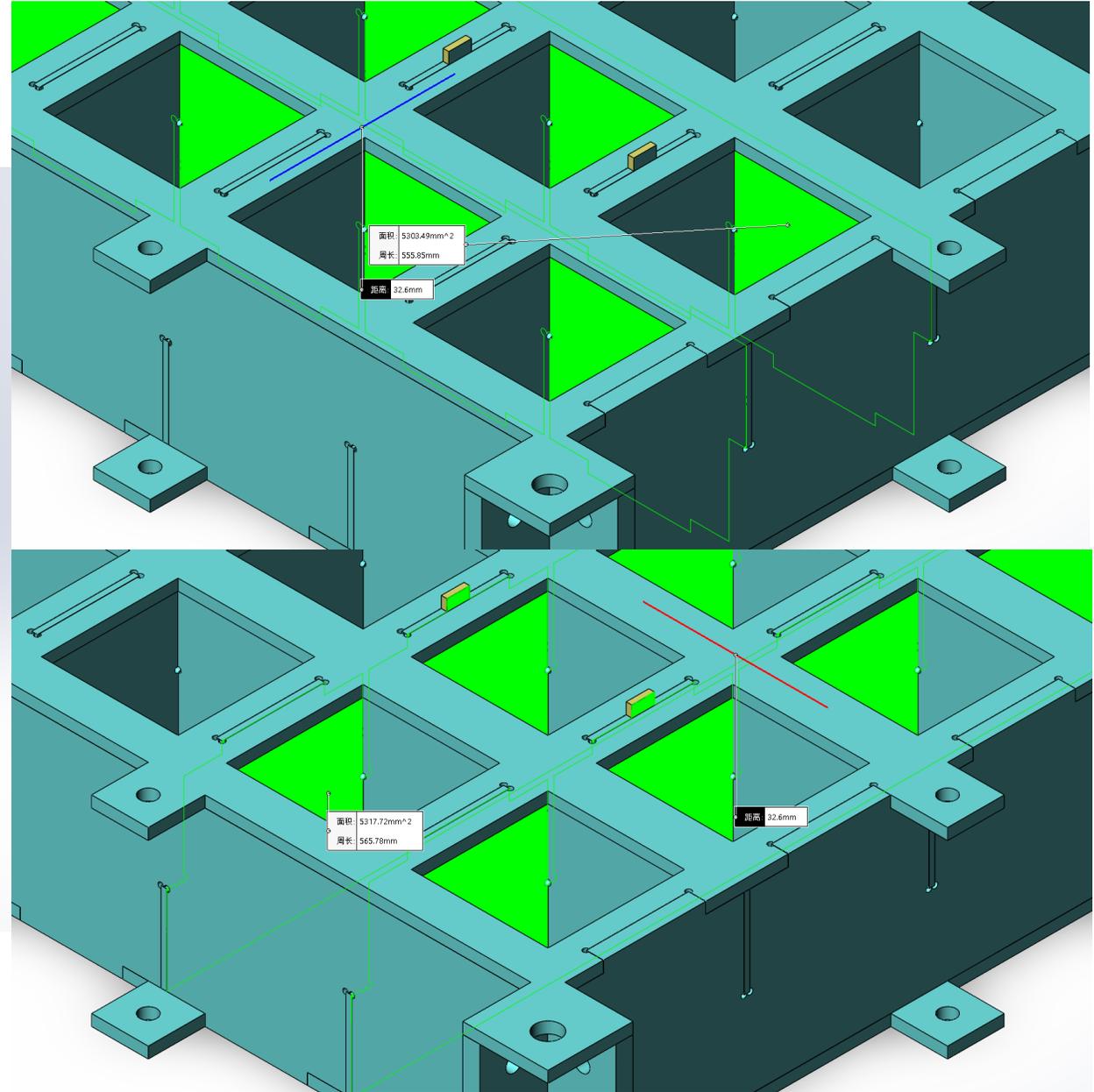
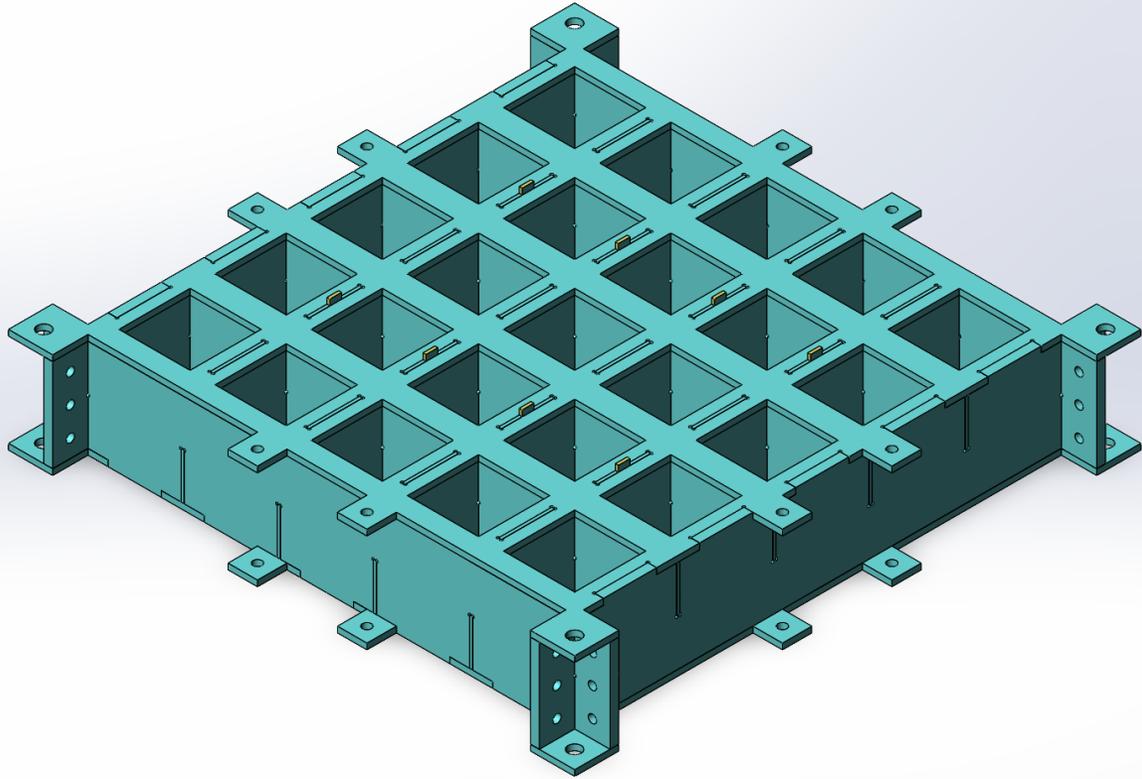


