

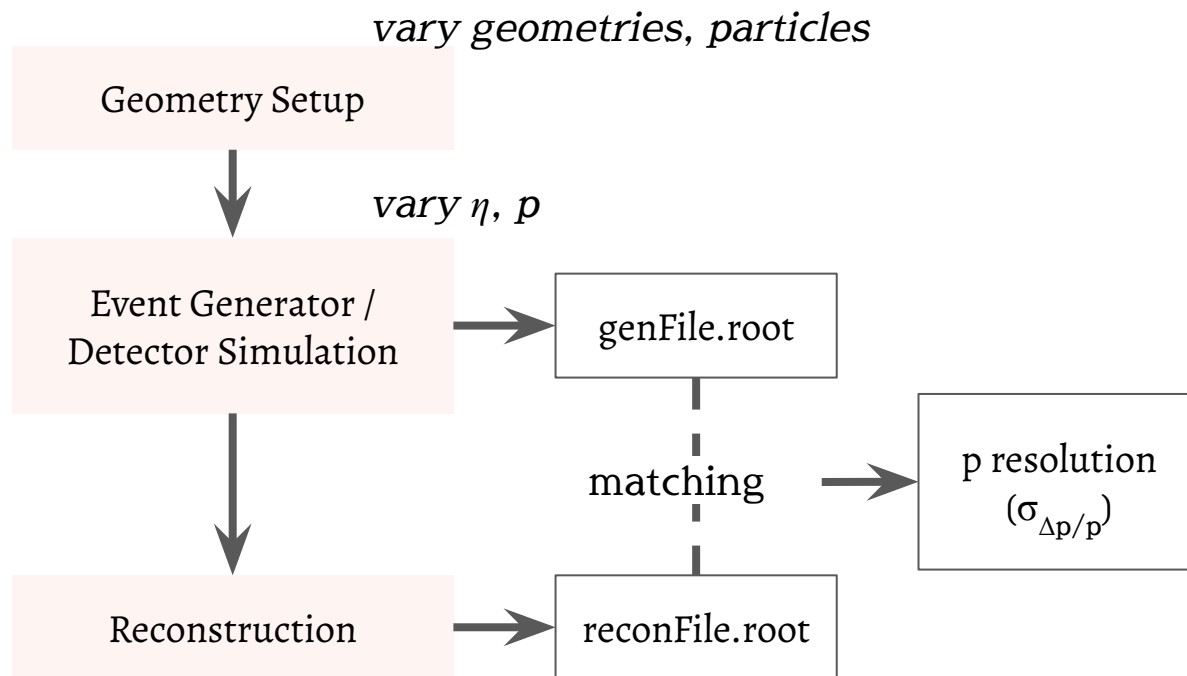
Study of momentum resolution of charged particles with tracker and TOF at ePIC

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20240229

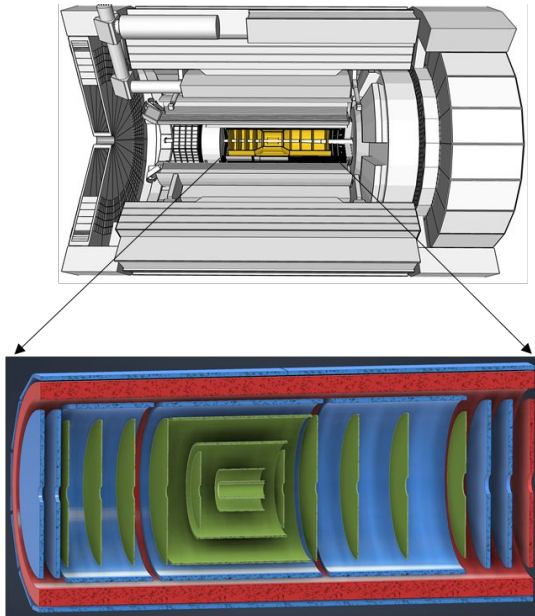
Simulation

- p resolution is defined as standard deviation of $\Delta p/p$ distribution between generated particle and reconstructed particle in each event.



without TOF hits

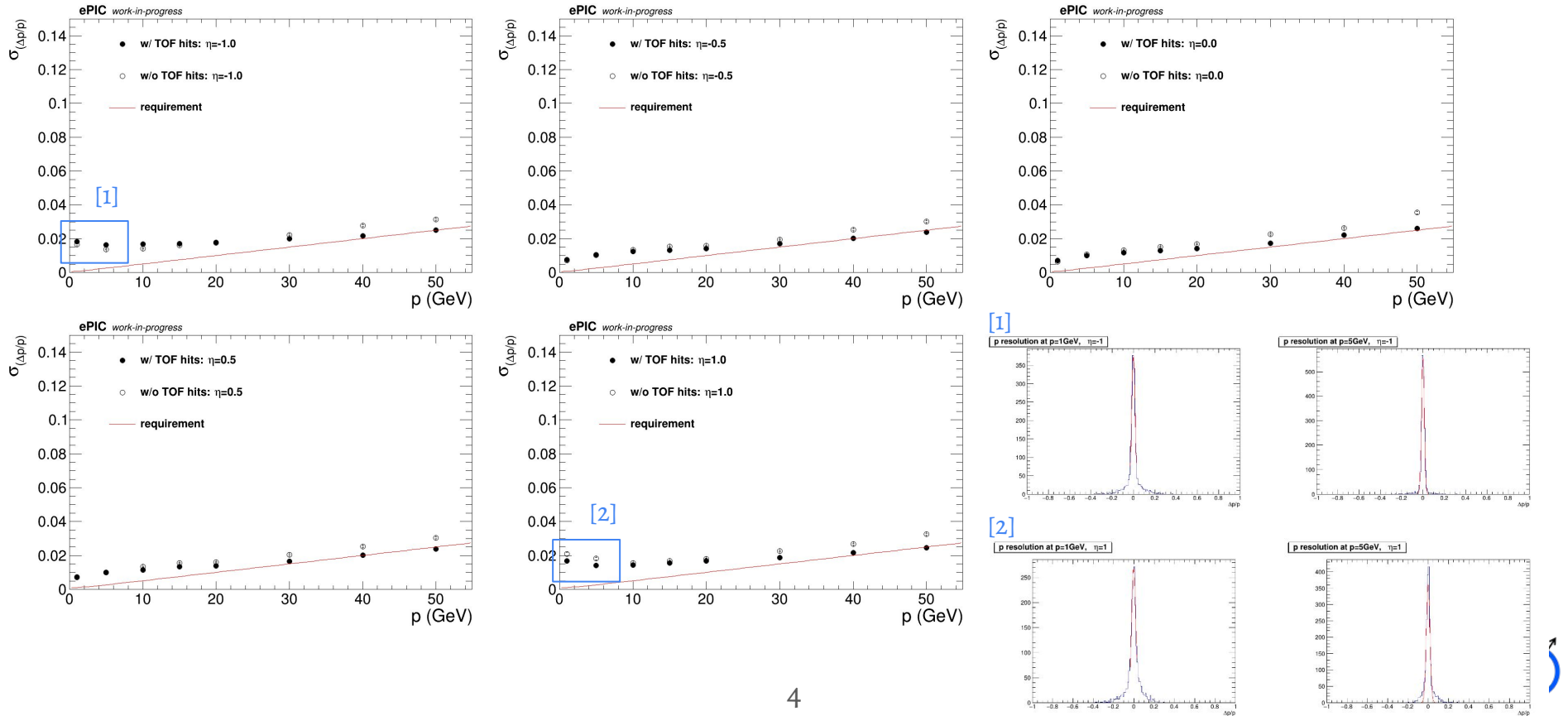
- Change in TOF material: Silicon→Vacuum
- 2000 π^+ guns were simulated
- variables:
 - with/without TOF hits
 - $\eta = -1.0, -0.5, 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5$
 - $p = 1, 5, 10, 15, 20, 30, 40, 50$ GeV



■ AC-LGAD based ToF

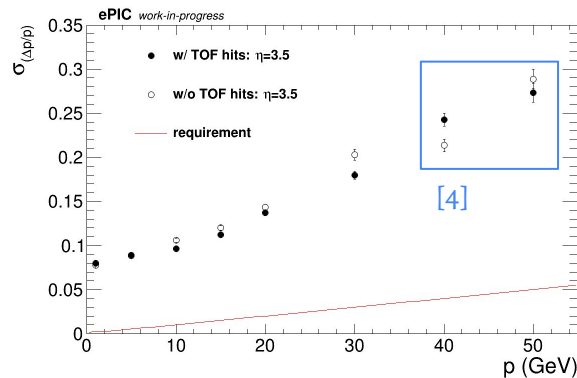
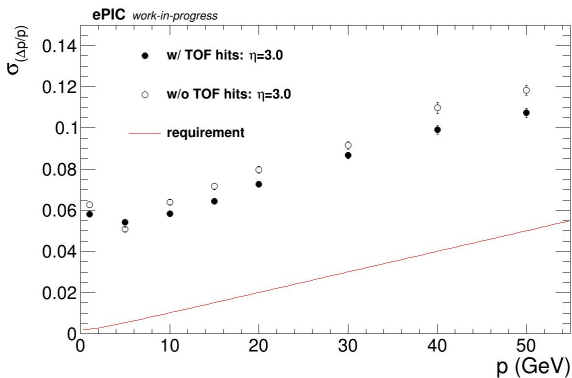
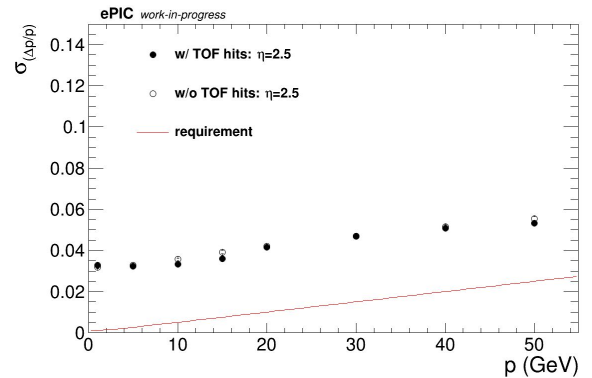
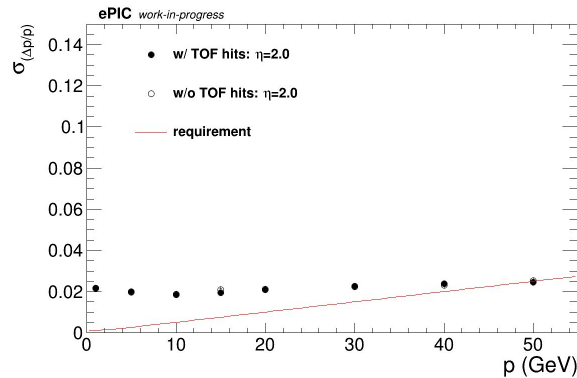
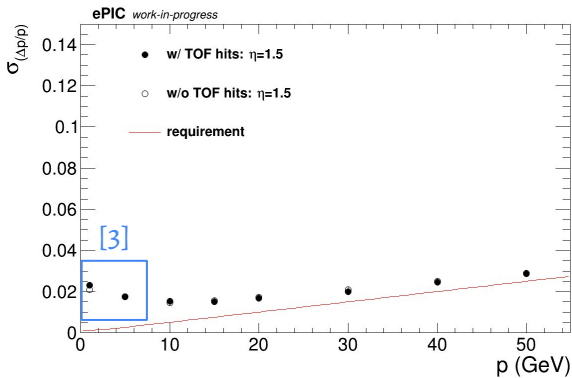
Momentum resolution - barrel

- Comparison of momentum resolution at different η . ($-1.0 \leq \eta \leq 1.0$)
- Missing TOF hits affect momentum resolution more in high p region.
- TOF hits improve momentum resolution, but there are opposite results in low p region at $\eta = \pm 1.0$. [1][2]
- Non-gaussian distribution of $\Delta p/p$ was found at $\eta = \pm 1.0$. [1][2]

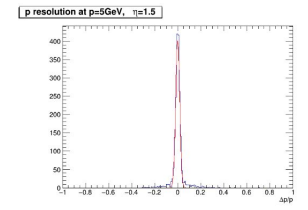
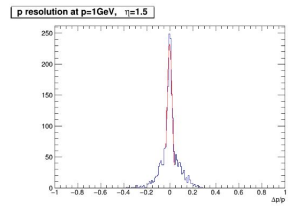


Momentum resolution - endcap

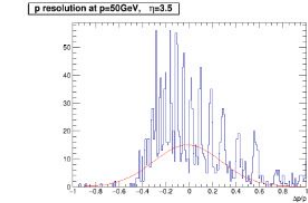
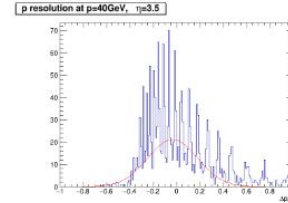
- Comparison of momentum resolution at different η . ($1.5 \leq \eta \leq 3.5$)
- Non-gaussian distribution of $\Delta p/p$ was found at $\eta=1.5$. [3]
- It's difficult to verify points at $\eta=3.5$ due to its poor momentum resolution. [4]
- Momentum resolution at high η is far from requirement.



[3]

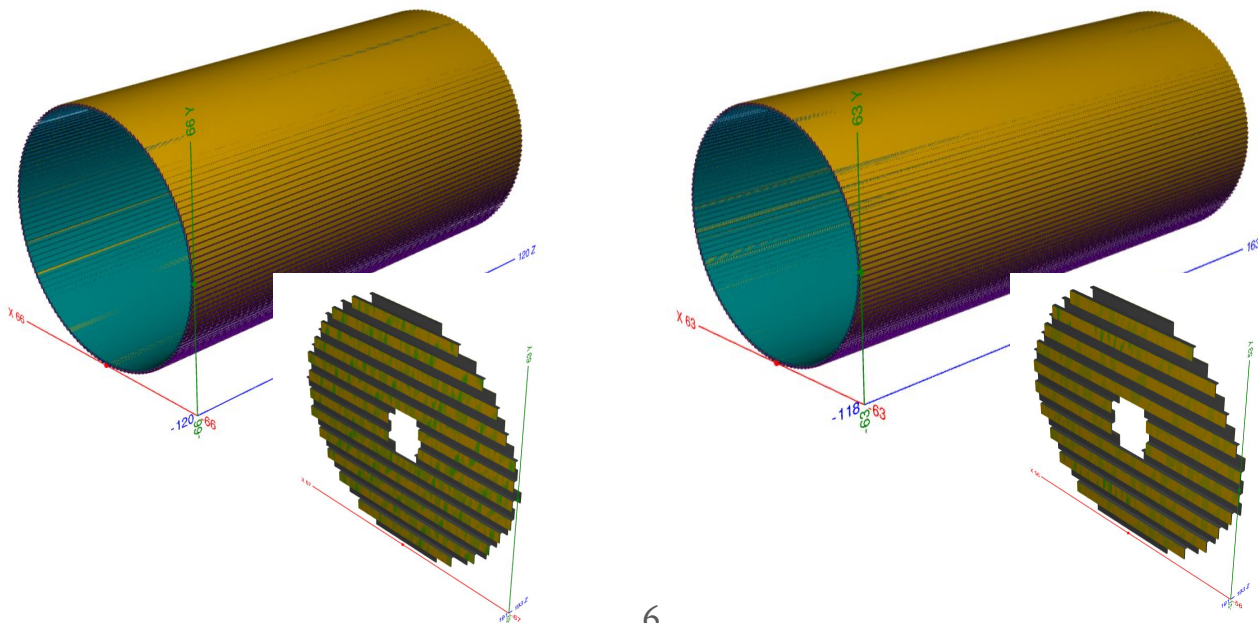


[4]



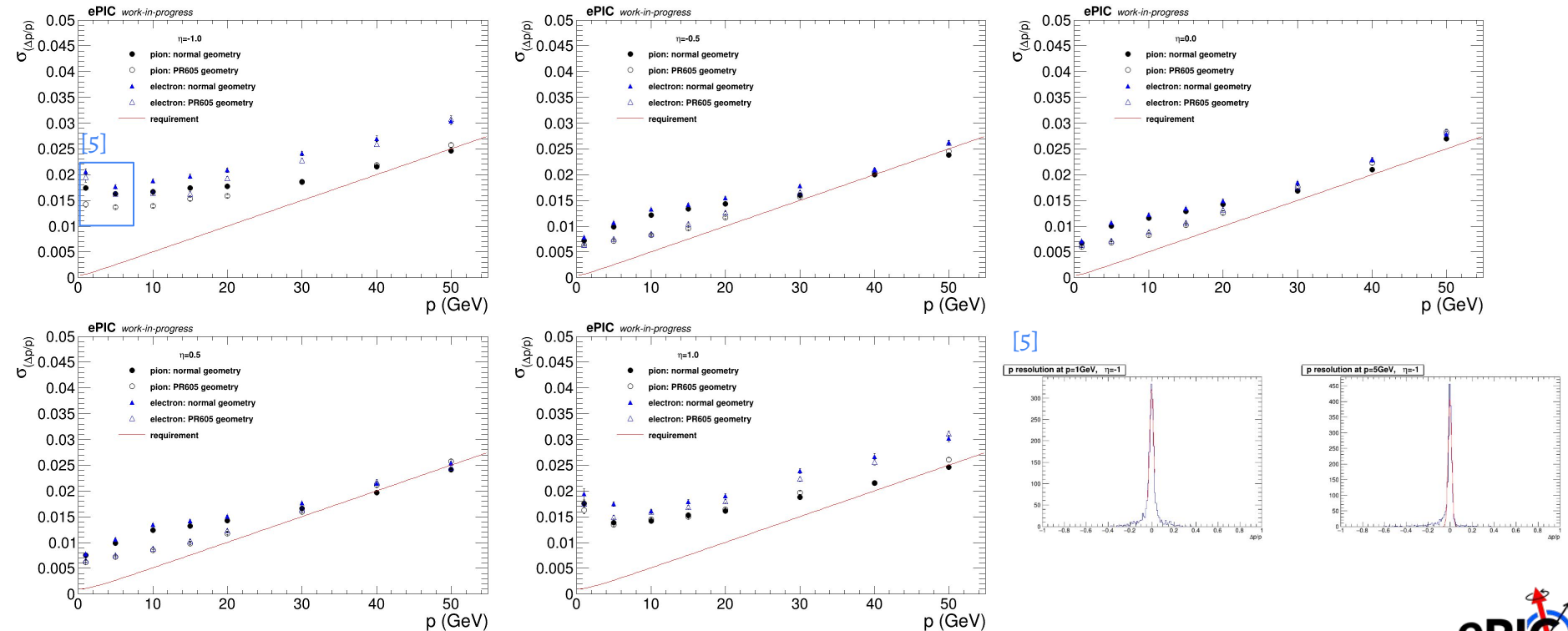
PR #605

- Change in barrel's radius: 64.6cm→61.6cm
- Change in barrel's length: 240cm→280cm
- Change in endcap's radius: 67cm→56cm (still need to be confirmed)
- 2000 π^+ , 2000 e^- guns were simulated
- variables:
 - π^+/e^-
 - with TOF/without TOF
 - $\eta = -1.0, -0.5, 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5$
 - $p = 1, 5, 10, 15, 20, 30, 40, 50$ GeV



