



Contribution ID: 99

Type: Oral

Experiments with stored ions at ISOLDE: TSR@HIE-ISOLDE proposal

Tuesday, 22 May 2012 12:20 (20 minutes)

Experiments with exotic nuclei stored in a ring have shown a huge potential in the last years. Such experiments profit from high revolution frequencies of stored beams, which allows one to 'recycle' the exotic nuclei, and from low background conditions. Well-established scientific programs on mass and half-life measurements are pursued at such facilities [1], and new ones are being tested on proton- and alpha- induced reactions in inverse kinematics at low energies [2].

We propose to store the ISOL-produced beams from HIE-ISOLDE in a ring, to perform precision experiments in nuclear and atomic physics and astrophysics. The Test Storage Ring (TSR) at MPIK Heidelberg [3] is well-suited for this purpose. The envisaged physics programme is rich and varied, spanning from investigations of nuclear ground-state properties and reaction studies of astrophysical relevance, to investigations with highly-charged ions and pure isomeric beams. The TSR can also be used to remove isobaric contaminants from stored ion beams and for systematic studies within the neutrino beam programme. In addition to experiments performed using beams recirculating within the ring, cooled beams can also be extracted and exploited by external spectrometers for high-precision measurements.

In this contribution we will present the proposal, outline the physics cases and give the present status of the project.

[1] Franzke B, Geissel H and Münzenberg G 2008 Mass Spectr. Rev. 27 428–469

[2] Zhong Q et al. 2010 J. Phys. Conf. Series 202 012011

[3] Ion Storage Ring TSR, <http://www.mpi-hd.mpg.de/blaum/storage-rings/tsr/index.en.html>

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Session Classification: Instrumentation

Track Classification: Instrumentation