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Collider Mode. Reduced Magnetic Field.

Progress on task 2:

Particle identification determination of spectra using information about the energy losses (dE/dx) in the TPC and the Time-of-flight from the TOF detector.

Supervisors:

Dr. Vadim Kolesnikov

Dr. Ivonne Alicia Maldonado Cervantes

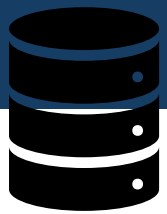
Viktar Kireyeu

Natalia Kolomoyets

PARAMETERS USED FOR ANALYSIS

Prodution-Generator

request 28 - UrQMD
BiBi@ 9.2 GeV reduced
magnetic
field.

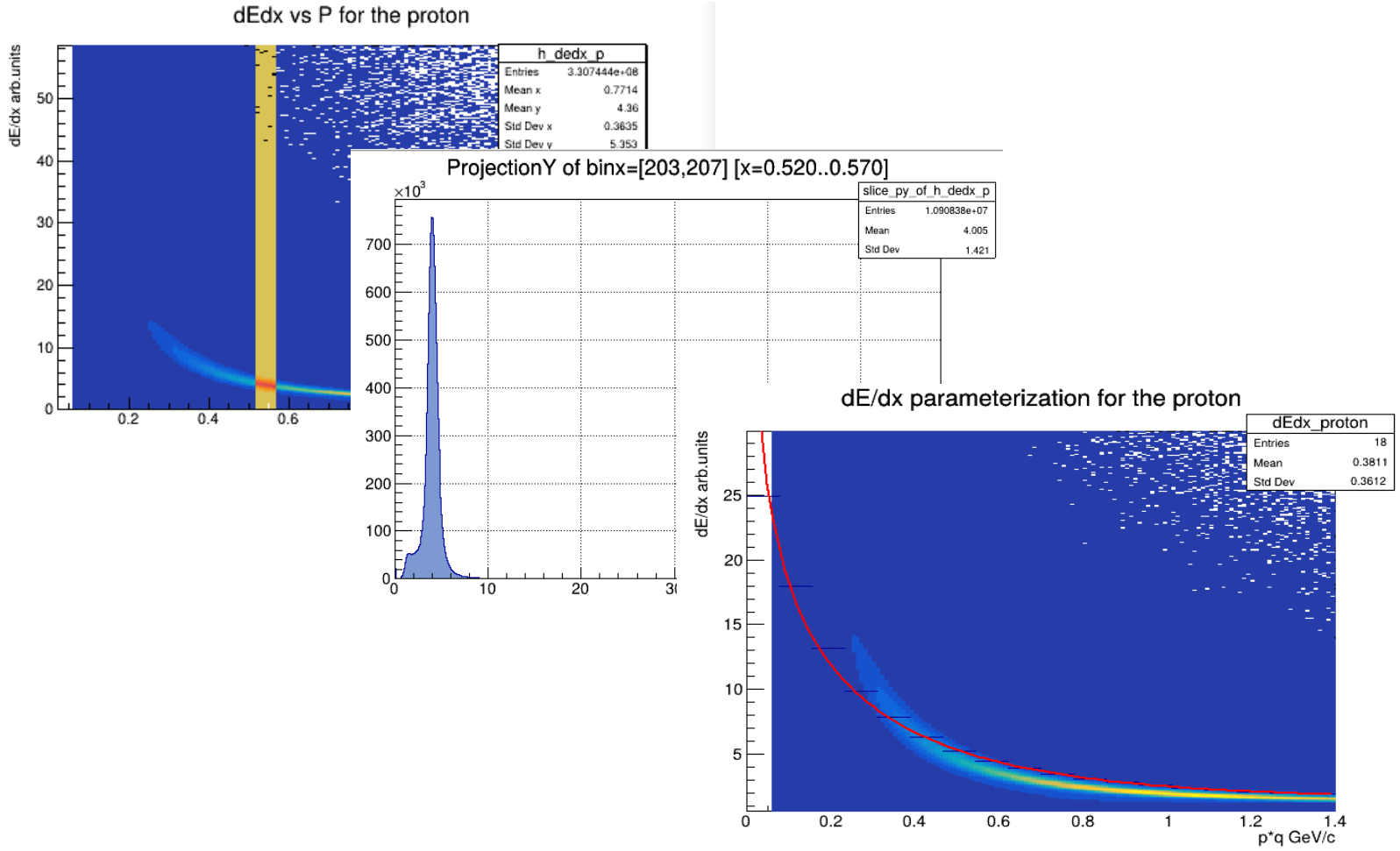


Number of events

10,500,000

PREVIOUS ACTIVITIES

- 10,500,000 events were analyzed
- I tried to get adjustment functions, but they were not adequate.



