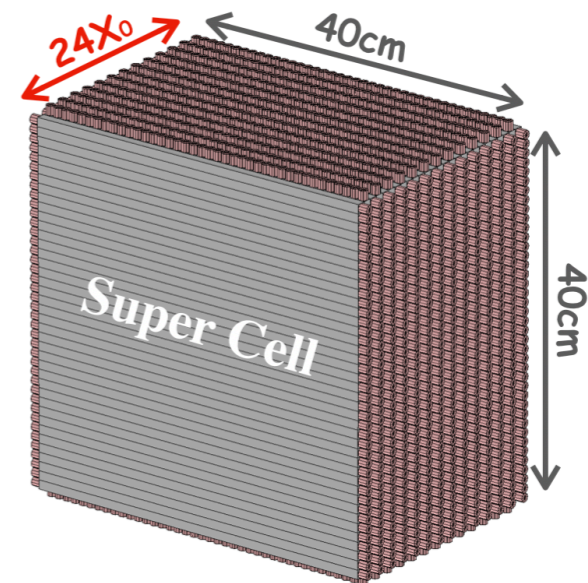
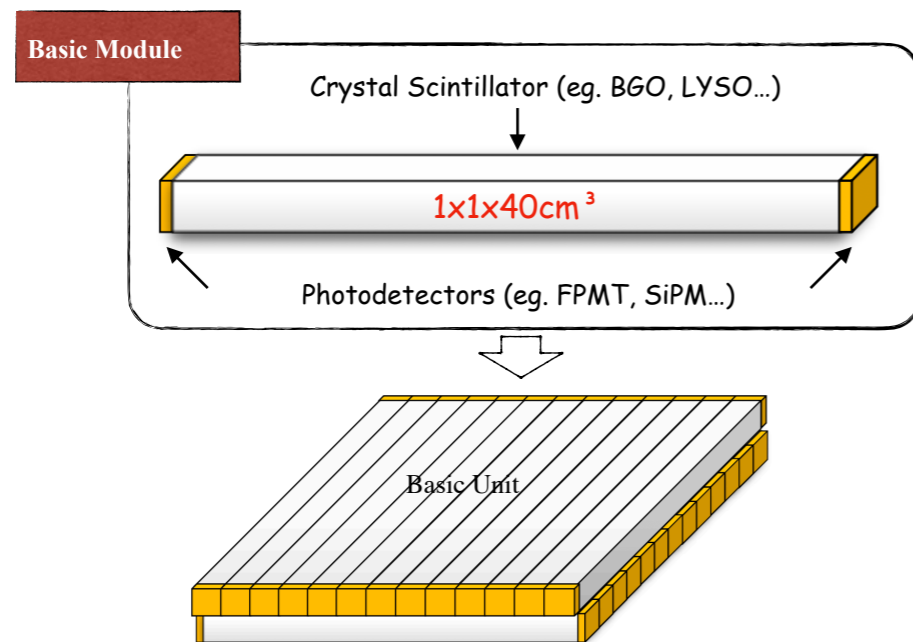
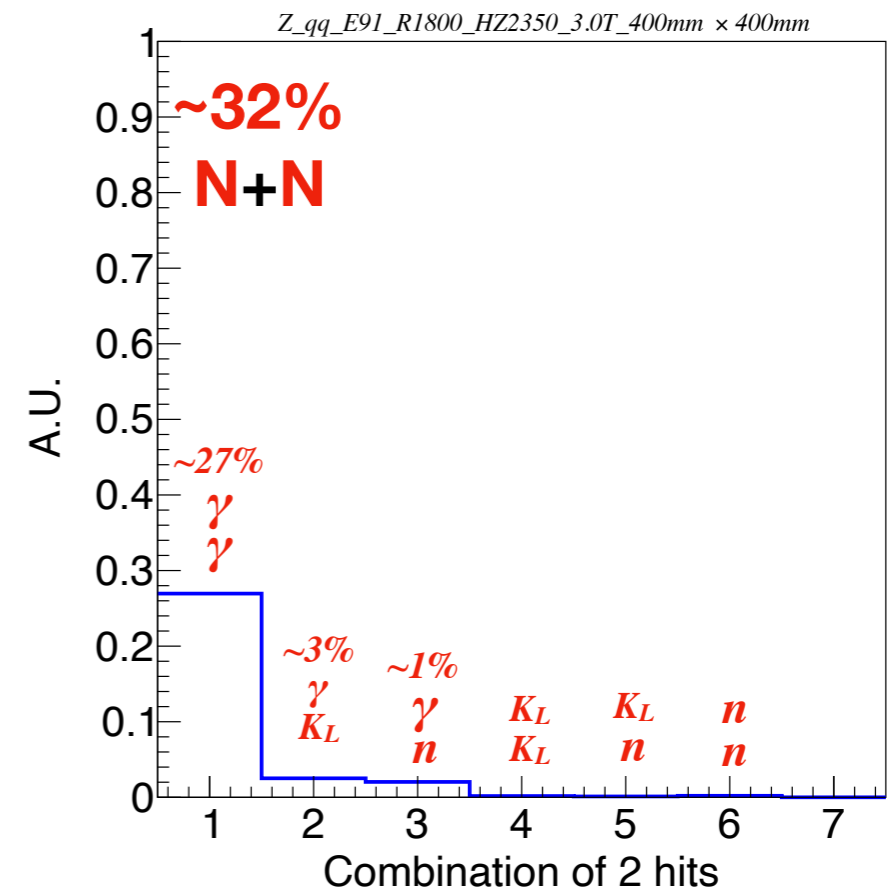
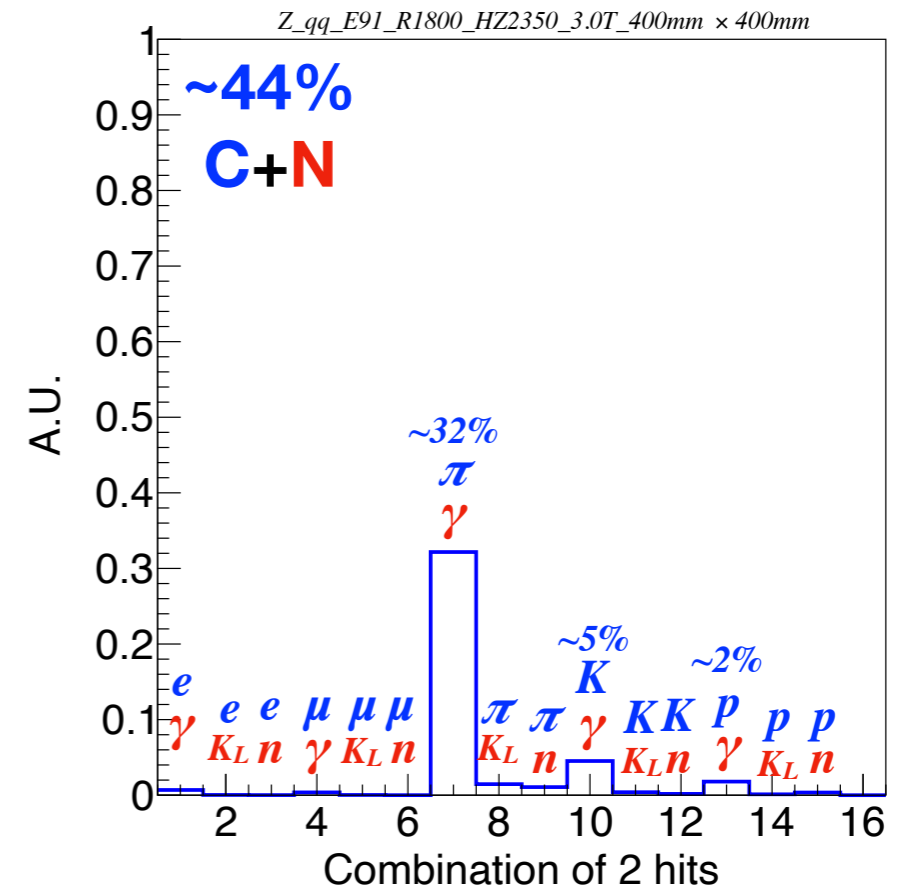
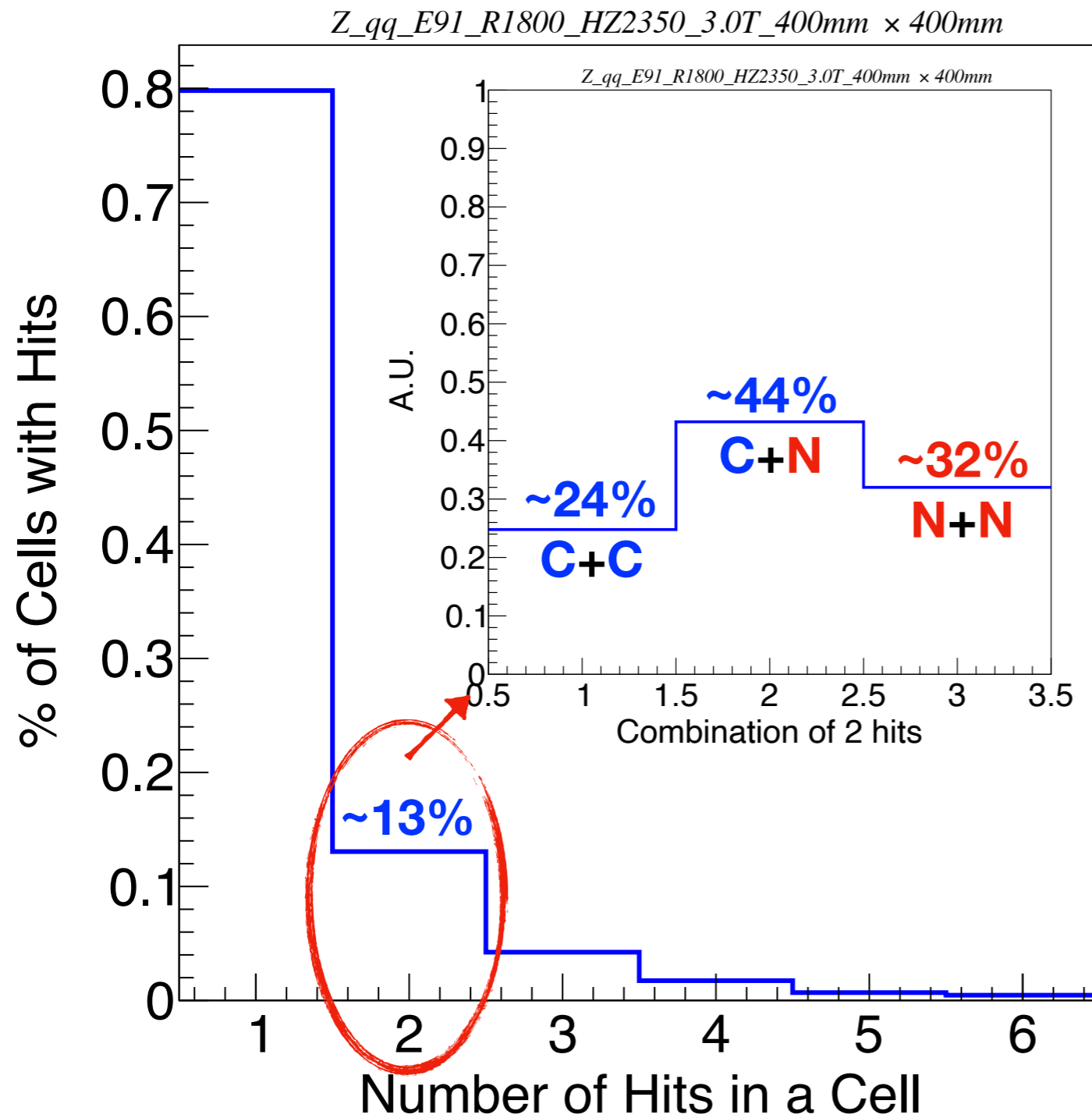


