

dRICH first very tentative porting of the geometry into ATHENA

28/June/2021

E. Cisbani (INFN/RM and ISS)

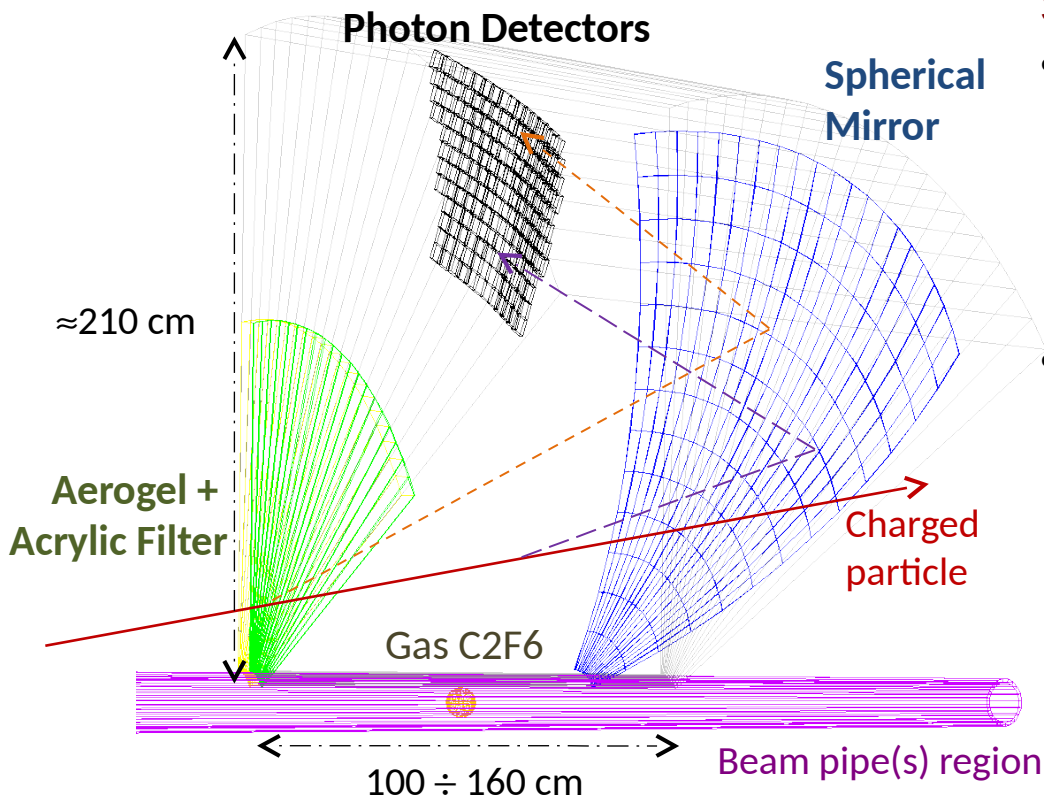
People involved (past and present):

M. Contalbrigo (INFN-FE), L. Barion (INFN-FE), A. Del Dotto (INFN-LNF), C. Dilks (Duke),
C. Fanelli (JLab/MIT), M. Mirazita (INFN-LNF), A. Movsisyan (INFN-FE),
R. Preghenella (INFN-BO), G.M. Urciuoli (INFN-RM), Z. Zhao (Duke/JLab),
... and those I forgot to mention
and the EIC-eRD14/PID Consortium

dRICH single sector baseline geometry

Main semi-quantitative features:

- aerogel transverse size $\sim \frac{1}{2}$ mirror transverse size
- mirror and photon surfaces are largely transverse to the beam
- optimal photo sensor surface is curved (\sim sphere)



