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High Resolution X-ray Spectroscopy at the Electron Cooler of CRYRING@ESR

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Recent develpoments regarding metallic microcalorimeters (MMCs) have resulted in a new class of detectors for precision X-ray spectroscopy, for example the maXs detectors [1] (cryogenic micro-calorimeter arrays for high resolution X-ray spectroscopy), which have been developed within the SPARC collaboration. Outstanding features of MMCs are the combination of a very high energy resolution (1.7 eV FWHM at 6 keV [2]) comparable to crystal spectrometers with the broad bandwidth acceptance of semiconductor detectors (0.1 – 100 keV) [3]. These detectors are based on the following measurement principle: The energy deposition of an incident X-ray phtoton leads to a measurable temperature rise of an absorber. At operation temperatures below 50 mK this leads to a change in the magnetisation of a paramagnetic sensor which can be measured by a superconducting quantum interference device (SQUID) [4]. In this contribution we present the first application of maXs-type detectors for high resolution x-ray spectroscopy at CRYRING@ESR. Within the experiment, X-ray radiation emitted as a result of recombination events between the electron cooler electrons and a stored beam of U91+ 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. We will focus on details of the experimental setup 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. References: [1] C. Pies et al., J. Low Temp. Phys. 167, 269–279 (2012) [2] J.-P. Porst et al., J. Low Temp. Phys. 176, 617–623 (2014) [3] S. Kempf et al., https://edms.cern.ch/ui/file/2059592/1/TDR_maXs_public_2016_02_11.pdf, (2016) [4] D. Hengstler et al., Phys. Scr. T166, 014054 (2015)

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