



Jefferson Lab Alignment Group

Data Transmittal

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Checked:

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DETAILS:

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Below are the results of the Torus magnet survey carried out on March 04, 2016. The coordinate system was established using the intersection of the adjacent vacuum jacket planes to define the Z axis. Roll is controlled by the bisected planes of vacuum jackets B, C, E and F. 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	-0.96	-1.02	500.00	-0.94	-1.67	0.50	-80.59906	103.35359	-401.68900
HUB DS	-0.28	-0.70	2448.44	-0.99	-1.40	0.84	-80.59901	103.35386	-403.63744

	VJ relative to Straight Ahead Beam		
	X	Y	Z
US_VJ	0.02	-0.65	-1.14
DS_VJ	-0.70	-0.70	-1.14

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	-0.80	3205.97	-508.44	0.00	3207.24	-506.90	-0.80	-1.27	-1.54	-1.27
B	-2778.58	1602.49	-507.59	-2777.55	1603.62	-506.90	-1.03	-1.13	-0.69	0.32
C	-2779.32	-1604.92	-508.03	-2777.55	-1603.62	-506.90	-1.77	-1.30	-1.13	2.18
D	-0.41	-3208.79	-506.42	0.00	-3207.24	-506.90	-0.41	-1.55	0.48	1.55
E	2776.06	-1604.74	-508.22	2777.55	-1603.62	-506.90	-1.49	-1.12	-1.32	-0.73
F	2776.08	1602.90	-508.77	2777.55	1603.62	-506.90	-1.47	-0.72	-1.87	-1.63

Downstream Points Found				Ideals			Deltas			Radial Error
Coil	x	y	z	x	y	z	x	y	z	
A	-1.17	4212.21	876.24	0.00	4212.84	878.30	-1.17	-0.62	-2.06	-0.63
B	-3650.51	2103.71	877.63	-3648.43	2106.42	878.30	-2.08	-2.71	-0.67	0.45
C	***	***	***	-3648.43	-2106.42	878.30	***	***	***	***
D	1.08	-4214.13	878.85	0.00	-4212.84	878.30	1.08	-1.29	0.55	1.29
E	***	***	***	3648.43	-2106.42	878.30	***	***	***	***
F	3647.86	2105.86	875.42	3648.43	2106.42	878.30	-0.57	-0.56	-2.88	-0.77

Circle Centers and Radius from above fit circles:						
	X	Y	Z		Calced Radius	Design Rad
Coil_US	-1.40	-1.40	-507.91		3207.31	3207.24
Coil_DS	-0.71	-0.96	876.44		4213.17	4212.84

Below are the Oops Centroids relative to the ZY plane of the vacuum jacket coordinate system with each VJ rotated in coil A's position. The X value gives the offset to the YZ plane of the Vacuum Jacket coordinate system.

	FOUND			IDEAL			DELTA		
OOPS CENTROID	X	Y	Z	X	Y	Z	X	Y	Z
COIL A									
FRONT US	-99.14	1608.99	439.47	-96.60	1608.21	440.46	-2.54	0.78	-0.99
FRONT DS	-98.57	2013.43	1437.61	-96.60	2011.74	1439.26	-1.97	1.69	-1.65
BACK US	95.33	1549.19	462.89	96.60	1549.33	464.24	-1.27	-0.14	-1.35
BACK DS	95.89	1954.28	1461.00	96.60	1952.91	1463.17	-0.71	1.37	-2.17
COIL B									
FRONT US	-96.14	1608.01	440.21	-96.60	1608.21	440.46	0.46	-0.20	-0.25
FRONT DS	-97.36	2011.98	1438.56	-96.60	2011.74	1439.26	-0.76	0.24	-0.70
BACK US	98.54	1549.24	464.27	96.60	1549.33	464.24	1.94	-0.09	0.03
BACK DS	97.10	1952.82	1462.65	96.60	1952.91	1463.17	0.50	-0.09	-0.52
COIL C									
FRONT US	-96.18	1607.35	441.13	-96.60	1608.21	440.46	0.42	-0.86	0.67
FRONT DS	-98.45	2010.52	1439.66	-96.60	2011.74	1439.26	-1.85	-1.22	0.40
BACK US	97.62	1547.87	465.56	96.60	1549.33	464.24	1.02	-1.46	1.32
BACK DS	95.50	1951.72	1464.73	96.60	1952.91	1463.17	-1.10	-1.19	1.56
COIL D									
FRONT US	-96.69	1606.65	441.14	-96.60	1608.21	440.46	-0.09	-1.56	0.68
FRONT DS	-96.96	2010.82	1439.44	-96.60	2011.74	1439.26	-0.36	-0.92	0.18
BACK US	97.15	1547.98	463.89	96.60	1549.33	464.24	0.55	-1.35	-0.35
BACK DS	96.87	1951.82	1462.74	96.60	1952.91	1463.17	0.27	-1.09	-0.43

	Found			Ideal			Delta		
	X	Y	Z	X	Y	Z	X	Y	Z
COILE									
FRONT US	-95.64	1605.46	438.55	-96.60	1608.21	440.46	0.96	-2.75	-1.91
FRONT DS	-96.13	2010.44	1436.19	-96.60	2011.74	1439.26	0.47	-1.30	-3.07
BACK US	98.74	1545.10	460.13	96.60	1549.33	464.24	2.14	-4.23	-4.11
BACK DS	98.07	1952.05	1460.54	96.60	1952.91	1463.17	1.47	-0.86	-2.63
COIL F									
FRONT US	-97.16	1606.98	438.01	-96.60	1608.21	440.46	-0.56	-1.23	-2.45
FRONT DS	-96.96	2012.47	1435.70	-96.60	2011.74	1439.26	-0.36	0.73	-3.56
BACK US	96.27	1547.63	462.12	96.60	1549.33	464.24	-0.33	-1.70	-2.12
BACK DS	96.54	1953.21	1459.22	96.60	1952.91	1463.17	-0.06	0.30	-3.95
S1								average z	-1.14
US	250.29	-0.30	780.75						
S4									
US	-253.11	0.45	781.71						

Below are the X values of the Oops Nuts relative to the ideal ZY plane of the vacuum jacket coordinate system with each VJ rotated into Coil A's position. The distance between the front and back nuts of VJ's A and D are given as well.

