Physics Assignment

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Problem Statement

A radio can tune over the frequency range of a portion of MW broadcast band: (800kHz to 1200kHz). If its LC circuit has an effective inductance of $200\mu H$, what must be the range of its variable capacitor?

Solution

To find the range of the variable capacitor (C) for a radio tuning over the frequency range of the MW broadcast band with an effective inductance (L) of $200\mu H$, we can use the formula for the resonant frequency (f) of an LC circuit:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

For this problem, we can rearrange the formula to solve for C:

$$C = \frac{1}{(2\pi f)^2 L}$$

Given the frequency range of 800 kHz to 1200 kHz, we can find the range of C by substituting these values into the formula:

$$C_1 = \frac{1}{(2\pi \times 800 \times 10^3)^2 \times 200 \times 10^{-6}} = 197.8\,\text{pF}$$

$$C_2 = \frac{1}{(2\pi \times 1200 \times 10^3)^2 \times 200 \times 10^{-6}} = 87.9\,\text{pF}$$

So, the variable capacitor should have a frequency range between 87.9 pF to 197.8 pF.

Table 1: Input Parameters given in question

Parameter	**Value**
Inductance (L)	$200\mu H$
Minimum Frequency	800 kHz
Maximum Frequency	1200 kHz

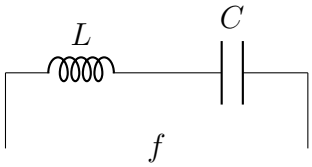

Figure 1: LC Circuit Diagram