Lab 13: The DIY Inductor

Philip Kim

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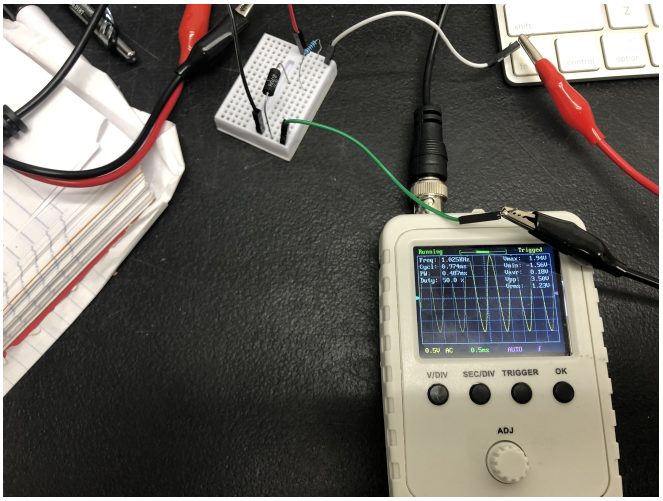
Table 1: Sizes	
Copper wire length l	51.2 cm
Diameter of pen d	0.25 cm
Number of windings N	70
Length of the inductor a	1.1 cm

Table 2: 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

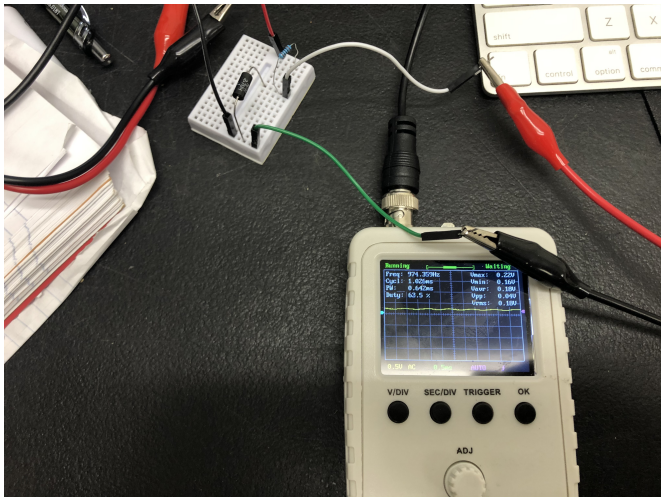
Table 2: First Approximation for L									
$f(Hz)$	s/DIV	$V_{RL}(V)$	V/DIV for V_{RL}	$V_L(V)$	V/DIV for V_L	$I_R(A)$	$Z_{L,eff}(\Omega)$	$X_L(\Omega)$	L (H)
65000	0.2ms	3.28V	0.5V	0.10V	0.5V	0.033	3.05	0.771	1.89e-6

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

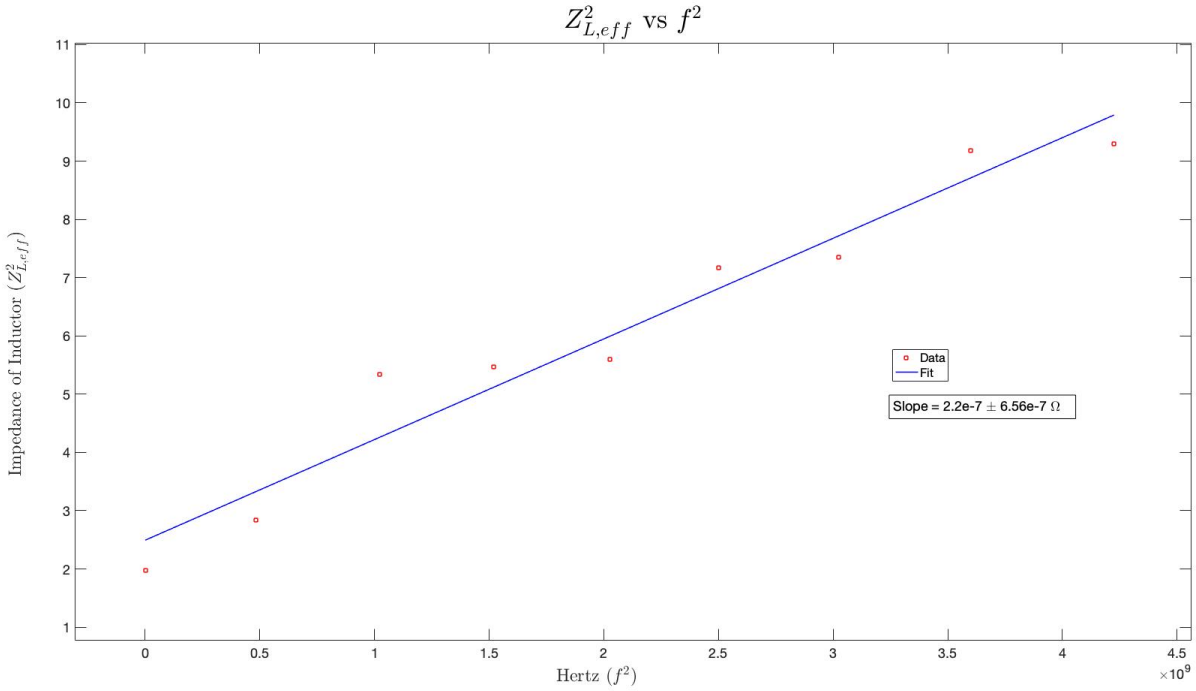


V_{RL}



V_L

GRAPH



- Compare the obtained value to that predicted for an ideal long inductor made of a wire of length l and taking up length a along the toothpick, $L = \frac{l^2}{a} \times 10^{-7} H \rightarrow \ L = \frac{.512m}{.011m} \times 10^{-7} H \rightarrow \ L = 4.65 \times 10^{-7} H$