Experimental campaign of laser plasma interaction on *Shenguang Octopus* laser facility

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On MJ-scale laser facility for inertial confinement fusion (ICF) experiments, several beams are bundled together and injected into the target chamber through a common port. This specific configuration could lead to laser plasma interaction (LPI) processes that are quite different from those in experiments on a 10s~100s-kJ-scale facility, as well as to more options for suppressing LPI via combination of different laser smoothing techniques on the beams in a bundle. For studying LPI of a bundle of beams in ignition-scale plasmas, a novel laser facility named *Shenguang Octopus* has been developed[1]. On this facility, eight laser beams are bundled together, operated at 351nm with a total energy of 30kJ, forming a 0.7-mm diameter focal spot with an overlapped intensity up to 2.5×10^{15}W/cm^2 at the target chamber centre. Recently, a series of LPI experiments have been performed[1-2] by axially irradiating the laser beams from one side of a gas-filled glass pipe or gold hohlraum target. Laser propagation and backscattering are measured to study the effects of several laser parameters (single beam's F-number, multi-color, etc.), in order to answer several challenging problems such as "whether it behaves like one single beam or eight individual beams" or "can it collectively excite LPI that coupled to a common plasma or scattered wave"[3-4]. Several beam smoothing techniques, such as mixed polarizations, smoothing by spectral dispersion, and "multi-color" mode, are demonstrated to be effective in suppressing LPI under current conditions.

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