PSNEXT/PSACRF Compromise Proposal

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IEEE P802.3bq

Background

- Larsen_3bq_01a_0914.pdf proposed TIA PSNEXT and PSACRF for 802.3bq link segment specifications because they were the most inclusive at lower frequencies where the specs were tightest.
- Discussion in the Task Force appeared to show consensus around a link segment specification follow the most inclusive spec at each frequency, but there was concern as to the magnitude of the relaxation at higher frequencies
- Analysis presented in here shows the difference is <1dB

Equations for PSNEXT

- Take the Minimum loss of ISO Cl1 and TIA Cat 8 at each frequency from 1MHz<f<2000MHz
- ISO Class I:

Table 7 – Equations for PS NEXT limits for a channel

	Frequency MHz	Minimum PS NEXT dB
Class I	$1 \le f \le 500$	$-20\lg\left(10^{\frac{72.3-15\lg(f)}{-20}}+2\times10^{\frac{91-20\lg(f)}{-20}}\right)$ For measurements 62,0 ffs max
	$500 < f \le 1\,600$ $1\,600 < f \le 2\,000$ ffs	$-20\lg\left(10^{\frac{72.3-15\lg(f)}{-20}}+2\times10^{\frac{37-38\lg(f/500)}{-20}}\right)$ For measurements 62,0 ffs max

- TIA Cat 8:

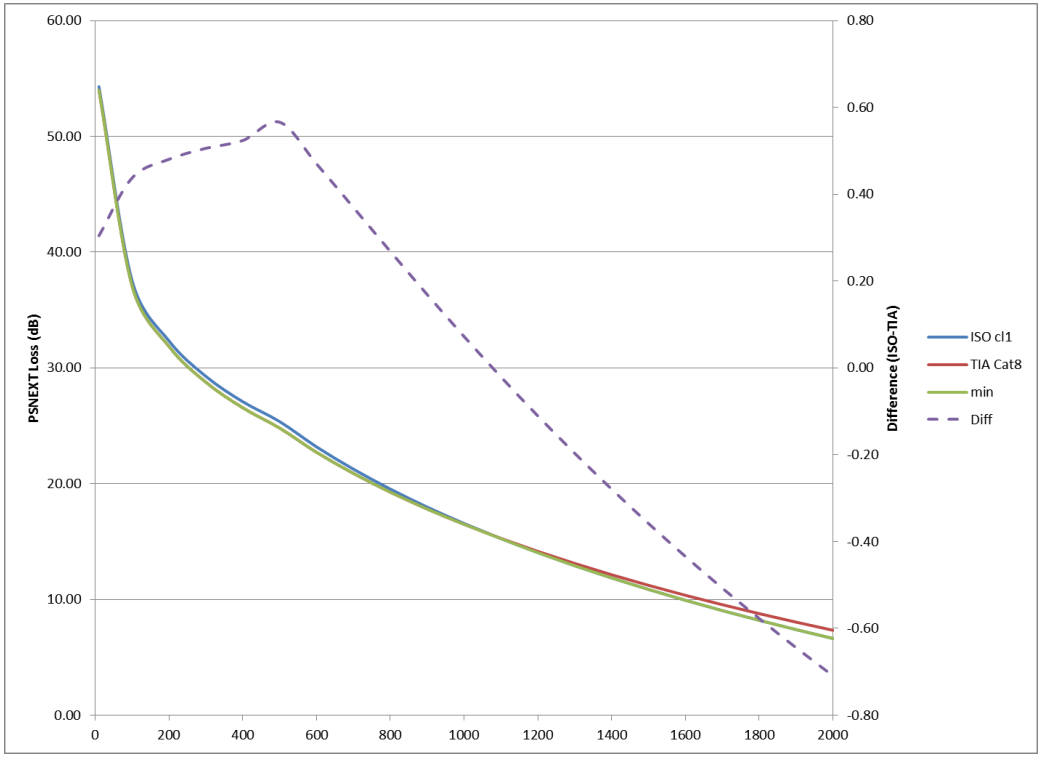
Table 11 - Channel PSNEXT loss

	Frequency (MHz)	PSNEXT loss (dB) [1]
Category 8	$1 \le f \le 500$	$-20\log\left(10^{\frac{(42.3-15\log(f/100))}{-20}}+2\cdot10^{\frac{(50.0-20\log(f/100))}{-20}}\right)$
	$500 < f \le 2000$	$-20\log\left(10^{\frac{(42.3-15\log(f/100))}{-20}}+2\cdot10^{\frac{(32.93-34.85\log(f/500))}{-20}}\right)$

1 Calculations that result in category 8 channel PSNEXT loss values greater than 62 dB shall revert to a requirement of 62 dB minimum.

PSNEXT Comparison

f	ISO cl1	TIA Cat8	min	Diff
10	54.30	53.99	53.99	0.30
100	37.52	37.08	37.08	0.44
200	32.33	31.85	31.85	0.48
300	29.27	28.76	28.76	0.51
400	27.08	26.56	26.56	0.52
500	25.37	24.80	24.80	0.57
600	23.18	22.71	22.71	0.47
700	21.25	20.88	20.88	0.37
800	19.53	19.27	19.27	0.27
900	17.98	17.81	17.81	0.17
1000	16.56	16.49	16.49	0.07
1100	15.25	15.27	15.25	-0.02
1200	14.04	14.15	14.04	-0.11
1300	12.91	13.11	12.91	-0.20
1400	11.86	12.14	11.86	-0.28
1500	10.86	11.22	10.86	-0.36
1600	9.93	10.36	9.93	-0.43
1700	9.04	9.55	9.04	-0.51
1800	8.20	8.77	8.20	-0.58
1900	7.40	8.04	7.40	-0.64
2000	6.63	7.34	6.63	-0.71
f	ISO cl1	TIA Cat8	min	Diff
1077.127	15.54	15.54	15.54	0.00



