IEEE P802.3bp (1000BASE-T1) PHY Task Force
Channel Definitions Ad Hoc Report

San Diego, CA
July 2014

Ad hoc – co-chairs
Chris DiMinico –
MC Communications/Panduit
Mehmet Tazebay –
Broadcom

Channel Definitions Ad Hoc

- Ad Hoc charted to develop channel definitions
- Initial meeting IEEE Interim May 2012
- Communications via RTPGE reflector
- Follow-on meetings and conference calls to develop
- consensus on baseline Link Segment specifications
  - June 5, July 3,10
- Approved baseline text in IEEE P802.3bp™/D0.4, 2 July 2014

Action items

- Optional link segment specifications
  - Straw proposal(s):
    - ✓diminico_3bp_01_0714.pdf

- Test fixture specifications
  - Straw proposal: 802.3bp test points-3-6-14.pdf
  - Revision Request to consider 3-port balance measurements – Broadcom
  - Update proposal due July 31

- Link segment balance test procedures (Annex)
  - Revisions to IEEE P802.3bp™/D0.4 – from ad hoc reviews

- Alien crosstalk topologies and test procedures (Annex)
  - Revisions to IEEE P802.3bp™/D0.4 – from ad hoc reviews

- *Note: 802.3bp to use Clause 97…*

Meeting Plan

- Meet week of July 14 – IEEE plenary San Diego, CA

- Next webex meeting July 31 - 8 AM PST
  - Meet every two weeks

Ad hoc review material

Annex:
Alien Crosstalk Test Procedure

Revisions to IEEE P802.3bp™/D0.4 – from ad hoc reviews

Annex: Alien Crosstalk Test Procedure

This Annex describes a procedure for measuring ANEXT loss and AFEXT loss between pairs of adjacent link segments consisting of cables and in-line connectors. The procedure is required to assess the alien crosstalk performance of the link segments as specified in 98.4.4.3 Coupling parameters between type A link segments and 98.4.4.4 Coupling parameters between type B link segments. This procedure is intended for use in the laboratory, to evaluate that the link segments complies with the PSANEXT loss and PSAACRF requirements, when properly installed.

Alien crosstalk test configurations

Alien crosstalk test configurations

Alien crosstalk coupled between type A link segments

The limits for PSANEXT and PSAACRF are based on the alien crosstalk test configuration in figures (TBD). The automotive link segment test configurations are derived from two automotive industry use cases representative of common scenarios. Measurements to be performed at 23 deg +/-5 deg C (TBD) relative humidity 25%-75% (TBD).

Multiport test fixtures shall be used for multiport link segments. The number of disturbing ports to be included in the power sum calculation is dependent on the configuration. Significant connectors may be located in the same or other mounting systems in close proximity and shall be assessed as follows. For any given configuration, the determination of which ports to be included can be made based on the ANEXT loss contribution to the disturbed port. If at any frequency point the ANEXT measurement is less than TBD, then the entire ANEXT loss and PSAACRF response of that connector combination shall be included in the overall power sum result

Multiport link segments not under test are terminated in 100 ohms differential mode and common mode (TBD ohms) at both ends.

Alien crosstalk test configurations

Alien crosstalk coupled between type A link segments

The use case 1 alien crosstalk test configuration consists of three link segments of 5 meter length and two inline connectors, equally spaced at 1.66 meter distance. The power sum ANEXT loss between any disturbed type A link segment and the disturbing type A link segments shall meet the values determined using Equation (98–7). The power sum AACRF between any disturbed type A link segment and the disturbing type A link segments shall meet the values determined using Equation (98–9).

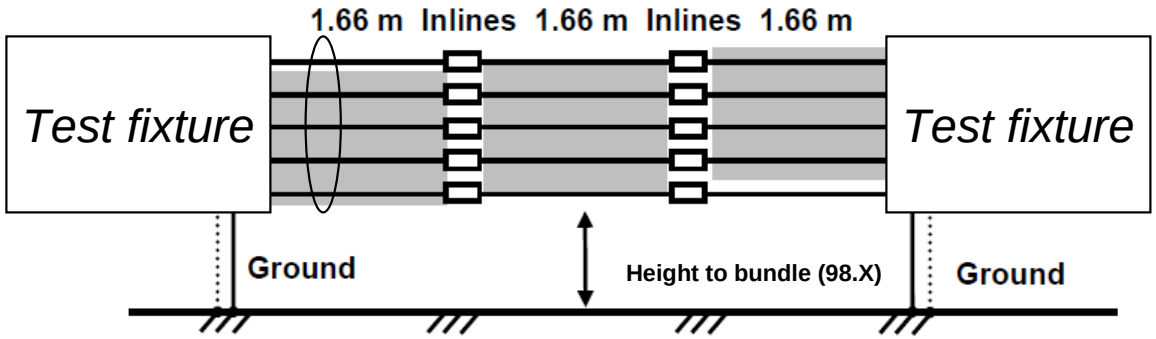


Figure 1: Alien crosstalk test configuration (channel)

