# Interaction effects in the electrons on helium system: from microscopic to macroscopic scales

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Electrons on the liquid helium surface form an extremely clean two-dimensional system where electron-electron interactions can induce collective phenomena like plasmon excitations, Wigner crystallization and microwave induced zero-resistance states. We will present experiments which probe the role of electron-electron interactions in these different contexts. The properties of magneto-plasmons can be understood from the long-range behavior of the Coulomb interactions, we will describe experiments on a new type of magneto-plasmon induced by a density gradient in the system with very good agreement with theoretical modeling. On the microscopic scale, a correlated Coulomb-liquid creates a fluctuating electric field, we show that the distribution of this fluctuating electric field can be measured directly in spectroscopic experiments in tilted magnetic fields with excellent agreement with the theoretical predictions. Finally zero-resistance states represent a case where microscopic and macroscopic scales meet leading to spectacular collective behavior but where developing a theoretical understanding remains a challenge.