



Jefferson Lab Alignment Group

Data Transmittal

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DETAILS:

data: inspection\hallc\qweak\100514A

Attached to this transmittal are the results from the R3 wire chamber rotation repeatability survey. The survey was carried out on the 13th and 14th of May, 2010. The goal of the survey was to check the reproducibility of the five production positions for the R3 assembly after being rotated.

The data shows the center of the reference fiducial location (center of 3/8" hole – not the target center) for each of the four wire chambers as the assembly was rotated about the beam line. The 5 production positions (0° (home), +45°, +90°, -45°, -90°) were measured twice; once to obtain the “standard” coordinates and again in the repeated position. At the home position, the detectors were measured after being slid along the arms then extended out again to measure the effect this would have on the reproducibility.

The results show the coordinates at the production position for each wire chamber relative to the QTOR magnet center. The coordinates taken at the “standard” position are given, and the coordinate differences between these and the repeated position are shown as deltas. There is also a column showing the root mean square of the difference (a vector difference).

The coordinates and differences are in millimeters with Z along the beamline positive downstream, X transverse to the beamline positive beam left, and Y in the vertical position, positive up. The values for the deltas indicate a +Z being downstream of the standard coordinate, +X to the beam left of the standard coordinate, and +Y being vertically above.

Page 7 shows distances between three tooling balls that were temporary attached to check deflections along the chamber. The distance between the 3 tooling balls are shown for the home position, then the differences from the home values are shown for the production positions. A positive difference indicates the distance between tooling ball increased, while a negative difference indicates the distance shortened. Units are millimeters.

A sketch showing the approximate location of the reference holes on the wire chambers is shown on page 7.

The measurements were made over a 2 day period (2 different setups). The order of measurements were:

May 13th : 0°, -45°, -90°, -45°, -90°

May 14th : 0°, +45°, +90°, +45°, +90°, 0° Slide.

