Progress on Si Tracker

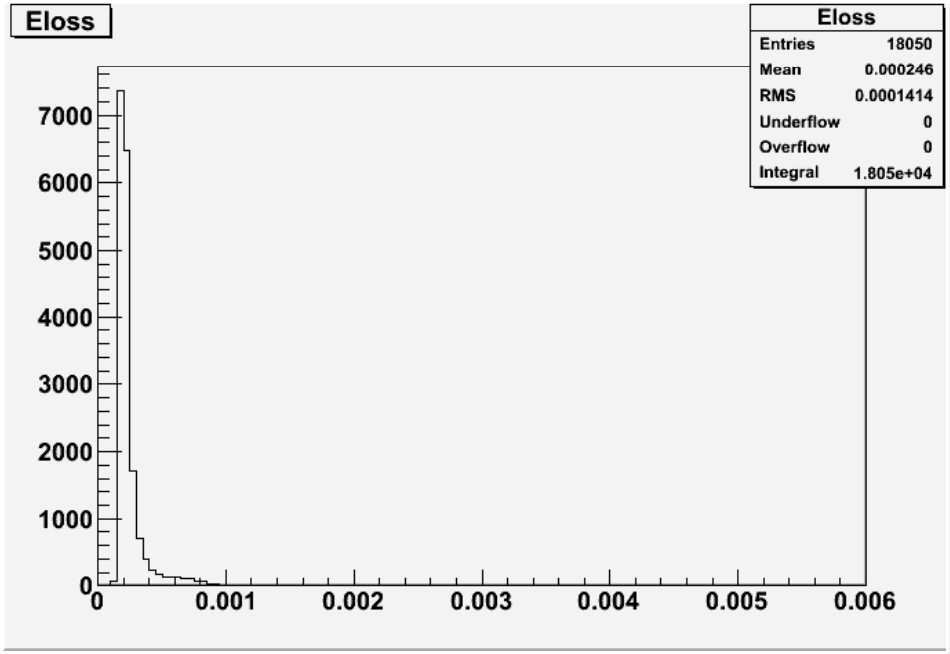
- Analysis code
- Event generators
- Resolution issues
- Targets
- R3B detector

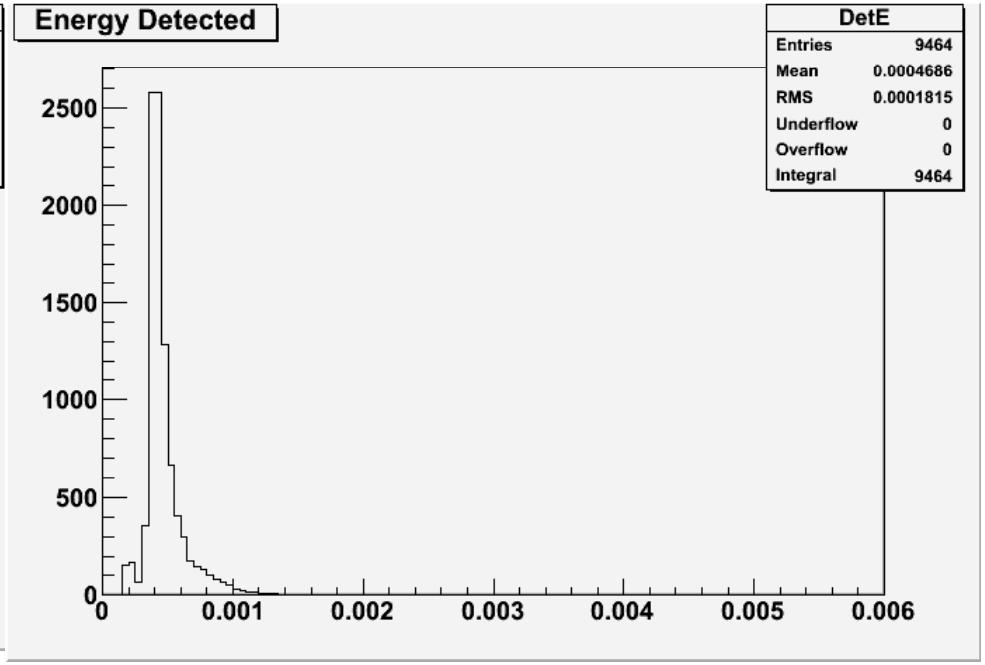
Analysis code

```
if(TrackMult==1){
   Energy = gRandom->Gaus(DetE[0],0.00005);
}
else{
    for(Int_t  j=0; j<TrackMult; j++){
       if(j==0){
         Energy = gRandom->Gaus(DetE[j],0.00005);
         TotalE[j] = Energy;
       }
        else{
          if(Track[j]==Track[j-1]){
             Energy = gRandom->Gaus(DetE[j],0.00005);
              TotalE[j] = TotalE[j-1] + Energy
             if(j==(TrackMult-1))  E_detected->Fill(TotalE[j]);
          }
          else{
             Energy = gRandom->Gaus(DetE[j],0.00005);
              TotalE[j] = Energy;
              E_detected->Fill(TotalE[j-1]);
         }
        }
    }
}
```

