

Progress in high-power single frequency master oscillator power amplifier

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In the recent years some tremendous progresses have been made to scale up the output power of fiber laser to the point where fiber laser technology is becoming a serious competitor to the solid-state lasers in most of the industrial applications. Nowadays single mode Ytterbium (Yb) doped fiber lasers with an output power of 2kW^[1] are commercially available and some 5kW systems are a reality in the laboratory environment. Unfortunately the scaling of laser systems up to increasingly higher power levels is limited by some nonlinear effects like Raman which degrade the laser efficiency or the thermo-optics effect which degrade the beam quality. Even if the fiber laser technology is able to overcome these problems to a certain degree, it is desirable to increase the system power levels beyond what is possible with a single fiber laser. One promising technology that is being studied to achieve this is to combine a large number of relatively lower power beams into a single high-power beam. In order to be effective, this technique requires that each single low power laser has to be single polarization, single mode and single frequency.

Master oscillator power amplifier (MOPA) is becoming the obvious choice in order to develop some high power single frequency laser sources. Its simplicity, reliability, robustness and perspective for power scaling have already allowed the demonstration a 500W output power laser system. In this publication we will review the latest development in high power single frequency MOPA. We will also describe the challenges which need to be overcome in order to demonstrate a 1 kW single frequency MOPA source.

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