Space available for CGEM installation

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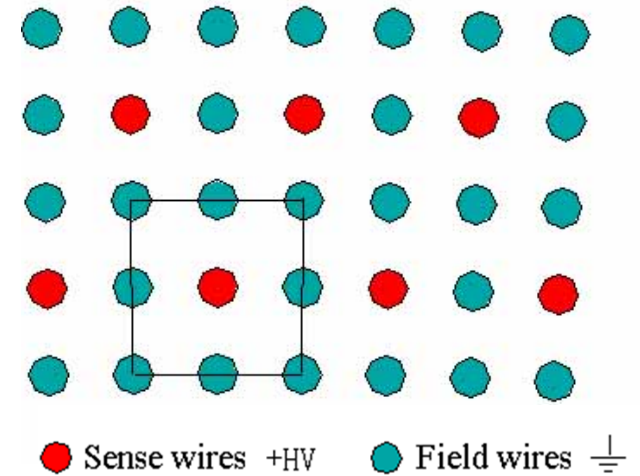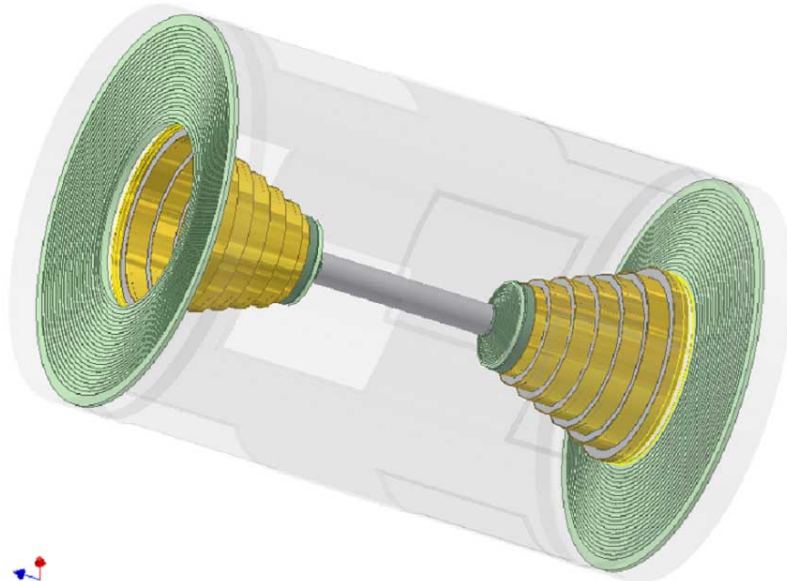
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Outline

◆ BESIII MDC

◆ The mechanical structure of inner MDC and space available for CGEM

◆ Summary

BESIII MDC

● Sense wires +HV   ● Field wires ⊥

- Consist of an inner chamber and an outer chamber
- Radial extent : from 59 to 810 mm,
  length : inner 774mm, outer 2582 mm,
  solid angle coverage : 93%×4π
- Inner cylinder : 1.2 mm carbon fiber,
  outer cylinder : 11.5 mm CF with 8 windows,
 end plate : 18 mm thick Al (6 steps & inner chamber: 25 mm thick Al)

- Cell size
  inner chamber : $12mm^2$
  outer chamber : $16.2mm^2$

MDC Cell arrangement

Layer	Number of cells per layer	type	solid angle(degree)
1 — 4	40/44/48/56	stereo (-)	2.9 ~ 3.3
5 — 8	64/72/80/80	stereo (+)	3.4 ~ 3.9
9 — 20	76/88/100/112/128/140	axial	—
21 — 24	160	stereo(-)	2.4 ~ 2.7
25 — 28	176	stereo(+)	2.7 ~ 3.1
29 — 32	208	stereo(-)	3.0 ~ 3.3
33 — 36	240	stereo(+)	3.3 ~ 3.6
37 — 40	256	axial	—
41 — 43	288	axial	—

