

# Modern Physics Experiment Report: Zeeman Effect

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## Abstract

This report investigates the Zeeman Effect, a phenomenon where spectral lines are split into multiple components in the presence of a magnetic field. The experiment aims to measure the splitting and verify the theoretical predictions.

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# 1 Introduction

The Zeeman Effect, discovered by Pieter Zeeman, is a crucial phenomenon in modern physics that demonstrates the interaction between magnetic fields and atomic energy levels. This section introduces the theoretical background and significance of the Zeeman Effect.

## 2 Theory

### 2.1 Quantum Explanation

test the quantum mechanical basis of the Zeeman Effect, including the role of magnetic dipole moments and energy level splitting.

### 2.2 Mathematical Formulation

Provide the equations governing the Zeeman Effect, such as:

$$\Delta E = m_l \mu_B B$$

where  $\Delta E$  is the energy shift,  $m_l$  is the magnetic quantum number,  $\mu_B$  is the Bohr magneton, and  $B$  is the magnetic field strength.

## 3 Experimental Setup

THIs is me. Describe the apparatus used, including the spectrometer, light source, and magnetic field generator. Include a diagram if possible:

## 4 Procedure

Outline the steps taken to perform the experiment, including calibration, data collection, and analysis.

## 5 Results

Present the observed spectral line splitting and compare it with theoretical predictions. Include tables and graphs where necessary.

## 6 Discussion

Analyze the results, discuss sources of error, and evaluate the agreement between experimental and theoretical values.

## 7 Conclusion

Summarize the findings and their implications for understanding the Zeeman Effect.

## References

List all references used in the report, formatted appropriately.