New activities

- Good fitting functions
- The parameterized equations of the functions

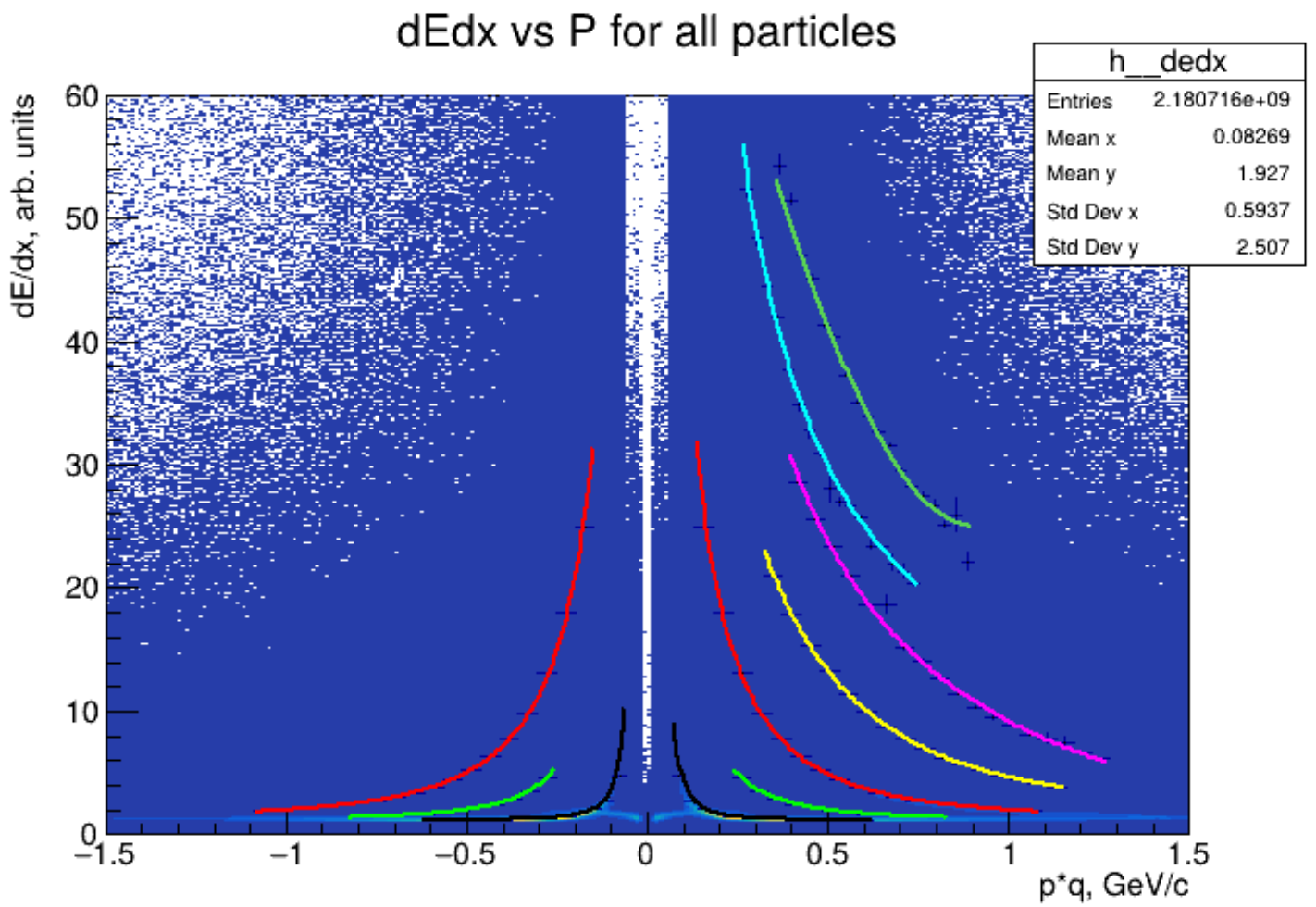
$$\langle \frac{dE}{dx} \rangle = \frac{P_0}{\beta^{P_3}} \left[P_2 - \beta^{P_3} - ln\{P_2 + \left(\frac{1}{\beta\gamma}\right)^{P_4}\} \right], \qquad \beta = \frac{P}{\sqrt{p^2 + M^2}}.$$

```
Double_t parPr(Double_t *x, Double_t *p)
{
   Double_t x1, x2, x3,ans;

   x1  = p[0] / TMath::Power(x[0] / TMath::Sqrt(x[0] * x[0] + 0.88), p[3]);
   x2  = p[1] - TMath::Power(x[0] / TMath::Sqrt(x[0] * x[0] + 0.88), p[3]);
   x3  = TMath::Log(p[2] + TMath::Power(1.0 / (x[0] / 0.9383), p[4]));
   ans = x1 * (x2 - x3);

   return ans;
}
 void FitPronocut(){

    //Histogram dE/dx
     TFile *file1 = new TFile("/home/alejandro/Documentos/Codigos MPDRoot/EnerClass1/simplept/pruereq28/pruebadef/ajusnocut/taskEnerAll.root");
     TH2F *h_dedx_p = (TH2F*)file1->Get("h_dedx_p");

    const int nBins=18;
    Stat_t
data1[nBins]={24.9622,17.9635,13.1672,9.88914,7.81359,6.31973,5.25655,4.47178,3.88242,3.43243,3.07454,2.78969,2.56354,2.37552,2.22018,2.09064,1.9

    const int nError=18;
    Stat_t
data2[nError]={0.0258993,0.0148647,0.0167922,0.00605115,0.0039364,0.00293919,0.00411013,0.00169941,0.0015333,0.000743479,0.000772767,0.000642989,

     TH1F *fa1 = new TH1F("dEdx_proton", "dE/dx parameterization for the proton; p*q GeV/c; dE/dx arb.units", 18,  0.13, 1.09);

     for(int i=0; i<nBins; i++){

     fa1->SetBinContent(i+1,data1[i]);
       for (int j=0; j<nError; j++){
         fa1->SetBinError(j+1,data2[j]);
       }
     }

     TF1 *fitparPr = new TF1("fitparPr",parPr,0.13,1.09,5);

    // fitparPr->SetParameters(500,fa1->GetMean(),fa1->GetRMS());
    // fitparPr->SetParNames ("Constant","Mean_value","Sigma");

     h_dedx_p->Draw("same");
     fa1->Draw("same");
     fa1->Fit("fitparPr");


}
```

