

Silicon Quantum Electronics: Toward a Re-definition of the Unit Ampere

Joint Electrical Institutions Sydney - Engineers Australia, IEEE, IET



ENGINEERS
AUSTRALIA

DATE & TIME

Thursday, August 27, 2015
5:30 pm for 6:00 pm start

VENUE

Engineers Australia Harricks
Auditorium
Ground Floor, 8 Thomas Street,
Chatswood NSW 2067

COST

EA, IET, IEEE Members – Free
Students – Free
Non-members - \$30

CPD

Eligible for 1.5 Continuing
Professional Development hours.

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HOSTED BY

Joint Electrical Institutions Sydney



The Knowledge Network

Presentation by Dr Alessandro Rossi, Research Fellow School of Electrical Engineering & Telecoms, The University of NSW

Silicon is the material of choice for most of modern microelectronics. Its properties, combined with advanced lithographic techniques, have allowed the semiconductor industry to achieve very large-scale integration and to deliver billions of transistors per chip. As mass-produced silicon transistors have reached the nano-scale, their behaviour and performances are increasingly affected, and often deteriorated, by quantum mechanical effects such as tunnelling through single dopants, scattering via interface defects, and discrete trap charge states. While present industry standards have reached minimum feature sizes for gate lengths below 20 nm, it is becoming increasingly evident that, at this level of miniaturization, quantum mechanical phenomena may complicate further downscaling.

Remarkably, progress in silicon technology has shown that the properties of matter at the nano-scale can be harnessed and exploited for a new class of quantum-based electronics. This has contributed to the development of entirely new fields such as quantum computing and quantum metrology. In the context of quantum computing, transistors are used to manipulate and store information on individual electrons. As for metrology, by precisely controlling the transfer rate of single electrons, ultra-accurate electric currents are generated. These may be used as reference standards toward a quantum-based redefinition of the unit ampere.

Alessandro will discuss the main challenges in the area of quantum electronics. Furthermore, he will illustrate his latest research findings resulting in the realization of the most accurate silicon-based single-electron current source to date. **For this work he was awarded the 2015 National Measurement Institute Prize for excellence in measurement research.**

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SPEAKER BIOGRAPHY

Alessandro Rossi studied Electrical Engineering at the University of Naples (Italy) where he received his BSc and MSc with first class honours in 2001 and 2003, respectively. After working for two years as a consultant at Altran Ltd, he moved to UK to engage in his doctoral studies at the University of Cambridge. Alessandro graduated in 2010 with a dissertation on microwave-assisted charge transport in single-electron transistors.



Following the award of his PhD, Alessandro worked for two years at the Hitachi Cambridge Laboratory (UK) as a research scientist in the area of silicon nanoelectronics. From late 2012 until present, he has worked at UNSW as a research fellow in the research group of Prof. Andrew Dzurak. Alessandro's research interests span from quantum computing to quantum electrical metrology in semiconductor systems, as well as development of hybrid semiconductor/superconductor technologies.

Alessandro regularly publishes on peer-reviewed international scientific journals and has spoken at numerous international conferences in the field of nanotechnology.

Alessandro is actively engaged in teaching. He is lecturing an undergraduate course at UNSW, besides supervising research students at both undergraduate and postgraduate levels.

To date, Alessandro has been granted competitive funding and scholarships for about \$500,000. Among others, he has been awarded a prestigious Marie Curie Fellowship from the European Union to carry out independent research starting in 2016.

Recently, he has also been the recipient of the 2015 Australia's National Measurement Institute Prize for excellence in measurement research for his ground-breaking work on single-electron current sources.

For further information: contact Trevor Blackburn

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