

## Complexity at small scales with Circuit QED Quantum Simulators

Wed, 2018-05-16 08:45 - [Nathan Langford](#) [1] **At:** University of Technology Sydney  
**Deadline:** 30 September, 2018

### Location

University of Technology Sydney 15 Broadway  
Ultimo 2065 Australia  
See map: [Google Maps](#) [2]

### SUMMARY

We are seeking applicants for experimental PhD positions to work in the area of circuit QED based quantum simulations at the University of Technology Sydney under the supervision of [Dr Nathan Langford](#) [3]. Please register interest by emailing [nathan \[dot\] langford \[at\] uts \[dot\] edu \[dot\] au](mailto:nathan.langford@uts.edu.au). Positions will remain open until filled.

### PROJECT DESCRIPTION

In the field of quantum simulations, research into the behaviour of complex, interacting systems is driven by applications in areas like quantum chemistry and condensed matter physics, where near-future quantum processors will find their first real-world applications. In this project, we aim to study these behaviours using small-scale experimental quantum simulators based on superconducting circuit quantum electrodynamics (circuit QED).

Circuit QED systems based on nanofabricated superconducting quantum circuits are among the most promising quantum information processing platforms, with major quantum computing efforts from global tech companies like Intel, IBM and Google. Here, by studying circuit QED simulators that achieve complexity at small scales, we will learn how to address challenges that will face more general circuit QED simulation platforms as they scale up in size and complexity.

We are seeking a talented, motivated and versatile PhD candidate who would thrive in a supportive, collaborative research environment. The successful candidate will join project supervisor, Senior Lecturer and ARC Future Fellow Dr Nathan Langford, to help build an exciting, dynamic new research team at University of Technology Sydney (UTS) in a purpose-built, state-of-the-art new circuit QED facility. In a young group, candidates will also use their own creativity to help shape future research directions.

Under Dr Langford's guidance, the candidate will develop the broad range of experimental and theoretical skills necessary for this demanding research field, from sample design and fabrication, cryogenics and microwave measurements, to quantum theory and numerical modelling. Fabrication access will be provided through state-of-the-art nearby national facilities when not available on campus. In addition to developing expertise in a highly competitive international research field, the candidate will build strong skills in communicating and presenting their results to the national and international research community in journal publications and conferences.

### POSITION DESCRIPTION

Candidates should have an excellent undergraduate first-class Honours degree or Master's degree in an appropriate subject area, such as physics or engineering, and strong results in undergraduate courses in quantum physics and other relevant subject areas. Demonstrated skills in numerical modelling (e.g., in Python or Matlab), experiments, fabrication or electronics will be an advantage. Candidates will require an appropriate level of competence in written and spoken English.

Candidates may apply for external and internal [scholarships](#) [4]. Standard scholarships include an annual, tax-free stipend of ~\$27k and additional funds (~\$7.5k) during the PhD for travel and other PhD-related expenses. International students may be eligible to apply for scholarships to cover tuition fees.

## APPLICATION INFORMATION

We support a diverse and inclusive research environment in our group. Email Dr Langford to enquire or apply: [nathan \[dot\] langford \[at\] uts \[dot\] edu \[dot\] au](mailto:nathan.langford@uts.edu.au). Positions will remain open until filled. When applying, please include CV, names of (preferably) at least two referees, academic transcript (with explanation of the grade scales used at your institution) and a brief cover letter outlining your goals and why you think you would be suitable.

## PROJECT SUPERVISOR: DR NATHAN K LANGFORD

After a PhD in experimental photonic quantum information with Prof Andrew White at the University of Queensland, Dr Langford conducted postdoctoral research in leading European research groups, including those of Prof Anton Zeilinger (University of Vienna), Prof Ian Walmsley (Oxford University) and Assoc. Prof Leo DiCarlo (QuTech, Delft University of Technology). He recently joined the School of Mathematical and Physical Sciences at UTS as a Senior Lecturer and ARC Future Fellow to establish a new research group and state-of-the-art experimental quantum information science laboratory in Circuit QED.

[[Google Scholar](#) [3] and [ResearcherID](#) [5]]

## REFERENCES

Langford et al., [Nature Communications 8, 1715 \(2017\)](#) [6]

- [PhD](#) [7]

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## Links:

[1] <http://qurope.eu/users/nathanklangford>

[2] <http://maps.google.com?q=15+Broadway%2C+Ultimo%2C+%2C+2065%2C+au>

[3] <https://scholar.google.com.au/citations?user=JFU1uMsAAAAJ>

[4]

<https://www.uts.edu.au/research-and-teaching/research-degrees/fees-and-scholarships/scholarships>

[5] <http://www.researcherid.com/rid/A-5699-2012>

[6] <https://www.nature.com/articles/s41467-017-01061-x>

[7] <http://qurope.eu/db/jobs/type/phd>