CC-01-01

Solid-state quantum emitters for quantum networking

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Abstract

Optically active and highly coherent emitters in solids are a promising platform for a wide variety of quantum information applications, particularly quantum memory and other quantum networking tasks. Rare-earth atoms, in addition to having record long coherence times, have the added benefit that they can be hosted in a wide range of solid-state materials. We can thus target particular materials (and choose particular rare-earth species and isotopes) that enable certain application-specific functionalities. I will discuss several ongoing projects with rare-earth atoms in different host materials and configurations. This includes investigations of inhomogeneous broadening in rare-earth ensembles and our efforts to identify and grow new materials with rare-earth atoms at stoichiometric concentrations in order to reduce the disorder-induced inhomogeneous broadening. I will also discuss our work on photonic integration of rare-earth emitters, namely developing thulium doped thin-film lithium niobate as a platform for quantum memory.