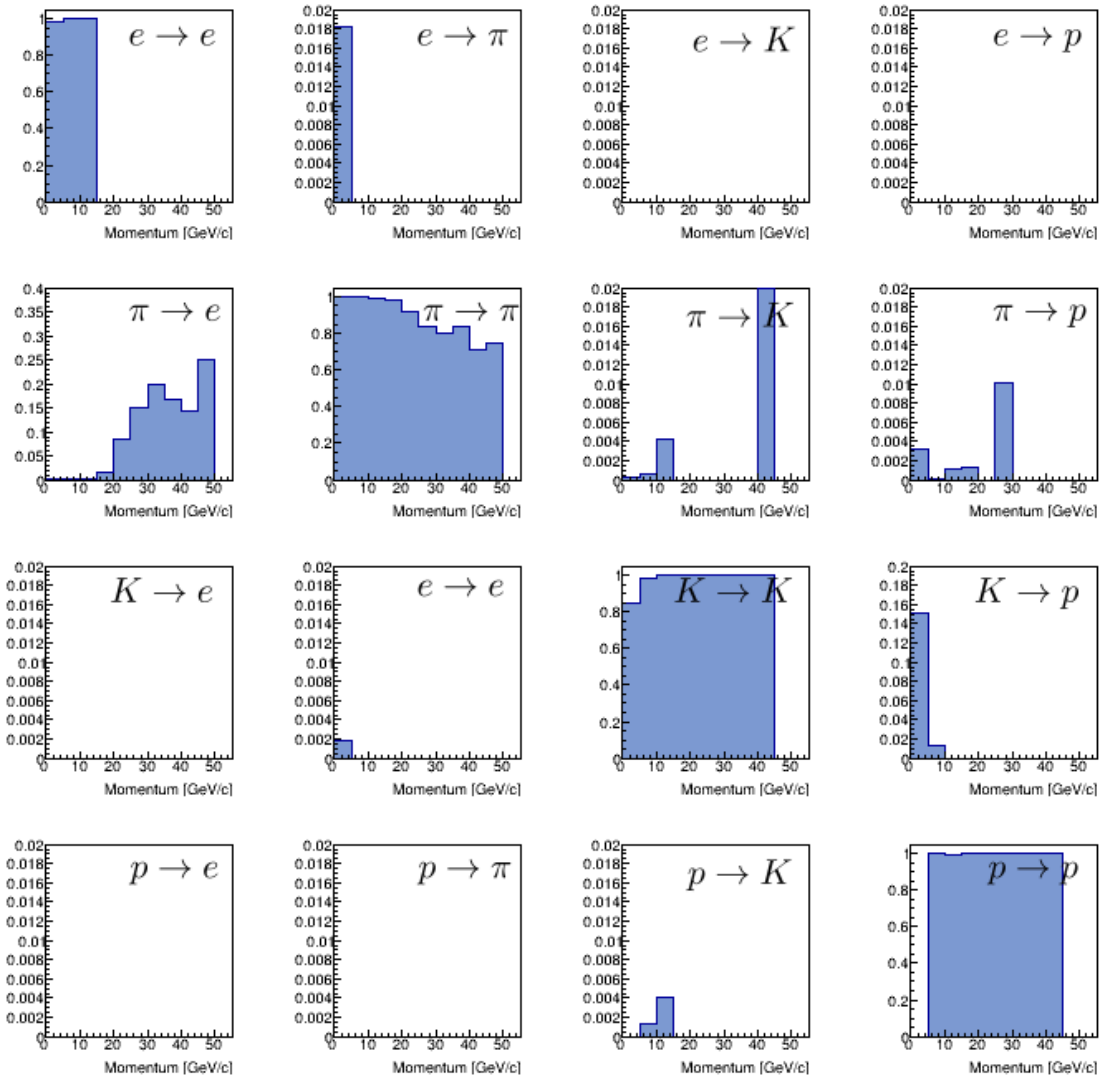
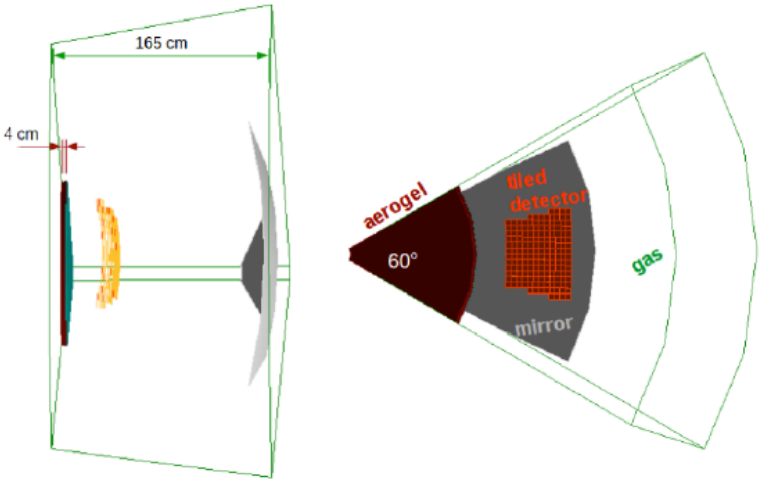
dRICH in real physics context (SIDIS)