- Takes the track multiplicities from the number of X_tracks.
- Smears Energy by 50 keV resolution.
- If M = 1 then only smears energy and then writes out.
- If M > 1 finds energy of first hit and then checks to see if second hit has the same track number.
  - If yes adds together and checks the track number of the next hit.
  - Once track number is different energy written out.

Analysis code





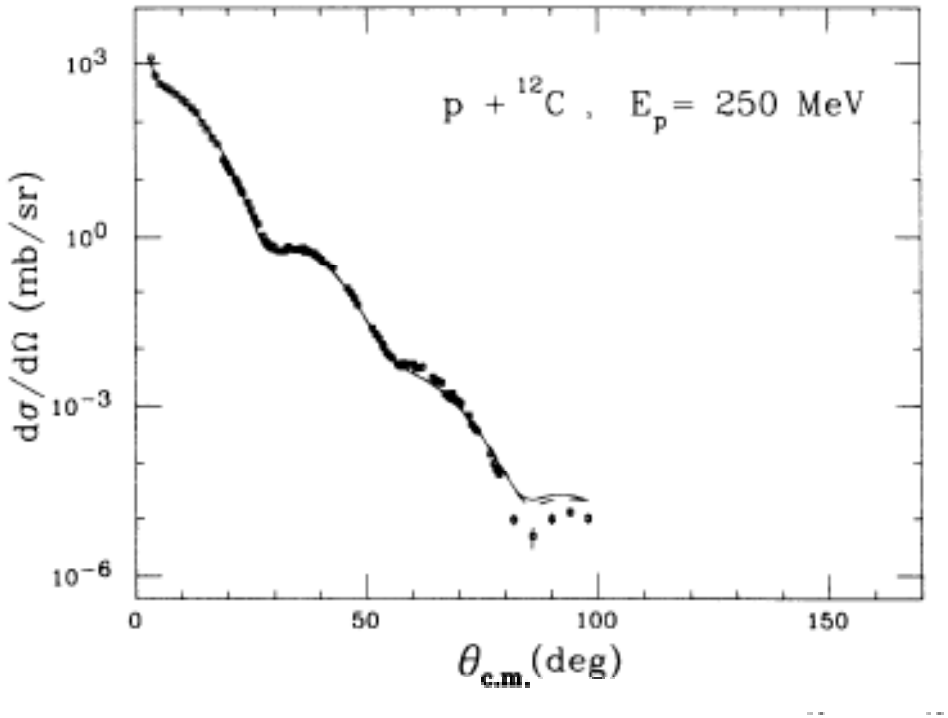
195 keV peak

