

Lab 12: The Impedance of an Inductor

Philip Kim

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Table 1: First Approximation for R_{int}

$f(Hz)$	s/DIV	$V_{RL}(V)$	V/DIV for V_{RL}	$V_L(V)$	V/DIV for V_L	$R_{int}(\Omega)$
1000	0.5ms	3.56V	0.5V	0.05V	0.5V	1.42

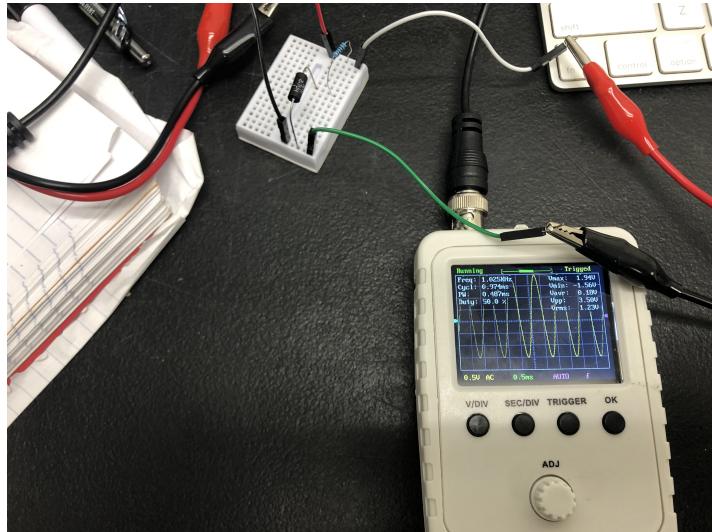
Table 2: First Approximation for L

$f(Hz)$	s/DIV	$V_{RL}(V)$	V/DIV for V_{RL}	$V_L(V)$	V/DIV for V_L	$I_R(A)$	$Z_{L,eff}(\Omega)$	$X_L(\Omega)$	L (H)
65000	0.2ms	3.28V	0.5V	0.10V	0.5V	0.033	3.05	0.771	1.89e-6

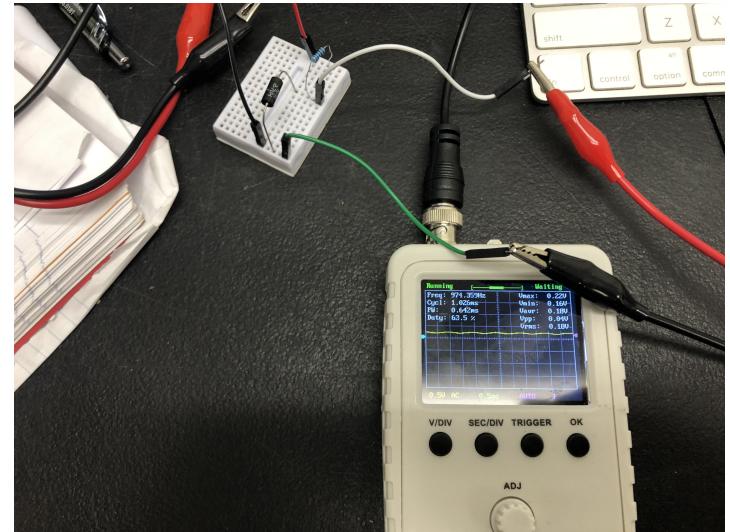
Table 3: The Impedance of an Inductor

$f(Hz)$	s/DIV	$V_{RL}(V)$	V/DIV for V_{RL}	$V_L(V)$	V/DIV for V_L
1000	0.5ms	3.56V	0.5V	0.05V	0.5V
22000	0.5ms	3.56V	0.5V	0.06V	0.5V
32000	0.5ms	3.46V	0.5V	0.08V	0.5V
39000	0.5ms	3.42V	0.5V	0.08V	0.5V
45000	0.5ms	3.38V	0.5V	0.08V	0.5V
50000	0.2ms	3.36V	0.5V	0.09V	0.5V
55000	0.2ms	3.32V	0.5V	0.09V	0.5V
60000	0.2ms	3.30V	0.5V	0.10V	0.5V
65000	0.2ms	3.28V	0.5V	0.10V	0.5V

