

Detached vertices validation

- Generated $ep \rightarrow e'k^+\Lambda; \Lambda \rightarrow p\pi^-$ exclusive reaction using EdGen phase space generator
- Coatjava tag 6c.6.3 used for running simulation/reconstruction
- Common vertices information for any two charged tracks in REC:: Particle bank are stored in REC::VertDoca bank
- Detected e', k^+, p, π^- in the final state in FD only
- e', k^+ has a common vertices and p, π^- has another common vertices
- Configuration used :: rga_fall2018

Calculate flight time for Lambda

Vector3D vtx_ppim = new Vector3D(x', y', z');

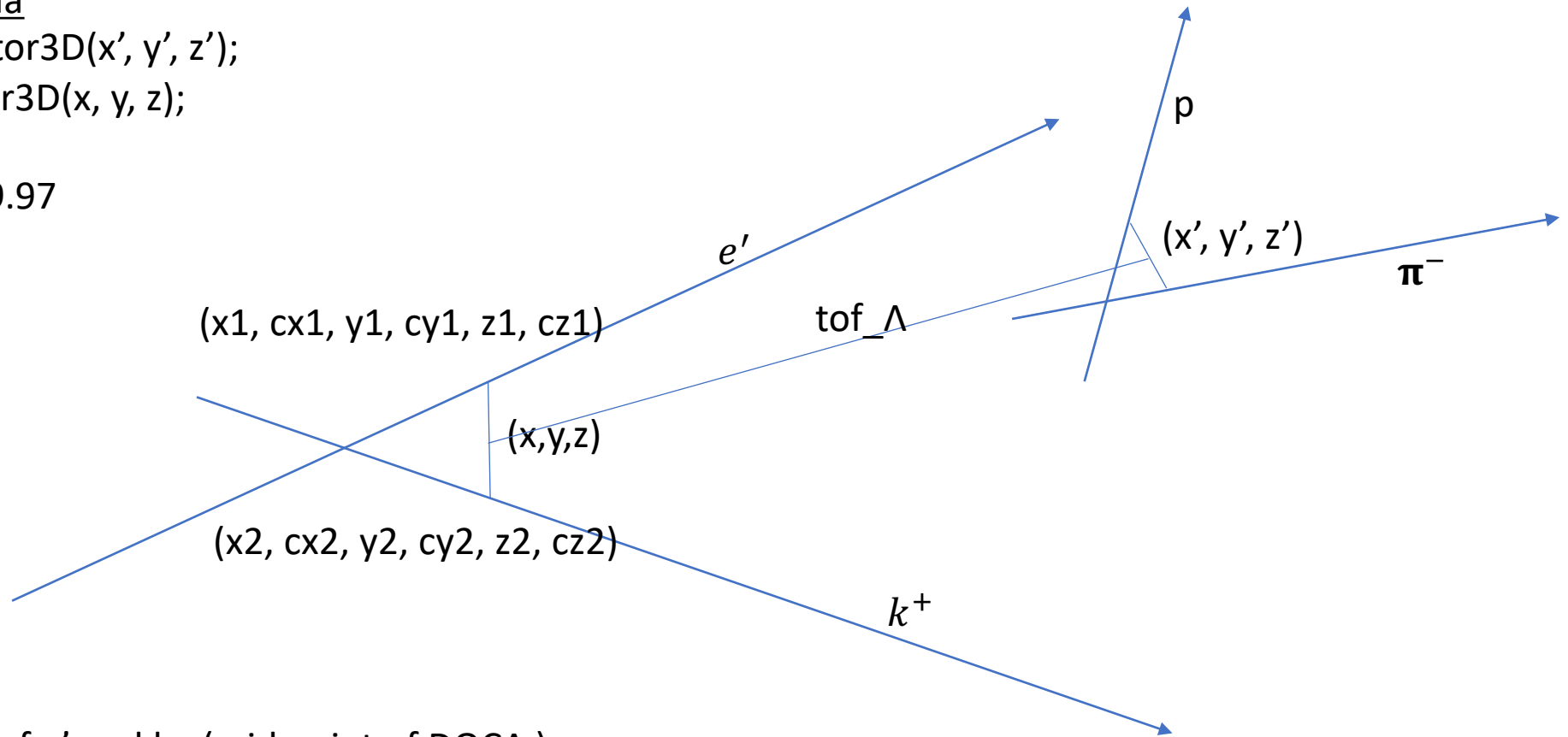
Vector3D vtx_ekp = new Vector3D(x, y, z);

