$\overline{D^0} \to K^+\pi^- \pi^0$

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■ $D^0 \rightarrow \pi^- \mu^+ \nu_\mu$

```
#
Decay D0
0.00267      pi-  mu+ nu_mu              PHOTOS  SLBKPOLE_Dtopilnu; #0.00267

#0.03945     K-  pi+                 PHSP;#0.03945
#0.1440      K-  pi+  pi0              D_DALITZ;#0.1440
#0.0822      pi+  K-  pi+  pi-           PHSP;#0.0822

#0.0014      pi+ pi-                 PHSP;#0.0014
#0.0572      anti-K0   pi+  pi-          D_DALITZ;#0.0286 * 2
#0.0149      pi+ pi- pi0               PHSP;#0.0149
Enddecay

#
Decay anti-D0
#0.00267      pi+ mu- anti-nu_mu           PHOTOS  SLBKPOLE_Dtopilnu;

0.03945     K+  pi-                  PHSP; #0.0389
0.1440      K+  pi- pi0               D_DALITZ;
0.0822      pi- K+ pi- pi+                  PHSP;

#0.0014      pi+ pi-                 PHSP;
#0.0572      K0  pi+ pi-                D_DALITZ;
#0.0149      pi+ pi- pi0               PHSP;
Enddecay
```

```
#
Decay D0
#0.00267     pi-  mu+ nu_mu              PHOTOS  SLBKPOLE_Dtopilnu; #0.00267

0.03945      K-  pi+                 PHSP;#0.03945
0.1440       K-  pi+  pi0              D_DALITZ;#0.1440
0.0822       pi+  K-  pi+  pi-           PHSP;#0.0822

#0.0014      pi+ pi-                 PHSP;#0.0014
#0.0572      anti-K0   pi+  pi-          D_DALITZ;#0.0286 * 2
#0.0149      pi+ pi- pi0               PHSP;#0.0149
Enddecay

#
Decay anti-D0
0.00267      pi+ mu- anti-nu_mu           PHOTOS  SLBKPOLE_Dtopilnu;

#0.03945     K+  pi-                  PHSP; #0.0389
#0.1440      K+  pi- pi0               D_DALITZ;
#0.0822      pi- K+ pi- pi+                  PHSP;

#0.0014      pi+ pi-                 PHSP;
#0.0572      K0  pi+ pi-                D_DALITZ;
#0.0149      pi+ pi- pi0               PHSP;
Enddecay
```

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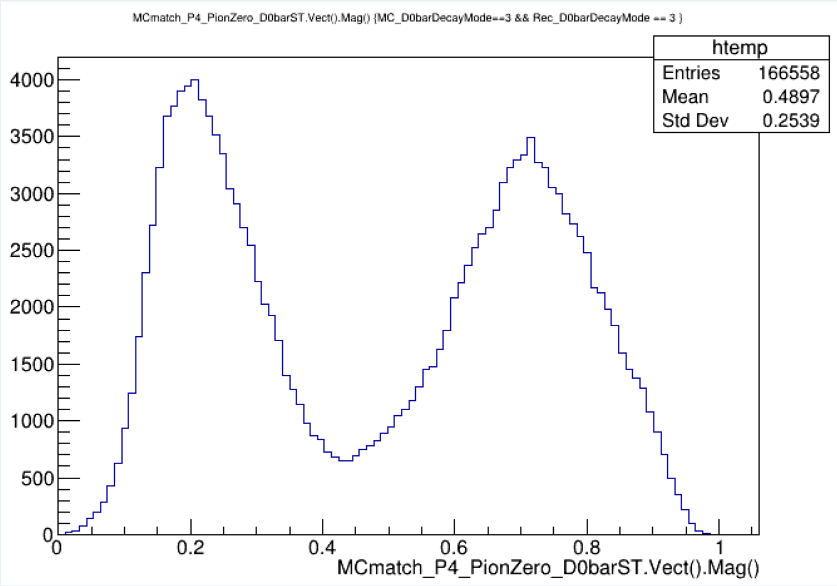
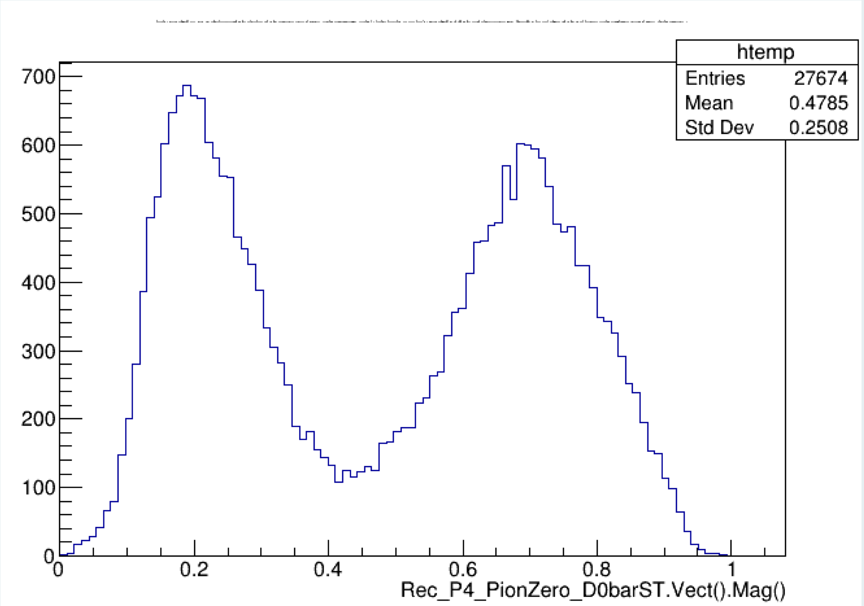
■ 标记道$\overline{D^0} \to K^+\pi^-\ \pi^0$ OSCAR@0819

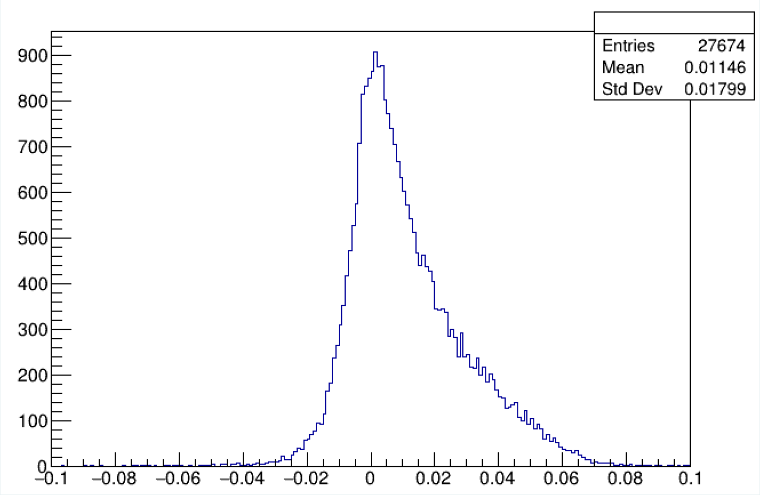


$\left|\vec{P}_{\pi^0}\right|_{truth}\ (\overline{D_0} \to K^+\pi^-\pi^0)$



$\left|\vec{P}_{\pi^0}\right|_{Rec}\ (\overline{D_0} \to K^+\pi^-\pi^0)$

$after\ All\ selection$

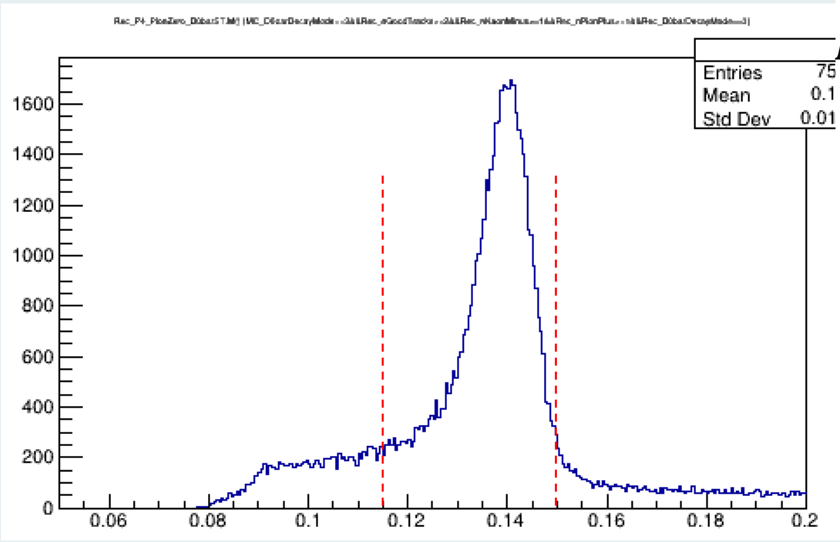


$\left|\vec{P}_{\pi^0}\right|_{truth} - \left|\vec{P}_{\pi^0}\right|_{Rec}$

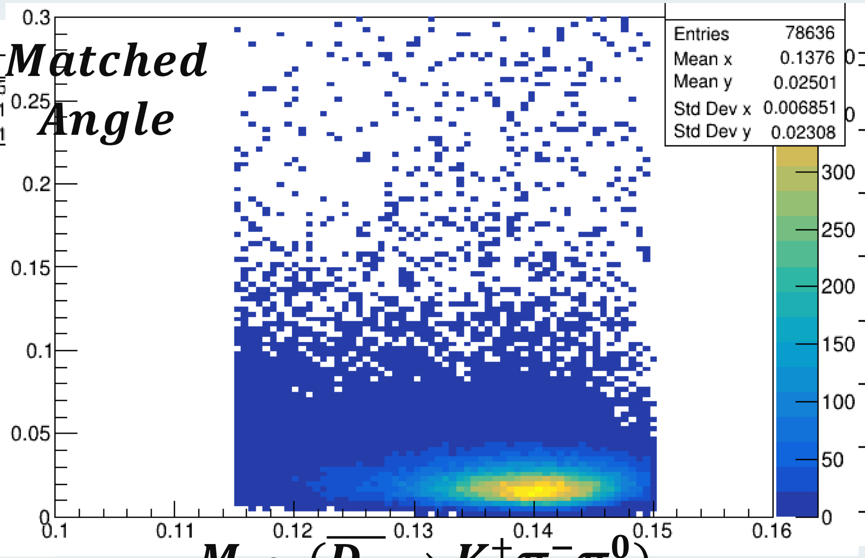
$after\ All\ selection$

- 产生子使用了Dalitz，动量分布有结构

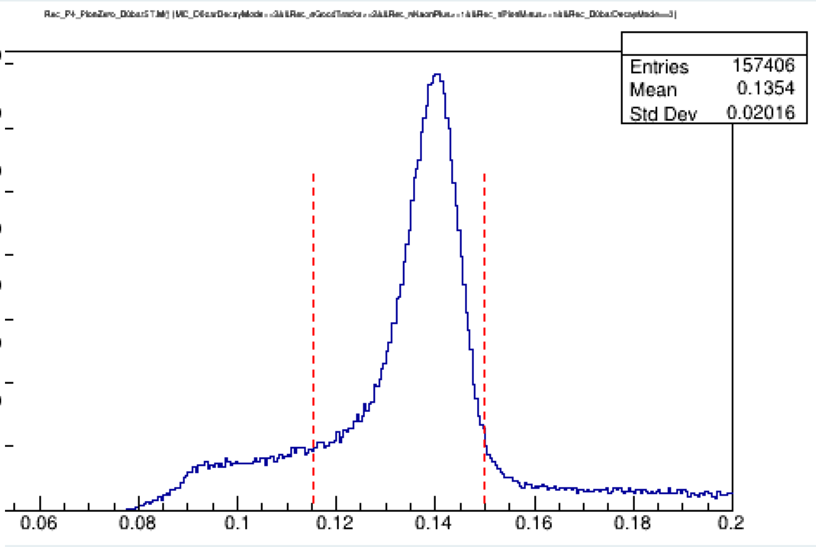
■ 标记道$\overline{D^0} \rightarrow K^+\pi^-\pi^0$　OSCAR2.6.2 @0603发行版



M_{π^0} $(D_0 \rightarrow K^-\pi^+\pi^0)$



M_{π^0} $(\overline{D_0} \rightarrow K^+\pi^-\pi^0)$



M_{π^0} $(\overline{D_0} \rightarrow K^+\pi^-\pi^0)$

- 筛选条件：

GoodTrack && PID
&& 三个标记道中ΔE最小
&& $M_{\pi^0} \in (0.115, 0.150) GeV/c^2$
&& $\Delta E \in (-40, 55) MeV$
&& $M_{BC} \in (1.859, 1.873)\ GeV/c^2$

