802.3bp Baseline Optional Link segment

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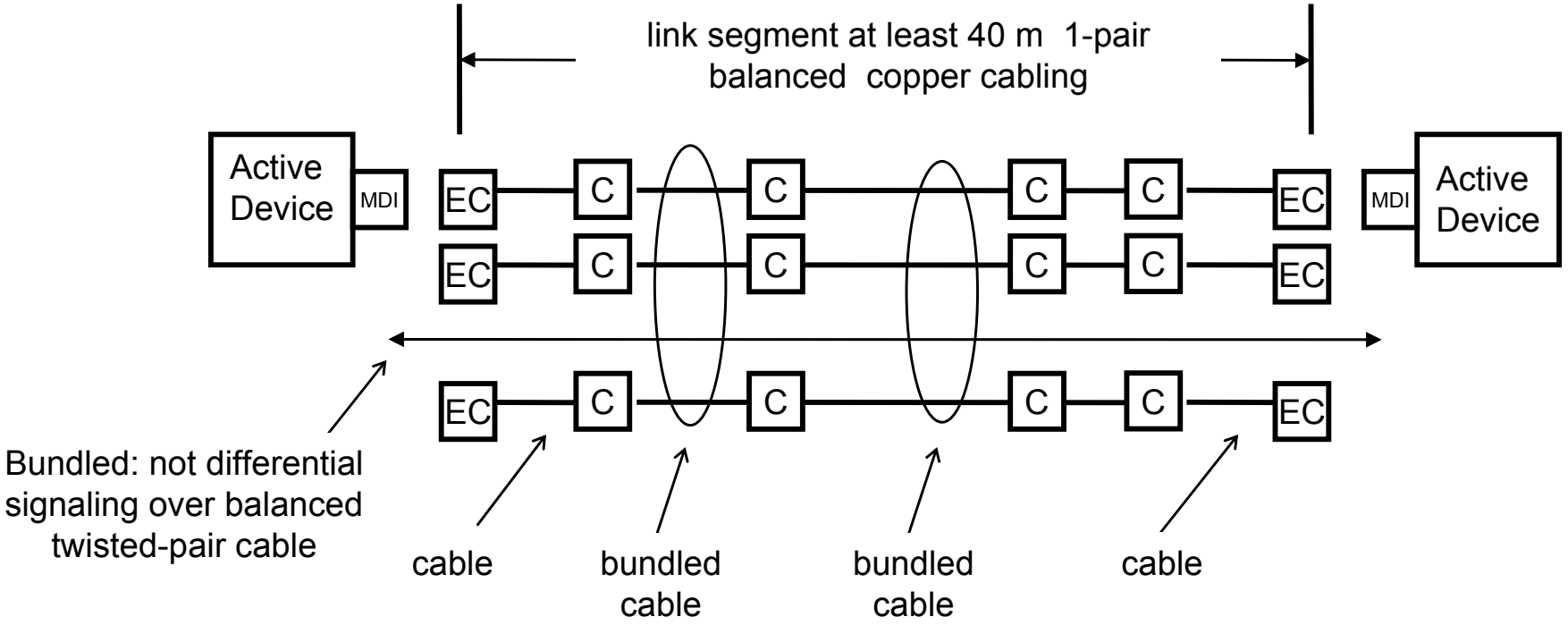
Purpose

- **Baseline for the 802.3bp optional Link Segment (ScTP/Shielded)**

- **Fill-in optional link segment TBD’s in 802.3bp D0.30 Clause 98.**

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

C = inline connector

EC = connection to equipment

MDI = 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).

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

where

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

This function 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.

