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Design and experimental progress of hybrid-drive ICF ignition on SG-III laser facility

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The hotspot-ignition scheme for ICF by hybrid-drive (HD) approach combines both laser indirect drive (ID) and direct drive (DD) stages [1-3]. Firstly a layered capsule is ablated by lower ID radiation temperature, which results in the pre-compression of fusion fuel and also the formation of a long-scale corona plasma. Later, the DD lasers are incident upon, which are absorbed near the critical surface and meanwhile generate a supersonic electronic-thermal wave (ETW). This ETW is significantly smoothed during propagating in the long-scale ID corona plasma, which slows down later to a sonic ETW and behaves like a “snowplow” that piles up the low corona plasma density into high density platform between sonic wave front and the ID ablation front. The resulting HD plasma pressure is far higher than the ID ablation pressure found in the well-studied ID scheme. The HD plasma pressure provides PdV work large enough to the hotspot, resulting in non-stagnation ignition. In this talk, we will present the 2D design with the convergent ratio less than 25. Related experimental demonstration of the boosted HD plasma pressure and the smoothing effect of the supersonic ETW carried out recently on SG-III laser facility will be reported.

References

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