

**Princeton Plasma Physics Laboratory
Procedure**

Procedure Title: To dock the Sample Exposure Probe (SEP) to the Argon Glove Box and transfer a quantity (< 680 mg) of lithium between the SEP and the Argon Glove Box.

Number: C-LTX-IP-3996	Revision: 0	Effective Date: 05/07/2018 Expiration Date: (3yr. unless otherwise stipulated)
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CAT: A1 A2 A3
Procedure Approvals

Author: A. Maan	Date 06/06/2018
Responsible Engineer: R. Majeski	Date 06/06/2018

Procedure Requirements
designated by Responsible Engineer

LABWIDE:

X	Work Planning Form # 2364 (ENG-032)		Lockout/Tagout (ESH-016)
	Confined Space Permit (5008, Sec. 8, Chap 5)		Lift Procedure (ENG-021)
	Master Equip. List Mod (MC-002/MC-003)		ES&H Review (NEPA, IH, etc.)
	RWP (HP-OP-20)	X	Independent Review
	Walkdown		Pre-job Brief
	Post-job Brief	X	Job Hazard Analysis – JHA (ESH-004)
	Run Copy Required (performance of procedure must be documented and archived per ENG-030)		Special archiving requested for completed Run Copies:

D-SITE SPECIFIC:

	D-Site Work Permit (OP-AD-09)		Door Permit (OP-G-93)
	Work on Tritium Contaminated Sys. (OP-AD-77)		Activity Certification Committee Review
	Pre-job brief (ENG-030)		T-MOD (ENG-036)
	USI Screening (OP-AD-131)		

FOR INSTALLATION PROCEDURES ONLY: Was an ECN required? No			
If ECN was required, list drawing numbers affected:			

REVIEWERS (designated by Responsible Engineer)
D-Site Shift Supervisor
NSTX Construction Manager
D-Site Caretaking
Vacuum:
Computer
Tritium
Quality Assurance/Quality Control
AC Power
Energy Conversion Systems
Engineering
Materials and Environmental Services
Water Systems
Neutral Beam (Heating Systems)
Radiofrequency (Heating Systems)
Diagnostics
Environmental, Safety, & Health
Pressure Systems SME (ES-MECH-015)
USI Screener
NSTX-U Work Control Center

REVIEWERS (designated by Chief Engineer for A1)
Independent Reviewers T. Kozub, R. Kaita, D. Cai

TRAINING (designated by Responsible Engineer)			
No training required _____		Instructor : A. Maan	
Personnel (group, job title or individual name)	Read Only*	Instruction	Hands-On
	X		
Responsible Engineer: R. Majeski			

* "Read Only" training for Administrative, Alarm Response, and Emergency Operations procedures must be documented on a Record of Training form (attachment 6). The completed Run Copy will serve as the documentation of "Read Only" training for all other types of

procedures.

1. PURPOSE & SCOPE

The purpose of this procedure is to attach the Sample Exposure Probe (SEP) to the Argon Glove Box (AGB) in L-245 to enable the transfer of lithium samples from the glove box to the SEP or vice versa. The procedure is limited to docking of the SEP to the AGB and loading/unloading samples into the SEP. All lithium handling is to be conducted in an Argon atmosphere inside the glove box. This procedure is limited to 1 gram lithium sample.

2. REFERENCES

2.1 ESHD 5008 PPPL Environment, Safety, and Health Directives

2.2 PPPL Lithium Safety Program Rev.0 Oct 2015.

3. PRECAUTIONS

- 3.1. Check the oxygen meter before and after the procedure to ensure it is operating correctly.
- 3.2. The procedure involves back-filling the AGB CF load lock with Argon. To enable this the valves on the CF load lock should be installed to be consistent with figure 2. **If the valves installed on the gas lines connected to the load lock are not consistent with figure 2, this procedure is invalid.** This is to ensure that during backfilling the pressure inside load lock does not exceed the pressure inside the AGB.

