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Development of a novel solid state detector for beam monitoring in proton therapy

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Solid state silicon detectors gained extensive applications in particle physics experiment. High detection precision, radiation resistance and very good time resolution are their main advantages that overcome many limitations of alternative gas detecting systems. Ultra Fast Silicon Detectors (UFSD) are a recent development which feature a faster charge collection (~1 ns), well suited for particle counting at high rates (100 MHz per channel with efficiency > 99% in the current prototypes), and an improved time resolution of few 10's of ps. UFSDs are under study for the development of a detector for high rate particle beams with two applications in radiation therapy: counting the particles delivered to a patient in a therapeutic proton beam and measuring the beam

particle's energy through time-of-flight methods. Two different designs of strip detectors have been developed at the Italian National Institute of Nuclear Physics (INFN) of Torino (Italy) in collaboration with the Bruno Kessler Foundation (FBK) of Trento, Italy, where the sensors were produced. The first was optimized for high rate counting while the second was optimized for time resolution, allowing to measure precisely the time of flight and hence the beam particle's energy. Based on the preliminary results, UFSDs are found to be promising for beam qualification and monitoring in Particle Therapy. The aim of this contribution is to report results of lab and beam tests using UFSD strip sensors with a therapeutic proton beam.

Biography

Zahra Shakarami is currently a PhD candidate at University of Turin. She is doing research in the field of Medical Physics

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