Equation Simplification

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CommScope

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Link Segment IL Equation is Complex

(98–11)

$$\text{Insertion loss}(f) \le \left(\begin{array}{c} 0.32\left(1.8 \times \sqrt{f} + 0.005 \times f + \frac{0.25}{\sqrt{f}}\right) + 0.0324 \times \sqrt{f} \\ +2\left(0.016835\sqrt{f} - 10lg\left[1 - 10^{\frac{32 - 20lg\left(\frac{f}{100}\right)}{-10}}\right] - 10lg\left[1 - 10^{\frac{51 - 20lg\left(\frac{f}{100}\right)}{-10}}\right]\right) \end{array} \right) \text{(dB}$$

where

f is the frequency in MHz; $1 \le f \le 250$

(98–12)

$$\text{Insertion loss}(f) \le \left(\begin{array}{c} 0.32\left(1.8 \times \sqrt{f} + 0.005 \times f + \frac{0.25}{\sqrt{f}}\right) + 0.0324 \times \sqrt{f} \\ +2\left(0.016835\sqrt{f} - 10lg\left[1 - 10^{\frac{32 - 20lg\left(\frac{f}{100}\right)}{-10}}\right] - 10lg\left[1 - 10^{\frac{43.04 - 30lg\left(\frac{f}{250}\right)}{-10}}\right]\right) \end{array} \right) \text{(d}$$

where

f is the frequency in MHz; $250 < f \le 500$

(98–13)

$$\text{Insertion loss}(f) \le \left(\begin{array}{c} 0.32\left(1.8 \times \sqrt{f} + 0.005 \times f + \frac{0.25}{\sqrt{f}}\right) + 0.0324 \times \sqrt{f} \\ +2\left(0.016835\sqrt{f} - 10lg\left[1 - 10^{\frac{32 - 20lg\left(\frac{f}{100}\right)}{-10}}\right] - 10lg\left[1 - 10^{\frac{34 - 40lg\left(\frac{f}{500}\right)}{-10}}\right]\right) \end{array} \right) \text{(dB}$$

where

f is the frequency in MHz; $500 < f \le 1000$

$$\text{Insertion loss}(f) \le \left(\begin{array}{c} 0.32\left(1.8 \times \sqrt{f} + 0.005 \times f + \frac{0.25}{\sqrt{f}}\right) + 0.0324 \times \sqrt{f} \\ +2\left(0.016835\sqrt{f} + 0.283 - 10lg\left[1 - 10^{\frac{34 - 40lg\left(\frac{f}{500}\right)}{-10}}\right]\right) \end{array} \right) \text{(dB)} \quad (98\text{–}14)$$

where

Link Segment IL Equation is Complex

- Complexity comes from the connector-based IL term in the ISO IL equation

0.1 dB minimum

1 to 250 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 7.9433\cdot10^{-10}\cdot f^2\right)$

250 to 500 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 3.1782\cdot10^{-12}\cdot f^3\right)$

500 to 1000 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 1.63551\cdot10^{-15}\cdot f^4\right)$

1000 to 2000 MHz $.016835\cdot\sqrt{f} + .28305 - 10\cdot\log\left(1 - 1.63551\cdot10^{-15}\cdot f^4\right)$

Link Segment IL Equation is Complex

- The TIA connector IL form is simpler

0.1 dB minimum

1 to 250 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 7.9433\cdot10^{-10}\cdot f^2\right)$

250 to 500 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 3.1782\cdot10^{-12}\cdot f^3\right)$

500 to 1000 MHz $.016835\cdot\sqrt{f} - 10\cdot\log\left(1 - 6.3096\cdot10^{-8}\cdot f^2\right) - 10\cdot\log\left(1 - 1.63551\cdot10^{-15}\cdot f^4\right)$

