

1AT1 Vacuum Leak Repair (W/P #C2020-1-24-1)

March 3, 2020

RonK

SUMMARY

After a few weeks of extensive local leak checking on the M11 B/L and the 1A B/L section between T1-1AT1 Collimator led to finding a very large leak on the T1 Monolith Vacuum vessel. Fast and high Helium detections were repeated when the helium probe was placed on the southwest corner of 1AQ9 magnet floor with the probe pointing southwest. This led to further investigation in the 1A Service Tunnel.

On February 6, 2020

The large vacuum air leak was confirmed at the south port of the T1 monolith vacuum vessel.

See TRIUMF Legacy Dwg D-3368 and the enclosed photos.

Investigation in the 1A Service Tunnel revealed a 4" Maron flange blank-off in a rectangular cavern approx. (12"W x 24"H x 36"L).

An Ion Chamber box approx. 7.5" Sq. was found in front of the Blank-off flange. It was carefully removed from the Cavern and placed on the tunnel floor after surface swipes were found clean with the RM-14 pancake and 44-2 monitors.

The Blank-off flange was heavily coated with iron rust particles which found 100 c/m on the Ludlum 26-3 Frisker monitor. Rad fields;

- Blank-off port was 7000uSv/Hr OC.
- Cavern opening at 1A Shield blocks was 750uSv/Hr @ 1M away.

Note: The T1 target was not removed from the B/L with the target in position 0. (raised up from the beam plane)

On February 7, 2020

The Blank-off and the Cavern cavity were vacuumed using RH's Nilfisk vacuum cleaner and a 3 Ft. Lg. tongs. The Blank-off with its flange clamp were remotely removed using the tongs.

Rad fields;

- Alum Blank-off flange was ~4000uSv/Hr, Swipes were ~1000 c/m on Ludlum 26-3 Frisker
- South T1 Port Swipes ~2000 c/m on Ludlum 26-3 Frisker

The south T1 port was remotely cleaned with Wipe-alls moistened with Methanol alcohol using the tongs. About four iterations were needed to complete the flange cleaning.

A new Alum blank-off, Buna-N O-ring and Clamp were installed hands on after a DOSE Estimate was filled in. As no Finger TLD's were available, Joe M. from RPG was consulted and approved this work task which took about 12 seconds receiving 0.017 mSv to the worker.

The 1A vacuum was re-established with no leaks detected when sprayed with Helium. The T1 vacuum pressure was quoted to be as good as it was in 2015 from Vacuum group records.

After fixing this T1 vacuum leak, the largest known leak in the T1 volume still remains at the M11 Septum bellows for the 1AM8/T1 Collimator joint. It's speculated that this leak has grown slightly but will be left as is as it does not appear to strain the current 1A vacuum pumps which means the additional M11 turbo pump will not be required at this time.