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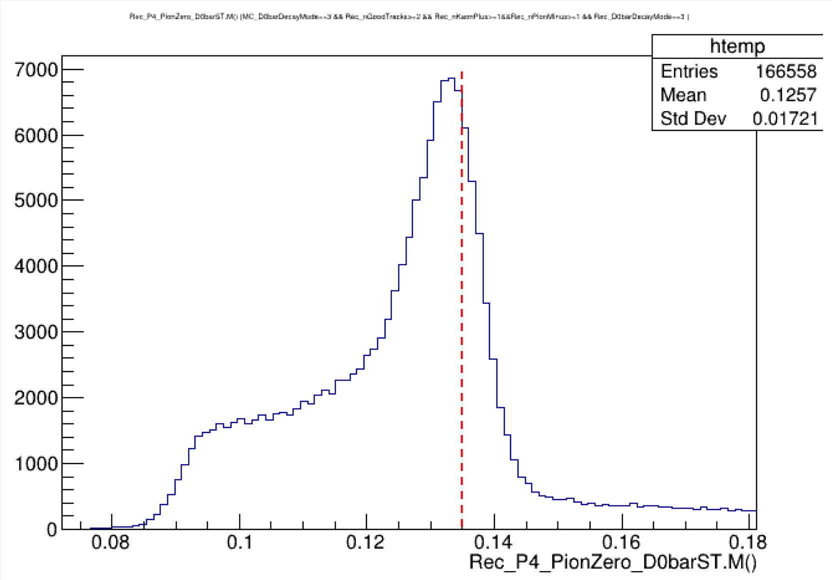
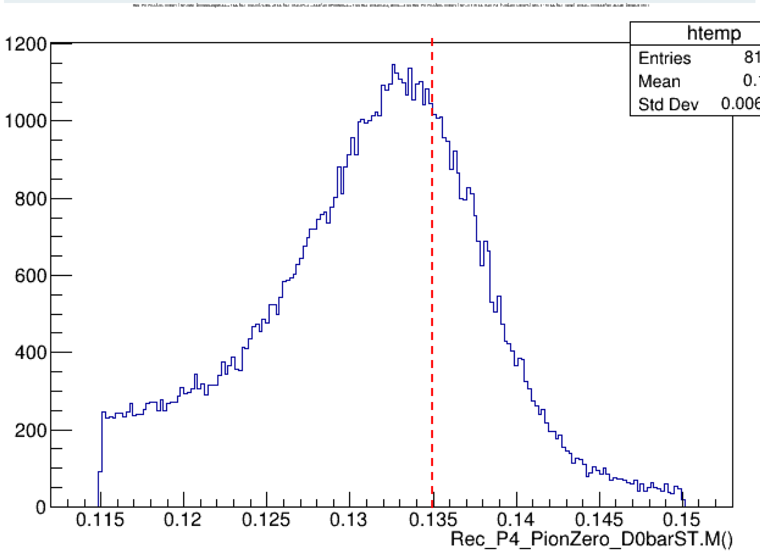
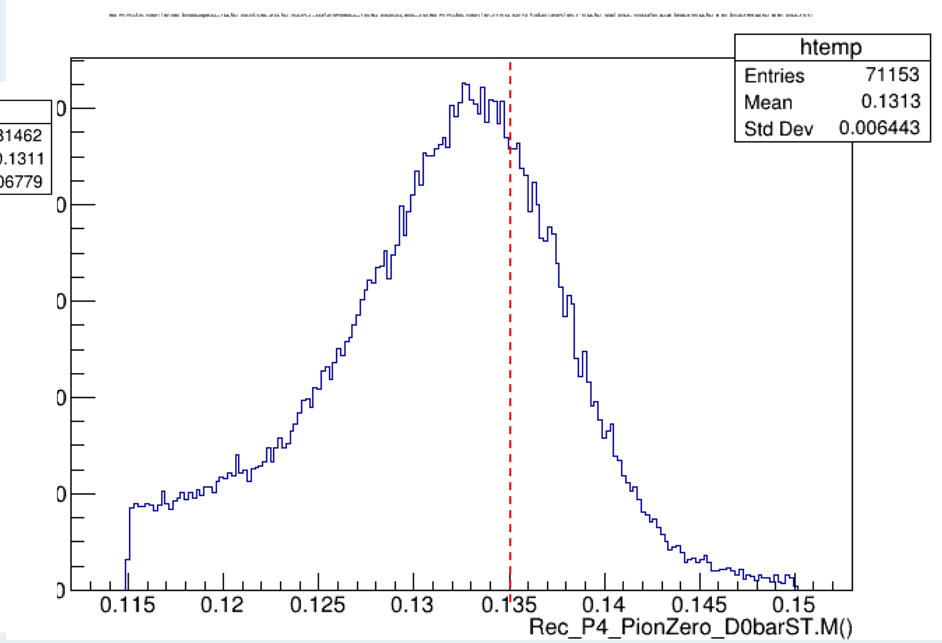
■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0819



M_{π^0} $(\overline{D_0} \to K^+\pi^-\pi^0)$



M_{π^0} $(\overline{D_0} \to K^+\pi^-\pi^0)$



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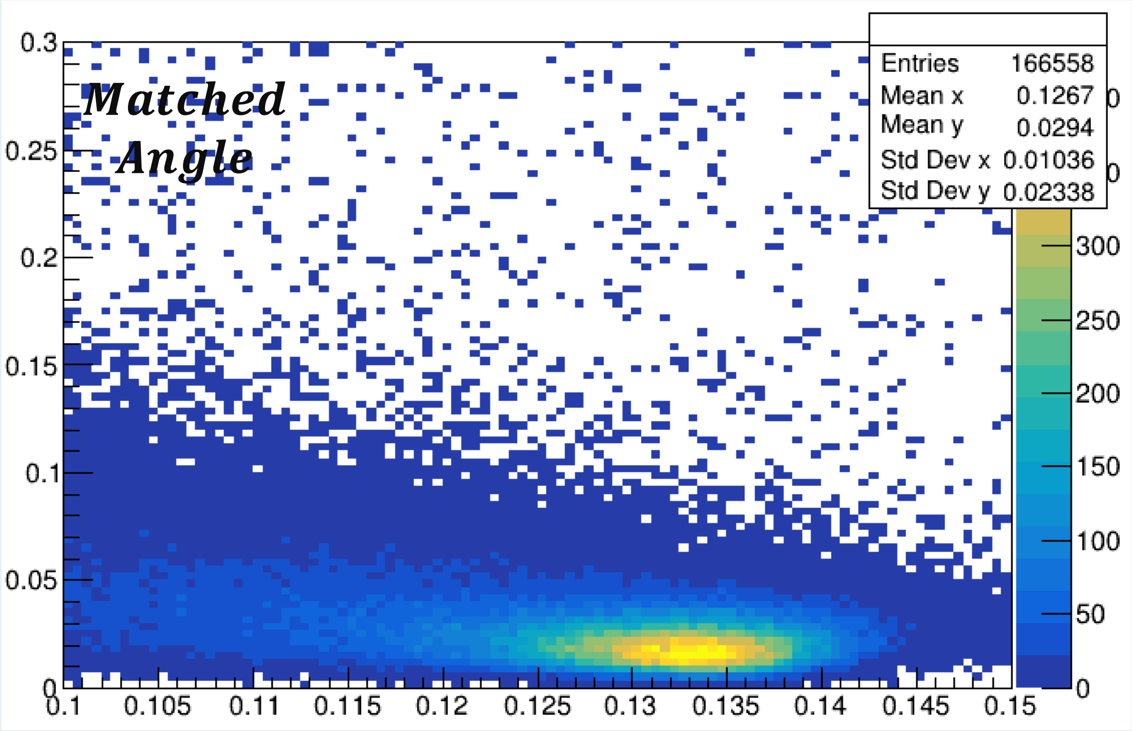
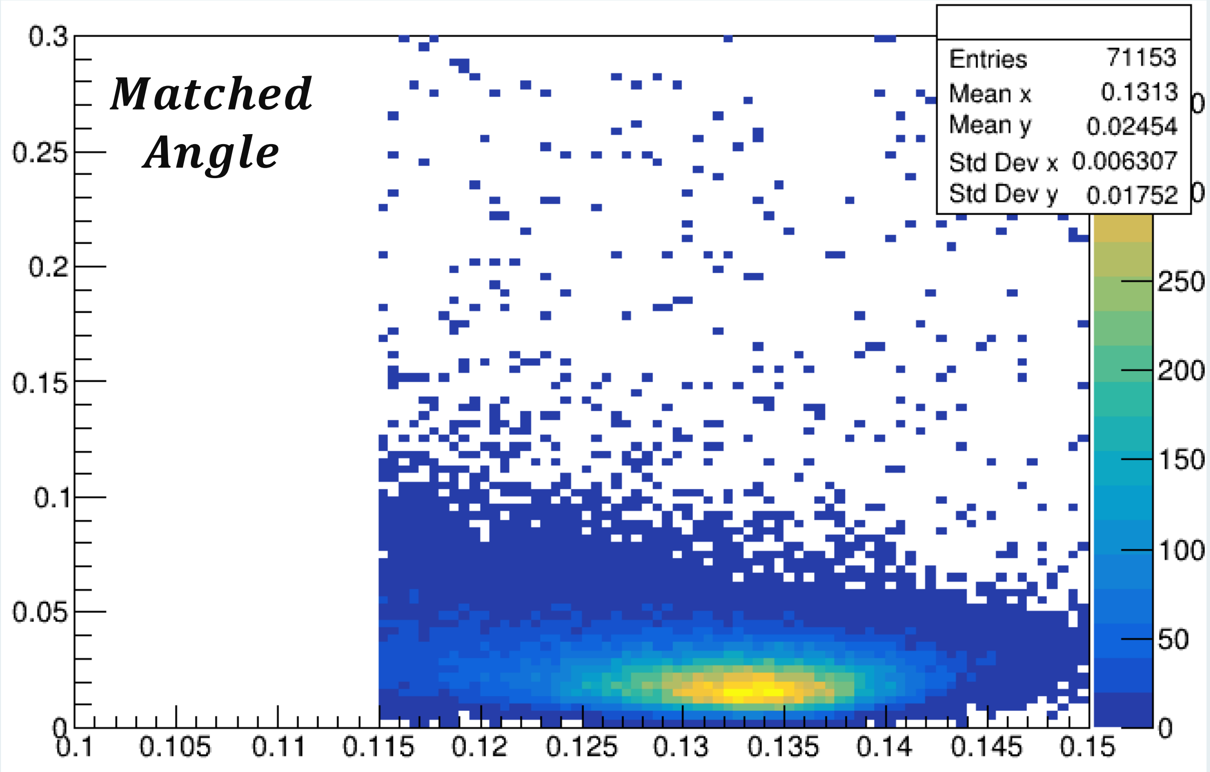


M_{π^0} $(\overline{D_0} \to K^+\pi^-\pi^0)$



M_{π^0} $(\overline{D_0} \to K^+\pi^-\pi^0)$

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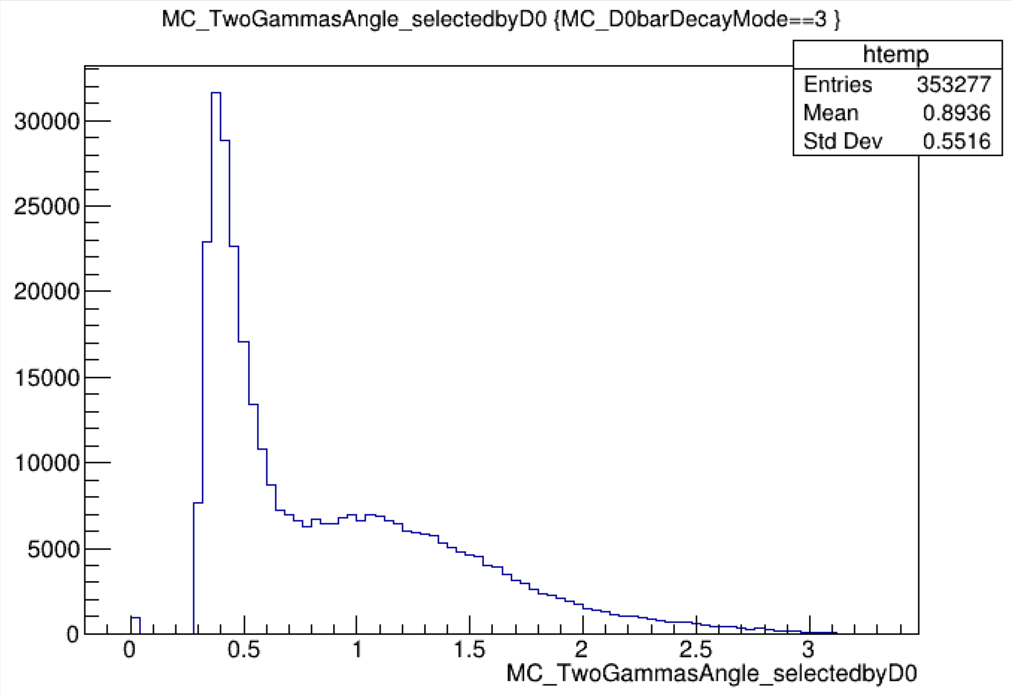
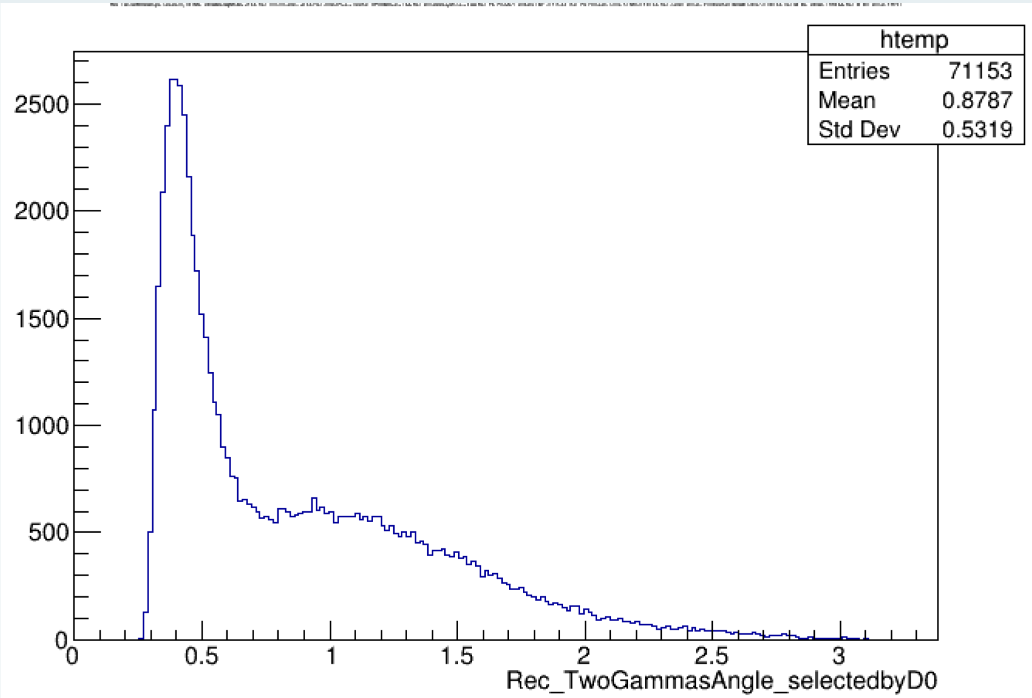
■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0819



