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Title of the Presentation: Emergence of orbital angular moment at van Hove singularity in graphene/*h*-BN moiré superlattice

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Short Biography:

Rai Moriya received his Ph.D. from Department of Information Processing, Tokyo Institute of Technology, in 2004. From 2004 to 2007, he was a postdoc at IBM Research Division, Almaden Research Center. From 2007 to 2009 he was a Research Staff Member of IBM Research Division, Almaden Research Center. From 2009 to 2017, he was a research associate of Institute of Industrial Science, University of Tokyo. Since 2017, he has been a project lecturer of Institute of Industrial Science, University of Tokyo. His research interests cover physics and applications of two-dimensional materials..

Abstract:

Bloch electrons lacking inversion symmetry exhibit orbital magnetic moments owing to the rotation around their center of mass; this moment induces a valley splitting in a magnetic field. For the graphene/h-BN moiré superlattice, inversion symmetry is broken by the h-BN. The superlattice potential generates a series of Dirac points (DPs) and van Hove singularities (vHSs) within an experimentally accessible low energy state, providing a platform to study orbital moments with respect to band structure. In this work, theoretical calculations and magnetothermoelectric measurements are combined to reveal the emergence of an orbital magnetic moment at vHSs in graphene/h-BN moiré superlattices. The thermoelectric signal for the vHS at the low energy side of the hole-side secondary DP exhibited significant magnetic field-induced valley splitting with an effective g-factor of approximately 130; splitting for other vHSs was negligible. This was attributed to the emergence of an orbital magnetic moment at the second vHS at the hole-side.

[1] R. Moriya R. Moriya, K. Kinoshita, J. A. Crosse, K. Watanabe, T. Taniguchi, S. Masubuchi, P. Moon, M. Koshino, T. Machida, Nature Communications 11, 5380 (2020).

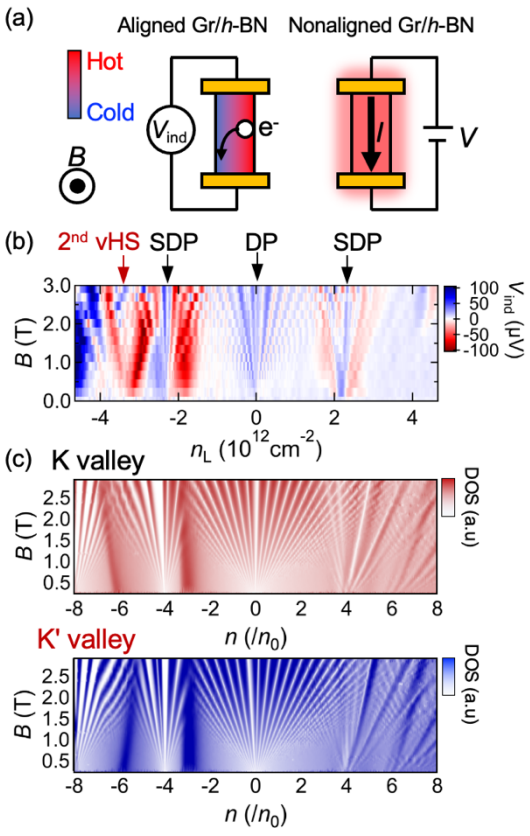

Figure 1: (a) Schematic illustration of thermoelectric voltage detection in a parallel graphene device. (b) Thermoelectric voltage (V_{ind}) as a function of carrier density (n_L) and magnetic field (B). (c) Calculated DOS for K and K´ valley as a function of the normalized carrier density n/n_0 and B.