

Status of CEPC Detector Magnet

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For the CEPC Detector Magnet Team

CEPC Physics and Detector Group Meeting
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Outline

- Plans for the CDR
- Concerns/Resources
- Timescale(including R&D)

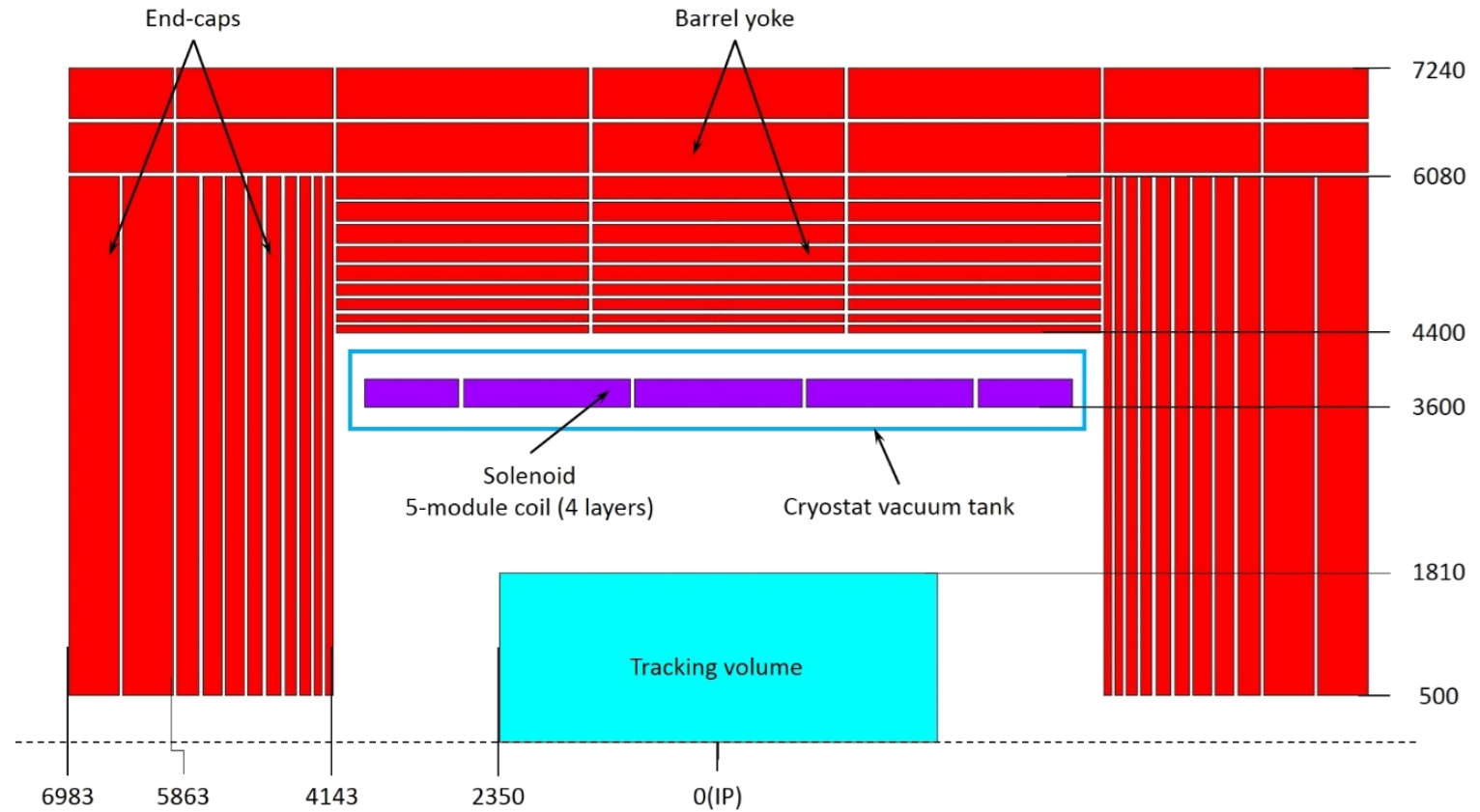
Plans for the CDR

From Pre-CDR to CDR, we plan to add:

- Design of the specific superconductor
- Quench simulation and protection design
- Magnetic field homogeneity of the tracking area with the MDI magnet
- Cryogenics process design
- Optimization according to the physics

