ST 2: Georg-Simon-Ohm-Prize Session (joint session PRV/ST)

Time: Tuesday 9:30–10:00 Location: Kunsthalle

Prize Talk ST 2.1 Tue 9:30 Kunsthalle

Exploring Gamma-detected Magnetic Resonance Imaging — •Robin Yoël Engel — CERN, Geneva, Schweiz — C.v.O. University of Oldenburg, Germany — HS Emden-Leer, Germany — Laureate of the Georg-Simon-Ohm-Prize 2019

In 2016, the proof of principle for a new method of imaging was presented (Nature 537.7622 (2016): 652-655.), which uses many elements of traditional Magnetic Resonant Imaging, but replaces the detection of RF induction signals with that of the anisotropic gamma-emission from a hyper-polarized radioactive noble gas. Since gamma-radiation is in comparison very easy to detect, this method is sensitive to concentrations of imaged nuclei that are up to ten orders of magnitude lower than those needed in conventional MRI. Therefore, it has the perspective of combining the advantages of nuclear tracers, as they are used in SPECT and PET, with the higher spatial resolution of MRI. In addition to a software for numerical simulations of the spin precession and nuclear emission behavior during magnetic resonance experiments on hyper-polarized radioactive xenon, dedicated setups were developed. The main setup is designed for magnetic resonance experiments on hyper-polarized xenon, capable of using both the anisotropic gamma emission from radioactive nuclei as well as induction signals from stable isotopes for detection. It utilizes an existing low-field MRI-scanner and Si-PMT based gamma detectors in combination with elements from a spin-exchange optical pumping setup developed for hyper-polarized MRI on stable Xenon. This talk introduces the principle of gamma detected MRI and presents the developments within the frame of this master thesis.