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Compact 1.5-GHz intra-burst repetition rate Yb-doped all-PM-fiber laser system for ablation-cooled material removal ONDER AK-CAALAN, HAMIT KALAYCIOGLU, F. OMER ILDAY, Department of Physics, Bilkent University, 06800 Ankara, Turkey — Although fs fiber laser systems are powerful technologies for material and tissue processing, limited ablation rates and high energy are drawbacks. Recently, we identified a new regime of laser-material interaction, ablation-cooled laser material removal, where the repetition rate has to be high enough so that the targeted spot size cannot cool down substantially by heat conduction which scales down ablation threshold by several orders of magnitude and reduces thermal effects to the bulk of the target. This opens the door to simplified laser systems for processing. In order to exploit this regime in tissue processing, a compact all-PM-fiber laser amplifier system with an intra-burst repetition rate of 1.5 GHz is developed on a 40 x 65 cm platform. The system is able to produce bursts ranging from 20-ns to 65-ns duration with 20 uJ to 80 uJ total energy, respectively, and pulses with up to 2 uJ individual energy and burst repetition rate ranging from 25 kHz to 200 kHz. The seed signal is generated by a home-built all-normal dispersion oscillator with 385 MHz repetition rate and converted to approximately 1.5 GHz by a multiplier. Amplified pulses are compressed to approximately 250-fs, the shortest pulse width for burst-mode fiber laser systems known to date.

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