4. PREREQUISITES

- 4.1 Ensure that housekeeping in the AGB is adequate to permit safe performance of this procedure.
- 4.2 Ensure that paint can of lithium rods (6 in length – 0.5 in diameter) is in AGB.
- 4.3 Ensure that following material/equipment are at hand.
 - a. Two 2.75 in CF Cu gaskets, cleaned and ready to install.
 - b. Sample Exposure Probe
 - c. ¼ in 12 point wrench.
 - d. Nitrile gloves.
- 4.4 Ensure that the following items are present in the glove box
 - a. Cheese cutter.
 - b. Hex screw driver size 0.050 in for 4-40 set screws.
 - c. A Polyethylene bottle with a pop-up lid.
 - d. Tweezers
 - e. Safety-Coated Glass Jar (7 in tall).
- 4.5 Ensure that the CF load lock on the glove box is back filled with Argon.
- 4.6 Ensure that the SEP is pumped down.
- 4.7 Hold a pre-job brief with the responsible engineer, anyone involved with the execution of the procedure and a representative from Industrial Hygiene. Discuss the

procedure pre-requisites and precautions. Also discuss the filled JHA (Job Hazard Analysis) form and get it signed by all participants.

4.8 Check to ensure that the lithium extinguisher is in unused condition and its inspection is up to date.

4.9 Confirm that all personnel involved in the execution of the procedure have completed the PPPL lithium safety training.

5. PROCEDURE

Assure all prerequisites and precautions have been completed.

- 5.1. Prepare lithium sample.
 - 5.1.1. Insert hands into the glove box. This must be done carefully to avoid damaging the gloves and to avoid sudden pressurizing of the AGB.
 - 5.1.2. There may be a polyethylene bottle with spare pieces of Li rod or a glass jar with Li rods in the AGB. If yes, remove a small piece from either and skip to 5.1.6.
 - 5.1.3. Open the paint can with lithium rods (6 in length – 0.5 in diameter) already in the glove box.
 - 5.1.4. The lithium rods inside the paint can are sealed inside a Mylar bag.
 - 5.1.5. Cut the Mylar bag open; remove lithium rods one by one and transfer them into the safety coated glass jars.
 - 5.1.6. Place one of the lithium rods on the cheese cutter.
 - 5.1.7. Cut a small section of the lithium rods (about 10 mm tall) using the cheese cutter.
 - 5.1.8. Place the rest of the lithium rod inside the polyethylene bottle and close the lid. If the rod is too long put it in the glass jar.
 - 5.1.9. Place the cut piece of lithium on the cheese cutter.
 - 5.1.10. Remove hands from the glove box.
- 5.2. Align the SEP to the 8 in CF port on the AGB. This can be done because the SEP is mounted on height adjustable caster mounted hydraulic jacks (figure 3,4).
- 5.3. Ensure that the door inside the glove box to the load lock is closed and secured.
- 5.4. Check to ensure that the load lock on the glove box is backfilled with Argon, such that the load-lock is at atmospheric pressure, the load lock pressure gauge should read 0 kPa (the gauge is referenced to atmospheric pressure; 0 kPa \approx 760 Torr).
- 5.5. Remove the 2.75 in CF blank on the load lock by loosening the screws.
- 5.6. Place a new, cleaned Cu gasket in the groove for the 2.75 in CF on the load lock.
- 5.7. Roll the SEP forward until the 2.75 in CF at the end of the formed bellows spool piece of the SEP comes in contact with gasket.
- 5.8. Make any required height and alignment adjustments to align the 2.75 in CF at the end of the SEP formed bellows with the 2.75 in CF on the glove box CF load-lock.
- 5.9. Make the 2.75 in CF seal between the load lock and the formed bellows using screws.
- 5.10. Pump-down the CF load lock by turning the three-way valve towards 'PUMP' label as shown in Fig. 1 and opening the 'O/C' valve.
- 5.11. Once the load lock is pumping, wait for the pressure reading in the pressure gauge to read -100 kPa (\approx 1 Torr) before backfilling the load lock with Argon. This can be done by moving the three way valve to 'PURGE' slowly and keeping the 'O/C' valve in open position. Note that argon is supplied from the glove box only – no external source (gas bottle + regulator) is allowed for purging/backfilling the load

