Experimental investigation of SiO_2 foam-filled hohlraums for inertial fusion

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The performance of SiO_2 foam-filled hohlraums is experimentally assessed as a candidate for ignition-relevant hohlraums to tamp the wall-motion with minimal to no increase in Laser Plasma Interactions (LPI). Three sub-critical foam densities (i.e. 1 mg/cc, 2 mg/cc and 4 mg/cc) for a 0.3 microm laser, were examined in a first experimental campaign conducted at the Omega laser facility [1]. X-ray images of the Laser Entrance Hole (LEH) show successful reduction in the expansion of the hohlraum wall in foam-filled targets, while measurements from two Full-Aperture Backscatter Stations (FABS) indicate backscatter levels from Stimulated Raman Scattering (SRS) and Stimulated Brillouin Scattering (SBS) are comparable to gas fills for 1 mg/cc foams. Additionally, hot-electron production was measured to be lower than for gas-fill or CH-lined hohlraums. Other diagnostics such as x-ray drive, and neutron yield, show no significant degradation due to the presence of the foam. Building upon these promising results, an upcoming experimental campaign at the Laser Megajoule (LMJ) facility [2] using a scaled-up target will assess the performance of a novel foam-fill design concept as a first step towards a more robust ignition-scale hohlraum.

[1] T.R. Boehly *et al.* "Initial performance results of the OMEGA laser system". In: *Optics Communications* 133.1 (1997), pp. 495–506. ISSN: 0030-4018.

[2] J-L. Miquel and P. Vivini. "The Laser Mega-Joule : LMJ & PETAL status and Program Overview". In: *Journal of Physics: Conference Series* 688 (2016), p. 012067.