2022年第二季度考核

Zeng Hao

Advisor：Joao Guimaraes da Costa

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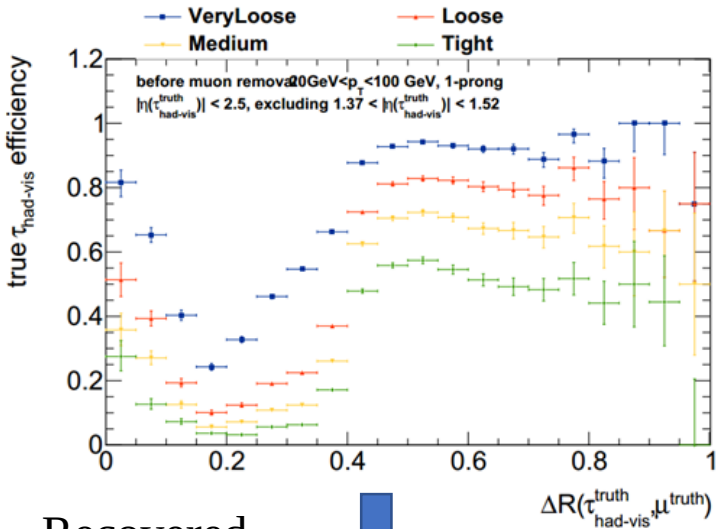
Content

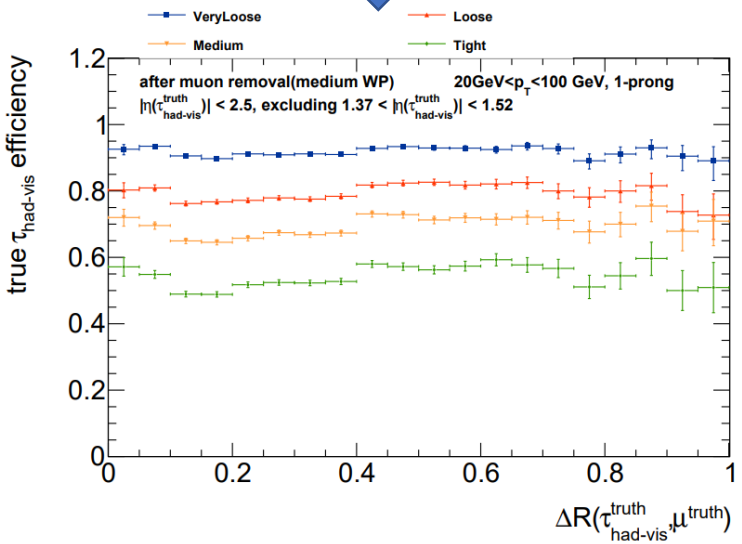
- H→2a→4tau merged analysis:
  - Validation of the new derivation TAUP6
    - The RNN variables and the tau reco and id efficiency of the muon removal algorithm.
    - TAUP6 DAOD checking in SUSYTool
- Qualification task: HGTD module automation assembly
  - Glue study and assembly exercise
  - Assembled several modules
  - Wrote QT note
- CEPC vertex detector simulation
  - Merged the MOST2 vertex code into official CEPCSW github repository

