

Cartesian Endcap Geometry

- ❑ Scheme with all crystals identical.
 - Renyuan Zhu points out this is what CMS and Panda do.
- ❑ Rectilinear array of crystals, tapered for approximate projectivity.
- ❑ After a look at CMS and Panda, give a sample SuperB design for discussion.

Claims in CMS TDR (1997)

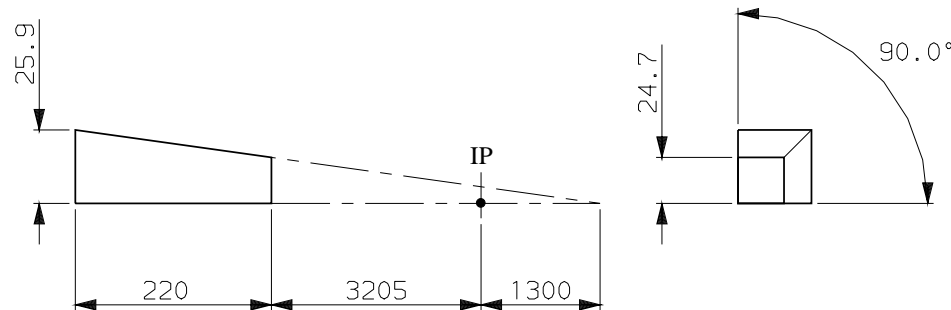
1. Optimal is approximate projectivity.
2. “Cost constraints clearly favour a solution where all the crystals are identical...”
3. Rectilinear grid – “advantages over other arrangements, such as wedge or petal”:
 - Event reconstruction – aligned corners and edges simplifies reconstruction, reduces dependence on position across detector.
 - Detector construction [But inflexible in replacing high- η crystals - RZ]

[Early CMS designs had the wedge/petal type of geometry]

CMS Endcap Design – Crystal shape

☐ All crystals identical

- Cross section is square.
- Two adjacent faces meet ends at right angles; other two faces give the projective taper.