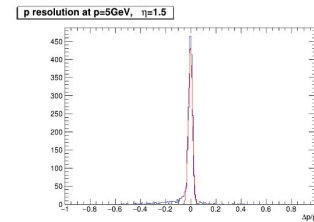
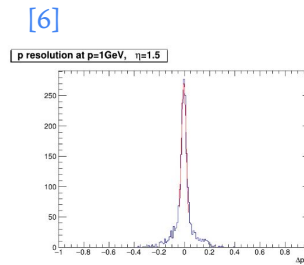
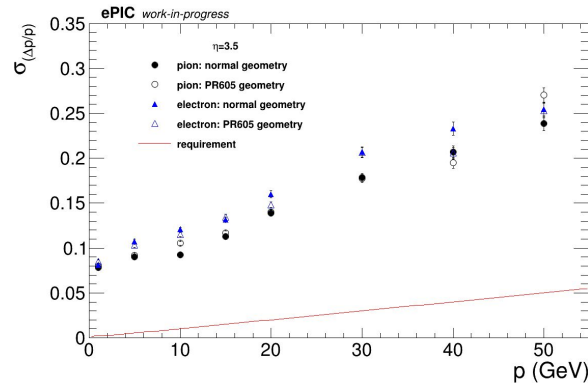
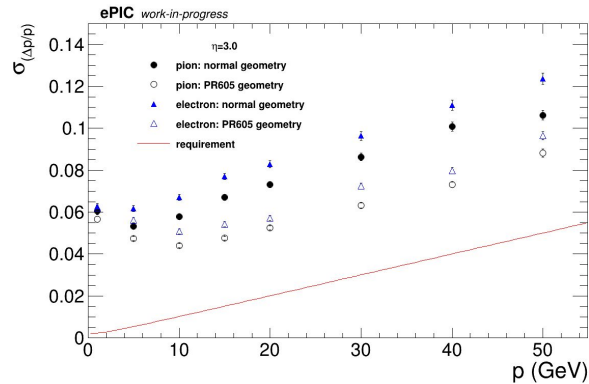
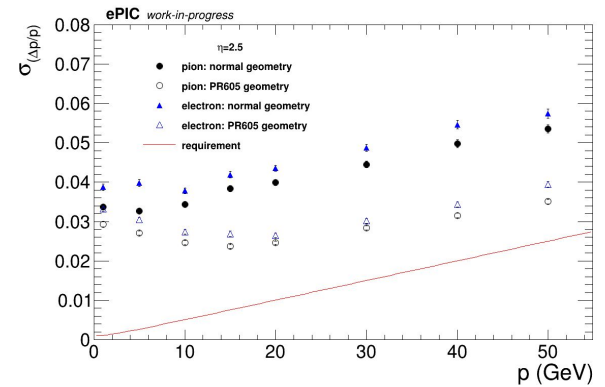
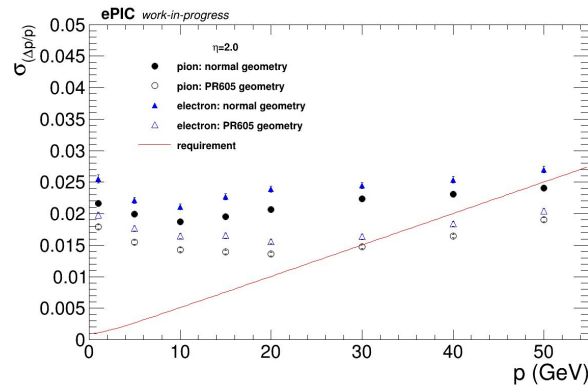
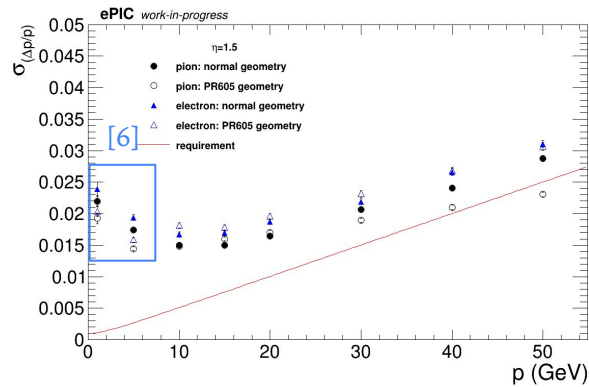
Momentum resolution - barrel

- Comparison of momentum resolution at different η . ($-1.0 \leq \eta \leq 1.0$)
- Smaller radius affect momentum resolution more in low p region
- Non-gaussian distribution of $\Delta p/p$ of both e^- and π^+ was found at $\eta = \pm 1.0$, but not as significant as w/o TOF. [5]
- Asymmetric distribution of $\Delta p/p$ of e^- is found at most of η . [5]



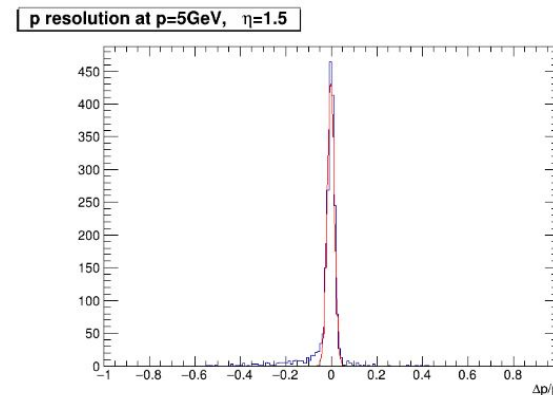
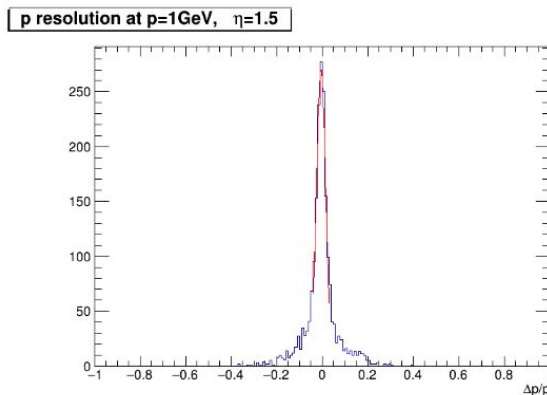
Momentum resolution - endcap

- Comparison of momentum resolution at different η . ($1.5 \leq \eta \leq 3.5$)
- Change in radius affect momentum resolution more in high η region. ($\eta=2.0, 2.5, 3$)
- Non-gaussian distribution of $\Delta p/p$ of both e^- and π^+ was found at $\eta=1.5$. [6]
- It's difficult to verify points at $\eta=3.5$ due to its poor momentum resolution.
- Momentum resolution at high η is far from requirement.



Summary

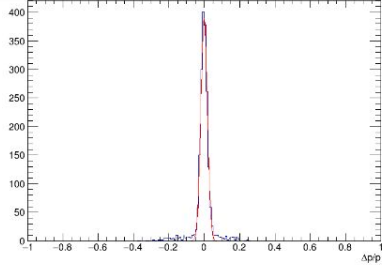
- Two geometry were simulated and compared to the original setup:
 - without TOF hits
 - PR#605: barrel radius↓, barrel length↑, endcap radius↓
- TOF hits improve momentum resolution, but there are opposite results in low p region. ($\eta=-1.0, 1.0$)
- Change in radius affect momentum resolution more in high η region. ($\eta=2.0, 2.5, 3$)
- Momentum resolution at high η is far from requirement. ($\eta=3.5$)
- Some non-gaussian distribution were observed:
 - Shoulders at $\eta=-1.0, 1.0, 1.5$, both pion and electron
 - Asymmetric distribution at most of η , electron



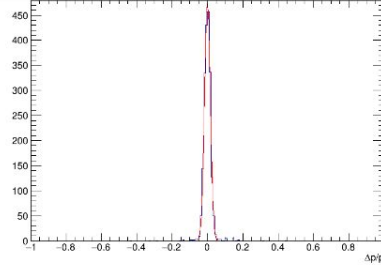
Back up

$\Delta p/p$ distribution with TOF (1/5)

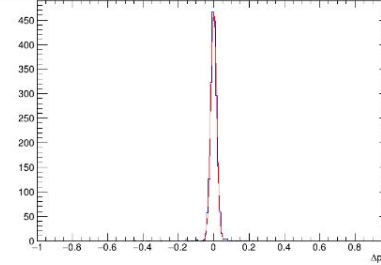
p resolution at p=1GeV, $\eta=1$



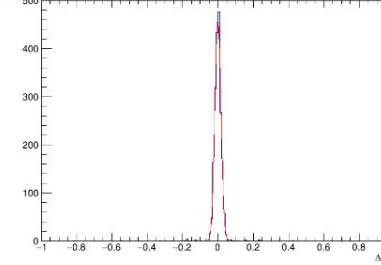
p resolution at p=5GeV, $\eta=1$



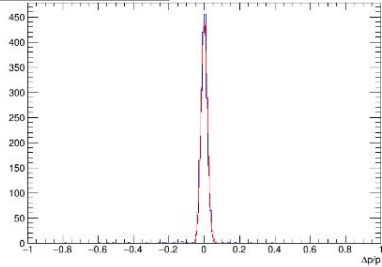
p resolution at p=10GeV, $\eta=1$



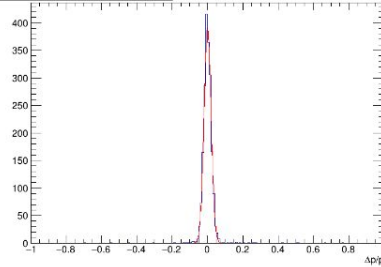
p resolution at p=15GeV, $\eta=1$



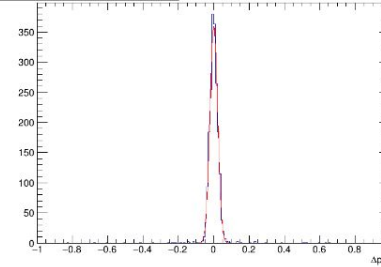
p resolution at p=20GeV, $\eta=1$



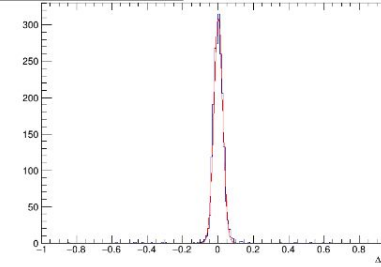
p resolution at p=30GeV, $\eta=1$



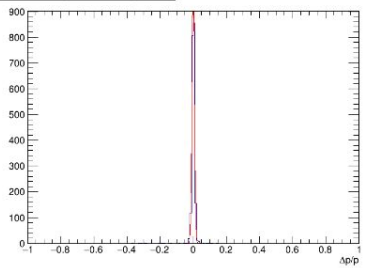
p resolution at p=40GeV, $\eta=1$



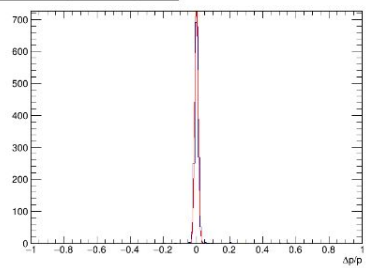
p resolution at p=50GeV, $\eta=1$



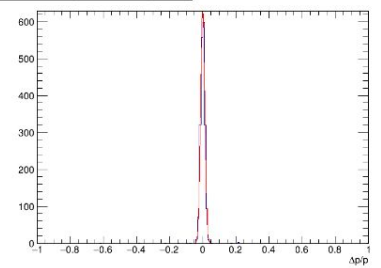
p resolution at p=1GeV, $\eta=0.5$



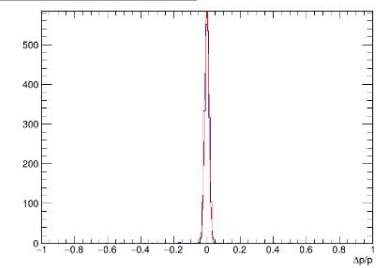
p resolution at p=5GeV, $\eta=0.5$



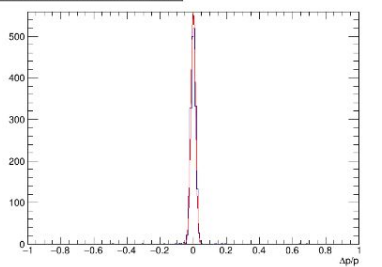
p resolution at p=10GeV, $\eta=0.5$



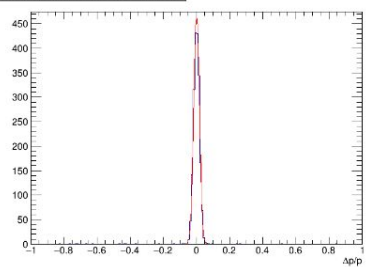
p resolution at p=15GeV, $\eta=0.5$



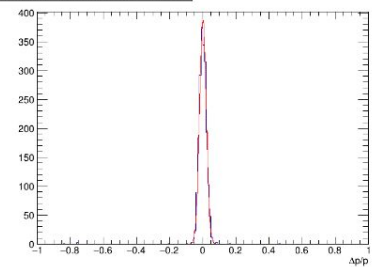
p resolution at p=20GeV, $\eta=0.5$



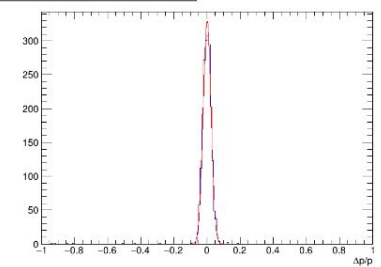
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

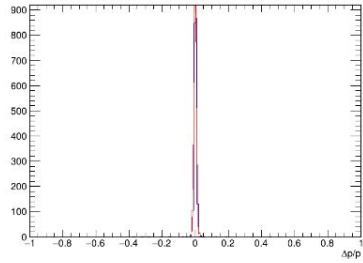


p resolution at p=50GeV, $\eta=0.5$

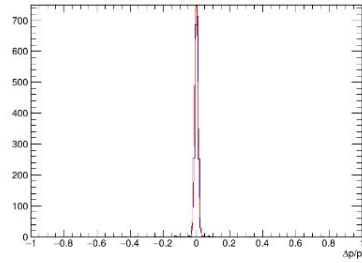


$\Delta p/p$ distribution with TOF (2/5)

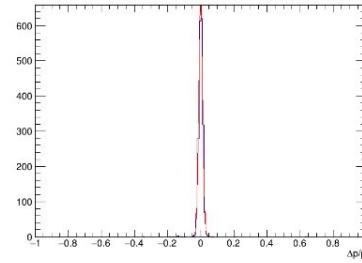
p resolution at p=1GeV, $\eta=0$



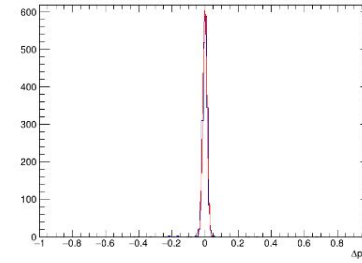
p resolution at p=5GeV, $\eta=0$



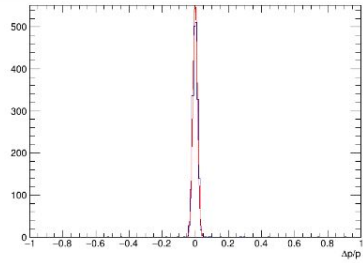
p resolution at p=10GeV, $\eta=0$



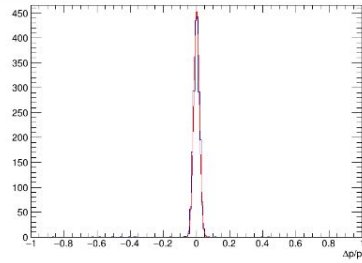
p resolution at p=15GeV, $\eta=0$



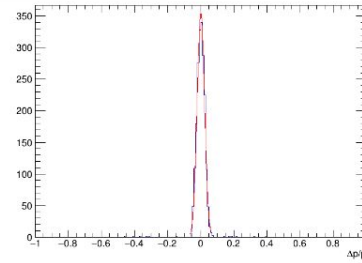
p resolution at p=20GeV, $\eta=0$



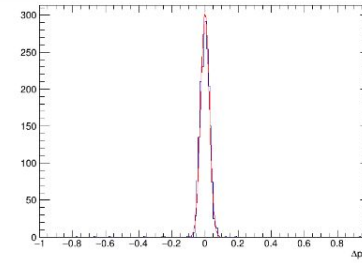
p resolution at p=30GeV, $\eta=0$



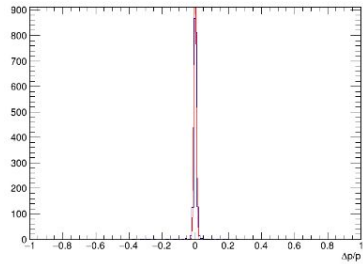
p resolution at p=40GeV, $\eta=0$



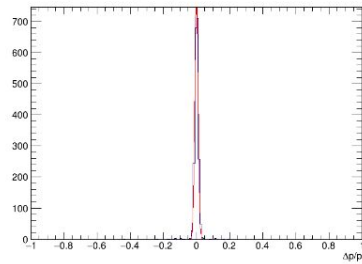
p resolution at p=50GeV, $\eta=0$



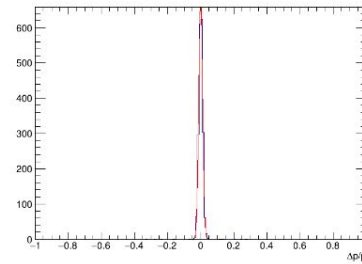
p resolution at p=1GeV, $\eta=0.5$



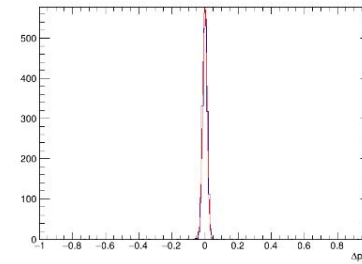
p resolution at p=5GeV, $\eta=0.5$



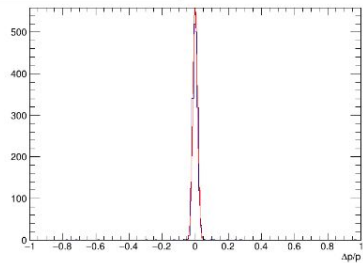
p resolution at p=10GeV, $\eta=0.5$



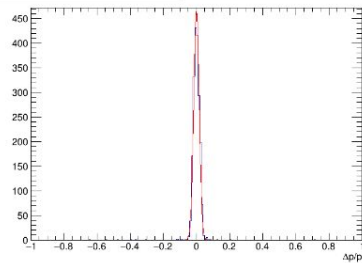
p resolution at p=15GeV, $\eta=0.5$



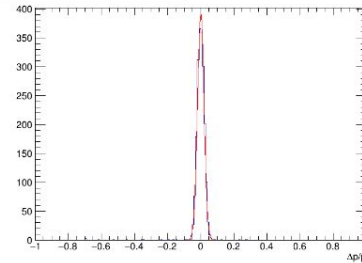
p resolution at p=20GeV, $\eta=0.5$



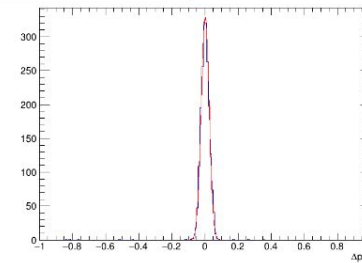
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