vtx_ppim.sub(vtx_ekp);

tof_Λ(ns) = vtx_ppim.mag()/29.97

$ep \rightarrow e' k^+ \Lambda;$

$\Lambda \rightarrow p \pi^-$

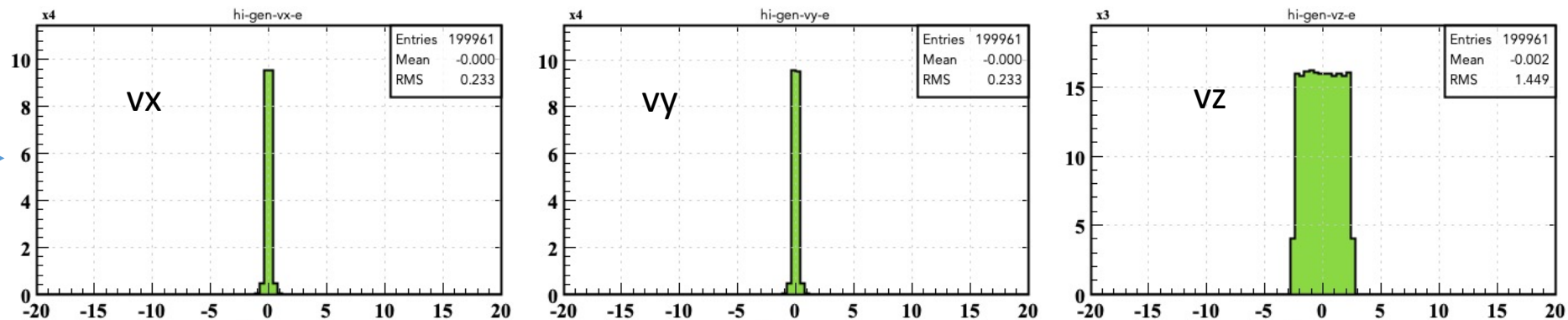


REC::VertDoca information

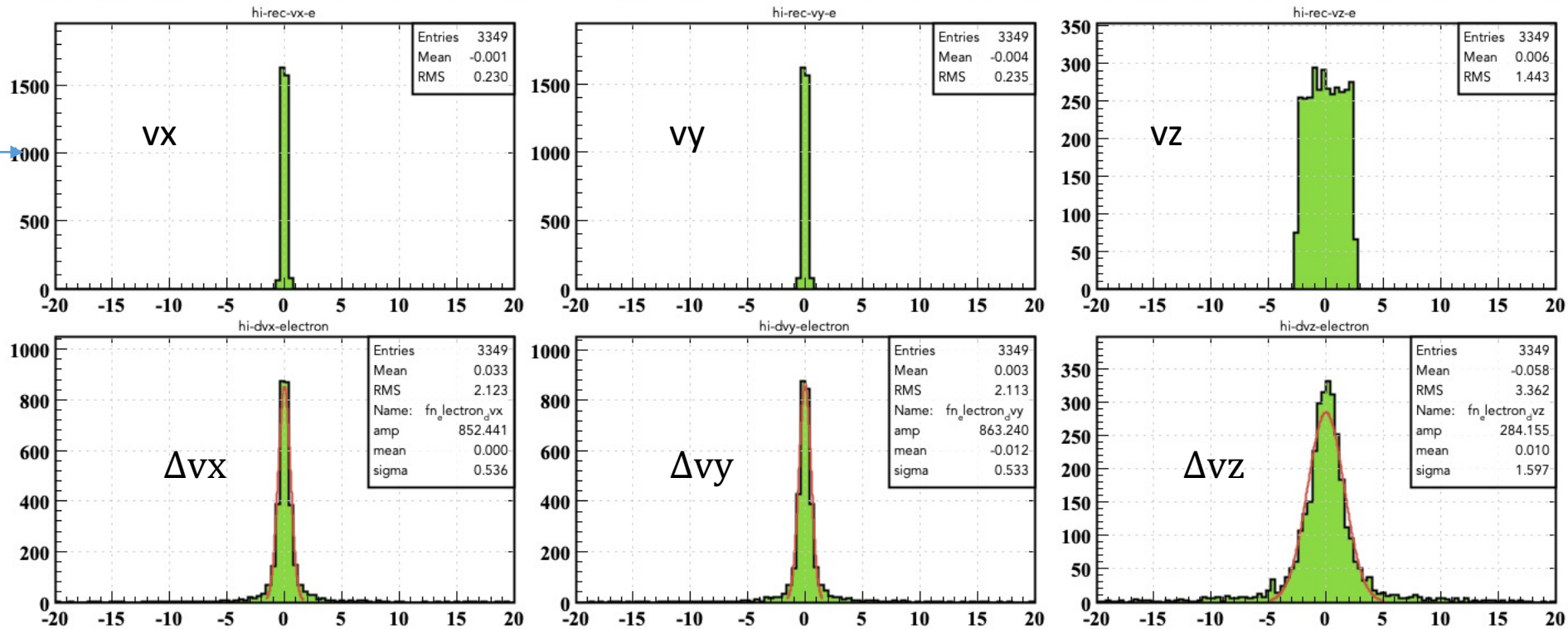
- $(x, y, z) ::$ common vertex of e' and k^+ (mid point of DOCA)
 - $(x1, y1, z1)/(cx1, cy1, cz1) ::$ position/direction vector of the first track (e') at the DOCA point (cm)
 - $(x2, y2, z2)/(cx2, cy2, cz2) ::$ position/direction vector of the second track (k^+) at the DOCA point (cm)
- $(x', y', z') ::$ common vertex of p and π^- (mid point of DOCA) and we also have position/direction vector of proton and π^- tracks at the DOCA point