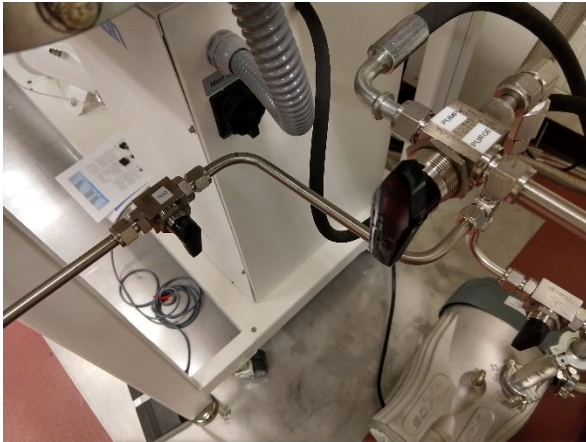
- lock.
- 5.12. Repeat the pump and back fill cycle two more times for a total of three repetitions. During the last cycle, after pumping, close the O/C valve and the three-way valve and wait for 20 minutes before back-filling. An increase in the gauge pressure (on the load lock) during these 20 minutes would indicate a leak in the recently sealed CF flange. Ensure that the leak is fixed before proceeding.
 - 5.13. If the pressure has not risen after 20 minutes, open the gate valve between the probe and the CF load lock and backfill the load lock.
 - 5.14. Open the door inside the AGB to the CF load-lock by using one of the gloves.
 - 5.15. Insert the probe head by manually turning the bellows drive. This must be done while supporting the bellows to keep the internal probe tube from scraping the inside of the bellows. A solid 1.5 inch thick sheet of UHMW Polyethylene is placed below the bellows for sag support as shown in figure 4.
 - 5.16. Insert hands into the gloves of the glove box and insert lithium rod samples into or remove them from the SEP probe head using a 0.05 in hex-head screw driver to loosen set screws around the probe head collar. If a sample is to be removed from the SEP probe head, take a pair of tweezers and remove the lithium sample from the probe head and rest the removed sample on the cheese-cutter. Weigh the sample using the scale in AGB. Enter weight (= W) here _____ (mg).
 - 5.17. Once a sample has been inserted or removed from the SEP probe head, retract the probe head into the SEP by turning the bellows drive.
 - 5.18. Close and secure the door between the inside of the glove box and the load lock.
 - 5.19. Pump down the CF load lock by following Step 5.10.
 - 5.20. Backfill the CF load lock with Argon (this backfills the SEP as well) and then close the gate valve between the probe head and the load lock.
 - 5.21. Unscrew the screws attaching the CF flange on the formed bellows of the SEP to the 8 in CF port.
 - 5.22. Re-install the 2.75 in CF blank on the load lock with a new, cleaned gasket. Pump and back fill the CF load lock thrice. Repeat the leak check procedure as enumerated in steps 5.12-13 before proceeding to the next step.
 - 5.23. Document the execution of the procedure and the amount of lithium transferred into the SEP (~ W mg) in the L-245 logbook.
 - 5.24. Update the L-245 lithium inventory to indicate that W mg has been removed/added from the room. Inventory forms can be found at the back of L-245 logbook.

6. FINAL CONDITIONS

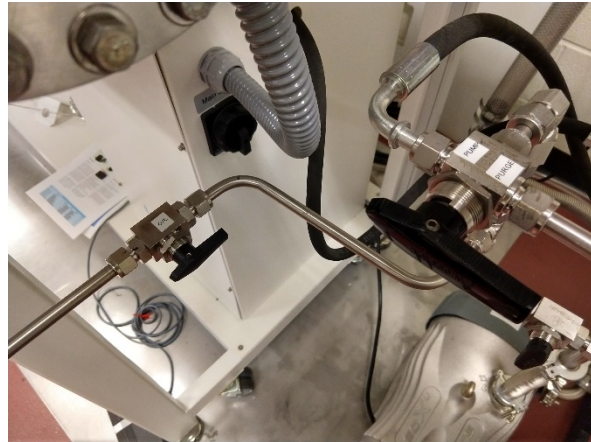
- 6.1 The SEP can now be removed from L-245
- 6.2 The CF load lock of the glove box should now be sealed and back filled with Argon.

