200 Gbps/lane Electrical interfaces and PMDs – Status Update

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Intro/Background

- The 100 Gbps/lane electrical interfaces and PMDs in P802.3df are (almost) complete
- Shift attention to 200 Gbps/lane electrical PMDs and AUIs

Looking at the (Recent) Past

High-level IEEE P802.3ck Influences on Host System Design include:

- Notable disparity in ILdd loss of AUI C2M host (11.9 dB) vs. CR host (6.875 dB)
  - I.e. two distinct system port types
- Two AUI C2M module output modes defined: short and long
  - And updated AUI C2M near-end and far-end eye measurement methodology
- AUI C2C management-configurable transmitter equalization, based on Cl 136.8.11 and Cl 162.8.11 PMD Control Function “link training”
- Along with numerous other improvements and adjustments

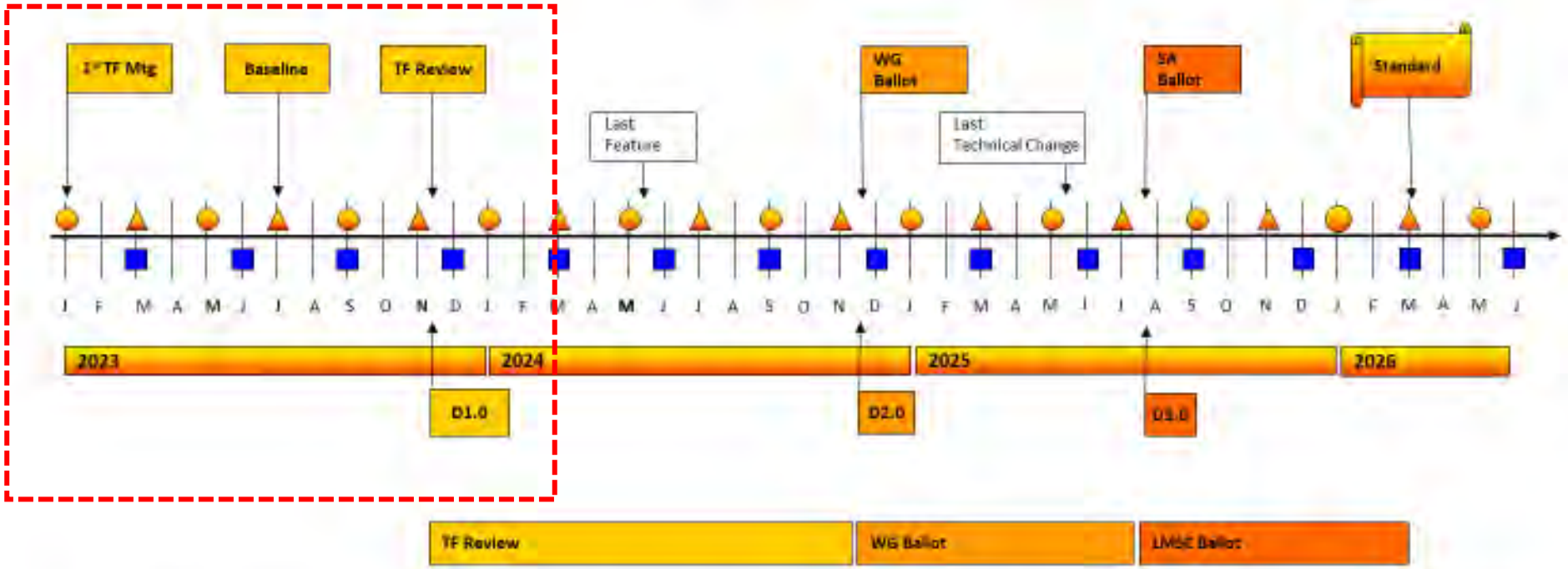
Contributed Channels Comparison

- For P802.3ck channel contributions, there were 8 backplane, 10 copper cable, 10 AUI C2M, 3 AUI C2C
  - Total of ~72+24+28+13 channels
- For P802.3df/dj channel contributions, there are 2 backplane and copper cable, 2 AUI C2M, 1 AUI C2C
  - Total of 15+24+2 channels

More channel contributions are needed!!!

Why the Rush?

Potential IEEE P802.3dj Timeline



Note – Timeline will need to be adopted, monitored, and adapted, based on progress, by future P802.3dj Task Force.

Legend
- IEEE 802 Plenary
- IEEE 802.3 Interim
- IEEE-SA Standards Board

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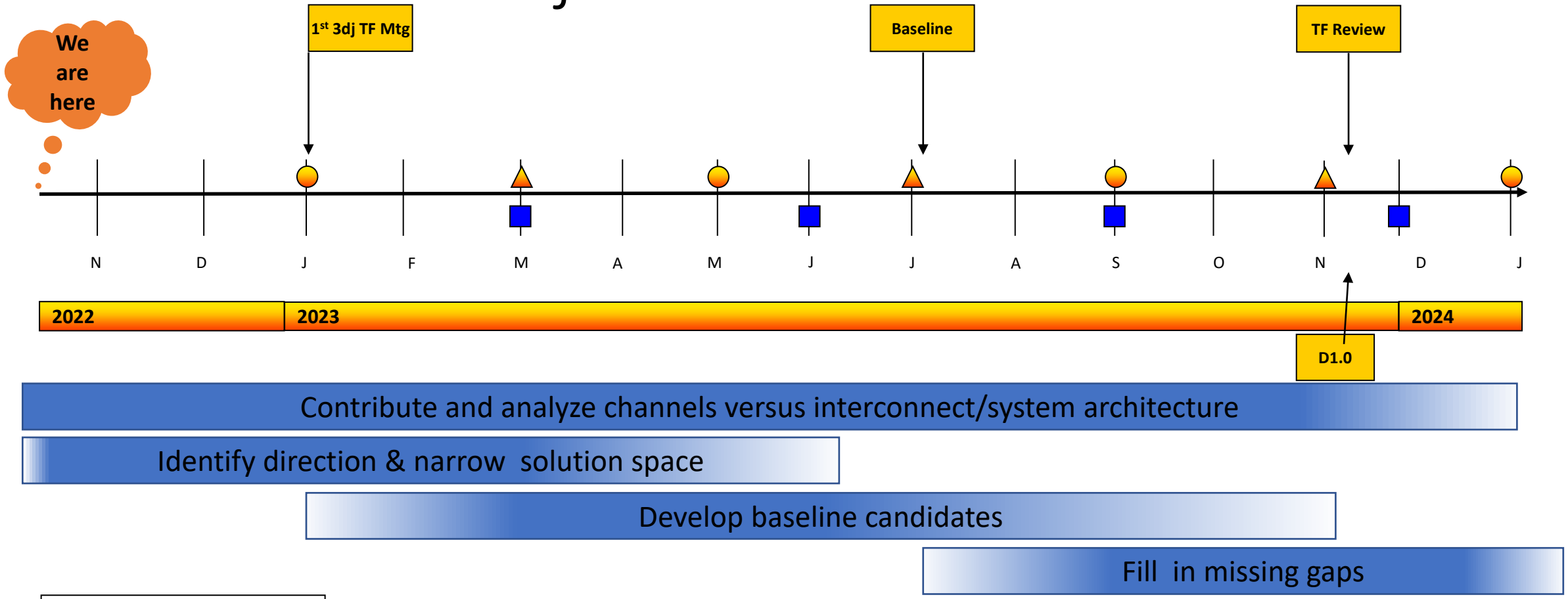
https://www.ieee802.org/3/df/public/22_09/dambrosia_3df_01a_2209.pdf

