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# **IEEE P802.3bp (RTPGE) PHY Task Force Channel Definitions Ad Hoc Report**

**Norfolk, VA  
May 2014**

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

# Channel Definitions Ad Hoc

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- Ad Hoc chartered 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
  - April 3, April 17, May 1
- Approved baseline text in IEEE P802.3bp™/D0.30, 31 December 2013

# Action items

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- **Optional link segment specifications**
  - **Straw proposal(s):**
    - ✓ **diminico\_3bp\_01\_0514.pdf**
- **Link segment balance test procedures (Annex)**
  - **Straw proposal: moffit\_3bp\_01\_1113.pdf**
  - **UNH-IOL: Curtis Donahue - Annex98Draft0.3-ckd.pdf**
- **Test fixture specifications**
  - **Straw proposal: 802.3bp test points-3-6-14.pdf**
  - **Request to consider 3-port balance measurements - Broadcom**
- **Alien crosstalk topologies and test procedures (Annex)**
  - **Straw proposal(s):**
    - ✓ **moffitt\_3bp\_01\_0713.pdf**
    - ✓ **mueller\_01\_0114\_baseline.pdf**
    - ✓ **alien crosstalk annex-discussion document.pdf C.DiMinico**

# Meeting Plan

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- **Meet week of May 19 – IEEE Interim Norfolk, VA**
- **Next webex meeting June 5 - 8 AM PST**
  - **Meet every week**

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# **Ad hoc review material**

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# **Annex: Alien Crosstalk Test Procedure**

**Chris DiMinico MC Communications/Panduit  
cdiminico@ieee.org**

# Annex: Alien Crosstalk Test Procedure

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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

### Automotive link segment

The automotive link segment test configurations are derived from automotive industry use cases.

### Optional link segment

The optional link segment test configurations are derived from automotive industry and industrial cabling use cases.

# PSANEXT loss and PSAACRF requirements

The power sum ANEXT loss between a disturbed type A link segment and the disturbing type A link segment shall meet the values determined using Equation (98-7).

$$\text{PSANEXT}(f) \geq \left\{ \begin{array}{ll} 54 - 10 \times \log\left(\frac{f}{100}\right) & 1 \leq f \leq 100 \\ 54 - 15 \times \log\left(\frac{f}{100}\right) - 6 \times \left(\frac{f-100}{400}\right) & 100 < f \leq 600 \end{array} \right\} \text{ dB}$$

The power sum AACRF between a disturbed type A link segment and the disturbing type A link segment shall meet the values determined using Equation (98-9).

$$\text{PSAACRF}(f) \geq -20 \log \left( 10^{\frac{-10 \times \log 0.15 + 38.2 - 20 \times \log \frac{f}{100}}{-20}} + 4 \times 10^{\frac{67 - 20 \times \log \frac{f}{100}}{-20}} \right) \text{ dB}$$

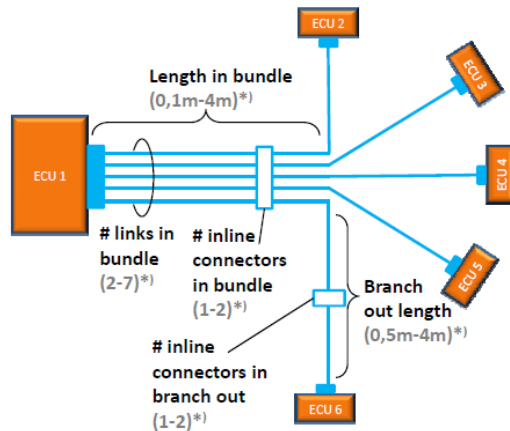
where

$f$  is the frequency in MHz



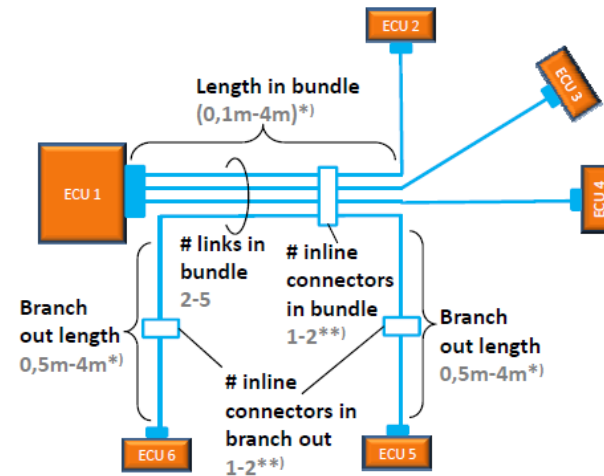
# RTPGE Alien XTALK Scenarios

## Most Common Scenario ECU output in Star Topology



\*)Typical numbers that do NOT add up to a worst case scenario, see later slides

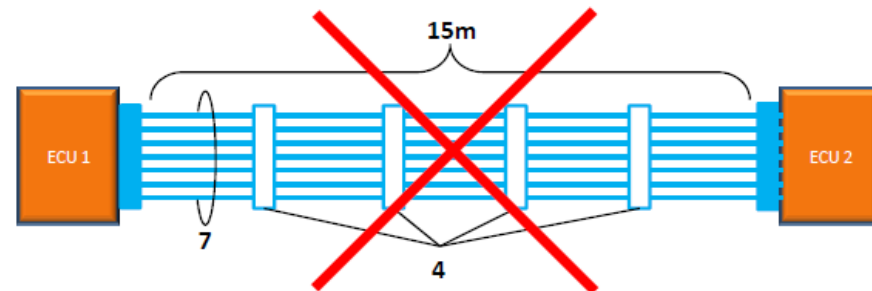
## Another possible Scenario Parallel links