7. SIGN-OFF

RE _____ Date _____



a) CF Port valves in closed position



b) CF port valves in 'Pump' position; the right angle O/C valve is opened and the three way valve is turned towards 'PUMP' label.

Figure 1. 8 in CF port valve manipulation for pumping and purging the load lock volume with Argon. To purge instead of pump, the three-way valve needs to be turned towards 'PURGE' label and the O/C valve opened.

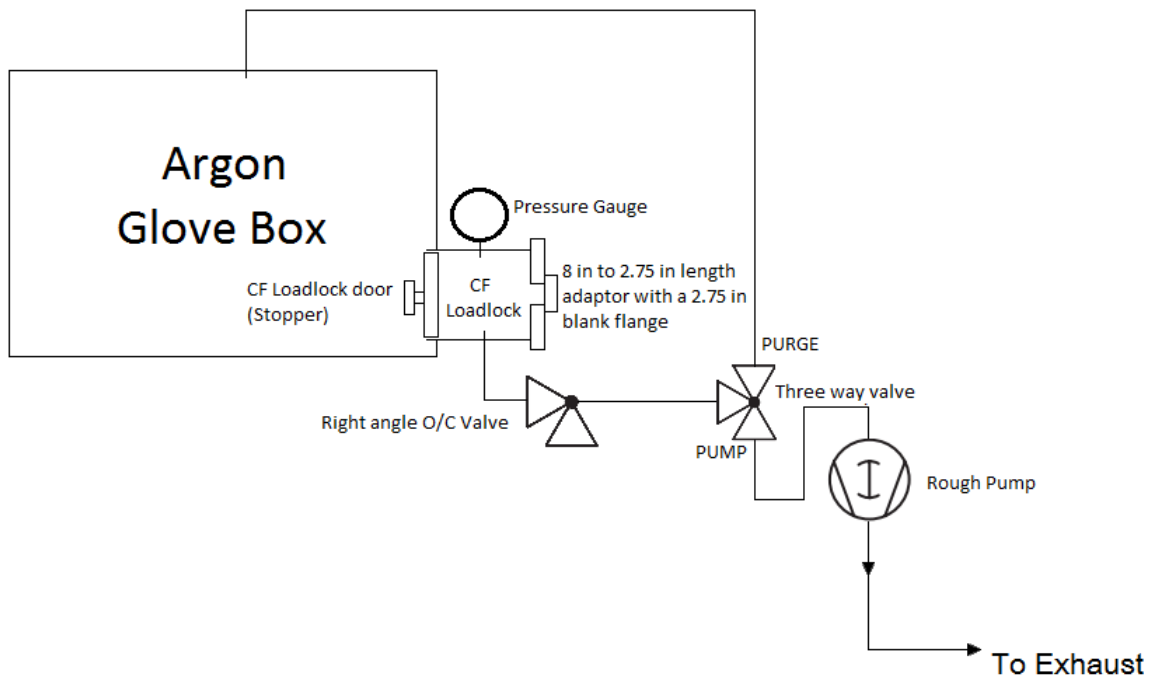


Figure 2 Line diagram of valves connected to the CF loadlock.

