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High-Resolution Microcalorimeter Measurement of X-Ray Transitions in He-like Uranium at CRYRING@ESR

Friday, 27 August 2021 11:00 (30 minutes)

The development of metallic magnetic calorimeters (MMCs) has resulted in a new class of detectors for precision X-ray spectroscopy such as the maXs detectors [1] (cryogenic micro-calorimeter arrays for high resolution X-ray spectroscopy experiments at FAIR), being developed within the SPARC collaboration. MMCs are energy dispersive detectors which combine the very high energy resolution comparable to crystal spectrometers (1.7 eV FWHM at 6 keV [2] and 50 eV FWHM at 100 keV within this experiment) with the broad bandwidth acceptance of semiconductor detectors (0.1 –100 keV) [3]. This is achieved by their unique measurement principle: at operating temperatures below 50 mK, the temperature rise caused by the absorption of an incident X-ray photon in an absorber leads to a change in the magnetisation of a paramagnetic sensor which can be measured by a superconducting quantum interference device (SQUID) [4]. By using these extraordinary capabilities, the ^{229}Th isomeric energy has recently been determined with unprecedented precision [5].

In this contribution we present the first application of maXs-type detectors for high resolution X-ray spectroscopy at CRYRING@ESR, the low energy storage ring of GSI, Darmstadt. Within the experiment, X-ray radiation emitted as a result of recombination events between the electron cooler electrons and a stored beam of U^{91+} ions was studied. For this purpose, two maXs detectors were positioned at the electron cooler under observation angles of 0° and 180° with respect to the ion beam axis. This report will focus on details of the experimental setup, its performance and its integration into the storage ring environment. Noteworthy aspects are a quasi-continuous energy calibration, as well as the first usage of the time resolution of the maXs detectors to achieve a coincidence measurement with a particle detector.

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References

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Is this abstract from experiment?

Yes

Name of experiment and experimental site

E138, GSI Helmholtzzentrum für Schwerionenforschung GmbH

Is the speaker for that presentation defined?

Yes

Details

Philip Pfäfflein, Helmholtz Institute Jena, Germany, https://www.hi-jena.de/en/

Internet talk

Yes

Primary author: PFÄFFLEIN, Ph. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Co-authors: ALLGEIER, S. (Kirchhoff-Institute for Physics, Heidelberg University); Dr FLEISCHMANN, A. (Kirchhoff-Institute for Physics, Heidelberg University); FRIEDRICH, M. (Kirchhoff-Institute for Physics, Heidelberg University); Dr GUMBERIDZE, A. (GSI Helmholtzzentrum für Schwerionenforschung GmbH); Dr HENGSTLER, D. (Kirchhoff-Institute for Physics, Heidelberg University); HERDRICH, M.O. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH); KRÖGER, F.M. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH); KUNTZ, P. (Kirchhoff-Institute for Physics, Heidelberg University); Dr LESTINSKY, M. (GSI Helmholtzzentrum für Schwerionenforschung GmbH); MENZ, E.B. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH); Dr SPILLMANN, U. (GSI Helmholtzzentrum für Schwerionenforschung GmbH); Dr WEBER, G. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH); Prof. ENSS, C. (Kirchhoff-Institute for Physics, Heidelberg University); Prof. STÖHLKER, Th. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Presenter: PFÄFFLEIN, Ph. (Helmholtz Institute Jena;Friedrich-Schiller-Universität Jena;GSI Helmholtzzentrum für Schwerionenforschung GmbH)

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