\*) Typical values  
\*\*) Not more than 4 overall

It is extremely unlikely that two RTPGE links run in parallel from source to sink, let alone seven

- There might be four inline connectors in one link (that might be 15m long), but there will never be 4 inline connectors in the bundle
- The above two point are independent from whether the link is 1m or 15m long

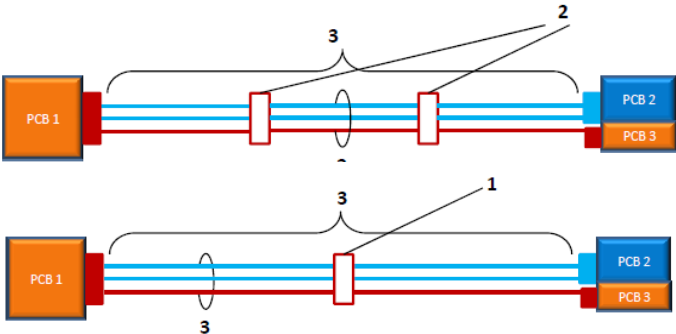


Source: RTPGE Alien XTALK Scenarios matheus\_3bp\_02\_0113

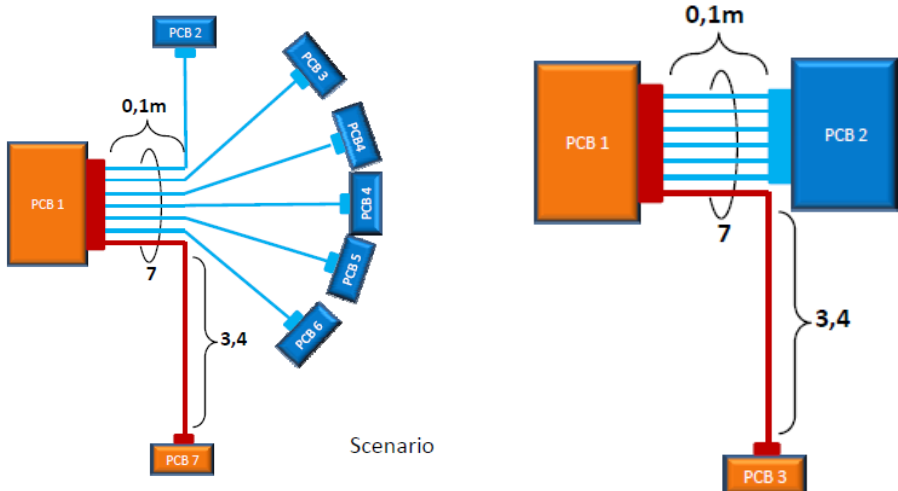
# Common Scenarios

#1) 3 parallel RTPGE links

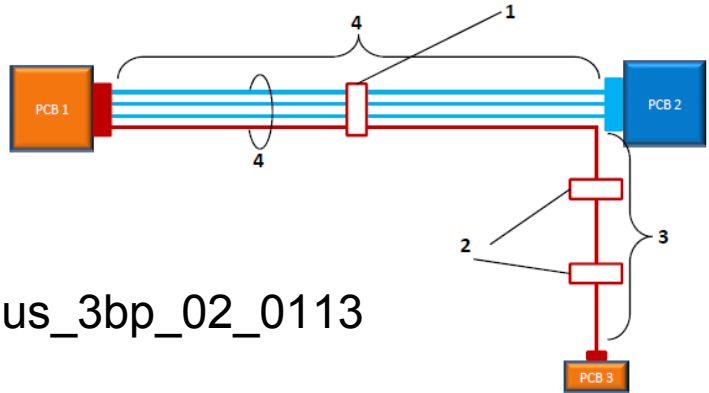
*moffitt\_3bp\_01\_0713.pdf*



#2) Central ECU output



#3) Surround view system in trunk



Source: RTPGE Alien XTALK Scenarios matheus\_3bp\_02\_0113

# Common Scenarios

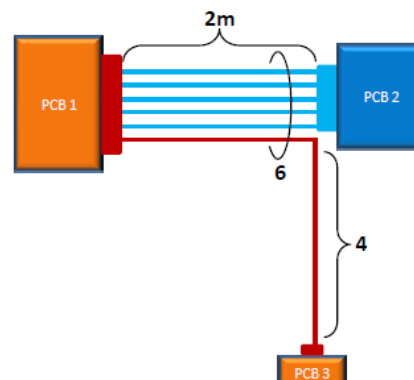
*moffitt\_3bp\_01\_0713.pdf*

Con-figuration	# of RTPGE links in bundle	Length of bundle (m)	# of inline connectors in bundle	Additional length of branch out [m]	# of inline connectors in branch out	Notes
#1a	3	3	2	0,1	0	Standard in car scenario
#1a	3	3	1	0,1	0	Standard in car scenario
#2	7	0,1	0	3,4	0	6 around one at one end of the cable (e.g. I&C), 3.5m as average length of high speed data cable
#3	4	4	1	3	2	Camera module in back to front camera, one inline connector in branch out

