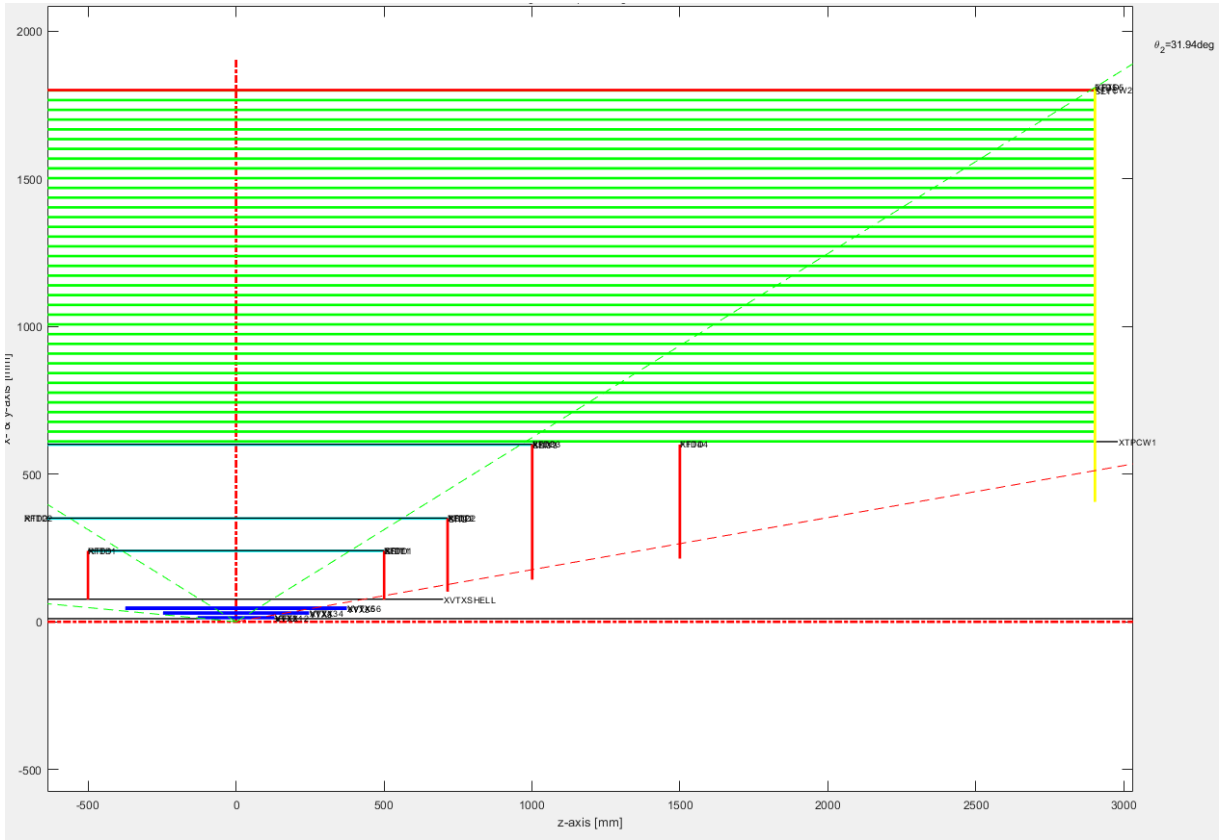
Residual distribution of σpt at different Pt with fast simulation

9.13耿青林

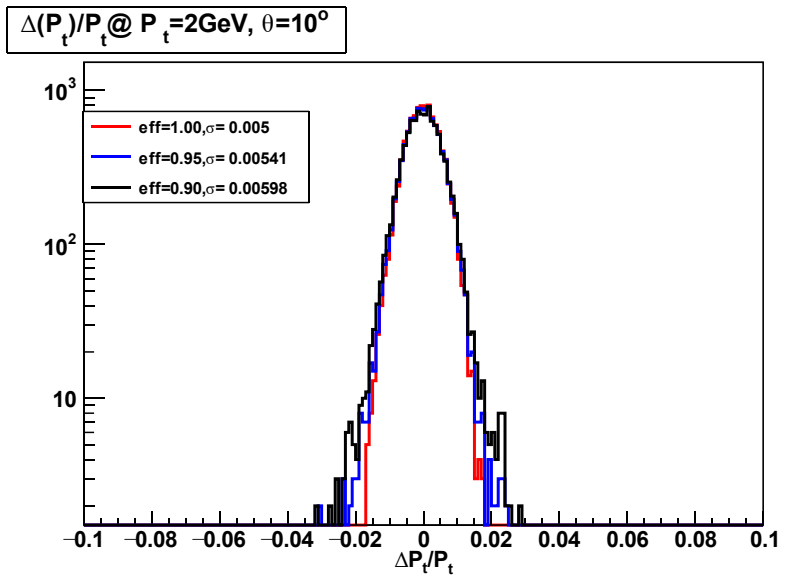
Global layout of tracking system

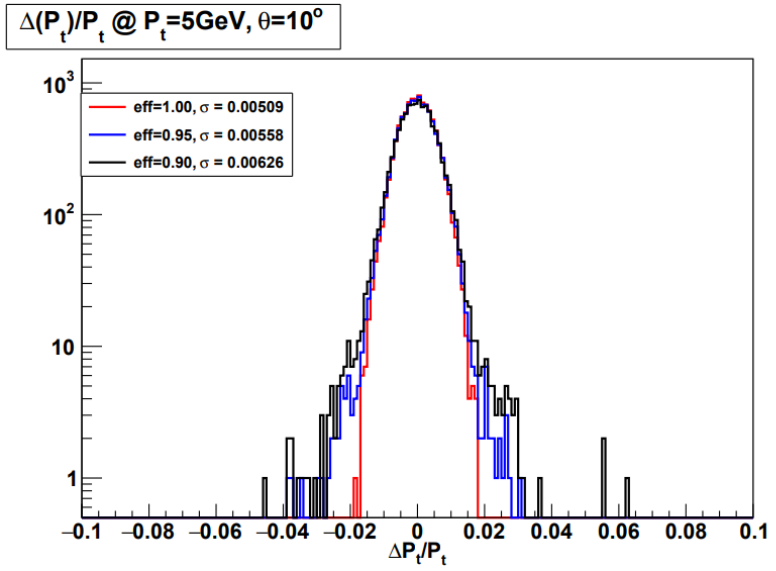
VXD			ITKE & OTKE				ITKB & OTKB			TPC		
layer	Half-Z	R	layer	Inner-R	Outer-R	Z	layer	Half-Z	R	Inner-R	Half-Z	Outer-R
L11	130	12.459	ITKE1	75	*240*	500.5	ITKB1	*500.5*	*240*	600	2900	1800
L12	130		ITKE2	101.9	*350*	715	ITKB2	*715*	*350*			
L21	247	27.892	ITKE3	142.6	*600*	1001	ITKB3	*1001*	*600*			
L22	247		ITKE4	214	*600*	1500	OTKB	*2900*	1800			
L31	374.5	43.792	OTKE	405.7	1810	2903						
L32	374.5											

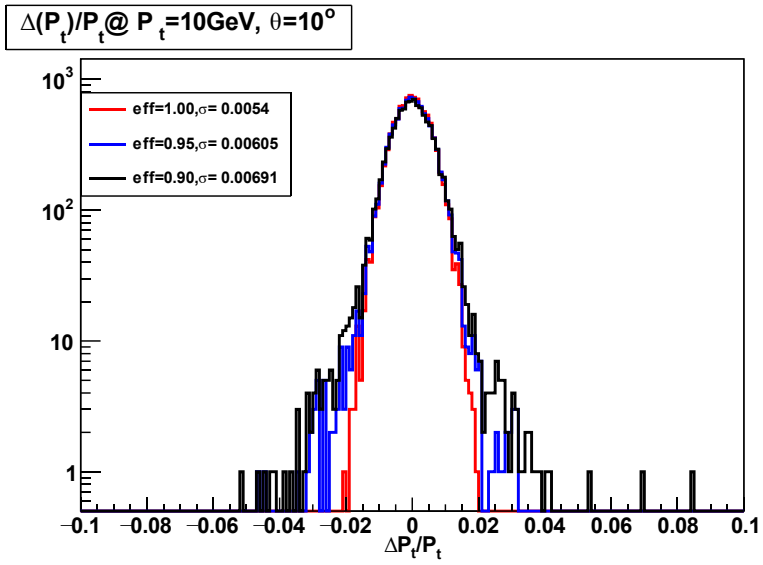


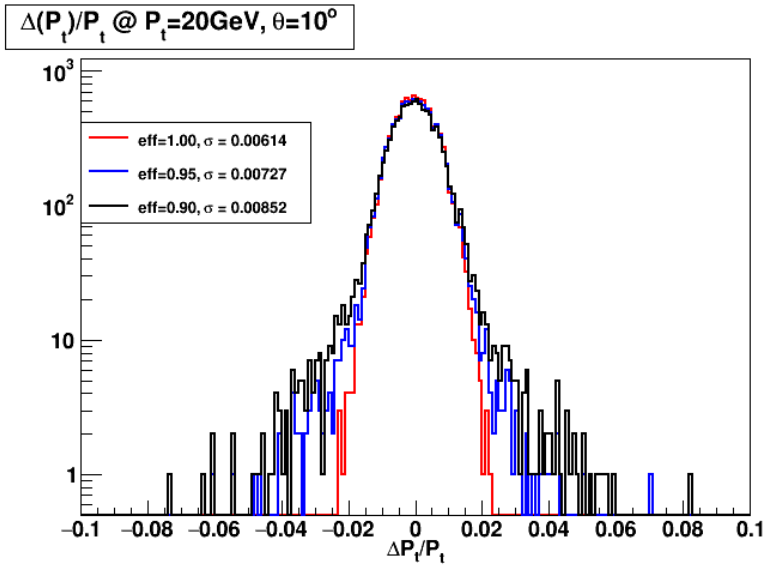
模拟中入射的角度选为10°，即只穿过VTX和端盖部分。把ITKE和OTKE的hit效率分别设为**1.00，0.95，0.90**三个不同的值，观察在不同动量下，动量分辨的残差分布。

