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The FOOT (FragmentatiON Of Target) Experiment

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Particle therapy uses proton or 12-C beams for the treatment of deep-seated solid tumours. Due to the features of energy deposition of charged particles a small amount of dose is released to the healthy tissue in the beam entrance region, while the maximum of the dose is released to the tumour at the end of the beam range, in the Bragg peak region. Dose deposition is dominated by electromagnetic interactions but nuclear interactions between beam and patient tissues inducing fragmentation processes must be carefully taken into account. In proton treatment the target fragmentation produces low energy, short range fragments along all the beam range. In 12-C treatments the main concern are long range fragments due to projectile fragmentation that release dose in the healthy tissue after the tumor. The FOOT experiment (FragmentatiON Of Target) is a funded project designed to study these processes. The detector includes a magnetic spectrometer based on silicon pixel and strip detectors, a TOF and ΔE scintillating detector and finally a scintillating crystal calorimeter for the fragment identification. In addition, a different setup with an emulsion spectrometer inserted before the target is foreseen to characterize the production of low Z fragments. The experiment is being planned as a 'table-top' experiment in order to cope with the small dimensions of the experimental halls of the CNAO, LNS, GSI and HIT treatment centers, where the data taking is foreseen in the near future (2020). The detector, the physical program and the timetable of the experiment will be presented as well as the results of a Monte Carlo study, which aims to evaluate the detector performance and the expected resolution on fragment identification and on the nuclear cross sections.

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