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# **802.3bp RTPGE Specifications**

## **Indian Wells, CA**

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# Purpose

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- **Baseline for the 802.3bp optional Link Segment (ScTP/Shielded)**
- **Review of test fixtures**

# 802.3bp Link Segment Objectives – 11/15/12

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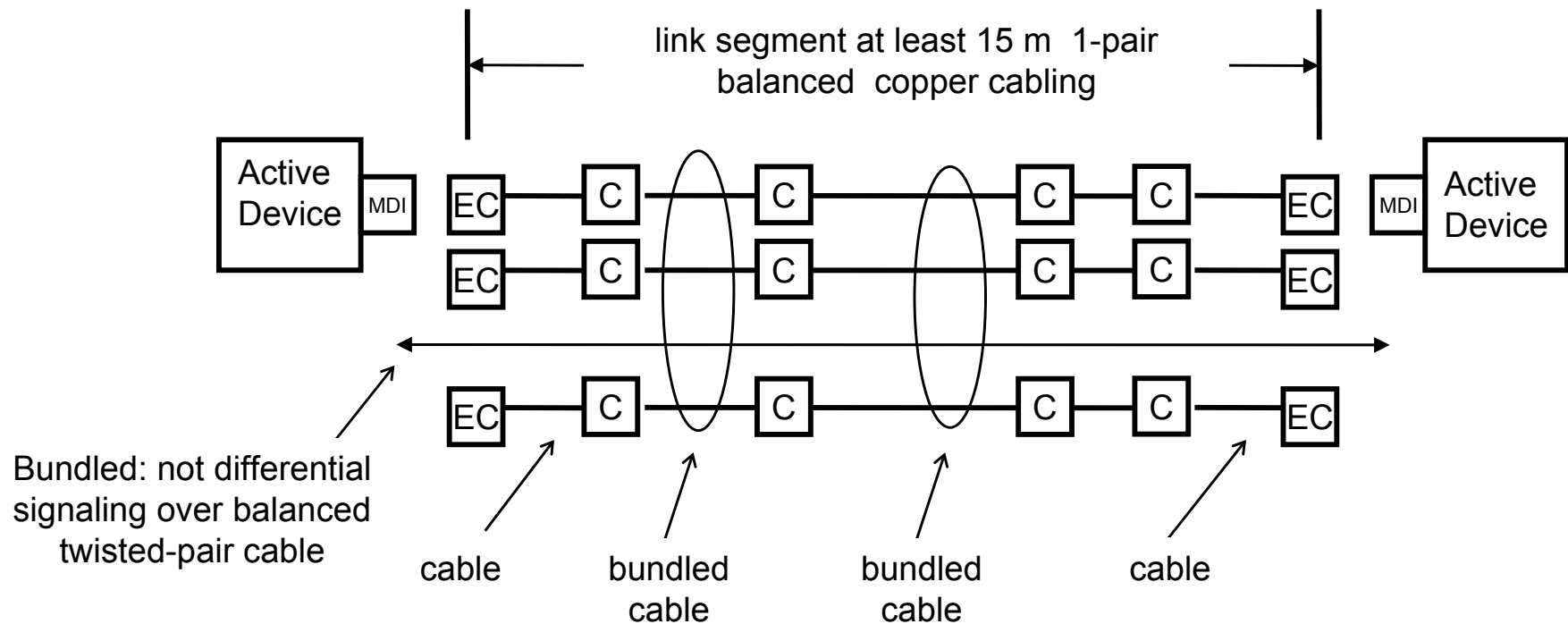
- Automotive link segment baseline approved -11/15/13

- Define the performance characteristics of an automotive link segment and a PHY to support point-to-point operation over this link segment with less than three twisted pairs supporting up to four inline connectors using balanced copper cabling for at least 15m for the automotive link segment.