H→2a→4tau merged analysis

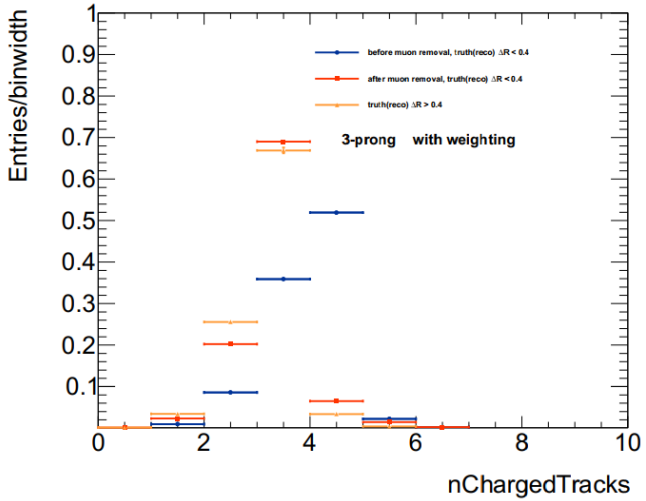
Identification efficiency study

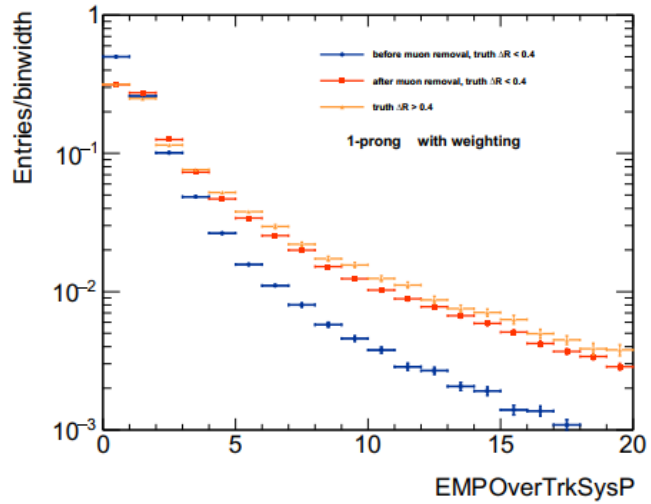


Recovered



Id variables distribution

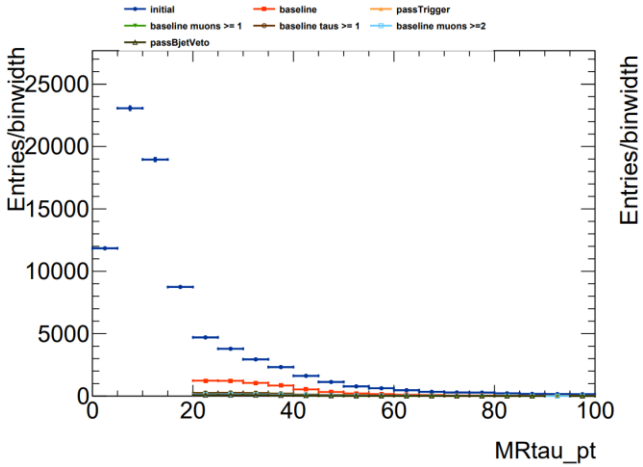


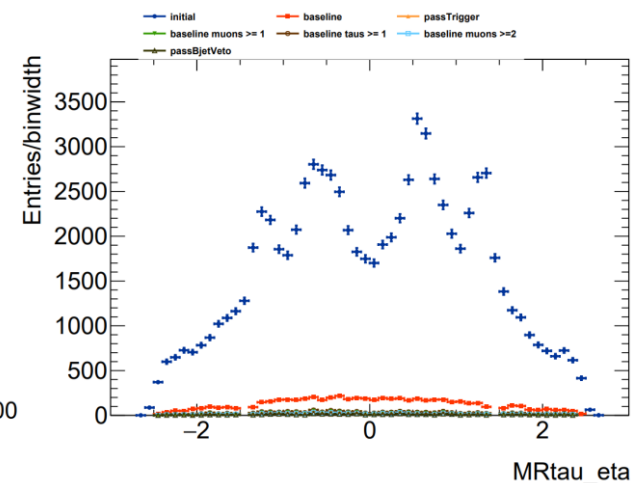


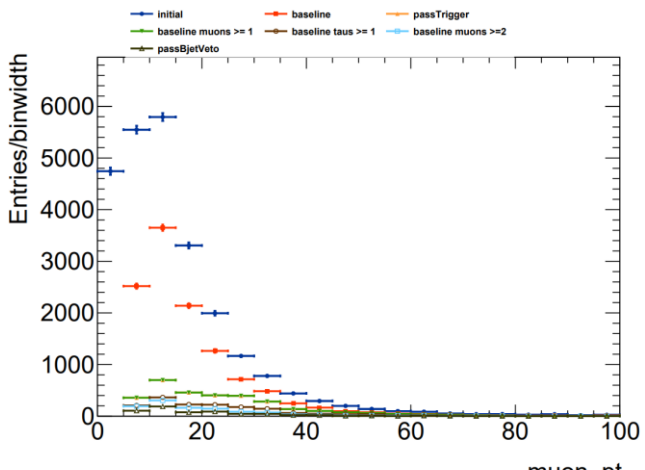
- The identification efficiency is not perfect but it is the best we can do and much better than the standard tau algorithm.
- The id variables were back to the good shape as the un-overlapped tau.