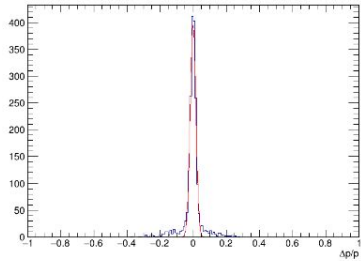


p resolution at p=50GeV, $\eta=0.5$

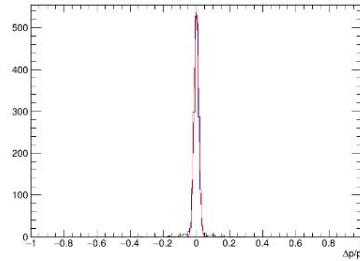


$\Delta p/p$ distribution with TOF (3/5)

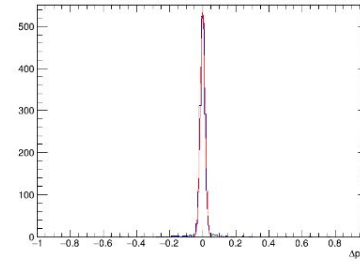
p resolution at p=1GeV, $\eta=1$



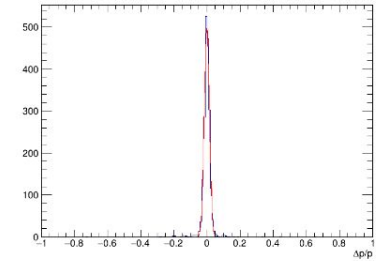
p resolution at p=5GeV, $\eta=1$



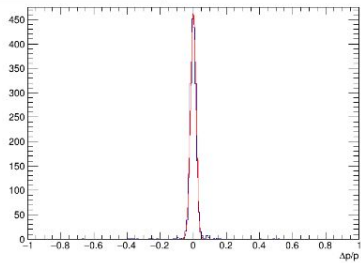
p resolution at p=10GeV, $\eta=1$



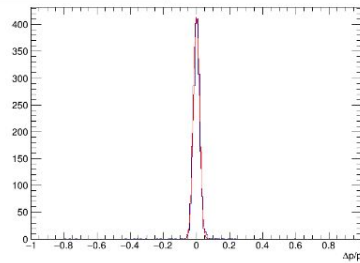
p resolution at p=15GeV, $\eta=1$



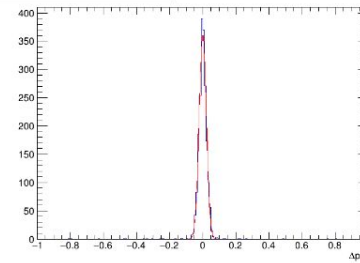
p resolution at p=20GeV, $\eta=1$



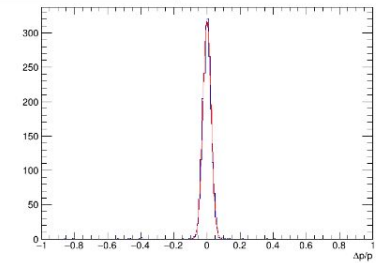
p resolution at p=30GeV, $\eta=1$



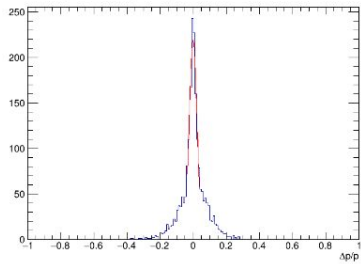
p resolution at p=40GeV, $\eta=1$



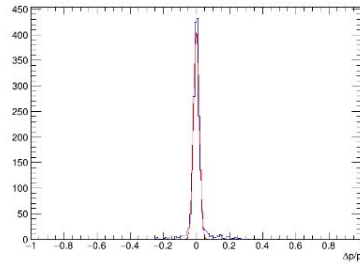
p resolution at p=50GeV, $\eta=1$



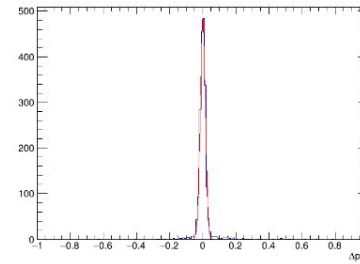
p resolution at p=1GeV, $\eta=1.5$



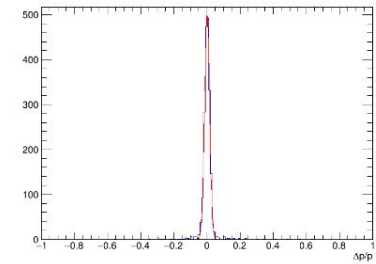
p resolution at p=5GeV, $\eta=1.5$



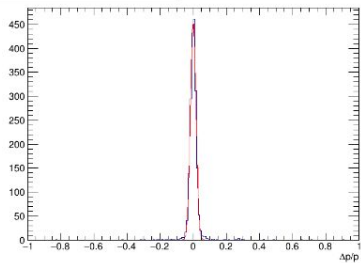
p resolution at p=10GeV, $\eta=1.5$



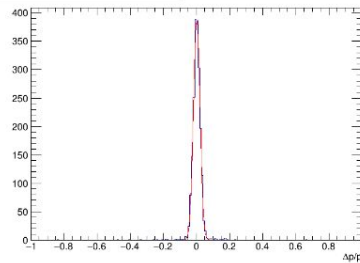
p resolution at p=15GeV, $\eta=1.5$



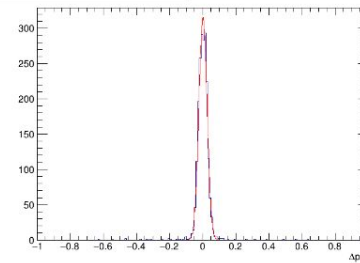
p resolution at p=20GeV, $\eta=1.5$



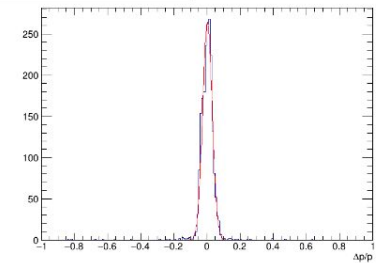
p resolution at p=30GeV, $\eta=1.5$



p resolution at p=40GeV, $\eta=1.5$

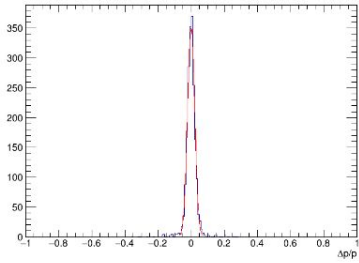


p resolution at p=50GeV, $\eta=1.5$

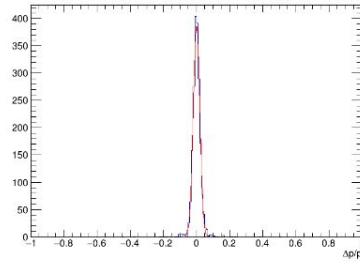


$\Delta p/p$ distribution with TOF (4/5)

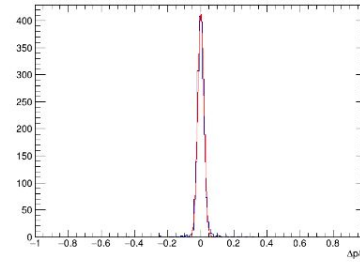
p resolution at p=1GeV, $\eta=2$



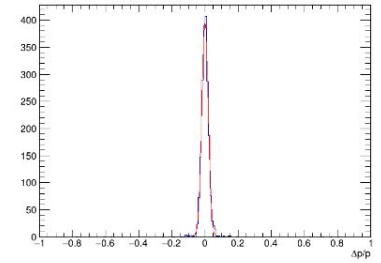
p resolution at p=5GeV, $\eta=2$



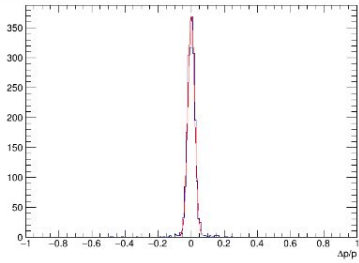
p resolution at p=10GeV, $\eta=2$



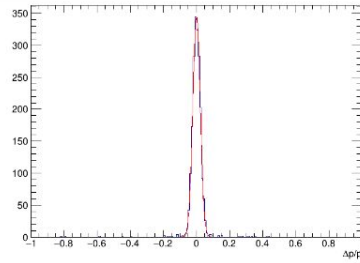
p resolution at p=15GeV, $\eta=2$



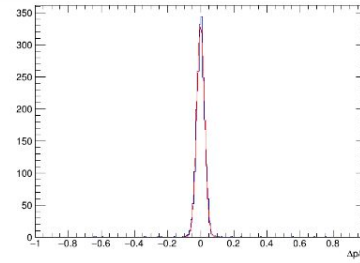
p resolution at p=20GeV, $\eta=2$



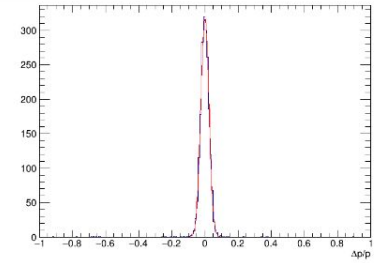
p resolution at p=30GeV, $\eta=2$



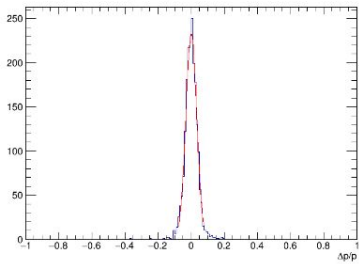
p resolution at p=40GeV, $\eta=2$



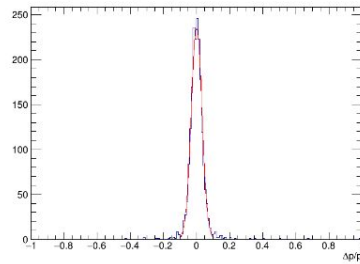
p resolution at p=50GeV, $\eta=2$



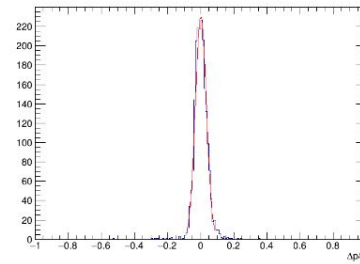
p resolution at p=1GeV, $\eta=2.5$



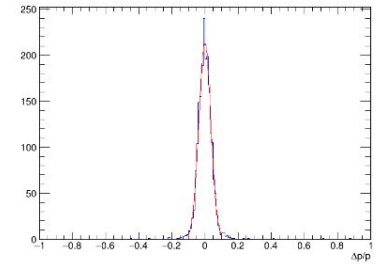
p resolution at p=5GeV, $\eta=2.5$



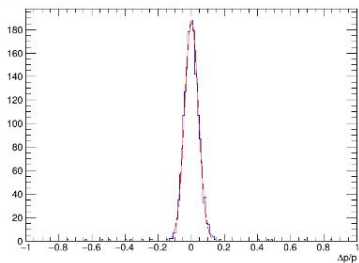
p resolution at p=10GeV, $\eta=2.5$



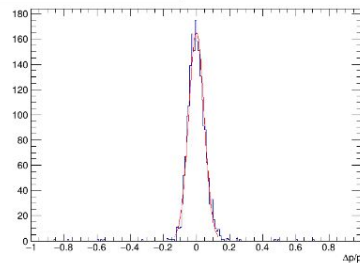
p resolution at p=15GeV, $\eta=2.5$



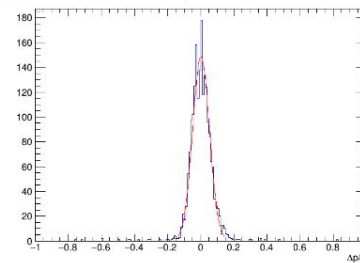
p resolution at p=20GeV, $\eta=2.5$



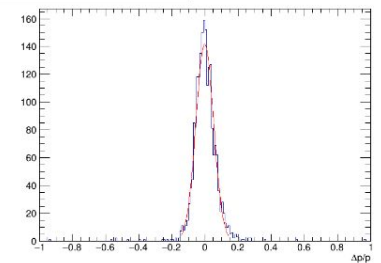
p resolution at p=30GeV, $\eta=2.5$



p resolution at p=40GeV, $\eta=2.5$

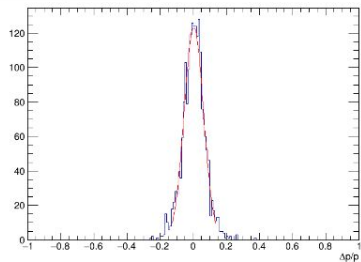


p resolution at p=50GeV, $\eta=2.5$

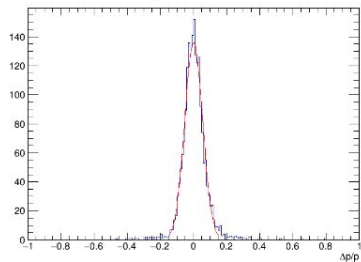


$\Delta p/p$ distribution with TOF (5/5)

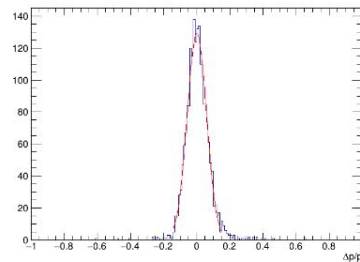
p resolution at p=1GeV, $\eta=3$



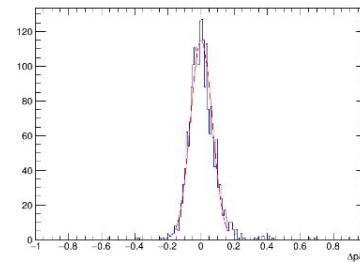
p resolution at p=5GeV, $\eta=3$



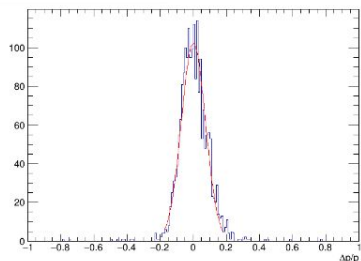
p resolution at p=10GeV, $\eta=3$



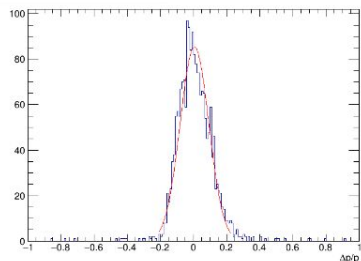
p resolution at p=15GeV, $\eta=3$



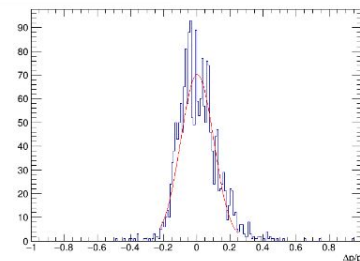
p resolution at p=20GeV, $\eta=3$



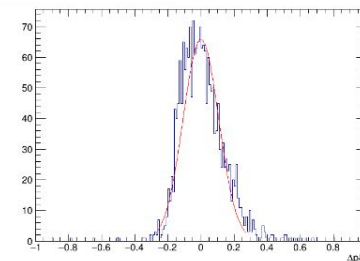
p resolution at p=30GeV, $\eta=3$



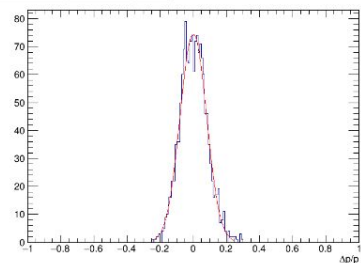
p resolution at p=40GeV, $\eta=3$



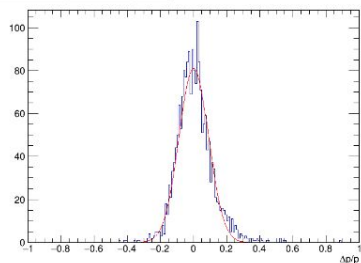
p resolution at p=50GeV, $\eta=3$



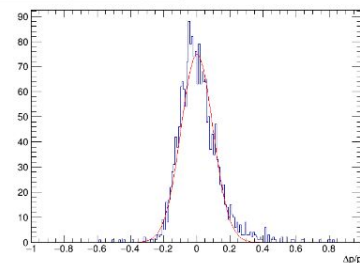
p resolution at p=1GeV, $\eta=3.5$



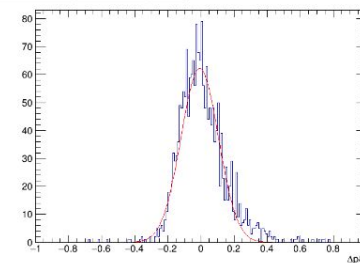
p resolution at p=5GeV, $\eta=3.5$



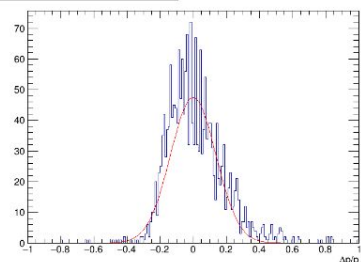
p resolution at p=10GeV, $\eta=3.5$



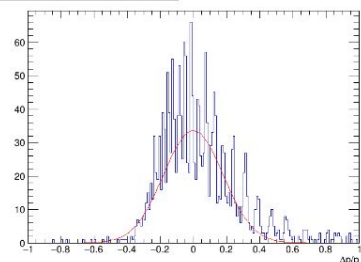
p resolution at p=15GeV, $\eta=3.5$



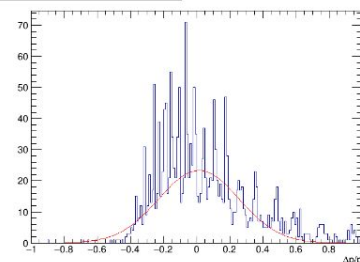
p resolution at p=20GeV, $\eta=3.5$



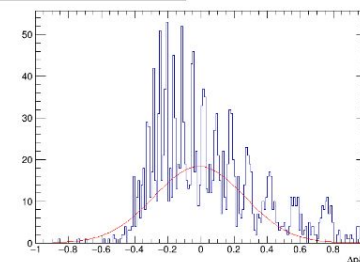
p resolution at p=30GeV, $\eta=3.5$



p resolution at p=40GeV, $\eta=3.5$

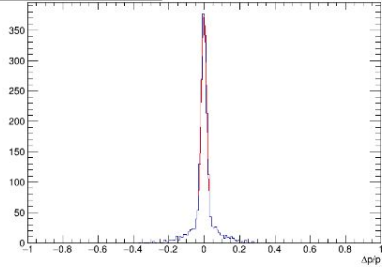


p resolution at p=50GeV, $\eta=3.5$

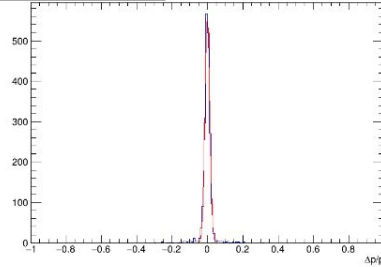


$\Delta p/p$ distribution without TOF (1/5)