$\angle_{\gamma_1\gamma_2}$ ***Truth***

无筛选



$\angle_{\gamma_1\gamma_2}$ ***Rec***

- 可能需要Gamma 极角分布

- 筛选条件：

GoodTrack && PID

&& 三个标记道中ΔE最小

&& $M_{\pi^0} \in (0.115, 0.150) GeV/c^2$

&& $\Delta E \in (-40, 55) MeV$

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■ $\overline{D^0} \to K^+\pi^- \pi^0$

- 研究ECAL分辨对物理道影响

  → 快模拟输入：$n_{\sigma_E}, n_{\sigma_\theta}, n_{\sigma_\phi} =_? k * scale$倍数 → 自行检验

  → 快模拟拿不到ECAL Hit Position，无法计算 $\sigma_{position}$

  → 物理道$Shower$能量不固定，不好计算 σ_E/E

  → 给出 $\sigma_E - \sigma_{M_{\pi^0}}$ 和 $n_{\sigma_\theta}, n_{\sigma_\phi} - \sigma_{M_{\pi^0}}$ 关系

- 思路：

  固定$\sigma_\theta\ \sigma_\phi$，扫描$\sigma_E$

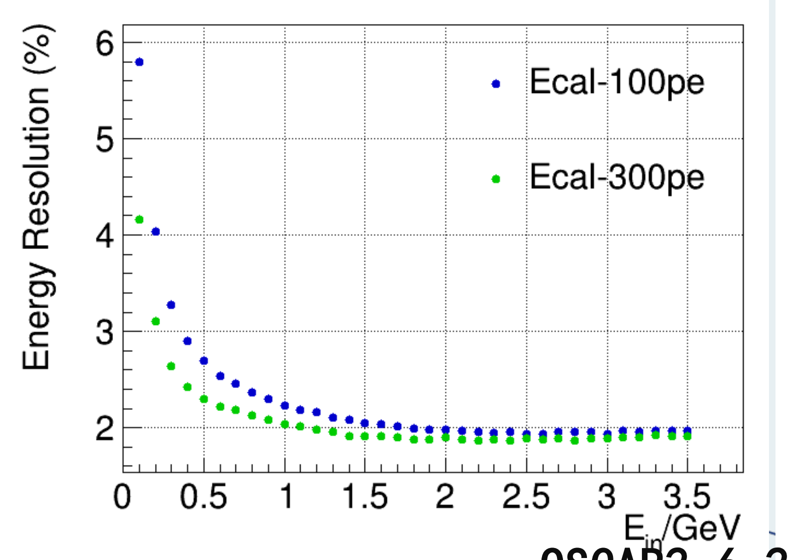
  固定σ_E，扫描$\sigma_\theta\ \sigma_\phi$

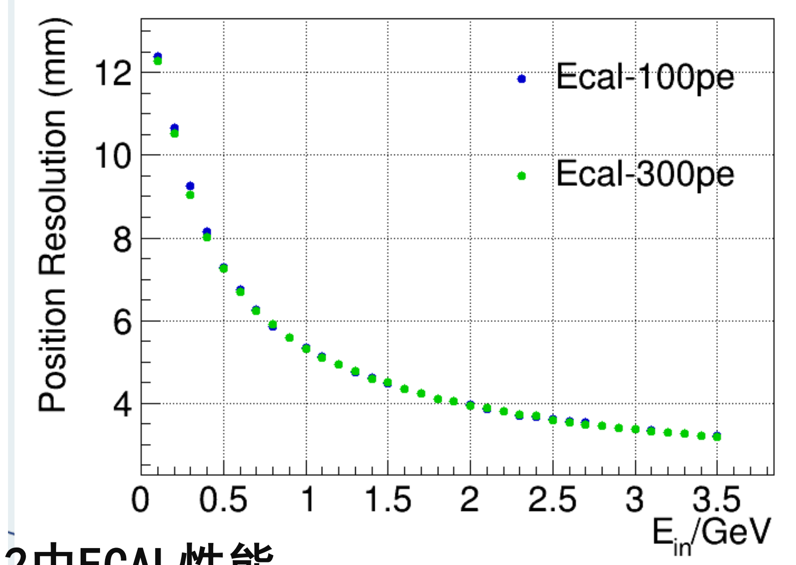
  → 单项效率对物理道影响

桶部性能整体优于端盖：　正比例Scale $\sigma_{position}$ 和 σ_E

晶体尺寸↑，$\sigma_E\uparrow, \sigma_{position}\downarrow$：　反比例Scale $\sigma_{position}$ 和 σ_E

→ 更贴进探测器设计情况





- ✓ $\sigma_E = 2.03\%$ @ 1 GeV
- ✓ $\sigma_E = 4.16\%$ @ 0.1 GeV
- ✓ With background
- ✓ Meet the requirement

- ✓ $\sigma_{pos} = 5.3$ mm @ 1 GeV
- ✓ With background
- ✓ Meet the requirement

OSCAR2.6.2中ECAL性能

■ $\overline{D^0} \to K^+\pi^- \pi^0$

- 注意到：ECAL使用$\sigma_{position}$，快模拟使用σ_θ，σ_ϕ

$$\Sigma_{\text{cart}} = \begin{pmatrix} \sigma^2_{\text{position}} & 0 & 0 \\ 0 & \sigma^2_{\text{position}} & 0 \\ 0 & 0 & \sigma^2_{\text{position}} \end{pmatrix}$$

■ 检查坐标变换：

- 假设：

直角坐标协方差矩阵Σ_{cart}，xyz分量服从相同分布

- 直角坐标→球坐标： 雅可比矩阵 J
- 球坐标系协方差矩阵：

$$\Sigma_{sph} = J * \Sigma_{cart} * J^T = \sigma^2_{position} J J^T$$

$$r = \sqrt{x^2+y^2+z^2}$$
$$\theta = \arccos\left(\frac{z}{r}\right)$$
$$\phi = \arctan 2(y, x)$$

$$\mathbf{J} = \begin{pmatrix} \frac{\partial r}{\partial x} & \frac{\partial r}{\partial y} & \frac{\partial r}{\partial z} \\ \frac{\partial \theta}{\partial x} & \frac{\partial \theta}{\partial y} & \frac{\partial \theta}{\partial z} \\ \frac{\partial \phi}{\partial x} & \frac{\partial \phi}{\partial y} & \frac{\partial \phi}{\partial z} \end{pmatrix}$$

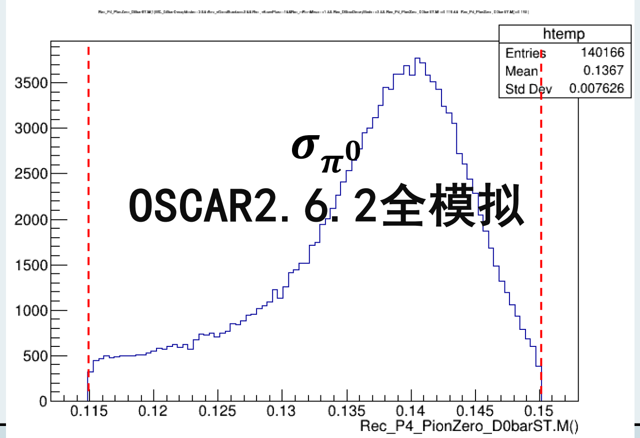
- $\sigma_\theta = \sqrt{(\Sigma_{sph})_{22}} = \frac{\sigma_{position}}{r}$
- $\sigma_\phi = \sqrt{(\Sigma_{sph})_{33}} = \frac{\sigma_{position}}{\sqrt{x^2+y^2}}$

$$\frac{\partial r}{\partial x} = \frac{x}{r}, \quad \frac{\partial r}{\partial y} = \frac{y}{r}, \quad \frac{\partial r}{\partial z} = \frac{z}{r}$$
$$\frac{\partial \theta}{\partial x} = \frac{xz}{r^2\sqrt{x^2+y^2}}, \quad \frac{\partial \theta}{\partial y} = \frac{yz}{r^2\sqrt{x^2+y^2}}, \quad \frac{\partial \theta}{\partial z} = -\frac{\sqrt{x^2+y^2}}{r^2}$$
$$\frac{\partial \phi}{\partial x} = -\frac{y}{x^2+y^2}, \quad \frac{\partial \phi}{\partial y} = \frac{x}{x^2+y^2}, \quad \frac{\partial \phi}{\partial z} = 0$$

- 没有常数项 & 高次项 ，
  可以用相同倍数scale $\sigma_{position}$ 和 σ_θ，σ_ϕ

■ $\overline{D^0} \to K^+\pi^- \pi^0$

- ➢ 计算$\sigma_{M_{\pi^0}}$和$\epsilon_{M_{\pi^0}}$时使用本物理课题cut flow
- ➢ 避免M_{π^0}长尾干扰 ，统计$\overline{M_{\pi^0}}$和$\sigma_{M_{\pi^0}}$时 cut ①,②,③, ④

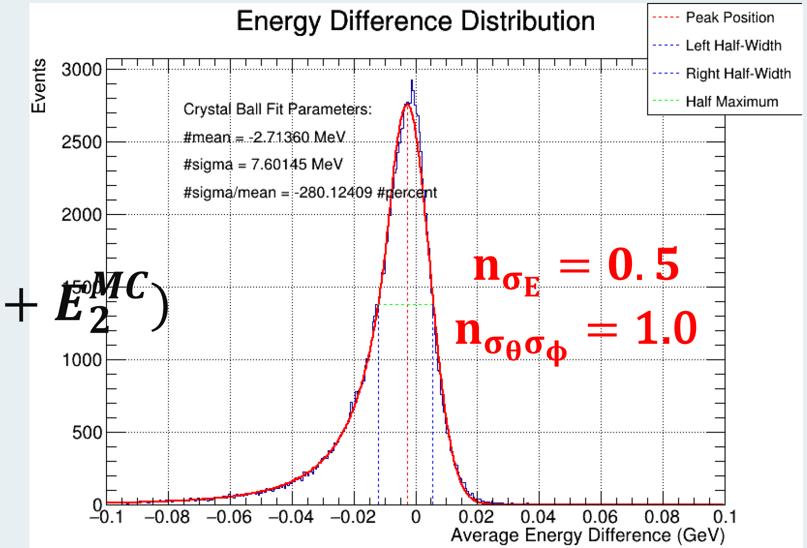


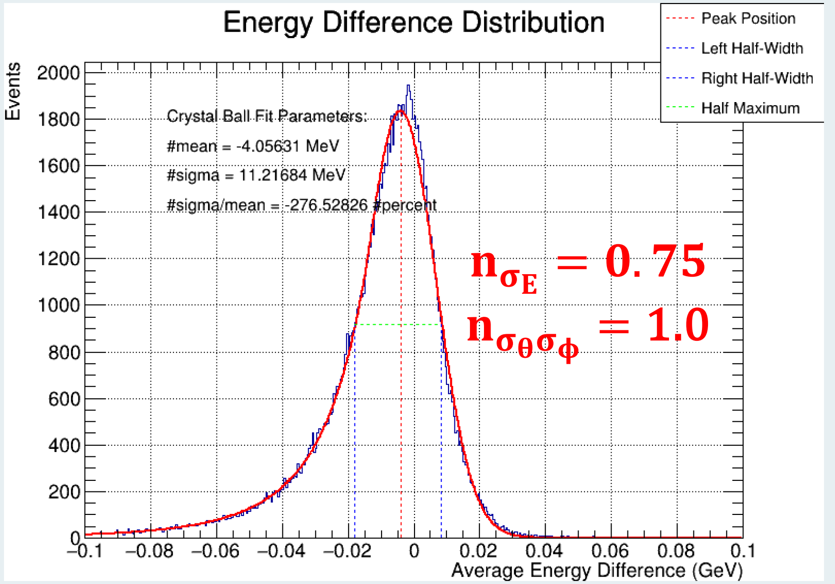
■ OSCAR2.6.2发行版：全模拟cut flow With Beam BKG

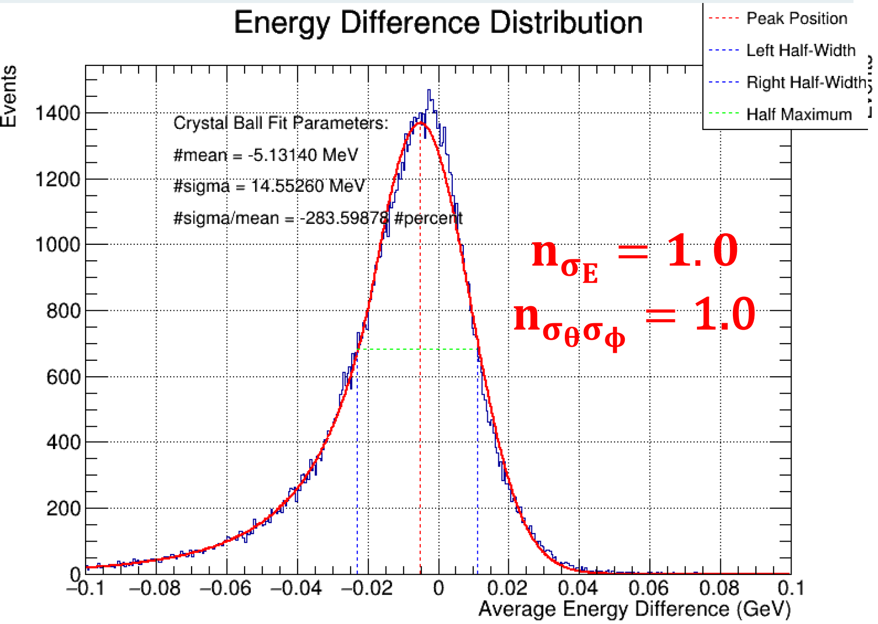
	类型	说明	筛选前后事例数		相对效率	绝对效率
$\overline{D^0} \to K^+\pi^- \pi^0$	①$N_{goodtrack} \geq 2$		361168	361138	100%	
	② PID	$N_{K^+} \geq 1 \&\& N_{\pi^-} \geq 1$		267315	74.01%	
	③ΔE在三个单标记道中最小	误组合效率		188921	70.67%	
	④$M_{\pi^0} \in (0.115, 0.150)$ GeV/c^2			140166	74.19%	
	⑤$\Delta E \in (-40, 55) MeV$			120053	85.65%	
	⑥$M_{BC} \in (1.859, 1.873)$ GeV/c^2			108253	90.17%	29.97%
$D^0 \to \pi^-\mu^+\nu_\mu$	$N_{goodtrack} \geq 4$			108253	100%	
	$N_{\mu^+} = 1 \&\& N_{\pi^-} = 2$	PID		59003	54.50%	
	$N_{others} = 0$	排除假径迹		57558	97.55%	15.93%

