

Abstract Submitted
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Towards valley valve operations in bilayer graphene devices JING LI, ZHENXI YIN, JUN ZHU, Pennsylvania State University — The application of a perpendicular electric field in bilayer graphene opens a band gap, the sign of which depends on the direction of the electric field. Recently, we have demonstrated the existence of one-dimensional edge channels (aka kink states) at the line junction of two oppositely gated bilayer graphene, i.e. $E_L \cdot E_R < 0$ [1]. Reversing the helicity of the electric field, i.e. E_L to $-E_L$ and E_R to $-E_R$ reverses the direction of the kink states. Two back-to-back kink states thus form a valve. The current transmission is expected to be high/low when the kink states have the same/opposite helicity. This novel valleytronics concept can potentially enable gate-controlled transmission of ballistic one-dimensional channels. Here we show the fabrication of a quad-split-gate structure, where two kink states with independently controlled helicity interact at a cross section. We discuss the operations of the valve. [1] J. Li et al, Nat. Nano. 10.1038/nnano.2016.158.

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