CT Example in fGATE

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1 CT simulation

The CT example simulation (Figure 1):

- 1 X-Rays conical source, with 6.8° angle emission
- 1 CTScanner:
  - 100x100 pixels
  - 1 pixel: 0.5x0.5x1 mm^3
  - pixels made up of Silicon
- 1 Phantom
  - 1 cylinder made up of Water
  - 4 balls (Aluminium, Glass, SpineBone, PVC) in the cylinder

During the simulation 16,835,281 photons are detected.

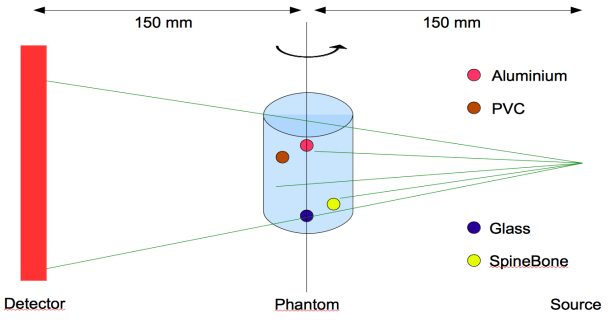

Figure 1: CT simulation scheme

There are 2 runs. Each run performs during 90 seconds. The phantom turns around its central axis at 1 $deg.s^{-1}$

2 Building and Running 'AnalyzeCT.cpp'

Compile the C++ file (in the classic directory) with the following command:
g++ -O3 'root-config –cflags –glibs' AnalyzeCT.cpp -o AnalyzeCT