Alien crosstalk test configurations

Alien crosstalk coupled between type A link segments)

The use case 2 alien crosstalk test configuration consists of 5 link segments bundled together over a 5 meter length with one of the link segments extending unbundled for 3 meters. The 3 meter unbundled section includes 2 inline connectors in addition to the 2 inline connectors in the 5 meter bundled section. The power sum ANEXT loss between any disturbed type A link segment and the disturbing type A link segments shall meet the values determined using Equation (98–7).
The power sum AACRF between any disturbed type A link segment and the disturbing type A link segments shall meet the values determined using Equation (98–9).
(add editors note for calculating PSAACRF asymmetrical link)

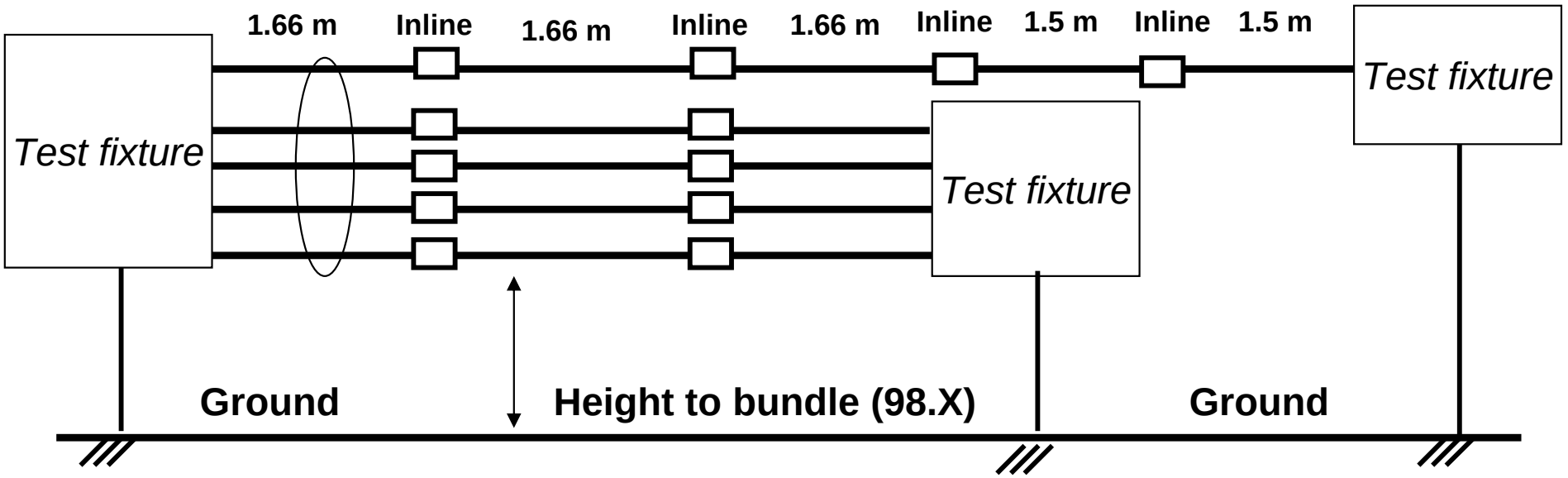
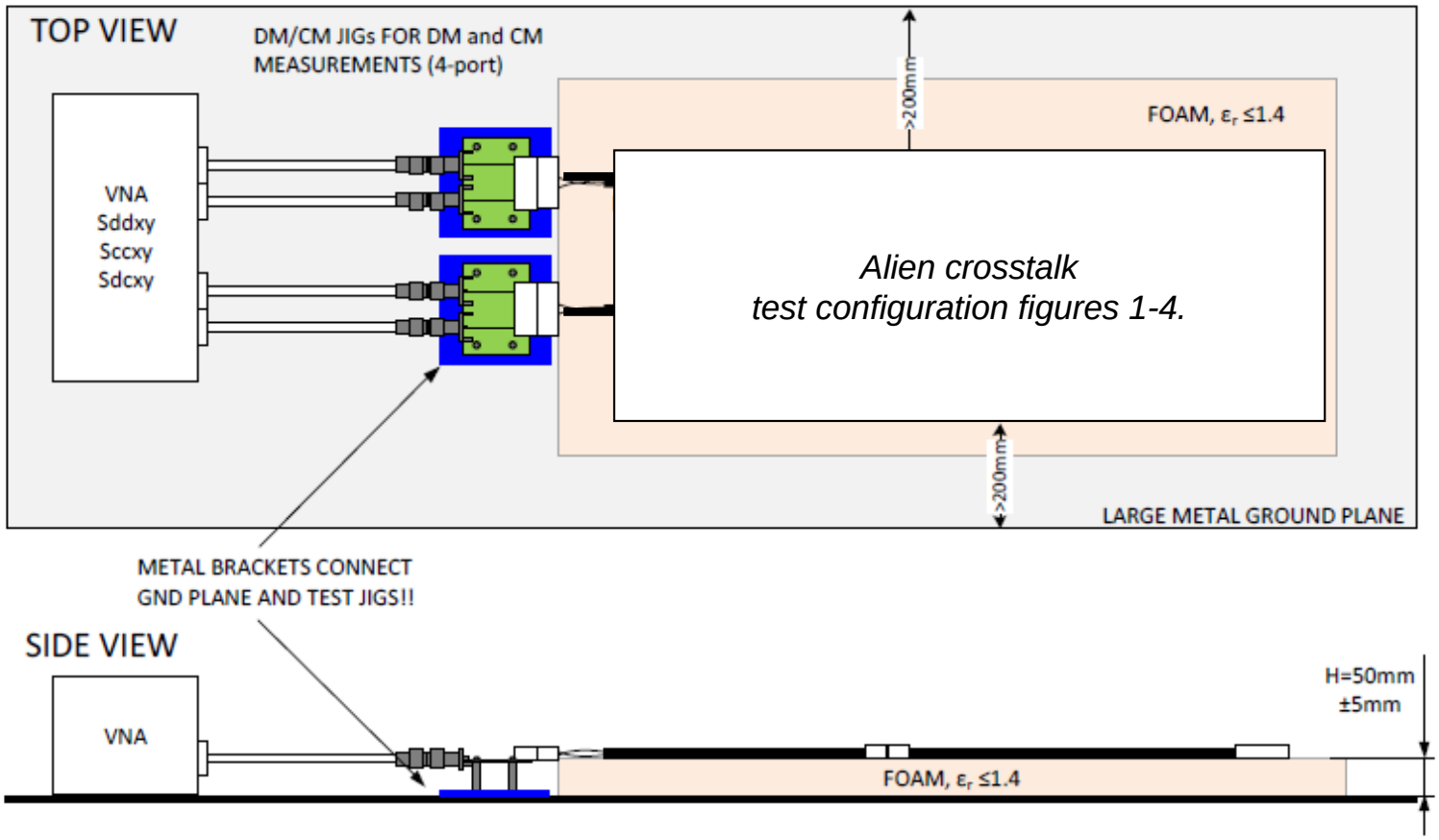


