



Introduction

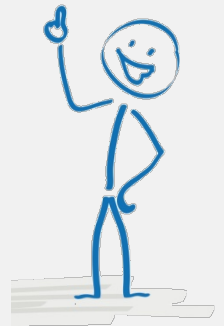
This white paper introduces the novel high energy version of our neoLASE picosecond laser series exceeding 1 GW peak power. The customized MOPA laser delivers a pulse energy of more than 5 mJ with a pulse duration of less than 5 ps and a repetition rate of 10 kHz. Additionally, this laser can be operated in burst operation or any user-defined temporal pulse pattern. The system is used for laser plasma generation and is also ideally suited for high energy applications with high photon flux.

neoMOS: high-energy picosecond laser

The MOPA laser is based on a mode-locked fiber oscillator with a minimum repetition rate of 100 kHz. After a preamplifier, the pulses are picked to the final repetition rate of 10 kHz and further amplified in three sub-sequent single-pass amplifier stages.

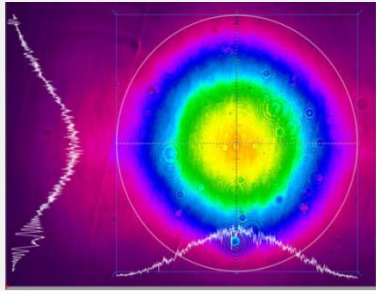


The integrated AOM can be used for burst mode operation or pulse picking to further reduce the repetition rate. Due to the low nonlinearities of the neoLASE concept and the possibility to scale the spot sizes in each amplifier stage, only a slight chirp of the input pulses is required. This allows a compact setup and a short grating compressor with only less than 40 cm separation. The setup allows high energy laser pulses with a pulse duration of about 1 to 10 ps, adjustable by the compressor settings.

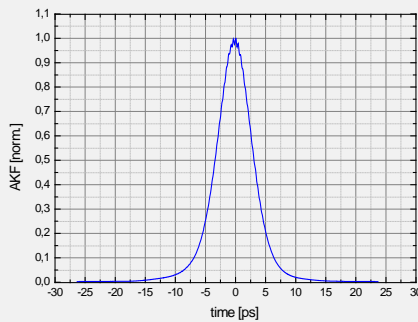


Parameter

The output specifications of the customized laser system are measured > 50 W at 10 kHz and a target pulse duration of about 5 ps, which results in a peak power of 1 GW. Higher average power up to 100 W would be generated from the same architecture at higher repetition rates. As the target pulses are achieved by a slight left-over chirp, it is easily possible to reach shorter pulse duration down to 1 ps by optimizing the compressor. The combination of high peak power with high repetition rates makes this system an ideal source for any nonlinear application, such as high harmonic generation, OPCPA pumping or material processing.



The good beam quality with $M^2 < 1.6$ and the angular pointing stability with less than $15 \mu\text{rad}$ over 2 hours provide ideal prerequisites for high energy applications. The long term power stability is better than 0.5 % rms measured over a period of 48 hours with a pulse-to-pulse energy stability of 2 %. The system is linear polarized with a contrast ratio of more than 100:1.



The temporal pulse profile shows very clean 5 ps pulses, which could be further compressed down to 1 ps.

Design

The compact systems footprint measures only (100 x 60) cm plus one additional 4HU rack for the laser electronics. The seed oscillator is directly integrated in the laser head. The system is equipped with the neoCON standard software to set all relevant laser parameters and monitor system control signals and temperatures. The system provides a TTL input for the user to control the gating AOM and a synchronization signal that can be used for further pulse picking.



neoMOS

The neoMOS laser platform offers a wide range of laser parameters starting from cw-single frequency, high energy pulses up to short pulse femtosecond radiation. The unique platform and the neoLASE long term experience enable a high quality production of customized laser systems on industrial standards and high reliability. True to our motto "brilliance in customized laser solutions", we look forward to your inquiry on www.neolase.com or info@neolase.com.