Home 0° Position											
Vader Standard Coordinates				Repeat – Standard				Slide – Standard			
Vader	z	x	y	dz	dx	dy	rms	dz	dx	dy	rms
VAH	4595.90	-2859.25	1210.16	0.67	0.40	0.59	0.98	-1.18	-0.51	-1.68	2.11
VBH	4424.60	-2484.09	1203.13	0.64	0.39	0.53	0.92	-1.18	-0.51	-1.53	2.00
VCH	4348.69	-2331.54	197.01	0.36	0.08	0.50	0.62	-0.70	0.10	-1.47	1.63
VDH	4672.57	-3049.02	210.33	0.41	0.11	0.63	0.76	-0.69	0.10	-1.75	1.89
VEH	4672.54	-3054.56	-81.69	0.33	0.02	0.63	0.71	-0.55	0.28	-1.76	1.86
VFH	4349.16	-2336.95	-94.95	0.28	-0.01	0.50	0.58	-0.55	0.28	-1.48	1.60
VGH	4427.03	-2526.36	-1095.14	0.02	-0.30	0.54	0.62	-0.06	0.89	-1.55	1.79
VHH	4596.06	-2902.45	-1088.30	0.04	-0.29	0.61	0.67	-0.06	0.89	-1.70	1.92
Leia Standard Coordinates											
Leia Standard Coordinates				Repeat – Standard				Slide – Standard			
Leia	z	x	y	dz	dx	dy	rms	dz	dx	dy	rms
LAH	5127.77	-3077.17	1215.28	0.69	0.44	0.51	0.97	-1.18	-0.51	-1.55	2.01
LBH	4956.82	-2702.07	1208.06	0.66	0.43	0.45	0.91	-1.18	-0.51	-1.40	1.90
LCH	4877.10	-2552.38	201.60	0.37	0.12	0.42	0.58	-0.69	0.11	-1.35	1.52
LDH	5203.59	-3268.60	215.60	0.43	0.15	0.55	0.71	-0.69	0.11	-1.63	1.77
LEH	5203.21	-3274.80	-76.46	0.35	0.06	0.55	0.66	-0.54	0.28	-1.63	1.74
LFH	4877.40	-2558.27	-90.46	0.29	0.03	0.43	0.52	-0.55	0.29	-1.35	1.49
LGH	4957.65	-2747.86	-1090.25	0.03	-0.26	0.46	0.53	-0.06	0.90	-1.43	1.69
LHH	5126.62	-3123.91	-1082.98	0.06	-0.25	0.53	0.59	-0.06	0.90	-1.58	1.82
Yoda Standard Coordinates											
Yoda Standard Coordinates				Repeat – Standard				Slide – Standard			
Yoda	z	x	y	dz	dx	dy	rms	dz	dx	dy	rms
YAH	4424.53	2542.76	1084.96	0.05	0.14	-0.55	0.57	-0.17	-0.25	0.73	0.79
YBH	4595.41	2918.08	1075.27	0.04	0.15	-0.63	0.64	-0.10	-0.28	0.84	0.89
YCH	4342.11	2348.48	86.58	0.01	-0.05	-0.51	0.51	-0.13	0.02	0.67	0.68
YDH	4667.73	3065.05	67.79	-0.01	-0.04	-0.66	0.66	0.01	-0.04	0.88	0.88
YEH	4341.75	2341.02	-205.23	0.00	-0.10	-0.51	0.52	-0.10	0.09	0.67	0.68
YFH	4667.03	3057.69	-224.18	-0.02	-0.10	-0.66	0.66	0.03	0.03	0.88	0.88
YGH	4421.18	2484.34	-1212.71	-0.05	-0.29	-0.54	0.61	0.00	0.33	0.71	0.79
YHH	4591.73	2859.71	-1222.42	-0.06	-0.29	-0.62	0.68	0.07	0.30	0.82	0.88
Hans Standard Coordinates											
Hans Standard Coordinates				Repeat – Standard				Slide – Standard			
Hans	z	x	y	dz	dx	dy	rms	dz	dx	dy	rms
HAH	4955.15	2762.31	1078.58	0.04	0.16	-0.61	0.63	-0.12	-0.36	0.83	0.91
HBH	5126.55	3137.18	1068.69	0.03	0.16	-0.69	0.71	-0.05	-0.39	0.94	1.01
HCH	4873.85	2566.75	80.45	0.01	-0.04	-0.57	0.57	-0.08	-0.09	0.77	0.78
HDH	5201.11	3282.52	61.23	-0.01	-0.03	-0.72	0.72	0.06	-0.14	0.98	0.99
HEH	4873.48	2559.15	-211.44	-0.01	-0.09	-0.57	0.58	-0.06	-0.01	0.77	0.77
HFH	5200.63	3274.94	-230.66	-0.02	-0.09	-0.72	0.73	0.08	-0.07	0.98	0.98
HGH	4952.05	2702.53	-1219.21	-0.05	-0.28	-0.60	0.67	0.05	0.23	0.81	0.84
HHH	5122.28	3077.79	-1229.23	-0.06	-0.28	-0.68	0.74	0.12	0.20	0.92	0.95

