OVERVIEW OF RELEVANT AREA AND POSITION SUMMARY

This position at UNSW Sydney in the School of Physics is fully funded by Silicon Quantum Computing (SQC). SQC is expanding its business and development program and seeking dedicated, enthusiastic and technically skilled people to join the UNSW Sydney R&D team that delivers that program.

This role is based within the School of Physics at UNSW Sydney (the employer); working with the SQC team and alongside the team at the Centre of Excellence for Quantum Computation and Communication Technology (the Centre), one of Australia’s elite research centres conducting world-leading research in atomic electronics and quantum computing.

The successful applicant will join the world-leading team of Professor Michelle Simmons, who has an international reputation for developing a radical new technology for building precision single atom qubits based in silicon. With the recent demonstration of single atom qubits in natural silicon with world record coherence times and the highest fidelity single shot spin read-out, this group is poised to scale to 10-qubit architectures within the next 3 years. The team is now expanding, seeking dynamic and enthusiastic technical people to join them.

Background:

- Silicon Quantum Computing is a well-funded Australian company formed by the Commonwealth Government, CBA, Telstra, the NSW Government and UNSW Sydney.
- SQC has a business plan to build a 10-qubit prototype quantum computer integrated circuit in silicon by the end of 2023 and, ultimately, a universal quantum computer. The Company’s work is building on more than 20 years of research in the development of a quantum computer in silicon at the Centre.
- This role and the Company are located the headquarters of the Centre at UNSW Sydney.
This is a prestigious technical position, within a dynamic and highly collaborative research and development environment. The role is based at UNSW Sydney and funded by Silicon Quantum Computing (SQC), a start-up company headquartered at UNSW Sydney. SQC is seeking to commercialise silicon quantum computing technology developed in Australia – technology that has the potential to have global impact when realised.

Within this environment, the Hardware Engineer will oversee the Company’s program’s electrical measurement facilities, with responsibility for designing, implementing and maintaining high frequency electronics on cryogenic measurement platforms. This role will be at the heart of assembling the quantum computer, working alongside quantum physicists, hardware and software in the design, assembly and testing stages of silicon-based quantum computers. The role will include expanding our extensive research facilities for the high frequency, low noise measurement of semiconductor spin qubits. It will also involve the development of FPGA and RF electronics as well as general maintenance of equipment, laboratory space and ensuring a safe operating environment for staff and students.

The current research is focussed on the development of a 10-qubit quantum integrated circuit prototype requiring the multiple detection and control of individual spins in silicon, the controlled coupling between them, and the coherent transport of quantum information.

The successful applicant will report to Professor Michelle Simmons. This Hardware Engineer role and has no direct reports, but works alongside other staff and students funded by SQC as well as the Centre, and may assist where necessary with the supervision of dedicated graduate engineers.

This position provides a unique opportunity to work within a truly multi-disciplinary team of scientists and engineers working at the forefront of global quantum computing internationally.
RESPONSIBILITIES

Specific responsibilities for this role include:

- Design and implement high frequency, low noise electrical measurement circuits for multi-qubit devices for quantum computation.
- Design and verify new FPGA experiments, implementing new hardware layer features for integration into Fridge experiments.
- Plan and coordinate the development of python-based FPGA control software for user friendly integration of FPGA modules into experiments.
- Assist research staff/students in planning PCB design projects.
- Order and maintain a stock of consumables for the laboratories.
- Develop manuals and write reports for equipment operators.
- Simulate novel DSP techniques in Matlab for scalable QC applications.
- Operate general lab equipment (digital multimeters, oscilloscopes, signal generators, DACs, ADCs).
- Assist with the maintenance of laboratory computer hardware and software infrastructure. Write and maintain software for data acquisition and experimental control systems.
- Repair, or organise the repair of electronic systems and its component parts.
- Collaborate with researchers to optimise the performance of the hardware used in experiments, including proposing and implementing new designs and acquisition techniques for improved quantum device performance.
- Standardise and ensure the effective operation of the cryogenic measurement platforms across multiple fridges to ensure high quality and highly consistent control and measurement standards are used.
- Manage the efficient maintenance of new control and measurement platforms including the coordination of efficient day-to-day management of equipment, version control and service delivery. Plan maintenance and scheduled routine updates accordingly.
- Ensure appropriate laboratory training and inductions are completed.
- Provide leadership to the project team to ensure delivery of project objectives, as appropriate.
- Prepare and contribute to the delivery of technical presentations, reports and publications to diverse range of stakeholders including team members, external partners and funding agencies.
- Cooperate with all health and safety policies and procedures of the university and take all reasonable care to ensure that your actions or omissions do not impact on the health and safety of yourself or others.