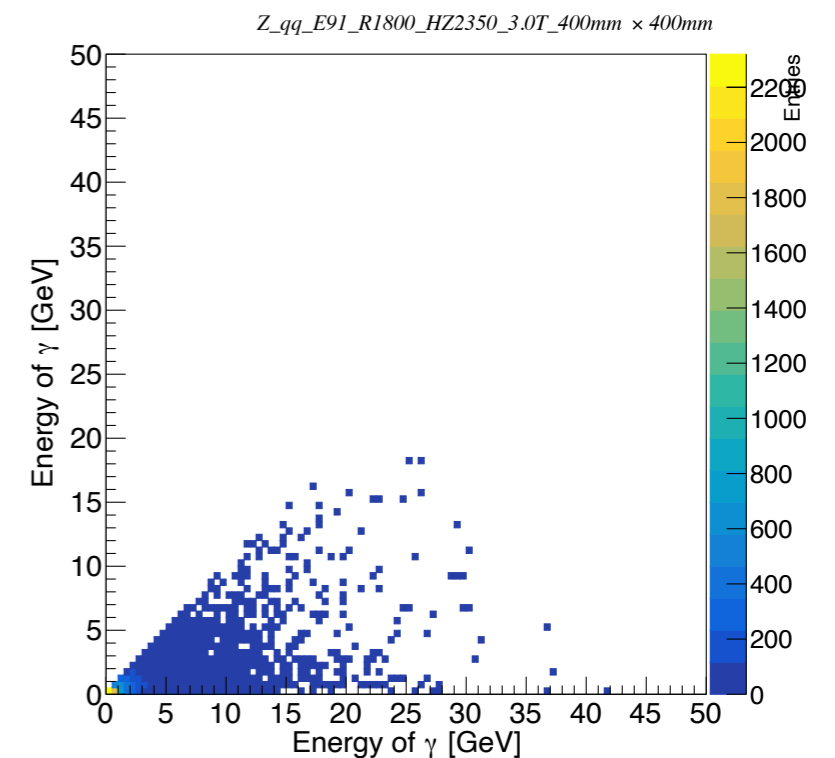
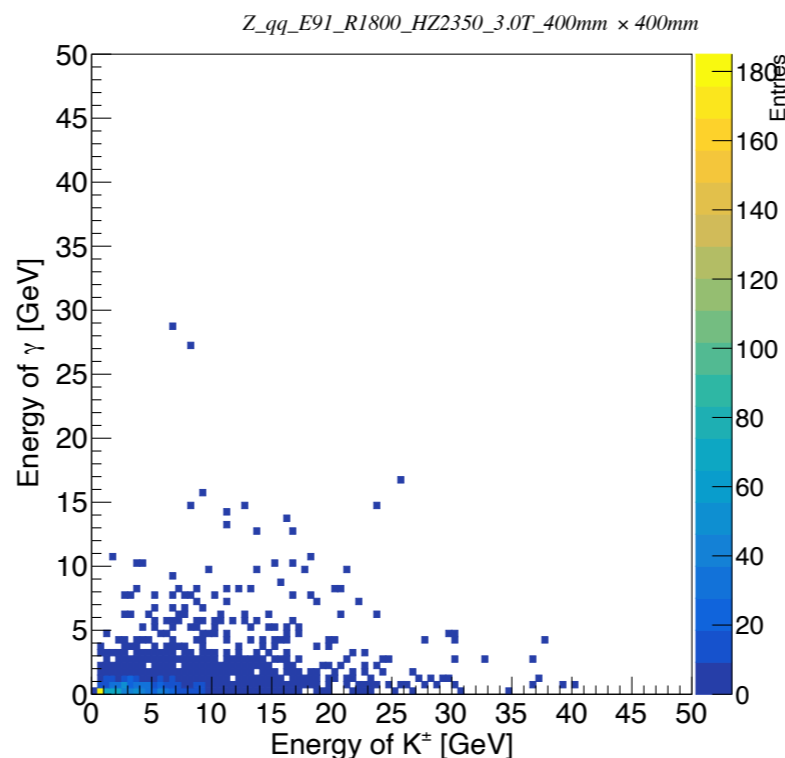
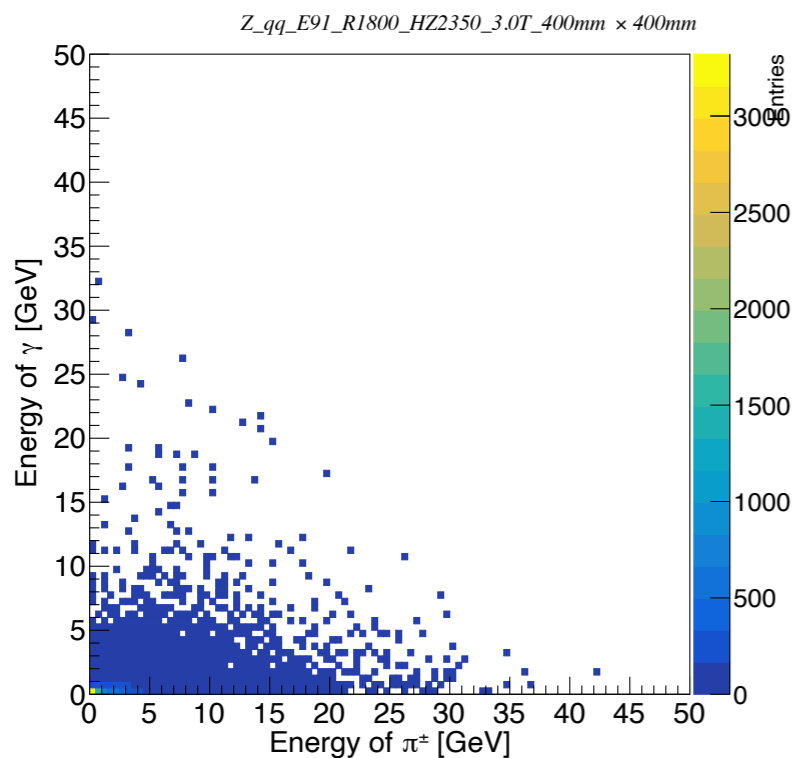
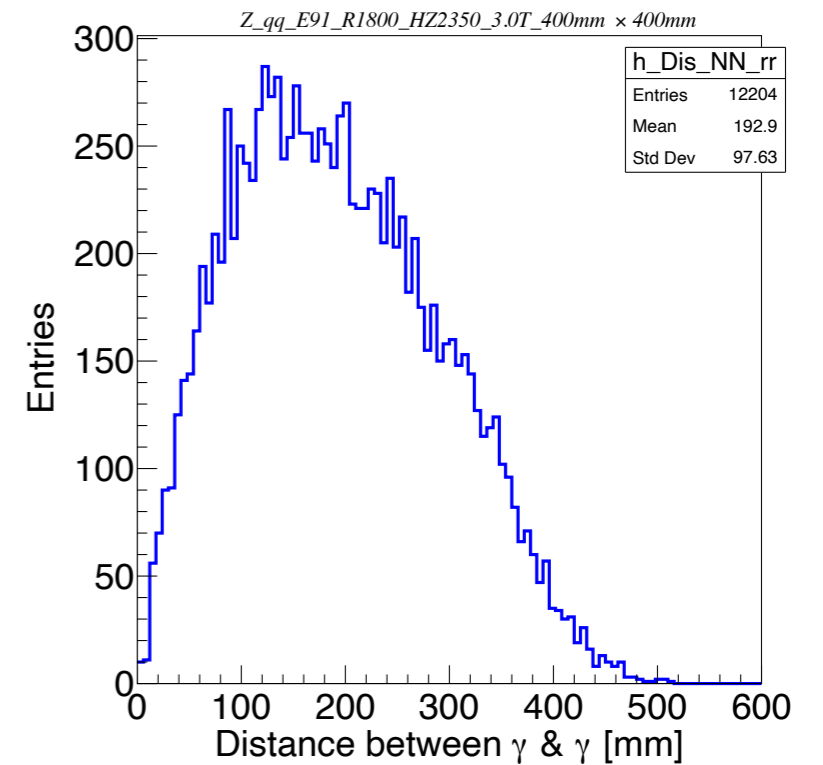
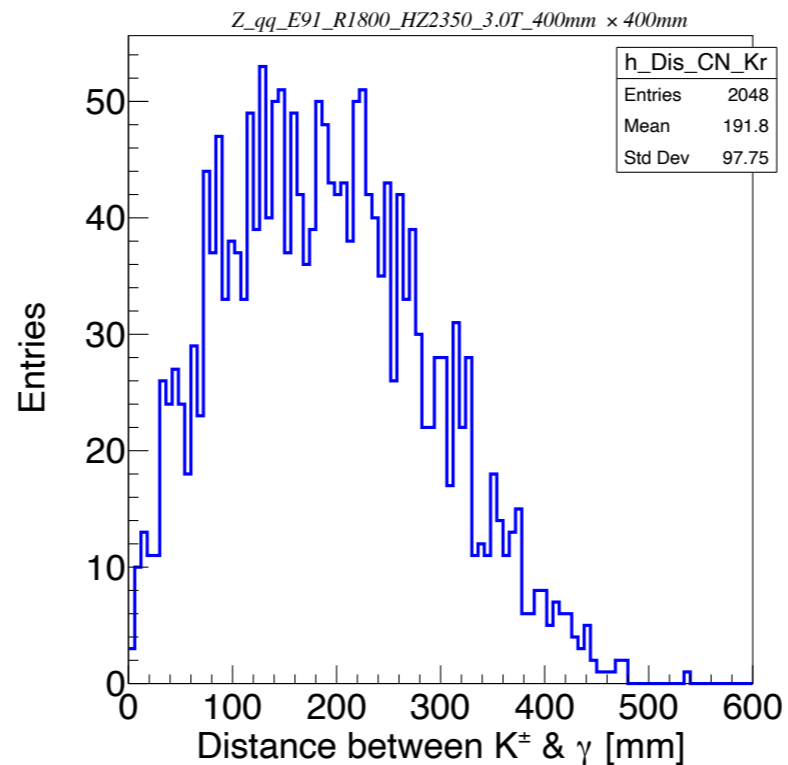
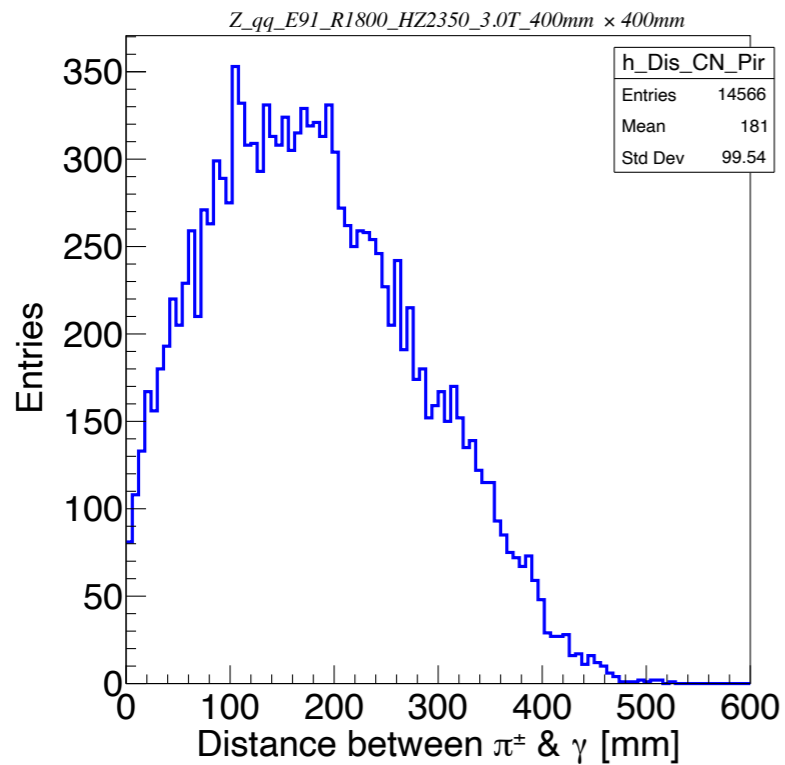
Reconstruction of Crystal ECAL