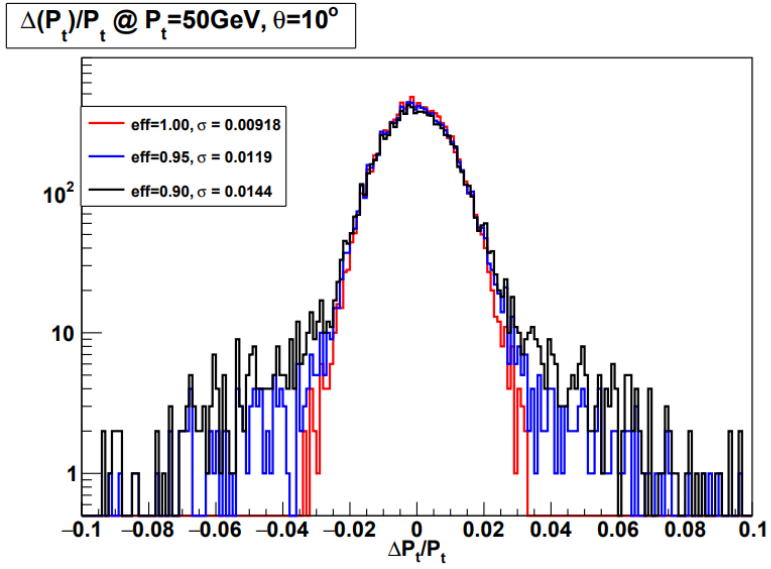
residual distribution of σPt

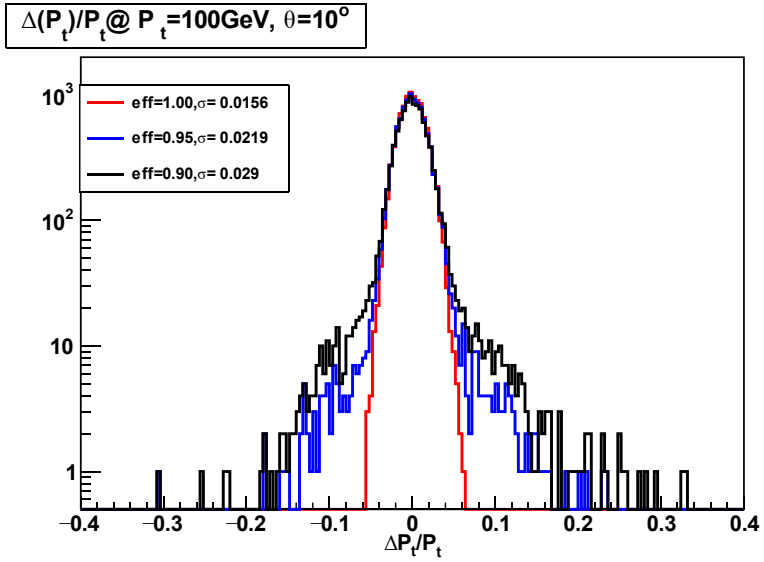








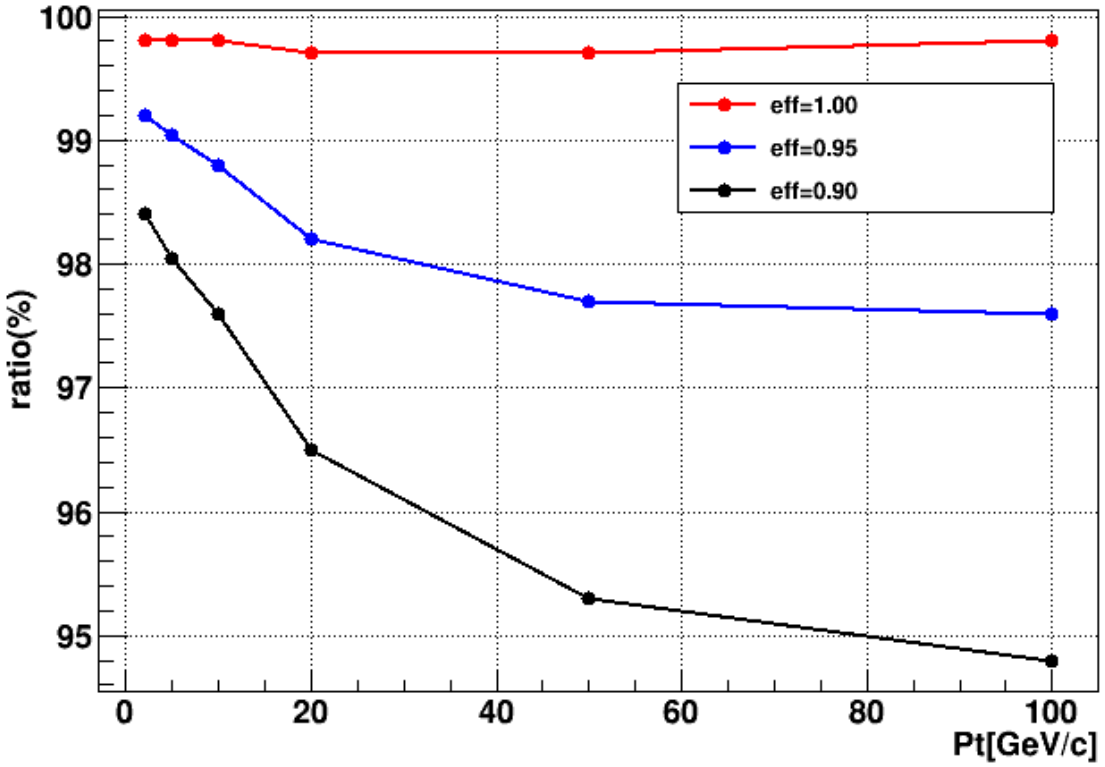




events ratio within 3σ

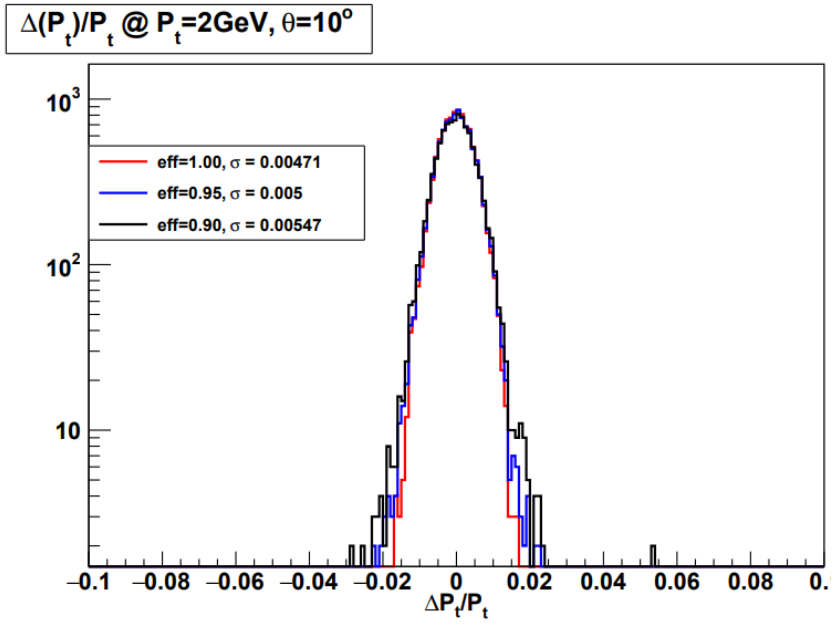
$events_{(between\ \pm 3\sigma)}$ / $events_{(total)}$

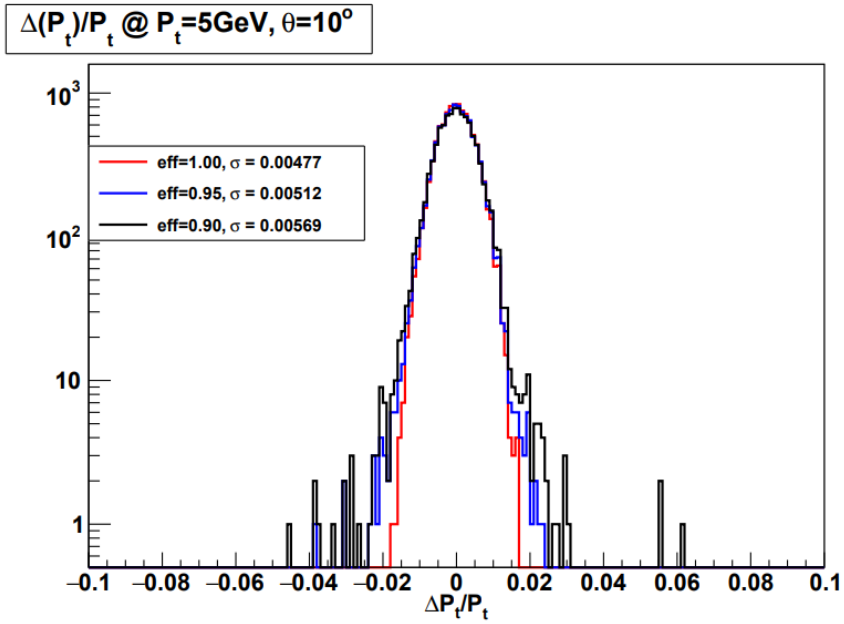
Pt / eff	2	5	10	20	50	100
100%	99.8%	99.8%	99.8%	99.7%	99.7%	99.8%
95%	99.2%	99.04	98.8%	98.2%	97.7%	97.6%
90%	98.4%	98.04	97.6%	96.5%	95.3%	94.8%

