Experiment: 10 **A03-Niraj Jha**

MAXWELL BRIDGE

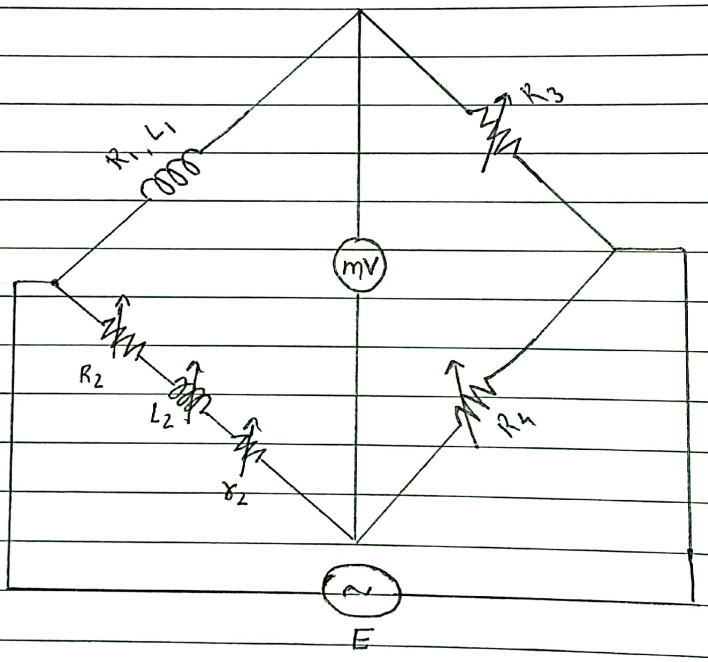
AIM

To study the Maxwell Bridge and determine the self inductance of an unknown coil.

THEORY

The bridge used for the measurement of self-inductance of the circuit is known as the Maxwell bridge. It is the advanced form of the Wheatstone Bridge. The Maxwell Bridge works on the principle of the comparison i.e the value of unknown inductance is determined by comparing it with the known value or standard value.

Circuit Diagram:



Let,

L_1 = unknown self inductance of resistance R_1,

L_2 = variable inductance of fixed resistance r_2

R_2 = variable resistance connected in series with inductor of L_2.

R_3, R_4 = known non-inductive resistance

At balance condition,

$$(R_1 + j\omega L_1)(R_4) = (R_2 + r_2 + j\omega L_2) R_3 \quad \text{---- (i)}$$