423 keV peak

Detector resolution not included

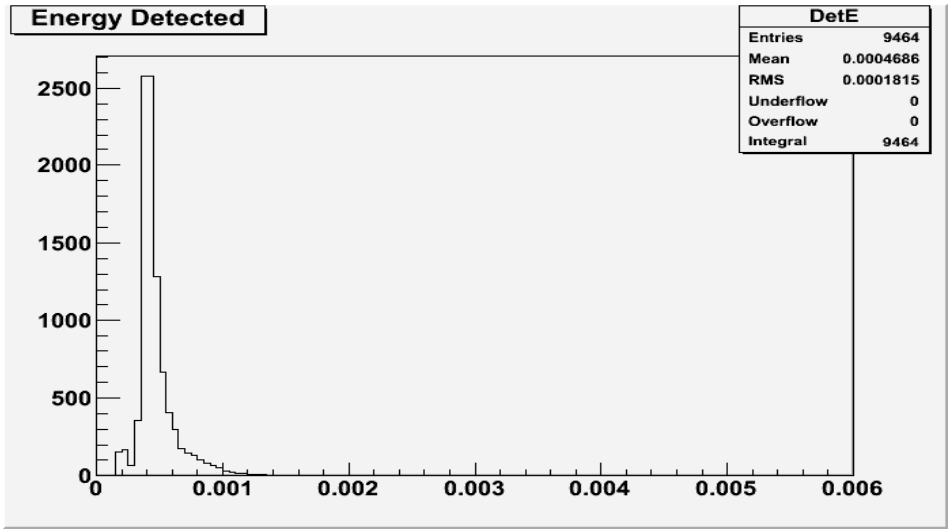
Event Generator

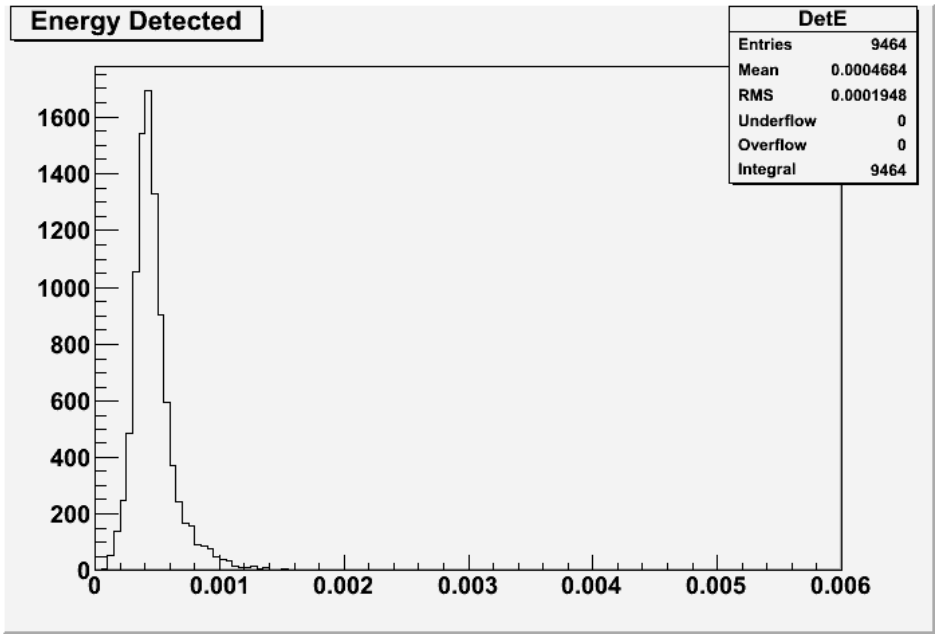
- $^{12}C(p,p)^{12}C$ event generator written for proton energies for 250 MeV.
- Elastic scattering normalised to cross-section up to 100^{o} in c.o.m.
- Cross-section taken from Meyer et al. PRC 37, 544 (1988)
- Also have optical model parameters for better description over all angles.
- Output normalised to 1^{o}