- 6796 cells in 43 circular layers
- 19 axial layers, 24 stereo layers
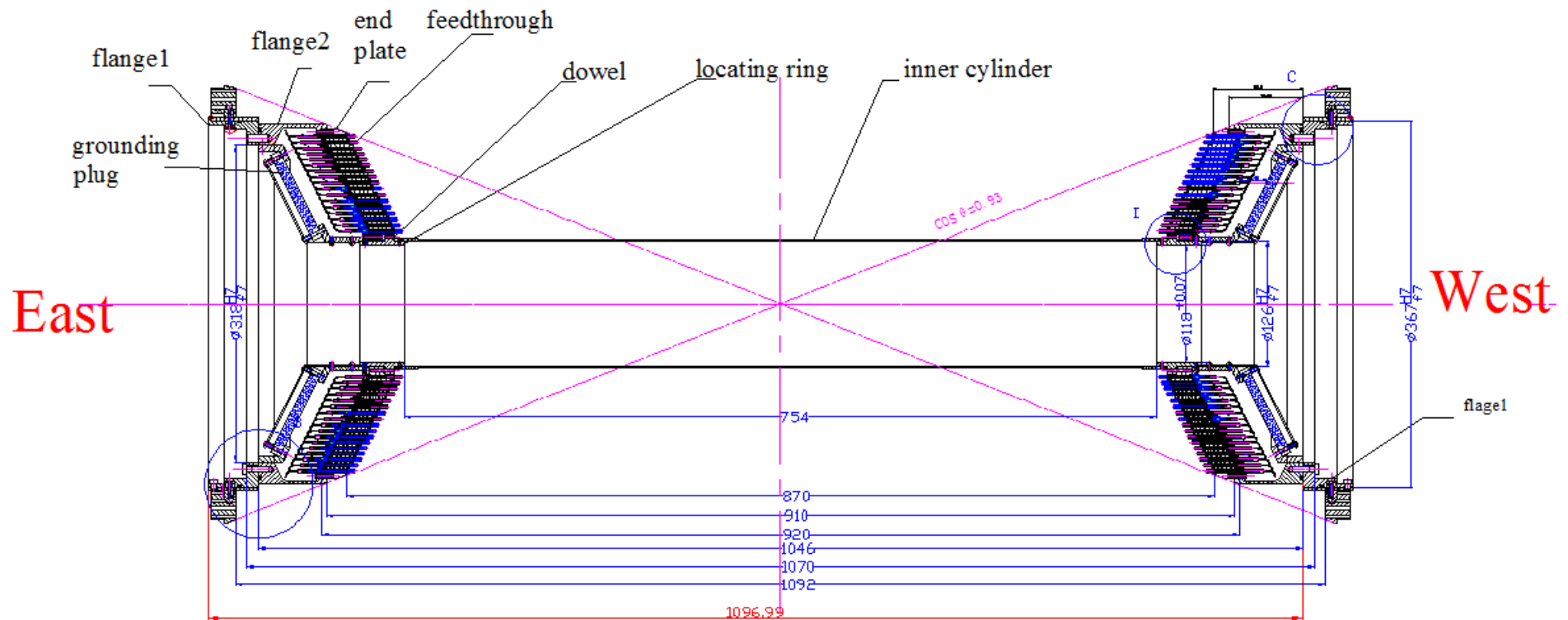- 8 stereo wire layers in inner drift chamber

