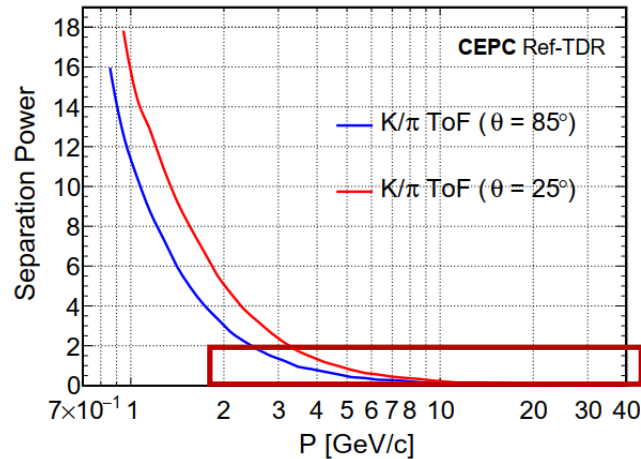


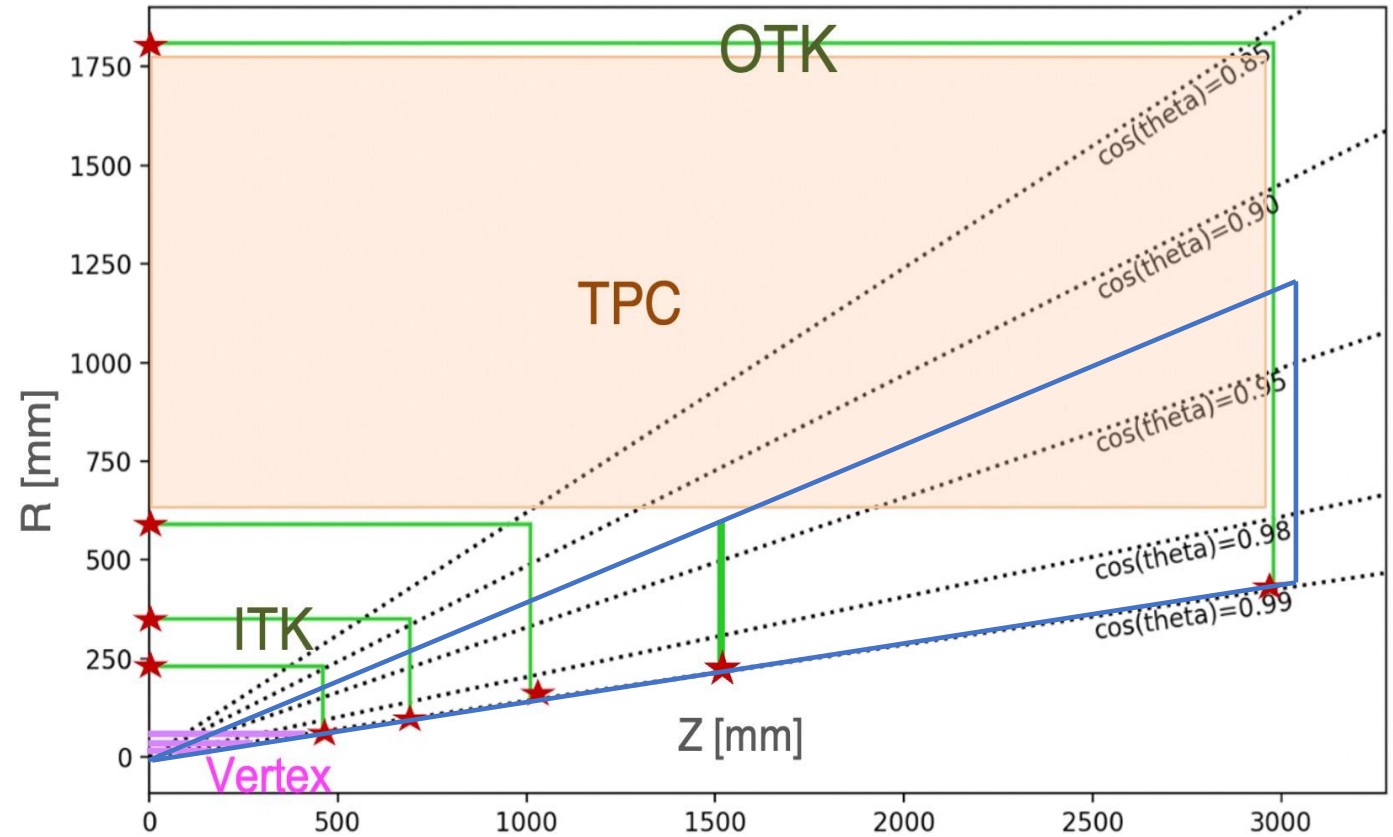
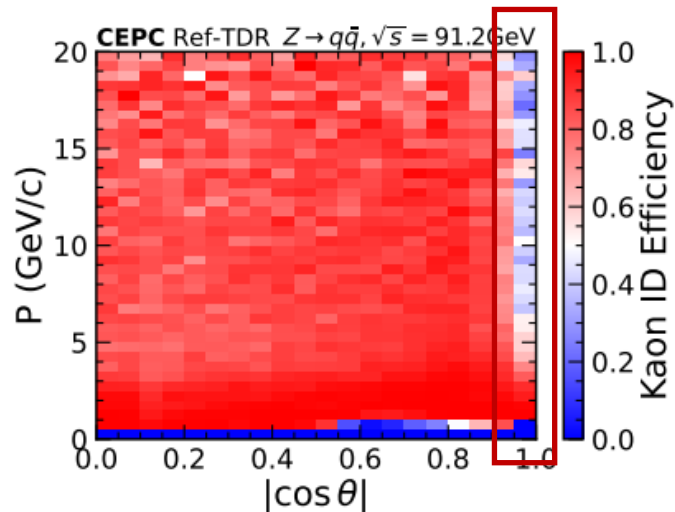
Motivation of the Cherenkov detector at CEPC

