

Towards TUCAN's Search for the Neutron Electric Dipole Moment

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TUCAN (TRIUMF ultracold advanced neutron source) is a transpacific collaboration with the objective to measure the neutron electric dipole moment (nEDM) with unprecedented precision. We aim at a precision of 10^{-27} e.cm, an improvement by a factor of 30 over the current upper limit for this elusive quantity. A non-zero nEDM violates parity and time-reversal symmetry, and is thus intimately linked to the baryon asymmetry of the universe. The tool of choice to search for an nEDM are ultracold neutrons (UCN) that move at velocities of only a few meters per second and can be stored and observed for up to hundreds of seconds. TUCAN recently completed a major milestone: production of the first UCN in Canada by operating a prototype source, developed at RCNP Osaka, Japan, at a dedicated proton beam line at TRIUMF, Vancouver, Canada. This source is based on a neutron spallation source combined with a superfluid helium cryostat –a unique approach among the handful of worldwide efforts to produce significant densities of UCN for nEDM searches and other high precision experiments. This presentation will describe TUCAN's current efforts and timeline towards design, implementation, and commissioning of the required next-generation UCN source and nEDM spectrometer.

E-mail

wschreyer@triumf.ca

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Primary author: Dr SCHREYER, Wolfgang (TRIUMF)

Presenter: Dr SCHREYER, Wolfgang (TRIUMF)

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