

PhD and post-doctoral positions in atomic vapor sensing at ICFO.

The Mitchell group at ICFO is looking for PhD students and post-docs for a variety of topics related to atomic vapor sensors and quantum technology with atomic vapors.

Quantum-enhanced atomic sensing – the group has pioneered the use of squeezed light [1,2] and spin squeezing [3–5] in atomic magnetometers, and recently demonstrated a squeezed state in the SERF regime containing $> 10^{13}$ entangled atoms [6].

Miniaturized atomic vapor sensors – we are developing optically-pumped magnetometers based on miniaturized atomic vapor cells as compact, high-sensitivity low-field sensors [7].

Application of atomic vapor sensors to zero- and ultra-low-field magnetic resonance, hyperpolarization techniques [8].

ICFO – The Institute of Photonic Sciences is a highly international research centre in the Barcelona area.

Interested candidates should contact morgan.mitchell@icfo.eu

- [1] F. Wolfgramm, C. Vitelli, F. A. Beduini, N. Godbout, and M. W. Mitchell, *Entanglement-Enhanced Probing of a Delicate Material System*, Nat Photon **7**, 28 (2013).
- [2] F. Wolfgramm, A. Cerè, F. A. Beduini, A. Predojević, M. Koschorreck, and M. W. Mitchell, *Squeezed-Light Optical Magnetometry*, Physical Review Letters **105**, 053601 (2010).
- [3] R. J. Sewell, M. Koschorreck, M. Napolitano, B. Dubost, N. Behbood, and M. W. Mitchell, *Magnetic Sensitivity Beyond the Projection Noise Limit by Spin Squeezing*, Physical Review Letters **109**, 253605 (2012).
- [4] F. Martin Ciurana, G. Colangelo, L. Slodička, R. J. Sewell, and M. W. Mitchell, *Entanglement-Enhanced Radio-Frequency Field Detection and Waveform Sensing*, Phys. Rev. Lett. **119**, 043603 (2017).
- [5] G. Colangelo, C. F. Martin, B. L. C., S. R. J., and M. M. W., *Simultaneous Tracking of Spin Angle and Amplitude beyond Classical Limits*, Nature **543**, 525 (2017).
- [6] J. Kong, R. Jiménez-Martínez, C. Troullinou, V. G. Lucivero, G. Tóth, and M. W. Mitchell, *Measurement-Induced, Spatially-Extended Entanglement in a Hot, Strongly-Interacting Atomic System*, Nature Communications **11**, 1 (2020).
- [7] <https://www.macqsimal.eu/>
- [8] S. Bodenstedt, M. Mitchell, and M. Tayler, *Fast-Field-Cycling, Ultralow-Field Nuclear Magnetic Relaxation Dispersion*, ArXiv E-Prints arXiv:2012.05546 (2020).