SETUP

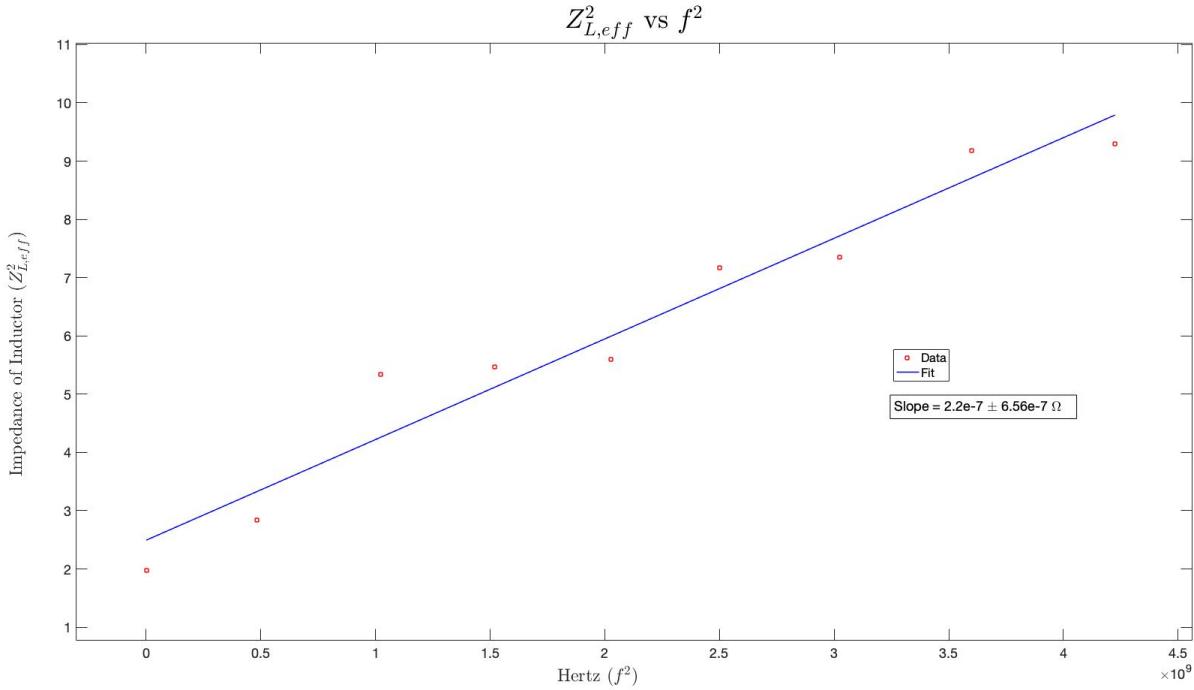


V_{RL}



V_L

GRAPH



$$R_{int} = R / ((V_{RL}/V_L) - 1)$$

$$I_R = V_{RL}/R$$

$$Z_L = V_L/I_R$$

$$X_L = \sqrt{Z_L^2 - R_{int}^2}$$

$$L = X_L/(2 * \pi * Hz)$$

$$R = 100$$

$$Hz = 1000, 22000, 32000, 39000, 45000, 50000, 55000, 60000, 65000$$

$$R_{int} = 1.43, 1.71, 2.37, 2.40, 2.42, 2.75, 2.79, 3.13, 3.14$$

$$L = 3.79 \times 10^{-5}, 2.27 \times 10^{-6}, 2.52 \times 10^{-6}, 2.10 \times 10^{-6}, 1.85 \times 10^{-6}, 2.01 \times 10^{-6}, 1.86 \times 10^{-6}, 2.03 \times 10^{-6}, 1.89 \times 10^{-6}$$

- We assume that the current is determined by the largest resistor in the circuit, R. How large is the error that we can expect as a result? $\pm 6.56 \times 10^{-7} \Omega$