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The Gradiometer: A detection system for magnetic contamination in n2EDM

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The n2EDM experiment at the Paul Scherrer Institut seeks to measure the neutron electric dipole moment with a sensitivity below 10^{-27} e . cm, which demands an extremely well-controlled magnetic environment. To track down tiny magnetic contaminants that could mimic an EDM signal, we built a mobile gradiometer based on optically pumped cesium magnetometers operating in the Mx configuration. Through differential phase-sensitive detection, the system achieves sub-picotesla gradient sensitivity and can resolve dipole moments as small as 0.1 nAm^2 . Combining the precision and reliability of cesium magnetometry, the device enables material scans under realistic experimental conditions, providing vital diagnostics to safeguard the magnetic cleanliness of the n2EDM setup.

Authors: Luz Sanchez-Real Zielniewicz, Lea Segner, Judith van Keirsbilck, Victoria Kletzl, Georg Bison, Vira Bondar on behalf of the nEDM collaboration

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Author: SANCHEZ-REAL ZIELNIEWICZ, Luz (ETH Zurich)

Presenter: SANCHEZ-REAL ZIELNIEWICZ, Luz (ETH Zurich)

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