
802.3da Mixing Segment Specifications

March 2024

Chris DiMinico
PHY-SI LLC/ MC Communications/SenTekse
cdiminico@ieee.org

Contributors

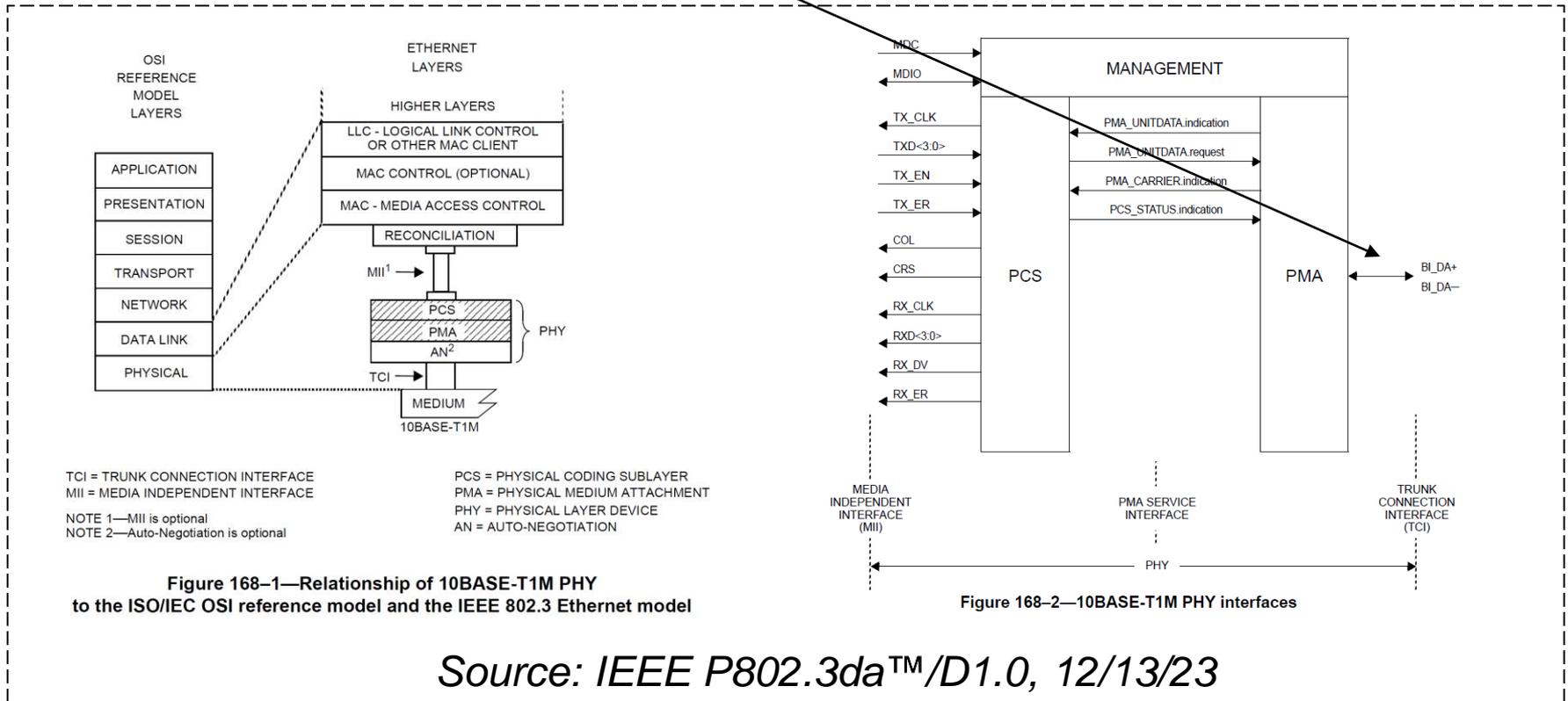
- Bob Voss/Paul Wachtel - Panduit
- Stephan Schreiner - Rosenberger
- Michael Paul - ADI

Purpose

- TCI and Mixing Segment Characteristics (2-wire)
- Specification methods - models and measurements
- Resultant TCI and mixing segment specification recommendations
- Related to comments; #3,#70,#32,#9,#10,#97

TCl Specifications - IEEE P802.3da™/D1.0, 12/13/23

- PMA connected to TCl (2-wire)



Source: IEEE P802.3da™/D1.0, 12/13/23

TCI Specifications - IEEE P802.3da™/D1.0, 12/13/23

168.7 Mixing segment characteristics - The TCI may physically be implemented as **two** two-wire connections to the DTE or as an adapter separate from the DTE's PMA assembly or the TCI and the PMA of the DTE may be located within a single assembly. The latter configuration presents a negligible stub length when the PMA attachment is open circuit. Either configuration may include compensation engaged when a PMA or PMA load is attached. Figure 168-17 shows one example of each configuration.