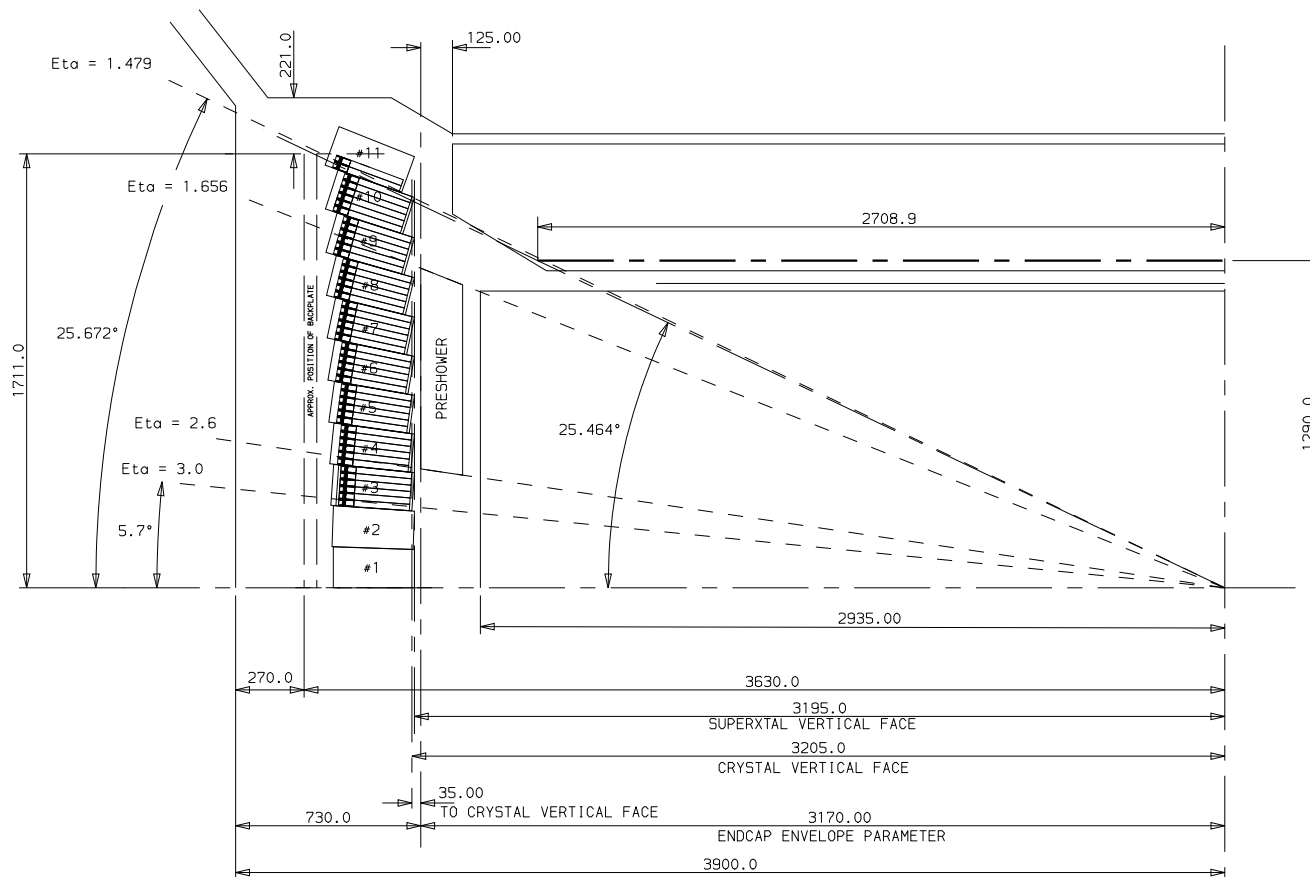
☐ “Supercrystals” are 5×5 arrays of crystals. [TDR version was 6×6 .]

