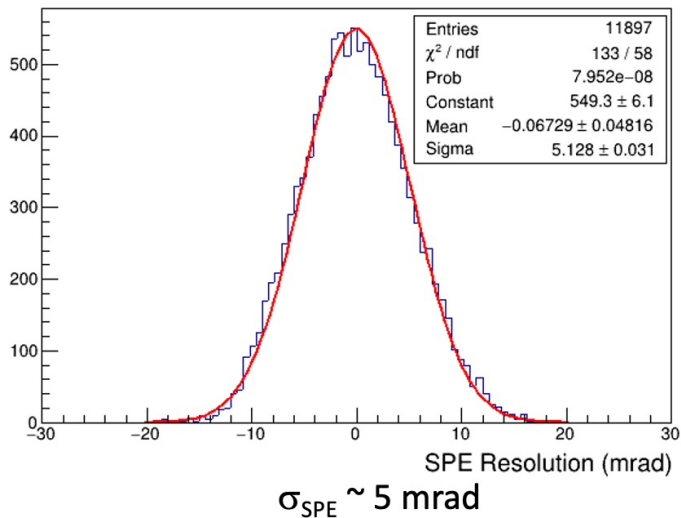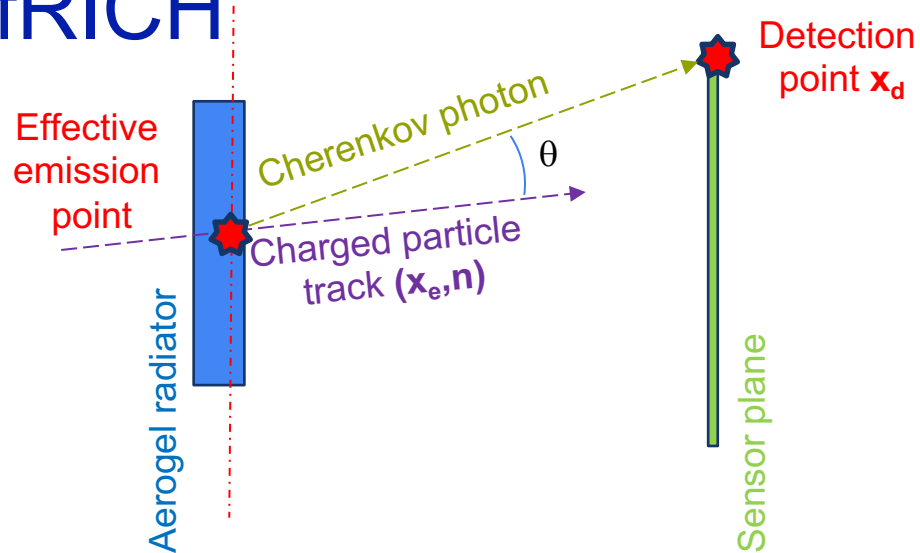# Tracking resolution for pfRICH
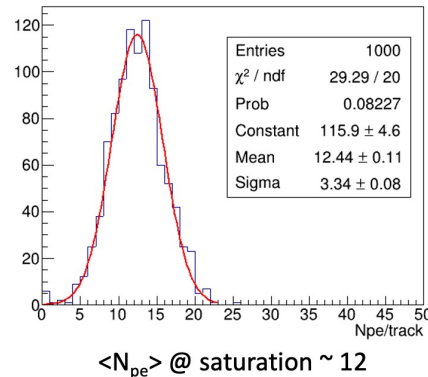
- ➤ Emission point uncertainty
- ➤ Detection point uncertainty
- ➤ Chromatic effects

-> Single photon Cherenkov angle resolution ~5 mrad

Detection point x_d

Effective emission point

Cherenkov photon

Charged particle track (x_e, n)

θ

Aerogel radiator

Sensor plane

Entries	11897
χ^2 / ndf	133 / 58
Prob	7.952e–08
Constant	549.3 ± 6.1
Mean	–0.06729 ± 0.04816
Sigma	5.128 ± 0.031

SPE Resolution (mrad)

σ_{SPE} ~ 5 mrad

- ➤ Expected $<N_{pe}>$ ~ 12
- ➤ Therefore, track-level Cherenkov angle resolution is ~1.5 mrad

-> To first order, require that tracking resolution for this angle as shown is reasonably small compared to 1.5 mrad

Entries	1000
χ^2 / ndf	29.29 / 20
Prob	0.08227
Constant	115.9 ± 4.6
Mean	12.44 ± 0.11
Sigma	3.34 ± 0.08

Npe/track

$<N_{pe}>$ @ saturation ~ 12

1

Other considerations

➢ This requirement can likely be relaxed for situations where all PID hypotheses of interest (e/π, π/K, K/p) are separated by much more than 1.5 mrad

➢ In general, it may be more productive to evaluate tracking effect on pfRICH reconstruction directly, rather than specifying a ballpark style set of requirements

➢ A proper pfRICH reconstruction algorithm should be able to take a full track covariance matrix into account, rather than dealing with just the diagonal term(s)