- A Cherenkov detector at CEPC is helpful, for high momentum PID(up to 20 GeV/c) at the endcap or forward region where there is only a short track or even no track in TPC (dN/dx not applicable)

ToF standalone
Ref-TDR



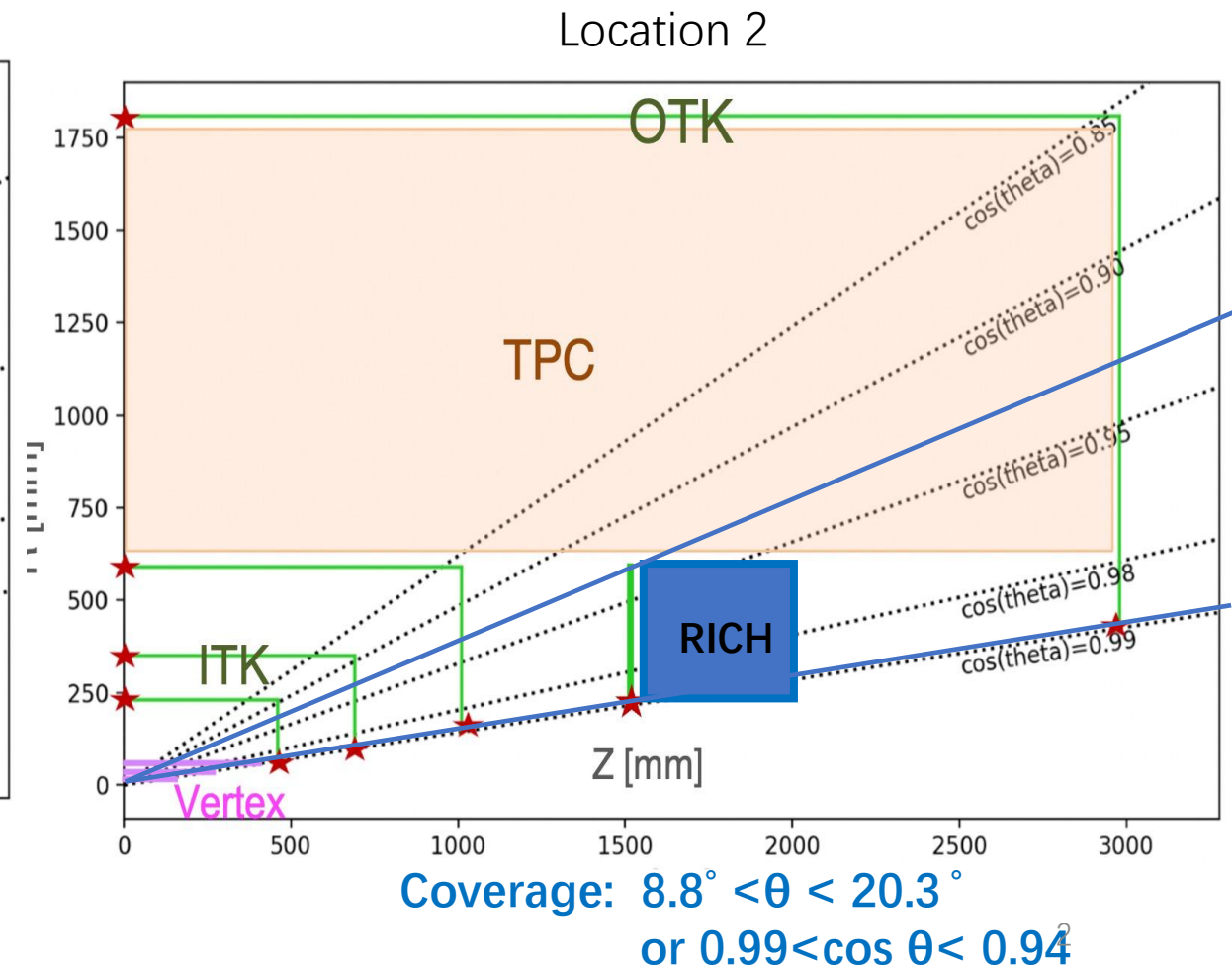
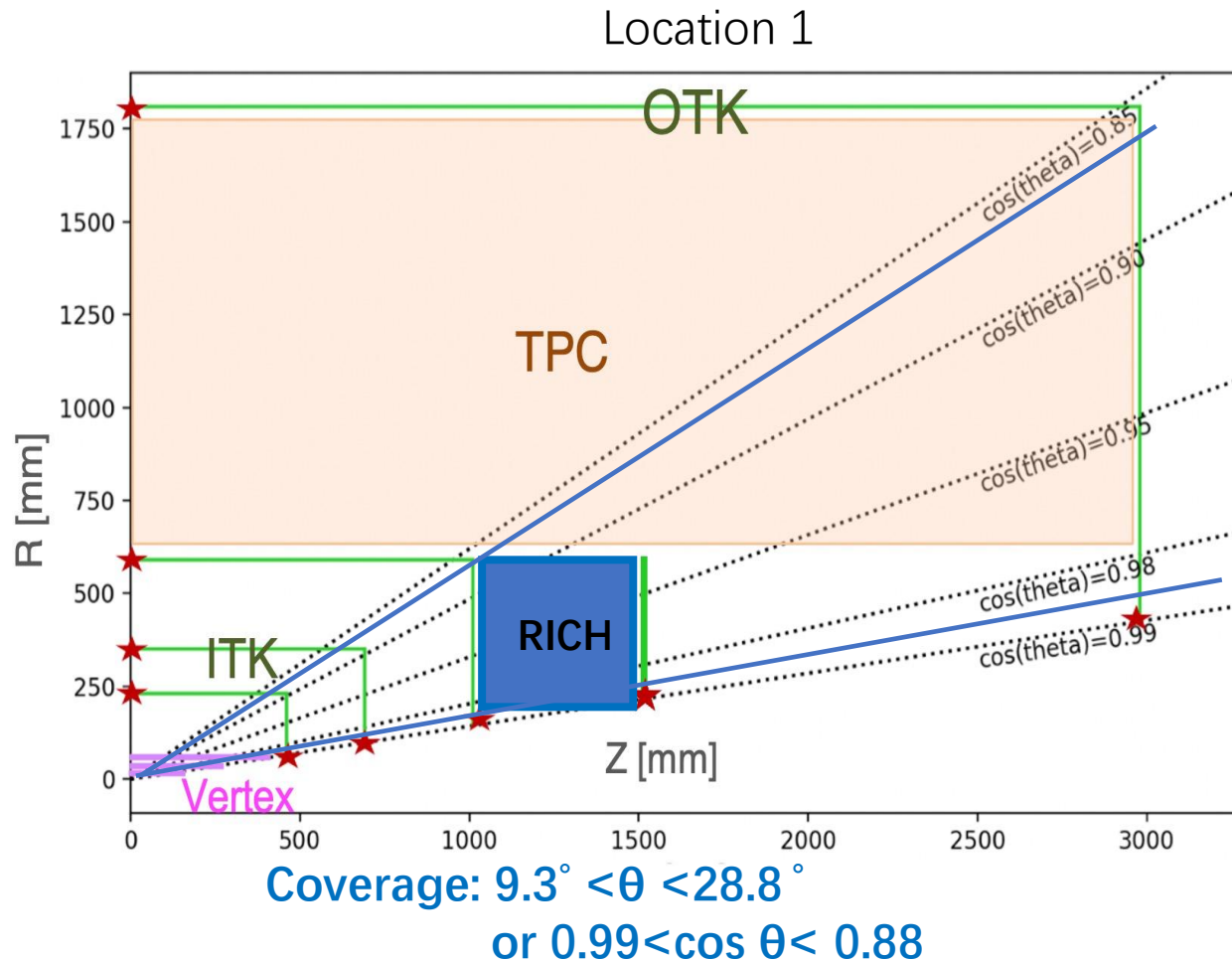
K ID eff,
Ref-TDR