CMS Endcap Design – Layout

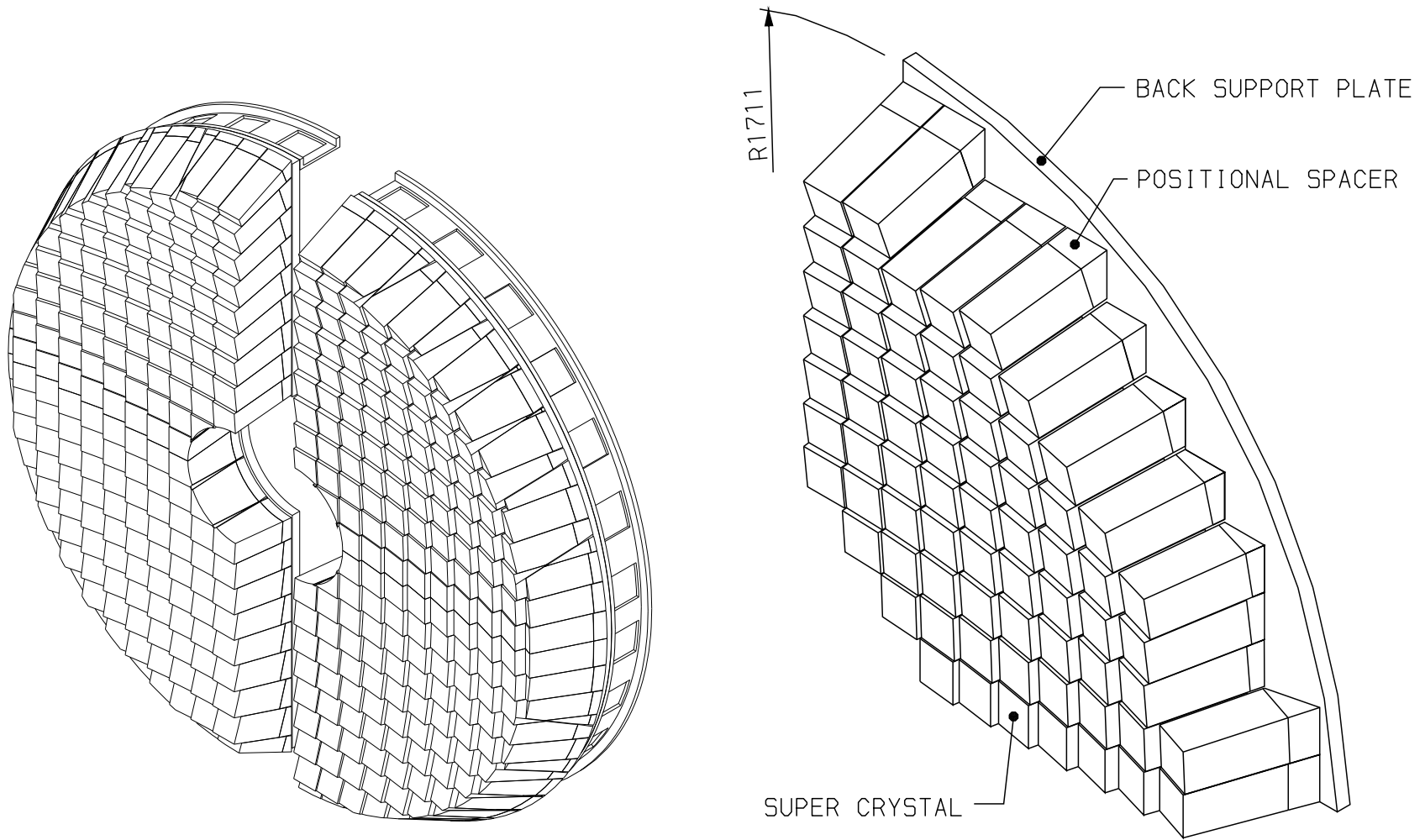


Supercrystals are stacked to form endcap

- All front faces adjusted to touch same z value.
- First stack columns, then rotate about y and translate to x -positions.

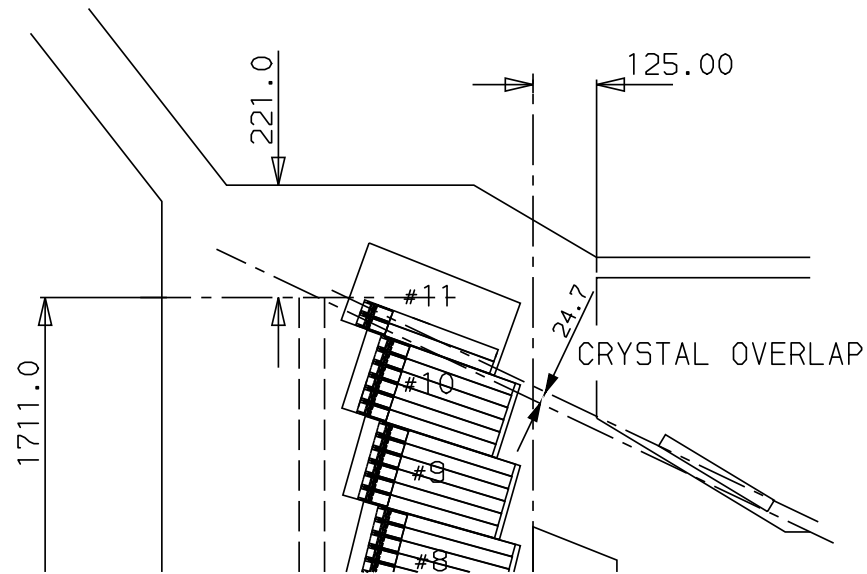


CMS Endcap Design – Stacked supercrystals



Each endcap has approximately 7500 crystals.

