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Hysteresis and saturation of intersubband absorption by electrons on helium DMITRI RYVKINE, Michigan State University, MICHAEL LEA, Royal Holloway, University of London, Egham, Surrey TW20 0EX, UK, MARK DYKMAN, Michigan State University — We propose a mechanism, develop a theory, and provide experimental data that demonstrate hysteresis of resonant inter-subband absorption by a quasi two-dimensional electron system on the surface of helium. The electrons form a strongly correlated nondegenerate electron liquid. The absorption occurs at the frequency of the transition from the ground to the first excited state of motion normal to the helium surface. The lifetime of the excited state is extremely long, 0.1 μs at 0.3 K, leading to strong absorption nonlinearity even for low radiation intensity [1]. Besides absorption saturation, radiation-induced occupation of the excited subband causes a shift of the resonant transition frequency. We show that this shift leads to absorption hysteresis with varying radiation frequency or intensity. As a result of electron correlations, the in-plane motion in all subbands is described by the same electron temperature, which is found self-consistently. The results bear on quantum computing with electrons on helium, since they demonstrate resonant transitions responsible for a single-qubit operation; the hysteresis results from the same mechanism that leads to two-qubit operations. 1. E. Collin et al., Phys. Rev. Lett. 89, 245301 (2002)

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