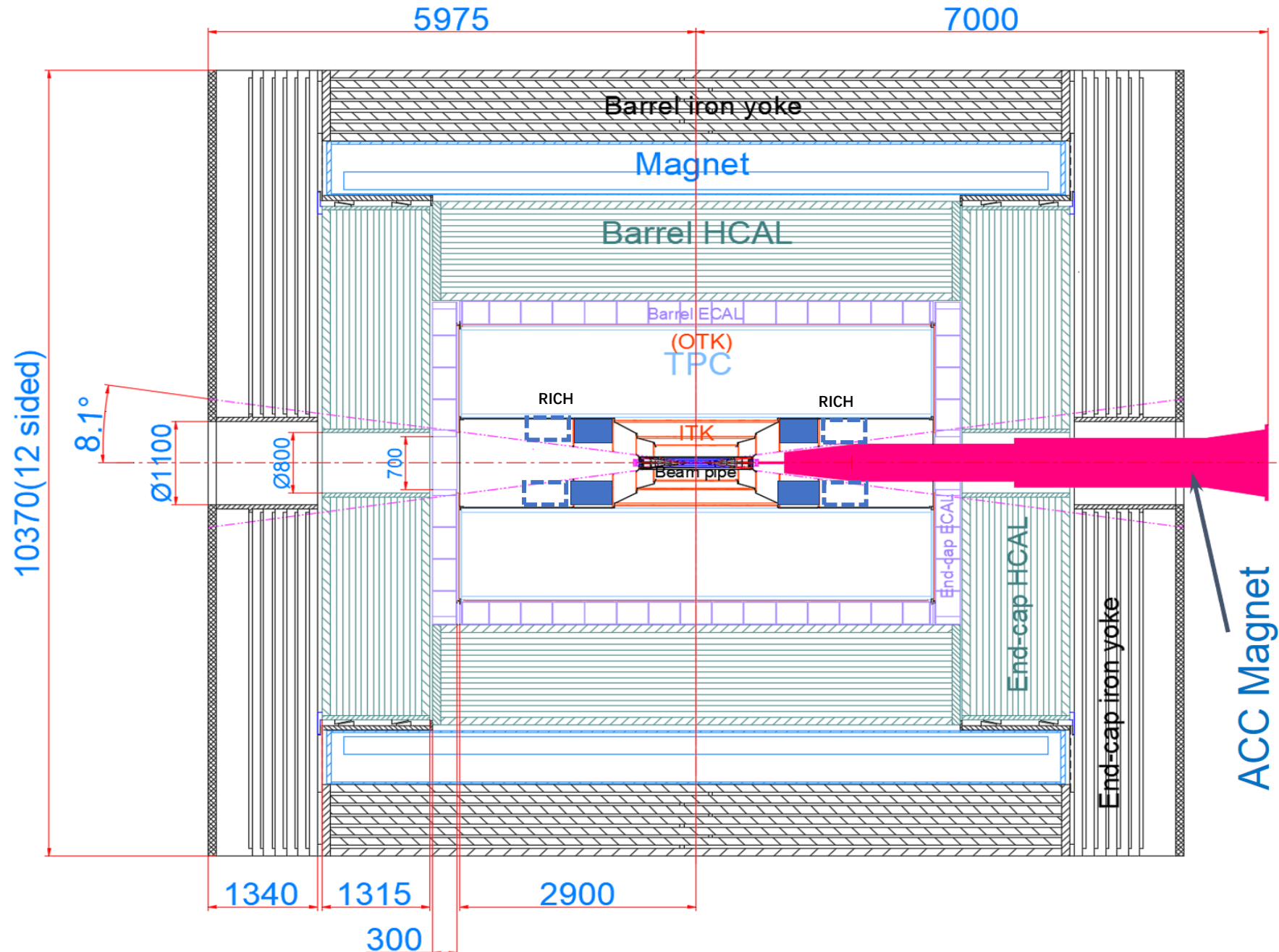
the possible location of the Cherenkov detector

