
Hall D Ion Chamber Functional Test Procedure

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Estimated Time to Perform: 30 minutes

Procedure Overview

This procedure tests whether or not each of the Hall D ion chambers trips beam off when the ion chamber's setpoint is exceeded. Using an upstream corrector, Tune-Mode beam is intentionally mis-steered to verify that beam trips off when an ion chamber's setpoint is exceeded. One at a time, each ion chamber is tested, with the exception of the East Wall ion chamber, which is tested using background radiation levels. This procedure is typically used to verify ion chamber functionality prior to sending CW beam to new experiments or after ion chamber hardware replacement. All Hall D ion chambers are physically located in the Hall D Tagger Vault; [Figure 1 on page 5](#) shows the ion chamber locations.

A separate document, the [Hall D Ion Chamber Calibration Procedure](#), determines appropriate ion chamber setpoints for anticipated beam delivery conditions and should be executed after ion chamber functionality is verified.

Prerequisites

1. The Hall D amorphous radiator is out of the beamline.
2. The Hall D goniometer is set to an empty target/no radiator position.
3. Tune-Mode beam has been established to the Hall D electron dump.

NOTE: When beam transport to the dump is optimized, for Tune-Mode beam the ion chamber readbacks should show very little activity.

4. Ion chamber trip points for Hall D have been set to just above ion chamber noise level (with beam OFF).
5. Open the *Hall D Ion Chambers – Expert* screen (**JTabs**⇒**Operations**⇒**Radcon**⇒**Hall D Ion Chambers**⇒**Expert**).



Procedure Steps

CAUTION: During this procedure Tune-Mode beam is intentionally mis-steered into the wall of the beam chamber (i.e., beam is “gronked”). The length of time beam dwells on the beam chamber should be minimized to avoid component damage and limit radiation.

1. Set the CW Crew Chief Permissive state to **CW Inhibit**.
2. Unmask all ion chamber FSD nodes (**JTabs**⇒**Operations**⇒**FSD**⇒**FSD Overview**⇒**TSB001**).

NOTE: See [Figure 1 on page 5](#) for a reference drawing showing the locations of all Hall D ion chambers, which are all located in the Hall D Tagger Vault.

3. Check with Hall D to verify that they are ready for beam. *??is this step necessary since beam never actually reaches Hall D proper??*
4. Establish 3 μA Tune-Mode beam to the Hall D dump. Were there any Hall D ion chamber trips while you were tuning beam?

NO YES →
Go to
[Step 5](#)

A. If an ion chamber trips during tune up, capture a screen shot of the tripped ion chamber for later inclusion in an ELog entry, then mask the ion chamber and continue tuning. It is okay to skip the functional test for the tripped ion chamber(s) later in this procedure; all that is needed to verify an ion chamber’s functionality (the goal of this procedure) is a documented trip associated with a specific beam-related action.

B. Go to Step 5, below.

5. Perform an AllSave and Twiddle Save the Hall D line correctors.
6. Clear any FSD trips, and capture a screen shot of the ion chambers that did not trip during Step 4, above.
7. Verify functionality of the East Wall ion chamber as follows.

NOTE: The East Wall ion chamber is located downstream of a permanent magnet, so it should only “see” beam when a radiator is inserted. To test its functionality before sending photon beam, background radiation is used in the following steps.

- a. Change the East Wall ion chamber setpoint to 10. Did this cause a trip?

YES NO → **A.** Reduce the setpoint to 5. Did this cause a trip?

YES NO → **B.** Reduce the setpoint to 1. Did this cause a trip?

YES NO → **C.** Call Safety System Group On-call.

- b. Capture a screen shot of the tripped East Wall ion chamber for inclusion in the final ELog entry at the end of this procedure.



8. Using correctors MBD5C11AH/V, mis-steer the beam in front of the target (use 1,000 G-cm steps) (capture screen shots of all trips in this and all following steps). Did the following ion chambers fault?

- Right and left goniometer
- Tagger flange
- Shield wall
- Labyrinth

NOTE: The dose rate readback is not always an accurate indicator of whether the ion chamber dose rate is rising. The readback response may not be fast enough to capture rapid increases.

YES NO → A. If at least one of these ion chambers did not fault, try the following to induce a beam-related trip (mask the other chambers if they have already tripped).

Go to
[Step 9](#)

- Move upstream and use the MBD5C11H & V correctors to mis-steer the beam (use 1,000 G-cm steps).