e/k+ common vertices reconstruction

generated →

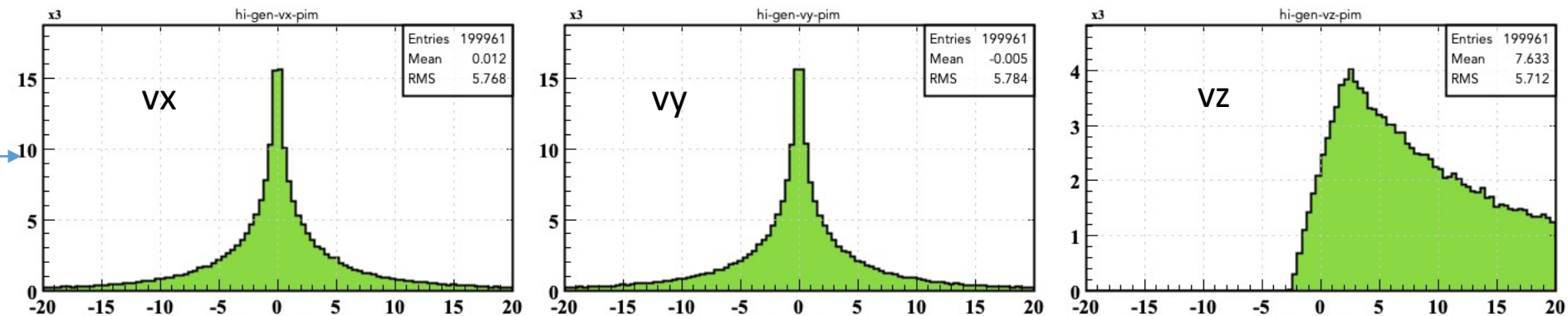


