We found problems with energy loss from secondaries

A very simple model has been implemented and tested in G4v5.2 and G4v6.0, then incorporated in GlastRelease-v4r1 (G4v5.1)

Done as follow:

- Define "G4VParticleChange *ApplyYourself" (G4v5) or "G4HadFinalState *ApplyYourself" (G4v6)
- Create a new process "*JQMD2G4InelasticModel::ApplyYourself"
- Add the process in PhysicsList for "Generic Ions"

When a reaction occurs:

- kill the track (theParticleChange.SetStatusChange(stopAndKill);)
- in G4v5 define number of secondaries:
  "theParticleChange.SetNumberOfSecondaries(mult);".
  Not necessary in G4v6.
- Define secondaries:
  1. G4PT = G4ParticleTable::GetParticleTable();
  2. G4DynamicParticle *nDP;
  3. for ions: nDP $\longrightarrow$ SetDefinition (G4PT $\longrightarrow$ GetIon (Z , A , ExcitationEnergy))
  4. nDP $\longrightarrow$ SetDefinition (G4Proton::Proton())); for protons
  5. SecondaryMomentum.set(pz , py , px);
  6. nDP $\longrightarrow$ SetMomentum (SecondaryMomentum);
  7. theParticleChange.AddSecondary(nDP);

Test with very simple ”reactions” for simplicity

We simulate Carbon at 2.0 GeV/nuclon.

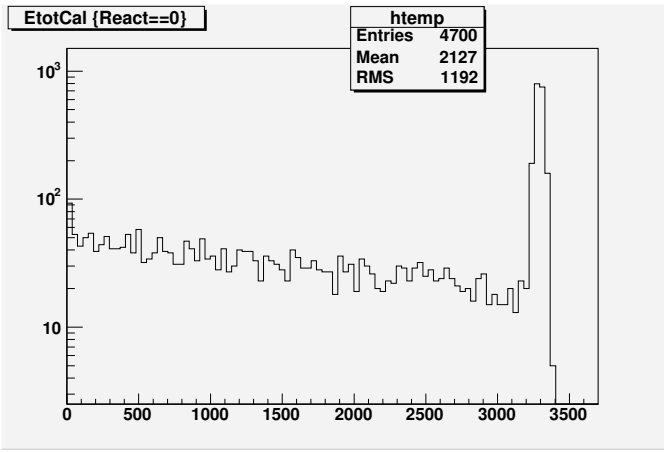
When a reaction occurs, we put a Carbon as a secondary and with a kinetic energy equals to the primary's one.

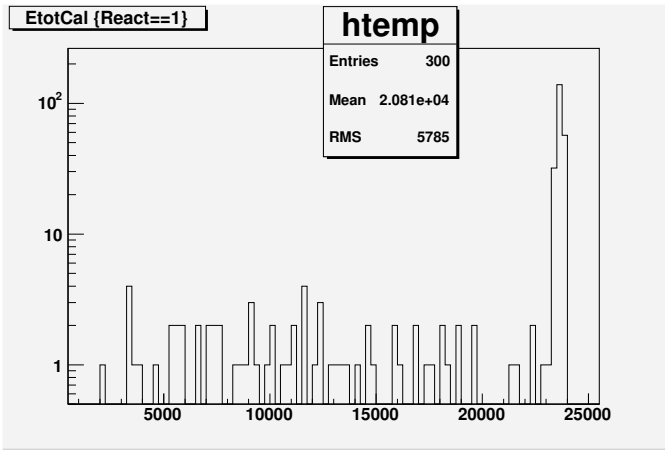
As far as GlastRelease is concerned we ran with the EM geometry (updated to xmlGeoDbs v1r15p3). We only look at the variable CalEnergySum from the RootTupleSvc.root output file.
So far we are not able to separate the events with ”reaction” from those without reaction.

