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The heavy ion irradiation facility at KVI-CART

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An in-air heavy ion irradiation facility equipped for providing masses up to xenon at 30 MeV/u is being developed at the Kernfysisch Versneller Instituut Center for Advanced Radiation Technology (KVI-CART). KVI-CART has operated a proton irradiation facility for radiobiological research since 1998. Since 2005, this facility has also been used for radiation hardness testing. The K600 superconducting AGOR (Accelerator Groningen Orsay) cyclotron at KVI-CART has been designed to provide ion beams with a large range of charge-to-mass ratios and energies. We are in the process of extending the radiation hardness test capabilities by providing heavy ion beams at several energies ranging from about 8 MeV/u to 90 MeV/u. KVI-CART will provide these irradiations for scientific and commercial users starting in 2018.

Three irradiation set-ups are being developed. For irradiations demanding lighter ions, including helium to oxygen at 90 MeV/u, the AGOR FIRM set-up, which was originally developed for protons [1], can be used with minor adaptations. For heavy ion beam irradiations with energies in the range of 8-10 MeV/u, the irradiations must be performed in vacuum using the BIBER irradiation set-up [2], which has been donated to us by HZB Berlin. We are additionally installing a new set-up for irradiations in air with heavy ion beams, specifically for carbon to xenon at 30 MeV/u, that allows for easy access of the device under test. The uniformity, dosimetry, beam purity and switching times of the different ion beams have had an influence on the design considerations of the facility and in particular on the choices of the ions in the beam cocktails. These considerations, as well as new strategies adopted to efficiently operate the sources and cyclotron, will be highlighted.

[1] The AGOR Facility for Irradiations of Materials, van der Graaf, E. R., Ostendorf, R. W., van Goethem, M. J., Kiewiet, H. H., Hofstee, M. A. Brandenburg, S. 2010 RADECS 2009 Proceedings. p. 443

[2] BIBER - The Berlin Ion Beam Exposure and Research Facility Optiz-Coutureau, J., Bundesmann, J., Denker, A., & Homeyer, H. Journal: Radiation and its Effects on Components and Systems, RADECS 2003, Proceedings of the 7th European Conference, held 15-19 September 2003 in Noordwijk, The Netherlands. Edited by K. Fletcher. ESA SP-536, ESA/ESTEC, 2004., p.507

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