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High peak power and high average power Ti :Sa lasers for high performance particle acceleration

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Laser plasma accelerators have seen an incredible development over the 2 past decades, leading to production of high electron energy close to 10 GeV. Both performance and reliability can be further improved thanks to the latest generation multi-PW lasers like the 10 PW laser of ELI-NP having performed its first shots on target few months ago. Data about pulse measurements at focal spot will be presented. In the same time, low repetition rate of these lasers prevents their use in many applications in industry and medicine where high accelerator currents are required for efficiency and speed of the process. This is why Thales and LOA have decided to develop a new electron acceleration platform within the LAPLACE HC project, using a brand new high repetition rate TiSa laser system operating at a repetition rate of 100 Hz becoming therefore compatible with the requirements of most societal applications of electron acceleration. We will present latest results obtained from Titanium Sapphire amplifiers at 100 Hz with output energy close to 1 Joule and average power close to 100 Watts thanks to a significant improvement in TiSa crystals thermal management while operating at ambient temperature.

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