Correct range for adjustment

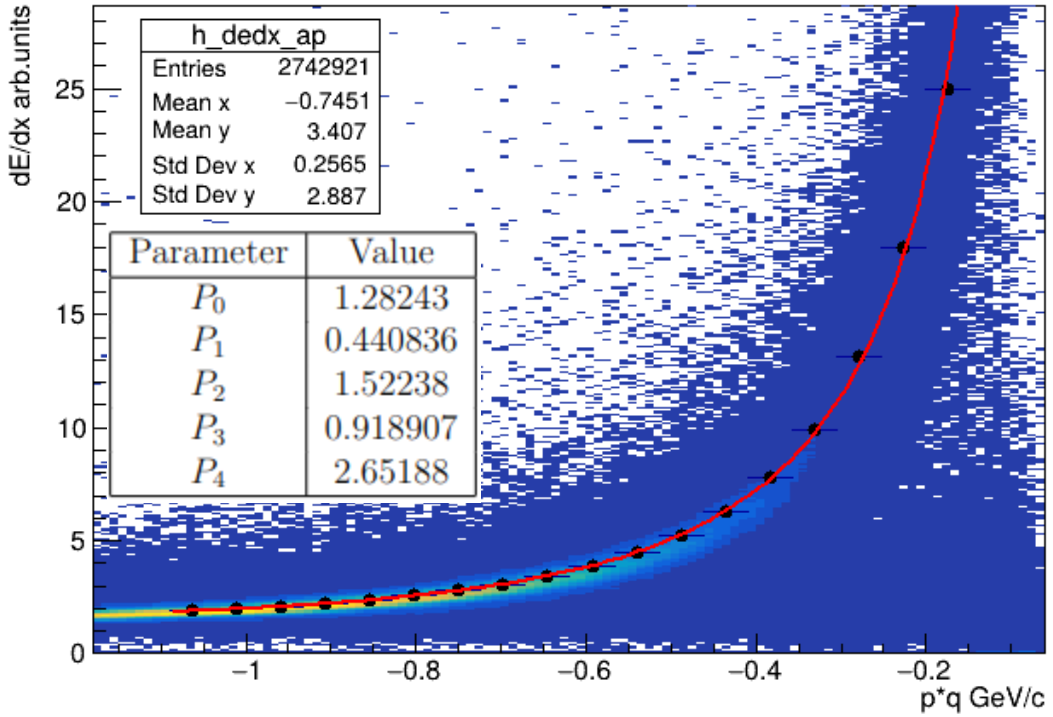
RESULTS

- P+
- P-
- K+
- K-
- Pi+
- Pi-
- D
- T
- He3
- He4

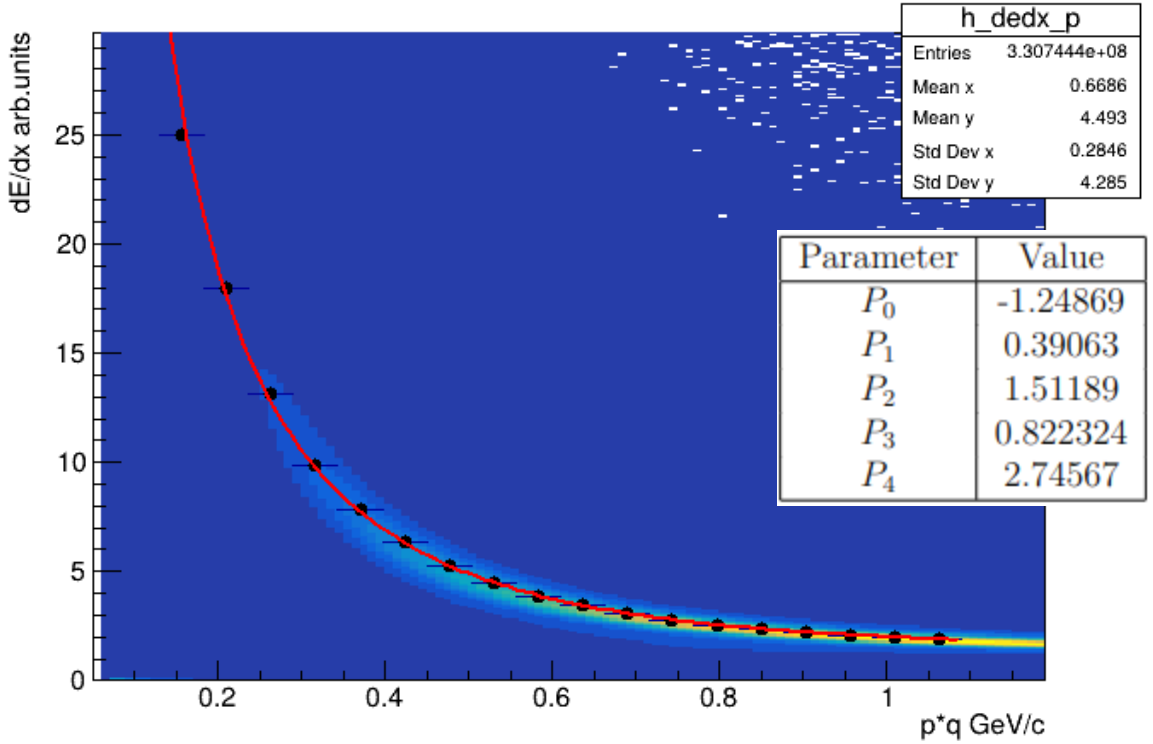


RESULTS

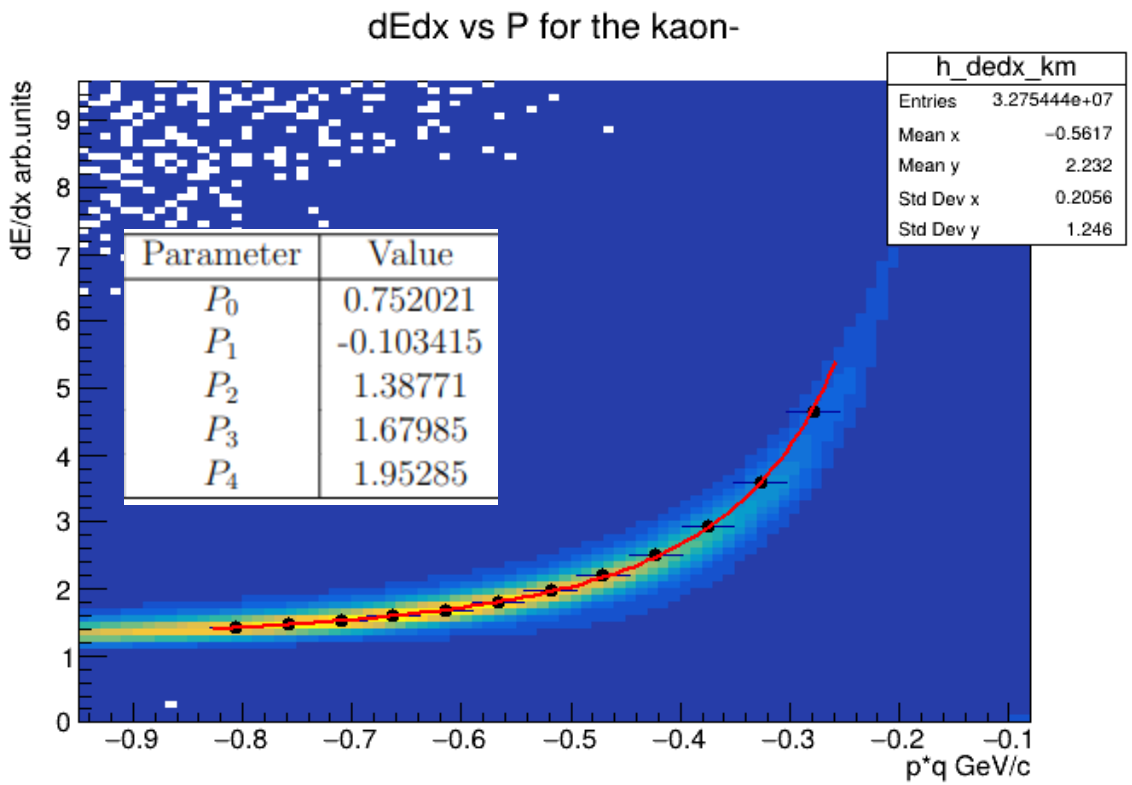