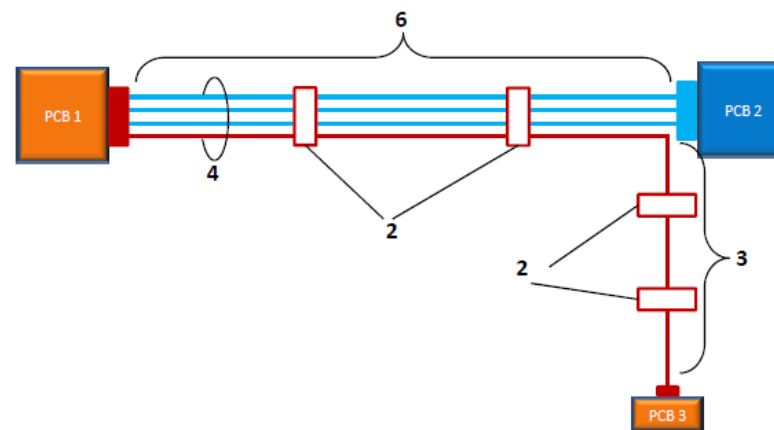
Source: RTPGE Alien XTALK Scenarios matheus\_3bp\_02\_0113

# Special Scenarios

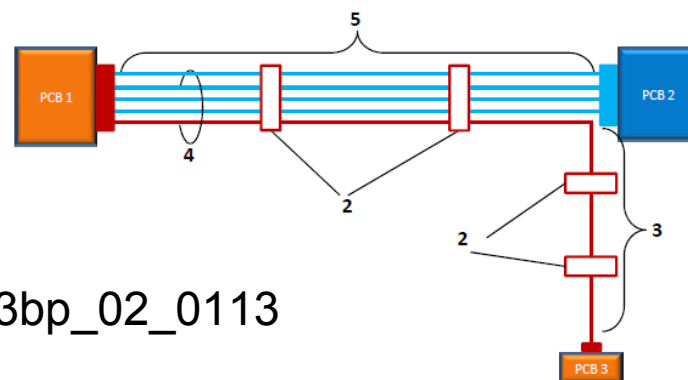
#4) Video Screens in Minivan



#5) Camera Module in extra long Vehicle



#6) Camera Module with more Cameras




*moffitt\_3bp\_01\_0713.pdf*

Source: RTPGE Alien XTALK Scenarios matheus\_3bp\_02\_0113

# Special Scenarios

Con-figuration	# of RTPGE links in bundle	Length of bundle (m)	# of inline connectors in bundle	Additional length of branch out [m]	# of inline connectors in branch out	Notes
#4	6	2	0	4	0	Video screens in Minivan
#5	4	6	2	3	2	Camera module extra long vehicle
#6	5	5	2	3	2	Camera module with more cameras

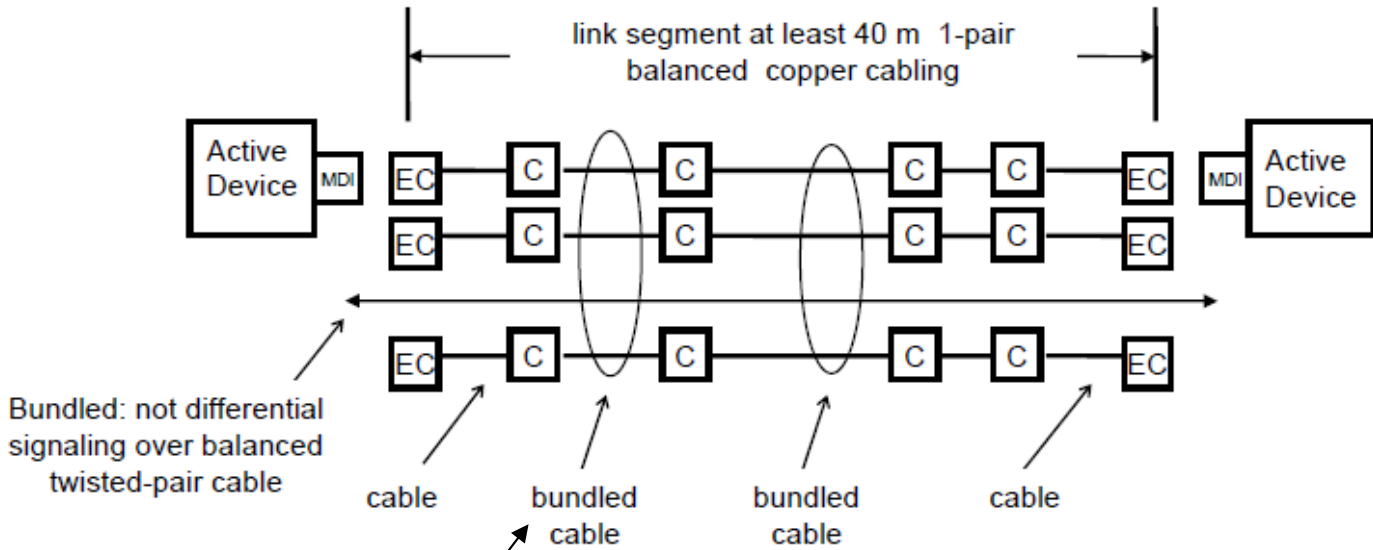
*moffitt\_3bp\_01\_0713.pdf*



Source: RTPGE Alien XTALK Scenarios matheus\_3bp\_02\_0113

# Alien crosstalk test configurations

## Optional Link Segment



The IEEE 802.3 nomenclature is bracketed to identify relationship to the IEEE 802.3 definitions.