Potential 200 Gbps/lane Electrical-Track Timeline to 3dj Task Force Review



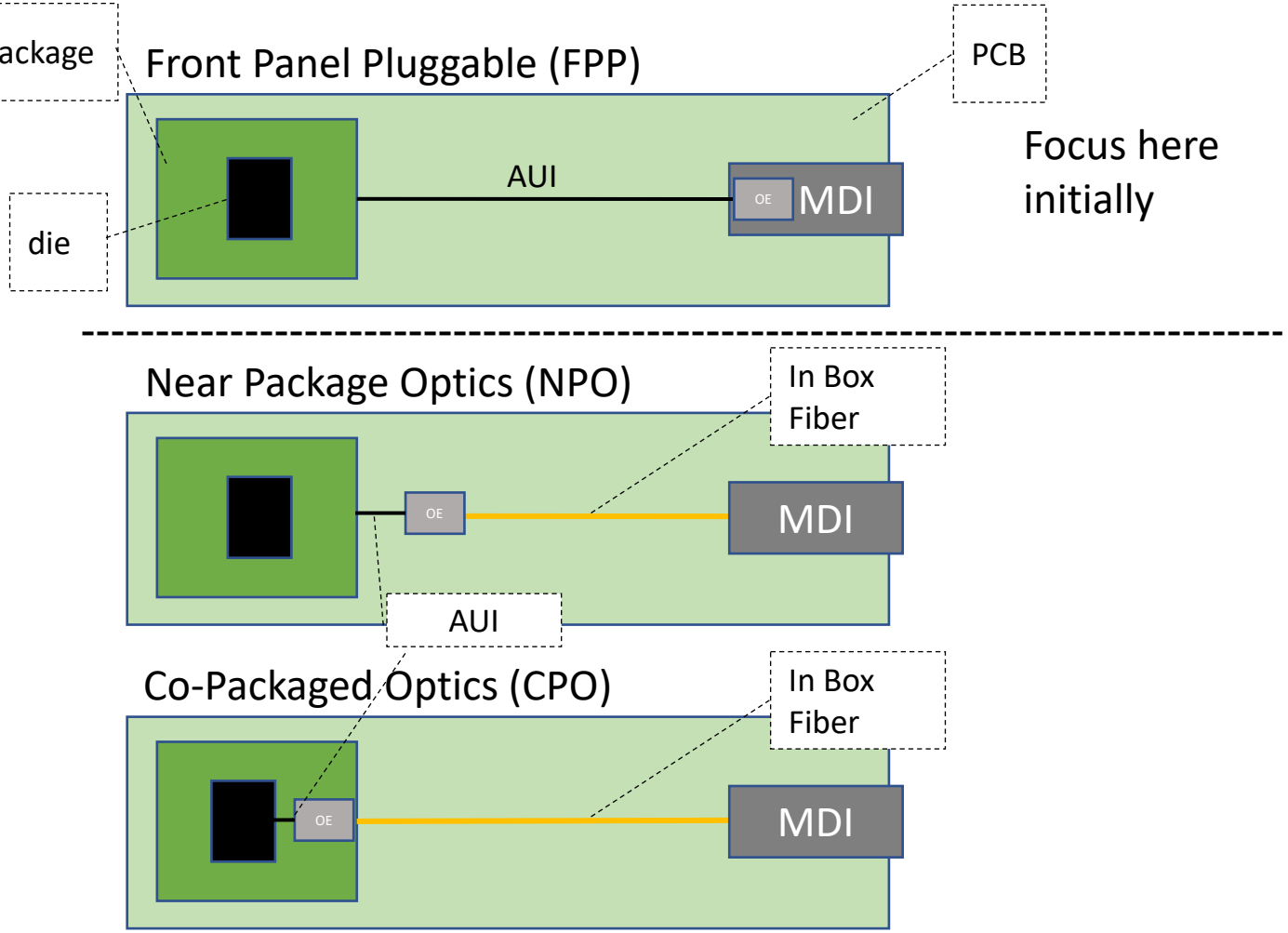
Finding A Starting Point

Initial Focus

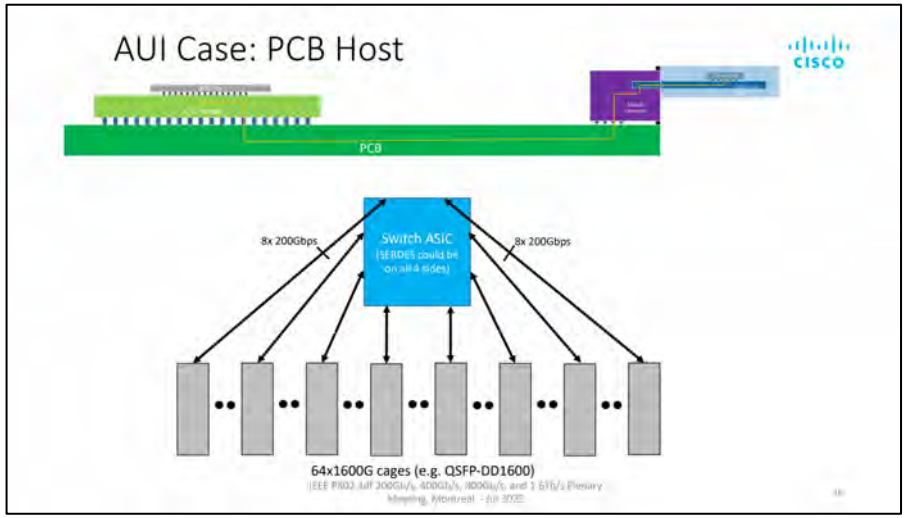
- Progressing PCS, FEC architecture, and optical PMDs is dependent on AUI interface definitions (e.g. insertion loss, pre-FEC BER target, channel effects, etc)
  - Optical PHYs are typically needed first by end users
  - Increased front panel bandwidth is needed for next generation optical modules
- Setting copper-based PMDs aside for now
  - The deployment of copper cable interfaces traditionally lags optics
  - Slightly decoupled from AUI decisions, yet similar
  - There are no 200 Gbps/lane backplane objectives adopted at this time