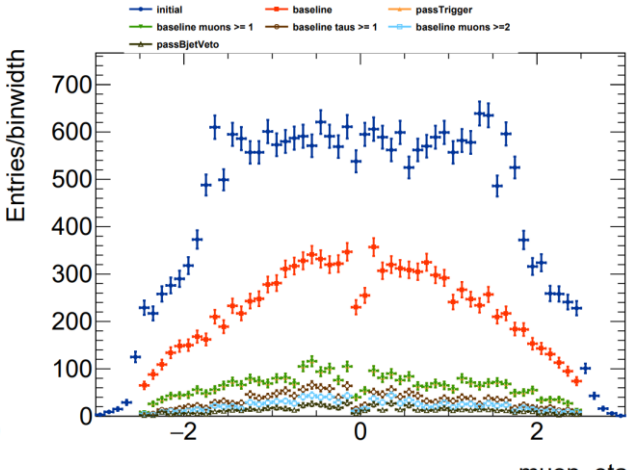
H→2a→4tau merged analysis

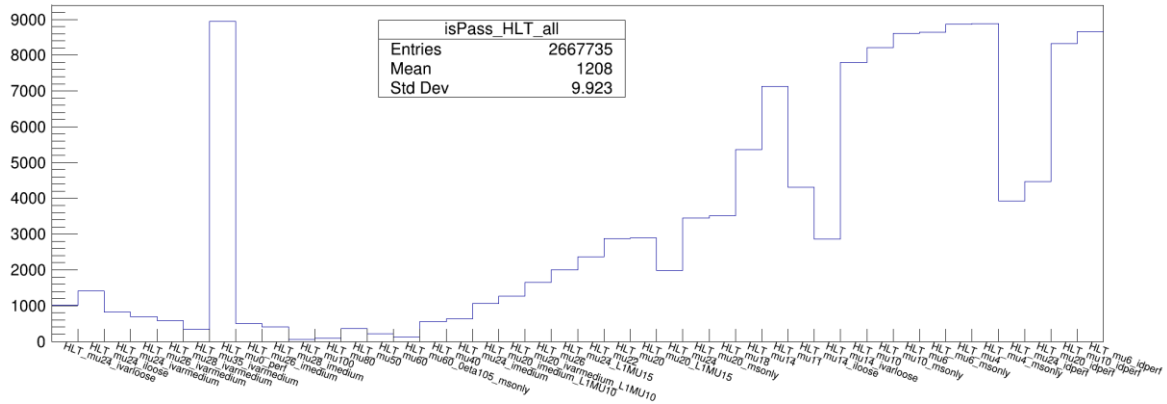
- Baseline Objects checking with SUSYTool











