



# Jefferson Lab Alignment Group

## Data Transmittal

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**DATE:** 18 Jan 2024

**FROM:** Elena Balan

**Checked:** cg

**# :** B2094\_revA

### DETAILS:

M:\align\DATA\Inspection\HallB\CRYO TARGET\240111A  
M:\align\DATA\Step2B\HALLB\FTC\240109A  
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Hall B Forward Tagger was surveyed multiple times in January 2024. The Beam Following coordinates are the offset amount from the designed (ideal) location, where positive X is the beam left, positive Y is above and positive Z is downstream from the ideal position. The delta angles are the difference from the design shown in degrees, in a right-hand rule. D Yaw is a positive counter-clockwise about the Y axis; d Pitch is counterclockwise about the X axis; d Roll is positive about the Z axis

The following table is the as-found position reported in data transmittal B1887 from 2018.

CEBAF Coord. Ideal			
COMPONENT	X[m]	Y[m]	Z[m]
FWDTAG	-80.60000	103.35526	-400.81933

Beam Following Movements						
Epoch	dx [mm]	dy [mm]	dz [mm]	d Yaw	d Pitch	d Roll
July 18.2018	0.12	0.374	-4.36	0.2272	0.0046	-0.3495

Below are the results of the post-run survey measured on 1/4/2024. The shield configuration is "FT\_OFF".

CEBAF Coord.				Beam Following Coord.					
COMPONENT	X[m]	Y[m]	Z[m]	Dx [mm]	Dy [mm]	dz [mm]	dYaw [deg.]	dPitch [deg.]	dRoll [deg.]
FWDTAG	-80.60023	103.35422	-400.81452	0.23	-1.04	-4.81	0.1974	0.0808	0.4976

Measurements of the shielding were made post-run. Two measurements of the FT\_OFF configuration were made. The first measurement is with the springs installed incorrectly, and the second was made after the spring correction. In the beam following system, the Z values are relative to the **As-Set** position of the Cryo target.

		CEBAF Coord. Measured	Beam Following Coord.		
COMPONENT		Z[m]	dx[mm]	dy[mm]	dz[mm]
FT_OFF_US Face /springs incorrectly installed		-399.27342	0.20	-7.6	481.52
FT_OFF_US Face/springs correctly installed		-399.27355	0.19	-6.74	481.65
FT_ON_US Face		-399.58176	0.79	-3.22	789.86
Forward tagger hub_US Face		-400.45994	0.53	-1.21	1668.04

Based on the as-found results of the two configurations, it was decided to pitch the upstream end of FT\_ON ~ 1.3mm up in an effort to equally distribute the error between FT\_ON and FT\_OFF. The following results reflect the as-build locations.

	CEBAF Coord. Measured			Beam Following Coord.					
COMPONENT	X[m]	Y[m]	Z[m]	Dx [mm]	Dy [mm]	Dz [mm]	dYaw [deg.]	dPitch [deg.]	dRoll [deg.]
FWDTAG	-80.60000	103.35466	-400.81466	0.00	-0.60	-4.67	0.2077	-0.0748	0.3690

	CEBAF Coord. Measured	Beam Following Coord.		
COMPONENT	Z[m]	dx[mm]	dy[mm]	dz[mm] Relative to CryoTgt. As-Set
FT_ON_US Face	-399.58185	0.07	1.35	789.95

Once the shield corrections were made, the final as-found survey of the forward tagger and FT\_OFF shielding was carried out.

	CEBAF Coord. Measured			Beam Following Coord.					
COMPONENT	X[m]	Y[m]	Z[m]	Dx [mm]	Dy [mm]	Dz [mm]	dYaw [deg.]	dPitch [deg.]	dRoll [deg.]
FWDTAG	-80.59993	103.35442	-400.81466	-0.07	-0.84	-4.67	0.2341	-0.0602	0.3570

	CEBAF Coord. Measured	Beam Following Coord.		
COMPONENT	Z[m]	dx[mm]	dy[mm]	dz[mm] Relative to Cryo Tgt. As-Set
FT_OFF_US Face	-399.27351	-0.97	-1.11	481.61

Below are the Forward Tagger fiducials provided by the Hall B design team. The table reflects the fit of those points as well as the weighting. The first table shows all of the fiducials fixed and the standard deviation. The second table shows the weighting method used from the 2018 B1887 report along with the standard deviation.

The pillar names have been assigned such that the number corresponds to the sector and the letter reflects the position either Upstream or Downstream. Each of the pillar ideals have a 25.4mm radial offset to account for the retroreflector offset.