HEIC-Cube structure

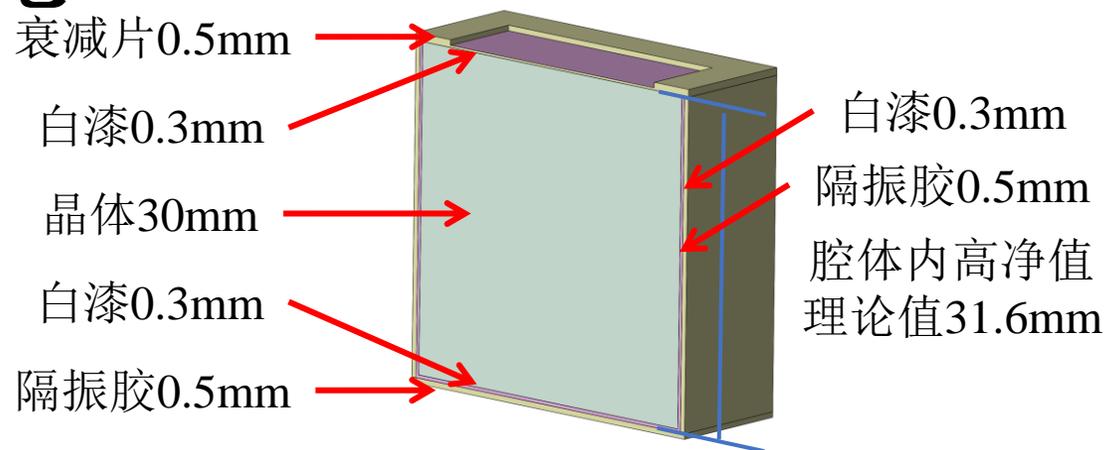
张研硕

2024.09.02

碳纤维框架

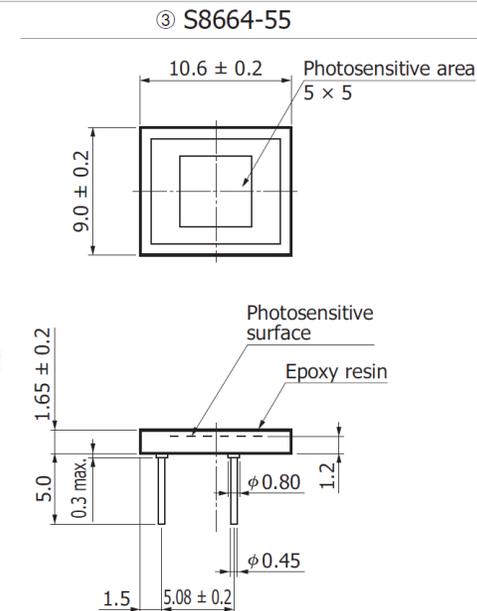
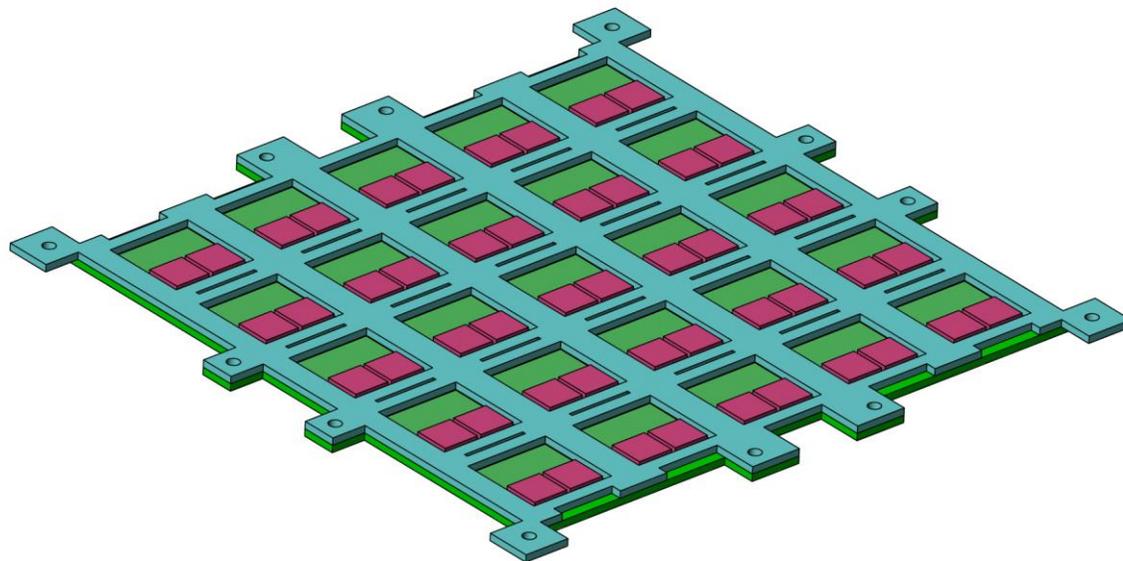
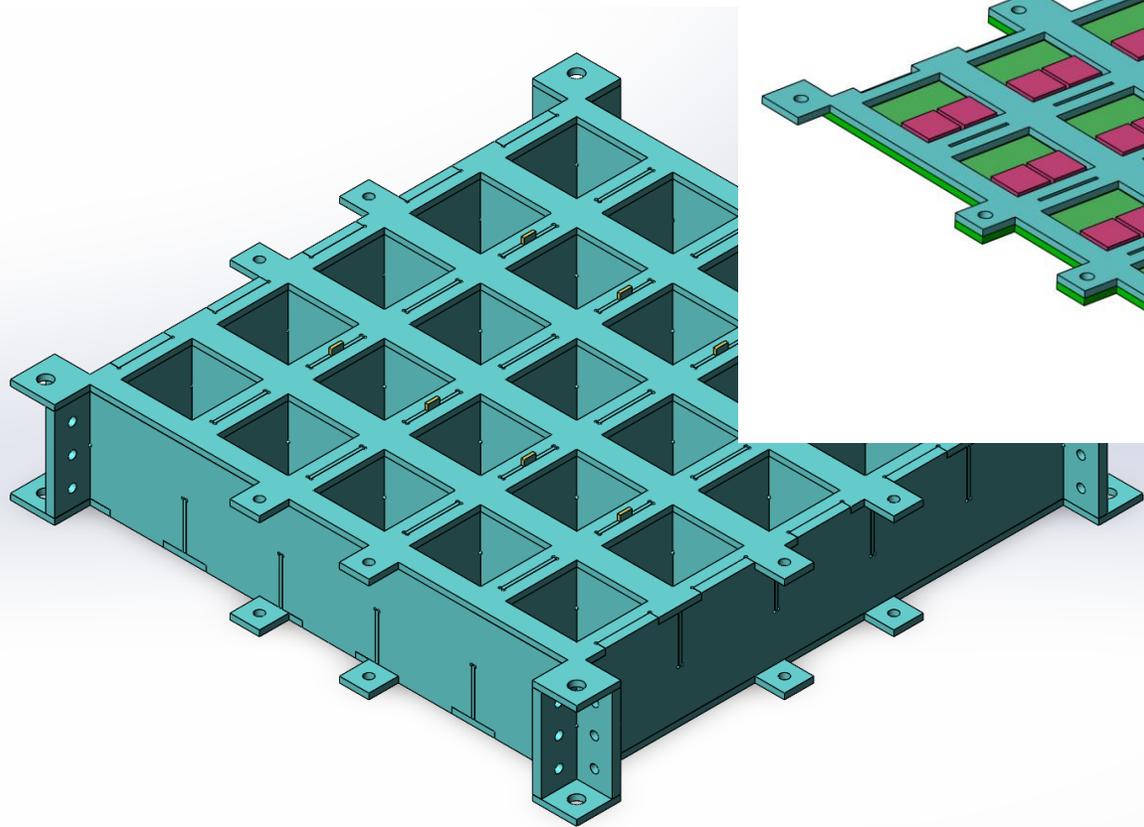


每个小单元



物质	尺寸	材料	说明
晶体中心至边线	15mm	BGO	上下左右四面都有
白色漆	0.3mm	BaSO ₄	左右下三面完整，上面开窗18.5mm*18.5mm
黑色减震胶	0.5mm	1.02g/cm ³ , C ₂ H ₆ OSi	左右下三面完整，上面完全去除，换成衰减片
衰减片	0.5mm	1.125g/cm ³ , C ₁₁ H ₁₂ O ₃	仅上面有
半个隔板	0.5mm	1.62g/cm ³ , 89C+2.5H+2.4N+6.1O	左右面有，上下面另计

