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Suggestion for a two-dimensional cryogenic complex plasma M. ROSENBERG, Dept. of Electrical and Computer Engineering, UCSD, La Jolla, CA 92093, G.J. KALMAN, Dept. of Physics, Boston College, Chestnut Hill, MA 02467 — We propose and discuss theoretically a novel type of 2D complex (dusty) plasma formed by positioning charged dust grains on the surface of liquid helium (He).[1] Liquid He provides a nearly ideal flat substrate, has very low polarizability and conductivity, and has been used previously to study 2D systems of electrons, ions, and charged clusters. The 2D cryogenic complex plasma system has several possible advantages compared with traditional 2D complex plasmas: (1) a more controlled environment; (2) the grains interact via an unscreened Coulomb interaction; (3) in addition to micron-size particles, nanoparticles might be used; (4) effects related to intrinsic magnetic dipole moments, as well as phenomena involving magnetized dust, may be more amenable to study; (5) binary mixtures of different charges and masses could be studied. At the same time, there are issues that invite further investigation: (a) the type of grain to use; (b) the possible choice of other, denser cryogenic liquids; (c) optimal methods for charging and discharging; (d) means of confinement; (e) possible diagnostic methods; (f) possible He transmitted damping mechanisms.

[1]Rosenberg, M. and Kalman, G. J., *Europhys. Lett.*, submitted, 2006.

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