Positive 45 degree Position							
Vader Standard Coordinates				Repeat – Standard			
Vader	z	x	y	dz	dx	dy	rms
VAH	4597.87	-1162.25	2877.11	-0.07	1.09	0.41	1.16
VBH	4426.33	-902.15	2606.81	-0.04	1.02	0.33	1.07
VCH	4351.12	-1505.89	1787.57	-0.13	0.76	0.53	0.93
VDH	4675.46	-2003.41	2304.42	-0.18	0.89	0.69	1.14
VEH	4675.66	-2213.84	2101.87	-0.21	0.82	0.76	1.14
VFH	4351.82	-1716.19	1584.98	-0.15	0.69	0.60	0.93
VGH	4430.61	-2557.36	1011.78	-0.27	0.49	0.87	1.04
VHH	4599.88	-2818.25	1282.60	-0.30	0.56	0.96	1.15
Leia Standard Coordinates				Repeat – Standard			
Leia	z	x	y	dz	dx	dy	rms
LAH	5129.87	-1312.16	3034.89	-0.09	1.07	0.46	1.17
LBH	4958.69	-1052.24	2764.50	-0.06	1.00	0.37	1.07
LCH	4879.66	-1658.24	1947.04	-0.14	0.74	0.57	0.95
LDH	5206.61	-2154.39	2463.48	-0.20	0.87	0.73	1.16
LEH	5206.46	-2365.32	2261.37	-0.23	0.81	0.80	1.16
LFH	4880.20	-1868.95	1744.72	-0.17	0.68	0.64	0.95
LGH	4961.37	-2709.96	1171.94	-0.28	0.48	0.92	1.07
LHH	5130.57	-2970.53	1443.03	-0.31	0.55	1.00	1.18
Yoda Standard Coordinates				Repeat – Standard			
Yoda	z	x	y	dz	dx	dy	rms
YAH	4420.35	2567.49	-1033.09	0.31	-0.23	-0.74	0.83
YBH	4590.79	2826.17	-1305.48	0.32	-0.33	-0.83	0.95
YCH	4339.30	1723.73	-1601.25	0.21	-0.41	-0.45	0.65
YDH	4664.07	2217.41	-2121.49	0.23	-0.61	-0.63	0.91
YEH	4339.27	1512.01	-1802.21	0.18	-0.48	-0.38	0.64
YFH	4663.72	2005.65	-2322.64	0.21	-0.68	-0.56	0.91
YGH	4419.68	900.68	-2615.64	0.09	-0.76	-0.18	0.78
YHH	4589.78	1159.38	-2888.07	0.11	-0.86	-0.27	0.91
Hans Standard Coordinates				Repeat – Standard			
Hans	z	x	y	dz	dx	dy	rms
HAH	4950.71	2719.02	-1192.95	0.31	-0.33	-0.81	0.93
HBH	5121.67	2977.24	-1465.16	0.33	-0.44	-0.90	1.06
HCH	4870.78	1874.53	-1760.03	0.21	-0.51	-0.52	0.76
HDH	5197.20	2367.34	-2280.01	0.24	-0.72	-0.70	1.03
HEH	4870.75	1662.66	-1960.95	0.19	-0.58	-0.45	0.76
HFH	5197.06	2155.49	-2480.94	0.21	-0.78	-0.63	1.03
HGH	4950.29	1051.16	-2774.62	0.10	-0.86	-0.25	0.90
HHH	5120.08	1309.57	-3047.20	0.11	-0.96	-0.35	1.03

Positive 90 degree Position							
Vader Standard Coordinates				Repeat – Standard			
Vader	z	x	y	dz	dx	dy	rms
VAH	4596.44	1214.67	2857.37	-0.33	2.74	-1.38	3.09
VBH	4424.98	1207.47	2482.28	-0.27	2.40	-1.40	2.79
VCH	4350.63	201.27	2329.47	-0.28	2.26	-0.47	2.32
VDH	4674.79	214.91	3046.82	-0.40	2.92	-0.43	2.97
VEH	4675.23	-77.11	3052.27	-0.41	2.92	-0.16	2.95
VFH	4351.57	-90.69	2334.80	-0.29	2.26	-0.20	2.29
VGH	4431.13	-1090.81	2523.90	-0.35	2.44	0.74	2.57
VHH	4600.31	-1083.80	2899.92	-0.41	2.78	0.76	2.91
Leia Standard Coordinates				Repeat – Standard			
Leia	z	x	y	dz	dx	dy	rms
LAH	5128.39	1220.58	3075.06	-0.37	2.93	-1.30	3.22
LBH	4957.29	1213.19	2700.03	-0.31	2.58	-1.32	2.91
LCH	4879.12	206.65	2550.09	-0.31	2.45	-0.39	2.50
LDH	5205.89	220.97	3266.18	-0.43	3.10	-0.35	3.15
LEH	5205.99	-71.09	3272.29	-0.44	3.11	-0.08	3.14
LFH	4879.90	-85.41	2555.90	-0.32	2.45	-0.12	2.48
LGH	4961.83	-1085.12	2745.17	-0.39	2.63	0.83	2.78
LHH	5130.95	-1077.69	3121.15	-0.45	2.97	0.85	3.12
Yoda Standard Coordinates				Repeat – Standard			
Yoda	z	x	y	dz	dx	dy	rms
YAH	4419.20	1088.59	-2544.91	0.13	-2.32	-1.29	2.66
YBH	4589.73	1079.29	-2920.39	0.19	-2.67	-1.26	2.96
YCH	4339.53	90.02	-2350.44	0.15	-2.14	-0.36	2.18
YDH	4664.48	71.98	-3067.34	0.26	-2.81	-0.29	2.83
YEH	4339.91	-201.79	-2342.95	0.16	-2.13	-0.08	2.14
YFH	4664.53	-219.99	-3059.95	0.28	-2.80	-0.01	2.81
YGH	4421.78	-1209.08	-2486.25	0.23	-2.26	0.89	2.44
YHH	4591.98	-1218.40	-2861.78	0.29	-2.61	0.92	2.79
Hans Standard Coordinates				Repeat – Standard			
Hans	z	x	y	dz	dx	dy	rms
HAH	4949.62	1083.54	-2764.99	0.17	-2.51	-1.20	2.78
HBH	5120.67	1074.04	-3140.02	0.23	-2.85	-1.17	3.09
HCH	4871.06	85.22	-2569.24	0.18	-2.32	-0.27	2.35
HDH	5197.66	66.76	-3285.33	0.30	-2.99	-0.20	3.01
HEH	4871.45	-206.67	-2561.61	0.20	-2.32	0.01	2.32
HFH	5197.93	-225.13	-3277.72	0.31	-2.98	0.08	3.00
HGH	4952.45	-1214.25	-2704.96	0.27	-2.45	0.98	2.65
HHH	5122.33	-1223.87	-3080.39	0.33	-2.80	1.01	2.99

