

Laser-based comagnetometry for neutron electric dipole moment experiments at TRIUMF

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The TUCAN EDM collaboration (TRIUMF Ultra-Cold Advanced Neutron Electric Dipole Moment experiment) is working to measure a permanent neutron EDM with an uncertainty below 1×10^{-27} e-cm [1]. The experiment uses a comagnetometer in the neutron precession cells to measure and control for magnetic field drift, based on the observation of free spin precession.

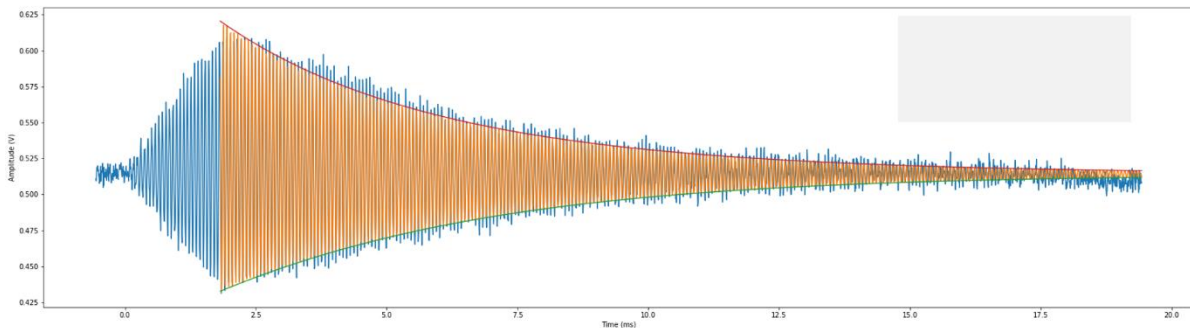


Figure 1: Free spin precession signal of ^{199}Hg during and after $\pi/2$ pulse.

In Phase I, an optically pumped ^{199}Hg comagnetometer measures the field magnitude while an array of external Cs magnetometers measures gradient systematics. A future Phase II adds spin-exchange optically pumped ^{129}Xe , as part of a dual-species $^{199}\text{Hg}/^{129}\text{Xe}$ comagnetometer capable of additionally measuring field gradients in situ. This presentation will give an overview of the TUCAN project, and recent progress with both Hg and Xe which guides the development of the two comagnetometer systems.

References

- [1] S. Ahmed et al. (TUCAN Collaboration), Phys. Rev. C **99**, 025503 (2019)