Simplistic considerations

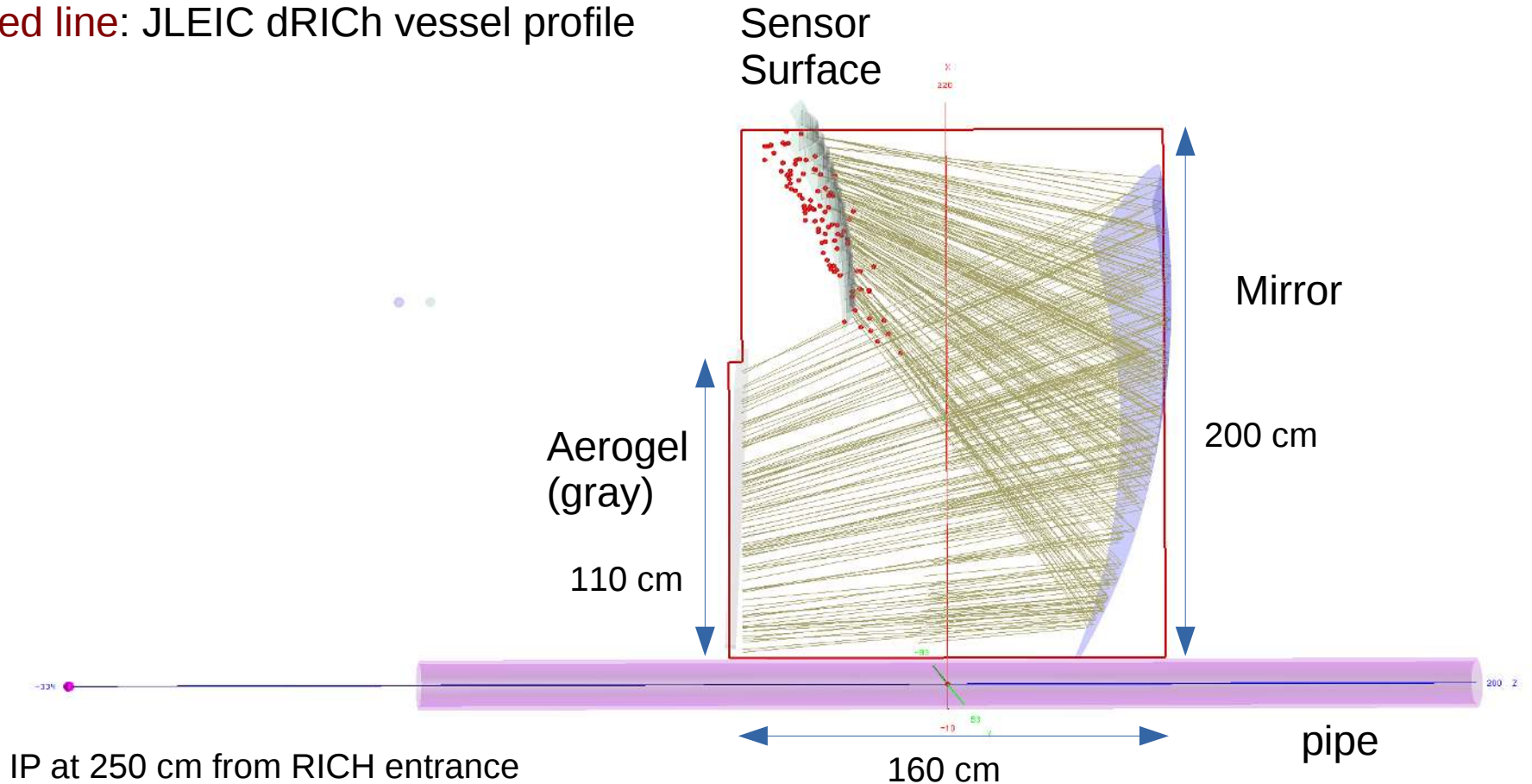
- Decrease longitudinal size:
 - improve chromatic aberration
 - tend to improve final photon acceptance
 - reduce number of gas photons
- Decrease transverse size
 - need to rotate mirror (and sensor)
 - may degrade chromatic aberration
 - reduce gas path length at smaller angles
 - photon detector may interfere with large angles aerogel photons

Original JLEIC dRICH (single sector)

red dots: focal region (approx.)

yellow lines: photons at gas Cherenkov angles relative to charger particles direction from IP

red line: JLEIC dRICH vessel profile



One of the first attempt to fit dRICH into ATHENA current constraints (single sector)

red dots: focal region (approx.)

