Introduction

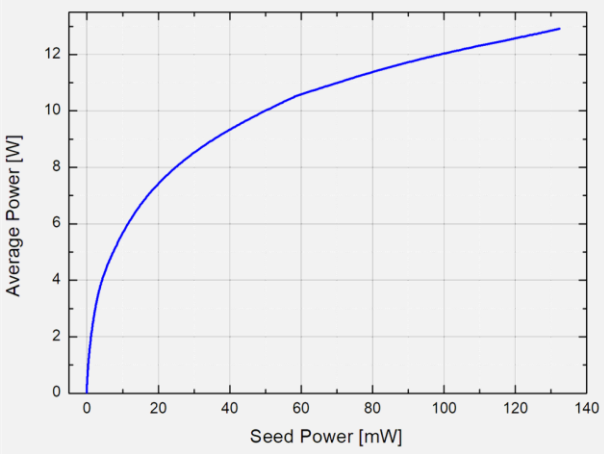
This white paper introduces the novel neoLASE Ytterbium amplifier modules which allow easy power and energy boosting of ytterbium based laser oscillators and amplifiers ranging from cw to femtosecond pulse duration. The units are stand-alone and have a compact footprint of only (246 x 120) mm and are available as pre- or main amplifier version.

neoYb: *stand-alone Yb amplifier modules*

High power femtosecond pulses have become a powerful tool which can be widely used either in industrial applications such as micromachining and material processing or as an enabling technology for nonlinear frequency conversion, spectroscopy, LIDAR or optical imaging. Low power, low energy sources are readily available from fiber-based oscillators and amplifiers, but the available energy is limited in these systems, as they suffer from strong nonlinearities. Therefore, the system architecture becomes much more complicated, bulky and expensive for energy levels above a few µJ, which are typically required for machining or nonlinear processes.

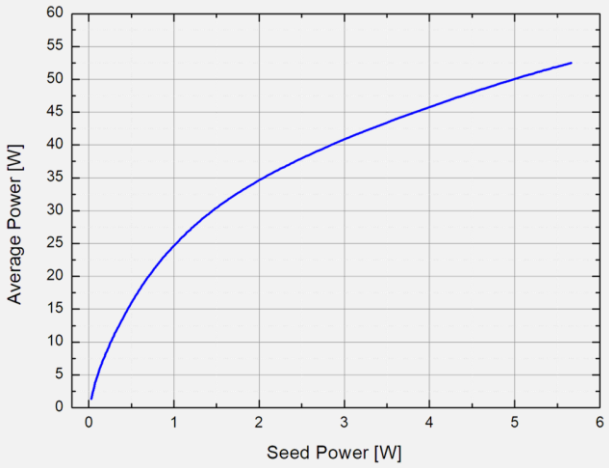
Bulk amplifiers show only minor nonlinear effects and can be scaled beyond 50 µJ without any required pulse stretching. The neoLASE stand-alone amplifier modules are compact and easy-to-implement. They can be combined with a fiber-based seeder as a power stage to reach high average power and high energies while maintaining a simple, straightforward system architecture.

Performance



The modules are available in two versions, designed for different input power levels as a pre-amplifier or main amplifier module. With low seed powers of a few mW, the pre-amplifier used in double-pass configuration, provides a small signal gain of > 10.000 and already boosts the power to a few Watts (see left Figure).

The output can be further boosted with the main amplifier module, that provides > 50 W of output power with only 5 W seed. In saturated operation the modules allow an optical to optical efficiency of more than 60%.

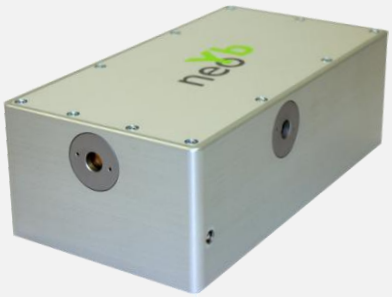


Due to the low nonlinearities, it supports > 50 µJ @ 700 fs without any stretching reqired and up to 1 mJ with only moderate chirp to 100 ps.

Using i.e. a fiber-based front-end providing 10 mW at 100 kHz, two stages are sufficient to reach an energy level beyond 500 µJ, boosting the energy by a factor of 5.000!

Design

The compact footprint measures only (246 x 120) mm and the modules include already the VBG-stabilized pump diode. For implementation, only a suitable current source and cooling water needs to be connected. Based on the neoLASE philosophy of "customization based on industrial proven performance", the modules provide a stable and robust amplifier stage, that can be easily implemented by the customer to boost his system performance.



neoYb

The neoLASE Amplifier 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 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.