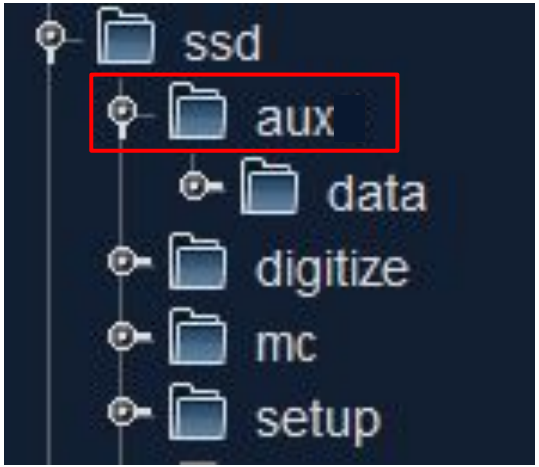
Git clone bmnroot on Windows



Naming Files, Paths, and Namespaces

- Do not use the following reserved names for the name of a file:

  CON, PRN, AUX, NUL, COM1, COM2, COM3, COM4, COM5, COM6, COM7, COM8, COM9, LPT1, LPT2, LPT3, LPT4, LPT5, LPT6, LPT7, LPT8, and LPT9. Also avoid these names followed immediately by an extension; for example, NUL.txt is not recommended.

https://docs.microsoft.com/ru-ru/windows/win32/fileio/naming-a-file?redirectedfrom=MSDN

decoder\BmnTof2Raw2DigitNew.cxx

```
3470                                                    3470
int BmnTof2Raw2DigitNew::readGeom(char *geomfile)       3471  int BmnTof2Raw2DigitNew::readGeom(const char *geomfile)
{                                                       3472  {
    char fname[128];                                    3473      const char * fname;
    FILE *fg = 0;                                       3474      FILE *fg = 0;
    float ic = 0;                                       3475      float ic = 0;
    int nf = 0, n = 0, i;                               3476      int nf = 0, n = 0, i;
    float step, sx, sy, x, y, z;                        3477      float step, sx, sy, x, y, z;
    if (strlen(geomfile) == 0)                          3478      if (strlen(geomfile) == 0)
    {                                                   3479      {
        printf("TOF700 geometry file name not defined!\n 3480          printf("TOF700 geometry file name not defined!\n");
        return 0;                                       3481          return 0;
    }                                                   3482      }
    TString dir = getenv("VMCWORKDIR");                 3483      TString dir = TString::Format("%s/geometry/%s", getenv("
    sprintf(fname,"%s/geometry/%s",dir.Data(),geomfile); 3484      fname = dir.Data();
    fg = fopen(fname,"r");                              3485      fg = fopen(fname,"r");
    if (fg == NULL)                                     3486      if (fg == NULL)
    {                                                   3487      {
```

run_sim_bmn.C — GEANT4

```
-I- MpdLAQGSMGenerator::ReadEvent: Event 1,  b = 9.910 fm, multiplicity 5
>>> Event 0
 *** Break *** segmentation violation
...
BmnSilicon::ProcessHits (this=0x5c3c6f0, vol=0xb4ecab0)
     at bmnroot/silicon/BmnSilicon.cxx:57

FairMCApplication::Stepping (this=0x81b6310)
     at fairroot/base/sim/FairMCApplication.cxx:701
...


Bool_t BmnSilicon::ProcessHits(FairVolume* vol) {

  // Determine station and module numbers for the current hit ----------------
  Int_t stationNum = -1; // current station number (default)
  Int_t moduleNum = -1; // current module number (default)

  TString moduleVolumeName = gGeoManager->GetCurrentNode()->GetMotherVolume()->GetName();
...
```

ZDC data analysis in bmnroot — new features

Convert BmnZdcPoint to BmnZDCDigit on the fly in run_sim_bmn.C

Implemented in zdc/BmnZdcDigitizer

Usage example:

```
// ZDC-Digitizer
BmnZdcDigitizer * zdcDigit = new BmnZdcDigitizer();
zdcDigit->SetScale(39e3);
zdcDigit->SetThreshold(500.);
fRun->AddTask(zdcDigit);
```

This will add branch ZDC containing TClonesArray of BmnZDCDigit.
The parameters are:

- 39×10^3 - Scale factor to convert energy losses in scintillator into overall deposited energy in MeV
- 500 MeV - Common threshold for all the modules

