

Search for permanent and oscillating EDM of the neutron

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On behalf of the nEDM collaboration, we will discuss the measurement that established the best upper limit on the electric dipole moment of the neutron, $d_n < 1.8 \times 10^{-26}$ e cm (90% CL) [1]. This result was obtained using the nEDM apparatus connected to the ultracold neutron source at the Paul Scherrer Institute (PSI). We will also present n2EDM, the next-generation experiment currently in the commissioning phase at PSI.

The absence of a neutron electric dipole moment (nEDM) at this sensitivity level constrains the CP-violating phase of QCD to an extremely small value, constituting the strong CP problem and motivating the existence of the Axion. Additionally, the neutron EDM is a highly sensitive probe of CP violation beyond the Standard Model.

Moreover, we performed a search in the nEDM data for an oscillating signal potentially due to an oscillating axion-like particles (ALPs) field. This search set upper limits on the axion couplings to gluons and neutrons in the mass range from 10^{-24} eV to 10^{-18} eV [2], and another limit in the mass range from 10^{-16} eV to 10^{-13} eV [3].

[1] C. Abel et al., Phys. Rev. Lett. 124, 081803 (2020)

[2] C. Abel et al., Phys. Rev. X 7, 041034 (2017)

[3] C. Abel et al., SciPost Phys. 15, 058 (2023)

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