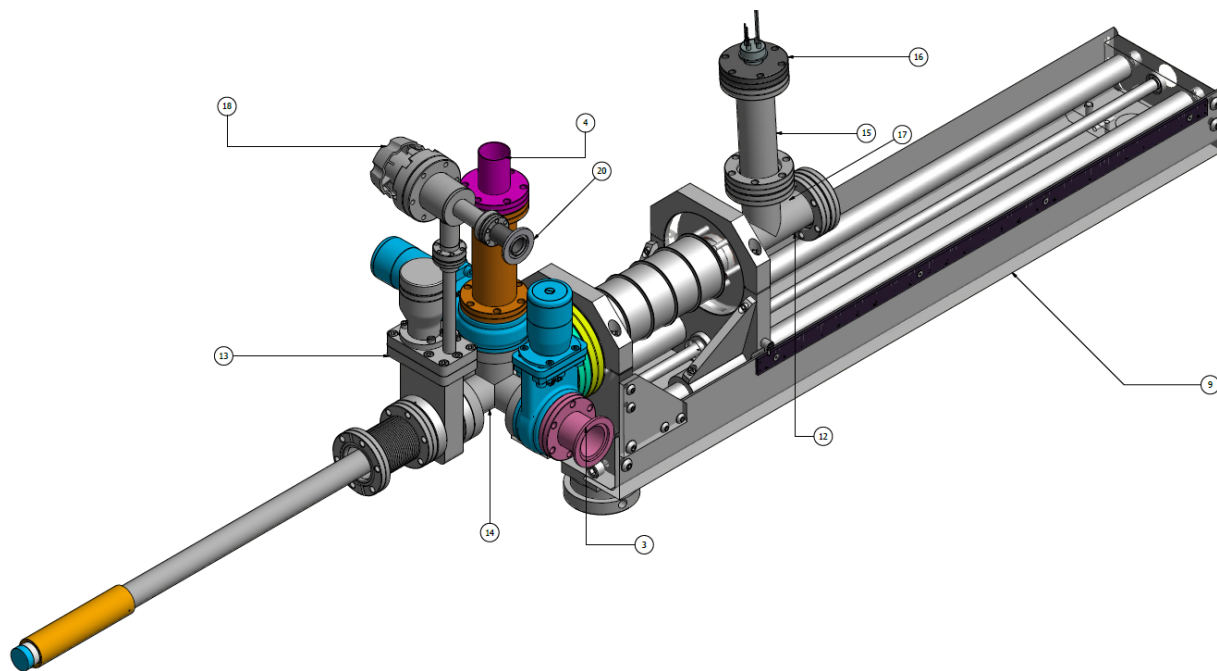


Figure 3 Sample Exposure Probe – as designed – note the formed bellows in front of the gate valve labeled “13” in the figure.

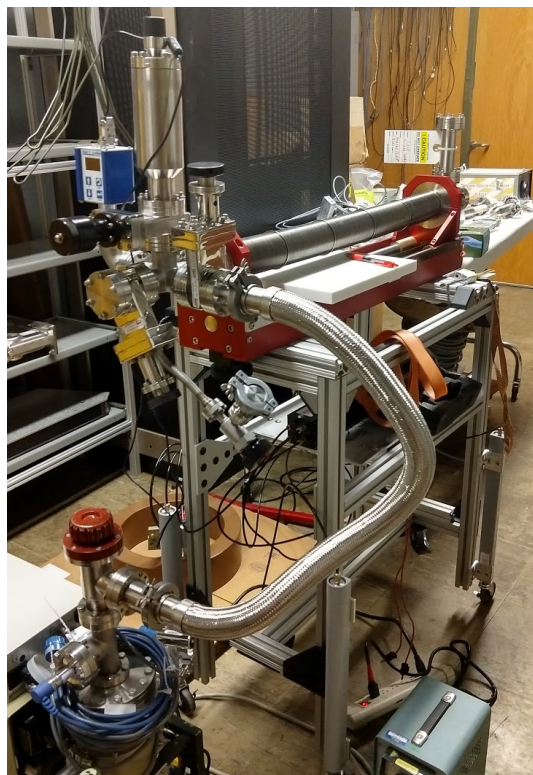


Figure 4 Sample Exposure Probe. The SEP is mounted on an 80-20 stand with caster-mounted, height-adjustable hydraulic jacks.