TU Dresden

Advanced practical course

Lab report

Nuclear Magnetic Resonace

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1 Introduction

1.1 Motivation

Nuclear Magnetic Resonance is a physical phenomenon that can be observed while placing an ensemble of nuclei into a static magnetic field and stimulate it with a high-frequent alterning field. A necessary condition for this effect is that the atoms of the sample have a *nuclear spin* different from zero. It is the central concept that is used for *NMR-Spectroscopy*, a standard methodology for the investigation of the structure and interaction of complex molecules and solid state bodies by measuring local magnetic fields, and the *magnetic resonance tomography* which is an imaging technique used in clinical diagnistics for describing the morphilogic and physiologic build-up of tissues and organs. For all of those applications we need to find out some central parameters of particular physical compensation-processes, the so called *relaxation times* T_1 and T_2. In the following experiment exactly those material-characteristic obserables are determined for an ensemble of ^{57}Fe-nuclei. But at first some basic knowledge.

1.2 Nuclear Zeeman-Effect

2 Experimental procedure

2.1 Preparation of a coil with an assay of iron powder

First a copper coil was prepared. It was wrapped over a pen, which has nearly the same diameter as the sample container which contains powder of iron. We can count 12 windings. The coil had to be solded carefully at the contacts of a stick, where one can vary some propertys of the coil. It also detects the resonance frequency.

2.2

3 Data Analysis

4 Discussion and conclusions

References

[01] S. Diez. *Advanced practical course - Experiment MMC*, Dresden, 2015

[02] `https://en.wikipedia.org/wiki/Histogram` [November 20, 2015]

[03] `https://en.wikipedia.org/wiki/Kinesin` [November 22, 2015]

[04] S. Ferbrugge et al. *Novel ways to determine kinesin-1's run length and randomness using fluorescence microscopy*. Amsterdam. October 2009

[05] S. Klumpp, R. Lipowsky.*Cooperative cargo transport by several molecular motors*. Potsdam. November 2005