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Valley-dependent transport through quantum barriers in bilayer graphene. BING-CHEN HUANG, Department of Electrical Engineering, National Tsing-Hua University, Hsin-Chu 30013, Taiwan, FENG-WU CHEN, YU-SHU WU, Physics Department, National Tsing-Hua University, Hsin-Chu 30013, Taiwan — Valley-based quantum devices are made possible in graphene due to the existence of an inherent carrier degree of freedom - valley pseudospin. As shown previously, a valley contrast emerges when obliquely incident electrons are transmitted through lateral graphene structures with a single interface where discontinuity of bandgaps or potentials occurs [1]. In this presentation, we expand the study to graphene structures with multiple interfaces, especially those with quantum barriers, and investigate the intriguing behavior of valley polarization in such structures. We focus on the Bernal-stacking bilayer graphene with broken inversion symmetry. Numerical results for single and double quantum barrier systems are presented. We apply the tight-binding model of graphene lattice, impose on the electron state the current continuity condition at each interface, solve for the wave function and then calculate the electron transmission. Our findings show that in the case of single barrier structures the valley polarization is positively correlated to the barrier width. In the case of double barrier structures, carrier transport through resonant tunneling states can lead to high valley polarization. Overall, transmission of obliquely incident electrons through single or double quantum barriers offers an effective way to generate valley-polarized electron sources. [1]F.W. Chen, M.Y. Chou, Y.R. Chen, and Y.S. Wu. Phys. Rev. B 94, 075407 (2016)

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