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Abstract

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Table of contents

List of figures

List of tables

Chapter 1

Theory

1.1 Rubidium

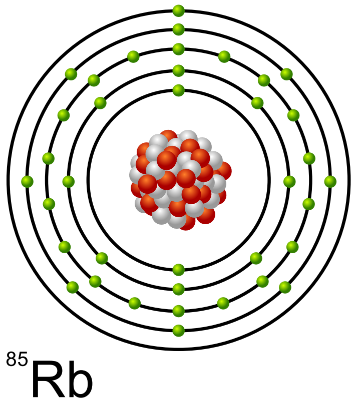

Fig. 1.1 Schematical representation of ^{85}Rb

Rubidium is a chemical element with symbol Rb and atomic number 37. It is a soft, silvery-white metallic element of the alkali metal group, with an atomic mass of 85.4678. Elemental rubidium is highly reactive, with properties similar to those of other alkali metals.

German chemists Robert Bunsen and Gustav Kirchhoff discovered rubidium in 1861 by the newly developed technique, flame spectroscopy. Because of the bright red lines in its emission spectrum, they chose a name derived from the Latin word rubidus, meaning “deep red”. [1]

Although rubidium is monoisotopic, rubidium in the Earth’s crust is composed of two isotopes: the stable ^{85}Rb and the radioactive ^{87}Rb. [2]

	Rubidium	
Isotope	85	87
Atomic mass	84.911794	86.909187
in 10^{-25}kg	1.40999	1.44316
Abundance	72.17%	27.83%
Spin I	$^5/_2$	$^3/_2$

Table 1.1 Properties of rubidium isotopes

1.2 D2 line

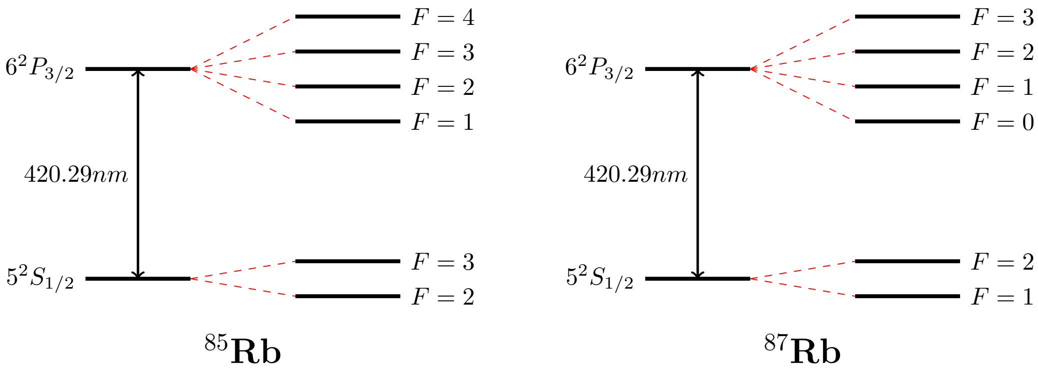

Fig. 1.2 $5^2S_{1/2} \rightarrow 6^2P_{3/2}$ transition of ^{85}Rb and ^{87}Rb with corresponding hyperfine structure

As we can see both isotopes have the same transition energy, but due to the different spin I (see table: 1.1) we get different energy levels for the groundstate [3]. This is the reason why we wittness four doppler peaks in our spectrum (see figure:1.3)

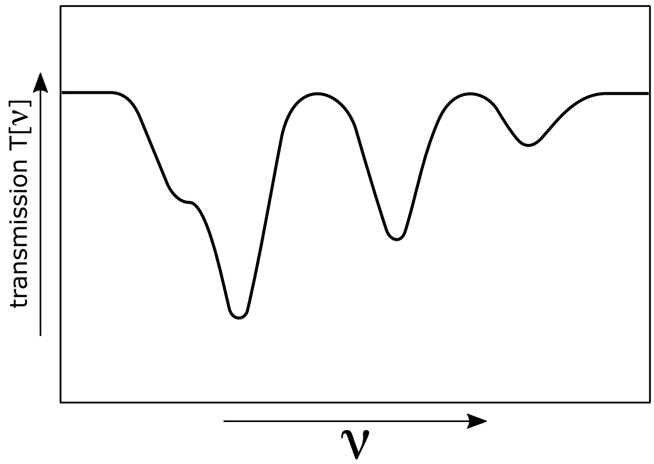

Fig. 1.3 Doppler spectrum of D2 line

1.3 Two-level atom

1.4 Laser absorbtion

1.5 Doppler shifts

1.6 Behavior of absorbtion coefficient

1.7 Non-linear differential equation

Chapter 2

Experiment

2.1 Setup & Tools

2.2 Laser diameter measurement

2.3 Power / intensity measurement

2.4 Doppler-free measurement

Chapter 3

Evaluation

3.1 Data processing

3.2 Temperature & saturation intensity

3.3 Comparison with theory

3.4 Compare Doppler-free measurement with theoretical values

References

[1] G. Kirchhoff and R. Bunsen. Chemische Analyse durch Spectralbeobachtungen. *Annalen der Physik*, 189:337–381, 1861.

[2] G. Audi, O. Bersillon, J. Blachot, and A. H. Wapstra. The NUBASE evaluation of nuclear and decay properties. *Nuclear Physics A*, 729:3–128, December 2003.

[3] J. Reader A. Kramida, Yu. Ralchenko and NIST ASD Team (2015). NIST atomic spectra database (ver. 5.3). *National Institute of Standards and Technology*, 2015.

Appendix A

Theory

Appendix B

Experiment

Appendix C

Evaluation