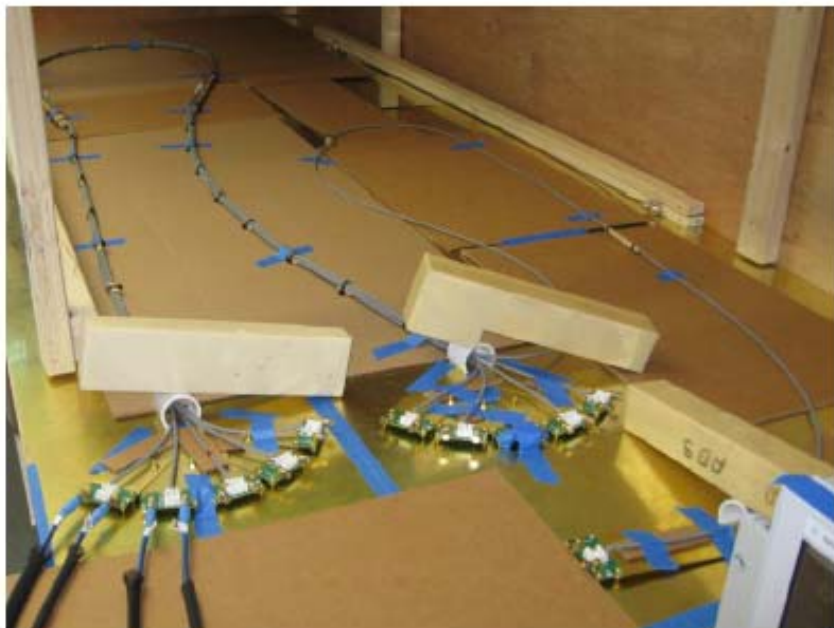
Length objective [EC] to [EC] at least 40 m  
Number of inline connectors [C] = 4

- C = inline connector
- EC = connection to equipment
- MDI = Active electronics connector [Medium dependent interface (MDI)]

