Hall A Target Configuration

January 2011

Revision History

1. January 31, 2011: Original document.
2. March 10, 2011: Added section for He target run period beginning March 10, 2011
3. November 11, 2011: Added calcium configuration for April run. Changed solid targets as well.

Overview

This document describes the Hall A target configuration for the run period beginning in February 2011. The following tables list the available targets and their BDS (lifter) positions for each running period. The hydrogen and deuterium loop positions are both allowed by the lifter and are loop 1 and 2 respectively. Loop 3 has a spacer for the future calcium target installation.

Target	Material/Description	BDS Encoder	Corrected Encoder
Loop1 15 cm	LD2	35185744	N/A
Loop1 4 cm	LD2	31610960	
Loop2 15 cm	LH2	28036176	
Loop2 4 cm	LH2	24461392	
Loop 3 Spacer	Calcium 48	20886608	
Loop 3 Spacer	Calcium 40	17311824	
Optics	Carbon	14397294	
Dummy 15 cm	Aluminum	13365584	
Dummy 4 cm	Aluminum	11739984	
BeO	BeO	9179984	
Solid Carbon	Carbon (5mm)	7554384	
Slanted Carbon	Carbon	3035983	
Empty	N/A	-1000000	

Standard Solid Target Ladder

The standard solid target ladder is installed. The following table lists the solid targets and their thicknesses. Errors reported are systematic and assume that the foil is of uniform thickness and density (that there are no voids in the material). The standard solid target ladder is shown in JLAB drawing TGT-101-5000-3001.

Target Name	Material	Purity	Thickness (g/cm^2)
BeO	BeO	99.0%	0.149 ± 0.001
Carbon	C	99.95%	0.8918±0.0008

Slanted Carbon	C	99.9%	0.0419±0.0005

Optics target thicknesses

The optics target consists of 13 carbon foils cut from the same sheet. The foils are 99.5% chemically pure carbon. Each foil is 0.0248 ± 0.001 g/cm^2. Upstream face of each foil is located at 0 cm, ±2.5 cm, ±5 cm , ±7.5 cm , ±10 cm , ±12.5 cm, and ± 15 cm. The optics target assembly is shown in JLAB Drawing TGT-101-5001-3012.

Dummy Target

The dummy target foils moved from the previous installation and are now placed such that the front faces of the foils are ± 5.0 cm ± 10 cm from the nominal center line for the 10 and 20 cm dummy targets respectively. The target foils and assembly are shown in JLAB drawing TGT-101-5000-3003. The thicknesses of these foils are shown below. The target foils are made from AL 7075 T-6 plate (this is the same as the cell).

Target	Position	Thickness (g/cm^2)
10 cm dummy	Upstream -5 cm	0.275±0.0003
	Downstream +5 cm	0.270±0.0003
20 cm dummy	Upstream -5 cm	0.427±0.0005
	Downstream +5 cm	0.429±0.0005

Measurements do not take into account any void in the material. The measurement assumes that the material free of voids and is of uniform thickness. The thickness uniformity was measured on both foils and found to be within 0.05 cm.

4 and 15 cm Cells

The target cells are installed at the top of the stack. The cell thicknesses are measured with a MagnaMike Hall Effect gauge. The thickness data for Loops 1 and 2 are given in the first table below. An average of many shots is taken for each position.

Target Position	Entrance window thickness (mm)	Exit window thickness (mm)	Wall thickness (mm)
Loop 2 top 15 cm	0.081 ± 0.004	0.207 ± 0.055	No data
Loop 2 bottom 4 cm	0.145 ± 0.004	0.149 ± 0.008	0.141 ± 0.014
Loop 1 top 4 cm	0.110 ± 0.004	0.147 ± 0.008	0.142 ± 0.021
Loop 1 bottom 15 cm	0.128 ± 0.002	0.194 ± 0.009	No data

Loop 1 and 2 Cell thicknesses.

Pictures

Pictures are included in the DocuShare folder containing this document.

Helium Run Period March 10, 2011

The cells in the loops were changed to newer slightly thicker cells with a 1.25" OD. The wall additional wall thickness was needed to contain the helium at higher pressures. Below is a list of the targets and positions.

Target	Material/Description	BDS Encoder	Corrected Encoder
Loop1 10 cm	He	35185744	N/A
Loop1 20 cm	He	31610960	
Loop2 10 cm	LD2	28036176	
Loop2 20 cm	LD2	24461392	
Loop 3 Spacer	N/A	20886608	
Loop 3 Spacer	N/A	17311824	
Optics	Carbon	14397294	
Dummy 15 cm	Aluminum	13365584	
Dummy 4 cm	Aluminum	11739984	
BeO	BeO	9179984	
Solid Carbon	Carbon (5mm)	7554384	
Slanted Carbon	Carbon	3035983	
Empty	N/A	-1000000	

The optics target was also modified such that every other foil has been removed. The upstream face of each foil is now located at 0 cm, ±5 cm, ±10 cm, and ± 15 cm.

High Pressure Cells

The high pressure cells are made from aluminum 7075-T6. The cell wall thicknesses were measured using the Magna-Mike. Multiple measurements were made for a given location and then averaged. The systematic uncertainty on the measurements is 0.0001 inches. The measurements are summarized below. The recorded error is statistical only.

Position	Entrance Window Thickness (in)	Exit Window Side Wall (in)	Exit Window Nose (in)
Loop 1 10 cm	0.0107±0.0002	0.0132±0.0007	0.0142±0.0005
Loop 1 20 cm	0.0108±0.0001	0.0129±0.0006	0.0139±0.0005
Loop 2 10 cm	0.0104±0.0001	0.0126±0.0006	0.0141±0.0005
Loop 2 20 cm	0.0107±0.0001	0.0129±0.0011	0.0142±0.0002
Loop 3 20 cm	0.0107±0.0001	0.0129±0.001	0.0141±0.0002
Loop 3 20 cm	0.0107±0.0001	0.0129±0.001	0.0141±0.0002

Calcium Target

Loop 3 top and bottom cells contained a vacuum and a calcium 48 and 40 disk respectively. The thickness of the calcium 48 was difficult to determine because of the rounded edges of the pellet. The measured density of the disk will therefore err on the low side and is 0.779±0.005 gm/cm^2. The calcium 40 pellet was made at JLAB and contained surface imperfections on the 1-3% level. The density of this

pellet was measured to be 0.889±0.01 g/cm^2. Adjusting for the radius on the edge of the calcium 48 pellet gives more error but perhaps a more correct density. This analysis gives a density of 0.819±0.01 g/cm^2.