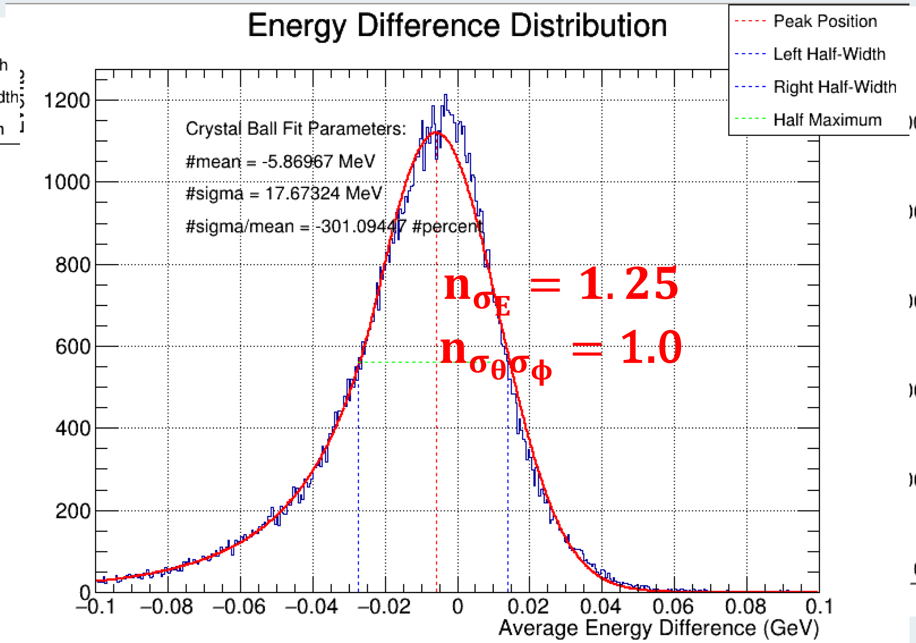
■ $\overline{D^0} \to K^+\pi^-\pi^0$

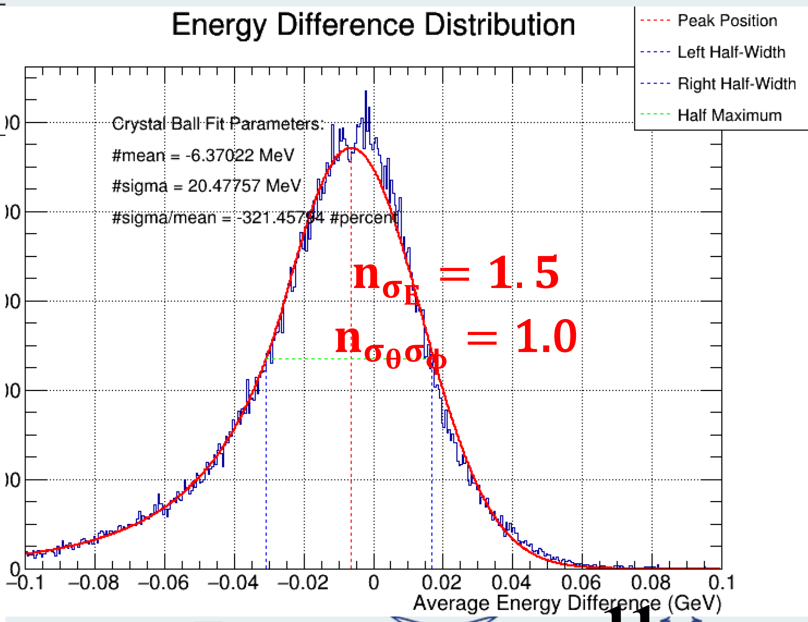
- $\pi^0 \to \gamma\gamma$,
- 将能量分辨表示为双光子之和：
- ➢ $\Delta E_{shower} = (E_1^{Rec} + E_2^{Rec}) - (E_1^{MC} + E_2^{MC})$
  - ➢ 避免误匹配
- ➢ 使用ECAL代码：
  - ➢ 水晶球函数拟合调参
  - ➢ 不便拟合本底
  - ➢ $\sigma_E^{ECAL} = \sigma_{\Delta E_{shower}}/\sqrt{2}$





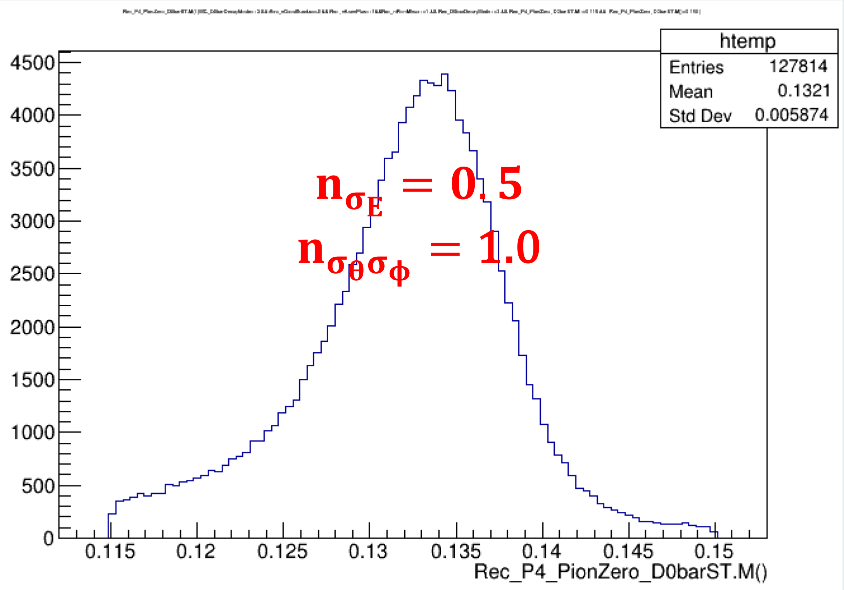


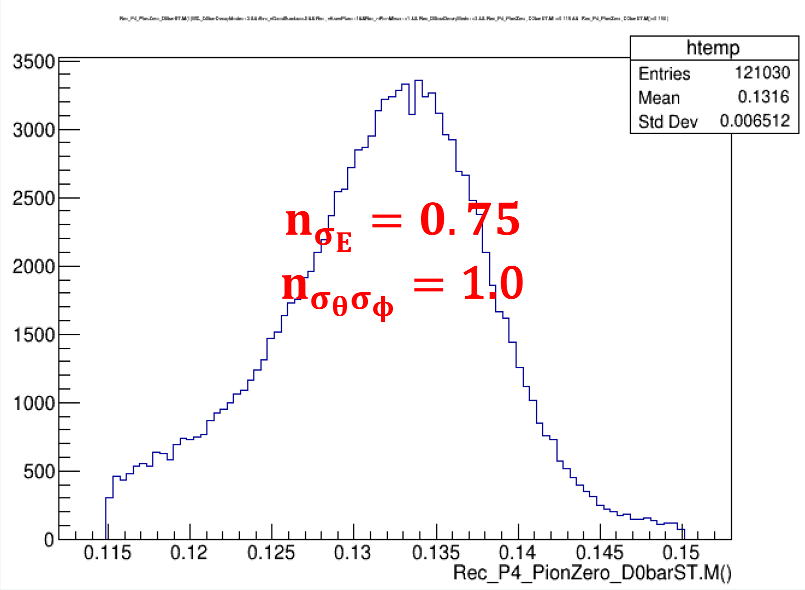


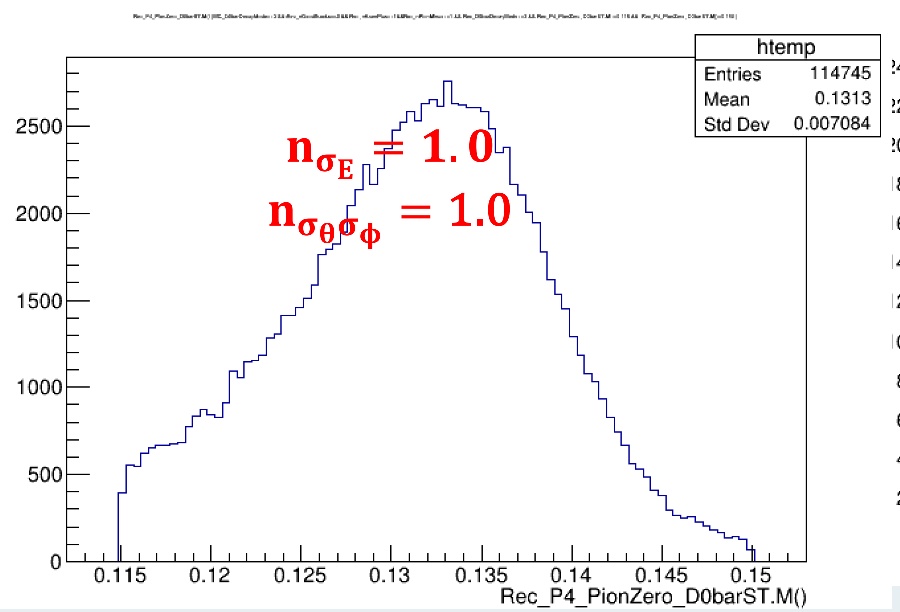


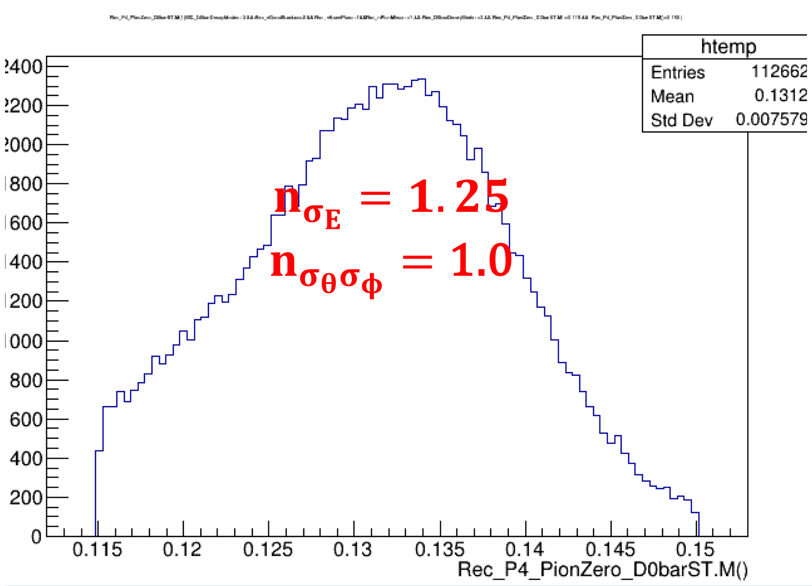
■ $\overline{D^0} \rightarrow K^+\pi^-\pi^0$, $\pi^0 \rightarrow \gamma\gamma$

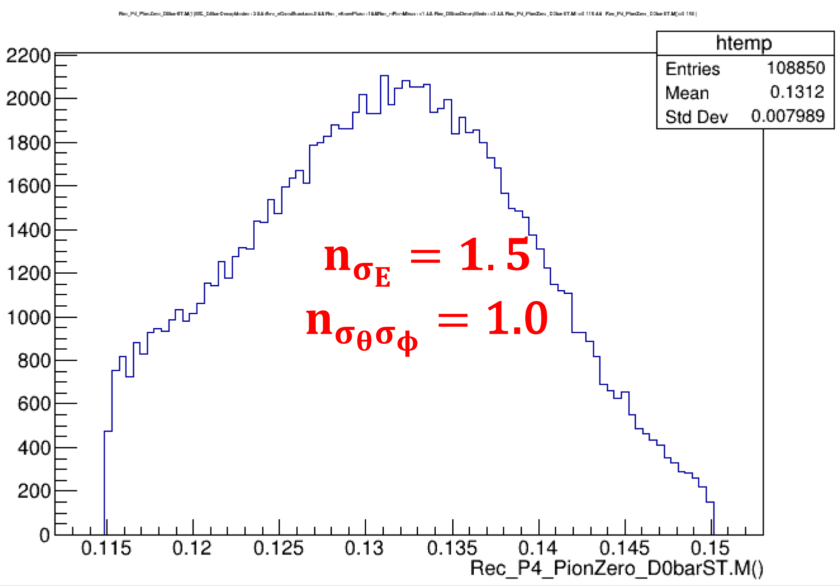
- $\sigma_{M_{\pi^0}}$使用直方图数据 +分析cut条件











- 标记道$\overline{D^0} \to K^+\pi^-\pi^0$　　OSCAR@0603
- 只改变能量分辨：

n_{σ_E}	0.5	0.75	1.0	1.25	1.5	OSCAR262 全模拟
$n_{\sigma_\theta}, n_{\sigma_\phi}$	1.0	1.0	1.0	1.0	1.0	
$\overline{M_{\pi^0}}$	$132.1\ MeV$	$131.6\ MeV$	$\mathbf{131.3\ MeV}$	$131.2\ MeV$	$131.2\ MeV$	$\mathbf{136.7\ MeV}$
$\sigma_{M_{\pi^0}}$	$5.874\ MeV$	$6.512\ MeV$	$\mathbf{7.084\ MeV}$	$7.579\ MeV$	$7.989MeV$	$\mathbf{7.626\ MeV}$
$\epsilon_{M_{\pi^0}}$	91.94%	88.90%	**85.39%**	82.03%	78.69%	**74.19%**
ϵ_{ST}	24.14%	22.66%	**21.26%**	20.58%	19.69%	**29.97%**
$\sigma_{\Delta E_{shower}}/\sqrt{2}$	$\mathbf{5.38\ MeV}$	$\mathbf{7.93\ MeV}$	$\mathbf{10.29\ MeV}$	$\mathbf{12.50\ MeV}$	$\mathbf{14.48MeV}$	
$\overline{\Delta E_{shower}}/2$	$\mathbf{-1.36\ MeV}$	$\mathbf{-2.03\ MeV}$	$\mathbf{-2.57\ MeV}$	$\mathbf{-2.93\ MeV}$	$\mathbf{-3.19MeV}$	