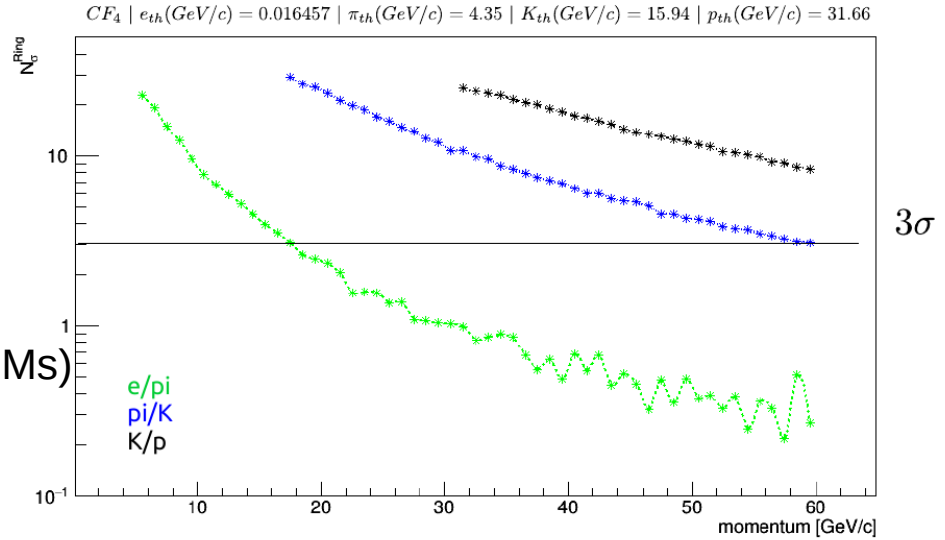
	Nominal Momentum Threshold	
Particle	Aerogel (n=1.02)	Gas (C_2F_6, n=1.0008)
	(GeV/*c*)	(GeV/*c*)
e	0.003	0.013
π	0.694	3.49
K	2.46	12.3
p	4.67	23.5

The PID capability of the system fulfill the expected even in context of multiplicity > 1.
A dedicated event based extension of the Indirect Ray Tracing have been developed and applied.

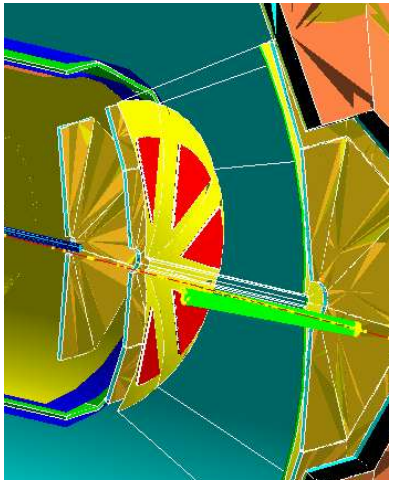
Dual - Radiator RICH in ePHENIX

PHENIX GEANT MC
based simulation:

-
- Gas RICH, CF_4
- inward reflecting mirrors,
- eight sectors in azimuthal
- angle
- eight detector planes (GEMs)
- The RICH is in sizable
- magnetic field