Concerns

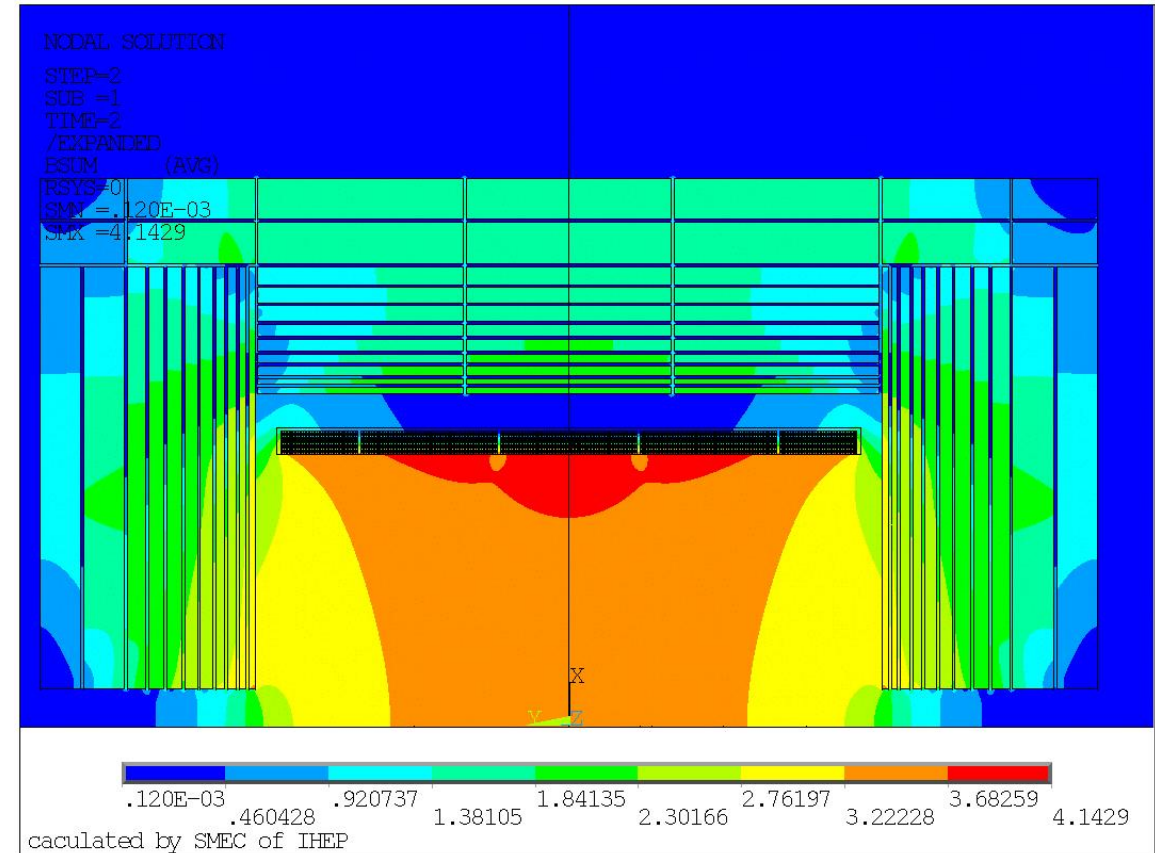
1. Magnetic field: 3.5T or others?
2. Stray field
3. Non Uniformity of TV