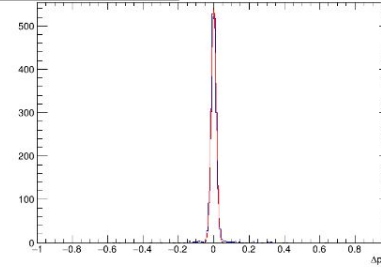
p resolution at p=1GeV, $\eta=-1$



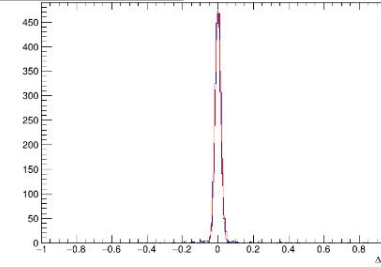
p resolution at p=5GeV, $\eta=-1$



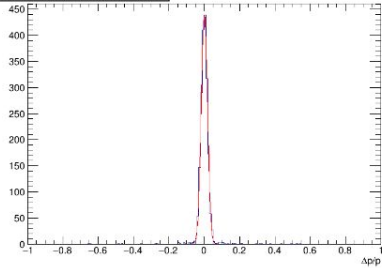
p resolution at p=10GeV, $\eta=-1$



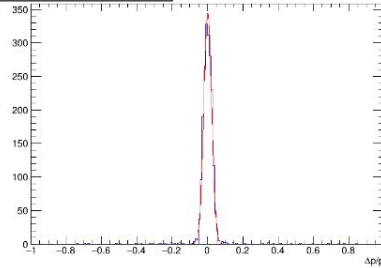
p resolution at p=15GeV, $\eta=-1$



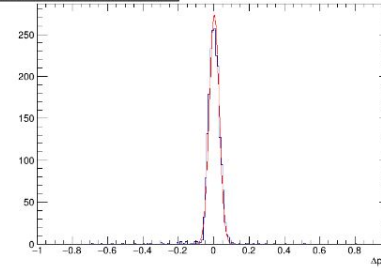
p resolution at p=20GeV, $\eta=-1$



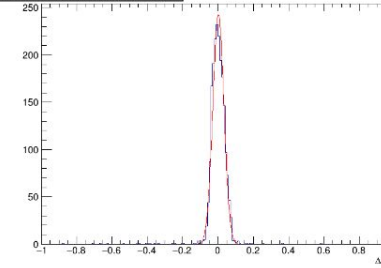
p resolution at p=30GeV, $\eta=-1$



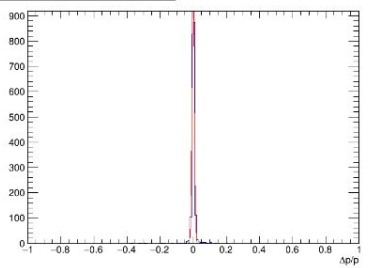
p resolution at p=40GeV, $\eta=-1$



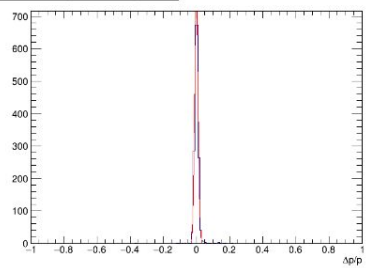
p resolution at p=50GeV, $\eta=-1$



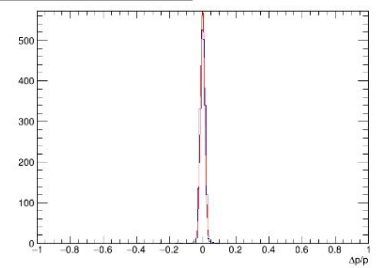
p resolution at p=1GeV, $\eta=-0.5$



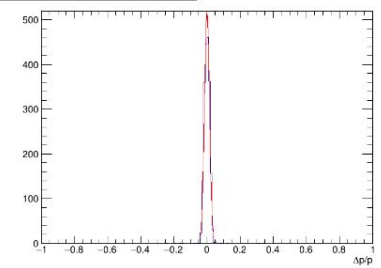
p resolution at p=5GeV, $\eta=-0.5$



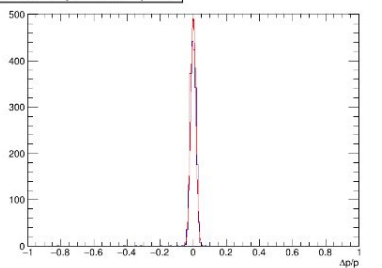
p resolution at p=10GeV, $\eta=-0.5$



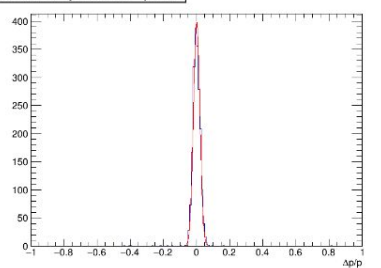
p resolution at p=15GeV, $\eta=-0.5$



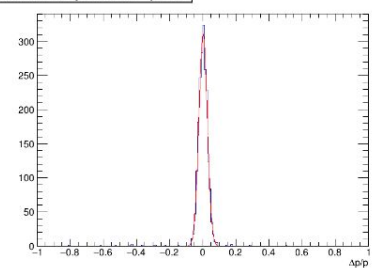
p resolution at p=20GeV, $\eta=-0.5$



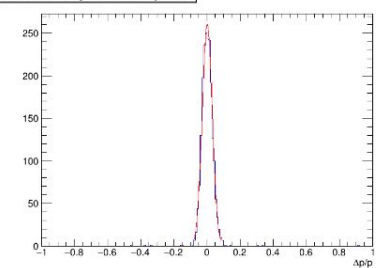
p resolution at p=30GeV, $\eta=-0.5$



p resolution at p=40GeV, $\eta=-0.5$

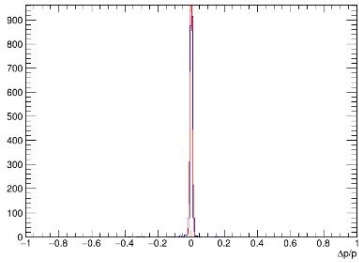


p resolution at p=50GeV, $\eta=-0.5$

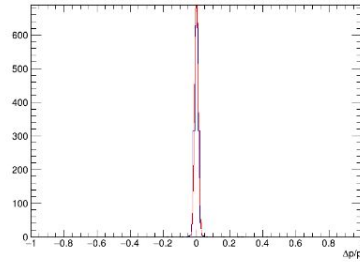


$\Delta p/p$ distribution without TOF (2/5)

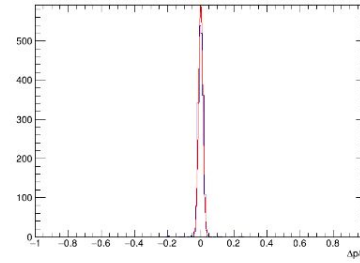
p resolution at p=1GeV, $\eta=0$



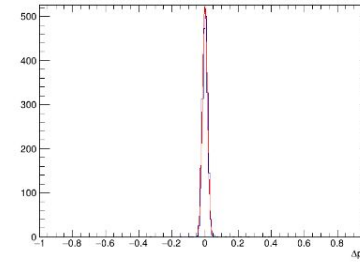
p resolution at p=5GeV, $\eta=0$



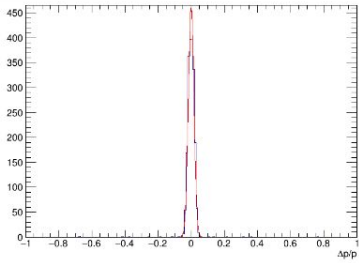
p resolution at p=10GeV, $\eta=0$



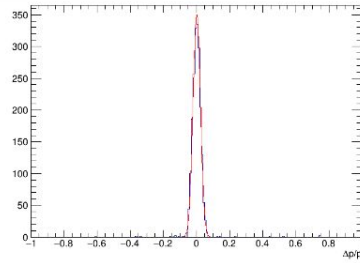
p resolution at p=15GeV, $\eta=0$



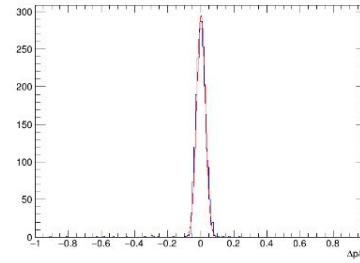
p resolution at p=20GeV, $\eta=0$



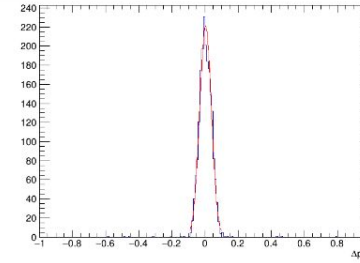
p resolution at p=30GeV, $\eta=0$



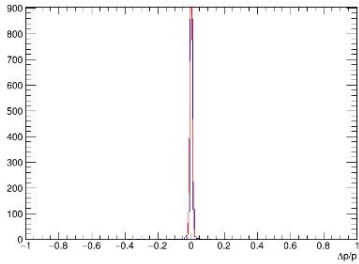
p resolution at p=40GeV, $\eta=0$



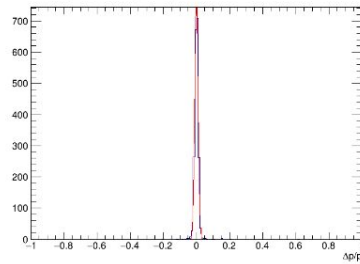
p resolution at p=50GeV, $\eta=0$



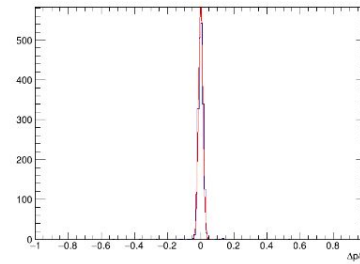
p resolution at p=1GeV, $\eta=0.5$



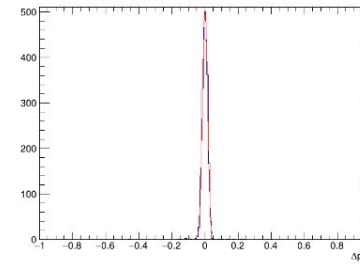
p resolution at p=5GeV, $\eta=0.5$



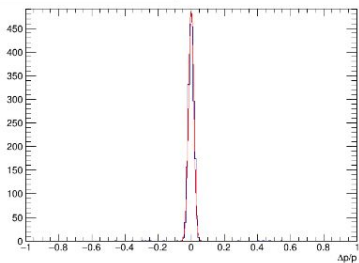
p resolution at p=10GeV, $\eta=0.5$



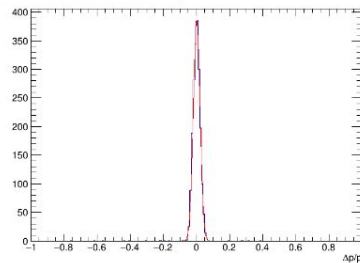
p resolution at p=15GeV, $\eta=0.5$



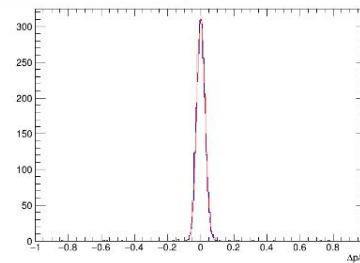
p resolution at p=20GeV, $\eta=0.5$



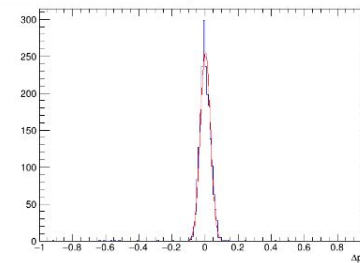
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

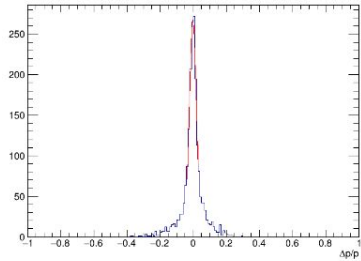


p resolution at p=50GeV, $\eta=0.5$

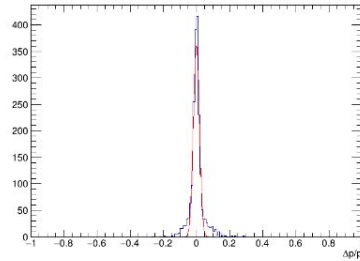


$\Delta p/p$ distribution without TOF (3/5)

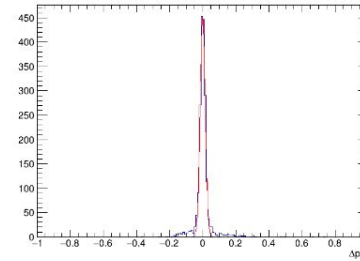
p resolution at p=1GeV, $\eta=1$



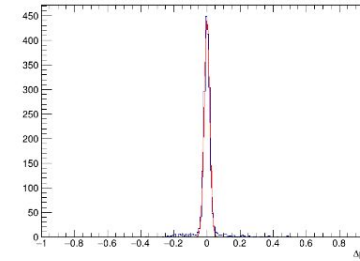
p resolution at p=5GeV, $\eta=1$



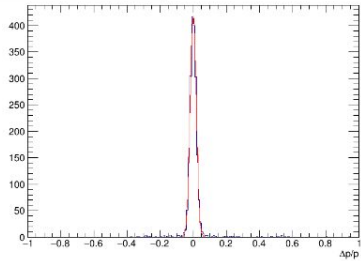
p resolution at p=10GeV, $\eta=1$



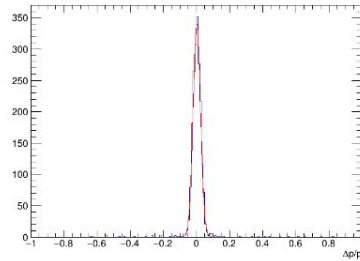
p resolution at p=15GeV, $\eta=1$



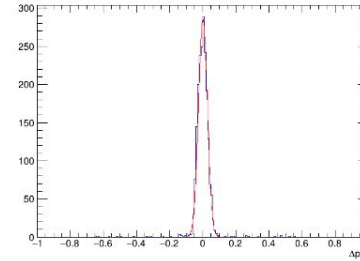
p resolution at p=20GeV, $\eta=1$



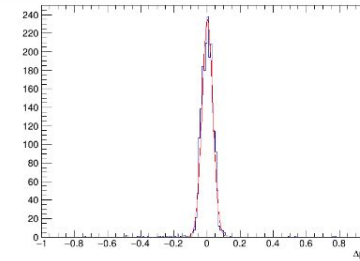
p resolution at p=30GeV, $\eta=1$



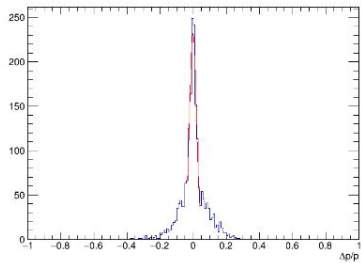
p resolution at p=40GeV, $\eta=1$



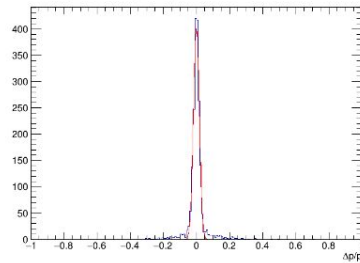
p resolution at p=50GeV, $\eta=1$



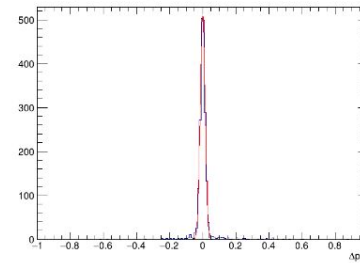
p resolution at p=1GeV, $\eta=1.5$



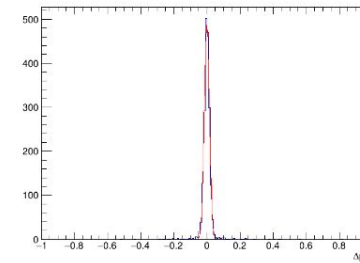
p resolution at p=5GeV, $\eta=1.5$



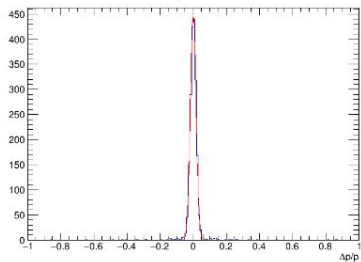
p resolution at p=10GeV, $\eta=1.5$



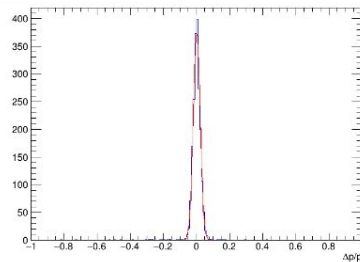
p resolution at p=15GeV, $\eta=1.5$



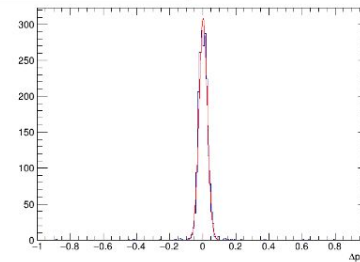
p resolution at p=20GeV, $\eta=1.5$



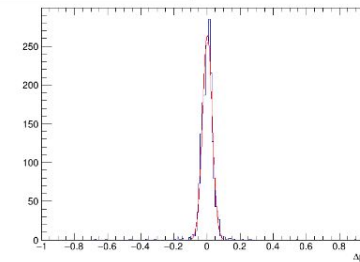
p resolution at p=30GeV, $\eta=1.5$



p resolution at p=40GeV, $\eta=1.5$

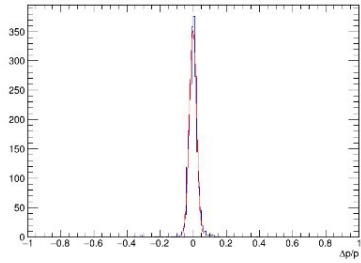


p resolution at p=50GeV, $\eta=1.5$

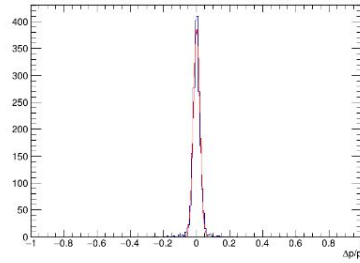


$\Delta p/p$ distribution without TOF (4/5)

