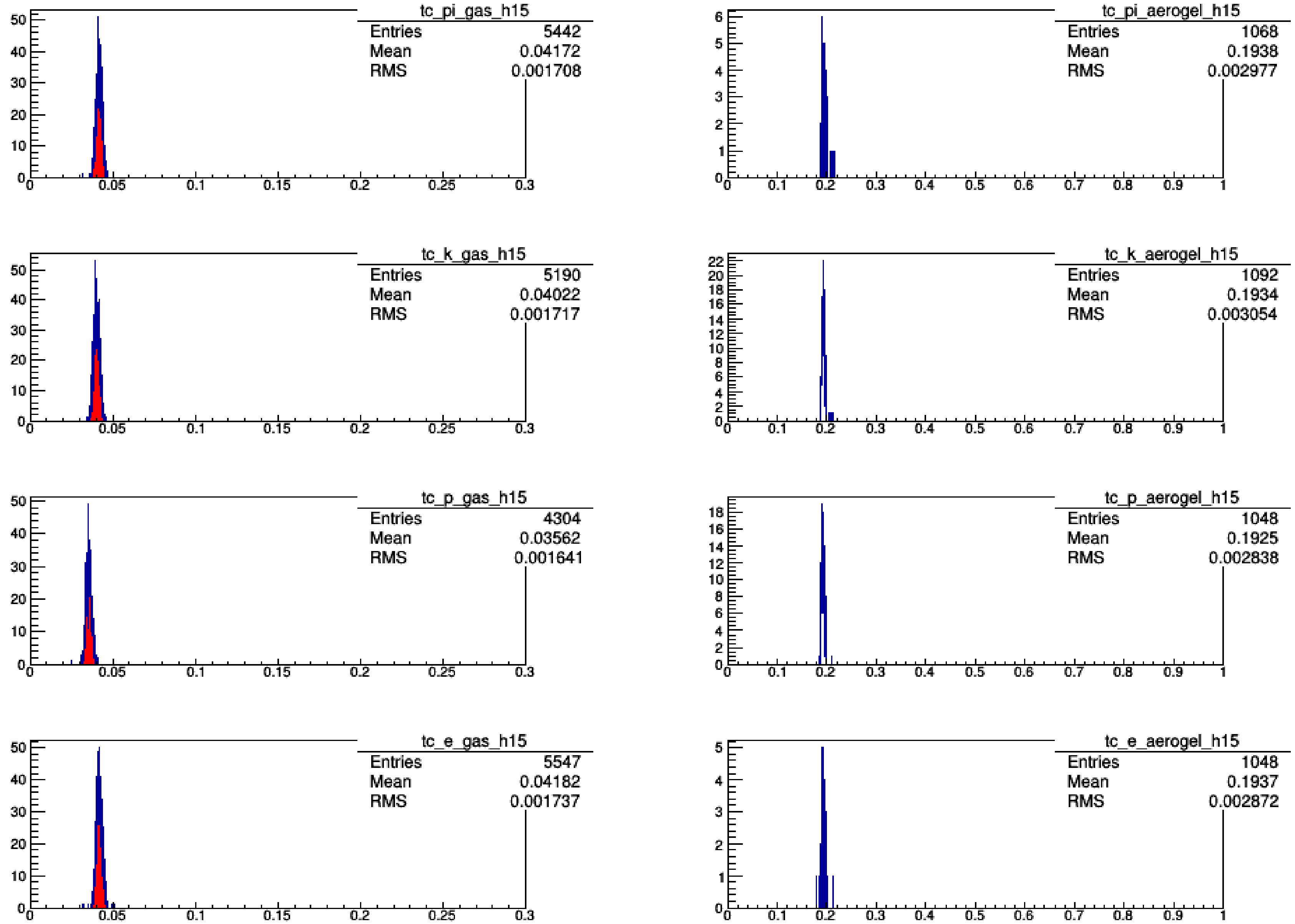
Dual-radiator RICH: update

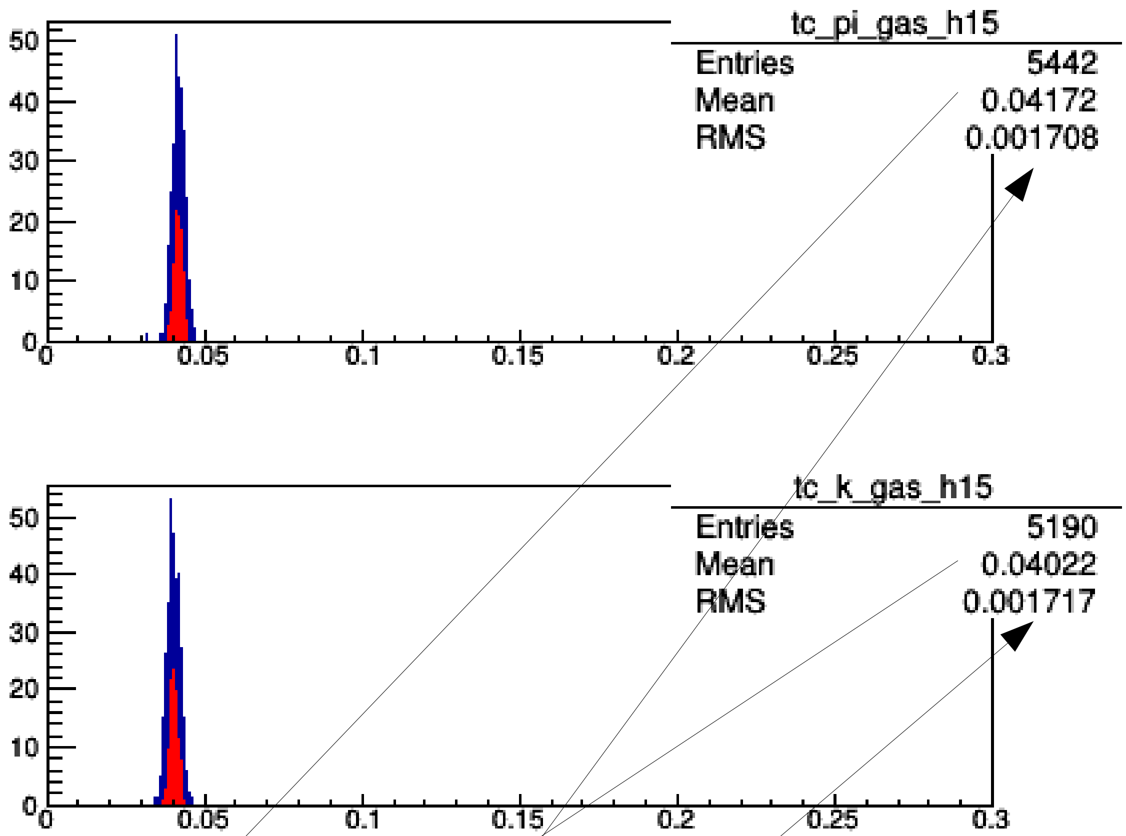
Alessio Del Dotto for the EIC PID/RICH collaboration
August 1, 2016

IRT algorithm output i.e. for p = 40 GeV/c

