

The FOOT (Fragmentation of Target) experiment: an overview and first results

Wednesday, 11 May 2022 11:20 (20 minutes)

The correct dose quantification in ion therapy is currently affected by limited knowledge of the double differential fragmentation cross-section of nuclei composing the biological tissue interacting with proton or carbon beams. Fragmentation of these nuclei generates ions with short range and high linear energy transfer, thus with high radiobiological effectiveness, out of the treatment region.

The FragmentatiOn Of Target (FOOT) experiment aims at measuring these cross sections for protons and ions interacting with carbon and oxygen material in the range of 200 MeV/u – 800 MeV/u. The results of the FOOT measurements will also be fundamental for the correct assessment of the radiobiological risk in long space travels, where astronauts have prolonged exposure to Galactic Cosmic Rays and potentially to Solar Particle Events.

The FOOT experiment is composed of two different setups. The first one consists of an emulsion spectrometer employed to identify low charge fragments (from H to Li), while the second one (named electronic setup) is optimized for heavier fragments (up to oxygen) and consists of a magnetic spectrometer, a time of flight (TOF) system and a calorimeter. In both setups, a drift chamber is used for beam monitoring. Targets of carbon and C₂H₄ will be irradiated using oxygen and carbon beams, in order to reconstruct the required cross-sections with an inverse kinematic approach. Data takings were already performed at GSI and CNAO using a subset of the detectors of the electronic setup. In this contribution, a detailed description of the apparatus will be presented, a particular focus will be then given to the TOF system and to its performances in terms of Z identification of the fragments.

Primary author: MORROCCHI, Matteo (University of Pisa, Department of Physics and Istituto Nazionale di Fisica Nucleare (Pisa))

Presenter: MORROCCHI, Matteo (University of Pisa, Department of Physics and Istituto Nazionale di Fisica Nucleare (Pisa))

Session Classification: Applicazioni e interdisciplinarietà della fisica nucleare