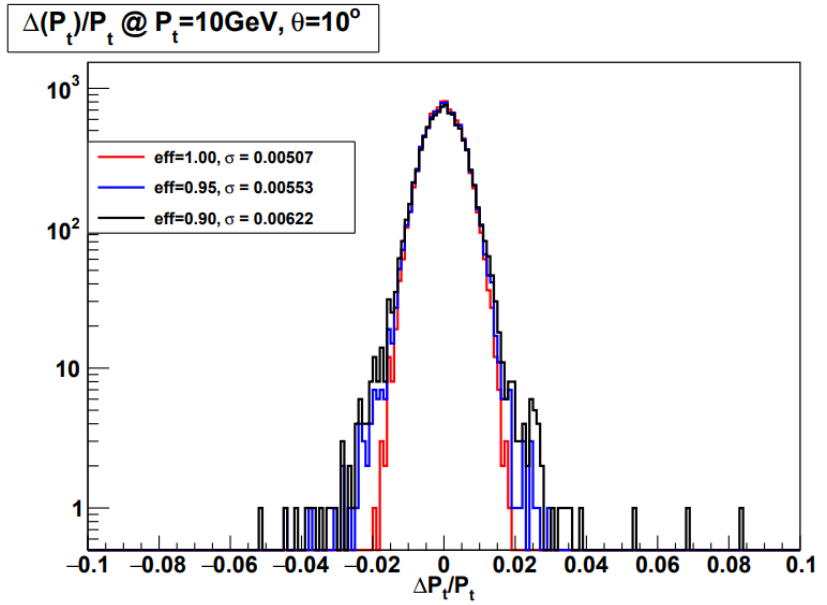


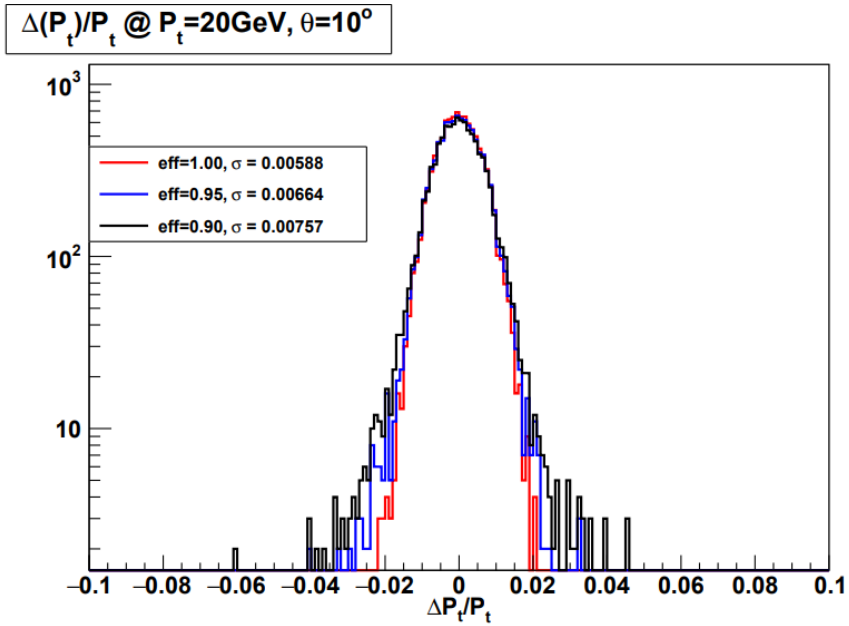
pt分辨的残差分布未观察到明显拖尾现象，3σ范围内事例数占比随效率和动量增加而降低。

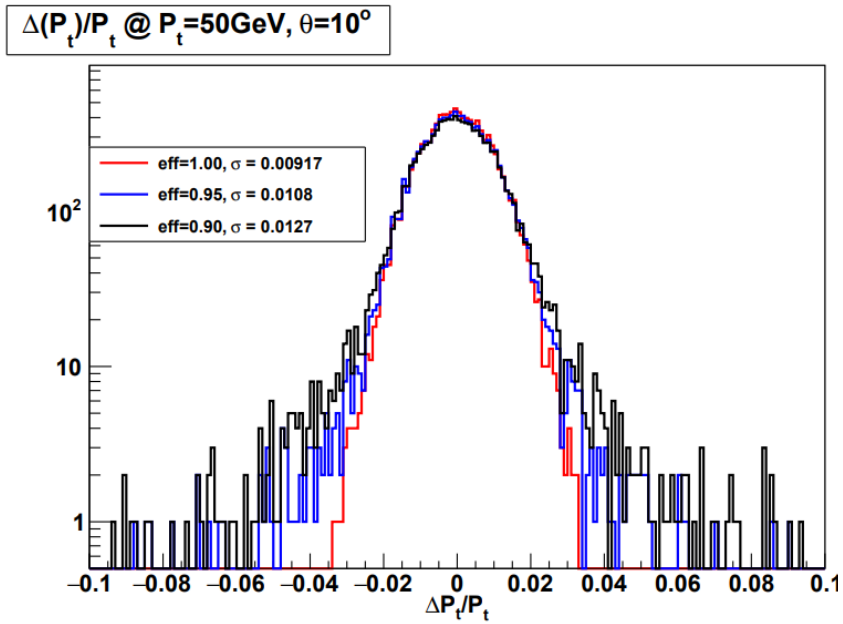
z of ITKE4: 1500mm→1800mm

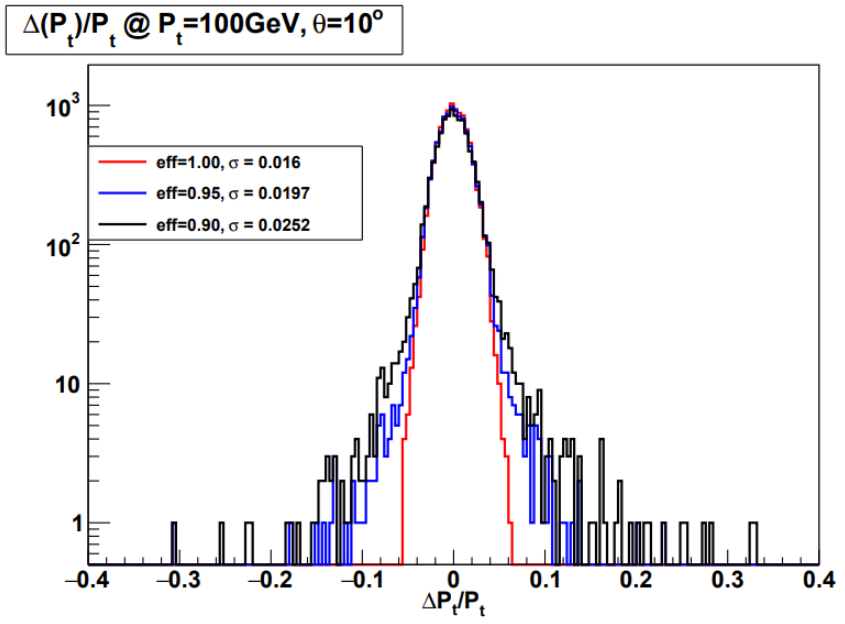










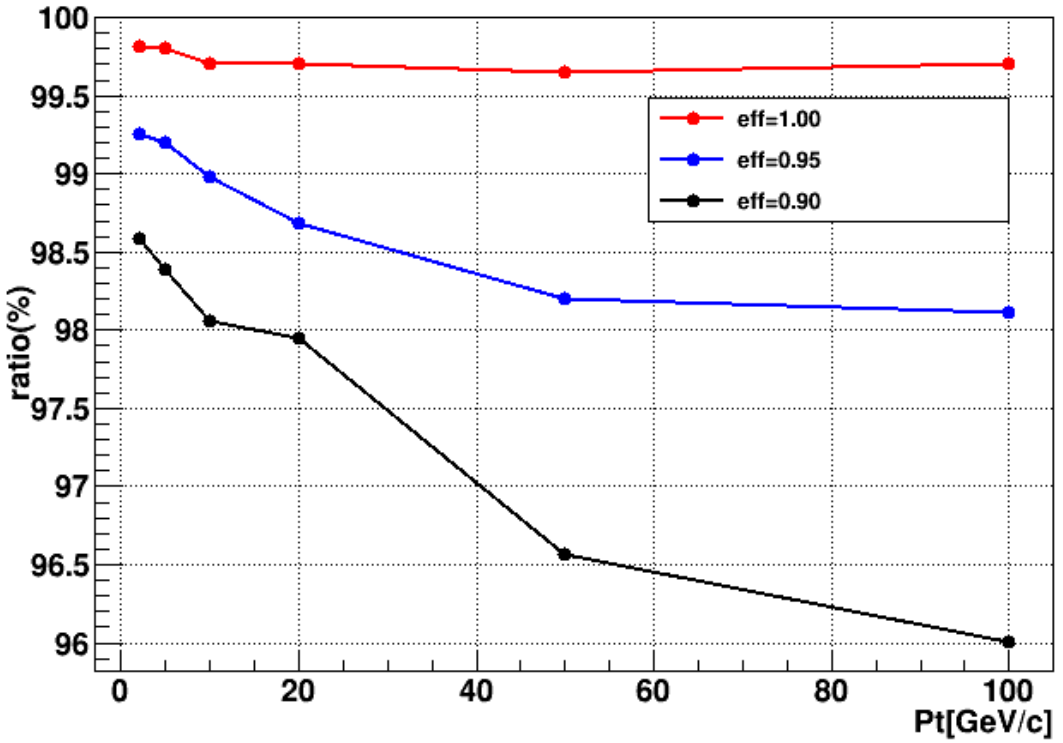


events ratio within 3σ for 4 endcaps

z of ITKE4: 1500mm→1800mm

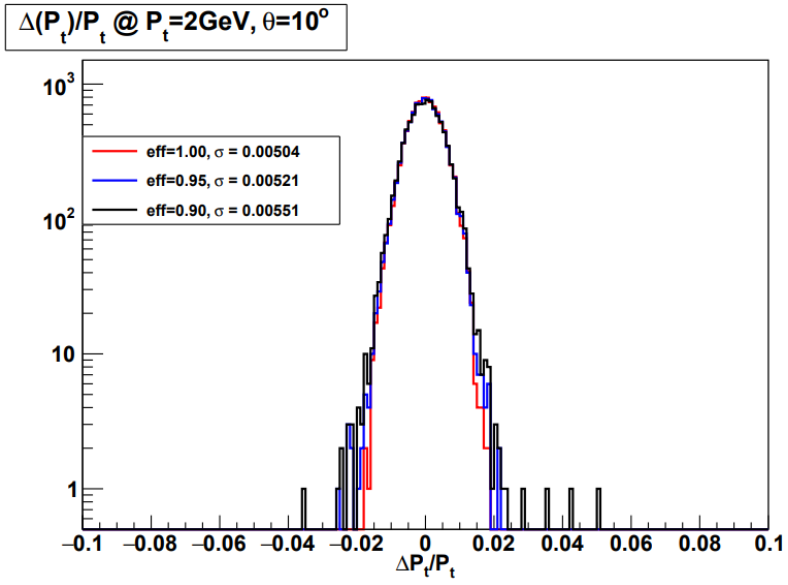
$events_{(between\ \pm 3\sigma)}$ / $events_{(total)}$

