Progress Report

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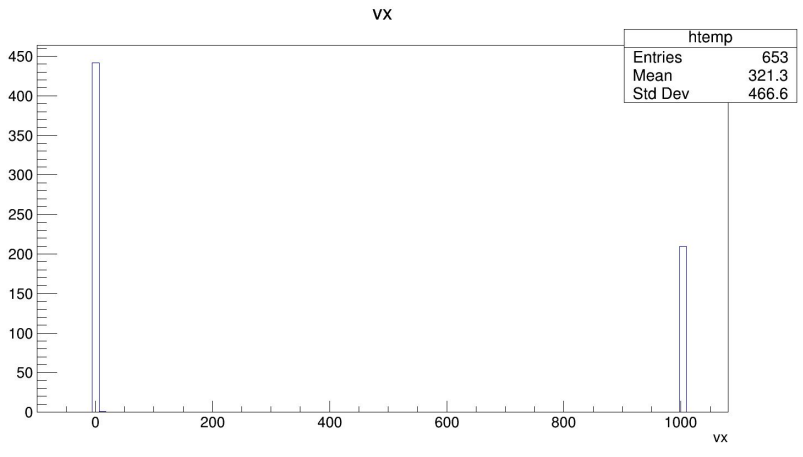
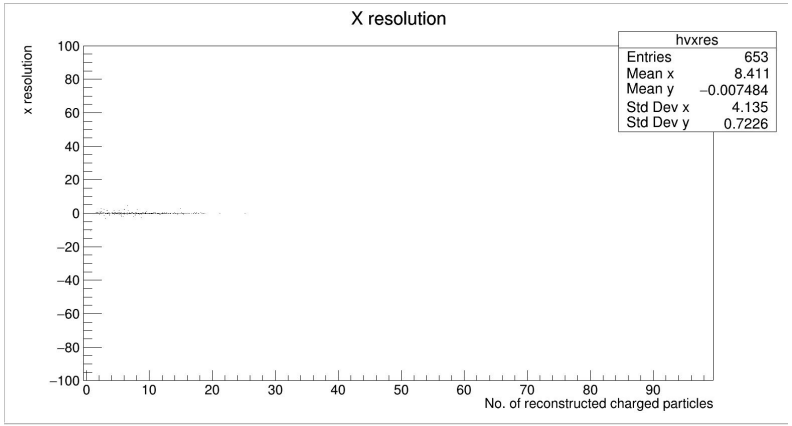
Checking the vertex 999

- I checked the code to understand the origin of the vertex position 999 which was there in vertex plots but not in resolution plots.





Checking the vertex 999

- Realised Sooraj has made a dummy vertex vector (999, 999, 999).

```
156    fmt::print("\n{:-^50}\n", fmt::format("Central Track Vertices ",e));
157    TVector3 evtVtx_rc(999.,999.,999.);
158    float diff = 999.;
159    int nTrks = 0;
160    int nvtx=0;
161    for(const auto& rec_vtx : rec_vtxs) {
162      nvtx++;
163      TVector3 aVtx(rec_vtx.getPosition().x, rec_vtx.getPosition().y, rec_vtx.getPosition().z);
164      TVector3 vtx_diff = aVtx - evtVtx;
165      hvr->Fill(vtx_diff.Mag());
166      fmt::print(" {:>20}: {}\n", "Vertex_diff_magnitude", vtx_diff.Mag());
167      if ( vtx_diff.Mag() < diff ) {
168       evtVtx_rc = aVtx;
169       diff = vtx_diff.Mag();
170      }
171    }
172    fmt::print(" {:>20}: {}\n", "nvtx", nvtx);
173    hnvtx->Fill(nvtx);
174
175    fmt::print("  {:>20}: ({}, {}, {}) mm\n", "RC Vertex", evtVtx_rc.x(), evtVtx_rc.y(), evtVtx_rc.z());
176    //
```