ZDC data analysis in bmnroot — new features

Add ZDC events information on the reconstruction stage (run_reco_bmn.C)

New data storage class — bmndata/BmnZDCEventData

- Energy (total, central part, protons side, neutrons side)
- Hits (total, central part, protons side, neutrons side)
- Asymmetry
- Moment

Class for reconstruction — zdc/BmnZdcAnalyzer

Usage example:

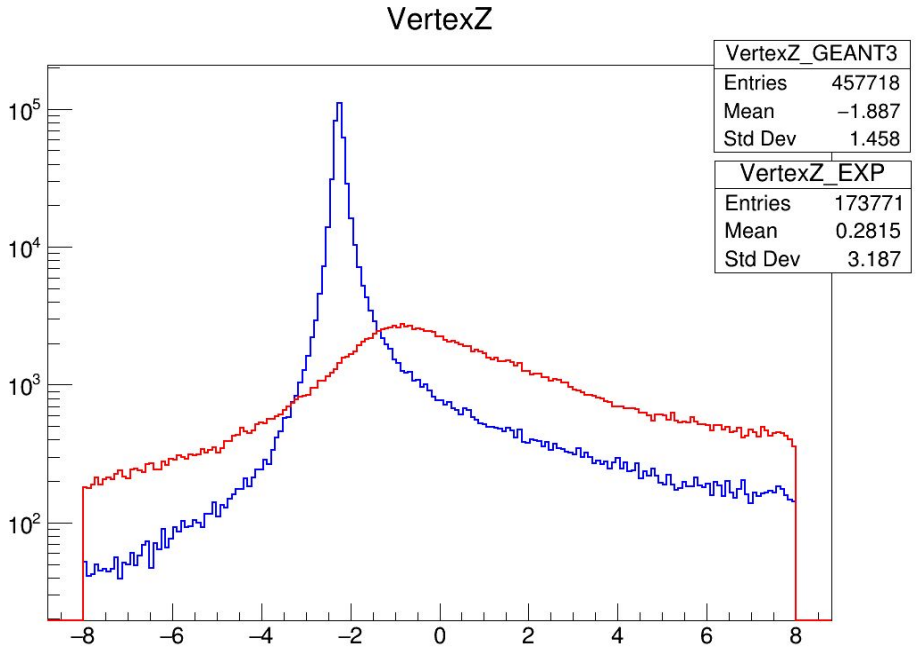
```
BmnZdcAnalyzer * zdcAna = new BmnZdcAnalyzer();
fRunAna->AddTask(zdcAna);
```

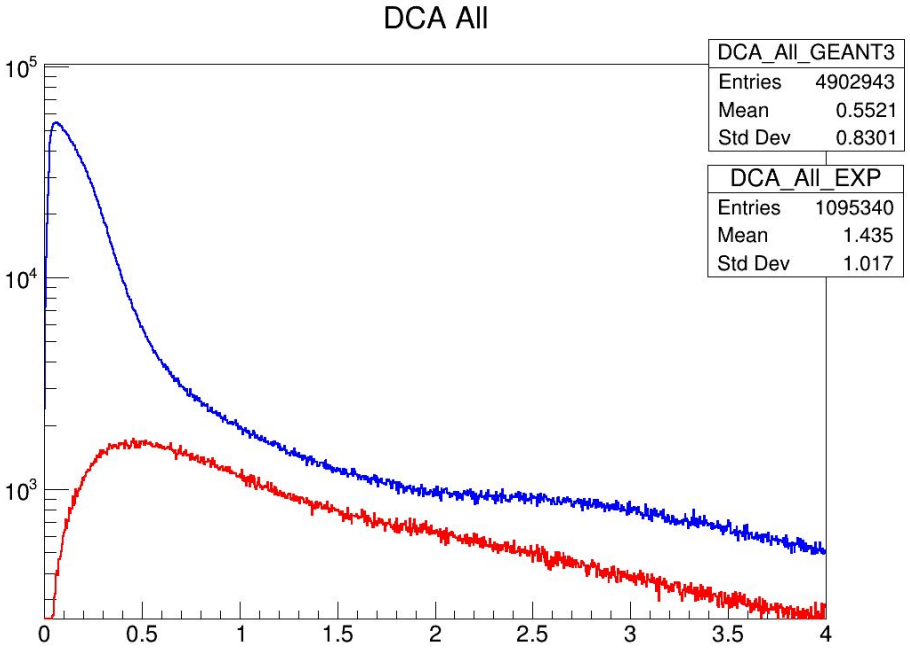
This will add branch ZdcEventData containing BmnZDCEventData

