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Towards quantum enhanced optically pumped magnetometer at Earth's magnetic field

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We describe progress toward quantum enhancement of an optically pumped magnetometer (OPM), operating around Earth's magnetic field. We demonstrate back-action evading scheme with sub-pT/√Hz quantum-noise-limited sensitivity, for frequency and amplitude modulation schemes. We also aim to demonstrate the quantum advantage of spin squeezing in highly polarized atomic ensembles within microfabricated isotopically enriched ⁸⁷Rb cells. This work represents a step forward in developing compact and highly sensitive magnetometers, with potential applications in fundamental physics experiments and field-deployable precision sensing technologies.

Author: MENDEZ-AVALOS, Diana (Institute of Photonic Sciences (ICFO))

Co-authors: SIERANT, Aleksandra (ICFO, Spain); MITCHELL, Morgan (ICFO - Institut de Ciències Fotòniques, 08860 Castelldefels (Barcelona), Spain); TABARES GIRALDO, Santiago (ICFO)

Presenter: MENDEZ-AVALOS, Diana (Institute of Photonic Sciences (ICFO))

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