- n_{σ_E}的$scale$倍数基本与$\sigma_{\Delta E_{shower}}/\sqrt{2}$符合
- 推测$n_{\sigma_\theta}, n_{\sigma_\phi} \approx scale$倍数

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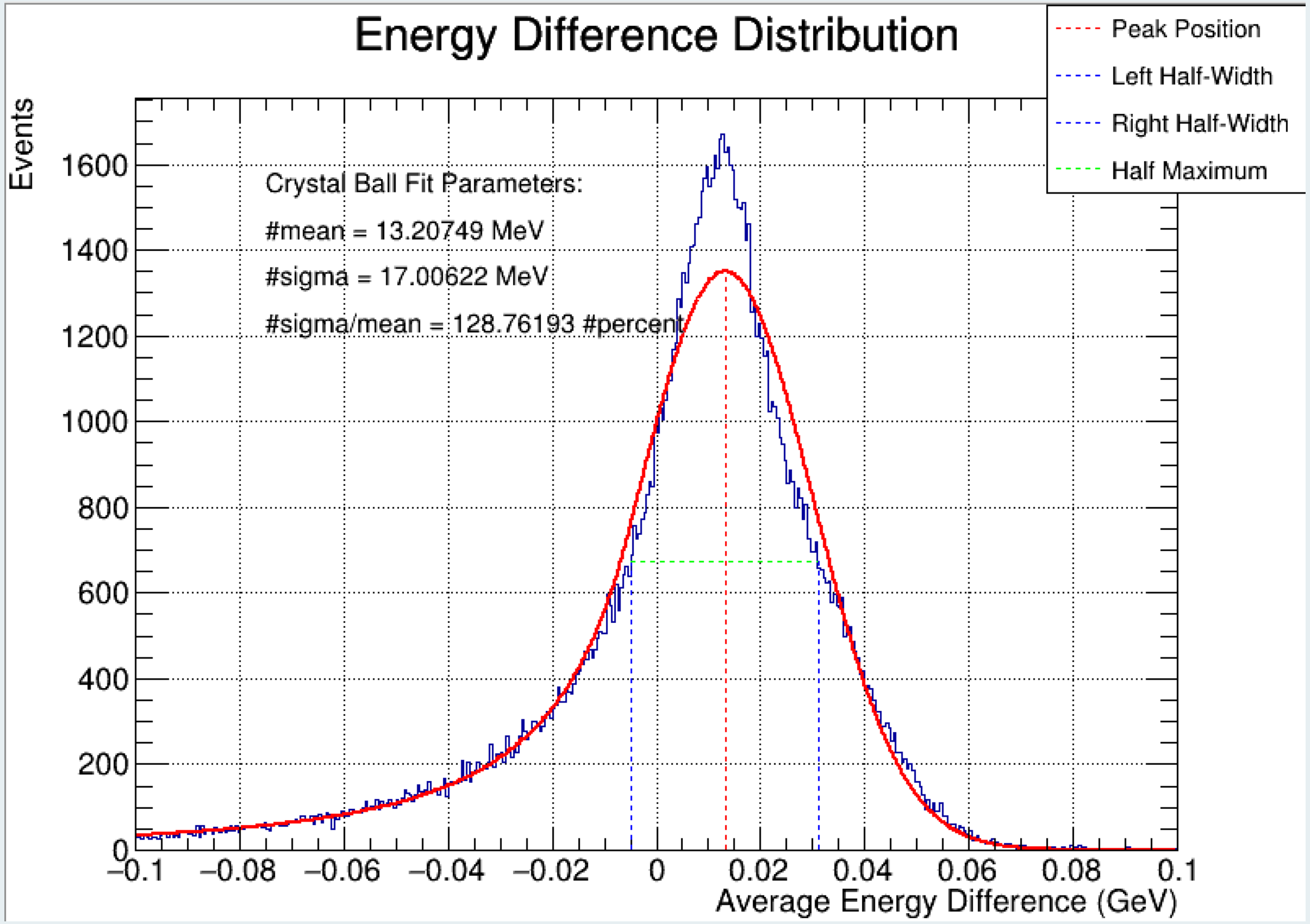
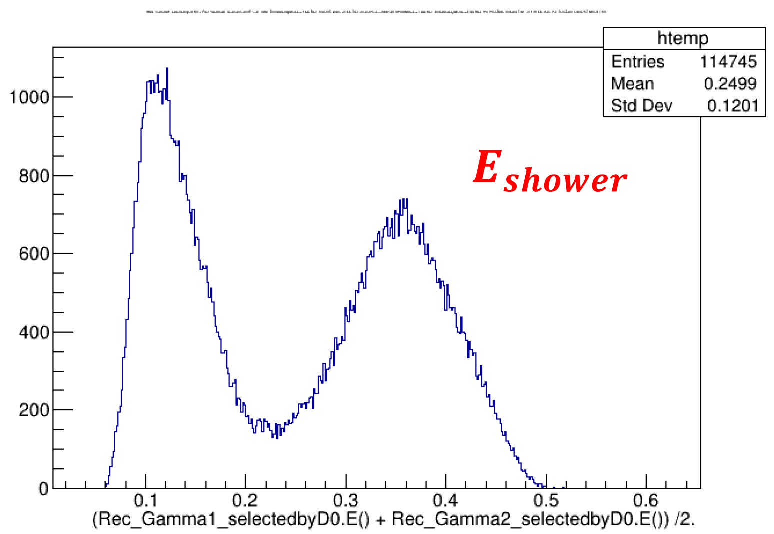
■ 标记道$\overline{D^0} \to K^+\pi^-\ \pi^0$
OSCAR@0603