OOPS NUT PLANE	MEAS.	IDEAL	DELTA				MEAS.	IDEAL	DELTA
CA_F_US	-94.27	-93.40	-0.87			A_US_F-B	187.42	186.80	0.62
CA_F_DS	-94.88	-93.40	-1.48			A_DS_F-B	187.47		0.67
CA_B_US	93.15	93.40	-0.25						
CA_B_DS	92.60	93.40	-0.80						
CB_F_US	-92.77	-93.40	0.63						
CB_F_DS	-94.61	-93.40	-1.21						
CC_F_US	-93.97	-93.40	-0.57						
CC_F_DS	-96.35	-93.40	-2.95						
							MEAS.	IDEAL	DELTA
CD_F_US	-92.22	-93.40	1.18			D_US_F-B	187.10	186.80	0.30
CD_F_DS	-93.42	-93.40	-0.02			D_DS_F-B	187.27		0.47
CD_B_US	94.88	93.40	1.48						
CD_B_DS	93.85	93.40	0.45						
CE_B_US	95.09	93.40	1.69						
CE_B_DS	94.80	93.40	1.40						
CF_B_US	94.10	93.40	0.70						
CF_B_DS	94.75	93.40	1.35						
S1_US	248.94								
S4_US	-251.12								

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

CAH	0.16	CDH	1.22
CA_US OUTSIDE	0.15	CD_US OUTSIDE	0.57
CA_DS OUTSIDE	-0.40	CD_DS OUTSIDE	0.04
CBH	-1.66	CEH	2.87
CB_US OUTSIDE	-1.72	CE_US OUTSIDE	0.98
CB_DS OUTSIDE	-1.76		
		CFH	0.35
CCH	-2.04	CF_US OUTSIDE	-1.90
CC_US OUTSIDE	-1.42	CF_DS OUTSIDE	-0.56

Coil fiducials relative to the ideal ZY plane with each coil rotated into Coil A's position.

	FOUND				IDEAL				DELTA		
	X	Y	Z		X	Y	Z		X	Y	Z
CAH	-1.35	170.56	492.12		0.00	171.50	492.06		-1.35	-0.94	0.06
CA_US	-0.80	3205.97	-508.44		0.00	3207.24	-506.90		-0.80	-1.27	-1.54
CA_DS	-1.17	4212.21	876.24		0.00	4212.84	878.30		-1.17	-0.62	-2.06
AVERAGE	-1.11										
CBH	-1.10	171.86	492.10		0.00	171.50	492.06		-1.10	0.36	0.04
CB_US	-1.49	3207.56	-507.59		0.00	3207.24	-506.90		-1.49	0.33	-0.69
CB_DS	-3.39	4213.29	877.63		0.00	4212.84	878.30		-3.39	0.45	-0.67
AVERAGE	-1.99										
CCH	-0.57	172.94	492.29		0.00	171.50	492.06		-0.57	1.44	0.23
CC_US	-0.25	3209.42	-508.03		0.00	3207.24	-506.90		-0.25	2.18	-1.13
AVERAGE	-0.41										
CDH_U	0.76	172.64	492.18		0.00	171.50	492.06		0.76	1.14	0.12
CD_US	0.41	3208.79	-506.42		0.00	3207.24	-506.90		0.41	1.55	0.48
CD_DS	-1.08	4214.13	878.85		0.00	4212.84	878.30		-1.08	1.29	0.55
AVERAGE	0.03										
CEH	1.38	171.27	492.14		0.00	171.50	492.06		1.38	-0.23	0.08
CE_US	1.72	3206.51	-508.22		0.00	3207.24	-506.90		1.72	-0.72	-1.32
AVERAGE	1.55										
CFH_U	0.46	170.30	492.11		0.00	171.50	492.06		0.46	-1.20	0.05
CF_US	-0.11	3205.61	-508.77		0.00	3207.24	-506.90		-0.11	-1.63	-1.87
CF_DS	0.20	4212.07	875.42		0.00	4212.84	878.30		0.20	-0.77	-2.88

Distance from the Vacuum Jacket to the ideal coil center.

	X	AVERAGE	DIST. BETWEEN
VJA_F	-63.03	-1.22	123.61
VJA_B	60.58		
VJB_F	-62.53	-0.62	123.83
VJB_B	61.30		
VJC_F	-62.64	-0.34	124.60
VJC_B	61.96		
VJD_F	-63.07	-1.03	124.09
VJD_B	61.02		
VJE_F	-62.16	-0.13	124.06
VJE_B	61.90		
VJF_F	-61.84	0.04	123.77
VJF_B	61.93		

The main Z&Y supports relative to the vacuum jacket coordinate system.

	Y	Z
Z_BR		-317.61
Z_CNTR		-315.10
Z_BL		-318.98
Y_USBL	509.56	
Y_DSBL	512.84	
Y_USBR	508.51	
Y_DSBR	509.03	