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New generation ultrafast fiber-lasers with automated pulse compression for biomedical imaging BAI NIE, Michigan State University, DMITRY PESTOV, Biophotonic Solutions Inc, ILYAS SAYTASHEV, SERGEY ARKHIPOV, Michigan State University, ANDY CHONG, HUI LIU, FRANK WISE, Cornell University, MARCOS DNATUS, Michigan State University — A double-clad Yb-doped all-normal-dispersion fiber laser is demonstrated to produce 22 nJ pulses at 42.5 MHz repetition rate. With a 3 nm intracavity spectral filter, self-similar evolution is formed in the gain segment. The formation of self-similar evolution allows the achievement of both short pulse duration and high pulse energy form a fiber laser oscillator. These pulses are characterized and compressed via multiphoton intrapulse interference phase scan to as short as 42 fs and 10 nJ/pulse. Adaptive compression underlies the achievement of 250-kW peak power, which enables efficient second and third harmonic generation with spectra spanning 30 nm and 20 nm, respectively. Using the newly developed fiber laser, multiphoton imaging on live tissues is demonstrated.

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