Using Superconductivity to probe the hinge states of nanowires of Bismuth, a Higher Order Topological Insulator

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Bismuth has very recently been shown to belong to the family of Higher Order Topological Insulators [1], i.e. materials with insulating bulk and surfaces, but with metallic 1D "hinges" at the junction of its surfaces. In this talk I will show how our experiments on monocrystalline bismuth nanowires confirm this prediction [1]. Specifically, by using superconducting contacts we have detected hinge states (via interference patterns of the critical current in a magnetic field), revealed their ballistic and chiral character (via the measurement of the supercurrent-versus-phase relation [2]), and probed their topological protection (via high frequency measurements [3]).

[1] Schindler et al, arXiv:1802.02585
[2] Murani et al., Nature Comm. DOI: 10.1038/ncomms15941 (2017).
[3] Murani et al., Phys.Rev. B **96**, 165415 (2017) ; Murani et al., in preparation (2018).

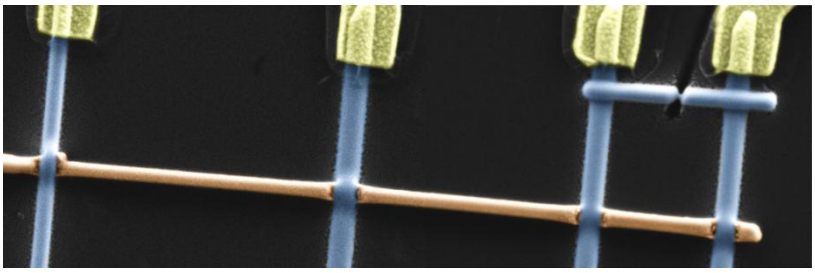

Figure 1 : Bismuth nanowire (in brown) connected to superconducting electrodes (in blue), including an asymmetric SQUID configuration enabling the supercurrent-versus-phase relation measurement.