dEdx vs P for the antiproton

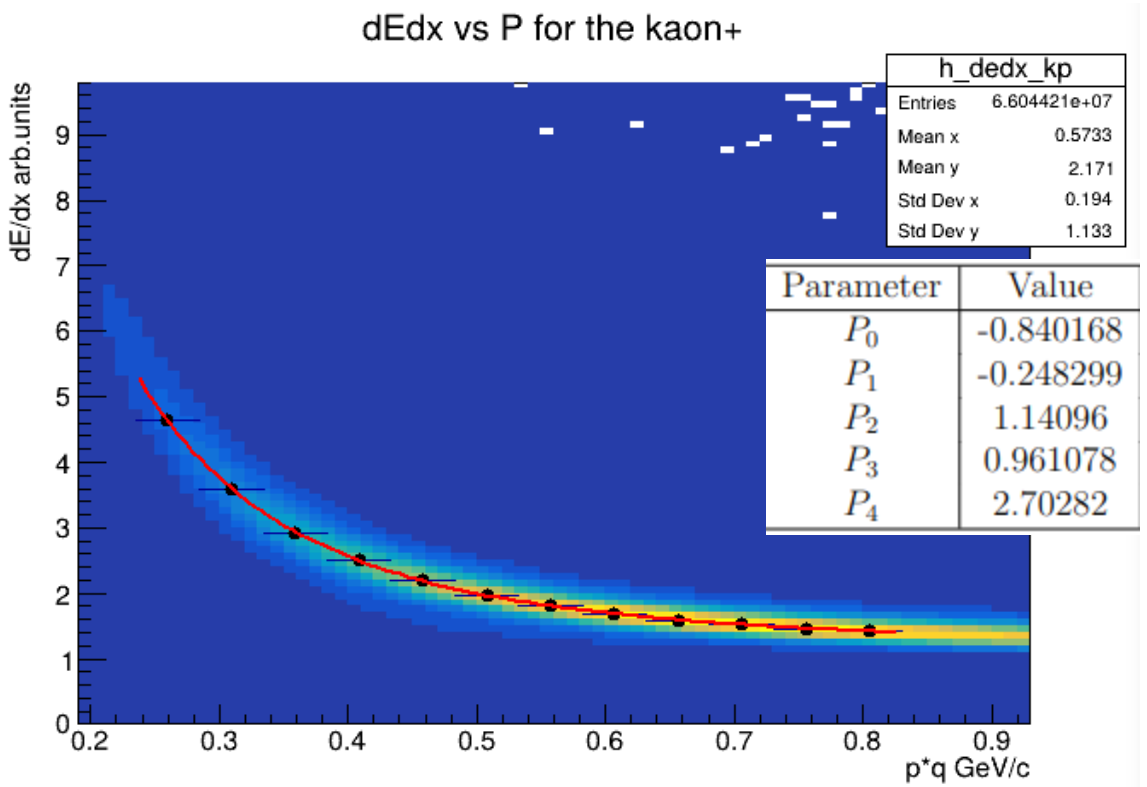


dEdx vs P for the proton

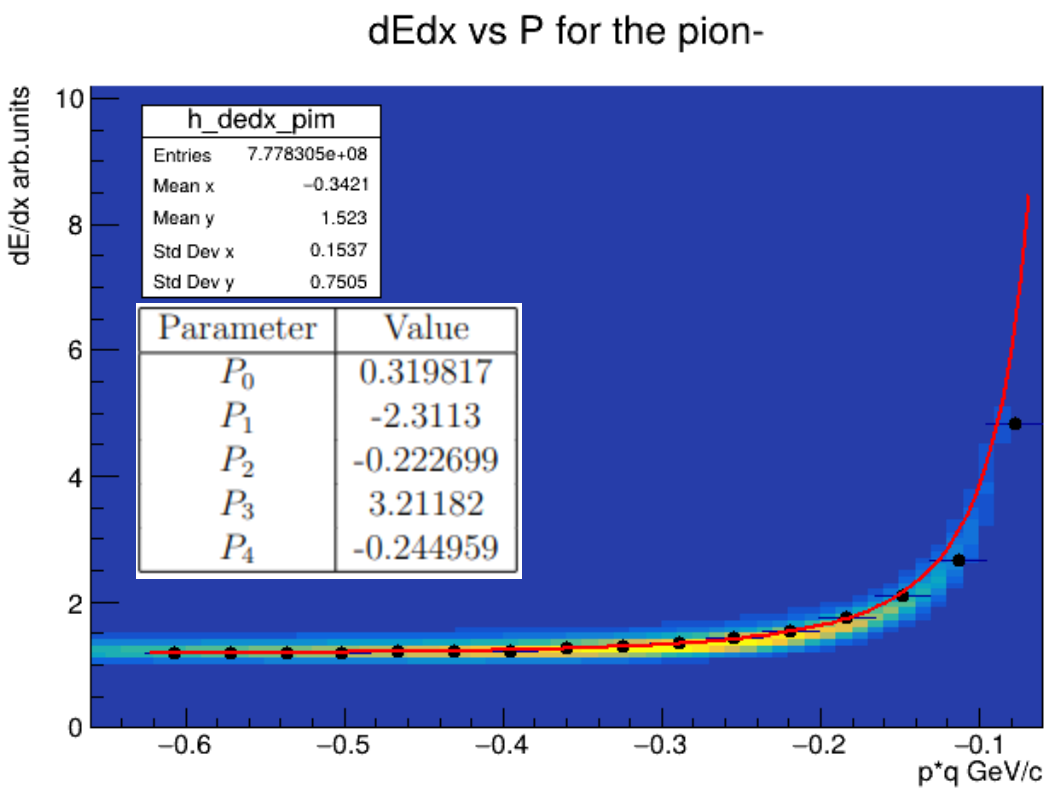


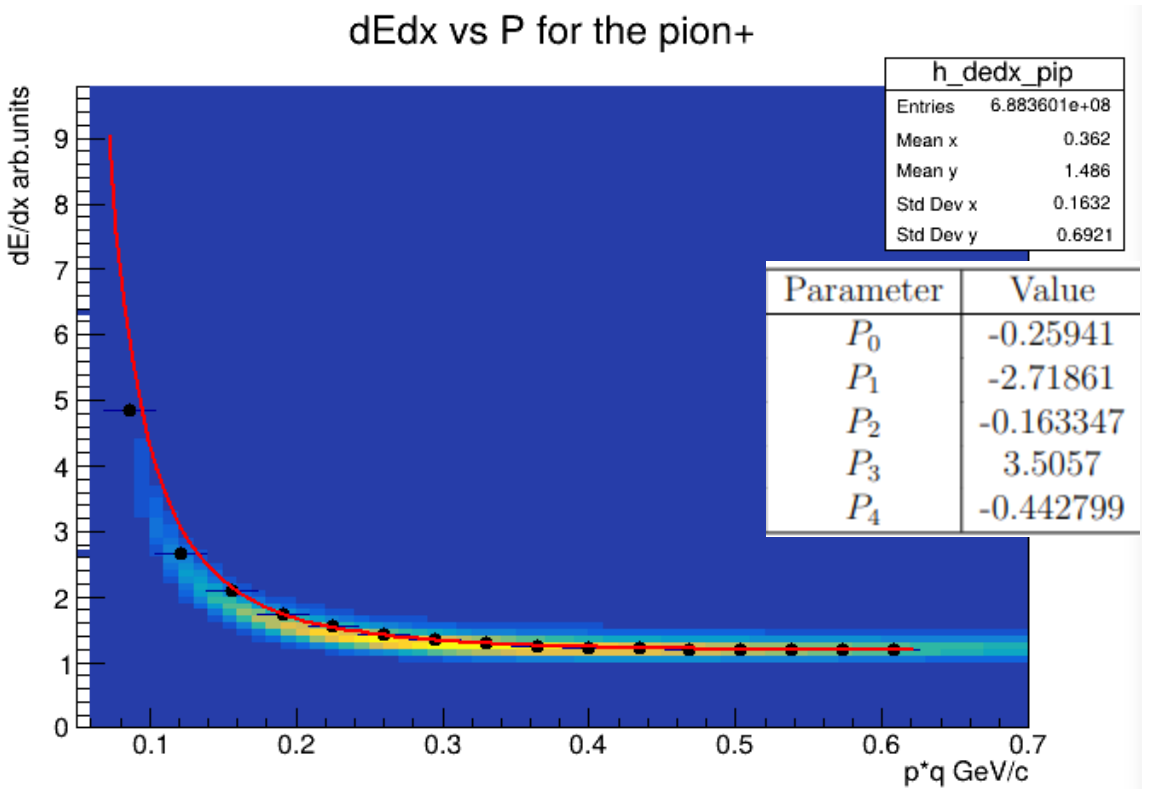
RESULTS


dEdx vs P for the kaon-
h_dedx_km