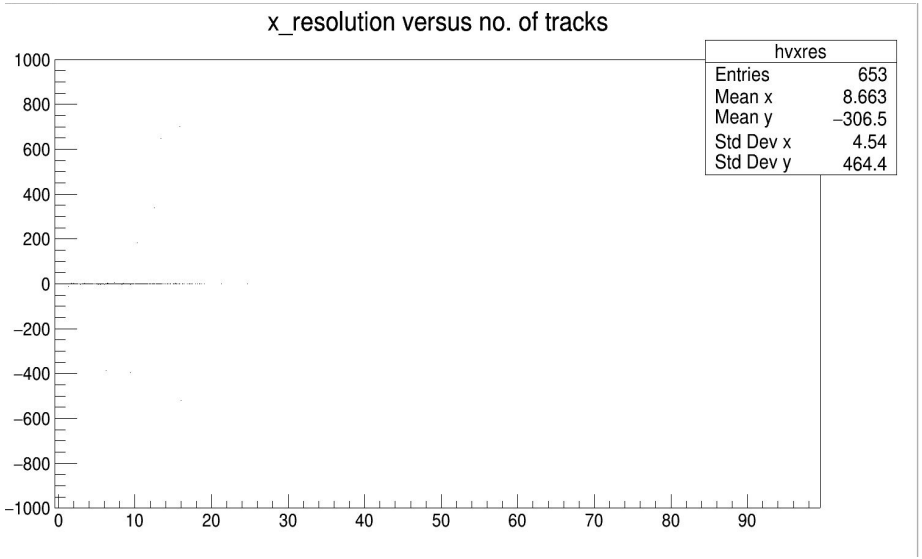
Checking the vertex 999

- Printed the number of reconstructed vertices for each event to realise that we actually do NOT have reconstructed vertices for some events for which this dummy vector is being used.

```
=== EVENT 650 ====================================
Number of entries in collections:
                    ReconstructedChargedParticles: 7
                             CentralTrackVertices: 0
                                        MCParticles: 50

-----------------MC Particles ------------------
            MC Vertex: (-0.027410154709438896, -0.002662891874325422, -3.0676527423319904) mm

------------Central Track Vertices -------------
                nvtx: 0
            RC Vertex: (999, 999, 999) mm
        x_Resolution: -999.0274

------------Reconstructed Particles ------------

=== EVENT 651 ====================================
Number of entries in collections:
                    ReconstructedChargedParticles: 6
                             CentralTrackVertices: 1
                                        MCParticles: 28

-----------------MC Particles ------------------
            MC Vertex: (-0.12813961465899404, -0.014077070345682667, 8.960979240124287) mm

------------Central Track Vertices -------------
 Vertex_diff_magnitude: 15.284540940710523
                nvtx: 1
            RC Vertex: (-2.567596912384033, 2.1035633087158203, -5.978292465209961) mm
        x_Resolution: 2.4394574

------------Reconstructed Particles ------------
```

Checking the vertex 999

- While plotting the resolution, we do not see this vertex because the range for resolution plots was fixed.
- Resolution plot with changed range:



Code:

```
77  TH1F* hnvtx = new TH1F("hnvtx","",100,-0.5,99.5); hnvtx->Sumw2();
78  TH1F* hvr   = new TH1F("hvr", "", 10000,0,100); hvr->Sumw2();
79  TH2F* hvxres = new TH2F("hvxres","x_resolution versus no. of tracks",100,-0.5,99.5,2000,-1000.,1000.); hvxres->Sumw2();
80  TH2F* hvyres = new TH2F("hvyres","",100,-0.5,99.5,2000,-100.,100.); hvyres->Sumw2();
81  TH2F* hvzres = new TH2F("hvzres","",100,-0.5,99.5,2000,-100.,100.); hvzres->Sumw2();
82
```

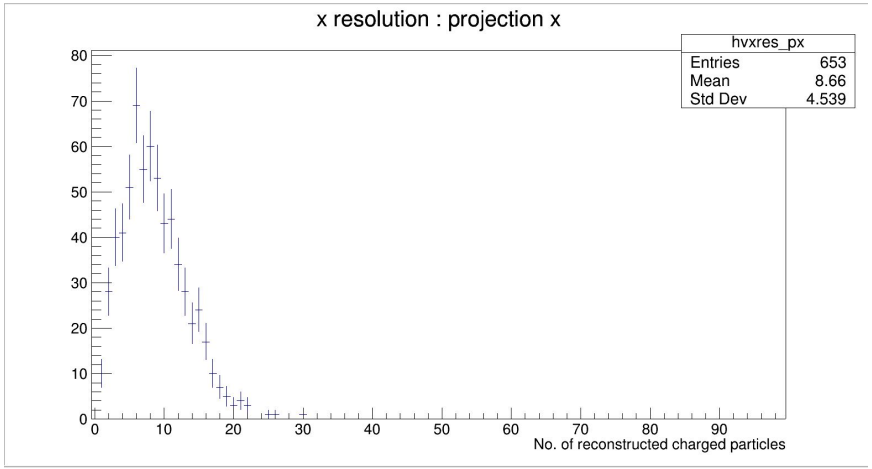
Making 1-D projections from 2-D resolution plots