reconstructed →

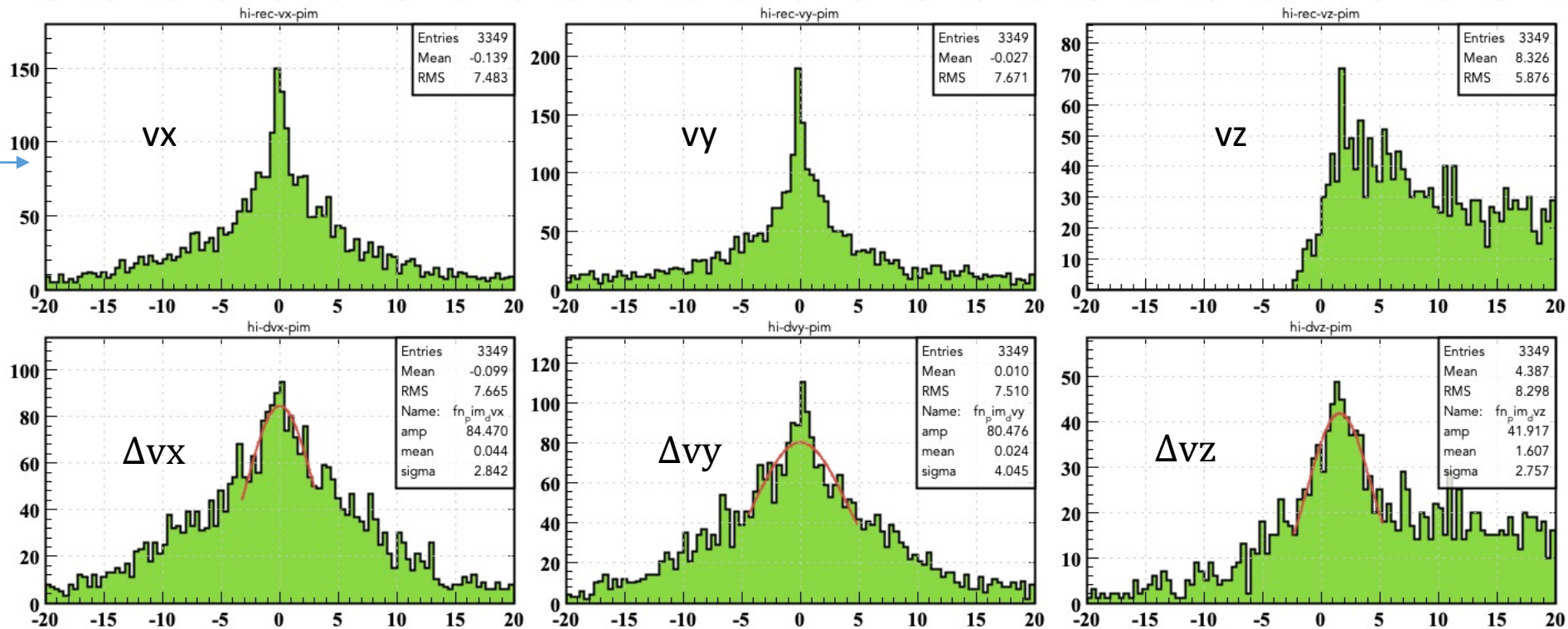


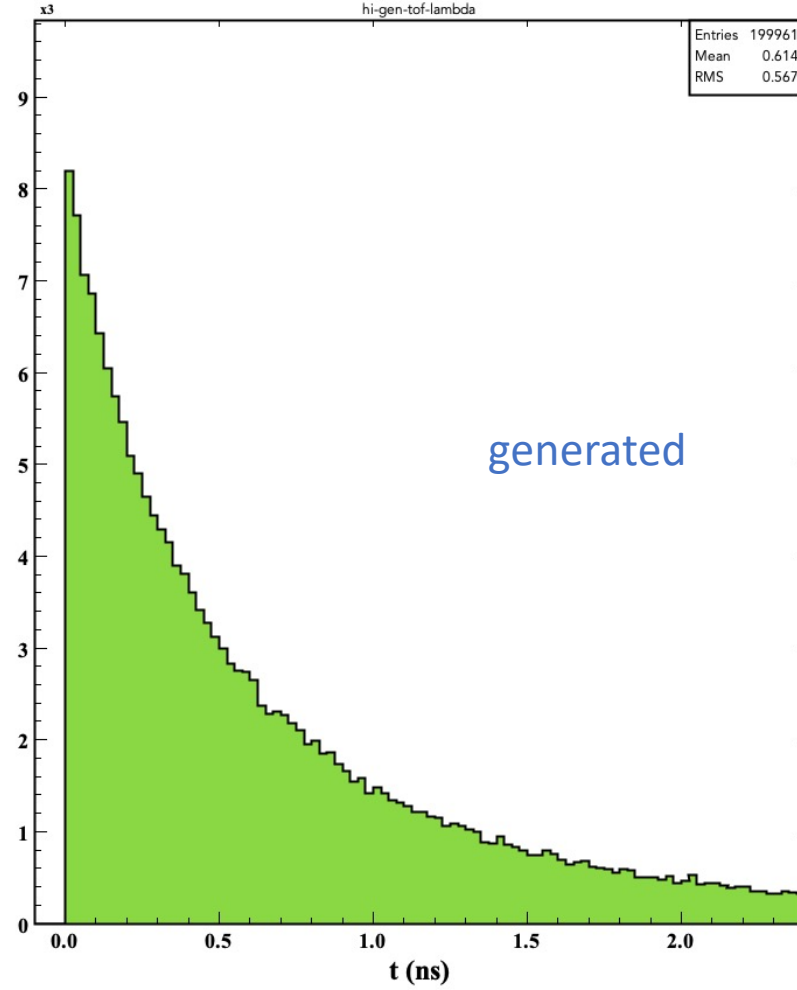
