

# Frozen Spin Target Manual

## Document 5: Condensing the 3He/4He in the Dilution Unit

C. Keith

rev. March 11, 2008

This document describes the preferred method to condense the 3He/4He mash into the FROST dilution refrigerator.

### Risk Assessment

No risk to personnel.

### Hazard Control

Not applicable.

### Overview

This document assumes that the 3He system has been cooled at least to a temperature of about 10K using pure 4He, and that the 4He has subsequently been removed from circulation.

#### A. Final clean-up of 4He from the 3He system

1. Confirm that all valves on the 3He gas panel are CLOSED except MV8361, MV8362A (or B), MV8363A (or B) and MV8364. Note that this is the standard valve configuration for circulation;
2. Confirm that the LN2 trap A (or B) is cold;
3. Turn ON the auxiliary pump MP8374, OPEN MV8374 and MV8371;
4. Pump 4He out of the system until thermocouple gauge PI8371 indicates a few torr;
5. CLOSE MV8371, MV8374 and turn OFF MP8374;
6. CLOSE MV8360V, the vent valve between the L70 exhaust and check valve CV8360;

#### B. Condensation of 3He/4He into the Dilution Unit

7. OPEN the valves on the 3He and 4He storage tanks (MV8367B, MV8368B/C);
8. OPEN valve MV8366;
9. Slowly OPEN MV8367A to bleed 3He gas into the circulating flow stream. Throttle this valve to maintain an appropriate flow rate and condensation pressure (less than 700 mbar and 40 slpm respectively). Keep an eye on the 1K level probe, if it begins to empty, you may need to open the 1K valve further, or reduce the 3He flow;
10. When MV8367A is fully open, and the 3He tank pressure still less than about 150 mbar, CLOSE MV8366 and slowly OPEN MV8365. In this manner, the L70 dry pumps are removing 3He directly from the storage tank;
11. Continue condensing 3He out of its storage tank until PI8367A indicates a pressure of 150

mbar, then close MV8365 and MV8367A;

12. OPEN MV8366 and slowly OPEN MV8368A to bleed 4He gas into the circulating flow stream. Follow the same guidelines as specified in step 9 above;
13. When MV8368A is fully open, and the 4He tank pressure still less than about 150 mbar, CLOSE MV8366 and slowly OPEN MV8365. In this manner, the L70 dry pumps are removing 4He directly from the storage tank;
14. When the 4He tank pressure indicates about 150 mbar, CLOSE MV8365 and MV8368A. Record the still level probe – it should be between -10% and +10%. The mixing chamber temperature should be below 300mK and cooling. The still temperature should be below 1K;