An RF Wien filter for a first Deuteron EDM-Measurement at COSY/Jülich

J. Slim[1], R. Gebel[2], D. Heberling[1,3], A. Nass[2], F. Rathmann[2], L. Reifferscheidt[4], H. Soltner[4], and H. Straatmann[4]
(for the JEDI Collaboration)[*]

[1] *Institute of High-Frequency Technology, Rheinisch-Westfälische Technische Hochschule Aachen, 52074 Aachen, Germany*
[2] *Institute of Nuclear Physics (IKP), Forschungszentrum Jülich GmbH, 52428 Jülich, Germany*
[3] *JARA-FAME (Forces and Matter Experiments), Forschungszentrum Jülich and RWTH Aachen University, 52056 Aachen, Germany*
[4] *Central Institute of Engineering and Analytics (ZEA), Forschungszentrum Jülich GmbH, 52428 Jülich, Germany*

June 20, 2016

Abstract

The JEDI (Jülich Electric Dipole Investigations) Collaboration aims for measuring the electric dipole moments (EDMs) of charged particles (deuterons and protons) at the COoler SYnchrotron (COSY). To make this possible, a new, high precision novel waveguide RF Wien filter is planned to be integrated in COSY to modulate the spin of deuterons and protons. With a Wien filter, the force of the radial electric field is canceled by the vertical magnetic force. So it is possible to directly manipulate the polarization vector of the particles without introducing any beam oscillations. This RF Wien filter is designed to operate at harmonics of the spin precession frequency ranging from 0.1 to 2 MHz. The working principle is based on the Transverse Electromagnetic (TEM) mode of a parallel-plates waveguide structure that is able of fulfilling the Wien filter condition *by-design* while being capable of generating high quality electromagnetic fields to the level of 10^{-5} to 10^{-6}. For systematic investigations of sources of false EDM signals, the waveguide RF Wien filter can be rotated by 90° around the beam axis.

---

[*] <http://collaborations.fz-juelich.de/ikp/jedi>