CMS Endcap Design – Overlap with barrel

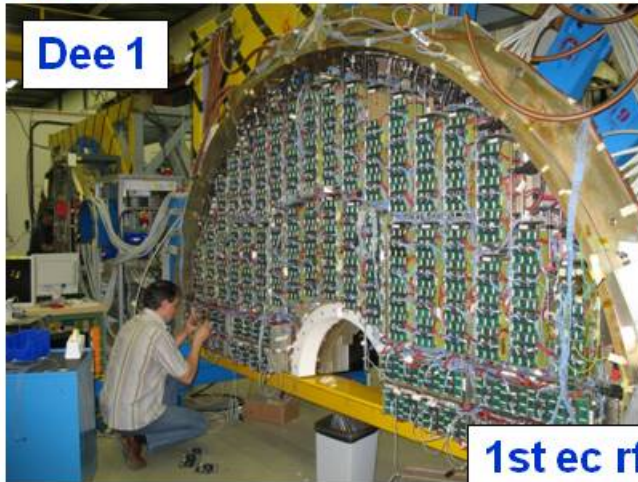


CMS Endcaps

[From Renyuan Zhu, 080521]



ECAL EE: Progress



Dee 1



Dee 2

1st ec rfi by mid-June
2nd by 21 July



Dee 3



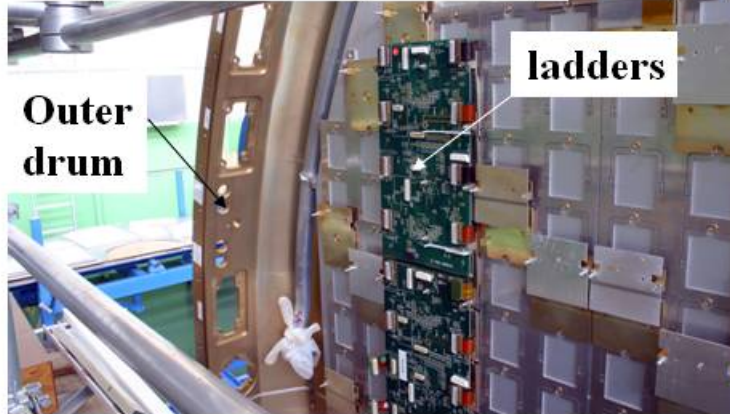
Dee 4

[From Renyuan Zhu, 080521]

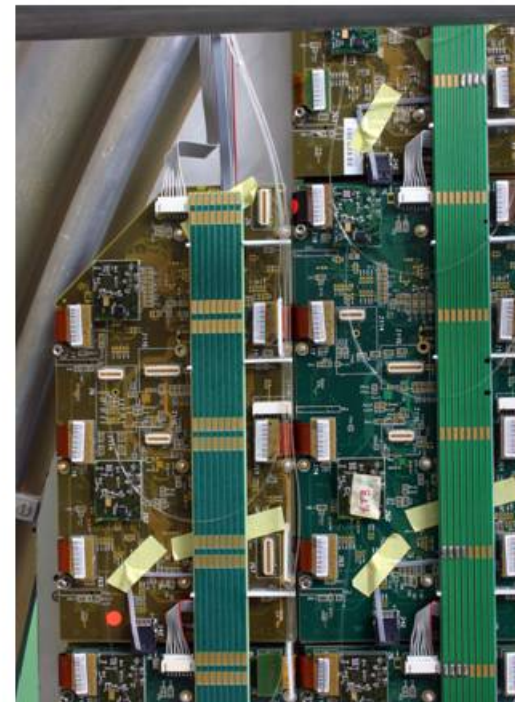
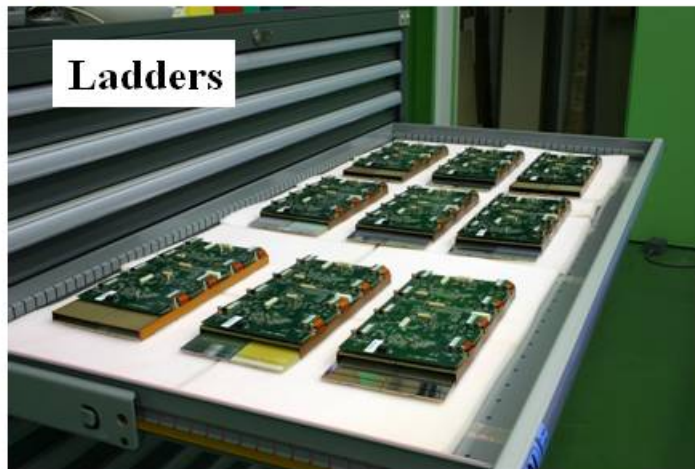


