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Anisotropic evaporation of a large nanoplasma CAMILA BACELLAR, Lawrence Berkeley Natl Lab, CHRISTOPH BOSTEDT, Argonne Natl Lab, ANDREY VILESOV, University of Southern California, OLIVER GESSNER, Lawrence Berkeley Natl Lab — Laser-induced plasma dynamics in ≈600 nm sized helium droplets are monitored by femtosecond time-resolved X-ray coherent diffractive imaging at the Linac Coherent Light Source (LCLS). An anisotropic, 20 nm wide softened surface region is established within 300 fs. At longer timescales, the width of this region remains largely constant but the dense plasma core diameter shrinks at average rates of 140 nm/ps along and 70 nm/ps perpendicular to the laser polarization. An anisotropic plasma evaporation model reproduces the key experimental observations and connects the findings of previous studies on small nanoscale systems with the dynamics of self-contained plasmas approaching micron scales. The model is supported by angle-resolved ion kinetic energy distributions recorded in coincidence with the X-ray diffraction patterns.

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