First results - global tracking

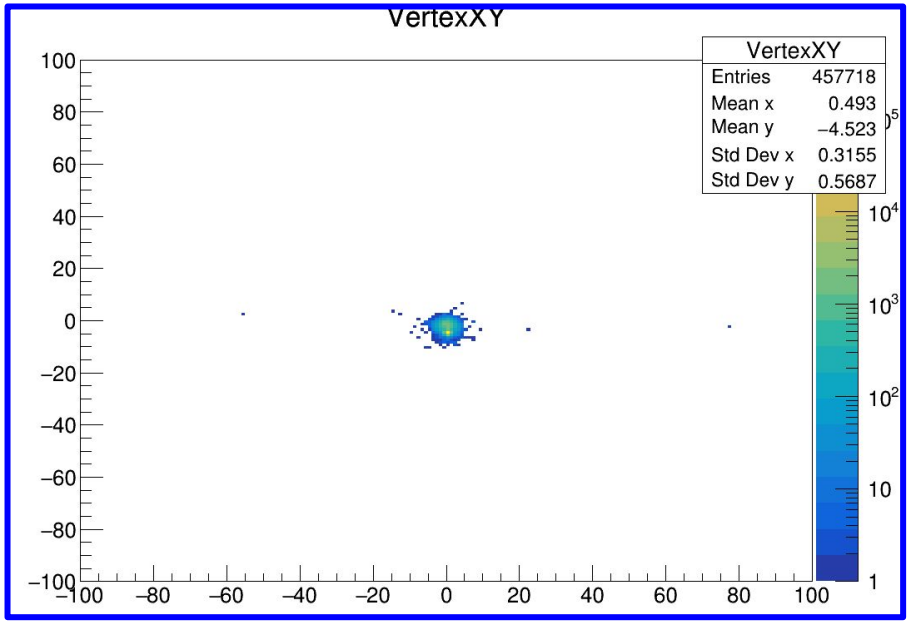
	Events	Track found	$\|Z_v\| < 8$ cm	pos & neg DCA < 8 mm
Simulation of ArSn 3.2 AGeV mb	661302	487049 (74%)	457718 (94%)	292364 (60%)
Experimental data ArSn (3812 - 4298)	5526090	779131 (14%)	153771 (20%)	7952 (1%)