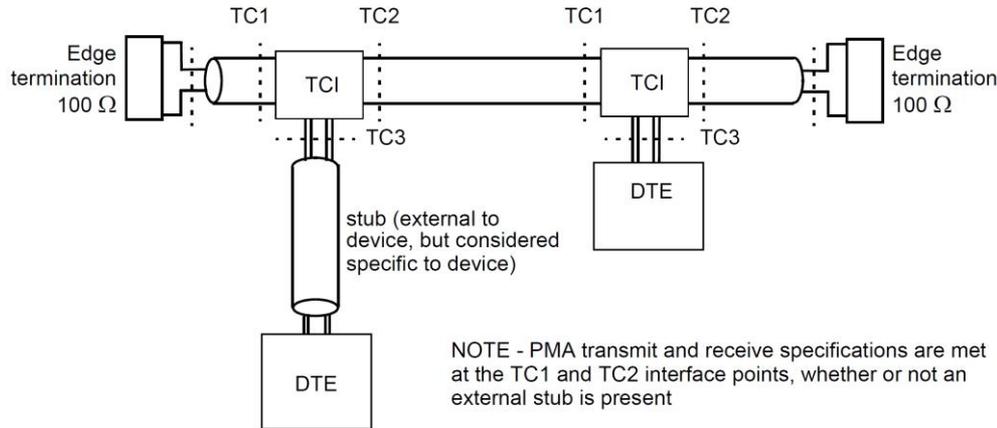
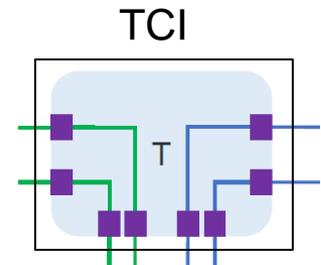
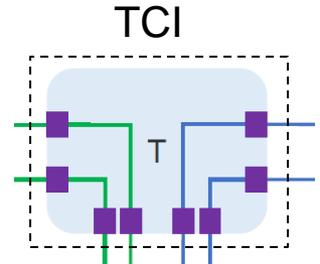
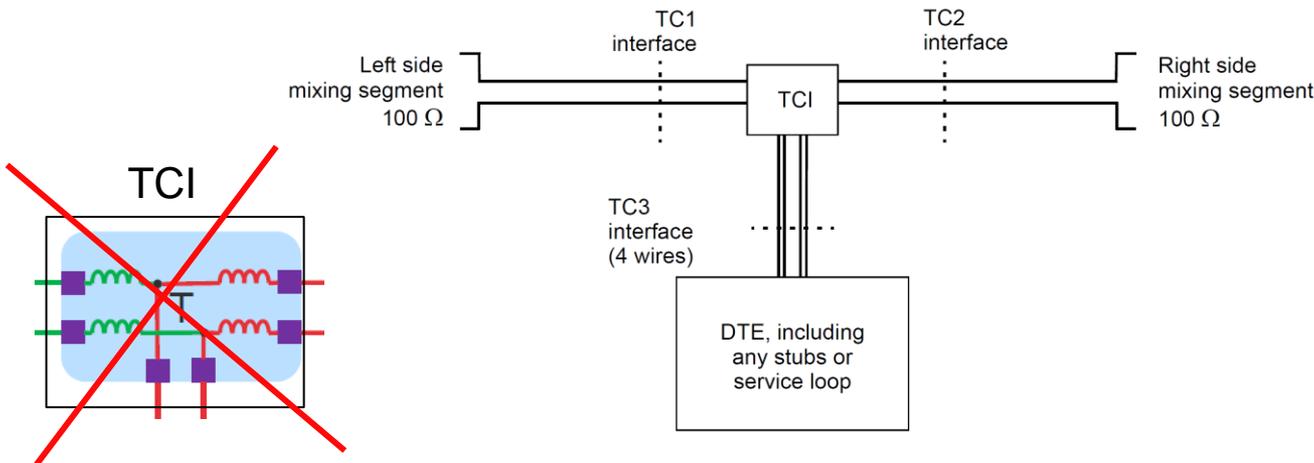


