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NITheCS Webinar Thursday, 17 June 2021, 14h00

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“Towards essential nodes in a simple quantum network based on photons and atomic ensembles”



ABSTRACT

Various efforts are making significant progress towards building networks that can distribute photonic entanglement over large distances. These are the first steps towards fully connected quantum processing networks (QPNs). I will present research on three elements of such a QPN, namely qubit memories, processing nodes, and single-photon sources. Electronically induced transparency (EIT) can map a photonic quantum state in polarization bases to an atomic ensemble - even at room temperature. This can be used to create a high-fidelity quantum memory. Next, I present a potential platform to investigate processing capabilities at the interplay of EIT in atomic ensembles and cavity field coupling. We assembled two moderate finesse Fabry-Perot cavities in a cross-cavity layout and coupled them to a cold atomic ensemble. Lastly, I will talk about using highly confined modes in integrated lithium niobate structures as a possible route towards efficient single-photon sources. I will discuss current obstacles and tests of the experimental apparatus using SPDC from a bulk crystal.

BIOGRAPHY

Dr Bertus Jordaan completed his BSc (Hons) Physics at the University of Pretoria in 2011. Between 2012 and 2018, he studied his PhD at Stony Brook University, New York, under Prof Eden Figueroa. His research included quantum memories, atom-light interfaces with optical cavities, QKD and quantum simulation. After graduating, he was a post-doctoral researcher in the group of Prof Rachel Grange at ETH in Switzerland, working on SPDC production and detection. Currently, Dr Jordaan is a data scientist in Cape Town.

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