N. Akopov & all, ”The HERMES dual-radiator ring imaging Cherenkov detector”, NIMA 479 (2002)



Formula for the number of sigma



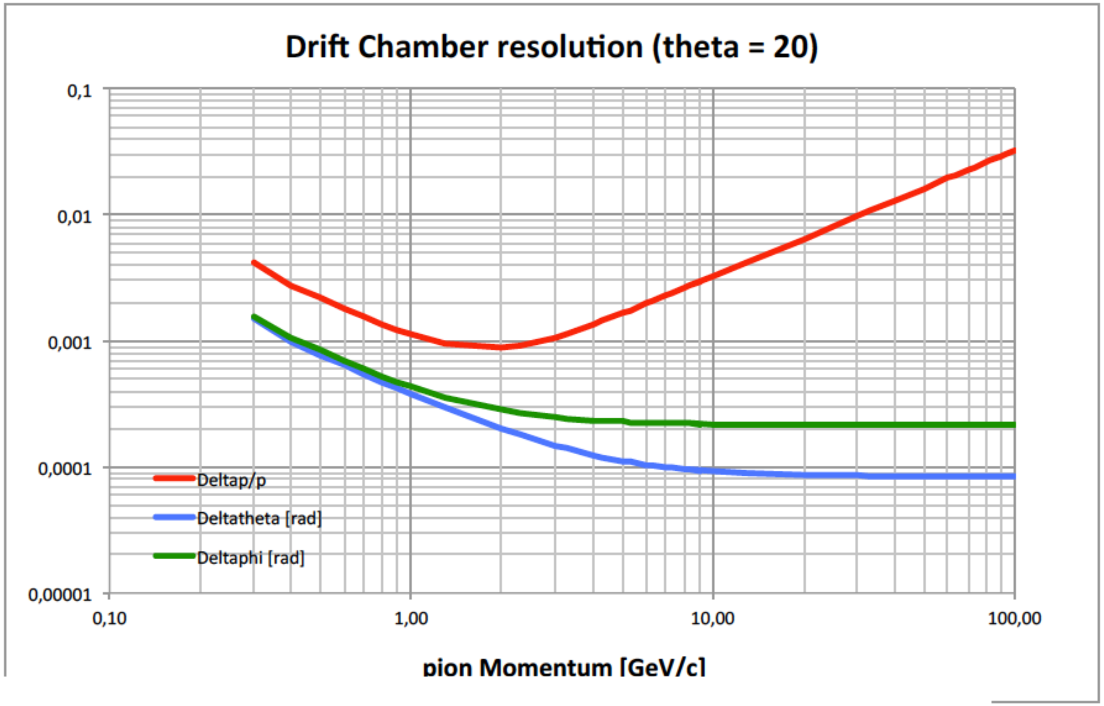
$$N_{\sigma}^{ring} = \frac{(<\theta_{p1}> - <\theta_{p2}>)\sqrt{N_{\gamma}}}{\sigma_{\theta}^{tot(1p.e.)}}$$

