

CDC Geometry

GlueX-doc-744 (version 1)

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The original CDC design had an active length of 200 *cm* and 23 instrumented layers going from about 16 *cm* to 58 *cm* radius ($L = 42$ *cm*). The wire layout is summarized in Table 1. As indicated in the table, the smallest radius of a stereo wire is about 23 *cm* at the center of the chamber.

One of the questions raised at the GlueX detector review had to do with vertex resolution and the placement of the stereo layers. It was suggested that the stereo layers be brought closer to the beam line to improve the z -vertex resolution from tracks. A careful study was carried out on this shortly after the review and concurred that moving both the straight and stereo layers closer to the beam axis would make a significant improvement in vertex resolution. Unfortunately, background estimates at the time indicated that moving closer to the beam line was not an option.

Since that time, it was realized that the magnetic field near the beam axis was not included in the original background estimates. The studies have been redone and it now looks reasonable to move the layers of the CDC closer to the beam line.

Table 2 shows a proposed placement of the the layers of the CDC. It moves the layers in such that they span from about 11 *cm* to 56 *cm* ($L = 45$ *cm*), and moves the first stereo layers into a radius of about 16 *cm*. These changes would improve both momentum and vertex resolution of the chamber as well as freeing up space between the CDC and the BCAL for infrastructure that may be needed. The one possible issue is that for the inner layer to be at about 11 *cm*, the inner radius of the end plates and shell of the chamber would need to be at about 9 *cm* radius.

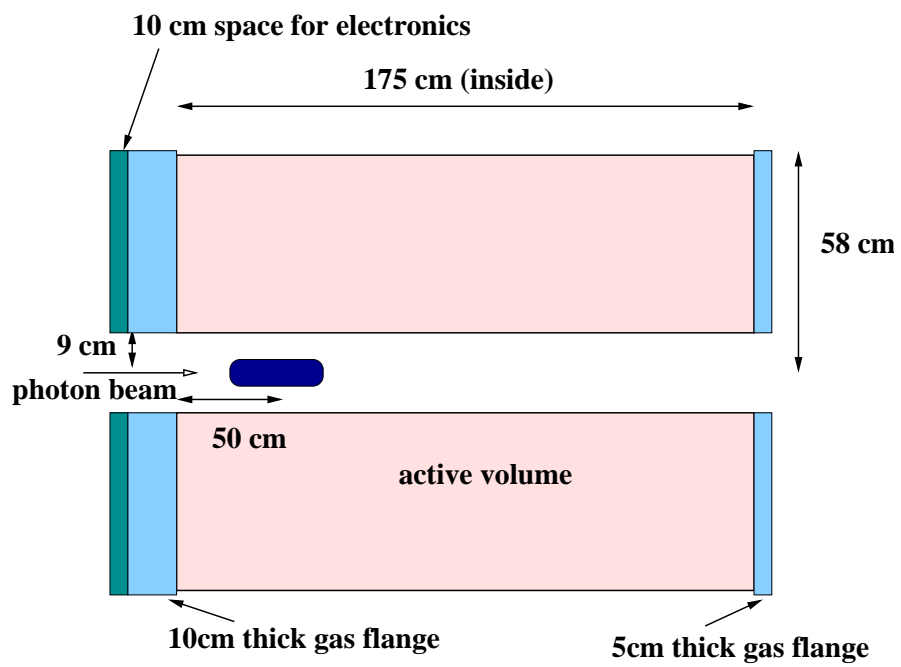


Figure 1:

Table 1: Reference Wire Layout. This has 3349 instrumented wires.

Layer	Wires	Radius (center)	Radius (plate)	Stereo
1	63	16.049	16.049	
2	70	17.831	17.831	
3	77	19.613	19.613	
4	84	21.395	21.395	
5	91	23.178	25.449	+6°
6	98	24.960	27.082	+6°
7	105	26.742	28.733	-6°
8	112	28.524	30.398	-6°
9	126	32.089	32.089	
10	133	33.871	33.871	
11	140	35.654	35.654	
12	147	37.436	37.436	
13	154	39.218	39.218	
14	161	41.001	42.326	+6°
15	168	42.783	44.055	+6°
16	175	44.566	45.788	-6°
17	182	46.348	47.525	-6°
18	193	49.149	49.149	
19	200	50.932	50.932	
20	207	52.714	52.714	
21	214	54.497	54.497	
22	221	56.279	56.279	
23	228	58.062	58.062	

Table 2: Shifted in Wire Layout. This has 3337 instrumented wires.

