

Spin-orbit coupling in an ultracold gas of Dysprosium: prospects towards topological superfluidity

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The Dysprosium atom exhibits a complex structure of electronic levels, with several narrow optical transitions. This should allow one to manipulate the atom internal degree of freedom using lasers in a new regime for which the spontaneous emission rate is negligible. I will discuss a particular laser coupling scheme which allows one to create an artificial spin-orbit coupling in a gas of fermionic Dy atoms. In the regime of strong interactions between atoms, one then expects the formation of a topological superfluid phase. The topological character of this phase is associated with the presence of robust edge states described as Majorana fermions, which are one of the simplest examples of quasi-particles with non-abelian quantum statistics. I will present several measurement schemes in order to probe the peculiar properties of this system.