UNIVERSITY OF MANITOBA

DETECTOR GEOMETRY AND BACKGROUND STUDIES

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Goal

- Write a root script to generate the detectorDaughter.gdml and use it for the background studies.

```
const int numRing = 7;  // Number of detector rings
int numDetPerRing[numRing] = {28, 28, 28, 28, 84, 28, 84};     // Number of detectors per ring
int physDetIndex[numRing]={500,600,700,800,900,1000,1100}  ;   // starting index for detectors in
detector region as auxilliary information.
float detThickness[numRing] = {15,15,15,15,15,15,15};            // Detector thickness along z-
direction
float detHeight[numRing] = {50, 100,60,40,120,100,120};          //  Detector height along radial
direction
float radRing[numRing] =  {656,731, 811, 860, 940, 1050, 940};  // Radii of detector rings
float detWidthOff[numRing] = { 0, 0, 0, 0, 0, 0, 0};
float zRing[numRing]= {0, 400, 800, 1200, 1400, 1600, 1800};   // Z-Position of rings in the local
coordinate system of detector module
float detWidth[numRing];                // detector widths
DetRing detRing[numRing];

float lightGuideAngle[numRing] ={45, 45, 45, 45, 45, 45, 45};  // angle between lightguides and quartz
detector ring.
float lightGuideLength[numRing] = {48.5,38.5,32.5,28.5,16.5,6.5,16.5}; // length of lightguides
```

Advantages

- Advantages:

- Define each quartz piece, lightguide and PMT as sensitive detectors with unique parameterized detector number.

- Access to the position, rotation and dimension information of each individual quartz piece after generation of gdml file.

Disadvantages and Solution

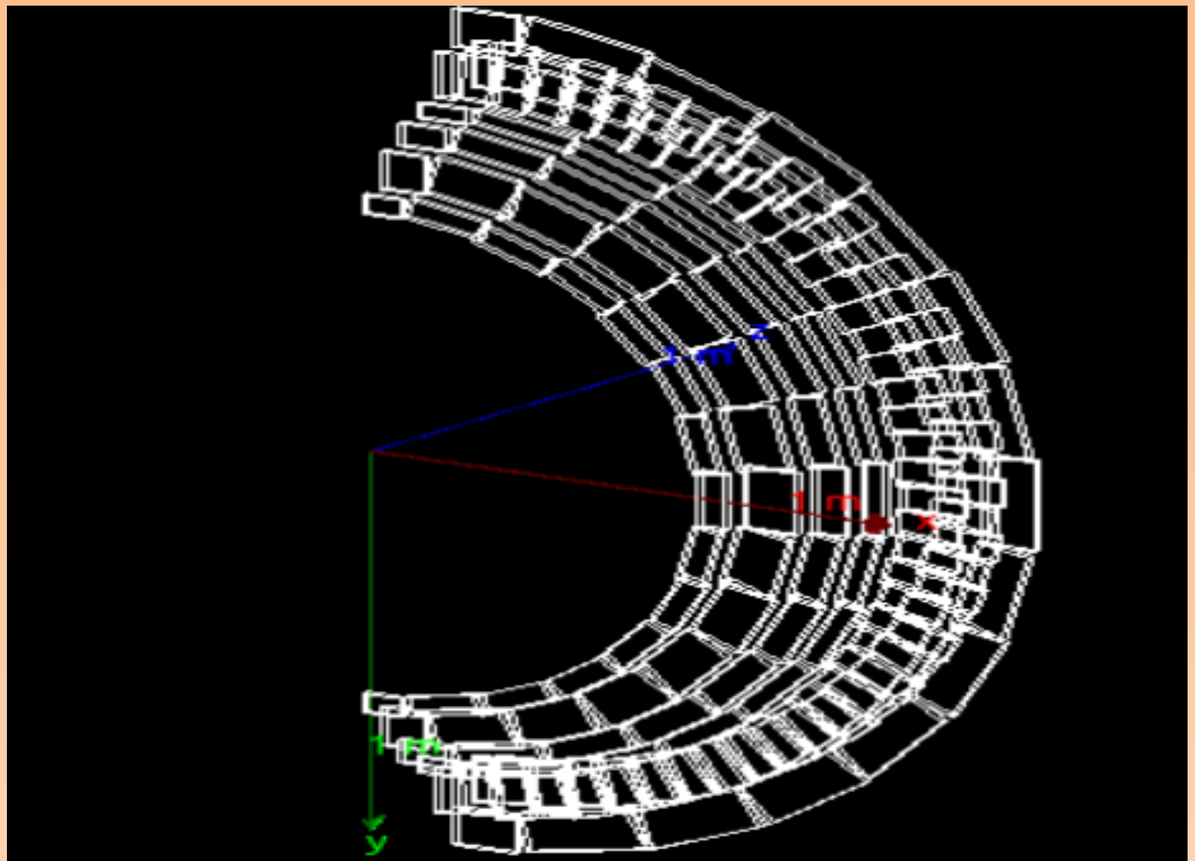
- File size becomes large for gdml files.

