



Canadian Association  
of Physicists

Association canadienne  
des physiciens et physiciennes

Contribution ID: 2243

Type: Oral (Non-Student) / Orale (non-étudiant(e))

## Quantum Vortex Limitations to Ultracold Neutron Production

*Thursday 14 June 2018 08:30 (15 minutes)*

The TRIUMF Ultracold Advanced Neutron (TUCAN) collaboration uses a neutron source based on superfluid helium to produce ultracold neutrons. Superfluids are usually thought of as having infinite thermal conductivity. But at the operating temperature and heat flux for our source, the transport of heat in the superfluid is expected to be limited by quantum vortices. In the two-fluid model, the heat is transported by the normal fluid component, which experiences mutual friction with the vortices. Based on this theory, temperature gradients in the superfluid will rise as the cubed power of the heat flux. Previous measurements have tended to support the theory, but our UCN source parameters (temperatures of less than 1 Kelvin) lie in an unmeasured regime where the normal component is less than a percent of the superfluid component. This motivated measurements conducted using our existing UCN source, which will be reported. Further measurements are planned to better constrain the design of our future UCN source.

**Author:** MARTIN, Jeffery (The University of Winnipeg)

**Presenter:** MARTIN, Jeffery (The University of Winnipeg)

**Session Classification:** R1-7 Neutrons (DNP) | Neutrons (DPN)

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