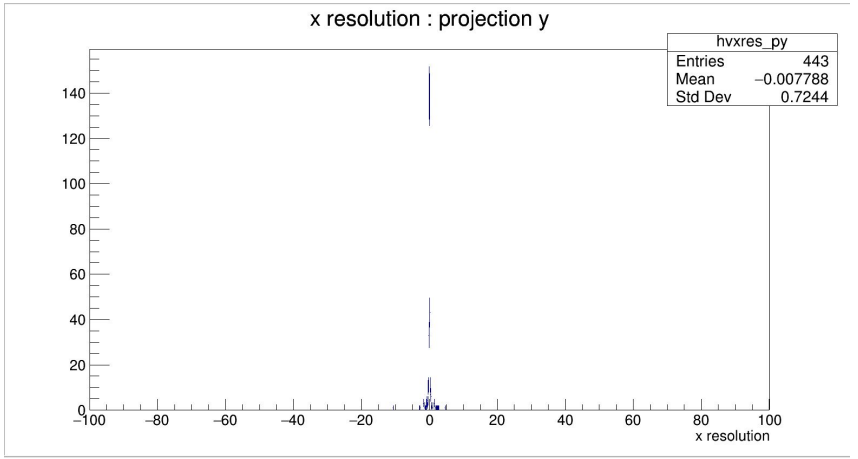
- Made Projections along both X and Y axis for resolution plots of all 3 vertex components .

```
TH1D* hx_proY = hvxres->ProjectionY();
TH1D* hx_proX = hvxres->ProjectionX();
TH1D* hy_proY = hvyres->ProjectionY();
TH1D* hy_proX = hvyres->ProjectionX();
TH1D* hz_proY = hvzres->ProjectionY();
TH1D* hz_proX = hvzres->ProjectionX();

hx_proY->SetTitle("x resolution : projection y");
hx_proX->SetTitle("x resolution : projection x");
hy_proY->SetTitle("y resolution : projection y");
hy_proX->SetTitle("y resolution : projection x");
hz_proY->SetTitle("z resolution : projection y");
hz_proX->SetTitle("z resolution : projection x");

mTree->Write();
hnvtx->Write();
hvr->Write();
hvxres->Write();
hvyres->Write();
hvzres->Write();
hx_proY->Write();
hx_proX->Write();
hy_proY->Write();
hy_proX->Write();
hz_proY->Write();
hz_proX->Write();

fout->Close();
```

