Design of Si-CsI detector systems (like CHIMERA)

2014. 05. 30. Group meeting

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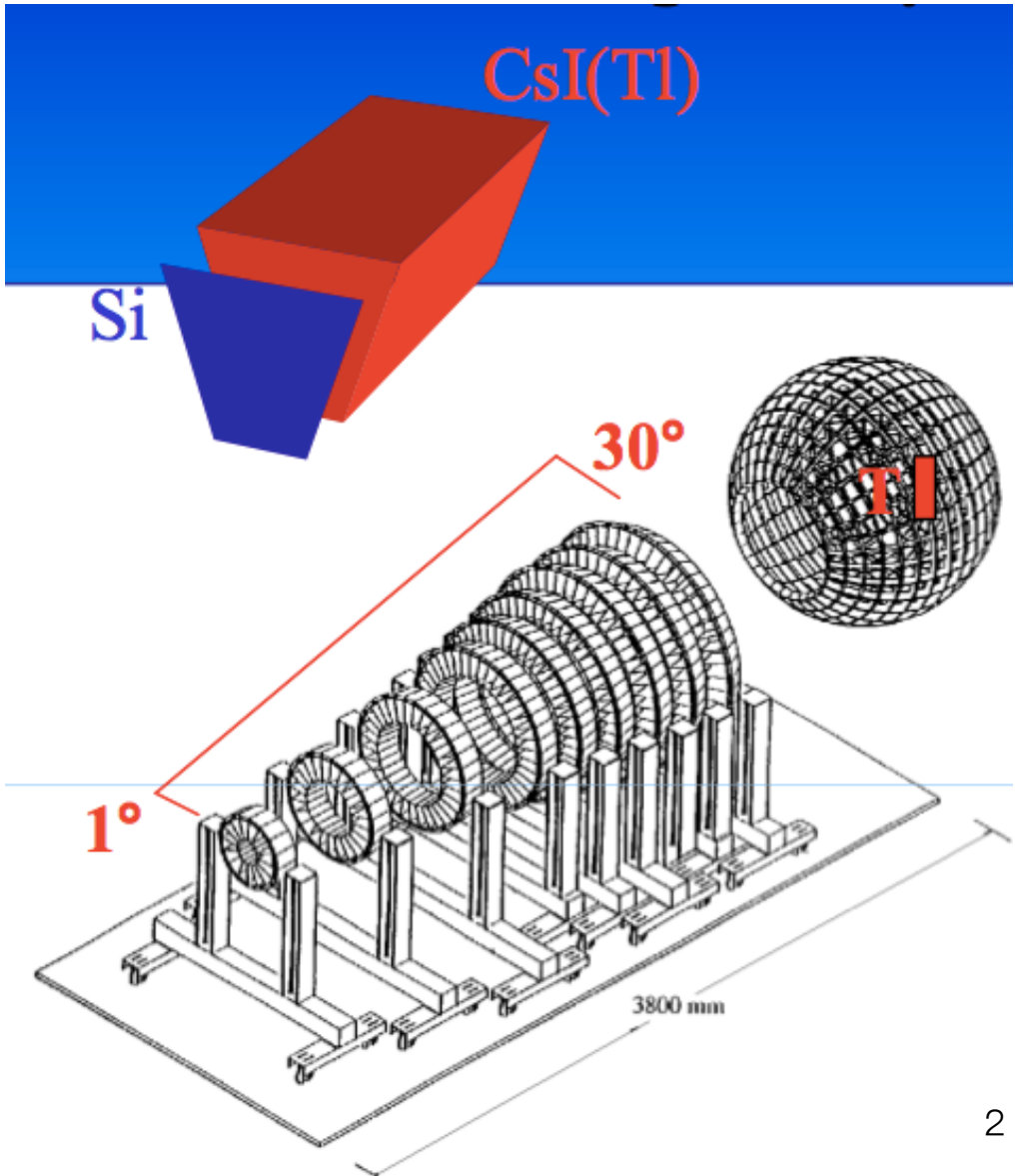
CHIMERA@LNS

(**C**harge **H**eavy **I**on **M**ass and **E**nergy **R**esolving **A**rray)



- **RINGS(18 rings)**:

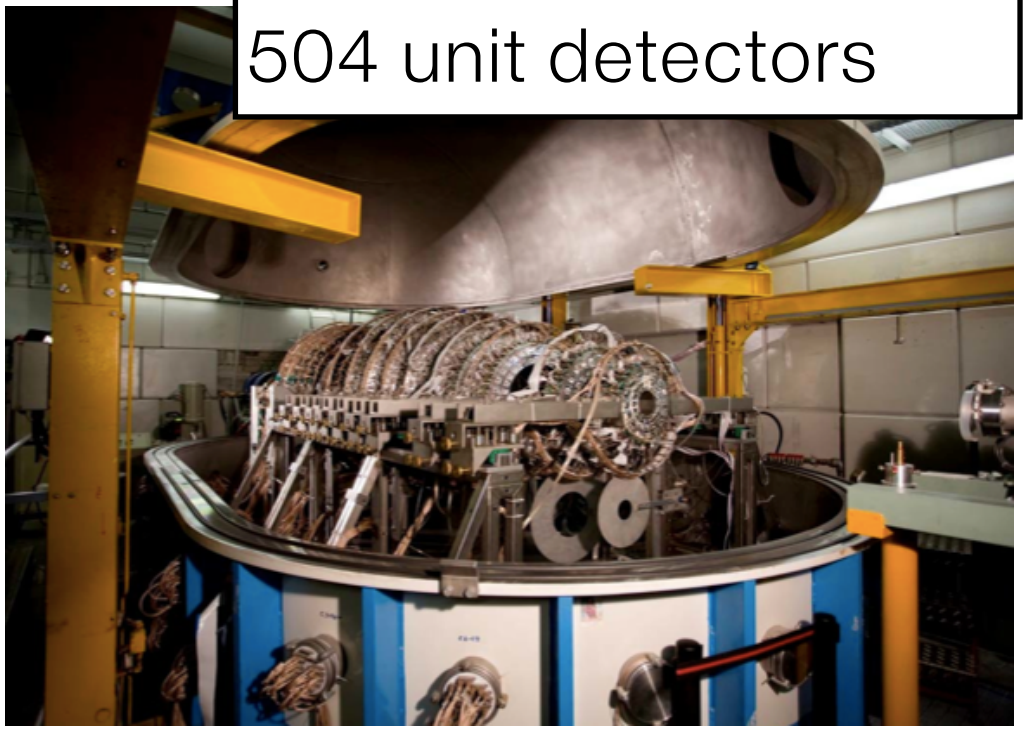
1°<θ<30°

688 unit detectors

- **SPHERE(17 rings)**:

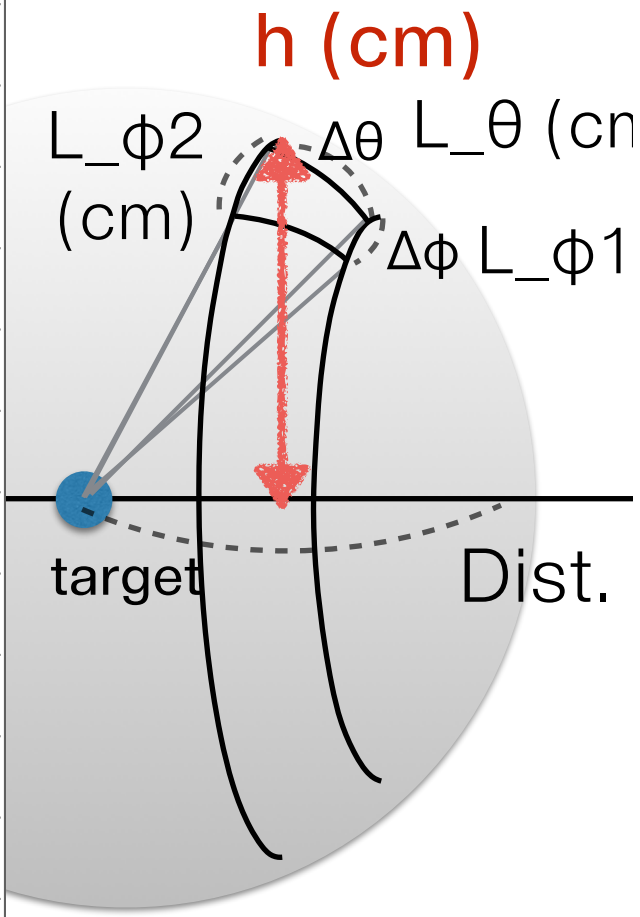
30°<θ<176°

504 unit detectors



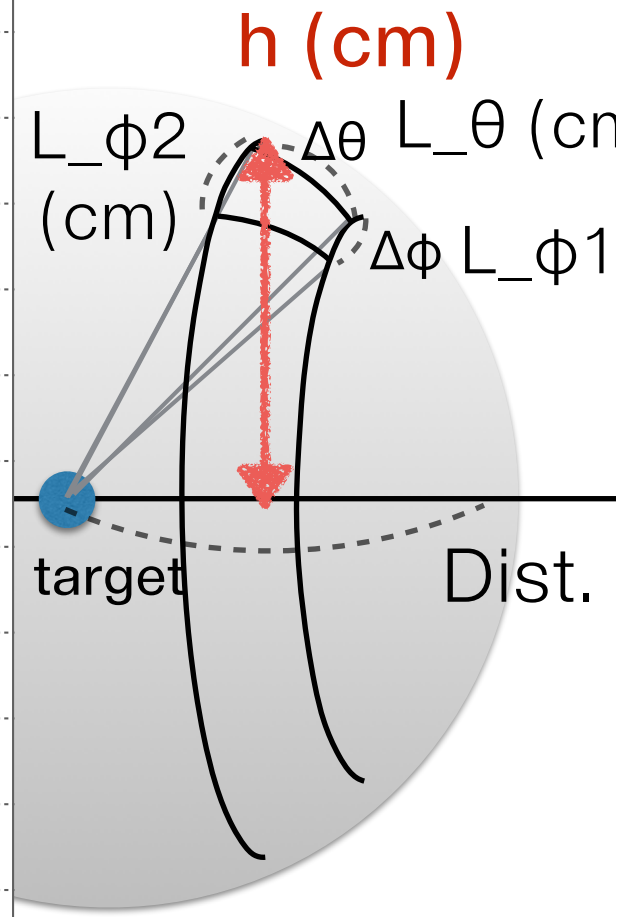
CHIMERA -rings

RING	Dist. (cm)	θ1 (°)	θ2 (°)	Δϕ (°)	Δθ (°)	L_θ (cm)	L_ϕ1 (cm)	L_ϕ2 (cm)	h (cm)	# of Det.
1	350	1	1.8	22.5	0.8	4.89	2.40	4.32	10.99	16
2	350	1.8	2.6	22.5	0.8	4.89	4.32	6.23	15.88	16
3	300	2.6	3.6	15	1	5.24	3.56	4.93	18.84	24
4	300	3.6	4.6	15	1	5.24	4.93	6.30	24.06	24
5	250	4.6	5.8	11.25	1.2	5.24	3.94	4.96	25.26	32
6	250	5.8	7	11.25	1.2	5.24	4.96	5.98	30.47	32
7	210	7	8.5	9	1.5	5.50	4.02	4.88	31.04	40
8	210	8.5	10	9	1.5	5.50	4.88	5.73	36.47	40
9	180	10	11.5	9	1.5	4.71	4.91	5.64	35.89	40
10	180	11.5	13	9	1.5	4.71	5.64	6.36	40.49	40
11	160	13	14.5	7.5	1.5	4.19	4.71	5.24	40.06	48
12	160	14.5	16	7.5	1.5	4.19	5.24	5.77	44.10	48
13	140	16	18	7.5	2	4.89	5.05	5.66	43.26	48
14	140	18	20	7.5	2	4.89	5.66	6.27	47.88	48
15	120	20	22	7.5	2	4.19	5.37	5.88	44.95	48
16	120	22	24	7.5	2	4.19	5.88	6.39	48.81	48
17	100	24	27	7.5	3	5.24	5.32	5.94	45.40	48
18	100	27	30	7.5	3	5.24	5.94	6.54	50.00	48