ECAL ES: Progress

Integration test (vertical)



Target: One endcap by mid-July
Definitive mounting on 1st plane
should start next week



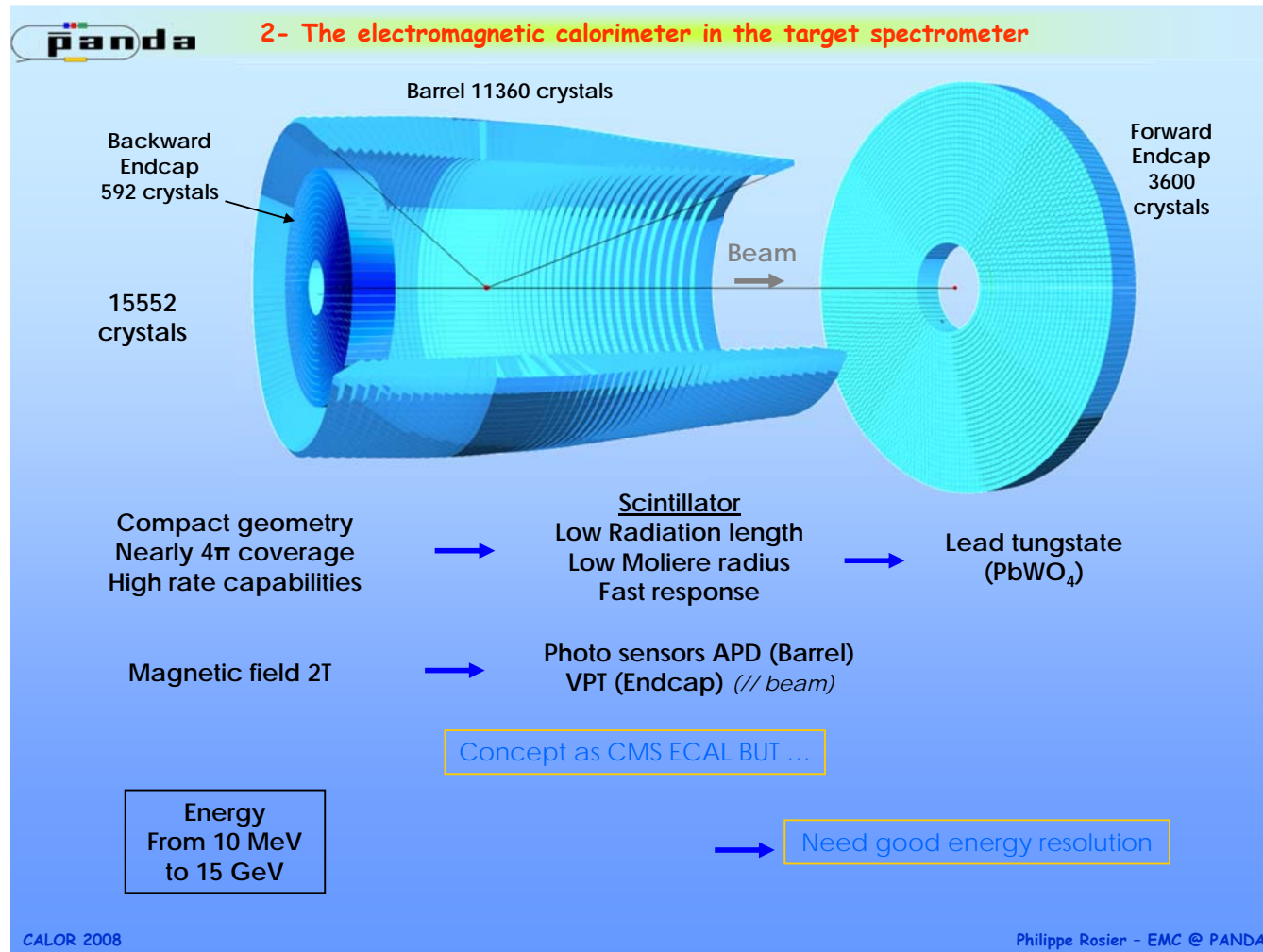
Trial Mounting on 1st Plane

