Short Update on Jet Simulations

SLAC-TTU Calorimeter R&D meeting

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Pythia Gen Updates

- Included Pythia in the simulation workflow:
  - Inject partons manually and pass to Pythia, Pythia to handle parton showers:
    - Pythia checks and requires conservation laws. So can not inject a single parton.
    - Approach is inject two partons back to back, one in positive z, the other in negative z; and drop the shower products in the negative z direction
  - Code available here
  - Longer term vise, more appropriate solution is probably to prepare a LHE file with the parton information and passing to Pythia so we can change partons more easily, but for now good enough to get started

```
// Information on a q qbar system, to be hadronized.
if (type == 1)
{
  int id = 2;
  double mm = pdt.m0(id);
  double pp = sqrtpos(ee * ee - mm * mm);
  event.append(id, 23, 101, 0, 0., 0., pp, ee, mm);
  event.append(-id, 23, 0, 101, 0., 0., -pp, ee, mm);

  // Information on a g g system, to be hadronized.
}
else if (type == 2)
{
  event.append(21, 23, 101, 102, 0., 0., ee, ee);
  event.append(21, 23, 102, 101, 0., 0., -ee, ee);

  // Information on a g g g system, to be hadronized.
}
```

Geant4 Sim Updates

- Pythia Gen process will produce a ROOT tree including all the final state visible particles, their kinematic information
- ROOT file can be passed to GEANT4 for downstream simulations
- This should be enough to get started on the reco jet pt (and mass), and compare with Gen performance

```
#$$$ CaloXPythiaON false   (true or false, true to use Pythia for particle gun)
#$$$ CaloXPythiaXmin 0.1
#$$$ CaloXPythiaXmax 0.11
#$$$ CaloXPythiaYmin 0.1
#$$$ CaloXPythiaYmax 0.11
#$$$ CaloXPythiaFile /home/yongbinfeng/Desktop/CaloSim/DREAMSim/pythia/PSParticles.root
```

- ToDO:
  - Implement the Geant4 hadronic shower tracking, so that can build the confusion matrix on the linking between RecHits and GenParticles

Back Up