

A Few Notes on Cosmic Overlays

- Cosmics generated using `protodune_corsika_cmc`
- “Beam” events generated using `dunefd_singlep` with customization to start particles at front face of beam window
- Overlay consists simply of including both generators in the producer module
 - This assumes the timing is set correctly for protoDUNE in the Corsika module (should be true)

```
# Define and configure some modules to do work on each event.  
# First modules are defined; they are scheduled later.  
# Modules are grouped by type.
```

```
physics:
```

```
[
```

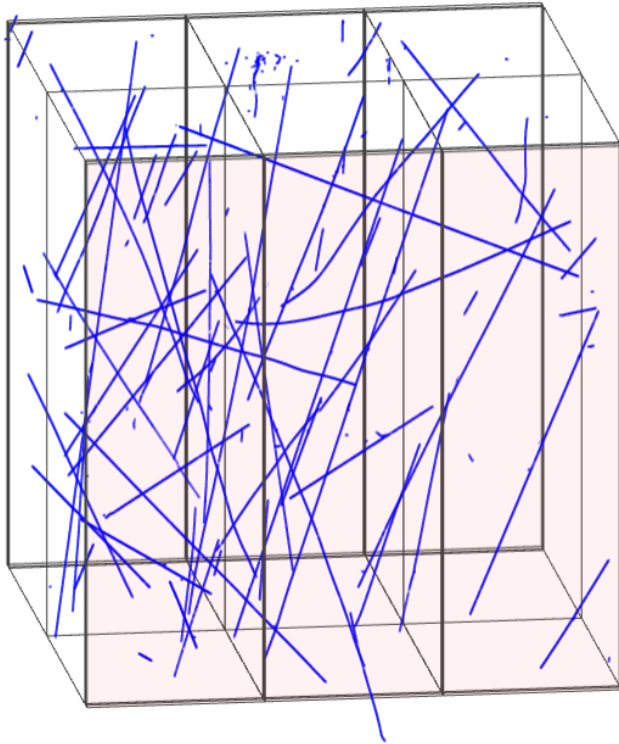
```
  producers:
```

```
  {  
    generator: @local::dunefd_singlep  
    cosmicgenerator: @local::protodune_corsika_cmc  
    rns: { module_type: "RandomNumberSaver" }  
  }
```

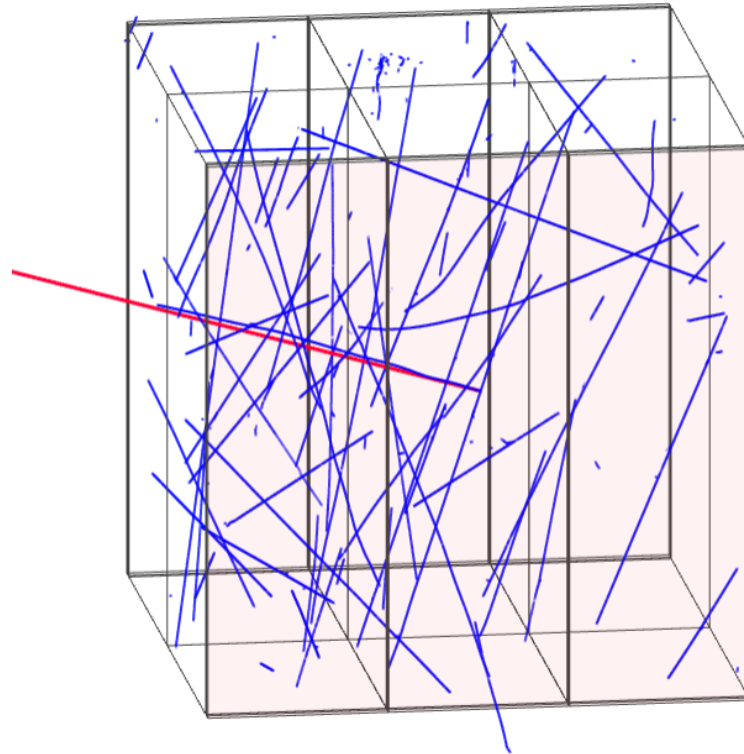
```
#define the producer and filter modules for this path, order matters,  
#filters reject all following items. see lines starting physics.producers below  
simulate: [ rns, generator, cosmicgenerator ]
```

Example Event Display

Reconstructed
PMTrack:



Reconstructed PMTrack w/
truth for beam particle:



Existing Sample

- 1 GeV beam muons w/ 5% spread in initial momentum
- Samples at: /pnfs/dune/scratch/users/seturner/cosmics/v06_02_00/reco/cosmics_mu_overlay/13603061_*/gensingle*_reco.root
- Additional samples easily generated upon request
 - Will work on updating protoDUNE fcl area to make this a standard job
 - Full reconstruction job is very slow for cosmics – can we decide on a reduced reconstruction fcl file (running fewer algorithms perhaps) that would allow the reco jobs to run in a more reasonable amount of time?