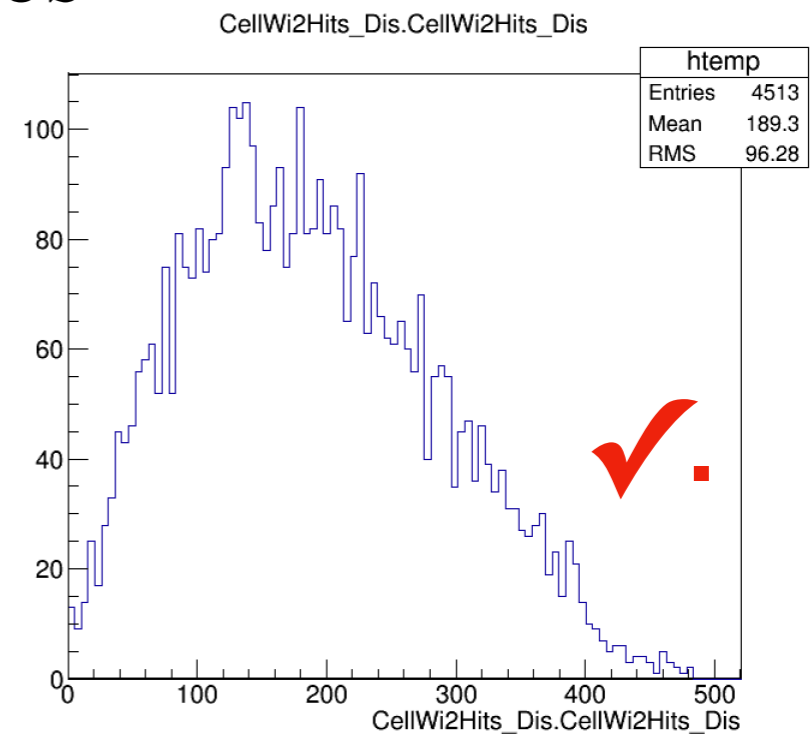
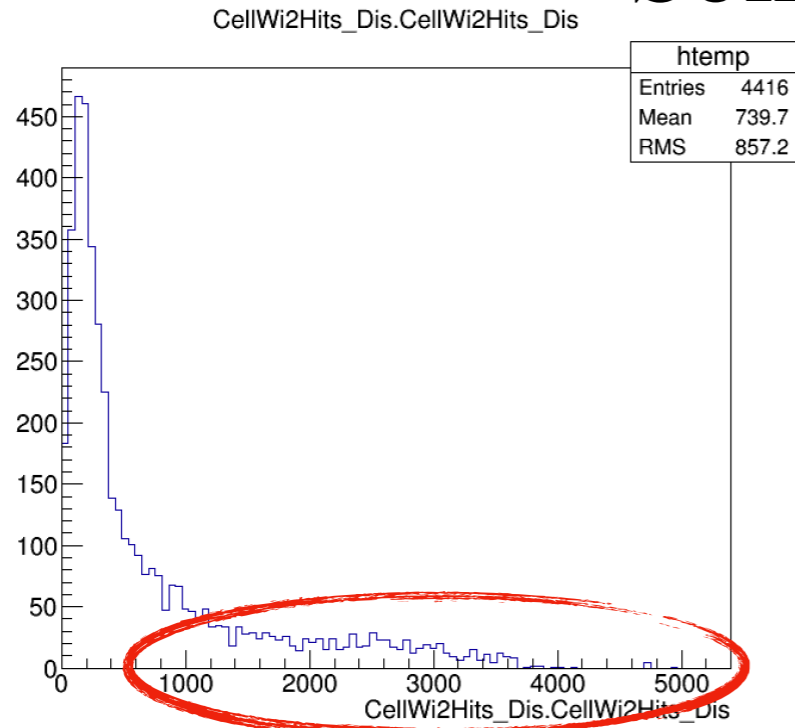
Multiplicity in a 40cm×40cm SuperCell



