Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Smart dusty plasma liquids on the International Space Station[1] EMERSON GEHR, EVELYN GUAY, MARTIN LECHUGA, EVDOKIYA KOSTADINOVA, Baylor University, MARLENE ROSENBERG, University of California San Diego, PETER HARTMANN, Baylor University, Wigner Research Centre for Physics, Hungary, JORGE CARMONA-REYES, LORIN MATTHEWS, TRUELL HYDE, Baylor University — This study examines dusty plasma liquids using data from the PK-4 facility on board the ISS. Similar to smart materials which change their properties in response to externally applied stimuli, microgravity dusty plasmas are highly sensitive to changes in the discharge conditions. Here we report the observation of dust acoustic waves at lower pressure and the formation of long dust chains (electrorheology) at higher pressures in a DC neon discharge with polarity switched field. The driving mechanism of the waves is studied by comparison to analytically derived dispersion relations corresponding to different scenarios, including strong coupling effects and fast ion drift speeds. Strong coupling of the dust grains is expected to deviate from the usual Yukawa form due to the formation of dust-ion-wakefield proxy dipoles. The possibility of large ion drift speeds in the bulk plasma can result from high frequency ionization waves due to the polarity switching of the DC field. These phenomena are further compared to data from on-ground experiments performed in the PK-4 analogue facility at Baylor University.

[1]This material is based on work supported by the NSF grant numbers 1903450, 1707215, and 1740203, NASA grant number 1571701.

Emerson Gehr
Baylor University

Date submitted: 08 Jul 2020 Electronic form version 1.4