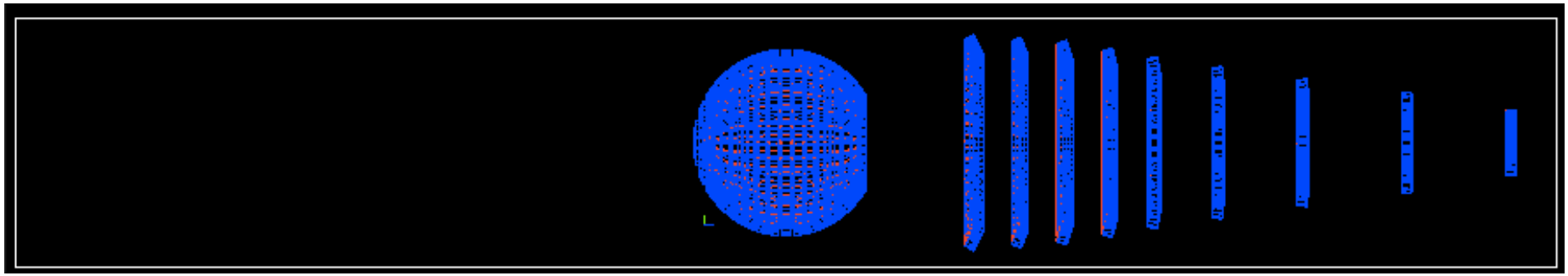


CHIMERA -sphere

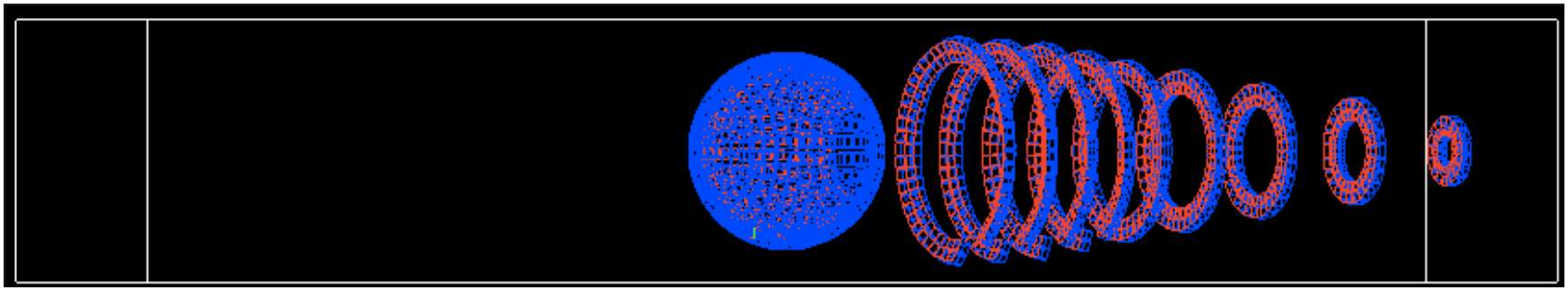
RING	Dist. (cm)	θ1 (°)	θ2 (°)	Δϕ (°)	Δθ (°)	L_θ (cm)	L_ϕ1 (cm)	L_ϕ2 (cm)	# of Det.
19	40	30	38	11.25	8	5.59	3.93	4.84	32
20	40	38	46	11.25	8	5.59	4.84	5.65	32
21	40	46	54	11.25	8	5.59	5.65	6.35	32
22	40	54	62	11.25	8	5.59	6.35	6.93	32
23	40	62	70	11.25	8	5.59	6.93	7.38	32
24	40	70	78	11.25	8	5.59	7.38	7.68	32
25	40	78	86	11.25	8	5.59	7.68	7.83	32
26	40	86	94	11.25	8	5.59	7.83	7.83	32
27	40	94	102	11.25	8	5.59	7.83	7.68	32
28	40	102	110	11.25	8	5.59	7.68	7.38	32
29	40	110	118	11.25	8	5.59	7.38	6.93	32
30	40	118	126	11.25	8	5.59	6.93	6.35	32
31	40	126	134	11.25	8	5.59	6.35	5.65	32
32	40	134	142	11.25	8	5.59	5.65	4.84	32
33	40	142	150	11.25	8	5.59	4.84	3.93	32
34	40	150	163	22.5	13	9.08	7.85	4.59	16
35	40	163	176	45	13	9.08	9.19	2.19	8



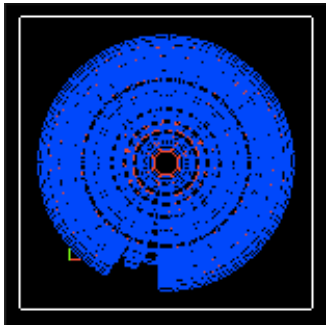
crude drawing of CHIMERA system using GEANT4



viewpointThetaPhi 90 180



viewpointThetaPhi 120 180



viewpointThetaPhi 0 90

Problems now

- want to make detector system ..

