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Novel charged particles monitor of light ions PT treatments: results of preliminary tests using a RANDO® phantom

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In Particle Therapy, the use of C, He and O ions as beam particles is being pursued to fully profit from their interaction with matter resulting into an improved efficacy in killing the cancer cells. An accurate on-line control of the dose release spatial distribution, currently missing in clinical practice, is required to ensure that the healthy tissues surrounding the tumor are spared, preventing undesired damages caused by, for example, morphological changes occurred in the patient during the treatment with respect to the initial CT scan. Charged secondary particles, produced by the projectile fragmentation in the collisions with the patient tissues, represent a valid option for light ions treatments monitoring since they are also emitted at large angles with respect to the beam direction and they can be detected with high efficiency in a nearly background free environment. The Dose Profiler detector, based on 8 pairs of orthogonal layers ($19.2 \times 19.2\ cm^2$) composed by squared plastic scintillating fibres, allows the online charged fragments reconstruction and backtracking at the clinical high rates ($\sim$100 kHz). Preliminary tests performed on the DP, using the ^{12}C ion beams of the CNAO treatment centre and an anthropomorphic phantom as a target, will be reviewed in this contribution. The results implications in view of a first clinical trial, scheduled to start at the CNAO in 2019, will be discussed in the framework of the upcoming clinical routine test.

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