# PANDA tracking performance

**test of tracking code as a preparation of forward tracking campaign**

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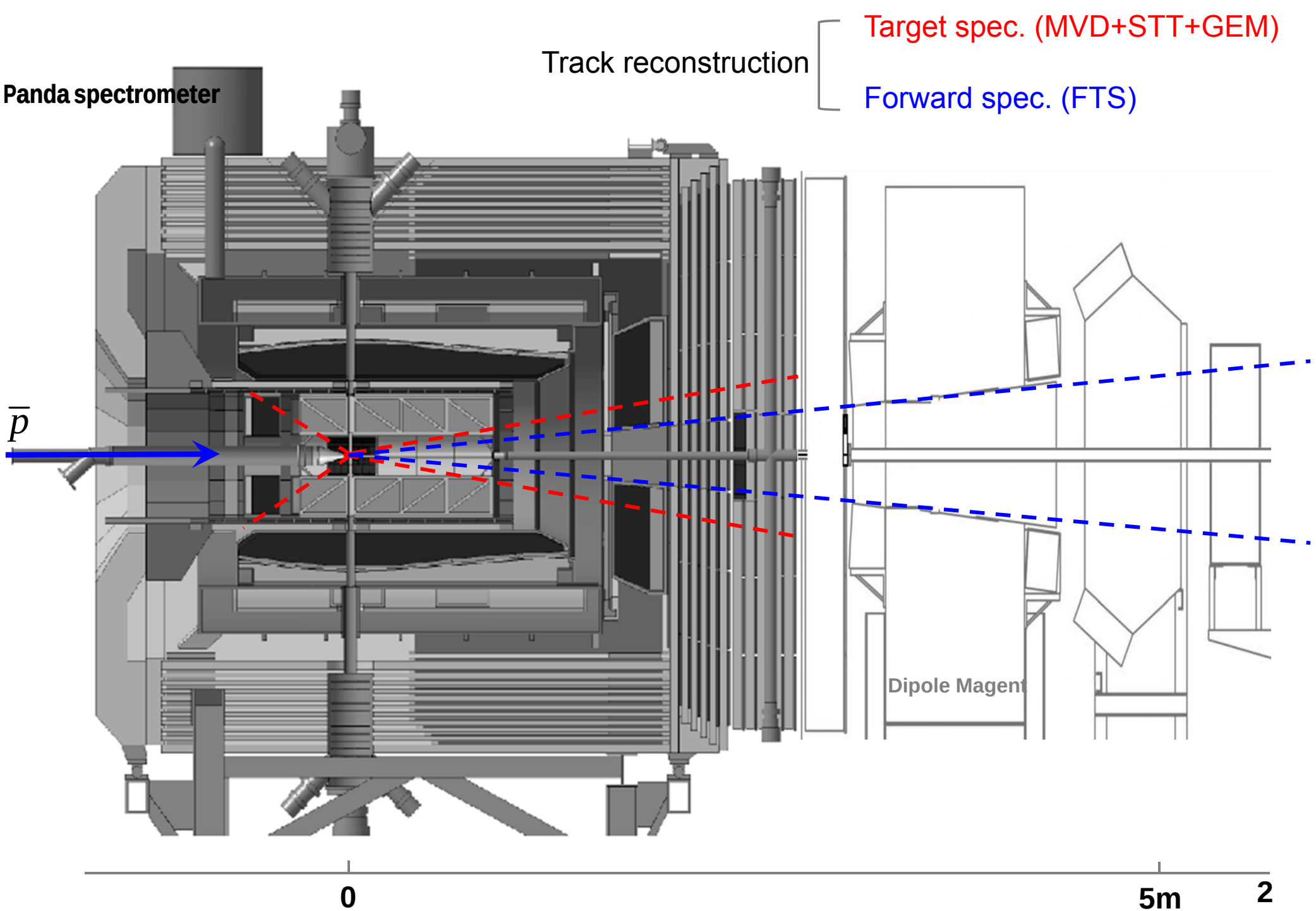
# Tracking @ PANDA

