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CHALLENGES IN THE DESIGN OF A LASER DRIVER FOR A PLASMA ACCELERATOR

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Novel optical, plasma based accelerators require high peak-power laser drivers at high repetition rate and kW-scale average power for their operation. Significant progress has been made in laser performance during the past decades, mainly concerning peak-power, now in the 10 PW range, well beyond what needed for driving laser-wakefied acceleration. Enhancement of other parameters, like repetition rate, average power, efficiency and footprint is needed to make these systems attractive are you for novel accelerators.
Most of the existing systems rely on chirped pulse amplification in titanium sapphire (Ti:Sa), pumped by frequency doubled conventional (flashlamp-pumped) Neodymium lasers. Recent developments include a range of different architectures, ranging from fiber lasers to systems using other gain materials, in place of Ti:Sa, that can be pumped directly with high efficiency diode lasers.
Here we discuss laser driver requirements for the most advanced accelerator schemes, examine pros and cons of emerging technologies and introduce a viable laser driver concept for a first generation of plasma accelerators.

Primary authors: GIZZI, Leonida Antonio (CNR-INO and INFN); Dr LABATE, Luca (CNR-INO and iNFN); Dr MATHIEU, Francois (Ecole Polytechnique, CNRS); Dr TOCI, Guido (CNR-INO and INFN)

Presenter: GIZZI, Leonida Antonio (CNR-INO and INFN)

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