REALIZATION OF SPACE-TIME CRYSTAL PATTERN IN φ_0 JOSEPHSON JUNCTION ON TOPOLOGICAL INSULATOR

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We present results of the current and calculation for space-time averaged current correlation function $J^{cor}(\delta y, \delta t)$ for the long φ_0 Josephson junction on a topological insulator (TI) (see figure).
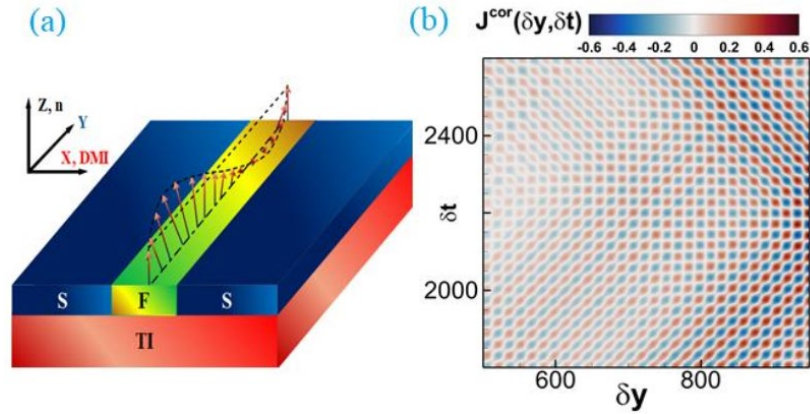

Figure. (a) Demonstration of SFS junction on TI. The direction of the gradient of the spin-orbit potential is in Z-axis and magnetic anisotropy is in Y-axis. The DMI vector is along X-axis. The arrows show magnetization precession in the F-layer. (b) an enlarged part for space-time-averaged current correlation function which shows space-time pattern.

In this specific type of junction, the critical current depends on the value of the in-plane magnetic moment and an additional phase shift is induced for the Josephson phase. Taking into account the exchange interaction between magnetic moments in the presence of Dzyaloshinskii–Moriya interaction (DMI), we demonstrate a space-time pattern in the junction current and $J^{cor}(\delta y, \delta t)$. This pattern can be considered as a fingerprint for the manifestation of time crystal in SFS hybrid junctions.