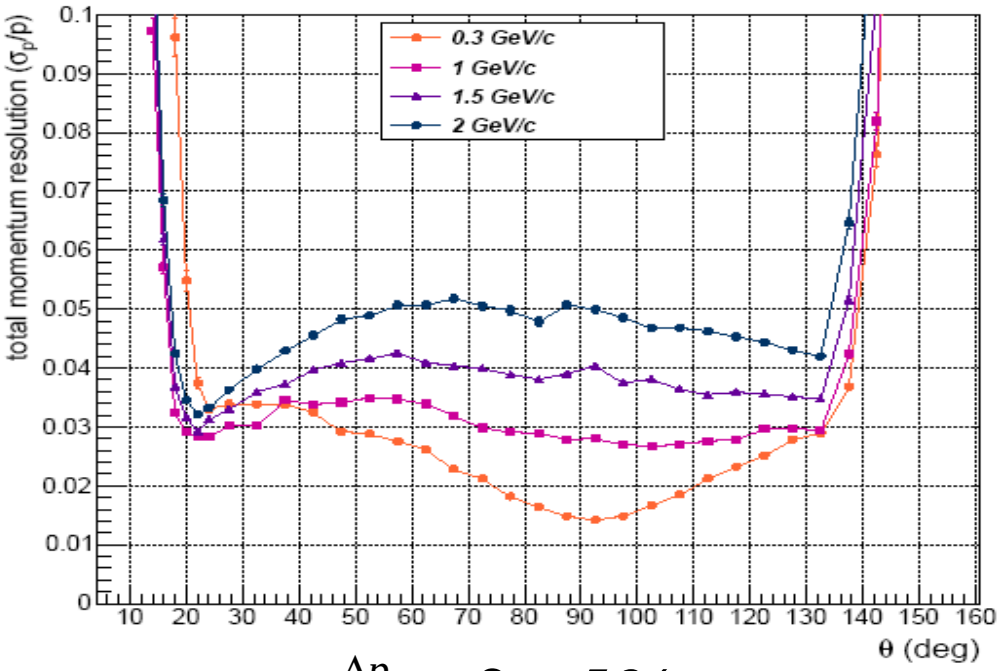


# Tracking performance

Tracking campaign for target spectrometer in sep. 2011

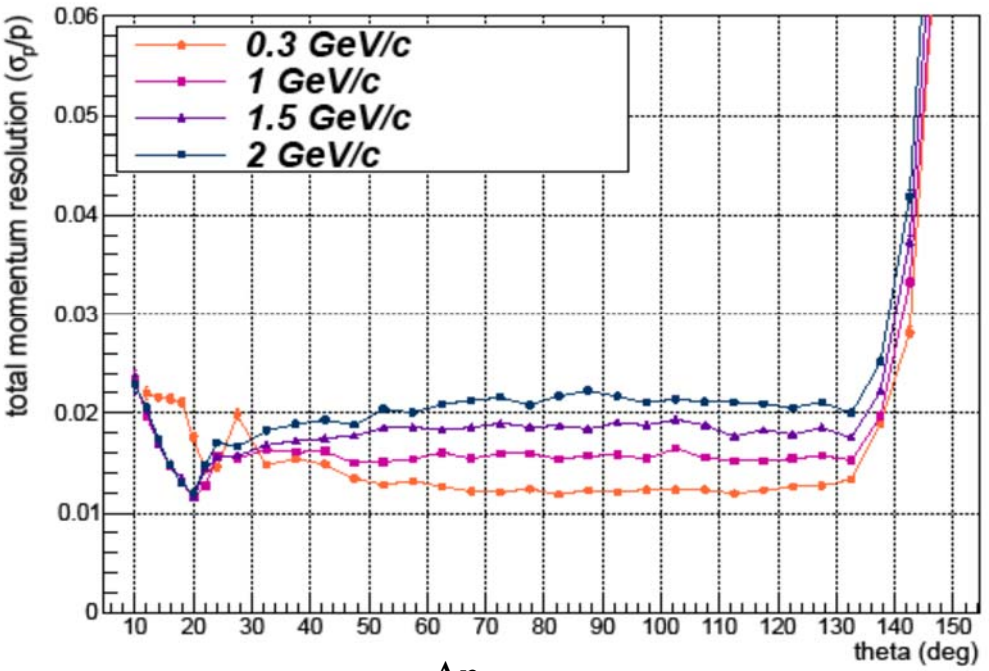
momentum resolution for $\mu$ @ barrel

STT standalone




$$\frac{\Delta p}{p} \sim 2-5\%$$

STT + MVD + GEM

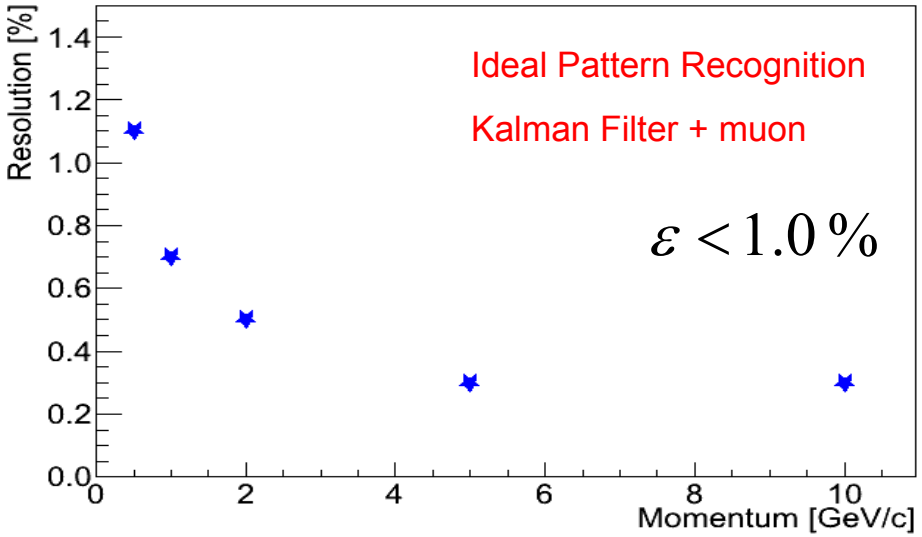



$$\frac{\Delta p}{p} \sim 1-2\%$$

**but never shown for other particles and for θ resolution(difference)**

# Tracking performance

- Momentum resolution for μ @ forward




- Study of reconstruction for combined two spectrometer

used PANDAroot version july12

**reconstruction**

SttMvdGemGenTrack

FtsIdealGenTrack

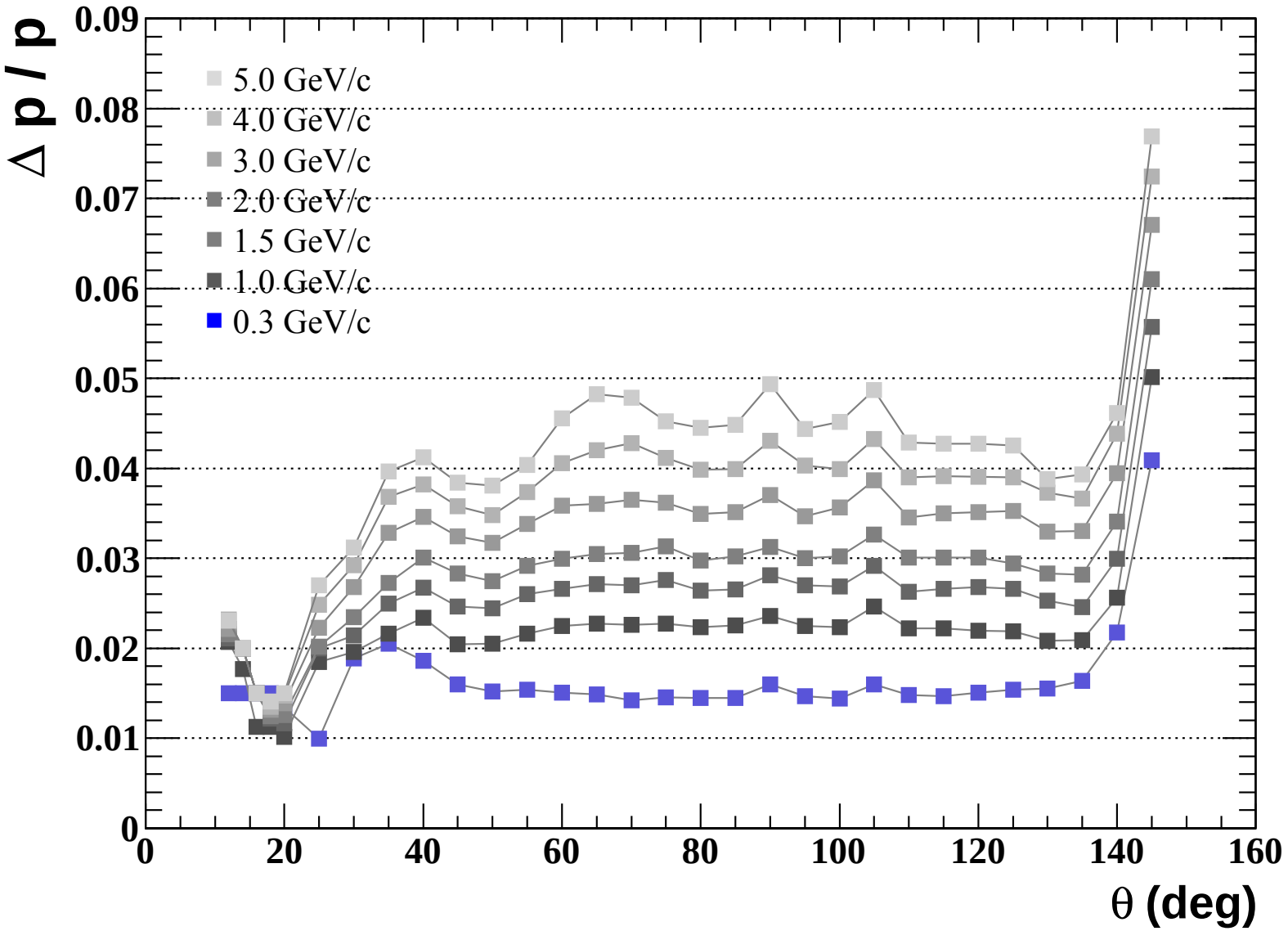
**PidCorrelator**

**combined both tracks**

# Tracking performance

Study on the point-like single particle resolution

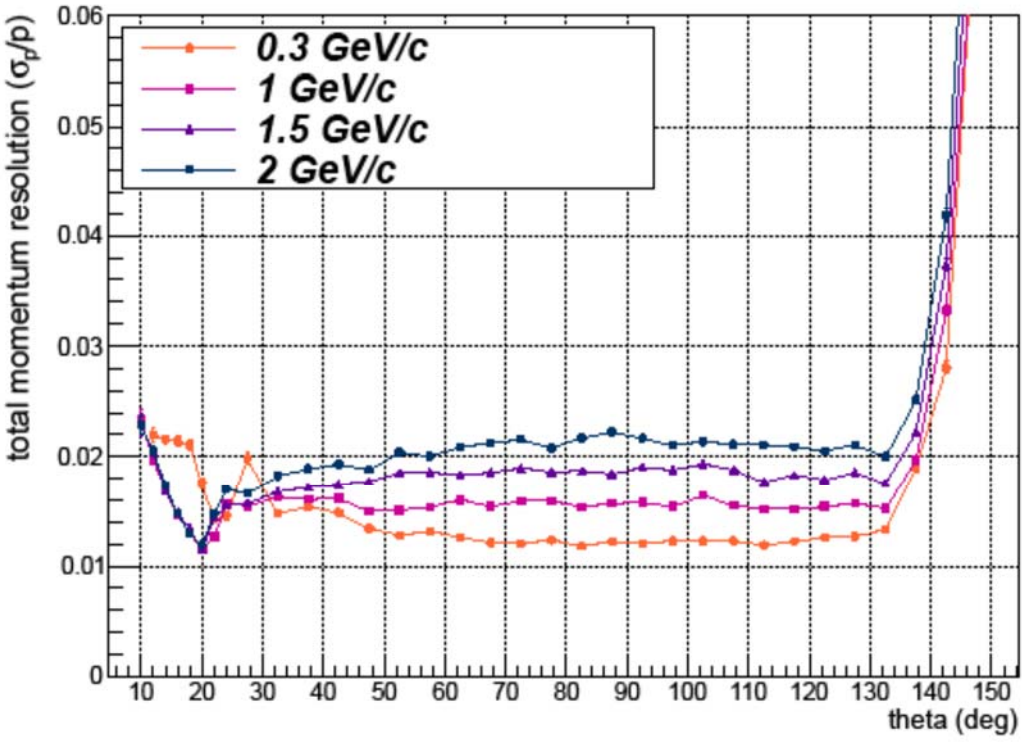