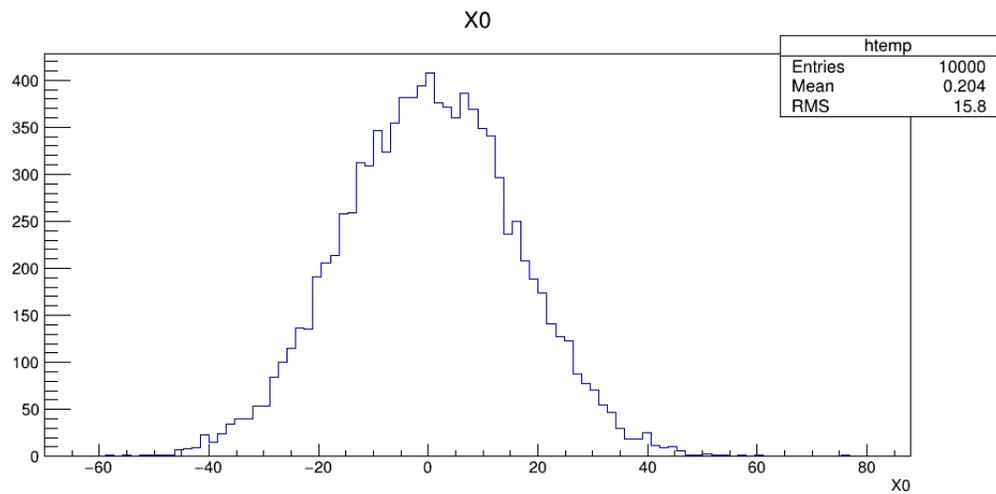
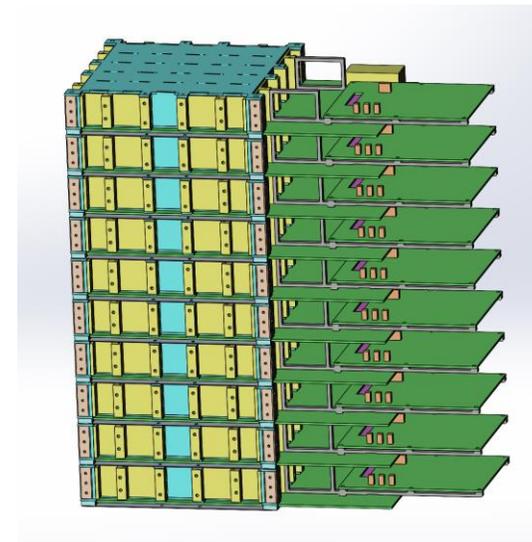
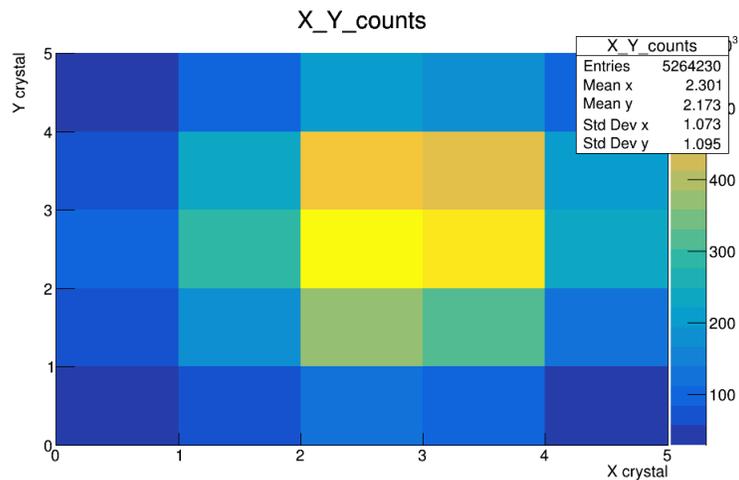
碳纤维框架



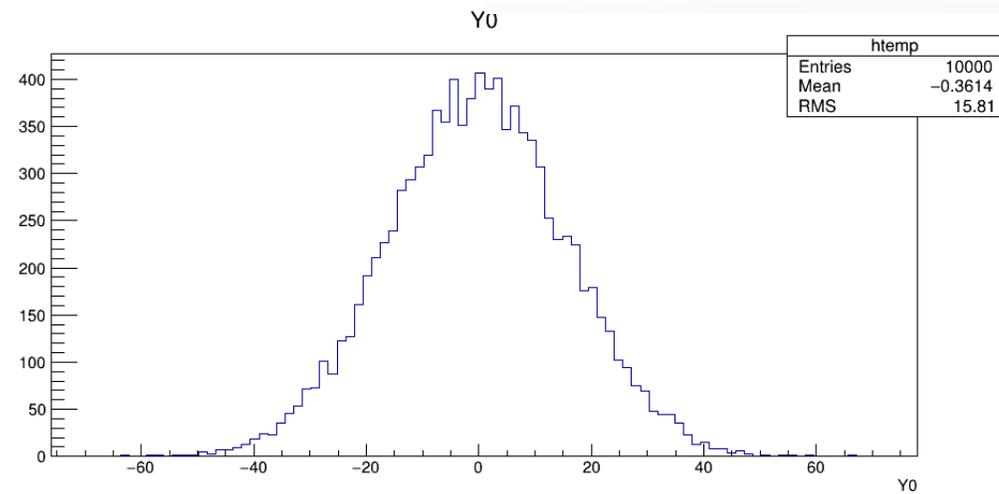
材料：碳纤维；1.62g/cm³；89C+2.5H+2.4N+6.1O；
底板：2mm厚，完整无开孔；
主体：每个小单元32.6mm*32.6mm*31.6mm，前后左右4个外框2mm厚，单元之间的隔板1mm厚；