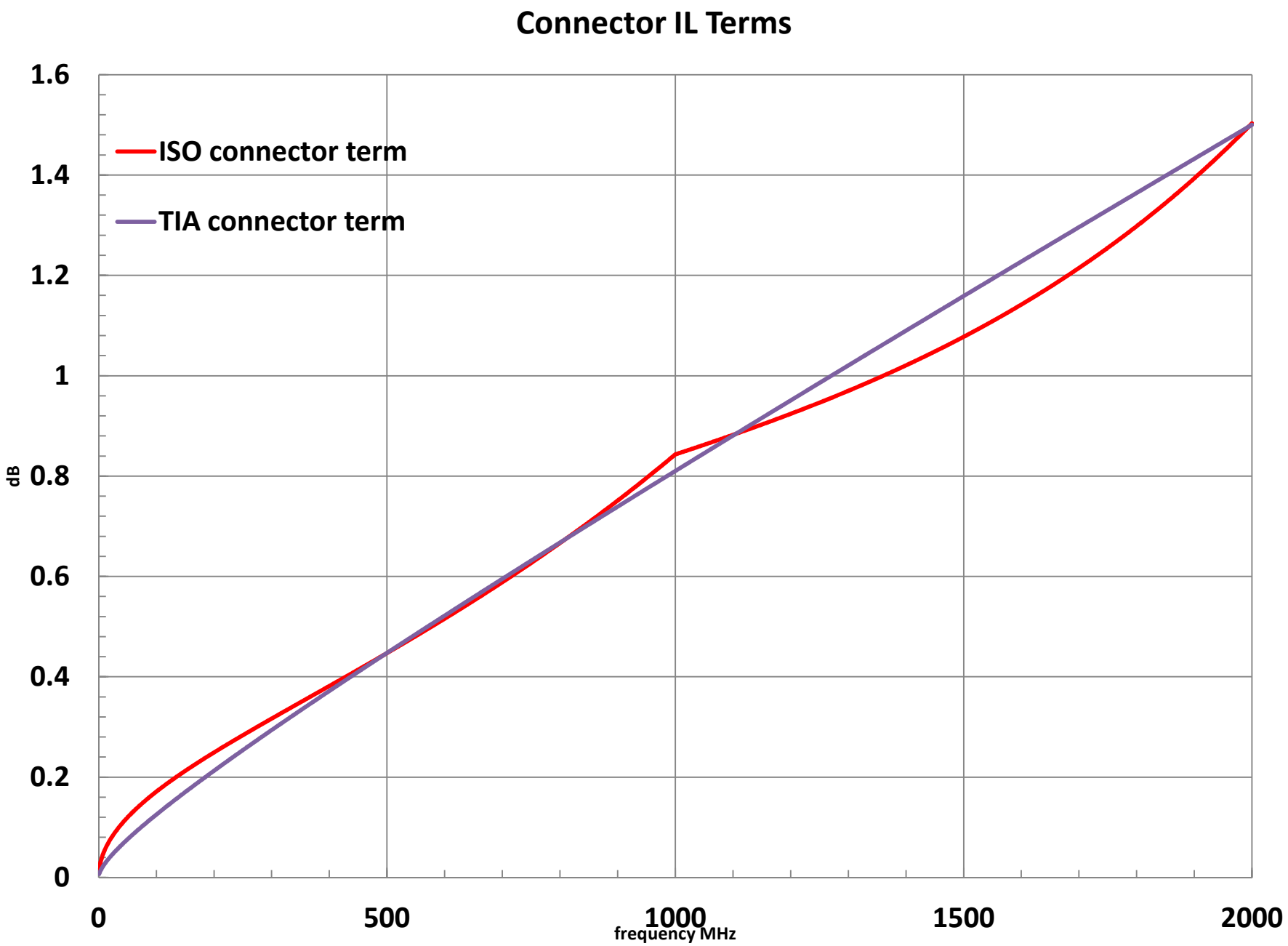
1000 to 2000 MHz $.016835\cdot\sqrt{f} + .28305 - 10\cdot\log\left(1 - 1.63551\cdot10^{-15}\cdot f^4\right)$

