Jefferson Lab Alignment Group

Data Transmittal

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DETAILS:

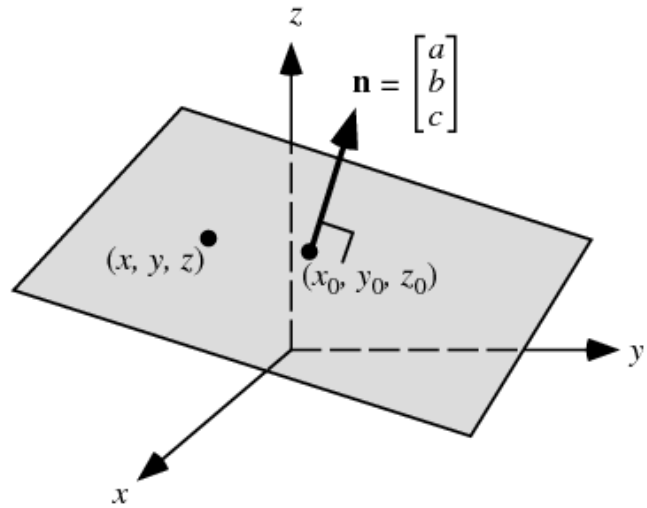
data: step2b\hallb\12GFwdCar\180111a\richcalcs

The Hall B Rich Detector was surveyed in position in January, 2018. The data below shows the location of the planes and the coordinates used to create the planes relative to the Hall B 12 GeV target. A,B,C are the unit vectors and D is a reference dimension (see attachment). Units for D, x, y, and z are millimeters with the rotation angles in degrees.

Mirror	A	B	C	D	Rx from Y	Ry from Z	Rz from X
Bottom Center	0.999998	0.001218	-0.001490	513.85	-50.733800	90.085400	0.069800
Bottom Left	0.498497	0.866879	0.004613	69.60	0.304900	89.469800	60.099000
Bottom Right	0.501618	-0.865063	-0.006756	136.21	-179.552500	90.771600	-59.892200
Top Left	0.498550	0.866849	0.004464	70.67	0.295000	89.487000	60.095600
Top Right	0.501539	-0.865106	-0.007078	138.22	-179.531200	90.808600	-59.897300

Beam Left Mirror			
Point Name	**X**	**Y**	**Z**
BLM1	-425.17	132.26	6003.84
BLM2	-1163.19	558.43	5669.65
BLM3	-1440.54	713.6	6480.42
BLM4	-452.57	143.14	6918.84
Top Left Mirror			
Point Name	**X**	**Y**	**Z**
TLM1	-1208.08	584.2	5647.26
TLM2	-1435.05	711.3	6314.75
TLM3	-1972.51	1022.63	5883.18
TLM4	-2290.39	1209.27	5143.21
Bottom Center Mirror			
Point Name	**X**	**Y**	**Z**
BCM1	-504.68	-100.29	6075.39
BCM2	-504.85	41.28	6079.5
BCM3	-503.67	37.66	6867.71
BCM4	-503.49	-103.34	6869.98

Bottom Right Mirror			
Point Name	**X**	**Y**	**Z**
BRM1	-1162.72	-560.95	5658.1
BRM2	-1426.64	-719.76	6397.6
BRM3	-442.25	-145.76	5989.68
BRM4	-457.67	-162.03	6928.15
Top Right Mirror			
Point Name	**X**	**Y**	**Z**
TRM5	-1194.74	-578.99	5636.57
TRM6	-1436.14	-724.79	6352.01
TRM7	-1970.97	-1031.17	5900.55
TRM8	-2303.92	-1217.77	5115.41
Sphere Center			
Point Name	**X**	**Y**	**Z**
Sphere	-467.85	11.98	3966.44
Points on Sphere			
Point Name	**X**	**Y**	**Z**
SP1	-2495.22	1214.09	5272.17
SP2	-2669.87	690.31	5363.28
SP3	-2716.64	375.88	5405.44
SP4	-2409.29	84.39	5833.47
SP5	-2148.76	87.94	6070.96
SP6	-2261.64	1113.7	5648.33
SP7	-2040.31	1021.06	5907.92
SP8	-1925.25	566.43	6163.89
SP9	-2685.57	-210.09	5480.58
SP10	-2633.08	-651.64	5426.44
SP11	-2462.79	-1109.36	5388.78
SP12	-2237.5	-1032.1	5709.56
SP13	-2344.14	-533.59	5821.73
SP14	-2255.91	-249.3	5965.14
SP15	-1996.31	-123.34	6181.32
SP16	-1567.35	-33.09	6425.97
SP17	-1586.49	-447.5	6374.29
SP18	-1547.86	447.67	6396.25
Reference Points			
Point Name	**X**	**Y**	**Z**
Origin	-319.73	-0.93	5922.36
RDA	-3012.11	1685.05	4675.14
RDB	-3005.14	-1679.29	4653.34
RDC	-315.52	-0.86	5913.29



The equation of a plane with nonzero normal vector $\mathbf{n} = (a, b, c)$ through the point $\mathbf{x}_0 = (x_0, y_0, z_0)$ is

$$\mathbf{n} \cdot (\mathbf{x} - \mathbf{x}_0) = 0,$$

where $\mathbf{x} = (x, y, z)$. Plugging in gives the general equation of a plane,

$$a\,x + b\,y + c\,z + d = 0,$$

where

$$d \equiv -a\,x_0 - b\,y_0 - c\,z_0.$$

A plane specified in this form therefore has x-, y-, and z-intercepts at

$$x = -\frac{d}{a}$$
$$y = -\frac{d}{b}$$
$$z = -\frac{d}{c},$$

and lies at a distance

$$D = \frac{d}{\sqrt{a^2 + b^2 + c^2}}$$

from the origin.