GEM geometry

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Intro

- PVDIS decide to add 1 more plane before Cherenkov to make total 5 planes.
- PVDIS proposal has 22-35 degree as required acceptance
- GEM size in PVDIS proposal was not optimized to accepted 22-35 degree from the full target.
- Current CLEO PVDIS setup have room to allow EC accept 21-36 degree from full target, even though the performance at the edges can be somewhat degraded
- Both GSM and EC need to decide to accept 22-35 or 21-36 degree and optimize for target center or full target after examining performance and cost.

PVDIS GEM

Assume 21-36 degree acceptance

id	Z (cm)	PVDIS target center			PVDIS target full		
		R_in (cm)	R_out (cm)	Area (m2)	R_in (cm)	R_out (cm)	Area (m2)
1	157.5	56	107	2.611612	48	122	3.952133
2	185.5	67	128	3.736933	59	143	5.330667
3	190	69	130	3.813588	65	143	5.096932
4	306	113	215	10.51054	105	230	13.15545
5	315	117	222	11.18253	109	237	13.91352
total				31.8552			41.4487

- CLEO coil center at 0.
- PVDIS 40cm long target with center at 10cm
- PVDIS angle 21-36 degree by EC nominal acceptance R(110,250)cm
- Considering the CLEO baffle, plane 1,2,3 are directly behind baffle and only need partial coverage (70-80%?), plane 4,5 are between Cherenkov and EC and need full coverage 157.5,185.5,190,306,315
- To cover full target, GEM needs to increase by 30% from cover target center only
- Largest GEM size in R 128cm

PVDIS GEM

Assume 22-35 degree acceptance

id	Z (cm)	PVDIS target center			PVDIS target full		
		R_in (cm)	R_out (cm)	Area (m2)	R_in (cm)	R_out (cm)	Area (m2)
1	157.5	59	104	2.304364	51	118	3.557234
2	185.5	70	122	3.136573	62	136	4.603072
3	190	72	126	3.358999	65	140	4.83021
4	306	119	207	9.012622	111	221	11.47312
5	315	123	213	9.500198	115	228	12.17653
total				27.31276			36.64017

- CLEO coil center at 0.
- PVDIS 40cm long target with center at 10cm
- PVDIS angle 22-35 degree by EC nominal acceptance R(117,240)cm
- Considering the CLEO baffle, plane 1,2,3 are directly behind baffle and only need partial coverage (70-80%?), plane 4,5 are between Cherenkov and EC and need full coverage 157.5,185.5,190,306,315
- To cover full target, GEM needs to increase by 34% from cover target center only
- Largest GEM size in R 113cm

PVDIS Err_Apv(%) (based on current baffle "more1" before trig cut)

Assume 21-36 degree acceptance

x	0.20-0.30	0.30-0.35	0.35-0.40	0.40-0.45	0.45-0.50	0.50-0.55	0.55-0.60	0.60-0.67	0.67-0.80
EC	0.262	0.284	0.275	0.286	0.314	0.354	0.427	0.468	0.641
GEM 5 (full target)	0.262	0.284	0.275	0.286	0.314	0.355	0.428	0.469	0.641
GEM 5 (target center)	0.287	0.304	0.292	0.303	0.331	0.376	0.450	0.496	0.668

- Err_Apv studied according to e DIS hits on different detectors.
- EC nominal acceptance R(110,250)cm
- GEM 5 (full target) acceptance R(109,237)cm
- GEM 5 (target center) acceptance R(117,222)cm
- If we use GEM 5 (target center) configuration, it will increase Err_Apv

PVDIS Err_Apv(%) (based on current baffle "more1" before trig cut)

Assume 22-35 degree acceptance

x	0.20-0.30	0.30-0.35	0.35-0.40	0.40-0.45	0.45-0.50	0.50-0.55	0.55-0.60	0.60-0.67	0.67-0.80
EC	0.282	0.300	0.286	0.297	0.324	0.366	0.439	0.482	0.649
GEM 5 (full target)	0.280	0.298	0.285	0.296	0.324	0.367	0.441	0.485	0.653
GEM 5 (target center)	0.316	0.328	0.311	0.325	0.353	0.403	0.481	0.529	0.707

- Err_Apv studied according to e DIS hits on different detectors.
- EC nominal acceptance R(117,240)cm
- GEM 5 (full target) acceptance R(115,228)cm
- GEM 5 (target center) acceptance R(112,213)cm
- If we use GEM 5 (target center) configuration, it will increase Err_Apv

