method and ~~contributed channels to support (pass vs. fail @ TP1a)~~
  - ~~Module package parameters for informative comparison of channels~~ ← Done

- TP1a Ref RX model parameters, including reference equalizer
  - Host TXFIR assumptions are used for informative comparison

- TP1a method and specifications (COM <-> EW & EH mapping contribution)

- Module-side specifications @ TP4.
  - Including how to specify TXFIR settings that work for the MCB and the range of expected hosts
  - Potentially host will need adaptive pre-cursor tap or assumed to be stronger receiver.

- Proposed values for TBD and missing items listed in brown_3ck_01_0519

- Precoding or not

C2M Termination Considerations

- Analysis shows that the inductor termination model improved COM margin @ TP1a
  - Potentially enabling path to weaker reference receiver per
    http://www.ieee802.org/3/ck/public/adhoc/jun26_19/sun_3ck_adhoc_01_062619.pdf

- There was group consensus to use the proposed inductor termination model for the host-side ASIC package on the C2M interface.
  - The group preferred to use the current termination parameter model for the module-side package until more analysis with the inductor termination on the module-side is available.
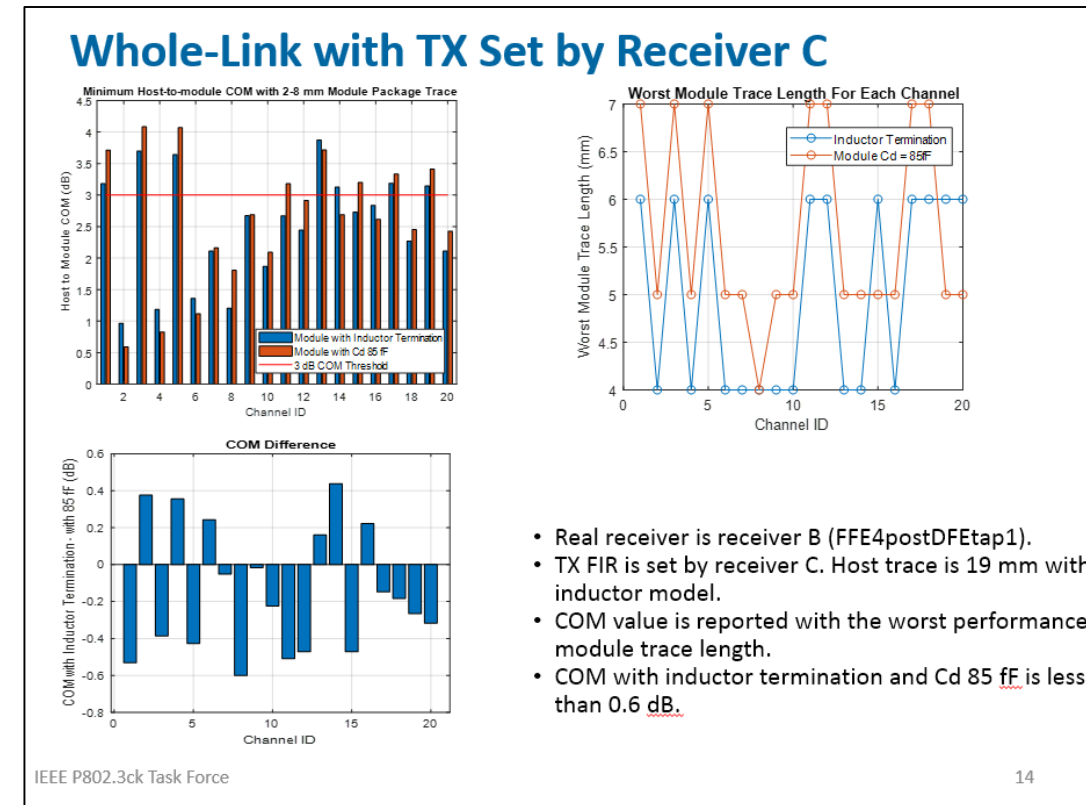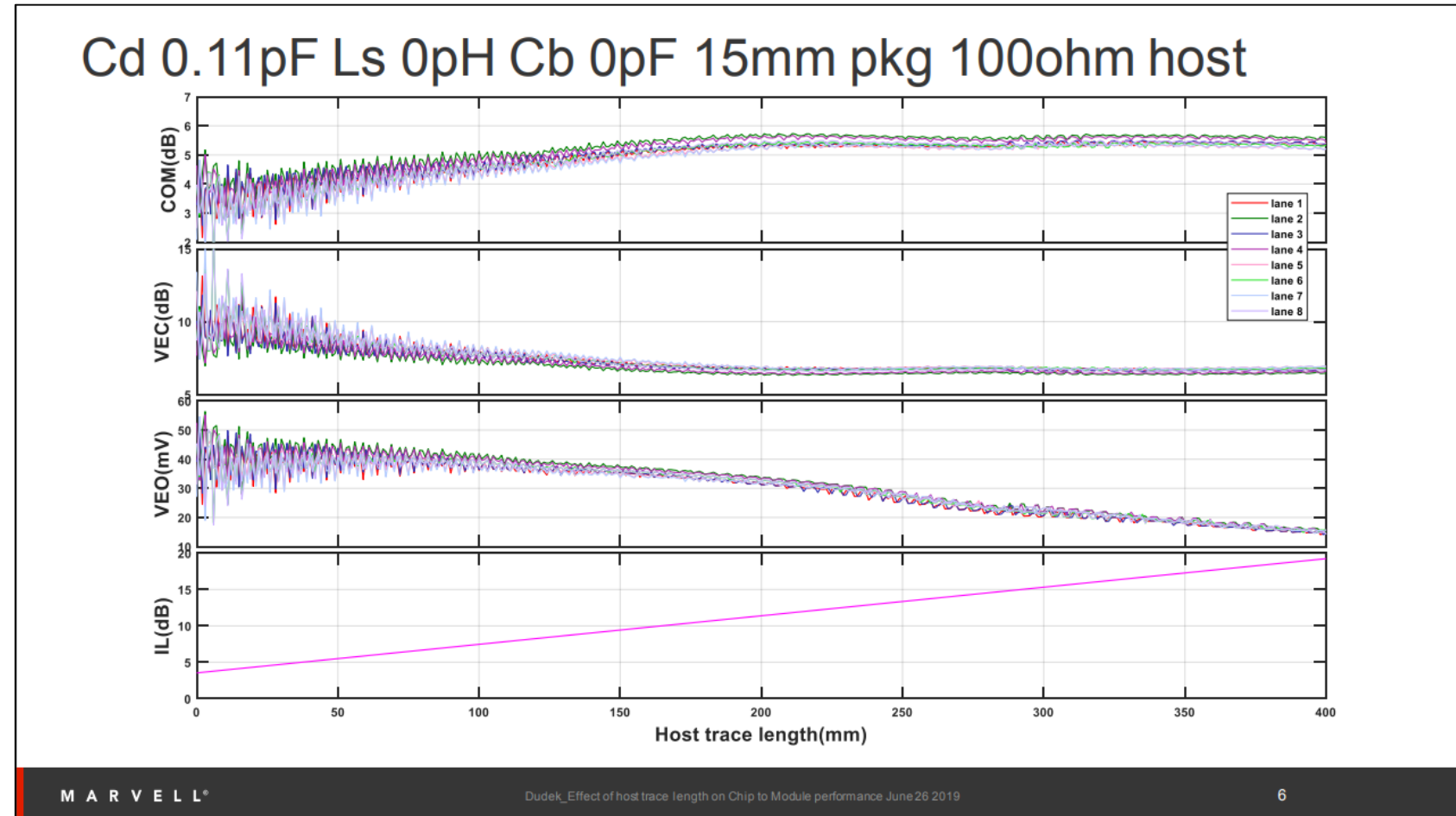

