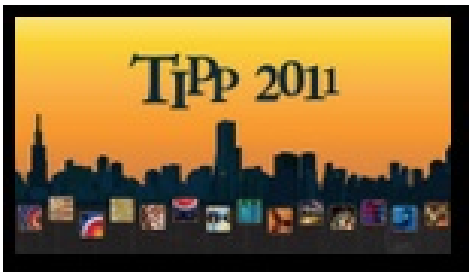

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The upstream detectors of the FIRST experiment at GSI

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The FIRST (Fragmentation of Ions for Relevant Space and Therapy) experiment at GSI has been designed for the measurement of Carbon fragmentation cross sections at different energies between 100 and 1000 AMeV. The experimental setup integrates an already existing magnet, TPC (Music), neutron detector (Land) and ToF scintillator wall with some newly designed detectors in the, so called, interaction region (IR) around the carbon removable target. The IR target upstream detectors are the scintillator Start Counter and a Beam Monitor drift chamber optimized for a precise measurement of the beam interaction time and impinging point on the target. The downstream detectors are a silicon vertex detector and a calorimeter for detection of the fragments emitted at large angles.

In this presentation we review the design of the upstream detectors as well as the test beam results obtained on 511 keV electrons (at the BTF facility in the INFN Frascati laboratories) and on protons and carbon ions (at the INFN LNS Laboratories in Catania) of 80 AMeV energy.

The Start Counter is a scintillator (EJ-228, Pilot U) detector designed for triggering and timing purposes, optimized trough a careful balancing of detector time resolution (the time of flight measured at the end of the Music TPC is used to disentangle the different fragments) and minimization of the detector thickness (and hence pre target beam interaction probability). The final adopted layout is implemented trough a 150 μm thick scintillator disc, with the light collected by means of optical fibers radially glued and connected to four UBA H10721-201 photomultipliers.

A preliminary evaluation of the time resolution obtained in the test beams ranges from 400 ps on protons to 200 ps on carbon ions.

The Beam Monitor is a drift chamber made of alternated horizontal and vertical wire layers, each with 3 rectangular cells 16 mm wide and 10 mm thick along the beam direction. The geometry layout has been optimized in order to minimize the beam interactions on the wires. A total of 12 layers provides tracking redundancy and ensures an high tracking efficiency and an excellent spatial resolution. On electron, proton and carbon ions beams, different gas mixtures have been tested (Ar/CO2 and P10) and preliminary results show that detector single cell space resolution matches the 100 μm design value.

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