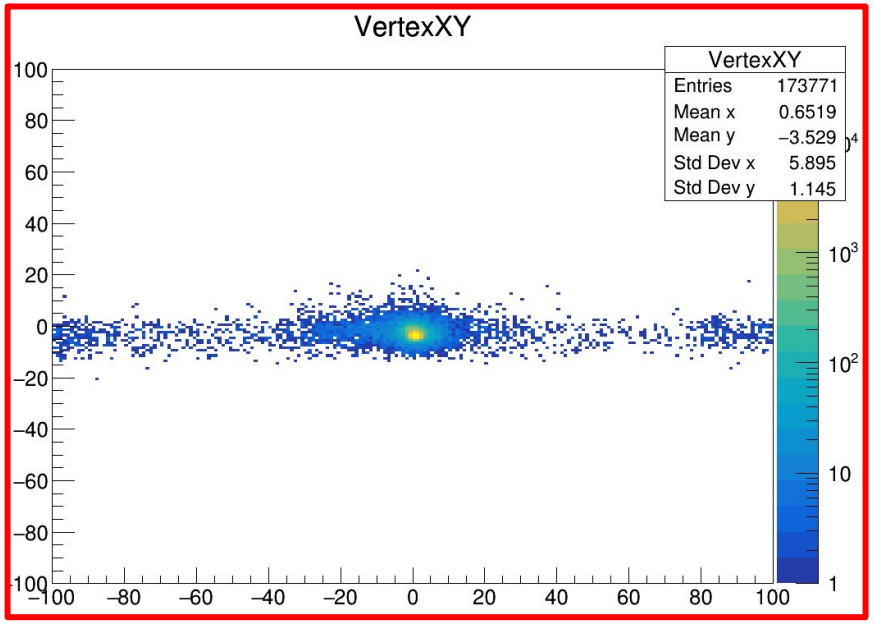
First results - global tracking



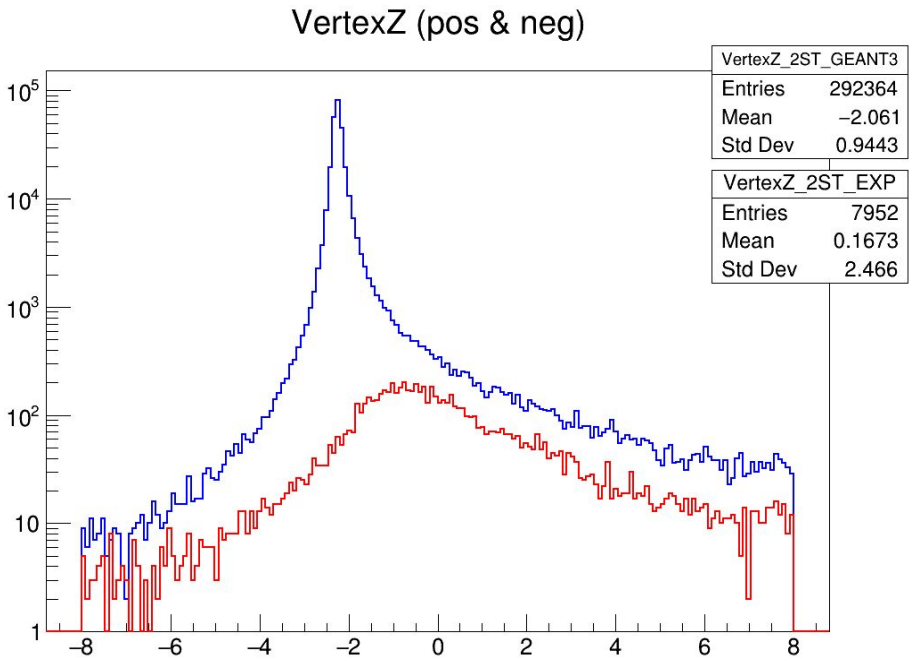


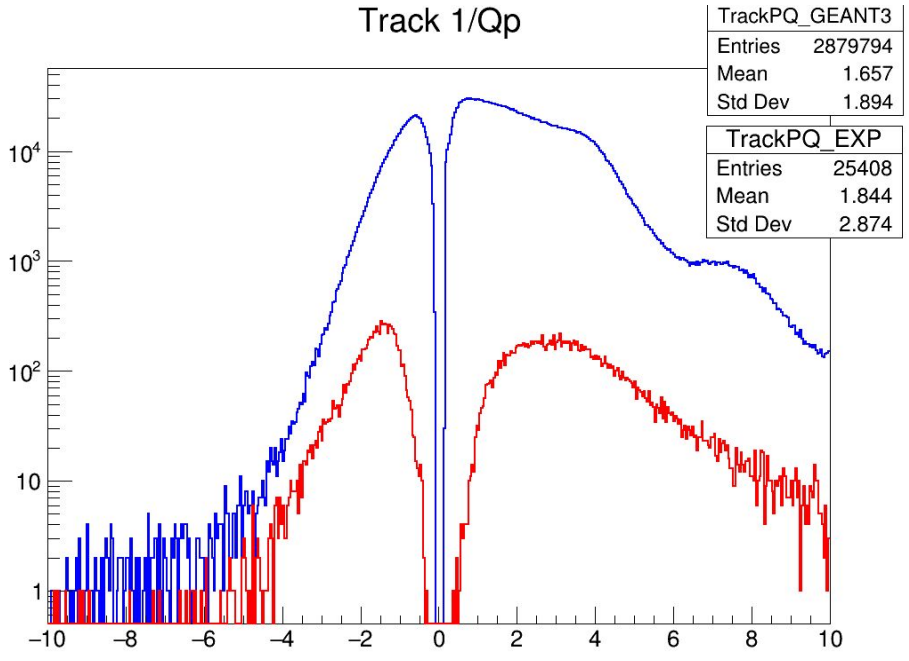
