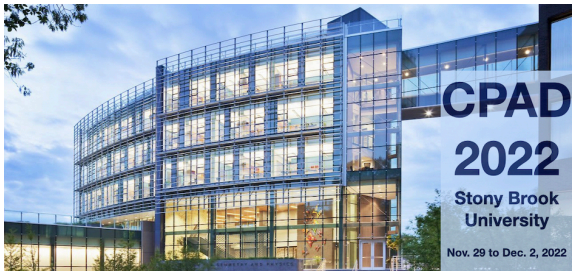

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Quantum Entangled Network of Magnetometers

Wednesday, 30 November 2022 09:30 (20 minutes)

Distributed quantum sensing promises paths to accelerate the development of time synchronization [1], sensing capabilities of gravity gradients and magnetic fields [2], and to advance the search of new physics [3,4]. Classical networks of magnetometers are already in place for the search of dark matter axions [5]. However, it is still an open question how to best entangle a large network of sensors to improve sensitivity and also obtain spatial information during the measurement. We report on the development of a multiplexed entangled network of atomic magnetometers. These room-temperature Electromagnetically Induced Transparency (EIT)-based magnetometers are tailored to be compatible with the quantum memories of the currently-under-construction Long Island Quantum Information Distribution Network (LiQuIDNet). We present the expected gains for such distributed sensing protocol when compared to a classical network, and the advances towards a distributed large-scale network.

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[2] B. k. Malia, et al. Distributed quantum sensing with a mode-entangled network of spin-squeezed atomic state, arXiv preprint arXiv:2205.06382
[3] Report of DOE Basic Research Needs Study on High Energy Physics Detector R&D, August 2020.
[4] Report of DOE Quantum Networks for Open Science Workshop, September 2018.
[5] S. Afach, et.al. Search for topological defect dark matter with a global network of optical magnetometers, Nature Phys. 17, 1396-1401 (2021)

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