- Optional link segment baseline proposal in development

- Define the performance characteristics of optional link segment(s) for the above PHY for industrial controls and/or automation, transportation (aircraft, railway, bus and heavy trucks) applications with a goal of at least 40m reach

# 802.3bp 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 15 m  
Number of inline connectors [C] = 4



= inline connector

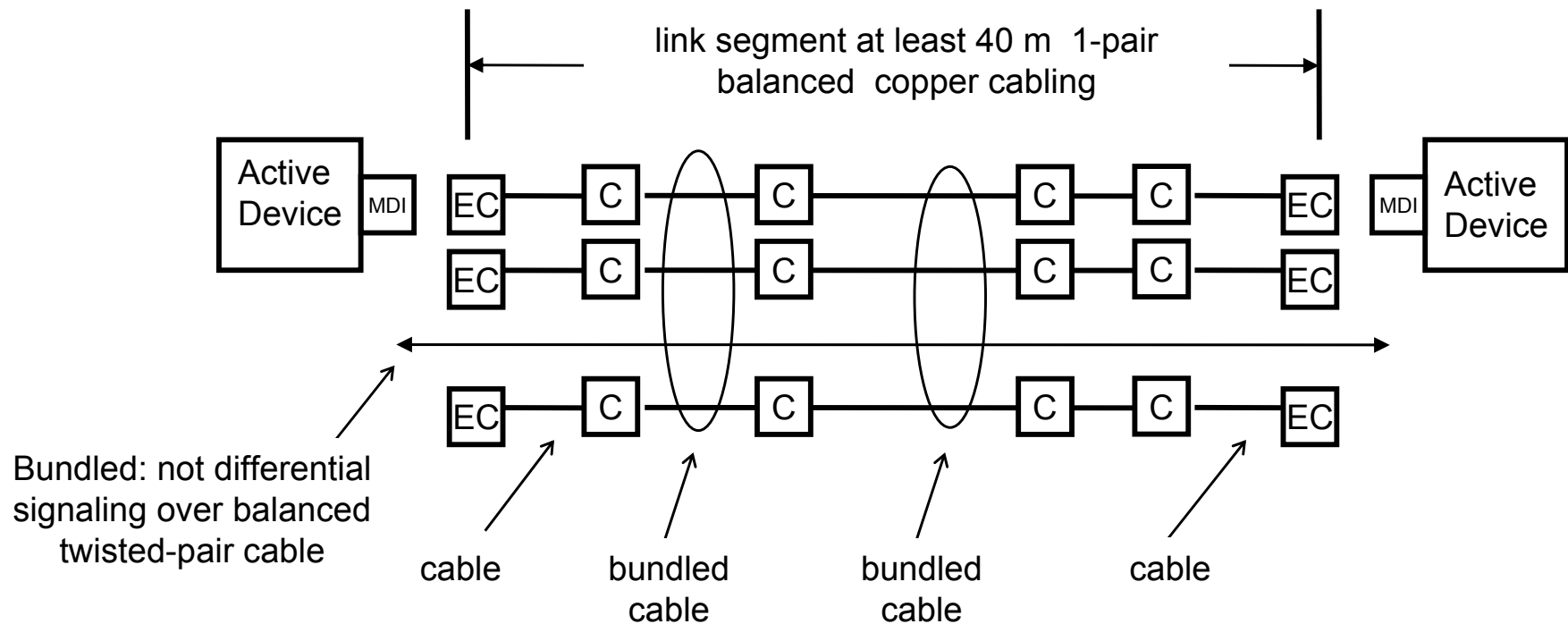


= connection to equipment



= Active electronics connector  
[Medium dependent interface (MDI)]

# 802.3bp Link Segment (optional)



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



= inline connector



= connection to equipment



= Active electronics connector  
[Medium dependent interface (MDI)]

# Link segment transmission parameters (ScTP/Shielded)

Link segment transmission and coupling parameters (ScTP/Shielded)

- Insertion loss - 22 AWG stranded copper at 70 degrees C (0.2% deg C)
- Return loss (UTP proposal)
- Alien Crosstalk
  - PSANEXT (Category 8), PSAACRF (Category 8)
- Coupling attenuation - ANSI/TIA-1005-A-2012 Telecommunications Infrastructure Standard for Industrial Premises. Electromagnetic environmental classifications specified in ANSI/TIA-568-C.0.
- Insertion loss

$$InsertionLoss(f) \leq \left| 0.8558\sqrt{f} + 0.0048 \cdot f + \frac{0.1320}{\sqrt{f}} \right| + \left| 0.08\sqrt{f} \right| + \left| 0.018\sqrt{f} \right|$$

