Vanishing conductance states of microwave-excited electrons on a liquid helium surface

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An ultra-high mobility 2D electron system, which can be formed on the surface of liquid helium, presents a unique classical counterpart to the degenerate Fermi gas in semiconductors. In strong magnetic fields applied perpendicular to the surface, such a system exhibits unusual transport properties when exposed to electromagentic radiation, which induces quatum transitions of electrons between the surface subbands.[1] In particular, the dissipative conductivity of electrons σ_{xx} vanishes, which is reminiscent of radiation-induced zero-resistance states of a 2D electron gas in GaAs/AlGaAs heterostructures.[2] Simultaneously, the radiation causes a highly nonequilibrium spatial distribution of electrons, where a large fraction of charge (more than 50%) is displaced towards the system edge. Possible scenarios of the latter effect include the charge instability caused by absolute negative conductivity and the microwave-assisted trapping of electrons at the system edge.

[1]Konstantinov and Kono, Phys. Rev. Lett. **103**, 266808 (2009), *ibid.* **105**, 226801 (2010).
[2]Mani *et al.* Nature (London) **420**, 646 (2002).

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