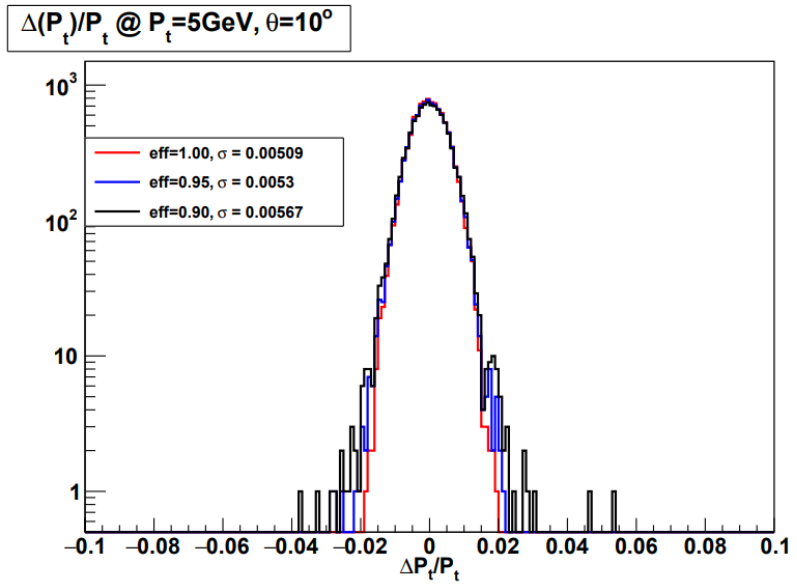
Pt / eff	2	5	10	20	50	100
100%	99.81%	99.80%	99.71%	99.70%	99.65%	99.71%
95%	99.25%	99.20%	98.98%	98.68%	98.20%	98.11%
90%	98.58%	98.39%	98.06%	97.95%	96.56%	96.01%

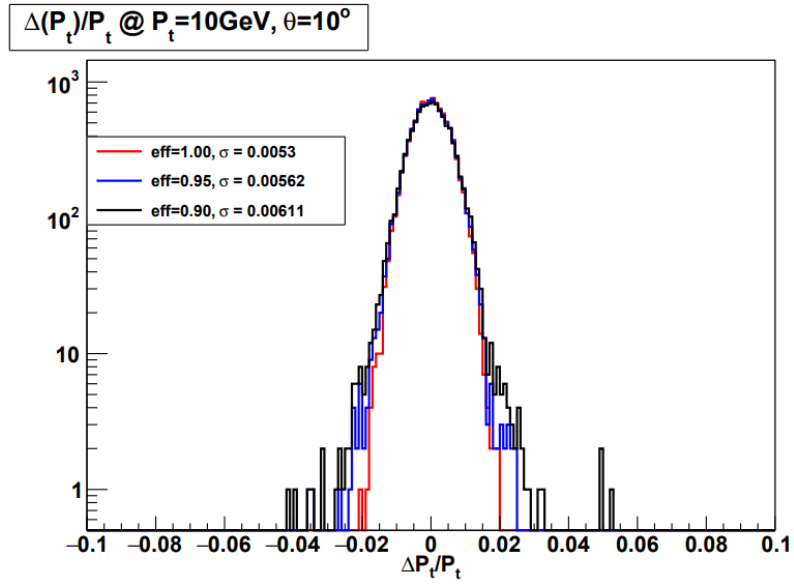


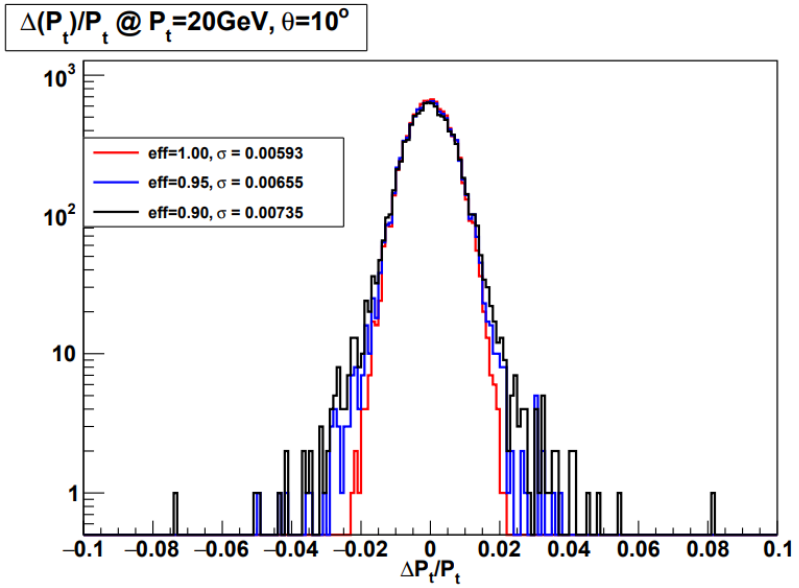
z of ITKE3、ITKE4:

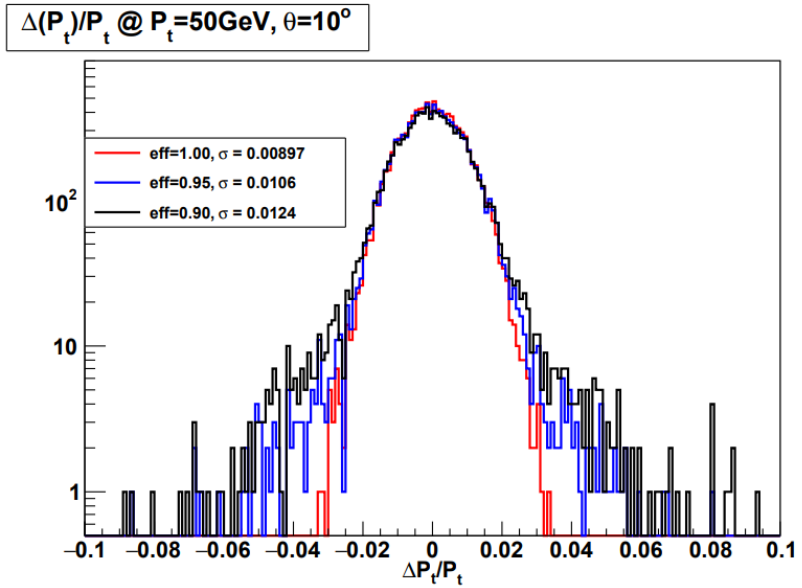
1001mm、1500mm→1301mm、1800mm

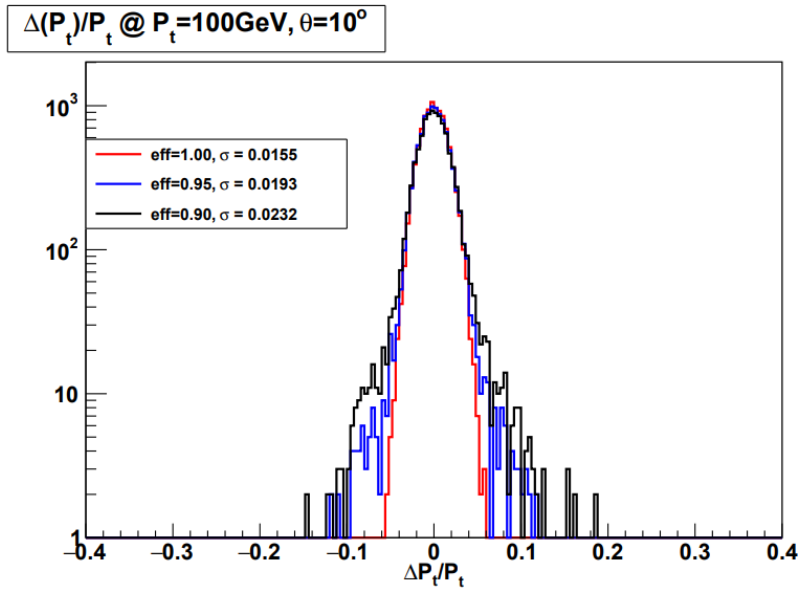










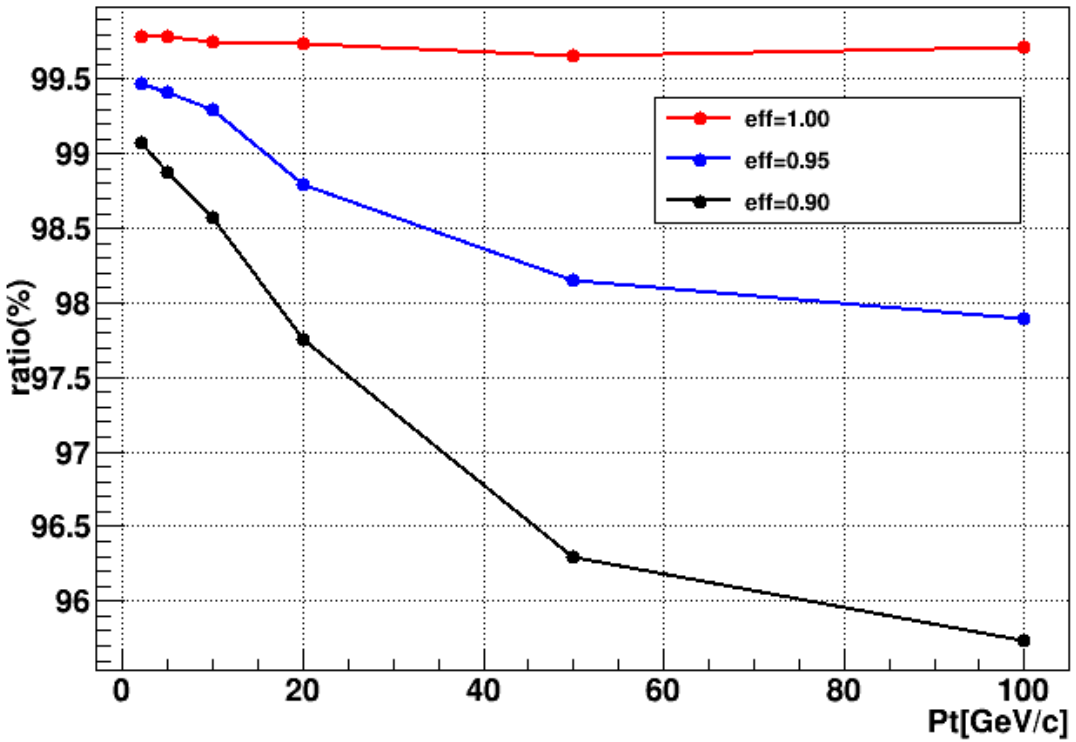


events ratio within 3σ for 4 endcaps

z of ITKE3、ITKE4:
1001mm、1500mm→1301mm、1800mm

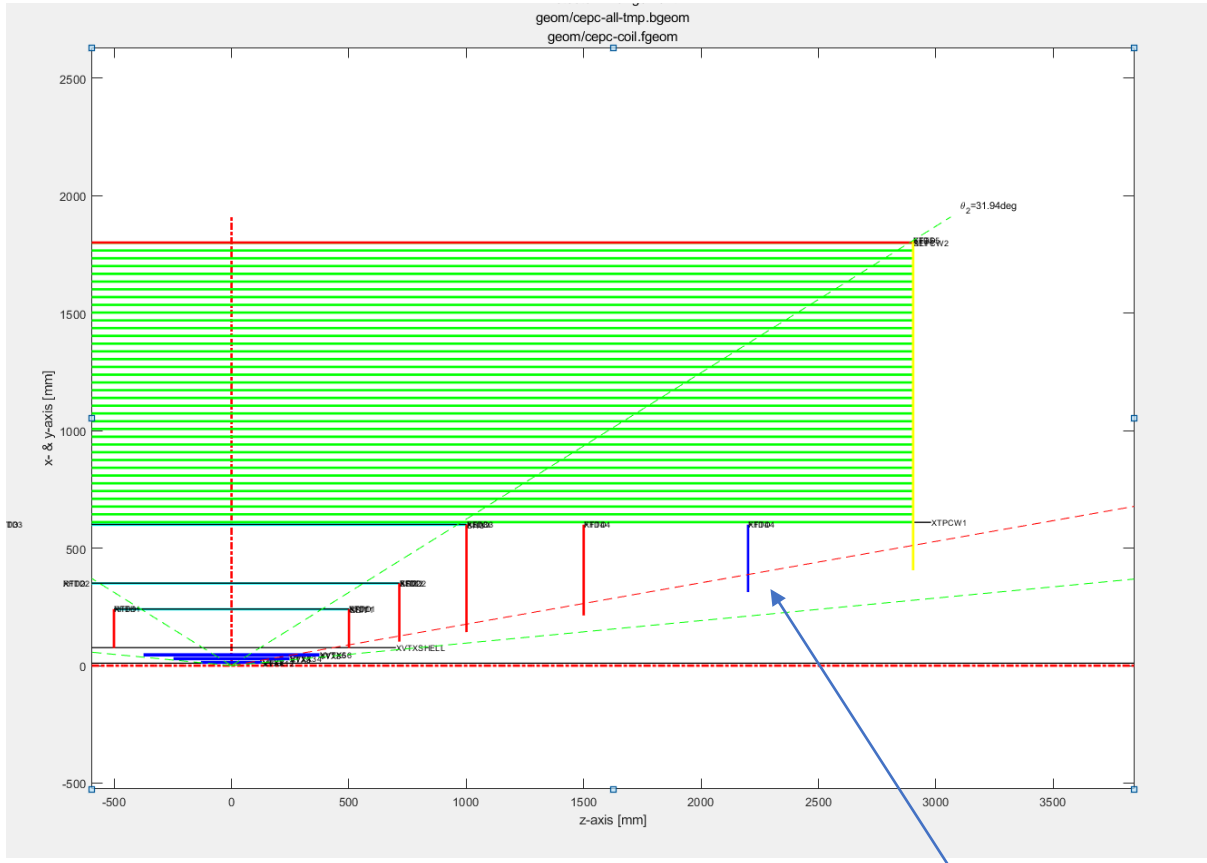
$events_{(between\ \pm 3\sigma)}$ / $events_{(total)}$

Pt / eff	2	5	10	20	50	100
100%	99.78%	99.78%	99.75%	99.74%	99.66%	99.71%
95%	99.47%	99.41%	99.29%	98.79%	98.15%	97.90%
90%	99.07%	98.87%	98.57%	97.76%	96.29%	95.74%



Global layout of tracking system

VXD			ITKE & OTKE				ITKB & OTKB			TPC		
layer	Half-Z	R	layer	Inner-R	Outer-R	Z	layer	Half-Z	R	Inner-R	Half-Z	Outer-R
L11	130	12.459	ITKE1	75	*240*	500.5	ITKB1	*500.5*	*240*	600	2900	1800
L12	130		ITKE2	101.9	*350*	715	ITKB2	*715*	*350*			
L21	247	27.892	ITKE3	142.6	*600*	1001	ITKB3	*1001*	*600*			
L22	247		ITKE4	214	*600*	1500	OTKB	*2900*	1800			
L31	374.5	43.792	OTKE	405.7	1810	2903						
L32	374.5											

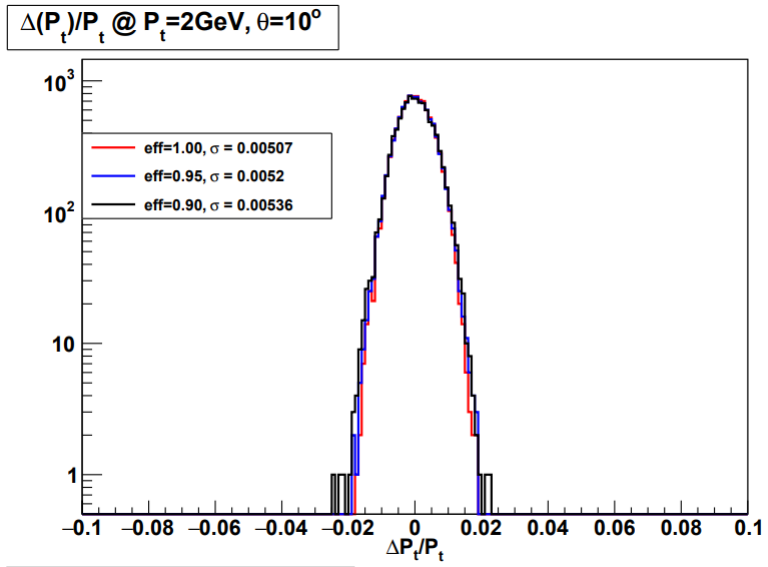


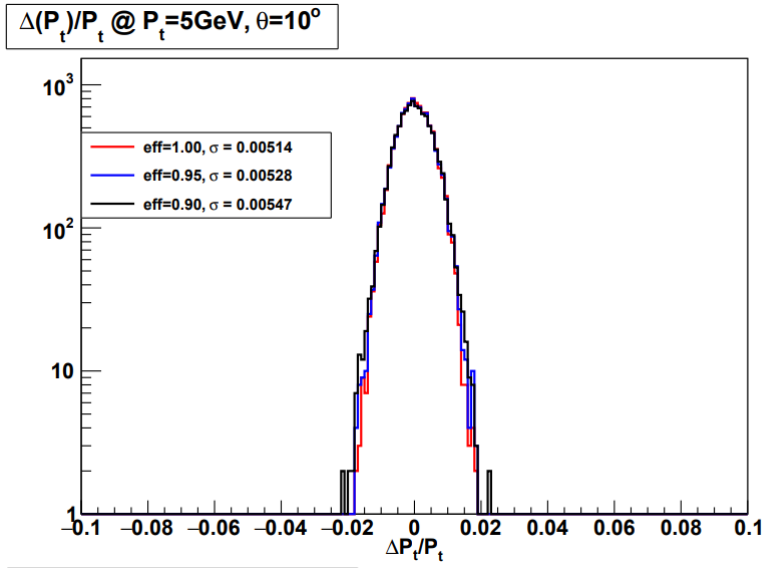
添加了第5层

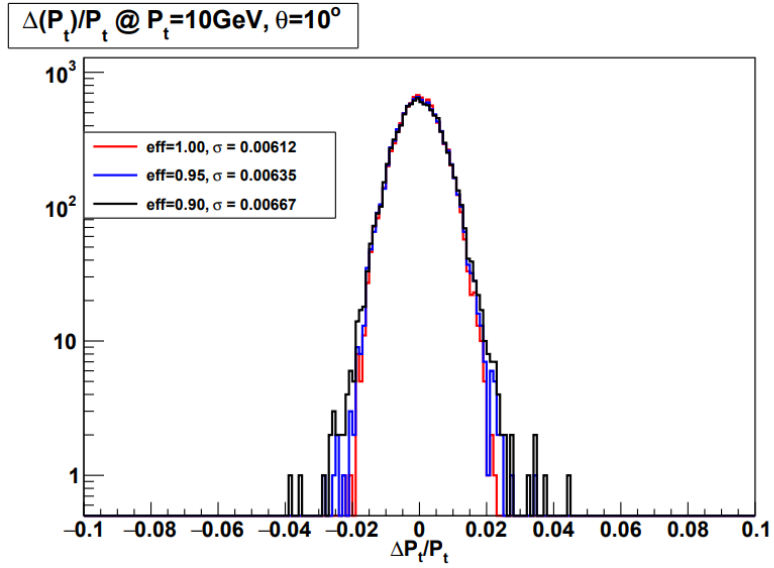
模拟中入射的角度选为10°，即只穿过VTX和端盖部分。把ITKE和OTKE的hit效率分别设为**1.00，0.95，0.90**三个不同的值，观察在不同动量下，动量分辨的残差分布。

