Edep-sim output

INFN Bologna

Std output

- File ROOT
  - **DetSimPassThru**: Folder (TDirectoryFile) con informazioni su input
    - **gRooTracker:** TTree di input
      formato rootracker (https://arxiv.org/pdf/1510.05494.pdf pag 116)
    - **InputKinem:** TTree con mappa tra eventi di input ed eventi simulati
      Per ogni evento simulato riporta a quale file di input (*inputFileNum*)
      ed a quale evento (*inputEntryNum*) corrisponde
    - **InputFiles:** Informazioni sui file di input
      (*fileName, generatorName, treeName, filePOT, fileEntries*)
  - **EDepSimGeometry**: TGeoManager con geometria
  - **EDepSimEvents**: TTree con informazioni sulla simulazione degli eventi

EDepSimEvents

(https://github.com/ClarkMcGrew/edep-sim/blob/master/README.md#output-tree-format)

- Ogni entry corrisponde ad un evento
  - *RunId* [int]
  - *EventId* [int]
  - *Primaries* [vector<TG4PrimaryVertex>]
    - one or more primary vertices
  - *Trajectories* [vector<TG4Trajectory>]
    - Traiettorie di tutte le particelle
  - *SegmentDetectors* [map<string,vector<TG4HitSegment>>]
    - Mappa tra sensitive detector e la corrispondente lista di hit

TG4PrimaryVertex

- *Position* [TLorentzVector]
- *GeneratorName* [string]
- *Reaction* [string]
- *Filename* [string]

```
Primaries.GeneratorName = GENIE:fixed@free-fixed
Primaries.Reaction = nu:14;tgt:1000060120;N:2112;proc:Weak[CC],RES;res:7;
Primaries.Filename = output.root.0.gtrac.root:gRooTracker:0
```

- *InteractionNumber* [int]
  - The index (or identifier) of the interaction in the kinematics file

TG4PrimaryVertex

- *CrossSection* [float]
  - The cross section for the reaction that created this vertex
- *DiffCrossSection* [float]
  - The differential cross section for the kinematics of the reaction that created this vertex
- *Weight* [float]
  - The weight of the interaction. This will be set to one if the interaction is not reweighted. If the vertex is oversampled, this will be less than one.
- *Probability* [float]
  - The overall probability of the interaction that created this vertex. This includes the effect of the cross section, path length through the material, etc. This should be one if it is not filled
- *Particles* [vector<TG4PrimaryParticle>]

TG4PrimaryParticle

- *TrackId* [int]
- *Name* [string]
- *PDGCode* [int]
- *Momentum* [TLorentzVector]
  - The initial momentum of the particle

TG4Trajectory

- *TrackId* [int]
- *ParentId* [int]
- *Name* [string]
- *PDGCode* [int]
- *InitialMomentum* [TLorentzVector]
- *Points* [vector<TG4TrajectoryPoint>]

TG4TrajectoryPoint

- *Position* [TLorentzVector]
- *Momentum* [TVector3]
- *Process* [int]
  - NotDefined, Transportation, Electromagetic, Optical, Hadronic, PhotoLeptonHadron, Decay, General, Parameterization, UserDefined
- *Subprocess* [int]
  - EMCoulombScattering, EMIonization, EMBremsstrahlung, EMPairProdByCharged, EMNuclearStopping, EMMultipleScattering, EMPhotoelectric, EMComptonScattering, EMGammaConversion, HadronElastic, HadronInelastic, HadronCapture, HadronChargeExchange, GeneralStepLimit

TG4HitSegment

- *Contrib* [vector<int>]
  - The TrackId for each trajectory that contributed to this hit
- *PrimaryId* [int]
  - The track id of the most important particle associated with this hit segment
- *EnergyDeposit* [float]
  - The total energy deposit in this hit

TG4HitSegment

- *SecondaryDeposit* [float]
  - The "secondary" energy deposit in this hit. Generally, this is used to help simulate the amount of energy emitted as scintillation light, i.e. opticalphotons, and is part of the total energy deposit. The remaining energy will be deposited as ionization. In this model (in argon), the mean number of quanta created will be $N_q = E_{dep} / (19.5*eV)$, N_q should be fluctuated around N_q, $N_{ph} = N_q * E_{sec.\ dep} / E_{dep}$, and $N_e = N_q - N_{ph}$.
- *TrackLength* [float]
  - The total charged track length in this hit. This includes the contribution from all of the secondary particles (e.g. delta-rays) that are included in this hit.
- *Start* [TLorentzVector]
- *Stop* [TLorentzVector]