

COM Reference RX Progress Update v4.5 – 13 May 2024

Kent Lusted, Intel Corporation, IEEE P802.3dj Task Force Electrical Track
Chair

Rich Mellitz, Samtec

Review: Adopted COM Ref RX Framework

- At the January 2024 interim meeting, the TF adopted (related to COM):
 - New reference RX framework of RXFFE+1DFE
 - New MMSE coefficient optimization procedure

https://www.ieee802.org/3/dj/public/24_01/healey_3dj_01_2401.pdf

Motion #10

Move to adopt lusted_nowell_3dj_01_2401 page 7

M: Kent Lusted

S: Adee Ran

Technical (>=75%)

802.3 voters only

Result: passed by unanimous consent 1:41 p.m.

Task Force: 3dj

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Bucket

- adopt the reference receiver framework baseline in healey_3dj_01_2401.pdf, slides 5-15
- adopt a PMD control function based on 162.8.11 (IEEE Std. 802.3ck-2022) for 200G/lane Backplane and Copper Cable PMDs, with max_wait_timer = TBD
- adopt the updated parameter values for Class B packages per benartsi_3dj_01_2401 slide 7
- adopt the AN73 baseline proposal in lusted_3dj_04_2401, slides 6-14
- adopt in-band training for PMAs with physically instantiated chip-to-chip interfaces (AUI-C2C) at 200 Gb/s per lane, based on 162.8.11 (IEEE Std. 802.3ck-2022) with training frame bit assignments and state diagrams TBD

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Review: Adopted MLSE Equation for Evaluation of Channels

- At the January 2024 interim meeting, the TF adopted (related to COM) the MLSE Eq U1.c for evaluation
 - Implementation penalty = TBD
- Note: No commitment to use MLSE effect in COM for any electrical interface or PMD

https://www.ieee802.org/3/dj/public/24_01/shakiba_3dj_01b_2401.pdf

Motion #7

Move to adopt lusted_nowell_3dj_01_2401 page 4

M: Kent Lusted

S: Mark Nowell

Technical (>=75%)

802.3 voters only

Result: Y: 58, N: 3, A: 20 Motion passed 11:33 a.m.

Task Force: 3dj

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MLSE (SP7)

Adopt the MLSE COM calculations based on equation U1.c in shakiba_3dj_01b_2401 slide 11 (with implementation penalty TBD) for the purpose of evaluating COM performance on channels (200G/lane electrical interfaces and electrical PMDs using MLSE are TBD.)

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COM Work Item List

Implemented and in Task Force test/use:

- RXFFE + 1 DFE framework and MMSE coef optimization
- FFE Floating taps
- • MLSE Eq U1.c – initial capability in place

Thank you to Adam Healey for the thorough review of COM v4.4 that identified several bugs

In the queue:

Observations with COM v4.5

- COM release v4.4 focused on fixes to the RXFFE + 1 DFE framework and MMSE coef optimization and *initial implementation of FFE floating tap and MSLE U1.c*
 - Code available at: <https://www.ieee802.org/3/dj/public/tools/index.html>
- COM development (pre-release) v4.5beta3 has several more important fixes to v4.4
 - Code available at: <https://www.ieee802.org/3/dj/public/adhoc/COM/index.html>
- Commit requests (e.g. changes) are posted and reviewed
 - <https://www.ieee802.org/3/dj/public/adhoc/COM/index.html>
- Current COM usage notes:
 - Do not use MLSE yet. Still not complete nor fully tested
 - If floating taps are used, then
 - RXFFE FLOAT CTL = FOM (or not specified)
 - Increasing Tx FFE beyond 1 tap will greatly increase run time
 - Full grid searching is recommended
 - Local search = 0 (or not specified)
 - sample_adjustment = [-16 16]

List of Commit Requests (1/2)

Commit Request #	Submitter	Description	Disposition
4p4 1	Rich Mellitz	Error in implementing method of computing COM with Rx FFE	Accept
4p4 2	Rich Mellitz	Reduce execution time when using Tx FFE	Accept
4p4 3	Rich Mellitz	Change name of MLSE function in code to align with adopted shakiba_3dj_01b_2401 and adjust PSDs	Accept
4p4 4	Rich Mellitz	Floating taps algorithm ISI method gives better results than FOM method when 3 or more groups are used	Revise. Overtaken by events.

List of Commit Requests (2/2)

Commit Request #	Submitter	Description	Disposition
4p4_5	Adam Healey	Correct errors in function MMSE_FOM()	Accept
4p4_6	Adam Healey	Indexing error in function get_PSDs()	Accept
4p4_7	Adam Healey	Sampling time search does not minimize mean-squared error	Accept
4p4_8	Adam Healey	Incorrect value of sigma_N assigned in function Create_Noise_PDF()	Accept

With these changes [4p4_1 : 4p4_8], COM v4.5beta3 = COM 4.5

Summary

- Participants are asked to review COM code changes to ensure alignment with P802.3dj Annex 178A
 - Need a few volunteers to cross check a few channel analysis results
- We must get the adopted framework and functionality correct **FIRST** ... then work on improving run time and adding the new adopted features
 - Other requests/changes/improvements/features/etc are not being considered at this time until the backlog is cleared
 - Create COM configuration spreadsheets after more baseline COM parameter values are adopted
- Please start using COM v4.5 in channel analysis and consider contributions for the electrical ad hoc meetings and the July Plenary
 - Floating taps may yield sub-optimal results. Caution urged here.
 - Initial U1.c MLSE function (U0 EQ also still in the code)
- The COM code may need to change because of comment resolution on D1.0
- Send bug reports or functional issues or change requests to Kent and Rich
 - Or bring them to the COM ad hoc