From Majorana- to Parafermions in Single and Double Nanowires

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Abstract

I will present some recent results on single and double nanowires with proximity gap hosting Majorana and Para-fermions [1]. Typically, the topological phases are engineered by tuning the magnetic field to the topological threshold value of typically a few Teslas. However, the magnetic field has a detrimental effect on the host superconductor and so it is interesting to search for ways to achieve the topological phase without or with smaller B-fields. A particular way to achieve this goal is to exploit crossed Andreev pairing in a double nanowire setup [1,2,3] which destructively interferes with the direct pairing, and thereby lowers the threshold for the B-field substantially [3]. In re-examining the proximity effect in such finite-size geometries we discovered that the standard procedure of 'integrating out superconductivity' breaks down [2].
I will also present some recent results on hybrid platforms for quantum computing which combine spin qubits in quatum dots with topological qubits on a surface code architecture [4].

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