SELECTION CRITERIA

Essential:

- A relevant tertiary qualification with substantial experience or equivalent level of knowledge gained through an appropriate combination of education/training and/or relevant experience in laboratory maintenance and operations.
- An undergraduate degree in Electrical Engineering, or equivalent and at least 3 years of electronics experience in either a commercial or academic environment (including FPGA design).
- Demonstrated ability to support and advise researchers and students on the technical aspects of laboratories and the design, development, and conduct of experiments.
- Excellent IT skills, including proficiency in a range of programming languages (e.g. Python) and experience with word processing such as MS-WORD, LaTex or equivalent.
- Demonstrated experience with LabVIEW and Matlab.
• Demonstrated initiative and a high level of self-motivation with excellent verbal and written communication skills.
• Proven ability to work as part of a team, meet deadlines, prioritise competing demands and attention to detail.
• High level of analytical and problem-solving skills, with a demonstrated ability to consider and make informed decisions regarding experimentation issues.
• Demonstrated experience in developing new initiatives, solving complex problems and in designing and optimising low noise electrical measurements.
• Demonstrated experience with high speed data acquisition, data analysis and mathematical modelling skills.
• Demonstrated ability to lead others in a technical capacity and manage projects on a given budget.
• Demonstrated ability to analyse, interpret and comprehend electrical measurement data.
• Demonstrated dedication to continuous improvement through long-term planning and expansion of laboratory policy and facilities.
• Experience in developing, implementing and managing Work Health & Safety and risk management systems and processes in a laboratory environment.
• Knowledge of health and safety responsibilities and commitment to attending relevant health and safety training.

Desirable:

• Demonstrated experience of cryogenics.
• Demonstrated experience in purchasing technical equipment.
• Competence with technical software packages.
• Previous experience in a tertiary or educational environment.

**It is not the intention of the position description to limit the scope or accountabilities of the position but to highlight the most important aspects of the position. The aspects mentioned above may be altered in accordance with the changing requirements of the role.**

**PRE-EMPLOYMENT CHECKS REQUIRED FOR THIS POSITION**

• Criminal record check.
• Verification of qualifications.

An appointment to this position is subject to the approval of Silicon Quantum Computing Pty Ltd (“SQC”). Personal information submitted as part of an application for this position may be disclosed to SQC for the purpose of processing the application.
ORGANISATIONAL ENVIRONMENT

UNSW is currently implementing a ten-year strategy to 2025 and our ambition for the next decade is nothing less than to establish UNSW as Australia’s global university. We aspire to this in the belief that a great university, which is a global leader in discovery, innovation, impact, education and thought leadership, can make an enormous difference to the lives of people in Australia and around the world.

Following extensive consultation in 2015, we identified three strategic priority areas. Firstly, a drive for academic excellence in research and education. Universities are often classified as ‘research intensive’ or ‘teaching intensive’. UNSW is proud to be an exemplar of both. We are amongst a limited group of universities worldwide capable of delivering research excellence alongside the highest quality education on a large scale. Secondly, a passion for social engagement, which improves lives through advancing equality, diversity, open debate and economic progress. Thirdly, a commitment to achieving global impact through sharing our capability in research and education in the highest quality partnerships with institutions in both developed and emerging societies. We regard the interplay of academic excellence, social engagement and global impact as the hallmarks of a great forward-looking 21st century university.

To achieve this ambition, we are attracting the very best academic and professional staff to play leadership roles in our organisation.

VALUES IN ACTION: OUR UNSW BEHAVIOURS

UNSW recognises the role of employees in driving a high-performance culture. The behavioural expectations for UNSW are below.

- These images represent the Behaviours:
  - Demonstrates Excellence
  - Drives Innovation
  - Builds Collaboration
  - Embraces Diversity

Delivers high performance and demonstrates service excellence.

- Thinks creatively and develops new ways of working. Initiates and embraces change.

- Works effectively within and across teams. Builds relationships with internal and external stakeholders to deliver on outcomes.

- Values individual differences and contributions of all people and promotes inclusion.

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