3 Results

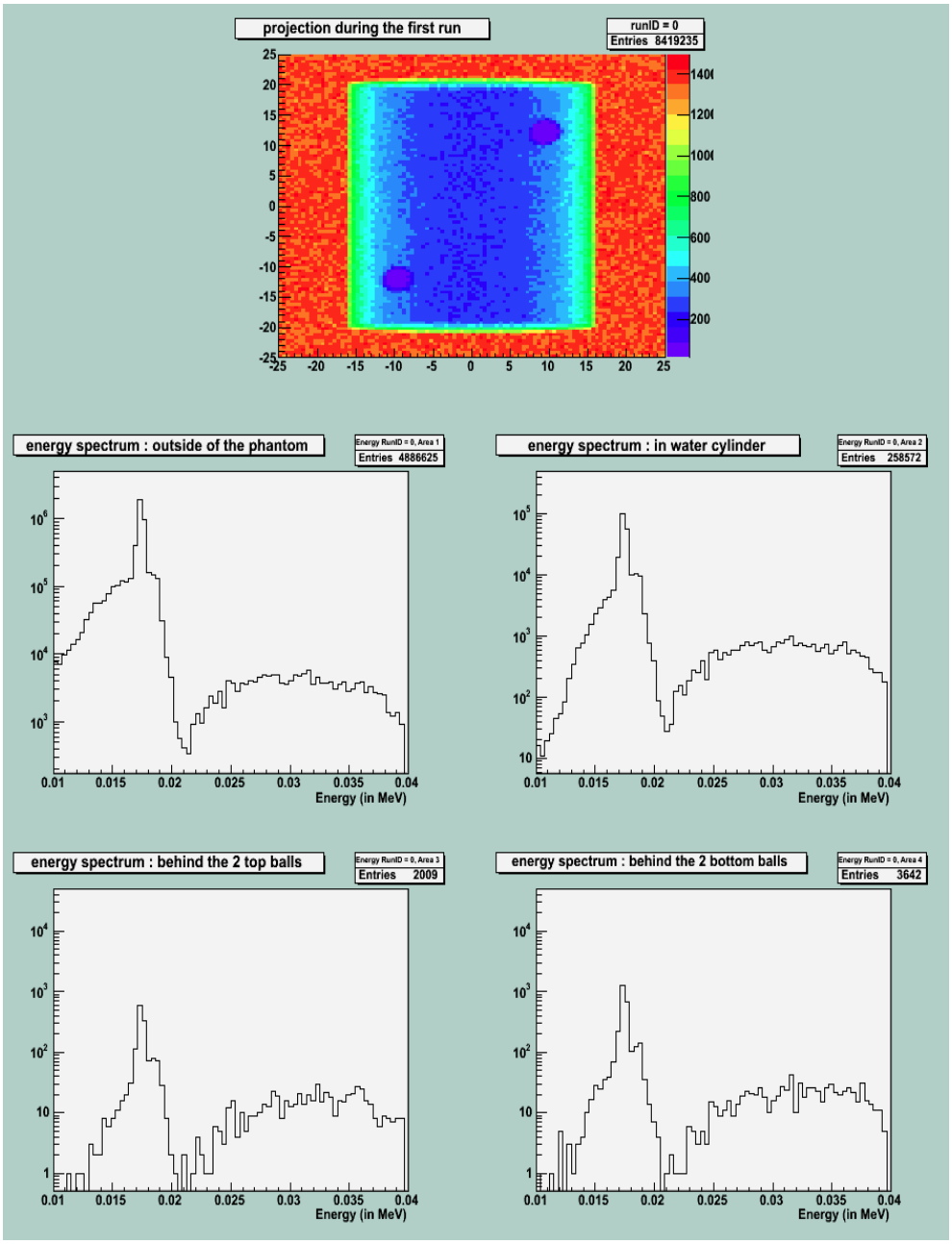

Figure 2: First projection

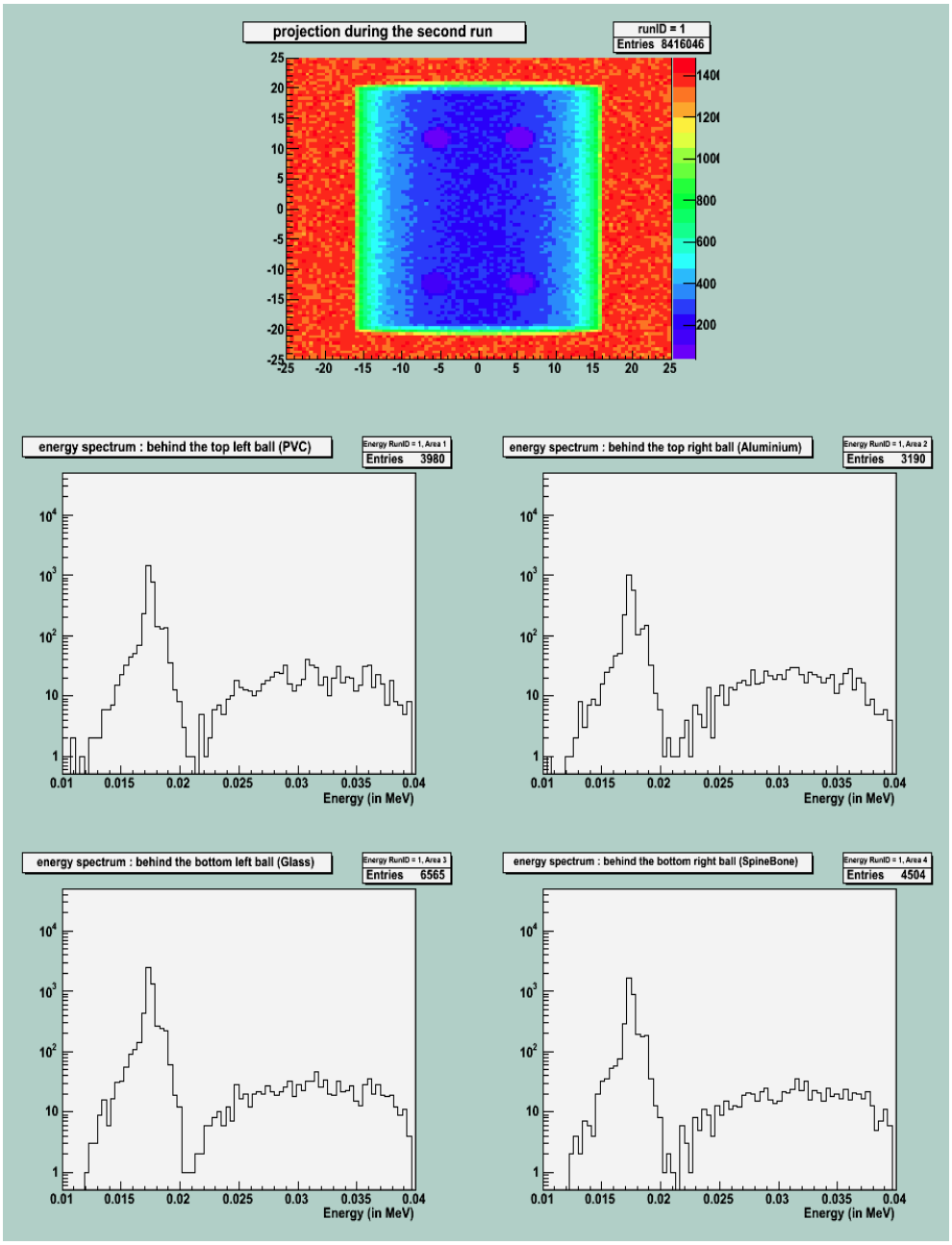

Figure 3: Second projection

```
Number of detected photons : 16835281
*****************************
* First Run (theta = 0) =>  *
*****************************
- Outside of the phantom :
-------------------------
Mean : 1357.4 ph./pix.
Standard Deviation : 36.8429
```

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- In the water cylinder :
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Mean : 243.019 ph./pix.
Standard Deviation : 15.5891

- Behind the 2 top balls :
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Mean : 47.8333 ph./pix.
Standard Deviation : 6.91616

- Behind the 2 bottom balls :
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Mean : 86.7143 ph./pix.
Standard Deviation : 9.31205

*******************************
* Second Run (theta = 90) =>  *
*******************************
- Outside of the phantom :
--------------------------
Mean : 1358.37 ph./pix.
Standard Deviation : 36.856

- In the water cylinder :
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Mean : 241.681 ph./pix.
Standard Deviation : 15.5461

- Behind the top left ball (PVC) :
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Mean : 107.238 ph./pix.
Standard Deviation : 10.3556

- Behind the top right ball (Aluminium) :
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Mean : 75.9524 ph./pix.
Standard Deviation : 8.71507

- Behind the bottom left ball (Glass) :
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Mean : 156.31 ph./pix.
Standard Deviation : 12.5024

- Behind the bottom right ball (SpineBone) :
--------------------------------------------
```

```
Mean : 94.7619 ph./pix.
Standard Deviation : 9.73457
```

4 Computation Time

- PC configuration: Intel Xeon E5345 2.33 GHz
- OS: Scientific Linux 4.8
- Compiler: 3.4.6
- Geant4 Version: geant4.9.2.p01
- ROOT Version: root-5.22
- CLHEP Version: clhep-2.0.4.2
- Computation Time (classic): 5,849.54 s
- Computation Time (fast): 5,629.16 s
- Computation Time (VRT): 407.65 s