TAUP6 as MuHad tau recon & ID

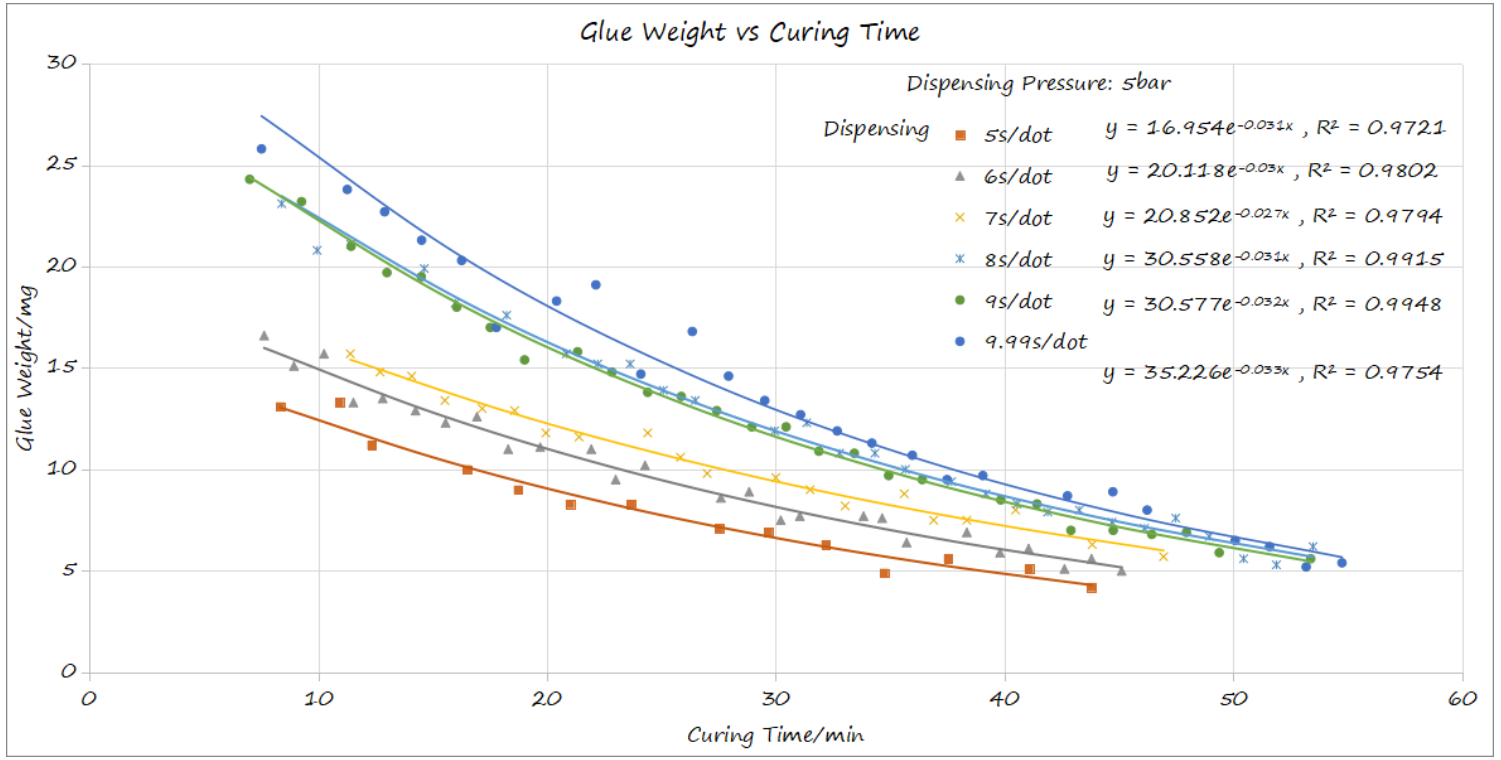
Open · Lianyou Shan requested to merge `lshan/muhadTauDeriv:21.2` into `21.2` 2 weeks ago

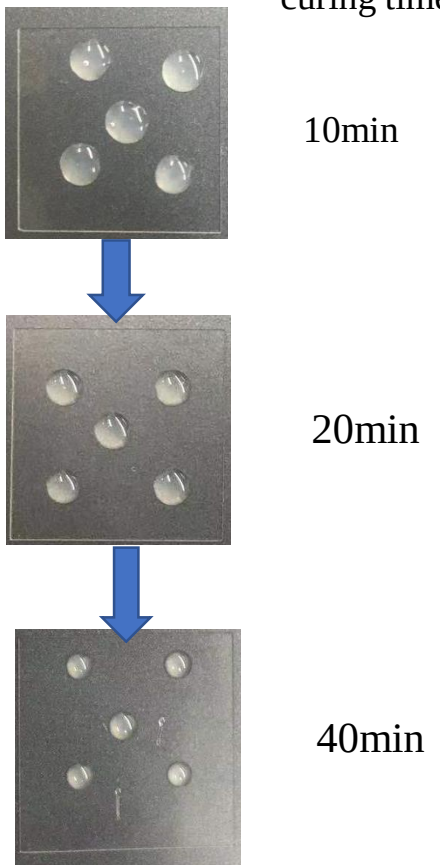
Overview 466 · Commits 15 · Pipelines 21 · Changes 36

- Baseline objects selection and event selection works very well in SUSYTool
- Trigger information was stored in the TAUP6 derivation
- The TAUP6 merging into official repository is on-going by Lianyou.

