

Wavelength tunable actively Q-switched fiber laser in *cw* and pulse operation based on a fiber Bragg grating

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We report a tunable actively Q-switched fiber laser using a FBG. The tuning of the laser was in a range from 1532 to 1542 nm, pulses obtained were 472 ns and 1 W average power. The laser is formed by pump high power diode laser, 3 m of Er³⁺/Yb³⁺ doped fiber, with a core diameter of 7 μm, an inner cladding diameter of 130 μm, and an outer cladding diameter of 245 μm. The NA of the signal is 0.17 and the inner cladding to the outer cladding ratio is 0.46. An AOM was inserted in the cavity. The pump light is launched into cavity through the combination of two optical sub-systems. The end of the doped fiber was spliced 1 m length of Corning SMF-28 fiber, in order to attenuate the residual pump signal. The FBG is attached to a flexible plate, bending to the FBG by means of a micrometric screw in a mechanical system, inside the grating will apply compression therefore the Bragg wavelength is shortened and if the FBG is stretched the Bragg wavelength is lengthens. In the experiment first the AOM was not placed and the output radiation from the doped fiber is sent directly to the FBG and in this way we setup the laser cavity (*cw*). Applying compression/strain on the FBG, with mechanical system, we obtain a tuning. Finally, we introduced the AOM in the cavity to get the Q-switching and obtain pulses at 1537.9 nm (Bragg wavelength). The total cavity length is ~5 m. Our tuning range is limited by the compression/strain on the FBG. Fig. 1(a) and 1(b) show the tuning spectra output, with a spectral separation of ~0.1 nm, and with a FWHM ~0.1 nm and ~0.5 nm for *cw* and pulsed operation respectively.

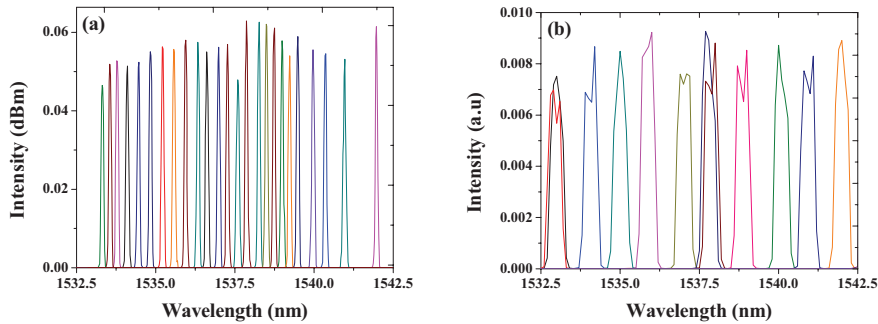


Fig. 1. Output spectra for tuning wavelength, a) in *cw* and, b) pulsed

Fig. 2(a) shows a pulse envelope; having FWHM ~472 ns, comparable to Q-switched fiber laser [3]. The laser efficiency is ~12% in pulse regiment. Fig 2(b) shows a train of pulse at repetition rate of 100 kHz at 1537.9 nm and 1 W.

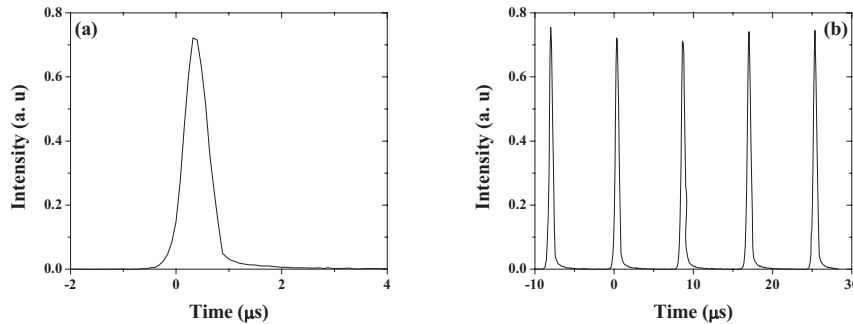


Fig.2. (a) Single pulse envelope, (b) Typical pulse train for 1 W output power, at 1537.9 nm and pulse duration of ~472 ns