Figure 3. Alien crosstalk test configuration (channel)

Alien crosstalk test configuration

The Alien crosstalk measurements are to be performed utilizing the test setup and methodology specified in Annex 98A.



Notes:
1. Two DM/CM jigs are used for all 4-port differential mode and common mode measurements.
2. Brackets provide reference "0V" for CM at the ends of DUT and VNA cables.
3. The entire setup is on a large metal GND plane, which extends at least 200mm beyond the setup.

Alien crosstalk test configurations

Cable bundling

The cable bundle shall be placed on dielectric insulation material (εR < 1.4) of 50 mm height over conducting ground plane. The cables should be fixed in their position by means of cable straps or adhesive tape to keep the cables attached together with a maximum distance between the fixation devices of 30 cm (TBD). The measurement test fixtures are to be connected to the reference ground plane by means of conducting stands, copper braid, or foil. Cables not under test are terminated in 100 ohms differential mode and (TBD ohms) common Mode at both ends. If it is necessary to split up the wiring harness at the end of the bundle in order to accommodate the measurement fixtures, the length of the area split up is limited to the maximum of 30 cm (TBD).

An example of cable bundling for the five around one alien crosstalk test configuration is illustrated in Figure 97B–5. For use case 2, the link segment extending unbundled for 3 meters is centered in the cable bundle e.g., cable 2 in Figure 97B-5.

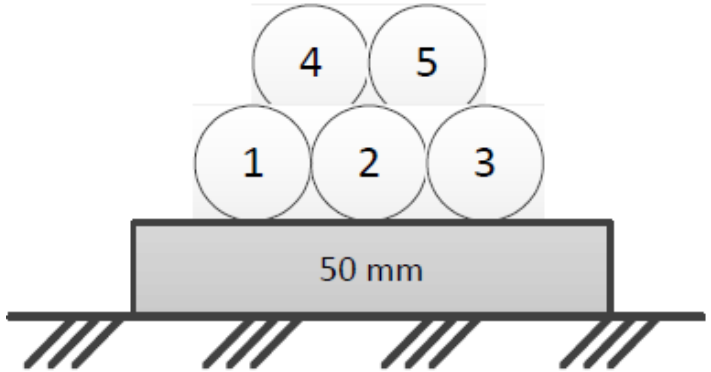


Figure 97B–5—Cable bundle in five around one configuration

Balance test procedures (Annex) June 5th meeting notes

1. *slide or page numbers are recommended Balance Link Annex*
2. *brackets should be identified as low inductance for proper ground referencing*