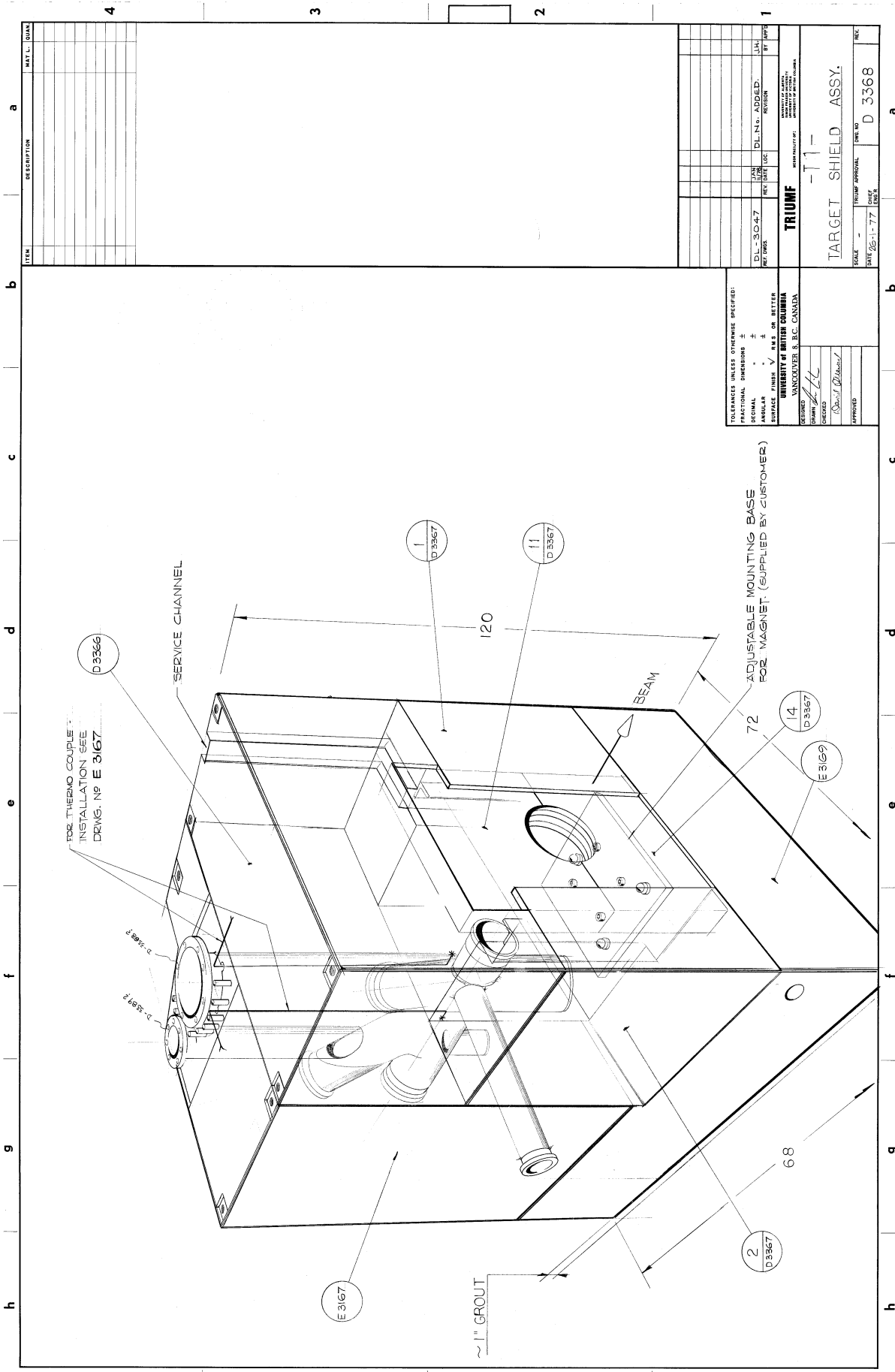
A four Ft. Lg. 1/8" copper tubing line was installed starting under the Blank-off flange leading out of the Cavern to the 1A Tunnel shielding for future Helium leak checking.

All the Diagnostic equipment involved with this Cavern were restored back as they were found. The Ion Chamber was carefully placed using the rust outline on the concrete as reference. The hand stack shielding was restored along with the 90° Detector probe which was then installed with the probe end inserted into a hole in one of the lead bricks.

Note:

- The outer insulation of the pair coax cables (RG 58 or 59?) with BNC connectors attached to the Ion Chamber were very brittle with pieces broken off exposing the meshed copper sheathing.
- This was reported to the Diagnostic group for investigation.

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ITEM	DESCRIPTION	MAT'L	QTY

DL - 3047	REV DATE	DL No. ADDED	BY APPR

UNIVERSITY OF BRITISH COLUMBIA
 VANCOUVER, B.C. CANADA

DESIGNED: *[Signature]*
 DRAWN: *[Signature]*
 CHECKED: *[Signature]*
 APPROVED: *[Signature]*

TOLERANCES UNLESS OTHERWISE SPECIFIED:
 FRACTIONAL DIMENSIONS ± .005
 DECIMAL DIMENSIONS ± .005
 ANGULAR DIMENSIONS ± .5
 HOLE LOCATIONS ± .010
 HOLE LOCATIONS ± .010