上盖：2mm厚，对应每个晶体的中心位置开窗24mm*24mm；

电路板：2mm厚；1.125g/cm³；C38H40O6Br4；
APD外壳：10.6mm*9mm*1.65mm；1.125g/cm³；C11H12O3；
灵敏区域：5mm*5mm*10um，距离底面1.2mm；
层间距：2.4mm

平面源

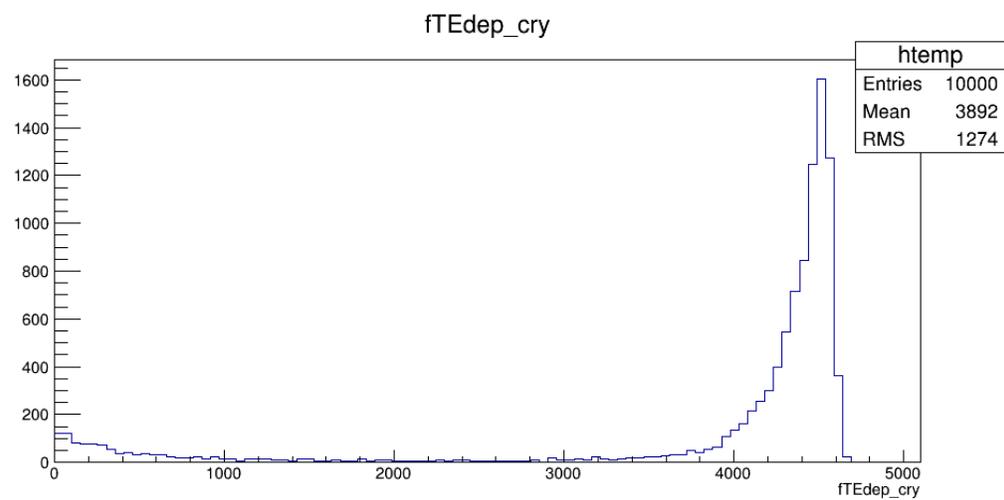
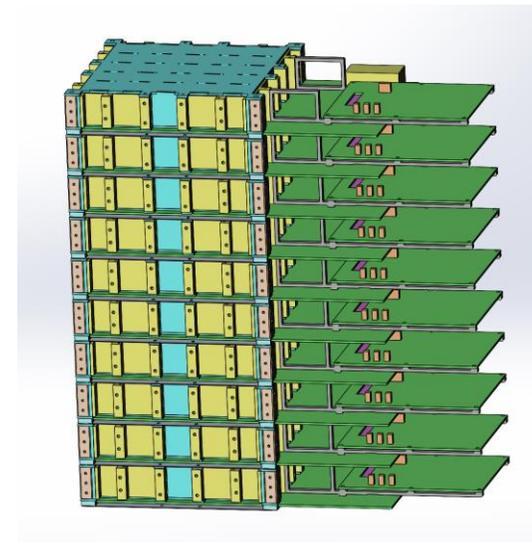