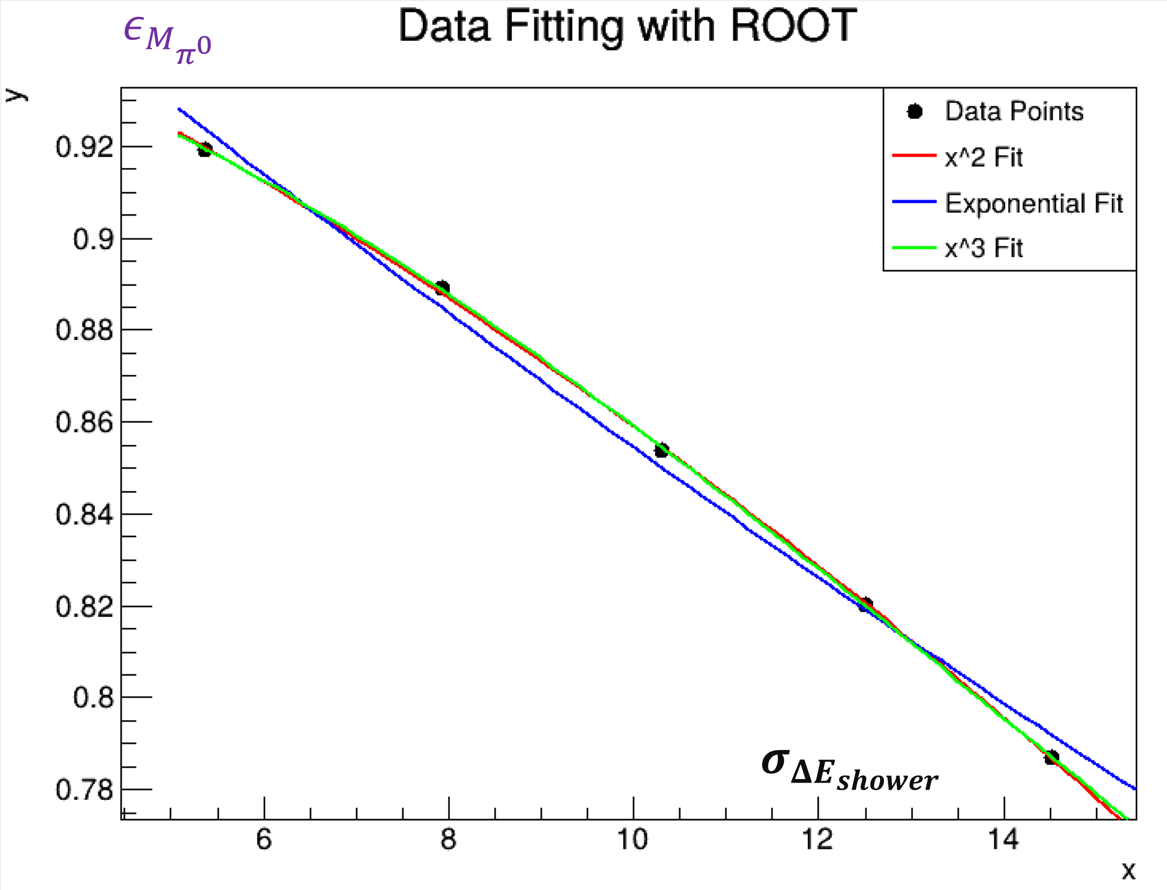
■ OSCAR2.6.2 ： 全模拟

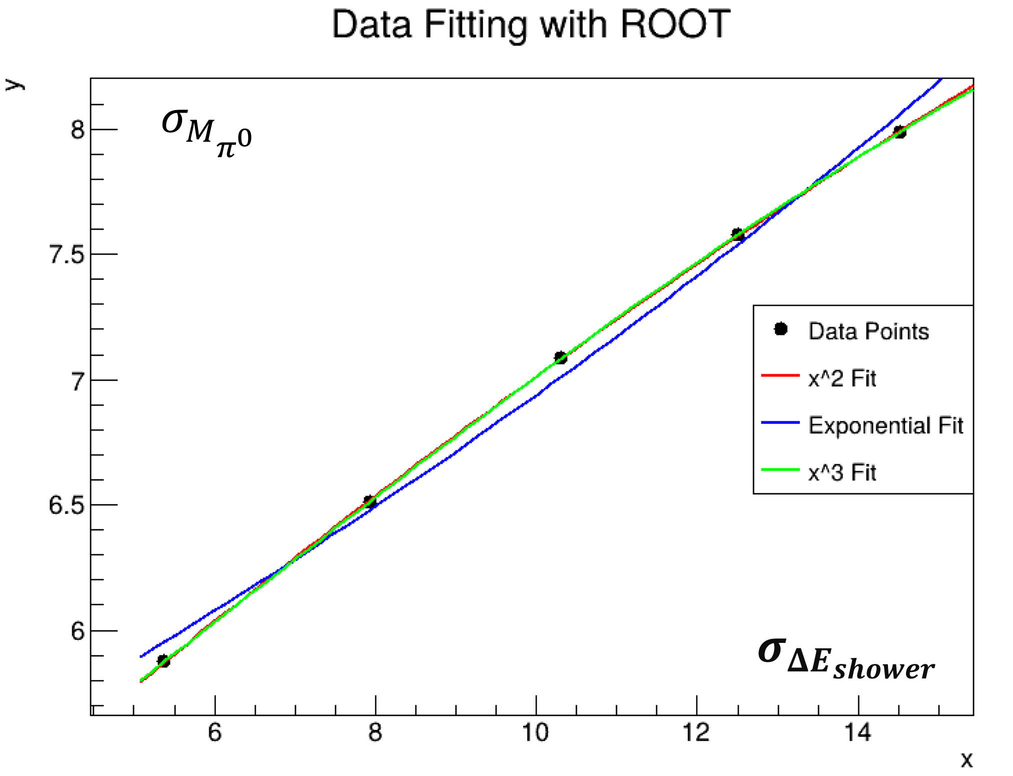
- 没拟合上，不是标准的水晶球

■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603



y = 0.9732 + -0.0082*x + -0.0003*x^2

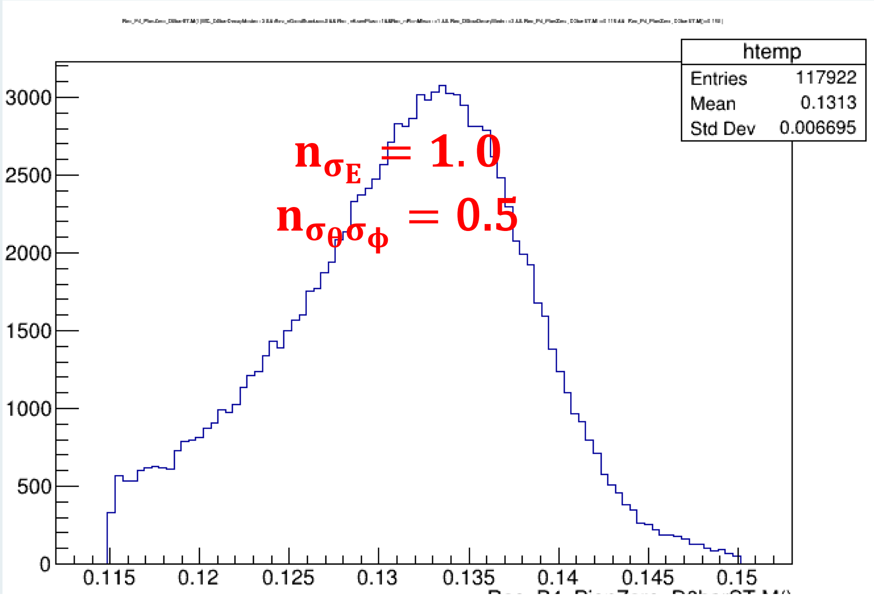


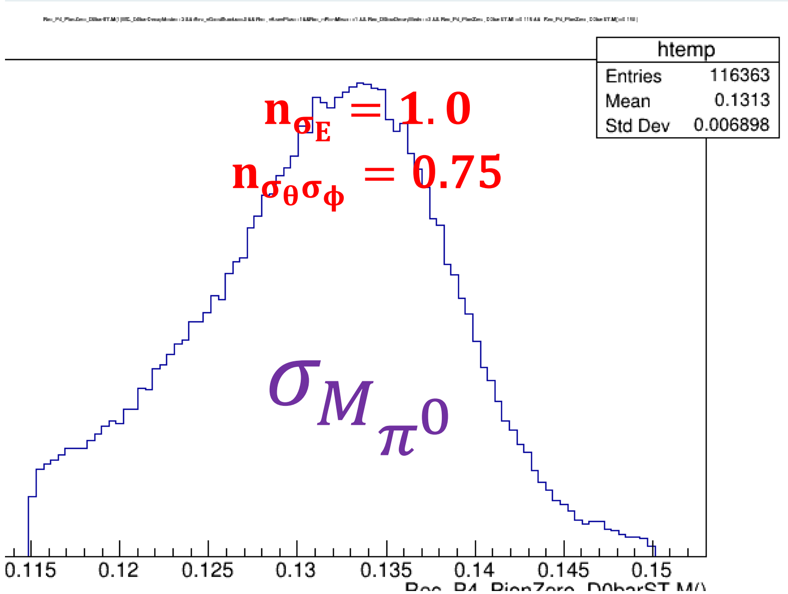


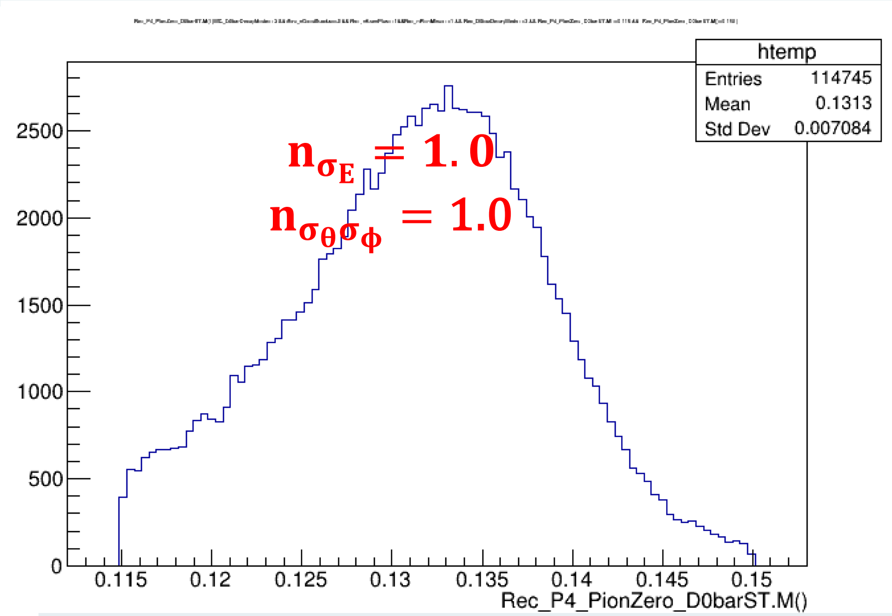
y = 4.3713 + 0.2968*x + -0.0033*x^2

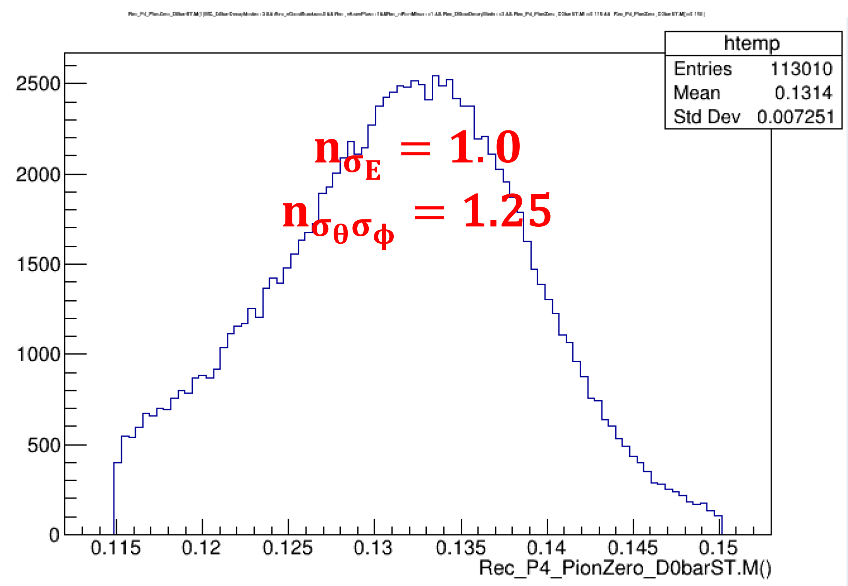
■ 标记道$\overline{D^0} \rightarrow K^+\pi^-\pi^0$ OSCAR@0603快模拟

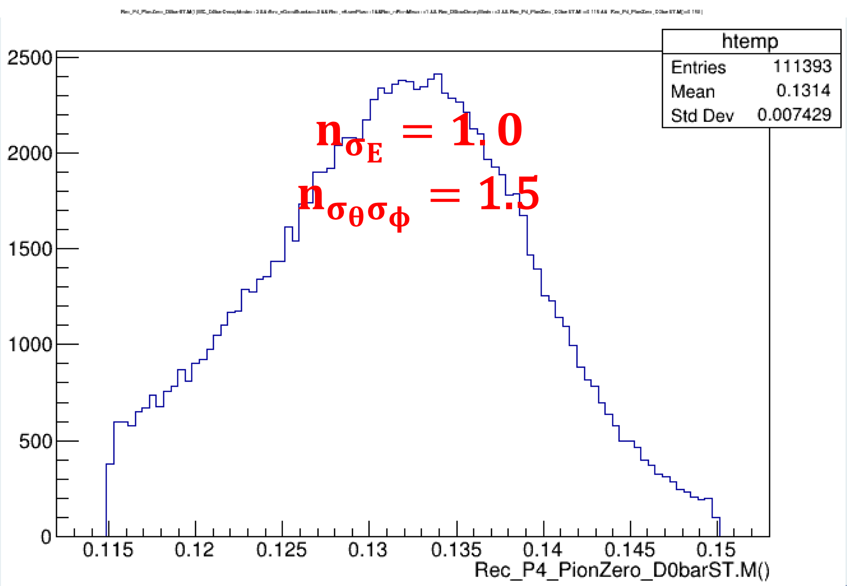
- 只改变位置分辨：











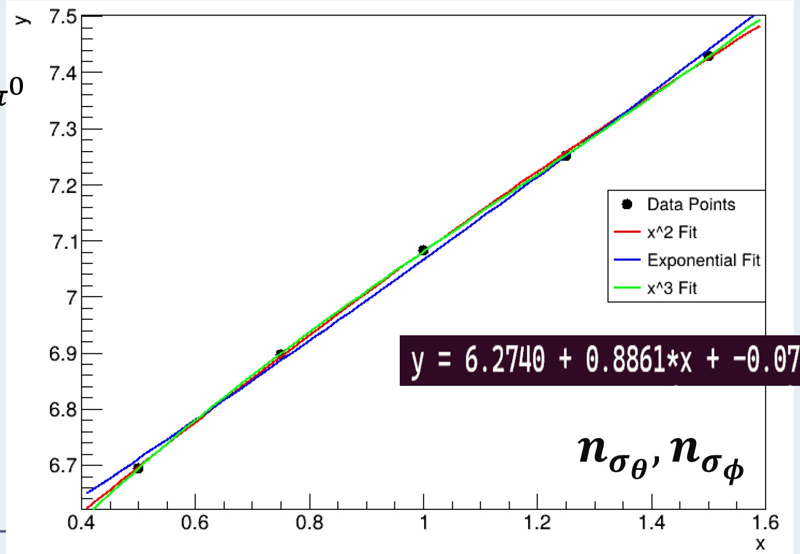
- 更多图片详见BackUp

■ 标记道$\overline{D^0} \to K^+\pi^- \pi^0$ OSCAR@0603

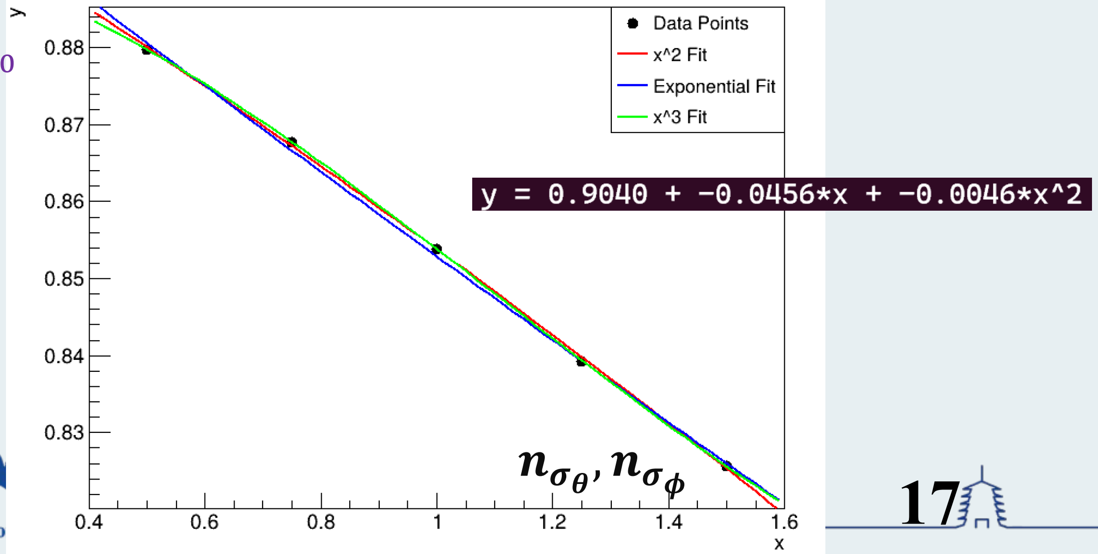
• 只改变位置分辨：

n_{σ_E}	1.0	1.0	1.0	1.0	1.0	OSCAR262 全模拟
$n_{\sigma_\theta}, n_{\sigma_\phi}$	0.5	0.75	1.0	1.25	1.5	
$\overline{M_{\pi^0}}$	$131.3\ MeV$	$131.3\ MeV$	$\mathbf{131.3\ MeV}$	$131.3\ MeV$	$131.4\ MeV$	$\mathbf{136.7\ MeV}$
$\sigma_{M_{\pi^0}}$	$6.695\ MeV$	$6.898\ MeV$	$\mathbf{7.084\ MeV}$	$7.251\ MeV$	$7.429 MeV$	$\mathbf{7.626\ MeV}$
$\epsilon_{M_{\pi^0}}$	87.98%	86.77%	**85.39%**	83.93%	82.56%	**74.19%**
ϵ_{ST}	22.44%	21.85%	**21.26%**	20.72%	20.23%	**29.97%**

$\sigma_{M_{\pi^0}}$

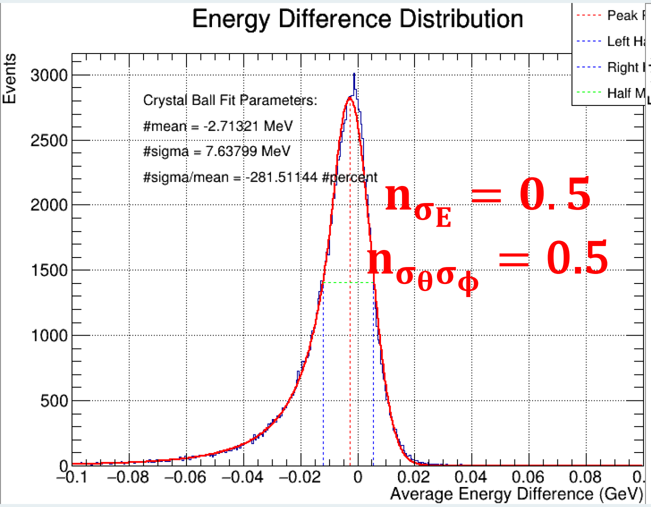


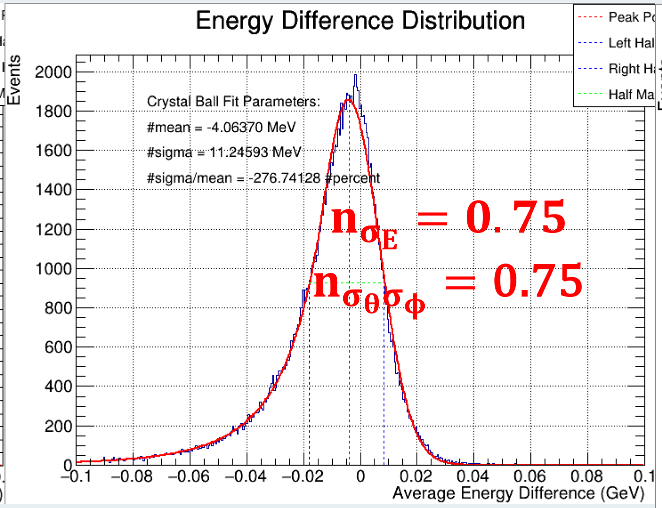
$\epsilon_{M_{\pi^0}}$

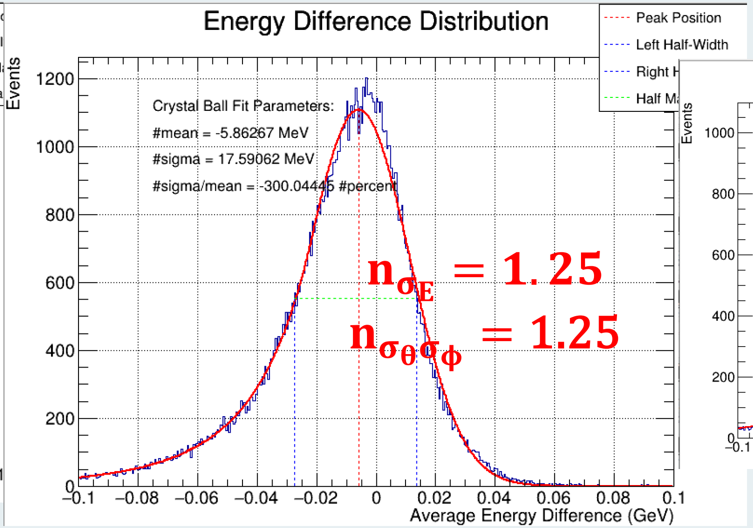


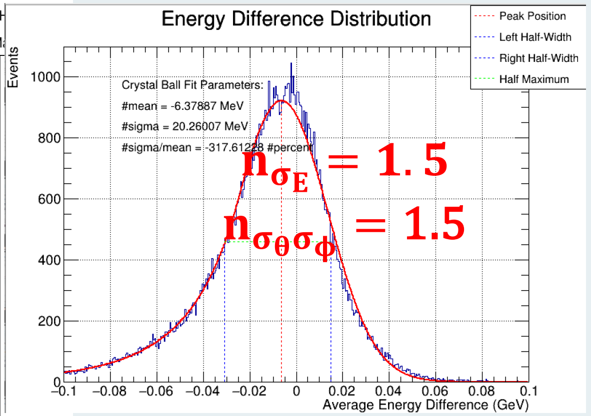
■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

