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The FOOT 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 concerns are long range fragments due to projectile fragmentation that release dose in the healthy tissue after the tumour. The FOOT experiment (FragmentatiOn Of Target) of INFN (Istituto Nazionale di Fisica Nucleare) is a new project designed to study these processes. Target (^{16}O,^{12}C) fragmentation induced by 150-250 MeV proton beam will be studied via inverse kinematic approach, where ^{16}O and ^{12}C beams, in the 150-200 AMeV energy range, collide on graphite and hydrocarbons target to allow the extraction of the cross section on Hydrogen. This configuration explores also the projectile fragmentation of these beams. The detector includes a magnetic spectrometer based on silicon pixel and strip detectors, a scintillating crystal calorimeter able to stop the heavier fragments produced and to achieve the needed energy resolution, and finally a TOF and ΔE scintillating detector for particle identification. 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 performances, the physical program and the timetable of the experiment will be presented.

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