X_direction

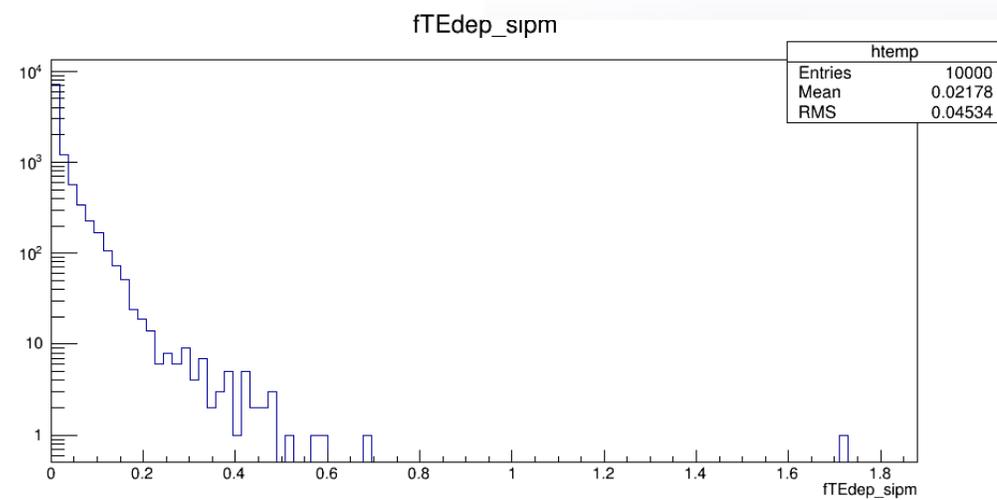


Y_direction

模拟结果



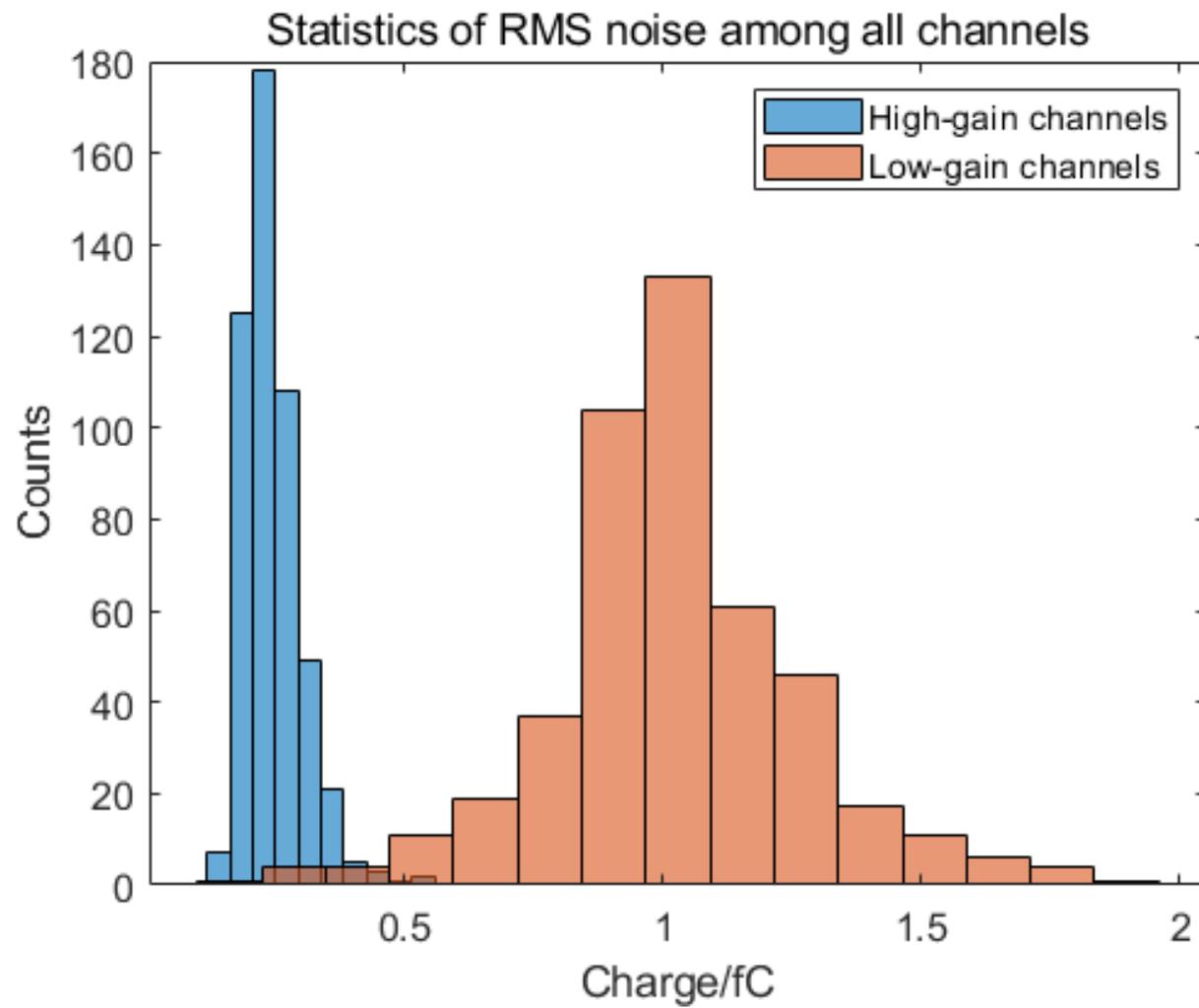
Crystal energy



APD energy

前端电子学噪声

- 电子学低增益通道 (HL和LL)
噪声均**小于 $2fC$**
- 电子学高增益通道 (HH和LH)
