

# Silicon Drift Chamber Tracker Status



中国科学院高能物理研究所  
*Institute of High Energy Physics*  
*Chinese Academy of Sciences*

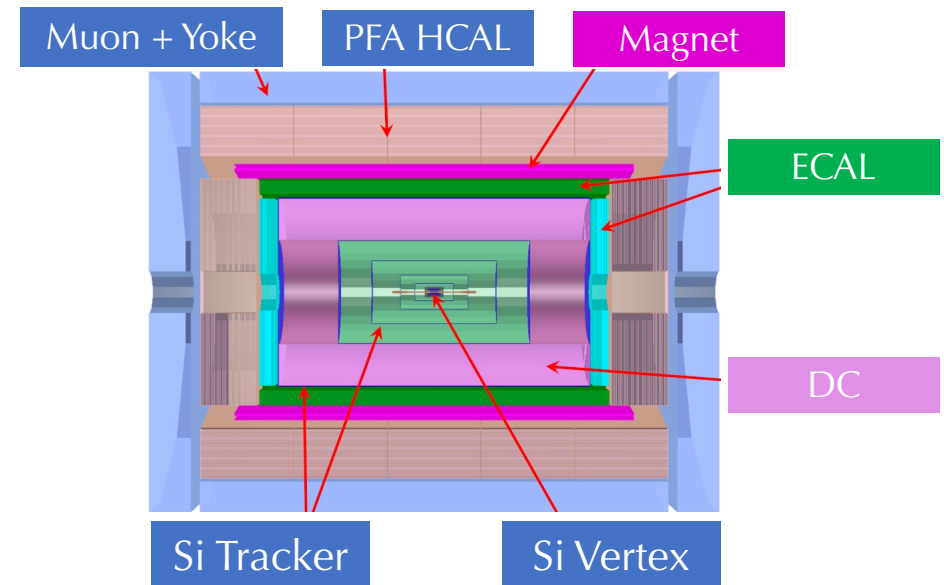
Xin Shi

On behalf of CEPC SDT Team

CEPC Days - 2021.05.21

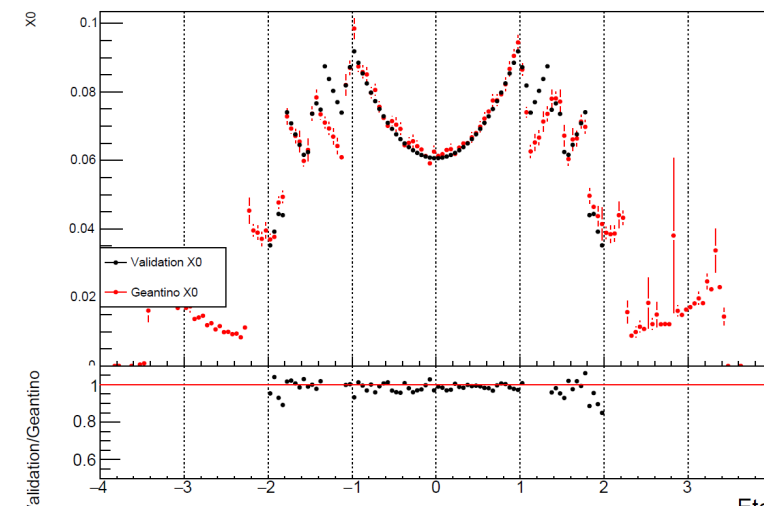
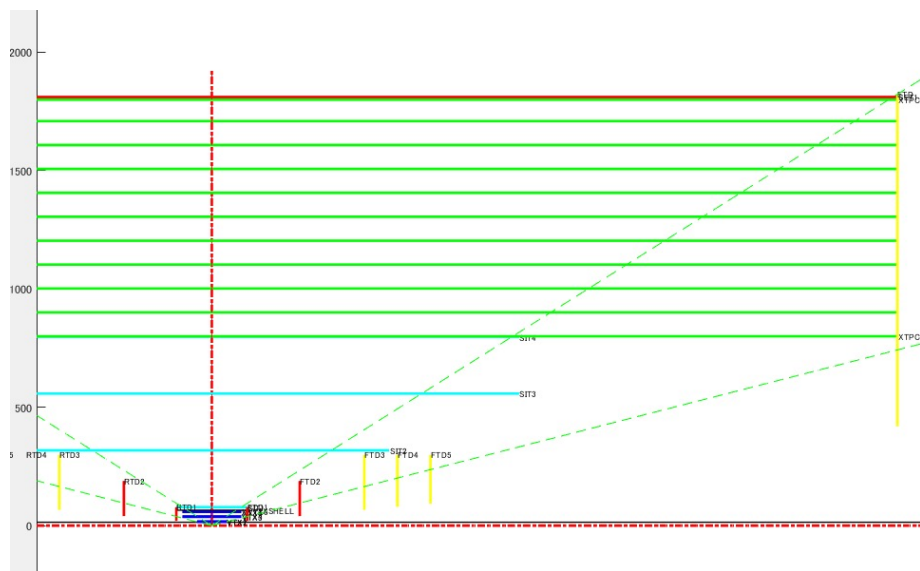
# Outline

- Tracking system optimization with LDT
- Switching to CEPCSW
- Progress of hardware and algorithm for drift chamber