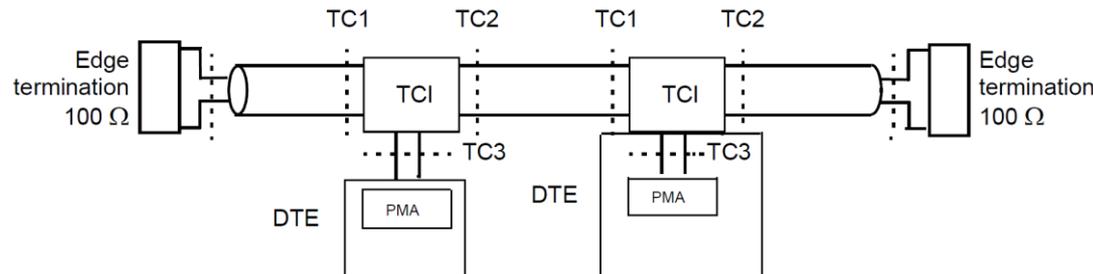
Figure 168-17—Mixing segment and reference points

168.8 TCI specification - Each TCI has one interface facing each direction of the mixing segment (TC1 and TC2), and a four-wire interface facing the PMA (and any associated stub or service loop) (TC3) as shown in Figure



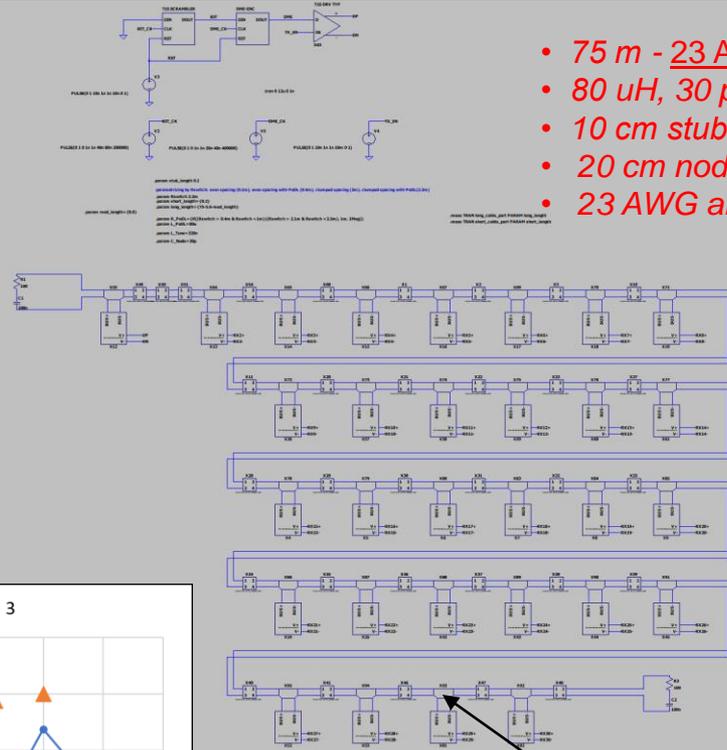
168.7 Mixing segment characteristics

- The mixing segment consists of TCIs with PMAs connected, TCIs with PMA loads, cable, and terminations.
 - The Trunk Connection Interface 2-wire (TCI) is specified electrically at TC1 and TC2 with PMA connected or PMA load connected.
 - The cable (AWG) is given, possibly referenced electrically (consider variant of SP-400).
- The mixing segments, consisting of specified TCIs and cable, shall meet electrical specifications edge-to-edge...
- All of the above is modeled with gitHub or similar to validate cable length (75 m), and the number of nodes (30), with the goal of reasonable independence of trunk location.
- Modeled results of a configuration is presented (75m, 30 node, 10 cm stub, 20 cm node spacing) sweeping separation in 20 cm increments between RX2 and RX3 while maintaining 75m length.
- In follow-up, minimum spacing tolerances will be considered from 4.5 mm min separation as well as component compensation tolerances; hopefully added before presentation is given.
- Note that compensated links look like cables, not ISI limited; we will need to consider length (loss) max limits relative to min receive voltage, board noise, and other noise for compensated and uncompensated .