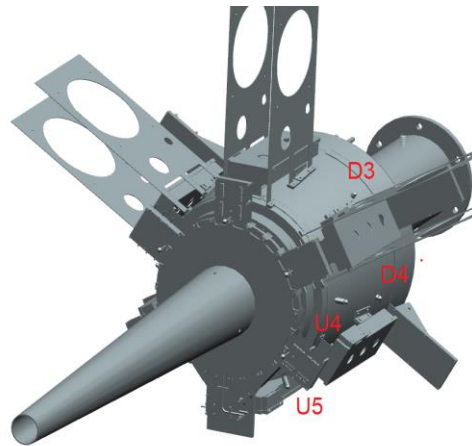
	Measured			Ideal								
name	x[mm]	y[mm]	z[mm]	X[mm]	Y[mm]	Z[mm]	DX[mm]	DY[mm]	DZ[mm]	X	Y	Z
U1	249.03	1.76	-92.73	247.50	0.00	-93.20	1.53	1.76	0.47	FIX	FIX	FIX
U4	-246.06	-1.64	-92.58	-247.50	0.00	-93.20	1.44	-1.64	0.62	FIX	FIX	FIX
U5	-102.59	-223.20	-93.39	-104.60	-224.31	-93.20	2.01	1.11	-0.19	FIX	FIX	FIX
U6	98.85	-225.93	-93.32	104.61	-224.30	-93.20	-5.76	-1.63	-0.12	FIX	FIX	FIX
D1	259.49	-52.76	92.31	259.64	-50.47	92.10	-0.15	-2.29	0.21	FIX	FIX	FIX
D2	175.94	199.42	91.73	176.99	196.56	92.10	-1.05	2.86	-0.37	FIX	FIX	FIX
D3	-176.42	198.62	92.35	-176.99	196.56	92.10	0.57	2.06	0.25	FIX	FIX	FIX
D4	-258.24	-52.71	91.23	-259.64	-50.47	92.10	1.40	-2.24	-0.87	FIX	FIX	FIX

Std. dev = 2.10

Below is the weighting scheme used on DT B1887.

name	Measured			Ideal								
	x[mm]	y[mm]	z[mm]	X[mm]	Y[mm]	Z[mm]	DX[mm]	DY[mm]	DZ[mm]	X	Y	Z
U1	248.06	-0.71	-92.99	247.50	0.00	-93.20	0.56	-0.71	0.21	FIX	FIX	FIX
U4	-247.03	-2.10	-92.32	-247.50	0.00	-93.20	0.47	-2.10	0.88	FIX	UNK	FIX
U5	-104.47	-224.24	-93.33	-104.60	-224.31	-93.20	0.13	0.07	-0.13	FIX	FIX	FIX
U6	96.96	-227.79	-93.47	104.61	-224.30	-93.20	-7.65	-3.49	-0.27	UNK	UNK	FIX
D1	258.49	-55.32	92.03	259.64	-50.47	92.10	-1.15	-4.85	-0.07	FIX	UNK	FIX
D2	175.97	197.20	91.59	176.99	196.56	92.10	-1.02	0.64	-0.51	FIX	FIX	FIX
D3	-176.39	197.83	92.58	-176.99	196.56	92.10	0.60	1.27	0.48	FIX	UNK	FIX
D4	-259.23	-53.16	91.50	-259.64	-50.47	92.10	0.41	-2.69	-0.60	FIX	UNK	FIX

Std. dev = 0.58



Below are the results of the Cryo Target survey and scattering chamber inspection carried out on the 11<sup>th</sup> of January, 2024. The end of the scattering chamber was measured under vacuum as well as at atmosphere.

	CEBAF Coord. Ideal		
COMPONENT	X[m]	Y[m]	Z[m]
CryoTarget	-80.60000	103.35526	-398.82153

	CEBAF Coord. Measured			Beam Following Coord.					
COMPONENT	X[m]	Y[m]	Z[m]	dx [mm]	dy [mm]	dz [mm]	dyaw [deg.]	dPitch [deg.]	Droll [deg.]
Cryo Target	-80.59983	103.35543	-398.79190	-0.17	0.17	-29.60	0.0059	-0.0042	-0.0058

The scattering chamber results are relative to the “CELL CENTER” shown in the following drawing.

	Beam Following Coord.		
COMPONENT	dx[mm]	dy[mm]	dz[mm]
GR-CELL_BASE	0.08	-0.29	-86.05
GR-HEAT_SHIELD	-0.70	-0.40	-204.60
GR-MOUNT_MID_FLG	1.07	-0.04	-1315.36
GR-MOUNT_MID_IN	1.08	-0.04	-1322.35
Scatter_Chamber_atm			272.05
Scatter_Chamber_Vac			271.89