*23.73 dB @500 MHz      40 meters cable      four connectors      ILD*

# Link segment transmission parameters (ScTP/Shielded)

Link segment transmission and coupling parameters (ScTP/Shielded)

- Insertion loss - 22 AWG solid copper at 70 degrees C (0.2% deg C)
- Return loss (UTP proposal)
- Alien Crosstalk
  - PSANEXT (Category 8), PSAACRF (Category 8)
- Coupling attenuation - ANSI/TIA-1005-A-2012 Telecommunications Infrastructure Standard for Industrial Premises. Electromagnetic environmental classifications specified in ANSI/TIA-568-C.0.

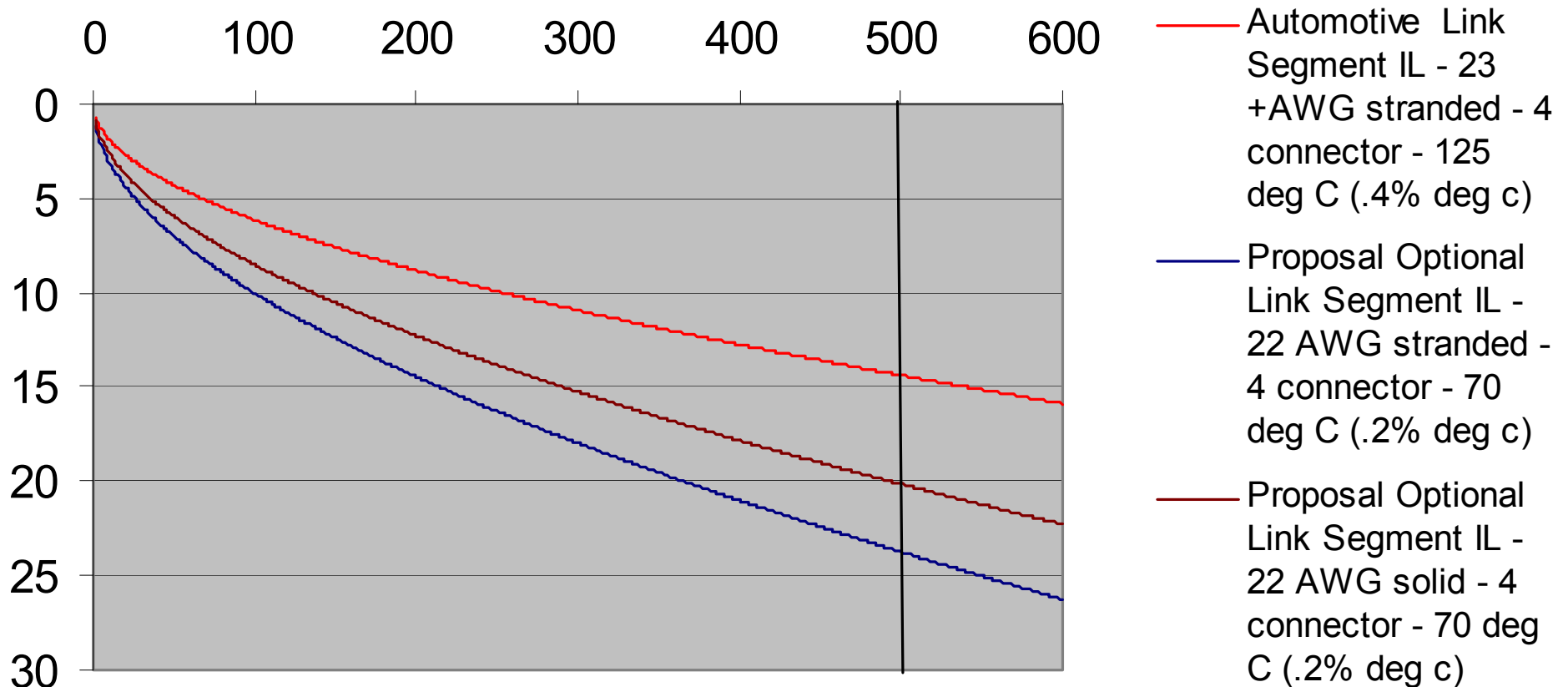
- Insertion loss

$$InsertionLoss(f) \leq \left| 0.7131\sqrt{f} + 0.0048 \cdot f + \frac{0.1320}{\sqrt{f}} \right| + \left| 0.08\sqrt{f} \right| + \left| 0.018\sqrt{f} \right|$$

