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Elemental and angular differential fragmentation cross section measurements with the FOOT experiment

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Nuclear fragmentation cross section measurements hold significant importance in both hadrontherapy and space radioprotection. Hadrontherapy is an external radiation therapy that employs beams of protons and heavier ions to target deep-seated tumors. These particles exhibit a favorable depth-dose distribution in tissues, featuring a low dose at the entrance and a maximum release at the end of their trajectory (Bragg peak). In these treatments, nuclear interactions between the beam and human body nuclei have also to be considered, since they can produce fragments that modify the profile of the dose delivered to healthy tissues.
In the context of space radioprotection, the growing interest in human missions beyond low Earth orbit requires a deep understanding of radiation risks, highlighting the need for precise nuclear fragmentation cross section data. Unfortunately, in the relevant energy range for these purposes, there are very few data available in the literature regarding nuclear fragmentation measurements.
The FOOT (FragmentatiOn Of Target) experiment was proposed to fill the gap in nuclear fragmentation cross section measurements and aims to provide measurements of double-differential cross sections in both angle and kinetic energy of nuclear fragments produced with a precision within 5% for light nuclei ($Z \leq 8$) in the kinetic energy range between 200 MeV/nucleon up to 800 MeV/nucleon.
In this contribution, the fragmentation cross section measurement of a 400 MeV/nucleon ^{16}O beam interacting with a graphite and a polyethylene target will be discussed, with data collected at the GSI accelerator facility in Darmstadt, Germany. The evaluation of the fragmentation cross sections on a Hydrogen target is also presented.

This presentation is given on behalf of the FOOT Collaboration.

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