AUI C2M Form Factors: FPP vs. NPO vs. CPO

- Several channel contributions related to FPP form factor of AUI C2M
- No contributions specifically related to CPO nor NPO form factor of AUI C2M
- CPO and NPO form factors can be considered chip-to-module or chip-to-chip AUIs
  - CPO and NPO are different physical realizations of the “traditional” use case
  - Conceivable to optimize these AUI variants for the shorter reach/loss



Some FPP Examples



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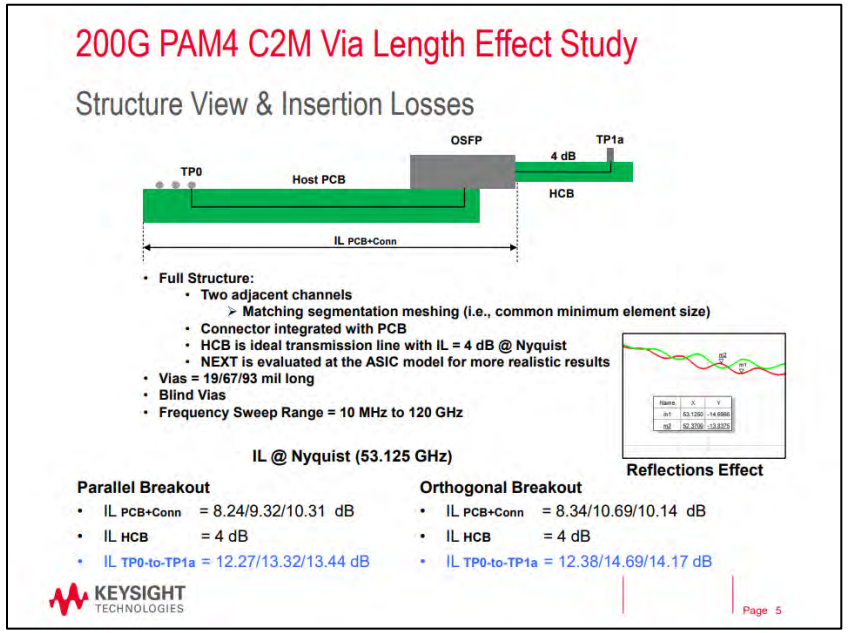

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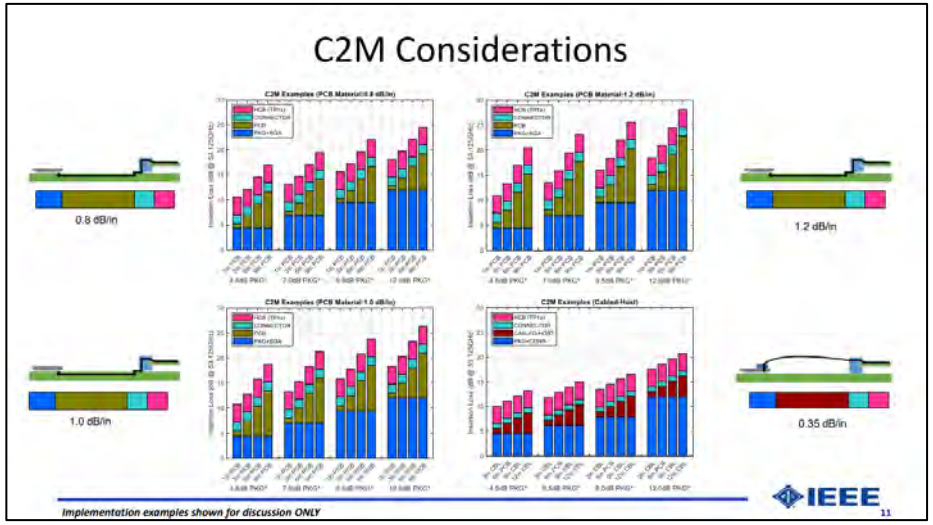

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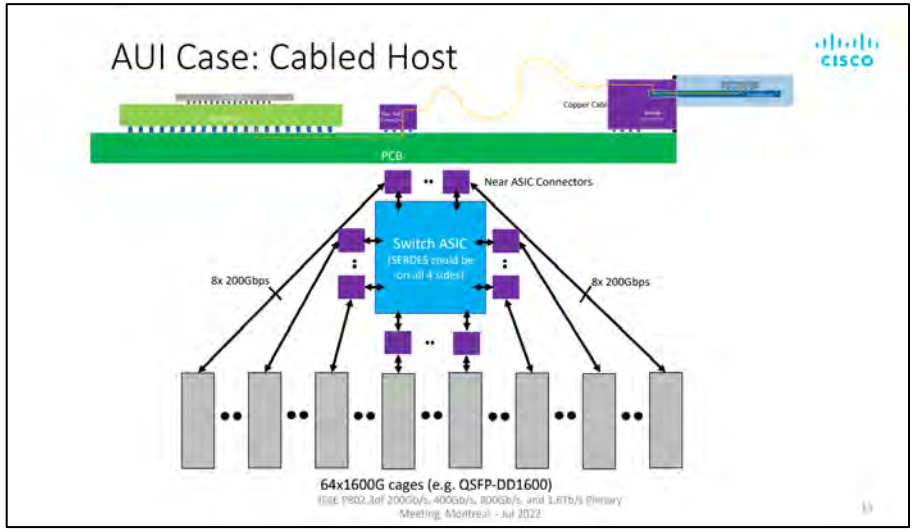

