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Rotational dynamics of levitated graphite flakes PAVEL NAGORNYKH, JOYCE COPPOCK, BRUCE KANE, University of Maryland, College Park — Trapping of charged graphene multilayer flakes in a quadrupole ion trap provides a unique method of characterization of 2D materials via complete separation of the flake and the environment. As the ability to cool the center-of-mass temperature of the flakes levitated in high vacuum was shown in the previous work [1], in this talk we concentrate on probing the internal dynamics of the spinning flake. A 671 nm circularly polarized laser was used to provide a spinning torque to the levitated micron-sized flakes, while a linear 532 nm laser, oriented orthogonal to the first one, acted as a light source. We have studied the effects of 671 nm laser power on measured frequency spectra at pressures of $10^{-7} - 10^{-9}$ Torr, where spinning frequencies of greater than 6 MHz have been achieved. Frequency decay data was collected by turning the laser on and off, which allowed us to estimate damping ratios from the flake deceleration. The spectra measured during the spinning acceleration showed multiple harmonics and other non-commensurate frequencies. We compare the observed frequencies to the behavior expected from a rigid body and from a membrane under the centrifugal tension.

[1] P. Nagornykh, J. E. Coppock, B. E. Kane, Appl. Phys. Lett. **106**, 244102 (2015)

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