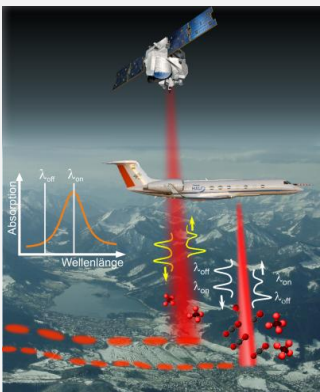




Introduction

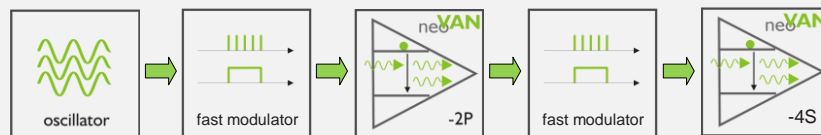
This white paper introduces a customized, high energy, narrow line width MOPA laser with tuneable pulse durations, kilohertz repetition rates and up to 5 mJ pulse energy for atmospheric measurements from airplanes or earth based stations.

neoMOS: high-energy single-frequency laser

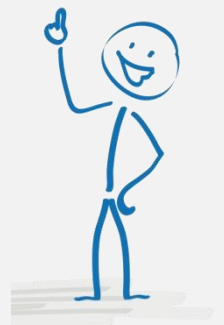


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The MOPA laser is based on a single-frequency continuous wave oscillator with MHz spectral line width, two modulators and two neoVAN amplifier modules. The first modulator allows amplitude modulation to generate nanosecond pulses out of a cw seed laser signal. The laser pulses will be amplified in a first pre-amplifier stage. Downstream a second modulator allows for further pulse forming and ASE suppression for low power, high energy pulses. The second, final amplifier will boost the nanosecond pulses into the millijoule regime.



This scheme allows high energy, single frequency pulses with a high flexibility in terms of repetition rates in the range from 1 kHz to MHz, pulse energies up to 5 mJ and pulse durations from 5 ns to 100 ns. A motorized half wave plate in combination with a polarizer downstream of the system enables flexible power variations while keeping laser beam parameters constant.



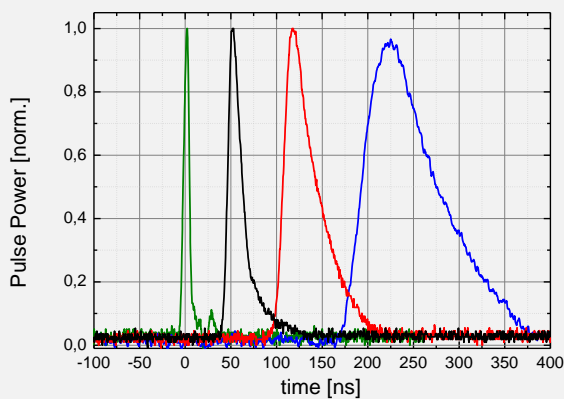
Parameter

The output power of the system was measured to be > 50W at 50 kHz and a pulse energy up to 5 mJ at 5 kHz. The beam pointing was measured with less than 10 μ rad over 1 hour with a long term power stability better than 0.3% RMS measured over a period of 16 hours. The beam quality factor M^2 was better than 1.4 in all power regimes and the beam roundness was better than 95%.



Pulse shaping

At high repetition rates above 50 kHz, the initially prepared pulse duration and pulse shape is amplified to > 50 W without any significant distortions. However, at repetition rates below 10 kHz, the amplifier shows significant gain dynamics.



A simple, rectangular 60 ns gate function applied to the AOM for example, will lead to output pulses with a full-width half maximum (FWHM) duration of less than 20 ns, which will not change notably by increasing the initial gate length (see black curve). However, the gain dynamics can be used to actually shape the pulses by using an adequate analogue voltage signal for the AOM.

In case of an exponential voltage slope, pulses as long as 90 ns can be obtained from the amplifier with an almost Gaussian shape (see red and blue curves). Using this pulse shaping mechanism and additionally the Pockels cell as a second pulse picker, an output pulse duration from 5 ns to more than 100 ns can be obtained from the system.

Design



The compact systems footprint measures only (630 x 490) mm plus two additional 4HU racks for the laser electronics and the seed laser. The seed laser is separated from the laser head and is connected by a single-mode fiber. 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.