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| **L2HE Downstream Beam Pipe Procedure** |
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| Document Owner: | C.Wilcox | Department Owner: | SRF Operations |

# Purpose

The purpose of this document is to provide instructions for installing the downstream beam pipe onto the L2HE Cryomodule to facilitate testing in the LERF.

# Scope

This procedure applies to L2HE Cryomodule assembly actions to be taken by trained and knowledgeable Assembly Technicians to cleanly add the downstream beam pipe which is required for testing. Details are contained in the attached process steps.

# Terms and Definitions

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| Term | Definition |
| Slow bleed/pump system | Specially outfitted vacuum cart with controls to specifically slow pump and bleed required for beam pipe clean assembly activities. |
| <Term 2> | <Definition> |
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# Roles and Responsibilities

The following roles have responsibilities described in this document.

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| Role | Responsibility |
| Supervisor | Will address and monitor work actions are done correctly, to Procedure |
| Vacuum Assembly Technician | Technician that has been trained and qualified for clean assembly work. Individual shall also be familiar with specialized pumping system and appropriate gowning and cleaning techniques. |

# Procedure

**This Procedure is for installing the downstream beam pipe extension on an L2HE CM. This Assembly is to be performed using clean assembly practices. Using a beam pipe that has been pre- assembled inside the cleanroom.**

1. Gather the Beam Pipe and all associated parts to be cleaned and sent into the main clean room
2. Pre-assemble beam pipe extension in the Cleanroom using standard clean assembly practices.
* Note: When assembling the Aluminum Magnesium seal flange, install 4 bolts perpendicular and lightly torque as this will function as a dust seal until final installation.
1. After pre-assembly is completed in the cleanroom, have the beam pipe double bagged and placed on the parts shelf.
2. Begin setting up the laminar flow hood over the downstream end of the Cryomodule.
* **During clean beam pipe work the following steps are to be followed!**
* Position the laminar flow hood over the work area.
* Wipe Down then tape the curtains to eliminate leaks into the hooded area.
* Cover all other exposed surfaces in the flow hood with plastic sheeting
* Allow the flow hood to run continuously.
* Wipe down all surfaces with Alcohol and then blow off with Ionized N2.
* Set up the particle counter and begin monitoring the particle count.
* Stage all supplies and tools inside the flow hood, on a perforated work surface.
* Stage the pre-assembled beam pipe onto the installation tooling inside the flowhood. (Remove the outer bag, then cut two small holes in the inner bag to allow for 2 brass bolts to thread in for installation of beam pipe onto the tooling. This will require 2 people)
* **MAKE SURE DOWNSTREAM COLD VALVE AND RIGHT ANGLE GATE VALVES ARE CLOSED BEFORE BEGINNING WORK.**
* Once you have verified the valves are closed and the particle count is stabilized at zero (.03 micron scale), you are ready to gown up for work.
1. Slow pump/bleedup system hook up #1
* **Verify the cold valve on the cavity string is closed.**
* Shut down the ion pump
* Verify the turbo pumping system is bled up with filtered N2
* Enter the flow hood using standard protocols
* Install the bleed up diffuser to the ion pump manifold using clean assembly practices. Align the flanges and torque down in a star pattern to achieve a uniform seal.
* Fast pump down the turbo and slow bleed up lines up to the right angle valve on the cavity string and then leak check the connection.
* Open the right angle valve on the cavity string making a common vacuum.
* Once common vacuum has been established in the space between the right angle valve and the cold valve, close the right angle valve connecting the turbo hose to the slow bleed up manifold.
* Begin the slow bleed up of the chamber to be removed.
* Monitor the gauging on the slow bleed up manifold and stop the slow bleed up at 780 Torr.
* Close the right angle valve on the cavity string and recondition the turbo system for the next phase.
* Re-enter the flow hood and remove the slow bleed up diffuser from the manifold that will be removed in the following steps.
1. Beam pipe hook up
* Remove the NEG manifold from the Cold Gate Valve
* Remove the old seal from the Cold Gate Valve and discard
* Using the beam pipe support tooling, and a clean diamond gasket, carefully slide the beam pipe flange to the cold gate valve. This must be done slowly to avoid generating particles.
* Install nuts and washers at the 3 o’clock and 9 o’clock positions. Tighten with a wrench to a snug fit.
* install nuts and washers on the lower half of the flange and tighten to a snug fit
* install the nuts and washers on the top half of the flange and tighten to a snug fit.
* Torque the (12) nuts and washers in a star pattern to 15 ft/lbs.
* Repeat the torque pattern at 31 ft/lbs. Repeat this process until you do not feel any more movement during the torque sequence.
* Using a clean copper gasket, install the pump down hose to the right angle valve on the other end of the beam pipe you just installed.
* Open the right angle valve on the beam pipe
* Start the slow pump process on the beam pipe and leak check your work.
* Once you have verified that your work is leak tight. Close the right angle valve on the beam pipe and bleed up the turbo system with filtered nitrogen.
* Cleanly remove the pumping hose from the beam pipe and replace it with the bleed up diffuser and new copper gasket.
* Pump down the turbo system and the hose to the back side of the right angle valve. Leak check the connection.
* Open the right angle valve on the beam pipe and start the slow bleed up process. Bleed up the chamber to 780 Torr.
* Close the right angle valve on the beam pipe and remove the diffuser.
* Install the blanking flanges on the diffuser and beam pipe.

**This work is complete until the end cap is installed. Once the end cap is installed you may set up the Ion Pump Tee assembly in a clean fashion**

# References

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# Release and Revision History

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| Rev # | Major Changes | Effective Date: |
| 1 | Initial version | DD Mmm YYY |

# Approvals

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