Equating both the real and imaginary parts in eq (i) and separating them,

$$L_1 = \left(\frac{R_3}{R_4}\right) L_2 \quad \text{---- (ii)}$$

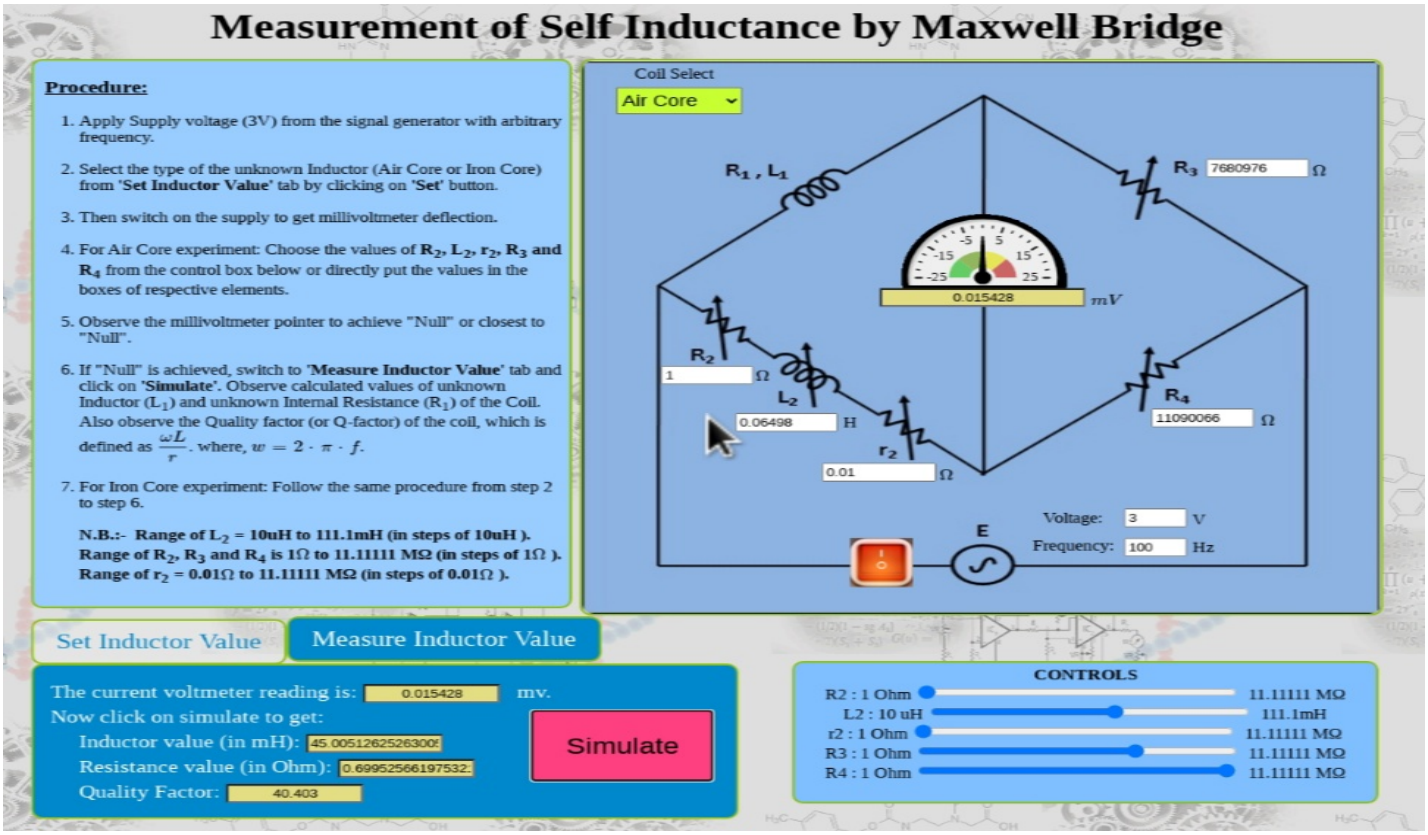
$$R_1 = \left(\frac{R_3}{R_4}\right)(R_2 + r_2) \quad \text{---- (iii)}$$

