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Identification of the existence of quantum Hall edge-state in graphene field-effect transistor at high temperatures JOONG GYU KIM, HAEYONG KANG, JEONGMIN PARK, YOOJOO YUN, THUY KIEU TRUONG, JEONG-GYUN KIM, NAHEE PARK, YOURACK LEE, CINAP, IBS, Department of Energy Science, Sungkyunkwan University, HOYEOL YUN, SANG WOOK LEE, School of Physics, Konkuk University, YOUNG HEE LEE, DONGSEOK SUH, CINAP, IBS, Department of Energy Science, Sungkyunkwan University — Quantum Hall effect (QHE) is one of the unique properties of two-dimensional electronic systems providing the universal standard of electrical resistance. Due to edge-state transport features in quantum Hall regime, the two-terminal graphene field-effect transistor (FET) is frequently examined for the study of the integer as well as the fractional QHEs of graphene. In this work, we present a simple method to identify the existence of quantum Hall state in the graphene FET especially at high temperatures. Using the monolayer graphene FET sample with fully broken degeneracy, we modified the equipotential line inside graphene FET by the addition of extra electrode for the clear identification of the quantum Hall state formation at given temperature and magnetic field. We suggest a simple model to explain the difference and similarity between two-terminal and multi-terminal configurations, including the discussion about the QHE devices connected in series.

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