Entries 3.275444e+07
Mean x −0.5617
Mean y 2.232
Std Dev x 0.2056
Std Dev y 1.246
Parameter Value
P_0 0.752021
P_1 -0.103415
P_2 1.38771
P_3 1.67985
P_4 1.95285
dE/dx arb.units
p*q GeV/c

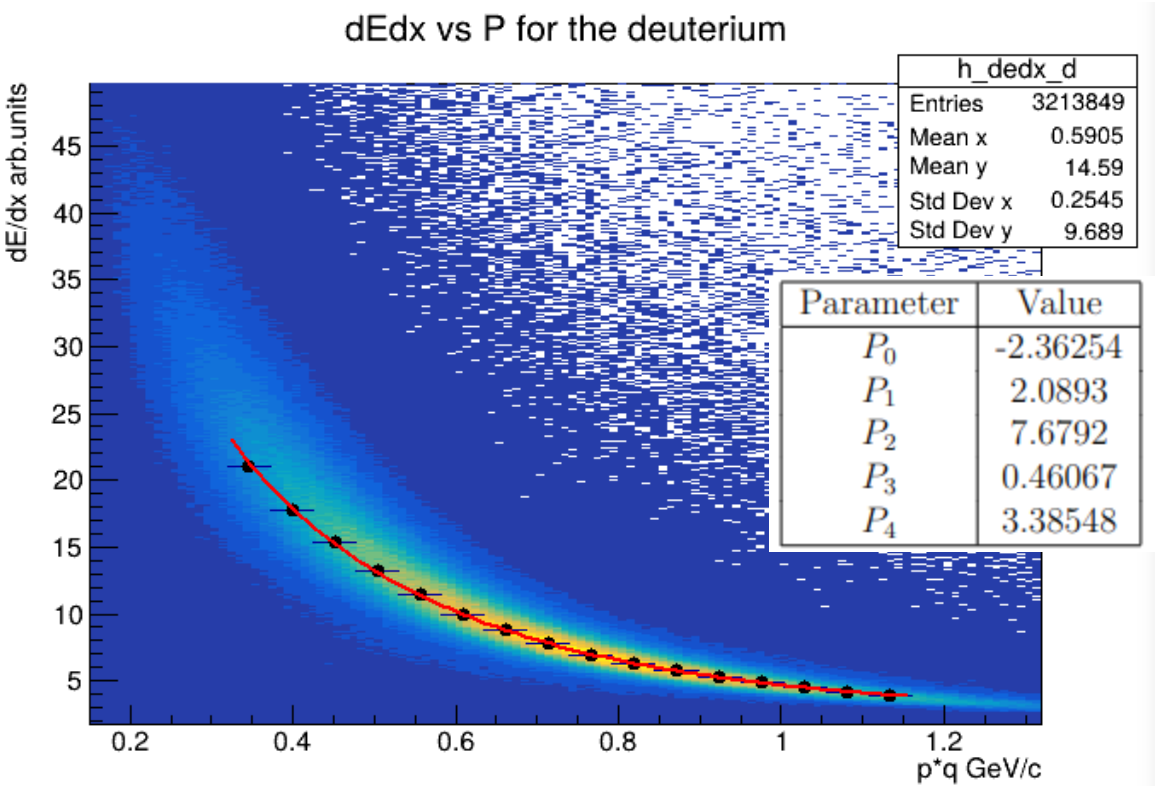

dEdx vs P for the kaon+
h_dedx_kp
Entries 6.604421e+07
Mean x 0.5733
Mean y 2.171
Std Dev x 0.194
Std Dev y 1.133
Parameter Value
P_0 -0.840168
P_1 -0.248299
P_2 1.14096
P_3 0.961078
P_4 2.70282
dE/dx arb.units
p*q GeV/c