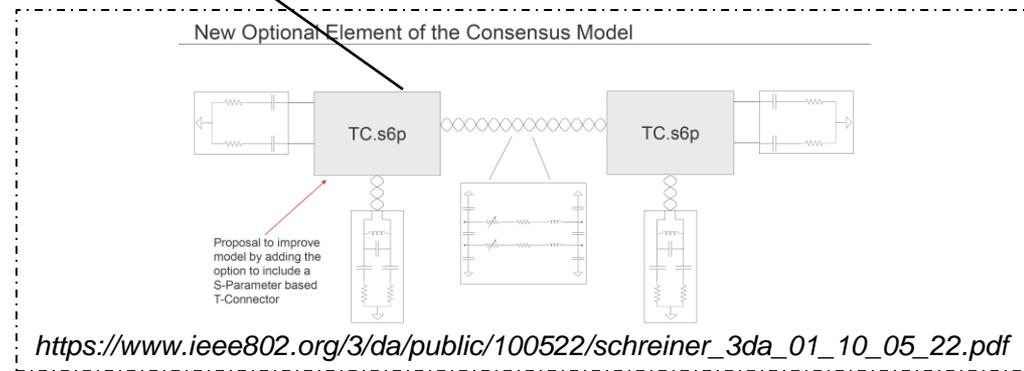
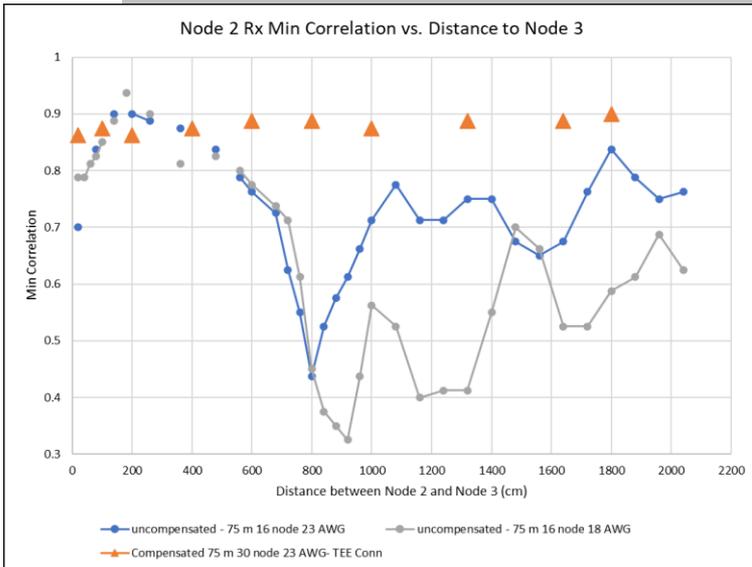


NOTE - PMA transmit and receive specifications are met at TC1 and TC2.

