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Time-resolved interference imaging of the air disc under an impacting drop E. Q. LI, S. T. THORODDSEN, King Abdullah University of Science and Technology — Water drop impacting on dry, solid surface, is rapidly decelerated by an air cushion. This thin air layer is formed by lubrication pressure in the gas, which is strong enough to stop the inertia of the drop liquid and deform its bottom tip. The contact of the drop with the solid therefore occurs along a ring, entrapping a central bubble. For very large impact velocities the lubrication pressure becomes large enough to compress the gas. We use the Kirana ultra-high-speed video camera and 50 ns pulsed laser-diodes for interferometric imaging, at time-resolution of 200 ns. We capture the evolution of the air-layer thickness profile over the entire bubble entrapment process. The maximum diameter of the air disc is in perfect agreement with earlier theoretical models, if one uses the bottom radius of curvature of the drop. The air-layer thickness is also in agreement with available theoretical models, if one assumes adiabatic compression of the gas. For the largest impact velocities the air is compressed by more than a factor of 10. Immediately after first contact, the air disc expands rapidly in the vertical. The outer edge of the air-disk forms a kink in the free surface. This kink can move radially outwards just before contact, at speed as large as 50 times the impact velocity.

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