



FIG. 1: (Color online) DMC energy as a function of r_s for ferromagnetic and antiferromagnetic triangular Wigner crystals and paramagnetic and fully ferromagnetic Fermi fluids. In each case the Madelung energy of a triangular crystal has been subtracted from the energy and the result has been rescaled by $r_s^{3/2}$ to highlight the differences between the curves.

An experimental result for the crystallization density is $r_s = 35.1(9)$ a.u. [29], which is somewhat lower than the QMC crystallization density. This suggests that the ideal 2D HEG is not a perfect model for electron layers in real semiconductor devices.

It has been argued that the transition from a 2D Fermi fluid to a Wigner crystal cannot be first order, because, at the transition density, it is energetically favorable to create boundaries between macroscopically separated regions of fluid and crystal [8]. The energy of the Bose fluid is substantially lower than that of the Fermi fluid in the vicinity of the crystallization density in 2D, unlike 3D [30]. There is therefore more scope for interesting phase behavior in 2D. Various intermediate phases have been proposed in the literature, such as a hexatic phase with orientational but not translational order [9], a supersolid phase [10], or a microemulsion phase [8]. Falakshahi and Waintal [11] have suggested that a “hybrid” phase is stable in the vicinity of the transition from a ferromagnetic fluid to a ferromagnetic Wigner crystal. (We have found that a paramagnetic fluid is stable at this density; however, we