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Physics of liquid break-up in a two-fluid coaxial atomizer forced by an external acoustic field[1] PETER DEARBORN HUCK, RODRIGO OSUNA-OROZCO, NATHANAEL MACHICOANE, ALBERTO ALISEDA, University of Washington — We investigate acoustic forcing as a means of actuation in the formation of liquid drops and ligaments at the interface between a low momentum liquid cylinder and a high momentum coaxial gas jet. A canonical two-fluid co-axial atomizer is experimentally investigated, at a wide range of gas to liquid momentum ratios, but within the high Weber number break-up limit. The liquid cylinder isplaced at the velocity of an acoustic waveguide where the second traverse mode of the cavity is excited.Anemometry measurements show disturbances in the boundary layer at the nozzles orifice, but the self-similar nature of the gas-phase jet is retained in the mid field.Phase Doppler Interferometry measurements of the droplet size, velocity and number density confirm that acoustic forcing in the near field is effective at enhancing atomization (the Sauter Mean Diameter decreases by 25%), and at modifying the dispersion of the droplet phase in the mid-field (increased radial extent of the spray).High-speed shadowgraphy, capable of resolving 15-micrometer droplets, illustrate the physics of atomization under a high-frequency acoustic field and help support real-time actuation in a feedback control implementation.

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