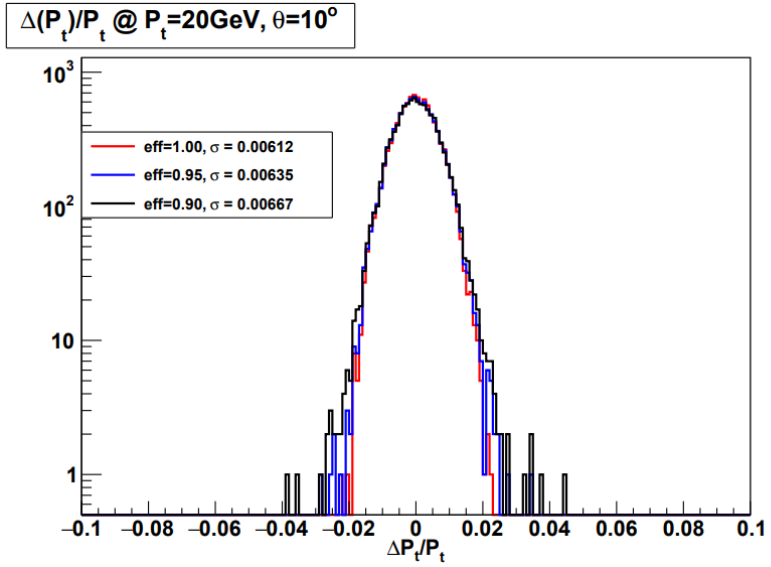
residual distribution of σPt for 5 endcaps

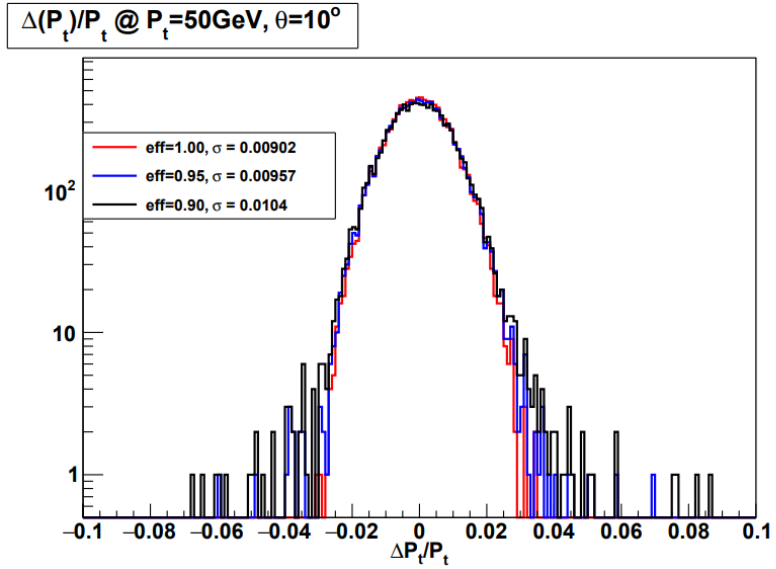
add endcap at z = 2200mm

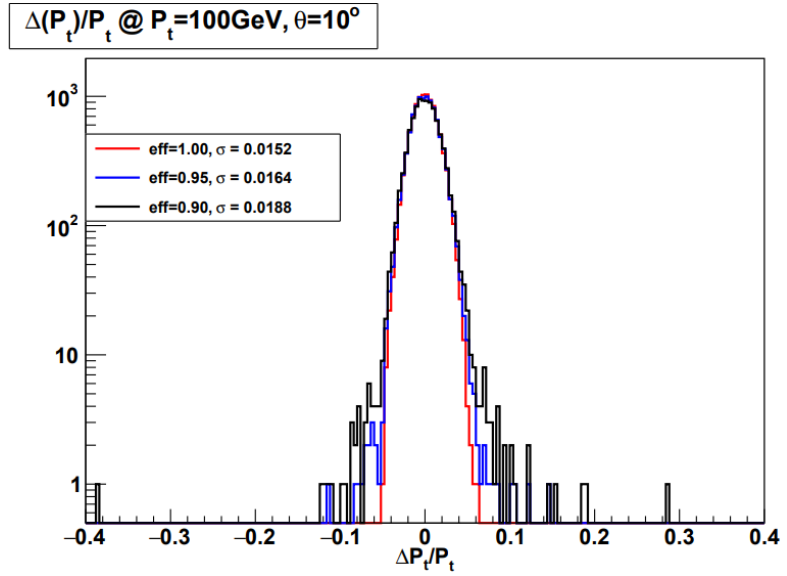










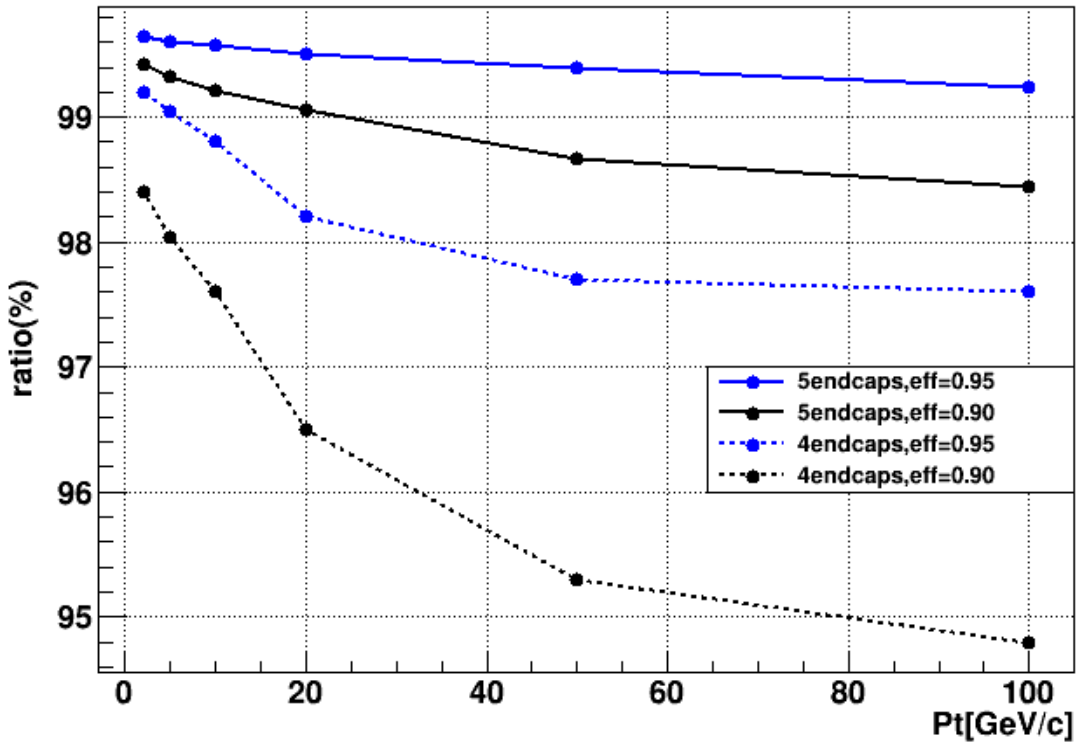


events ratio within 3σ for 5 endcaps

add endcap at z = 2200mm

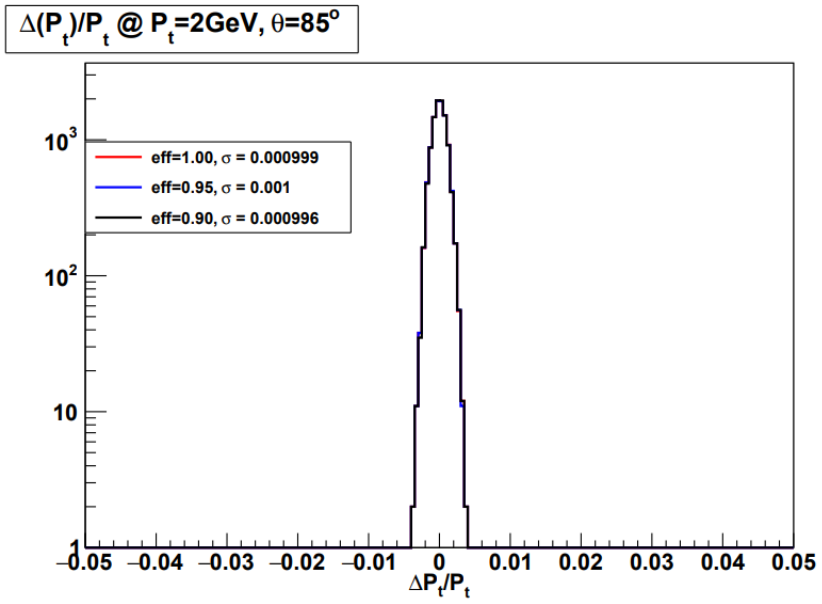
$events_{(between\ \pm 3\sigma)}$ / $events_{(total)}$