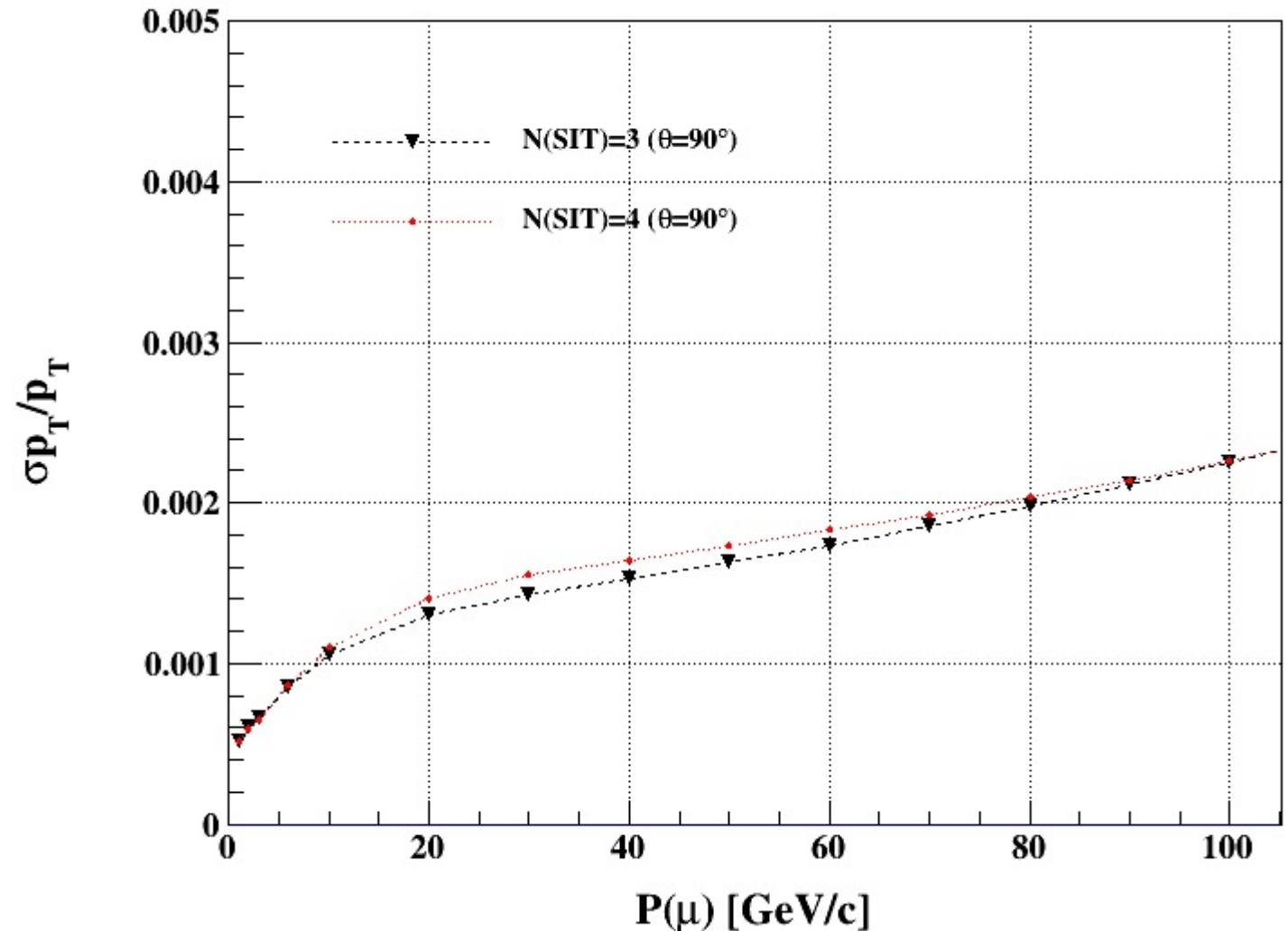
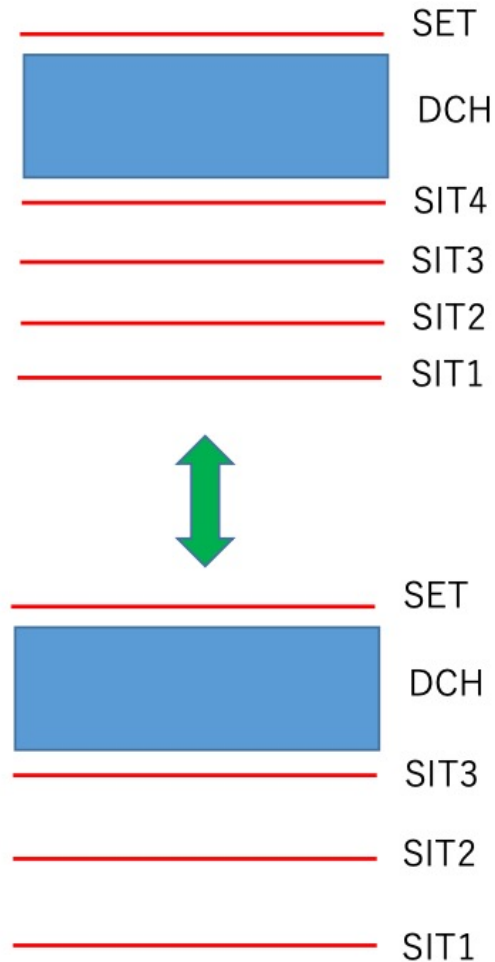
# Tracking system optimization with LDT

# Configuration for simulation study from Yangzhou meeting (v0)



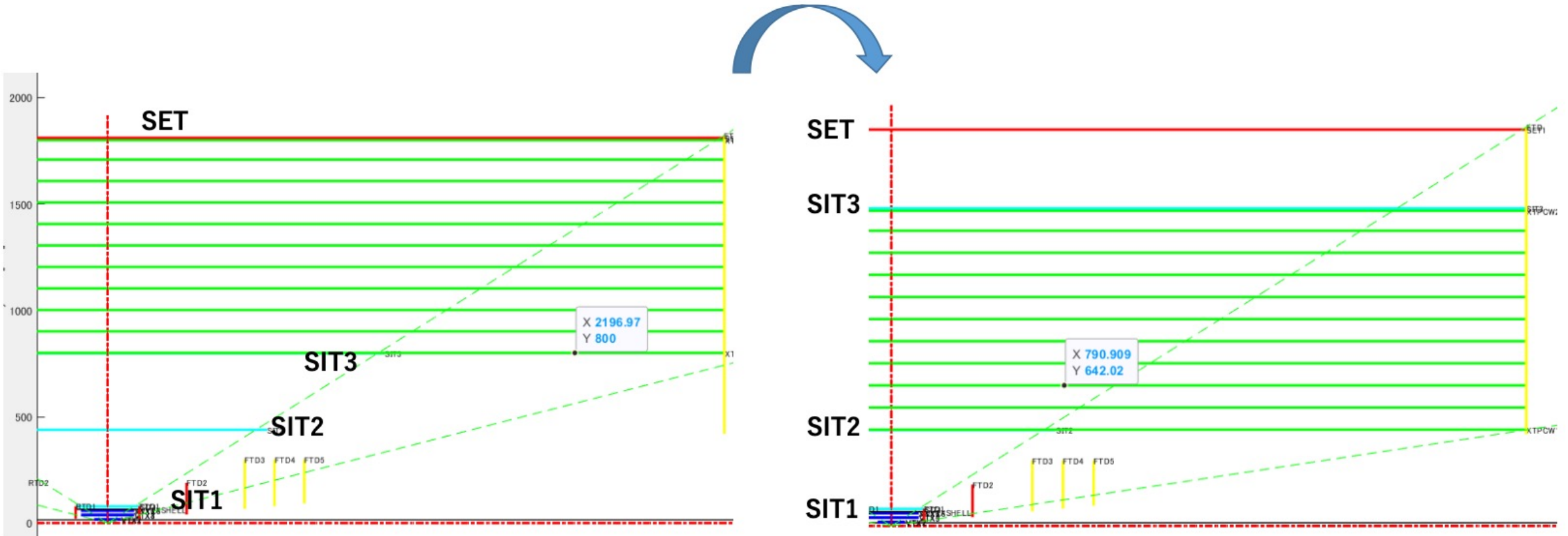
Sub detector	N layers	Resolution (μm)		Material budget (%X <sub>0</sub> )
		r-φ	z	
VXD	6	2.8 / 6 / 4 / 4 / 4 / 4	2.8 / 6 / 4 / 4 / 4 / 4	0.15 per layer
SIT	4	7.2	86.6	0.65 per layer
DC (cell 1x1cm <sup>2</sup> )	100	100	2000	1.2
SET	1	7.2	86.6	0.65
Total	111	--	--	5.35