Distribution of Distance & Energy

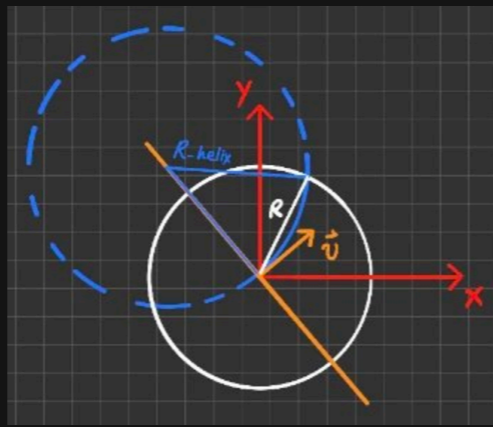


Some diagnoses



```

65 TVector3 ImpactPoint_Old( MCParticle *aMCP, double Track_Half_Z, double Track_Radius, double B_Field )
66 //B_Field always along Z+ direction
67 {
68     TVector3 MCP_Mom = aMCP->getMomentum();
69     int MCP_Charge = aMCP->getCharge();
70
71     TVector3 ImpactP(0, 0, 0);
72     double impact_En = MCP_Mom.Mag();
73     double impact_Pt = MCP_Mom.Perp();
74     double impact_Phi = MCP_Mom.Phi();
75     double ScaleFactor = 1.0;
76     double Tau = 0;
77     double R_helix = 1000*impact_Pt/(0.3*B_Field);
78     double Ratio_Z_Pz = 1000/(0.3*B_Field);
79
80     if(MCP_Charge == 0)
81     {
82         if( fabs(MCP_Mom[2]/impact_En) > Track_Half_Z/sqrt(Track_Half_Z*Track_Half_Z +
83             Track_Radius*Track_Radius) ) // Endcap
84         {
85             ScaleFactor = fabs(Track_Half_Z/MCP_Mom[2]);
86         }
87         else
88         {
89             ScaleFactor = Track_Radius/impact_Pt;
90         }
91         ImpactP.SetXYZ( ScaleFactor*MCP_Mom.X(), ScaleFactor*MCP_Mom.Y(), ScaleFactor*MCP_Mom.Z() );
92     }
93     else{
94         Tau = std::min( fabs(1.0/Ratio_Z_Pz*Track_Half_Z/MCP_Mom.Z()), fabs(Track_Radius/R_helix));
95         ImpactP.SetXYZ( R_helix*(MCP_Charge*sin(MCP_Charge*Tau - impact_Phi) +
96             MCP_Charge*sin(impact_Phi)), R_helix*(MCP_Charge*cos(MCP_Charge*Tau - impact_Phi) -
97             MCP_Charge*cos(impact_Phi)), Ratio_Z_Pz*MCP_Mom.Z()*Tau);
98     }
99
100     return ImpactP;
101 }
    
```