Current BESIII inner drift chamber

Inner endplate
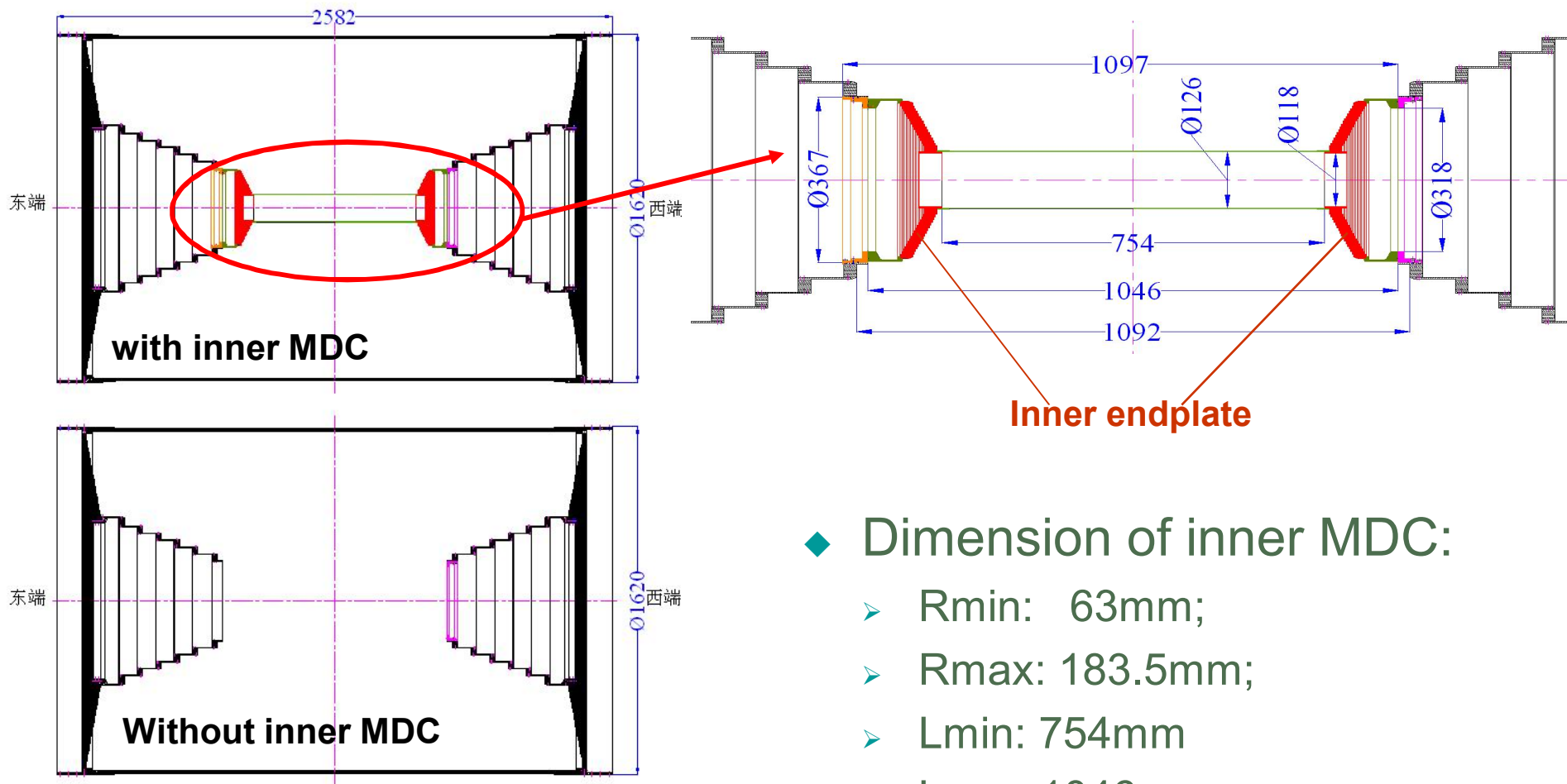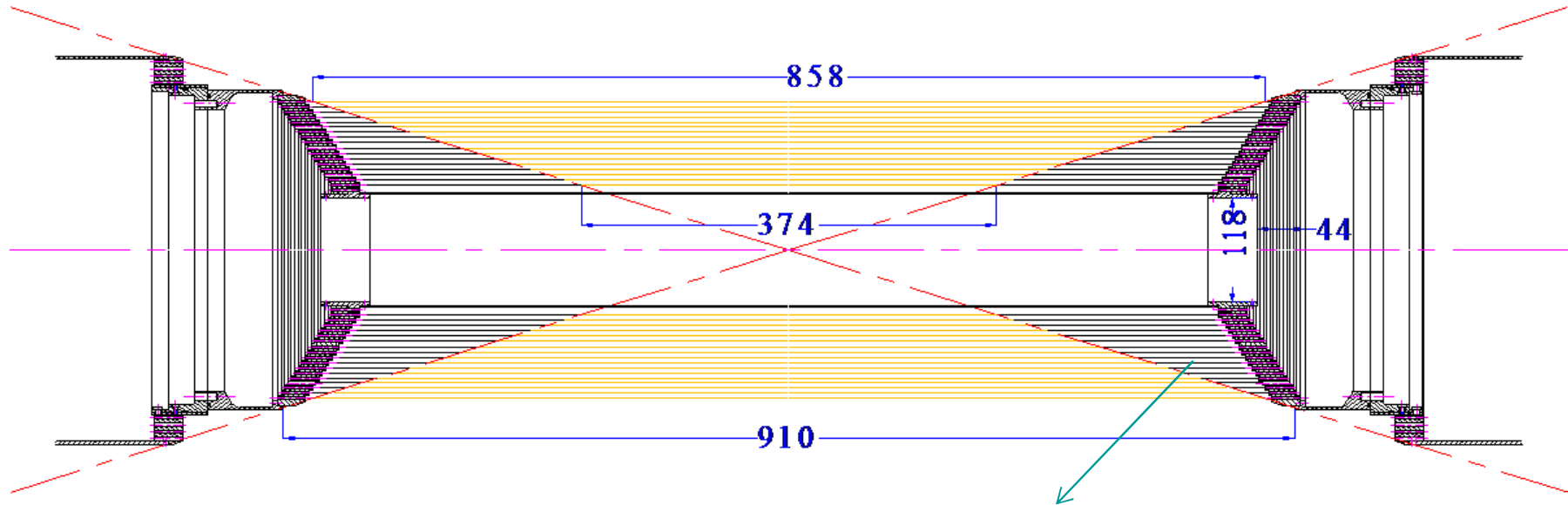
◆ Dimension of inner MDC:

