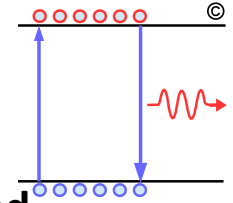# Clause 137 Channel Insertion Loss

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**IEEE 802.3cd Task Force Meeting**

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# Overview

- **Current clause 137 PMD sublayer for type 50GBASE-KR, 100GBASE-KR2, and 200GBASE-KR4 has very strong sqrt($f$) response**
  - The recommended channel response has 750% stronger sqrt($f$) than clause 92A
- **To better fit material lower loss than Megtron 6 should increase sqrt($f$) coefficient of clause 92 A but there is no reason to increase the coefficient by 7.5x**
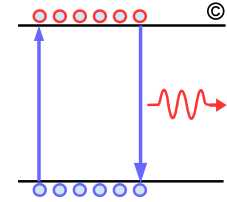- **In support of comment 122 which proposes to increase the sqrt($f$) coefficient by ~2.2x compare to CL92A.**

# Clause 137 Channel Response
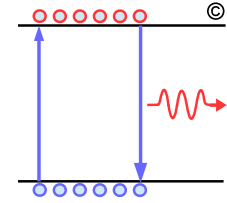
❑ **In comparisons to clause 92A and proposed response**
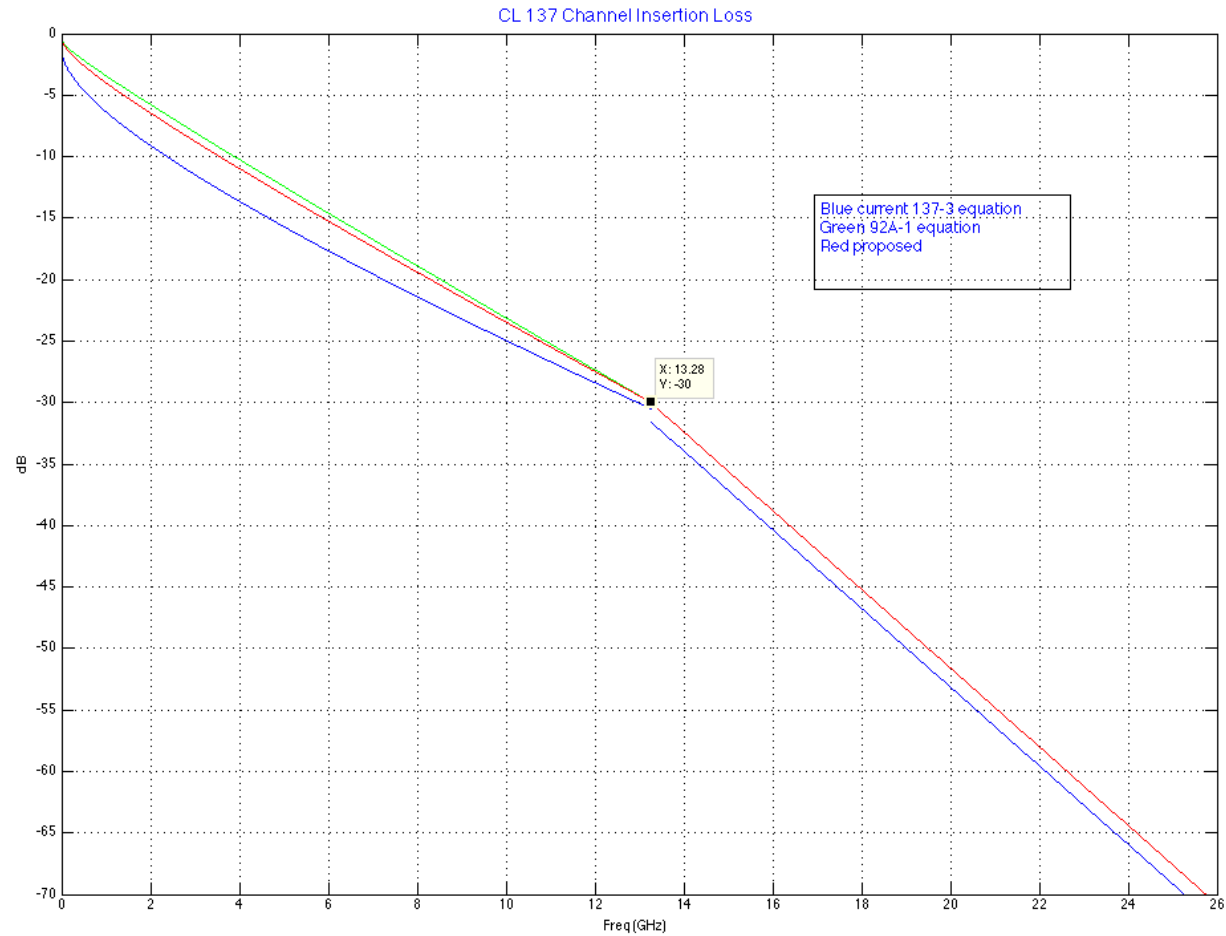
# Different Channel Responses

- **Clause 92A, equation 92A-1 dominated by linear $f$ loss**

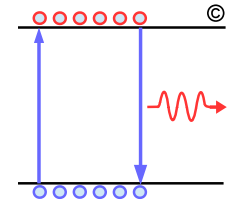$$IL_{PCB} \le 0.5\left(0.0694+0.4248\times\sqrt{f}+0.9322\times f\right) \ (dB) \ for \ 0.01 \le f \le 19 GHz$$

- **Clause 137, equation 137-1 is strongly dominated by $\sqrt{f}$**

$$IL_{PCB} \le \begin{cases} 1.3+3.9\sqrt{f}+1.13\times f & for \ 0.01 \le f \le fb/2 \\ -10.89+3.2\times f & for \ fb/2 \le f \le fb \end{cases} \ (dB)$$

- **Proposed channel response has more f domination than equation 92A-1 to better fit lower loss dielectric material**

$$IL_{PCB} \le \begin{cases} 0.4842+1.744\sqrt{f}+1.744\times f & for \ 0.01 \le f \le fb/2 \\ -12.44+3.2\times f & for \ fb/2 \le f \le fb \end{cases} \ (dB)$$

# Summary

❑ **Equation 137-1 does not represent any common implementation of low loss PCB**

  – Response similar to equation 137-1 can be constructed naked microstrip on Rogers material or from cable

  – Equation 137-1 sqrt(f) response is increased by 7.5x from equation 92A-1

❑ **The suggested modification increases equation 137-1 sqrt(f) response by 2.2x in comparison to equation 92A-1 to better fit lower loss PCB material.**