Development of Beam Tracking Detectors & Exotic Nuclei Reactions

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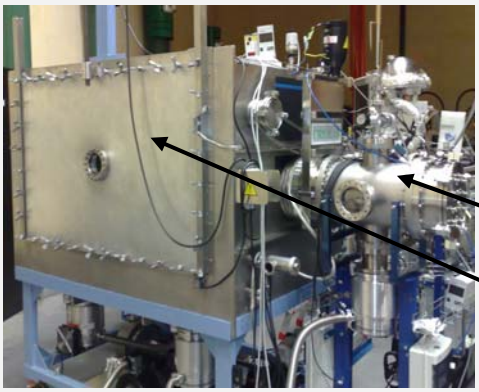
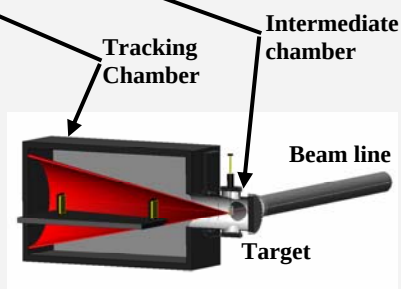
Due to the intense beam time requested by experiments and maintenance in RIB facilities, the time available to test or develop new technologies is tight. The low energy TANDEM of the CNA is playing an important role to fill this gap. With the construction of a new Nuclear Physics line, the CNA is generating an interesting environment and tool for the international scientific community, in order to study the tracking of nuclear particles and beam diagnostics.

The Nuclear Physics Line



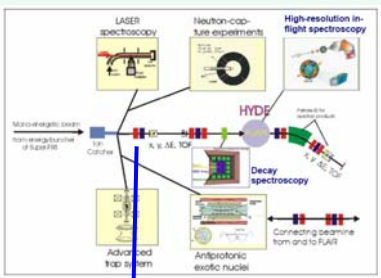
A stable beam delivered from the accelerator, through the line, strikes on the target; the solid angle generated by the ~ 90° scattered particles, simulates a large emittance of an exotic beam, and irradiates a tracking detector system. The tracking system is mounted in a special reaction chamber, conceived to receive such tests.



The CNA is generating an interesting environment and tool for the international scientific community, in order to study the tracking of nuclear particles and beam diagnostics.
Our Nuclear Physics line is dedicated to test different kind of beam tracking detectors, as well as their electronics and data acquisition system.

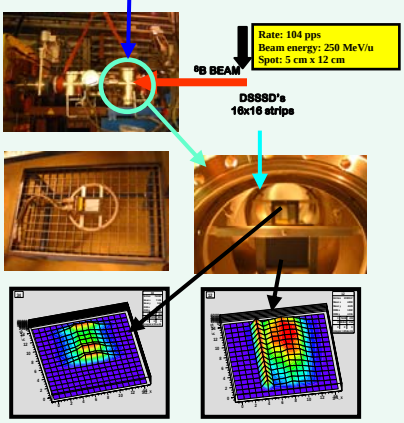
Development of a tracking system for the low-energy branch of FAIR - GSI

Low energy branch of GSI-FAIR



General Activities:

1.S271 Test & Experiment Campaign at GSI: Phys. Rev. Lett. 99, 182501 2007

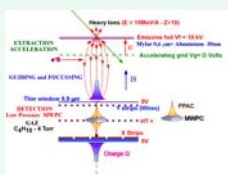


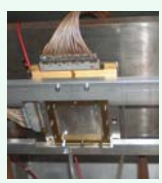
Beam profile detected by DSSSD

MiniSeD & Other Beam Tracking Detector Systems: Tracking candidates for FAIR:

In a collaboration with *CEA – Saclay**, we built and tested an emissive foil detector: the MiniSeD. The MiniSeD is a mini version (active area 70x70 mm^2) of the Secondary electron Detector operating in the spectrometer VAMOS in GANIL – France.

Configuration of the SeD





Preliminary Results of the tests performed on the MiniSeD

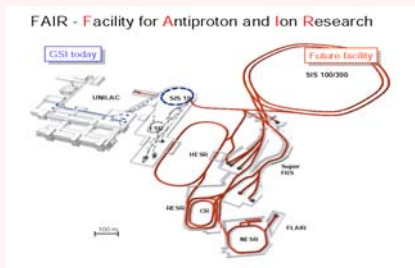
With the following settings:
- *Detector at 600 V*
- *Filled with C_4H_{10} at 4 Torr*

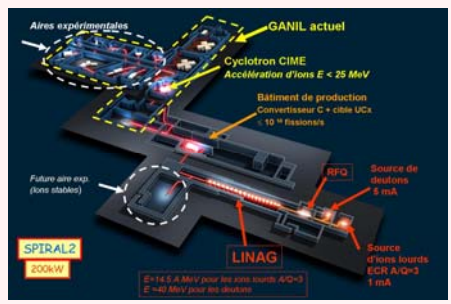
The MiniSeD gives, for the fission fragments of a ^{252}Cf source the results below:
- ***Time Resolution (σ) : 130 ps***
- ***Spatial Resolution (FWHM) on the Y-Coordinate : 1.3 mm (for a magnetic field of 100 Gauss)***

2. Construction of a BTD prototype:
****Collaboration with CEA – Saclay : J. Pancin, A. Drouart, M. Kebbiri, M. Riallot***

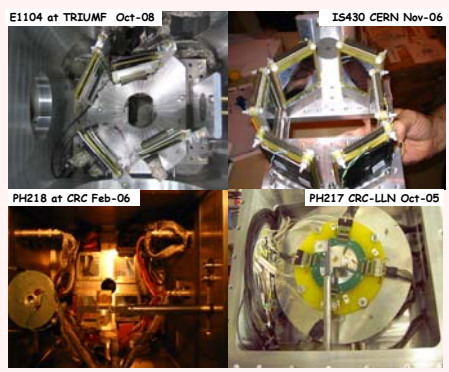
Exotic Nuclei Reactions

Since the first experiments with radioactive ions, we learned that the exotic nuclei are different, in the collisions, in comparison with normal stable nuclei. To study the nuclear structure of weakly bound nuclei, we should improve our knowledge about the reactions induced by these nuclei. The current Radioactive Ion Beam (RIB) facilities and the development of the new ones SPIRAL II (France) and FAIR (Germany), provide the ideal environment to study exotic nuclei.





During the last couple of years we have performed a series of experiments in RIB facilities around the world, followed by data and theoretical analysis.



The motivation behind these experiments is to study the exotic and stable nuclei in terms of structure, interaction and reaction mechanisms. Regarding the exotic nuclei, the goal is to determine how the weakly bound characteristics affect the structure of halo nuclei and modify the way in which they interact with other nuclei.

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