PROCEDURE

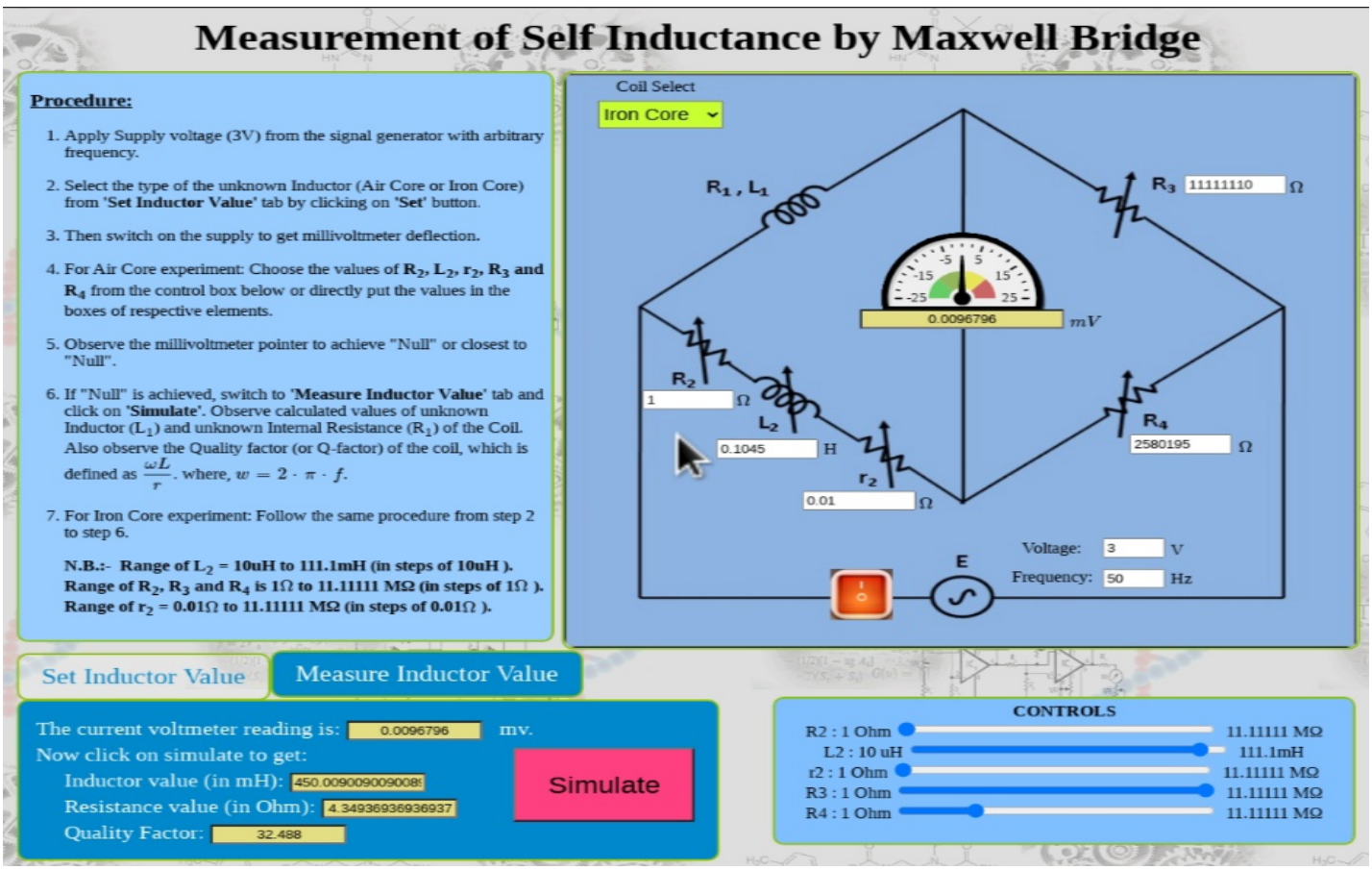
1)Apply Supply voltage from the signal generator with arbitrary frequency. (V =3v). Also set the unknown Inductance value from 'Set Inductor Value' tab.
2)Then switch on the supply to get millivoltmeter deflection.
3)Choose the values of L2, r2, R2, R3 and R4 from the inductance and resistance box. Varry the values to some particular values to achieve "NULL".
4)Observe the millivoltmeter pointer to achieve "NULL".
5) If "NULL" is achieved, switch to 'Measure Inductor Value' tab and click on 'Simulate'. Observe the calculated values of unknown inductance (L1) and it's internal resistance (R1) of the inductor.

SIMULATION

- **For Air core**



- **For Iron core**



OBSERVATION TABLE:

Voltage = 3V

Sr No	Core	R_1 (Ω)	R_2 (Ω)	r_2 (Ω)	R_3 (Ω)	R_4 (Ω)	L_2 (H)	L_1 (H) (Measured)	L_1 (H) (True)	% Error
1.	Air	40.2	1	0.01	7.68M	11.09M	64.98m	45.005 m	45 m	0.01
2.	Iron	40.2	1	0.01	11.11M	2.58M	104.5m	450.009 m	450 m	0.001

Average % Error = 0.005

Result: The accuracy of the bridge is 99.995%.

CONCLUSION

In this experiment we studied about the working of Maxwell Bridge to determine the self inductance of an unknown coil by comparing it with standard value and verified the results with the help of simulation.