# Momentum resolution : $N_{\text{Si-layer}} = 5$ vs 4



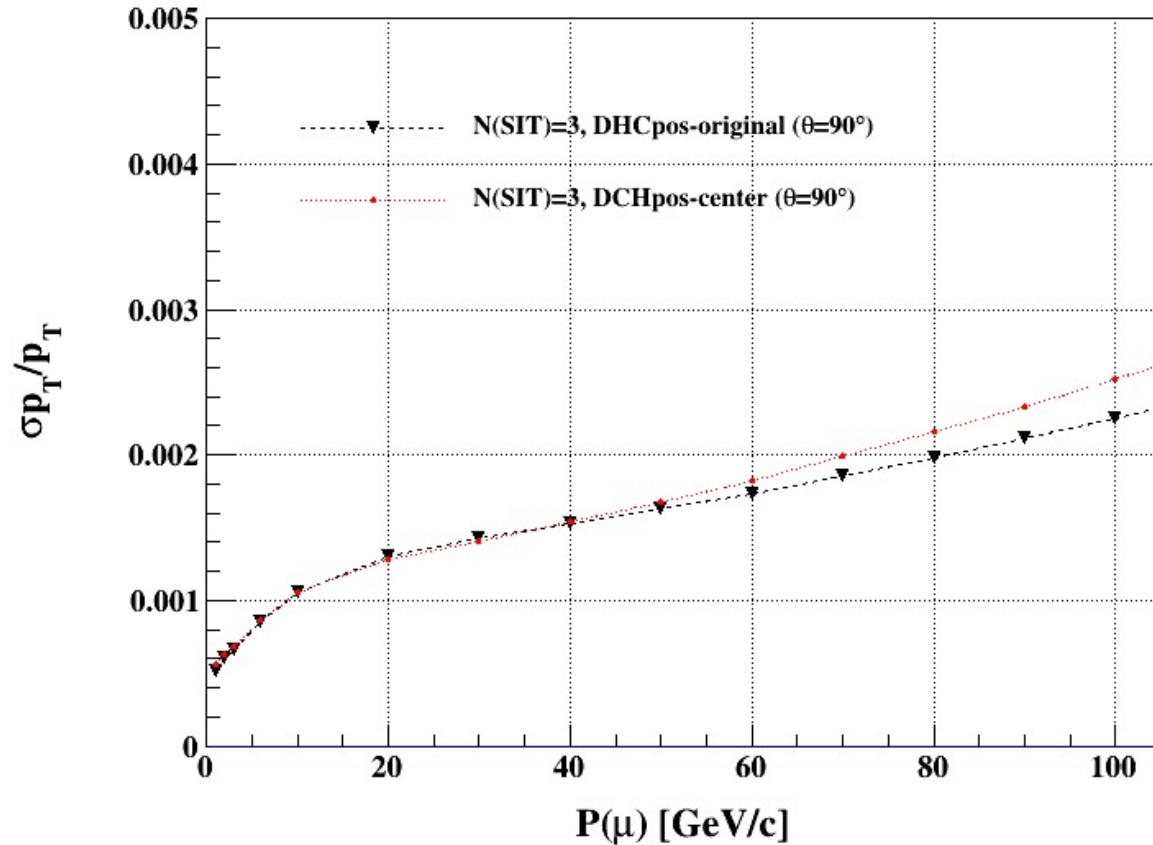
- Better resolution from less material budget

