TRIμP – a Radioactive Atom Trapping Facility at KVI

G.P. Berg[1], M. Boswell[2], U. Dammalapati[1], S. De[1], S. Dean[1], P. Dendooven[1], O. Dermois[1], G. Ebberink[1], L. Huisman[1], K. Jungmann[1], H. Kiewiet[1], J. Mulder[1], A. Rogachevskiy[1], L. Slatius[1], M. Sohani[1], M. Stokroos[1], E. Traykov[1], L. Willmann[1], H.W. Wilschut[1], A.R. Young[2]

[1]KVI, Zernikelaan 25, 9747 AA Groningen, The Netherlands

[2]Dept. of Physics, North Carolina State University, Box 8202, Raleigh, NC 27695, USA

The TRIμP-programme (Trapped Radioactive Isotopes: μicro-laboratories for Fundamental Physics) [1] at the Kernfysisch Versneller Instituut (KVI) investigates fundamental interactions in nature, and in particular searches for new physics not yet provided in the standard model of particle physics. The research programme focuses on precision studies of β-neutrino(recoil nucleus) correlations in the decay of sodium and neon isotopes and the search for a permanent electric dipole moment using radium isotopes.

For this, a new experimental facility to trap radioactive atoms is coming on-line at KVI [2]. Radioactive isotopes are produced using heavy-ion beams from the AGOR cyclotron. The fragment and recoil magnetic separator [3] for selecting reaction products became operational in 2004 (fig. 1). The high-energy radioactive ion beam from the separator will first be converted to a low-energy beam using an ion catcher device (a hot cavity surface ionization ion source at first), then cooled and bunched in a radio-frequency quadrupole, and finally sent to the atom trap set-ups. A new laser laboratory for high-precision spectroscopy has been set-up. The instrumentation includes a Ti:sapphire laser, a ring dye laser, semiconductor lasers (built at KVI) as well as a wavemeter and interferometers for laser-beam diagnostics. New heavy alkali-earth optical atom trapping is being developed.

After a brief overview of the physics goals, the TRIμP experimental facility will be described; emphasis will be placed on its possibilities and performance.

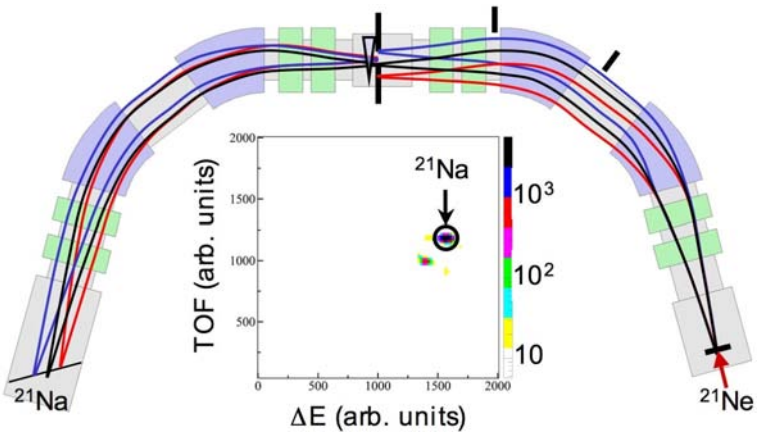

Figure 1: The TRIμP separator as used for the production of a ^{21}Na beam. A 43 MeV/u ^{21}Ne primary beam on a cold hydrogen gas target is used. The resulting ΔE-TOF identification plot is shown.

[1] www.kvi.nl/~trimp/web/html/trimp.html
[2] G.P. Berg *et al.*, Nucl. Instrum. Meth. Phys. Res. **B204**, 532 (2003)
[3] G.P.A. Berg *et al.*, Nucl. Phys. **A721**, 1107c (2003)