A New Search for the Neutron Electric Dipole Moment at LANSCE

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A measurement of the neutron electric dipole moment, EDM, is a test of time reversal invariance and a search for evidence for new sources of CP violation beyond the Standard Model, SM. The current limit, $< 0.6 \times 10^{-25}$ e-cm [1], is already constraining predictions of extensions of the SM. We are developing a new technique [2] for this measurement that promises to reduce the systematic errors and to lower the limit on the neutron EDM by about two orders of magnitude. The technique relies on simultaneous precession of trapped ultra-cold neutrons and ^{3}He atoms in a bath of superfluid ^{4}He at a temperature of about 300 mK. The relative precession frequencies of the neutrons and the ^{3}He atoms in a B field are compared when an external electric field is turned on and off. The ^{3}He atoms play several monitoring roles in the measurement which are crucial in controlling systematic errors. The principle of the measurement and the present status of the project will be described.

References

[1] P. G. Harris et al., **Phys. Rev. Lett.** 82, 904 (1999).
[2] R. Golub and S. K. Lamoreaux, **Phys. Rep.** 237, 1 (1994).