**Monte Carlo-based benchmark of a method for proton energy spectra reconstruction using radiochromic films**

Giuliana Milluzzo [1,2], Sean McCallum [2, 3], Marco Borghesi[2], Anna Subiel[3], Linda Mortimer [4], F. Romano [1].

[1] Istituto Nazionale di Fisica Nucleare, Sezione di Catania, Via S. Sofia 64, 95123 Catania, Italy
[2] Centre for Plasma Physics, Queen's University Belfast, BT7 1NN, United Kingdom
[2] Medical Radiation Science, National Physical Laboratory, Teddington, TW11 0LW, United Kingdom
[4] Clatterbridge Cancer Centre Wirral, Clatterbridge Road, Bebington, Wirral, CH63 4JY

E-mail: giuliana.milluzzo@ct.infn.it

**Background/aims:**
Dosimetry and diagnostics of ultra-high dose rate (UHDR) particle beams, which recently became attractive in the medical physics field for the observed FLASH effect, are extremely challenging due to saturation effects incurring at high dose-rate with the conventional active dosimeters [1]. The use of dose-rate independent detectors is clearly a key feature to ensure the high-level of accuracy required for future clinical applications. Radiochromic films (RCF) have been proved to be independent on the dose-rate and if used in a stack configuration can provide the reconstruction of the energy distribution for both mono-energetic and polyenergetic particle beams, also for both conventionally and laser-accelerated proton beams.

**Materials and methods:** An optimized Monte Carlo-based algorithm for the deconvolution of energy spectra by means of RCF has been recently developed [2] and used for the measurement of the energy spectrum of a 62 MeV SOBP (Spread Out Bragg Peak) clinical proton beam accelerated at the Clatterbridge Cancer Centre (UK). The experimental setup, including the RCF stack configuration has been rigorously modelled with the TOPAS Geant4 [3,4] extension to validate the analysis approach.

**Results:** The experimental depth-dose distributions measured with the RCF stack and using the developed procedure have been compared with the distributions obtained with the Monte Carlo TOPAS code used as reference. A complete successful benchmarking and validation of the spectroscopic method has been achieved and will presented.

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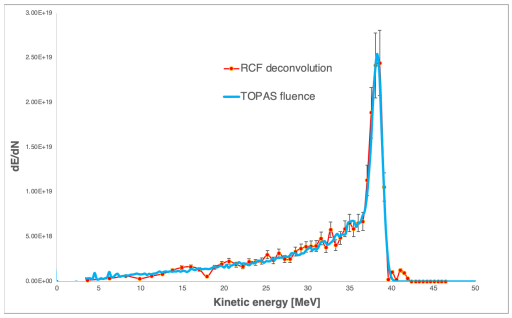


**Fig. 1**. Comparison of the experimental and simulated spectra.

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