Qualification task: HGTD module automation assembly

- Glue weight measurement depending on the pressure and curing time has been done using the integration software

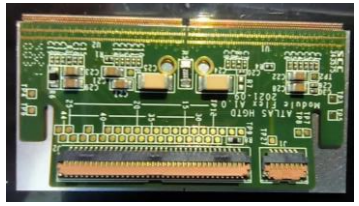


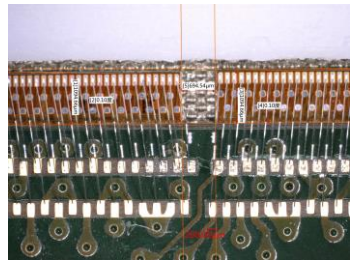


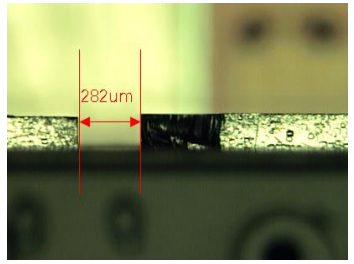
- ✓ The glue weight exponentially decreases.
- ✓ We can get the dispensing time for a given curing time, which can be used for glue weight calibration.

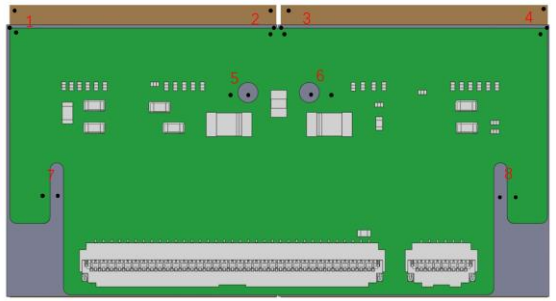
Qualification task: HGTD module automation assembly

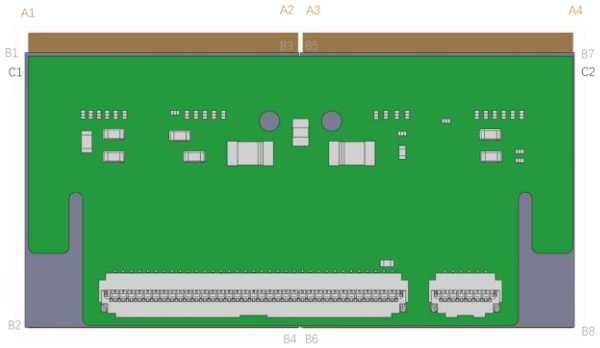
- Several digital module and full module has been assembled using the gantry and custom tooling
  - Wire-bonding was performed successful
  - The metrology results are very close the specifications

