

Quantum Sensing Workshop

Lawrence Berkeley National Laboratory, February 14-16, 2023

Quantum sensing is rapidly evolving from proof-of-concept demonstrations to novel capabilities that are uniquely enabled by quantum properties [1]. In this workshop, organized by Lawrence Berkeley National Laboratory, Sandia National Laboratory, and the Atomic Weapons Establishment (UK), participants will assess the status of quantum sensing science and technology and evaluate future opportunities for quantum sensing to advance the mission of Defense Nuclear Nonproliferation Research and Development (DNN R&D) in the US Department of Energy's National Nuclear Security Administration (NNSA).

Quantum sensing is broadly based on the use of quantum resources and processes in sensing and measurement devices. Examples of quantum resources for sensing are sources of entangled photons, squeezed light and microwaves, (single) color centers in diamond, both hot and cold atoms, and trapped ions. Recent demonstrations of quantum sensing with potential relevance to the DNN R&D mission space include gravity cartography, seismic sensing, use of squeezed light, magnetic and electric field sensing, and thermometry. Quantum sensing applications are now being considered in many areas and mission spaces, from biomedical to energy applications.

In this workshop we will review recent advances in light of opportunities in the mission space of DNN R&D. Leading questions will be how currently existing quantum sensors can already enhance critical performance metrics and what future developments are needed to improve quantum sensors for critical DNN R&D applications including remote sensing, surveillance, safeguarding, nuclear forensics and emergency response.

We plan on holding a 2.5 day workshop at Lawrence Berkeley National Laboratory, Feb 14-16, 2023. In-person attendance will be limited and we will offer an option for remote participation via zoom. The workshop findings will be summarized in a report to DNN R&D which will highlight priority R&D opportunities for future advancements in support of the mission of DNN R&D.

The workshop chairs are Thomas Schenkel (t_schenkel@LBL.gov), Peter Schwindt (psschwin@sandia.gov), Scott Bisson (sebisso@sandia.gov), and Neil Gaspar (Neil.Gaspar@awe.co.uk). More information about the workshop can be found under: <https://conferences.lbl.gov/event/1064/>.

[1] "Quantum sensing", C. L. Degen, F. Reinhard, and P. Cappellaro, Rev. Mod. Phys. 89, 035002 (2017), <https://doi.org/10.1103/RevModPhys.89.035002>