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The FIRST experiment for nuclear fragmentation measurements at GSI

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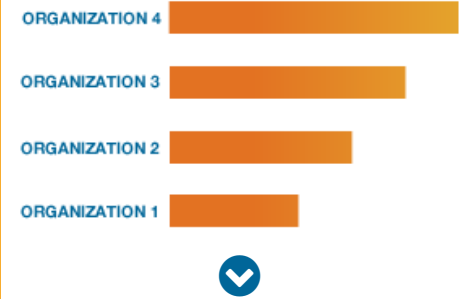
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Abstract:

Nuclear fragmentation processes are relevant in different fields of physics concerning both basic research and applications. FIRST (Fragmentation of Ions Relevant for Space and Therapy) is an experiment aimed at the measurement of double differential cross sections (DDCS), with respect to kinetic energy and scattering polar angle, of nuclear fragmentation processes relevant for hadron therapy and for space radiation protection applications, in the energy range between 100 and 1000 MeV/u. The experiment was mounted at the GSI laboratories of Darmstadt, in Germany. A first data taking was performed in August 2011, using 400 MeV/u ^{12}C on carbon and gold targets. In this work we present a description of the experimental apparatus and some figures from the data acquisition and from the preliminary work on data analysis.

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I. Introduction

Hadron therapy has well known advantages with respect to conventional radiation therapy based on X or γ rays. The ion beam energy spectrum can be chosen in such a way that the Bragg peak, which is present in the profile of the dose as a function of penetration depth, falls on the tumor, sparing surrounding organs at risk. Hadron therapy based on ^{12}C beam has reduced lateral and longitudinal dose diffusion and higher biological effectiveness compared to proton therapy.

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