μ(muon) momentum resolution



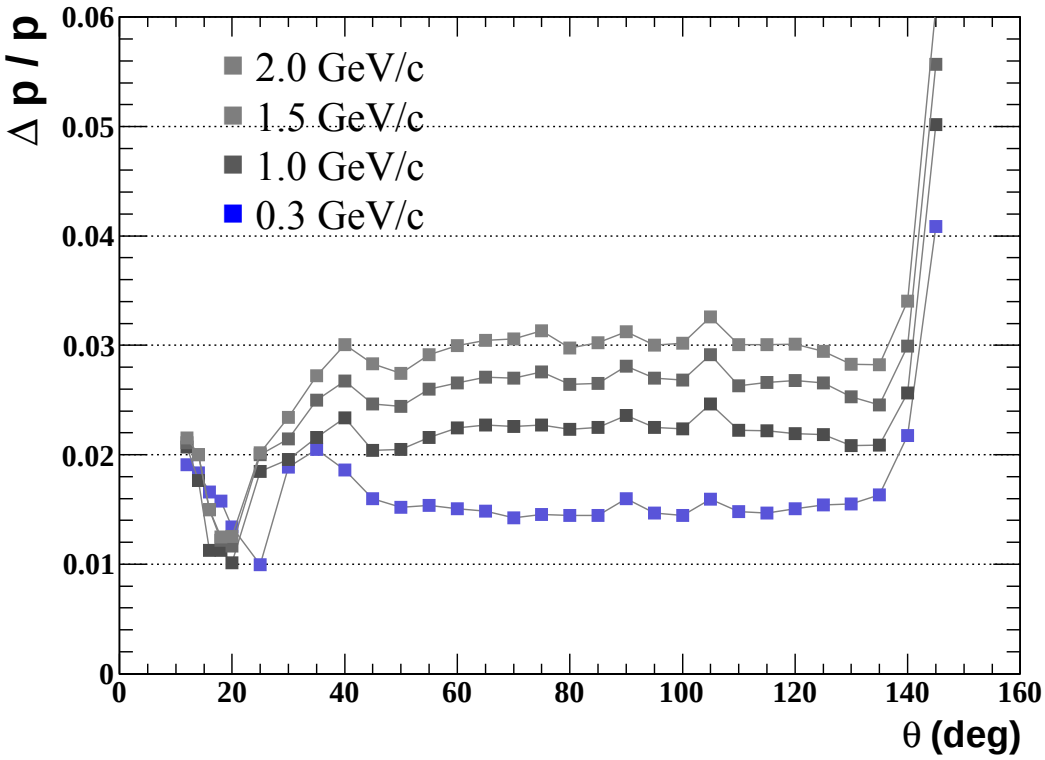
# Tracking performance

## Comparison of the momentum resolution for μ

STT + MVD + GEM



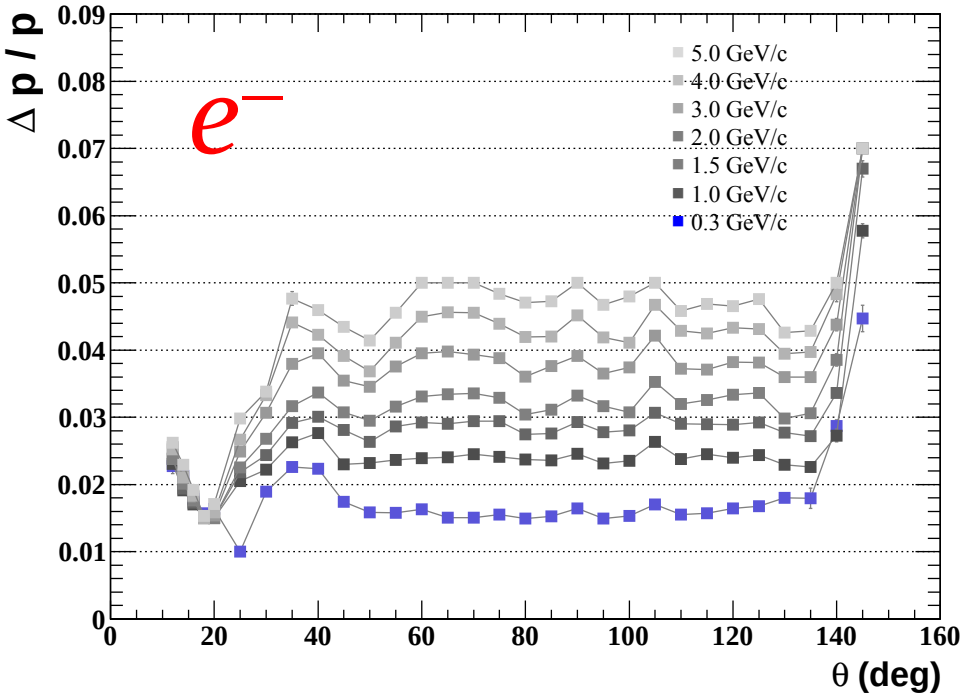

STT+MVD+GEM and FTS

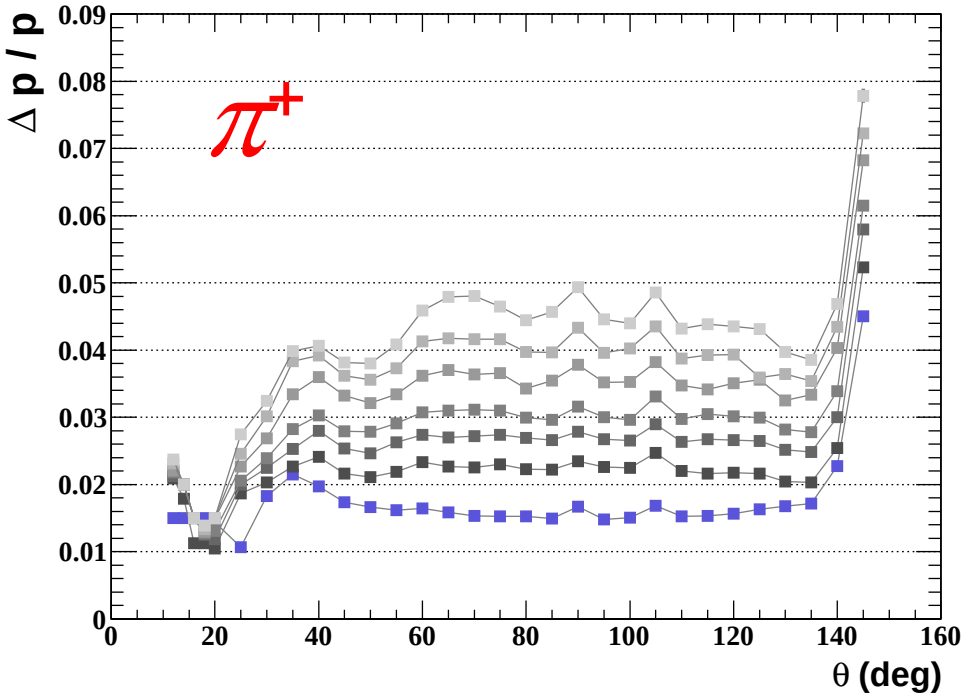


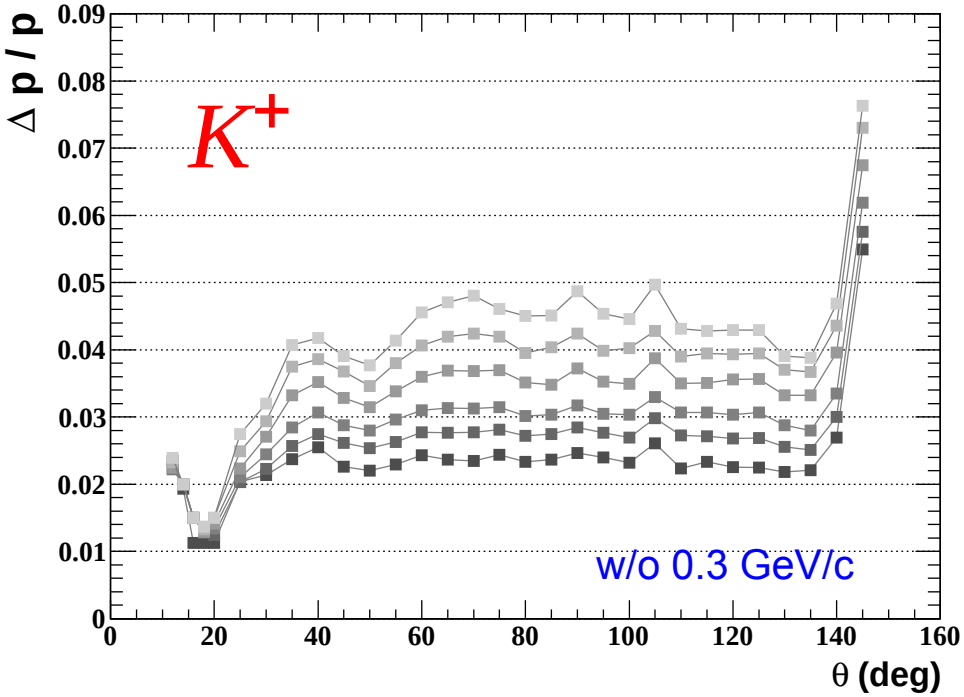

had been presented during the tracking campaign in sep. 2011

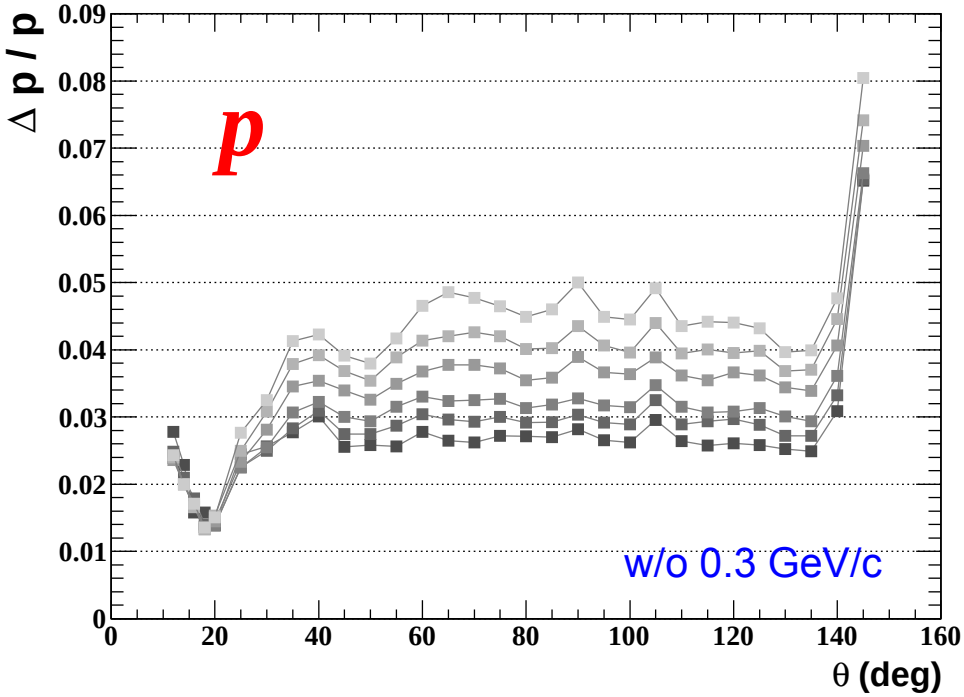
2 times worser than 2011 values

# Momentum resolution



# Momentum resolution of $e^-$

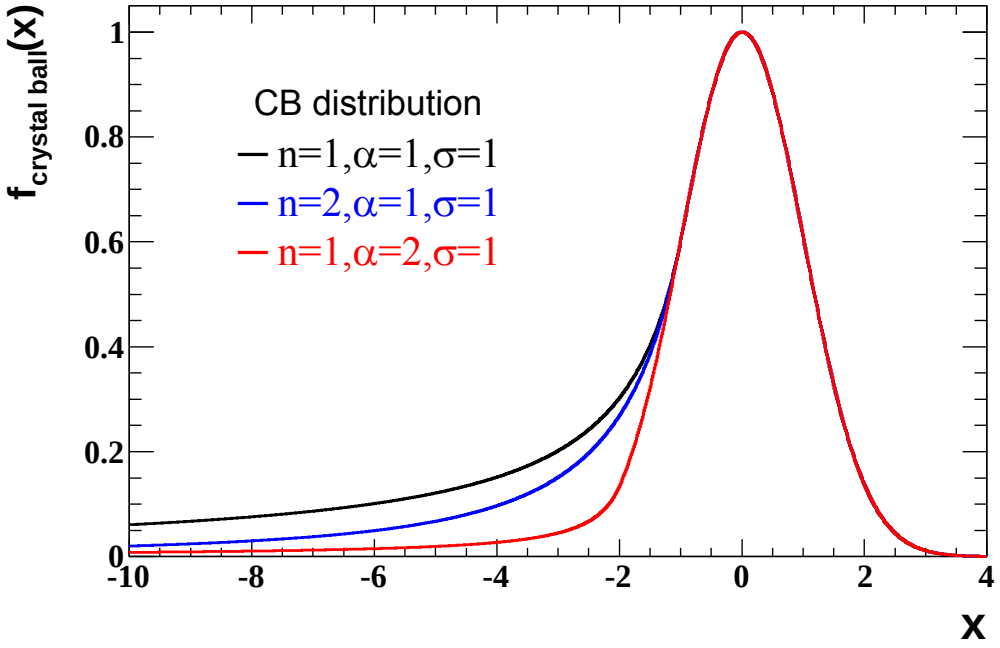
## Crystal Ball function

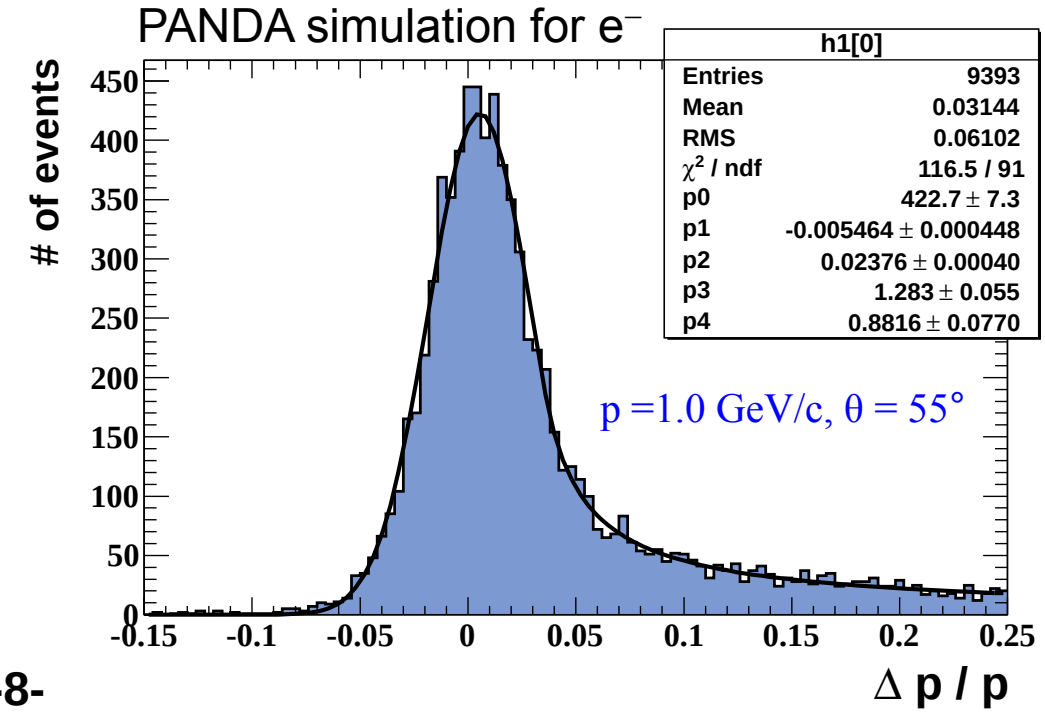
$$C(x) = \begin{cases} N \exp\left[-\dfrac{(x-x_0)^2}{2\sigma^2}\right] & \text{for } x > x_0 - \alpha\sigma \\ N \dfrac{(n/\alpha)^n e^{-\frac{\alpha^2}{2}}}{[(x_0 - x)/\sigma + n/\alpha - \alpha]^n} & \text{for } x \le x_0 - \alpha\sigma \end{cases}$$