➢ Rmin: 63mm;

➢ Rmax: 183.5mm;

➢ Lmin: 754mm

➢ Lmax:1046mm

Mechanical structrue of inner MDC

- ◆ Inner drift chamber is fixed on the first step ring of MDC through two flanges

Space available for CGEM

parts of the sense wires in
this region are ineffective

- ◆ Parts of inner sense wires in z direction are out of the effective solid angle (cosθ = 0.93)
- ◆ Also available space when we consider CGEM installation

Ineffective wire length of inner MDC

| Layer No.	Wire length(mm)	Ineffective	Proportion of ineffective (%)
L1	780	381	48.8
L2	792	333	42.0
L3	804	283	35.2
L4	816	233	28.6
L5	828	184	22.2
L6	840	138	16.4
L7	852	92	10.8
L8	864	46	5.3

- In CGEM design, If the length of CGEM matches the MDC effective solid angle ($\cos\theta = 0.93$), the total count rate will be reduced, and available space for readout electronics will be increased
- The length of each layer of CGEM is different

Suppose 3 layers CGEM

Component	L1(Rin/Rout)	L2(Rin/Rout)	L3(Rin/Rout)	Material
Cathode	78.0/81.0	120.5/123.5	163.0/166.0	3 mm Honeycomb
Conversion + drift	81.0/84.0	123.5/126.5	166.0/169.0	3 mm gas
Transfer 1	84.0/86.0	126.5/128.5	169.0/171.0	2 mm gas
Transfer 2	86.0/88.0	128.5/130.5	171.0/173.0	2 mm gas
Induction	88.0/90.0	130.5/132.5	173.0/175.0	2 mm gas
Readout	90.0	132.5	175.0	
Outer shield	90.0/93.0	132.5/135.5	175.0/178.0	3 mm Honeycomb

