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**Shock waves from non-spherically collapsing cavitation bubbles**

OUTI SUPPONEN, EPFL, DANAIL OBRESCHKOW, International Centre for Radio Astronomy Research, University of Western Australia, MOHAMED FARHAT, EPFL — Combining simultaneous high-speed imaging and hydrophone measurements, we uncover details of the multiple shock wave emission from laser-induced cavitation bubbles collapsing in a non-spherical way. For strongly deformed bubbles collapsing near a free surface, we identify the distinct shock waves caused by the jet impact onto the opposite bubble wall and by the individual collapses of the remaining bubble segments. The energy carried by each of these shocks depends on the level of bubble deformation, quantified by the anisotropy parameter $\zeta$, the dimensionless equivalent of the Kelvin impulse. For jetting bubbles, at $\zeta < 0.01$, the jet impact hammer pressure is found to be the most energetic shock. Through statistical analysis of the experimental data and theoretical derivations, and by comparing bubbles deformed by different sources (variable gravity achieved on parabolic flights, and neighboring free and rigid surfaces), we find that the shock peak pressure may be approximated as the jet impact-induced water hammer as $p_h = 0.45\left(\rho c^2 \Delta p\right)^{1/2} \zeta^{-1}$.

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