    1. have **not too many kinds of size** of unit detectors

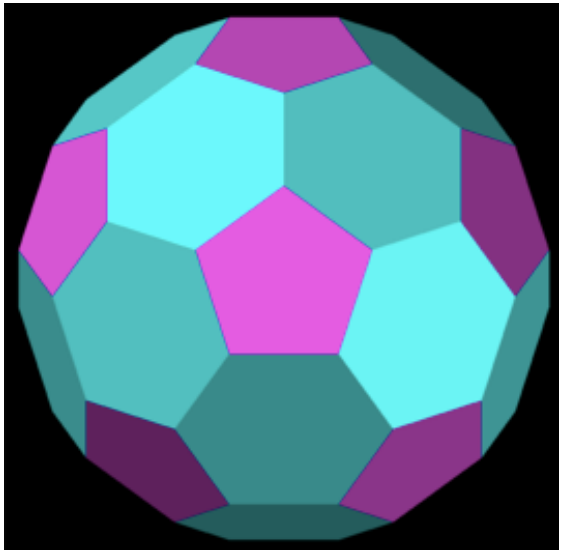
    2. have **not too many number of unit detectors** (it causes too low occupancy for unit detectors & costs high)

- **square shape** unit detectors results in so much **empty space**

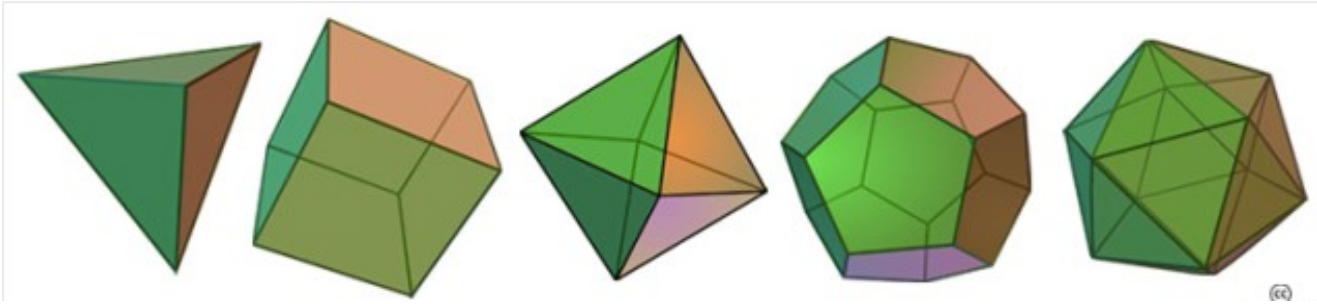
-> make smaller size (need many unit detectors)

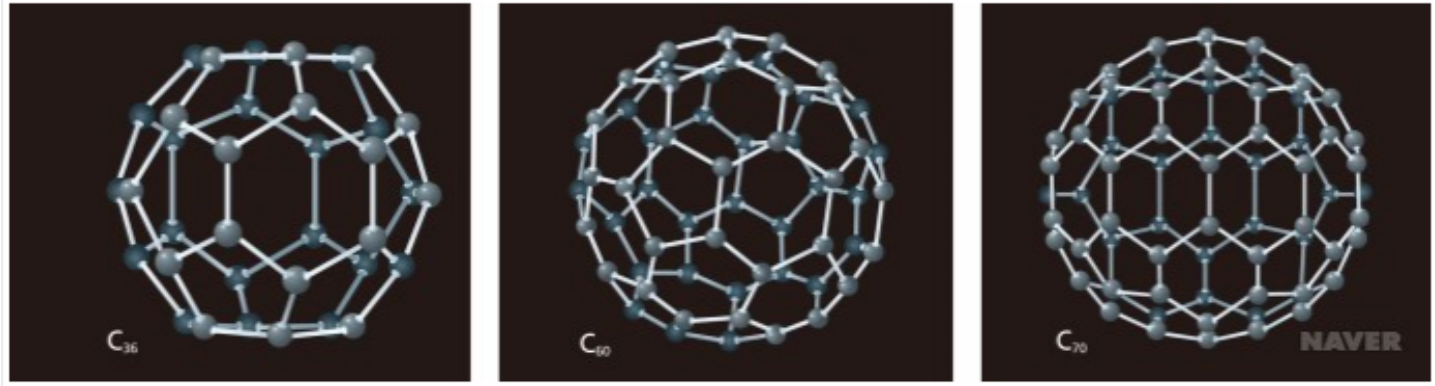
-> change the shape of unit detectors

change the shape..?



