

Sorin Paraoanu

Title: Quantum-enhanced magnetic field estimation using a transmon qubit

Abstract:

Superconducting circuits represent a promising platform for implementing quantum information protocols, with significant effort in recent years directed toward the development of quantum processors. Here we demonstrate that this platform can be used for enhanced quantum sensing, by employing phase estimation algorithms. We modify and implement two such algorithms, the Kitaev and the semiclassical Fourier-transform, to realize detection of a magnetic field below the standard quantum limit and approaching the Heisenberg scaling.

The experiment demonstrates the potential of these quantum devices to outperform classical magnetic field detectors.

References: S. Danilin, A. V. Lebedev, A. Vepsäläinen, G. B. Lesovik, G. Blatter & G. S. Paraoanu, *npj Quantum Information* **4**, 29 (2018); A. R. Shlyakhov, V. V. Zemlyanov, M. V. Suslov, A. V. Lebedev, G. S. Paraoanu, G. B. Lesovik, G. Blatter, *Phys. Rev. A* **97**, 022115 (2018).