



Contribution ID: 57

Type: not specified

## Realization of an innovative Dose Profiler for range monitoring in particle therapy treatments

Particle Therapy exploits accelerated charged ions, typically protons or carbon ions, for cancer treatments. This technique allows to achieve better accuracy in dose release and help to spare healthy tissues around tumour. To fully profit from the therapy spatial selectiveness, a novel monitoring technique, capable to provide a high precision in-treatment feedback on the dose release position, is required. We propose a novel approach based on detection of secondary charge fragments and prompt photons, correlated to dose release, emitted at large angles with respect to the beam direction. A dedicated detector called "Dose Profiler" is currently under development in the frame of the collaborations of INSIDE (Innovative Solutions for In-beam Dosimetry in hadrontherapy) MIUR project and INFN-RDH experiment. Such a device, that will be tested at CNAO (Centro Nazionale di Adroterapia Oncologica) is composed by a tracker and a calorimeter. Six layers ( $20 \times 20 \text{ cm}^2$ ) of square scintillating fibers ( $0.5 \times 0.5 \text{ mm}^2$ ) give the information of the direction of the particle, while a matrix of sixteen pixellated LYSO crystals ( $5 \times 5 \text{ cm}^2$ ) provides the measurement of energy. Four layers ( $20 \times 20 \text{ cm}^2$ ) of plastic scintillator are put between tracker and calorimeter in order to absorb backscattered electrons. The light of the fibers is collected by Silicon PhotoMultipliers (SiPM), while the light of calorimeter by multi-anode photomultipliers. The mechanical structure of the device has been already realized at SBAI (Sapienza Università di Roma, Italy) department mechanic's workshop. Front-end electronics are composed of 4096 channels, 2304 for tracker, 768 for absorber, 1024 for calorimeter. Readout is performed by 128 ASICs developed by Politecnico di Bari named BASIC32, trigger system and data acquisition by an interacting system of 21 FPGAs. The full electronics system is currently under development in collaboration with Laboratori nazionali di Frascati of INFN. The first prototype of the two front-end boards, with 192 SiPMs, 6 BASIC32 and 1 FPGA, has been already produced; test of all components is currently in process. The architecture of the readout system of the Dose Profiler will be presented.

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