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$$F_1^2 = \frac{1}{4 \pi^2 L C} \quad (1)$$

$$F_2^2 = \frac{1}{4 \pi^2 L (C + C_{cal})} \quad (2)$$

$$F_3^2 = \frac{1}{4 \pi^2 L (C + C_{cu})} \quad (3)$$

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Isolate C from (1)

$$C = \frac{1}{4 F_1^2 \pi^2 L} \quad (4)$$

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Substitute (4) into (2)

$$F_2^2 = \frac{1}{4 \pi^2 L \left(\frac{1}{4 F_1^2 \pi^2 L} + C_{cal} \right)} \quad (5)$$

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Substitute (4) into (3)

$$F_3^2 = \frac{1}{4 \pi^2 L \left(\frac{1}{4 F_1^2 \pi^2 L} + C_{cu} \right)} \quad (6)$$

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Isolate L from (5)

$$L = \frac{1}{4} \frac{\frac{F_1^2}{F_2^2} - 1}{C_{cal} F_1^2 \pi^2} \quad (7)$$

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Isolate L from (6)

$$L = \frac{1}{4} \frac{\frac{F_1^2}{F_3^2} - 1}{C_{cu} F_1^2 \pi^2} \quad (8)$$

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Equate (7) and (8)

$$\frac{1}{4} \frac{\frac{F_1^2}{F_3^2} - 1}{C_{cu} F_1^2 \pi^2} = \frac{1}{4} \frac{\frac{F_1^2}{F_2^2} - 1}{C_{cal} F_1^2 \pi^2} \quad (9)$$

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Simplify (9) by canceling out common terms, and there you have it!

$$\frac{\frac{F_1^2}{F_3^2} - 1}{C_{cu}} = \frac{\frac{F_1^2}{F_2^2} - 1}{C_{cal}}$$

(10)

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