Mixing Segment LT spice model- compensated Tee

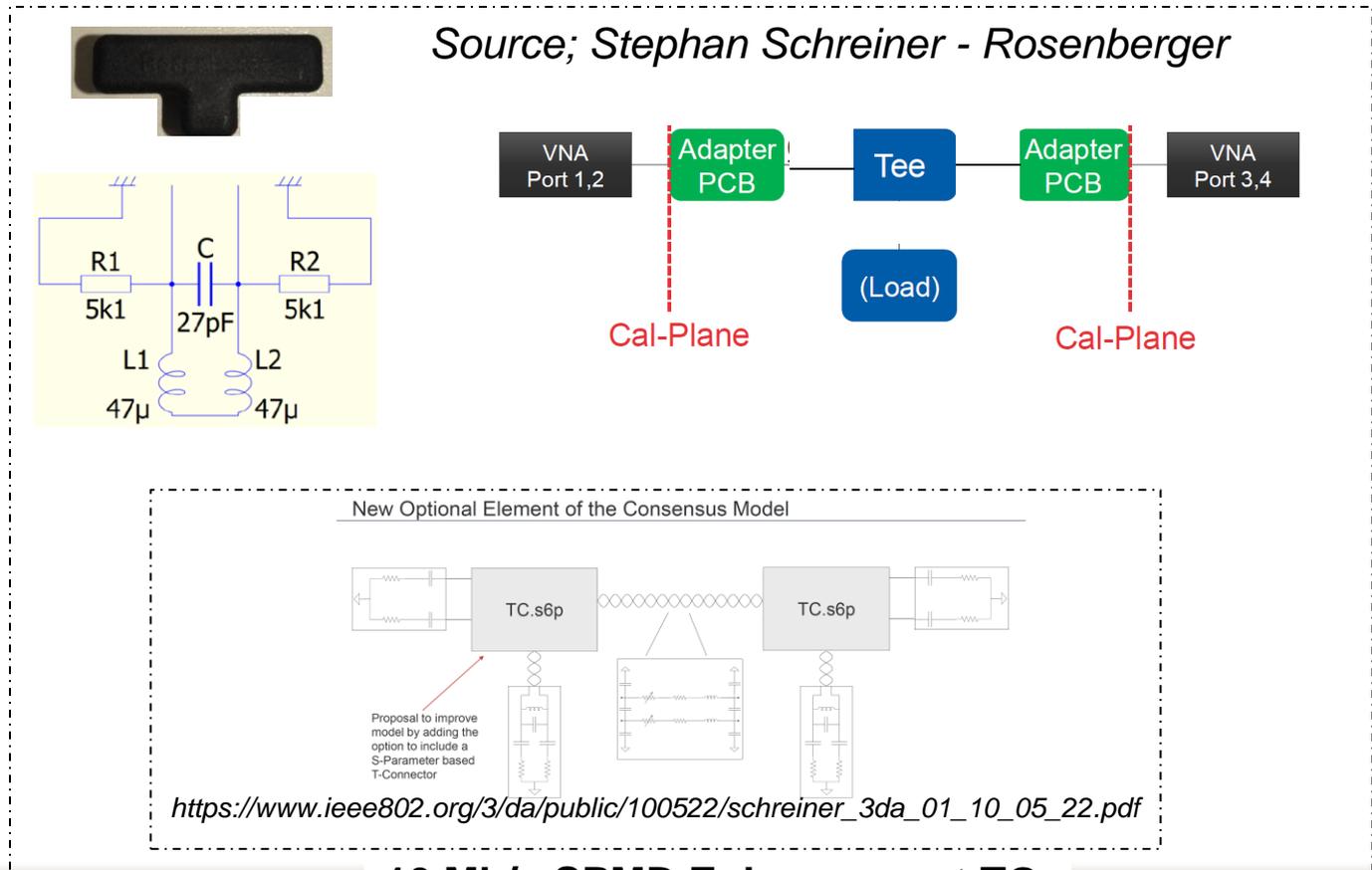


- 75 m - 23 AWG, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths
- 20 cm node spacing
- 23 AWG and 18 AWG



TCl Specifications

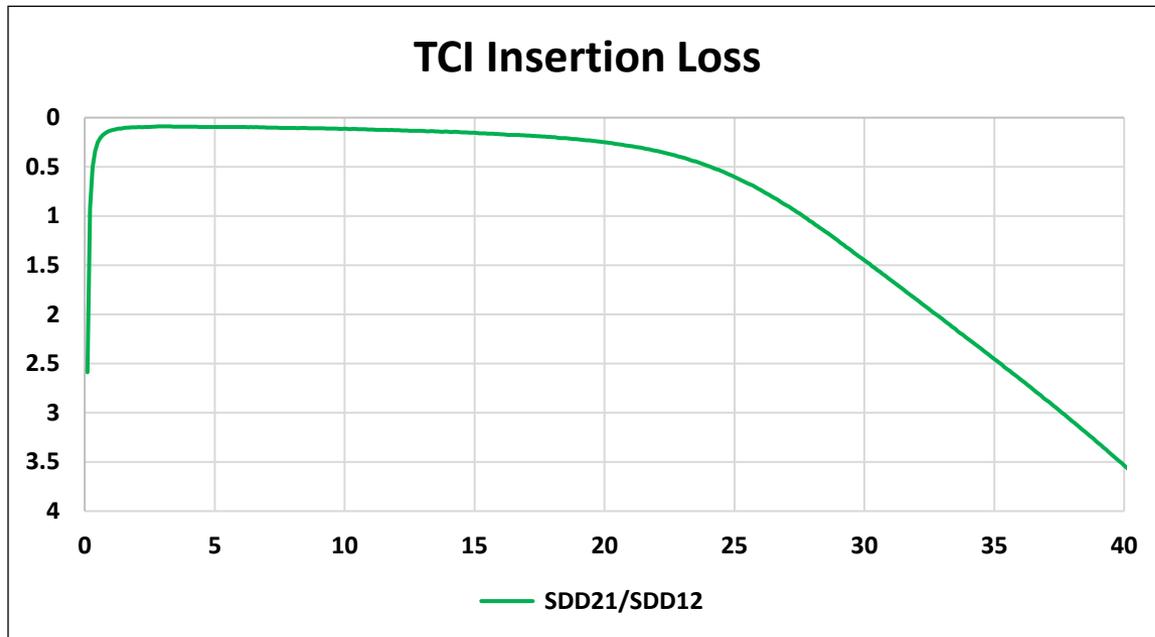
- S-parameter measurements of ferrite compensated Tee used in LT spice model (slide 7) provides the basis for TCl specifications; illustrates specification is achievable.
- Next step to carefully consider limits to avoid imposing unnecessary design constraints.



