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Atomic Magnetometry for Neutron EDM experiment at TRIUMF

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The neutron electric dipole moment (EDM) experiment at TRIUMF aims to constrain the neutron EDM to the 1×10^{-27} level in its initial phase of operation. At this level of precision, magnetic stability must be measured at the tens of fT level in the 1 uT operating field of the experiment. Comagnetometers based on Hg-199 and Xe-129 will be used to measure this stability in real time inside the neutron EDM cell, at the same time as the EDM measurement is being conducted. Furthermore, external magnetometers with similar precision would be used to confirm the magnetic environment with a similar level of precision around the neutron EDM measurement cell. We have been developing external magnetometers based on non-linear magneto-optical rotation (NMOR) in rubidium vapour, based on the successful techniques developed by Budker, et al. Magnetometers based on this principle promise to provide the precision necessary for the EDM experiment. Recent results from our prototype NMOR system at the University of Winnipeg will be presented.

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