

CURRENT STATUS OF KUMGANG LASER TOWARD A IFE LASER DRIVER

Hong Jin Kong¹, Jungsuk Oh¹, Sangwoo Park¹, Seongwoo Cha¹, Jom Sool Kim², Kilsung Churn¹, and Bong Ju Lee³

¹Department of Physics, KAIST, Daejeon, Korea

²Laser Spectronix, Seoul, Korea

³Department of AGEE, HGU, Pohang, Korea
hjkong@kaist.ac.kr

The inertial fusion energy (IFE) laser driver is known that it requires the minimum output power of 500 kJ @ ~10 Hz [1]. However, it is hard to build such high-energy and high-repetition rate laser. One of the promising techniques to achieve both the high output energy and high repetition rate of the system is a coherent beam combination using stimulated Brillouin scattering phase conjugation mirrors (SBS-PCMs) [2]. It was shown that the coherent beam combination using SBS-PCMs can produce high output energy with high repetition rate if the number of lasers to be combined is increased as many as required [3, 4].

In this presentation, the authors will introduce the Kumgang Laser system [5]. Kumgang Laser system has the total output power of 4 kW (0.4 J @ 10 kHz / 10 ns), by coherently combining 4 amplifier modules having powers of 1 kW (0.1 J @ 10 kHz / 10 ns). Kumgang Laser system consists of the front-end, the pre-amplifier, and the 4 main amplifier modules.

The front-end is a hybrid master-oscillator power-amplifier (MOPA) system. The front-end consists of a CW LD oscillator, an Yb-doped fiber amplifier, and a Nd:YAG rod regenerative amplifier. The front-end produces a seed beam of 5.1 W (0.51 mJ @ 10 kHz / 8.5 ns).

The pre-amplifier utilize Nd:YAG rod as gain medium. The pre-amplifier amplifies the seed beam from 5.1 W (0.51 mJ @ 10 kHz / 8.5 ns) to 200 W (20 mJ @ 10 kHz / 8.5 ns). After the pre-amplifier, the coherent beam divider/combiner divides the laser beam to 4 sub-beams, and main amplifier module is designed to amplify the sub-beams up to 1 kW (100 mJ @ 10 kHz / 8.5ns). In the recent experiment, the main amplifier amplifies the laser beam from 90 W (9 mJ @ 10 kHz / 8.5 ns) to 1.075 kW (107.5 mJ @ 10 kHz / 8.5 ns).

As introduced above, the front-end, the pre-amplifier, and the main amplifier module of the Kumgang laser is developed. Kumgang laser system will be completed in the end of 2015. The Kumgang laser will prove the feasibility of the coherent beam combination laser using SBS-PCM for the IFE laser driver.

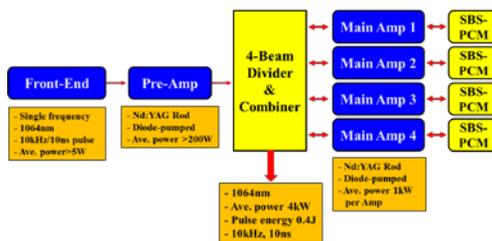


Figure 1. A schematic diagram of the Kumgang laser.

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