噪声均**小于 $0.5fC$**

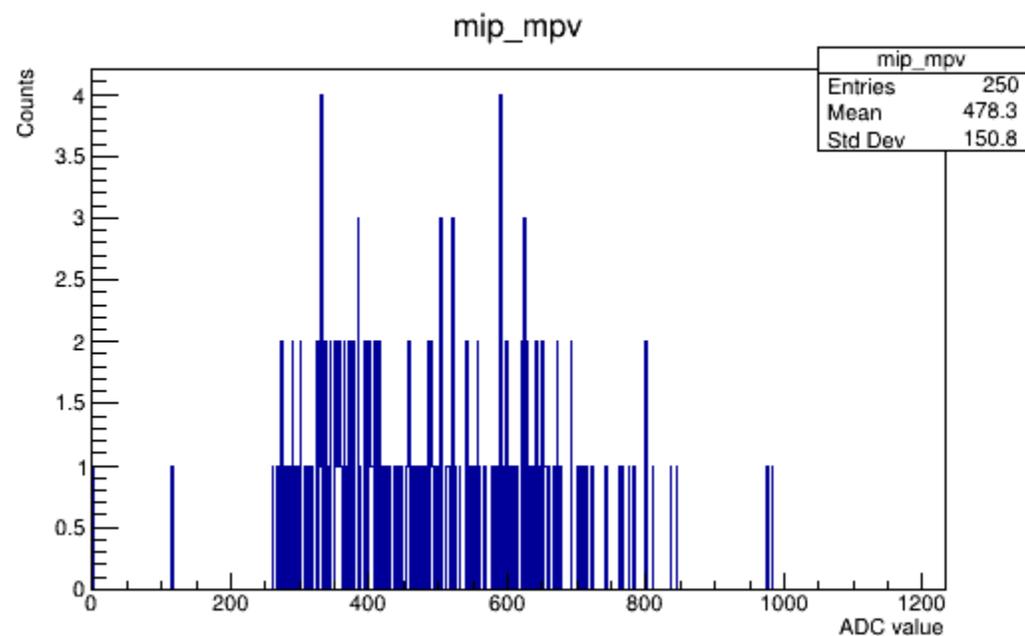


数字化

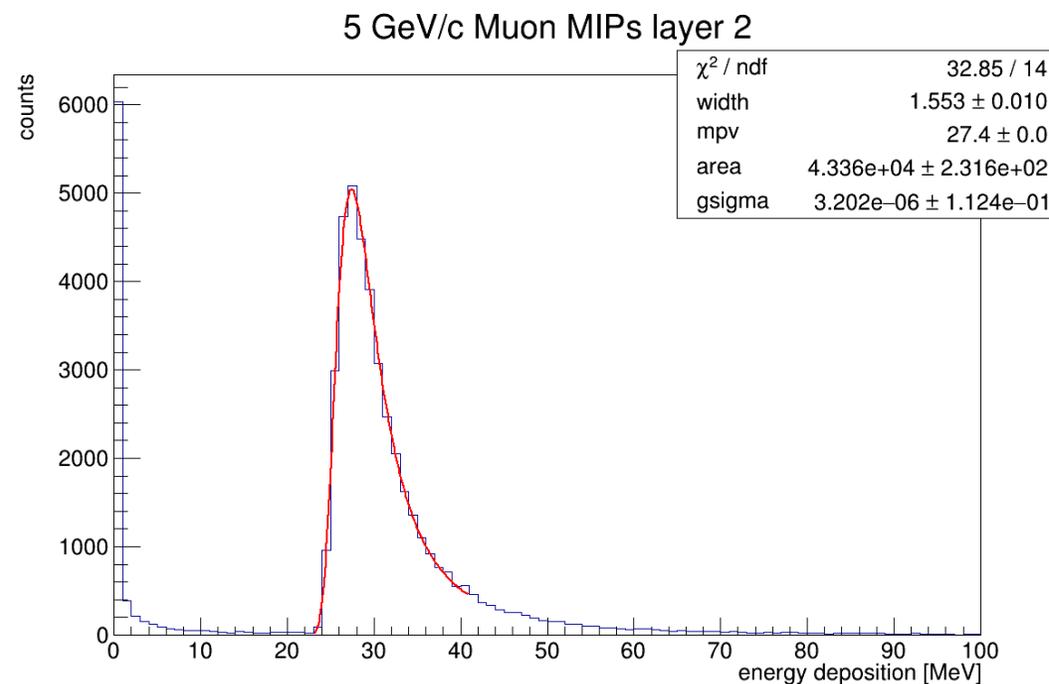
$\frac{3 \times 0.5E-15 C}{1.6E-19 C} \times \frac{27.4}{480} = 535.2$, 取BGO 1MeV对应500个光电子;