*20.14 dB @500 MHz      40 meters cable      four connectors      ILD*

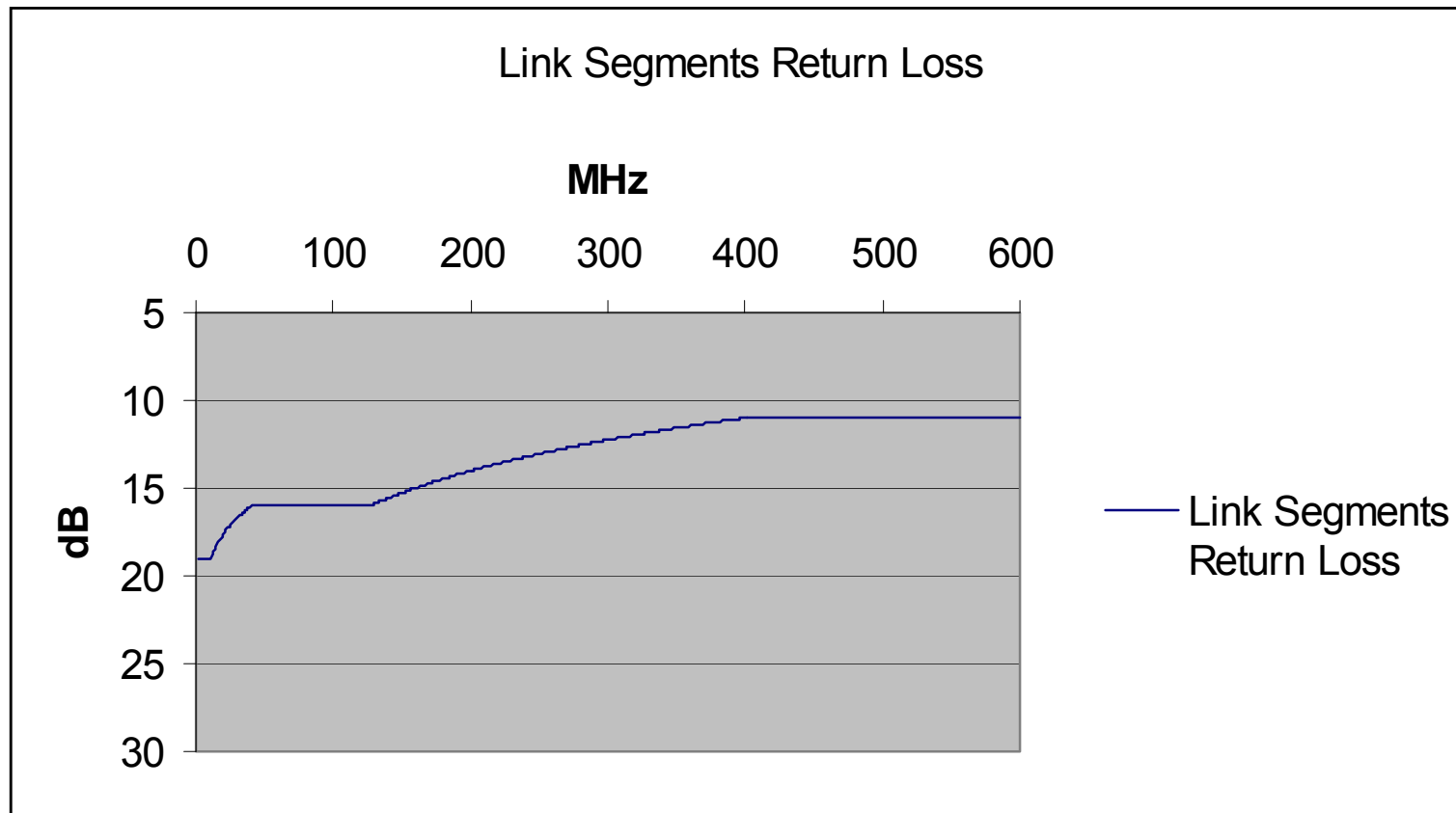
# RTPGE Link Segments IL

## RTPGE Link Segments IL





# Automotive and Optional Link Segment 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

# Link segment transmission parameters (ScTP/Shielded)

- Alien Crosstalk

- PSANEXT

Calculations that result in PSANEXT loss values greater than 75 dB (TBD) shall revert to a requirement of 75 dB minimum (TBD).

Frequency (MHz)	PSANEXT (dB)
$1 \leq f < 100$	$\geq 85 - 10\log(f/100)$
$100 \leq f \leq 600$	$\geq 85 - 15\log(f/100)$

- PSAACRF

Calculations that result in PSAACRF loss values greater than 75 dB (TBD) shall revert to a requirement of 75 dB minimum (TBD). PSAACRF values are for information only when PSANEXT loss is greater than either  $72 - 15\log(f/100)$  dB or 67 dB (TBD).

Frequency (MHz)	PSAACRF (dB)
$1 \leq f \leq 600$	$\geq 61 - 20\log(f/100)$