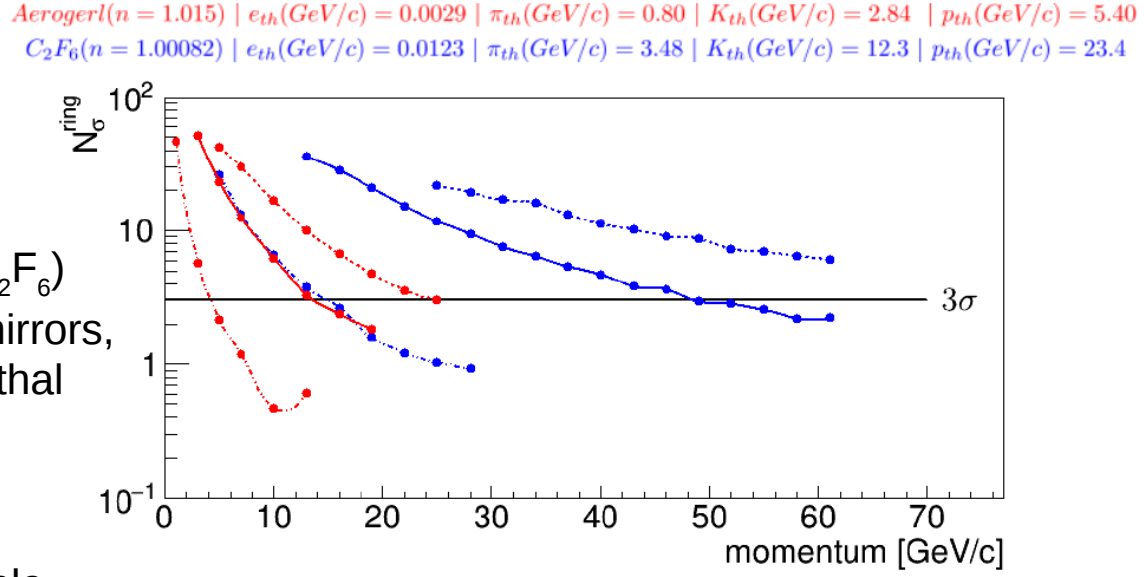


ePHENIX CF_4 gas RICH

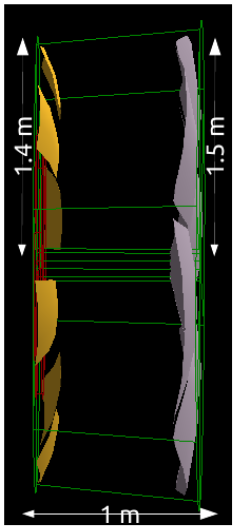


GEMC
based simulation:

-
- dRICH (aerogel + C_2F_6)
- outward reflecting mirrors,
- six sectors in azimuthal
- angle
- six detector planes
- (SiPM, LAPPD)
- The RICH is in sizable
- magnetic field