First results - global tracking



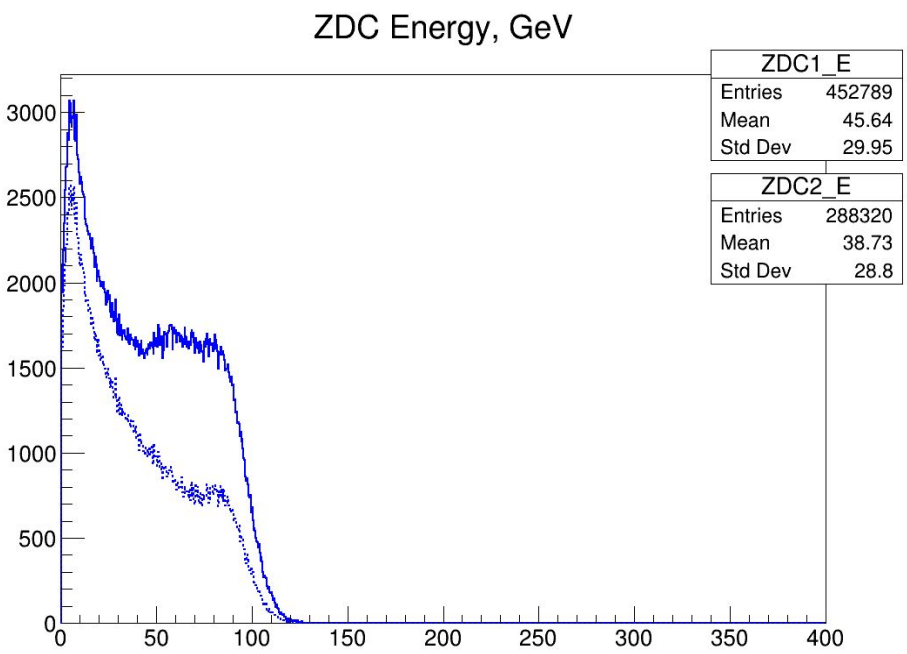


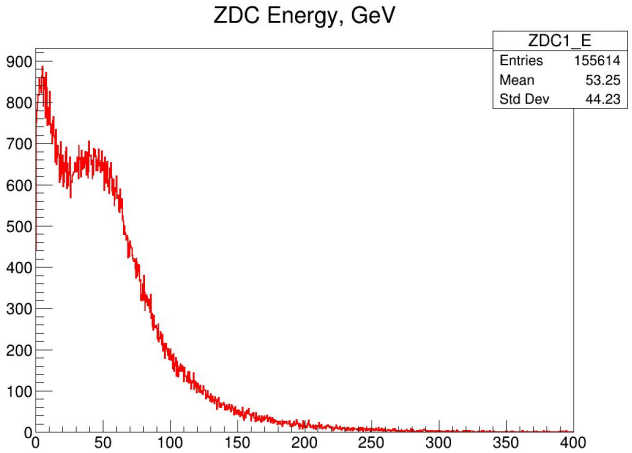
First results - global tracking. pos & neg tracks found

