Jefferson Lab Alignment Group

Data Transmittal

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DETAILS: data : inspection\hallb\vac_jacket\hall_b_vac_jacket_surveys\140329A

The 1st article Torus vacuum jackets were surveyed March 29th, 2014 at Craft machine shop in Hampton. The hole numbering system that was followed is the same shown on drawings B00000-04-01-1301 rev E and B00000-04-01-1302 rev. D. The un-numbered holes were assigned numbers starting at 40 and are shown on the sketch at the end of this transmittal.

The front plate was measured on the coil side. The 1st table shows the comparison between the measured and design coordinates and their circle diameters. A least squares fitting routine was used holding the design values and the 29 common points to accomplish this comparison. The standard deviation value on the residules is 0.14 mm.

Table 1 Front Plate Design vs Measured

Design					Measured					Deltas			
Units millimeters													
pt	x	y	Dia		pt	x	y	Dia		pt	dx	dy	dia
1	0.00	0.00											
2	851.93	611.42	26.00		2	851.93	612.15	25.6		2	0	-0.73	0.38
3	1234.82	579.73	26.00		3	1235.04	580.28	26.0		3	-0.22	-0.55	0.00
4	1611.83	579.84	26.00		4	1612.2	580.15	25.5		4	-0.37	-0.31	0.50
5	1955.13	630.73	26.00		5	1955.57	630.88	25.4		5	-0.44	-0.15	0.60
6	1391.54	907.71	26.00		7	1391.83	908.48	25.5		6	-0.29	-0.77	0.50
7	1843.37	993.21	26.00		6	1843.82	993.75	25.6		7	-0.45	-0.54	0.40
8	699.43	968.39	26.00		8	699.63	969.33	25.4		8	-0.2	-0.94	0.60
9	1032.32	1103.01	26.00		9	1032.59	1103.64	25.4		9	-0.27	-0.63	0.60
10	1356.58	1233.90	26.00		10	1356.86	1234.64	25.6		10	-0.28	-0.74	0.40
11	1693.92	1370.20	26.00		11	1694.29	1370.91	25.5		11	-0.37	-0.71	0.50
12	534.04	1372.82	26.00		12	534.4	1373.75	25.4		12	-0.36	-0.93	0.60
13	870.52	1508.75	26.00		13	870.88	1509.66	25.5		13	-0.36	-0.91	0.50
14	1196.68	1640.54	26.00		14	1197.02	1641.34	25.4		14	-0.34	-0.8	0.60
15	1531.16	1775.69	26.00		15	1531.59	1776.44	25.4		15	-0.43	-0.75	0.60
16	370.44	1777.93	26.00		16	370.79	1779.02	25.4		16	-0.35	-1.09	0.60
17	704.50	1912.90	26.00		17	704.97	1913.94	25.3		17	-0.47	-1.04	0.70
18	1053.02	2053.69	26.00		18	1053.49	2054.8	25.3		18	-0.47	-1.11	0.70
19	1366.70	2180.42	26.00		19	1367.5	2181.21	25.4		19	-0.8	-0.79	0.60
20	208.59	2183.75	26.00		20	209.17	2184.91	25.5		20	-0.58	-1.16	0.55
21	551.09	2322.13	26.00		21	551.67	2323.23	25.3		21	-0.58	-1.1	0.70
22	868.57	2450.42	26.00		22	869.2	2451.43	25.3		22	-0.63	-1.01	0.70
23	1200.41	2584.50	26.00		23	1201.16	2585.56	25.3		23	-0.75	-1.06	0.75

