Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Drop fragmentation by laser-induced cavitation bubbles S. ROBERTO GONZALEZ-A, Nanyang Technological University, PJOTR KERSSENS, University of Twente, CLAUS-DIETER OHL, Nanyang Technological University — The fragmentation of water droplets by a short laser pulse has received significant attention since the 70's. The fundamental understanding of droplet vaporization/fragmentation is of interest in laser beam propagation in the atmosphere, in situ analysis of combustion products -a great concern due to its ecological implications- and more recently driven by a better understanding of the drop shaping by a laser pulse which is of interest in the development of extreme ultraviolet (EUV) machines. In this presentation we discuss about the incipient events that lead to the fragmentation of a drop produced by a cavitation bubble. When the bubble expands, it stretches the drop into a thin liquid film; this liquid film is eventually ruptured and a shockwave and small droplets are ejected as fast as 4 times the speed of sound in air. Interestingly, we also observe bubbles on the surface of the stretched film. Numerical simulations of a shock wave propagating inside a droplet show that cavitation bubbles appear when counter propagating shock waves that rebound from the walls of the drop meet. We also show different fragmentation scenarios recorded with high-speed video, one of them being a jelly fish like liquid film that eventually fragments into smaller drops.

Roberto Gonzalez
Nanyang Tech Univ

Date submitted: 30 Jul 2015 Electronic form version 1.4