Possible locations of the Cherenkov detector at CEPC

- Two possible locations without changing the other detector design in ref-TDR
- Depending on physics requirement, Cherenkov detector performance and also material budget

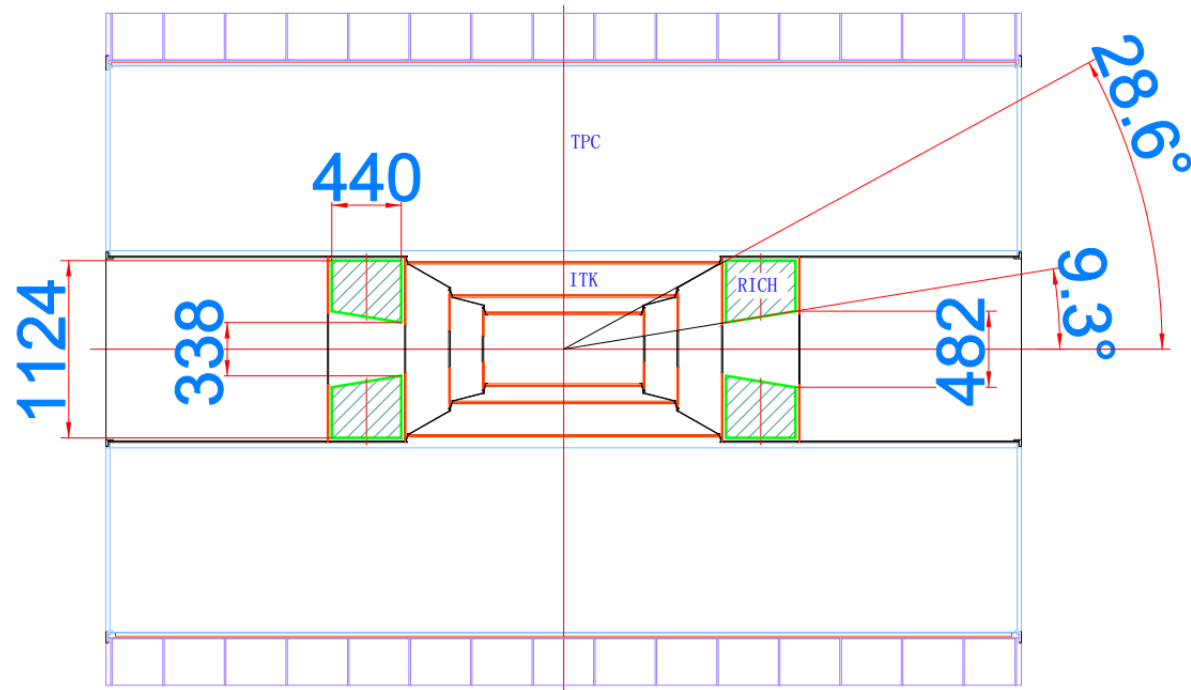


An overall view for the locations

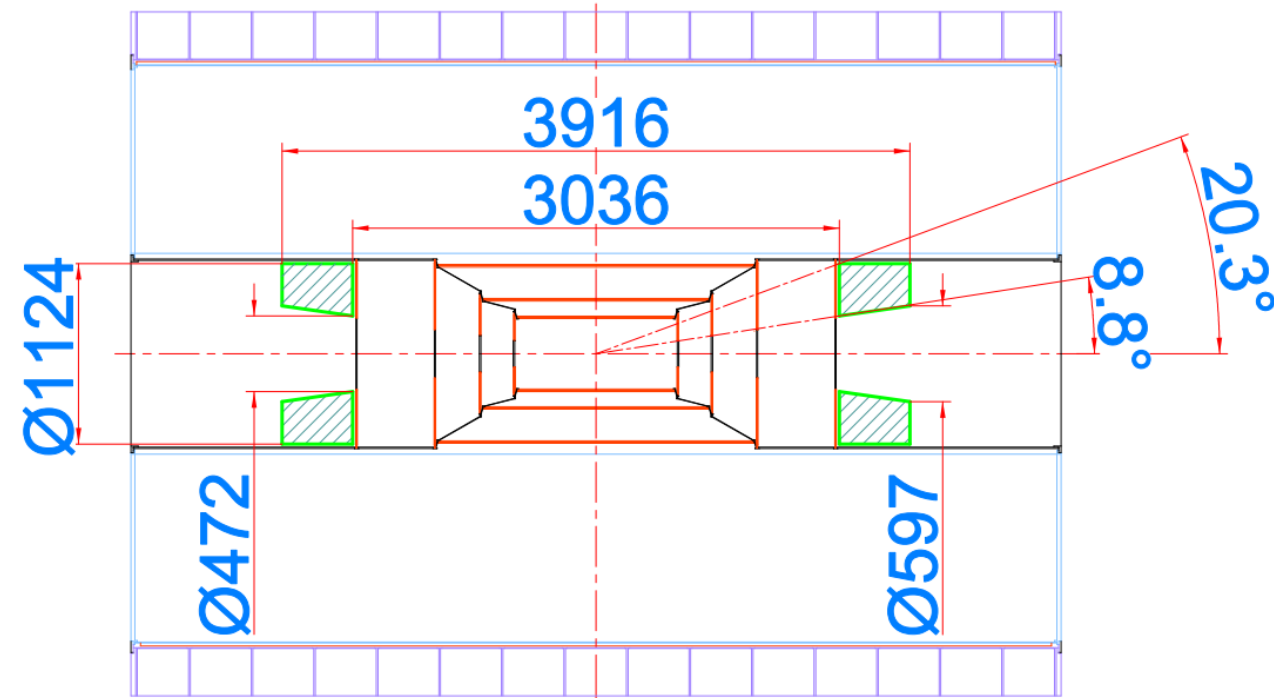


Detailed geometry of the two locations

From Jian Wang,
mechanics group



	Inner diameter (cm)	Outer diameter (cm)	Total area (two endcaps) (cm ²)
Radiator	33.8	112.4	18050
Photon detector	48.2	112.4	16200