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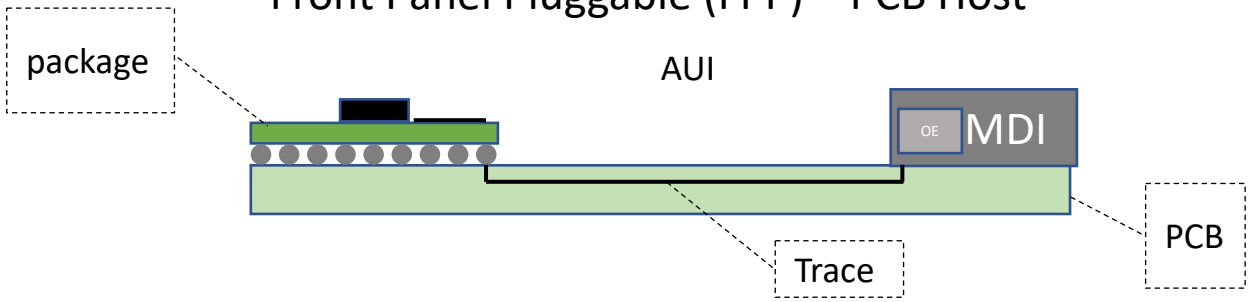
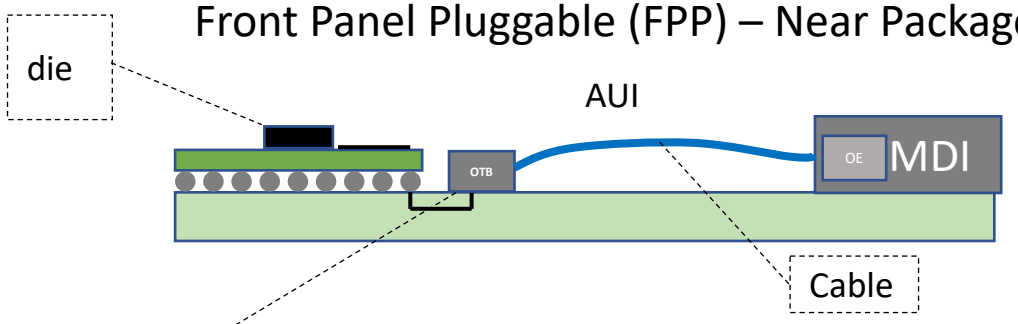
AUI C2M FPP Implementations

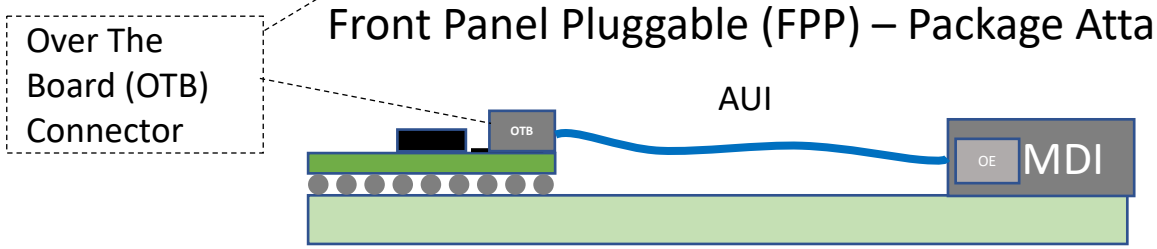
Front Panel Pluggable (FPP) – PCB Host



Front Panel Pluggable (FPP) – Near Package Attach Cabled Host



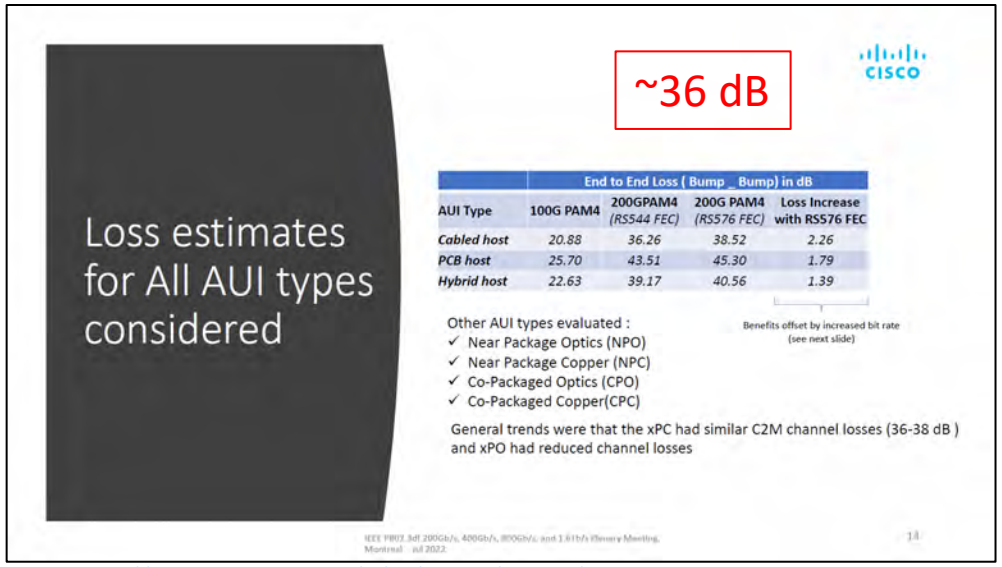
Front Panel Pluggable (FPP) – Package Attach Cabled Host



Not intended to be an exhaustive list.
Other implementations may exist.

C2M IL Targets (die-die)

- What is the loss range?



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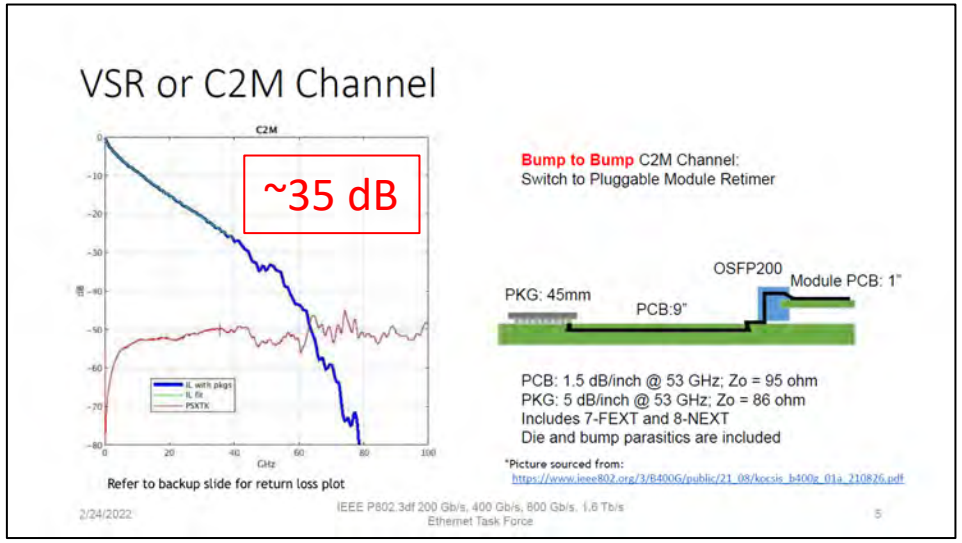