如下是 $R_{helix} < R/2$ 打在端盖上的

```

Charge = -1, Px = -0.0996212, Py = -0.425107, Pt = 0.436624, Pz = 0.374203, Phi = -1.80099
R_helix = 485.138 vs R/2 = 900
nT_Endcap = 0.899545
Beta_Endcap = 5.65201
R_helix < R/2 ----->
Beta = 5.65201
Beta_z = 5.65201
L = 301.15
IPx = -25.6865
IPy = 300.053
IPt = 301.15
IPz = 2350
New: Particle 84, PDG = -211, Charge = -1, Pt = 0.436624, Pz = 0.374203, IPt = 301.15, IPz = 2350
Old: Particle 84, PDG = -211, Charge = -1, Pt = 0.436624, Pz = 0.374203, IPt = 931.315, IPz = 1542.67
    
```

如下这种情况是对 $\sin(\beta/2)$ 做了近似 $\sim R/R_{helix}$ 所导致的精度不够

```

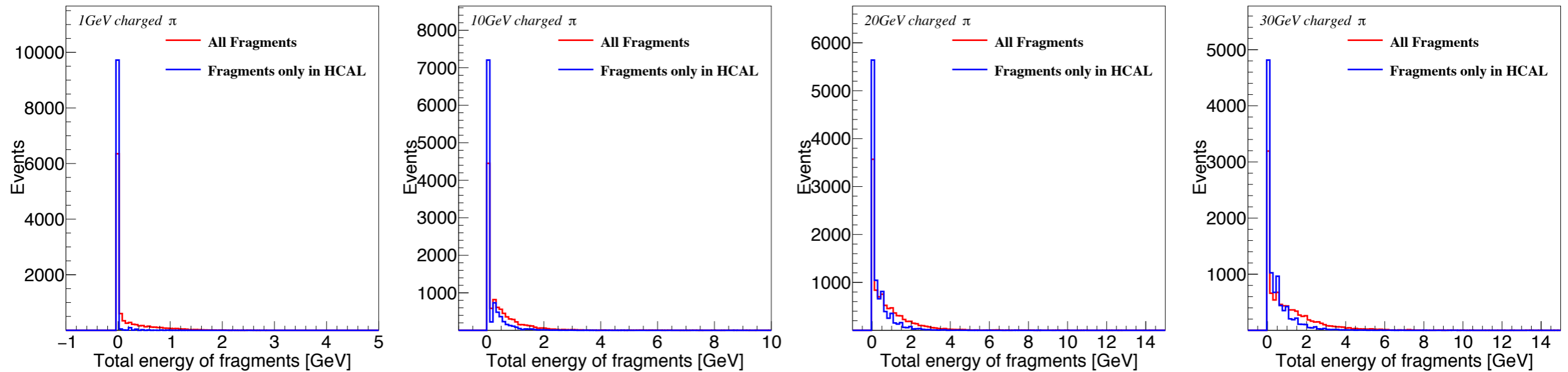
Charge = 1, Px = -7.24169, Py = 3.901, Pt = 8.22556, Pz = 3.16863, Phi = 2.64748
R_helix = 9139.51 vs R/2 = 900
nT_Endcap = 0.106233
Beta_Endcap = 0.66748
R_helix >= R/2 ----->
Beta_Barrel = 0.197267
nT_Barrel = 0.031396
Beta = 0.197267
Beta_z = 0.197267
L = 1800
IPx = -1661.06
IPy = 693.455
IPt = 1800
IPz = 694.517
New: Particle 74, PDG = 211, Charge = 1, Pt = 8.22556, Pz = 3.16863, IPt = 1800, IPz = 694.517
Old: Particle 74, PDG = 211, Charge = 1, Pt = 8.22556, Pz = 3.16863, IPt = 1797.09, IPz = 693.392
    
```

Fragment Optimization

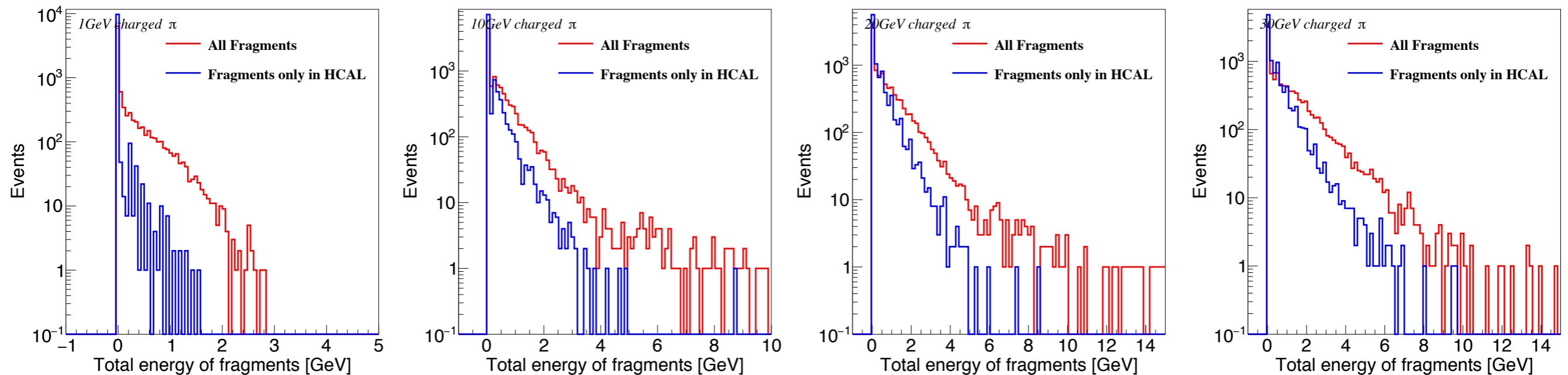
Ceiling of Fragment Optimization Using ECAL Time