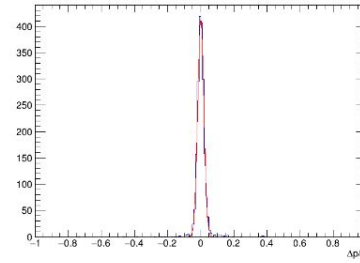
p resolution at p=1GeV, $\eta=2$



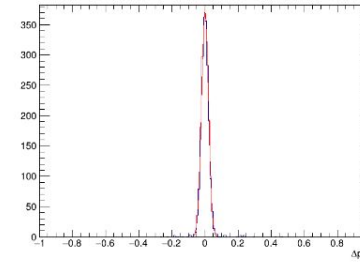
p resolution at p=5GeV, $\eta=2$



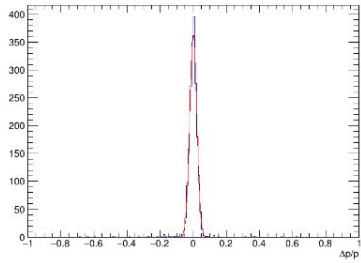
p resolution at p=10GeV, $\eta=2$



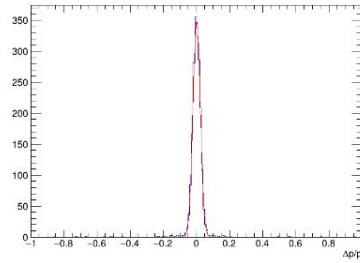
p resolution at p=15GeV, $\eta=2$



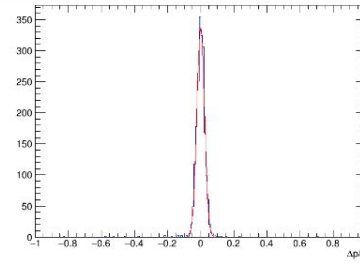
p resolution at p=20GeV, $\eta=2$



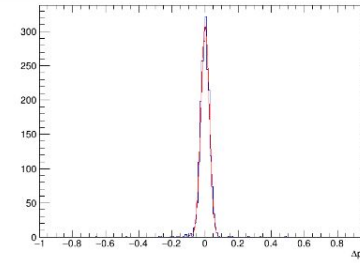
p resolution at p=30GeV, $\eta=2$



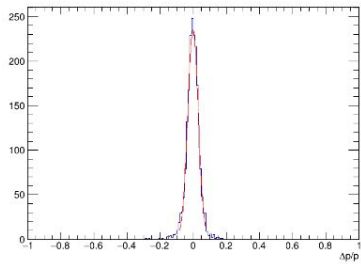
p resolution at p=40GeV, $\eta=2$



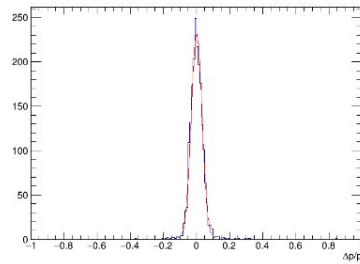
p resolution at p=50GeV, $\eta=2$



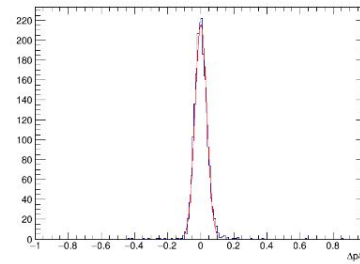
p resolution at p=1GeV, $\eta=2.5$



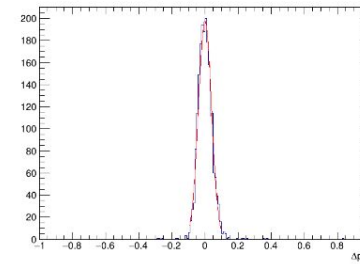
p resolution at p=5GeV, $\eta=2.5$



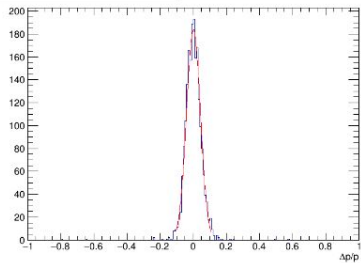
p resolution at p=10GeV, $\eta=2.5$



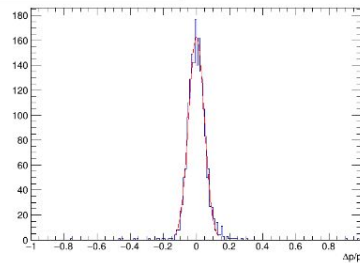
p resolution at p=15GeV, $\eta=2.5$



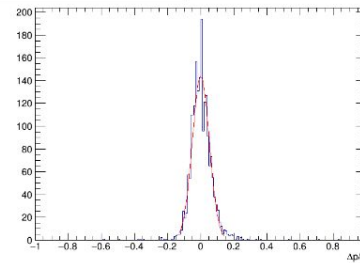
p resolution at p=20GeV, $\eta=2.5$



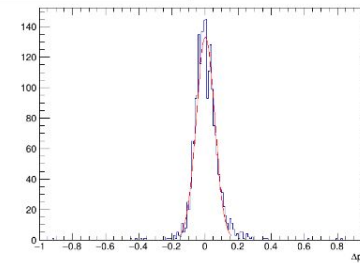
p resolution at p=30GeV, $\eta=2.5$



p resolution at p=40GeV, $\eta=2.5$

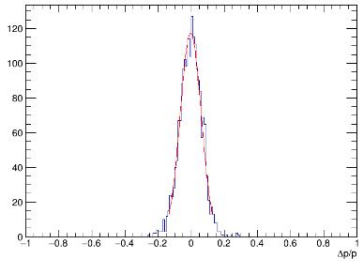


p resolution at p=50GeV, $\eta=2.5$

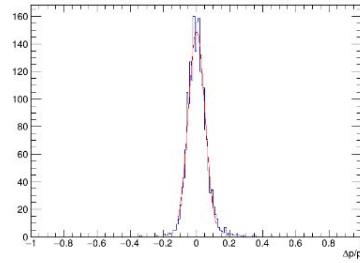


$\Delta p/p$ distribution without TOF (5/5)

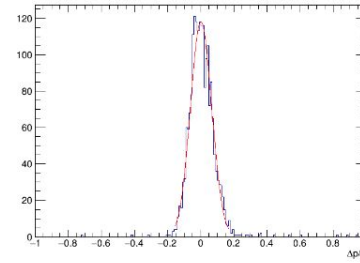
p resolution at p=1GeV, $\eta=3$



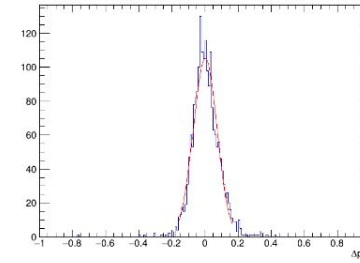
p resolution at p=5GeV, $\eta=3$



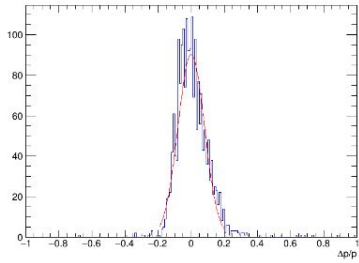
p resolution at p=10GeV, $\eta=3$



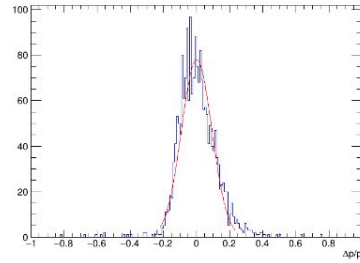
p resolution at p=15GeV, $\eta=3$



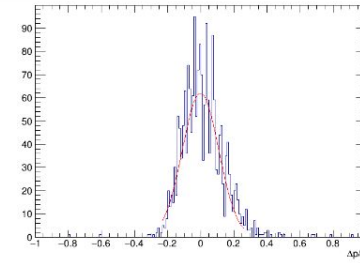
p resolution at p=20GeV, $\eta=3$



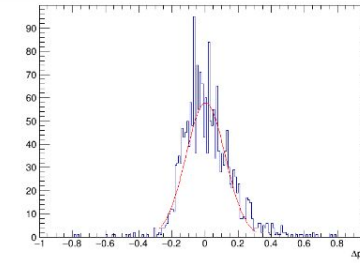
p resolution at p=30GeV, $\eta=3$



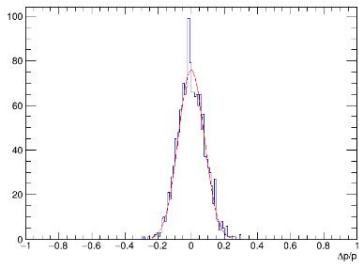
p resolution at p=40GeV, $\eta=3$



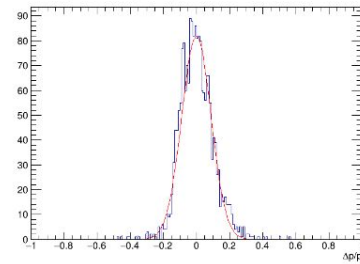
p resolution at p=50GeV, $\eta=3$



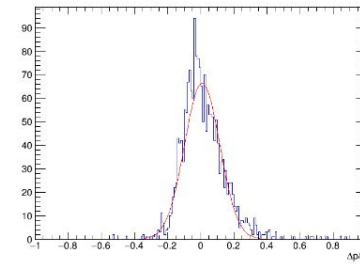
p resolution at p=1GeV, $\eta=3.5$



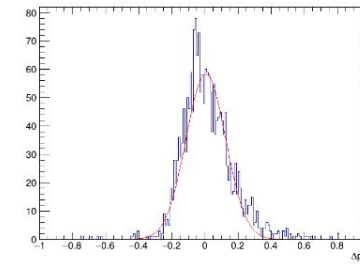
p resolution at p=5GeV, $\eta=3.5$



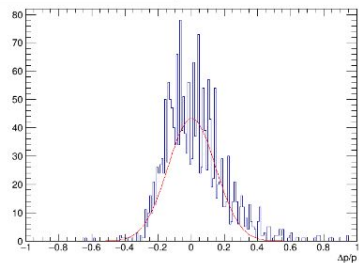
p resolution at p=10GeV, $\eta=3.5$



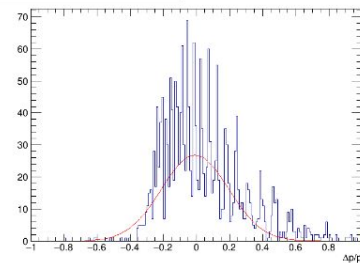
p resolution at p=15GeV, $\eta=3.5$



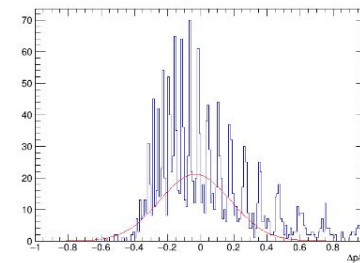
p resolution at p=20GeV, $\eta=3.5$



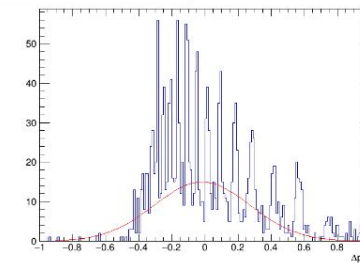
p resolution at p=30GeV, $\eta=3.5$



p resolution at p=40GeV, $\eta=3.5$

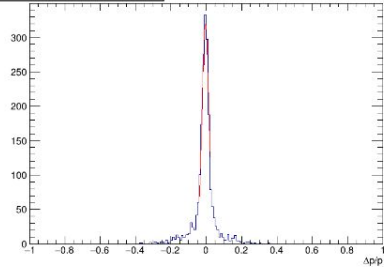


p resolution at p=50GeV, $\eta=3.5$

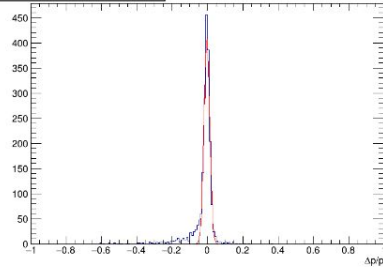


$\Delta p/p$ distribution of electron with PR#605 (1/5)

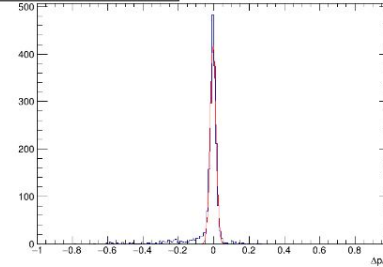
p resolution at p=1GeV, $\eta=1$



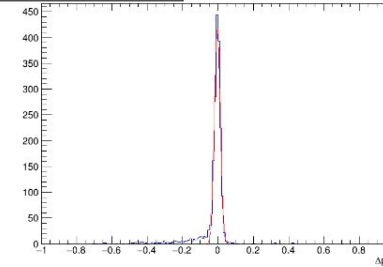
p resolution at p=5GeV, $\eta=1$



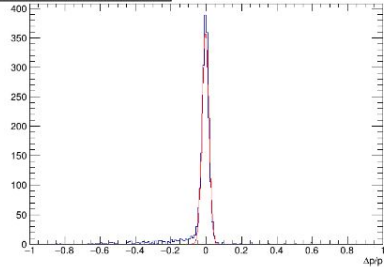
p resolution at p=10GeV, $\eta=1$



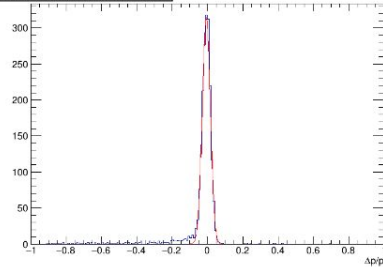
p resolution at p=15GeV, $\eta=1$



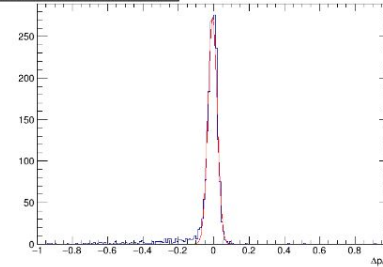
p resolution at p=20GeV, $\eta=1$



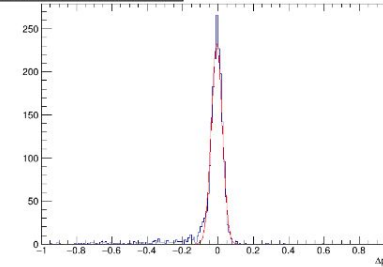
p resolution at p=30GeV, $\eta=1$



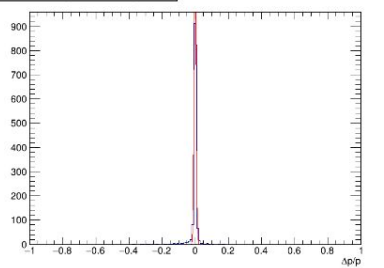
p resolution at p=40GeV, $\eta=1$



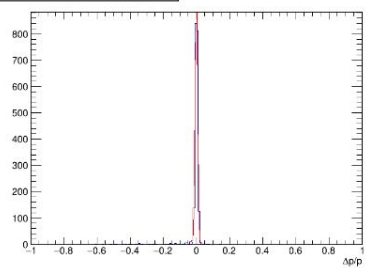
p resolution at p=50GeV, $\eta=1$



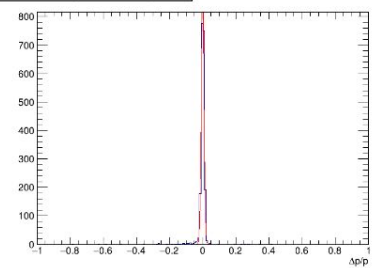
p resolution at p=1GeV, $\eta=0.5$



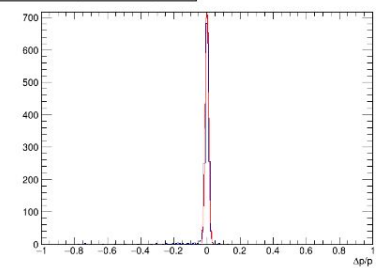
p resolution at p=5GeV, $\eta=0.5$



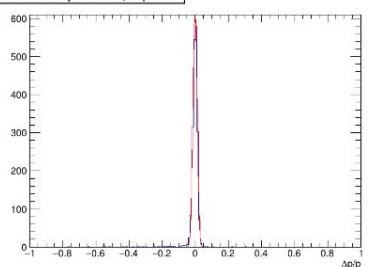
p resolution at p=10GeV, $\eta=0.5$



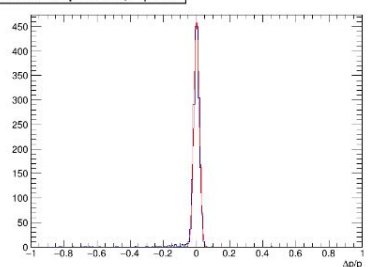
p resolution at p=15GeV, $\eta=0.5$



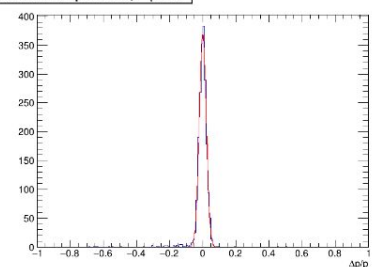
p resolution at p=20GeV, $\eta=0.5$



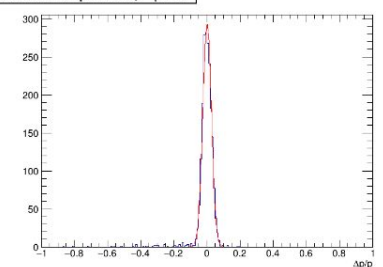
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

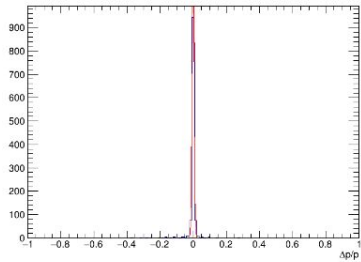


p resolution at p=50GeV, $\eta=0.5$

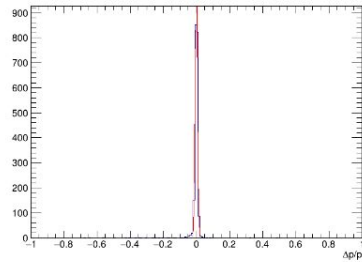


$\Delta p/p$ distribution of electron with PR#605 (2/5)