All CMS7 May08 tsv 2

Panda Electromagnetic Calorimeter

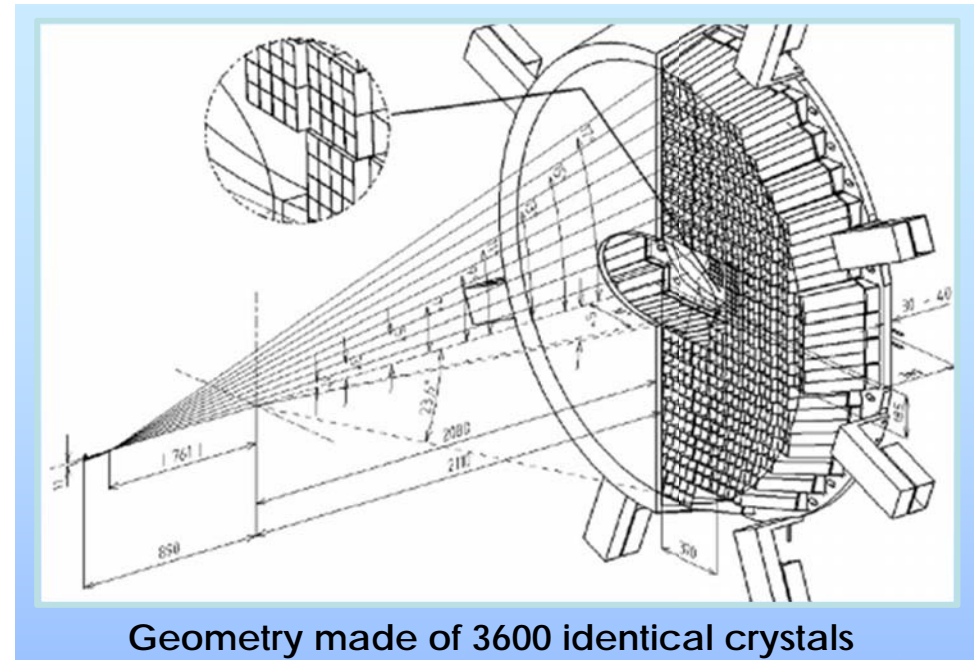
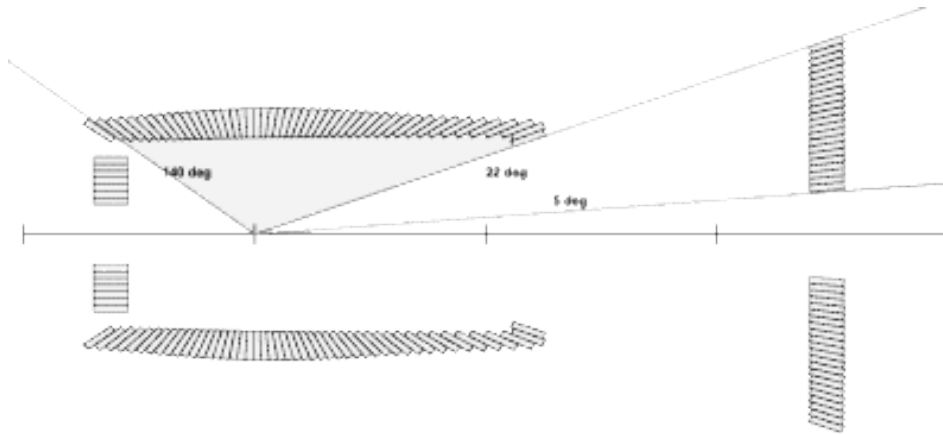
Panda – See Philippe Rosier talk at Calor 2008, 27 May 2008.