# Change the DCH position



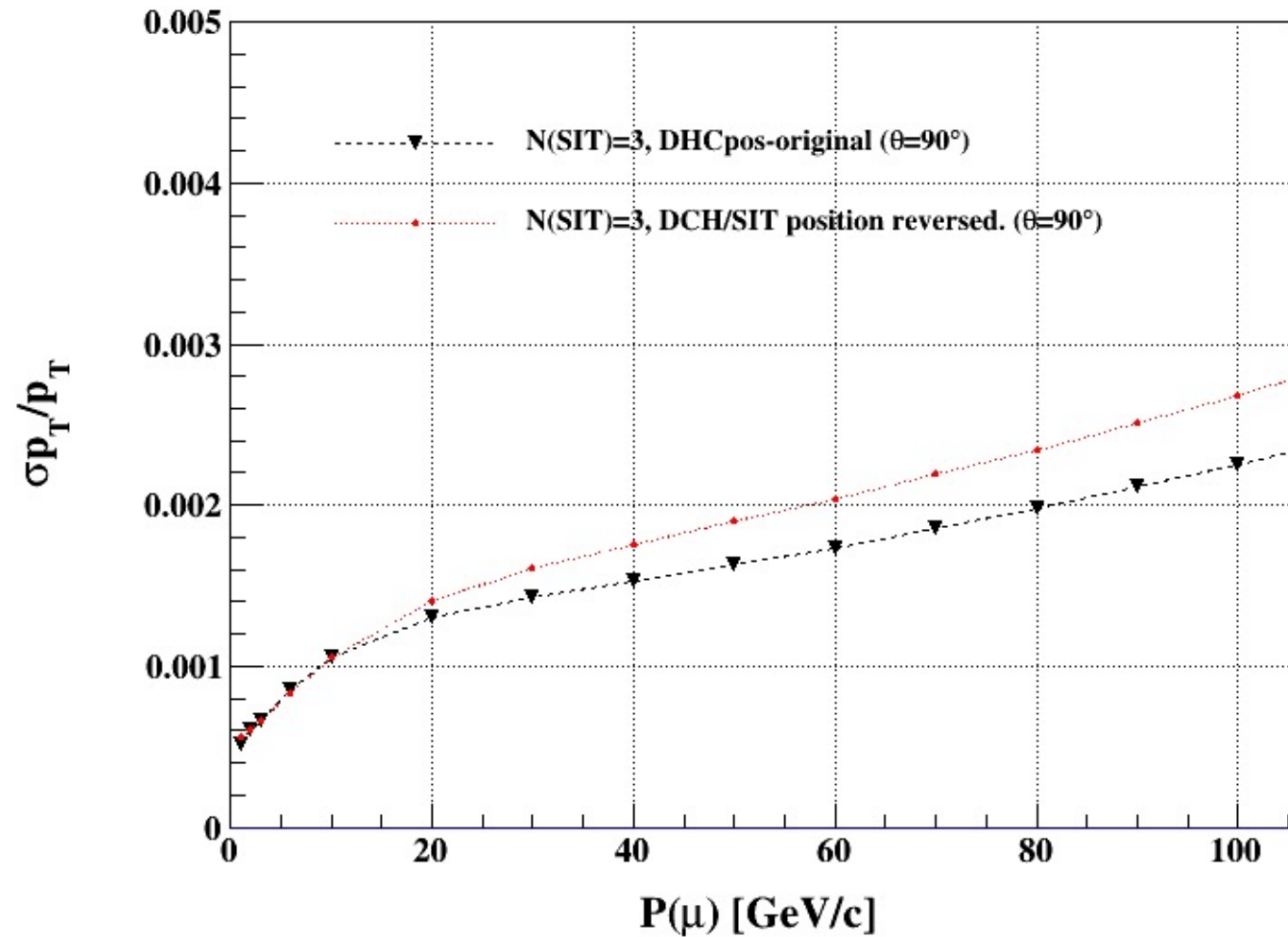
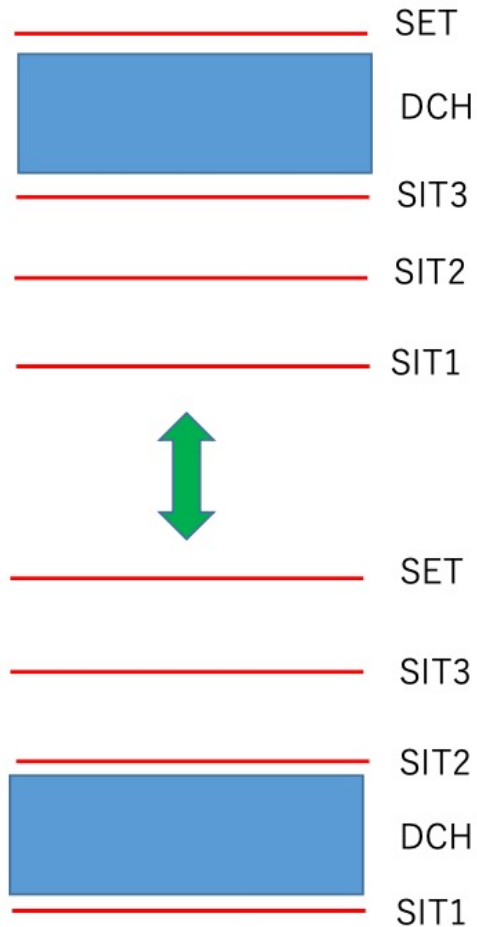
- DCH size = 1000mm,  $N_{\text{layers}}=100$  unchanged
- position of "SIT3" is shifted when the DCH is set at the center

# Momentum resolution : DCH position center



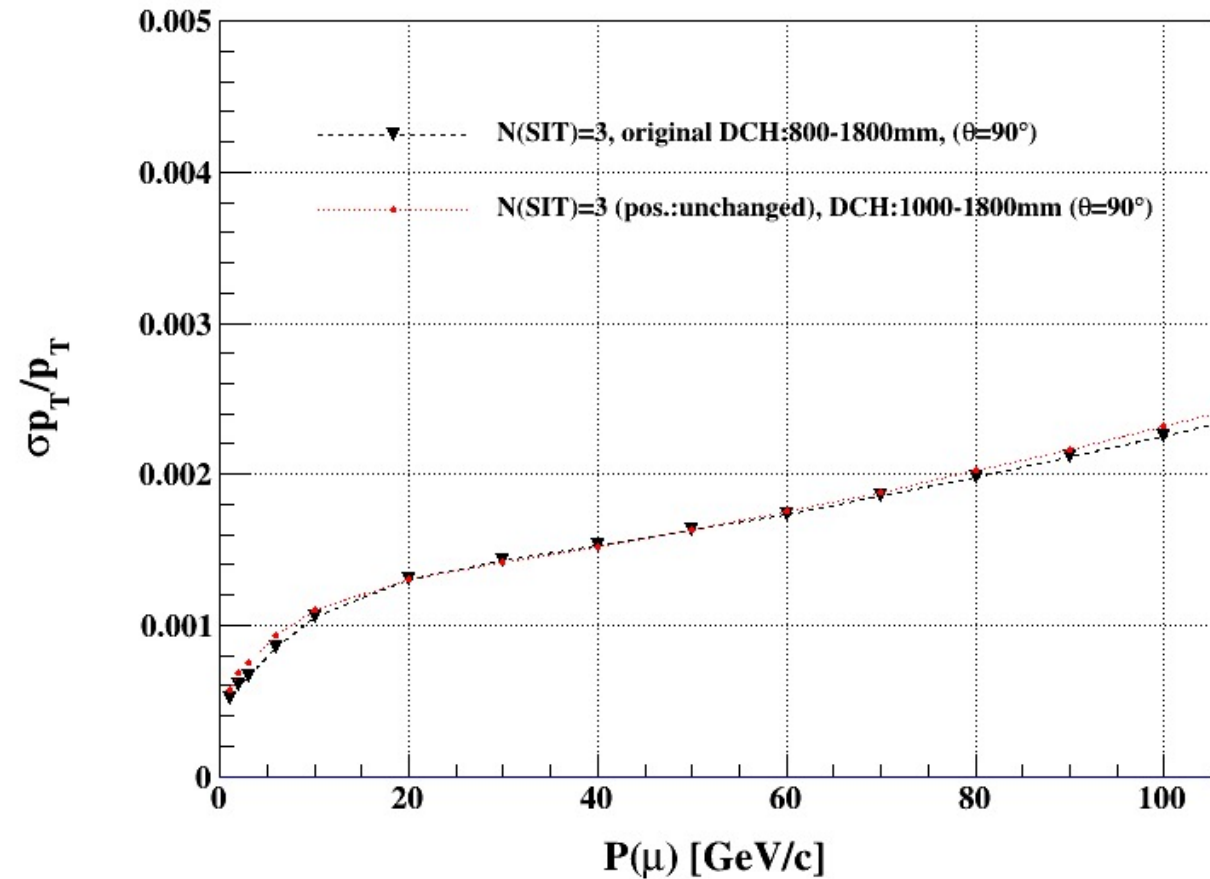
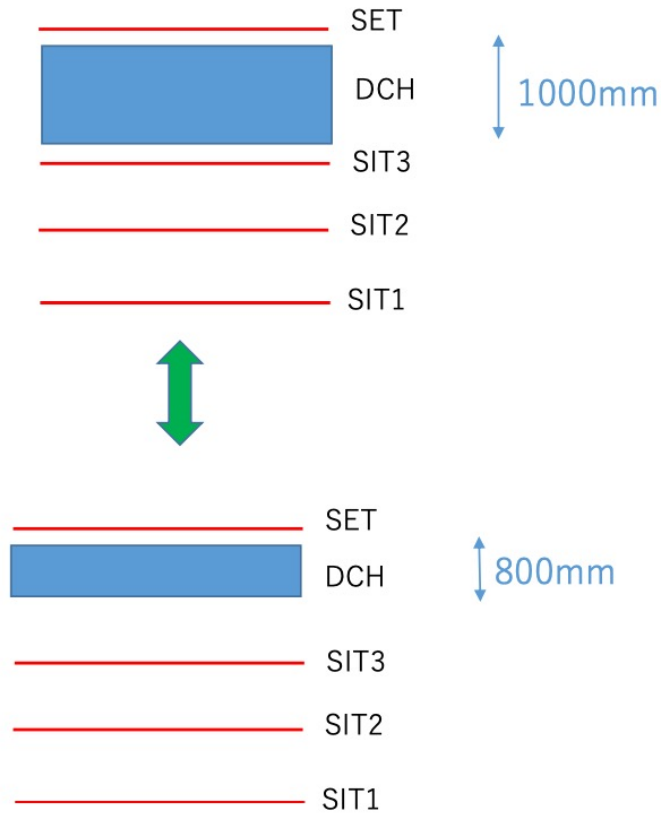
- At higher momentum, resolution for DHC-center became worse

