

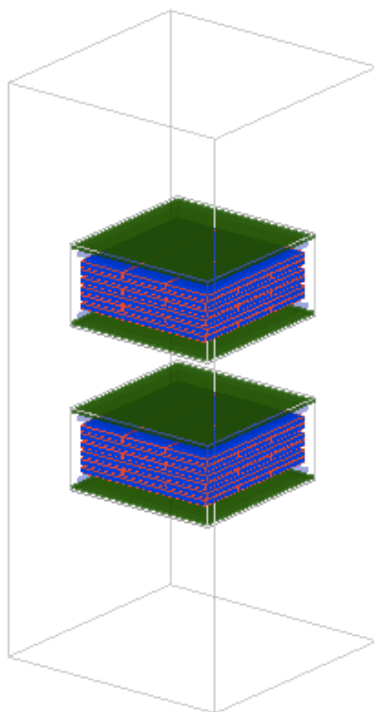
Running the CHANCE Simulation with a different detector Example

When chance_g4sim loads it automatically loads a geometry file given inside data/chance/defaultdetectorsystem.geo

Here the world is setup, and the detector systems below and above are added. If you want to change the flux/world information, first you will need to edit this file. The best thing to do is copy it to your current directory, and make any changes to it. In this example we will increase the world and flux planes to 10 x 10 m, and remove the bottom RPC layers in both detectors.

1. Making a new world geometry

When we first run chance_g4sim, it creates a 3 x 3 m vertical shaft for the simulations.



To edit this, first copy the default detector file to your current directory

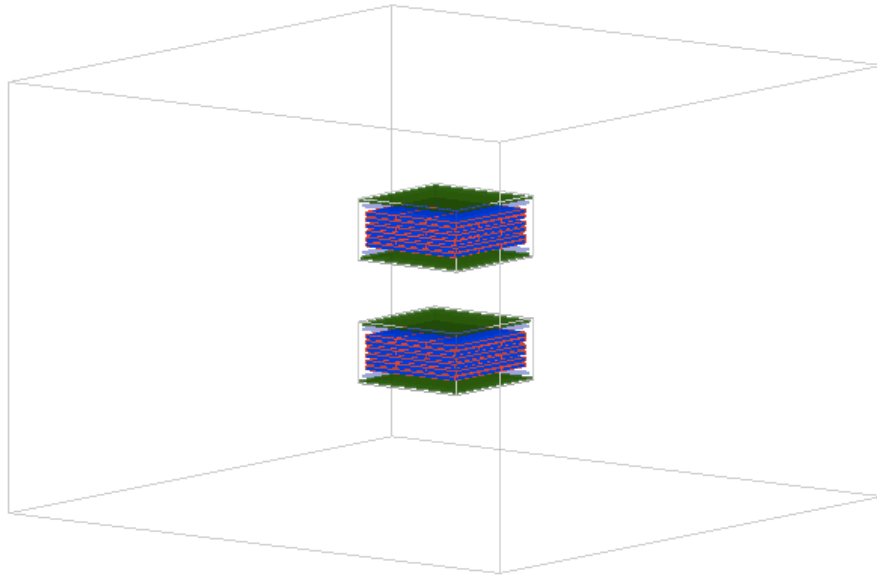
```
$ cp $GLG4DATA/chance/defaultdetectorsystem.geo ./mynewdetector.geo
```

We are then going to edit the world volume information at the top to say 10 x 10 m.

```
...
{
  name: "GE0",
  index: "world",
  material: "G4_AIR",
  size: ["10.*m", "10.0*m", "7.*m"],
  type: "box",
}
...
```

Now, to override the default geometry, we have to tell chance_g4sim to use a different base geo file. This is done using the "--detector" flag.

```
$ chance_g4sim --detector mynewdetector.geo -i
```