$N$ – normalization factor
$x_0$ – peak position
$\sigma$ – gaussian width
$\alpha$ – joint parameter
$n$ – exponent of power law

commonly used parameterizations of the energy loss distribution (e.g. ECAL)

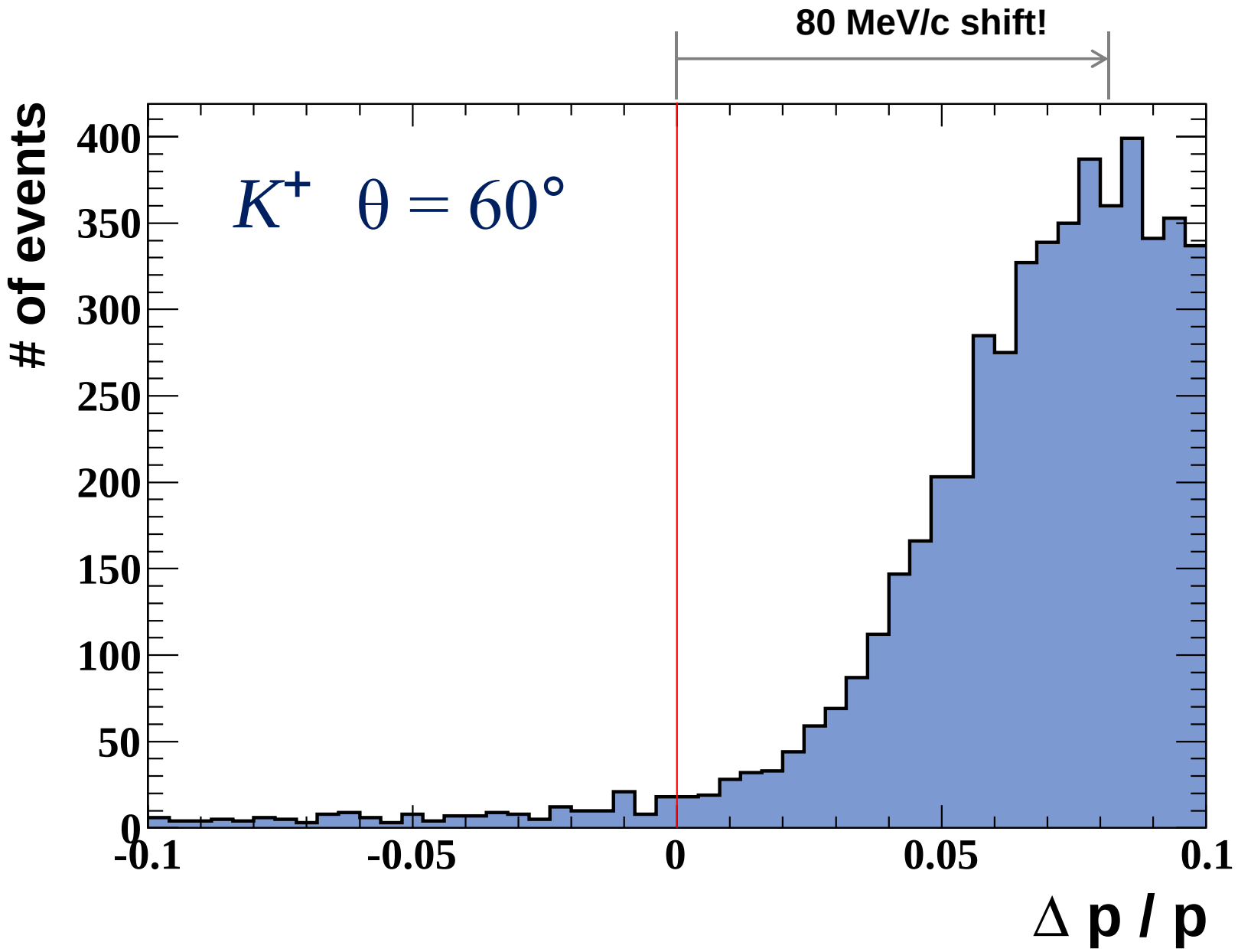
or use alternatively Novosibirsk function



# Momentum resolution

Reconstruction of 0.3 GeV/c (low momentum track) for kaon and proton
Mom. shift due to the fact of muon mass hypothesis in the tracking code