Resolution

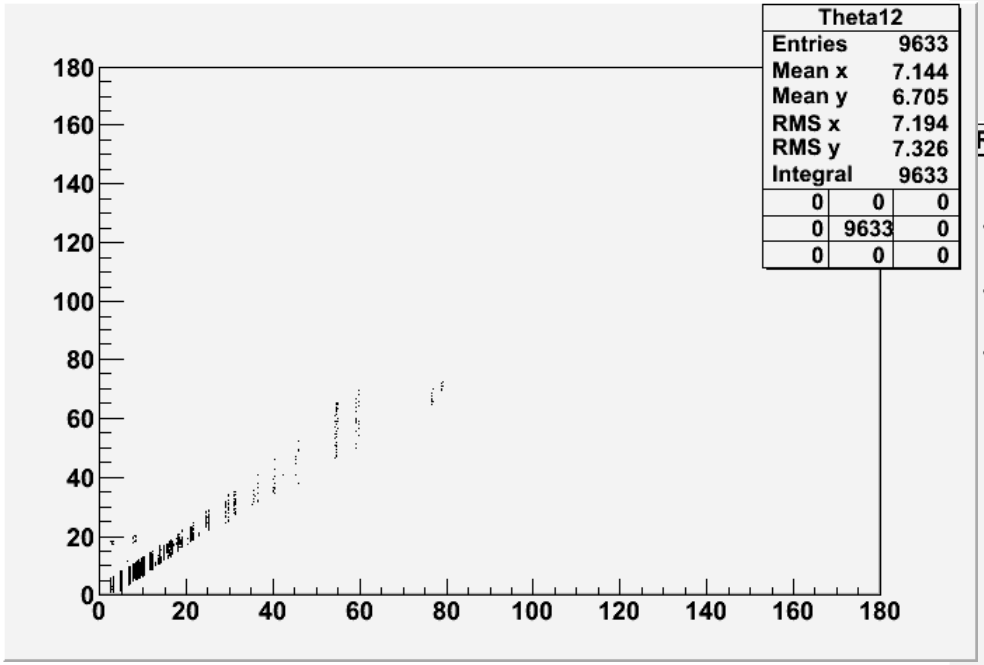
- Energy resolution set at 50 keV for LAND detectors.
- Smear using Gaus fn as seen earlier.
- 250 MeV protons
  - For unsmeared total particle energy FWHM = 129 keV @ E = 427 keV
  - For smeared FWHM = 272 keV @ E = 433 keV

