**A micro-scale self-starting femtosecond passively mode-lock fiber laser used in ICF**

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### ABSTRACT

A short pulse self-starting mode-lock fiber laser with femtosecond pulse width and high repetition rates is demonstrated. The oscillator features linearly cavity employing WDM system with a piece of Yb doped fiber. Semiconductor saturable absorber mirror (SESAM), with modulation depth of 30% and relaxation time of 4 ps, is employed. Two chirped fiber Bragg gratings are adopted. One FBG is placed in the cavity, with wide reflection near 1053nm. It compensates for the residual dispersion of the oscillator cavity elements and serves as an output coupler for the oscillator. The other FBG is placed out of the cavity to compress the pulse width further more. The length of laser cavity is around 10m. This mode-lock laser can self-start. Pulses as short as 225 fs pulse widths at repetition rates of 20 MHz are generated, with average output power is about 5mW.

As all of the optical fiber components are small or bendable, the size of this laser is as tiny as Φ60mm×15mm.This femtosecond mode-lock all fiber laser affords a compact, novel and high-efficiency approach as seed source in the Front-End in inertial confinement fusion (ICF) laser illumination schemes.

**Keywords:** ultrafast, fiber laser, self-starting, femtosecond, mode-lock, ICF, LPI, STUD