PID for MPD-TPC detector at NICA

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The Multi-Purpose Detector (MPD) is at Nuclotron Ion Collider fAcility (NICA) of Joint Institute for Nuclear Research (JINR). An important part of the experiment is the particle identification analysis.
This work is at early stage, with the idea to be able to determine from reconstruction the particles that interact with each MPD sub-detector.

Analysis from reconstruction

```
TString fileName = "reco_urqmd_AuAu_11GeV_nev500.root";

Int_t nEvents=cbmSim->GetEntries();

//loop over events
for (Int_t i=0; i<nEvents; i++){

  Int_t nmpdTracks =  mpdTracks->GetEntries();

  //loop over particles
  for (Int_t j=0; j<nmpdTracks; j++){

    MpdTrack *mpdt = (MpdTrack*)mpdTracks->At(j);

    Int_t ID_MC = mpdt->GetID();
```

```
        //Getting the momentum distribution
      Double_t px=mpdt->GetPx();
      Double_t py=mpdt->GetPy();
      Double_t pz=mpdt->GetPz();

      Double_t p  = TMath::Sqrt(px*px +py*py + pz*pz);

      hp->Fill(p);

      //Getting dE/dx
      Double_t dEdx=mpdt->GetdEdXTPC();
      hdEdx->Fill(p,dEdx);

    } //loop over particles
  } //loop over Events
```

PID for TPC

Running:

- Simulation of AuAu collision at 11 GeV using UrQMD and reconstruction with mpdroot (500 events).
- Simulation of BiBi collision at 11 GeV using UrQMD and reconstruction with mpdroot (100 events).

Figures

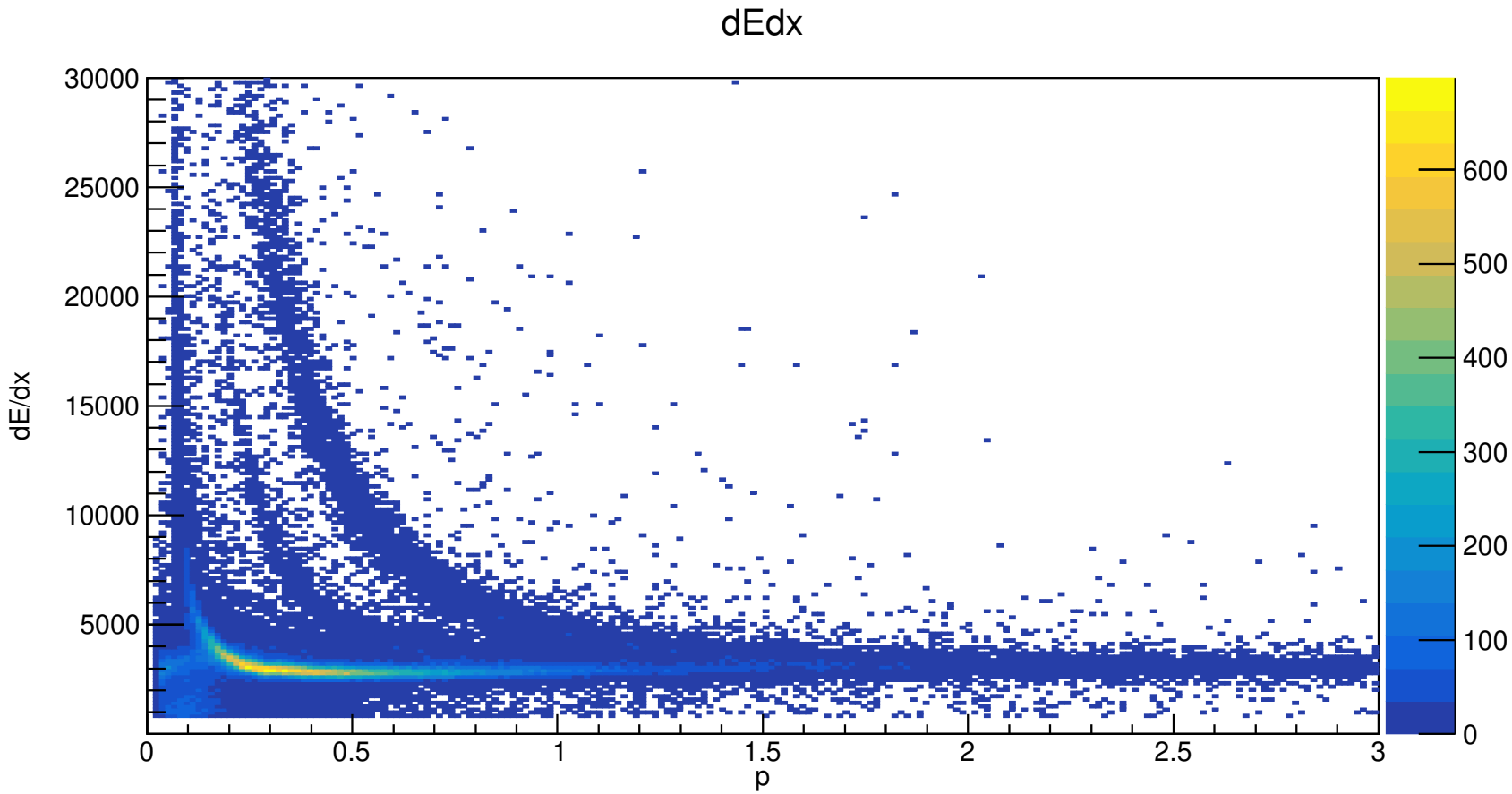

Figure 1: dE/dx vs p. 500 eventos para colisiones AuAu a 11 GeV.