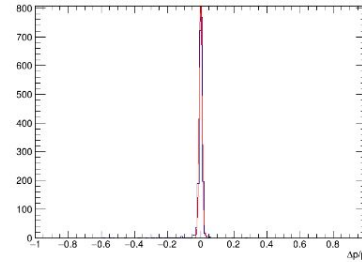
p resolution at p=1GeV, $\eta=0$



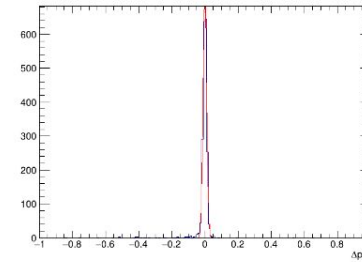
p resolution at p=5GeV, $\eta=0$



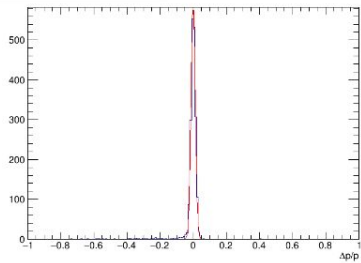
p resolution at p=10GeV, $\eta=0$



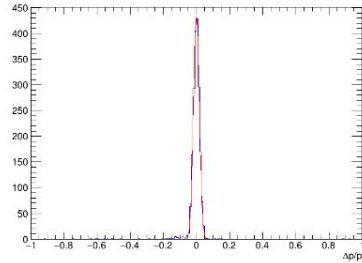
p resolution at p=15GeV, $\eta=0$



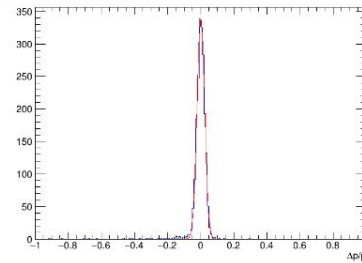
p resolution at p=20GeV, $\eta=0$



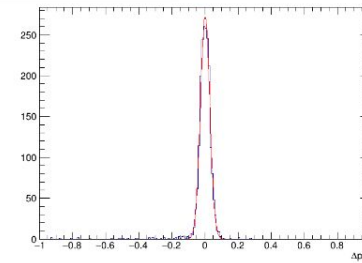
p resolution at p=30GeV, $\eta=0$



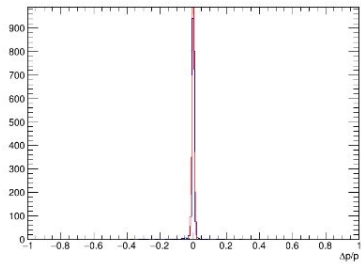
p resolution at p=40GeV, $\eta=0$



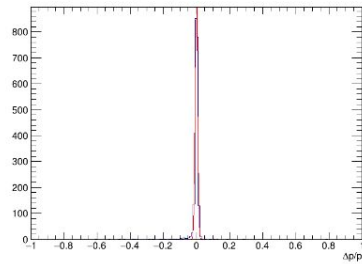
p resolution at p=50GeV, $\eta=0$



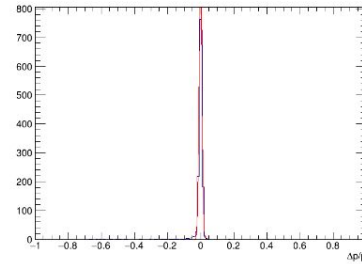
p resolution at p=1GeV, $\eta=0.5$



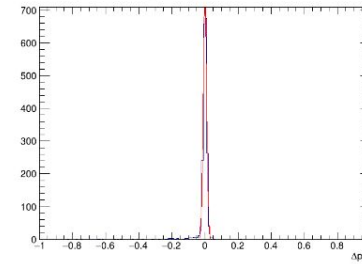
p resolution at p=5GeV, $\eta=0.5$



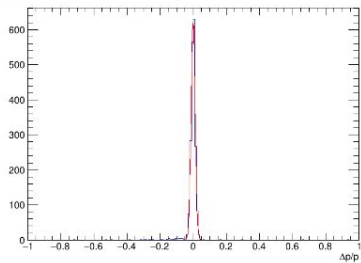
p resolution at p=10GeV, $\eta=0.5$



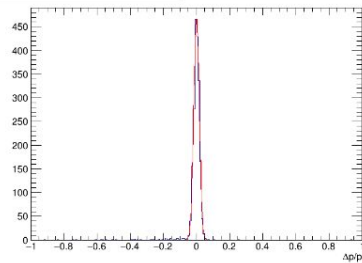
p resolution at p=15GeV, $\eta=0.5$



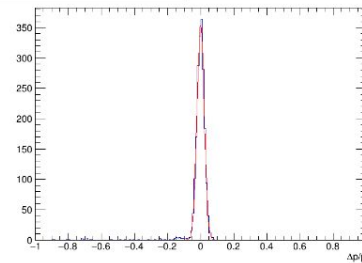
p resolution at p=20GeV, $\eta=0.5$



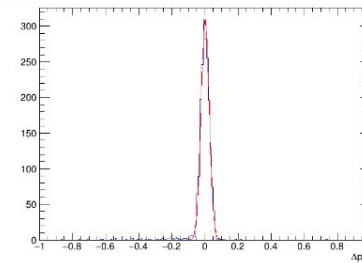
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

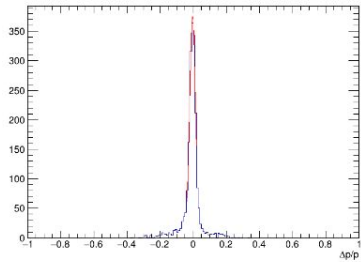


p resolution at p=50GeV, $\eta=0.5$

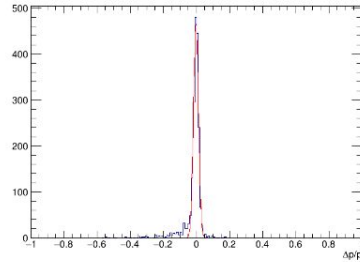


$\Delta p/p$ distribution of electron with PR#605 (3/5)

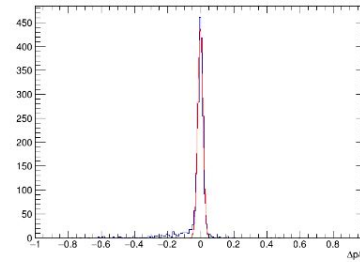
p resolution at p=1GeV, $\eta=1$



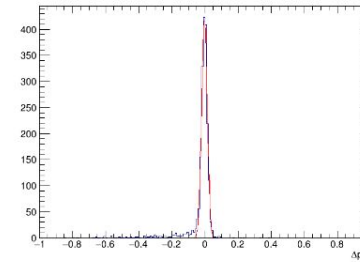
p resolution at p=5GeV, $\eta=1$



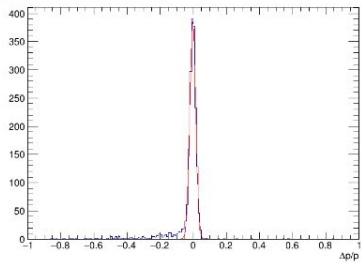
p resolution at p=10GeV, $\eta=1$



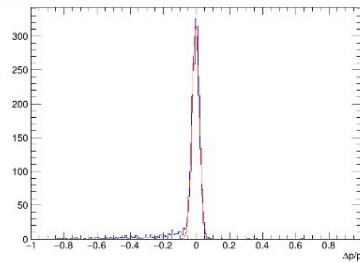
p resolution at p=15GeV, $\eta=1$



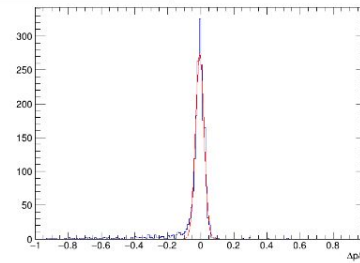
p resolution at p=20GeV, $\eta=1$



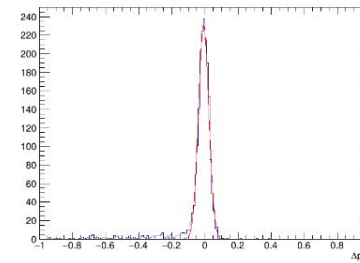
p resolution at p=30GeV, $\eta=1$



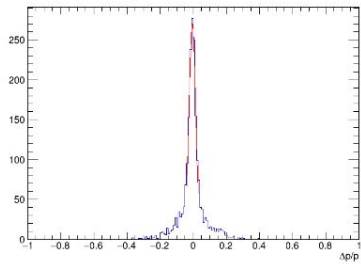
p resolution at p=40GeV, $\eta=1$



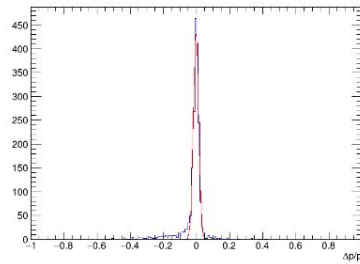
p resolution at p=50GeV, $\eta=1$



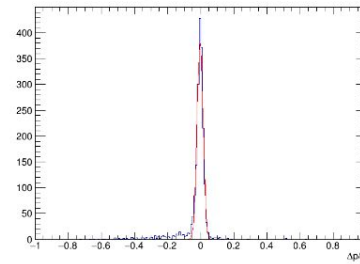
p resolution at p=1GeV, $\eta=1.5$



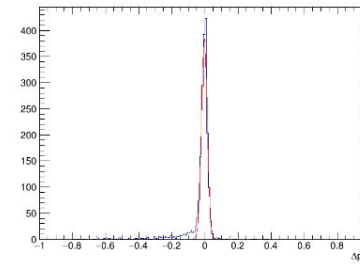
p resolution at p=5GeV, $\eta=1.5$



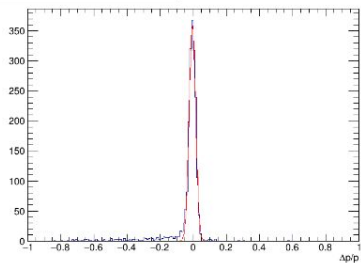
p resolution at p=10GeV, $\eta=1.5$



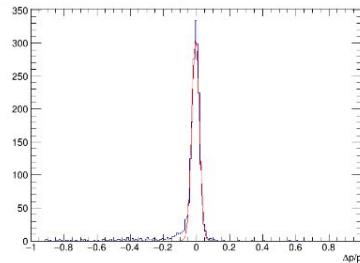
p resolution at p=15GeV, $\eta=1.5$



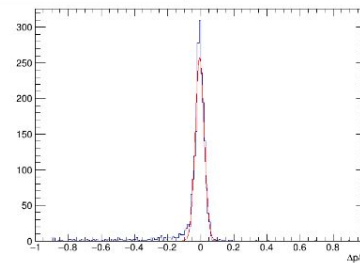
p resolution at p=20GeV, $\eta=1.5$



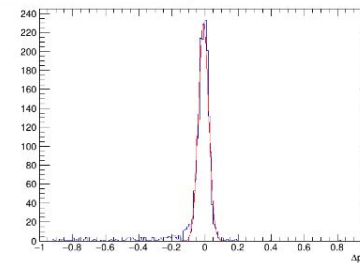
p resolution at p=30GeV, $\eta=1.5$



p resolution at p=40GeV, $\eta=1.5$

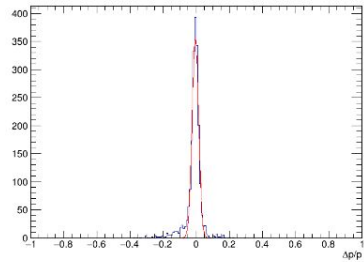


p resolution at p=50GeV, $\eta=1.5$

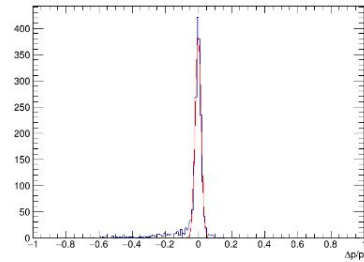


$\Delta p/p$ distribution of electron with PR#605 (4/5)

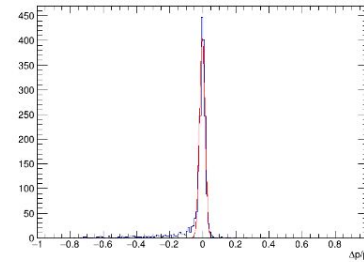
p resolution at p=1GeV, $\eta=2$



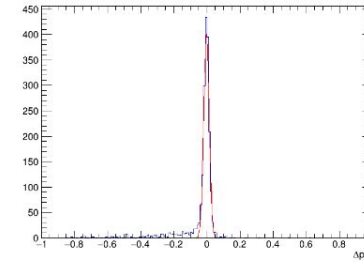
p resolution at p=5GeV, $\eta=2$



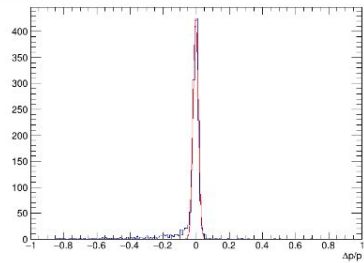
p resolution at p=10GeV, $\eta=2$



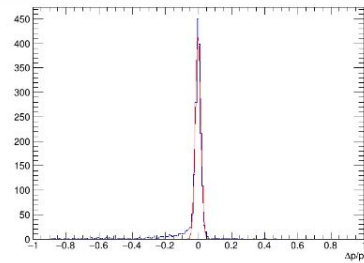
p resolution at p=15GeV, $\eta=2$



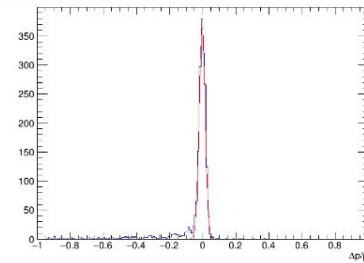
p resolution at p=20GeV, $\eta=2$



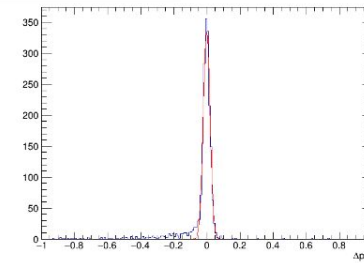
p resolution at p=30GeV, $\eta=2$



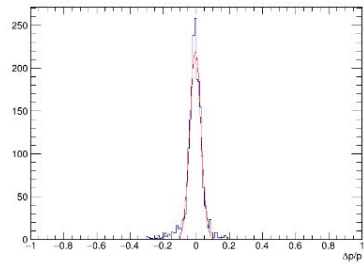
p resolution at p=40GeV, $\eta=2$



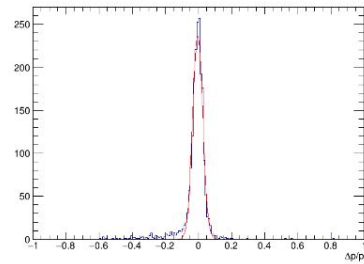
p resolution at p=50GeV, $\eta=2$



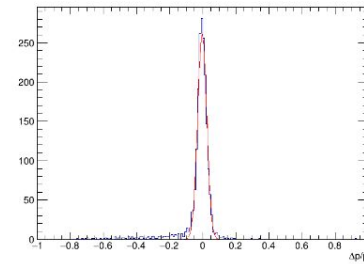
p resolution at p=1GeV, $\eta=2.5$



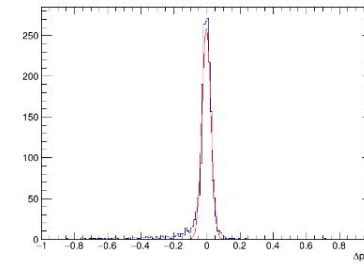
p resolution at p=5GeV, $\eta=2.5$



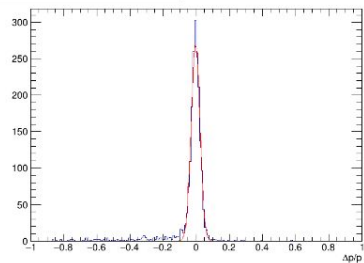
p resolution at p=10GeV, $\eta=2.5$



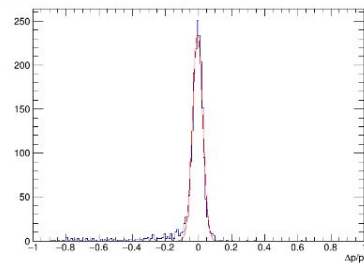
p resolution at p=15GeV, $\eta=2.5$



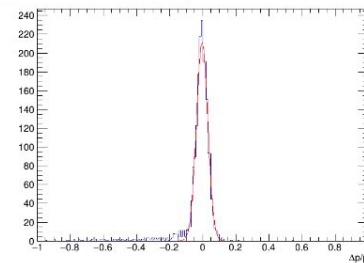
p resolution at p=20GeV, $\eta=2.5$



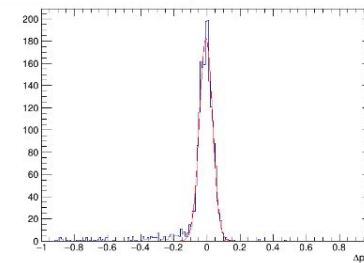
p resolution at p=30GeV, $\eta=2.5$



p resolution at p=40GeV, $\eta=2.5$

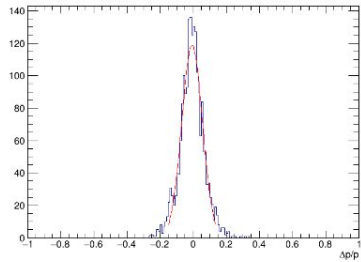


p resolution at p=50GeV, $\eta=2.5$

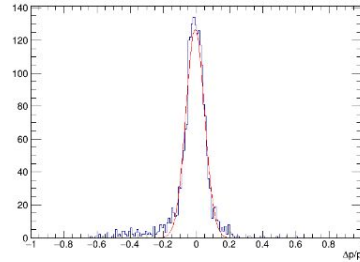


$\Delta p/p$ distribution of electron with PR#605 (5/5)

