Comparison of the Non-Linear Phase Transitions in 2D Electron System and 2D Helium Film

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The two-dimensional electron crystal over liquid helium undergoes the non-linear phase transition induced by the electric field $E_{||}$ in the layer plane. The complex inverse conductivity of the layer $\sigma^{-1} = \chi = \chi_1 + i\chi_2$ is measured through the transition depending on surface electron density, frequency and temperature. The field dependencies $\chi_1(E_{||})$ and $\chi_2(E_{||})$, which reflect the energy losses and inertia in the layer are compared qualitatively with the velocity dependencies of dissipation Q^{-1} and inertia moment change (proportional to the superfluid density) in the helium film measured by the torsional oscillator method. Similarities between these phase transitions are found. The superfluid phase transition can be treated on the base of Berezinskii-Kosterlitz- Thouless theory, and the similarities allow to consider the non-linear transition in the electron crystal as dynamic melting.