Hall C Target Configuration November 28, 2022

Engineering Report

Thomas Jefferson National Accelerator Facility
12000 Jefferson Ave.
Newport News Virginia, 23606

Document Title: Hall C Target Configuration November 28, 2022	
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Author:	David Meekins
Check:	David Meekins
Approved:	David Meekins

Description: Configuration report for the Hall C Target ladder installed for the September 2022 run period. This document gives BDS positions, target thicknesses, cell thicknesses and overall assembly data.

1 Revision History

Revision: 0	10/2/2022	Original

2 Purpose and Scope

This report documents the configuration for the Hall C Target as installed for September 2022. Target thicknesses and uncertainties are included.

3 Target list and lifter positions

The following lifter positions were determined by alignment of the system. The BDS positions were adjusted for cooldown and vacuum motion by 4 mm down (larger BDS values).

Target Position	Actual	Adjusted for beam	Material
Loop 1 10 cm	31444060	31648860	LD2
Loop 2 10 cm	23870300	24075100	LH2
Optics 1 +/-8 cm	19112909	19317709	Carbon
10 cm Dummy	18300109	18504909	AL 7075
Lithium 7	16511949	16716749	Li7
Lithium 6	15374029	15578829	Li6
Be	14236109	14440909	Ca48
C (natural)	13098189	13302989	Carbon
B4C-11	11960269	12165069	B4C-11
B4C-10	10822349	11027149	B4C-10
Aluminum	9684429	9889229	Al
Copper	8546509	8751309	Cu
Titanium	7408589	7613389	Ti
Iron	6270669	6475469	Fe
Gold	5132749	5337549	Au
Calcium 40	3994829	4199629	Ca40
Empty	2856909	3061709	N/A
Hole	1817170	2021970	N/A
Home			

4 Target Thicknesses

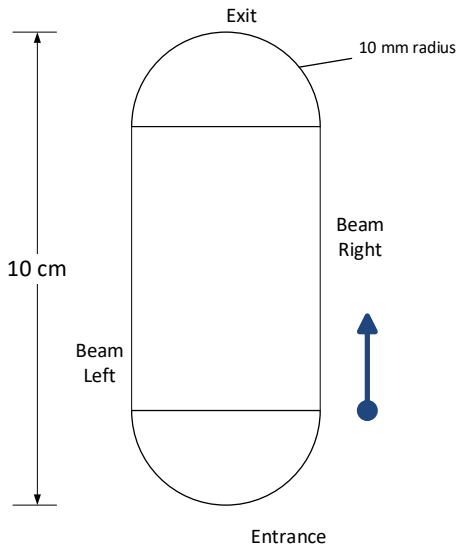
4.1 Cells

Hydrogen loops entrance and exit window thicknesses are given below. Loop 2 is connected to the H2 panel and Loop 1 is connected to the D2 panel.

Target	Entrance (mm)	Exit (mm)	Right (mm)	Left (mm)
Loop 1 (10 cm) Cell #3	0.168 ± 0.009	0.2024 ± 0.0.056	0.462 ± 0.0.011	0.330 ± 0.0.008
Loop 2 (10 cm) Cell #5	0.264 ± 0.082	0.208 ± 0.0.035	0.444 ± 0.0.015	0.329 ± 0.0.007

Each cell is 99.98 mm long. The entrance and exit of each cell was reduced by hand to values listed above. Uncertainties in the hand working process are larger than machine worked sides as expected. Target cells are fabricated from Al7075 (lot # 308151).
Material Certification (lot # 308151)for AL7075 to be used for Hall C 10 cm exit windows | Jefferson Lab Electronic Logbook (jlab.org)

A schematic of the cell is shown below:



4.2 Dummy Targets

The dummy targets are aluminum foils mounted on separate frames with foils located at Z positions corresponding to the cryotarget exit and entrance windows. The material is same as that of target cells.

Target	Thickness Total (g/cm^2)
10 cm Dummy Upstream	0.240 ± 0.003
10 cm Dummy Downstream	0.236 ± 0.003

4.3 Optics Target

The optics target has two positions with carbon (99.95% C) foils in a linear array with foils located nominally at:

1. Two foils located at Z = ± 8 cm

The nominal thickness of each carbon foil is: 0.044 ± 0.001 g/cm^2. This is same target that was used in the previous configuration (see TGT-RPT-22-003

4.4 Solid Targets

Solid targets are located on the solid target ladder nominally at Z = 0.

Target Position	Thickness (g/cm^2)	Chem Pure (%)	Enrichment (%)
Lithium 7	0.254±0.003	99.99	99.88
Lithium 6	0.225±0.0008	99.9	95
Beryllium	0.986±0.003	99.5	NAT
C (natural)	0.574±0.002	99.99	NAT
B4C-11	0.633 ± 0.002	99.99	99.8
B4C-10	0.576 ± 0.002	99.99	96.6
Aluminum	0.460±0.001	99.9	NAT
Copper	0.942±0.003	99.999	NAT
Gold	0.4047±0.0006	99.9	NAT
Ti	0.294±0.001	99.99	NAT
Fe-54	0.367±0.001	99.99	97.68
Ca40	0.785±003	99.99	99.97

Certified material test reports have been uploaded to the e-logs where available. The solid targets are centered at the nominal z=0 position prior to vacuum and cryo motion.

5 Alignment

Target was aligned on September 14, 2022. Data transmittal C2049 has been filed on the E-log. The solid target ladder used for the experiment was not installed at the time of the alignment to prevent exposure of Ca to air. Instead, a mock solid target ladder having only the hole target was installed. Using Hall coordinates the hole target was found to be 0.8 mm beam left and 0.0 mm vertical. Picture of the alignment configuration is shown below.