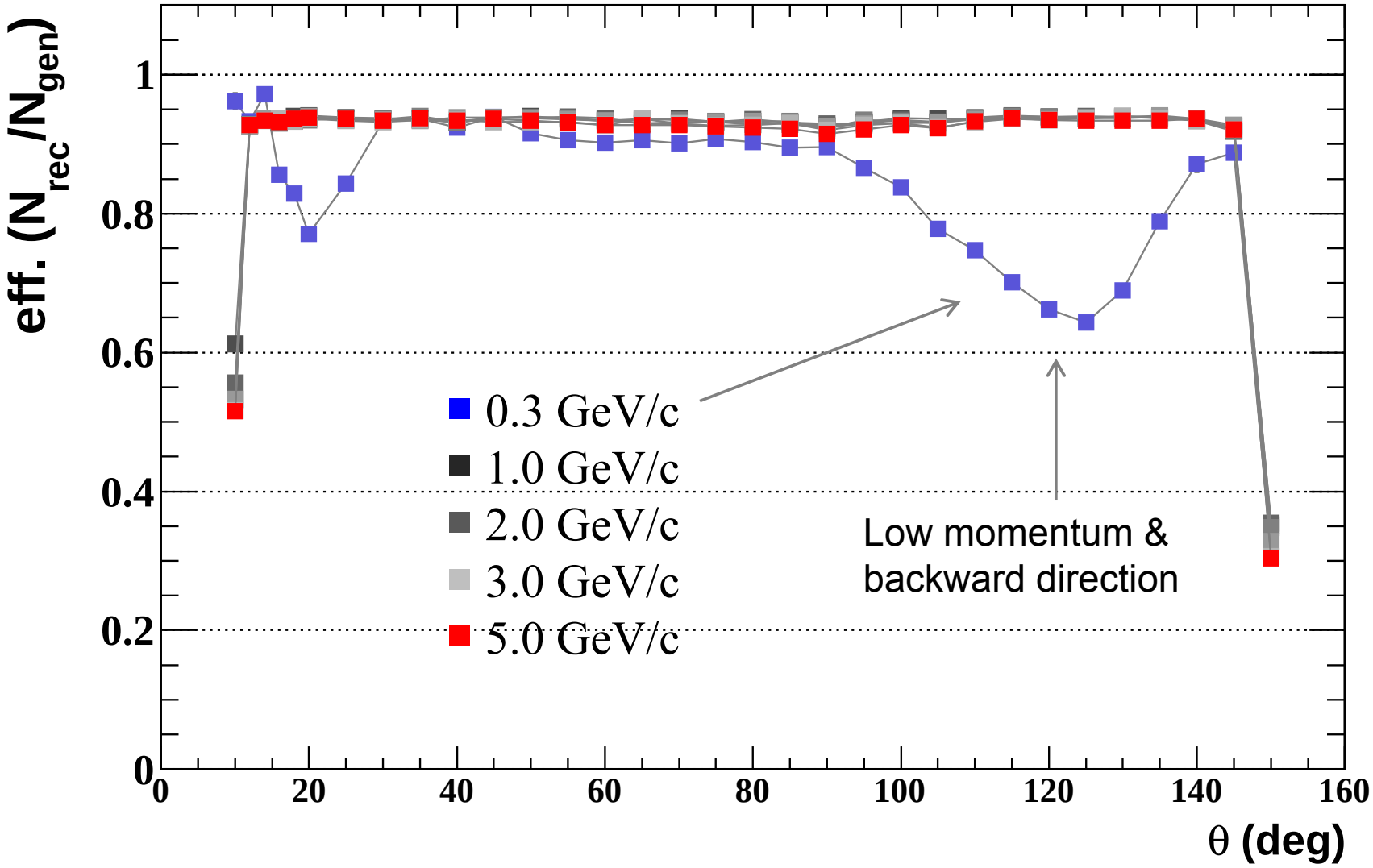


# Reconstruction efficiency

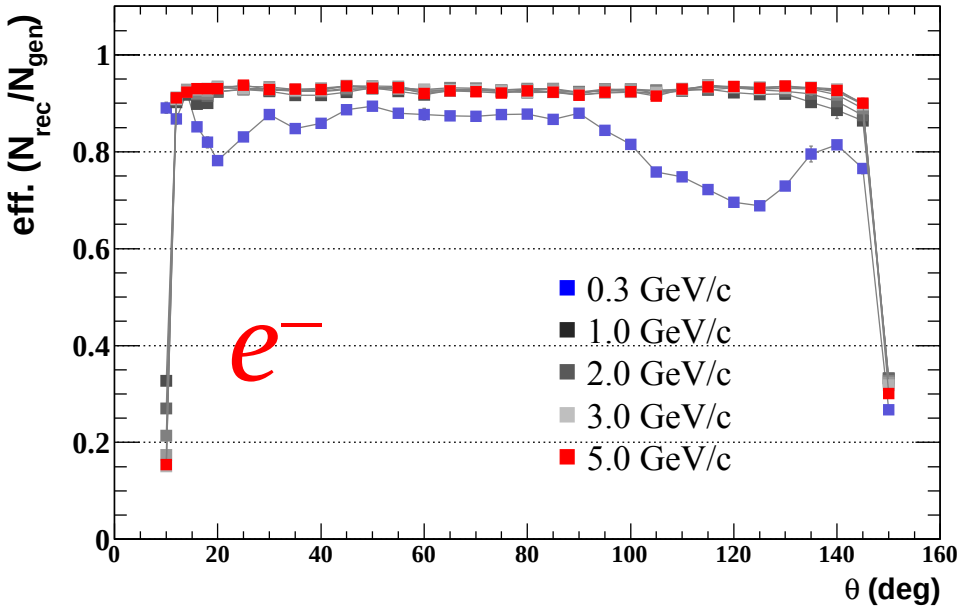
## Reconstruction efficiency of μ

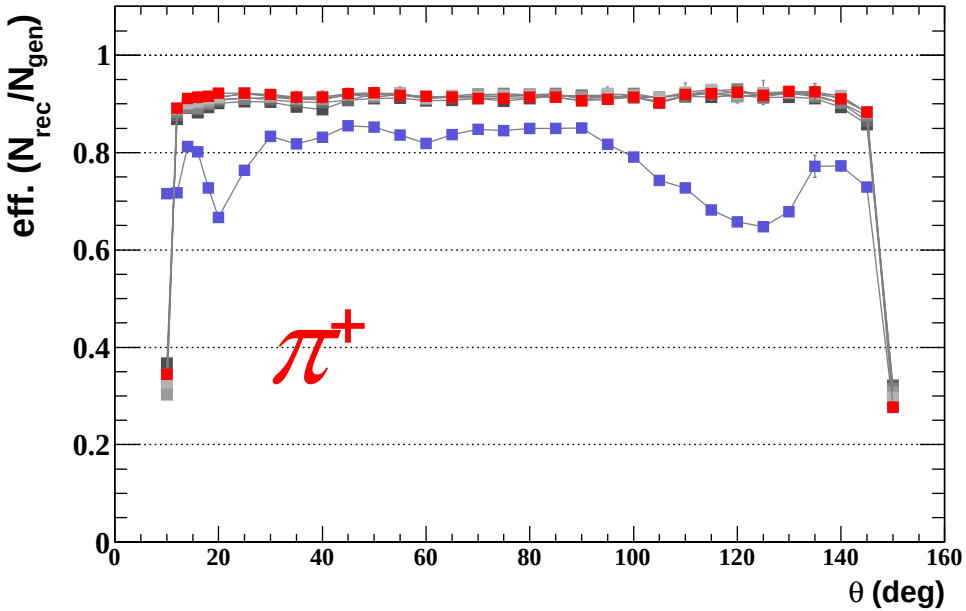
$$\varepsilon = \frac{N_{rec,MC}}{N_{gen,MC}}$$

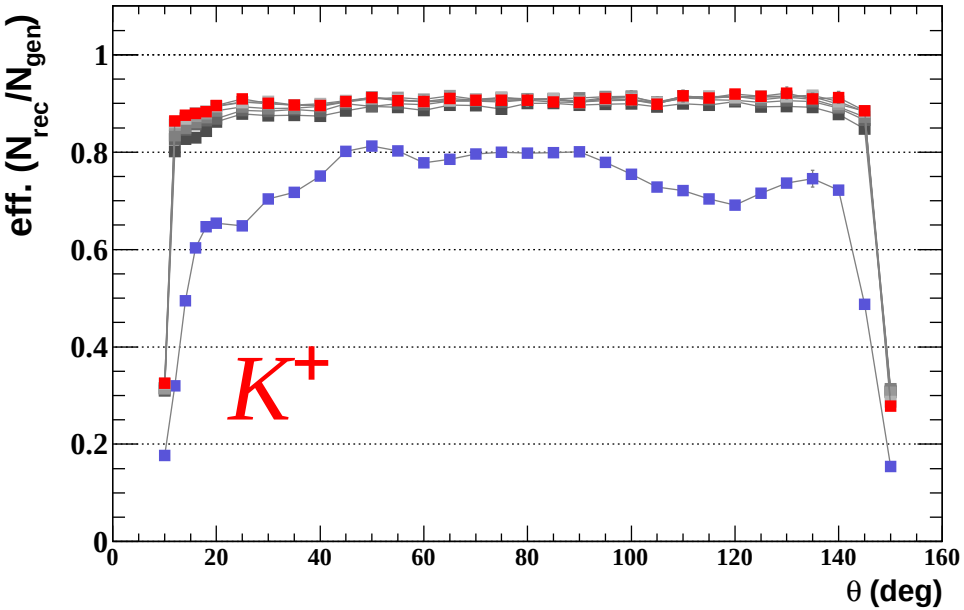
where, $N_{rec,MC}$ number of reconstruced of MC truth matched