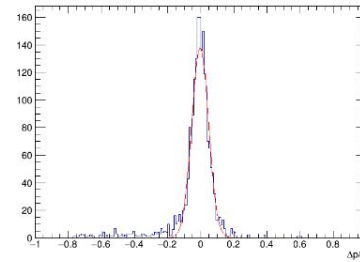
p resolution at p=1GeV, $\eta=3$



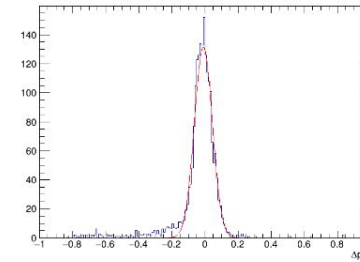
p resolution at p=5GeV, $\eta=3$



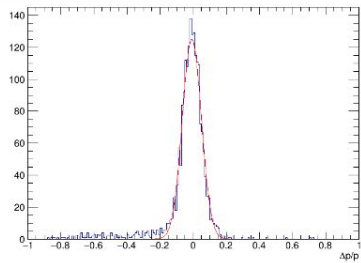
p resolution at p=10GeV, $\eta=3$



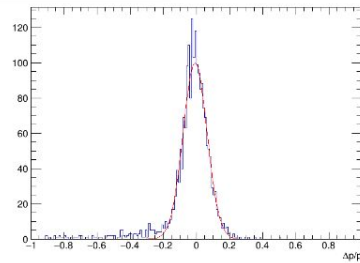
p resolution at p=15GeV, $\eta=3$



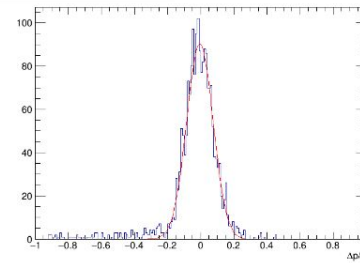
p resolution at p=20GeV, $\eta=3$



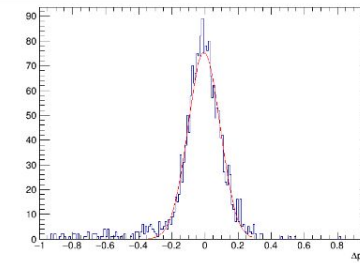
p resolution at p=30GeV, $\eta=3$



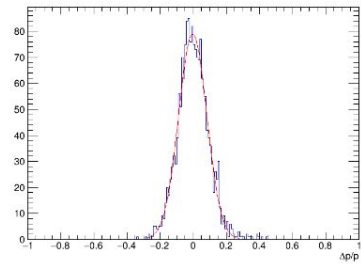
p resolution at p=40GeV, $\eta=3$



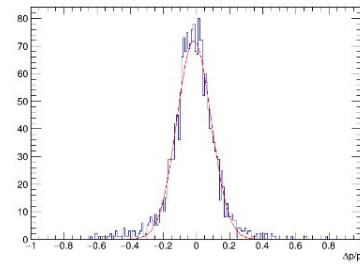
p resolution at p=50GeV, $\eta=3$



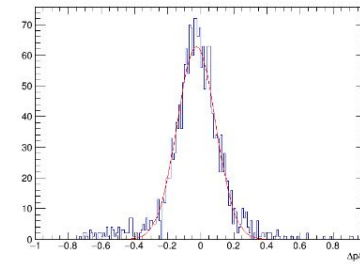
p resolution at p=1GeV, $\eta=3.5$



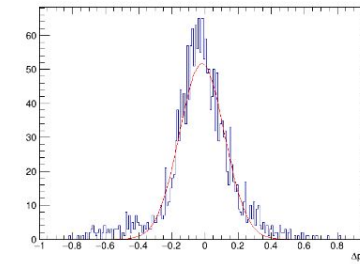
p resolution at p=5GeV, $\eta=3.5$



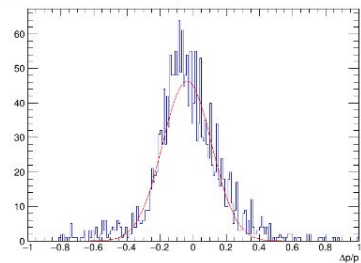
p resolution at p=10GeV, $\eta=3.5$



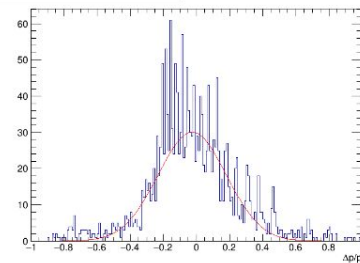
p resolution at p=15GeV, $\eta=3.5$



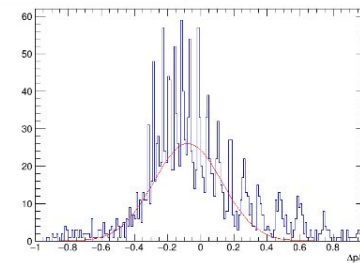
p resolution at p=20GeV, $\eta=3.5$



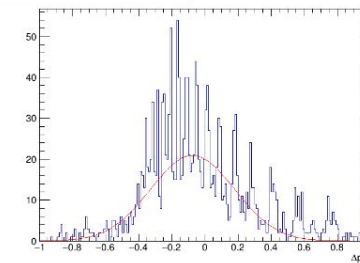
p resolution at p=30GeV, $\eta=3.5$



p resolution at p=40GeV, $\eta=3.5$

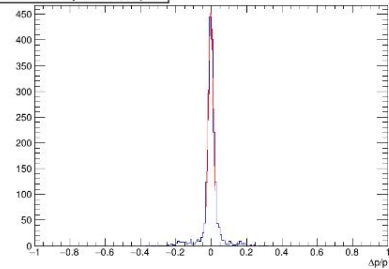


p resolution at p=50GeV, $\eta=3.5$

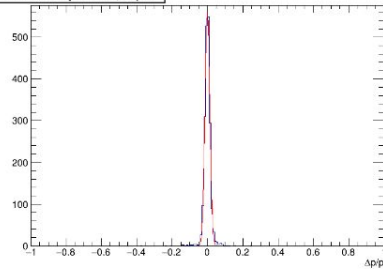


$\Delta p/p$ distribution of pion with PR#605 (1/5)

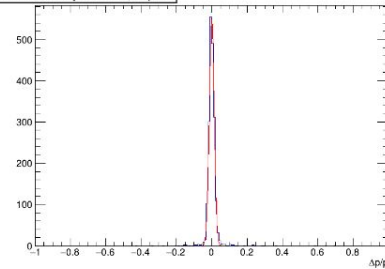
p resolution at p=1GeV, $\eta=1$



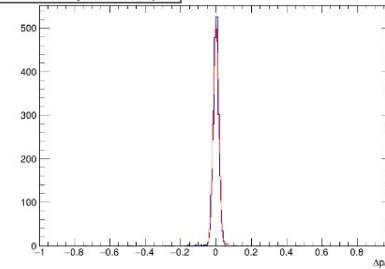
p resolution at p=5GeV, $\eta=1$



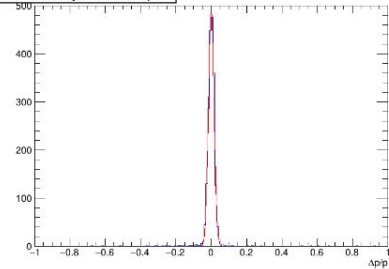
p resolution at p=10GeV, $\eta=1$



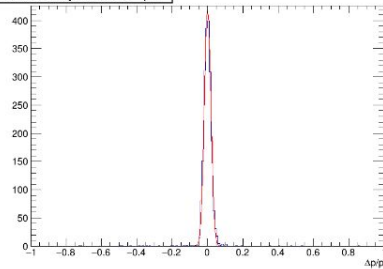
p resolution at p=15GeV, $\eta=1$



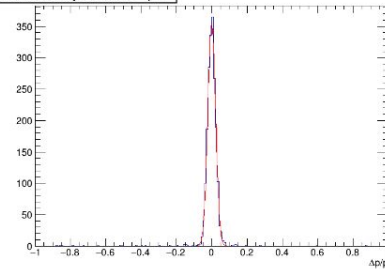
p resolution at p=20GeV, $\eta=1$



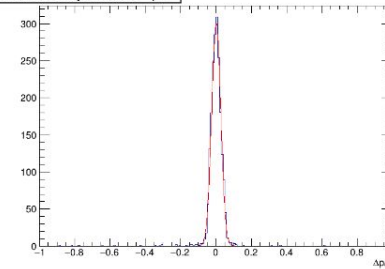
p resolution at p=30GeV, $\eta=1$



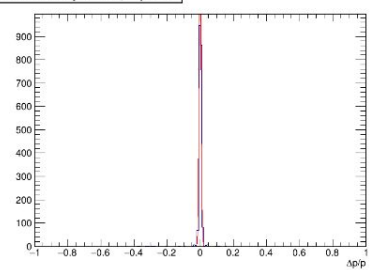
p resolution at p=40GeV, $\eta=1$



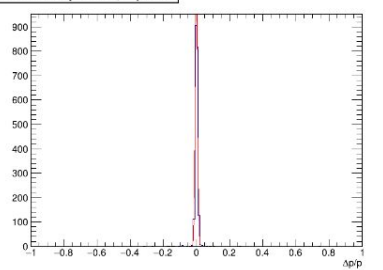
p resolution at p=50GeV, $\eta=1$



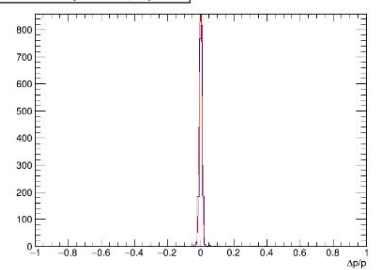
p resolution at p=1GeV, $\eta=0.5$



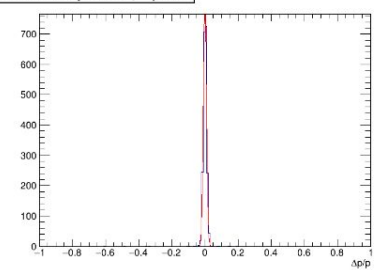
p resolution at p=5GeV, $\eta=0.5$



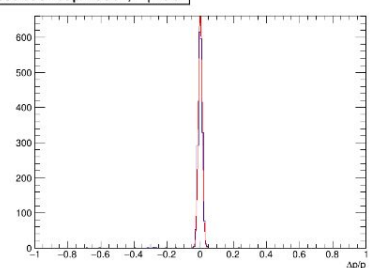
p resolution at p=10GeV, $\eta=0.5$



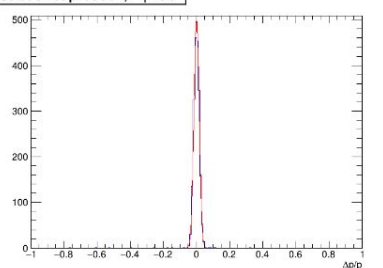
p resolution at p=15GeV, $\eta=0.5$



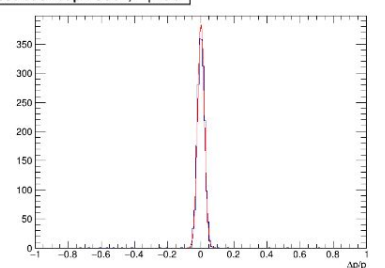
p resolution at p=20GeV, $\eta=0.5$



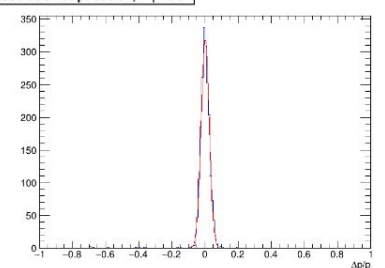
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

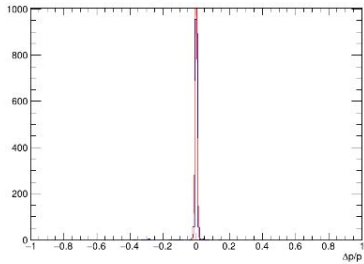


p resolution at p=50GeV, $\eta=0.5$

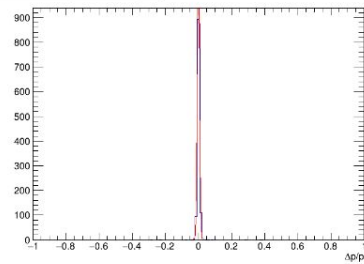


$\Delta p/p$ distribution of pion with PR#605 (2/5)

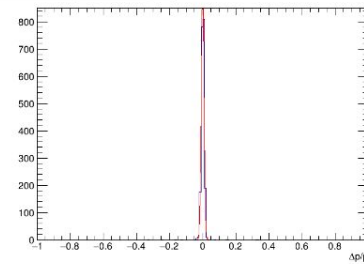
p resolution at p=1GeV, $\eta=0$



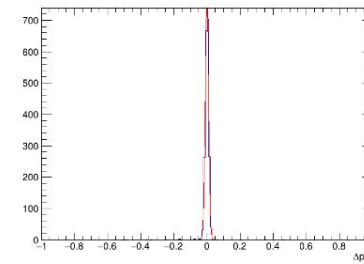
p resolution at p=5GeV, $\eta=0$



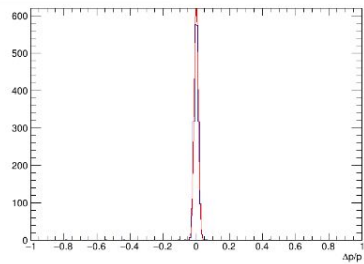
p resolution at p=10GeV, $\eta=0$



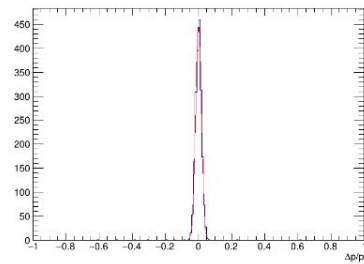
p resolution at p=15GeV, $\eta=0$



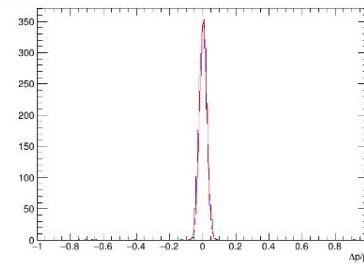
p resolution at p=20GeV, $\eta=0$



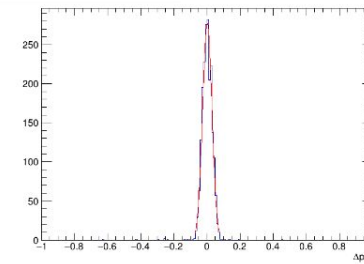
p resolution at p=30GeV, $\eta=0$



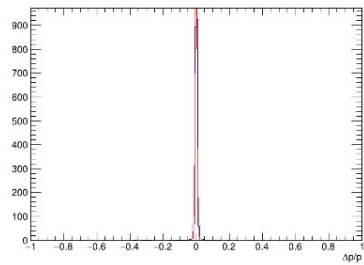
p resolution at p=40GeV, $\eta=0$



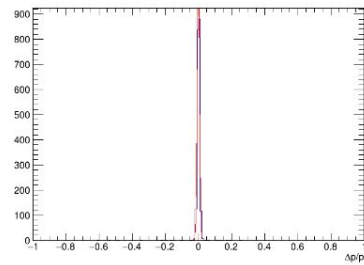
p resolution at p=50GeV, $\eta=0$



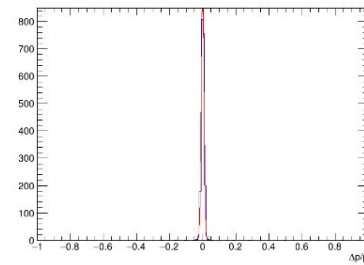
p resolution at p=1GeV, $\eta=0.5$



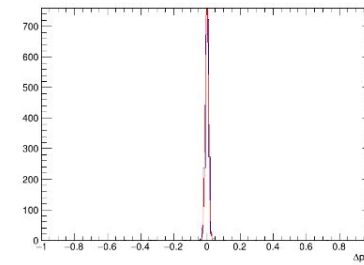
p resolution at p=5GeV, $\eta=0.5$



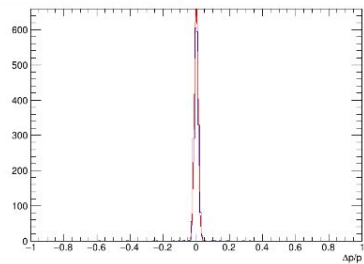
p resolution at p=10GeV, $\eta=0.5$



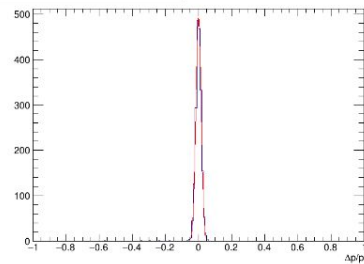
p resolution at p=15GeV, $\eta=0.5$



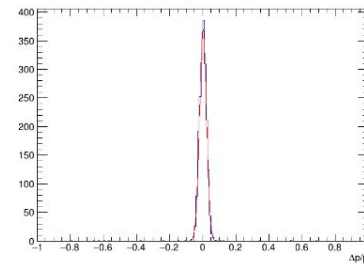
p resolution at p=20GeV, $\eta=0.5$



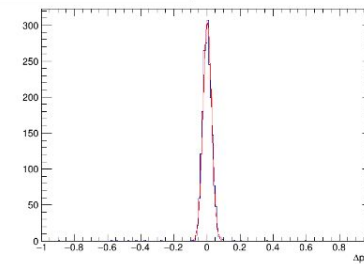
p resolution at p=30GeV, $\eta=0.5$



p resolution at p=40GeV, $\eta=0.5$

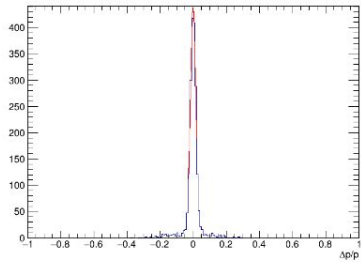


p resolution at p=50GeV, $\eta=0.5$

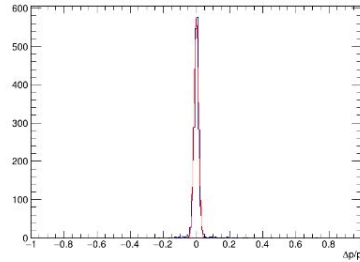


$\Delta p/p$ distribution of pion with PR#605 (3/5)