Maximum difference is 0.71 dB, crossover is at 1077 MHz

- Negligible effect

PSNEXT Equation

- Editorially simplify by following TIA to 1100MHz and ISO Class I from 1100MHz to 2000MHz (0.02dB difference at 1100MHz), and equating first term

Freq (MHz)	PSNEXT limit (dB) (calculations that result in values > 62 dB loss shall revert to 62 dB)
1≤ f ≤ 500	-20*LOG10(10^((42.3-15*LOG10(f /100))/-20) +2*10^((50-20*LOG10(f /100))/-20))
500 < f ≤ 1100	-20*LOG10(10^((42.3-15*LOG10(f /100))/-20) +2*10^((35.95-34.85*LOG10(f /500))/-20))
1100 < f ≤ 2000	-20*LOG10((10^((42.3-15*LOG10(f / 100))/-20) +2*10^((37-38*LOG10(f /500))/-20))

Equations for PSACRF

- ISO Class I and TIA Cat 8 results are within 0.01 dB of each other: Specify ISO Class I extended to 2000MHz
- ISO Class I:

Table 9 – Equation for ACR-F limits for a channel

	Frequency MHz	Minimum ACR-F dB
Class I	$1 \le f \le 1\,600$ $1\,600 < f \le 2\,000$ ffs	$-20\lg\left(\sqrt{0{,}6}\cdot 10^{\frac{76{,}8-20\lg(f)}{-20}} + 2\times 10^{\frac{83{,}1-20\lg(f)}{-20}}\right)$ For measurements 65,0 ffs max

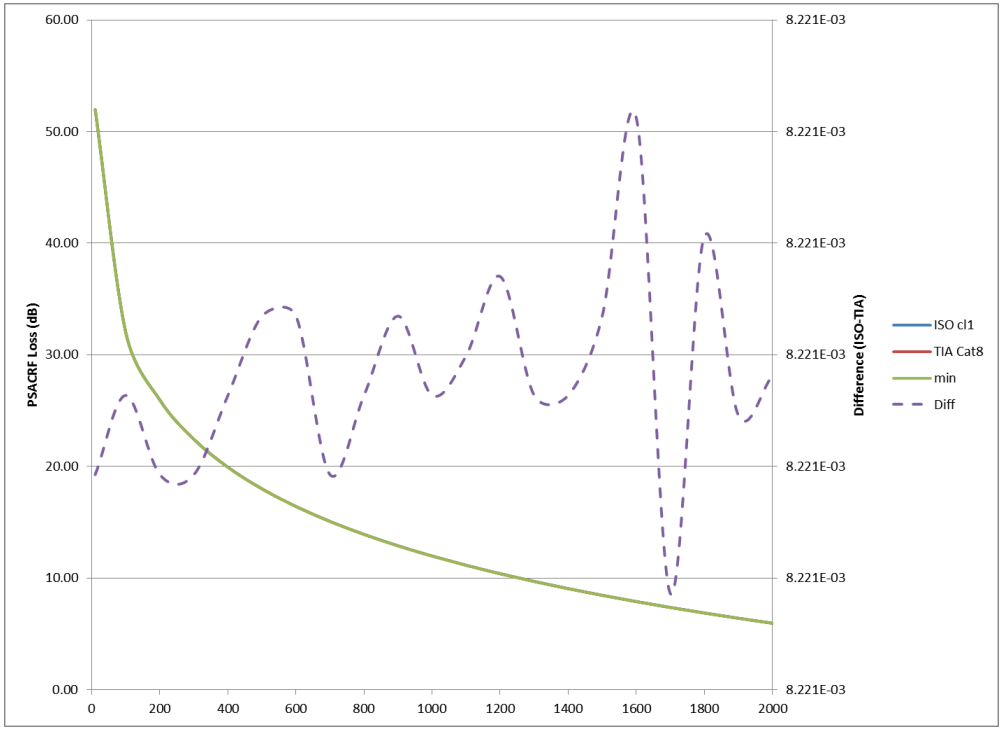
- TIA Cat 8:

Table 13 - Channel ACRF

	Frequency (MHz)	ACRF (dB)[1]
Category 8	$1 \le f \le 2000$	$-20\log\left(10^{\frac{(39.0-20\cdot\log(f/100))}{-20}} + 2\cdot 10^{\frac{(43.1-20\cdot\log(f/100))}{-20}}\right)$
1 Calculations that result in category 8 channel ACRF loss values greater than 65 dB shall revert to a requirement of 65 dB minimum.		

PSACRF Comparison

f	ISO cl1	TIA Cat8	min	Diff
10	51.97	51.97	51.97	0.01
100	31.97	31.97	31.97	0.01
200	25.95	25.95	25.95	0.01
300	22.43	22.42	22.42	0.01
400	19.93	19.92	19.92	0.01
500	17.99	17.99	17.99	0.01
600	16.41	16.40	16.40	0.01
700	15.07	15.06	15.06	0.01
800	13.91	13.90	13.90	0.01
900	12.89	12.88	12.88	0.01
1000	11.97	11.97	11.97	0.01
1100	11.15	11.14	11.14	0.01
1200	10.39	10.38	10.38	0.01
1300	9.70	9.69	9.69	0.01
1400	9.05	9.04	9.04	0.01
1500	8.45	8.44	8.44	0.01
1600	7.89	7.88	7.88	0.01
1700	7.37	7.36	7.36	0.01
1800	6.87	6.86	6.86	0.01
1900	6.40	6.39	6.39	0.01
2000	5.95	5.95	5.95	0.01



Difference is roundoff error