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First proof-of-principle of inorganic perovskite real-time detection under 9MeV electron beam Flash Radiotherapy

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Flash radiotherapy (RT), characterized by the delivery of ultra-high dose rates (UHDR), recently demonstrated a reduced toxicity towards surrounding non-malignant tissues while mantaining damage efficiency and tumour control. Conventional dosimeters, as ionization chambers and thick solid state detectors, under UHDR beams suffer of unwanted effects as e.g. ion-recombination effects. The frontier research for Flash RT dosimeters is directed towards thin solid state devices. In this respect, inorganic halide perovskites as CsPbBr3 combines a high theoretical sensitivity to high-energy particle beams and the possibility to be deposited as thin layers directly on flexible electronics. This work presents first measurement of perovskite detectors under flash RT. Inorganic CsPbBr3 perovskite 1um-thick films are deposited by magnetron sputtering on substrates carrying interdigitated electrodes. Then, detectors have been exposed to the 9MeV electron beam produced by the EF with triode-gun (SIT-Sordina) in Pisa (CPFR) with single and train-pulses with different dose per pulse DPP and frequencies, in the ranges (0.2-11Gy) and (1-245Hz). Current responses during pulsed beam are monitored in real-time with sampling times down to µs. Charge collected by the perovksite detectors showed to depend linearly on the DPP in the entire investigated range, with no evidence of saturation effects. We thank Fondazione Pisa for funding CPFR with the grant “prog. n.134/2021

Primary experiment

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