$$N_{\gamma} = (N_{\gamma}^{p1} + N_{\gamma}^{p2})/2$$

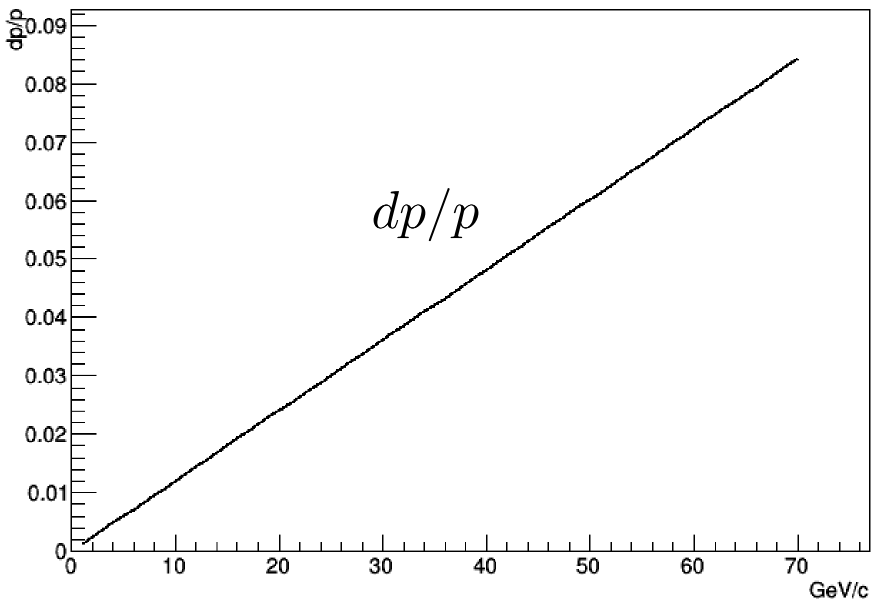
$$\sigma_{\theta}^{tot(1p.e.)} = (\sigma_{\theta}^{p1} + \sigma_{\theta}^{p2})/2$$