Making 1-D projections from 2-D resolution plots

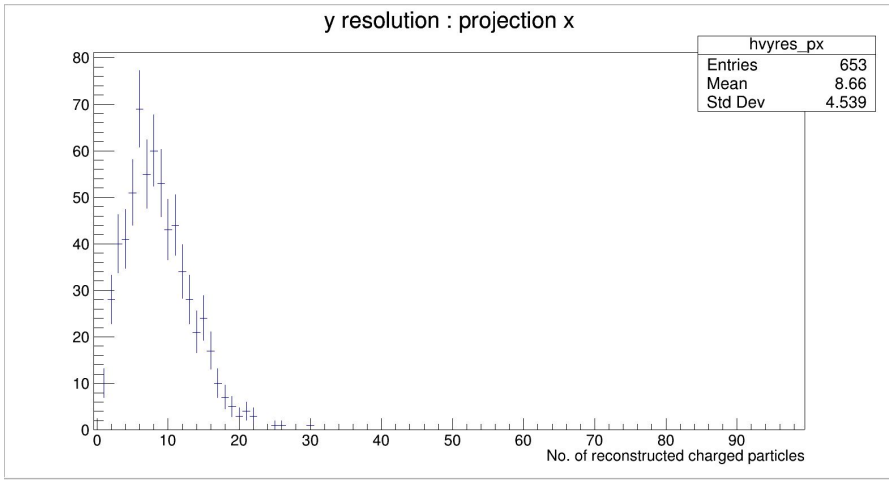
- X resolution

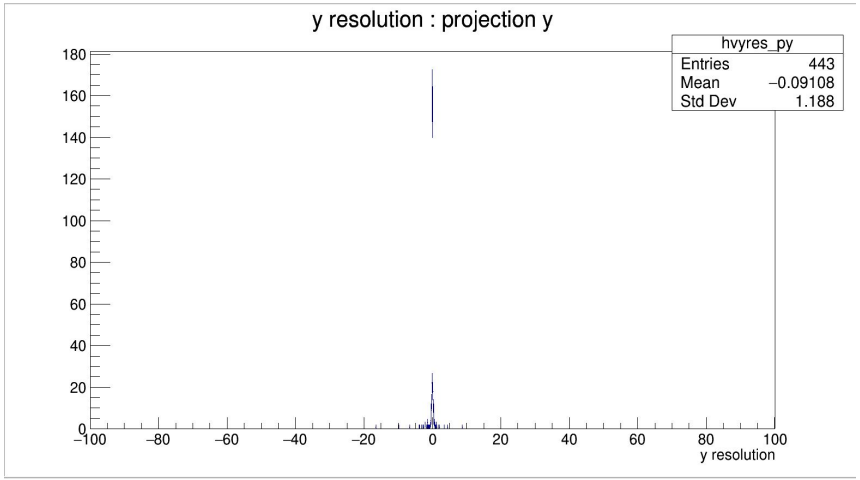




Making 1-D projections from 2-D resolution plots

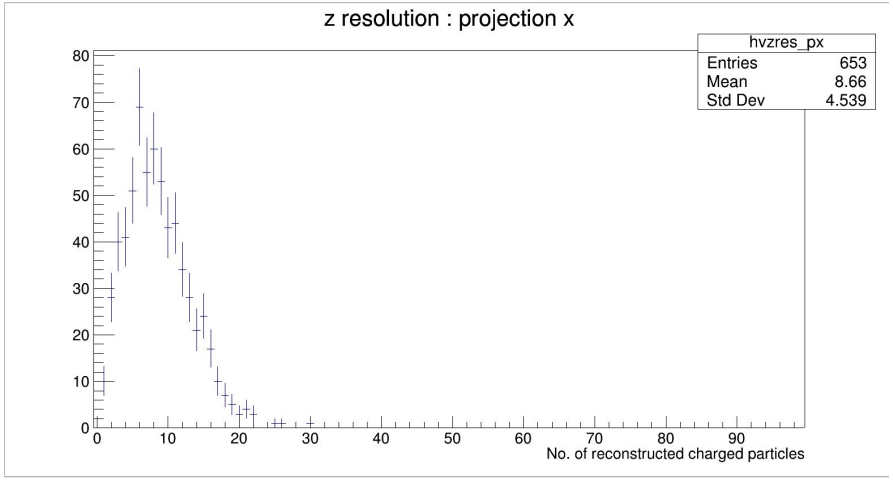
- Y resolution

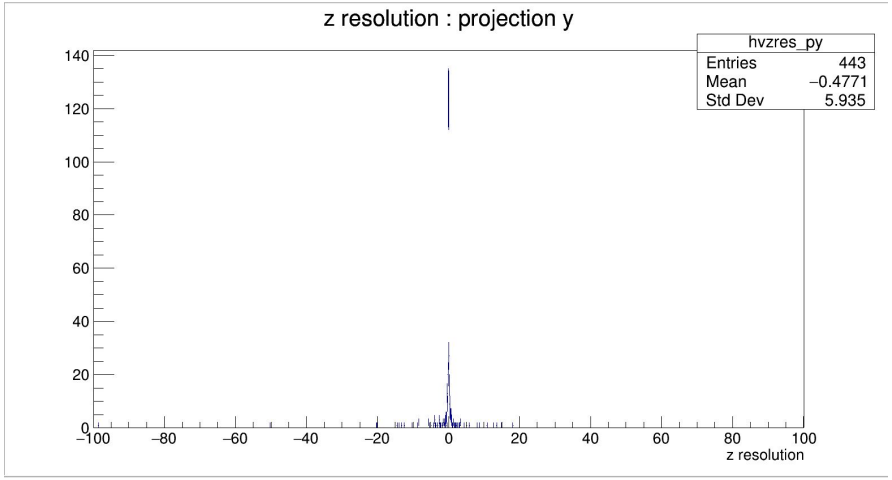




Making 1-D projections from 2-D resolution plots

- Z resolution





Update about Pythia

- Started reading the documentation of Pythia8.
- Learned the general structure of a C++ code to generate Pythia events.
- Still have doubts about how to actually run the code files inside the container.