Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **525** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Magnetic Field Requirements for the TUCAN nEDM Experiment

Wednesday 9 June 2021 12:55 (10 minutes)

The TUCAN collaboration is preparing to make a precision measurement of the neutron's permanent electric dipole moment, d_n, with a sensitivity of $\sigma(d_n) \leq 10^{-27} e \cdot cm$. To reach the goal sensitivity it is required to have highly uniform and well understood magnetic fields in the measurement cells. With ambient magnetic fields on order of hundreds of μT, passive magnetic shielding combined with compensation and shim coils are required to achieve the needed field uniformity
($\sigma(Bz) < 40\,\mathrm{pT}$) and stability over several measurement cycles.

A magnetically shielded room (MSR) will reduce external fields by a factor of $100,000$, and provide magnetic fields with gradients of $0.1 - 1\,\mathrm{nT/m}$ in its interior. Inside the MSR a cosine theta coil will be used to provide a $1\mu\,\mathrm{T}$ holding field in which the neutron's spins will precess during the measurement process. Additional trim and shim coils will be used to reduce non-uniformities in the magnetic field, with dedicated coils to be used for systematics studies.

In this presentation I will summarize our collaboration's strategy to obtain sufficient information about the shape and strength of the magnetic field such that it can be modified and characterized to fulfill the measurement requirements. This covers items such as ambient field compensation coils around the MSR, highly accurate offline magnetic field mapping inside the MSR, and high precision magnetometry and co-magnetometry during the actual measurement of d_n.

Authors: MCCREA, Mark (University of Winnipeg); TUCAN COLLABORATION

Presenter: MCCREA, Mark (University of Winnipeg)

Session Classification: W2-7 Instrumentation II (DNP) / Instrumentation II (DPN)

Track Classification: Nuclear Physics / Physique nucléaire (DNP-DPN)