

Research and Design of Yb Fiber and Thin Disk Hybrid Laser System for the Second RF Gun of SuperKEKB

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In order to get high luminosity and low emittance electron beam for SuperKEKB accelerator, an Yb fiber and Yb:YAG thin disk hybrid laser system has been built and used for the first RF gun[1]. The configuration of laser system was decided from last year, only routine maintenance has been being done[2]. By use of this laser system, durable and stable 10 mJ output energy was generated for 46 days, as shown in Fig. 1. For realizing beam diagnosis and backup in the future, another new RF gun is about to be built. New laser system is under construction for the second RF gun.

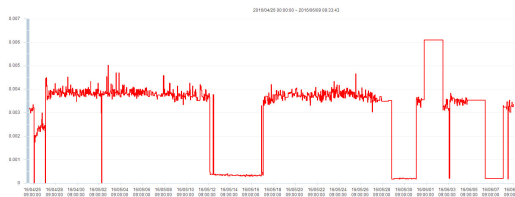


Fig. 1 Stability for 46 days laser operation

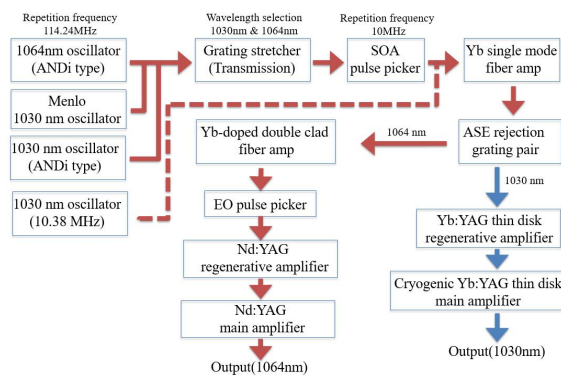


Fig.2 Layout of new Yb laser system for 2nd RF gun

As shown in Fig.2, except three 114 MHz oscillators are adopted, another new fiber oscillator at 10 MHz is under making for direct fiber amplification. In order to get flexible design laser injection with selective wavelength, 1030 nm and 1064 nm laser is selected separately by a grating pair after fiber amplification. As to 1030 nm laser, a novel and compact low temperature disk pre-amplifier is adopted. Efficient amplification can be realized compared to room temperature operation. Then, seed laser will be amplified successfully by Yb:YAG thin disk regenerative amplifier and cryogenic main amplifier. In addition, 1064 nm seed will be injected into Nd:YAG rod regenerative amplifier and main amplifier. Both lasers will be injected into RF gun after wavelength changing by two stages of nonlinear optics. Until now, fiber part and regenerative amplifiers for two wavelengths has been achieved.

Reference

- [1] X.Y. Zhou et.al., “Development of Yb Fiber and Thin Disk Hybrid Laser System of RF gun for SuperKEKB”, 18a-F7-2, JSAP14, Sagamihara, Kanagawa, 2014 Spring
- [2] Rui. Zhang et.al., “Development of Yb Fiber and Thin Disk Hybrid Laser System of RF gun for SuperKEKB 2”, 13a-2D-1, JSAP15, Nagoya, Aichi, 2015 Autumn