Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Realizing 1-D conducting channel between oppositely gated regions in bilayer graphene. JANGHEE LEE, Pohang University of Science and Technology, KENJI WATANABE, TAKASHI TANIGUCHI, Advanced Materials Laboratory, National Institute for Materials Science, HU-JONG LEE, Pohang University of Science and Technology — The band gap of bilayer graphene (BLG) can be tuned by applying an external electric field perpendicular to the plane of a BLG sheet. If direction of the electric fields in two adjacent regions in BLG are opposite, one-dimensional (1-D) conducting channel emerges at the boundary between two regions with chiral nature. In this presentation, we introduce a method for fabricating two pairs of split-gates attached to BLG, which is sandwiched between two atomically clean hexagonal boron nitride (h-BN) single crystals and thus allows ballistic transport of carriers at least within the device size. Current-voltage characteristics show a large transport gap, which is comparable to the results obtained from optical measurements and numerical calculations. Opening the band gap in two adjacent regions of the BLG flake by oppositely gated electric fields, we observed metallic behavior in transport characteristics along the boundary between the two regions although the resistance of two gapped regions are a few hundreds of kΩ. These results indicate that a 1-D conducting channel formed between the two regions where the induced band gaps were inverted to each other. The formation of this 1-D conducting channel mimics the topological edge conducting channels emerging at the boundary of a two-dimensional topological insulator and may be utilized for applying BLG to valleytronics

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Date submitted: 05 Nov 2015 Electronic form version 1.4