# Silicon Quantum Electronics Workshop

**FINAL**

## Marriott Hotel, Albuquerque

***Monday – August 18, 2014***

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| 7:00 am<br>**Salons A-D** | **Registration & Continental Breakfast** | |
| 8:00 am<br>**Sandia/Pecos Ballroom** | **Opening Remarks** | **James Peery**<br>**Steven Rinaldi**<br>**Malcolm Carroll**<br>*Sandia National Laboratories* |
| | ***Session 1* – Single Spin ESR**<br>***Chair* – Jarryd Pla, London Centre for Nanotechnology** | |
| 8:20 am<br>**Sandia/Pecos Ballroom** | **Addressable quantum dot qubits with fault-tolerant control fidelity** | **Menno Veldhorst**<br>*University of New South Wales* |
| 8:40 am<br>**Sandia/Pecos Ballroom** | **High gate fidelity and long coherence time of an electron spin in a Si/SiGe quantum dot** | **Erika Kawakami**<br>*Kavli Institute of Nanoscience, TU Delft* |
| 9:00 am<br>**Sandia/Pecos Ballroom** | **Single donor qubits in isotopically purified $Si^{28}$: New benchmarks for solid-state qubits** | **Juha Muhonen**<br>*University of New South Wales* |
| 9:20 am<br>**Sandia/Pecos Ballroom** | **Entanglement of an Electron-Nuclear Spin Pair in $Si^{28}$** | **Stephanie Simmons**<br>*University of New South Wales* |
| 9:40 am<br>**Sandia/Pecos Ballroom** | **Electron Spin Resonance of a Single Electron Spin in Silicon** | **Dwight Luhman**<br>*Sandia National Laboratories* |
| 10:00 am<br>**Salons A-D** | ***Break – Posters Available*** | |
| | ***Session 2* – Donor-devices-ensembles**<br>***Chair* – Andrea Morello, UNSW** | |
| 10:30 am<br>**Sandia/Pecos Ballroom** | **Transport Measurements on Si Nanostructures with Counted Sb Donors** | **Meenakshi Singh**<br>*Sandia National Laboratories* |
| 10:50 am<br>**Sandia/Pecos Ballroom** | **Electrical manipulation of donor spins in silicon** | **Gary Wolfowicz**<br>*University of Oxford*<br>*University College London* |
| 11:10 am<br>**Sandia/Pecos Ballroom** | **Limitations of Dynamical Decoupling Arising from Pulse Errors** | **Stephen Lyon**<br>*Princeton University* |

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| 11:30 am<br>**Sandia/Pecos Ballroom** | **Electrically-Controlled Quantum Gates in Silicon** | **Arne Laucht**<br>*University of New South Wales* |
| 11:50 pm<br>**Zuni Terrace** | ***Lunch – Posters Available*** | |
| | ***Session 3* – Valley-and-other-material-physics**<br>***Chair* – Toby Jacobson, SNL** | |
| 1:20 pm<br>**Sandia/Pecos Ballroom** | **Valleys in few-electron quantum states probed in real space** | **Benoit Voisin**<br>*University of New South Wales* |
| 1:40 pm<br>**Sandia/Pecos Ballroom** | **Rapid simulation of donors in silicon using internally consistent effective mass theory** | **John Gamble**<br>*Sandia National Laboratories* |
| 2:00 pm<br>**Sandia/Pecos Ballroom** | **Atomistic simulations of multi-electron states for silicon qubits** | **Rajib Rahman**<br>*Purdue University* |
| 2:20 pm<br>**Sandia/Pecos Ballroom** | **Spin-valley physics and ESR in realistic Silicon quantum dots** | **Rousko Ruskov**<br>*Laboratory for Physical Sciences* |
| 2:40 pm<br>**Sandia/Pecos Ballroom** | **Charge noise, spin-orbit coupling, and coherence of single-spin qubits** | **Dimitrie Culcer**<br>*University of New South Wales* |
| 3:00 pm<br>**Salons A-D** | **Break– Posters Available** | |
| | ***Session 4* - Cryogenic-electronics-misc**<br>***Chair* – Steve Carr, SNL** | |
| 3:30 pm<br>**Sandia/Pecos Ballroom** | **A high-sensitivity gate-based charge sensor in silicon** | **Andreas Betz**<br>*Hitachi Cambridge Laboratory* |
| 3:50 pm<br>**Sandia/Pecos Ballroom** | **A Silicon Single-Electron Pump with Tunable Electrostatic Confinement** | **Alessandro Rossi**<br>*University of New South Wales* |
| 4:10 pm<br>**Sandia/Pecos Ballroom** | **Anisotropic Stark Effect and Electric Field Noise Suppression for Phosphorus Donor Qubits in Si** | **Anthony Sigillito**<br>*Princeton University* |
| 4:30 pm<br>**Sandia/Pecos Ballroom** | **Single-electron and single-hole tunneling in ambipolar silicon quantum dots** | **Filipp Mueller**<br>*University of Twente* |
| 4:50 pm<br>**Salons A-D** | ***Poster Session*** | |
| 7:30 pm<br>**Salon E** | ***Dinner Banquet*** | |

