NANYANG TECHNOLOGICAL UNIVERSITY

URECA
Undergraduate Research Experience on CAmpus

Category: 3 **Student: Guo Mingzhe** **Project ID: EEE13099**
School of Electrical and Electronic Engineering

Master Oscillator Power Amplifier(MOPA) Fiber Laser

Objective

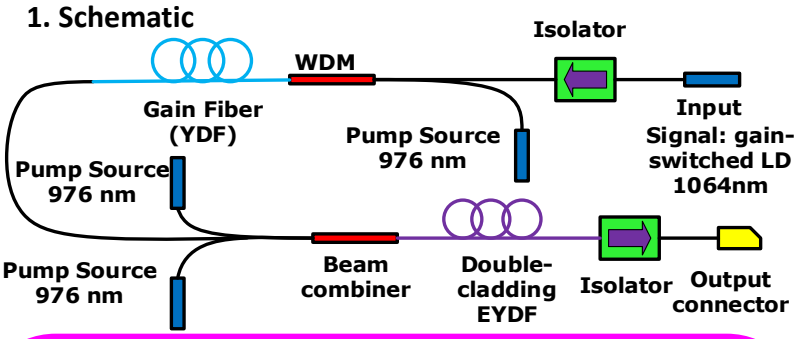
To design a 1064nm picosecond MOPA gain-switched fiber laser.

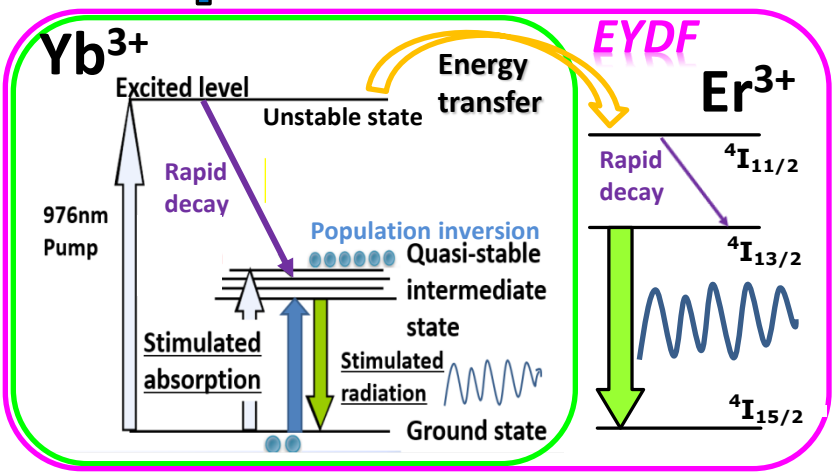
Introduction

Fiber laser has now accounted for a market volume of over SGD 870 million, corresponding to 23.5% share of laser market due to its superior attributes of compact size, high wall-plug efficiency and low maintenance operation. In this experiment, we introduce the *master oscillator power amplifier* (MOPA) referring to a configuration consisting of a master laser and an optical amplifier to boost the output power. With MOPA, it is easy to realize the output with high peak value and narrow pulse width, which proves to be efficient in welding/micro-machining, telecommunications, medical area (e.g. Fractional Resurfacing) and military (e.g. remote sensing).

Methodology

1. Schematic



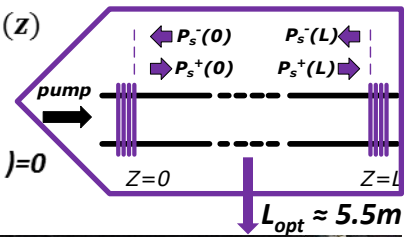


2. Calculate the length of YDF

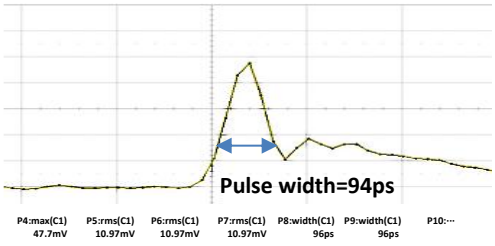
1. $P_s(z)=\frac{1}{2}P_{sat}\left(\sqrt{\psi(z)^2+B^2}\pm\psi(z)\right)$

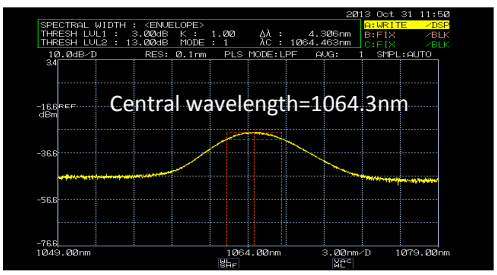
2. $g_s(z)=g_0(z)/\left[1+\left(\frac{P_s^{+}(L)+P_s^{-}(L)}{P_{sat}}\right)\right]$

3. $\frac{dP_s^{+}}{dz}\Big|_{z=Lopt}=[g_s(L_{opt})-\alpha_s]\cdot P_s^{+}(L_{opt})=0$



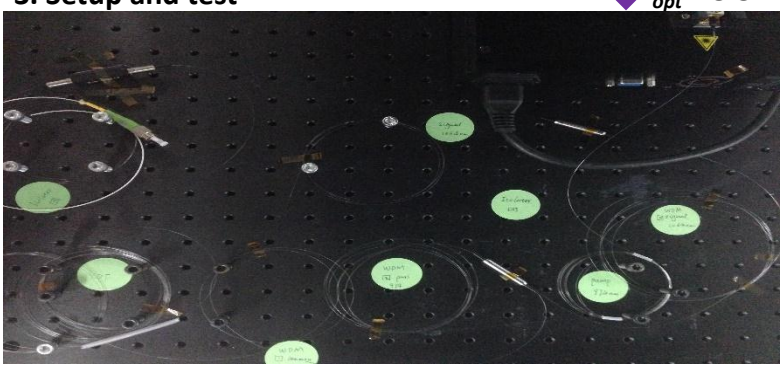
Results & Conclusion





Successfully constructed the 1st stage of a 1064nm 100ps gain-switched MOPA fiber laser.

3. Setup and test



Project Title: Fiber Laser
Supervisor: Prof Shum Ping **Collaborator: Ms Zhang Meng**