Source: sun_3ck_01_0719

C2M Channel Length

- Work to date primarily focused on higher loss C2M channels

- Short channels need more study

http://www.ieee802.org/3/ck/public/adhoc/jun26_19/dudek_3ck_adhoc_01_062619.pdf

Module-to-host Considerations

- Jane Lim's previous C2M channel contributions were intended for host-to-module direction, not module-to-host.
  - New channel contributions for July 2019 plenary meeting are on the Task Force website
- Small group looking at three module-to-host cases, initially:
  - Case1: MCB like
  - Case2: TP5 short host trace with BGA footprint
  - Case3: TP5 long host trace with BGA footprint
- Actively soliciting feedback on the number of cases

Summary

- Great work completed to date! Thank you!
- C2M baseline progress slowed by package termination investigations and uncertainty of TP1a/TP4 reference receiver model and parameters
  - We have a potential path to close on these at this meeting
- There is much more work to do to make the C2M interface portion of the specification technically complete.

Next Steps & Asks

- Select a TP1a and TP4 reference receiver model(s) and parameters
- Further explore short C2M channels

- Need for a module PCB model contribution that has AC caps on it.
- Need a mated test fixture S-parameter contribution and MCB model to use with TP4 simulation.

Potential Straw Poll Topics

- For C2M, I support trying to use the same reference receiver type for TP1a "host-to-module" and for TP4 "module-to-host". Y/N/A.

- For TP1a (and/or TP4), I would support the reference receiver to be:
  - C: 5-tap FFE (post 1-4)
  - C2: 3-tap FFE (post 1-2)
  - D: 4-tap DFE (tap 2-4)
  - D2: 1-tap DFE (tap 2 only)

- Please chat with me about other straw poll ideas

Thanks!

BACKUP

General Observations on C2M AUI

- The contributions to date have been *primarily* focused on 4 reference receiver model candidates:
    - A: 4-tap DFE (b1max=0.5)
    - B: 5-tap FFE with 1-tap DFE (FFE4post with DFE b1max=0.5)
    - C: 5-tap FFE (FFE4post)
    - D: 4-tap DFE (b1max = 0.0. I.e. only three DFE taps.)
    - Note: Some analysis done with other types, such as 12-tap FFE, etc.
- The COM and VEC/VEO results change depending on the channel, Cd, Cp, host and module package trace lengths, reference receiver model architecture & settings, etc.
- 100G/lane C2M is a challenging problem; one that is compelling us to re-examine assumptions and explore different solution techniques than in the past