# Momentum resolution : DC closer to beampipe



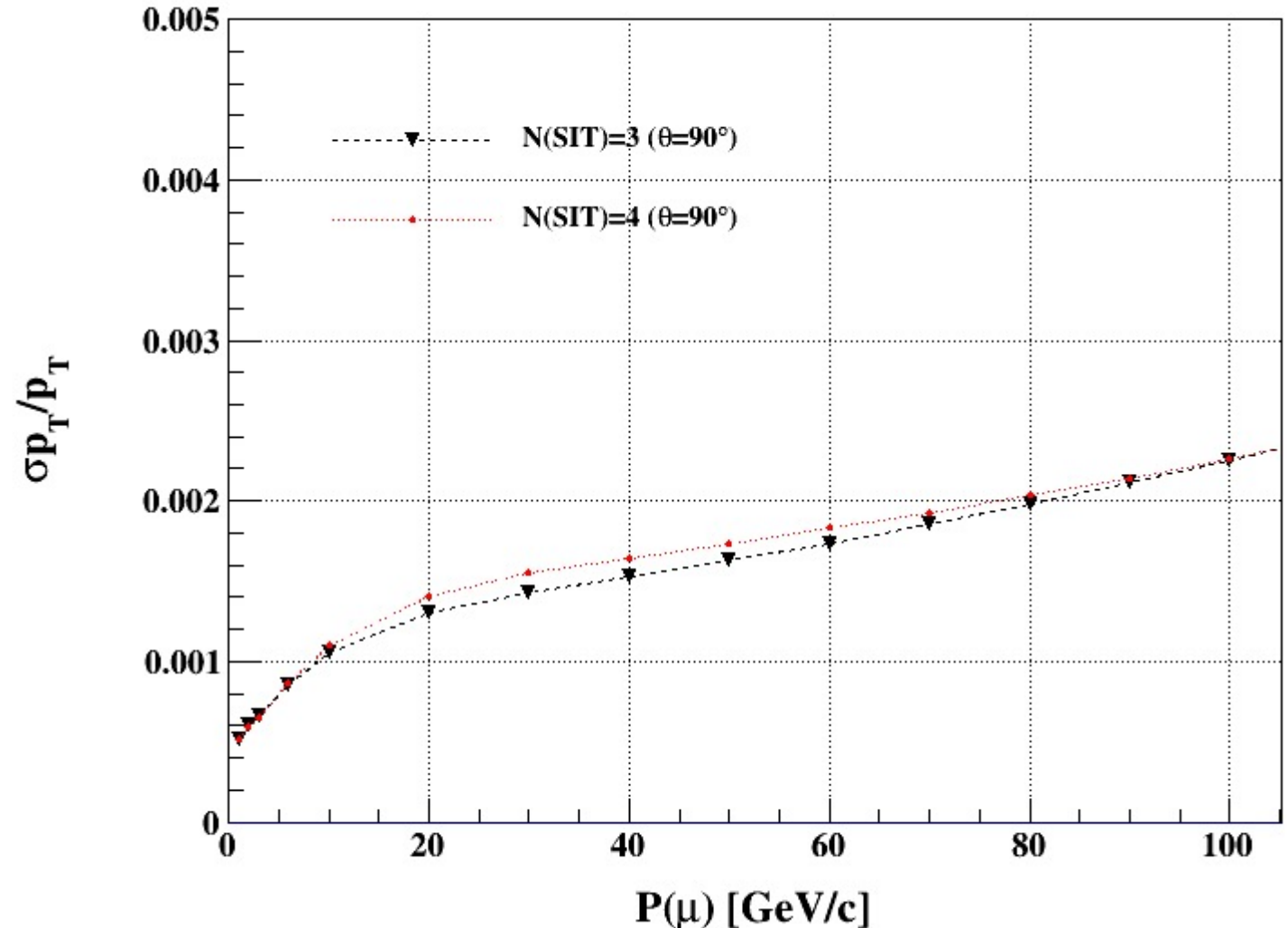
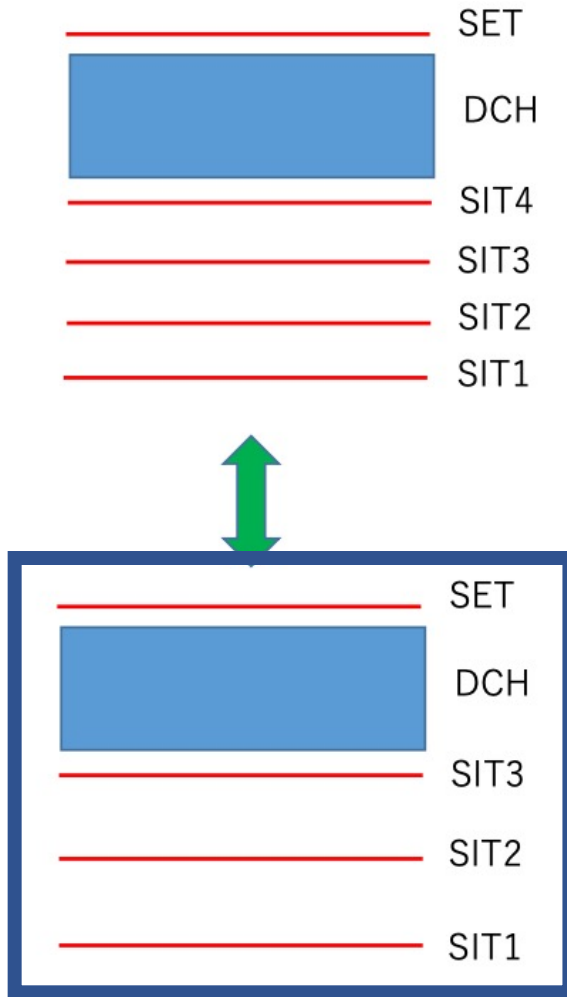
- Moving DCH even closer does not help, need further study

# Comparison by changing DCH size



- These configuration show resolution of very similar level.