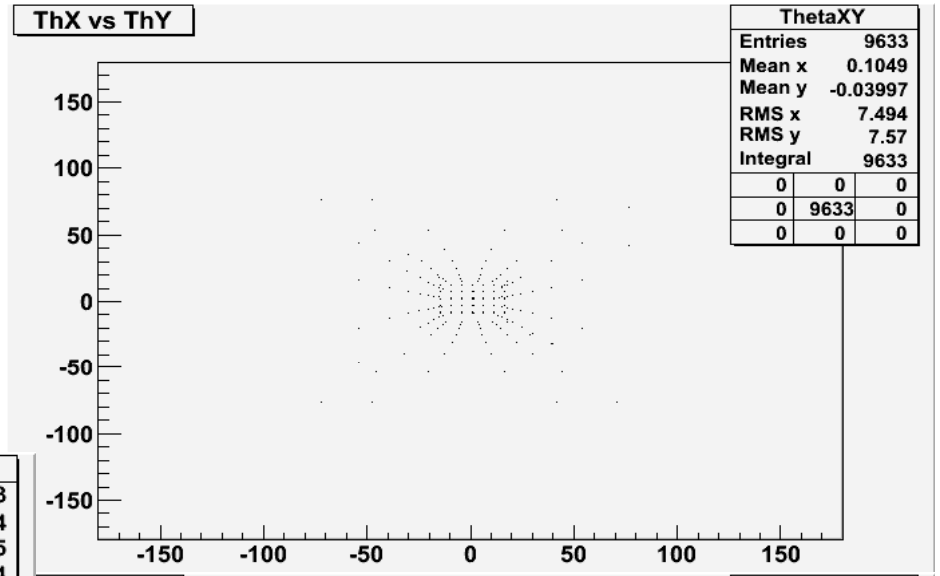


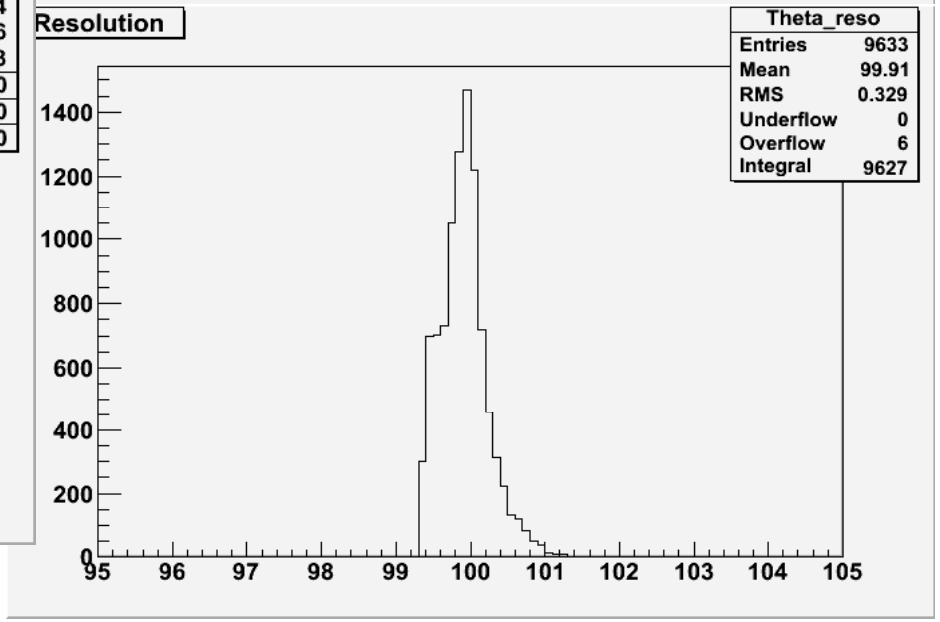


Resolution

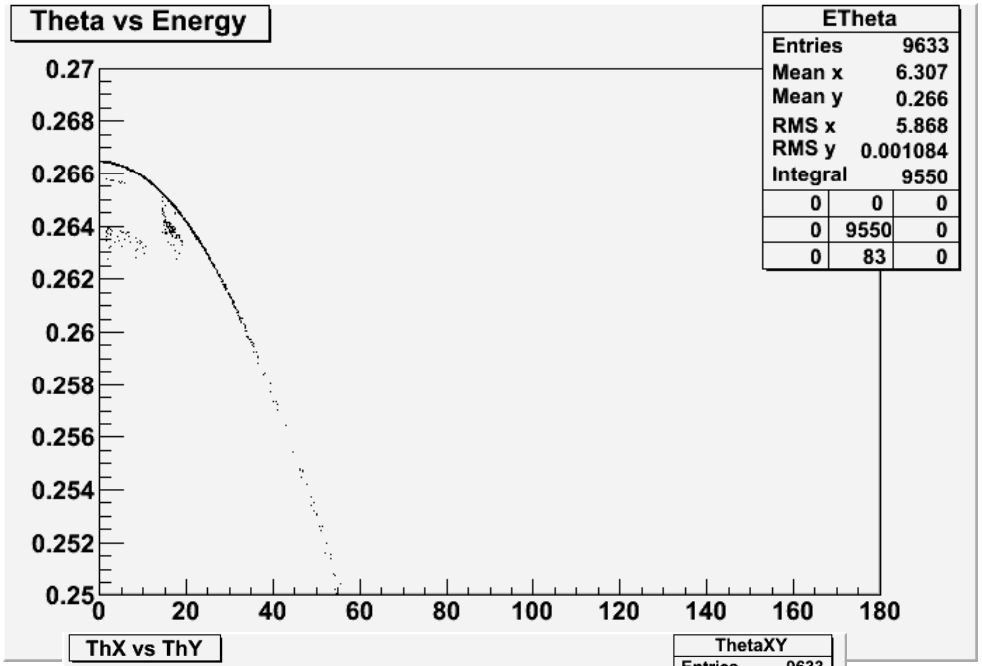
- Compare detection angle with emission angle for different strip pitches.

