

ALBUS –Advanced Laser-driven Beamlines for User-specific Studies

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The ALBUS technology platform tackles the challenges arising from the unique properties of laser-driven ion beams. The central part of ALBUS is the advanced pulsed electromagnet technology adapted from high-field laboratory know-how in combination with custom-designed current pulse generators, with a repetition rate matching the pulsed nature of a common LPA source, aiming towards 1 Hz.

The magnets can be used as particle beam optics, featuring inherent tunability, large apertures and short focal lengths for efficient beam capture, transport, and energy selection. Arranged as beamlines, the magnets not only allow to tailor LPA particle sources for application but also provide a valuable test bed for detector development. The ALBUS-2S beamline configuration, based on two pulsed high-field solenoid magnets ($B \leq 20$ T), was designed to transport and shape laser-driven proton beams to provide homogeneous dose distributions to volumetric radiobiological samples and according dose-detection setups. It enabled the worldwide-first controlled volumetric in vivo tumor irradiations with laser-accelerated protons.

Furthermore, split-pair coils for the investigation of magnetized plasma phenomena in the laboratory are developed. Featuring optical access to the magnetized laser-driven plasma they enable optical and X-ray probing as well as insertion of obstacles and/or laser targets.

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