Negative 45 degree Position							
Vader Standard Coordinates				Repeat – Standard			
Vader	z	x	y	dz	dx	dy	rms
VAH	4592.34	-2880.09	-1169.30	0.10	0.42	-1.15	1.22
VBH	4421.58	-2609.79	-908.68	0.10	0.31	-1.03	1.08
VCH	4346.09	-1790.04	-1511.70	0.07	0.56	-0.69	0.89
VDH	4668.93	-2306.89	-2010.20	0.07	0.77	-0.91	1.19
VEH	4668.94	-2104.19	-2220.49	0.06	0.86	-0.82	1.19
VFH	4346.61	-1587.31	-1721.85	0.07	0.64	-0.60	0.88
VGH	4424.39	-1013.60	-2562.77	0.03	0.99	-0.37	1.06
VHH	4592.88	-1284.41	-2824.17	0.03	1.11	-0.48	1.21
Leia Standard Coordinates				Repeat – Standard			
Leia	z	x	y	dz	dx	dy	rms
LAH	5123.89	-3038.33	-1320.33	0.10	0.49	-1.22	1.32
LBH	4953.49	-2767.94	-1059.90	0.10	0.38	-1.11	1.18
LCH	4874.18	-1949.97	-1665.17	0.07	0.63	-0.77	0.99
LDH	5199.62	-2466.41	-2162.31	0.07	0.84	-0.99	1.30
LEH	5199.29	-2264.15	-2373.09	0.06	0.93	-0.90	1.30
LFH	4874.53	-1747.50	-1875.74	0.06	0.72	-0.68	0.99
LGH	4954.69	-1174.21	-2716.50	0.03	1.07	-0.45	1.16
LHH	5123.11	-1445.30	-2977.58	0.03	1.18	-0.56	1.31
Yoda Standard Coordinates				Repeat – Standard			
Yoda	z	x	y	dz	dx	dy	rms
YAH	4427.71	1028.26	2563.62	-0.09	-1.06	0.47	1.16
YBH	4599.09	1300.24	2822.11	-0.08	-1.16	0.57	1.30
YCH	4345.59	1597.09	1720.42	-0.08	-0.73	0.69	1.01
YDH	4672.15	2116.56	2213.73	-0.05	-0.93	0.88	1.28
YEH	4345.37	1798.19	1508.83	-0.08	-0.65	0.77	1.01
YFH	4671.61	2317.85	2002.11	-0.05	-0.85	0.96	1.28
YGH	4425.55	2611.92	897.87	-0.05	-0.42	1.08	1.16
YHH	4596.59	2883.95	1156.38	-0.04	-0.52	1.18	1.29
Hans Standard Coordinates				Repeat – Standard			
Hans	z	x	y	dz	dx	dy	rms
HAH	4958.62	1187.30	2714.10	-0.08	-1.13	0.52	1.25
HBH	5130.52	1459.09	2972.12	-0.07	-1.24	0.62	1.39
HCH	4877.61	1755.04	1870.16	-0.07	-0.81	0.74	1.10
HDH	5205.82	2274.25	2362.60	-0.05	-1.01	0.94	1.38
HEH	4877.39	1956.10	1658.42	-0.07	-0.73	0.82	1.10
HFH	5205.49	2475.32	2150.88	-0.04	-0.93	1.01	1.38
HGH	4956.71	2770.08	1047.29	-0.04	-0.49	1.13	1.24
HHH	5127.43	3042.25	1305.51	-0.03	-0.60	1.23	1.37