# Link segment transmission parameters (ScTP/Shielded)

- Coupling attenuation - Consistent with Category 6A specified in ANSI/TIA-1005-A-2012 Telecommunications Infrastructure Standard for Industrial Premises. The coupling attenuation requirements (E1, E2, E3) depend on the electromagnetic environmental classifications specified in ANSI/TIA-568-C.0.

- Coupling attenuation

Frequency (MHz)	Minimum (dB)		
	E1	E2	E3
$30 \leq f \leq 600$	80-20Log(f) (Max 60 dB)	90-20Log(f) (Max 60 dB)	100-20Log(f) (Max 60 dB)

- Environmental classification

Electromagnetic	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>
Radiated RF - AM	3 V/m at (80 to 1 000 MHz) 3 V/m at (1 400 to 2 000 MHz) 1 V/m at (2 000 to 2 700 MHz)	3 V/m at (80 to 1 000 MHz) 3 V/m at (1 400 to 2 000 MHz) 1 V/m at (2 000 to 2 700 MHz)	10 V/m at (80 to 1 000 MHz) 3 V/m at (1 400 to 2 000 MHz) 1 V/m at (2 000 to 2 700 MHz)
Conducted RF	3 V at 150 kHz to 80 MHz	3 V at 150 kHz to 80 MHz	3 V at 150 kHz to 80 MHz

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# **RTPGE Test Fixture Specifications**

