Re: Application for Master Thesis-Error Correction Codes for Single Photons (Req ID: 704962)

To Jonas Almöf and Niclas Persson,

I am writing in response to the advertisement on master thesis - Error Correction for Single Photons dated on Nov 4th, 2022 at Ericsson-one of the most renowned leading tech firms of over 54,000 patents, I respectfully send this letter as my abilities and interests are in line with the company on quantum-based innovation to develop my career and shape the future technology.

Academic Background

As a MSc Engineering Physics (Quantum Technology) student at KTH, I have been taking advanced courses requiring research and development knowledge and collaboration with other learners. Through daily rigorous practice, I have been investigating several quantum technology experiments, such as quantum entanglement of photons, SNSPD nanowire's characteristics structure with various wavelengths of photons, JosephsonEffect in SQUID, quantized conductance in macroscopic scale of gold wires. Besides, I also held presentations on Satellite-Based Entanglement, Silicon-Based Nuclear Spin Quantum Computers and a lecture seminar on Topological Insulators. Recently, I have taken fiber-optic communication with hands-on activities investigating attenuation and wavelength dispersions for the transmission in a single mode fiber. This experience enabled me to come across scientific methodology, experimental skills, modeling & simulations to analyze complex issues with critical mind and programming skills. Also, I have always been deeply interested in quantum technology, quantum computing, telecommunication, machine learning, Artificial Intelligence, which led to graduate study at forefront polytechnic institute - KTH and contributed to the IBM community.

Other Experience

As an IBM Qiskit Advocate [1], I collaborate with advocates and researchers all over the world, participating in several international competitions, receiving the Qiskit Community Award in the Qiskit Hackathon Global 2020 [2]. As a tech enthusiast, I am able to implement algorithms for daily applications, like stock market, music and games. I have been building repositories on quantum computing and data science in various aspects [3]. Recently, I have been creating quantum-related contents for non-profit organization QuantumGrad [4] to facilitate the accessibility of quantum knowledge to the public. I also participated in the International Physicist Tournament 2021 [5] representing KTH to win National Selection.

Motivation to write a Master Thesis

In the development of error-free quantum computation, one of the challenges is the development of error-correcting codes. There are many ways to realize quantum computers by certain physical implementations, one of which is to use polarization of photons. However, quantum computers are subject to environmental error that the information carried by qubits can be lost due to decoherence. Because of this, quantum computers may be even slower than ordinary computers due to quantum error correction that decimates the clock speed anot not many many usable qubits can accelerate computing. Besides, photons sent to fiber optic can be implemented to the development of a quantum network that will deliver the quantum internet. This project can demonstrate a protocol using vacuum in the coding to send polarized single photons or any polarized electromagnetic pulse. The approach not only can be energy efficient in transmission (1 bit/photon) compared to brute force (105-108 photons per bit) and avoid sending a wider spectrum that may cause potential health problems to the environment, as well as interference with other telecommunications. This transmission protocol can facilitate our daily life telecommunication and space applications.

Expected Work Duty and Performance

The master thesis project will be conducted for 6 months (from February to June) at Ericsson Research in Stockholm (Kista), Sweden, which includes comparing the patented protocol using polarized single photons with Pulse Position Modulation (PPM) with added Reed-Solomon error correction. The final products will be a thesis report and a result presentation for the Ericsson research team. I would see myself as an initiative, diligent and responsible person. My study, participation in projects and competitions sharpened my ability to achieve specific goals and communicate among colleagues. I believe that my motivation, knowledge, and skills enable me to contribute my dedication to solve challenging problems..

Please kindly find the attached links of my resume. Should you have any inquiries about the qualification and academic background, I am welcome to provide them in detail. I am looking forward to hearing from you.

Yours Faithfully,

Shek Lun Leung, Alan
Resume: https://resume.io/r/rrqnb7iUc