   (add to annex physical attributes to identify low inductance)
3. *link segment should include MDI at ends? (It is drawn as TP test leads) (will address in test fixture discussions)*
4. *height is only for 5 cm? Should it allow for 10mm? (5 cm - correlation to EMC setup – 2m?) (we should allow 10 mm (see correlation measurements moffit and mueller *.pdf), we need to add text for equivalency) i*

   Thomas M…to generate proposal….
5. *Need schematic for 3 port circuit (yes, Nevin)*
6. *Need equivalence calculations between the two methods (yes, Nevin)*
7. *Test setup - VNA common mode impedance calibration (common mode ground plane calibration)*

Annex:
Common mode conversion test methodology

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Annex 97A – Common mode conversion test methodology

Annex 97A

(normative)

Common mode conversion test methodology

97A.1 Introduction

This annex describes the test methodologies used to measure the 1000BASE-T1 link segment differential to common mode conversion loss specified in 97.4.4.1.4.

97A.2 Test Configuration and Measurement

The common mode conversion loss is measured in a specified test environment to ensure repeatability; illustrated in Figure 97A–1 and Figure 97A–2. The 1000BASE-T1 link segment (TBD length) is placed on a reference plane raised (1, 5, TBD) cm from the surface of the ground plane.

To avoid ground-plane edge effects the 1000BASE-T1 link segment (TBD length) must be (3, 15, TBD) cm from the edge of the ground plane, this same spacing is used between adjacent sections of the same link segment to avoid unwanted coupling. The test fixtures used in the measurement conform to the test fixture specifications in clause TBD. The link segment parameters specified in 97.4.4 are to be measured using Annex 97A methodology.

Editorial Note (to be removed prior to publication): Include, either in the Annex or in the test fixture sub-clause, allowance for 3-port common mode conversion loss measurements when equivalency has been demonstrated

Annex 97A – Common mode conversion test methodology

Annex 97A

(normative)

Common mode conversion test methodology

97A.1 Introduction

This annex describes the test methodologies used to measure the 1000BASE-T1 link segment differential to common mode conversion loss specified in 97.4.4.1.4.

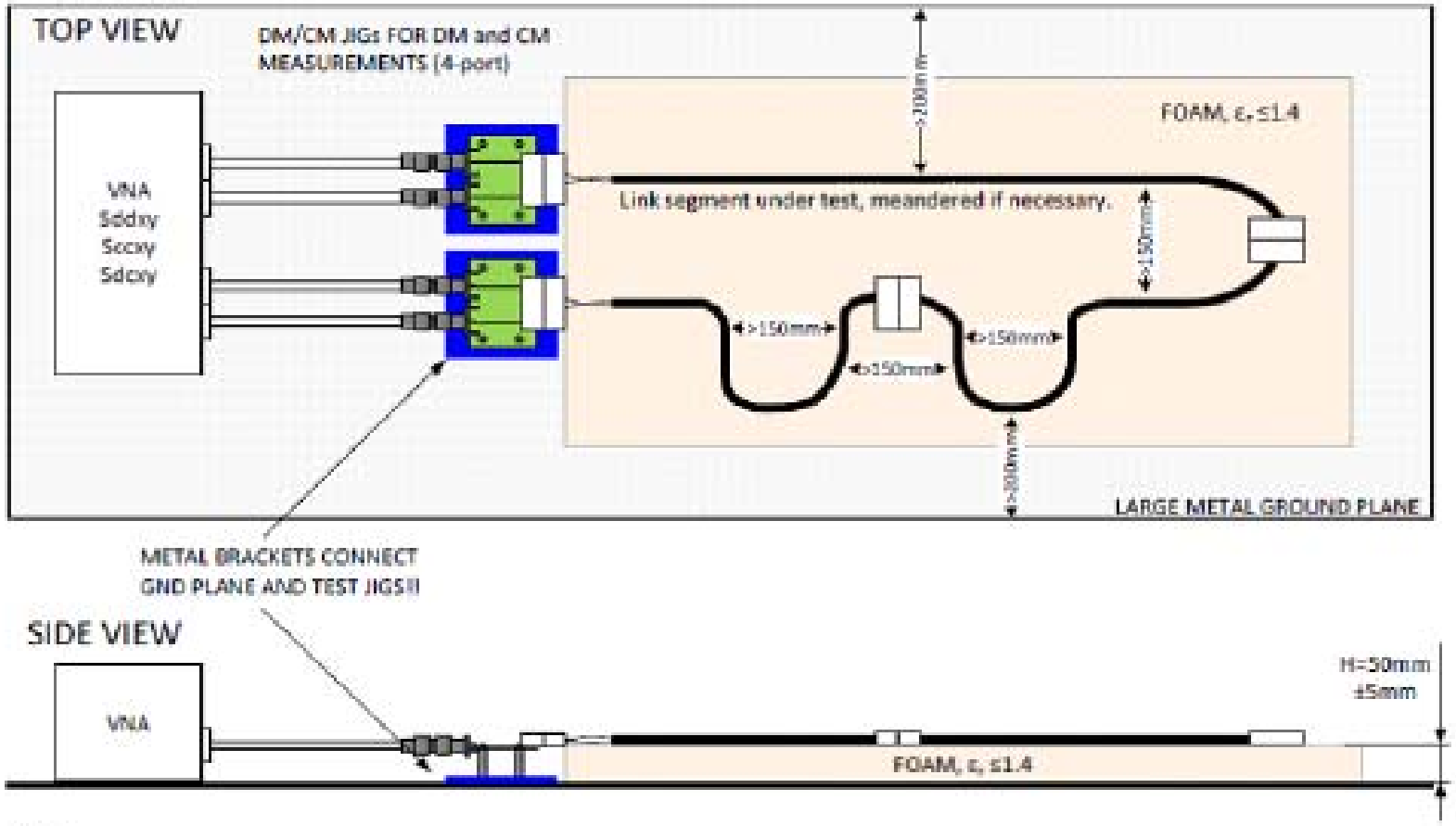
97A.2 Test Configuration and Measurement

