PRAGUE: the first detector protype to measure the proton beam range

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Measuring and verifying the reliability and stability of the dosimetric properties of a radiotherapeutic beam, is the most important task of any external-beam radiotherapy quality assurance program. The beam characteristics can be assessed in terms of several different parameters, such as the percentage depth-dose distribution, flatness, symmetry, and absolute dose output. The depth-dose-distribution measure is today performed, adopting commercial systems whose main advantage is the short operational time. The aim of PRAGUE (Proton RAnGe measure Using silicon carbidE) project is to design and construct a detector, based on a new generation of Silicon Carbide (SiC) devices, to measure proton depth dose distributions in real-time and with high spatial resolution (10 μm). The extreme radiation hardness of such devices and the independence of their response with the proton beam energy, makes them capable to operate with clinical hadrontherapy beams and laser-driven ion beams, where extremely high dose rates are delivered. The detector will be composed by a stack of new generation, large area SiC devices with an active thickness of 10 μm. A first detector protype was already designed and tested. The obtained results indicate the SiC detector as a suitable detector for relative dosimetry with charged particles. It showed, in fact, a stable and reproducible response and an extremely good behavior in terms of linearity as respect to absorbed dose was found. The negligible dependence of its response against energy and dose-rate and the high radiation hardness, represent advantageous features as respect other commercial solid-state detectors for ion beams dosimetry.