AUI C2M Interfaces: Link Training or Not

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Observations

- Much work has been done or is in progress on the AUI C2M interfaces. Thank you!
  - https://www.ieee802.org/3/dj/public/23_01/23_0116/lit_3dj_01a_230116.pdf
  - https://www.ieee802.org/3/dj/public/23_01/23_0116/lit_3dj_02a_230116.pdf
  - https://www.ieee802.org/3/dj/public/23_01/23_0116/ghiasi_3dj_02a_230116.pdf
  - There are other contributions not listed here
- Many of these contributions make assumptions about the optimization of the AUI C2M link performance… “link training” or “die-die evaluation”

Terminology

- “Link Training” is an ambiguous term, within the scope of the IEEE Std. 802.3 for high-speed serial PHY types
  - Term is used in the standard for BASE-T PHY types (29 instances)
- “Link Training” or “LT” is *loosely* used to refer to the PMD Control Function in Cl 72.6.10, Cl 92.7.12, Cl 136.8.11, and Cl 163.8.11
  - Per Cl 163.8.11, “The PMD control function performs the PMD startup protocol. This protocol facilitates timing recovery and equalization while providing a mechanism through which the receiver can configure the transmitter to optimize performance. The protocol supports these functions through the continuous exchange of fixed-length training frames.”

PMD Control Function Usage

- Currently specified for use with most of the backplane and passive copper cable PHYs (e.g., 50GBASE-CR, 800GBASE-KR8, etc.)
  - P802.3dj could follow the same approach
- Some AUI C2C (Annex 120D, Annex 120F, etc.) provide a method to configure by management a transmit equalizer using a set of control and status variables based on the PMD Control Function
  - No training frames are used
  - P802.3dj could follow the same approach

What about 200 Gbps/lane AUI C2M interfaces?

Clarity Needed

- The topic of “link training” on the AUI C2M interfaces is surfacing in contributions, Q&A, discussions, and baseline proposals
  - For example, https://www.ieee802.org/3/dj/public/23_01/23_0116/ghiasi_3dj_01_230116.pdf
  - https://www.ieee802.org/3/dj/public/23_01/23_0116/lit_3dj_01a_230116.pdf
  - https://www.ieee802.org/3/dj/public/23_01/23_0116/lit_3dj_02a_230116.pdf
- Assumptions on “link training” are murky. Is it:
  - A start-up only protocol (no mission data) -> “out-of-service”
  - A periodic tuning (mission data mode) -> “In-service”
  - Both?

What are your assumptions for “link training” on the AUI C2M?

Potential Impact to AUI C2M Methodology

- From IEEE 802.3ck-2022, AUI C2M uses these compliance points and associated methodologies:

