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Quantum Hall Effect in Black Phosphorus Two-dimensional Electron System LIKAI LI, FANGYUAN YANG, Fudan University, GUO JUN YE, University of Science and Technology of China, ZUOCHENG ZHANG, Tsinghua University, ZENGWEI ZHU, Huazhong University of Science and Technology, WENKAI LOU, XIAOYING ZHOU, Chinese Academy of Sciences, LIANG LI, Huazhong University of Science and Technology, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, KAI CHANG, Chinese Academy of Sciences, YAYU WANG, Tsinghua University, XIAN HUI CHEN, University of Science and Technology of China, YUANBO ZHANG, Fudan University — The recent advent of black phosphorus has greatly enriched the material base of two-dimensional electron systems (2DES). In this work, we reached a milestone in black phosphorus research the observation of integer quantum Hall (QH) effect in high quality black phosphorus 2DES. We achieved high carrier mobility by embedding the black phosphorus 2DES in a van der Waals heterostructure close to a graphite back gate; the graphite gate screens the impurity potential in the 2DES, and brings the Hall mobility up to 6000 cm¡sup¿2¡/sup¿/Vs. The exceptional mobility enabled us, for the first time, to observe QH effect, and to gain important information on the energetics of the spin-split Landau levels in black phosphorus. Our results set the stage for further study on quantum transport and device application in the ultrahigh mobility regime.

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