
802.3bp Baseline Optional Link segment

**Norfolk, Virginia
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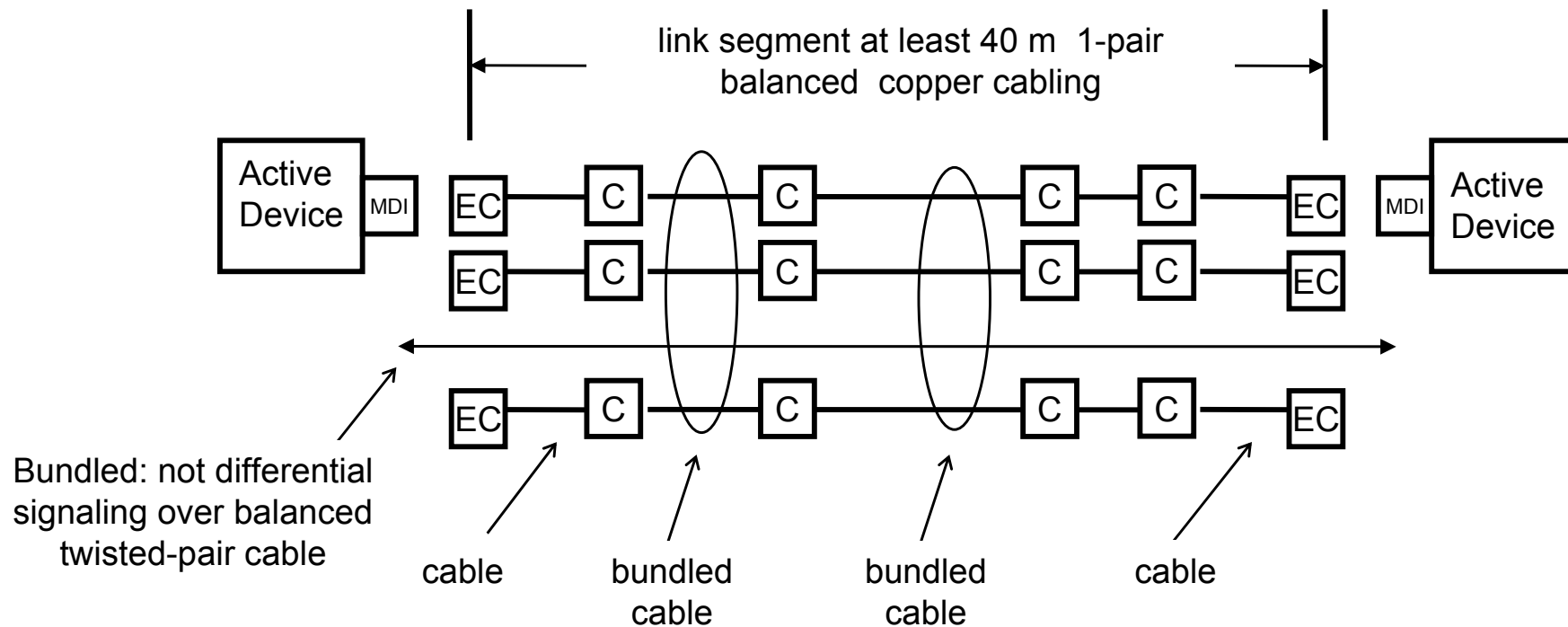
Purpose

- **Baseline for the 802.3bp optional Link Segment (ScTP/Shielded)**
- **Fill-in optional link segment TBD's in 802.3bp D0.30 Clause 98.**

Discussion




- I've spoken with phy contributors to the 802.3bp phy specifications regarding the optional link specifications; all have indicated that return loss is the key parameter to consider.
- Further agreements on phy characteristics during and immediately following May Interim will enable return loss considerations with more specificity of applicable phy attributes.
- I've decided to hold-off trying to close optional link segment proposal till after May IEEE Interim .
- In the meantime, I'm planning to provide the phy ad hoc with optional link measurements including coupling attenuation characterization.

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)]

1000BASE-T1 Link Segments IL

98.4.4.2.1 Insertion loss

The insertion loss of each type B link segment shall meet the values determined using Equation (98–4).

$$\text{InsertionLoss}(f) \leq \text{TBD} \text{ dB} \quad (98-4)$$

where

f is the frequency in MHz; $1 \leq f \leq 600$

This function $\text{InsertionLoss}(f)$ accounts for the insertion loss of the balanced cabling pair and four inline connectors within each link segment.