yellow lines: photons at gas Cherenkov angles relative to charger particles direction from IP (they start after front vessel for coding simplicity)

red line: ATHENA vessel profile

JLEIC Surface (reference)

Sensor Surface

very difficult (impossible?) to adapt the sensor surface to the focal region



x	0 cm
y	0 cm
z	0 cm
Aerogel Length	40 cm
Aerogel Radius	100 cm
Detector Length	110 cm
Bore Radius	10 cm
E1 Radius (Corner)	220 cm
E2 Radius (Corner)	125 cm
Offset from Center	-290 cm
Segment Count	6
Volume (Cylindrical)	12.139899 m ³

Aerogel tilted by ~24 deg to gain gas path length

90 cm

25 cm

Mirror

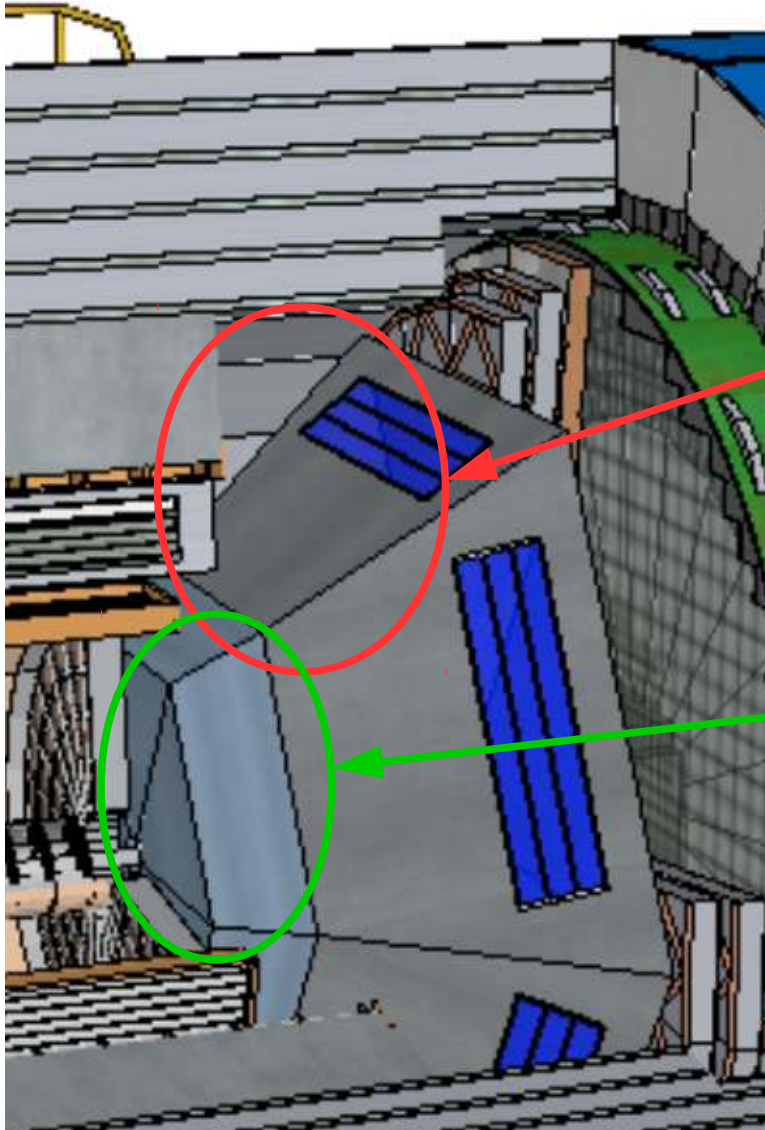
210 cm

pipe

IP at 200 cm from RICH entrance

40+110 cm

Couple of quick comments



Very likely the dRICH vessel needs to expand in this space.

Front vessel reduces acceptance (respect to JLAIC); aerogel geometry can likely be adapted (tilted or staggered) to maintain adequate gas paths.