The Role of Resonance Conditions at the Edge of 2D Electron Pool in MW-Induced Zero-Resistance States Formation in 2DES on Liquid Helium

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The conductivity of a two-dimensional electron system (2DES) on liquid helium subjected to the microwave (MW) excitation at the frequency of surface subband resonance $\omega = \omega_{1\to 2}$ exhibits magneto-oscillations governed by the ratio ω/ω_c, where ω_c is the cyclotron frequency.[1] At certain conditions the minima of the magneto-oscillations evolve into zero-resistance states[2] (ZRS) which appear to be very similar to the magneto-oscillations and ZRS effect observed previously in GaAs/AlGaAs heterostructures.[3] The theory shows that the nonequilibrium filling of the second surface subband induced by the MW resonance can be the origin of the negative conductivity which leads to ZRS in 2DES on liquid helium.[4] However, microscopic mechanisms of ZRS formation have still not been fully clarified. Here we present preliminary experimental results showing that the ZRS formation is very sensitive to resonance conditions at the 2DES edge.

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Section: QF - Quantum Fluids

Keywords: 2DES, surface electrons, liquid helium-4, microwave radiation, ZRS