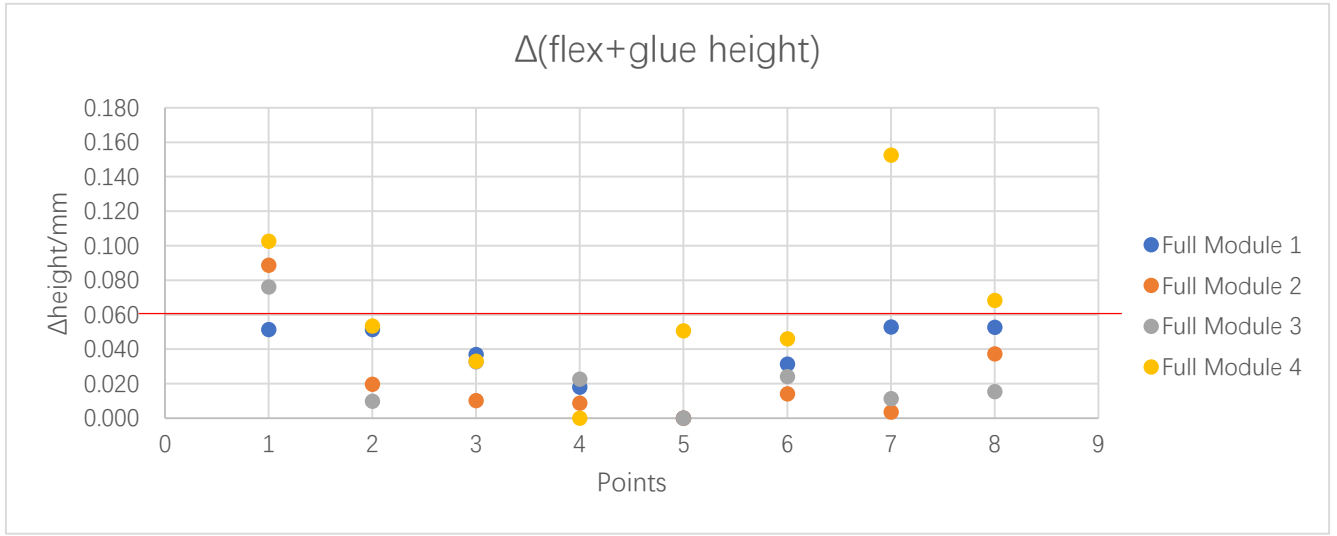












	B3B5(mm)	B4B6(mm)	Nominal gap(um)	Average Δ nominal(um)
Full Module 1	0.215	0.200	280	-72
Full Module 2	0.235	0.311	280	-7
Full Module 3	0.157	0.196	280	-104
Full Module 4	0.282	0.285	280	3

	Full Module 1	Full Module 2	Full Module 3	Full Module 4
Average rotation angle[°]	-0.067	0.128	0.070	-0.182

Qualification task: HGTD module automation assembly

- The qt note draft has been finished
- Summarized almost all HGTD module assembly work at IHEP
  - Hardware and software of the gantry system
  - Module assembly details
  - Preliminary metrology results

Automation Assembly of ATLAS HGTD Modules with Gantry System

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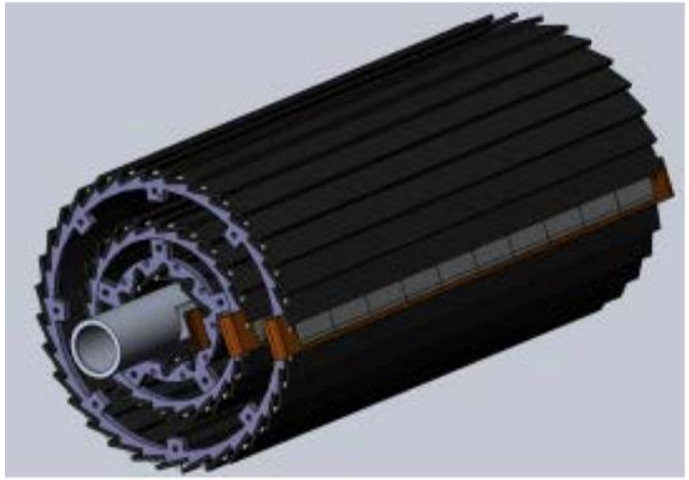
This note is the summary of the QT task developing the procedures of positioning and gluing steps in HGTD module assembly. This note also summaries the hardware and software of the automation HGTD module assembly at IHEP. The gantry system, the custom tools and the C++ Qt program to control the gantry system is introduced in this note. The automation HGTD module assembly procedures and the semi-automated HGTD module assembly trials are presented in this note. Several digital modules and real modules were assembled with this gantry system and those custom tools. The metrology results of those modules is shown in this note.

