Effects of the perpendicular magnetization on the nonlocal transport properties of the topological insulator ferromagnet/insulator/superconductor/insulator/ferromagnet junction

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We investigate theoretically the effects of the perpendicular magnetization on the electron elastic cotunneling (CT) and crossed Andreev reflection (CAR) in a ferromagnet/insulator/superconductor/insulator/ferromagnet (F/I/SC/I/F) junction formed on the surface of a three dimensional topological insulator. The perpendicular magnetization induces an energy gap in the linear spectra of the Dirac fermions on the surface of the topological insulator. We find that in the parallel magnetization configuration the conductance resulting from cotunneling G_{CT} is larger than the conductance resulting from crossed Andreev reflection G_{CAR}. While, for the antiparallel magnetization configuration the contrary is true and the nonlocal conductance $G_C = G_{CAR} - G_{CT}$ increases with increase of the magnetization. We also investigate the effect of the magnetically induced gap on the barrier strength dependence of the nonlocal conductance. We find that both the electron elastic cotunneling and the crossed Andreev reflection, as a function of barrier strength, show a $\pi/2$ periodic oscillatory behavior with mean value and amplitude which depend on the magnetically induced gap.