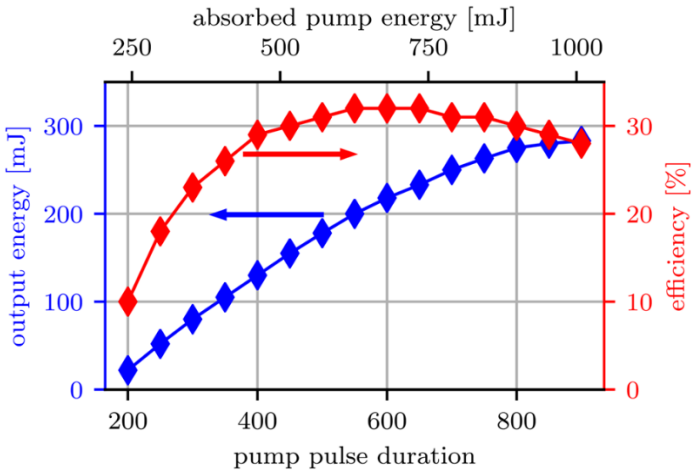
HIGH-ENERGY AND COMPACT UNSTABLE RESONATORS

The HiLASE team, in collaboration with Dr. Koerner from the Institute of Optics and Quantum Electronics of the Friedrich-Schiller University in Jena (Germany), have successfully demonstrated the operation of a compact high-energy pulsed laser based on a novel unstable cavity design (Opt. Express 27, No. 15, pp. 21622-21634 (2019)). The laser system produced 13 ns pulses with an energy of 285 mJ at a repetition rate of 10 Hz and an extraction efficiency of 35%. Cavity dump operation was also successfully demonstrated delivering an output energy of 110mJ. Figure below shows the output energy (blue curve) and the efficiency (red curve) as a function of the pump pulse duration.



Recent improvements performed at the IOQ-Jena have allowed the generation of > 1 J /10 Hz laser output with 12 ns pulse duration. These results clearly demonstrate that the use of a homogenized longitudinal laser diode pump in combination with an unstable resonator is a powerful approach to realize compact high-energy Q-switched Yb:YAG lasers.

In September 2019, a patent related to this technology was released under publication number CZ 307955 with the title "A laser system providing a shaped intensity profile of an output beam within an unstable optical resonator layout and method thereof" (https://isdv.upv.cz/webapp/resdb.print_detail.det?pidspis=mxhWTTVnCtlRZbf).

The HiLASE Centre is now ready to licence this technology to the interested manufacturers.

Contact: solutions@hilase.cz

Potential applications of the high-energy unstable resonators include industrial applications like laser shock peening and advanced 3-D printing, and scientific applications like generation of x-rays for biology and medicine. This technology can also be applied for future pumps in ultrashort Ti:sapphire lasers and optical parametric amplifiers, or high-energy 2-micron sources for advanced applications in the area of particle acceleration, mid-IR spectrocopy and pollution detection, and material processing.