The common mode conversion loss is measured in a specified test environment to ensure repeatability; illustrated in Figure 97A–1 and Figure 97A–2. The 1000BASE-T1 link segment (TBD length) is placed on a reference plane raised (1, 5, TBD) cm from the surface of the ground plane.

To avoid ground-plane edge effects the 1000BASE-T1 link segment (TBD length) must be (3, 15, TBD) cm from the edge of the ground plane, this same spacing is used between adjacent sections of the same link segment to avoid unwanted coupling. The test fixtures used in the measurement conform to the test fixture specifications in clause TBD. The link segment parameters specified in 97.4.4 are to be measured using Annex 97A methodology.

Editorial Note (to be removed prior to publication): Include, either in the Annex or in the test fixture sub-clause, allowance for 3-port common mode conversion loss measurements when equivalency has been demonstrated

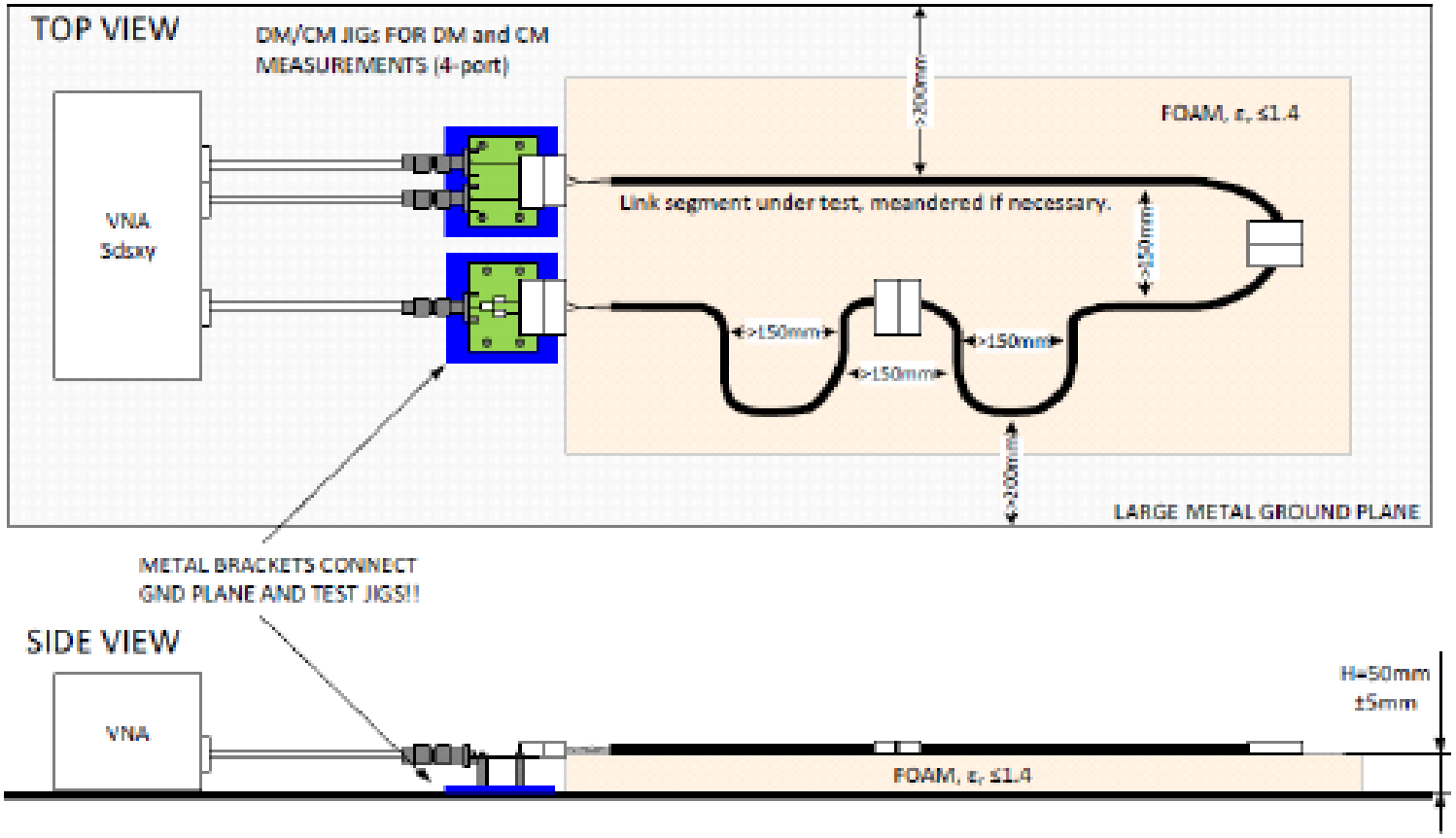
Annex 97A – Test setup



Notes:
1. Two DM/CM jigs are used for all 4-port differential mode and common mode measurements.
2. Brackets provide reference "0V" for CM at the ends of DUT and VNA cables.
3. The entire setup is on a large metal GND plane, which extends at least 200mm beyond the setup.

Figure 97A–1—4-port test setup

Annex 97A – Differential to common mode test setup



Notes:
1. The 50 Ω 0.1% resistors are RF-type SMD 0805 or smaller, e.g. Vishay FC series thin-film resistors.
2. Brackets provide reference "0V" for CM at the ends of DUT and VNA cables.
3. The entire setup is on a large metal GND plane, which extends at least 200mm beyond the setup.

Figure 97A–2—3-port common mode conversion loss measurement

802.3bp test points, test fixtures and parameters

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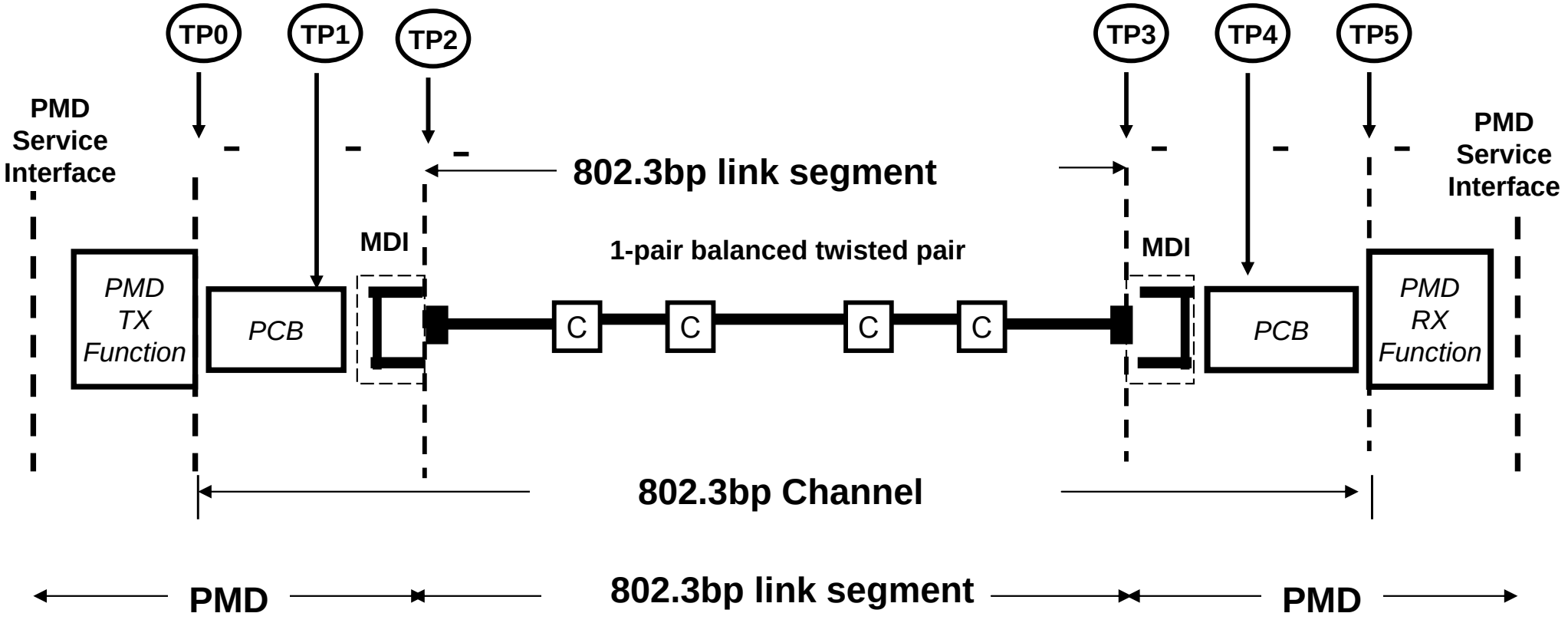
Presentation objectives

