Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Dynamics of Oscillating and Rotating Liquid Drop using Electrostatic Levitator SATOSHI MATSUMOTO, Japan Aerospace Exploration Agency, SHIGERU AWAZU, University of Tsukuba, YUTAKA ABE, TADASHI WATANABE, Japan Atomic Energy Agency, KATSUHIRO NISHINARI, University of Tokyo, SHINICHI YODA, Japan Aerospace Exploration Agency — In order to understand the nonlinear behavior of liquid drop with oscillatory and/or rotational motions, an experimental study was performed. The electrostatic levitator was employed to achieve liquid drop formation on ground. A liquid drop with about 3 mm in diameter was levitated. The oscillation of mode n=2 along the vertical axis was induced by an external electrostatic force. The oscillatory motions were observed to clarify the nonlinearities of oscillatory behavior. A relationship between amplitude and frequency shift was made clear and the effect of frequency shift on amplitude agreed well with the theory. The frequency shift became larger with increasing the amplitude of oscillation. To confirm the nonlinear effects, we modeled the oscillation by employing the mass-spring-damper system included the nonlinear term. The result indicates that the large-amplitude oscillation includes the effect of nonlinear oscillation. The sound pressure was imposed to rotate the liquid drop along a vertical axis by using a pair of acoustic transducers. The drop transited to the two lobed shape due to centrifugal force when nondimensional angular velocity exceeded to 0.58.

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Date submitted: 02 Aug 2006 Electronic form version 1.4