

A 100 Hz laser system with with few-cycle and TW Pulses

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Ultrashort pulse laser systems operational in large scale facilities like ELI are heavily booked for secondary source developments and user experiments. The requirement for scientific and technological developments related to high average power laser-matter interactions, like target systems, diagnostics, etc., calls for frequent experimental testing with appropriate laser sources.

Our versatile laser system was designed utilizing the recent achievements in Ti:S -based short pulse amplification. The three stage, 100Hz repetition rate laser system is based on the configuration of negatively and positively chirped pulse amplification. Since cryogenic cooling increases CEP noise, our water-cooled amplifiers have been designed according to the scheme of extraction during pump. In the current status, the few cycle output provides pulses with 9.2fs and 0.3mJ, while the power output supports sub-25fs pulses with almost 40mJ. The output energy stability is better than 1.5%. Such a system has been successfully used for the development of two high repetition rate target systems.

To shorten the pulse duration, the booster amplifier is converted to a polarization encoded operation mode, so that 15 fs pulses are expected still with 40mJ. For experiments requiring sub-two cycle laser pulses, a single-plate pulse compressor have been developed.

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