利用雙纖核全正色散光纖雷射產生高能量似噪音脈衝之研究

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中文摘要

在本論文中，我們提出一種新型的雷射用以產生高能量似噪音的脈衝。於此共振腔中有兩段不同的摻鐿光纖，纖核的大小分別為 10 微米與 30 微米。此外，共振腔中增長 200 公尺被動光纖的長度，以降低似噪音脈衝之重複率到 920 千赫，我們嘗試在共振腔中使用不同頻寬的濾波器，以產生穩定的似噪音脈衝。我們找到較佳的濾波器之頻寬為 10 奈米。此共振腔之優點為可以降低共振腔中的非線性效應並提升輸出的雷射功率，目前我們可以得到最高 2.29 瓦的輸出功率，對應的輸出脈衝能量為 2.49 微焦耳；這是迄今由單一共振腔可以得到似噪音脈衝的最高能量。

High energy noise-like pulses generated by a dual-core size all-normal dispersion fiber laser

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Abstract

In this thesis, I have designed, constructed and characterized a high energy all-normal dispersion mode-locked fiber laser. Two ytterbium doped fibers with 10 μm and 30 μm core sizes were employed in an attempt to acquire higher output power and at the same time lower lasing threshold. To further scale up the energy, a 200 meters passive fiber was added to the cavity to reduce the repetition rate. The bandpass filter with different bandwidths was inserted into cavity to study its effect on the generation of stable mode-locked pulses. The optimal bandwidth of bandpass filter is found to be 10 nm. This laser can generate noise-like pulses with output power as high as 2.29 W at a repetition rate of 920 kHz corresponding to the pulse energy of 2.49 μJ.