



Jefferson Lab Alignment Group

Data Transmittal

TO: B. Miller, D. Kashy

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FROM: Chris Gould

Checked:

: B1698

DETAILS:

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Below are the results of the Torus magnet survey carried out on February 10th, 2016. The coordinate system was established using the intersection of the adjacent vacuum jacket planes to define the Z axis. The origin is at the design zero point in drawing B00000-04-01-1101. Values are in mm.

The upstream and downstream hub locations are given in three coordinates systems. The first is relative to the vacuum jacket coordinate system described above. The second is in a beam following system where Z is pointing downstream, X is pointing beam left and Y is pointing up. The third is relative to the CEBAF metric system.

	Relative to VJ				Relative to straight ahead beam				CEBAF System [meters]		
	X	Y	Z		X	Y	Z		X	Y	Z
HUB_US	-0.50	0.20	500.00		-1.22	-1.89	-16.21		-80.59878	103.35337	-401.70401
HUB_DS	1.08	2.21	2448.72		0.05	-0.96	-16.82		-80.60005	103.35430	-403.65272

	VJ relative to Straight Ahead Beam		
	X	Y	Z
US_VJ	-0.65	-2.10	16.21
DS_VJ	-0.63	-3.18	16.82

The found fiducial coordinates relative to the Vacuum Jacket coordinate system are below. A circle was formed to the found upstream and downstream data. The Radial error is to the 'fit' data.

Upstream Points Found				Ideals			Deltas			Radial Error
Coil	x	y	z	x	y	z	x	y	z	
A	-0.57	3206.42	-511.68	0.00	3207.24	-506.90	-0.57	-0.82	-4.78	-0.82
B	-2778.15	1603.04	-508.21	-2777.55	1603.62	-506.90	-0.60	-0.58	-1.31	0.23
C	-2779.43	-1603.25	-503.96	-2777.55	-1603.62	-506.90	-1.88	0.37	2.94	1.44
D	-0.57	-3208.70	-503.30	0.00	-3207.24	-506.90	-0.57	-1.46	3.60	1.46
E	2775.86	-1604.55	-509.10	2777.55	-1603.62	-506.90	-1.69	-0.93	-2.20	-0.99
F	2776.07	1602.51	-512.51	2777.55	1603.62	-506.90	-1.48	-1.11	-5.61	-1.83
Downstream Points Found				Ideals			Deltas			Radial Error
Coil	x	y	z	x	y	z	x	y	z	
A	-0.02	4213.92	871.93	0.00	4212.84	878.30	-0.02	1.08	-6.37	1.08
B	-3649.86	2105.68	876.75	-3648.43	2106.42	878.30	-1.43	-0.74	-1.55	0.87

C	***	***	***	-3648.43	-2106.42	878.30	***	***	***	***
D	1.43	-4212.60	883.10	0.00	-4212.84	878.30	1.43	0.24	4.80	-0.24
E	***	***	***	3648.43	-2106.42	878.30	***	***	***	***
F	3648.71	2107.00	870.61	3648.43	2106.42	878.30	0.28	0.58	-7.69	0.54

Circle Centers and Radius from above fit circles:					
	X	Y	Z		
				Calced Radius	Design Rad
Coil_US	-1.30	-1.11	-508.13	3207.16	3207.24
Coil_DS	-0.19	0.65	877.05	4213.24	4212.84

Using the lines formed from the found exterior tooling balls to the found hub line, the adjacent angles were calculated for each cryostat in the upstream and downstream positions.

UPSTREAM		DOWNSTREAM	
	DEGREES		DEGREES
CA TO CB	60.0118	CA TO CB	60.0369
CB TO CC	59.9720	CA TO CD	179.9898
CC TO CD	60.0138	CB TO CD	119.9529
CD TO CE	59.9731	CD TO CF	119.9814
CE TO CF	60.0166	***	***
CF TO CA	60.0127	CF TO CA	60.0288

Below are the locations of the Stay Bars with each coil rotated to the Coil A position. The numbering convention follows DWG. B00000-04-01-1302.

	FOUND			IDEAL		DELTA	
	Y	Z		Y	Z	Y	Z
COIL A							
SB 32 Back	3446.24	1219.10		3445.55	1224.64	0.69	-5.54
SB 32 Front	3446.87	1220.21		3445.55	1224.64	1.32	-4.43
SB 8 Back	968.36	698.77		968.39	699.43	-0.03	-0.66
SB 2 Front	611.78	852.13		611.42	851.93	0.36	0.20
COIL B							
SB 32 Back	3444.65	1222.40		3445.55	1224.64	-0.90	-2.24
SB 27 Front	2941.66	1015.41		2942.25	1016.64	-0.59	-1.23
SB 2 Back	610.77	852.39		611.42	851.93	-0.65	0.46
COIL C							
SB 32 Back	3443.42	1225.54		3445.55	1224.64	-2.13	0.90
SB 32 Front	3444.05	1226.67		3445.55	1224.64	-1.50	2.03
SB 2 Back	609.89	853.00		611.42	851.93	-1.53	1.07
SB 2 Front	608.92	853.27		611.42	851.93	-2.50	1.34

