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The TUCAN magnetics lab at TRIUMF –research and development towards a neutron electric dipole moment search

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A non-zero electric dipole moment (EDM) of the free neutron violates CP symmetry. Searching for this elusive quantity can thus reveal information about the matter-antimatter asymmetry of our Universe. The TUCAN collaboration intends to improve the current upper limit on the neutron EDM by one order of magnitude and push into the low 10^{-27} ecm sensitivity regime. During a neutron EDM measurement, electric and magnetic fields are applied, and the spin precession of polarized neutrons is observed.
To achieve competitive sensitivity it is crucial to have precise control over the magnetic fields. Accurate knowledge of its properties, such as stability and homogeneity, as these properties affect both the systematic and statistical precision of a neutron EDM measurement.
In this presentation I want to introduce ongoing development work at a magnetics laboratory at TRIUMF. We are working on several prototype setups of magnetic field and magnetometry infrastructure, such as a small-scale magnetic shield, a magnetization detection device, a non-magnetic robot to create field maps, and others. I will discuss how these activities inform the detailed design of the next generation TUCAN neutron EDM spectrometer.

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