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Beam-Plasma Interaction and Instabilities in a 2D Yukawa Plasma[1] S. KYRKOS, Le Moyne College, G. KALMAN, Boston College, M. ROSENBERG, UCSD — In a complex plasma, penetrating charged particle beams may lead to beam-plasma instabilities. When either the plasma, the beam, or both, are strongly interacting [1], the features of the instability are different from those in a weakly coupled plasma. We consider the case when a 2D dusty plasma forms a lattice, and the beam is moving in the lattice plane. Both the grains and the beam particles interact through a Yukawa potential; the beam particles are weakly coupled to each other and to the lattice. The system develops both a longitudinal and a transverse instability. Based on the phonon spectrum of a 2D hexagonal Yukawa lattice [2], we determine and compare the transverse and longitudinal growth rates. As a function of the wavenumber, the growth rates exhibit remarkable gaps, where no instability is excited. The gap locations are governed by the ratio of the lattice and the beam plasma frequencies. The behavior of the growth rates also depends on the direction of the beam and on the relationship between the beam speed and the longitudinal and transverse sound speeds. [1] GJ Kalman, M Rosenberg, JPA 36, 5963 (2003). [2] T Sullivan, GJ Kalman, S Kyrkos, P Bakshi, M Rosenberg, Z Donko, JPA 39, 4607 (2006).

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