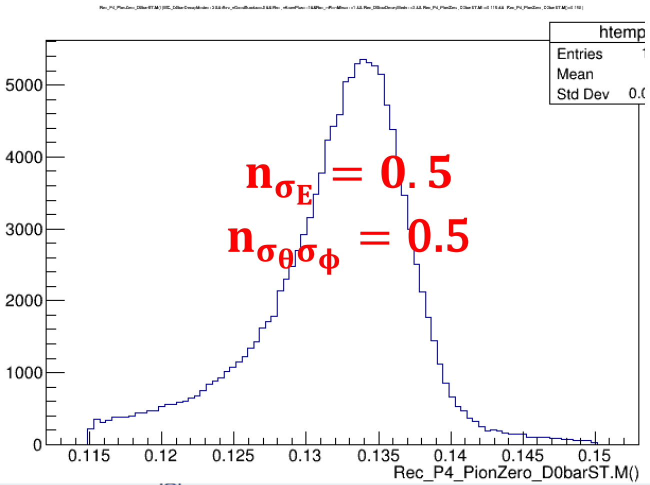
- 同时放大 & 缩小 n_{σ_E} 和 $n_{\sigma_\theta}, n_{\sigma_\phi}$

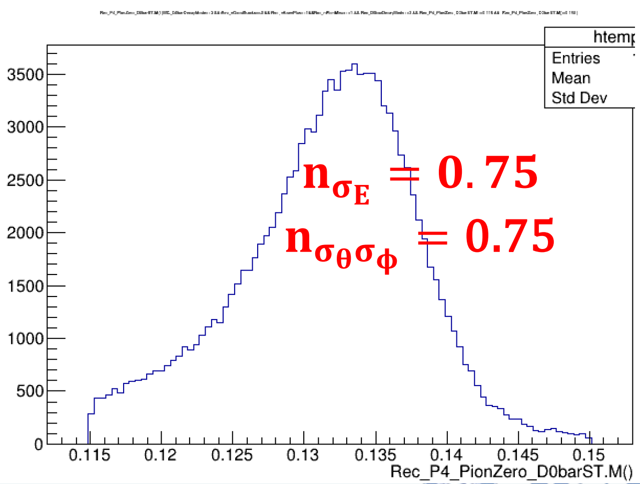


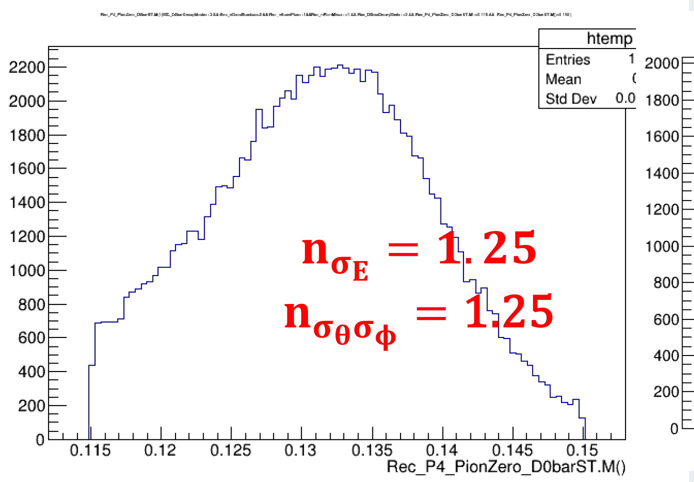


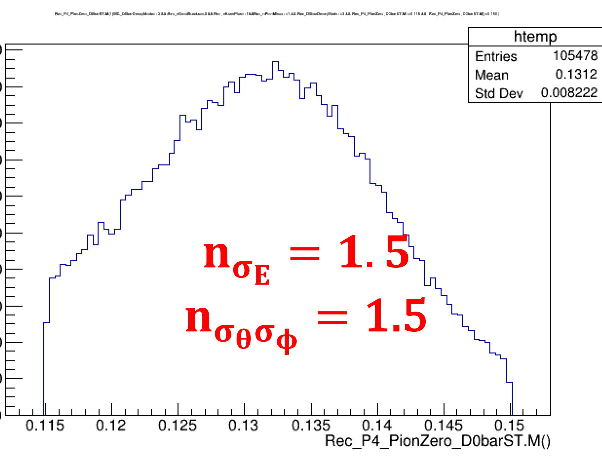












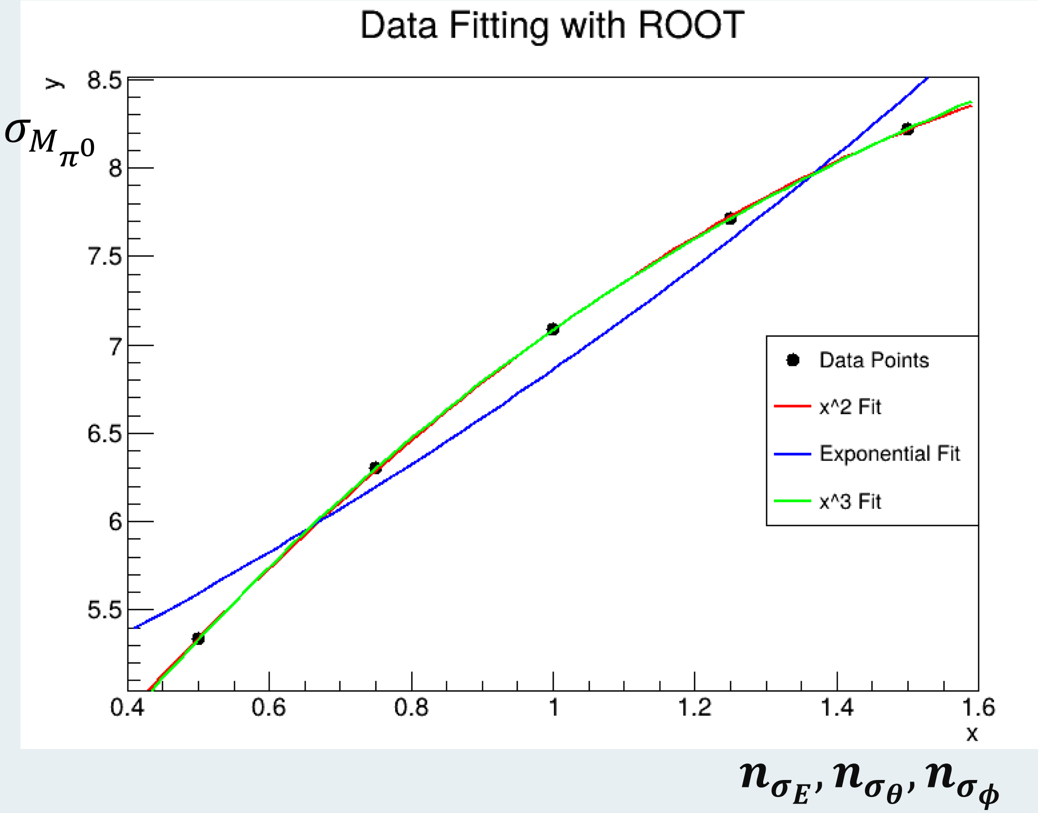
■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

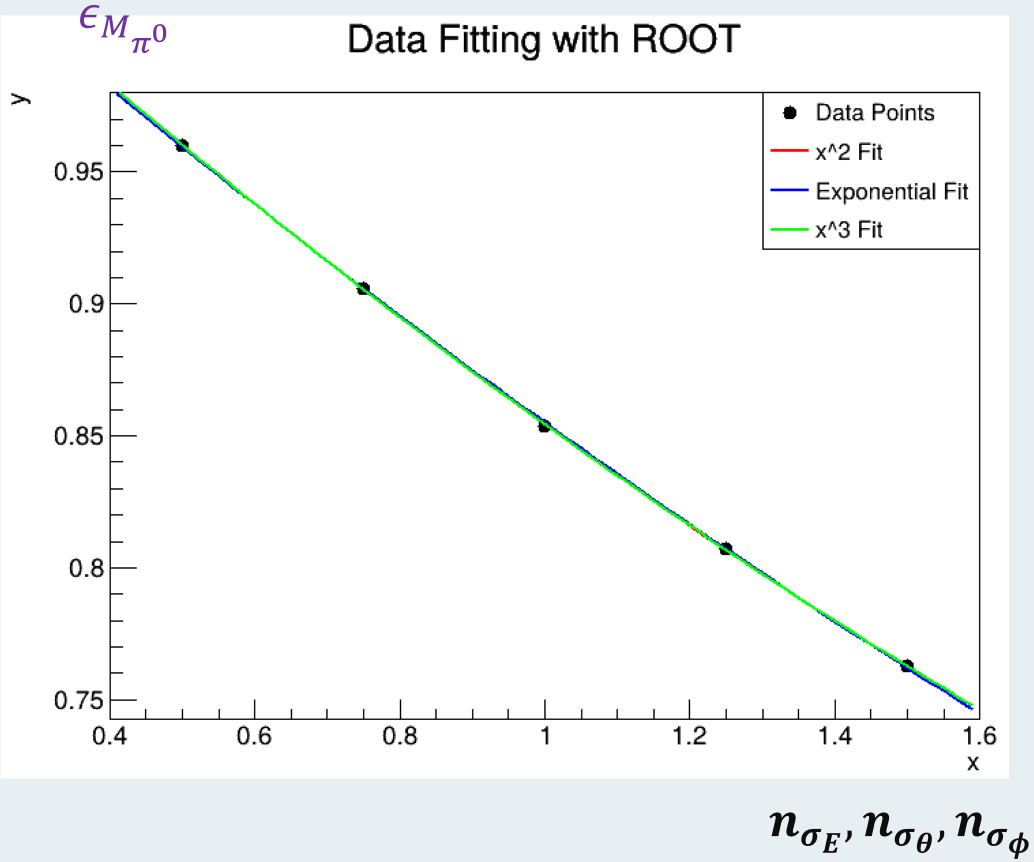
- 同时放大 & 缩小 n_{σ_E} 和 $n_{\sigma_\theta\sigma_\phi}$

n_{σ_E}	0.5	0.75	1.0	1.25	1.5	OSCAR262 全模拟
$n_{\sigma_\theta}, n_{\sigma_\phi}$	0.5	0.75	1.0	1.25	1.5	
$\sigma_{\Delta E_{shower}}/\sqrt{2}$	$5.40MeV$	$7.95MeV$	$10.29MeV$	$12.44MeV$	$14.33MeV$	
$\overline{\Delta E_{shower}}/2$	$-1.36MeV$	$-2.03MeV$	$-2.57MeV$	$-2.93MeV$	$-3.19MeV$	
$\overline{M_{\pi^0}}$	$132.1MeV$	$131.6MeV$	$131.3\ MeV$	$131.3MeV$	$131.2MeV$	$136.7\ MeV$
$\sigma_{M_{\pi^0}}$	$5.334MeV$	$6.3MeV$	$7.084\ MeV$	$7.714MeV$	$8.222MeV$	$7.626\ MeV$
$\epsilon_{M_{\pi^0}}$	96.02%	90.58%	85.39%	80.71%	76.26%	74.19%
ϵ_{ST}	25.26%	23.23%	21.26%	20.02%	18.57%	29.97%

■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

- 同时放大 & 缩小 n_{σ_E} 和 $n_{\sigma_\theta}, n_{\sigma_\phi}$






```
y = 2.9848 + 5.3217*x + -1.2229*x^2
```

```
y = 1.0804 + -0.2545*x + 0.0285*x^2
```

■ 标记道$\overline{D^0} \to K^+\pi^- \pi^0$ OSCAR@0603

- π^0动量低，按0.5GeV/c处的PhotonShower分辨估算倍数
- OSCAR262，桶部5x5 ，端盖4.5x4.5，平均分辨：$\sigma_{position} \approx 7.25mm$，$\sigma_E \approx 2.35\%$

晶体尺寸/cm^2	3x3	4x4	OSCAR262	5x5	外推
n_{σ_E}	0.69	0.81	1	0.89	1.1
$n_{\sigma_\theta}, n_{\sigma_\phi}$	1.27	1.14	1	1.042	

- 没有检查$n_{\sigma_\theta}, n_{\sigma_\phi}$和$\sigma_{position}$是否匹配，暂时不做精细调参

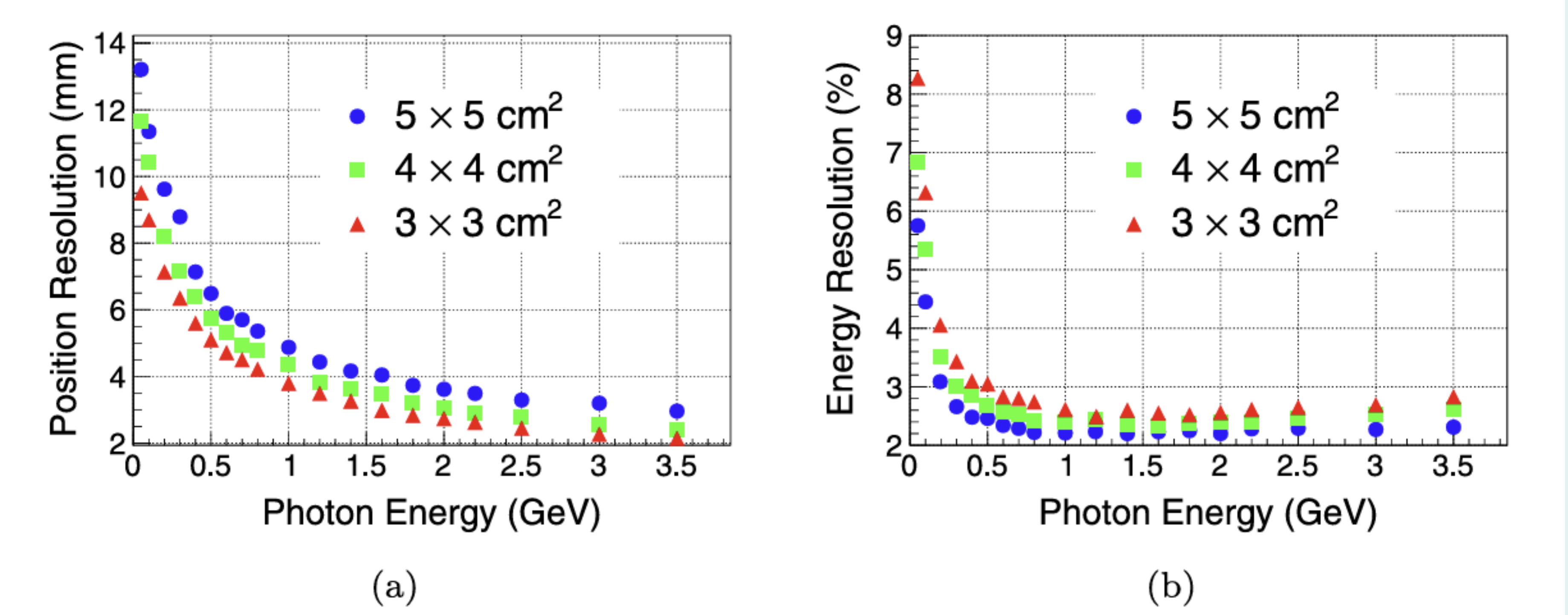


Fig. 7. Position resolution (a) and energy resolution (b) at different crystal sizes.

