高功率掺 Yb 可调谐脉冲光纤激光器研究

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摘　要：被动锁模掺镱光纤激光器具有结构紧凑、成本低、稳定性好等优势，其产生的超短脉冲激光在光纤通信系统、医疗器械、超连续谱的产生等众多领域有着广阔的应用前景，并因此而备受人们关注,其中高功率可调谐脉冲光纤激光器作为其中一个热点更是得到了深入与广泛的研究。

本项目研究了一种基于非线性偏振旋转被动锁模的可调谐掺镱光纤激光器，在无外加滤波器的情况下实验产生了锁模耗散孤子脉冲。并以之作为种子源，对其进行四级 MOPA 高功率放大，最终获得 18.10W 的脉冲激光输出，其波长在 1031nm~1051nm 范围内可调谐，重复频率为 197MHz，脉冲宽度为 15.4ps, 光谱宽度的的变化范围为 11~14ps 和 5.71~11.33nm。

关 键 词：被动锁模掺镱光纤激光器；非线性偏振旋转；可调谐；MOPA 高功率放大

High-power wavelength-tunable Yb-doped pulsed fiber laser

Abstract: Passively mode-locked ytterbium doped fiber laser has the advantages such as compact structure, low cost, and stability, The ultrashort pulse laser it generated has a broad application prospect in many fields, such as optical fiber communication system, medical, equipment, supercontinuum, etc. As one of the hot spot, the high power tunable pulse fiber laser have got an extensive research.

Our project investigated a kind of tunable ytterbium doped fiber laser based on nonlinear polarization rotation passive mode-locking effect, which can generated mode-locked dissipative soliton pulse without additional filter.We take it as a seed and then amplified it with 4 level MOPA high power amplifier. High stability pulses with 197MHz repetition rate, 18.1W average power, 15.4 ps pulse duration, 5.71~11.33 nm bandwidth (FWHM), and central wavelength tunable from 1 031 nm to 1 051 nm were generated. This system provides a compact, stable and reliable high-power tunable picosecond fiber laser source.

Key words: Passively mode-locked ytterbium doped fiber laser; the nonlinear polarization rotation; tunable; MOPA high power amplifier

教师点评：本文以非线性偏振旋转（NPR）被动锁模皮秒脉冲掺镱光纤激光器作为种子源，搭建基于主震荡功率放大（MOPA）的掺 Yb 光纤放大器对种子源进行功率放大，实现了波长调谐范围为 1031-1051 nm 的高功率可调谐皮秒脉冲光纤激光器，最大输出功率为 18 W，脉冲宽度为 15.4 ps，重复频率为 197 MHz。

论文选题具有较好的应用价值和创新性，难度偏难，文献材料收集翔实，工作量饱满，设计合理，方案可行，数据合理，书写规范，条理清晰。值得一提的是该同学从大二开始就积极进入实验室参与实验项目，通过两年多的锻炼学习，理论基础扎实，具有较强的实验技能，目前已初步形成独立分析问题、解决问题的科研能力，毕业设计中，工作努力，积极认真、很好地完成了毕业设计任务,是篇优秀的毕业论文。