6-around-1

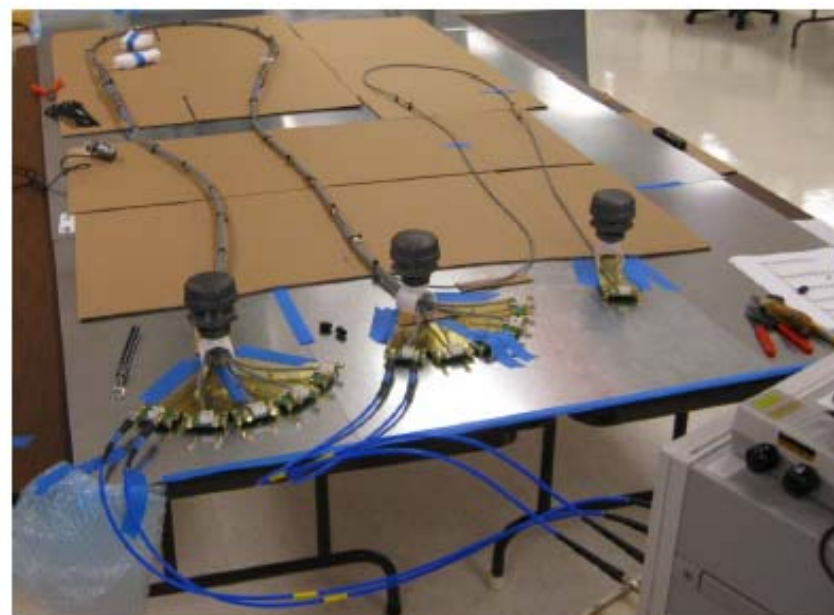
# Annex: Alien Crosstalk Test Procedure

## Test setup



UNH-IOL Test Setup

CommScope Test Setup



Source: *moffitt\_3bp\_01\_0713.pdf*

# Annex: Alien Crosstalk Test Procedure

Use Annex 98A test setup

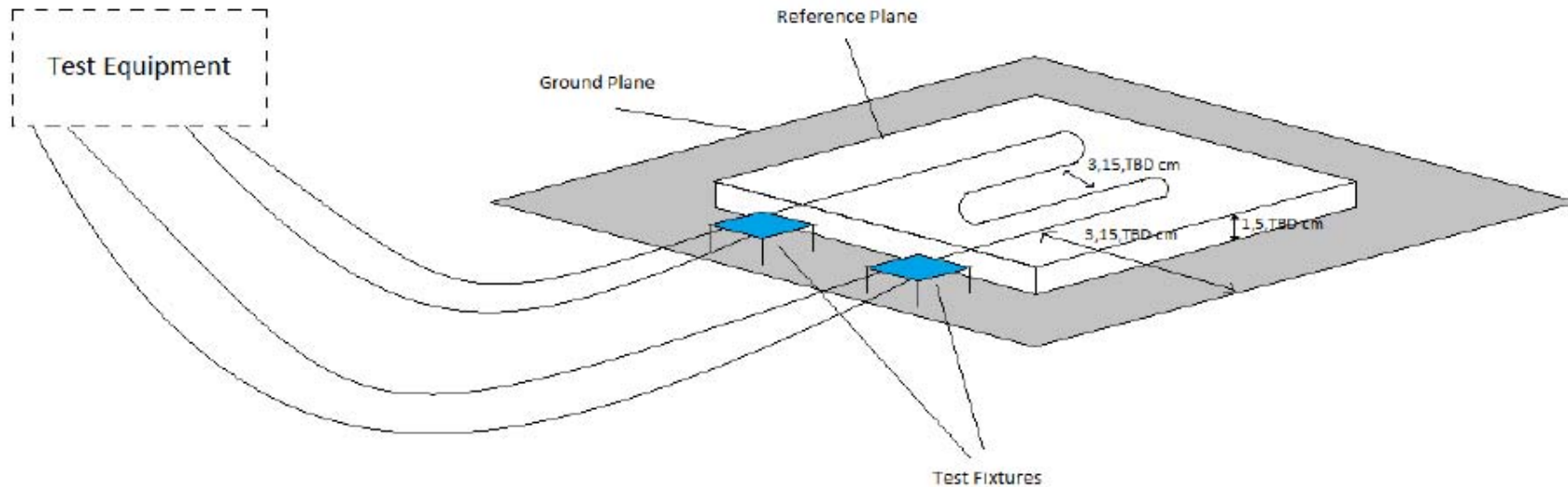


Figure TBD



# Annex 98A – Common mode conversion test methodology

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## Annex 98A

### **Introduction**

This annex describes the test methodologies used to measure the 1000BASE-T1 link segment differential to common mode conversion loss (SCD12/SCD21) specified in 98.4.4.1.4.

### **Test Configuration and Measurement**

The common mode conversion loss is measured in a specified test environment to ensure repeatability; illustrated in Figure TBD. The 1000BASE-T1 link segment (TBD length) is placed on a reference plane raised (1,5,TBD) centimeters 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) centimeters 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.

Editor's note: 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 98A – Test setup (TBD)

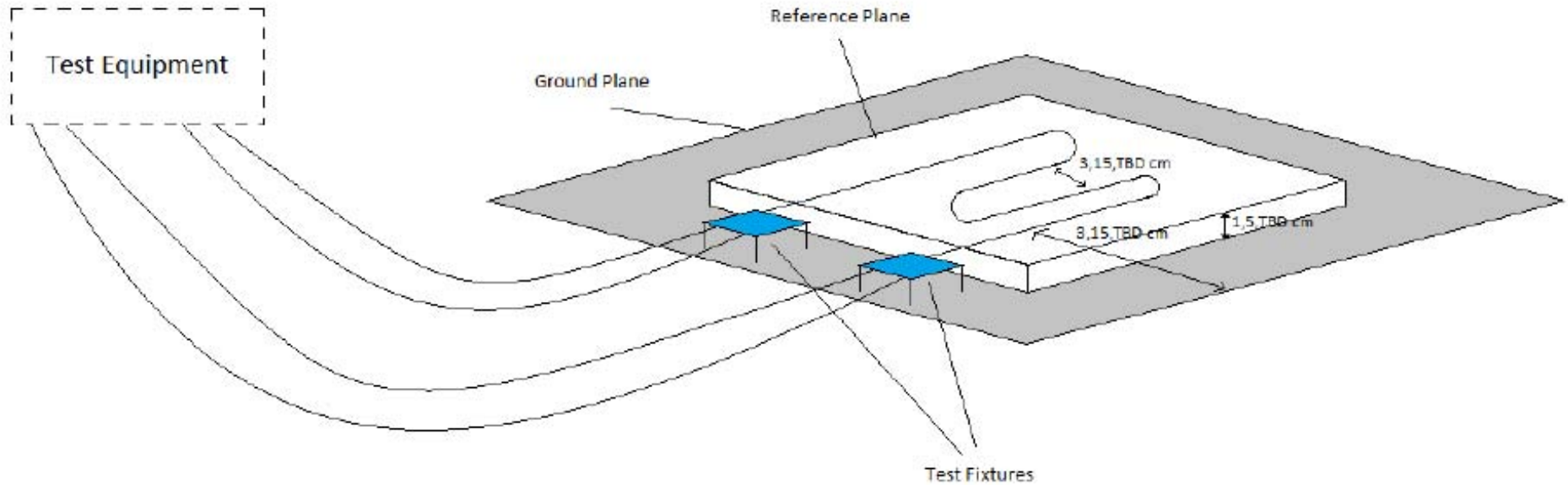


Figure TBD

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# 802.3bp test points, test fixtures and parameters