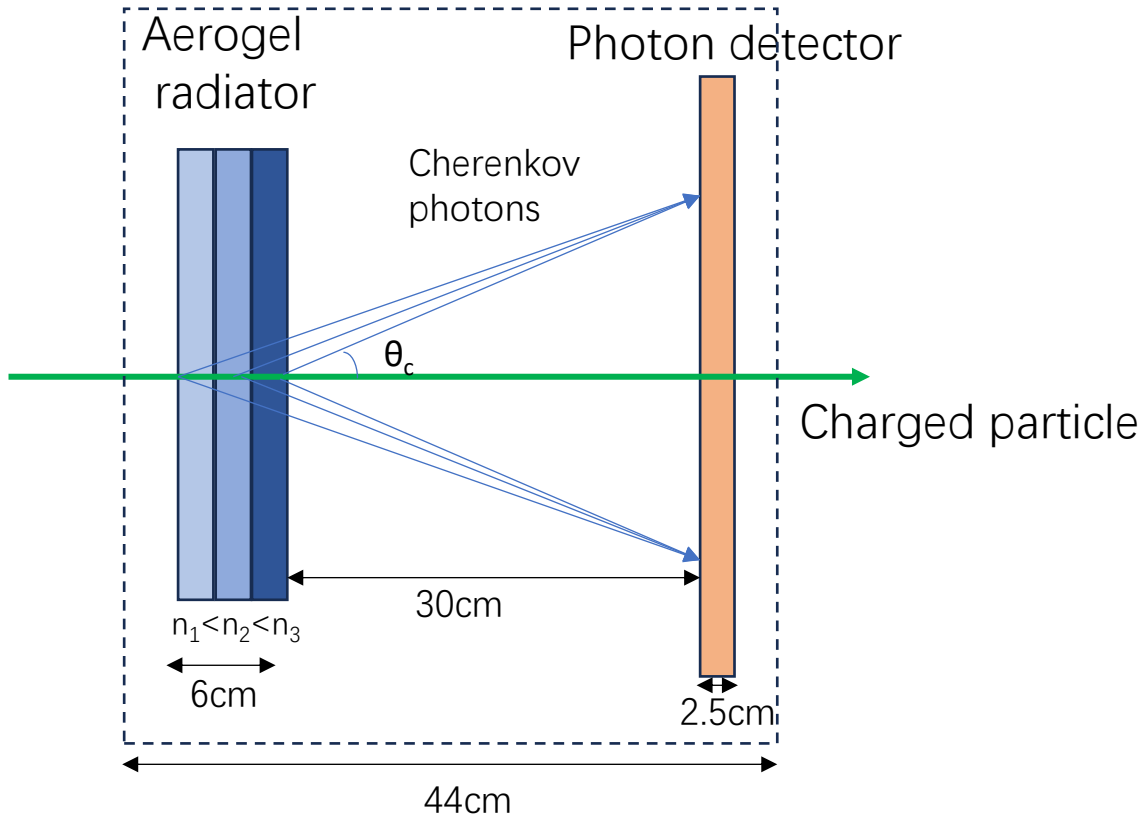


	Inner Diameter (cm)	Outer diameter (cm)	Total area (two endcaps) (cm ²)
Radiator	47.2	112.4	16350
Photon detector	59.7	112.4	14250

Possible design of CEPC Cherenkov detector

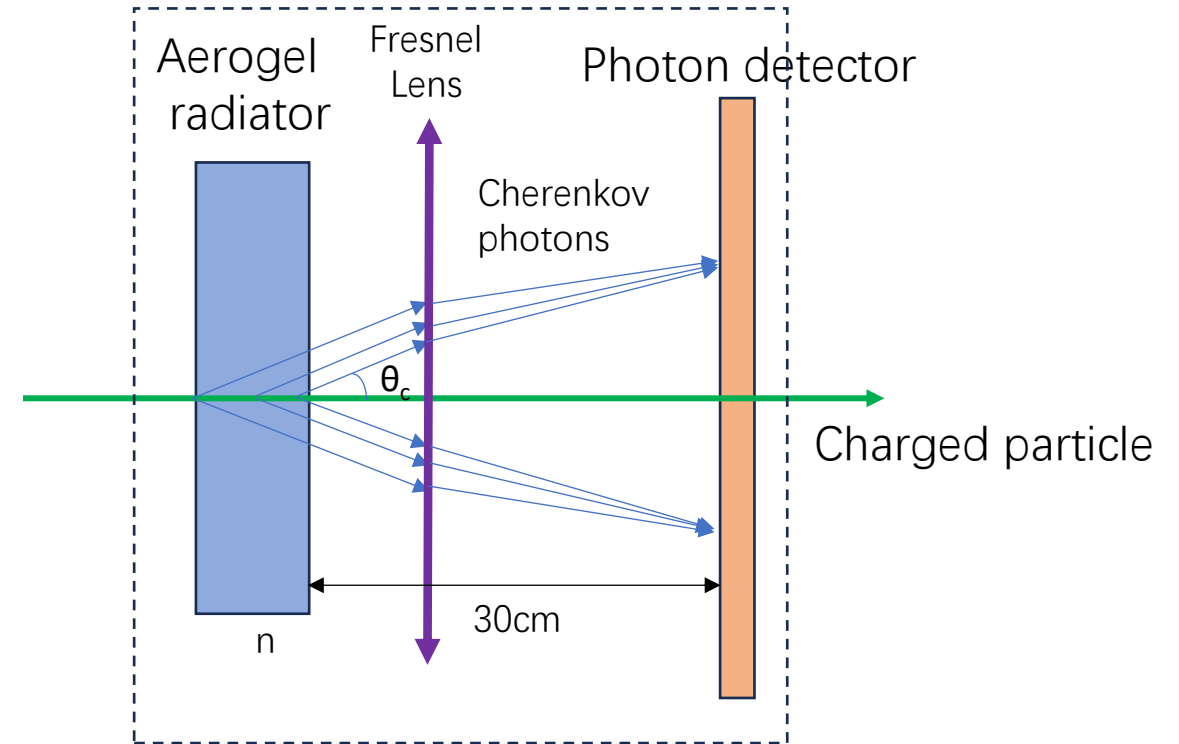
- The proximity focusing method:

Reference: T.Iijima, NIM A548 (2005) 383; A.Yu.Barnyakov, NIM A553 (2005) 70; D. Sharma, NIM A1061 (2024) 169080