QE -→H12700 maPMT

Particle track resolution effects on RICH



Plot by the INFN Lecce group

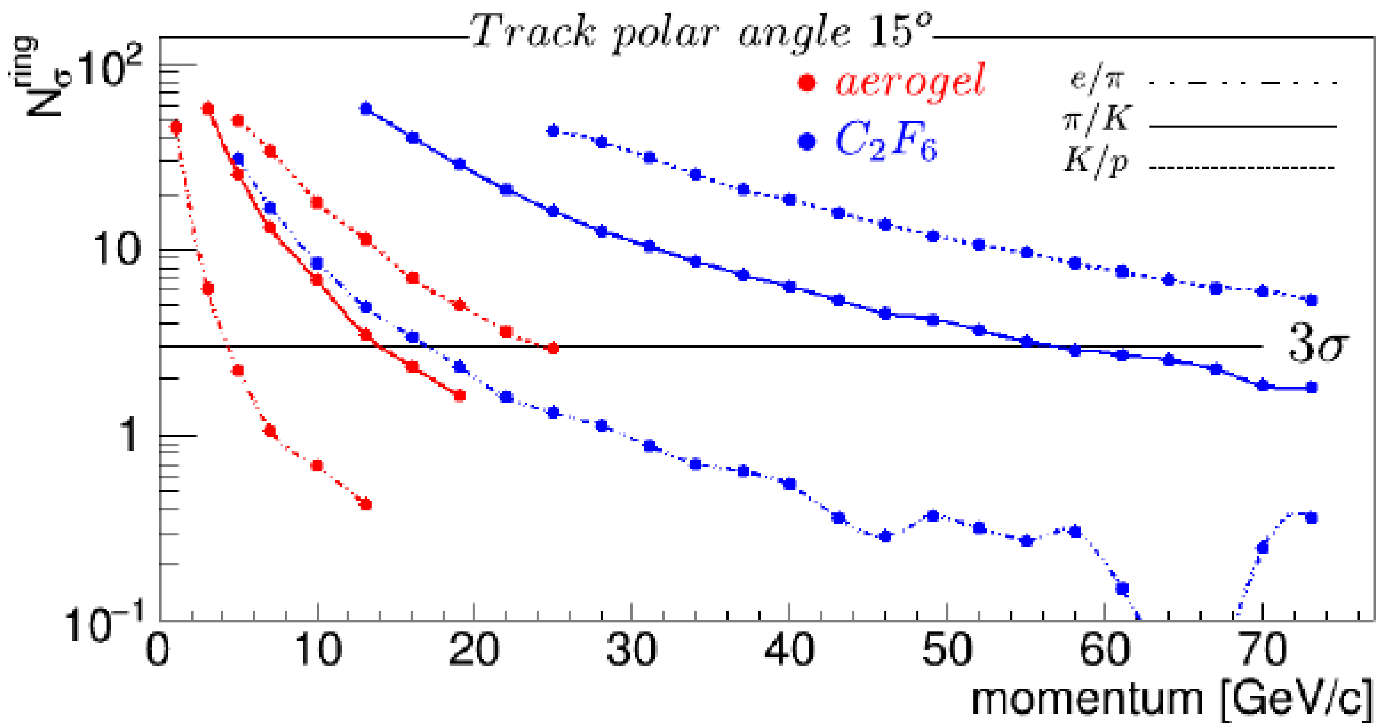


I have assumed this error for dp/p at 15°

And a constant error of 0.5 mrad for the angular resolution

$$\Delta\phi = \Delta\theta = 0.5\ mrad$$

Performances at 15° for the fast MC



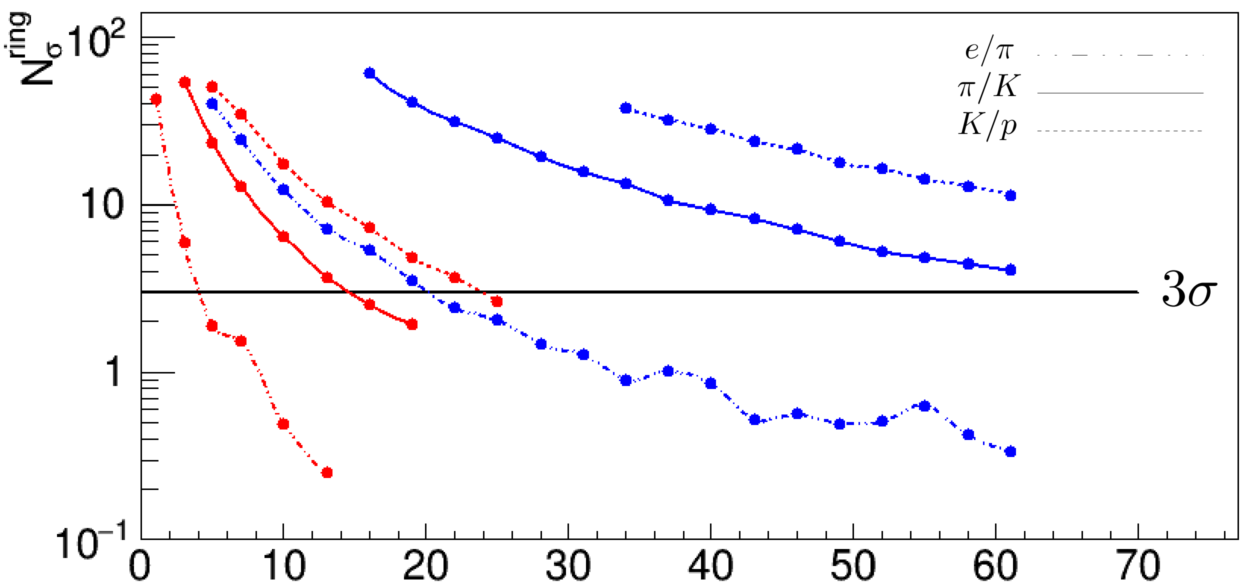
e/pi(gas):	3.17	16 (GeV)	
pi/k(aerogel):	3.49	13 (GeV)	
pi/k(gas):	3.08	55 (GeV)	
k/p(aerogel):	3.60	22 (GeV)	
k/p(gas):	5.30	73 (GeV)	(beyond 73 GeV under simulation)

