3D versus 2D wall motion in hohlraum

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Inside a hohlraum, the plasma blow-off of the wall heated by laser beams is a serious concern as this determines how the laser beams propagate through the hohlraum and where they subsequently deposit their energy in the hohlraum. In turn, this determines the X-ray drive that an ICF capsule sees, and therefore impacts the symmetry of the implosion. To date, only indirect experimental measurements of wall motion have been obtained, and comparisons to simulations have been limited. It is clear that there is here a need to benchmark wall motion in simulations with experimental measurements. Recently, a series of experiments have been carried out on the Omega laser facility to examine such an issue. In an open cylinder, the motion of the laser-driven plasma bubbles was observed with proton radiography. A nearly uniform irradiation of the 59° laser cone with 10 laser spots was compared to the classic irradiation with 5 laser spots for which more 3D effects are expected

We present here 2D and 3D calculations of these experiments. The impact of the 3D is demonstrated: the 3D-calculated bubbles move faster than the 2D-calculated ones. Radial velocities are supersonic (Mach=3-5) and exceed 1000 km/s. However, the 3D calculations still underestimate the experimentally measured bubble motion.