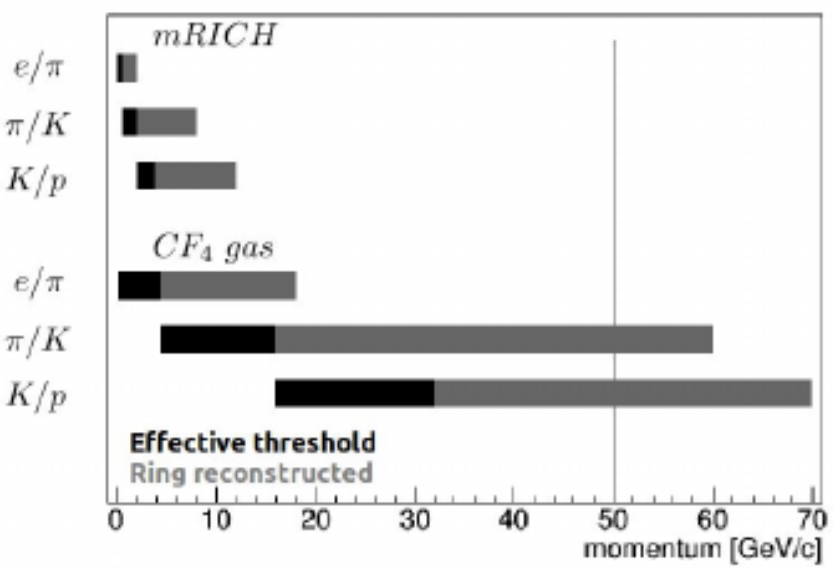


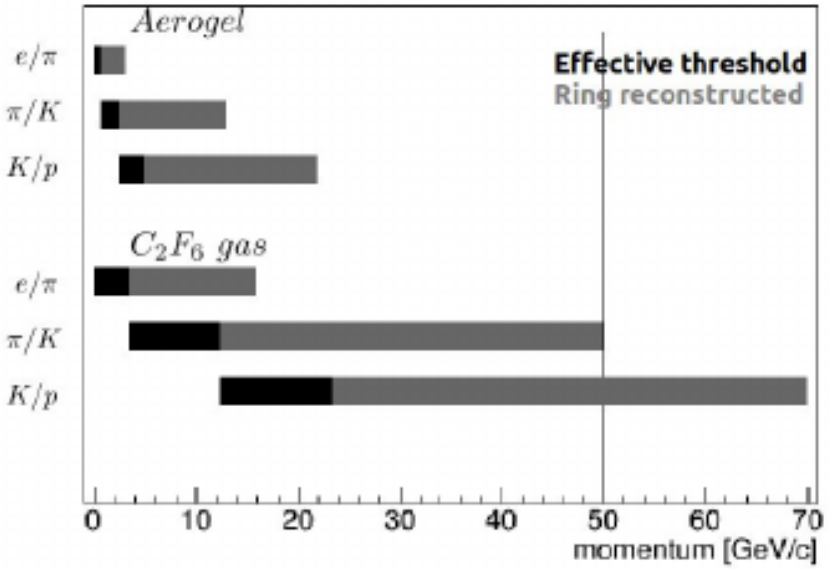
dRICH ePHENIX-like



Spherical detector plane

Systems comparison



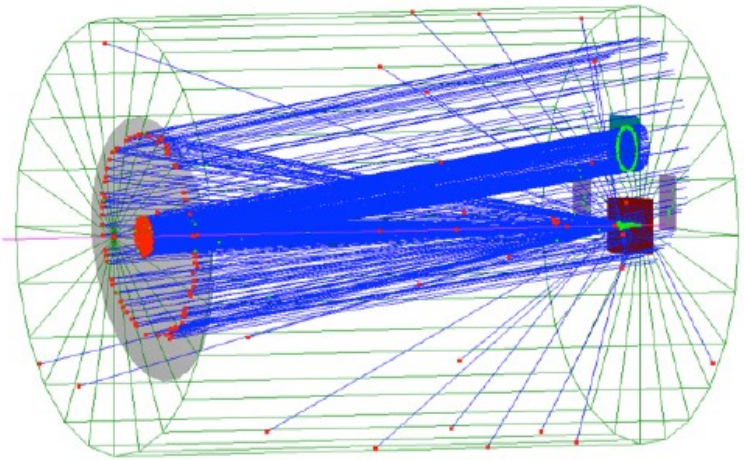


- Chromatic dispersion dominates the angular resolution.
- CF_4 gas seems not optimal to be coupled with another system (i.e. mRICH) to cover the relevant momentum range . Other heavier gases should be explored.
- Important properties of the gas: transparency in the UV region (GEMs), low scintillation.

- Outward reflection: the emission error dominates the resolution at small angles, but it can be managed with some care.
- A dRICH can guarantee a continuous coverage, by construction.
- The detector plane is away from the beam: lower background, small magnetic field. Aerogel drives the photon detector to be solid state detector (SiPMs, LAPPDs, ...).

FY18 achievements

- Baseline definition of the dRICH completed
- PID performances tested in channel of interest for EIC
- Shorter version of the dRICH useful for ePHENIX implemented in GEMC
- The dRICH analysis framework adapted to investigate the gas ePHENIX RICH
- An event based IRT approach has been initiated



FY19 proposed activities

- Development of a small scale, flexible, prototype
- Study of the interface between gas and aerogel
- Consolidate design and test a SiPM detector matrix with proper cooling and thermal stability that needs to be designed and properly evaluated