# Silicon Quantum Electronics Workshop
## Marriott Hotel, Albuquerque

***Tuesday – August 19, 2014***

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|---|---|---|
| 7:00 am<br>**Salons A-D** | **Registration &<br>Continental Breakfast** | |
| 8:00 am<br>**Sandia/Pecos Ballroom** | **Opening Remarks** | |
| | ***Session 5* – Optically coupled qubit sys*tems***<br>***Chair* – Stephen Lyon, Princeton** | |
| 8:20 am<br>**Sandia/Pecos Ballroom** | **Optical study of $^{209}$Bi donor hyperfine structure in Bismuth-implanted $^{28}$Si** | **Mike Thewalt<br>obo Kamyar Saeedi Ilkhchy**<br>*Simon Fraser University* |
| 8:40 am<br>**Sandia/Pecos Ballroom** | **Optical and radio-frequency study of arsenic-75 and antimony-121 neutral donor hyperfine states and coherence times in silicon-28** | **Jeff Salvail**<br>*Simon Fraser University* |
| 9:00 am<br>**Sandia/Pecos Ballroom** | **Charge transfer dynamics in silicon donors** | **Ben Murdin**<br>*University of Surrey* |
| 9:20 am<br>**Sandia/Pecos Ballroom** | **Picosecond dynamics of a silicon donor based terahertz detector device** | **Byron John Villis**<br>*London Centre for Nanotechnology* |
| 9:40 am<br>**Sandia/Pecos Ballroom** | **Donor bound excitons in silicon at high magnetic fields** | **Nikolas Stavrias**<br>*FELIX Facility* |
| 10:00 am<br>**Salons A-D** | ***Break – Posters Available*** | |
| | ***Session 6* – QD-devices-qubits**<br>***Chair* – Susan Coppersmith, Wisc.** | |
| 10:30 am<br>**Sandia/Pecos Ballroom** | **Microwave-driven coherent gate operations of silicon-based quantum dot qubits** | **Dohun Kim**<br>*University of Wisconsin* |
| 10:50 am<br>**Sandia/Pecos Ballroom** | **Two-axis control of a singlet-triplet qubit with an integrated micromagnet** | **Xian Wu**<br>*University of Wisconsin* |
| 11:10 am<br>**Sandia/Pecos Ballroom** | **A CMOS artificial atom transistor** | **Marc Sanquer**<br>*CEA/University of Grenoble Alpes* |
| 11:30 am<br>**Sandia/Pecos Ballroom** | **Single-electron regime and Pauli spin blockade in a silicon metal-oxide-semiconductor double quantum dot** | **Sophie Rochette**<br>*Universite de Sherbrooke* |

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| 11:50 am<br>**Sandia/Pecos Ballroom** | **An Exchange-Only Qubit in Isotopically Enriched $^{28}$Si** | **Kevin Eng**<br>*HRL Laboratories* |
| 12:10 pm<br>**Zuni Terrace** | ***Lunch – Posters Available*** | |
| | ***Session 7* – QD-device-modeling-qubit-proposals**<br>***Chair* – Mark Friesen, Wisc.** | |
| 1:40 pm<br>**Sandia/Pecos Ballroom** | **Randomized Benchmarking of Silicon Quantum Dot Qubits** | **Henry Yang**<br>*University of New South Wales* |
| 2:00 pm<br>**Sandia/Pecos Ballroom** | **Noise-compensating pulses for electrostatically controlled silicon spin qubits** | **Xin Wang**<br>*University of Maryland* |
| 2:20 pm<br>**Sandia/Pecos Ballroom** | **Stable Bias Triangles in a Double Quantum Dot and the Capacitive Model** | **Neil Zimmerman**<br>*National Institute of Standards and Technology* |
| 2:40 pm<br>**Sandia/Pecos Ballroom** | **Characteristics of Si-Based Quantum Dot Circuits for Quantum Information Processing: Theory and Experiment** | **Alexey Andreev**<br>*Hitachi Cambridge Laboratory* |
| 3:00 pm<br>**Sandia/Pecos Ballroom** | **Quantum Networks of Spin Qubits** | **Michael Gullans**<br>*National Institute of Standards and Technology* |
| 3:20 pm<br>**Sandia/Pecos Ballroom** | **Break– Poster Retrieval** | |
| | ***Session 8* - Materials-device Fab-future Qubit**<br>***Chair* – Mike Thewalt, Simon Fraser University** | |
| 3:50 pm<br>**Sandia/Pecos Ballroom** | **Probing limits of STM field emission patterned Si-P delta-doped devices** | **Martin Rudolph**<br>*Sandia National Laboratories* |
| 4:10 pm<br>**Sandia/Pecos Ballroom** | **Enriched $^{28}$Si substrates for Quantum Information research** | **Joshua Pomeroy**<br>*National Institute of Standards and Technology* |
| 4:30 pm<br>**Sandia/Pecos Ballroom** | **Silicon Isotope Engineering for Quantum Information Processing: An Overview** | **Kohei Itoh**<br>*Keio University* |
| 4:50 pm<br>**Sandia/Pecos Ballroom** | **Reduced Short-Range Scattering and Enhanced Electronic Transport Properties in Nanomembrane-based Epitaxial Si/SiGe Heterostructures** | **Yize Li**<br>*University of Wisconsin, Madison* |
| 5:10 pm<br>**Sandia/Pecos Ballroom** | **Superconducting-silicon quantum devices** | **Yun-Pil Shim**<br>*Laboratory for Physical Sciences* |
| 5:30 pm<br>**Sandia/Pecos Ballroom** | **Closing Remarks** | **Steven Rinaldi**<br>**Malcolm Carroll**<br>*Sandia National Laboratories*<br>**Kohei Itoh,** *Keio University* |