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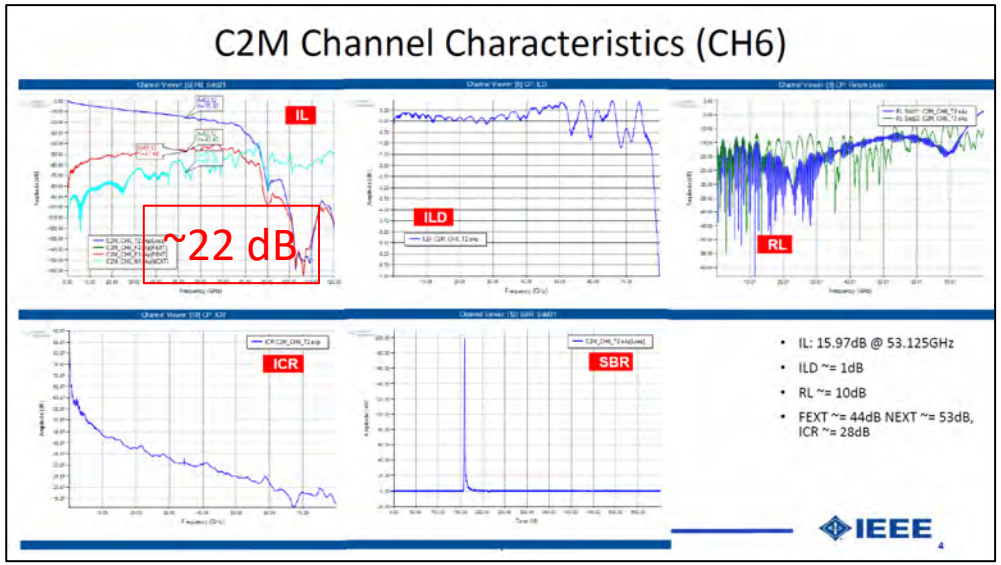

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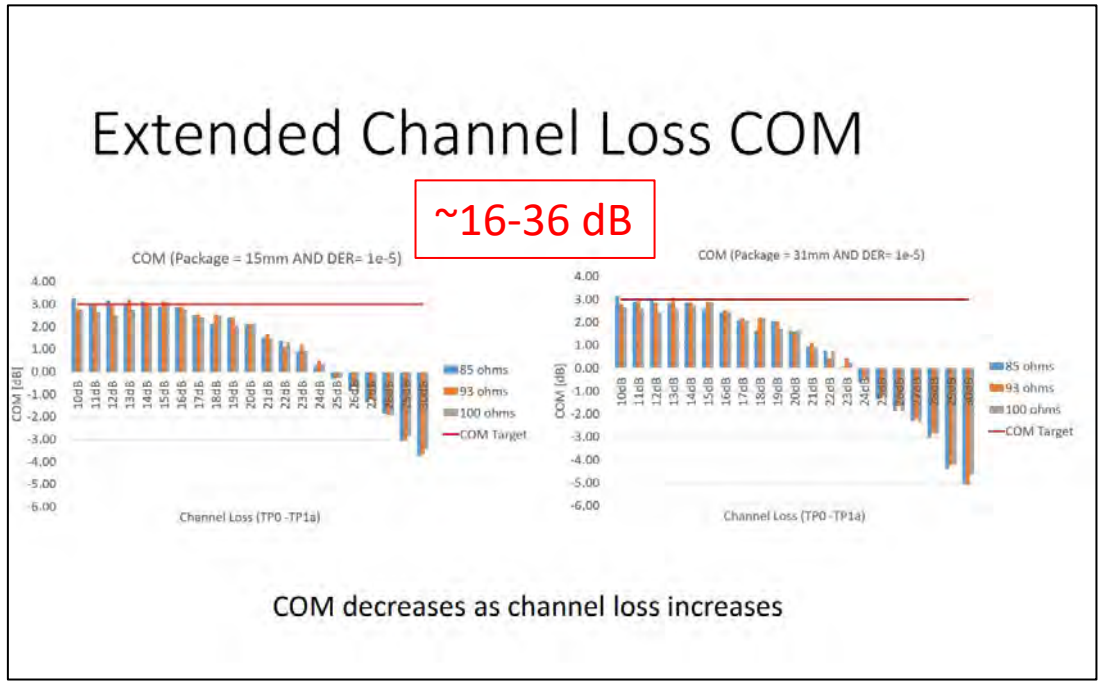
C2M IL Targets (die-die)



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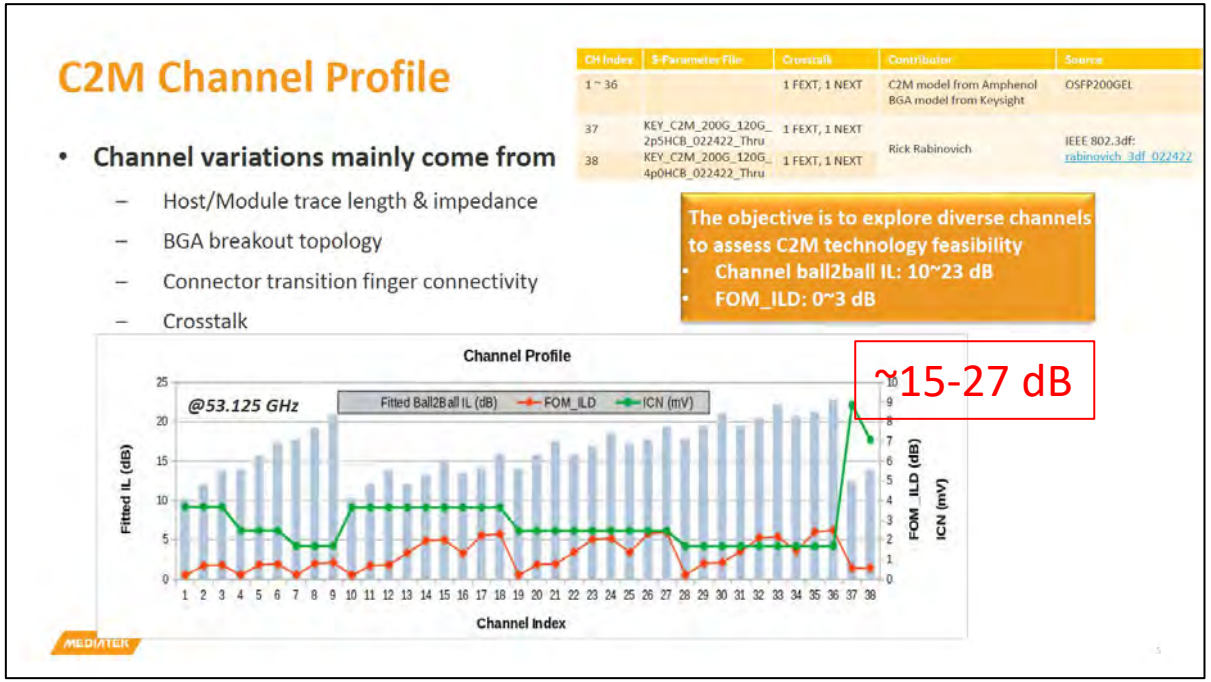