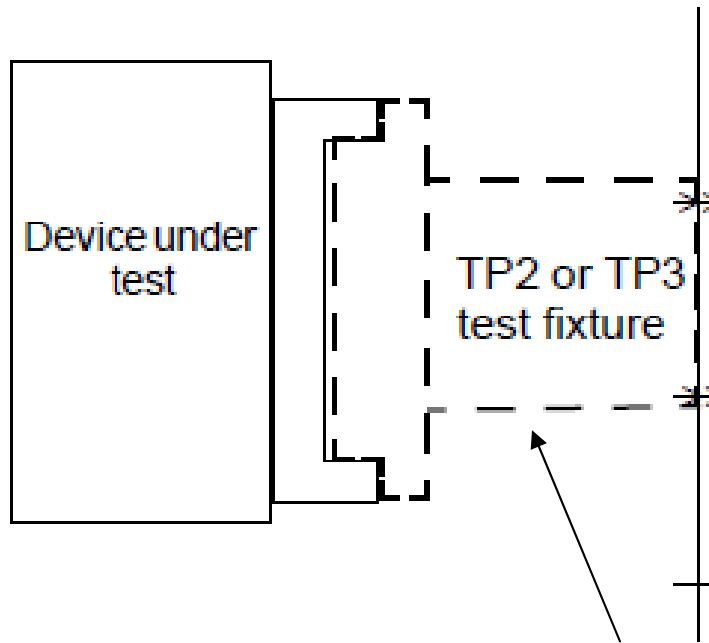
# Purpose

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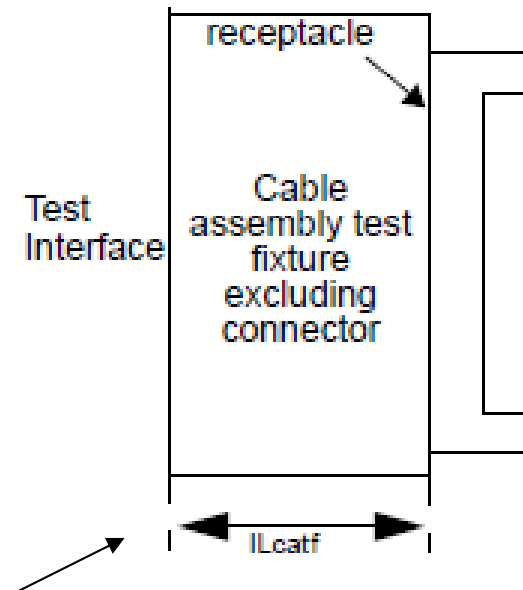
- **RTPGE Test fixture specifications**
  - **MDI Test Fixture**
  - **Link Segment Test Fixture**

# 802.3bj Test Fixtures

TP2/TP3 Test fixture (HCB)

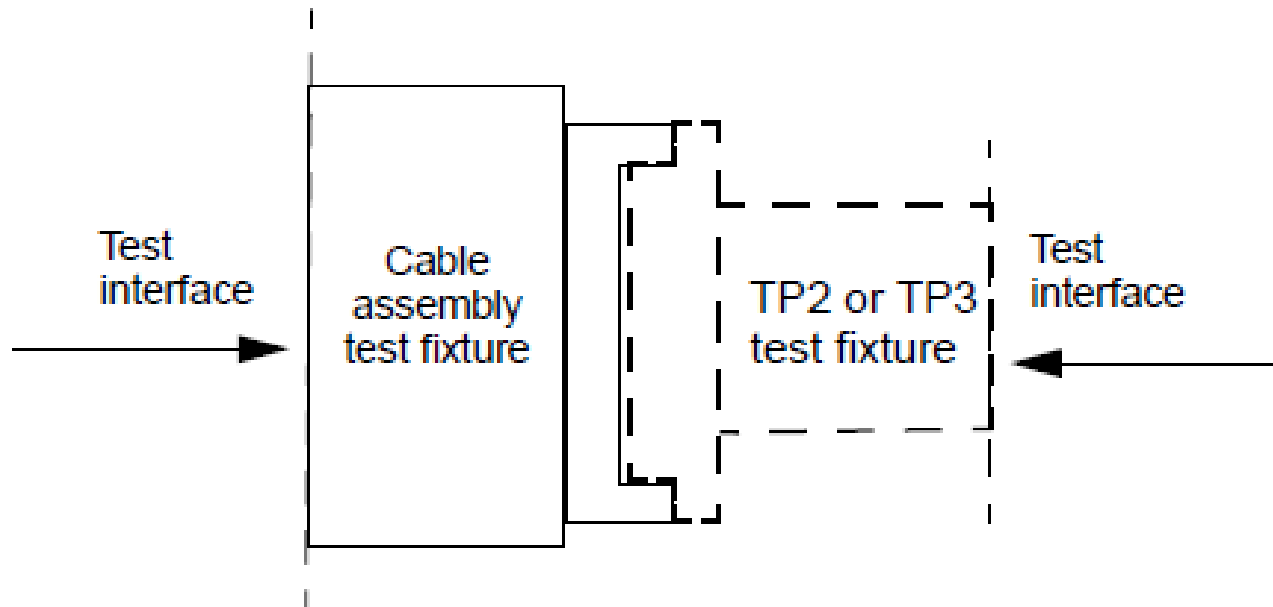


Cable assembly test fixture (MCB)



