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Towards measuring the electron's electric dipole moment using trapped molecules

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The permanent electric dipole moment (EDM) of a fundamental particle is a CP violating property, and can be used as a sensitive probe for physics beyond the Standard Model (BSM). The electron leaves a greatly enhanced EDM signature when bound to a heavy polar molecule. This has allowed molecular precision measurements to explore well into the parameter space of BSM theories. A next generation of electron EDM experiments will be performed using trapped polyatomic molecules, which offer longer coherence times and reduced systematic effects [1]. We have investigated the main challenges and requirements needed to realise a competitive measurement using trapped BaOH molecules [2,3]. In this talk I will outline our approach, which is capable of testing the Standard Model reaching for PeV energy scales.

[1] Anderegg et al., Science 382, 665-668 (2023).
[2] Bause et al., Phys. Rev. A 111, 062815 (2025).
[3] Schellenberg et al., arXiv:2507.17521 (2025).

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