Optimization of a micro-magnet array for Majorana fermions in a two-dimensional electron gas.

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Résumé

Majorana fermions are topologically protected quasi-particles that appear at the end of unidimensional semiconductor wires with large spin-orbit coupling and induced superconductivity. While current implementations mostly rely on nanowires with large intrinsic spin-orbit coupling, these approaches offer poor control on properties such as the length of the wire and the confinement potential. Here, a versatile design consisting of a micro-magnet array is explored to engineer the spin-orbit coupling in a two-dimensional electron gas. With numerical simulations of different geometries, suitable conditions for the experimental observation of Majorana fermions in gallium arsenide and silicon are determined.

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