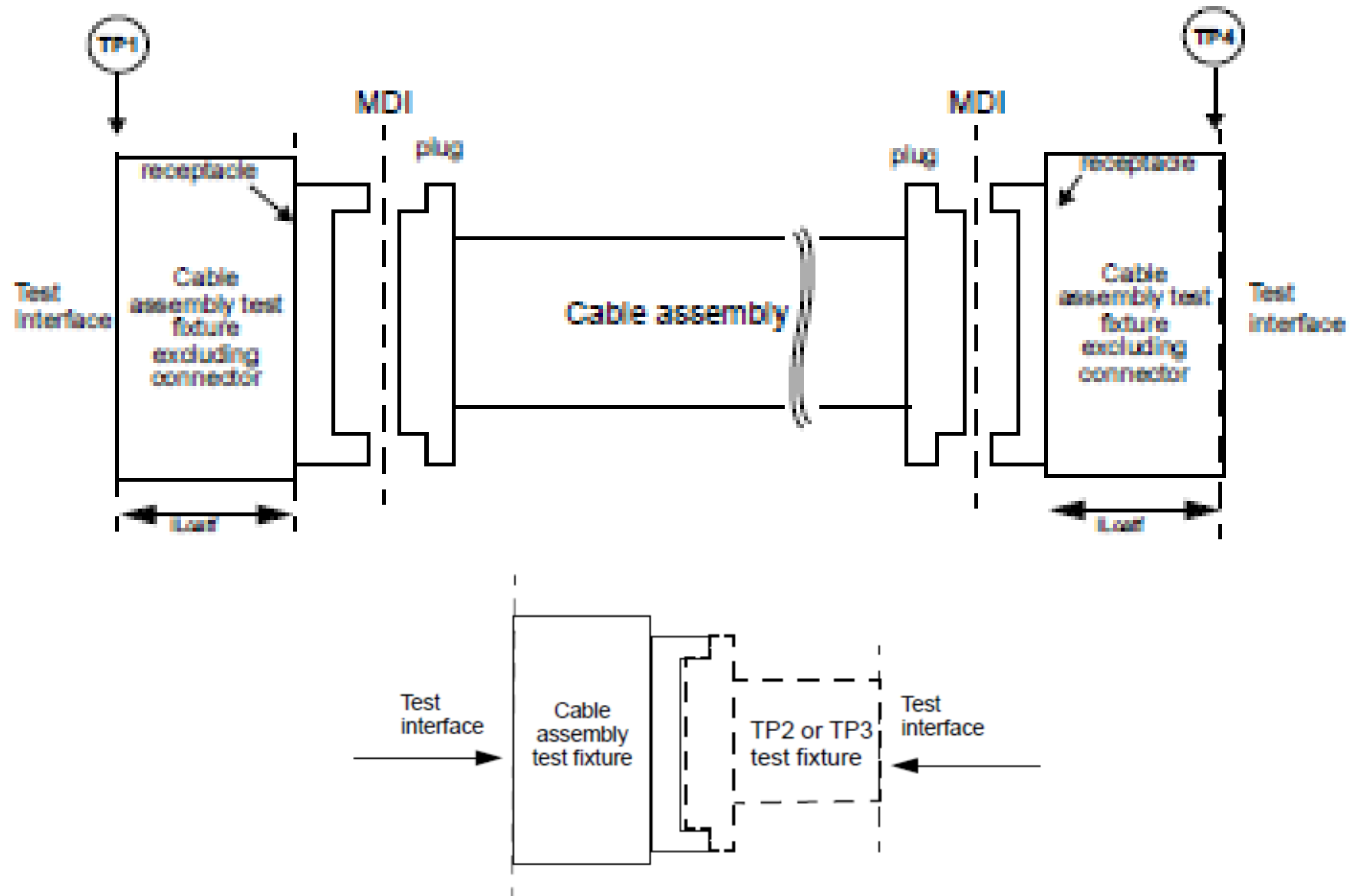
•PCB reference IL specified

# 802.3bj Test Fixtures



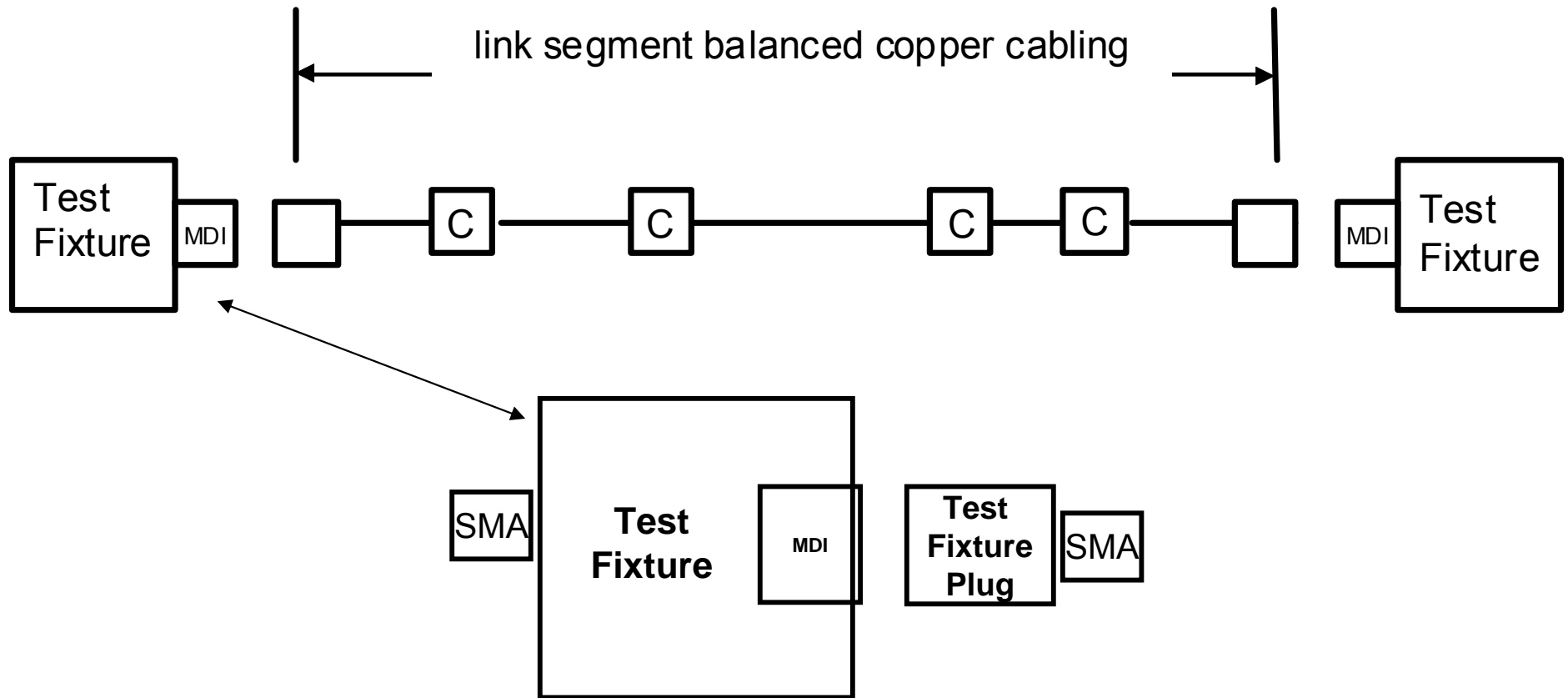
- Specified in mated state
  - Insertion loss
  - Differential return loss
  - Common mode return loss
  - Common to differential mode conversion loss
  - Common to differential mode return loss
  - Integrated crosstalk noise (ICN)

# 802.3bj Test Fixtures





# RTPGE Test Fixtures



Specified in a mated state

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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, 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

PSANEXT

from 1 to 100 MHz

$$\text{PSANEXT} := 60 - 10 \cdot \log\left(\frac{f}{100}\right)$$

from 100 to 500 MHz

$$\text{PSANEXT} := 60 - 15 \cdot \log\left(\frac{f}{100}\right) - 6 \cdot \left[ \frac{(f - 100)}{400} \right]$$

PSAACRF

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

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

$-50_{\text{dB}}$	$10 < f_{\text{MHz}} < 80$
$[5 \log_{10} (f_{\text{MHz}}) - 72]_{\text{dB}}$	$80 < f_{\text{MHz}} < 600$

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