# New baseline configuration (v1) : 4 Silicon + 1 Drift chamber

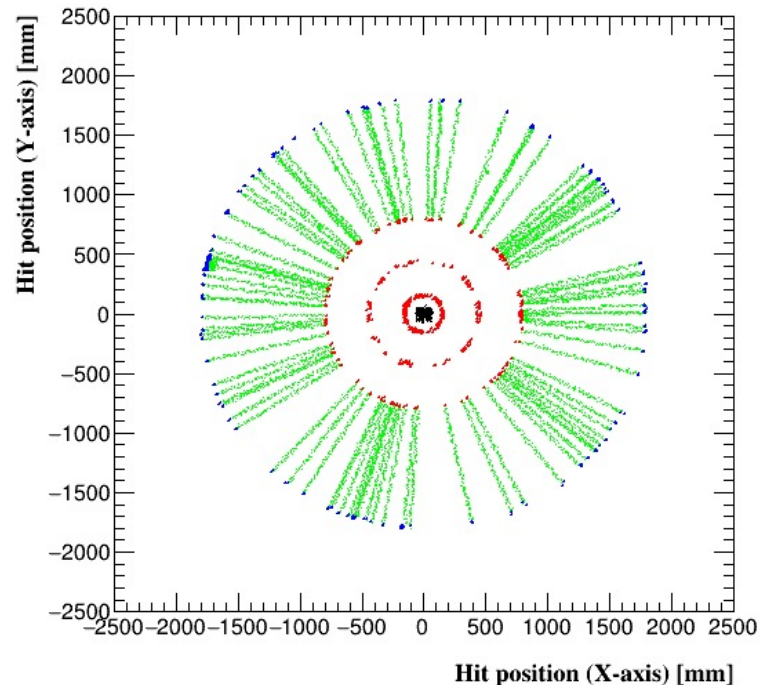
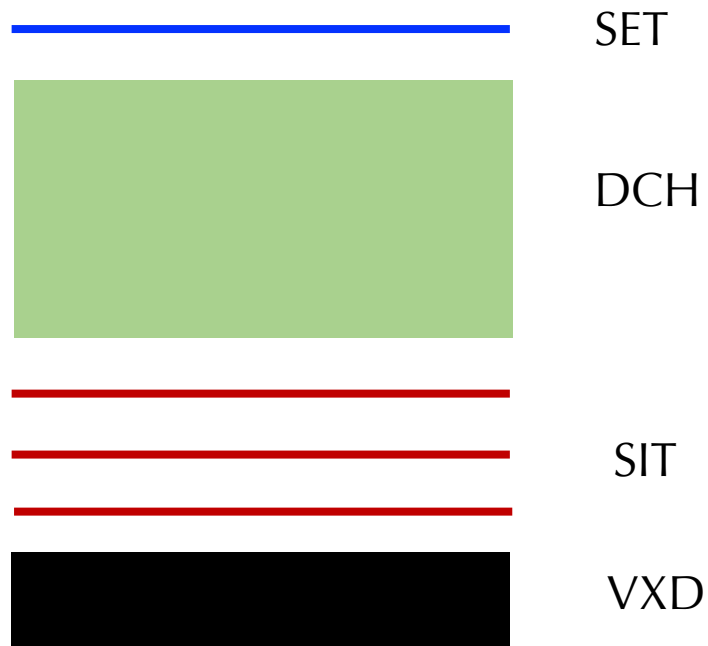


- Will focus on this baseline for further studies

Switching to CEPCSW

# First trial with the developing CEPCSW

- Fitting programme (Genfit2) with drift chamber + silicon detectors
- Basic workflow to produce the momentum resolution is complete
- Further investigation is on-going to understand the algorithm



Thanks a lot from software team !

# DC Hardware and Algorithm Progress

- Data and waveforms are obtained with the prototype test system
  - To estimate the noise level in simulation
  - To optimize the cluster counting algorithm
- Design and development of preamplifier with fast rise time and high bandwidth are in discussion
- Fast simulation algorithm of the cluster counting method is being developed in CEPCSW
- Study on the limitation of wire length is ongoing

