Status of JUNO software release

Tao Lin <lintao@ihep.ac.cn>

on behalf of offline group

May 10th - 15th , 2018

JUNO workshop @WHU

Outline

- Overview of major actions in last PDR

- Replies to these actions

- Migration to ROOT6 and Geant4 10

- Summaries and Plans

Major action items in last PDR

Liangjian Wen, JUNO-doc-3267

- Migrate to Geant4.10
- AEDM (Analysis Event Data Model)
- Database and interfaces (review in July 2018)
- Generator (add more generators, geo-v, more flexible)
- Physics Models (PMT/LS optical model, Positronium)
- Geometry and detector parameters
- Basic distribution, performance plots (website to archive)
- Simulation of detection system as a whole
- Develop a requirement table for individual reconstructions
- Use measured PMT waveforms to optimize waveform rec alg.
- Effect of PMTs and electronics to rec in CD.
- Clusters in some analysis.
- Combination of convention and deep learning methods.

Replies to these actions

Status of offline software from last collaboration meeting

Status (I)

- Migrate to Geant4.10
  - See next section *in this talk*.

- AEDM (Analysis Event Data Model)
  - Still in preliminary design.

- Database and interfaces
  - Wenhao, *Status of database interface and crestdb*
  - Wenshuai, *Status of database*

- Generator (add more generators, more flexible)
  - Generators related to background are not done yet.
  - Geo-v generator is in offline repository now.
  - Update generator framework. (not started yet)

Status (II)

- Simulation of detection system as a whole
  - Yan, *Update on SPMT electronics simulation*
  - Joao, JUNO-doc-3405, *Top Tracker: Recent Software Updates*
  - Haoqi, *Update of water Cherenkov detector* and *Status of EMF*

- Physics models
  - Yaoguang, *PMT Optical Simulation*
  - Cecile, JUNO-doc-3381, *Positronium generator and tagging*

- Geometry and detector parameters
  - Jiang, *Status of geometry management*

- Basic distribution, performance plots (website to archive)
  - Already have tool to generate static html pages.
  - No website yet.

Status (III)

- Develop a requirement table for individual reconstructions
  - Wenjie, *Energy reconstruction*
  - Yongbo, *Energy resolution with different MC configurations*
  - Jilei, *SPMT+WP reconstruction*
- Use measured PMT waveforms to optimize waveform recalg.
- Effect of PMTs and electronics to rec in CD.
  - Haiqiong, *PMT testing data*
- Clusters in some analysis.
  - Philipp, in PDR discussion.
- Combination of convention and deep learning methods.
  - Any news?

Items need more efforts

- AEDM (Analysis Event Data Model)
- Generators related to background are not done yet.
- Basic distribution, performance plots (website to archive)
- Develop a requirement table for individual reconstructions
- Combination of convention and deep learning methods.

Comments:

- Some items are still missing. Need more discussions.

Migration to ROOT6 and Geant4 10

Note: it is still single threaded version

Replies to comments in last PDR

- We keep trunk version stable, using the same libraries as before.

- To speedup the migration to ROOT6 and Geant4 10, we create a separate branch to develop code:
  - A new version of SNiPER, with better support of multi threading.
  - Common services, such as ROOT IO.
  - Detector simulation.

- Need validation between Geant4 9.4 and 10.

- Roadmap for us:
  - ROOT6/Geant4 10 without multi-threading.
  - Simulation with SNiPERMT.

Towards to ROOT6

- ROOT 5.34 becomes a long-term bug fix only version, without any new features.

- ROOT 6 is the next long term support version.

- A lot of new features such as multi-threading support, thread safe, C++11, new interpreter Cling and so on.
  - Thread safe for TFile/TTree operations.
  - Using rootmap, users don't need to load dictionaries manually.
  - Better Python support: access EDM, Jupyter support.

Towards to Geant4 10

- The geant4 9.4 used in JUNO is a very old version, which is not maintained any more.
  - Most of important physics processes are validated by Daya Bay MC.
- Geant4 10 is released several years ago. The latest version is 10.4.
- Several interfaces are different between 9 and 10.
  - Need effort to migrate the code.
  - The changes of physics list need to be checked carefully.
- The multi-threading feature is not enabled in this branch.
- The long term plan is using MT in production.