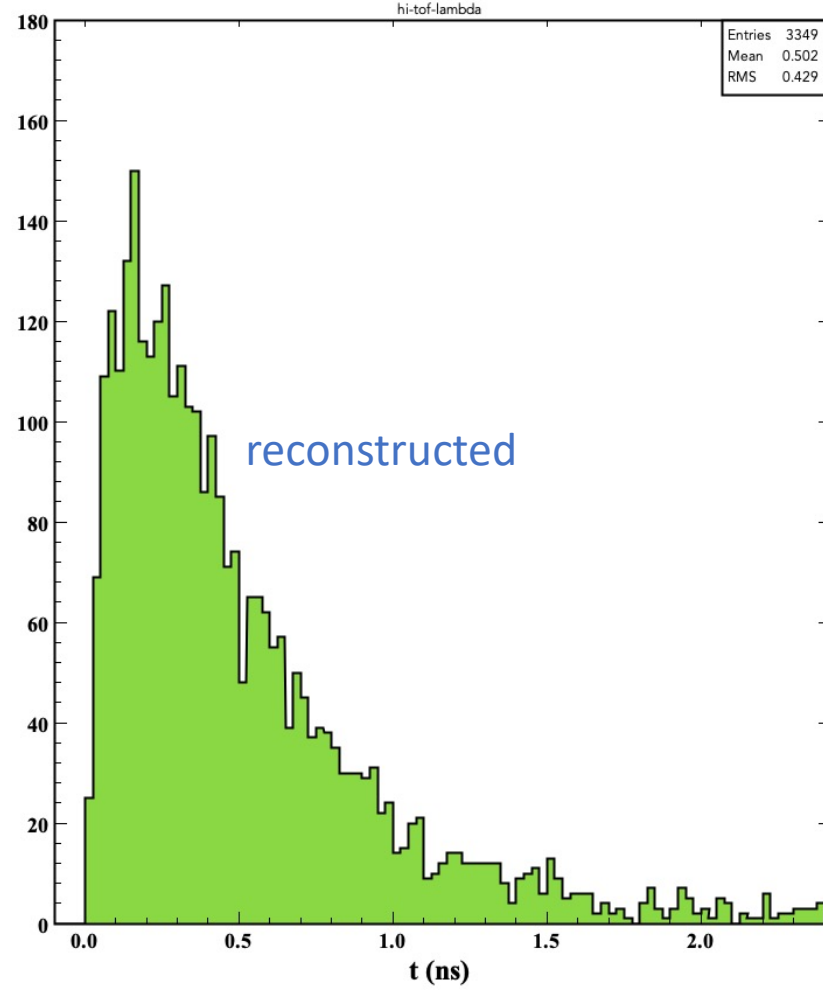
proton /pi- common vertices reconstruction