168.8.1.1 TCI Insertion Loss

168.8.1.1 TCI Insertion Loss

With the PMA or PMA load present at TC3, the differential insertion loss of the TCI between TC1 and TC2 shall be less than Equation (168-x) TBD dB measured in both directions. The differential reference impedance is 100 ohm.

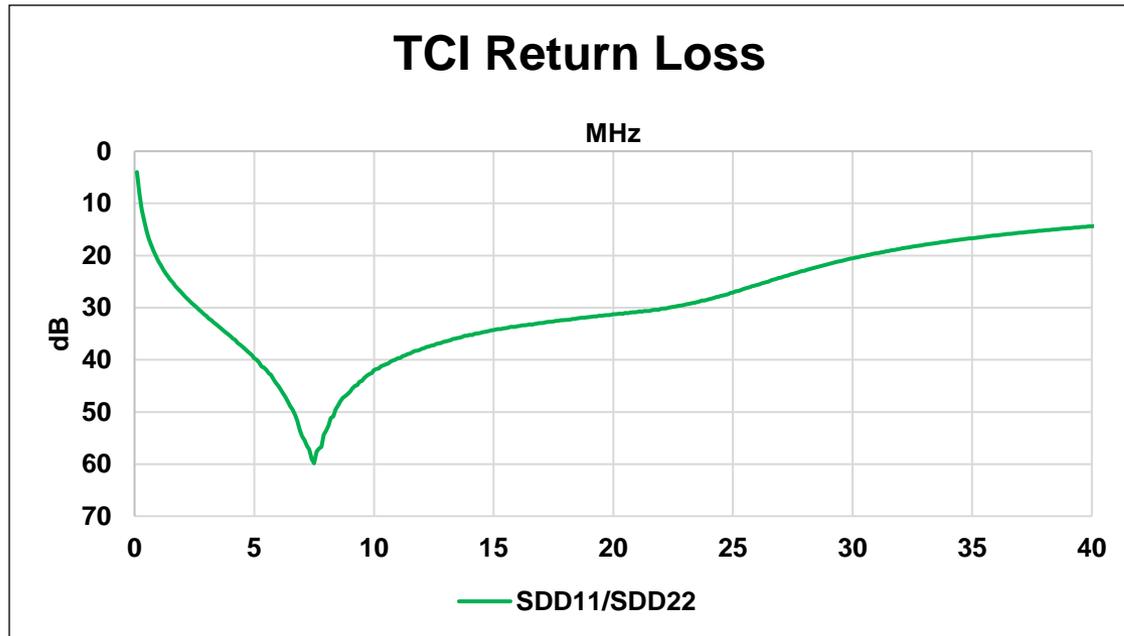


Equation (168-x) (TBD)