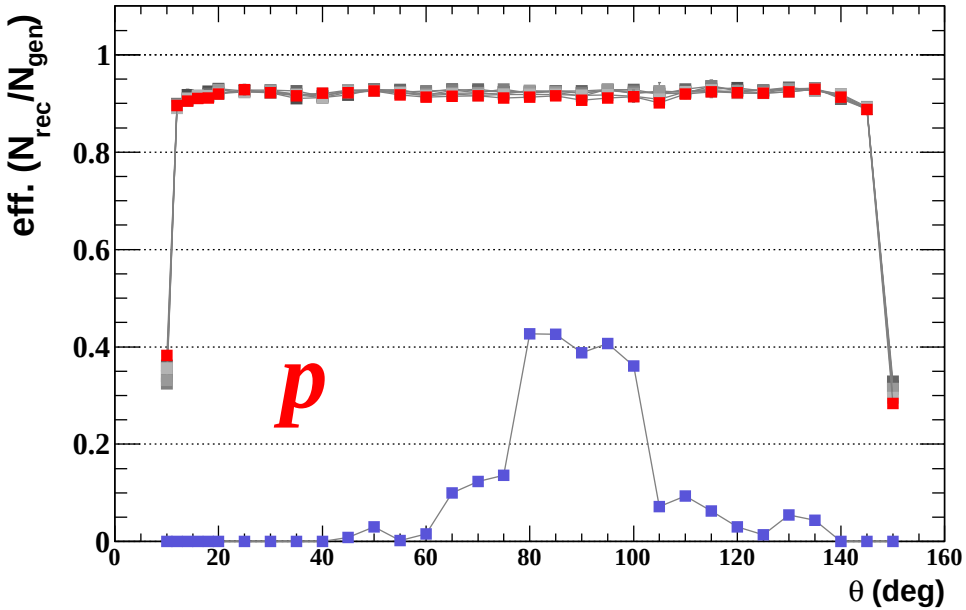


# Reconstruction efficiency



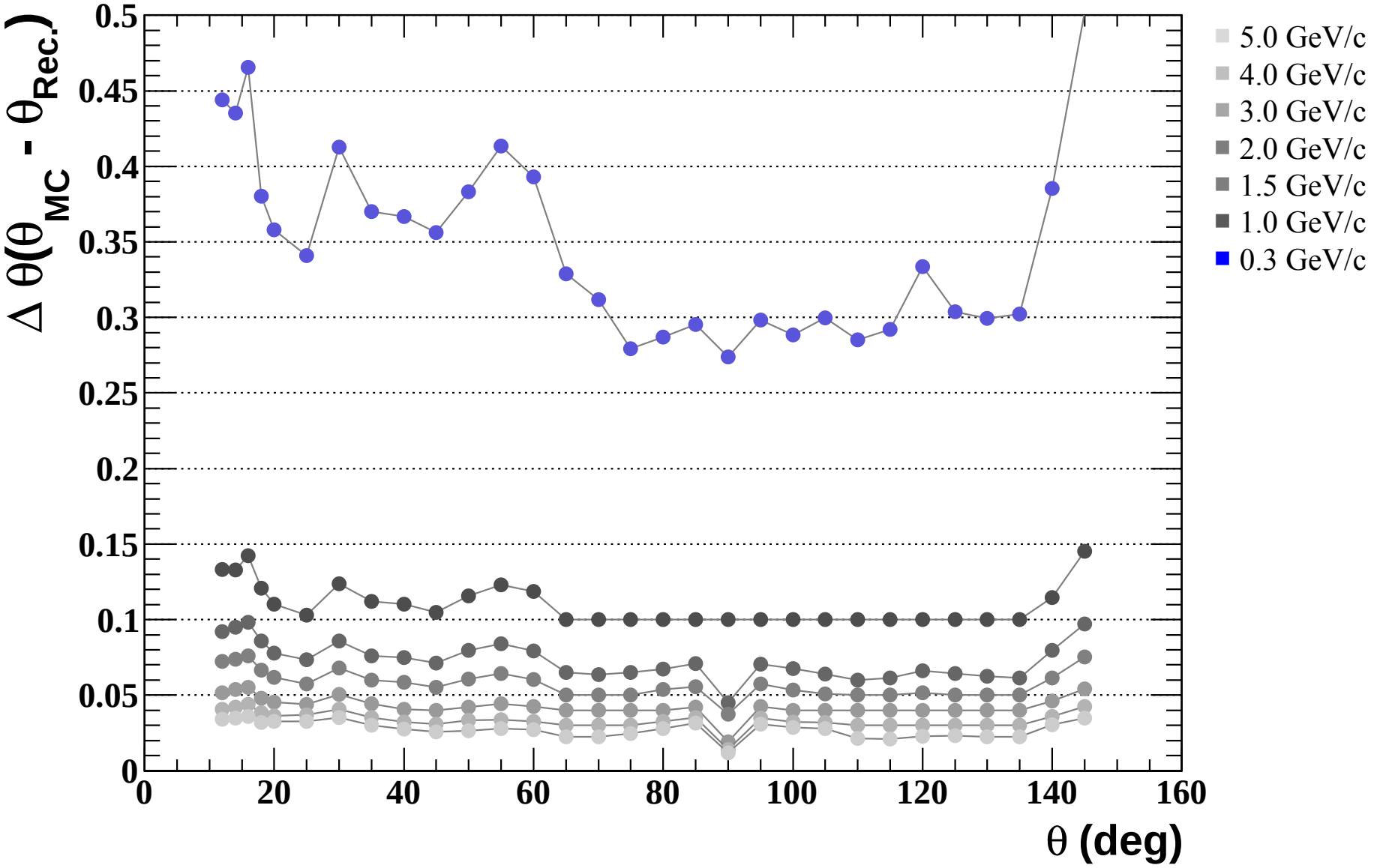



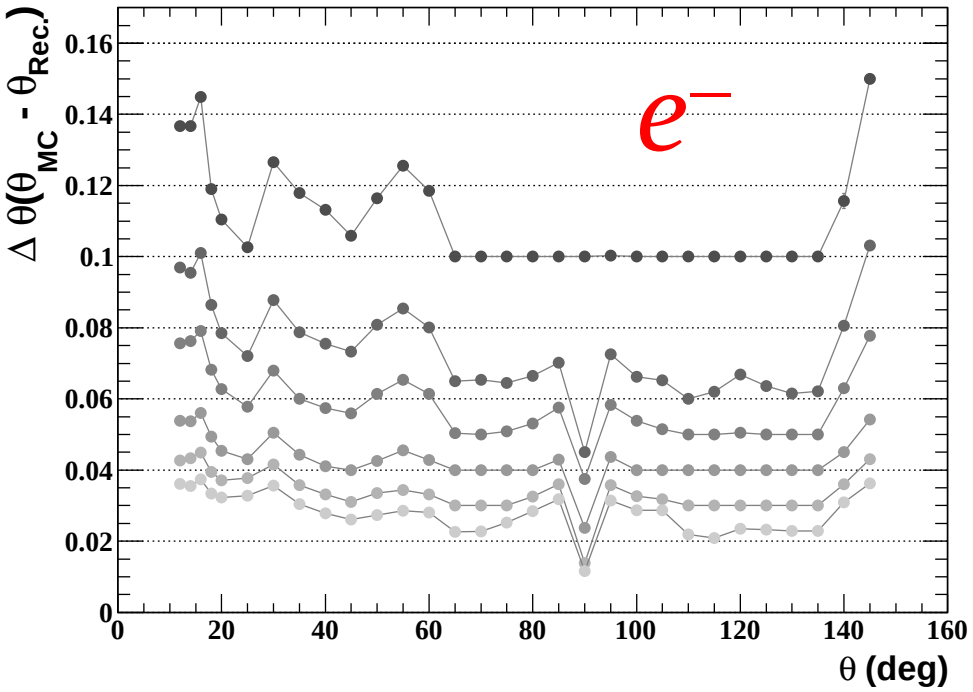



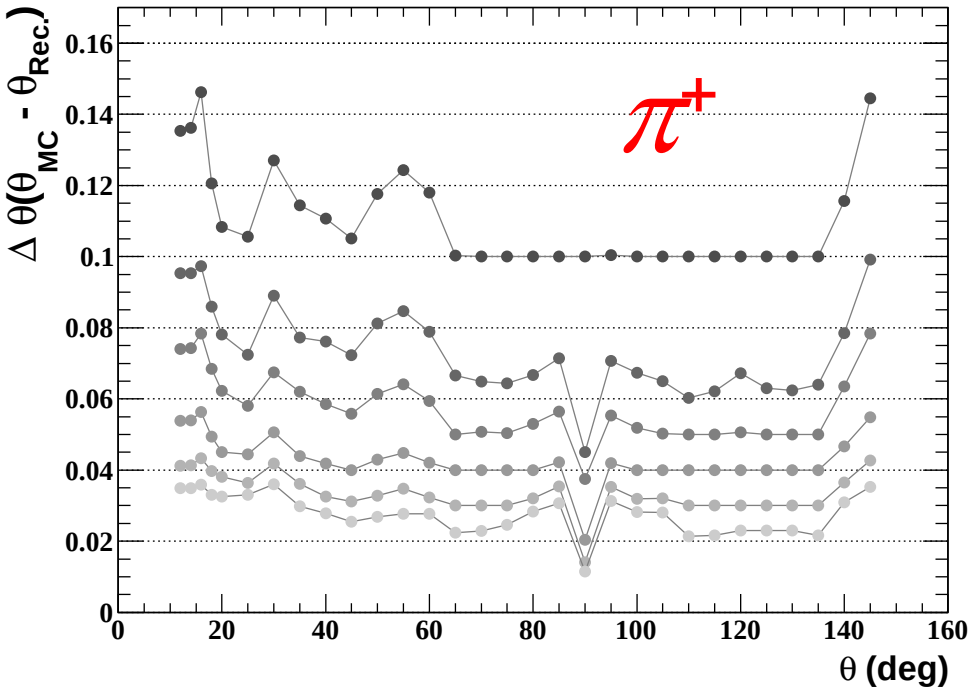
# θ resolution

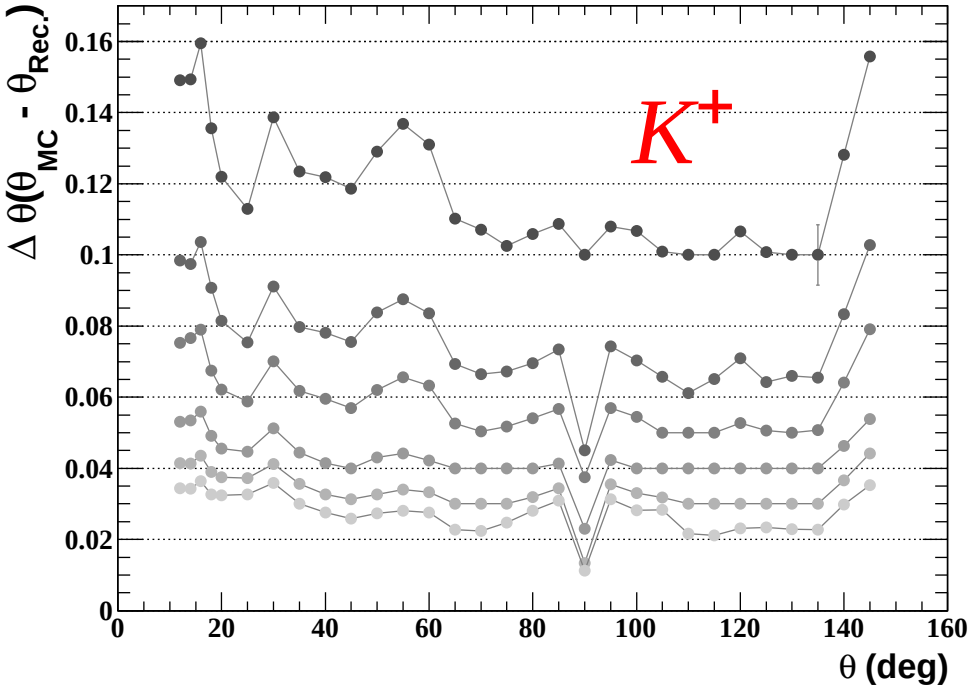
## difference of θ for μ(muon)

