

THE BEAM QUALITY AND OUTPUT ABILITY IMPROVEMENT OF THE HIGH POWER LASER FACILITY

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The SG II -UP laser facility located in shanghai is one of the most important high power laser facilities in china. It consists of 8 laser beams (2 bundles) with the output beam aperture 310mm × 310mm, and is designed to provide 5000J laser energy per beam (1ω) for square pulse of 3ns. The above design specification has been accomplished in the middle of laser year. After that, the maximum output capacity of this laser facility is improved to 8000J. This paper will discuss how to improve the beam quality and output ability of the high power laser facility based the development of the SG laser facility.

The SG II -UP laser facility consists of a number of subsystems such as preamplifier, main amplifier, final optics assembly, and so on. Its main amplifier includes the two passes power amplifier and four passes cavity amplifier, as shown in Fig. 1. Fig. 2 (a) ~ (c) shows typical results during the near field beam quality improving process. Fig. 2 (a) shows the initial near field quality when the first beam line is completed, it is very terrible, and can not be accepted. After some improvements of the gain uniformity and other factors, the near filed beam quality is improved to Fig.2 (b). As the further improvement of the understanding about this kind of facility, the near field quality is further improved to Fig. 2 (c). Such good near field beam quality could increase output ability and ensure system working safely. Fig. 2 (d) shows the initial far field beam quality when the first beam line is completed. Its focus point is too poor to satisfy physical experiment requirement. Besides that, it can also endanger the safety of the laser system. After some systematic optimization, the high quality far field is successfully realized as shown in Fig. 2 (e). Based on the above improvements, the output ability of our laser facility is improved to 8000J from the design point 5000J, and further improvement is on going. More specific contents will be presented in the conference.

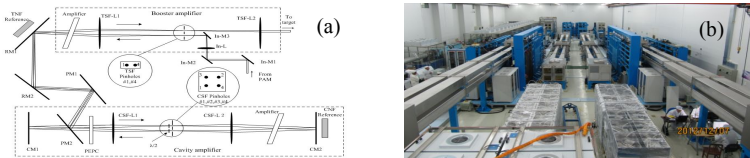


Fig.1. (a) Schematic of the main amplifier, (b) laser bay

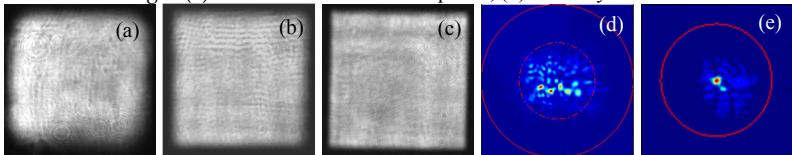


Fig.2. (a~c) Near field beam quality of three stages, and (d, e) far field quality of two stages

[1] Yan-Qi Gao, et al, "Characteristics of beam alignment in a high power four-pass laser amplifier," Appl. Opt. vol. 48, pp.1591-1597, 2009