SEMINAR: Chemically tunable rare-earth molecular crystals for optical quantum technologies

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12:00 to 13:00
Blue Lecture Room

Rare-earth ions in solids combine long-lived optical and spin coherence, making them leading candidates for quantum memories and spin-photon interfaces. Most of these advances, however, have relied on a limited number of inorganic crystals whose properties offer relatively little flexibility for chemical tuning. Molecular chemistry provides an alternative route, allowing the local environment of rare-earth ions and their optical and hyperfine properties to be tailored through chemical synthesis.
In this talk, I will present Eu(III) molecular crystals exhibiting optical homogeneous linewidths in the kilohertz range, orders of magnitude narrower than those typically observed in molecular emitters. I will then discuss the mechanisms limiting optical coherence in these materials and how they can be investigated and controlled through chemical modifications. Finally, I will show how the suitable hyperfine structure of a molecular Eu(III) crystal enables broadband optical storage at the single-photon level, with a 200 MHz prepared spectral bandwidth and a storage efficiency of 14.9%, as well as the storage of four temporal modes.
Hosted by: Prof. Dr. Hugues de Riedmatten