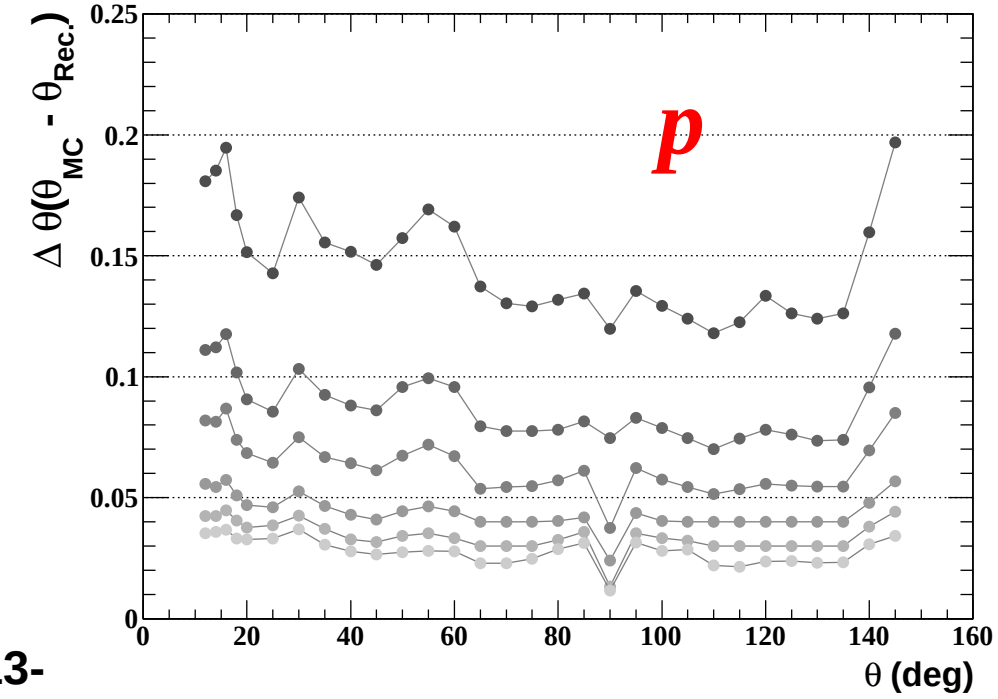


# θ resolution



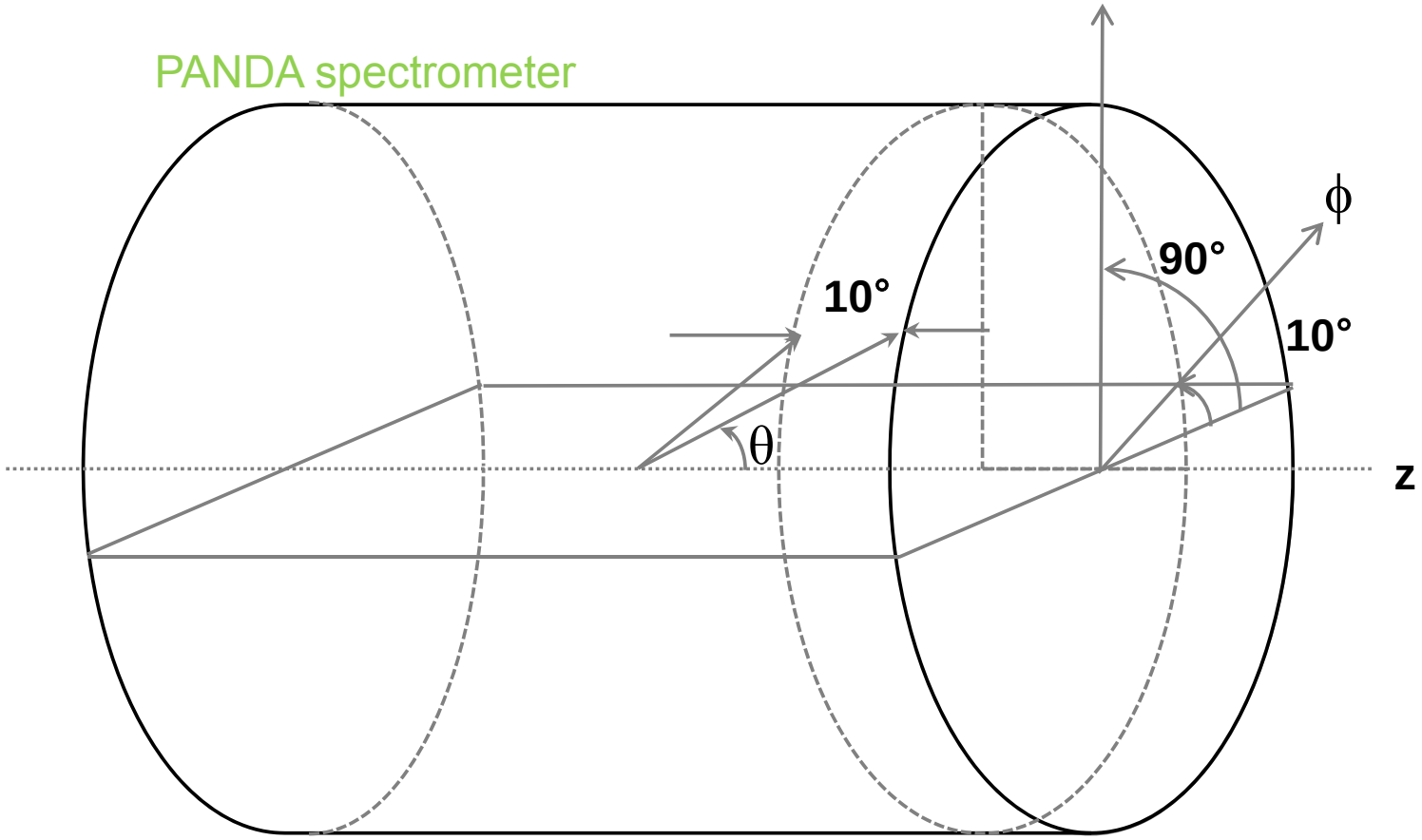



# Impact of high multiplicity

Study on the reconstruction efficiency with the environment of high multiplicity

- contain 10 particles ($e^{\pm}$, $\mu^{\pm}$, $\pi^{\pm}$, $K^{\pm}$, $p^{\pm}$) in one event
- tracking simulation in the map of $\phi$ & $\theta$



# Efficiency as a funtion of θ & ϕ

momentum
$p$ = 1.0 GeV/c

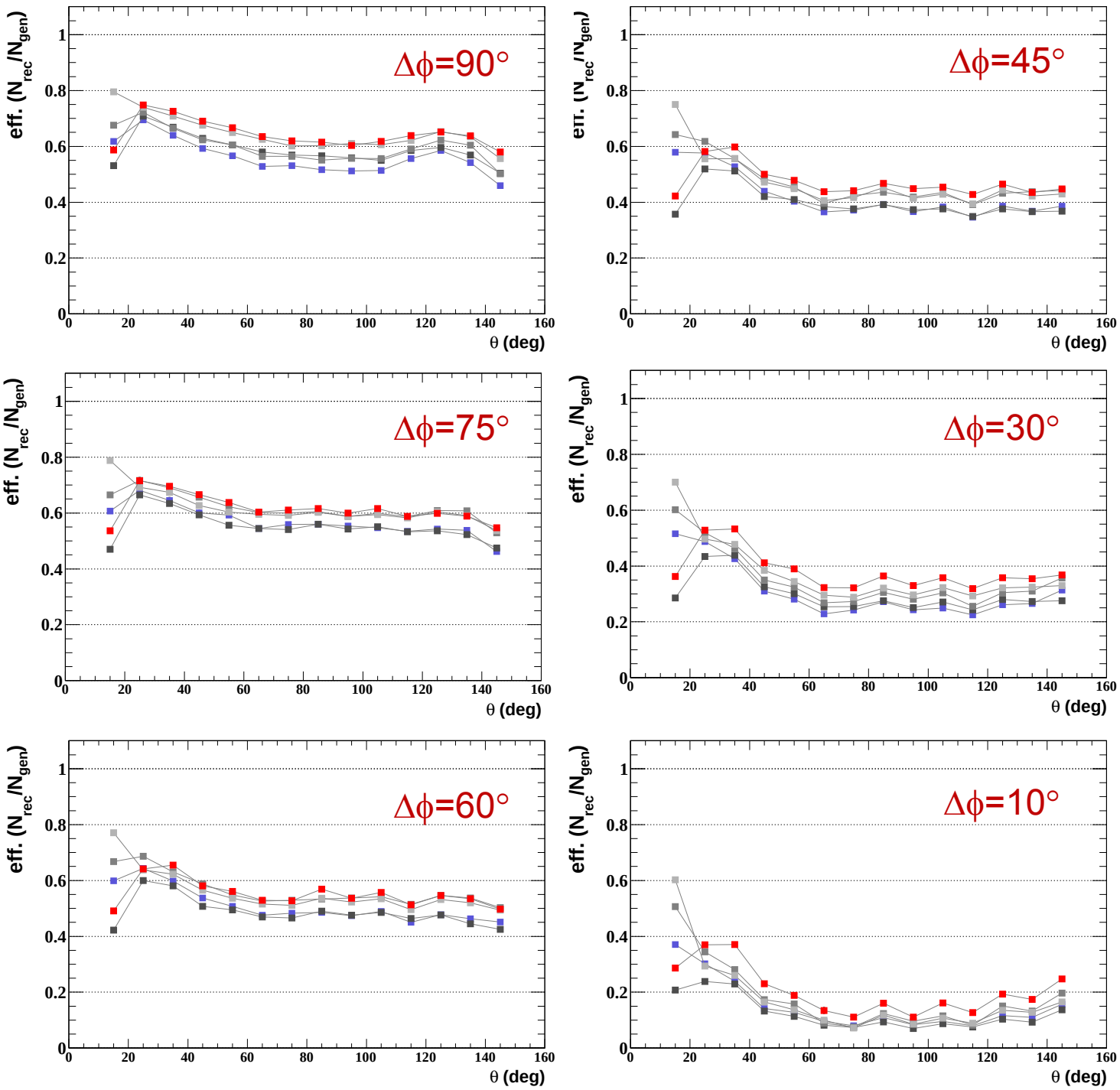
- electron
- muon
- pion
- kaon
- proton

Efficiency :

$$\varepsilon_{particle} = \frac{N_{rec.particle}}{N_{gen.MCevent}}$$

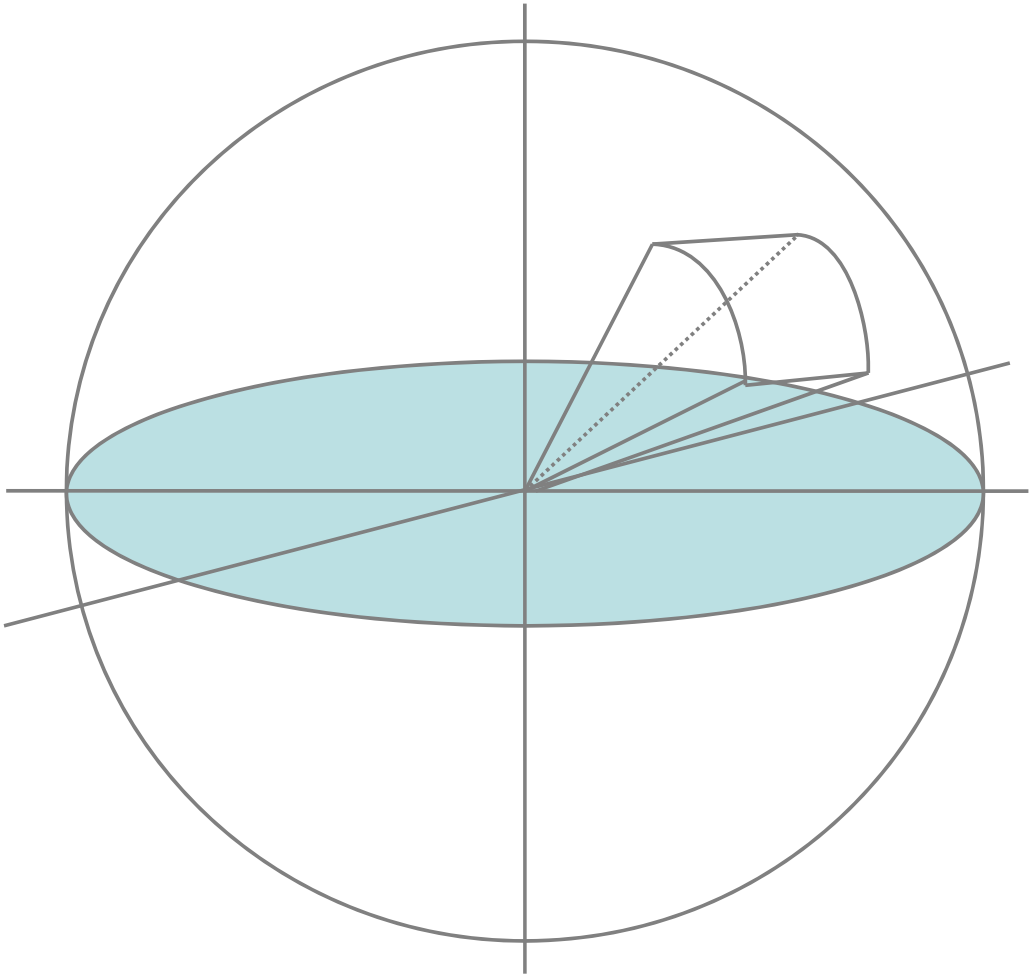
where, $N_{rec.particle}$ is number of reconstruced of MC truth matched

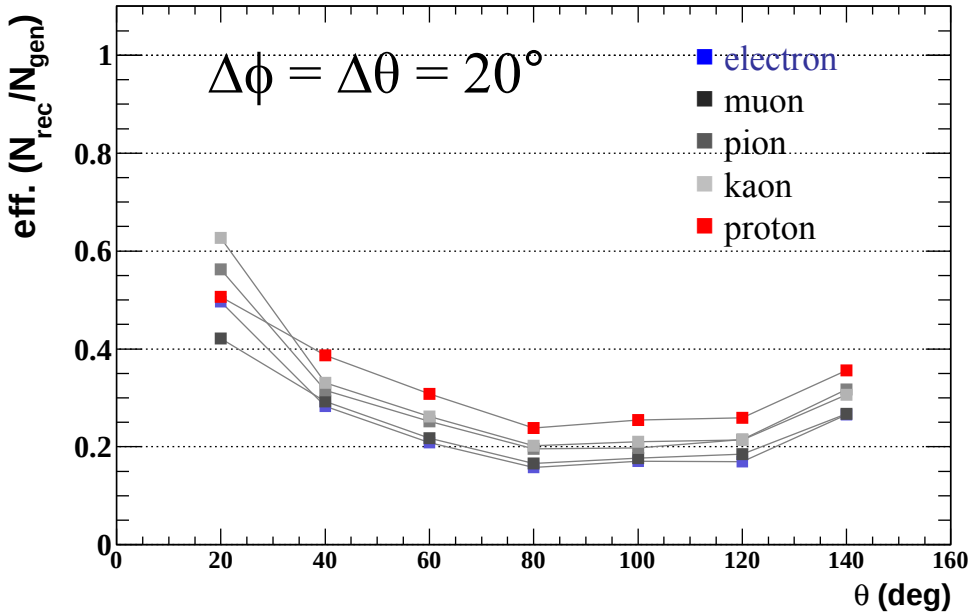
for single particle prod. efficiency ε ≥ 0.9

