TRIμP - A Radioactive Isotope Trapping Facility at KVI

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The design and construction of a new research facility TRIμP (Trapped Radioactive Isotopes μicrolaboratories for fundamental Physics) has started at the KVI. For this facility the existing superconducting cyclotron AGOR [1] will be used to produce a variety of radioactive isotopes in reversed kinematic. The facility consists of a dual function magnet separator, a gas-catcher cooler to produce low energy ions, which will subsequently be trapped in a variety of ion-traps, such as Penning and magneto-optical traps, for precision experiments.

The TRIμP facility creates a new environment for high precision physics experiments typical for ion-traps with rare and short-lived (lifetime $>$ 1 s) isotopes. The planned and envisioned experiments cover Nuclear Physics (very rare isotopes, nuclear moments) Atomic Physics (atomic moments), mass spectroscopy but also more speculative and challenging studies of Fundamental Symmetries and Interactions, notably tests of the Standard Model of Weak Interactions by precision experiments. This includes correlations in β-decays, which are at high precision only possible with cooled trapped ions, atomic parity violation and searches for permanent electric dipole moments of radioactive atoms.

In reversed kinematics the beam (max. Bρ= 3.6 Tm) and reaction products, i.e. the desired isotopes up to Bρ = 3.0 Tm are emitted in forward direction and will be separated due to their difference in magnetic rigidity in a dual function magnet separator. The magnet separator can be operated in two different modes to maximize the efficiency and the number of ion species that can be analyzed. For light mass, fully ionized isotopes the system operates as achromatic fragment separator [2] with a dispersive focal plane in the center for Bρ analysis. For heavy reaction products with a wide atomic charge distribution the second part of this system can be used as gas-filled system [3] to efficiently analyze a wide atomic charge distribution while the first part is operated as beam transport line.

We will present the motivation, concept and status of the facility. The completed design of the dual magnet separator will be presented in more detail.

References

[1] The AGOR cyclotron, see Web Page http://www.kvi.nl/
[2] R. Anne, D. Bazin, A.C. Mueller, J.C. Jacmart, M. Langevin, Nucl. Instr. Meth. A257 (1987) 215
[3] A. Ghiroso et al., Nucl. Inst. Meth. 269 (1988) 192 and references therein