COIL D								
SB 32 Back	3444.51	1225.27			3445.55	1224.64	-1.04	0.63
SB 27 Front	2942.08	1017.43			2942.25	1016.64	-0.17	0.79
SB 2 Back	610.28	853.22			611.42	851.93	-1.14	1.29
SB 2 Front	611.32	853.11			611.42	851.93	-0.10	1.18
COIL E								
SB 32 Back	3445.03	1219.70			3445.55	1224.64	-0.52	-4.94
SB 27 Front	2940.84	1013.45			2942.25	1016.64	-1.41	-3.19
SB 2 Back	610.00	852.80			611.42	851.93	-1.42	0.87
SB 2 Front	609.79	852.30			611.42	851.93	-1.63	0.37
COIL F								
SB 27 Back	2941.91	1010.64			2942.25	1016.64	-0.34	-6.00
SB 32 Front	3445.75	1218.16			3445.55	1224.64	0.20	-6.48
SB 2 Back	610.55	851.91			611.42	851.93	-0.87	-0.02
SB 2 Front	610.66	851.70			611.42	851.93	-0.76	-0.23

Below are the Oops Centroids with each coil rotated to the Coil A position. The X value gives the offset to the YZ plane of the Vacuum Jacket coordinate system.

OOPS CENTROID	X				X		
COIL A				COIL D			
BACK US	96.00			BACK US	96.75		
BACK DS	96.34			BACK DS	96.53		
FRONT US	-98.47			FRONT US	-97.14		
FRONT DS	-98.42			FRONT DS	-97.29		
COIL B				COIL E			
BACK US	98.26			BACK US	98.79		
BACK DS	***			BACK DS	97.65		
FRONT US	-96.06			FRONT US	-95.46		
FRONT DS	-96.92			FRONT DS	-96.20		
COIL C				COIL F			
BACK US	97.27			BACK US	97.03		
BACK DS	95.44			BACK DS	96.86		
FRONT US	-97.25			FRONT US	-96.29		
FRONT DS	-98.78			FRONT DS	***		

Below are the Z values of the small inner and outer upstream planes of the vacuum jackets.

		Z			Z
COIL A OUTER		-675.13		COIL D OUTER	-665.53
COIL A INNER		404.71		COIL D INNER	403.78
COIL B OUTER		-671.39		COIL E OUTER	-672.85

COIL B INNER		402.75		COIL E INNER		404.72
COIL C OUTER		-667.32		COIL F OUTER		-675.38
COIL C INNER		404.11		COIL F INNER		403.63

Distance from the Vacuum Jacket to the ideal coil center.

	MIN	AVG	MAX	DIST. BETWEEN AVGS.
A_BACK	60.43	61.12	61.83	124.69
A_FRONT	62.28	63.57	64.87	
B_BACK	60.34	61.78	62.87	124.66
B_FRONT	62.07	62.88	63.70	
C_BACK	61.45	62.29	63.07	124.03
C_FRONT	60.21	61.74	63.27	
D_BACK	59.71	61.27	62.93	124.73
D_FRONT	62.24	63.46	64.68	
E_BACK	60.16	61.12	62.08	122.91
E_FRONT	60.61	61.79	63.60	
F_BACK	61.09	63.34	65.59	125.13
F_FRONT	60.68	61.79	63.10	

Distance from the tooling balls to the bisected plane of the measured Vacuum Jacket.

CAH_US	0.43
CA_US	-1.22
CA_DS	-0.99
CBH_US	0.99
CB_US	-1.73
CB_DS	-2.02
CDBH_US	1.73
CDB_US	-0.34
CDB_DS	-2.21
CFH_US	-0.68
CF_US	-2.57
CF_DS	-2.00

The main supports were not measured in this survey. The coordinates were calculated by transforming the measured data of the previous survey into the Vacuum Jacket coordinate system.

	X	Y	Z
CB_ZUP	-3467.79	1986.24	-318.60
CD_ZUP	-2.20	-3997.28	-310.92
CF_ZUP	3464.50	1998.41	-323.78
S1_US_Y	2922.25	508.87	-464.18
S1_DS_Y	3792.18	511.69	921.13
S4_US_Y	-2926.60	508.23	-461.52
S4_DS_Y	-3796.12	509.35	928.39
S1_US_VJ_Y	2967.27	-747.50	-433.03
S1_DS_VJ_Y	3815.31	-744.74	933.43
S4_US_VJ_Y	-2964.86	-747.83	-425.96
S4_DS_VJ_Y	-3811.90	-748.62	921.76