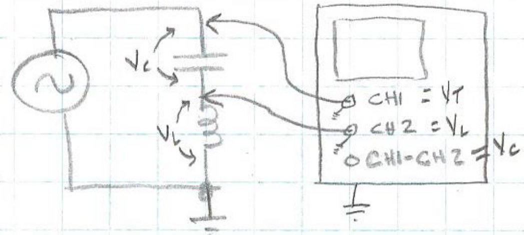
VIDEO 55

A LOOK AT LC RESONANCE

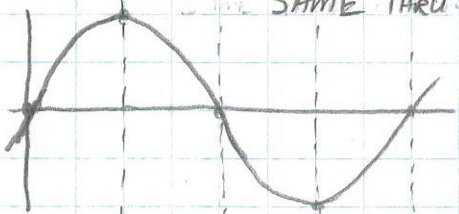
W2AEW ①

SERIES LC

CURRENT IS SAME THRU L+C



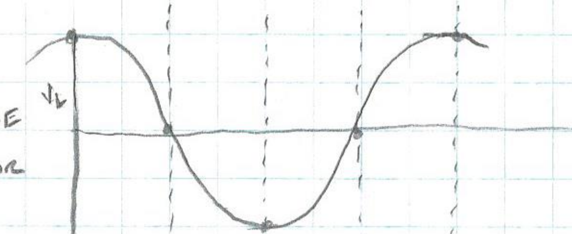
SERIES CURRENT



... LETS LOOK AT VOLTAGES

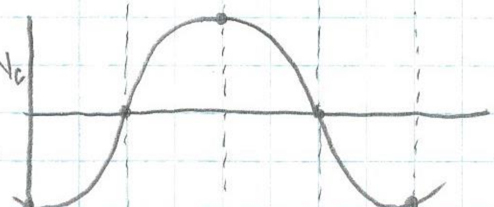
- FOR INDUCTOR, CURRENT LAGS VOLTAGE

VOLTAGE ACROSS INDUCTOR



\+ - FOR CAPACITOR, CURRENT LEADS VOLTAGE

VOLTAGE ACROSS CAPACITOR



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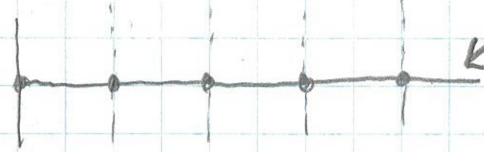
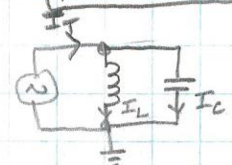
V_T



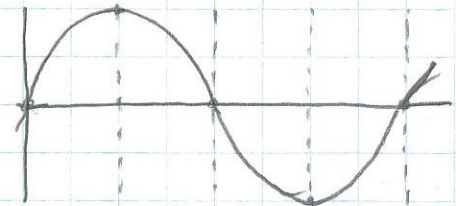
SERIES L-C LOOKS LIKE A SHORT CKT AT RESONANCE

PARALLEL LC

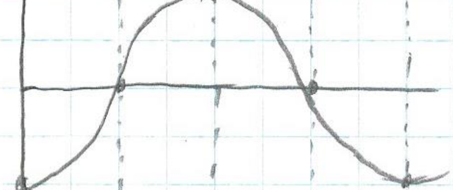


VOLTAGE IS SAME ACROSS L + C

VOLTAGE ACROSS L + C

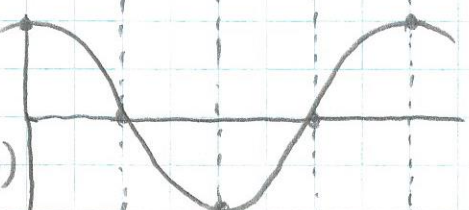


I_L (LAGS)



\+

I_C (LEADS)



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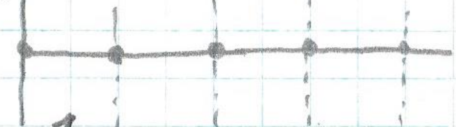
I_T



PARALLEL LC LOOKS LIKE OPEN CKT AT RESONANCE

RESONANT CIRCUITS - PART II

$X_L = 2\pi f L$

$X_C = \frac{1}{2\pi f C}$

RESONANCE IS WHEN $X_L = X_C$

OR..

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

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

SOLVE FOR L: $L = \frac{1}{39.48 \cdot f^2 \cdot C}$

SOLVE FOR C: $C = \frac{1}{39.48 \cdot f^2 \cdot L}$

SOLVE FOR f: $f = \frac{1}{2\pi \cdot \sqrt{LC}}$

IN AN IDEAL WORLD, THERE ARE INFINITE COMBINATIONS OF L & C VALUES THAT WILL RESONATE AT ANY GIVEN FREQUENCY.

EXAMPLE: $f = 10\text{MHz}$ RESONANT FREQUENCY

START WITH <u>1pF</u> CAPACITOR...

$f_R = 10\text{MHz} \rightarrow L = \underline{253\mu H}$

OR

<u>1μF</u> CAPACITOR, $L = \underline{253pH}$

1pF & 253μH = 1μF & 253pH

- PRACTICAL, NON-IDEAL FACTORS DETERMINE WHAT TO DO...