Assume 21-36 degree acceptance

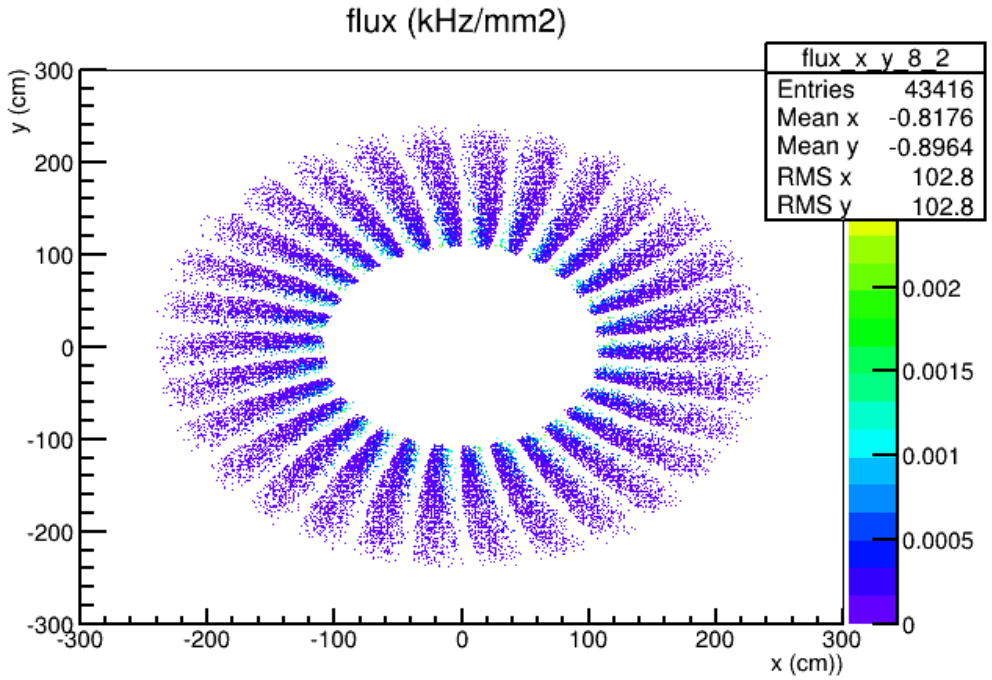
Err_Apv(%) (based on current baffle "more1" before trig cut)

x	0.20-0.30	0.30-0.35	0.35-0.40	0.40-0.45	0.45-0.50	0.50-0.55	0.55-0.60	0.60-0.67	0.67-0.80
GEM 5	0.262	0.284	0.275	0.286	0.314	0.355	0.428	0.469	0.641
GEM 4	0.261	0.284	0.274	0.286	0.314	0.354	0.427	0.467	0.641
GEM 3	0.26	0.283	0.274	0.285	0.313	0.353	0.426	0.466	0.641
GEM 2	0.259	0.283	0.274	0.285	0.313	0.353	0.426	0.466	0.641
GEM 1	0.219	0.261	0.26	0.275	0.304	0.344	0.414	0.451	0.623

- Err_Apv studied according to e DIS hits on different GEM planes (full target)
- GEM 1 has more hits because it's between baffle planes
- Overall the sizes of GEM planes have matching acceptance.

PVDIS e DIS hit on EC

- Based on current “more1” baffle
- Pattern is similar on GEM 4,5 plane because they are close by in Z.
- This suggests almost full coverage in phi.



SIDIS/JPsi GEM

id	Z (cm)	SIDIS target center		SIDIS target full		JPsi target center		Overall	
		R range (cm)	Area (m2)	R range (cm)	Area (m2)	R range needed (cm)	Area needed (m2)	R range (cm)	Area (m2)
1	-175	46-78	1.2466	41-87	1.8498	36-67	1.0031	36-87	1.9707
2	-150	26-91	2.3892	23-98	2.8510	21-80	1.8720	21-98	2.8786
3	-119	30-103	3.0502	27-112	3.7118	25-97	2.7595	25-112	3.7445
4	-68	37-126	4.5575	34-135	5.3624	32-123	4.4312	32-135	5.4039
5	5	46-95	2.1705	44-100	2.5334	42-90	1.9905	42-100	2.5874
6	92	58-118	3.3175	55-123	3.8026	55-115	3.2044	55-123	3.8026
total			16.7315		20.1110		15.2607		20.3877

- CLEO coil center at 0.
- Plane (1,2,3,4) cover large angle and plane (2,3,4,5,6) cover forward angle
- SIDIS 40cm long target with center at -350cm, SIDIS angle 7.5-14.85-24 degree accepted by EC
- JPsi 15cm long target with center at -300cm tentatively, JPsi angle 8- 16.28-28 degree accepted by EC
- Jpsi coverage is only optimized by target center as it's length is smaller
- Overall GEM size determined by "Jpsi target center" inner and "SIDIS target full" outer
- PVDIS has more than enough GEM for SIDIS/JPsi to cover full target