generated



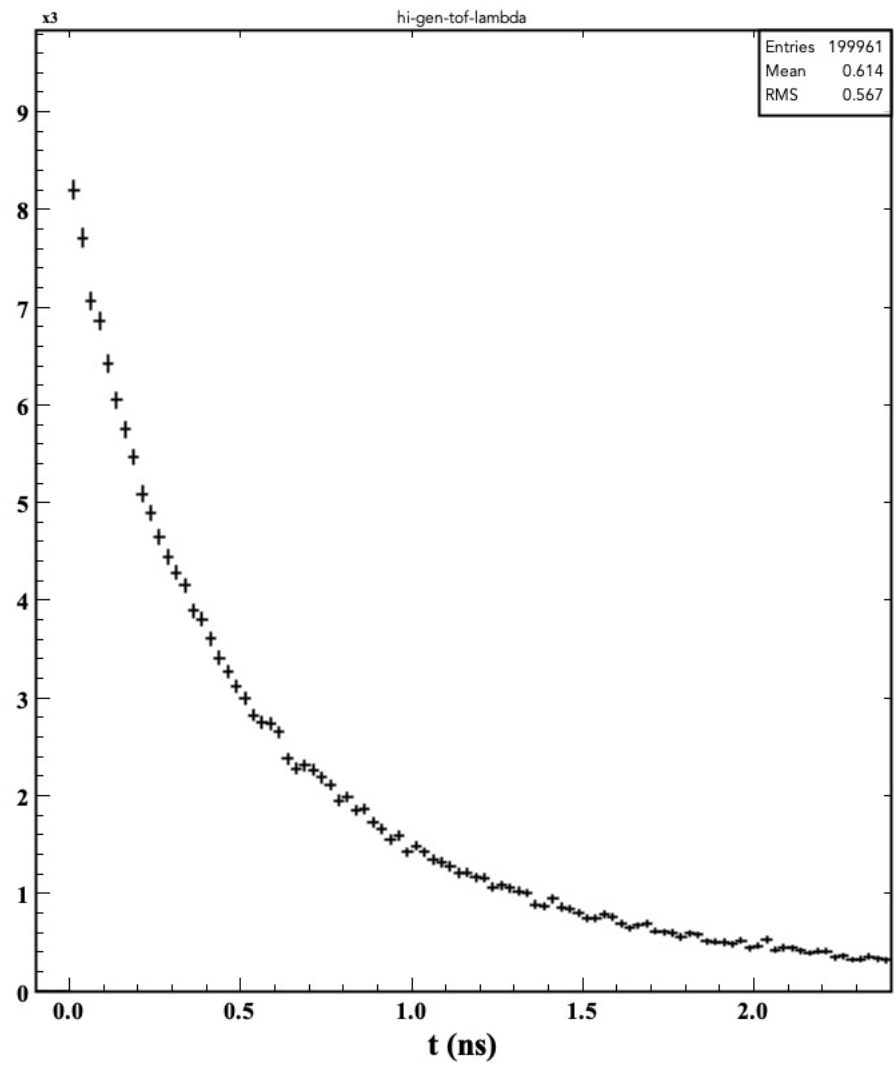
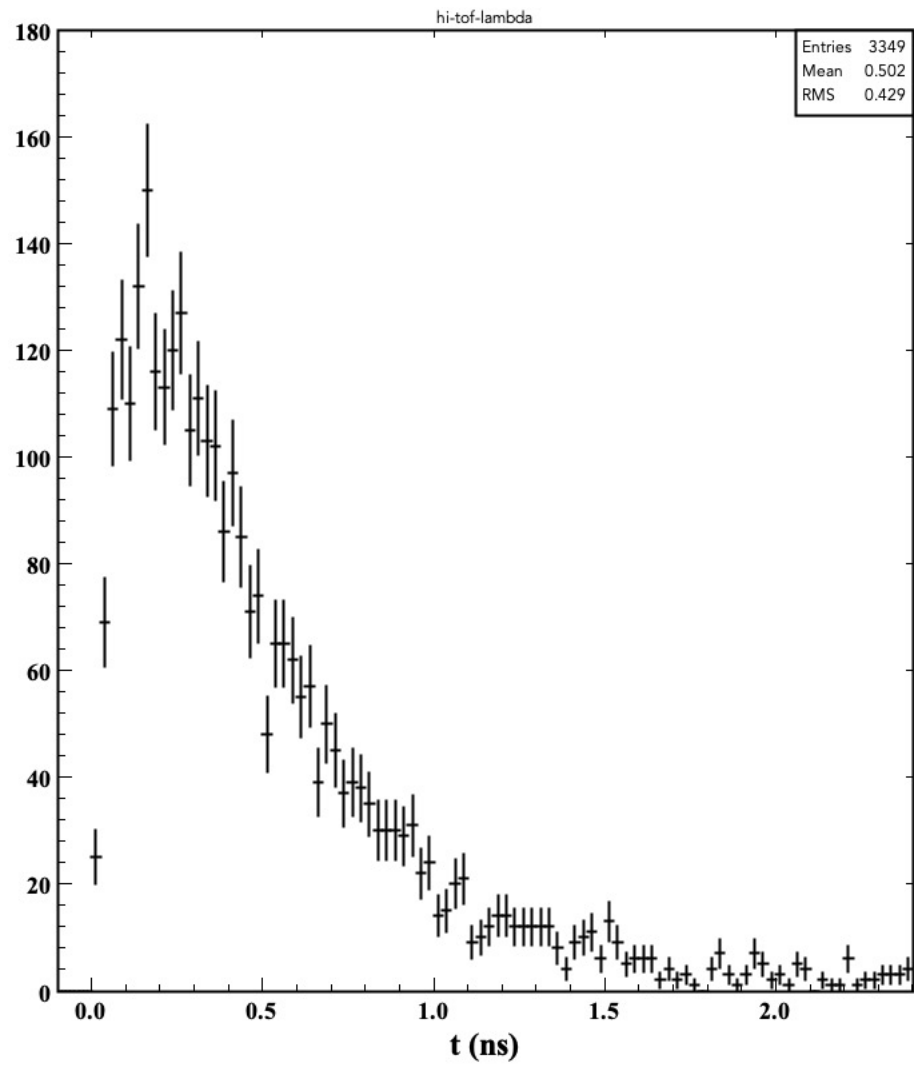
reconstructed





```
Vector3D vtx_ppim = new Vector3D(x', y', z');
Vector3D vtx_ekp = new Vector3D(x, y, z);
vtx_ppim.sub(vtx_ekp );
```

```
tof_Λ(ns) = vtx_ppim.mag()/29.97
```



```

choose (n=next,p=previous, q=quit), Type Bank Name or id : REC::Particle
position for [REC::Particle] == 41113
NODE * group = 300, item = 31, type = 11, size = 172
    pid : 11 2212 321 22
    px : -0.9344 0.6592 0.1023 0.2239
    py : 1.4069 -0.7160 -0.5045 -0.1588
    pz : 7.1370 2.0747 0.7797 0.4923
    vx : -0.1459 0.8443 0.0472 -0.1459
    vy : -0.1143 0.7947 0.0376 -0.1143
    vz : 0.3422 -1.2503 0.9093 0.3422
    vt : 124.2245 124.1714 124.2434 -1.0000
    charge : -1 1 1 0
    beta : 1.0000 0.9233 0.8920 0.9379
    chi2pid : -0.2460 0.5906 -1.1192 9999.0000
    status : -2231 2210 2100 2010