24													
25	388.57	2710.47	26.00		25	389.19	2711.64	25.4		25	-0.62	-1.17	0.60
26	712.32	2841.26	26.00		26	712.98	2842.45	25.5		26	-0.66	-1.19	0.50
27	1016.64	2942.25	26.00		27	1017.37	2943.34	25.4		27	-0.73	-1.09	0.60
28													0.00
29	184.65	3215.04	26.00		29	185.38	3216.43	25.3		29	-0.73	-1.39	0.70
30	508.44	3345.85	26.00		30	509.24	3346.87	25.4		30	-0.8	-1.02	0.65
31	834.84	3470.68	26.00		31	835.63	3472.03	25.3		31	-0.79	-1.35	0.70
32	1224.64	3445.55	26.00		32	1225.52	3446.66	25.3		32	-0.88	-1.11	0.70
33	440.46	1608.21	63.80		33	440.68	1609.24	63.3		33	-0.22	-1.03	0.50
34	1439.26	2011.74	63.80		34	1440.29	2012.61	63.1		34	-1.03	-0.87	0.70
40	520.70	244.50	38.1		4	520.33	245.28	37.0		40	0.37	-0.78	1.10
41	2409.40	388.00	38.1		3	2409.18	388.08	37.3		41	0.22	-0.08	0.80
42										42			
43	1268.50	3606.60	38.1		2	1269.44	3608.06	38.0		43	-0.94	-1.46	0.10
44	706.70	4012.20	38.1		1	708.6	4013.17	38.1		44	-1.9	-0.97	0.00

Similarly, the back plate data is shown in table 2. The same methodology used for the right plate was used. Thirty one hole locations were used in the transformation resulting in a standard deviation of 0.20 mm.

Table 2 Back Plate Design vs Measured

Design					Measured					Deltas			
Units millimeters													
Pt	x	y	Dia		Pt	x	y	Calipered Dia			dx	dy	dia
1	0.00	0.00			1								
2	851.93	611.42	25.4		2	852.11	609.8	25.10		2	-0.18	1.64	0.30
3	1234.82	579.73	25.4		3	1234.51	579.1	25.10		3	0.31	0.67	0.30
4	1611.83	579.84	25.4		4	1612.03	578.4	25.10		4	-0.20	1.44	0.30
5	1955.13	630.73	25.4		5	1955.09	629.6	25.00		5	0.04	1.17	0.40
6	1391.54	907.71	25.4		6	1391.48	906.2	25.20		6	0.06	1.55	0.20
7	1843.37	993.21	25.4		7	1843.7	992.0	25.20		7	-0.33	1.20	0.20
8	699.43	968.39	25.4		8	699.09	966.5	25.10		8	0.34	1.88	0.30
9	1032.32	1103.01	25.4		9	1031.6	1101.9	25.20		9	0.72	1.16	0.20
10	1356.58	1233.90	25.4		10	1356.08	1232.5	25.20		10	0.50	1.37	0.20
11	1693.92	1370.20	25.4		11	1693.13	1369.6	25.20		11	0.79	0.58	0.20
12	534.04	1372.82	25.4		12	533.41	1370.9	25.20		12	0.63	1.96	0.20
13	870.52	1508.75	25.4		13	869.49	1507.4	25.20		13	1.03	1.38	0.20
14	1196.68	1640.54	25.4		14	1195.74	1639.1	25.50		14	0.94	1.45	-0.10
15	1531.16	1775.69	25.4		15	1530.36	1774.9	25.20		15	0.80	0.84	0.20
16	370.44	1777.93	25.4		16	369.41	1775.8	25.20		16	1.03	2.09	0.20
17	704.50	1912.90	25.4		17	703.17	1911.3	25.20		17	1.33	1.62	0.20
18	1053.02	2053.69	25.4		18	1051.85	2052.5	25.10		18	1.17	1.20	0.30
19	1366.70	2180.42	25.4		19	1365.44	2179.5	25.20		19	1.26	0.88	0.20
20	208.59	2183.75	25.4		20	207.34	2181.7	25.20		20	1.25	2.06	0.20
21	551.09	2322.13	25.4		21	549.47	2320.5	25.30		21	1.62	1.65	0.10