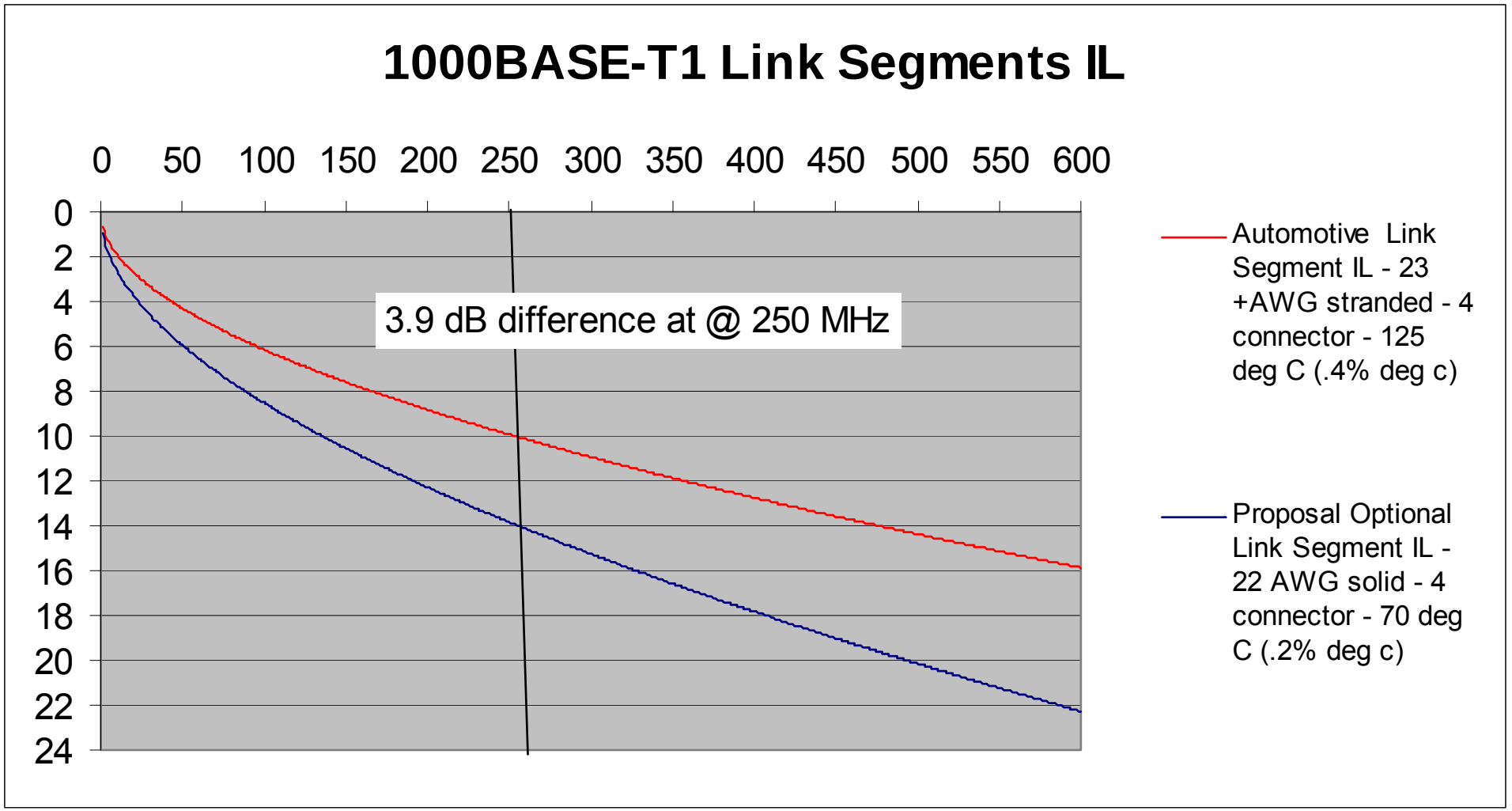
•Alien Crosstalk -Alien crosstalk between bundled link segments within shielded* cable same as automotive link segment.

•Insertion loss

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

$$InsertionLoss(f) \le 0.7131\sqrt{f} + 0.0048 \cdot f + \frac{0.1320}{\sqrt{f}} + 0.08\sqrt{f} + 0.018\sqrt{f}$$