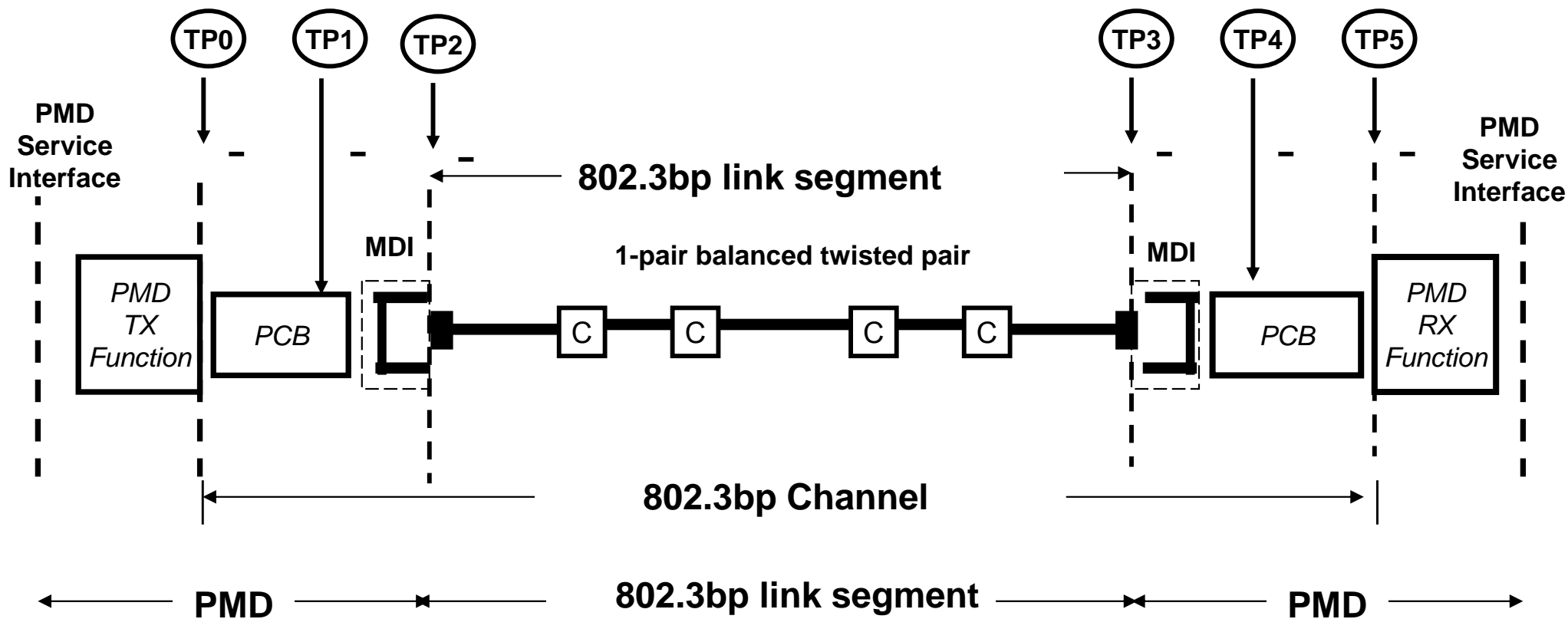
Chris DiMinico  
MC Communications/Panduit  
cdiminico@ieee.org

# Presentation objectives

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- **802.3bp test points, test fixtures and parameters**

# 802.3bp test points



1000BASE-Tx link (one direction is illustrated)

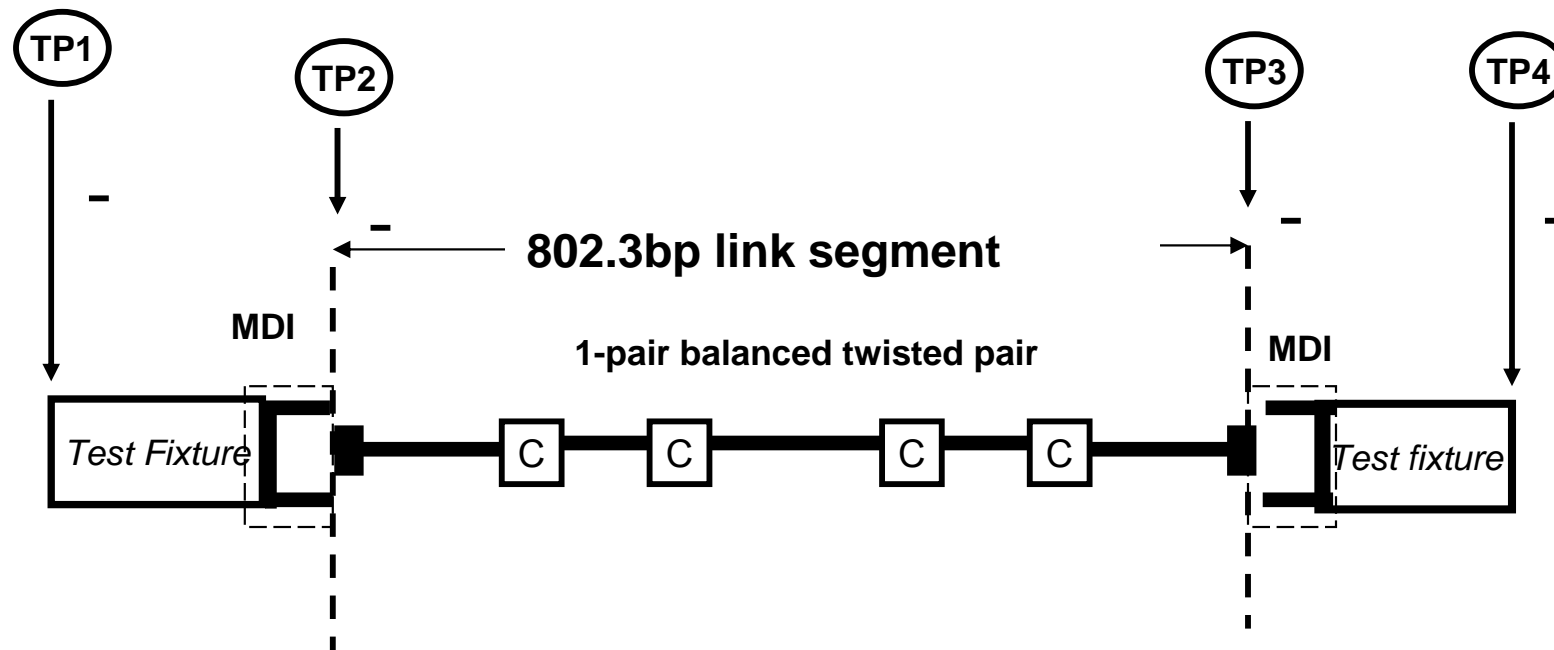
\*Material for baseline draft PMD Function

