Contribution ID: **11** Type: **not specified**

Nuclear resonance fluorescence of ^{242}Pu

Tuesday, 29 October 2024 13:25 (25 minutes)

The electromagnetic dipole response of ^{242}Pu was studied for the first time using the nuclear resonance fluorescence (NRF) method, hence with real photons. The experiment was performed at TU Darmstadt, where monoenergetic electrons are provided by the superconducting Darmstadt linear electron accelerator S-DALINAC to produce bremsstrahlung by impinging on a gold radiator target. A sample of PuO_2 with a total mass of about 1 g was irradiated by a bremsstrahlung beam, having a continuous energy distribution up to 3.7 MeV. Resonantly scattered photons were detected with two high-purity Germanium detectors at angles of 90° and 130° relative to the direction of the incident photon beam, which allows us to distinguish between dipole and quadrupole transitions based on their different angular distributions. The highly-enriched ^{242}Pu target was placed in a special container taking into account the sample's total radioactivity of about 370 MBq. To identify the NRF signals originating from the target, NRF spectra of an empty target container, γ-ray spectra of the sample's radioactivity, and background measurements were compared. Evidence for decays of photo-excited states of ^{242}Pu was found – making ^{242}Pu the heaviest nuclide for which NRF data is available for the moment. Details of the experiment, γ-ray spectra, and preliminary results will be presented.

We thank the Institute of Resource Ecology of HZDR for providing the ^{242}Pu sample. This work was supported by the State of Hesse within the LOEWE program and by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under project-ID 499256822 – GRK 2891 "Nuclear Photonics".

Primary authors: BEUSCHLEIN, M. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); BIRKHAN, J. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); KLEEMANN, J. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); PAPST, O. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); PIETRALLA, N. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); SCHWENGNER, R. (Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany); WEIß, S. (Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany); WERNER, V. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); AHMED, U. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); BECK, T. (Facility for Rare Isotope Beams, Michigan State University, East Lansing, MI, USA); BRANDHERM, I. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); GUPTA, A. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); HAUF, J. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); IDE, K. E. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); KOSEOGLOU, P. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); MAYR, H. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); NICKEL, C. M. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); PRIFTI, K. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); SINGER, M. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); STETZ, T. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany); ZIDAROVA, R. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany)

Presenter: BEUSCHLEIN, M. (Technische Universität Darmstadt, Department of Physics, Institute for Nuclear Physics, Darmstadt, Germany)

Session Classification: Oral contributions III