

Emergent Majorana States in Atomic-Scale Magnet-Superconductor Hybrid Systems

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Modern solid state physics has become greatly inspired by particle physics theories in recent years. The reason is that quasiparticles are a very useful concept for understanding complex phenomena in many-body physics. Recent outstanding examples are Skyrmions as topological defects in vector fields characterized by a topological charge, or the Majoranas, i.e. particles being their own antiparticles. Majorana states in hybrid solid state systems offer great potential for future quantum computing concepts. The lecture will focus on the exciting search for Majoranas in atomic-scale model systems consisting of bottom-up fabricated spin chains on elemental superconducting substrates. In particular, the role of the spin texture within the atomic chains as well as the strength of spin-orbit-coupling for the emergence of Majorana states will be discussed. First experiments toward network structures for Majorana state manipulation will also be presented.