THE MOST POWERFUL PICOSECOND UV (257 NM) COHERENT LIGHT SOURCE DEMONSTRATED

The laser beam from the PERLA C2 laser system was first frequency doubled in an LBO crystal. The generated second harmonic beam (wavelength of 515 nm) then reflected on two dichroic mirrors and entered a box with a CLBO crystal surrounded by a protective atmosphere of argon. The fourth harmonic (257 nm) was produced in the CLBO as the second harmonic of this frequency doubled beam. Fig. 1 presents our latest results, (a) the second harmonic generation and conversion efficiency in the dependence on the input power of the fundamental, (b) the fourth harmonic and conversion efficiency on the second harmonic. The pulse duration was ~10 ps. Fig. 1(b) shows our best result at present: **the output power of the fourth harmonic was 20 W** at a conversion efficiency of 26%, related to the second harmonic. The output power is up to our knowledge the **highest achieved for picosecond pulses at a repetition rate of ~100 kHz,** including the journal publications and commercial products. The deep ultraviolet radiation around 260 nm is important for materials processing, e.g. it initiates unique phase transitions on surface of some materials (the usage examined at HiLASE), due to the very short wavelength and pulse duration it can be used for very precise microstructuring of surfaces and in lithography, due to the high photon energy (4.8 eV) it enables spectroscopy of electronic transitions in molecules. An outstanding application is in science, for very efficient illumination of photocathodes in free electron lasers. Our previous publications on the subject are [1, 2].

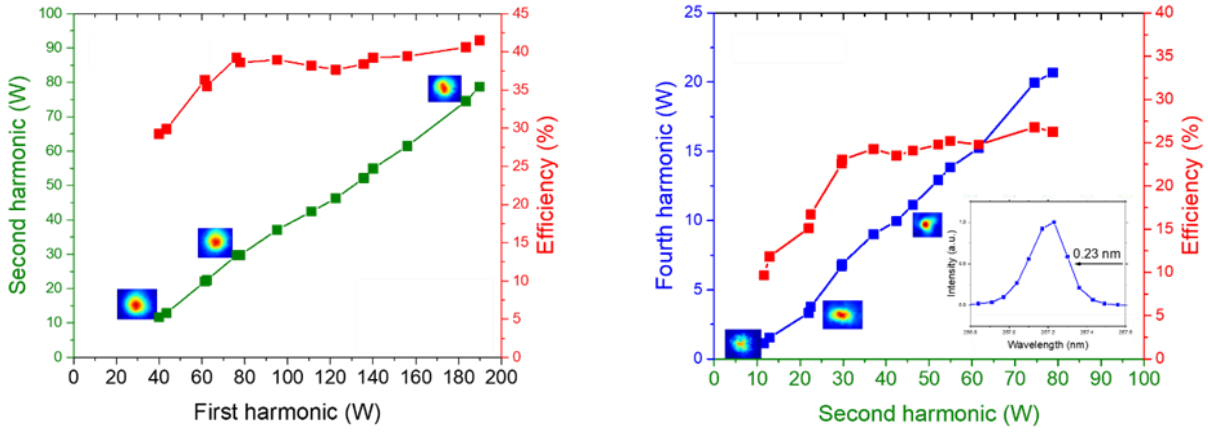

Fig. 1. Output power and conversion efficiency of (a) 2ω on 1ω, and (b) 4ω on 2ω. The inset is the 4ω spectrum.

References

[1] Novak, O., Turcicova, H., Smrz, M., Miura, T., Endo, A., and Mocek, T., "Picosecond green and deep ultraviolet pulses generated by a high-power 100 kHz thin-disk laser," Optics Letts. 41(22), 5210-5213 (2016).

[2]H. Turcicova, O. Novak, L. Roskot, J. Muzik, M. Smrz, A. Endo, T. Mocek, "Picosecond deep ultraviolet pulses generated by a 100 kHz thin-disk laser system, XXII. Con. High Power Laser Systems and Applications, Oct. 9-12, frascati, 2018.

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