# Summary and Plan

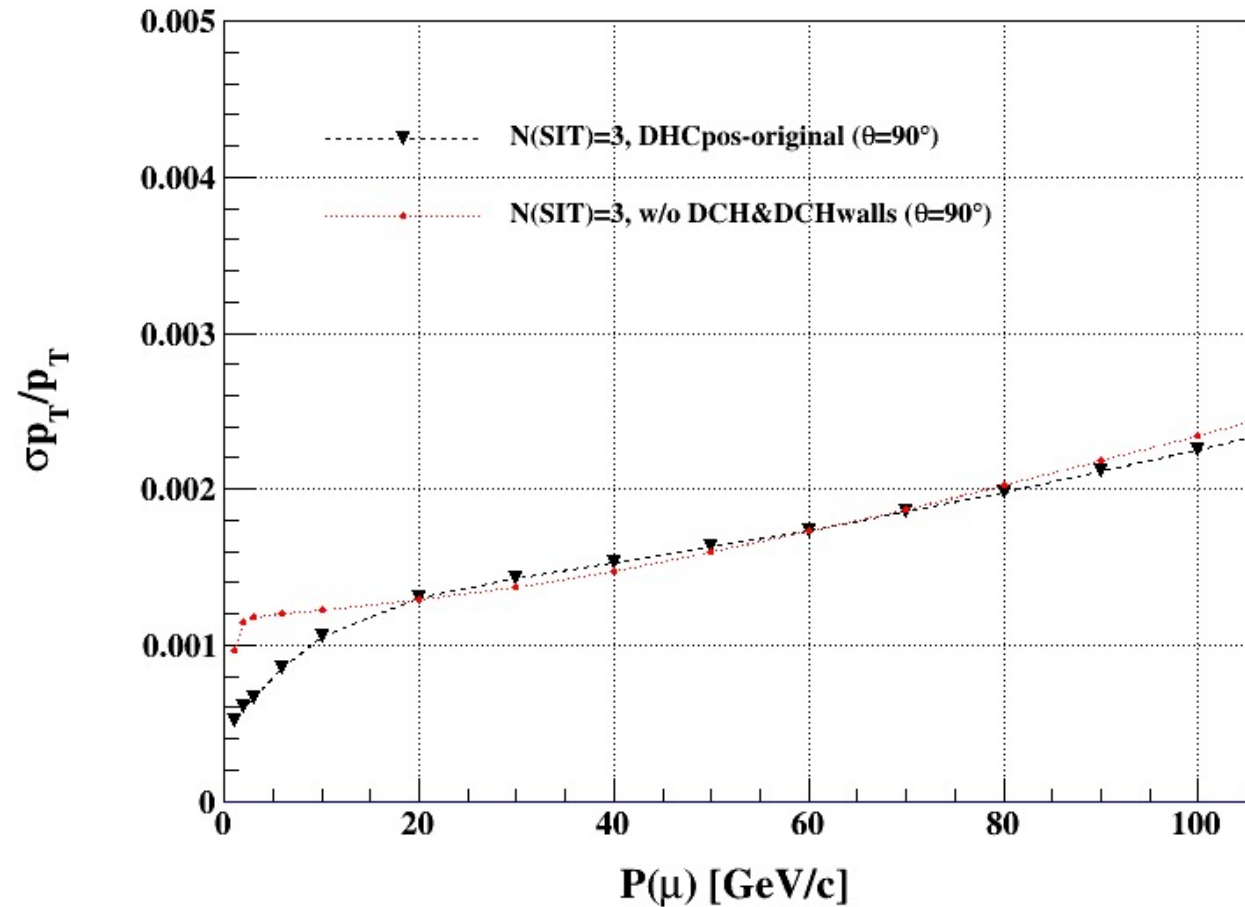
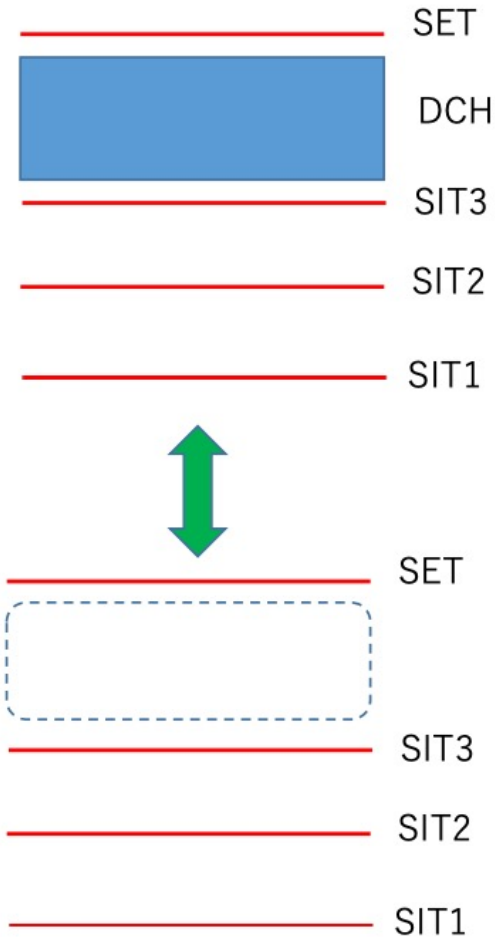
- Studies with LDT indicate the new baseline configuration (v1):
  - 4 layers of silicon + 1 drift chamber on the top position
- First trial with CEPCSW with rather complete workflow
- Steady progress on DC prototype and cluster counting algo development

## Plan

- Fully investigate the new baseline in CEPCSW framework
- Carry on the detector optimization focusing on barrel region
  - Material budget, Drift chamber thickness, cell size, PID performance
- Setup the DC prototype to study noise level and cluster counting algo.

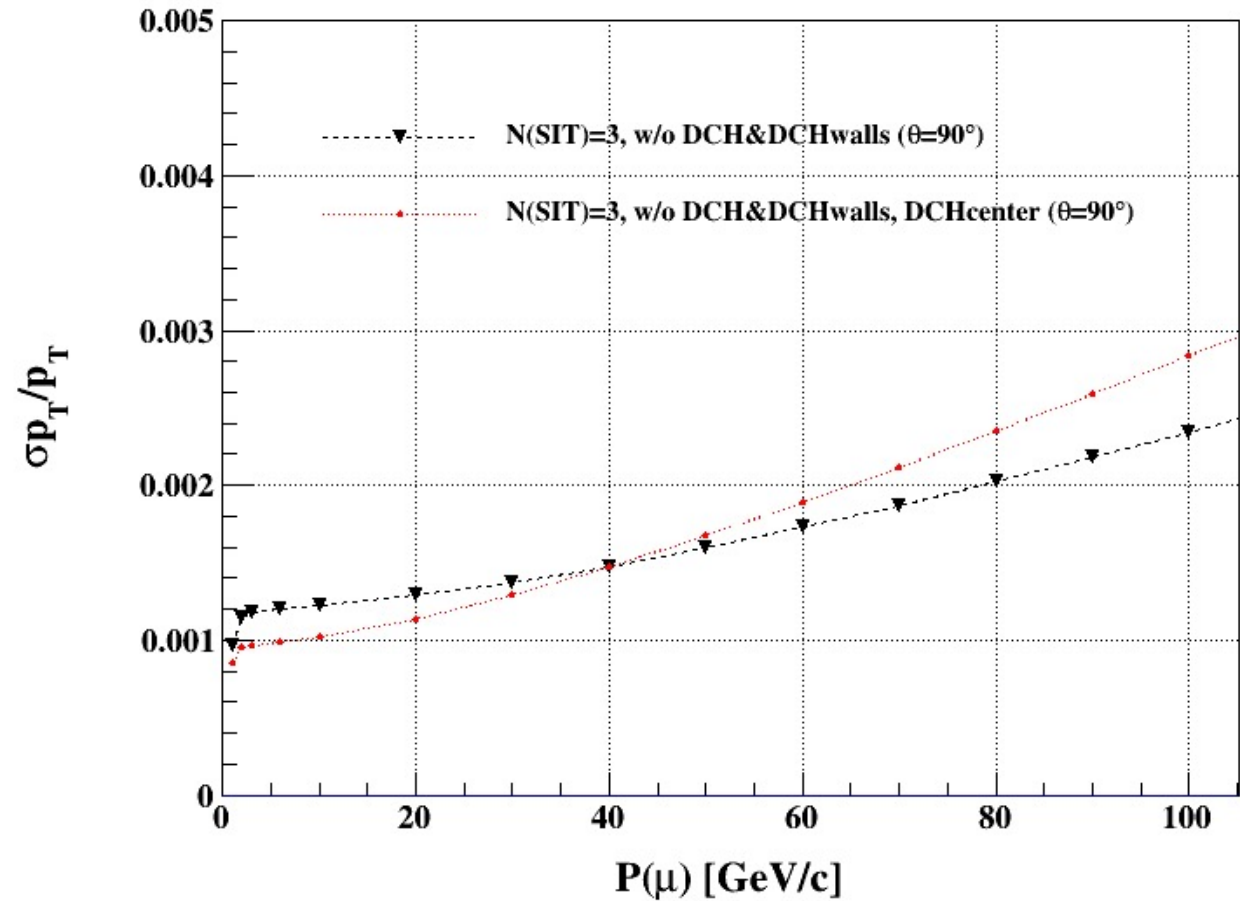
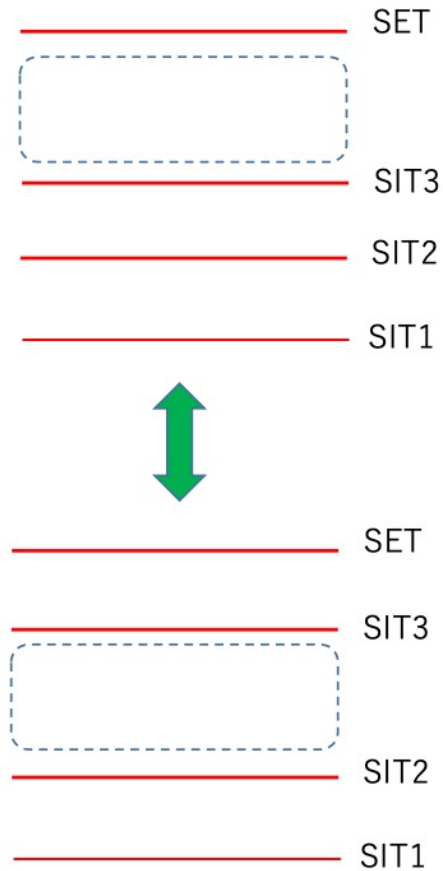
# Backup