Separation power CF4 - formulas

$Aerogerl \mid e_{th}(GeV/c) = 0.002542 \mid \pi_{th}(GeV/c) = 0.67 \mid K_{th}(GeV/c) = 2.46 \mid p_{th}(GeV/c) = 4.89$

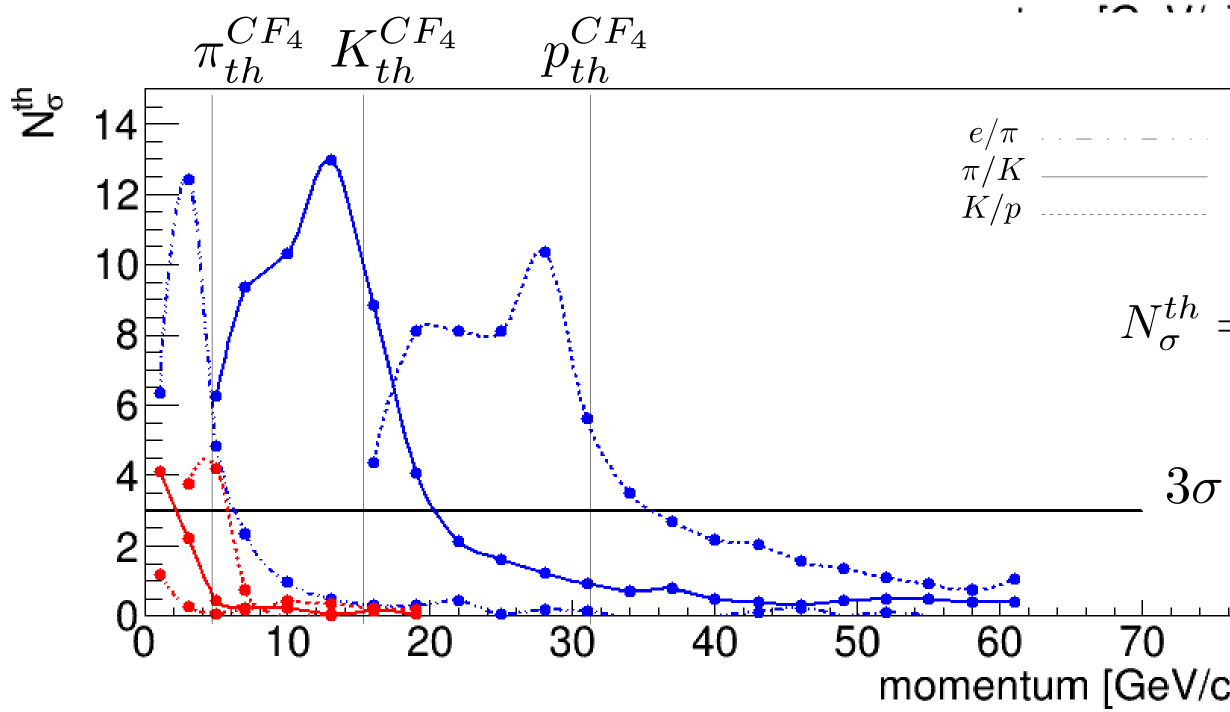
$CF_4 \mid e_{th}(GeV/c) = 0.016457 \mid \pi_{th}(GeV/c) = 4.35 \mid K_{th}(GeV/c) = 15.94 \mid p_{th}(GeV/c) = 31.66$

RICH



Polar angle = 15°

Threshold Cherenkov



$$N_\sigma^{th} = \frac{(< N_\gamma^{p1} > - < N_\gamma^{p2} >)}{\sigma_{N_\gamma}}$$

$$\sigma_{N_\gamma} = (\sigma_{N_\gamma}^{p1} + \sigma_{N_\gamma}^{p2})/2$$

To do next

- Simulation of data with dp/p*2, dp/p*3
- Different angular resolution (i.e. 0.8 mrad) can be set by software