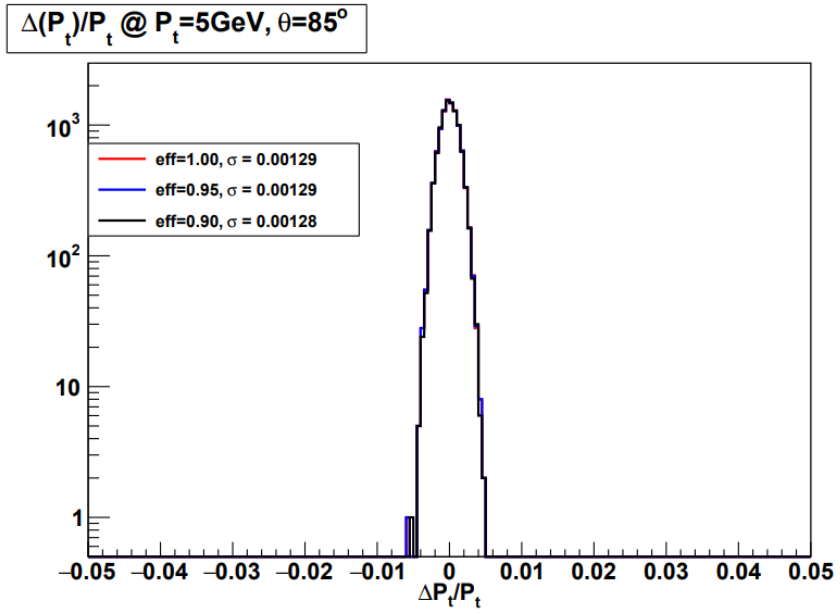
eff \ Pt	2	5	10	20	50	100
100%	99.81%	99.81%	99.80%	99.79%	99.81%	99.79%
95%	99.64%	99.61%	99.58%	99.50%	99.39%	99.24%
90%	99.42%	99.33%	99.21%	99.06%	98.67%	98.44%