168.8.1.2 TCI - Return Loss

168.8.1.2 TCI Return Loss

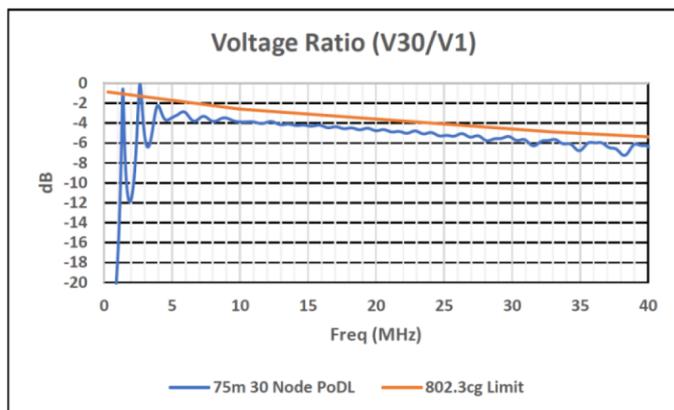
With a PMA or PMA load present at the TCI connection, the return loss of the TCI at TC1 and TC2 shall be greater than Equation (168-x) with the other trunk connection (i.e., TC2 or TC1, respectively) terminated in 100 Ω .



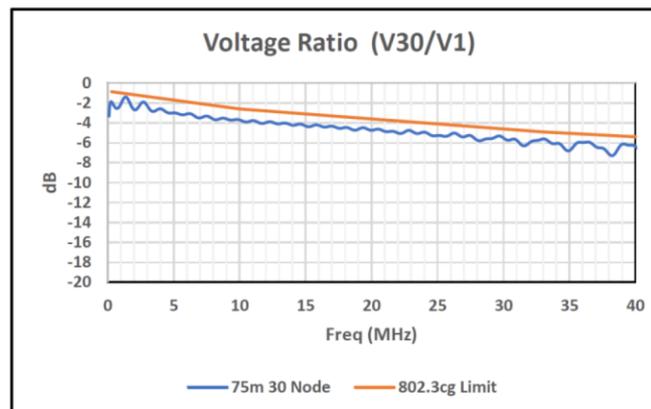
Equation (168-x) (TBD)

Mixing Segment Characteristics - 18 AWG

Multidrop Topology - 75 m, 30 node, clumped compensated

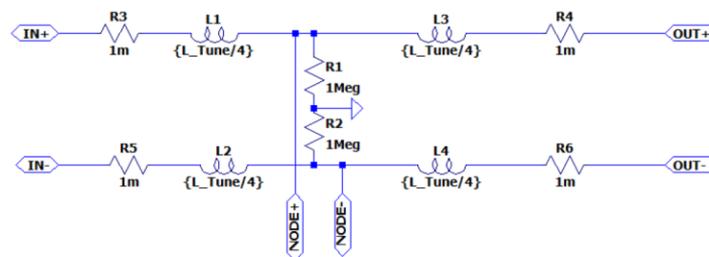


PoDL



No PoDL

- 75 m, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths
- 4X80 nH inductances



https://www.ieee802.org/3/da/public/1122/diminico_SPMD_01_1122.pdf

TCI 168.7 - suggested revision to IEEE P802.3da™/D1.0

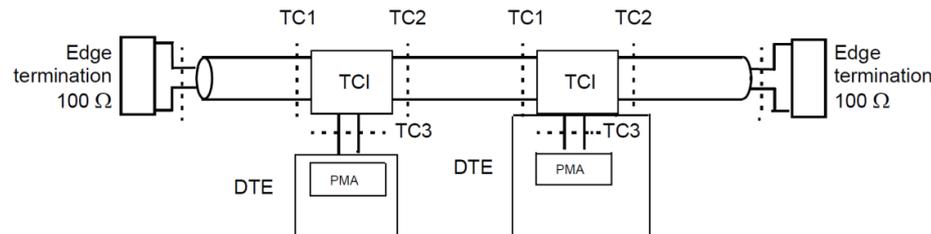
(2)>>Change text under 168.7 TCI specification line 8-11;

From: The mixing segment shall be a linear topology, with DTE attached at a TCI, where each TCI has two interfaces on the mixing segment, one interface facing in the direction of left edge termination of the mixing segment (TC1), and one facing in the direction of the right edge termination of the mixing segment (TC2), and a four-wire interface facing the PMA (and any associated stub or service loop) (TC3) (see Figure 168–18).

Changing to two-wire and removing service loops which can be implemented in trunk without calling it a TCI (four-wire)...

