Overview of the FIRST Project at GSI

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In this contribution one reviews the run of the whole project.

The FIRST collaboration was formed in December 2008 and the proposal for the experiments on nuclear fragmentation of carbon, oxygen, silicon and iron beams on different targets relevant both for the particle therapy and space research was presented in front of the G-PAC committee at GSI in February 2009 [1]. From 2009 till summer 2011 a part of the former ALADIN detector set-up was restarted and new detectors for the interaction region were built and tested in the beam [2]. In August 2011 the experiment with the carbon beam on thin graphite and gold target at 400 MeV/u was performed at GSI accelerator facility in cave C [3]. Charged reaction fragments were measured in coincidence by means of small and big detectors. The small detectors ([4] and see Fig. 1 – 3) are positioned around the target and cover a big solid angle relative to the beam. Very forward reaction products were analysed in the magnetic field of the ALADIN dipole and then detected in the big detectors (ToF scintillator wall and LAND detector). An independent reference measurement was performed in cave A at the same time. In this case charged reaction fragments were detected in $\Delta E - E$ telescope consisting of thin plastic and thick BaF_2 scintillator and positioned at different angles relative to the beam. The data analysis of the measurement performed in cave C has started in autumn 2011. Calibration runs were analysed and particle identification and tracking reconstruction were done all small and big detectors. At present a global reconstruction algorithm for charged particle tracks is tested with data obtained from the experiment and Monte-Carlo simulations.

The FIRST collaboration plans to carry out next experiments in near future. In order to perform high-accuracy measurements on double-differential cross sections of charged reaction fragments the experimental setup will be upgraded. Position sensitive big area gaseous drift chambers will be placed in front and behind the magnetic field to strengthen the global particle tracking.

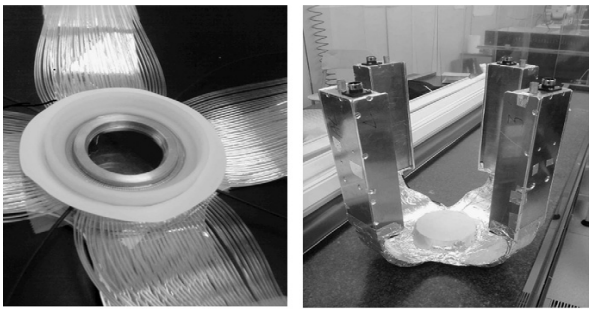

Figure 1: The thin scintillator foil of the Start Counter read out by scintillating fibres.

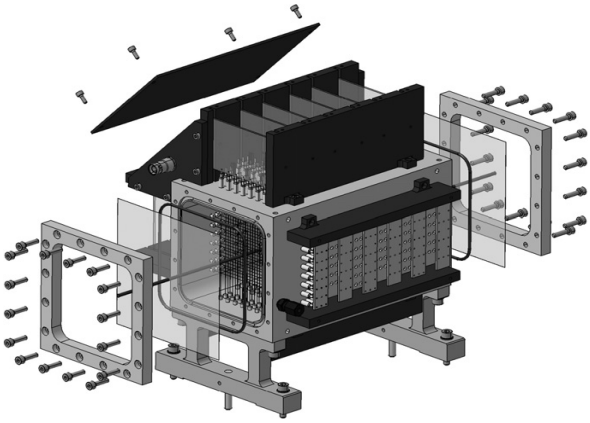

Figure 2: Technical drawing of the Beam Monitor Drift chamber.

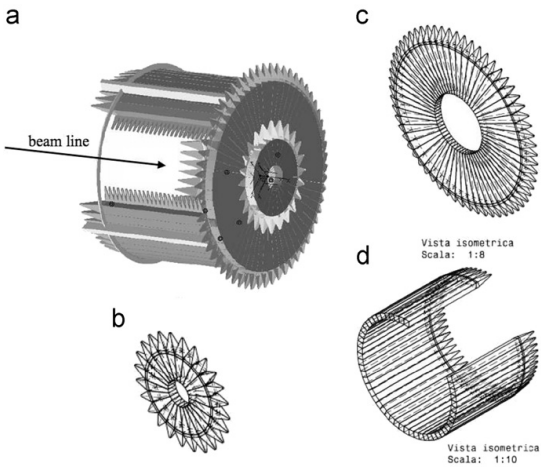

Figure 3: Technical drawing of the KENTROS Proton Tagger: (a) general assembly, (b) small end-cap, (c) big end-cap and (d) barrel.

References

[1] FIRST collaboration, "Extensive study of nuclear reaction of interest for medical and space applications", Project proposal, January 2009

[2] R. Pleskac, "The status of the FIRST experiment", GSI Scientific Report 2009 and 2011, Darmstadt

[3] R. Pleskac et al., "The FIRST experiment at GSI", NIM A, Vol. 678, 21 June 2012, p. 130-138

[4] Z. Abou-Haidar et al., "Performance of upstream interaction region detectors for the FIRST experiment at GSI", JINST 7, Vol. 7, 13 February 2012