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A detection system for magnetic contamination in n2EDM

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The n2EDM experiment at the Paul Scherrer Institut aims to probe the neutron electric dipole moment with a sensitivity below 10^{-27} e·cm, requiring an exceptionally clean magnetic environment. To identify minuscule magnetic impurities that could introduce false EDM signals, we developed a mobile gradiometer based on optically pumped cesium magnetometers in the Mx configuration. The system detects dipole moments down to 0.1 nAm^2 , using differential phase-sensitive readout to map magnetic gradients with sub-picotesla sensitivity. The device leverages the high precision and robustness of cesium magnetometry to scan materials under realistic experimental conditions, providing essential diagnostics for maintaining magnetic integrity in the n2EDM apparatus.

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