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Oscillatory modes of two particulates levitated in an RF plasma
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A dusty plasma contains micron-size particulates of solid matter. The particulates collect more electrons than ions from the plasma and charge to -4000 e. They are electrically levitated by a sheath electric field. We dropped 4.8 μm polymer microspheres into a capacitively coupled 13.56 MHz RF discharge with 13 mTorr Ar. By shaping the sheath above the horizontal electrode, we were able to confine just two particulates so that they were aligned vertically or horizontally. Using high-speed video microscopy as the diagnostic, we observed the random motion of the particulates, which we analyzed to determine their harmonic oscillations and correlations. Langevin simulations of the particulate motion, taking into account Debye shielding modified by the ion wakefield downstream of the particulates, are compared to experiments. Work supported by NASA and NSF.

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