The fragments whose cluster hits are all in HCAL

Linear



Log

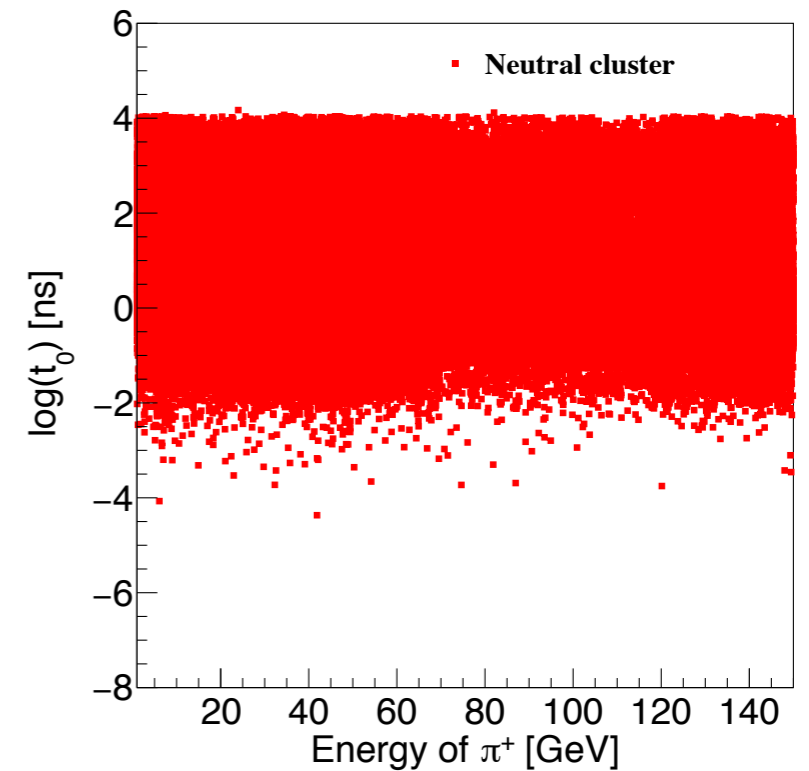
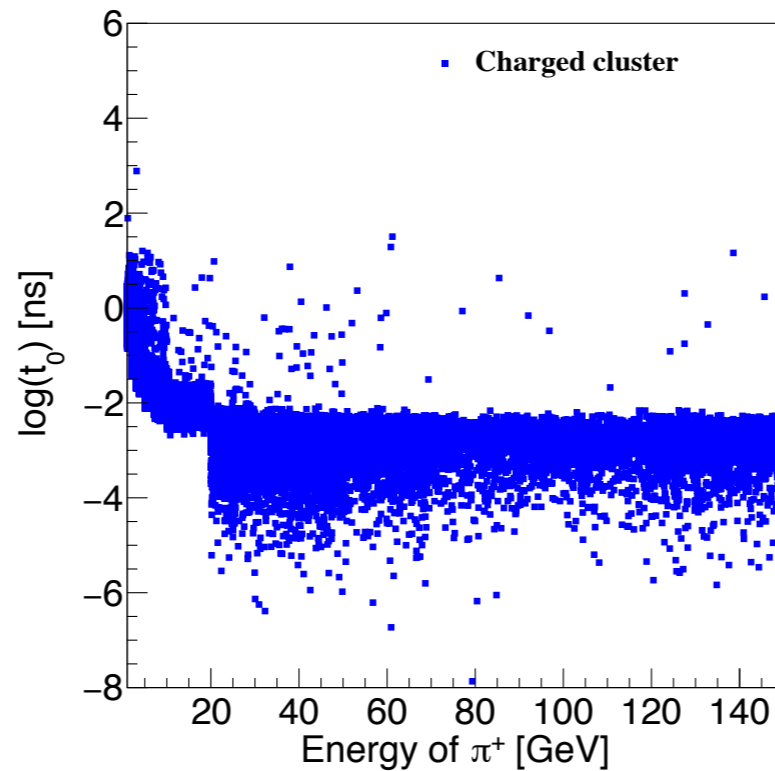
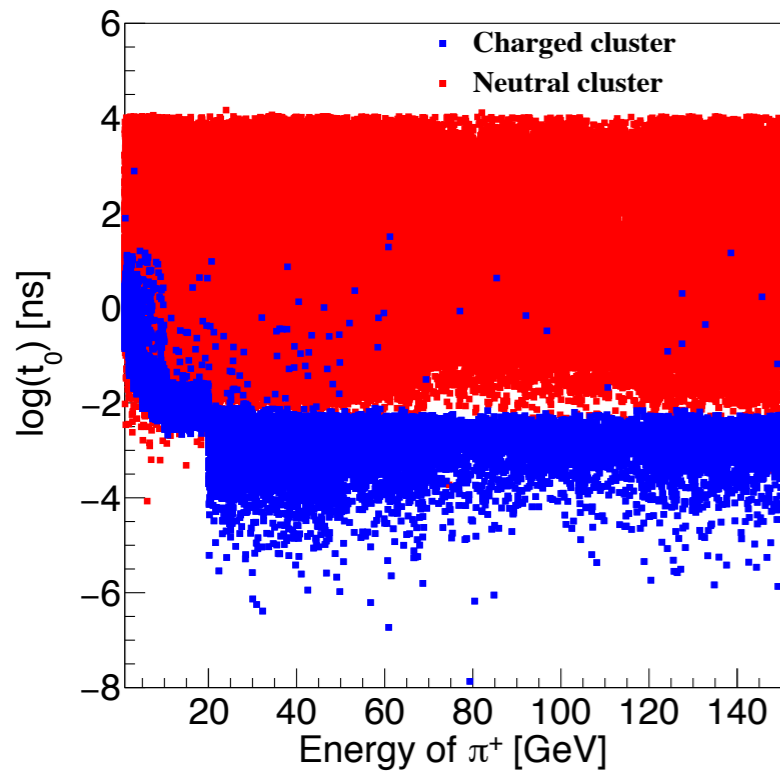
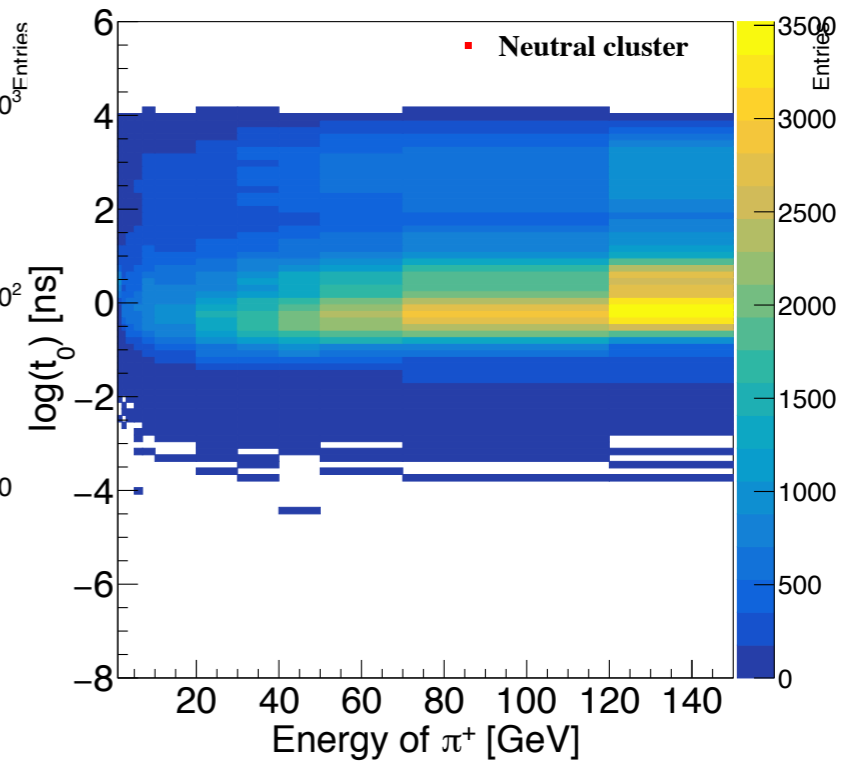
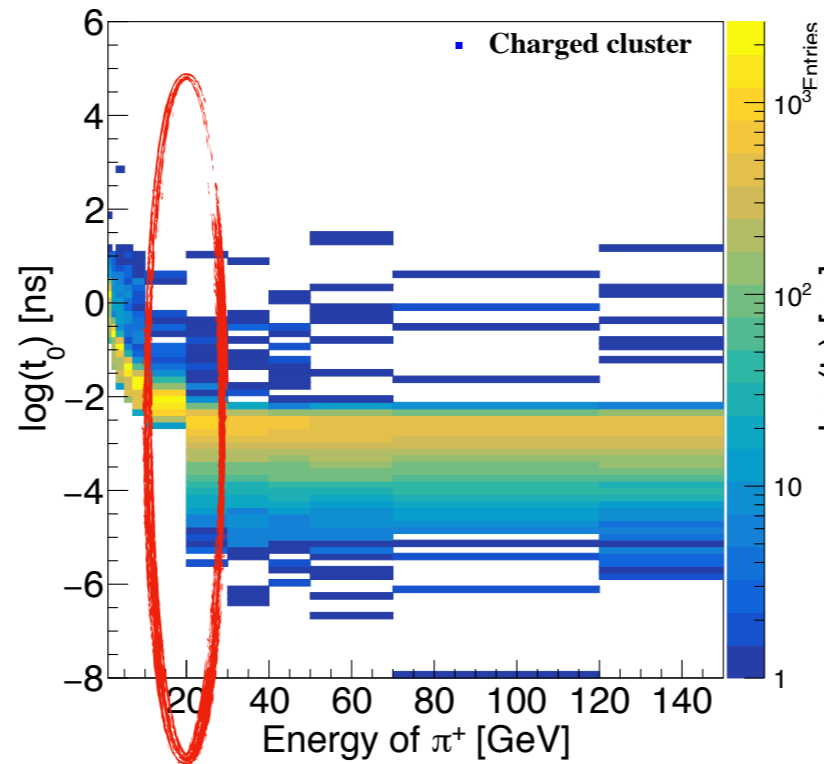
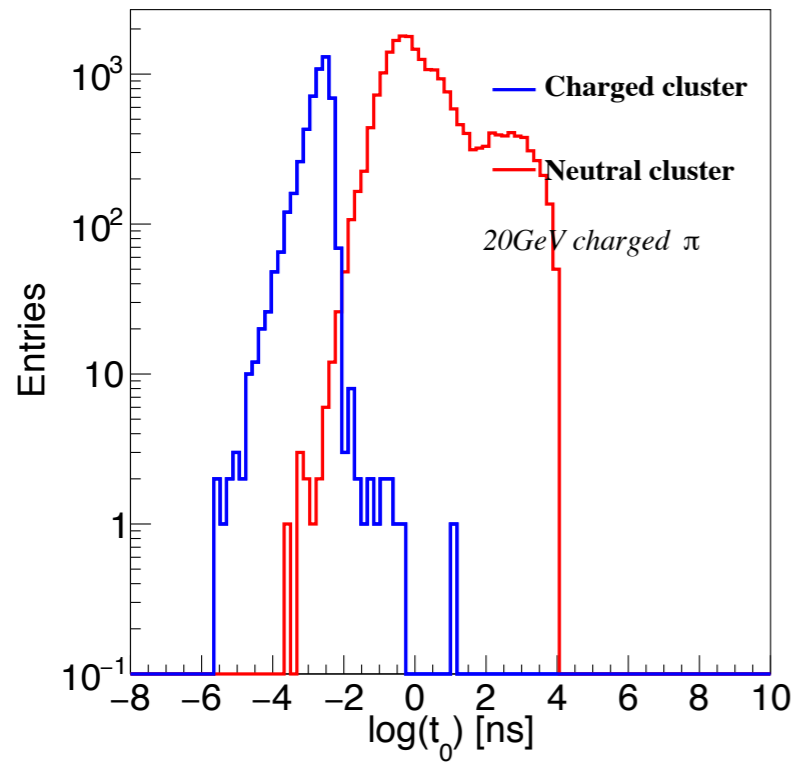


