Discussion
for Truth Information

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Truth Propagation

1. Generation: outgoing particles are produced.
2. Adding mother particle(s) for outgoing particles by stdhep tools: there are two tools to add mother particles, such as
    1. Add a mother particle for all outgoing particles; applicable for all physics channels.
    2. Add a mother particle for e+e- pair and another mother particle for recoiled e-; applicable for rad, ap and BH.
   - Note: For samples with merging of multiple physics channels, different PDG could be optionally set for mother particles of each channel so that MC particles from different channels could be identified in final samples after reconstruction.
3. SLIC: full information for MC particles is output.
4. Readout: MC particles around triggers are output; more details will be discussed.
5. Reconstruction: MC particles from readout are saved after reconstruction.

What hard to build full truth?

- Readout (What I can think of)

  - For a triggered event, it could be that plenty of MC particles have relations with the event, especially for MC samples with background.

  - For each detector, relative MC particles could be different, i.e., a particle could have hits at some detectors, but have no hit at others.

  - For a time window of ADC samples of a channel (Ecal/Hodo/SVT), it could be overlap of multi-hits, and these hits are produced by different particles.

  - Besides MC particles, which produced hits, their mother-to-root particles are needed.

  - MC hits associated with MC particles are needed.

- Recon:

  - Hits are rebuilt by raw hits (windows of ADC samples), and further clusters, tracks, vertices, etc, are reconstructed.

  - It will be a huge matrix to build a relation table between MC particles&hits and reconstructed samples.

How Readout Propagates MC Particles/hits from SLIC to Output?

- There are two optional ways, which are set in readout steering files:

  - MC particles/hits within a time range around trigger time are output

  - Ecal/Hodo/SVT MC hits and relative MC particles (and their mother-to-root particles) in time windows of raw hits (i.e. ADC samples) are output. Meanwhile, a relation collection (i.e., a ID table) between truth hits and raw hits is output. Note: There is an option to choose if relative truth is written for Ecal/Hodo, while no such option for SVT.

- Information for MC particles/hits needs large disk space to be saved. What truth information should be saved depends on requirement of analysis.

What can be Improved?

- Generally, we utilize truth information of mother particles and corresponding daughter particles for analysis, such as rad. frac. analysis.

- We still can improve our system:

  - Event number from readout: currently, event number for triggered events from readout is confused and useless, since it can not help to build relations between readout and SLIC events through their event number. Event number from readout should be re-defined.

  - All MC particles from readout are saved in the same collection. It cause two problems: 1) we cannot directly judge if a particle has a hit at Ecal/Hodo/SVT; 2) If both of ways (mentioned in the last slide) are open, the same MC particles could be recorded several times in the MCParticles collection. To avoid such issues, readout could be updated to save MC particles into different collection for different readout driver.

  - Welcome suggestions!!!