APD灵敏区域是硅, 平均电离能为 3.6eV;

台基大小取0.25MIPs位置, 电子学噪声固定为125个光电子;



MIPs mpv

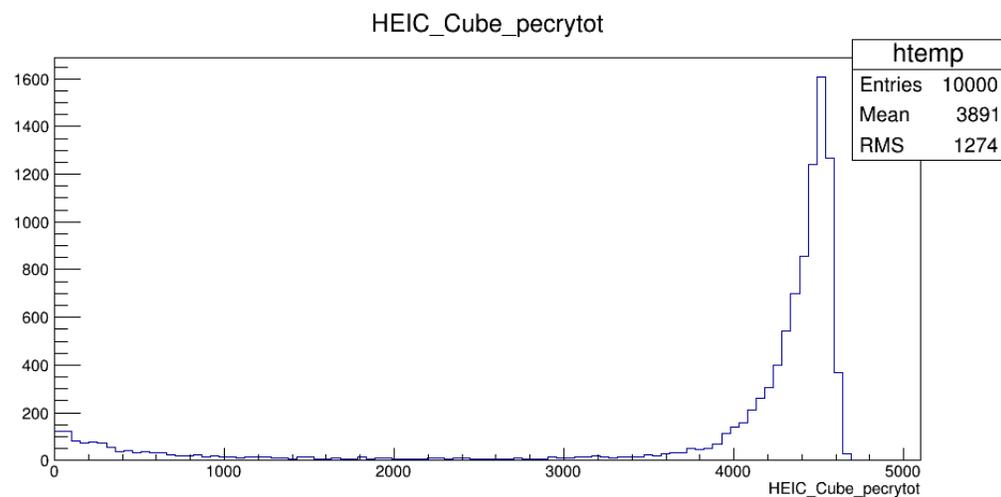


MIPs energy

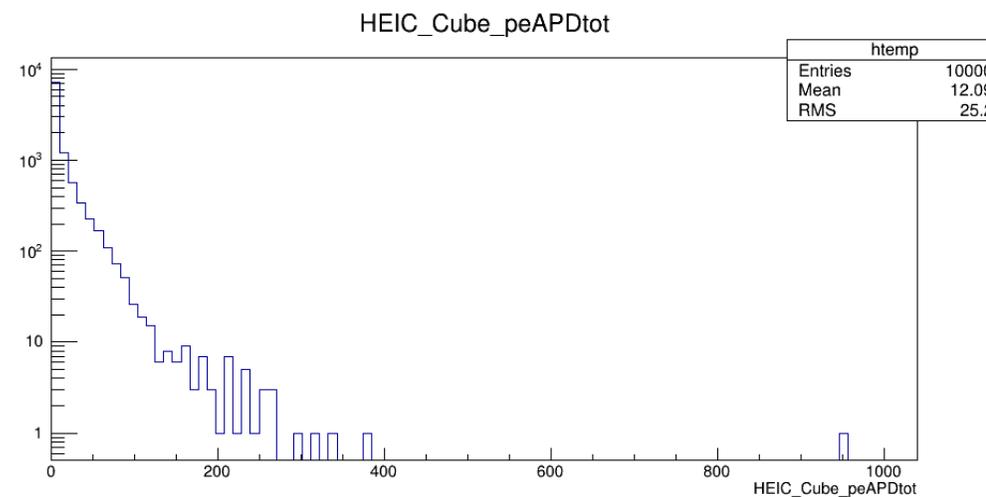
数字化

```
Pe_cry=eng_cry*500;  
Pe_APD=(eng_APD/eV)/3.6;  
Pe_ped=0;
```

```
CLHEP::RandGauss* gauss->shoot(pe_cry,sqrt(pe_cry))/500;  
CLHEP::RandGauss* gauss->shoot(pe_APD,sqrt(pe_APD))/500;  
CLHEP::RandGauss* gauss->shoot(0,sqrt(125));
```