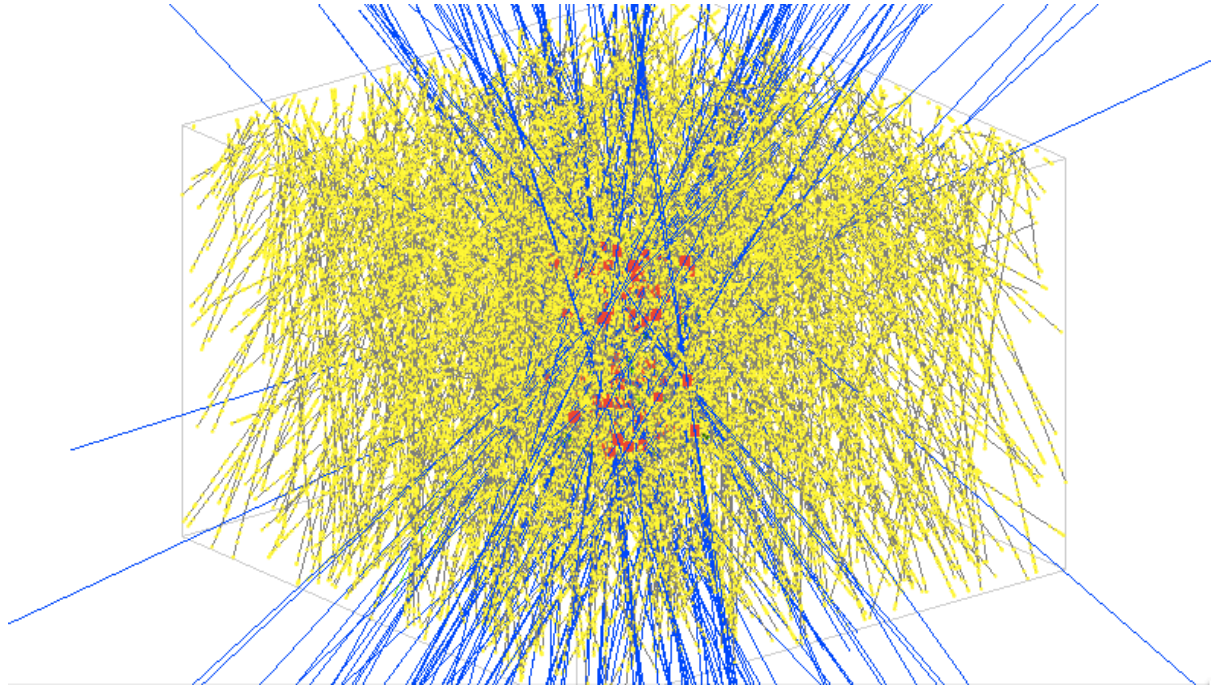
2. Changing the flux planes

The flux source plane is given by the "FLUX : source_box" table. Lets also edit this to say 10 by 10 meters.

```
...
{
  name: "FLUX",
  index: "source_box",
  size: ["10.0*m", "10.*m", "0.05*m"],
  position: ["0.0", "0.0", "3.475*m"],
}
...
```

Again, we run the modified geometry with

```
$ chance_g4sim --detector mynewdetector.geo -i
```



3. Modifying the detector positions

The detectors themselves are given in the following JSON tables. If you wanted to change their vertical spacings, without changing their internal components, you can do this by editing the positions given here.

```
{
  name: "GE0",
  index: "det_below",
  type: "hybrid_muontom",
  mother: "world",
  position: ["0.0","0.0","-1.0*m"],
}

{
  name: "GE0",
  index: "det_above",
  type: "hybrid_muontom",
  mother: "world",
  position: ["0.0","0.0","1.0*m"],
}
```

4. Modifying the internal detector spacings/contents

The detectors load the "hybrid_muontom" class, located in the "src/chance" folder. When one of these classes is instantiated, by default it loads a second geometry file located inside
"\$GLG4DATA/hybrid/muontomographydetector.geo"

If we want to make our own detector combination, we must first copy that file to our own directory for editing.

```
$ cp $GLG4DATA/hybrid/muontomographydetector.geo ./myhybriddetector.geo
```

This file has lists of scintillator/rpc/drift chamber positions. E.g. for the RPC's

```
{
  name: "GE0",
  index: "rpc_positions",
  rpc_0: ["0.0","0.0","rpc_offset", "0.0","0.0","90.0"],
  rpc_1: ["0.0","0.0","rpc_offset+rpc_spacing", "0.0","0.0","0.0"],
}
```

```

    rpc_2: ["0.0","0.0","-rpc_offset",          "0.0","0.0","90.0"],
    rpc_3: ["0.0","0.0","-rpc_offset-rpc_spacing", "0.0","0.0","0.0"],
}

```

For each entry, an RPC will be placed at that position and angle. Whether that RPC is saving X or Y information is given in the table at the top. You have to make sure these two lists match up.

```

{
  name: "INFO"
  index: "detectors",
  rpc_0: "x",
  rpc_1: "y",
  rpc_2: "x",
  rpc_3: "y",
  ...

```

So for example, if you wanted to remove the drift chambers, you would just delete the corresponding entries in those tables so that they become

```

{
  name: "INFO"
  index: "detectors",
  rpc_0: "x",
  rpc_1: "y",
  rpc_2: "x",
  rpc_3: "y",
  rpc_4: "x",
  rpc_5: "y",

  // No Drift Chambers
}
...
{
  name: "GEO",
  index: "drift_positions",
  //
  // pos and rot [x,y,z,thx,thy,thz]
  // pos and rot [x,y,z,thx,thy,thz] in m
  // No Drift Chambers
}

```

If we make these changes, we can then load them in our geometry file by editing our “mynewdetector.geo” file to tell the hybrid detectors to use a different input file.

```

{
  name: "GEO",
  index: "det_below",
  type: "hybrid_muontom",
  mother: "world",
  position: ["0.0","0.0","-1.0*m"],
  input_file: "myhybriddetector.geo"
}

{
  name: "GEO",
  index: "det_above",
  type: "hybrid_muontom",
  mother: "world",
  position: ["0.0","0.0","1.0*m"],
  input_file: "myhybriddetector.geo"
}

```

Running with this new table should produce the following geometry

```
$ chance_g4sim --detector mynewdetector.geo -i
```

