Record average power CW and QCW green and UV fiber lasers

Alexey Avdokhin*, Valentin Gapontsev, Pankaj Kadwani, Andreas Vaupel, Igor Samartsev
IPG Photonics Corp., 50 Old Webster Rd, Oxford, MA, USA 01540
*aavdokhin@ipgphotonics.com; phone +1 508 373-1234; www.ipgphotonics.com

Abstract - We report a single-mode (SM) green fiber laser based on single-pass frequency doubling of a linearly-polarized (LP) narrow-linewidth Yb fiber laser in LBO crystal, and configured to operate in a range of regimes from continuous-wave (CW) to high-repetition-rate quasi-continuous-wave (QCW). Adjusting the duty cycle, we maintained high second harmonic generation (SHG) efficiency for various output powers. Average powers of over 550W in QCW and over 350W in CW regimes were obtained with the wall-plug efficiency up to 24%, opening the possibility to creating new class of simple, compact and efficient single-mode green lasers with output power up to 1kW and above. We also report a nearly single-mode ultraviolet (UV) fiber laser source based on cascaded single-pass frequency tripling of LP narrow-linewidth high-repetition-rate QCW Yb fiber laser in two LBO crystals. Average power of over 90W at 355nm was obtained with the THG efficiency of up to 30% and wall-plug efficiency of up to 10%. No changes in the shape and divergence of the UV beam were observed over the whole range of output powers. Utilizing 1kW narrow-linewidth ytterbium fiber laser, we plan to increase output UV power to 300W in the near future.

Keywords - Frequency doubling, tripling, SHG, THG, high-power, single-mode, green, ultraviolet, UV, fiber laser, LBO