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Leidenfrost droplets in an electric field SANDER WILDEMAN, CHAO SUN, DETLEF LOHSE, University of Twente — In a recent video broadcast dubbed the "Knitting Needle Experiment," astronaut Don Petit aboard the ISS demonstrated how weightless water droplets can be made to orbit a statically charged Teflon rod. We study the earthly analogue of mobile droplets in an electric field, whereby the mobility is ensured by a thin vapor film sustained between the droplet and a hot plate (the Leidenfrost effect). We find that in a strong vertical electric field the droplet starts to bounce progressively higher, defying gravitational attraction. From its trajectory we can deduce the temporal evolution of the charge on the droplet. The measurements show that the charge starts high and then decreases in a step-like manner as the droplet evaporates. The discharge trend is predicted well by treating the droplet as a dielectric sphere in electrical contact with the hot plate, but the mechanism by which definite lumps of charge are transferred through the vapor film is still an open question.

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