

低複屈折リオフィルタを用いた全ファイバー波長可変モード同期レーザ

All-fiber tunable mode-locked laser by using low birefringence Lyot-filter

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Wavelength tunable mode-locked fiber lasers have attracted significant interests because of their widespread application in biomedical research, spectroscopy, fiber-optic sensors, optical instrumentation and telecommunications [1]. Currently, the dominant technology is based on semiconductor saturable absorber mirrors (SESAMs). However, these have a narrow tuning range, and require complex fabrication and packaging. Besides, although semiconductor saturable absorber mirror serves to be a sophisticated saturable absorber, the limited bandwidth is an inherent drawback of wavelength tuning. Another method is using tilted fiber grating as a filter. However, it will have huge insertion loss [1-2].

In this paper, we demonstrate a tunable mode-locked Erbium doped fiber laser with low loss by utilizing low-birefringence Lyot-filter and carbon nanotube (CNT) as saturable absorber (SA). The range of this wavelength tunable output is from 1547 nm to 1562 nm.

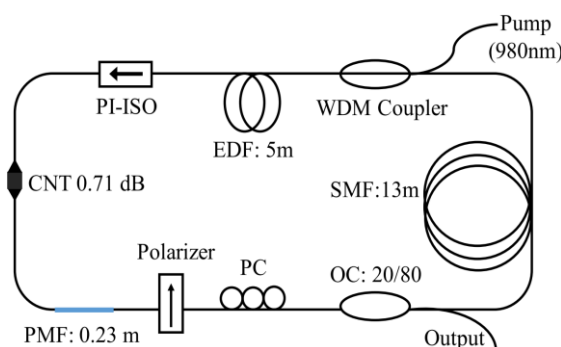


Figure 1. Experimental setup

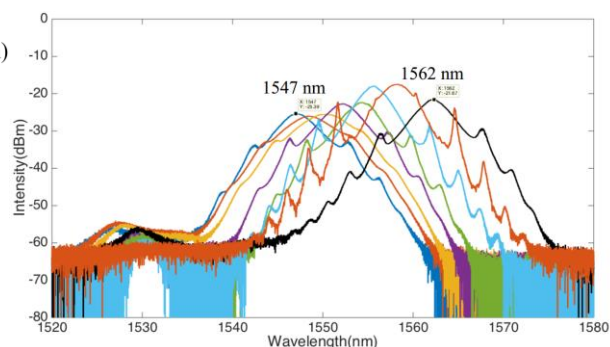


Figure 2. Tunable output

The experimental setup is shown in Fig 1. A 13 m long single-mode fiber, 5 m-long EDF, a pump laser diode, a 1550/980 nm wavelength-division multiplexing (WDM) coupler, a polarization independent isolator (PI-ISO), a Polarization controller (PC), a polarizer, a CNT and a 20/80 OC consist a ring cavity. The total length of this laser cavity is 30 m. By adjusting the PC, wavelength tunable mode-locked output can be obtained. The observed wavelength tunable mode-locked optical spectrum is shown in Fig. 2. The tunable range is from 1547nm to 1562nm. In addition, the output spectrum exhibited symmetrically Kelly sidebands, which confirm that they are conventional Soliton.

Reference

- [1] Zou C, Wang T, Yan Z, et al. Wavelength-tunable passively mode-locked Erbium-doped fiber laser based on carbon nanotube and a 45 tilted fiber grating[J]. Optics Communications, 2018, 406: 151-157.
- [2] Sun Z, Popa D, Hasan T, et al. A stable, wideband tunable, near transform-limited, graphene-mode-locked, ultrafast laser[J]. Nano Research, 2010, 3(9): 653-660.