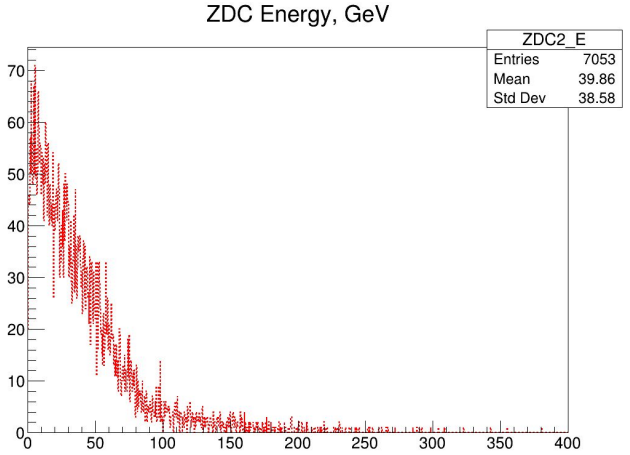




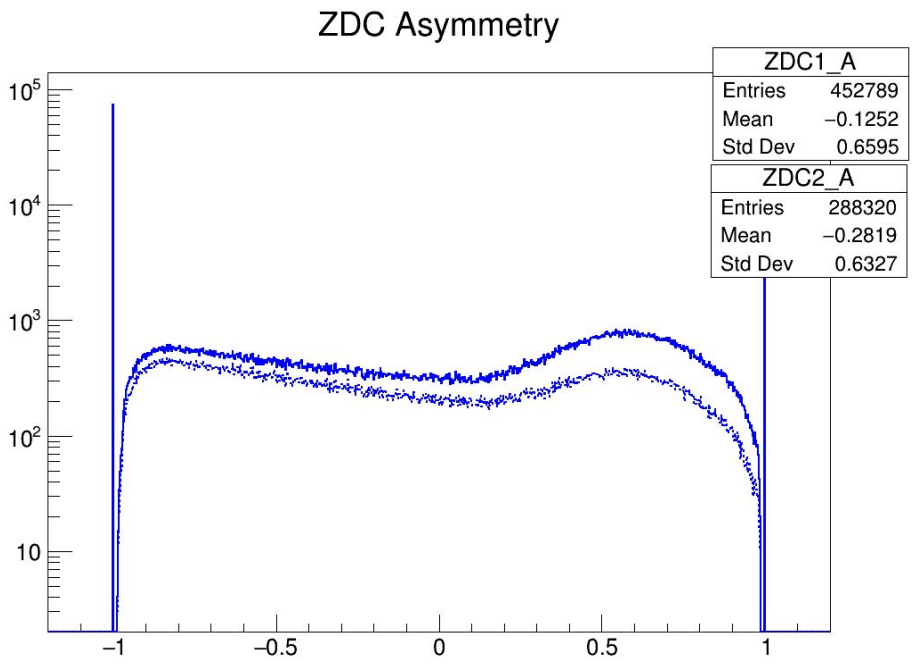
First results - ZDC energy (all events - solid, pos. & neg. - dashed)

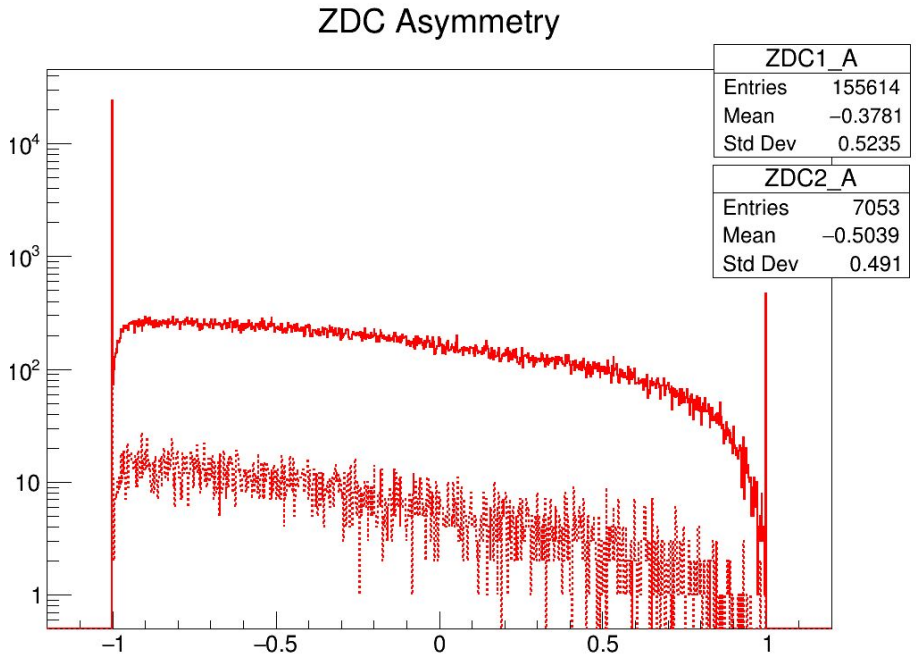






First results - ZDC asymmetry (all events - solid, pos. & neg. - dashed)





Birks' law

https://en.wikipedia.org/wiki/Birks%27_law

$$\frac{dL}{dx} = S\frac{\frac{dE}{dx}}{1 + k_B\frac{dE}{dx}}$$

G4EmSaturation.cc

```
// M.Hirschberg et al., IEEE Trans. Nuc. Sci. 39 (1992) 511
// SCSN-38 kB = 0.00842 g/cm^2/MeV; rho = 1.06 g/cm^3
g4MatNames.push_back("G4_POLYSTYRENE");
g4MatData.push_back(0.07943*mm/MeV);
```

zdc/BmnZdc.cxx

```
//0.07943 *(0.1/0.001) = 7.943 cm/GeV
//0.126 *(0.1/0.001) = 12.6 cm/GeV
//(0.126 mm/MeV - from Wikipedia, 0.07943mm/MeV in Geant4)

//fELoss += eLoss;
fELoss += eLoss / (1. + 7.943 / gMC->TrackStep() * eLoss); // Birk;
```

$Z = +2, +4, +6, +8, +10, +12, +14, +16, +18 \qquad K_B = 12.6$