Link segment transmission parameters (ScTP/Shielded)

Link segment transmission and coupling parameters (ScTP/Shielded)

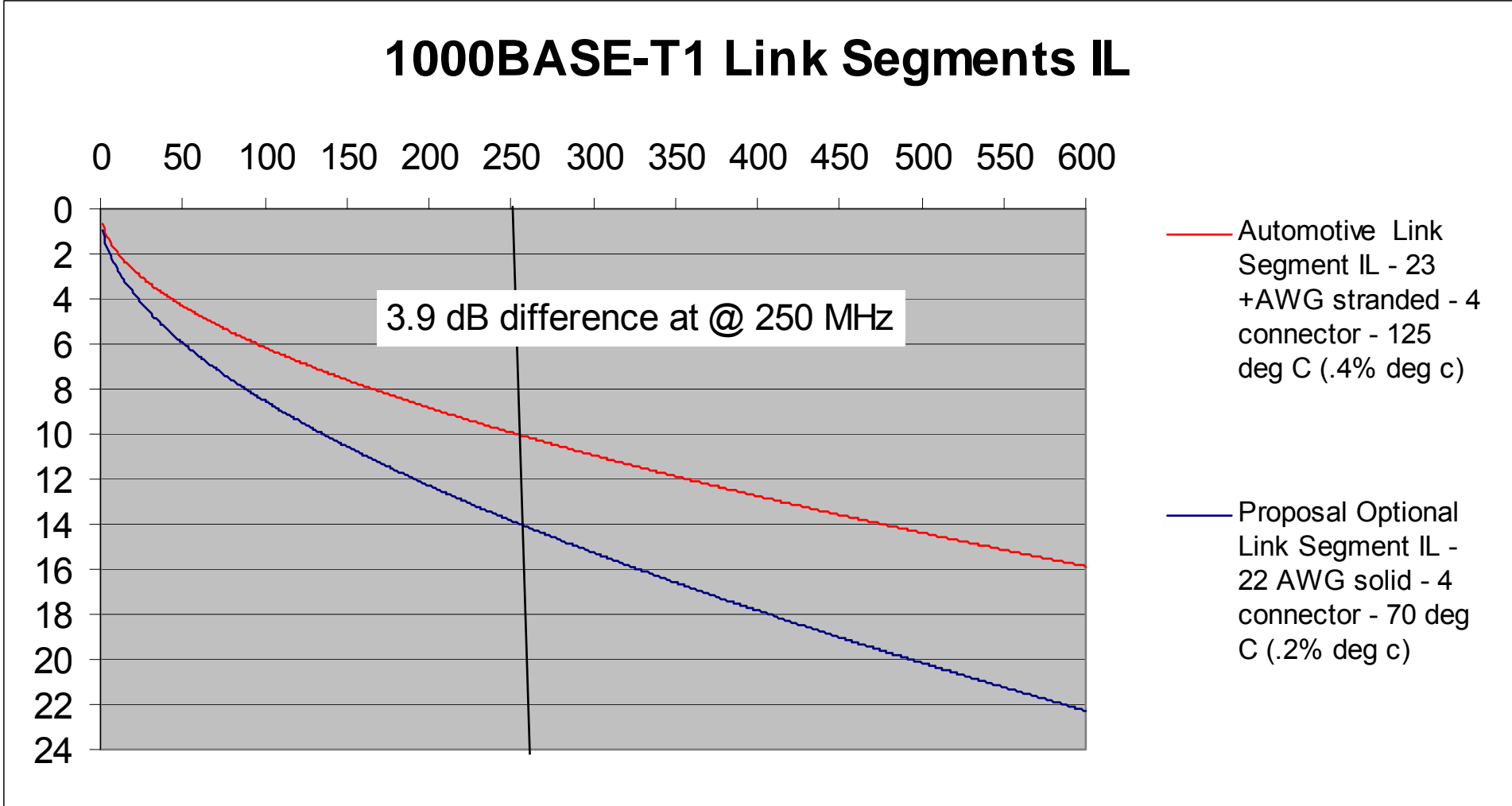
- Insertion loss - 22 AWG solid copper at 70 degrees C (0.2% deg C)
- Return loss (UTP proposal)
- Coupling attenuation - ANSI/TIA-1005-A-2012 Telecommunications Infrastructure Standard for Industrial Premises. Electromagnetic environmental classifications specified in ANSI/TIA-568-C.0.
 - Automotive electromagnetic environmental classification added.