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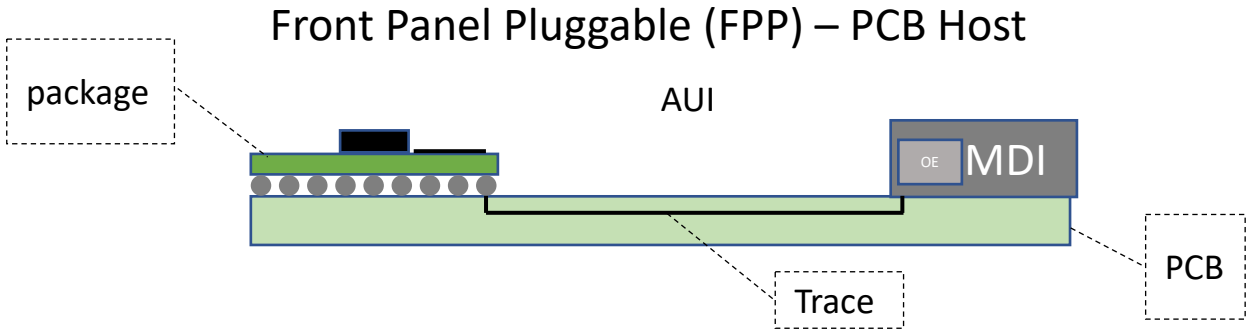
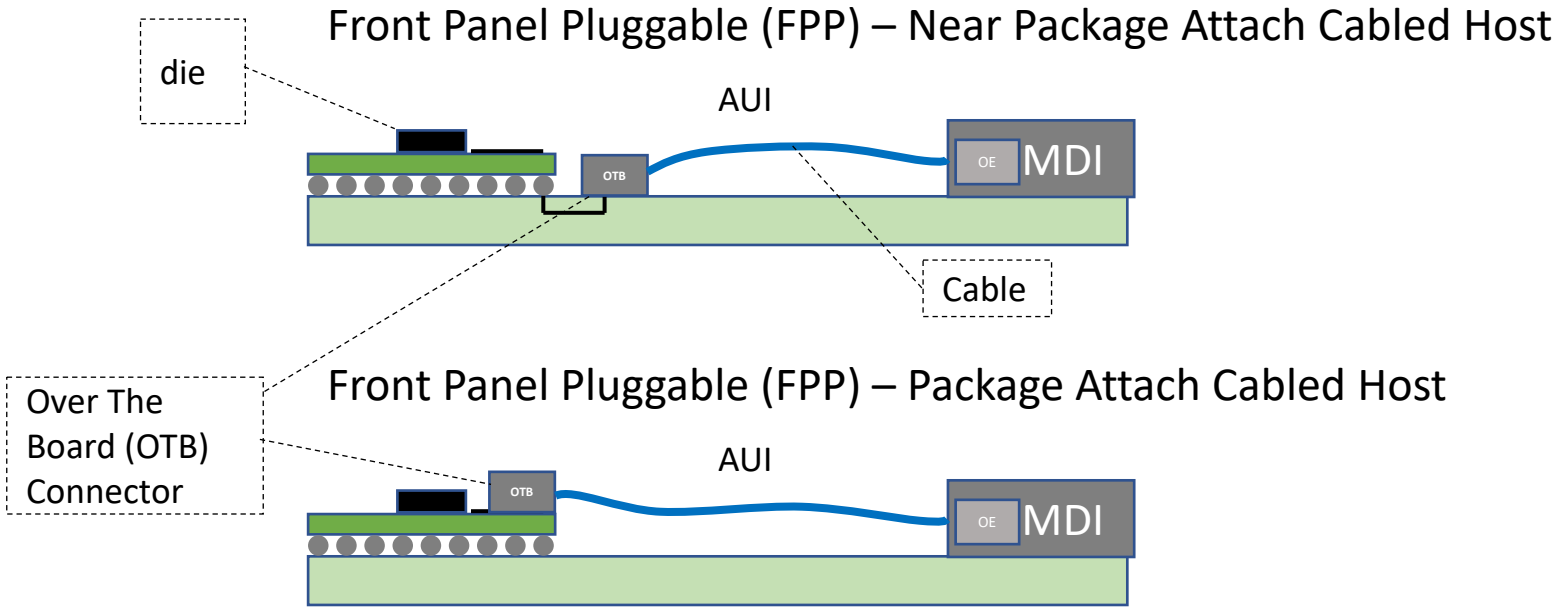
AUI C2M FPP Observations

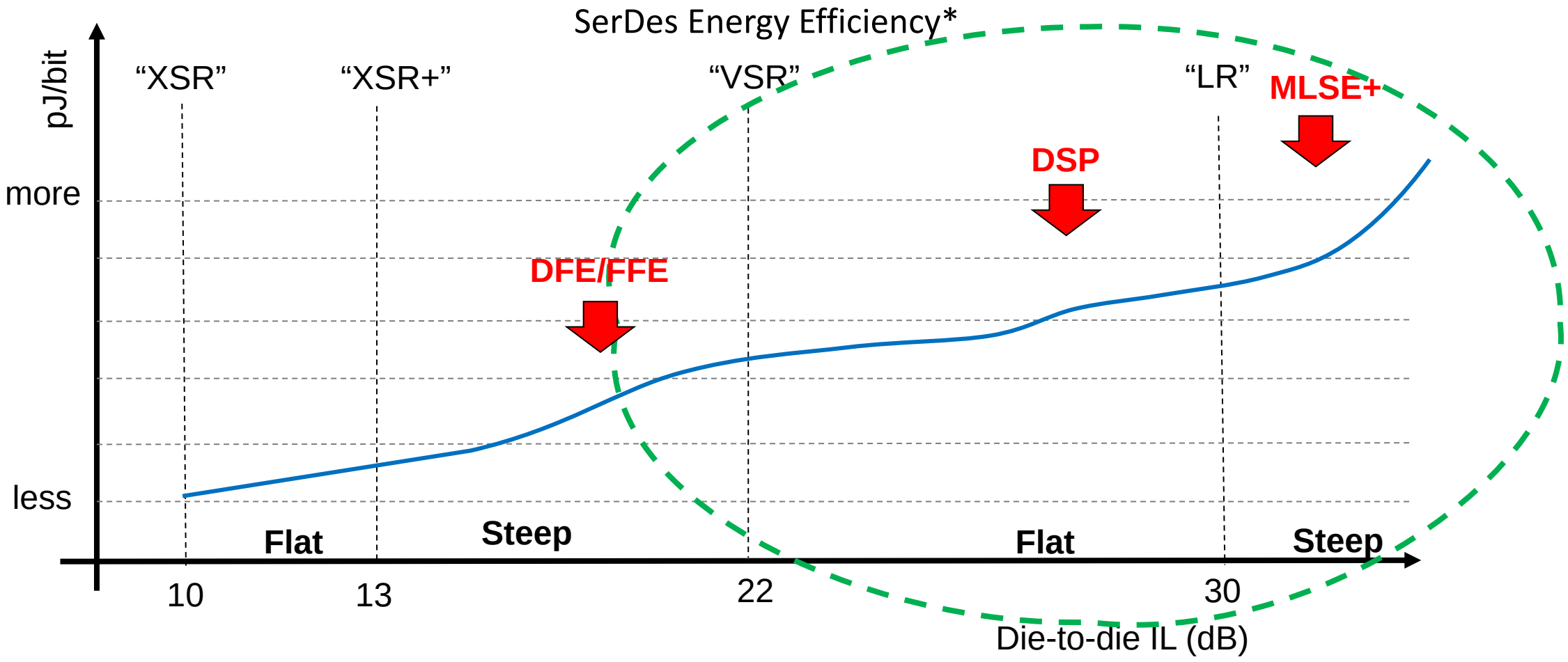
- Lower host interconnect cost with shorter in-box reach



