调 Q 光纤激光器研究

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摘　要:本文通过实验对掺铥光纤激光器的连续输出、被动调 Q 脉冲输出和自锁模现象进行研究。利用 785nm 的半导体激光器泵浦源和 F-P 型谐振腔，得到 1.675W 的连续输出。利用 SESAM 被动调 Q 可得到平均功率为 0.418W，脉冲能量为 6.27μJ，脉宽为 1.1μs，重复频率为 66.7KHz，峰值功率为 5.7W 的脉冲。在光纤长度为 3.1m，入纤泵浦功率为 8.72W 时，得到了脉宽为 1.829ns，脉冲能量为 0.65μJ，重复频率为 32MHz，峰值功率为 35.4W 的自锁模脉冲。实验还研究在不同光纤长度和泵浦功率下，连续输出、被动调 Q 脉冲和自锁模脉冲的输出特性。

关 键 词：光纤激光器；掺铥光纤；SESAM；调 Q；自锁模

Studies on Q-Switched Thulium-Doped Fiber Laser

Abstract：This project studies the CW, passively Q-switched and self-mode-locked Tm-doped fiber laser in experiment. Continuous output power of 1.675W is obtained pumped by a 785nm laser diode with an F-P resonant cavity. Passively Q-switched pulse trains are obtained with a SESAM as a Q switcher. The maximum average power is 0.418W, pulse energy is up to 6.27μJ, pulse width is 1.1μs, repetition rate is 66.7 KHz and the peak power is up to 5.7W. When the fiber length is 3.1m and the launched pump power is 8.72W, self-mode-locked pulse can be obtained whose pulse width is 1.829ns, pulse energy is 0.65μJ, repetition rate is 32MHz and the peak power is 35.4W. The performances of the continuous wave, passively Q-switched pulse and self-mode-locked pulse are studied under different fiber lengths or launched pump power.

Key words：fiber laser; Tm^{3+}-doped fiber; SESAM; Q-switch; self-mode-locking

教师点评：黄德波同学对掺铥双包层光纤激光器进行了较全面的研究，实现了连续运转，分析了不同长度、不同腔镜透过率对输出特性的影响；实现了 SESAM 调 Q，观察并分析了自锁模现象。论文选题有较强的应用价值，难度较大，文献材料收集翔实，所得数据合理，结论正确，工作量饱满。论文书写规范，条理清晰。该同学较好地掌握了本学科的基础理论和专业知识，在毕业设计中，工作态度端正，圆满地完成了毕业设计任务，是一篇优秀的毕业论文。