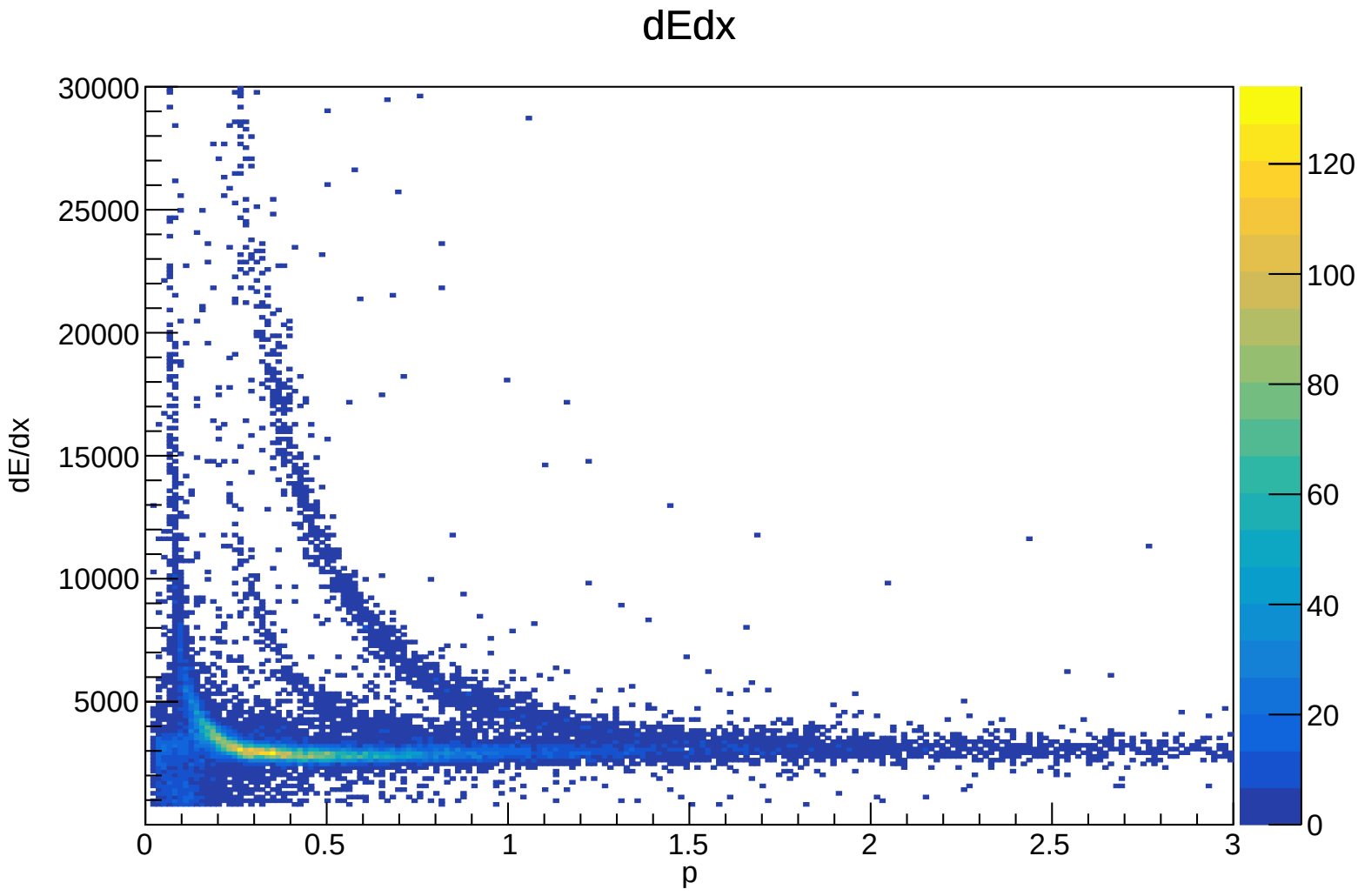

Figure 2: dE/dx vs p. 100 eventos para colisiones BiBi a 11 GeV.

Bethe-Bloch distribution

For a charge particle with velocity $v = \beta c$ through in medium with atomic number Z y density number n, the ionization lost energy per unit length travelled it could be described by Bethe-Bloch equation:

$$\frac{dE}{dx} \approx -4\pi\hbar^2 c^2 \alpha^2 \frac{nZ}{m_e v^2} \left\{ ln \left[\frac{2\beta^2\gamma^2 c^2 m_e}{I_e} \right] - \beta^2 \right\} \qquad (1)$$

Bethe-Bloch distribution

For ultrarelativistic particles, $\beta\gamma$:

$$\beta\gamma = \frac{p}{mc} \tag{2}$$

with m the mass of the particle as a parameter.

Work in progress

- Implementation of Bethe-Bloch distribution.
- Analysis with larger number of events using MC events generated with UrQMD for AuAu and BiBi.