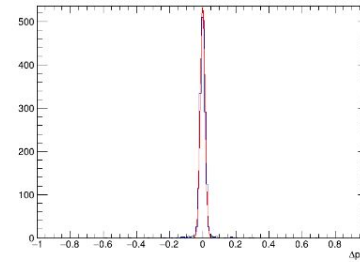
p resolution at p=1GeV, $\eta=1$



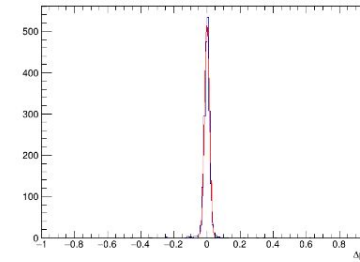
p resolution at p=5GeV, $\eta=1$



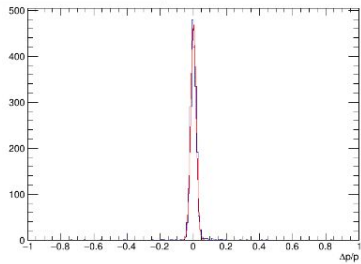
p resolution at p=10GeV, $\eta=1$



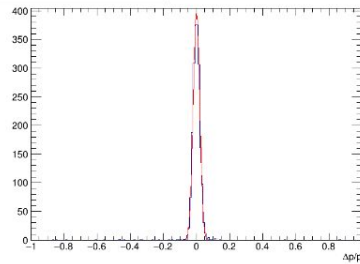
p resolution at p=15GeV, $\eta=1$



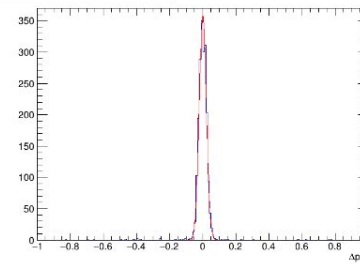
p resolution at p=20GeV, $\eta=1$



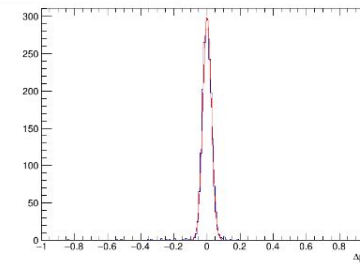
p resolution at p=30GeV, $\eta=1$



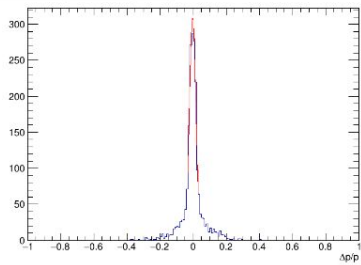
p resolution at p=40GeV, $\eta=1$



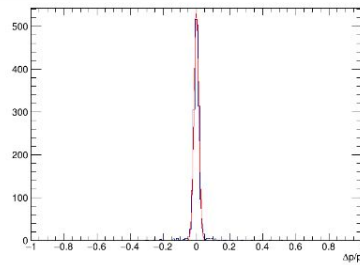
p resolution at p=50GeV, $\eta=1$



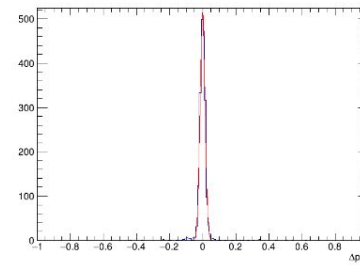
p resolution at p=1GeV, $\eta=1.5$



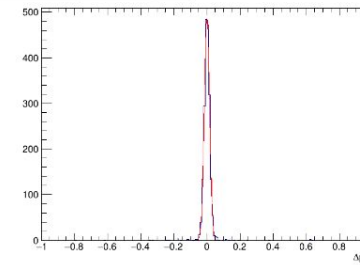
p resolution at p=5GeV, $\eta=1.5$



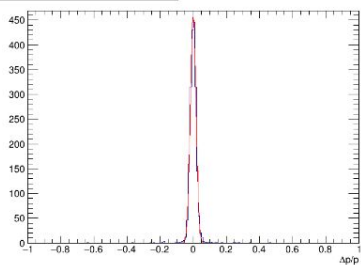
p resolution at p=10GeV, $\eta=1.5$



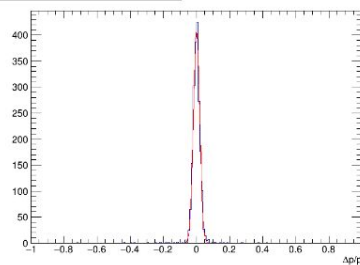
p resolution at p=15GeV, $\eta=1.5$



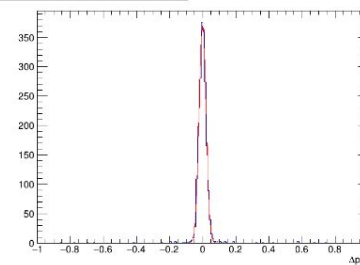
p resolution at p=20GeV, $\eta=1.5$



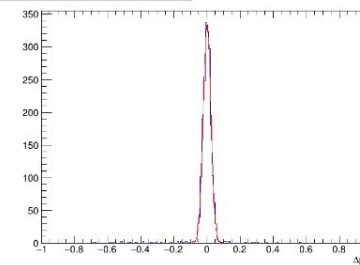
p resolution at p=30GeV, $\eta=1.5$



p resolution at p=40GeV, $\eta=1.5$

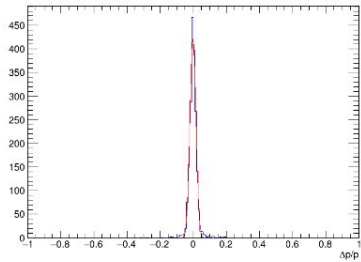


p resolution at p=50GeV, $\eta=1.5$

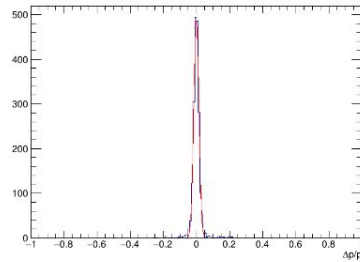


$\Delta p/p$ distribution of pion with PR#605 (4/5)

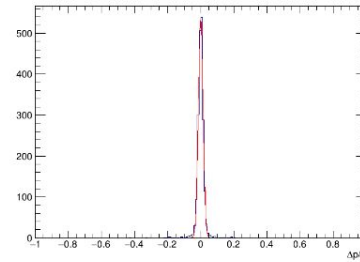
p resolution at p=1GeV, $\eta=2$



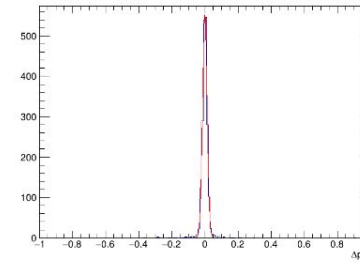
p resolution at p=5GeV, $\eta=2$



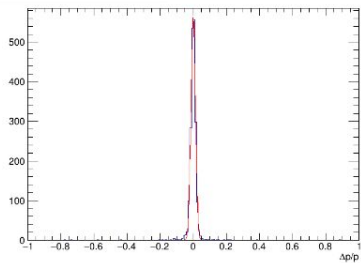
p resolution at p=10GeV, $\eta=2$



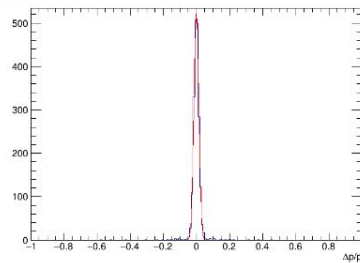
p resolution at p=15GeV, $\eta=2$



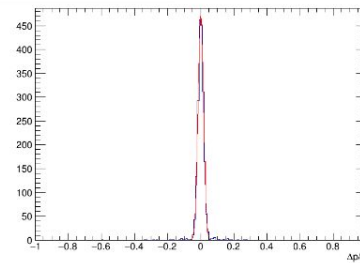
p resolution at p=20GeV, $\eta=2$



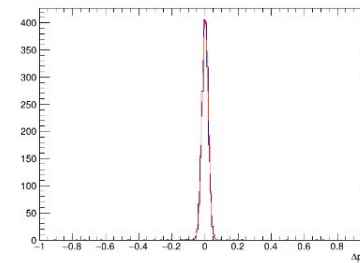
p resolution at p=30GeV, $\eta=2$



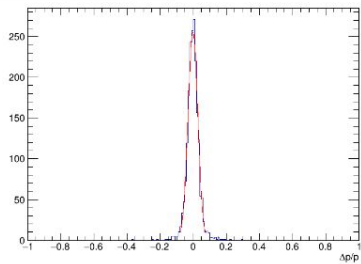
p resolution at p=40GeV, $\eta=2$



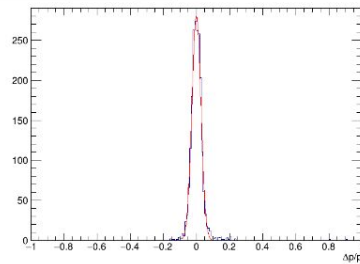
p resolution at p=50GeV, $\eta=2$



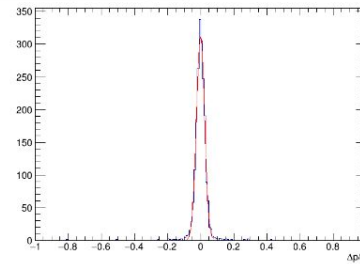
p resolution at p=1GeV, $\eta=2.5$



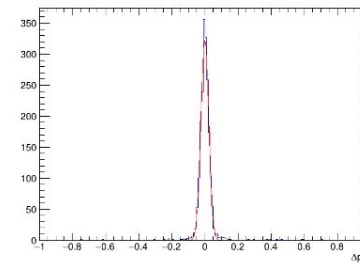
p resolution at p=5GeV, $\eta=2.5$



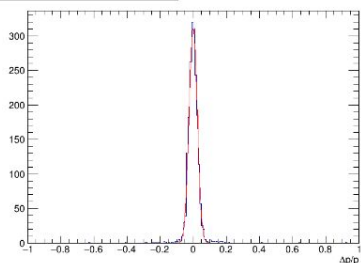
p resolution at p=10GeV, $\eta=2.5$



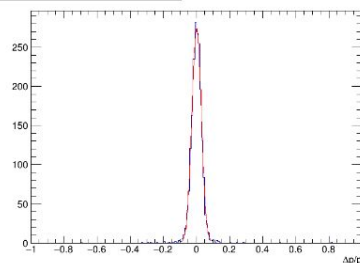
p resolution at p=15GeV, $\eta=2.5$



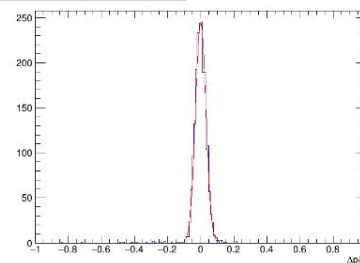
p resolution at p=20GeV, $\eta=2.5$



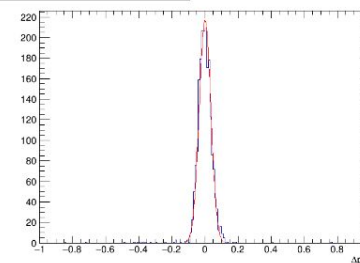
p resolution at p=30GeV, $\eta=2.5$



p resolution at p=40GeV, $\eta=2.5$

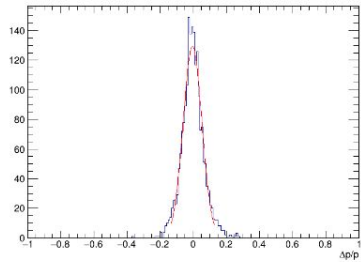


p resolution at p=50GeV, $\eta=2.5$

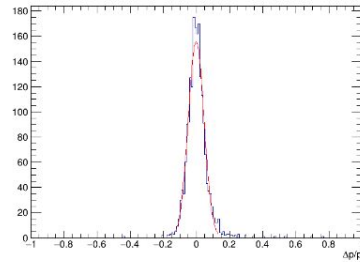


$\Delta p/p$ distribution of pion with PR#605 (5/5)

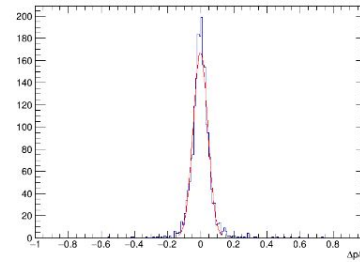
p resolution at p=1GeV, $\eta=3$



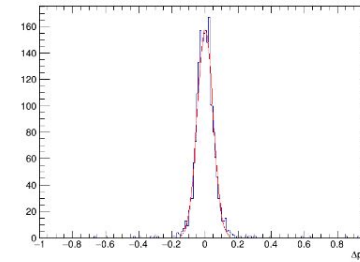
p resolution at p=5GeV, $\eta=3$



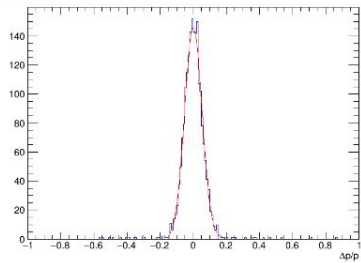
p resolution at p=10GeV, $\eta=3$



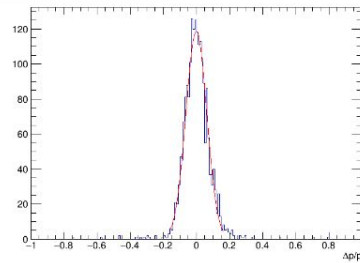
p resolution at p=15GeV, $\eta=3$



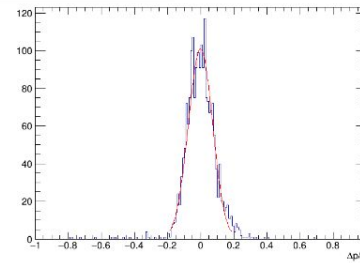
p resolution at p=20GeV, $\eta=3$



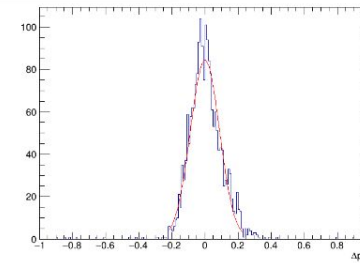
p resolution at p=30GeV, $\eta=3$



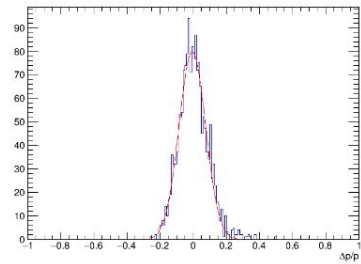
p resolution at p=40GeV, $\eta=3$



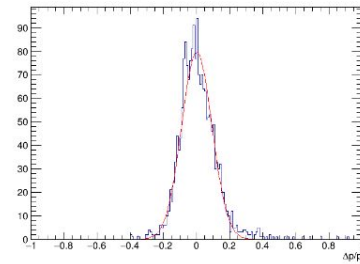
p resolution at p=50GeV, $\eta=3$



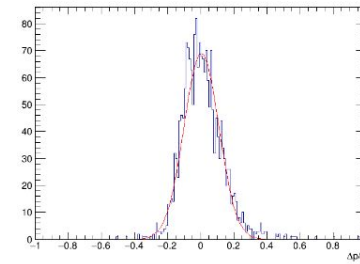
p resolution at p=1GeV, $\eta=3.5$



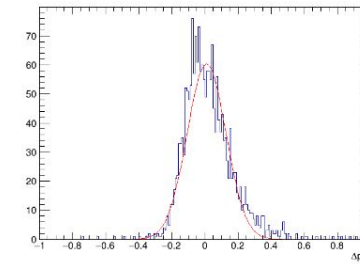
p resolution at p=5GeV, $\eta=3.5$



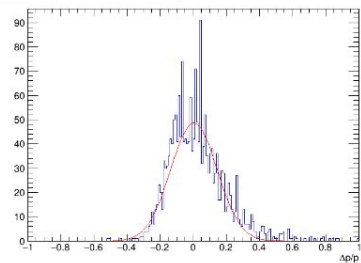
p resolution at p=10GeV, $\eta=3.5$



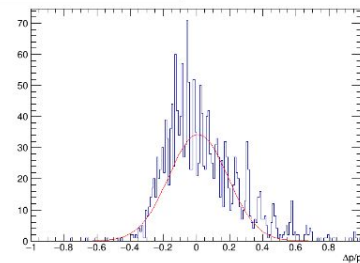
p resolution at p=15GeV, $\eta=3.5$



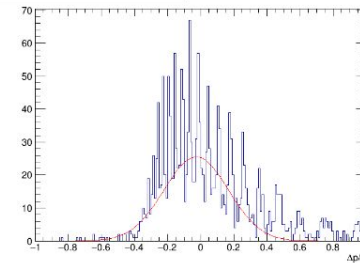
p resolution at p=20GeV, $\eta=3.5$



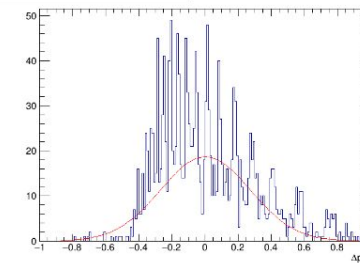
p resolution at p=30GeV, $\eta=3.5$



p resolution at p=40GeV, $\eta=3.5$



p resolution at p=50GeV, $\eta=3.5$



Requirement

https://indico.cern.ch/event/1005396/contributions/4222296/attachments/2188996/3699256/ECCE_LGADs_WeiLi_v1.pdf?fbclid=IwARoMKTUzINXig_49851wLgJLdftvo6KGUKsZolLtyofoaRvB5ndy15uc9uQ

EIC Detector Requirements

η	Nomenclature		Tracking			Electrons		$\pi/K/p$ PID		HCAL	Muons									
			Resolution	Allowed X/X_0	Si-Vertex	Resolution σ_r/E	PID	p-Range (GeV/c)	Separation	Resolution σ_r/E										
-6.9 – -5.8	↓ p/A	Auxiliary Detectors	low- Q^2 tagger	$\delta\theta/\theta < 1.5\%$; $10^{-6} < Q^2 < 10^{-2} \text{ GeV}^2$																
...																				
-4.5 – -4.0				Instrumentation to separate charged particles from photons																
-4.0 – -3.5	Central Detector	Backwards Detectors		$\sigma_p/p \sim 0.1\% \times p + 2.0\%$	~5% or less	$\sigma_{xyz} \sim 20 \mu\text{m}$, $d_0(z) \sim d_0(r\phi) \sim 20/p_T \text{ GeV } \mu\text{m} + 5 \mu\text{m}$	2%/√E	π suppression up to 1:10 ⁴	≤ 7 GeV/c	≥ 3σ	~50%/√E									
-3.5 – -3.0																				
-3.0 – -2.5																				
-2.5 – -2.0																				
-2.0 – -1.5																				
-1.5 – -1.0																				
-1.0 – -0.5																				
-0.5 – 0.0			Barrel	$\sigma_p/p \sim 0.05\% \times p + 0.5\%$																
0.0 – 0.5																				
0.5 – 1.0																				
1.0 – 1.5	Forward Detectors				TBD	(10-12)%√E			≤ 8 GeV/c	≥ 3σ	~50%/√E									
1.5 – 2.0																				
2.0 – 2.5																				
2.5 – 3.0																				
3.0 – 3.5																				
3.5 – 4.0	↑ e	Auxiliary Detectors	Instrumentation to separate charged particles from photons																	
4.0 – 4.5																				
...																				
> 6.2			Proton Spectrometer	$\sigma_{\text{intrinsic}}(I\theta/I\theta) < 1\%$; Acceptance: $0.2 < p_T < 1.2 \text{ GeV}/c$																

Table 2: Physics requirements for an EIC detector