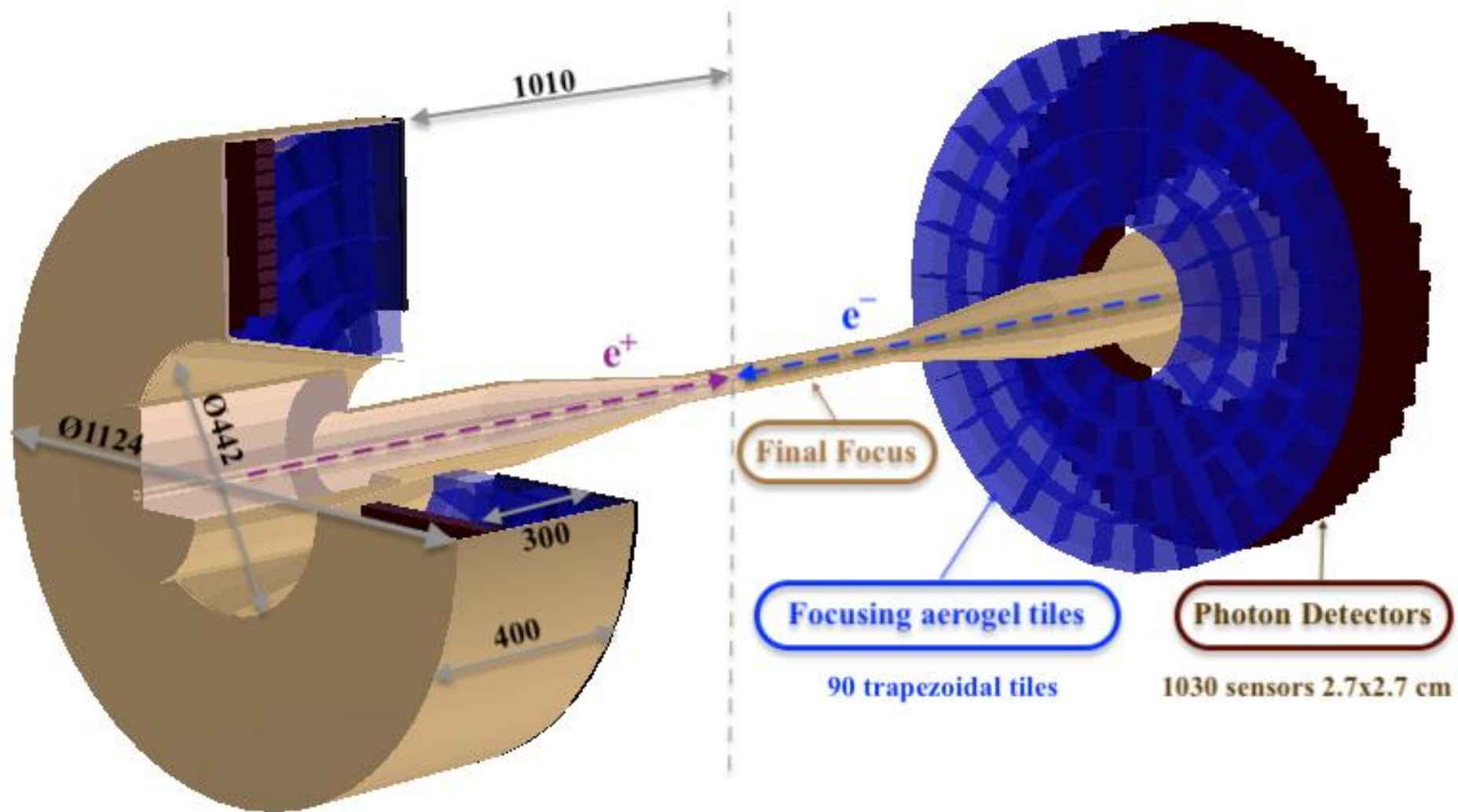
Option1:

Multiple layers of aerogel with varying n , overlapped ring for different emission points



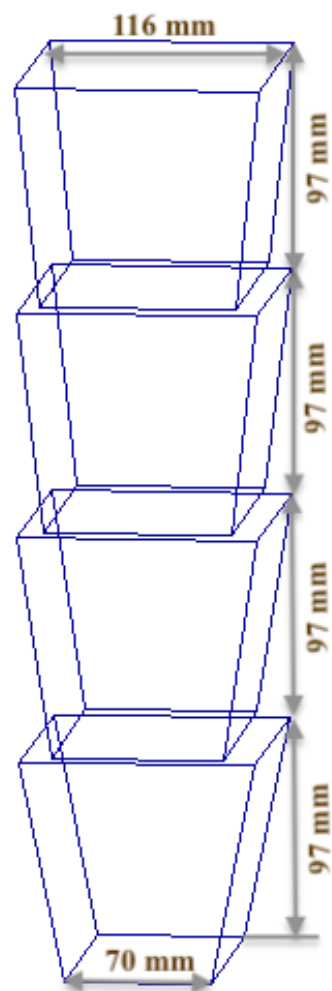
Option 2:

A single layer of aerogel, focused by a Fresnel lens.



A sketch by root

Focusing radiator based on 8-layer aerogel with $n=1.008\div 1.01$
total thickness $6\div 7$ cm



30 tiles per end-cap

25 tiles per end-cap

20 tiles per end-cap

15 tiles per end-cap

Aerogel stack

Possible items for discussion:

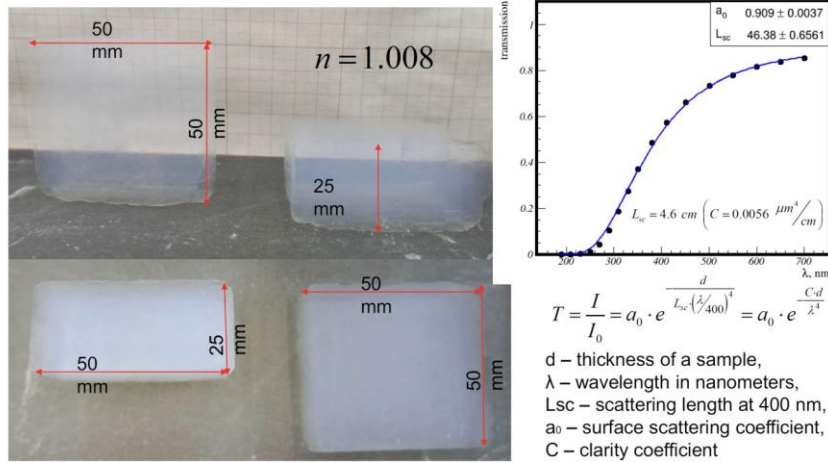
- A similar sketch for the detector 3D design (can be optimized later)
- How to fix the aerogel and photon sensor
- How to fix the detector
- Cabling, cooling etc.