22	868.57	2450.42	25.4		22	867.07	2448.9	25.20		22	1.50	1.55	0.20
23	1200.41	2584.50	25.4		23	1198.77	2583.8	25.20		23	1.64	0.66	0.20
24	93.97	2572.36	25.4		24	92.38	2570.3	25.20		24	1.59	2.11	0.20
25	388.57	2710.47	25.4		25	386.72	2708.5	25.20		25	1.85	1.99	0.20
26	712.32	2841.26	25.4		26	710.53	2839.7	25.20		26	1.79	1.61	0.20
27	1016.64	2942.25	25.4		27	1014.74	2940.9	25.20		27	1.90	1.40	0.20
28	-137.37	3079.01	25.4		28	-139.38	3076.7	25.20		28	2.01	2.30	0.20
29	184.65	3215.04	25.4		29	182.43	3213.1	25.20		29	2.22	1.96	0.20
30	508.44	3345.85	25.4		30	506.25	3343.9	25.20		30	2.19	1.94	0.20
31	834.84	3470.68	25.4		31	832.26	3468.9	25.20		31	2.58	1.79	0.20
32	1224.64	3445.55	25.4		32	1222.54	3444.4	25.20		32	2.10	1.13	0.20
33	464.24	1549.33	63.8		33	460.85	1546.4	63.80		33	3.39	2.97	0.00
34	1463.17	1952.91	63.8		34	1462.09	1951.8	63.65		34	1.08	1.08	0.15
40	520.70	244.50	38.1		40	520.48	242.9	38.00		40	0.22	1.65	0.10
41	2409.40	388.00	38.1		41	2408.99	388.3	38.00		41	0.41	-0.26	0.10
42	-469.3	2684.90	38.1		42	-471.02	2682.6	38.20		42	1.72	2.28	-0.10
43	1268.50	3606.60	38.1		43	1266.12	3605.7	38.20		43	2.38	0.86	-0.10
44	706.70	4012.20	38.1		44	704.22	4011.1	38.20		44	2.48	1.08	-0.10

The common holes for the back and front plates were then compared fitting the back plate hole centers to the front plate values. The following residuals were obtained along with a standard deviation of 0.20 mm.

Table 3 Back Plate fit to Front plate

Hole	dX [mm]	dY [mm]
2	-0.34	-0.09
3	0.40	-0.84
4	0.04	0.15
5	0.30	0.06
6	-0.14	0.44
7	-0.47	0.41
8	-0.02	0.22
9	0.28	-0.50
10	-0.07	0.26
11	0.15	-0.20
12	-0.02	0.05
13	0.23	-0.16
14	-0.02	0.18
15	-0.23	-0.15
16	-0.08	0.24
17	0.19	0.03
18	-0.12	0.08
19	0.16	-0.16
20	-0.08	0.05
21	0.14	-0.05

22	-0.07	0.11
23	0.04	-0.30
25	-0.02	0.18
26	-0.19	0.15
27	-0.12	0.18
29	-0.10	0.15
30	-0.20	0.15
31	0.04	0.67
32	-0.33	0.23
40	0.09	-0.43
41	0.27	-0.94
43	-0.16	0.38
44	0.45	-0.53

A comparison of edges measured was then calculated. See the accompanying drawing for the key to the edge locations. Table 4 shows the comparison of the back plate edgesto the front plate edges. Note that not all the edges could be directly compared.

Table 4 Back Plate sides fit to Front plate edges

Units Millimeters		
SIDE	Left	Right
A	0.07	0.20
B	0.18	0.01
C	0.16	-0.69
D	-0.25	0.31
E	0.39	-0.16
F	0.10	0.20
G	0.10	0.26
H	-0.08	-0.12
J	-0.93	-0.61
K	-0.52	-0.56
M	0.87	0.89
N	0.70	0.91
P	-0.89	-0.81

The Front Plate edges were compared to the ideal edges with the following results (a positive value indicates larger than ideal; a negative less than ideal).

