QUANTUM OSCILLATIONS AT THE TOPOLOGICAL INSULATOR MICROWIRE/TOPOLOGICAL SUPERCONDUCTOR INTERFACE

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In this work, the magnetoresistance (MR) of topological insulator (TI) single-crystal $Bi_{0.83}Sb_{0.17}$ and polycrystalline Bi_2Te_2Se glass-coated microwires in contact with In_2Bi superconducting (SC) leads was investigated. To study the TI/SC interface, the glass-coated microwire was connected to copper leads on one side using In_2Bi superconducting alloy (T_c=5.6 K) and on the other side using gallium. Gallium has superconductivity at temperatures below 1 K, so it was a normal metal in our measurements. The topologically nontrivial 3D superconductor In_2Bi has proximity-induced superconductivity of topological surface states. The *h/2e* oscillations of magnetoresistance in longitudinal and transverse magnetic fields (up to 1 T) at the TI/SC interface were observed at different temperatures (4.2 K–1.5 K) [1,2] (see Fig. 1). To explain the observed oscillations, we used magnetic flux quantization, which requires a multiply connected geometry where flux can penetrate into normal regions surrounded by a superconductor. The effective width Δr of the closed superconducting area of the TI/SC interface was determined to be 15 nm based on the analysis of FFT spectra and the beats of the MR oscillations for two different directions (longitudinal and transverse) of the magnetic field.

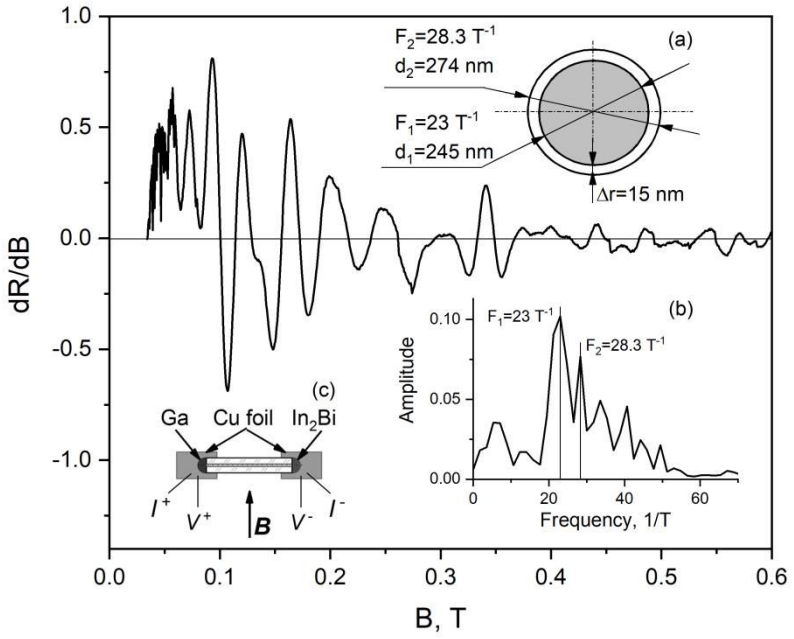

Figure1. Magnetic field dependence of the derivative of transverse MR for the $Bi_{0.83}Sb_{0.17}$ glass-coated microwire, D = 19 μm, d = 1.7 μm measured at 1.5 K (monotonic part is subtracted); Insert (a): The TI-SC contact area, for example, is presented in the form of a circle; Insert (b): FFT of the oscillating part of the derivative of transverse MR; Insert (c): Sketch of microwire mounting.

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[2] L. Konopko, A. Nikolaeva, T. Huber. *IFMBE Proceedings* **91** (2023) 293-302.