■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

- 画图时横轴不使用自己计算的$\sigma_{\Delta E_{shower}}/\sqrt{2}$，而是使用$n_{\sigma_E} * \sigma_E^{ECAL,1GeV/c}$
- 检查M_BC的分辨，是否有平台，可能需要拟合
- 检查哪一项效率导致快模拟标记道总效率低于全模拟
- 使用不加束流本底的全模拟进行对比
- 可以用R ， phi表示 x,y平面上的误差 ， 可以用costheta 表示 Z方向误差，用误差传递转换ECAL的位置分辨和角分辨

- 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

- M_{BC}
- 只修改n_{σ_E}

BackUp

■ 标记道$\overline{D^0} \to K^+\pi^- \pi^0$ OSCAR@0603

```
EventTree->Draw("Rec_P4_PionZero_D0barST.M()","MC_D0barDecayMode==3 &&
Rec_nGoodTracks>=2 && Rec_nKaonPlus>=1&&Rec_nPionMinus>=1 &&
Rec_D0barDecayMode==3 && Rec_P4_PionZero_D0barST.M()>0.115 &&
Rec_P4_PionZero_D0barST.M()<0.150 ")

EventTree->Draw("Rec_P4_PionZero_D0barST.M()","MC_D0barDecayMode==3 &&
Rec_nGoodTracks>=2 && Rec_nKaonPlus>=1&&Rec_nPionMinus>=1 &&
Rec_D0barDecayMode==3 && Rec_P4_PionZero_D0barST.M()>0.115 &&
Rec_P4_PionZero_D0barST.M()<0.150 && Rec_deltaE_D0bar>-
0.040&&Rec_deltaE_D0bar<0.055 && Rec_M_BC_D0bar>1.859 &&
Rec_M_BC_D0bar<1.873 ")

EventTree-
>Draw("((Rec_Gamma1_selectedbyD0.E()+Rec_Gamma2_selectedbyD0.E()) -
(MC_Gamma1.E()+MC_Gamma2.E())) /2.>>(400,-
0.1,0.1)","MC_D0barDecayMode==3 && Rec_nGoodTracks>=2 &&
Rec_nKaonPlus>=1&&Rec_nPionMinus>=1 && Rec_D0barDecayMode==3 &&
Rec_P4_PionZero_D0barST.M()>0.115 &&
Rec_P4_PionZero_D0barST.M()<0.150")
```

■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

```
EventTree->Draw( “((Rec_Gamma1_Position + Rec_Gamma2_Position) - (MC_Gamma1_Position + MC_Gamma2_Position)).Mag()/2.>>(400,-1,1)","MC_D0barDecayMode==3 && Rec_nGoodTracks>=2 && Rec_nKaonPlus>=1&&Rec_nPionMinus>=1 && Rec_D0barDecayMode==3 && Rec_P4_PionZero_D0barST.M()>0.115 &&  Rec_P4_PionZero_D0barST.M()<0.150")
```

■ 标记道$\overline{D^0} \to K^+\pi^-\pi^0$ OSCAR@0603

- $D^0 \to K^-\pi^+\pi^0$ 筛选条件：

① $N_{goodtrack} \geq 2$ ， $N_{K^+} \geq 1 \&\& N_{\pi^-} \geq 1$ (PID)

② ΔE在三个标记道中最小

③ $M_{\pi^0} \in (0.115, 0.150) GeV/c^2$

④ $\Delta E \in (-40, 55) MeV$ ， $M_{BC} \in (1.859, 1.873) GeV/c^2$

- 统计$\overline{M_{\pi^0}}$和$\sigma_{M_{\pi^0}}$时不cut ④

n_{σ_E}	1.0	1.0	1.0	1.0	1.0	OSCAR262 全模拟
$n_{\sigma_\theta \sigma_\phi}$	0.5	0.75	1.0	1.25	1.5	
$\overline{M_{\pi^0}}$						
$\sigma_{M_{\pi^0}}$						
$\epsilon_{M_{\pi^0}}$	$\frac{117922}{134038}$	$\frac{116363}{134109}$	$\frac{114745}{134378}$	$\frac{113010}{134645}$	$\frac{111393}{134929}$	
ϵ_{ST}	$\frac{80377}{358118}$	$\frac{78236}{358118}$	$\frac{76141}{358118}$	$\frac{74211}{358118}$	$\frac{72461}{358118}$	

■ 标记道$\overline{D^0} \rightarrow K^+\pi^-\pi^0$ OSCAR@0603

n_{σ_E}	0.5	0.75	1.0	1.25	1.5	OSCAR262 全模拟
$n_{\sigma_\theta\sigma_\phi}$	1.0	1.0	1.0	1.0	1.0	
$\overline{M_{\pi^0}}$						
$\sigma_{M_{\pi^0}}$						
$\epsilon_{M_{\pi^0}}$	$\frac{127814}{139017}$	$\frac{121030}{136142}$		$\frac{112662}{137342}$	$\frac{108850}{138327}$	
ϵ_{ST}	$\frac{86464}{358118}$	$\frac{81158}{358118}$		$\frac{73698}{358118}$	$\frac{70521}{358118}$	

■ 标记道$\overline{D^0} \to K^+\pi^- \pi^0$ OSCAR@0603

- 同时放大 & 缩小 n_{σ_E} 和 $n_{\sigma_\theta\sigma_\phi}$

n_{σ_E}	0.5	0.75	1.0	1.25	1.5	OSCAR262 全模拟
$n_{\sigma_\theta\sigma_\phi}$	0.5	0.75	1.0	1.25	1.5	
$\sigma_{\Delta E_{shower}}$			$12.65 MeV$			$16.62 MeV$
$\overline{\Delta E_{shower}}$			$-6.03 MeV$			$1.81 MeV$
$\overline{M_{\pi^0}}$			$131.3\ MeV$			$136.7\ MeV$
$\sigma_{M_{\pi^0}}$			$7.084\ MeV$			$7.626\ MeV$
$\epsilon_{M_{\pi^0}}$	$\frac{131309}{136755}$	$\frac{122738}{135506}$	85.39%	$\frac{110899}{137403}$	$\frac{105478}{138309}$	74.19%
ϵ_{ST}	$\frac{90478}{358118}$	$\frac{83208}{358118}$	21.26%	$\frac{71686}{358118}$	$\frac{66503}{358118}$	29.97%

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BackUp

■ $\overline{D^0} \to \pi^+\mu^-\nu_\mu$

- OSCAR2.6.2@ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$D^0 \to K^-\pi^+$	$\mathrm{N_{goodtrack}} \geq 2$		97817	97602	99.78%	
	PID	$N_{K^-} \geq 1\&\&N_{\pi^+} \geq 1$		76786	78.67%	
	ΔE在三个单标记道中最小	误组合效率		75461	98.27%	
	$\lvert\Delta E\rvert < 25MeV$			63920	84.71%	
	$M_{BC} \in (1.859,1.873)\ GeV/c^2$			61118	95.62%	62.48%
$\overline{D^0} \to \pi^+\mu^-\nu_\mu$	$\mathrm{N_{goodtrack}} \geq 4$			55617	90.99%	
	PID	$N_{\mu^-} = 1\&\&N_{\pi^+} = 2$		22489	40.44%	
	$N_{others} = 0$	排除假径迹		21911	97.43%	22.39%

■ $D^0 \to \pi^- \mu^+ \nu_\mu$

- OSCAR2.6.2 @ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$D^0 \to K^- \pi^+ \pi^+ \pi^-$	$\mathrm{N_{goodtrack}} \geq 4$		203419	202444		
	PID	$N_{K^-} \geq 1 \&\& N_{\pi^+} \geq 2 \&\& N_{\pi^-} \geq 1$		114816		
	ΔE在三个单标记道中最小	误组合效率		98466		
	$\lvert\Delta E\rvert < 25MeV$			71966		
	$M_{BC} \in (1.859, 1.873)$ GeV/c^2			67587		33.23%
$\overline{D^0} \to \pi^+ \mu^- \nu_\mu$	$\mathrm{N_{goodtrack}} \geq 6$			62382		
	PID	$N_{\mu^-} = 1 \&\& N_{\pi^+} = 3$		24720		
	$N_{others} = 0$	排除假径迹		23885	96.62%	11.74%

■ $D^0 \to \pi^- \mu^+ \nu_\mu$

- OSCAR2.6.2 @ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$D^0 \to K^- \pi^+ \pi^0$	$N_{goodtrack} \geq 2$		355564	355142		
	PID	$N_{K^-} \geq 1 \&\& N_{\pi^+} \geq 1$		264039		
	ΔE在三个单标记道中最小	误组合效率		166783		
	$M_{\pi^0} \in (0.115, 0.150)$ GeV/c^2			105262		
	$\Delta E \in (-40, 55) MeV$			80993		
	$M_{BC} \in (1.859, 1.873)$ GeV/c^2			70704		19.88%
$D^0 \to \pi^- \mu^+ \nu_\mu$	$N_{goodtrack} \geq 4$			64420		
	$N_{\mu^+} = 1 \&\& N_{\pi^-} = 2$	PID		25967		
	$N_{others} = 0$	排除假径迹		25307		7.11%

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■ $D^0 \rightarrow \pi^- \mu^+ \nu_\mu$

- OSCAR2.6.2 @ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$\overline{D}^0 \rightarrow K^+\pi^-$	$N_{goodtrack} \geq 2$		97389	97172		
	PID	$N_{K^+} \geq 1 \&\& N_{\pi^-} \geq 1$		77108		
	ΔE在三个单标记道中最小	误组合效率		75815		
	$\vert\Delta E\vert < 25MeV$			63932		
	$M_{BC} \in (1.859,1.873)\ GeV/c^2$			61115		62.75%
$D^0 \rightarrow \pi^-\mu^+\nu_\mu$	$N_{goodtrack} \geq 4$			55229		
	PID	$N_{\mu^+} = 1 \&\& N_{\pi^-} = 2$		23677		
	$N_{others} = 0$	排除假径迹		23005		23.62%

■ $D^0 \to \pi^- \mu^+ \nu_\mu$

- OSCAR2.6.2 @ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$\overline{D^0} \to K^+\pi^-\pi^+\pi^-$	$\mathrm{N_{goodtrack}} \geq 4$		201334	200423		
	PID	$N_{K^+} \geq 1 \&\& N_{\pi^-} \geq 2 \&\& N_{\pi^+} \geq 1$		114151		
	ΔE在三个单标记道中最小	误组合效率		99046		
	$\lvert\Delta E\rvert < 25MeV$			73518		
	$M_{BC} \in (1.859,1.873)\ GeV/c^2$			69217		34.38%
$D^0 \to \pi^- \mu^+ \nu_\mu$	$\mathrm{N_{goodtrack}} \geq 6$			63558		
	PID	$N_{\mu^+} = 1 \&\& N_{\pi^-} = 3$		26047		
	$N_{others} = 0$	排除假径迹		25045		12.44%

■ $D^0 \to \pi^- \mu^+ \nu_\mu$

- OSCAR2.6.2 @ 0819
- With Beam BKG

	类型	说明	筛选前后事例数		相对效率	绝对效率
$\overline{D^0} \to K^+\pi^- \pi^0$	$\mathrm{N_{goodtrack}} \geq 2$		353277	352826		
	PID	$N_{K^+} \geq 1 \&\& N_{\pi^-} \geq 1$		264137		
	ΔE在三个单标记道中最小	误组合效率		166558		
	$M_{\pi^0} \in (0.115, 0.150)\ GeV/c^2$			105928		
	$\Delta E \in (-40, 55) MeV$			81197		
	$M_{BC} \in (1.859, 1.873)\ GeV/c^2$			71109		20.13%
$\boldsymbol{D^0 \to \pi^- \mu^+ \nu_\mu}$	$\mathrm{N_{goodtrack}} \geq 4$			64436		
	$N_{\mu^+} = 1 \&\& N_{\pi^-} = 2$	PID		27658		
	$N_{others} = 0$	排除假径迹		26774		7.58%

■ $\overline{D^0} \to \pi^+ \mu^- \nu_\mu$

- OSCAR2.6.2 @ 20250819
  →非正式发布版，效率有问题
  →回退到OSCAR2.6.2正式版