- L1 length: 532mm , L2 length: 690mm
- L3 length: 847mm

Space available in z direction

3 layers CGEM
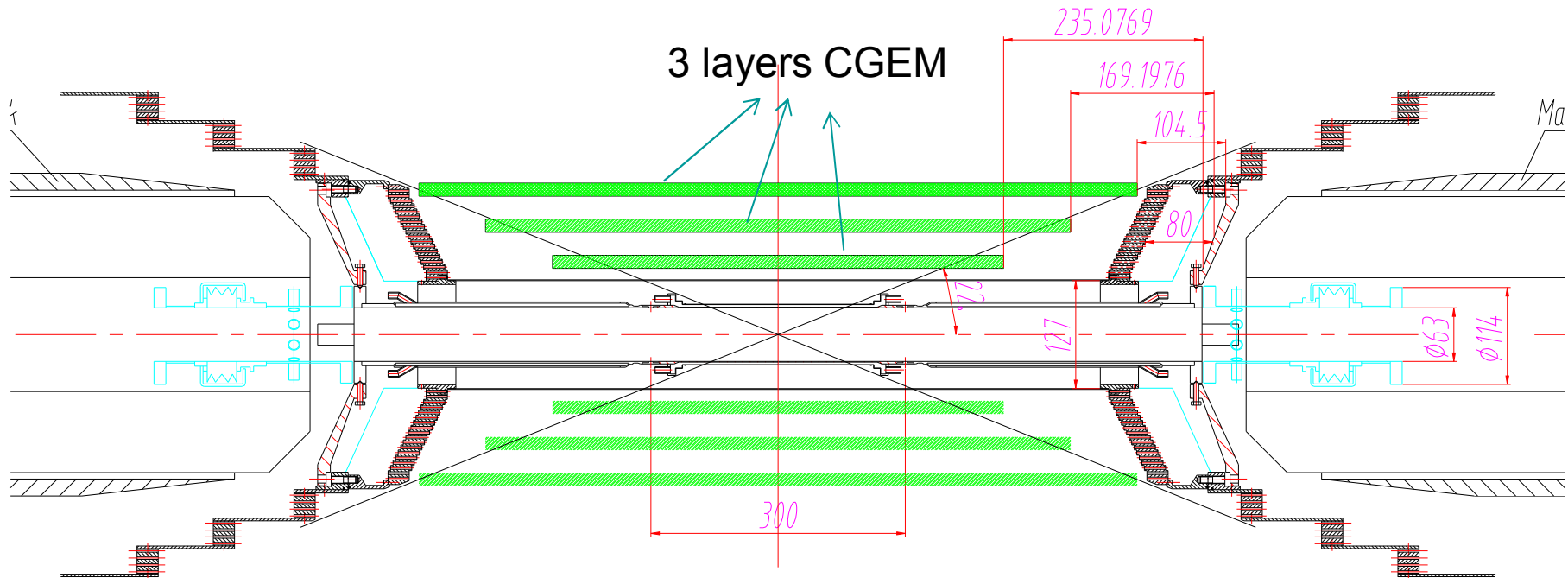
- The gap is about 80mm~100mm between the end plate of MDC inner chamber and the mechanical support of beam pipe
- 105mm~235mm in z direction is available for the support structure, readout electronics, cables of CGEM on each side

Summary

◆ Space available for CGEM in r direction is about 63mm~183.5mm

◆ If the length of CGEM matches the MDC effective solid angle ($\cos\theta = 0.93$), space available for CGEM in z direction is about 105mm~235mm on each side

Thank you !