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Probing current and temperature effects on the direct insulator-quantum Hall transition KUANG YAO CHEN, C.-T. LIANG, Dept Phys, NTU, N. AOKI, Y. OCHIAI, Dept Elect & Mech Engn, Chiba Univ, K.A. CHENG, Dept Elect Engn, Lung Hwa Univ Sci & Technol, LI-HUNG LIN, Grad Inst Optoelect & Solid State Elect, NCYU, C.F. HUANG, CMS/ITRI, YU-RU LI, YEN SHUNG TSENG, CHUN-KAI YANG, Dept Phys, NTU, PO-TSUN LIN, Grad Inst Optoelect & Solid State Elect, NCYU, JAU-YANG WU, SHENG-DI LIN, Dept Elect Engn, NCTU — We report a magneto-transport study on the two-dimensional electron system (2DES) in an AlGaAs/GaAs heterostructure. The direct insulator-quantum Hall transition is observed at different temperatures by increasing the magnetic field B perpendicular to the 2DES. Such a transition can also be observed by varying the current I since the electron temperature is given by $T_e = CI^{\alpha}$ in both the insulator and quantum Hall sides of the transition. Here α denotes the exponent for the power law and C is a constant at a particular magnetic field. The value of α may be determined by comparing the temperature and current dependences. Our results show that α takes on different values on either sides of the transition point, indicating the presence of different heating mechanisms in the low-field insulator and in the quantum Hall liquid. The effects due to electron-electron interaction and scattering are also discussed.

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