Contribution ID: **19** Type: **Poster**

Compensation of Magnetic Fields at the the TRIUMF nEDM Experiment

Wednesday, 18 October 2017 15:00 (45 minutes)

The existence of a non-zero neutron electric dipole moment (nEDM) would violate parity and time-reversal symmetry. Extensions to the Standard Model predict the nEDM to be 10^{-26} – 10^{-28} e-cm. The current best upper limit set by Sussex/RAL/ILL nEDM experiment is 3.0×10^{-26} e-cm. The nEDM experiment at TRIUMF is aiming at the 10^{-27} e-cm sensitivity level . We are developing the world's highest density source of UCN. The experiment requires a very stable (<~pT) and homogeneous (<~nT/m) magnetic field (B0) within the measurement cell. My involvement in the nEDM experiment is the development of active magnetic shielding to stabilize the external magnetic field by compensation coils. A prototype active magnetic shield has been tested at The University of Winnipeg. I will report on latest experimental results from this prototype and simulations conducted to understand the results. The magnetic environment at TRIUMF is more challenging than in our laboratory in Winnipeg, because of the closeness of the experiment to the TRIUMF cyclotron magnetic field (B $\sim$ 350$-$400 μT 'which is almost one order of magnitude larger than usual background fields') and the changing environment with iron. Studies of the implementation at TRIUMF will also be reported.

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Funding Agency

1. Natural Sciences and Engineering Research Council of Canada (NSERC).
2. Canada Foundation for Innovation (CFI).

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Session Classification: Posters

Track Classification: Magnetic field control (passive and active shielding, coil design, current sources)