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C-A OPERATIONS PROCEDURES MANUAL

7.2.1 Procedure for Operating LHe Target at E931

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Hand Processed Changes

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 Collider-Accelerator Department Chairman Date

L. Jia

7.2.1 Procedure for Operating LHe Target at E931

1. Purpose

- 1.1 To provide instructions for the Cryogenic System Specialist (CSS) to ensure the safe operation of the LHe target at E931.

2. Responsibilities

- 2.1 It is CSS's responsibility to notify the MCR to start the system.
- 2.2 It is the CSS's responsibility to implement this procedure each time when operating the LHe Target system.

3. Prerequisites

- 3.1 Operators should be qualified and trained Cryogenic System Specialist.

4. Precautions

- 4.1 Be sure that all necessary system components are not malfunctioning for start-up.

5. Procedure

5.1 System Start-Up

- 5.1.1 Pump/purge/charge the RS compressor, E931 Cold Box/Target, and G-M coolers/compressors.
- 5.1.2 Evacuate thermal insulation space to a vacuum at 5×10^{-4} torr or better.
- 5.1.3 Pump/purge internal lines using GHe for three times.
- 5.1.4 Fill system with GHe at 20 psia (5 psig).
- 5.1.5 GB37/CP25 charge pressure: 195~205 psig; operating pressure: 280~310 psig/75~100 psig.
- 5.1.6 CTI1020R charge pressure: 195~205 psig; operating pressure: 280~290 psig/80~100 psig.
- 5.1.7 Charge the two GHe tanks at pressure 45 psig (write down the pressure values to calculate the amount of GHe in tank).

5.1.8 Run the RS compressor by throttling the local by-pass valve V1 with V2 and V3 closed (as shown in Figure 1) for about two hours. Operating parameters for RS compressor: Pressure: HP ~250 psig, LP ~2.0 psig.

5.1.9 Close valves HV1 and HV2 in the E931 system; Close JT valve.

5.2 System Cool-Down

5.2.1 Open V3 and throttle V2 (as shown in Figure 1), check the pressure of the supply and return at the cold box, P4~250 psig, P2~2.0 psig.

5.2.2 Check P5<5psig (leaks in HV1 and HV2).

5.2.3 Throttle JT according to the flow meters in flow circuits, flow rate: 0~13 SCFM by readings of the meters. Adjust the by-pass V1, if needed, to maintain the HP and LP at RS compressor.

5.2.4 Run GB37 and CTI1020 cryocoolers. The system temperatures start to drop.

5.2.5 Cool-down may take about 10 hours (0.3~0.6 K/min).

5.3 Target Fill-Up

5.3.1 Check the pressure and keep P5<1~3 psig.

5.3.2 Use by-pass circuit for target precooling.

5.3.3 Fully open valve HV2. Throttle HV1, according to temperature drop rate<10 K/min at Mylar target (T10 and T11). Adjust HV1, to reduce the fast rise of the target pressure during target cooling down process.

5.3.4 Fully open HV1 to fill LHe to the target. It will take more than 18 hours to have the target full. The target is full if the pressure drop in the tank meets the specification.

5.3.5 When the target is full, the pressure in the GHe tanks should be a couple of psi higher than one atmosphere. Leave the access open for vaporized gas to flow back to tank.

5.3.6 Use JT valve to control the mass flow rate in the refrigeration.

5.4 System Warm-Up

5.4.1 Close the JT and stop cooling.

5.4.2 OR close the HV1 to keep the cold box cold, if necessary.

5.4.3 For both cases, leave the HV2 open all the time to allow the vaporized gas to flow back to tank or release to air.

5.4.4 Shut down GB37 and CTI 1020 cryocoolers.

5.4.5 Recover helium gas and run the compressor to send the gas back to tank.

5.4.6 Adjust by-pass valve V1 if necessary.

5.5 Shut-Down

5.5.1 Turn-off the compressors and secure the system.

6. Documentation

6.1 E931 Log Book

6.2 E931 Flow Diagram

7. Reference

7.1 “A Five-Watts G-M/J-T Refrigerator for LHe Target at BNL” BNL Tech Note.

7.2 “Thermal Oscillations in Liquid Helium Targets” BNL Tech Note.

8. Attachments

8.1 Schematic of the LHe Target System.

Attachment 8.1

Schematic of the LHe Target System