We look at the total energy deposited in the Calorimeter and expect to find a total energy deposited mainly peaked around the ionization energy loss by Carbon nuclei at 2 GeV/nucleon (i.e. $415 * 8 = 3300 MeV$)

G4v5.2 results

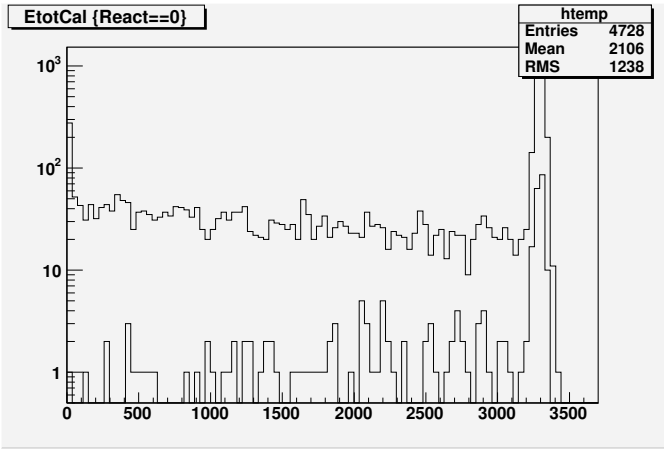
First is shown the result with standalone G4v5.2, left when no reaction occurs, right when a reaction takes place. Obviously the total energy of the incident Carbon is lost when a ”reaction” occurs (EtotCal peaked around 24 GeV)





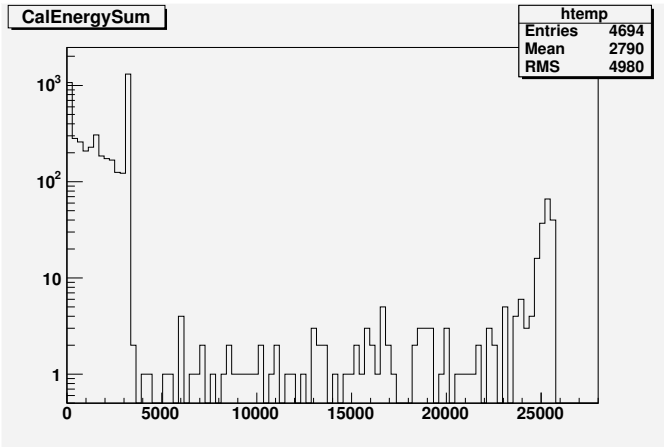
G4v6.0 results

below is shown the result with standalone G4v6. The case ”reaction” is superposed to the case ”no reaction”. Both are very similar.

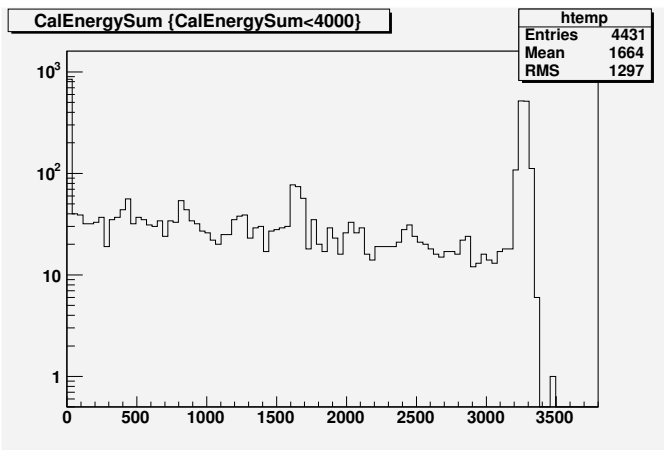


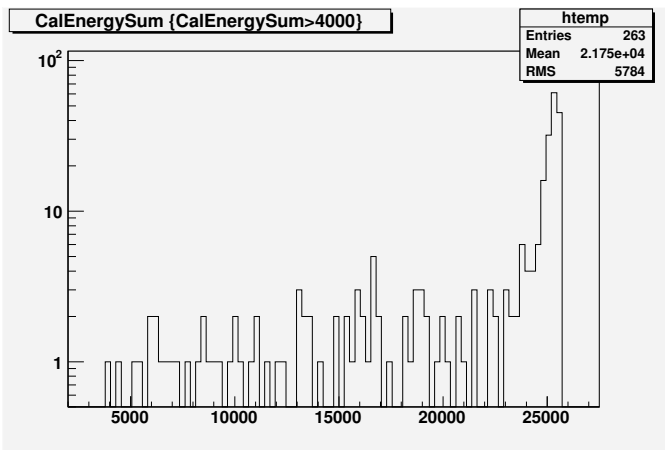
GlastRelease-v4r1 results

The first plot is the overall CalEnergySum and shows 2 features: below 4000 GeV and above 4000 GeV.



The last two plots show the same quantity zoomed into the two regions mentioned.





It is very clear that those last figures are very similar to those from g4v5.2 standalone whith the 2 regions corresponding to ”no reaction” and ”reaction”.