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Medical applications development using laser-driven protons generated at the high-power PEARL facility

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An experimental platform is presented, aimed at studying the impact of laser-driven high-energy protons on biological objects. The platform has been developed using the PW-class PEARL laser facility (IAP RAS Nizhny Novgorod, Russia). Pilot experiments were performed using laser-accelerated protons having up to 25 MeV energy, and we demonstrated the possibility of transferring doses up to 10 Gy to bio-objects in a single shot. Magnetic separation was used in order to expose the bio-objects solely to protons, which were free from parasitic X-ray radiation and fast electrons. During the test experiments, cells from the culture HeLa Kyoto was irradiated and the fraction of survived cells was measured. In the talk, we will discuss ways of optimizing the parameters of proton beams and suitable methods for controlling the proton energy distribution as well as transport the protons onto the bio-objects. Future plans include upgraded laser capabilities in order to address hadron therapy of malignant neoplasms.

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