- 802.3bp test points, test fixtures and parameters

802.3bp test points



1000BASE-Tx link (one direction is illustrated)

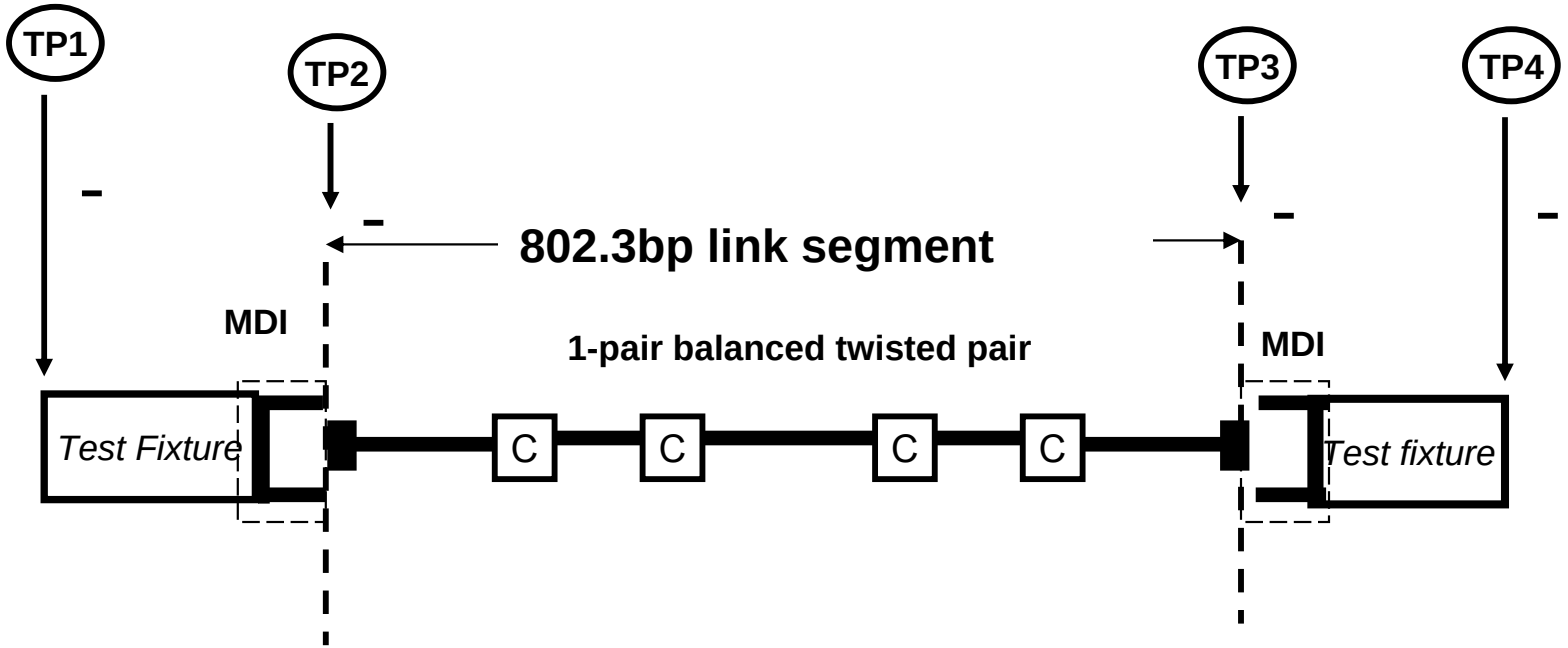
*Material for baseline draft PMD Function

1000BASE-Tx test points

Reference	Description
TP0-TP5	The 1000BASE-Tx channel including the transmitter and receiver differential controlled impedance printed circuit board insertion loss, the MDI, and the link segment insertion loss.
TP1-TP4	The test fixture specified in 98(TBD) is required for measuring the link segment specifications in 98.4.4 at TP1 and TP4.
TP2-TP3	The link segment specifications in 98.4.4 are referenced to TP2 and TP3.
TP2	Transmitter measurements defined in 98(TBD) are made at TP2 utilizing the test fixture specified in 98(TBD).
TP3	Transmitter measurements defined in 98(TBD) are made at TP3 utilizing the test fixture specified in 98(TBD).