Need Discussion 1: Magnetic field

The central magnetic field of CEPC is 3.5 T in pre-CDR

	Central field (T)
CEPC	3.5
CMS	4
ILD	4
BESIII	1
Super KEKB	1.5

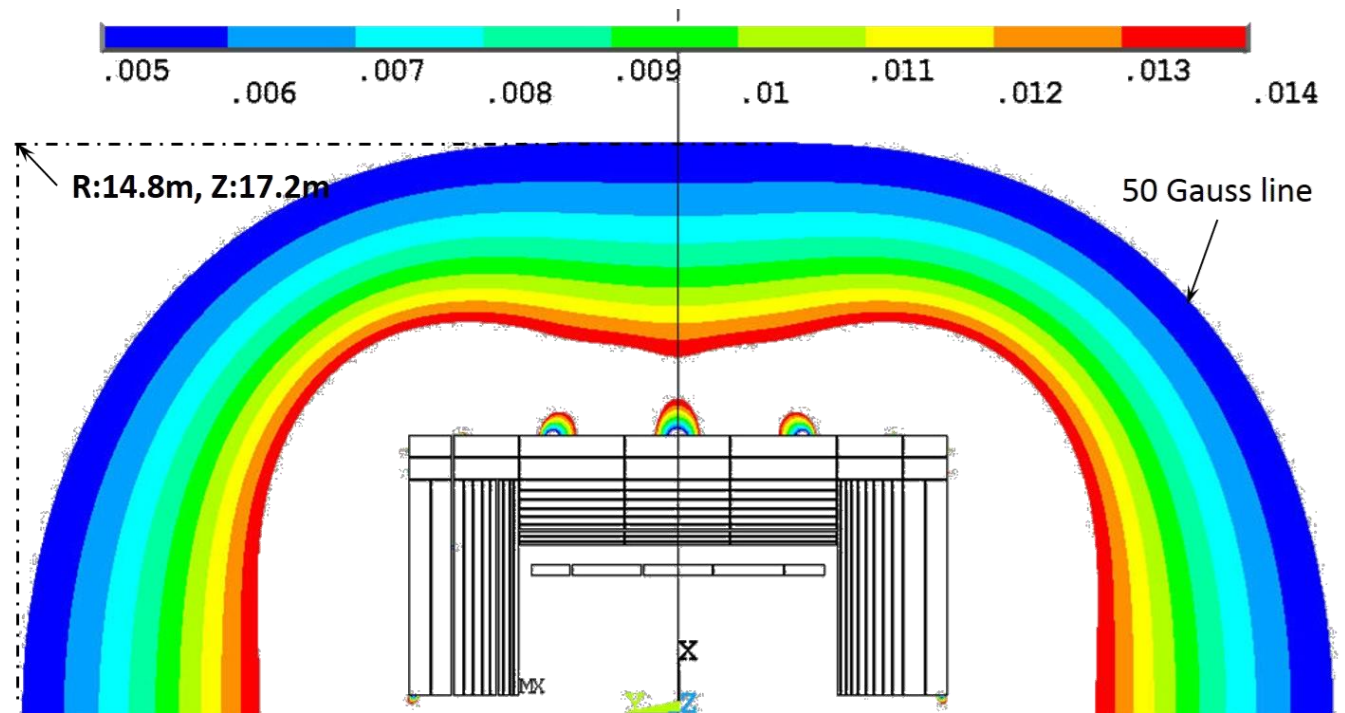


Need Discussion 2: stray field

It is related to the weight of yoke.

	Weight
End yoke	6425 t
Barrel yoke	5775 t
Total weight	12200 t

Require the definition of the leak field



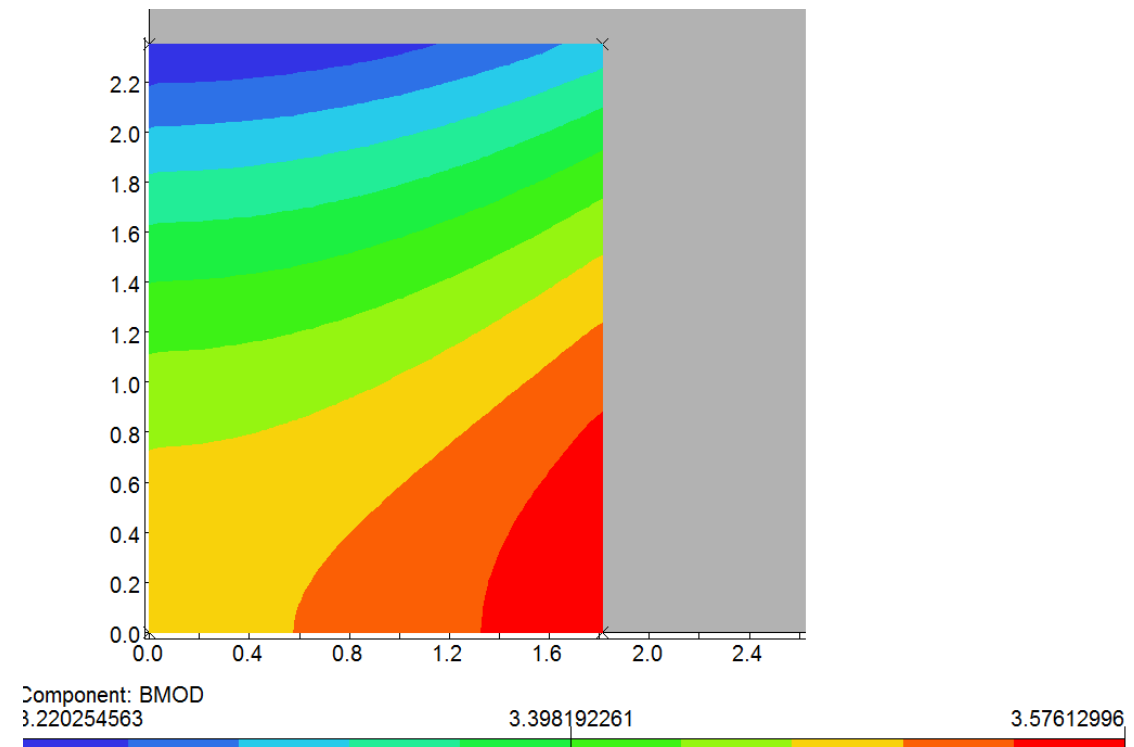
	CMS	CEPC _{-pre CDR}
Axial 100Gs	25m	13m
Axial 50Gs	30m	17m
Radial 100Gs	20m	11m
Radial 50Gs	28m	15m