TRIUMF
 TARGET SHIELD ASSY.
 SCALE: AS SHOWN
 DATE: 2011-11-27
 TRUMP APPROVAL: *[Signature]*
 DWG NO: D 3368
 REV:

Ron K copy
2 FEB 2020

Tl Ion Chamber

83-F-ACC/GEN
BR/RP/OC24

Beam Development Shift, October 11, 1983

B. Rawnsley
Dr. G. Mackenzie
Operators - Shifts B and E

Ion Chamber Measurements of Tl Target Rates

Abstract

A multiplate ion chamber with ambient air as the working gas is installed in the Tl target shield and responds to ionizing radiation from the target. (Fig. 0).

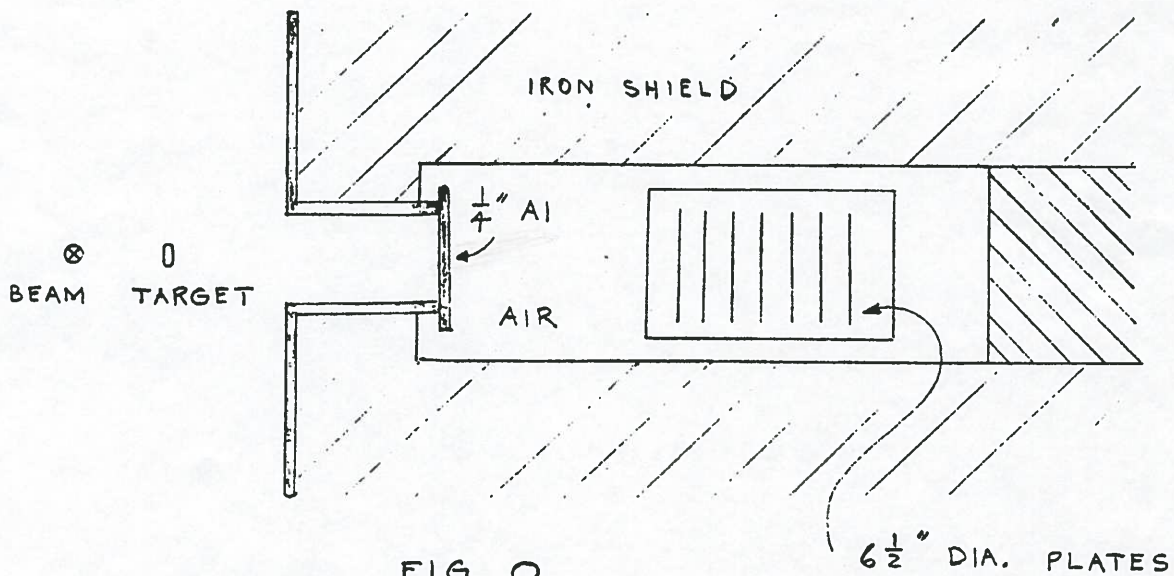


FIG. 0

Measurements were made of the rate from each of 5 targets on the Tl ladder as a function of beam current and also as a function of beam position with respect to the target. The measurements were made successfully by an operations crew following the instructions appended. The elapsed time was of the order of 6 hours.

We found that the flux from the solid targets varied linearly with beam current whereas that from the water targets deviated from linearity when the beam power input was 200 - 250 watts. This is probably due to nucleation and boiling, however, see section 7.

We also found a flux reduction at the tip of the water cooled 10 mm graphite target consistent with a 50-60% erosion over a 2 x 2 mm area.

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DSCN1642.jpg

1A Service Tunnel



T1 South Vac Port4.jpg



T1 South Vac Port1.jpg T1 Ion Chamber

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IMG_6019.jpg Before repair



T1 South Vac Port2.jpg T1 Ion Chamber



IMG_0434.jpg Removing leaking Blank-off flange

1AT1 Vacuum Leak Repair (W/P #C2020-1-24-1)



IMG_0441.jpg Removed Blank-off flange



IMG_0442.jpg T1 Target @ Position #0



IMG_0449.jpg New Blank-off flange installed



IMG_0450.jpg