# Momentum resolution : with/without DCH



- SITs are the original position.  $dp_t/p_t$  became worse at low momentum

# Momentum resolution : comparison configs w/o DCH

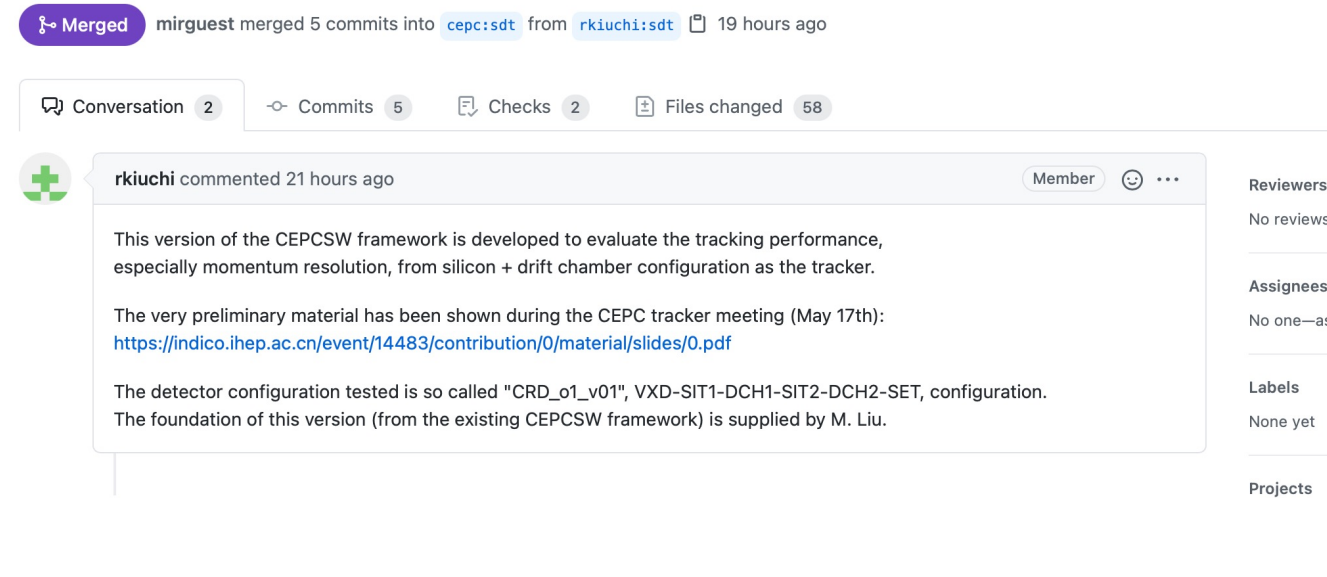


- SITs position affect the momentum resolution (higher momentum side is mainly decided by this)

# Tracking development on github.com

- <https://github.com/cepc/CEPCSW/pull/170>

A version for evaluation of tracking performance of Silicon+Drift chamber tracker #170



Merged mirgquest merged 5 commits into `cepc:sdt` from `rkiuchi:sdt` 19 hours ago

Conversation 2 Commits 5 Checks 2 Files changed 58

**rkiuchi** commented 21 hours ago

This version of the CEPCSW framework is developed to evaluate the tracking performance, especially momentum resolution, from silicon + drift chamber configuration as the tracker.

The very preliminary material has been shown during the CEPC tracker meeting (May 17th): <https://indico.ihep.ac.cn/event/14483/contribution/0/material/slides/0.pdf>

The detector configuration tested is so called "CRD\_o1\_v01", VXD-SIT1-DCH1-SIT2-DCH2-SET, configuration. The foundation of this version (from the existing CEPCSW framework) is supplied by M. Liu.

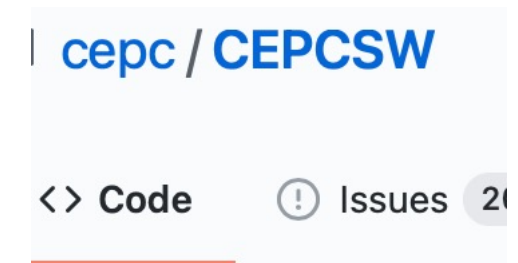
Reviewers: No reviews

Assignees: No one—ass

Labels: None yet

Projects

- SDT team will maintain this branch “sdt”
  - Keep the dialog between the detector and software team



cepec / CEPCSW

<> Code ! Issues 20



sdt