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Polarized spin and valley transport across ferromagnetic silicene junctions V. VARGIAMIDIS, P. VASILOPOULOS, Concordia University, V. FESSATIDIS, Fordham University — We study ballistic transport of Dirac fermions through silicene barriers, of width d, with an exchange field M and metallic gates above them that provide tunable potentials of height U. Away from the Dirac point (DP) the spin- and valley-resolved conductances, as functions of U, exhibit resonances and close to it a pronounced dip that becomes a transport gap when an appropriate electric field E_z is applied. The charge conductance g_c of such a junction changes from oscillatory to a monotonically decreasing function of d beyond a critical E_z. This tuning of g_c can be used to realize electric-field-controlled switching. Further, the field M splits each resonance of g_c in two spin-resolved peaks. The spin polarization p_s of the current near the DP increases with E_z or M and becomes nearly perfect above certain of their values. We also show that p_s can be inverted either by varying U or by reversing the direction of M. For two barriers there is no splitting in g_c when the fields M are in opposite directions. Most of these phenomena have no analogs in graphene.

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