Status

- The compiler and external libraries are updated.
    - Feature such as rootmap is used in offline now.
    - Installation scripts are also updated.
- A new SNiPER is used, which is optimized for parallelized computing. (Jiaheng)
    - Such as optimization of task management.
- Event data model and ROOT IO are updated. (Irakli and Tao)
- The migration of DetSim is done. (Ziyan and Tao)
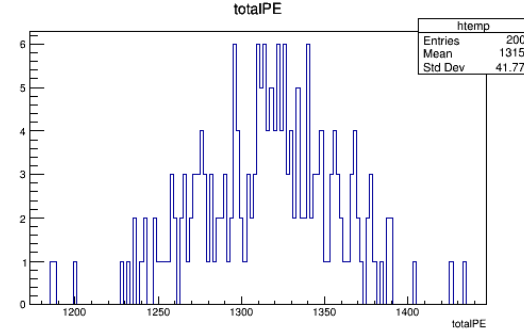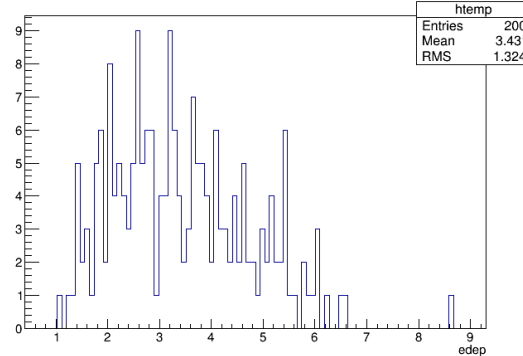- Measure performance. (Ziyan)
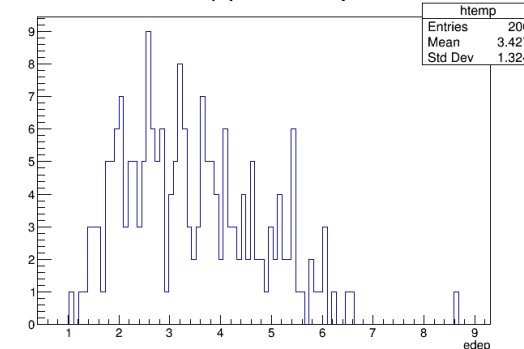
Performance measurement
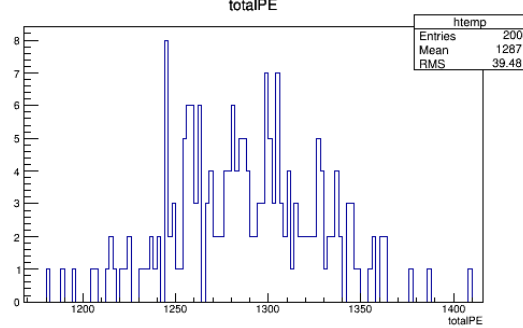
Geant4.9.4   Geant4.10   Done by Ziyan

1MeV gamma

IBD events
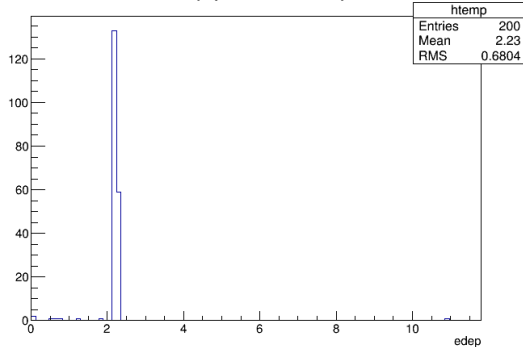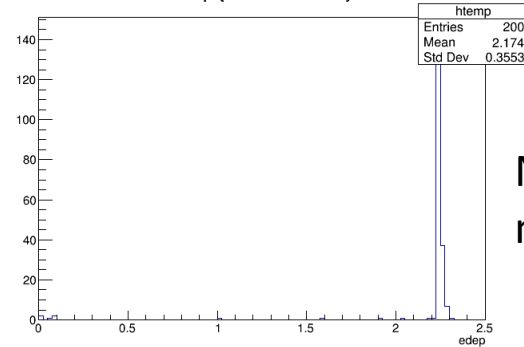
Need to check neutron capture?

Summaries and Plans

- Summaries
  - According to the last PDR, we maintain two branches.
  - Trunk (ROOT5/Geant4.9): most of work are already started or even done.
  - Branch ROOT6/Geant4.10: framework and detector simulation.

- Plans
  - Stable release of J18v1 for trunk version.
  - A release for ROOT6 version.
  - Validation of the release between two versions.
  - Start a new round of valprod.

Status of action items

- Migrate to Geant4.10
- AEDM (Analysis Event Data Model)
- Database and interfaces (review in July 2018)
- Generator (add more generators, geo-v, more flexible)
- Physics Models (PMT/LS optical model, Positronium)
- Geometry and detector parameters
- Basic distribution, performance plots (website to archive)
- Simulation of detection system as a whole
- Develop a requirement table for individual reconstructions
- Use measured PMT waveforms to optimize waveform rec alg.
- Effect of PMTs and electronics to rec in CD.
- Clusters in some analysis.
- Combination of convention and deep learning methods.

Discussions