Discussion 3: Non uniformity of TV magnetic field

- Magnetic field distribution: central field 3.5 T, the Peak-peak field percent deviation of TV (diameter 3.62m, length 4.7m) is 10.1%

$$B_p = \frac{B_{max} - B_{min}}{B_{center}} = 10.1\%$$

- It will be influenced by accelerator magnets, need to analyze the influence from accelerator magnets



Resources

- CDR work: IHEP, USTB
- R&D work: IHEP, TOLY Wuxi, Dalian Jiaotong University
- Potential cooperators: IRFU, France, need to find fund

Aluminum cladding process study and improvement discussion:

Zhu Zian, Yuan Ye, Hou Zhilong ,Mu Zhihui

Oct. 2016



Continuous extrusion and continuous cladding technology

Engineering Research Center of the Ministry of education for continuous extrusion

Dalian Conform Ltd. (Dalian Jiaotong University)

Insert progress

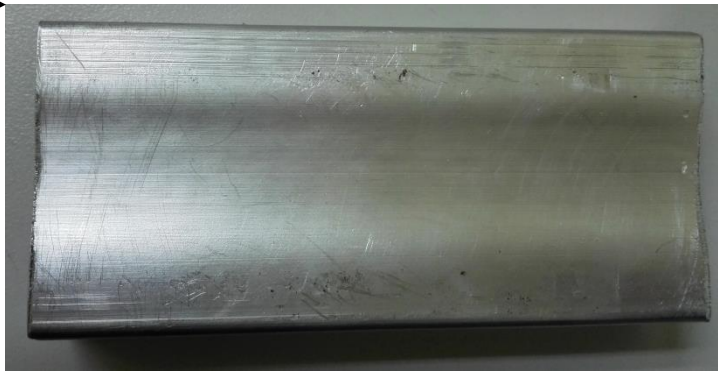
- Completed two rounds of insert process:
Hollow aluminum alloy, Aluminum alloy + copper cable
- Result: Depression in the middle and the tooling needs to be improved.(2016.4)
The strands of the cable are separate after the tooling improvement.
- There is a great improvement from the latest result, but the shear strength 8MPa not enough to reach 20MPa.



2016.1
Hollow aluminum alloy



2016.2
Aluminum alloy + copper cable



2016.5~6:
Aluminum alloy + copper cable



2016.8:
Aluminum alloy + copper cable

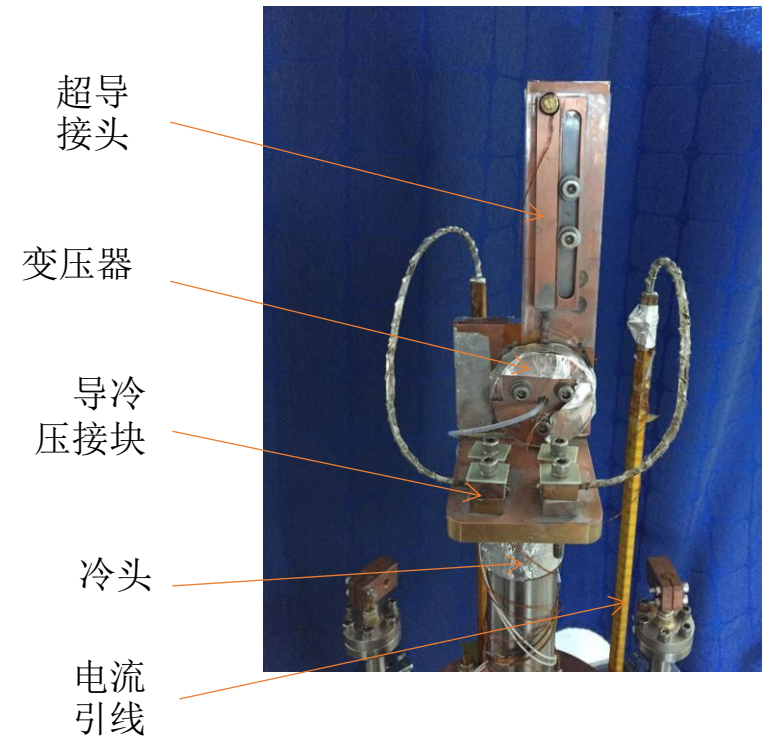


Ic test of strand joint

Measure the cable I_c without using liquid helium, need good superconducting joint with each strand

Based on the cold press joint of MRI superconducting magnet, the consistency is not good, need to explore the new joint technology

- Currently measured the joint I_c in zero field is 270A, the goal is 600A
- Improvement with cold pressure welding and diffusion welding



Joint I_c measurement setup

Timescale

- After the definition of detector field and leak field for CDR, the update of physical design of the detector magnet will be finished in 2 months.
- Finished the 10kA NbTi/Aluminum superconductor and in field measurement by end of June 2017.

Thank you for your attention!

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