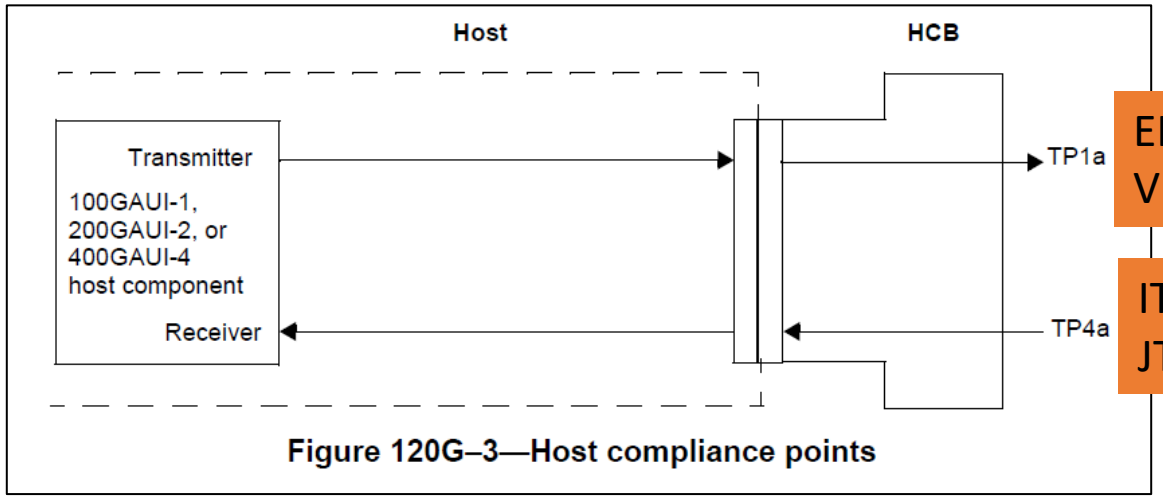


Figure 120G–3—Host compliance points

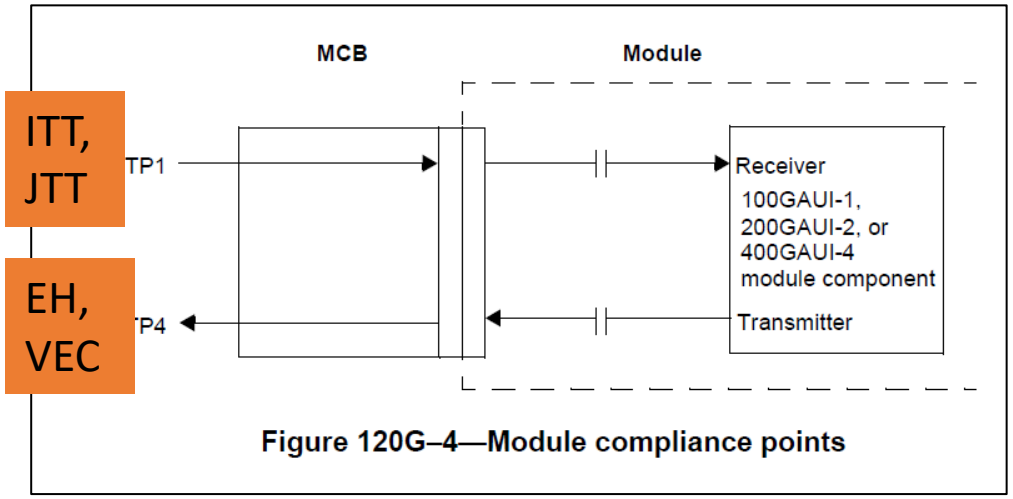
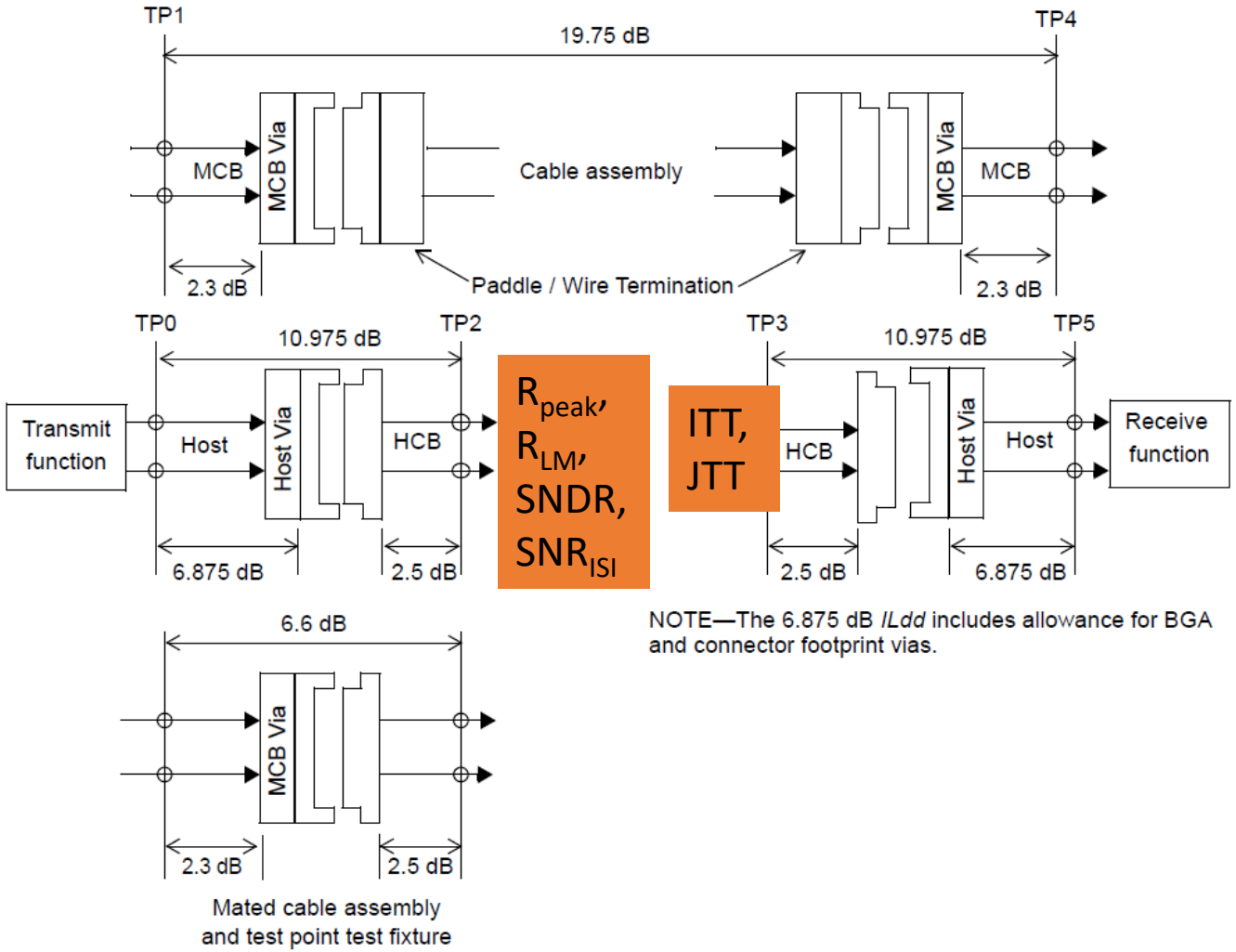


Figure 120G–4—Module compliance points

- Does this approach still work, if using “link training” on AUI C2M interfaces?

Comparison

- For reference, passive copper cable test points and associated methodologies:



NOTE—The 6.875 dB *ILdd* includes allowance for BGA and connector footprint vias.

Summary

Inputs to consider in the development of AUI C2M Baseline Proposals:

- Requirement:
  - Use “link training” or not?
  - Mandatory or optional?
- Operational mode:
  - “out-of-service” or “in-service” or both
- Test points and methods:
  - Which approach is used?
  - Any modifications?

Thanks!