- backup

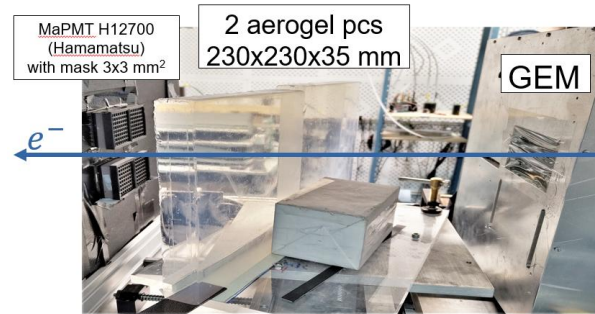
Past and ongoing R&Ds on the radiator

- By Alexander Barnyakov from BINP

Aerogel with $n=1.008$ (Novosibirsk)

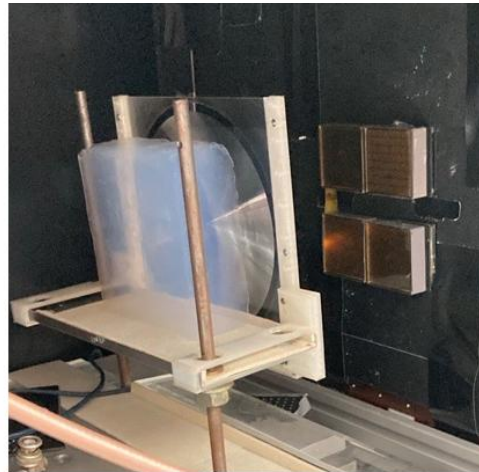


CEPC International Workshop, Haghzhou 23-27/10/2024



Single photon Cherenkov angle resolution is investigated with relativistic electrons at BINP beam test facilities "Extracted beams of VEPP-4M complex".

Some results of beam tests at the BINP with mRICH design

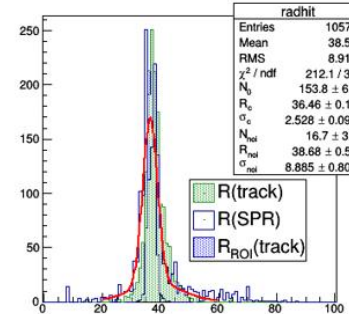
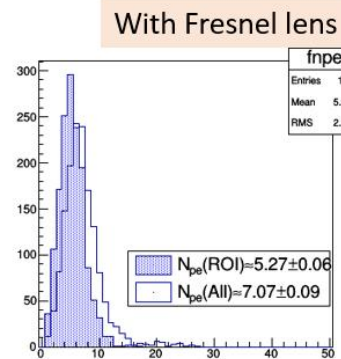
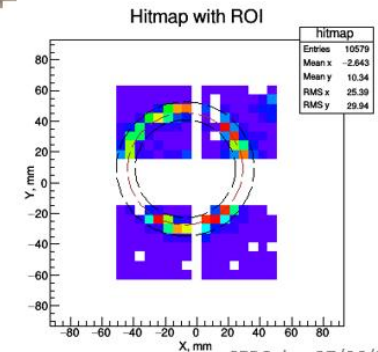
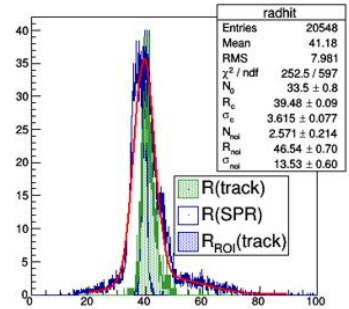
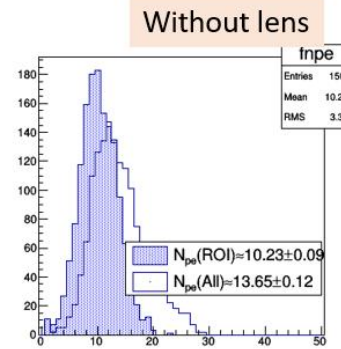
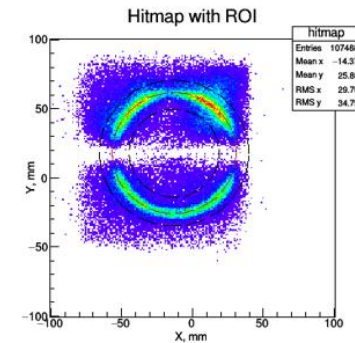


Aerogel:

- $n=1.028$
- $L_{sc}(400\text{nm})=48.2 \pm 0.7 \text{ mm}$
- Thickness=40mm

Fresnel lens:

- Acrylic (PMMA)
- $L_f=6''$
- Manufacturer: Edmund PMT:
- 4 Hamamatsu H12700
- pixel 6x6 mm



CEPC day, 27/06/2024