# 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

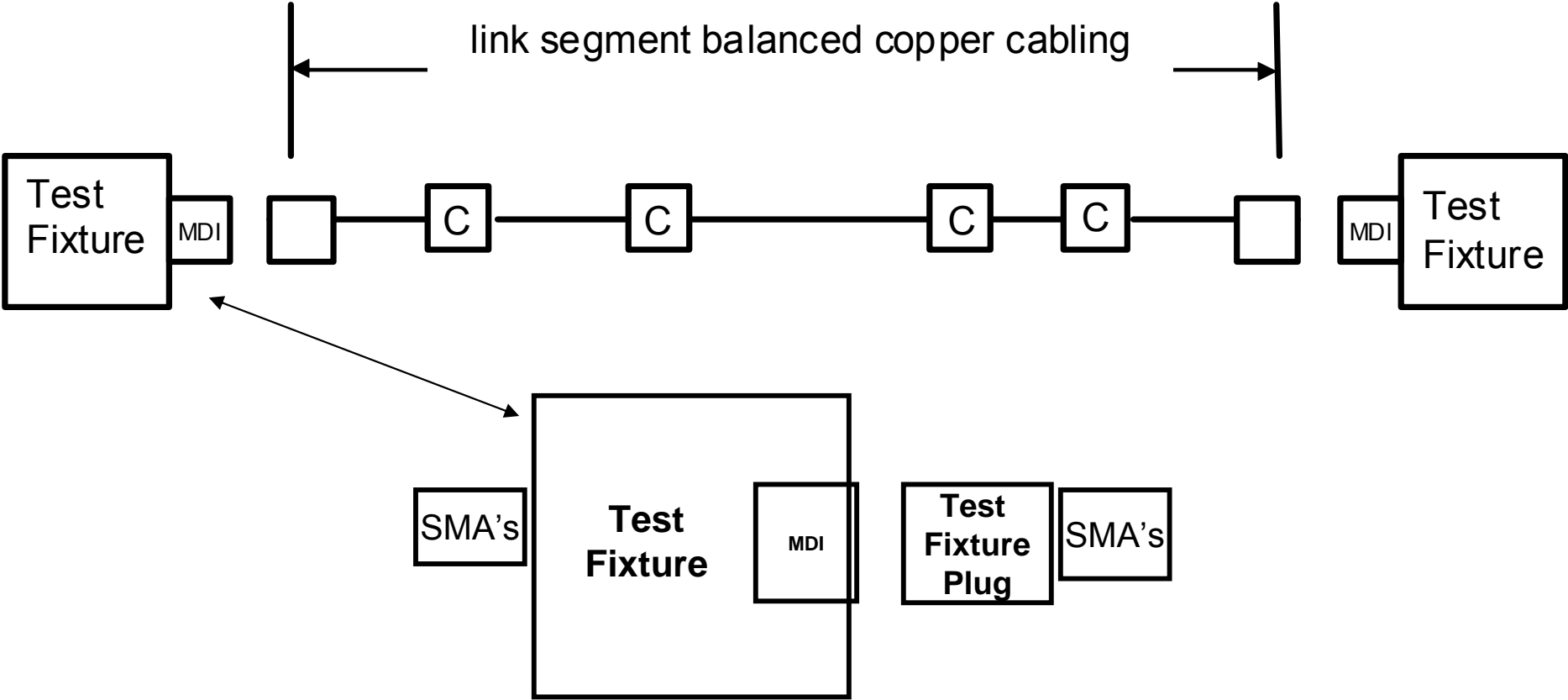


Link segment transmission and coupling parameters – TP2-TP3

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

\*Material for baseline test fixture specifications

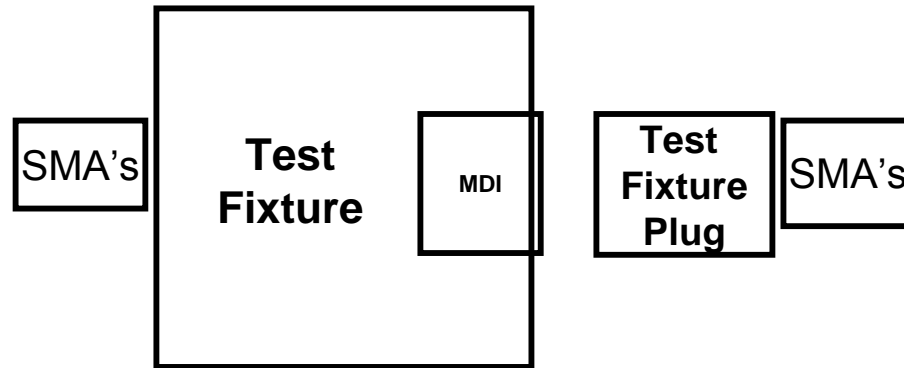
# RTPGE Test Fixtures



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

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# Backup

# Link segment transmission parameters (UTP)

## Link segment transmission and coupling parameters (UTP)

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

## • Insertion loss

- Amended Motion #2 - Move that The IEEE P802.3bp Task Force affirms the proposed
- Baseline IL Channel Performance for link segment insertion to establish the absolute
- value across the frequency range through 600MHz. (herman\_3bp\_01\_0913.pdf)
- Technical 75%
- Vote
- Y: 25 N: 0 A: 4
- MOTION: Passes

$$IL = .4927\sqrt{f} + 0.0023f + (0.0639 / \sqrt{f}) + 0.08\sqrt{f} + 0.018\sqrt{f}$$

where

f := frequency\_in\_MHz

# Link segment transmission parameters (UTP)

## • Alien Crosstalk -PSANEXT

Motion 4: Move that 802.3bp adopt the “Proposed baseline” Alien NEXT specification on slide 8 of mueller\_01a\_3bp\_0314.pdf

M: Thomas Müller S: Chris Mash

Y: 29 N:0 A: 9

### Existing baseline

$$60 - 10 \log\left(\frac{f}{100}\right) \quad [1 \text{ to } 100 \text{ MHz}]$$
$$60 - 15 \log\left(\frac{f}{100}\right) - 6 * \left(\frac{f-100}{400}\right) \quad [100 \text{ to } 600 \text{ MHz}]$$

### Proposed baseline

$$54 - 10 \log\left(\frac{f}{100}\right) \quad [1 \text{ to } 100 \text{ MHz}]$$
$$54 - 15 \log\left(\frac{f}{100}\right) - 6 * \left(\frac{f-100}{400}\right) \quad [100 \text{ to } 600 \text{ MHz}]$$