Layer	Wires	Radius (center)	Radius (plate)	Stereo
1	43	10.960	10.960	
2	50	12.741	12.741	
3	57	14.522	14.522	
4	64	16.304	18.718	+6°
5	71	18.086	20.289	+6°
6	78	19.868	21.892	-6°
7	85	21.650	23.522	-6°
8	99	25.214	25.214	
9	106	26.997	26.997	
10	113	28.779	28.779	
11	120	30.561	30.561	
12	127	32.344	32.344	
13	134	34.126	35.343	+6°
14	141	35.908	37.067	+6°
15	148	37.691	38.796	-6°
16	155	39.473	40.530	-6°
17	166	42.274	42.274	
18	173	44.057	44.057	
19	180	45.839	45.839	
20	187	47.621	47.621	
21	194	49.404	49.404	
22	201	51.186	51.186	
23	208	52.969	52.969	
24	215	54.751	54.751	
25	222	56.534	56.534	

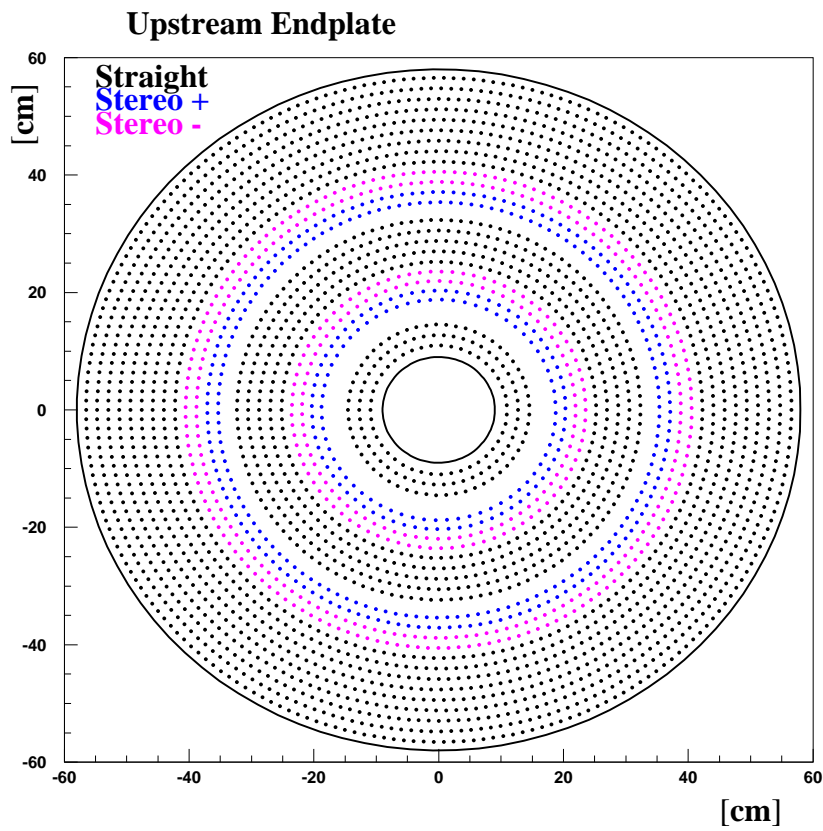


Figure 2: The drill pattern for the up-stream endplate using the 2 geometry. The black dots correspond to straight tubes. The blue dots are the $+6^\circ$ stereo layers while the magenta is the -6° stereo layers.

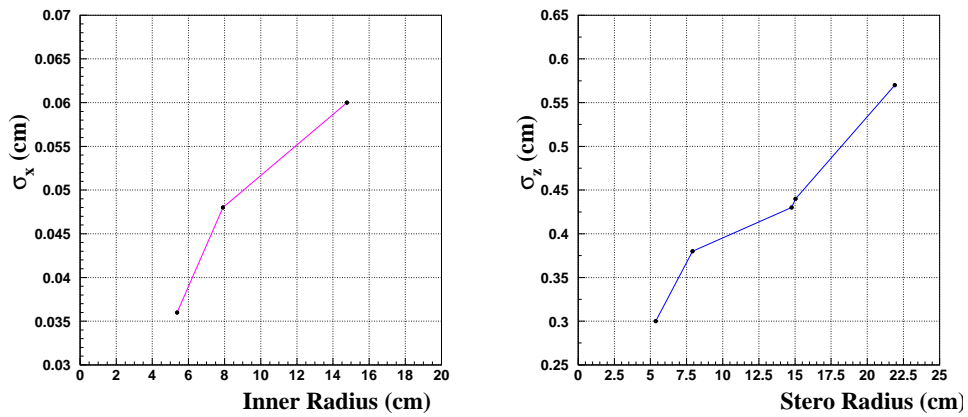


Figure 3: The estimated vertex resolution as a function of the radius of the innermost layer of tubes. For the case of the x resolution, this corresponds to the straight layers. For the z resolution, it is a function of the location of the first stereo layer.