Measuring the Zeeman Effect

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Abstract

1 Introduction

1.1 Historical Background

1.2 Theory of the Zeeman Effect

2 Methods and Procedures

To study the Zeeman effect, observations of a mercury lamp were made first with no magnetic field and 90 deg polarization, then with an approximately $1T$ magnetic field. Observations with a magnetic field included:

- 90 deg (field-perpendicular) polarization
- 0 deg (field-parallel) polarization
- No polarization
- Axial B-field at polarization varying from 90 deg to 0 deg

2.1 Method Description

3 Data and Results

3.1 Spectra Through a Perpendicular Magnetic Field

3.1.1 Spectra with Field-Perpendicular Polarization

3.1.2 Spectra with Field-Parallel Polarization

3.2 Spectra Along an Axial Magnetic Field

3.3 Measurement of the Bohr Magneton

With the precise measurement of spectral line splitting in the presence of the perpendicular magnetic field, it was possible to measure the value of the Bohr magneton.

4 Conclusion

(a) Perpendicular field configuration.

(b) Axial field configuration.

Figure 1: The two magnetic field configurations observed. In (1a), the magnetic field is oriented perpendicularly to the path of the observed light from the mercury lamp. In configuration (1b), light from the lamp travels along the magnetic field lines down the center of one of the solenoids through a sight hole.