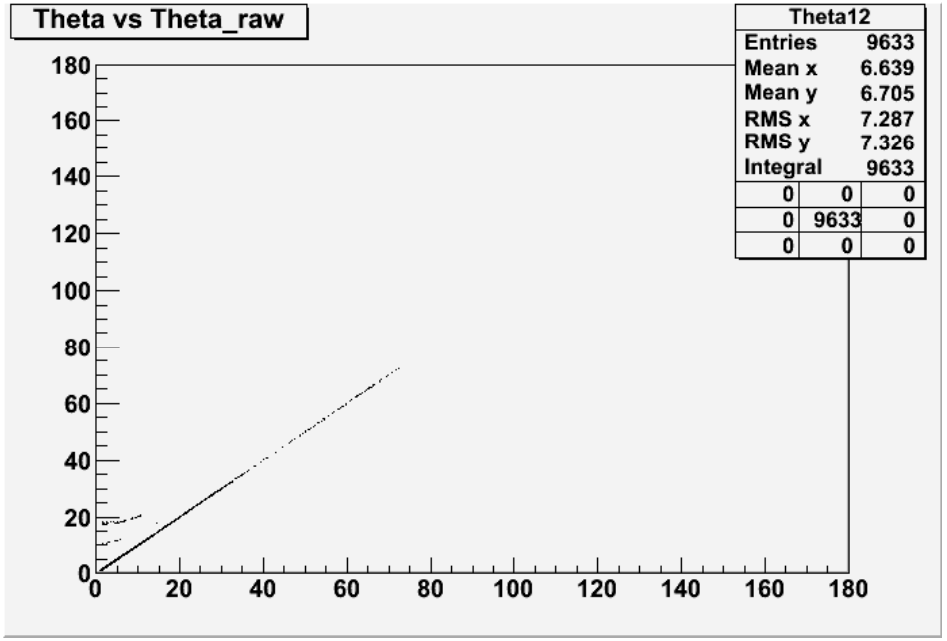


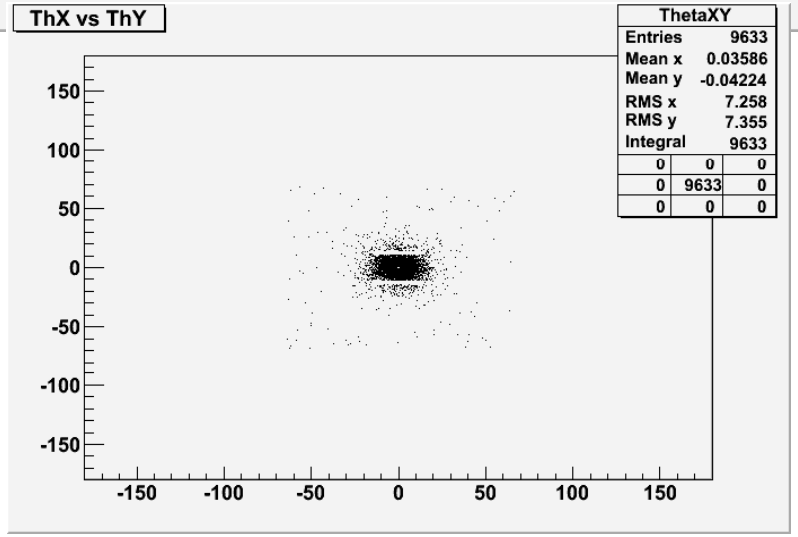


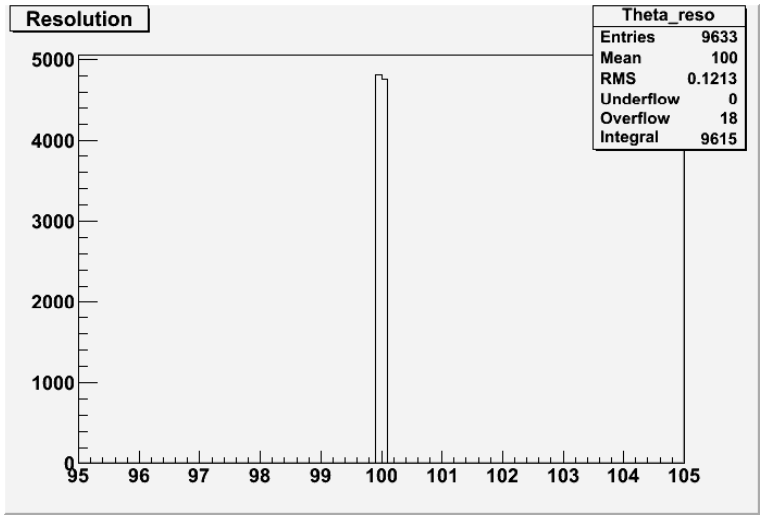


Resolution

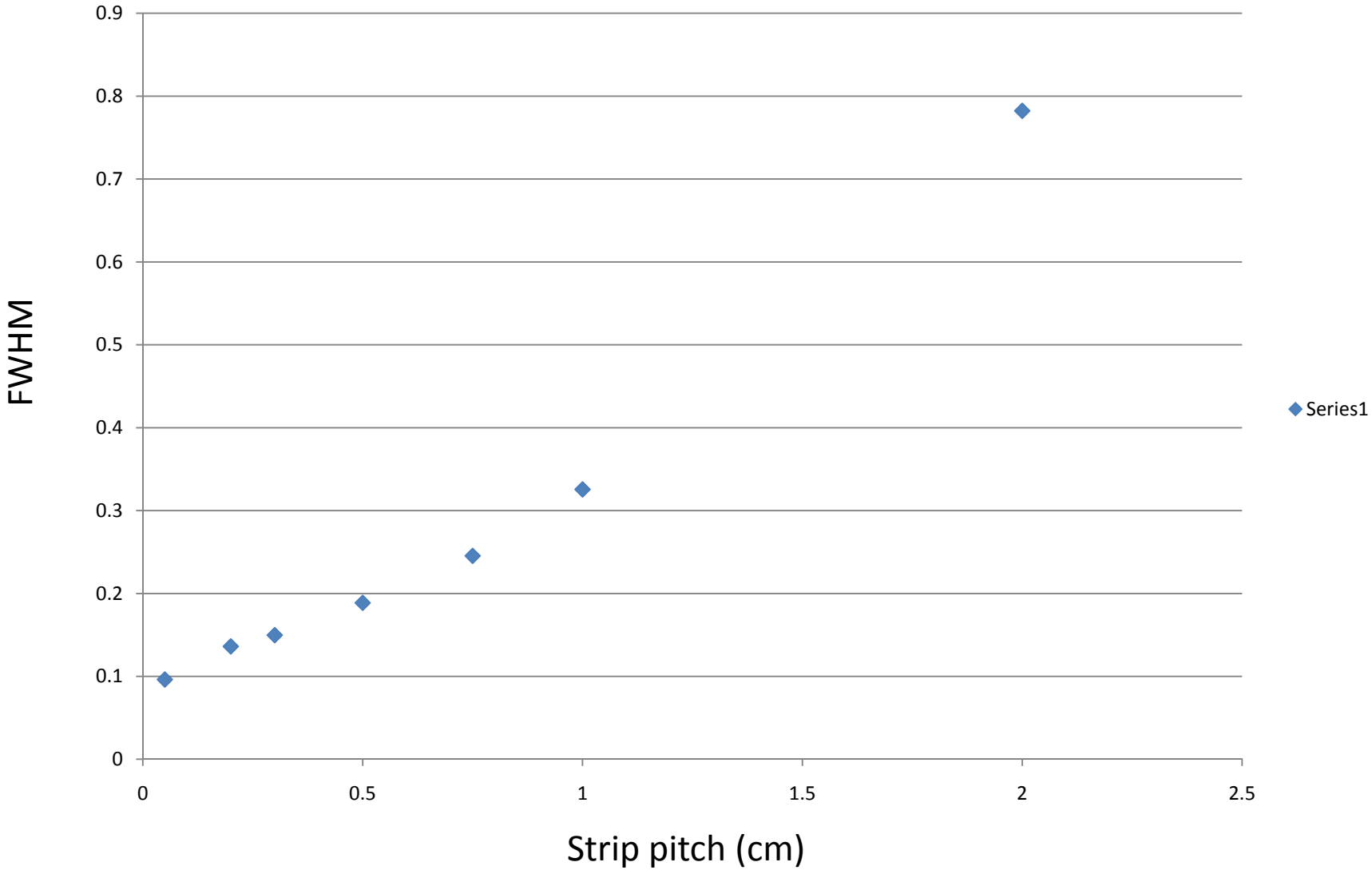

Theta vs Energy
ETheta
Entries 9633
Mean x 6.307
Mean y 0.266
RMS x 5.868
RMS y 0.001084
Integral 9550
0 0 0
0 9550 0
0 83 0
0.27
0.268
0.266
0.264
0.262
0.26
0.258
0.256
0.254
0.252
0.25
0 20 40 60 80 100 120 140 160 180


Theta vs Theta_raw
Theta12
Entries 9633
Mean x 6.639
Mean y 6.705
RMS x 7.287
RMS y 7.326
Integral 9633
0 0 0
0 9633 0
0 0 0
180
160
140
120
100
80
60