To:

The mixing segment topology has the PMA or PMA load connected to a TCI, where each TCI has two connections on the mixing segment, one connection facing in the direction of left edge termination of the mixing segment (TC1), and one facing in the direction of the right edge termination of the mixing segment (TC2), and a two-wire connection facing the PMA (and any associated stub) (TC3). TC3 may not be accessible in an implemented system.



NOTE - PMA transmit and receive specifications are met at TC1 and TC2.

Figure 168–17—Mixing segment and reference points

TCI 168.8 suggested revision to IEEE P802.3da™/D1.0

(1)>>Change text under 168.8 TCI specification line 34-36 and associated figure;

From: >>Each TCI has one interface facing each direction of the mixing segment (TC1 and TC2), and a four-wire interface facing the PMA (and any associated stub or service loop) (TC3) as shown in Figure 168–18.

To: Each TCI has one connection facing each direction of the mixing segment (TC1 and TC2), and a two-wire connection facing the PMA as shown in Figure 168-17 (slide 11). TC3 may not be accessible in an implemented system.

The coax cable interface (MDI) to the shared media is not three interfaces..... treat TCI similarly...

1.4.249 coaxial cable interface: The electrical and mechanical interface to the shared coaxial cable medium either contained within or connected to the Medium Attachment Unit (MAU). Also known as the Medium Dependent Interface (MDI).

Summary

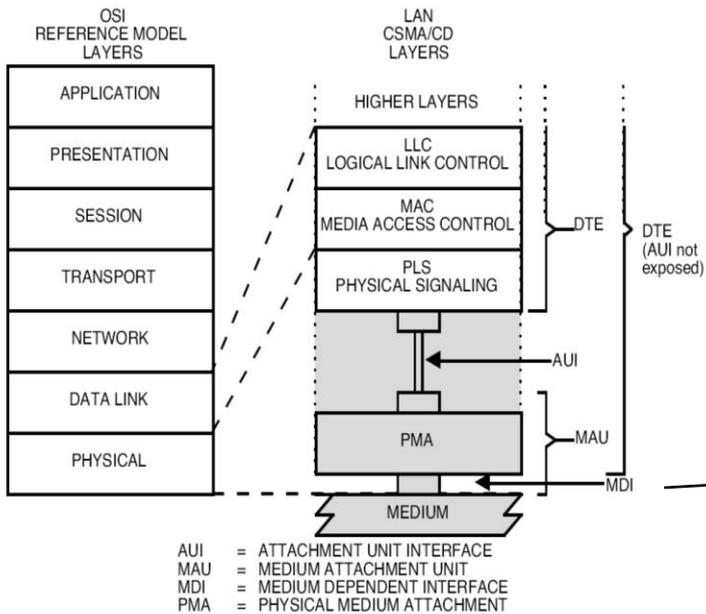
- TCI and Mixing Segment Characteristics (2-wire)
- Specification methods - models and measurements
- Resultant TCI and mixing segment specification recommendations

Supplemental

Background - 10BASE2

10. Medium attachment unit and baseband medium specifications, type 10BASE2

1.4.249 coaxial cable interface: The electrical and mechanical interface to the shared coaxial cable medium either contained within or connected to the Medium Attachment Unit (MAU). Also known as the Medium Dependent Interface (MDI).



10.6 Coaxial trunk cable connectors

The trunk coaxial medium requires termination and is partitioned into sections. Devices to be attached to the medium require a means of connection to the medium. This means is provided by a BNC "T" adapter, as shown in Figure 10-7.

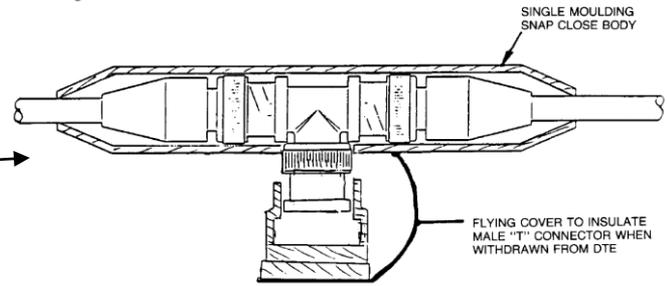


Figure 10-1—Physical Layer partitioning, relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model

Source: IEEE Std 802.3-2022

Attachment is with specified plug/receptacle

- Specified without DTE attached > 10.5.1.4 Edge jitter; entire segment without DTEs attached