# Link segment transmission parameters (UTP)

## • Alien Crosstalk -PSAACRF

Motion #8 - Move that The IEEE P802.3bp Task Force affirms the proposed Baseline PSANEXT (in slide 11 in herman\_3bp\_01\_0913.pdf ) and PSAACRF (in slide 13 in herman\_3bp\_01\_0913.pdf) for link segment specification over frequency range 1MHz - 600MHz. (alien crosstalk configuration in

[http://www.ieee802.org/3/bp/public/jul13/moffitt\\_3bp\\_01\\_0713.pdf](http://www.ieee802.org/3/bp/public/jul13/moffitt_3bp_01_0713.pdf))

M: Todd Herman S: Xiaofeng Wang

Technical 75%

Vote

Y: 18 N: 1 A: 10

MOTION: Passes

$$\text{PSAACRF} := -20 \cdot \log_{10} \left( 10^{\frac{-10 \cdot \log\left(\frac{15}{100}\right) + 38.2 - 20 \cdot \log\left(\frac{f}{100}\right)}{-20}} + 4 \cdot 10^{\frac{67 - 20 \cdot \log\left(\frac{f}{100}\right)}{-20}} \right)$$

where

f := frequency\_in\_MHz

# Link segment transmission parameters (UTP)

## •Return Loss

Frequency range	Requirement
1-10 MHz	19 dB
10-40 MHz	$24-5\log(f)$ dB
40-130 MHz	16 dB
130-400 MHz	$37-10\log(f)$ dB
400-600 MHz	11 dB

**Motion #2:** Move that the IEEE P802.3bp Task Force affirms that proposed RL specifications for the automotive link segment in herman\_3bp\_01\_1113.pdf for inclusion in the 802.3bp baseline specification.

Moved by: Xiaofeng Wang

Seconded by: Mehmet Tazebay

Technical 75%

# Link segment transmission parameters (UTP)

- Mode conversion

Frequency, MHz

$$- 50_{\text{dB}} \quad 10 < f_{\text{MHz}} < 80$$

$$[ 5 \log_n ( f_{\text{MHz}} ) - 72 ]_{\text{dB}} \quad 80 < f_{\text{MHz}} < 600$$

**Motion #3: Move that The IEEE P802.3bp Task Force affirms the proposed Mode Conversion limit line for the automotive link segment in Slide # 13 of tazebay\_3bp\_01a\_0913.pdf for inclusion in 802.3bp baseline specification.**

**Moved by: Mehmet Tazebay**

**Seconded by: Gary Yurko**

**Technical 75%**

**Y: 33 N: 0 A: 5**

**MOTION: Passes**