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Measurement Of The Linear Polarization Of Radiative Electron Capture

To improve the understanding of cosmic and laboratory plasmas with their high temperatures, charge states and field strengths, the determination of the linear polarization of the emitted photons is very important. Many Si(Li) and Ge(i) Compton polarimeters have been built and used within the SPARC collaboration for this purpose [1,2,3]. The development of these detector systems was accompanied by a significant increase of the energy resolution as well as an extension of the lowest accessible photon energy.

To make use of this improvement, the newest double-sided segmented Si(Li) detector with cryogenic preamplifiers was employed at an experiment at the internal gas target of the ESR storage ring of GSI, Darmstadt. The polarization of photons at the comparably low energy of 56 keV, arising from the radiative electron capture (REC) into the K shell of bare xenon ions interacting with the hydrogen gas target at an energy of 31 MeV/u, was measured. At such low-Z targets, the REC can be well approximated as the time-inversed process of photoionization. The dipole emission pattern of this process exhibits a next to full linear polarization [4]. The preliminary results of this experiment will be shown in this contribution.

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- [2] G. Weber et al., J. Instrum. 5, C07010 (2010)
- [3] M. Vockert et al., Nucl. Instr. Meth. B 408, 313-316 (2017)
- [4] J. Eichler, Th. Stöhlker, Phys. Rep. 439, 1-99 (2007)

Primary author: Mr VOCKERT, Marco (Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität Jena)

Co-authors: Dr WEBER, Günter (Helmholtz-Institut Jena); Prof. STÖHLKER, Thomas (GSI Helmholtzzentrum für Schwerionenforschung GmbH); Dr SPILLMANN, Uwe (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Presenter: Mr VOCKERT, Marco (Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität Jena)

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