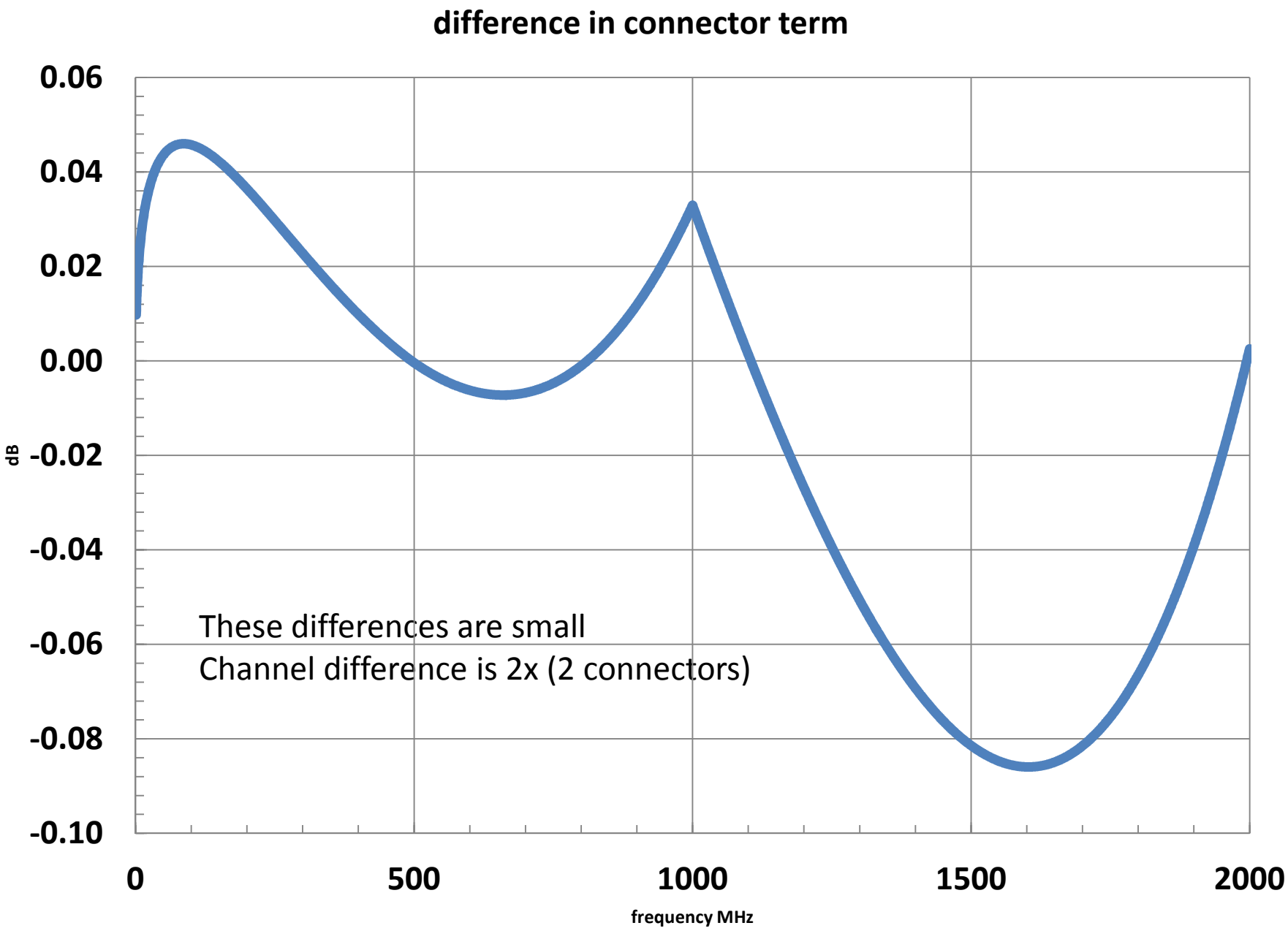
$1 \le f \le 500$

$500 < f \le 2000$

$$0.02\sqrt{f}$$

$$\left(0.00649\sqrt{f} + 0.000605f\right)$$


Connector IL Terms
ISO connector term
TIA connector term
dB
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
500
1000
1500
2000
frequency MHz

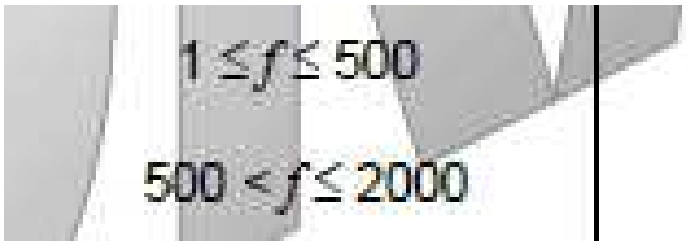

difference in connector term
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
dB
0
500
1000
1500
2000
frequency MHz
These differences are small
Channel difference is 2x (2 connectors)

Advantages of Proposed IL Form

- Saves about 1 page in the standard, less ink will be used
- Less time will be spent by the users of the standard, in understanding and programming the IL limit
- Retains implicit information on the physical origin of the IL
- There is no substantial difference in the IL levels allowed by the existing and proposed IL limits

Motion

- Re-write the link segment IL equations with the connector IL term in the TIA form shown below, instead of the ISO form. Editor to implement.



$$0.02\sqrt{f}$$
$$\left(0.00649\sqrt{f} + 0.000605 f\right)$$