INTERNSHIP PROPOSAL

(One page maximum)

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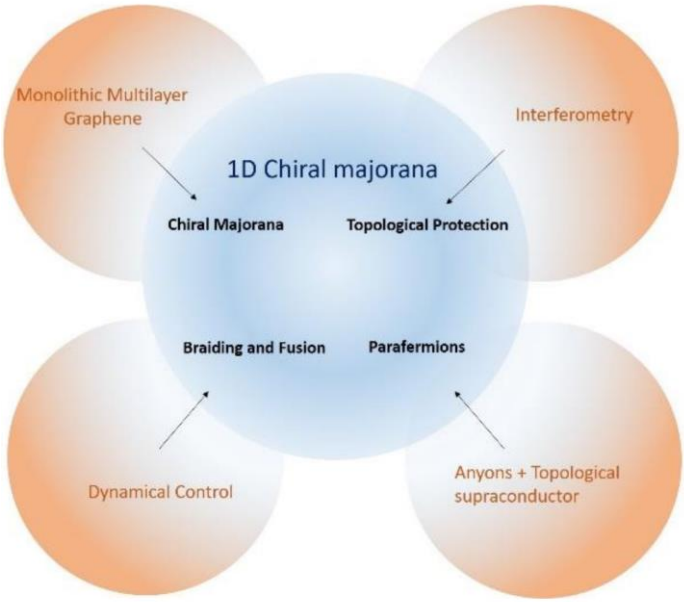
Internship location: SPEC/ CEA Saclay

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: Europe

1D Chiral Majorana

Quantum technology leaders like Microsoft have invested heavily in **Majorana Zero Modes** (MZMs) for topological qubits, exploiting their nonlocal nature to guard against decoherence. This promising route, however, depends on intricate hybrid devices combining nanowires, quantum dots, and superconducting gates. Such multi-material architectures demand extreme fabrication precision and suffer from a gate count that grows linearly with qubit number, hindering scalability. Moreover, Microsoft's "Majorana 1" platform hosts static MZMs at nanowire ends, making the braiding operations that reveal non-Abelian statistics particularly challenging.
In sharp contrast, our project offers a radically simpler and inherently scalable solution. Our approach harnesses **rhombohedral pentalayer graphene**—a single, monolithic material—to host both chiral topological superconductivity and the quantum anomalous Hall effect. This unified platform removes the need for complex hybrid integration across disparate materials. Crucially, it realises **1D chiral Majorana modes**—"flying" quasiparticles that travel along defined paths—rather than static zero modes. These propagating modes enable real-time control, dynamic manipulation, and **braiding of Majoranas**.



Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: YES