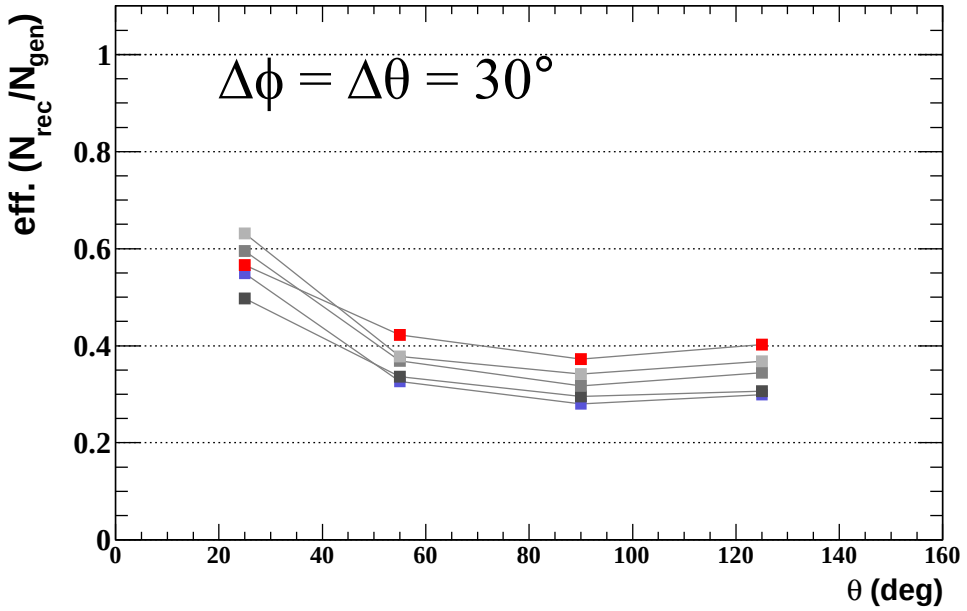


# Reconstruction efficiency

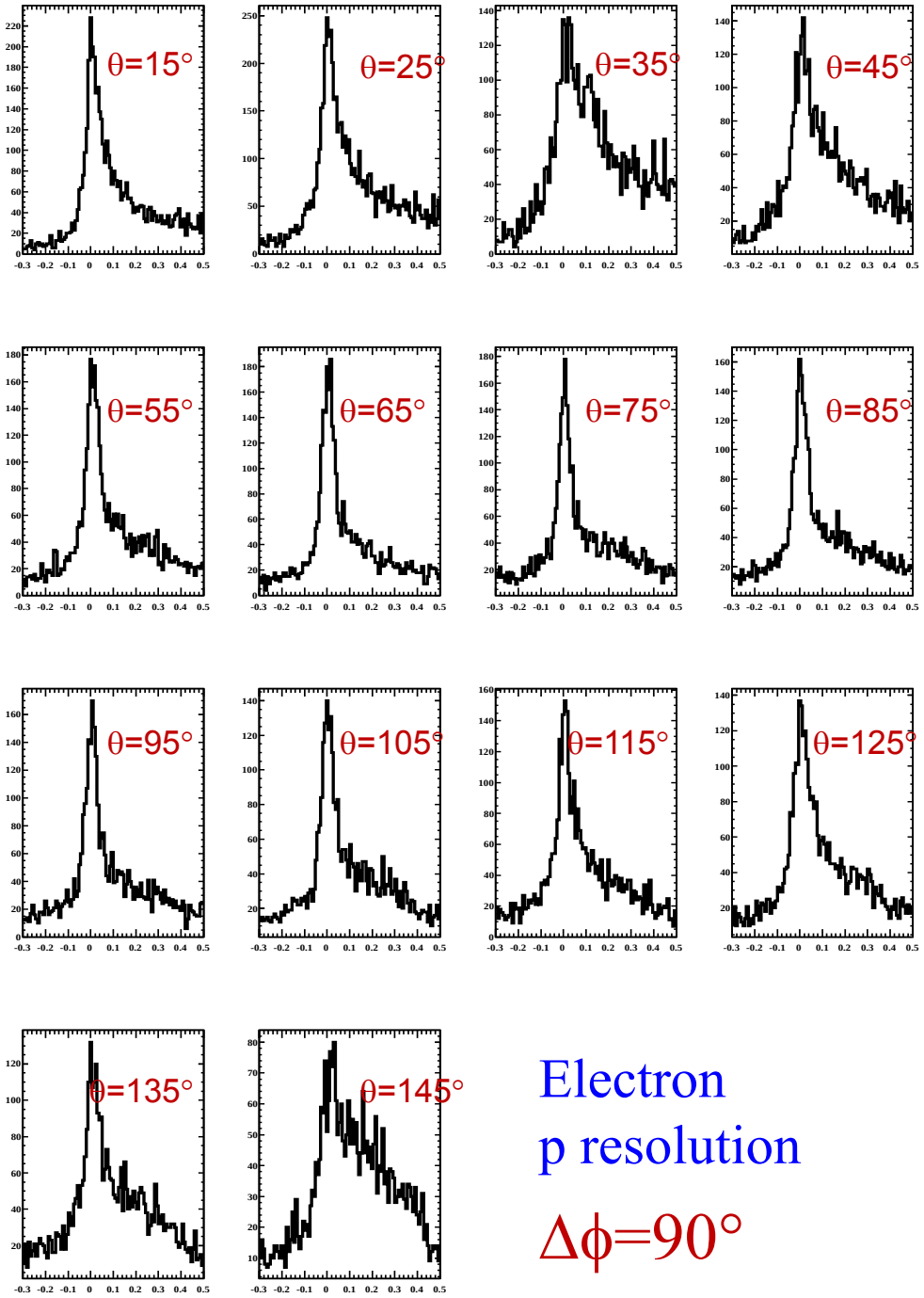
Test with
same binning : $\Delta\phi = \Delta\theta$





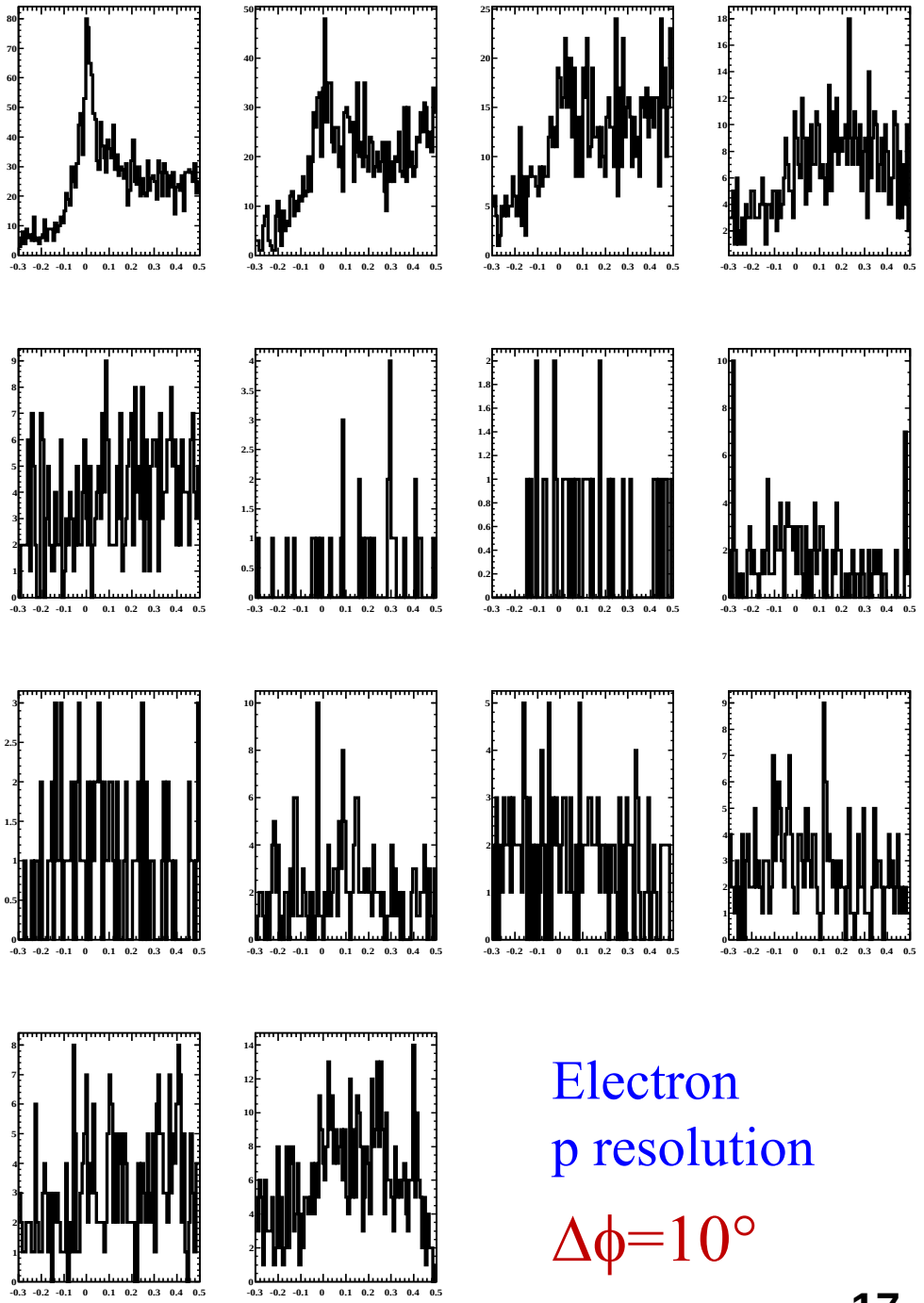



# Residual distribution of mom.




Electron
p resolution

$\Delta\phi=90°$



Electron
p resolution

$\Delta\phi=10°$

# Comparison of θ resolution

## θ resolution for high multiplicity