# Active-Q-switched Tb:$LiYF_4$ green lasers at 544 nm

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$Tb^{3+}$ lasers that can emit directly in the green and yellow spectral region under blue semiconductor pumping have the advantages of high optical-to-optical efficiency, compact cavity design, and UV generation in a simple SHG approach in comparison with conventional frequency-converted visible lasers. Moreover, $Tb^{3+}$ is a promising active ion for Q-switching in light of its long lifetime and low nonradiative losses that lead to a good energy storage capability. Recently, we have demonstrated the passive Q-switching and Q-switched SHG operation of the Tb:$LiYF_4$ green lasers.

Herein, we report the active-Q-switched operation of the Tb:$LiYF_4$ green lasers. The Tb:$LiYF_4$ lasers oscillate at 544 nm in a compact linear cavity and is modulated by an acousto-optic modulator. We employed a 488-nm OPSL as pump source and output transmittance 10%. The laser characteristics were schematically depicted in Fig. 1. The pulsed laser was running stably at the designated repetition rate of 3 kHz at maximum incident pump power of 3 W. The average output power was 445 mW, which results in single-pulse energy of 148 μJ. The typical pulse width was recorded to be 190 ns. The peak power was calculated to be around 580 W, which is two orders of magnitude higher to the highest peak power of 6.6 W obtained by passive Q-switching with single-layer graphene in our previous experiment.

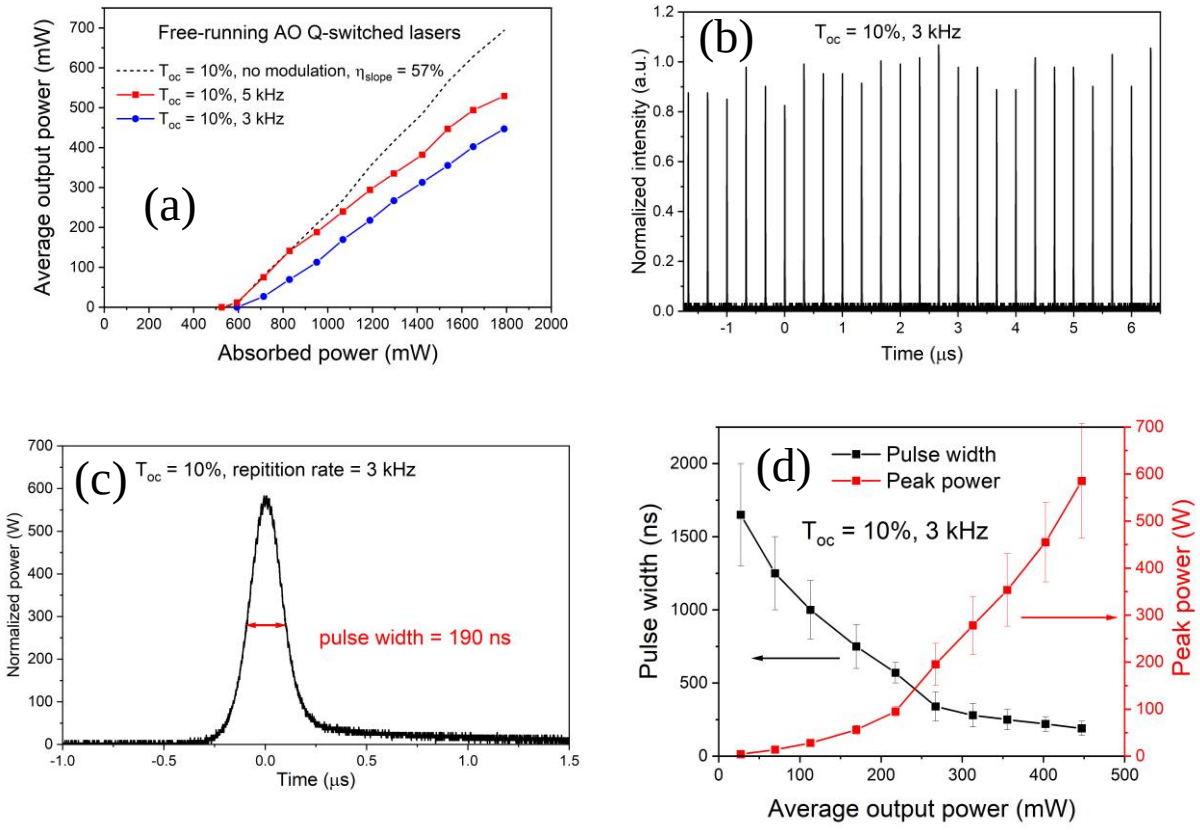


**Fig. 1. Laser properties: (a) output power characteristics of the Tb:$LiYF_4$ lasers operated without modulation, at a repetition rate of 5 kHz, and of 3 kHz; (b) a pulse train of the AO-Q-switched Tb:$LiYF_4$ laser at 3 kHz with $T_{oc}$ = 10%.; (c) a typical pulse shape at maximum incident power; (d) evolution of the pulse width and peak power with average output power.**