Cluster Time Pattern

Isolated Hit Time Updated
6% → 3% hit time = 0 @ 20 GeV

Definition of Hit Time: Raw hit time - Fly time (speed of light)

Definition of Cluster Time, t_0 : Initial hit time (fastest)



Next Step...

Reconstruction of Crystal ECAL

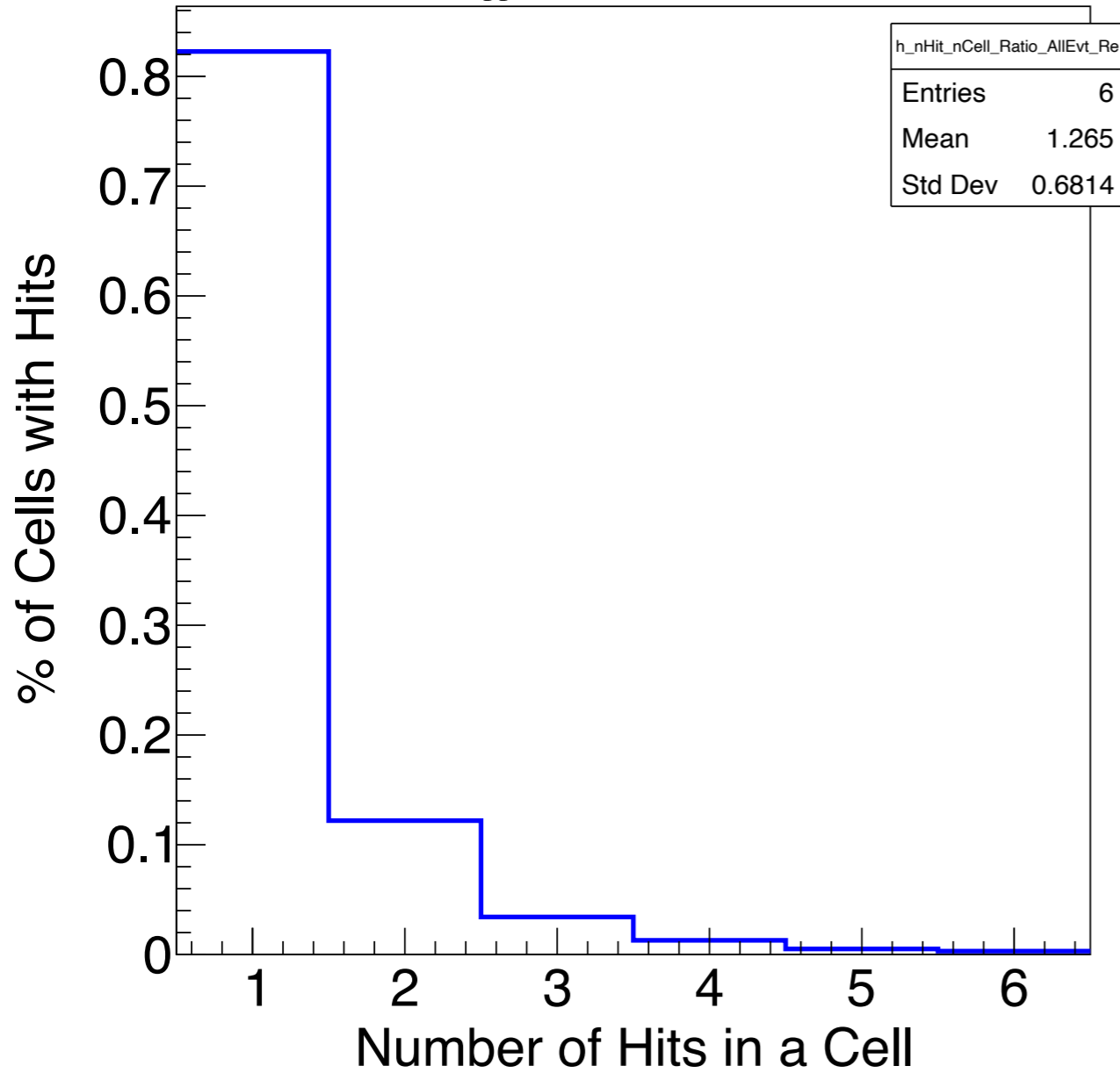
- *Simulation sample of di-particle*
- *Validation of Digitization (Energy & Time)*
- *Pattern study for reconstruction...*

