

physics practical report

Shanil Shah sbs57
Part IB Physics Report

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Abstract

Abstract Guidance:

1. This is NOT an introduction. It is a summary of the entire report.
2. Structure:
 - State the question/open problem (1-2 sentences).
 - Briefly describe what was done and how (method).
 - Present the MAIN results, including specific numerical values (e.g., power dissipated, permeability) and uncertainties.
 - Conclude with the implication of the results.
3. Constraints:
 - No bullet points.
 - No tables or graphics.
 - No references usually.
 - Paragraphs should not be single sentences.

1 Introduction

Introduction Guidance:

1. Context Motivation:
 - Why is this experiment interesting? (e.g., understanding magnetic properties of materials).
 - Explain the physics FIRST, then the technical details.
2. Audience:
 - Write for another 1B Physics student who has NOT seen the manual.
3. Content:
 - Briefly introduce hysteresis and ferromagnetic materials.
 - State the aims: Investigate B-H curves, measure energy loss, check saturation behavior.

2 Theory

Theory Guidance:

1. Key Equations:
 - Solenoid field: $H = I * n_p / L_p$ (Eq 6.1)
 - Measurement of I via $V_x : V_x = I * R_p$ (Eq 6.2)
 - Induced EMF: $E_s = n_s * d(\phi) / dt$ (Eq 6.3)
 - Integrator output: V_y proportional to B (Eq 6.5)
 - Flux in sample: $\phi \approx B_{sample} * A_{sample}$ (Eq 6.6)
2. Concepts:
 - Explain Hysteresis: Directional dependence, energy loss per cycle = Area of loop (integral H dB).
 - Saturation: Explain that μ_r approaches 1 at saturation.
3. Conventions:
 - Variables in italic (e.g., B , H), Units not in italic (e.g., T , A/m).
 - Define all symbols before use.

3 Experimental Setup

Experimental Setup Guidance:

1. General:
 - Do NOT rewrite the lab manual step-by-step.
 - Focus on what is relevant for the reader to understand the results.
2. Apparatus:
 - Include a schematic diagram of the setup (Solenoid, Secondary coil, Integrator, Oscilloscope).
 - Describe the integrator circuit (R and C values) and why it's used.
 - Mention the calibration step using the air core (linear B-H).
3. Samples:
 - List the materials tested: Mild steel, Transformer iron, Cu/Ni alloy.
 - Mention the temperature variation setup for Cu/Ni.

4 Results

Results Guidance:

1. Graphs (Crucial): - Plot Hysteresis loops (B vs H) for Mild Steel and Transformer Iron. - Plot loops for Cu/Ni above and below 40 deg C. - Ensure axes are labeled (Quantity / Unit). - Include ERROR BARS on graphs. - Use solid data markers.
2. Quantitative Results:
- Calculate and report Power dissipated per unit volume (P / V): Area of loop).
3. Report Relative Permeability (μ_r): Max, Min, and Range.
- Compare values for different materials.
3. Presentation:
- Figures must have detailed captions describing the features.
- Refer to every figure in the text.

5 Discussion

Discussion Guidance:

1. Interpretation:
- Do the results match theoretical expectations? (e.g., Does μ_r approach 1 at saturation?)
- Discuss the shape of the loops.
2. Comparison:
- Compare your results with literature values (cite references).
3. Uncertainties:
- Critical evaluation of Systematic and Random errors.
- Discuss the limitations of the apparatus (e.g., temperature measurement accuracy for Cu/Ni).
- How do uncertainties affect your conclusions?

6 Conclusion

Conclusion Guidance:

1. Summary:
- Summarize the main findings (Power dissipated, μ_r values).
- State whether the aims were achieved.
2. Final Remarks:
- Comment on the validity of the method.
- No new information should be introduced here.
- No bullet points.