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Experimental studies of Landau quantization in GaAs two-dimensional electron systems at low magnetic fields D.R. HANG, Department of Materials and Optoelectronic Science; Center for Nanoscience and Nanotechnology, National Sun Yat-sen University, C.F. HUANG, CMS/ITRI, K.A. CHENG, Department of Electronic Engineering, Lunghwa University of Science and Technology, SHIH-FANG CHEN, CMS/ITRI — The effects of Landau quantization are very important in two- dimensional electron systems (2DESs). Based on such quantization, it is well-established how to explain the quantum Hall effect by considering the localization effects under a high perpendicular magnetic field. On the other hand, the localization strength is reduced with decreasing the magnetic field. In this way, the semiclassical Shubnikov-de Haas (SdH) formula can become valid. To further understand the magnetic- field-induced crossover from the quantum Hall liquid to semiclassical transport, we performed the transport measurements on GaAs 2DESs at low magnetic fields. Semiclassical oscillations following SdH formula were observed under the formation of the localization-induced mobility gap. Our measurements revealed the difference between the bulk and edge transports in the low-field quantum Hall effect. From our study, the semiclassical-conducting and localized electrons can coexist in the 2DESs at low magnetic fields.

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