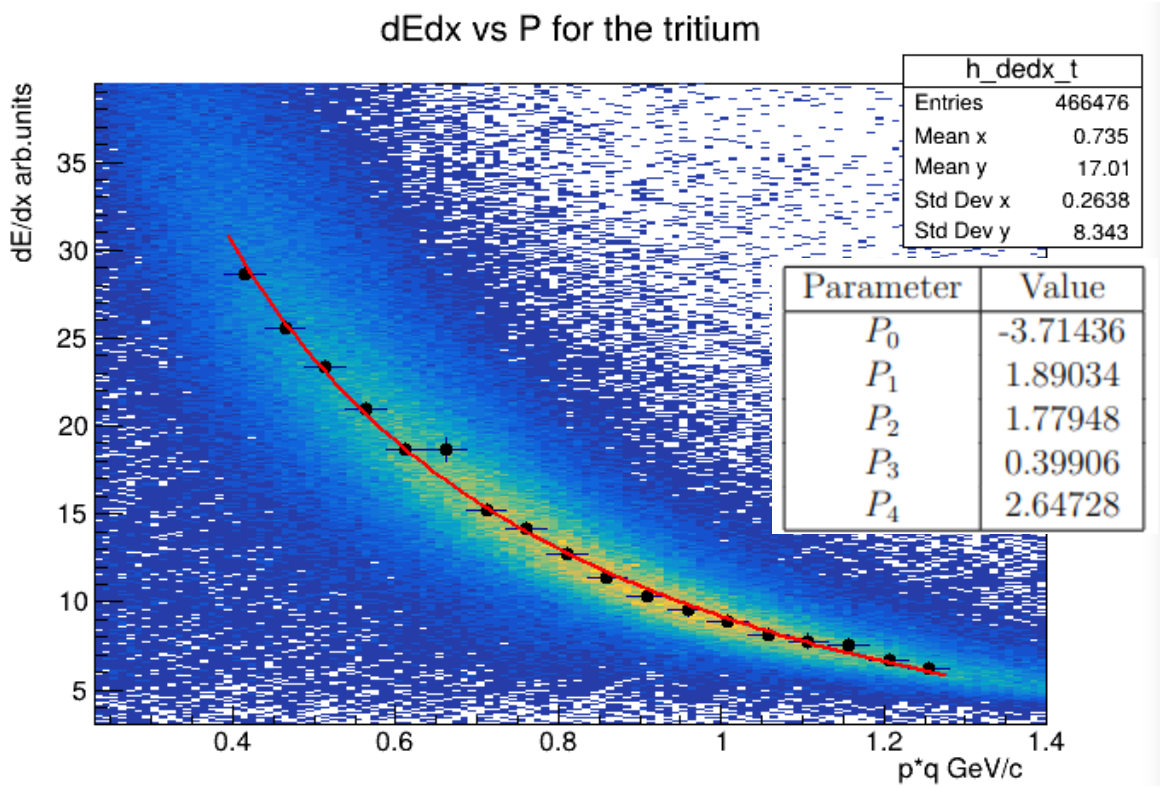
RESULTS


dEdx vs P for the pion-
h_dedx_pim
Entries 7.778305e+08
Mean x −0.3421
Mean y 1.523
Std Dev x 0.1537
Std Dev y 0.7505
Parameter Value
P_0 0.319817
P_1 -2.3113
P_2 -0.222699
P_3 3.21182
P_4 -0.244959
dE/dx arb.units
p*q GeV/c