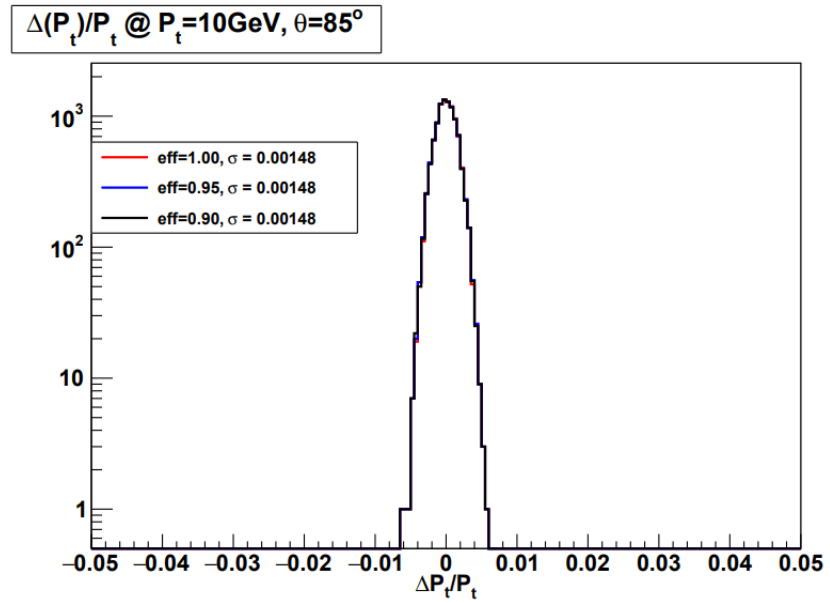


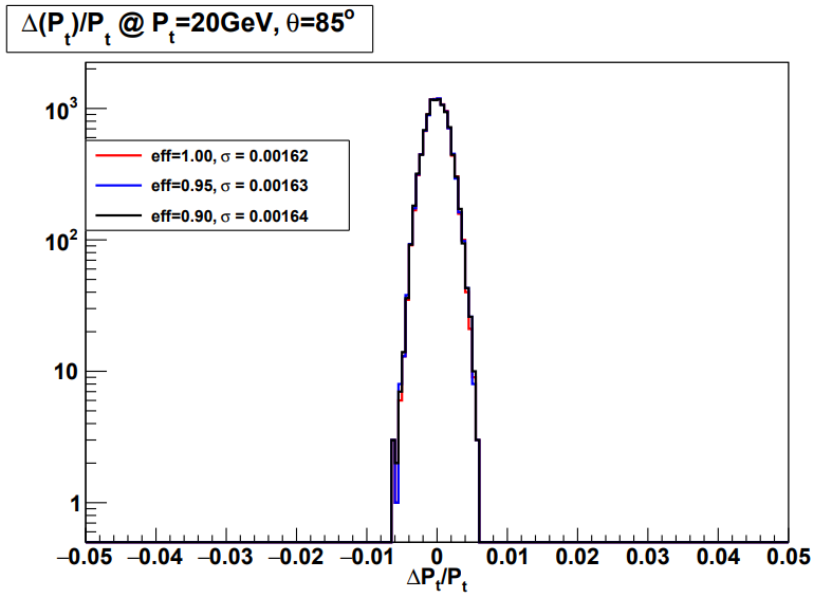
5层端盖情况下，3σ内事例数占比相比4层在不同动量下有~2%提升

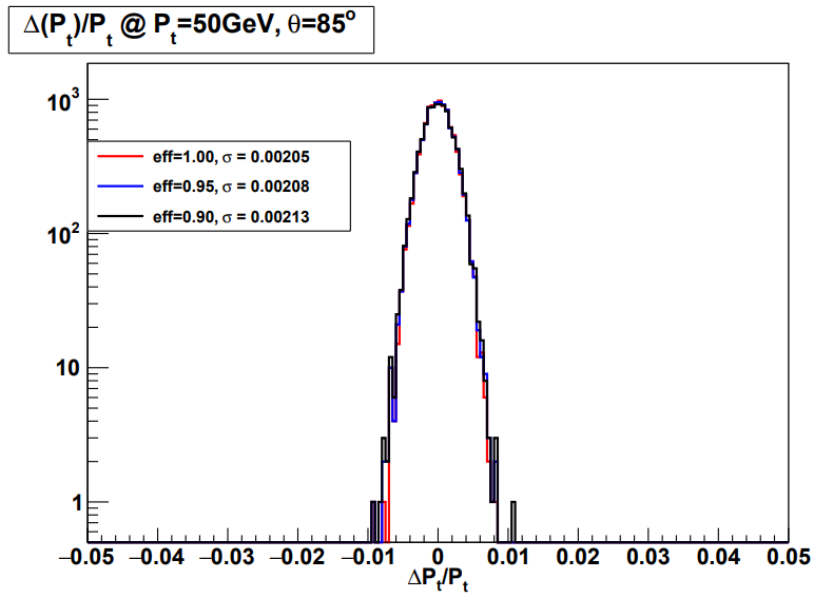
residual distribution of σPt for barrel

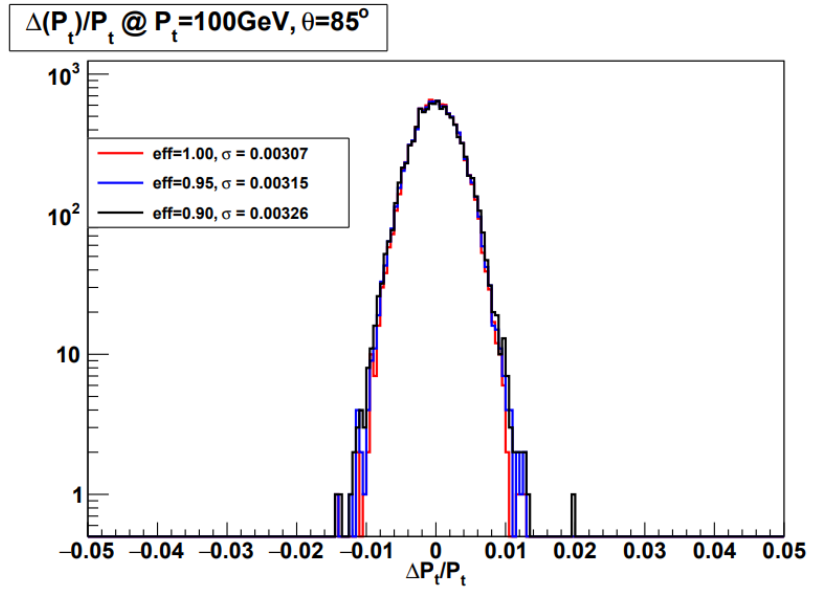








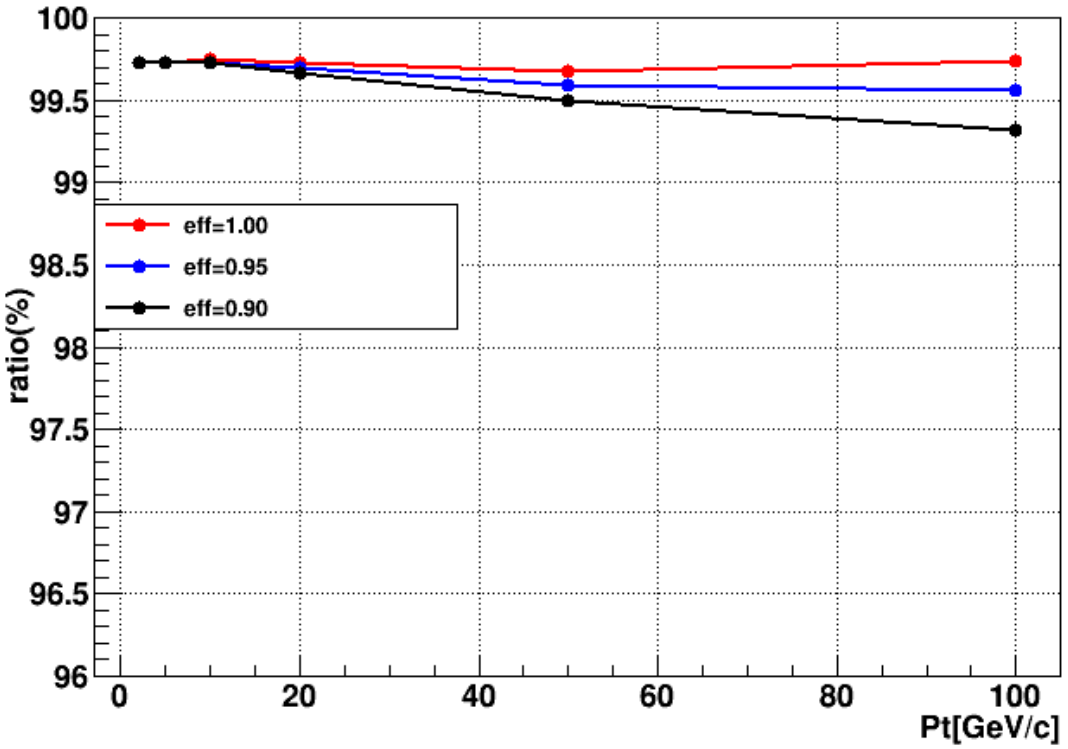




events ratio within 3σ for barrel

$events_{(between\ \pm 3\sigma)}$ / $events_{(total)}$

Pt / eff	2	5	10	20	50	100
100%	99.73%	99.73%	99.75%	99.73%	99.68%	99.74%
95%	99.73%	99.73%	99.73%	99.70%	99.59%	99.56%
90%	99.73%	99.73%	99.73%	99.66%	99.50%	99.32%

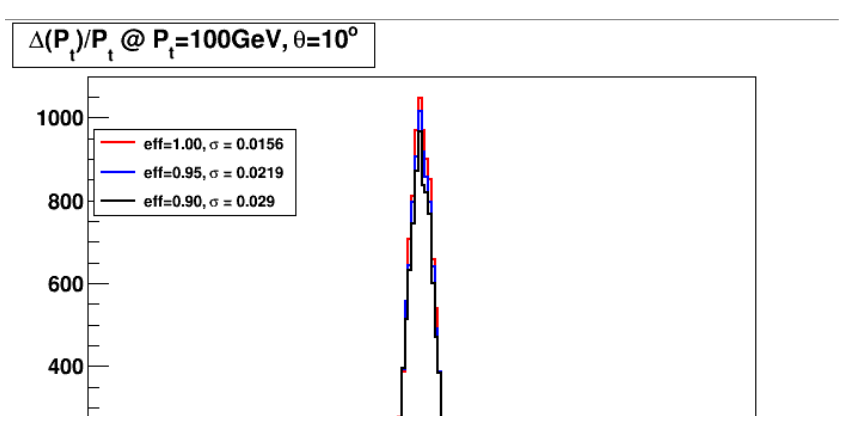


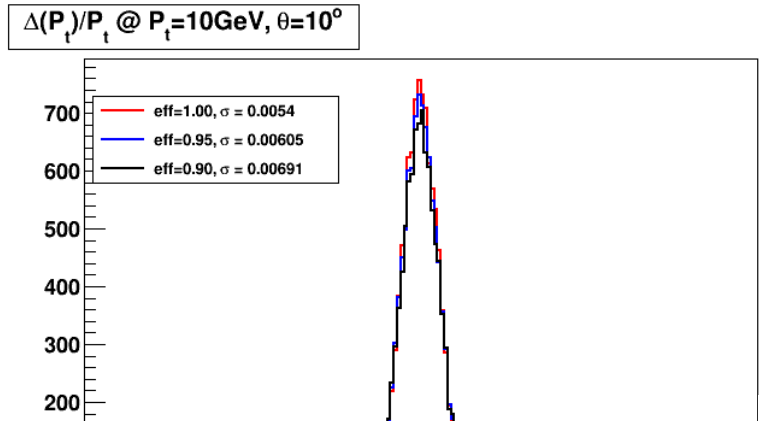
不同效率的差别，对桶部的影响较小。3σ内事例数占比在各个动量下差别均小于1%

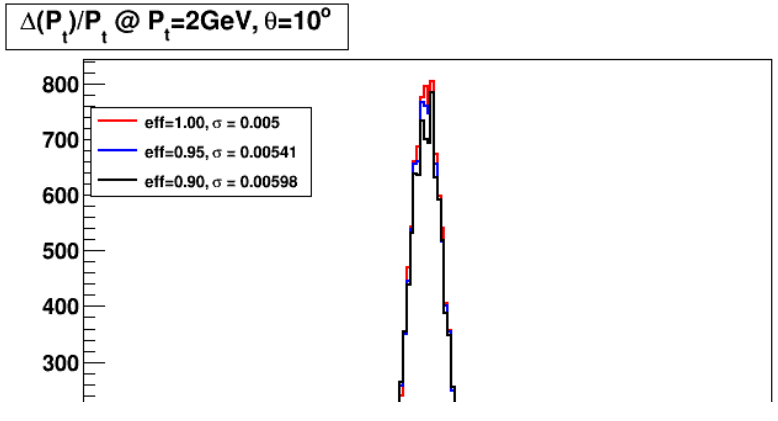
summary

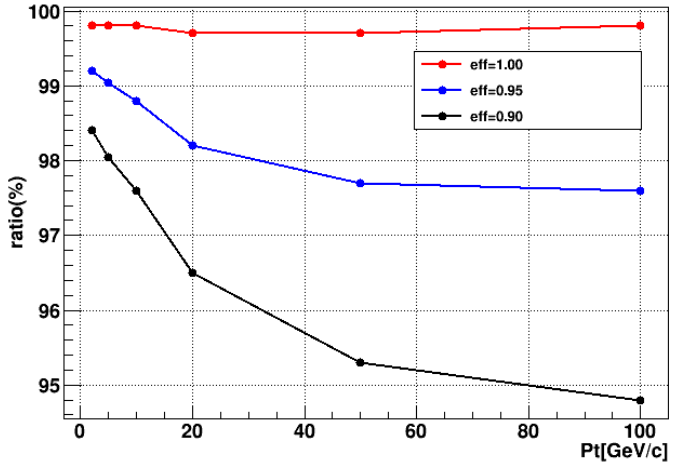
- 对于5层端盖的情况，在高动量会比4层端盖有更好的表现， 减少因为hit效率问题造成的事例的丢失，差别在2%左右。
- 桶部三层ITKB部分，受不同hit效率影响较低，差别小于1%。
- fast simulation具有局限性，相关的full simulation正在进行，下周会有一个初步的结果。

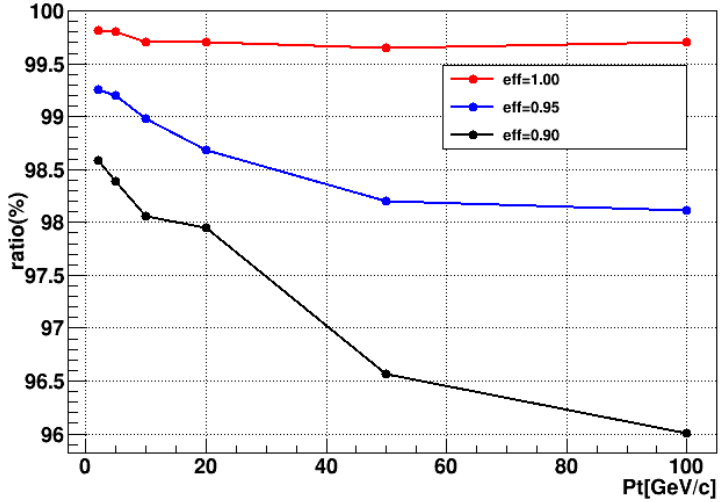
backup

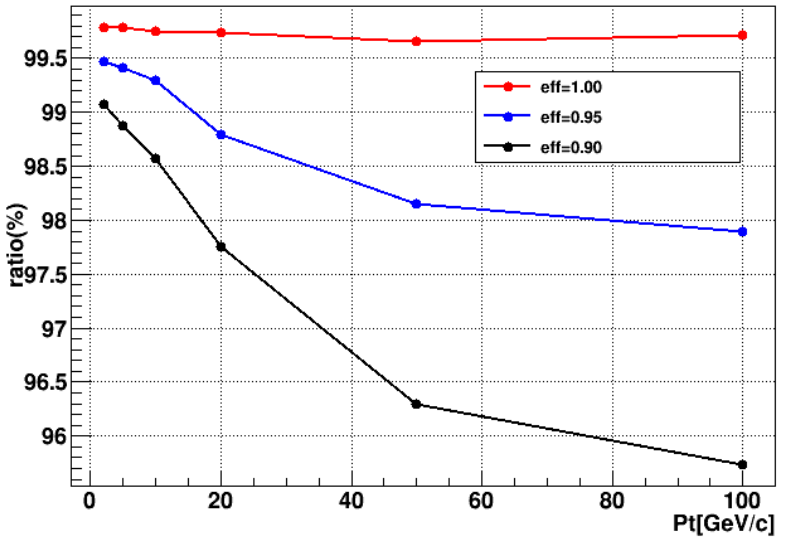

Δ(P_t)/P_t @ P_t=100GeV, θ=10°
eff=1.00, σ = 0.0156
eff=0.95, σ = 0.0219
eff=0.90, σ = 0.029


Δ(P_t)/P_t @ P_t=10GeV, θ=10°
eff=1.00, σ = 0.0054
eff=0.95, σ = 0.00605
eff=0.90, σ = 0.00691


Δ(P_t)/P_t @ P_t=2GeV, θ=10°
eff=1.00, σ = 0.005
eff=0.95, σ = 0.00541
eff=0.90, σ = 0.00598


eff=1.00
eff=0.95
eff=0.90
ratio(%)
Pt[GeV/c]


eff=1.00
eff=0.95
eff=0.90
ratio(%)
Pt[GeV/c]


eff=1.00
eff=0.95
eff=0.90
ratio(%)
Pt[GeV/c]