Forward endcap is projective rectilinear, with 4×4 supercrystals.



Panda Electromagnetic Calorimeter

<http://www-panda.gsi.de/html/det/emc/emc.gif>



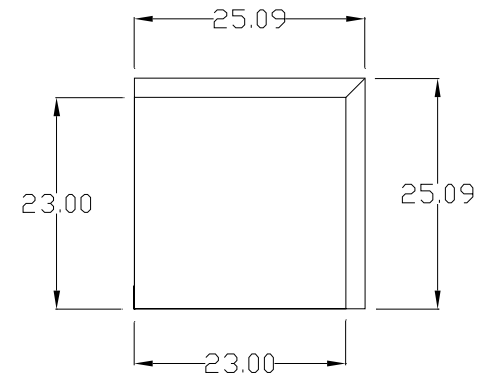
- ❑ Rear endcap is rectilinear non-projective array.
- ❑ Forward endcap is rectilinear projective array.

SuperB Rectilinear Endcap Geometry

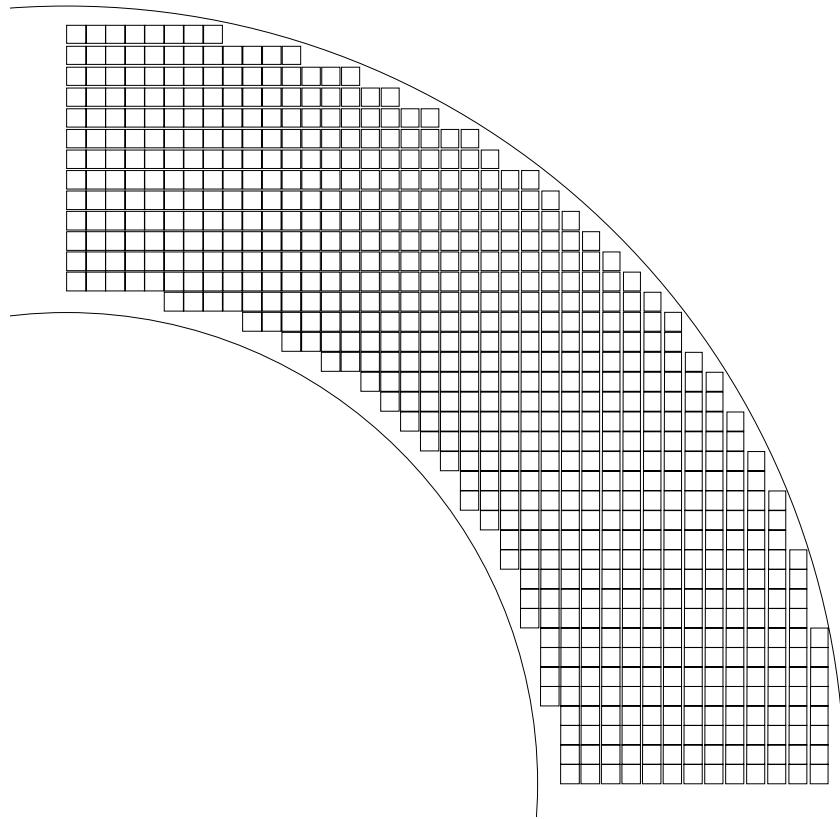
- ❑ Similar with CMS and Panda approach
 - For now, no “super-crystal” sub-structure.
 - Start at end of drift chamber; hence, no overlap with barrel.
 - Strict 300 mrad stay clear respected.
 - Maximum radius at front is 920 mm.
- ❑ Dimensions should be considered “nominal”, for illustration.

