A Multi-Node Quantum Network with Defects in Diamond

Ph.D. proposal

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November 23, 2018

Introduction

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1 Research goals

The goal of my Ph.D. is:

Demonstration of quantum applications on a multi-node network.

2 THE NV CENTRE AS A QUANTUM NETWORK NODE

Quantum networks are expected to deliver definitive security for communication, blind quantum computation, improved clock synchronization and more exotic applications such as connecting far apart telescopes [2].

3 GENUINE REMOTE MULTIPARTITE ENTANGLEMENT

4 LINK LAYER: A PROOF OF CONCEPT

5 ENTANGLEMENT TELEPORTATION

6 CLIENT-SERVER SECURE DELEGATION

7 CHALLENGES AND RISKS

8 GRADUATE SCHOOL PROGRESS

8.1 *Courses*

I attended (or I am currently attending) the following courses:

- Collaboration across disciplines (? GSC)
- PhD Start-up (2 GSC)
- Conversation skills (2 GSC)
- Casimir Course - Programming (5 GSC)
- Casimir Course - Electronics for Physicists (5 GSC)
- QuTech Academy - Quantum Communication and Cryptography (5 GSC)

8.2 *Supervision*

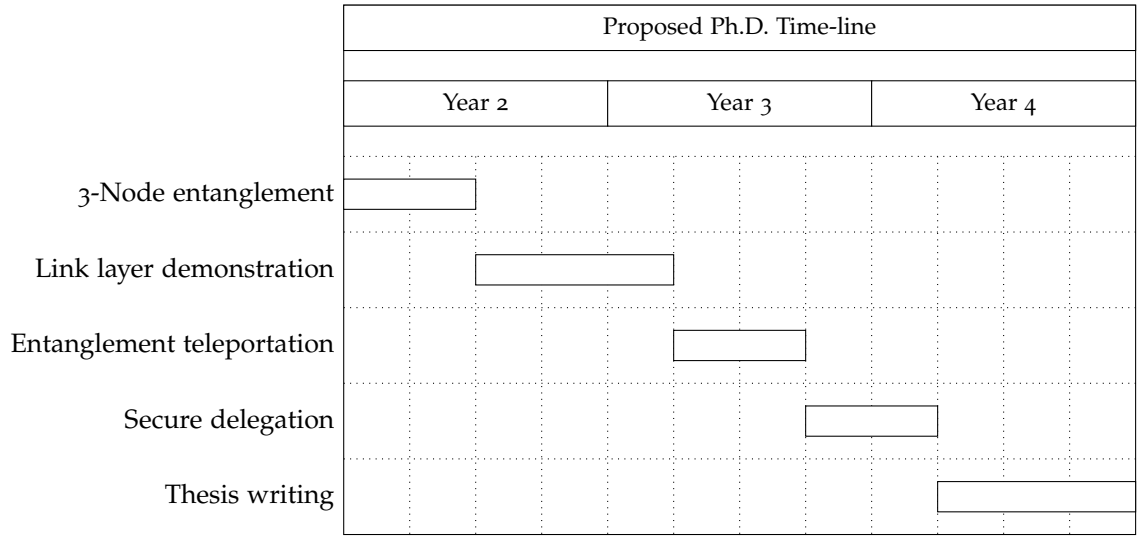
I have been supervising Hans K. C. Beukers, a MSc student, since February 2018. Hans has been working on setup improvements and techniques that, if successful, will increase the lifetime of our memory qubits.

8.3 *Outreach*

As an Early Stage Researcher in the MSCA ITN Spin-NANO, I have to carry out outreach activities regarding my research field to the wider audience. I have currently carried out two outreach activities:

- January 2018, Sheffield, UK. Introduction to quantum- and nano-technologies to local high-school students
- September 2018, Brussels, BE. Two days stand about quantum technologies at the European Researchers Night, EU Parlamentarium, mainly to children between 5 and 10.

9 PH.D. TIME-LINE



ACKNOWLEDGEMENTS

REFERENCES

[1] Peter C. Humphreys et al. 'Deterministic delivery of remote entanglement on a quantum network'. In: *Nature* 558.7709 (June 2018), pp. 268–273. DOI: 10.1038/s41586-018-0200-5.

[2] Stephanie Wehner, David Elkouss and Ronald Hanson. 'Quantum internet: A vision for the road ahead'. In: *Science* 362.6412 (Oct. 2018), eaam9288. DOI: 10.1126/science.aam9288.