• Insertion loss

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

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

1000BASE-T1 Link Segments IL



1000BASE-T1 Link Segment RL

98.4.4.2.3 Return loss

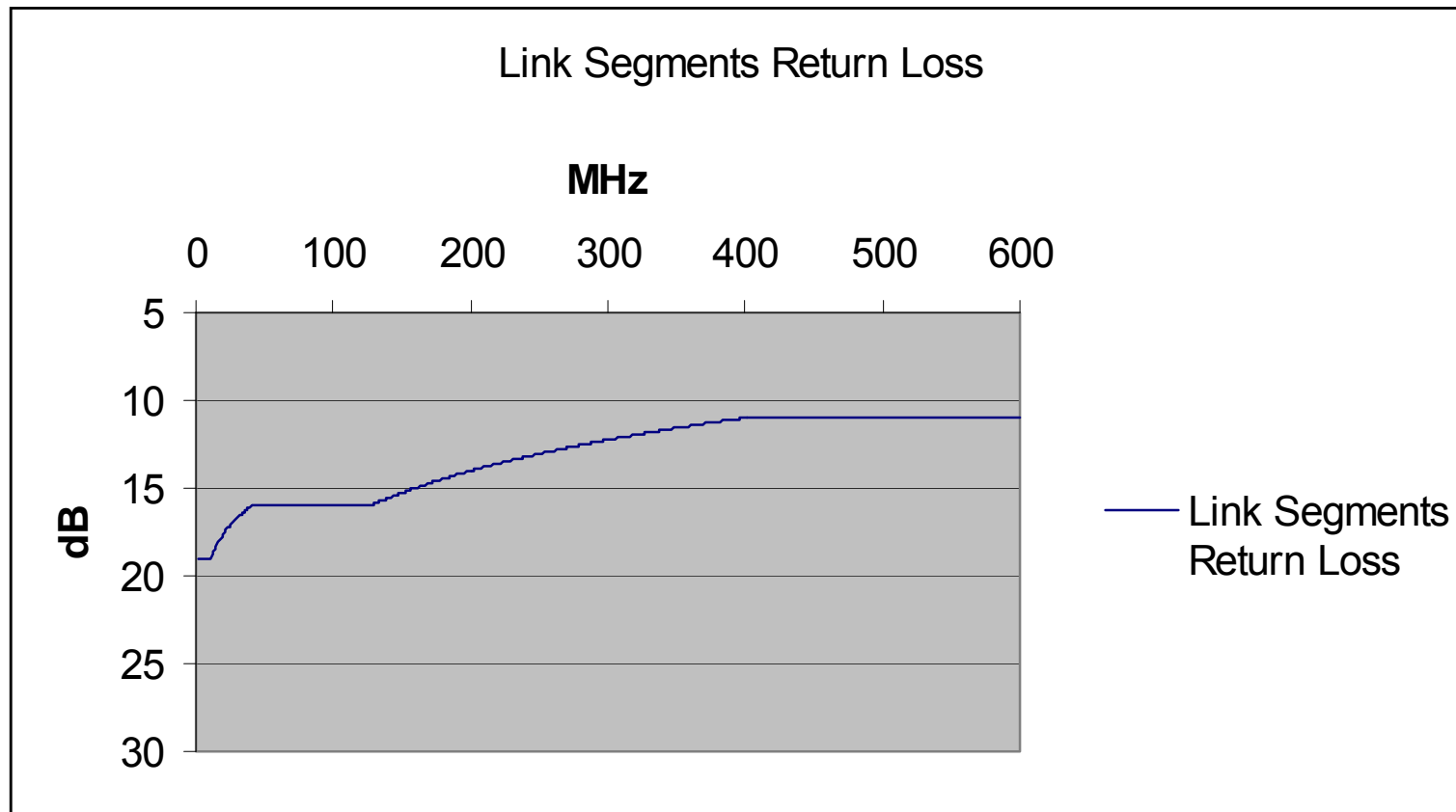
In order to limit the noise at the receiver due to impedance mismatches each type B link segment shall meet the values determined using Equation (98–5) at all frequencies from 1 MHz to 600 MHz. The reference impedance for the return loss specification is 100 Ω .

$$\text{ReturnLoss}(f) \leq \text{TBD dB} \quad (98-5)$$

where

f is the frequency in MHz.

Automotive and Optional Link Segment Return Loss



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

802.3bp (RTPGE)

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. The coupling attenuation requirements (E4) TBD depend on the electromagnetic environmental specifications for automotive applications.

- **Coupling attenuation**

Frequency (MHz)	Minimum (dB)			
	E1	E2	E2	E4
$30 \leq f \leq 600$	80-20Log(f) (Max 60 dB)	90-20Log(f) (Max 60 dB)	90-20Log(f) (Max 60 dB)	TBD

- **Environmental classification**

Electromagnetic	E ₁	E ₂	E ₃	E ₄
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)	TBD Automotive Applications
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	TBD Automotive Applications

Backup

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

$$InsertionLoss(f) \leq \underbrace{0.8558\sqrt{f}}_{23.73 \text{ dB @500 MHz}} + \underbrace{0.0048 \cdot f}_{40 \text{ meters cable}} + \underbrace{\frac{0.1320}{\sqrt{f}}}_{\text{four connectors}} + \underbrace{0.08\sqrt{f}}_{\text{four connectors}} + \underbrace{0.018\sqrt{f}}_{ILD}$$

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)

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