Contents

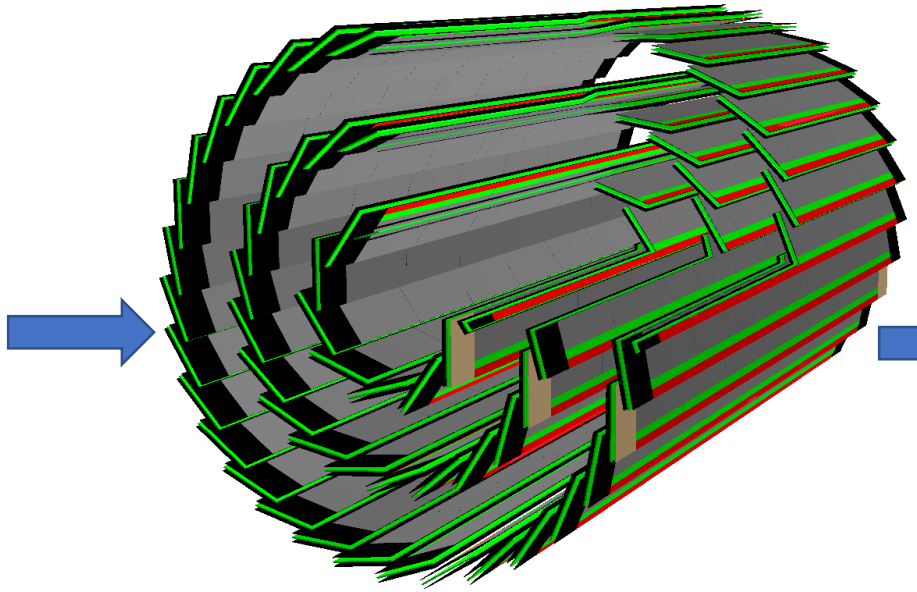
CEPC vertex detector simulation

- The MOST2 vertex geometry and ladder were implemented into the CEPCSW framework.
- Code was reviewed by Chendong and merged into the official CEPCSW github repository.
- The code could be used for MOST2 vertex prototype test beam simulation

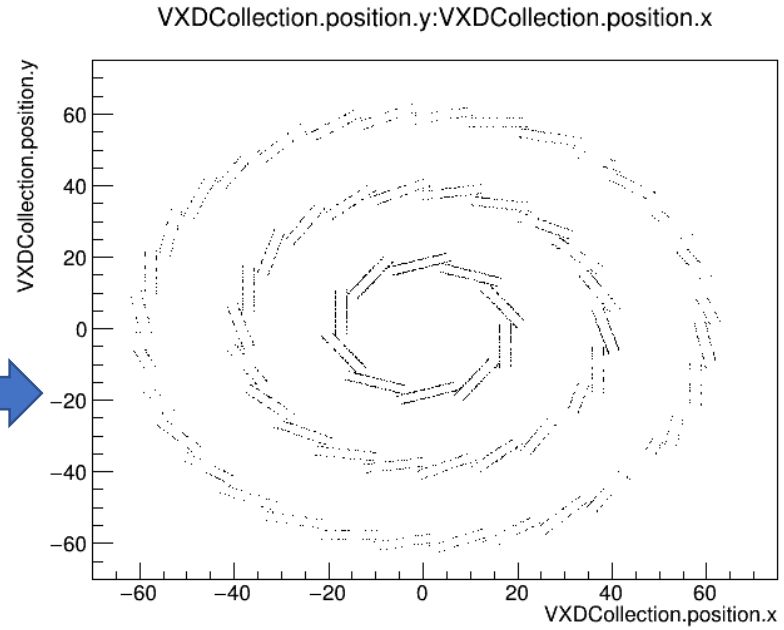
Merged **mirguest** merged 10 commits into `cepc:master` from `zenghaowhu:master`



Mechanical design



Geometry (only barrel)



Simulation hits distribution

Summary

- H→2a→4tau merged analysis:
  - Validation for the new derivation TAUP6 is almost done
    - The RNN variables distribution after muon removal are in very good shape
    - The tau reco and id efficiency was recovered after removing the muon and re-run the standard tau algorithm.
    - TAUP6 is running in the SUSYTool very successful
  - The new derivation was accepted by the tau CP people
    - merging the code into the official repository
- Qualification task: HGTD module automation assembly
  - Several modules have been assembled and tested
  - QT note draft has been written
- CEPC vertex detector simulation
  - The MOST2 vertex geometry and ladder design was merged into CEPCSW github repository

- Next
  - H→2a→4tau merged analysis:
    - Merging the code and official production (Lianyou Shan)
    - Produce DAOD (data, MC)privately
    - Regions, selections study
  - Qualification task: HGTD module automation assembly
    - Final report
    - Technical Supervisor approval
    - Continue part-time work
  - CEPC vertex detector simulation
    - Help with the test beam geometry simulation

$H \to 2a \to 4\tau$ merged analysis

- $H \to 2a \to 4\tau$: a mass range 4~15 GeV
  - Boosted a decays into two merged tau
  - Only consider "had-mu" merged case: $\Delta R(\mu, \tau_{had}) < 0.4$.
- Dedicated had-mu di-tau tagger has been developed
  - Measuring efficiency in data is still difficult (no enough Upsilon)
- Moving to the muon removal method
  - Tracks which satisfy "Medium" muon ID working point were removed from the reconstructed τ_{jet} candidates at the xAOD level (R21).
    - Muon tracks and associated clusters will be removed
  - Relevant tau ID variables were re-calculated after muon removed.
- The muon removal method was implemented in a new derivation TAUP6 for the 4τ merged analysis