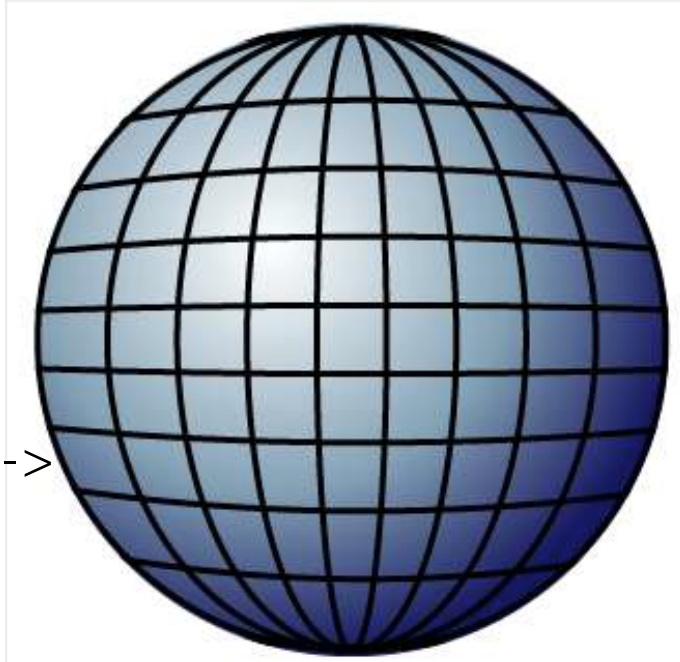
- advantage : almost no empty space
  same shape&size of unit detectors
- disadvantage : occupancy problem
  -> for forward direction, divide the unit detector more





| 풀러렌의 분자 모형

for this case, need different shape unit detectors ->



Status

- Studying GEANT4 for a simulation using AMD data
- working on designing detector system with two kinds of size& square-shape of unit detectors, trying to make less empty space