Negative 90 degree Position							
Vader Standard Coordinates				Repeat – Standard			
Vader	z	x	y	dz	dx	dy	rms
VAH	4589.66	-1212.26	-2863.74	-0.06	-2.40	0.90	2.56
VBH	4419.20	-1205.34	-2488.19	-0.12	-2.08	0.87	2.25
VCH	4344.42	-199.25	-2334.83	-0.12	-1.95	0.01	1.95
VDH	4666.69	-212.37	-3053.04	-0.01	-2.56	0.07	2.56
VEH	4666.87	79.65	-3058.40	0.00	-2.56	-0.18	2.57
VFH	4345.10	92.71	-2340.07	-0.11	-1.95	-0.23	1.97
VGH	4423.33	1092.96	-2529.02	-0.06	-2.11	-1.06	2.37
VHH	4591.51	1086.23	-2905.49	0.00	-2.43	-1.03	2.64
Leia Standard Coordinates				Repeat – Standard			
Leia	z	x	y	dz	dx	dy	rms
LAH	5121.03	-1217.65	-3082.84	-0.03	-2.59	0.98	2.77
LBH	4950.93	-1210.54	-2707.36	-0.08	-2.27	0.95	2.47
LCH	4872.33	-204.11	-2556.85	-0.08	-2.15	0.09	2.15
LDH	5197.20	-217.91	-3273.82	0.03	-2.76	0.15	2.76
LEH	5197.04	74.15	-3279.83	0.03	-2.76	-0.09	2.76
LFH	4872.84	87.95	-2562.57	-0.07	-2.15	-0.15	2.16
LGH	4953.45	1087.80	-2751.71	-0.02	-2.31	-0.98	2.51
LHH	5121.57	1080.64	-3128.14	0.03	-2.63	-0.95	2.80
Yoda Standard Coordinates				Repeat – Standard			
Yoda	z	x	y	dz	dx	dy	rms
YAH	4427.18	-1087.87	2539.77	0.07	2.09	0.76	2.22
YBH	4598.78	-1078.52	2914.77	0.05	2.38	0.75	2.50
YCH	4346.17	-89.32	2345.74	0.06	1.94	-0.02	1.94
YDH	4673.17	-71.18	3061.71	0.03	2.50	-0.02	2.50
YEH	4346.31	202.49	2338.31	0.05	1.93	-0.24	1.95
YFH	4672.97	220.79	3054.38	0.03	2.49	-0.25	2.50
YGH	4427.80	1209.81	2481.58	0.03	2.04	-1.02	2.28
YHH	4599.07	1219.18	2856.63	0.02	2.34	-1.02	2.55
Hans Standard Coordinates				Repeat – Standard			
Hans	z	x	y	dz	dx	dy	rms
HAH	4958.22	-1082.45	2758.33	0.06	2.27	0.77	2.39
HBH	5130.34	-1072.90	3132.87	0.05	2.56	0.77	2.67
HCH	4878.32	-84.16	2563.02	0.05	2.11	-0.01	2.11
HDH	5206.97	-65.59	3278.17	0.03	2.67	-0.01	2.67
HEH	4878.46	207.73	2555.45	0.04	2.11	-0.23	2.12
HFH	5206.99	226.30	3270.62	0.02	2.67	-0.24	2.68
HGH	4959.09	1215.35	2698.77	0.02	2.22	-1.01	2.44
HHH	5130.04	1225.02	3073.72	0.01	2.51	-1.01	2.71

Tooling ball locations on assembly			
Key (BL = beam left tooling ball ; Cent = Center tooling ball ; BR = beam right tooling ball)			
Position	BL - Cent	BL - BR	Cent - BR
Home 0°	2510.78	4926.86	2421.99
Home 0° repeat	0.02	0.03	0.02
Home 0° Slide	-0.61	-0.73	-0.13
45° degrees	-0.08	-0.15	-0.06
45 repeat	-0.13	-0.19	-0.05
Negative 45 degrees	-0.06	0.02	0.09
Negative 45 degrees repeat	-0.10	-0.01	0.10
Negative 90	0.07	0.36	0.37
Negative 90 repeat	0.09	0.37	0.37