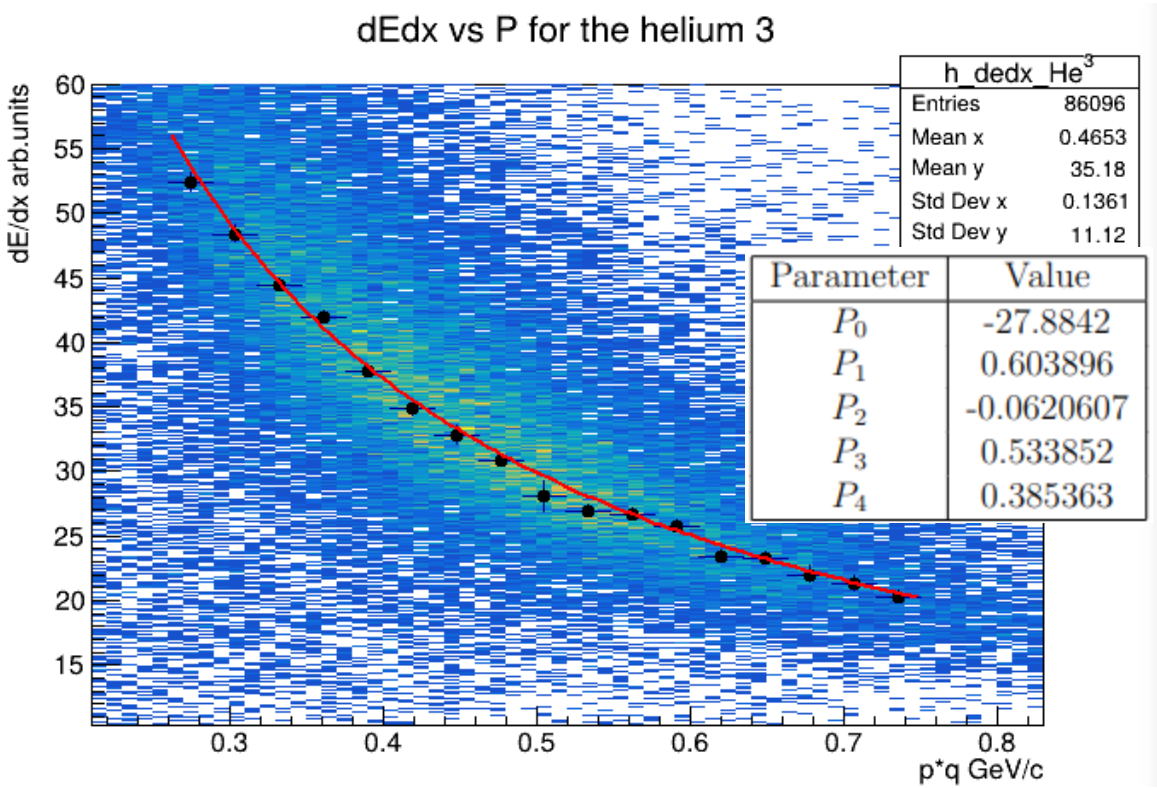

dEdx vs P for the pion+
h_dedx_pip
Entries 6.883601e+08
Mean x 0.362
Mean y 1.486
Std Dev x 0.1632
Std Dev y 0.6921
Parameter Value
P_0 -0.25941
P_1 -2.71861
P_2 -0.163347
P_3 3.5057
P_4 -0.442799
dE/dx arb.units
p*q GeV/c

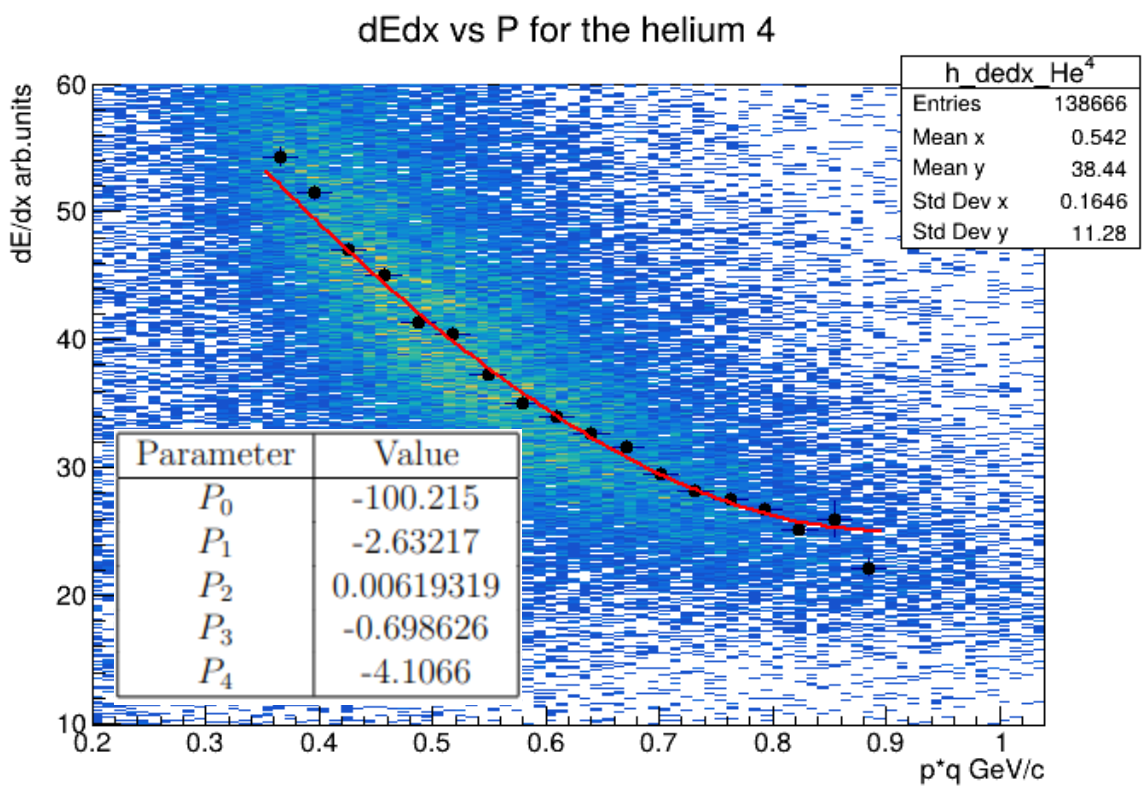
RESULTS


dEdx vs P for the deuterium
h_dedx_d
Entries 3213849
Mean x 0.5905
Mean y 14.59
Std Dev x 0.2545
Std Dev y 9.689
Parameter Value
P_0 -2.36254
P_1 2.0893
P_2 7.6792
P_3 0.46067
P_4 3.38548
dE/dx arb.units
p*q GeV/c


dEdx vs P for the tritium
h_dedx_t
Entries 466476
Mean x 0.735
Mean y 17.01
Std Dev x 0.2638
Std Dev y 8.343
Parameter Value
P_0 -3.71436
P_1 1.89034
P_2 1.77948
P_3 0.39906
P_4 2.64728
dE/dx arb.units
p*q GeV/c

RESULTS


dEdx vs P for the helium 3
h_dedx_He3
Entries 86096
Mean x 0.4653
Mean y 35.18
Std Dev x 0.1361
Std Dev y 11.12
Parameter | Value
P_0 -27.8842
P_1 0.603896
P_2 -0.0620607
P_3 0.533852
P_4 0.385363
dE/dx arb.units
p*q GeV/c


dEdx vs P for the helium 4
h_dedx_He4
Entries 138666
Mean x 0.542
Mean y 38.44
Std Dev x 0.1646
Std Dev y 11.28
Parameter | Value
P_0 -100.215
P_1 -2.63217
P_2 0.00619319
P_3 -0.698626
P_4 -4.1066
dE/dx arb.units
p*q GeV/c

Future work

- Get the adjustments for the square mass histograms, as well as the equations describing them

- Get track efficiency graphs for each charged particle