Table 5 Front Plate edges fit to design edges

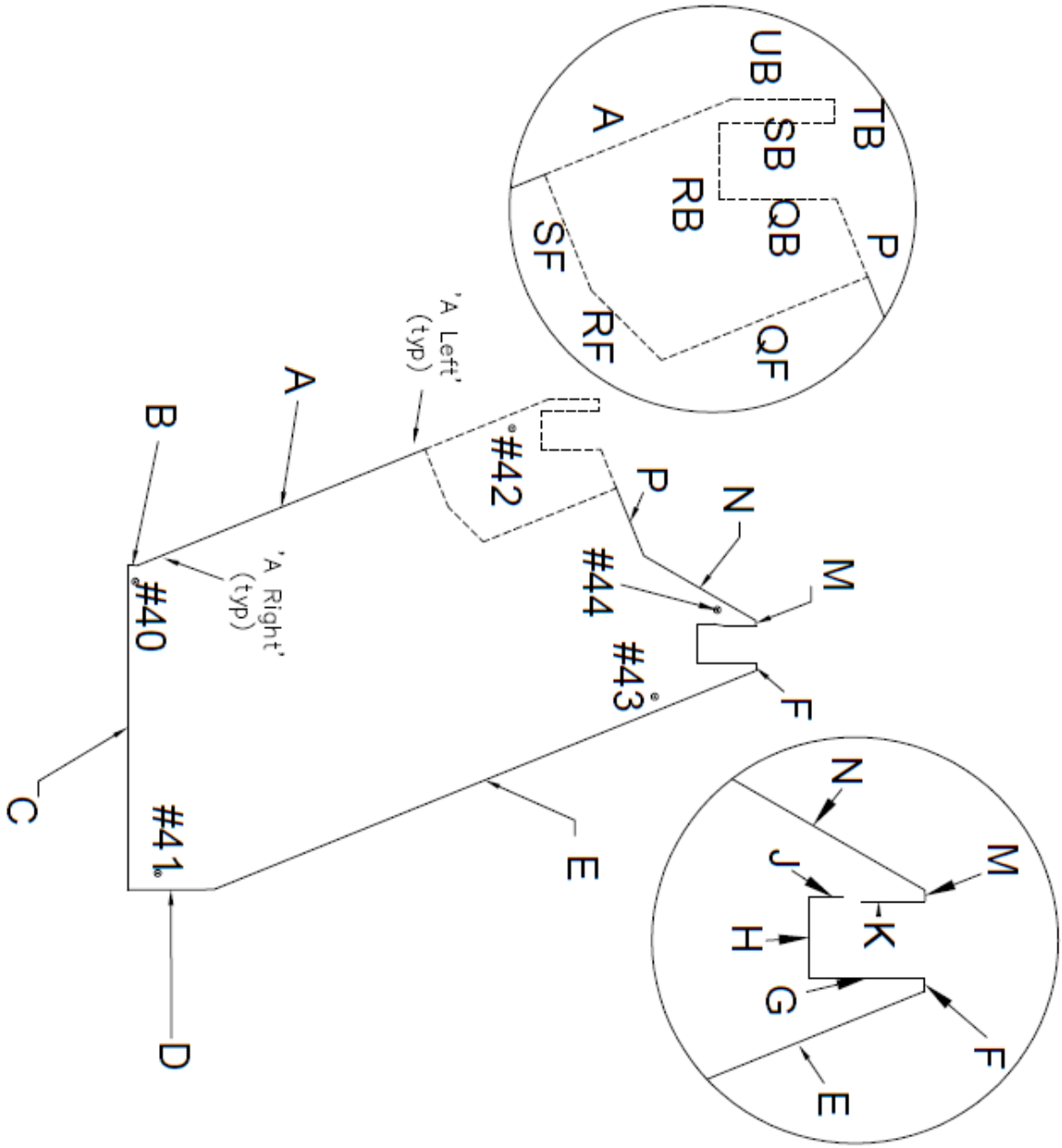
Units Millimeters		
SIDE	Left	Right
A	1.19	1.37
B	0.22	0.44
C	0.13	0.49
D	-0.02	-0.16
E	-1.00	-0.57
F	0.89	0.85
G	-0.60	-0.63
H	0.71	0.41
J	1.28	1.01
K	1.02	1.08
M	0.27	0.08
N	-0.99	-0.83
P	-0.49	-0.25
QF	0.60	1.02
RF	1.60	-0.04
SF	0.61	0.94

Finally the back Plate edges were compared to the ideal edges with the following results (a positive value indicates larger than ideal; a negative less than ideal).

Table 6 Back Plate edges fit to design edges

Units Millimeters		
SIDE	Left	Right
A	1.13	1.57
B	0.40	0.48
C	0.29	-0.21
D	-0.26	0.15
E	-0.61	-0.73
F	1.00	1.05
G	-0.50	-0.38
H	0.62	0.59
J	0.34	0.36
K	0.50	0.52
M	1.10	0.89
N	-0.29	0.09
P	-1.38	-0.86
QB	0.31	0.40
RB	0.60	0.52
SB	-0.19	-0.28
TB	0.18	0.19
UB	0.08	-0.01

Sketch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SB
RB
P
QB
QF
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SF
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A
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