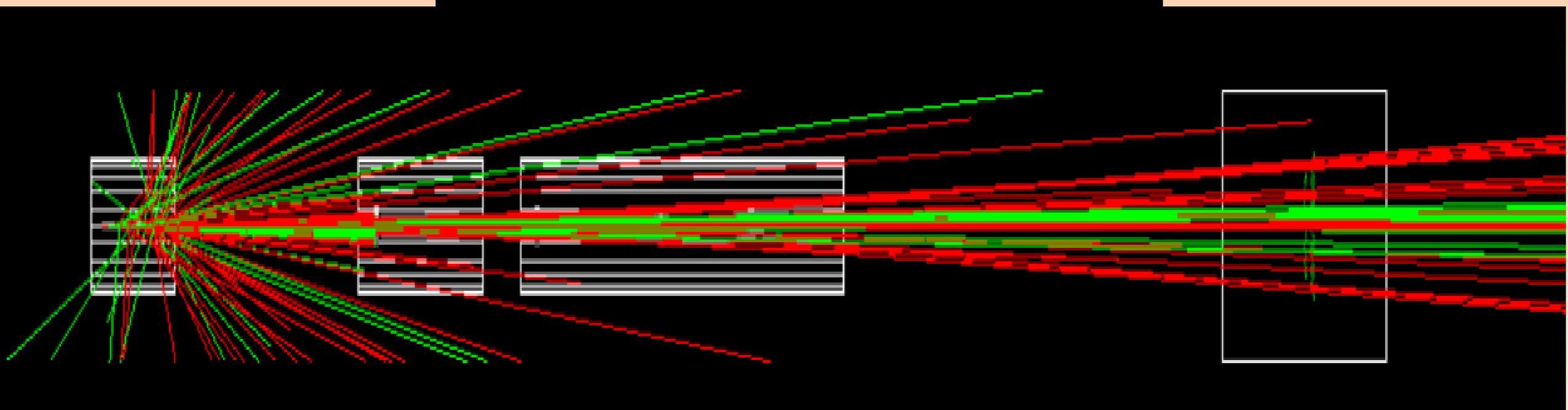
Solution:

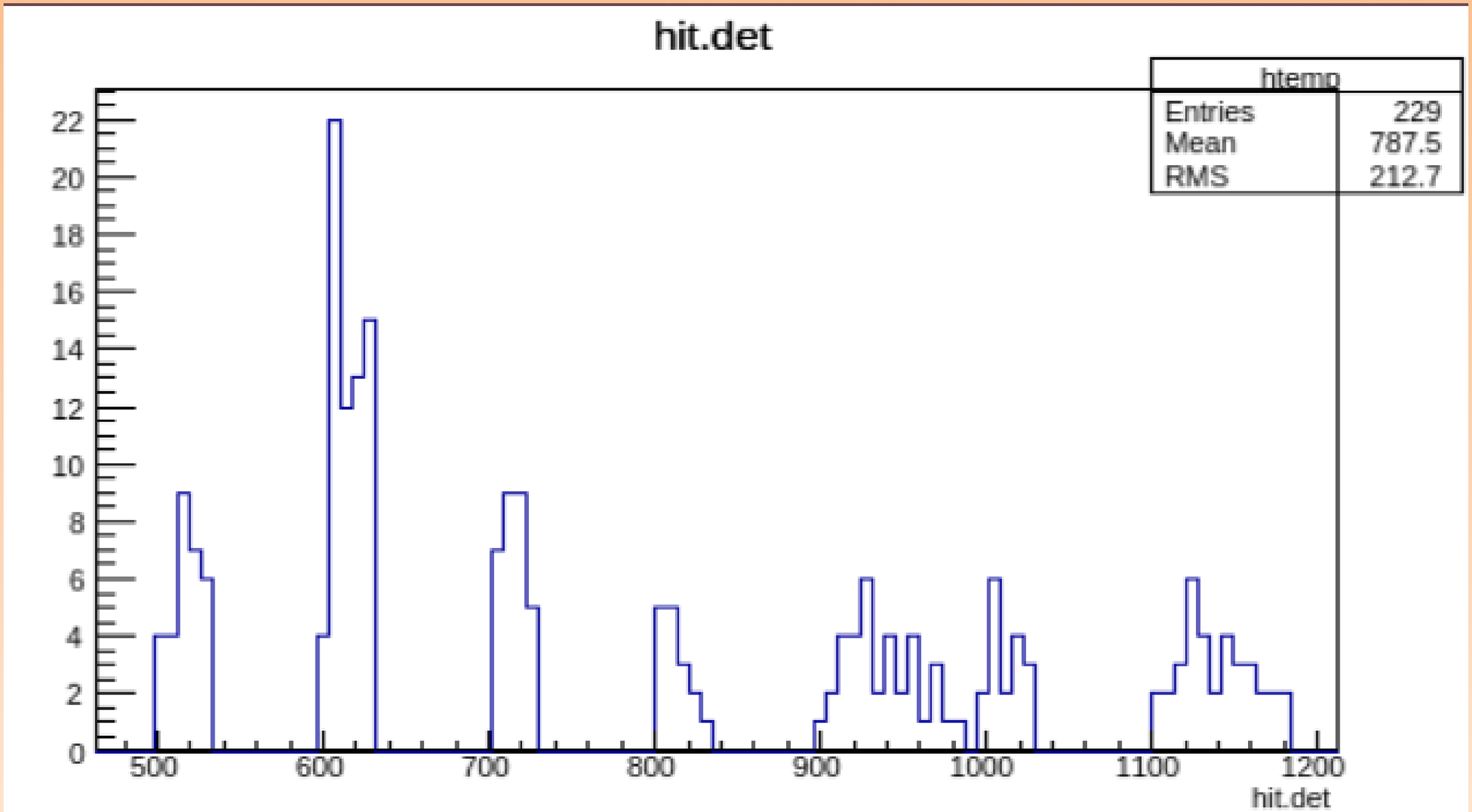
- Use entities to divide up the module into definitions, solids , materials and structure.

- Only information in the definitions file needs to be edited to change position, rotation or dimension of any individual quartz detector.

Progress






hit.det
htemp
Entries 229
Mean 787.5
RMS 212.7
22
20
18
16
14
12
10
8
6
4
2
0
500
600
700
800
900
1000
1100
1200
hit.det

Problems

- It was difficult to parameterize the tilt angle between individual quartz piece and z-axis and the tilt angle between the quartz piece and the light guide.

  - Using trapezoids for light guides leaves gaps when there is a tilt angle.

  - Use tessellated solids?- At least parameterizes the tilt angle between the quartz piece and light guide.

Future Work

- Parameterizing full geometry will take time
- Adding in light guides, PMTs and optical properties.
- Add messenger class to change position, rotation and dimension information for each quartz piece.
- Put in a series of vacuum plane detectors in the detector region to estimate what kind of background is roughly expected and then do the same later with the full detector geometry.