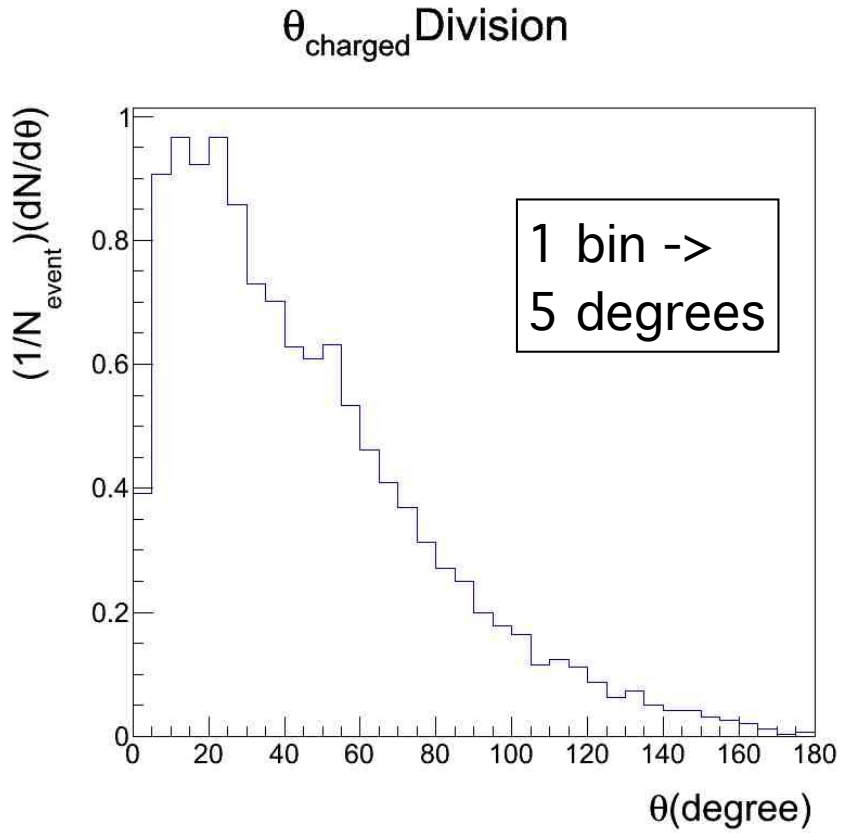
Plan

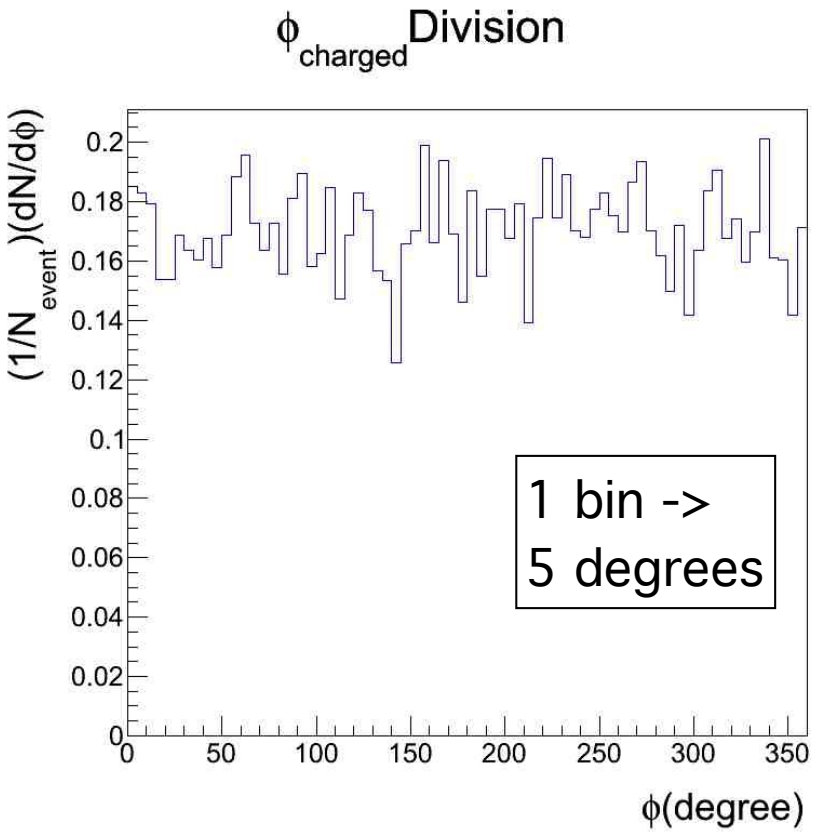
- determine the design and make a simulation using GEANT4 to see how it works