*Material for baseline draft PMD Function

802.3bp link segment

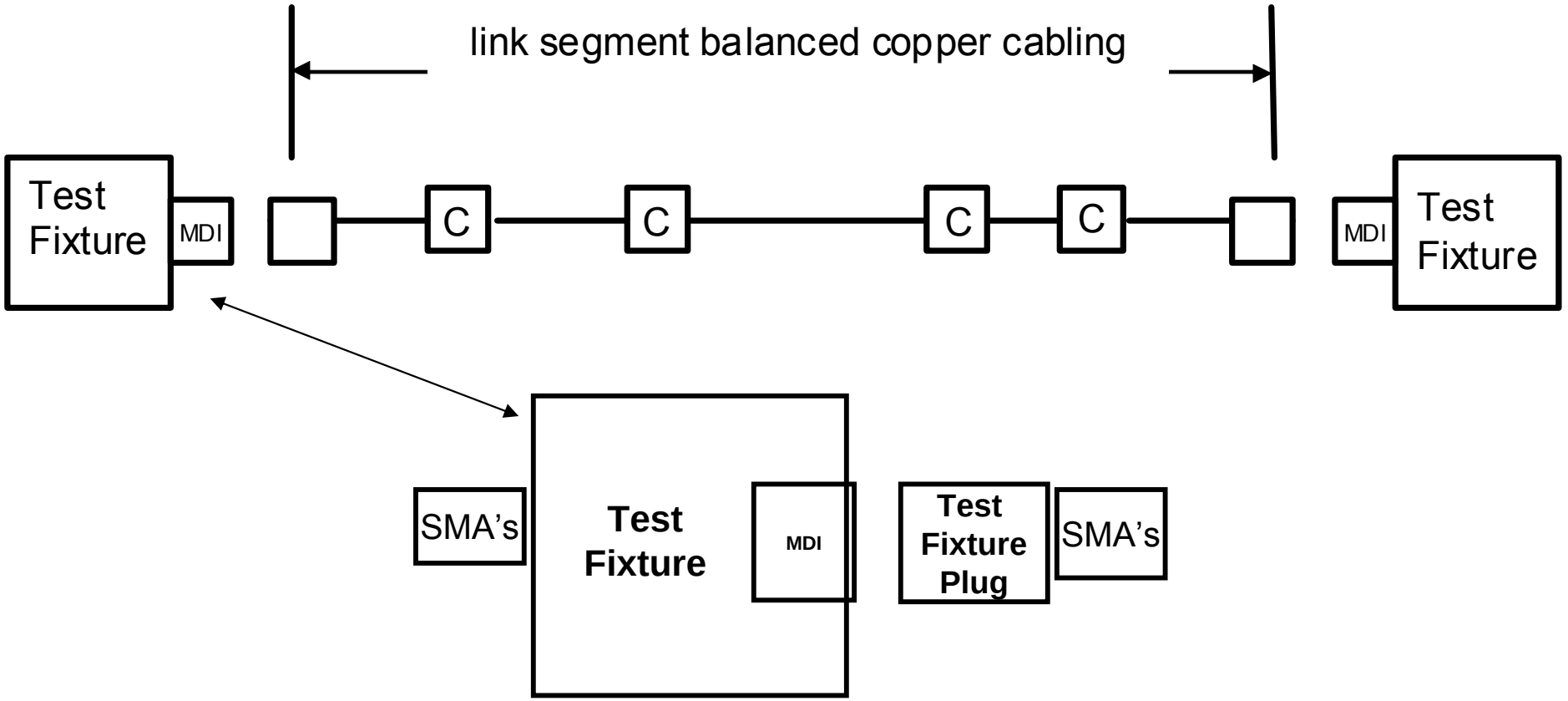


Link segment transmission and coupling parameters – TP2-TP3

- Insertion loss
- Return loss
- Common to differential conversion loss (SDC12/SDC21) (UTP)
- Alien Crosstalk
  - PSANEXT, PSAACRF

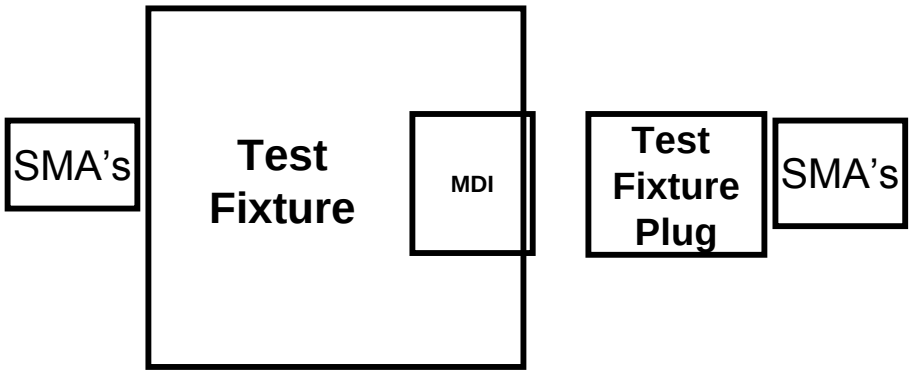
*Material for baseline test fixture specifications

RTPGE Test Fixtures



Specified in a mated state

RTPGE Test Fixtures



Specified in a mated state

- **Insertion loss**
- **Return loss**
- **Common to differential conversion loss (SDC12/SDC21)**
- **Common to differential conversion loss (SDC11/SDC22)**

- **Alien Crosstalk (between MDI's)**
  - **PSANEXT, PSAFEXT**

*Material for baseline test fixture specifications