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REVIEWER'S REPORT

Manuscript No.: **IJAR-53198** Date: 07-08-2025

Title: INDUCTOR TESTING CAN DETERMINE THE VALUES OF IMPENDATION, INDUCTIVE REACTANCE AND INDUCTANCE IN THE INDUCTOR

Recommendation:
Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality	√			
Clarity	√			
Significance		√		

Reviewer Name: Dr. Manju M **Date:** 07-08-25

Reviewer's Comment for Publication.

1. The experiment clearly demonstrated how **coil turns and core material** substantially affect inductance. Inductors with more turns and ferromagnetic cores produced higher inductance values, confirming textbook theory on magnetic permeability and coil design.

2. *Using* a **DC power source** restricted the analysis to resistance only, missing the crucial concept of **inductive reactance**, which appears under AC conditions. This limits the scope of the experiment in analyzing complete inductor behavior in real-world AC circuits.

3. The **broad range of inductance values (0.31 H to 31.4 H)** across different inductors underscores that inductors must be carefully selected based on their intended function, such as filtering, energy storage, or impedance matching in specific frequency ranges.

4. The experiment provided **valuable hands-on experience** and real data, reinforcing theoretical concepts from Basic Electronics. The findings also offer a **reference point** for future experimental setups and circuit design considerations involving inductors.

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Detailed Reviewer's Report

1. **Objective of the Study:**

The study aimed to measure and analyze key electrical properties—resistance, voltage, current, impedance, inductive reactance, and inductance—of four different inductors to understand their behavior in circuits.

2. **Background on Inductors:**

Inductors are passive components that store energy in magnetic fields. Their electrical characteristics depend on coil windings and core materials such as ferromagnetic (Fe), paramagnetic (Cu), or diamagnetic (Al), affecting their performance in AC and DC circuits.

3. **Selection of Inductors:**

Four inductors were tested: 1000 Winding (Wdg), 500 Wdg, 33 mH, and 10 mH, chosen for their varying inductance values and physical construction to represent a range of typical inductors.

4. **Experimental Setup and Materials:**

Measurements were taken using an Avometer for voltage, current, and resistance, connected through a terminal board and powered by a DC power supply to ensure stable excitation during testing.

5. **Measurement Procedure:**

Each inductor was individually connected to the circuit. Voltage across and current through each inductor were measured, followed by resistance measurement. Data were recorded systematically for analysis.

6. **Resistance Observations:**

Resistance values varied significantly: the 1000 Wdg inductor showed the highest resistance (20 Ω), while the 33 mH inductor exhibited the lowest (1.3 Ω), indicating differences in wire length and gauge.

7. **Voltage and Current Findings:**

Voltage drops across inductors ranged from 1.1 V to 1.5 V, while current ranged from 0.01 mA to 0.28 mA. Lower current flow corresponded with inductors of higher resistance and impedance.

8. **Calculation of Impedance (Z):**

Impedance was calculated as the ratio of voltage to current for each inductor. The 1000 Wdg inductor had the highest impedance (~20 Ω), demonstrating greater opposition to current flow.

9. **Inductive Reactance (X_l) and Inductance (L) Analysis:**

Inductive reactance and inductance were theoretically calculated assuming AC conditions. X_l ranged from 1 Ω to 100 Ω and inductance values ranged from 0.31 H to 31.4 H, reflecting the influence of winding count and core material.

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10. Core Material Influence:

Inductors with ferromagnetic cores (Fe) displayed significantly higher inductance due to increased magnetic permeability. Paramagnetic (Cu) and diamagnetic (Al) cores showed reduced inductance, illustrating core material's impact.

11. Limitations of the DC Test Method:

The use of a DC power supply allowed only measurement of resistance and voltage. Inductive reactance and true impedance require AC excitation, so the reactance and inductance values obtained are theoretical, limiting full characterization.

12. Conclusion and Practical Implications:

The study confirmed that inductors with more windings and ferromagnetic cores have higher inductance and impedance, affecting current flow and voltage drop. Understanding these characteristics is vital for designing efficient filters, transformers, and energy storage devices. AC testing is recommended for comprehensive inductor analysis.

13. **Significances**:

- **Improved Circuit Design:**
  Understanding how different inductors behave electrically—especially how resistance, inductance, and impedance vary with coil turns and core material—helps engineers and students select the right inductor for specific applications like filters, transformers, and energy storage. This leads to more efficient and reliable circuit performance.
- **Foundational Knowledge for AC Analysis:**
  Although the experiment used DC testing, the study highlights the importance of AC-based measurements for fully characterizing inductors. This foundational understanding prepares learners and practitioners to properly analyze and apply inductors in real-world AC circuits, where frequency-dependent behavior is critical.