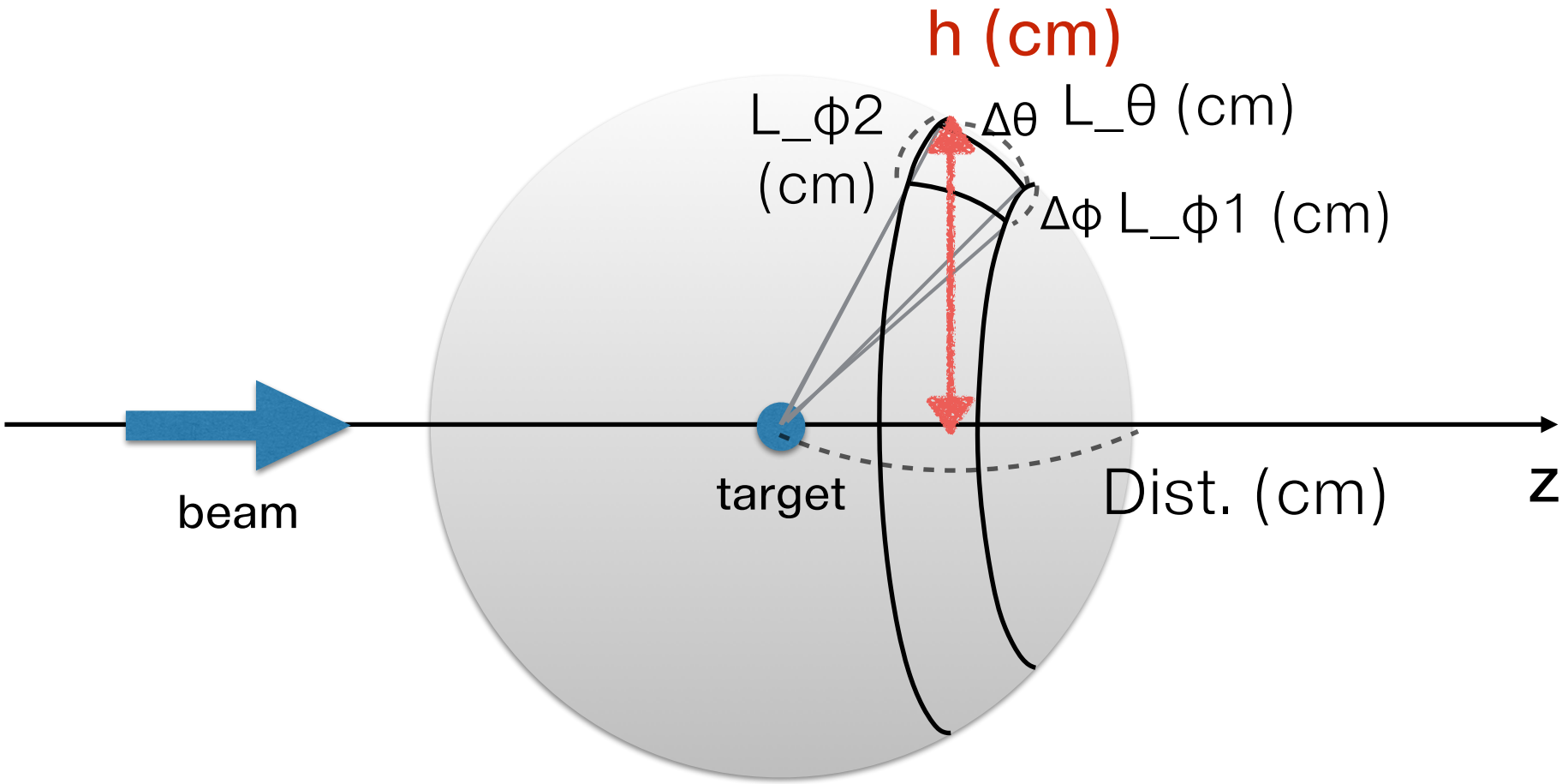
back-up

AMD data

- beam: ^{132}Sn, 20 MeV/u
- target: ^{124}Sn






h (cm)
L_ϕ2
(cm)
Δθ
L_θ (cm)
Δϕ
L_ϕ1 (cm)
beam
target
Dist. (cm)
z

CHIMERA -rings

RING	Dist. (cm)	θ1 (°)	θ2 (°)	Δϕ (°)	Δθ (°)	L_θ (cm)	arc (cm)	L_ϕ 1	arc (cm)	L_ϕ 2	arc (cm)	h (cm)	# of Det.
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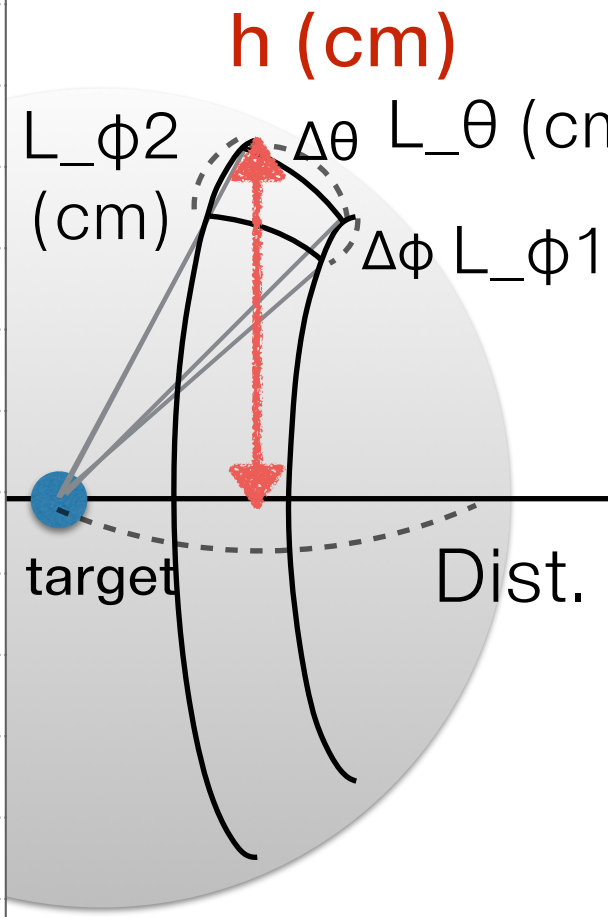

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CHIMERA -sphere