B. Were you able to make the ion chamber(s) fault?

YES NO → C. Increase the Tune-Mode beam current to 5 μ A and try to induce a trip. Were you able to cause a trip?

Go to
[Step H](#)

YES NO → D. Open a StripTool that shows the ion chamber readback response, and check to see if the readback increases when you attempt to induce a trip. Are you seeing a readback response but no resulting trip?

Go to
[Step H](#)

YES NO → E. Contact SSG on-call.

F. Using the StripTool information, try lowering the ion chamber trip point to a level where the ion chamber will trip. Were you able to induce a trip?

YES NO → G. Contact the MCC Group Leader.

H. Go to Step 9, below.

9. Reset the corrector(s) to their previous values and clear the FSD trips.
10. Has every Hall D ion chamber faulted at least once during this procedure?

WARNING: All Hall D ion chambers *must* pass the functional test (i.e., fault during the course of this procedure) before delivering beam to the hall.

YES NO → A. Contact the MCC Group Leader, and do not run beam to the hall.

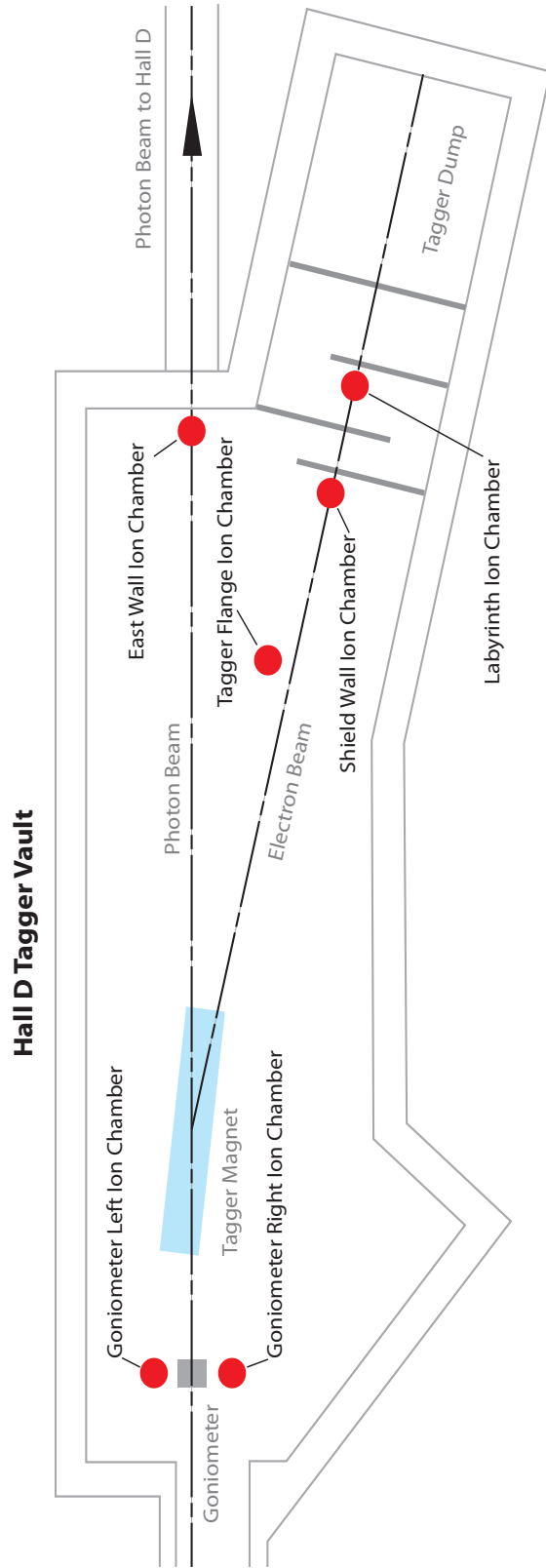
11. Verify that you have captured screen shots of all the faulted ion chambers. If not, repeat that portion of the procedure.
12. Change the Hall D ion chamber setpoints to ~10% above noise level/background with beam OFF.



13. Unmask all Hall D ion chamber FSD nodes.
14. The ion chamber functional test is complete. Make an appropriate ELog entry that includes the captured screen shots of all the faulted ion chambers. To adjust/calibrate the ion chamber trip points for specific physics beam delivery conditions, execute the [Hall D Ion Chamber Calibration Procedure](#).
15. PROCEDURE COMPLETE.



Appendix A - Hall D Ion Chamber Locations



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Figure 1: Hall D Ion Chamber Locations