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High repetition rate TiSa lasers for laser plasma acceleration

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There is a growing interest of using Laser Plasma Acceleration (LPA) for societal applications provided that particle flux is large enough to fulfill the needs of those applications. This calls for the use of lasers with higher pulse repetition rate than the lasers used up to now in laser plasma acceleration research. In this talk, we present the achievements and the technology roadmap related to 100 Hz Titanium Sapphire Chirped Pulse Amplifiers. In particular we present initial results obtained from a full system delivering 200 mJ compressed pulses and results from main technology developments regarding the significant increase of average power obtained from TiSa based laser system which will be based on disk active mirror amplifiers strongly reducing lensing effects at room temperature and actively cooled gratings compressors. These technical breakthroughs will be used for 1 J –100 Hz lasers currently under construction for LAPLACE HC project in France and EuAPPS project in Italy, the latter aiming specifically to the investigation of LPA potential use for cancer therapy using VHEE (Very High Energy Electrons). Beyond that, this is also paving the way for developments needed to build the laser system of laser-driven machine for EuPRAXIA project.

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