Centre de Nanosciences & de Nanotechnologies

Seminar

Friday Febuary 4th - 14h00

Amphithéâtre du C2N

"Thulium Doped Garnets for Quantum Repeaters and Optical Quantum Memory"

Jake DAVIDSON

Delft University of Technology

Quantum memories for light are a crucial resource for quantum repeaters and quantum networks. In this talk I will detail results over the course of my studies working with atomic frequency comb (AFC) quantum memories based on rare earth ion-doped crystals. From early experiments, some of our first connecting multiple devices, it was clear that improvement was needed across various figures of merit. I will detail our path through fabrication and spectroscopic studies to create improvements to the device properties of our quantum memories. This includes measurements of material and ion properties, fabrication of optical resonators out of bulk Garnet, and use of these devices for proof of principle quantum networking demonstrations. More specifically, and after some background, I will discuss some key results including: measurements of the magnetic hyperfine tensors of thulium ions in Yttrium Gallium Garnet (Tm: YGG), modeling the electronic dynamics of the ion absorption behavior in response to adiabatically shaped driving signals and in the presence of spectral diffusion, and creating impedance matched cavity AFC quantum memories for improved light matter absorption.

Jake Davidson (Philadelphia, PA) received his bachelor in physics and Math from Hamilton College (2015). After a stint as a software developer, he completed a master in physics and Astronomy at the University of Calgary (2018) in Alberta, Canada where his research centered on creating remote entanglement between a pair of quantum memory devices. After a move to Delft in 2018 he joined Qutech to continue his studies of rare earth ions for building quantum repeaters. As an experimentalist, his work has involved studies in labs across the world, and across different disciplines including device fabrication, material studies, and quantum information.