# Geant4 Report

Setup:

1. Build a sampling calorimeter using the class G4PVReplica
2. Select two materials corresponding to the active (scintillator) and passive layers on the Geant4 material database
3. Define the sensitive volumes (*Sensitive Detector*) and the *Hit* class so to extract the following informations: coordinates (x,y,z) and energy deposit in the interaction
4. Define the particle gun as event generator (*Primary Generator*) and choose the type and the energy range of the primary particle to be studied (one for each student, as in the included table)

Analysis:

1. Determine the longitudinal (along the direction of the primary beam) and transverse dimensions of the calorimeter that are suitable for the measurement, depending on the type and energy of the primary particle, and compare the performance obtained using two different materials as absorber
2. Fixing the number of active and passive layers, describe the energy resolution of the calorimeter in the assigned energy range.
3. From the distribution of the shower centroid positions (weighted average with respect to the energy of the positions of all energy deposits) determine the spatial resolution.
4. Discuss how the energy resolution of the calorimeter varies when doubling the thickness of the active layers (maintaining the absorber thickness unchanged)

Presentation of the results:

Write a short report that contains:

- The description of the simulated calorimeter, motivating the choices depending on the assigned particle beam
- The most meaningful plots
- The discussion of the results

Attach:

- A ZIP or TAR file containing the simulation code
- A README file with the instructions to compile and run the simulation code

| Student n. | Particle | Energy range (GeV) |
|---|---|---|
| 1 | Electron | 1-10 |
| 2 | | 10-50 |
| 3 | | 50-100 |
| 4 | | 100-150 |
| 5 | Photon | 1-10 |
| 6 | | 10-50 |
| 7 | | 50-100 |
| 8 | | 100-150 |
| 9 | Pion (charged) | 1-10 |
| 10 | | 10-50 |
| 11 | | 50-100 |
| 12 | | 100-150 |
| 13 | Proton | 10-50 |
| 14 | | 50-100 |
| 15 | | 100-150 |

Students

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