1000BASE-T1 Link Segments IL



1000BASE-T1 Link Segment RL

98.4.4.2.3 Return loss

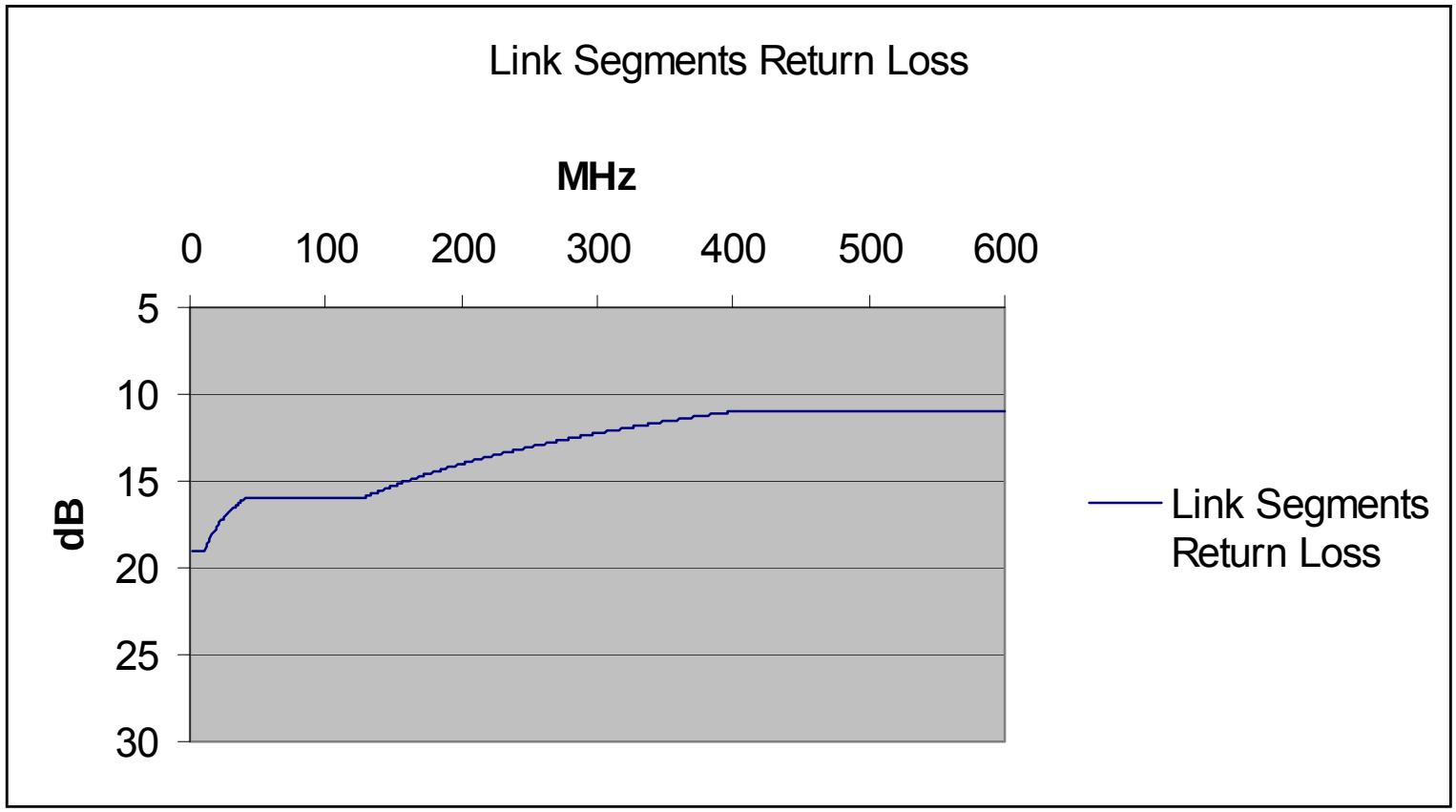
In order to limit the noise at the receiver due to impedance mismatches each type B link segment shall meet the values determined using Equation (98–5) at all frequencies from 1 MHz to 600 MHz. The reference impedance for the return loss specification is 100 Ω.

$$\text{ReturnLoss}(f) \leq \text{TBD dB} \qquad (98\text{–}5)$$

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

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_1**	**E_2**	**E_3**
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

Alien Crosstalk

98.4.4.4.2 Multiple disturber power sum alien near-end crosstalk (PSANEXT) loss

PSANEXT loss is determined by summing the power of the individual pair-to-pair differential alien NEXT loss values over the frequency range 1 MHz to 600 MHz as follows in Equation (98–10).

$$\mathrm{PSANEXT}_N(f) \geq -10\log \sum_{j=1}^{m} 10^{\frac{-\mathrm{AN}(f)_{j,N}}{10}} \ \mathrm{dB} \qquad (98\text{–}10)$$

where the function $\mathrm{AN}(f)_{j,N}$ represents the magnitude (expressed in dB) of the alien NEXT loss at frequency f of the disturbing type B link segment j (1 to m) for the disturbed type B link segment N.

