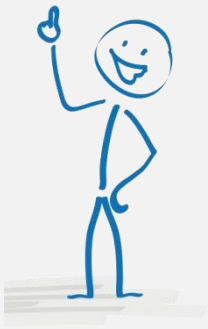
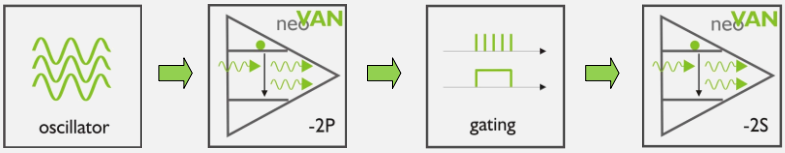
Introduction

This white paper introduces a high power and high energy nanosecond pulsed MOPA design with more than 70 W output power, up to 3 mJ pulse energy and tuneable pulse durations ideally suited for LIBS or PLD processes.

neoMOS *high power tuneable pulse duration*

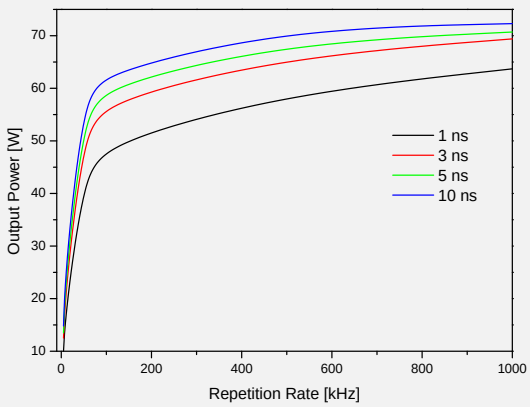


The MOPA laser was realized on basis of a commercial fiber laser or a modulated laser diode as seeder, two neoVAN amplifier modules and a modulator for gating the laser pulses into the application. Beside a flexible repetition rate from 10 kHz to 1 MHz the pulse duration of the seeder can be changed in ranges from 1-100 ns.



Parameter

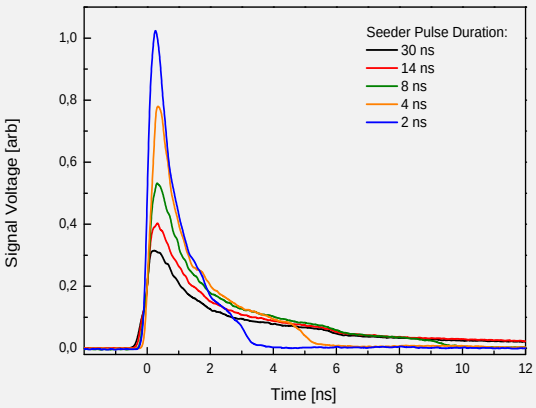
The output power of the system was measured to be > 70 W at a repetition rate of 1 MHz and 10 ns pulse duration as shown in the figure below for the case of a modulated diode laser as seeder. The maximum pulse energy of 3 mJ is reached at 5 kHz. The typical long term power stability was determined with < 1 % RMS over a period of 8 hours. The beam quality factor M^2 is below 1.3 in all power regimes and the beam roundness is better than 95%.



The lasers pulse duration can be changed by the seed laser and will additionally be formed by the gain dynamic of the amplifier stages. Therefore typical pulses will have a peak with a few nanosecond length followed by a declining tail with a changeable slope.

For laser applications requiring high peak power this shaping is well-suited to initiate the laser process and keep the process alive for a specify time changeable by

the trailing part. Examples are laser-induced plasma applications such as, laser-induced breakdown spectroscopy (LIBS) or thin-film or pulsed laser deposition (PLD).



The rising edge of the pulse is determined by the gain of the amplifiers and can be manipulated to get pulse durations down to about 650 ps with a 2 ns input pulse. On the other hand the steepness can be flattened and the fullwidth half maximum duration variedby shaping the input pulse and therefore generate longer pulse durations.

Design

The compact system is based on the neoLASE customized MOPA architecture as shown below and measures a footprint of only 680 x 412 mm^2. In addition a 4HU laser electronic is needed to control the laser system parameters. The system is equipped with the neoCON standard software to set all relevant laser parameters and monitor system control signals and temperatures. The seed oscillator is fully integrated and also controlled by neoCON software.

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.