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Proton tomography imaging for cancer treatment:

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Proton Computed Tomography (pCT) makes it possible to render 3D images of the human body like traditional x-ray Computed Tomography (CT), with the advantage of a much lesser dose delivered to the patient (1% to 10% respect to a traditional CT) and a far more accurate tissue density discrimination (i.e. the capability to map the different dE/dx stopping power of different tissues). The drawbacks mostly consist in a slightly worse spatial resolution, and indeed in the necessity to accelerate protons up to energies of about 250 MeV. Nevertheless, the superior tissue density discrimination characteristic makes it very desirable when applied in conjunction with cancer hadroteraphy, where the major limiting factor in correctly pinpointing the tumor cells comes from the uncertainty in the density of the tissues the ions beam must travel across before reaching the target.

Proton Computed Tomography apparatuses have been so far restricted to the R&D phase, the main limitation being the long acquisition times (orders of minutes(, clearly non compatible with a real clinical use. However, within the iMPACT project, by employing the latest advancement in Monolithic Active Pixel Sensors (MAPS) and Silicon Photo-multipliers (SiPM) derived from the High Energy Physics research, such limitations have been overcome, and a prototype of a fast pCT scanner, capable to take a complete 3D image in some seconds, is currently being developed.

This contribution describes the design, realization and first test results of the iMPACT scanner, a complete detector which employs the ALPIDE MAPS sensor (developed by the ALICE experiment) for its tracker, and a novel configuration of SiPM and plastic scintillators to implement an extremely fast, hermetic range calorimeter.

Secondary track (number)

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