The power sum ANEXT loss between a disturbed type B link segment and the disturbing type B link segment shall meet the values determined using Equation (98–11).

$$\mathrm{PSANEXT}(f) \geq \mathrm{TBD\ dB} \qquad (98\text{–}11)$$

where

f is the frequency in MHz

Alien crosstalk between bundled link segments within shielded* cable

- **Use same as automotive link segment with cable PSAACRF scaled to 40 m**

PSAACRF

$$PSAACRF := -20\cdot\log\left(10^{\frac{-10\cdot\log\left(\frac{40}{100}\right)+38.2-20\cdot\log\left(\frac{f}{100}\right)}{-20}} + 4\cdot 10^{\frac{67-20\cdot\log\left(\frac{f}{100}\right)}{-20}}\right)$$

where

f := frequency_in_MHz

PSANEXT

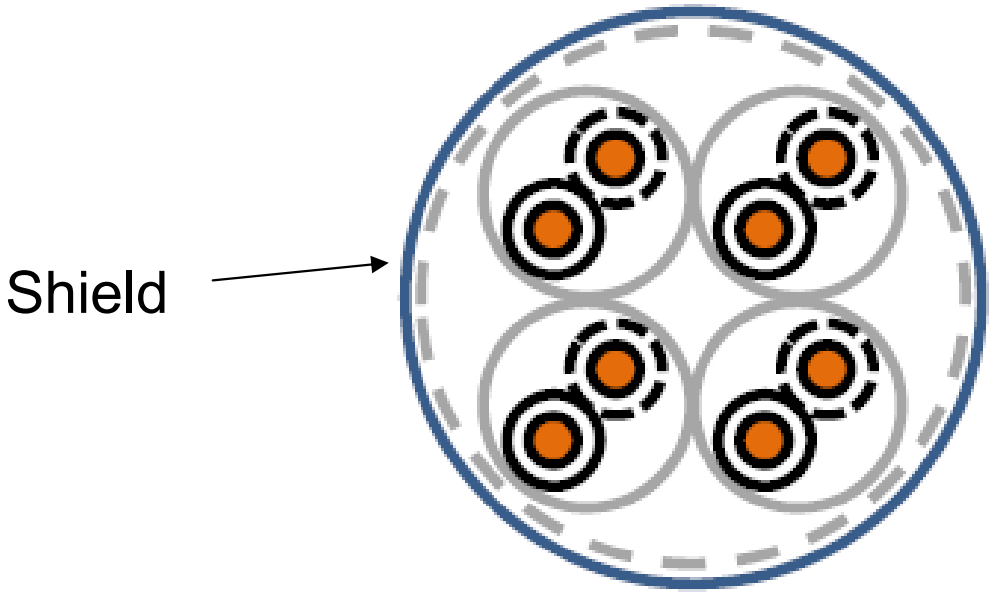
$$54 - 10\log\left(\frac{f}{100}\right) \quad \text{[1 to 100 MHz]}$$

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

***shielded cabling meeting coupling attenuation**

Alien Crosstalk

•Alien crosstalk between bundled link segments within shielded* cable



***shielded cabling meeting coupling attenuation**

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

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

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

$60 - 10\log\left(\frac{f}{100}\right)$ [1 to 100 MHz]

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

Proposed baseline

$54 - 10\log\left(\frac{f}{100}\right)$ [1 to 100 MHz]

$54 - 15\log\left(\frac{f}{100}\right) - 6 * \left(\frac{f-100}{400}\right)$ [100 to 600 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

PSAACRF

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

where

$f := frequency\_in\_MHz$

Link segment transmission parameters (UTP)

- Return Loss

Frequency range	Requirement
1-10 MHz	19 dB
10-40 MHz	24-5log(f) dB
40-130 MHz	16 dB
130-400 MHz	37-10log(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_{dB}	$10 < f_{MHz} < 80$
$[\,5 \log_n (f_{MHz}) - 72\,]_{dB}$	$80 < f_{MHz} < 600$

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