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Quantum enhanced optical magnetic induction tomography of low conductivity objects

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Magnetic induction tomography (MIT) is a method of detecting and imaging conductive objects, based on the detection of induced radio-frequency electromagnetic fields. It is a promising non-invasive method, which can be used for biomedical applications such as the diagnostics of heart diseases. The induced electromagnetic fields are measured by the polarization of light sent through a cell filled with the Cesium gas, as the macroscopic atomic spin of the cesium gas responds to the electromagnetic fields. However, the sensitivity of MIT is limited by non classical noise. By applying methods such as stroboscopic spin-squeezing and back action evasion to reduce the quantum noise of Cesium gas inorder to get the sensitivity limited to the projection noise. Through varying the duration of the stroboscopic spin preparation with a duty cycle of 15% we are shown to have achieved more than -3 dB of squeezing at a Larmor frequency of 722 kHz, progressing towards quantum enhanced MIT measurements of a salt water sample.

Field of study

Quantum Physics

Supervisor

Eugene Polzik

Author: OESTERLE, Alan

Co-authors: ZHENG, Wenqiang; WANG, Hengyan; SCHMIEG, Rebecca; POLZIK, Eugene

Presenter: OESTERLE, Alan

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