SuperB Rectilinear Endcap Geometry

Characteristic	Value	Units
Number of crystals	2672	
Crystal length	200	mm
Crystal front side	23	mm
Crystal back side	25.09	mm
Crystal taper angle (two sides)	0.599	degrees
z projection offset	400	mm
Maximum stacking gap	0.17	mm
Crystal z_{\min}	1801	mm
Crystal z_{\max}	1994	mm

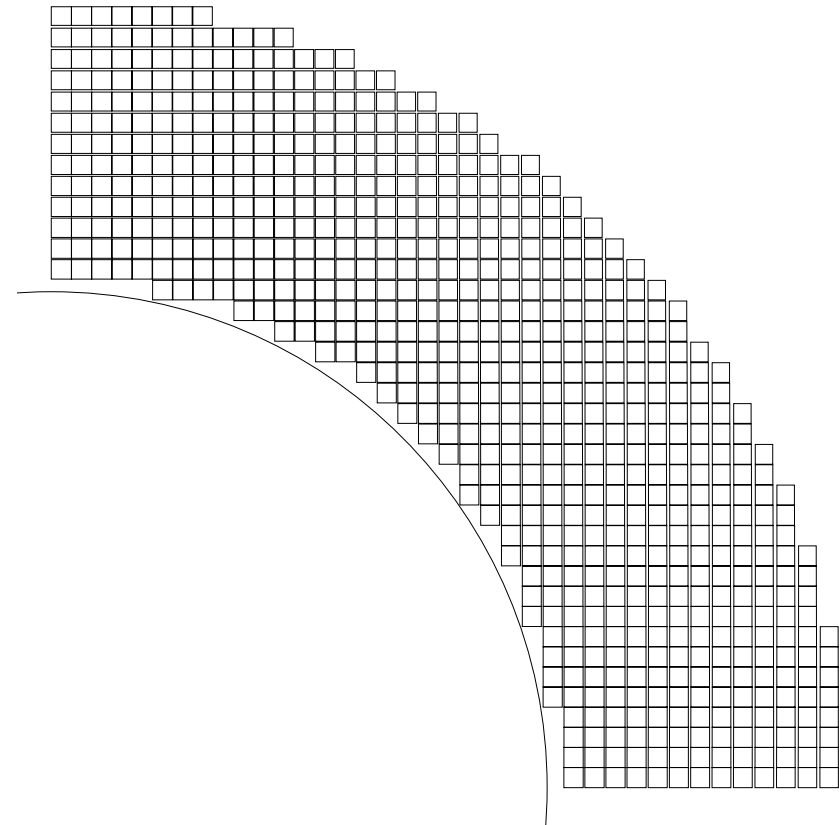


SuperB Cartesian Endcap – Front, rear faces



300 mrad 920 cm

Front faces



300 mrad

Rear faces

Comments

☐ Cost savings from crystal vendors:

- Ren-yuan has asked SIPAT about the cost of the metal module standards. These cost a few crystals worth for each shape.
- Still awaiting further information, but does not appear to be a major factor.

☐ Open questions:

- Advantages/disadvantages in mechanical construction?
- Advantages/disadvantages in pattern recognition?
- Advantages/disadvantages in cracks?
- (Lack of) overlap with barrel?

Summary

- ☐ Sketched a possible rectilinear forward endcap geometry for SuperB detector.
 - Identical crystals.
 - Projective.
- ☐ Modeled on CMS (also Panda), except no supercrystals (yet).
- ☐ For discussion.
 - If deemed a plausible candidate, can pursue refinements and address issues.