```

```

choose (n=next,p=previous, q=quit), Type Bank Name or id : REC::VertDoca
position for [REC::VertDoca] == 43583
NODE * group = 300, item = 39, type = 11, size = 204
    index1 : 0 0 1
    index2 : 1 2 2
    x : 0.1293 -0.0152 -0.6725
    y : 0.5791 -0.2121 2.5283
    z : 0.2381 0.3655 4.4203
    x1 : -0.1459 -0.1459 -0.9148
    y1 : -0.0969 -0.0969 2.6888
    z1 : 0.3422 0.3422 4.2874
    cx1 : 0.1274 0.1274 -0.2875
    cy1 : -0.1918 -0.1918 0.3125
    cz1 : 0.9731 0.9731 0.9053
    x2 : 0.4045 0.1155 -0.4301
    y2 : 1.2551 -0.3273 2.3678
    z2 : 0.1341 0.3888 4.5533
    cx2 : -0.2876 -0.1096 -0.1091
    cy2 : 0.3125 0.5400 0.5401
    cz2 : 0.9053 0.8345 0.8345
    r : 1.4745 0.3516 0.6392

```

```

choose (n=next,p=previous, q=quit), Type Bank Name or id : REC::Track
position for [REC::Track] == 43524
NODE * group = 300, item = 36, type = 11, size = 51
    index : 1 2 0
    pindex : 0 1 2
    detector : 6 6 6
    sector : 3 6 6
    status : 100 110 100
    q : -1 1 1
    chi2 : 484.5081 945.1547 106.6522
    NDF : 37 31 34
    hbindex : 0 1 2

```

```
{
```

```
"name": "REC::VertDoca",
"group": 300,
"item" : 39,
"info": "Track Cross information for Particles bank",
"entries": [
  {"name":"index1",  "type":"S", "info":"index of the first track in Tracks bank"},
  {"name":"index2",  "type":"S", "info":"index of the second track in Tracks bank"},
  {"name":"x",       "type":"F", "info":"x-position of the common vertex (cm)"},
  {"name":"y",       "type":"F", "info":"y-position of the common vertex (cm)"},
  {"name":"z",       "type":"F", "info":"z-position of the common vertex (cm)"},
  {"name":"x1",      "type":"F", "info":"x-position of the first track at the DOCA point (cm)"},
  {"name":"y1",      "type":"F", "info":"y-position of the first track at the DOCA point (cm)"},
  {"name":"z1",      "type":"F", "info":"z-position of the first track at the DOCA point (cm)"},
  {"name":"cx1",     "type":"F", "info":"x-direction vector of the first track at the DOCA point (cm)"},
  {"name":"cy1",     "type":"F", "info":"y-direction vector of the first track at the DOCA point (cm)"},
  {"name":"cz1",     "type":"F", "info":"z-direction vector of the first track at the DOCA point (cm)"},
  {"name":"x2",      "type":"F", "info":"x-position of the second track at the DOCA point (cm)"},
  {"name":"y2",      "type":"F", "info":"y-position of the second track at the DOCA point (cm)"},
  {"name":"z2",      "type":"F", "info":"z-position of the second track at the DOCA point (cm)"},
  {"name":"cx2",     "type":"F", "info":"x-direction vector of the second track at the DOCA point (cm)"},
  {"name":"cy2",     "type":"F", "info":"y-direction vector of the second track at the DOCA point (cm)"},
  {"name":"cz2",     "type":"F", "info":"z-direction vector of the second track at the DOCA point (cm)"},
  {"name":"r",       "type":"F", "info":"The distance between two tracks (cm)"}
]
```

```
Choose (n=next,p=previous, q=quit), Type Bank Name or id : MC::Particle
position for [MC::Particle] == 8027
* NODE * group =      40, item =   2, type = 11, size =      128
      pid :         11      321      2212      -211
      px :    -0.9317    0.1069    0.7133    0.1115
      py :     1.4051   -0.5045   -0.7033   -0.1972
      pz :     7.1097    0.7850    2.0913    0.6180
      vx :    -0.2923   -0.2923    1.1700    1.1700
      vy :    -0.0663   -0.0663   -1.6628   -1.6628
      vz :     1.0878    1.0878    5.8908    5.8908
      vt :    124.2500  124.2500  124.4377  124.4377
```