Lab 13: The DIY Inductor

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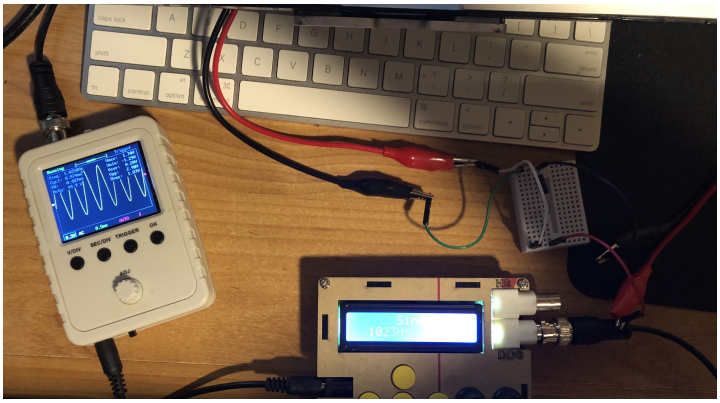
Table 1: Sizes	
Copper wire length l	51.2 cm
Diameter of pen d	0.25 cm
Number of windings N	70
Length of the inductor a	1.1 cm

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	2.98V	0.5V	0.04V	0.5V	1.36

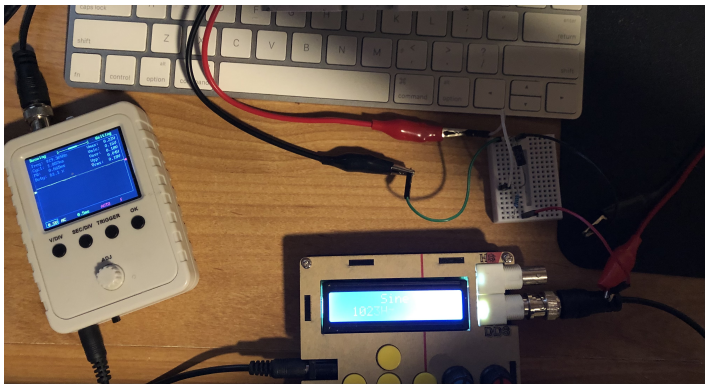
Table 2: First Approximation for L									
$f(Hz)$	s/DIV	$V_{RL}(V)$	V/DIV for V_{RL}	$V_L(V)$	V/DIV for V_L	$I_R(A)$	$Z_{L,eff}(\Omega)$	$X_L(\Omega)$	L (H)
65000	20us	3.02V	0.5V	0.06V	0.5V	0.030	1.99	0.402	9.84e-7

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	2.98V	0.5V	0.04V	0.5V
22000	20us	3.04V	0.5V	0.04V	0.5V
32000	20us	3.02V	0.5V	0.04V	0.5V
39000	20us	3.04V	0.5V	0.04V	0.5V
45000	20us	3.00V	0.5V	0.06V	0.5V
50000	20us	2.98V	0.5V	0.06V	0.5V
55000	20us	3.02V	0.5V	0.06V	0.5V
60000	20us	3.02V	0.5V	0.06V	0.5V
65000	20us	3.02V	0.5V	0.06V	0.5V

SETUP



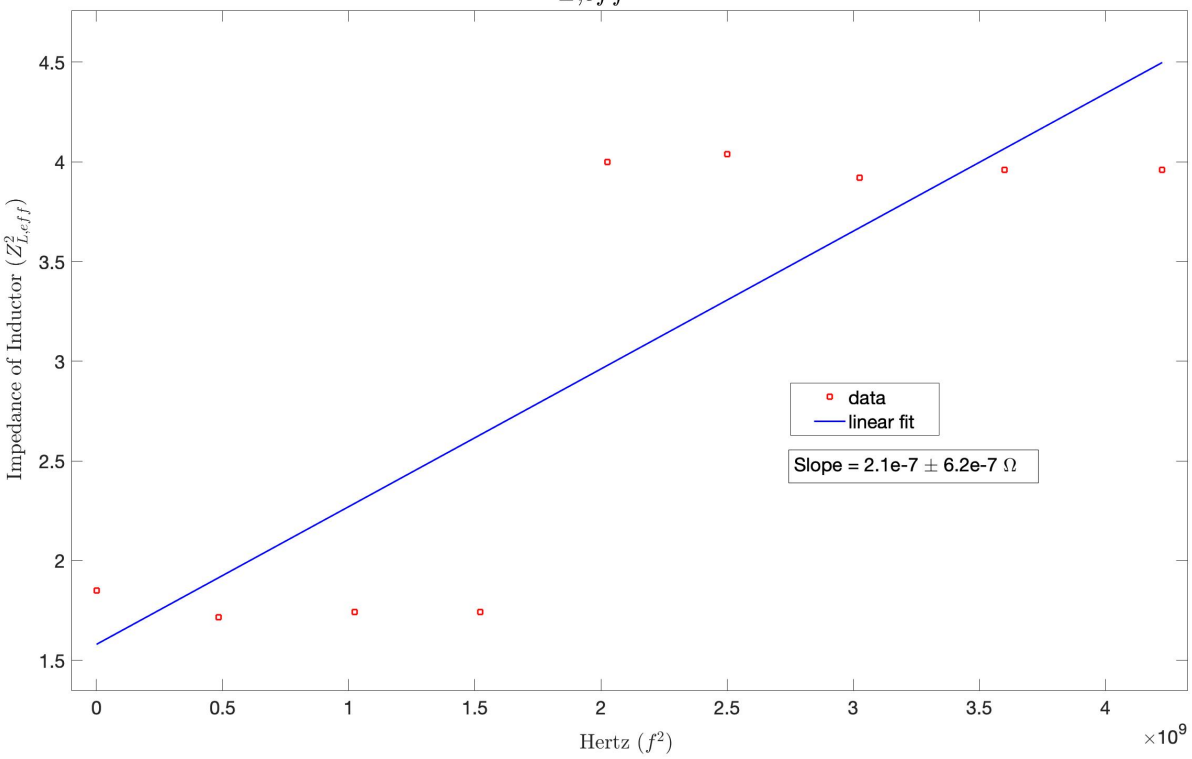
V_{RL}



V_L

GRAPH

$Z^2_{L,eff}$ vs f^2



- 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, $L = \frac{l^2}{a} \times 10^{-7} H \rightarrow \ L = \frac{.512m}{.011m} \times 10^{-7} H \rightarrow \ L = 4.65 \times 10^{-7} H$