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Quantum hall effect in multilayered massless dirac fermion systems

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First bulk (multilayer) two-dimensional (2D) zero-gap state with massless Dirac particles was realized in an organic conductor α-(BEDT-TTF)$_2$I$_3$ under pressure. We have succeeded in detecting the zero-mode Landau level and its spin-split levels in this system probed by inter-layer magneto resistance. The Shubnikov-de Haas oscillations (SdHO) or the quantum Hall effect (QHE), however, have not been observed yet because Fermi level always locates at the Dirac point. Moreover, the multilayered structure makes control of Fermi level by the field-effect-transistor method much more difficult than in the case of graphene.

In this work, we prepared highly hole-doped samples and then investigated the transport phenomena. The detection of SdHO originated from the Dirac particles strongly indicates that the carrier doping was successful. The most impressive phenomenon is the QHE plateaux for v=6, 10, 14 and 18. Those steps are essence of 2D Dirac fermion systems. This multilayered Dirac fermion system is characterized further from the detection of SdHO and QHE and its interpretation.

Biography

Naoya Tajima has completed his PhD at the age of 27 years from Toho University and became an Assistant Professor at Gakusyuuin University. He is an Associate Professor, Department of Physics, Toho University. He has published more than 60 papers in reputed journals and serving as an editorial board member of J. Physical Society of Japan.

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