Contribution ID: **146** Type: **Poster**

A fluorescence-based beam monitor for ultra-high dose rate therapeutical beams

Tuesday, 28 May 2024 08:34 (1 minute)

Recent studies shown and increased effectiveness of radiotherapy (RT) and particle therapy (PT) in treating tumors while minimizing damage to healthy tissue in presence of an ultra-high dose rates (~100 Gy/s). The phenomena, called Flash effect, requires the dose to be delivered concentrated in a short time (<500 ms). However, conventional detectors face challenges in monitoring charged beams in these ranges of dose-rate due to non-linear effects. To address this challenge, a Flash Detector beam Counter - FlashDC - has been developed. This beam monitor exploits air fluorescence to characterize the beam fluence and spatial distribution in real-time with high accuracy and minimal impact on treatment delivery, providing a linear response for various charged beams, dose rates, and energies. Multiple prototypes have been developed and optimized using Monte Carlo simulations. The analysis of data from recent test beam campaigns with electrons delivered at FLASH intensities has demonstrated a linear correlation between the detector signal and the delivered dose-per-pulse, confirming the potential of the technique, and optimization is ongoing to increase the signal-to-noise ratio bringing the project to its next stage of development. This contribution introduces the FlashDC monitor, discusses its expected performance, and presents preliminary test beam results obtained with electron beams in FLASH mode.

Collaboration

Role of Submitter

I am the presenter

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Session Classification: Applications to Industrial and Societal Challenges - Poster session

Track Classification: T5 - Applications to Industrial and Societal Challenges