- Higher host interconnect cost for longer in-box reach or reduced AUI power



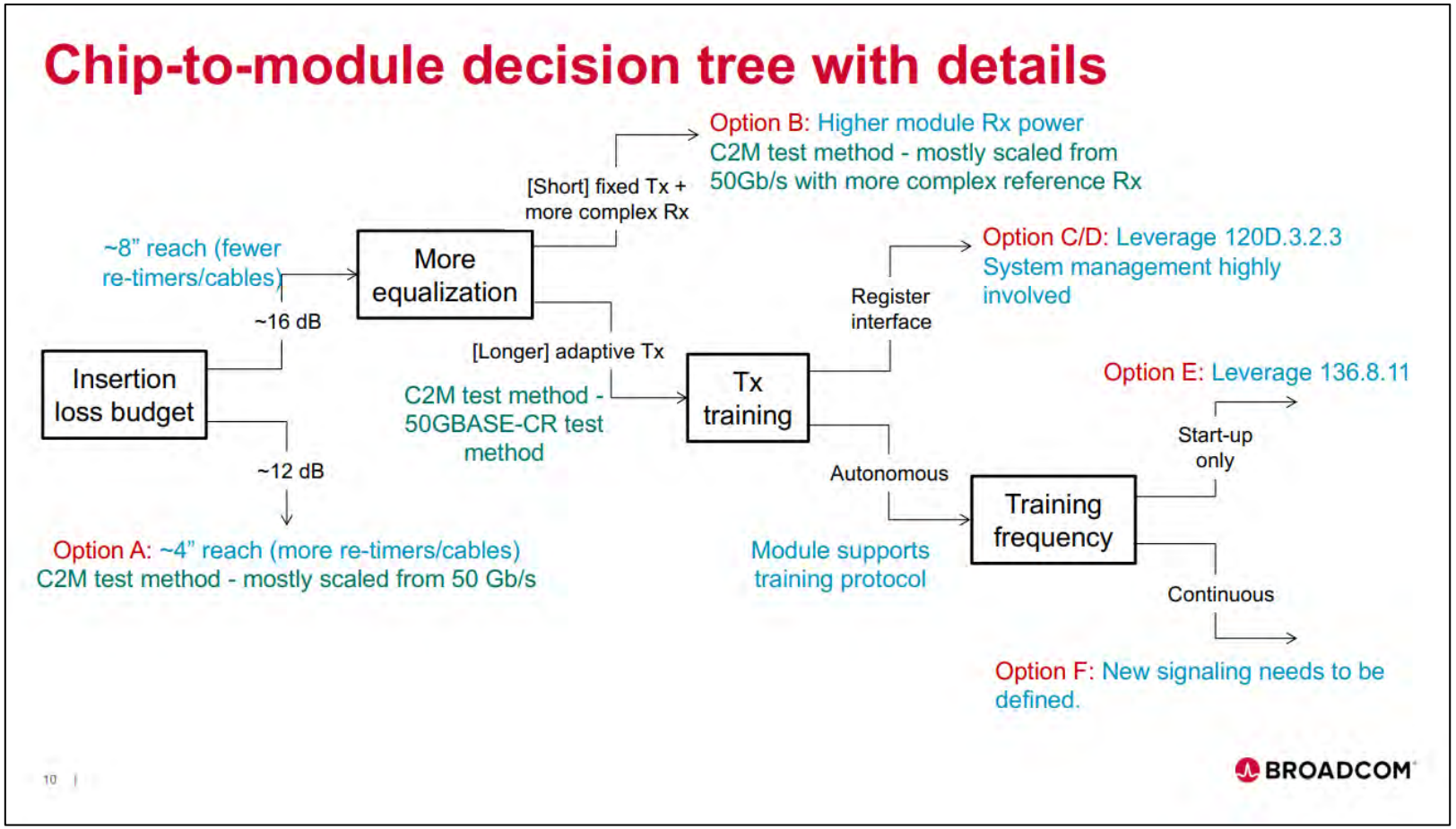
AUI C2M (die-to-die) Loss Landscape



Graph inspiration courtesy of Davide Tonietto, Huawei

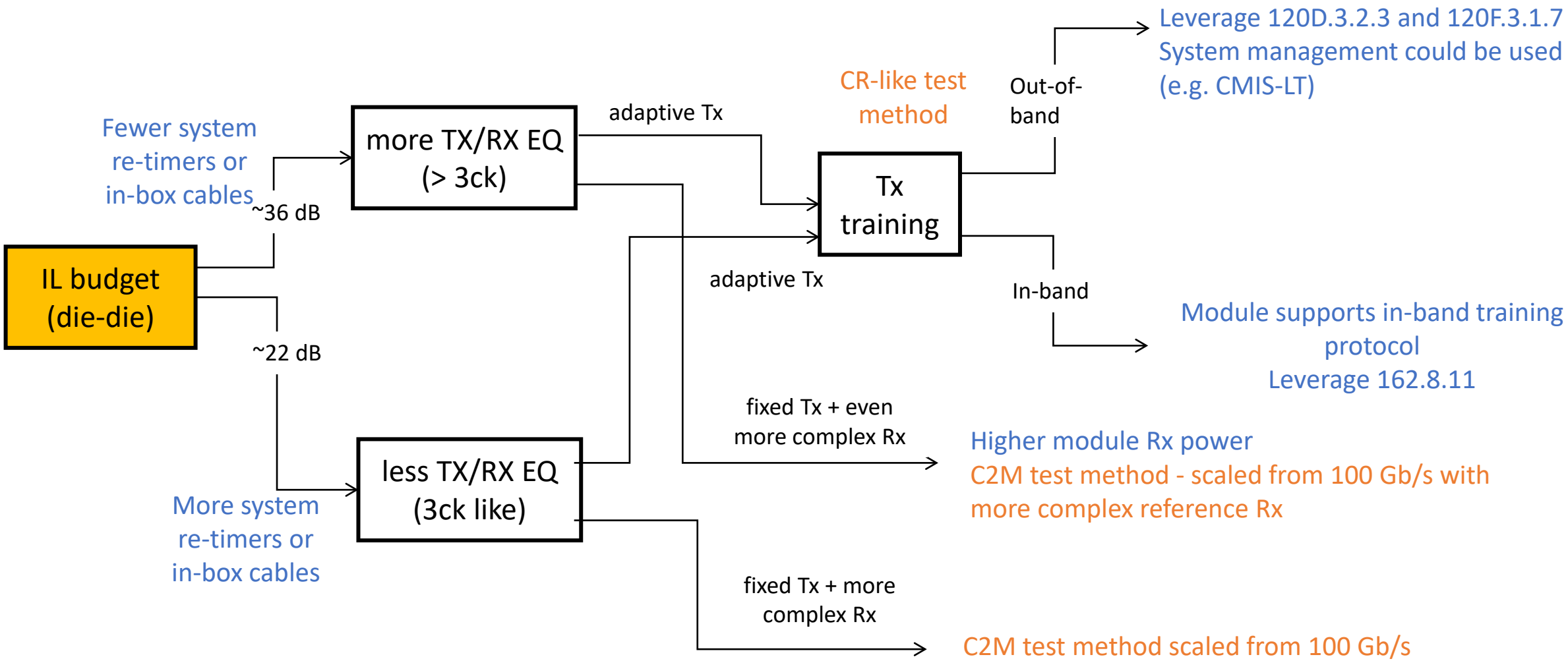
Remembering P802.3ck?

- 3ck used a decision tree to help set a C2M AUI loss direction
- Something similar could be used for 200 Gbps/lane AUIs



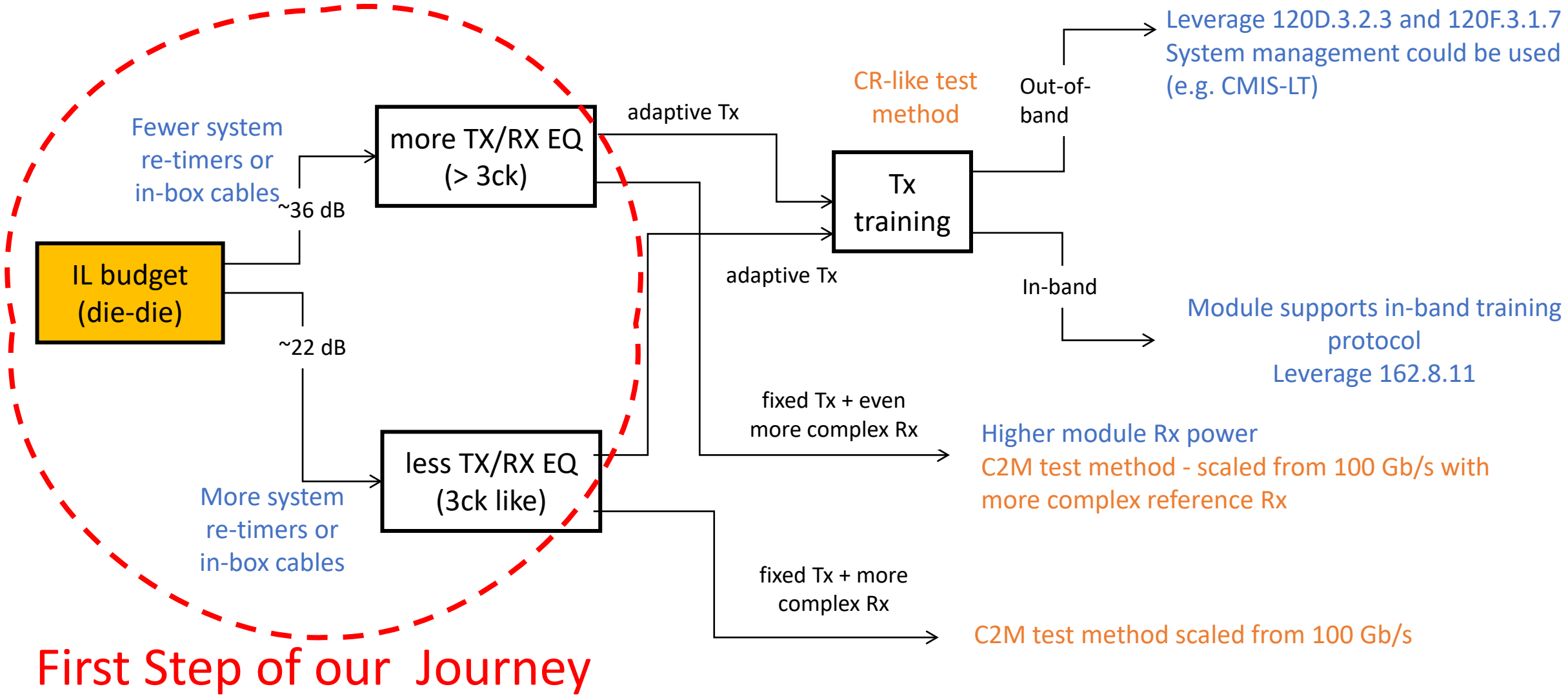
https://www.ieee802.org/3/ck/public/18_09/slavick_3ck_02_0918.pdf

3df/3dj AUI C2M Decision Tree



Acknowledgement to Jeff Slavick and Adam Healey

3df/3dj AUI C2M Decision Tree



Acknowledgement to Jeff Slavick and Adam Healey

Summary

- P802.3ck electrical decisions influenced system design
- Roughly 1 year until first 3dj Task Force review
- To progress PCS, FEC architecture, and optical PHYs, the initial focus should be AUIs
  - Front panel pluggable specifically
- Assessing the AUI C2M loss direction is a first step
  - There are tradeoffs to make

Thanks!

Straw Poll

- For the front panel pluggable use case, I would support a 200 Gbps/lane AUI C2M die-to-die insertion loss maximum of:
- (a) 22 dB (3ck AUI C2M like)
- (b) 36 dB (3ck CR/KR like)
- (c) need more information
- A: , B: , C:
- Pick one