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## Enhancing Thermal Stability in Dilution Refrigeration at TRIUMF

*Wednesday, 14 May 2025 11:55 (20 minutes)*

This contribution will discuss the operation of the VeriCold Dilution Refrigerator (DR) at TRIUMF, a crucial cryogenic instrument for experiments that need ultra-low temperatures and long-term operational duration. A significant challenge was achieving and maintaining stable millikelvin temperatures, essential for effectively operating our Superconducting Tunnel Junction (STJ) detectors for BeEST Experimentation.

A primary focus of this work was optimizing the cooldown procedure and system to improve thermal stability. Several enhancements played a vital role in increasing the refrigerator's performance. Key actions included thoroughly cleaning the DR system, removing potential heat bridges, examining the thermal effects from varying turbo pump speeds from the mixing chamber, and resolving a helium leak issue. Additionally, we meticulously refined the timing of each transition stage in the cooling process. After conducting multiple cooldowns and revising our procedures, we successfully lowered the previous minimum achievable temperature of approximately 40 mK to a more stable range of 19-20 mK at the MC plate.

The methodologies we developed and refined not only enhanced the DR's operational efficiency but will now serve as useful references for future troubleshooting, scheduling, and upgrades for time-dependent experiments involving millikelvin environments. This includes a brief discussion of the next steps in outfitting and commissioning the DR for STJ operation.

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**Session Classification:** BeEST setups at collaborating facilities