40
20
0
0 20 40 60 80 100 120 140 160 180


ThX vs ThY
ThetaXY
Entries 9633
Mean x 0.03586
Mean y -0.04224
RMS x 7.258
RMS y 7.355
Integral 9633
0 0 0
0 9633 0
0 0 0
150
100
50
0
-50
-100
-150
-150 -100 -50 0 50 100 150


Resolution
Theta_reso
Entries 9633
Mean 100
RMS 0.1213
Underflow 0
Overflow 18
Integral 9615
5000
4000
3000
2000
1000
0
95 96 97 98 99 100 101 102 103 104 105

Resolution


FWHM
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.5
1
1.5
2
2.5
Strip pitch (cm)
Series1

Targets

- Targets now include:
  - Pb
  - CH2
  - Carbon
  - Liquid H
- Resolution checked with C target with interaction point changing in target
  - No difference with protons at 250 MeV as expected.
  - Need to look at ^{12}C scattering off CH2 target.

R3B detector

- Some initial progress.
  - Two layer 150 μm thick barrel detector created in R3BRoot.
    - Each strip detector is 5cm x 10cm in outer barrel.
      - 6 cm from beam axis.
    - 3cm x 10 cm in inner barrel.
      - 3.6 cm from beam axis.
- Only 50k channels allowed due to budget.
  - At 100 μm strip pitch detector has 22400 channels.

R3B detector