Crystal energy

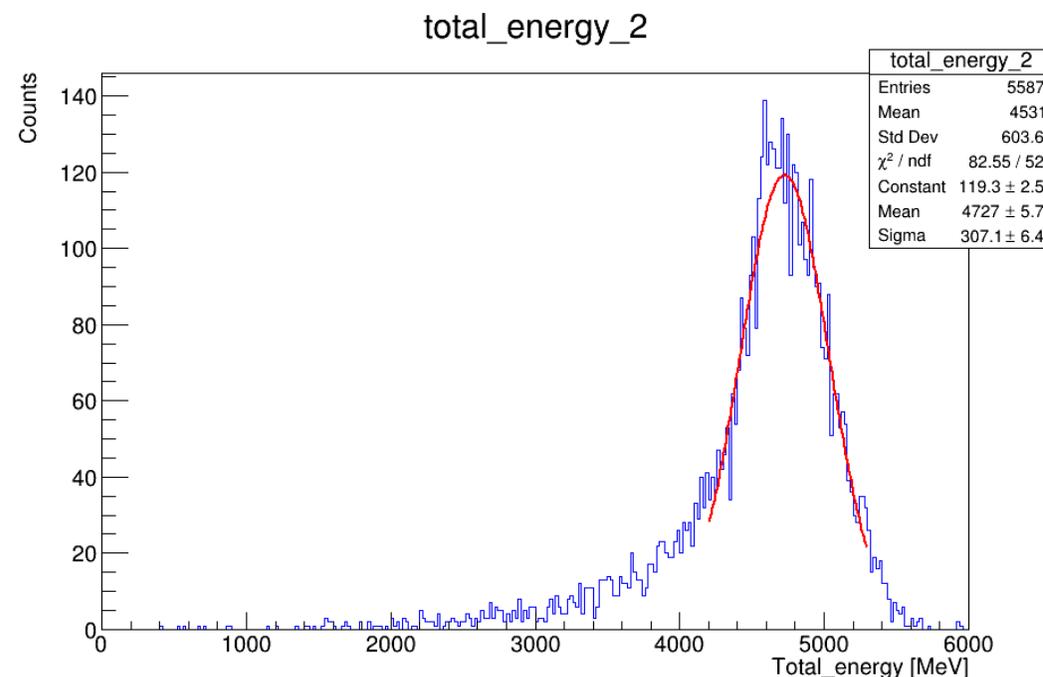


APD energy

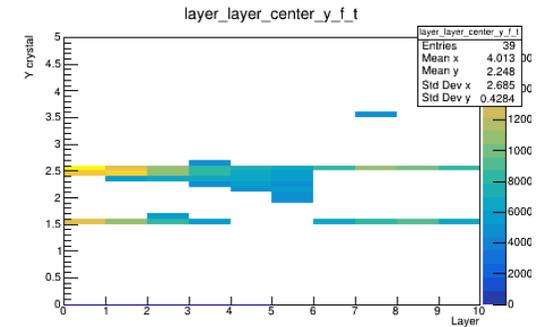
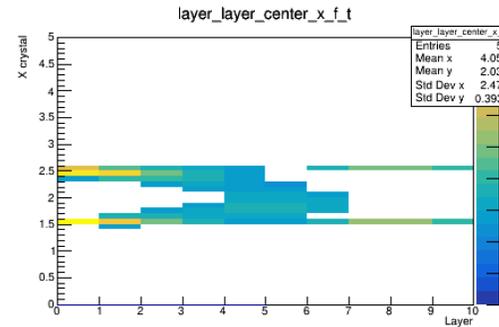
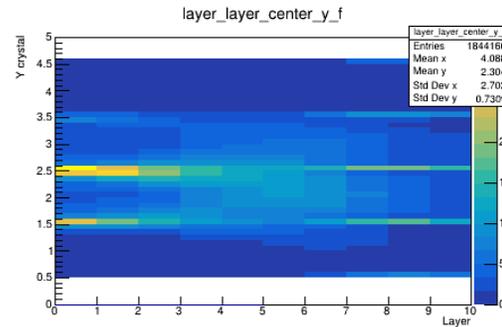
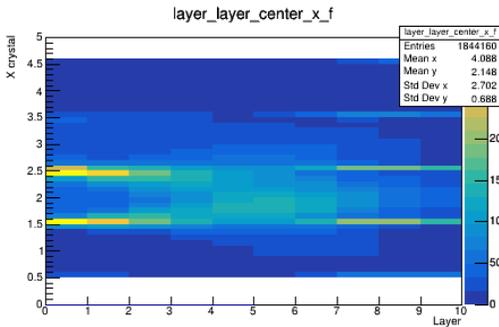
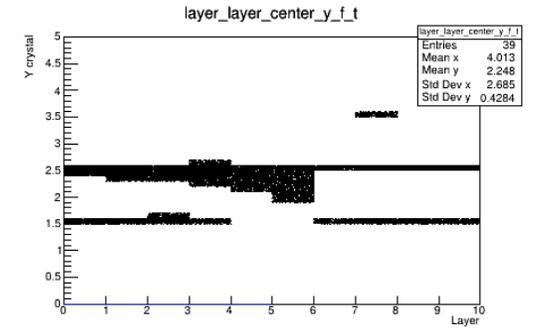
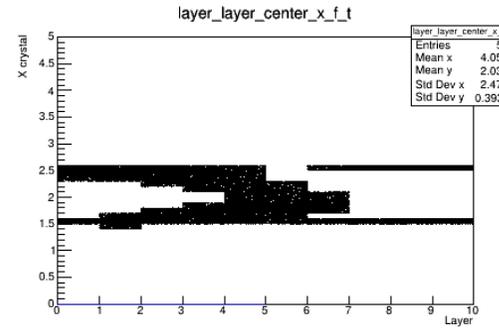
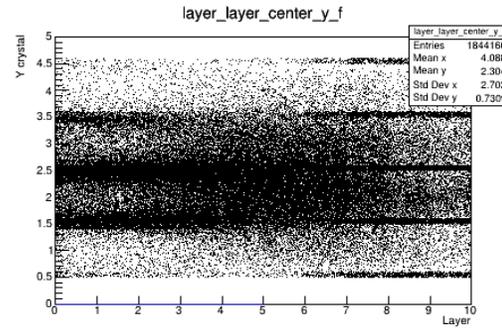
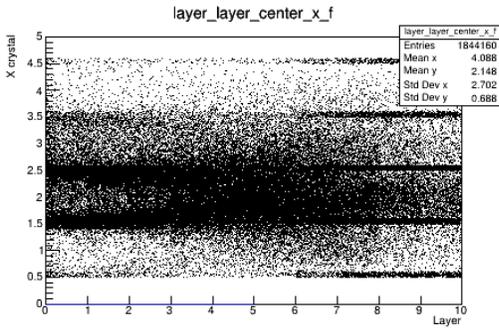
5GeV electron – beam test



- 筛选条件：
 - 前6层中至少3层的总能量大于2个MIPs;
 - $2.3 \leq x_center[2] \leq 2.7$;
 - $2.3 \leq y_center[2] \leq 2.7$;
 - $2.3 \leq x_center[3] \leq 2.7$;
 - $2.3 \leq y_center[3] \leq 2.7$;



X_center; Y_center – beam test



5GeV electron – simulation

