



Introduction

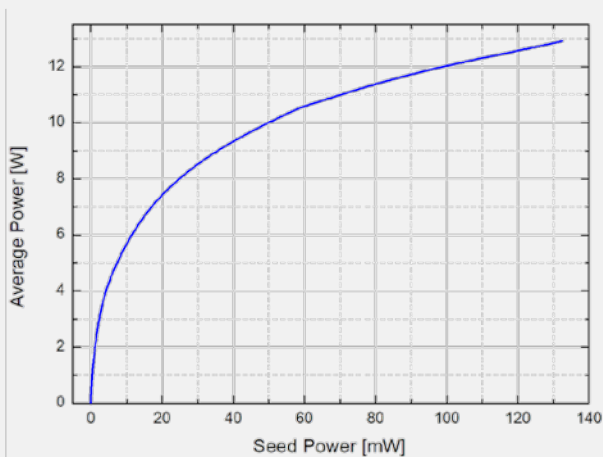
This white paper introduces the novel neoLASE Ytterbium amplifier modules which allow easy power and energy boosting of ytterbium based laser oscillators ranging from cw to femtosecond pulse duration.

neoYb: *Yb amplifier modules*

High power femtosecond pulses have become a powerful tool which can be widely used either in industrial applications such as micro-machining 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.

The neoLASE amplifiers are ideally suited for power and energy scaling as they provide several orders of magnitude less nonlinearities. Sub-ps pulse with more than 50 μJ pulse energy are supported without any required pulse stretching and further scaling to the mJ level requires only moderate stretching to 50 ps. The neoLASE amplifier modules are designed as a compact and easy-to-implement booster stage. 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 and cost-effective system architecture.

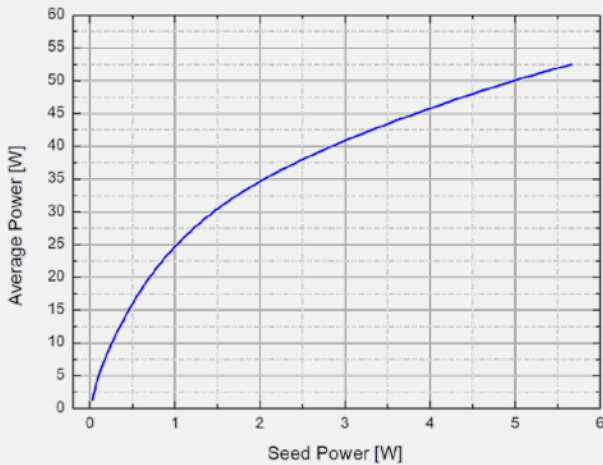
Performance



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).



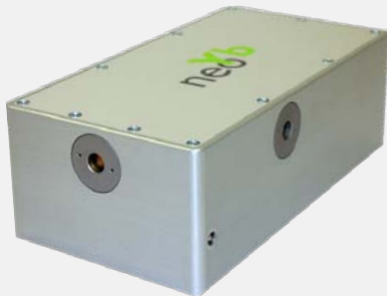
The output can be further boosted with the main amplifier module, that provides > 50 W of output power with only 5 W seed. In saturated operation the modules allow an optical to optical efficiency of more than 60%.



Due to the low nonlinearities, it supports > 50 μJ @ 700 fs without any stretching required and up to 1 mJ with only moderate chirp. With 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! A three stage design already show > 100 W output power and > 1 mJ pulse energy.

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.