Note of Fast Simulation

更改“磁场偏转函数”前后对比，对之前主要结论的影响不大

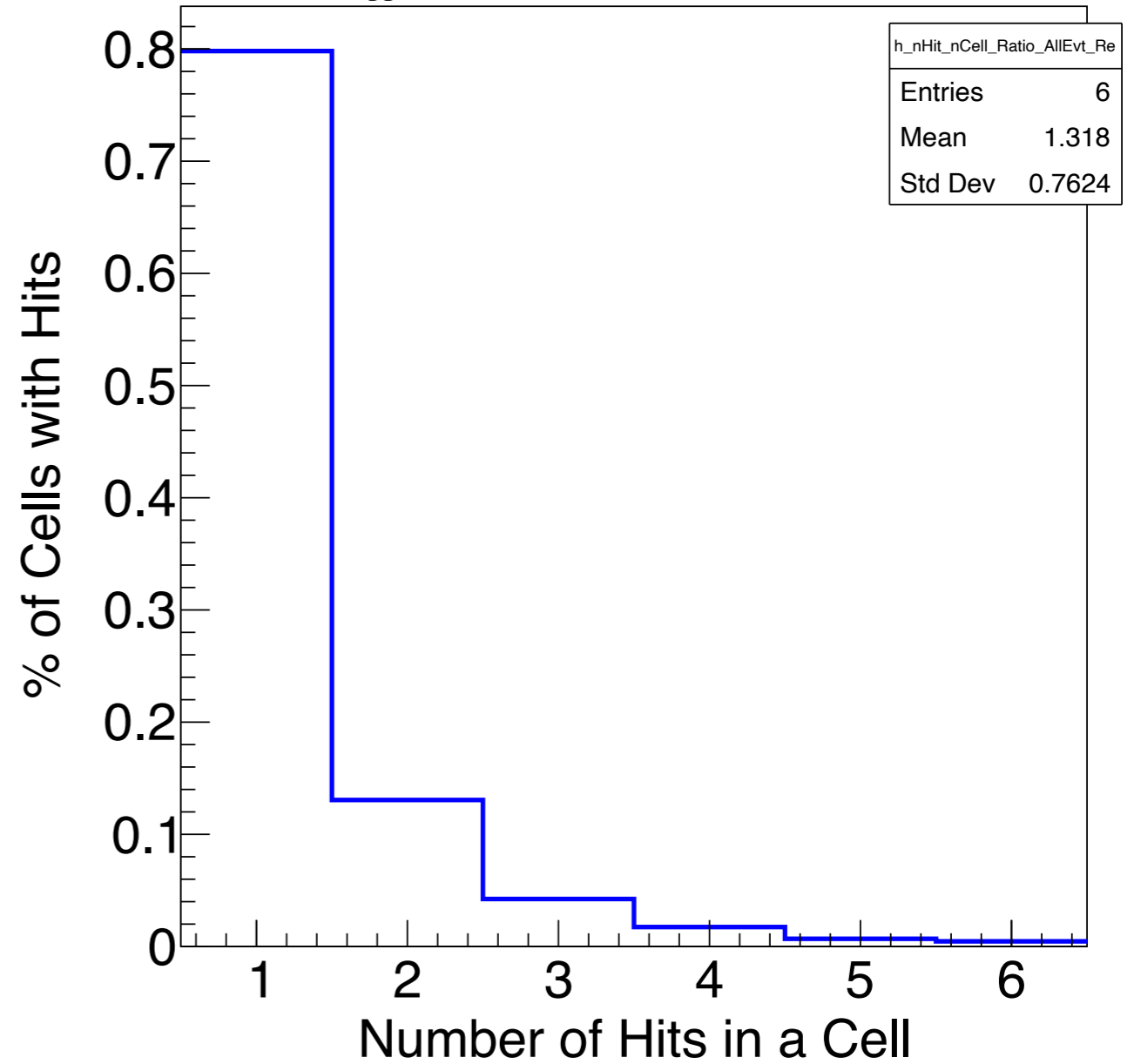
Old

Z_qq_E91_3.0T_400mm × 400mm



New

Z_qq_E91_R1800_HZ2350_3.0T_400mm × 400mm



Isolated Hit Time Updated
6%→3% hit time = 0 @ 20GeV

为什么还有t=0的啊!

20GeV

更新isolated hit time之后的比例

```
[ VERBOSE "ClusterAna" ] EvtNo = 9991, Evt_T0 = 0/190 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9992, Evt_T0 = 0/238 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9993, Evt_T0 = 0/0 = -nan
[ VERBOSE "ClusterAna" ] EvtNo = 9994, Evt_T0 = 0/180 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9995, Evt_T0 = 34/75 = 0.453333
[ VERBOSE "ClusterAna" ] EvtNo = 9996, Evt_T0 = 0/205 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9997, Evt_T0 = 0/194 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9998, Evt_T0 = 0/141 = 0
[ VERBOSE "ClusterAna" ] -----
[ VERBOSE "ClusterAna" ] EvtTot_T0 = 81267/2.45209e+06 = 0.0331419
[ MESSAGE "Marlin" ] -----
```

之前的比例

```
[ VERBOSE "ClusterAna" ] EvtNo = 9988, Evt_T0 = 5/239 = 0.0209205
[ VERBOSE "ClusterAna" ] EvtNo = 9989, Evt_T0 = 0/239 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9990, Evt_T0 = 0/176 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9991, Evt_T0 = 0/190 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9992, Evt_T0 = 0/238 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9993, Evt_T0 = 0/0 = -nan
[ VERBOSE "ClusterAna" ] EvtNo = 9994, Evt_T0 = 0/180 = 0
[ VERBOSE "ClusterAna" ] EvtNo = 9995, Evt_T0 = 44/75 = 0.586667
[ VERBOSE "ClusterAna" ] EvtNo = 9996, Evt_T0 = 10/205 = 0.0487805
[ VERBOSE "ClusterAna" ] EvtNo = 9997, Evt_T0 = 7/194 = 0.0360825
[ VERBOSE "ClusterAna" ] EvtNo = 9998, Evt_T0 = 0/141 = 0
[ VERBOSE "ClusterAna" ] -----
[ VERBOSE "ClusterAna" ] EvtTot_T0 = 147097/2.44753e+06 = 0.0601001
[ MESSAGE "Marlin" ] -----
```

说明除了isolated hit还是有t=0的hit

会不会是preshowerhit呀? 可是digi的时候都没写进去, 应该就不可能被重建到cluster里吧

Cluster Time Pattern

Definition of Hit Time: Raw hit time

Definition of Cluster Time, t_0 : Initial hit time (fastest)

