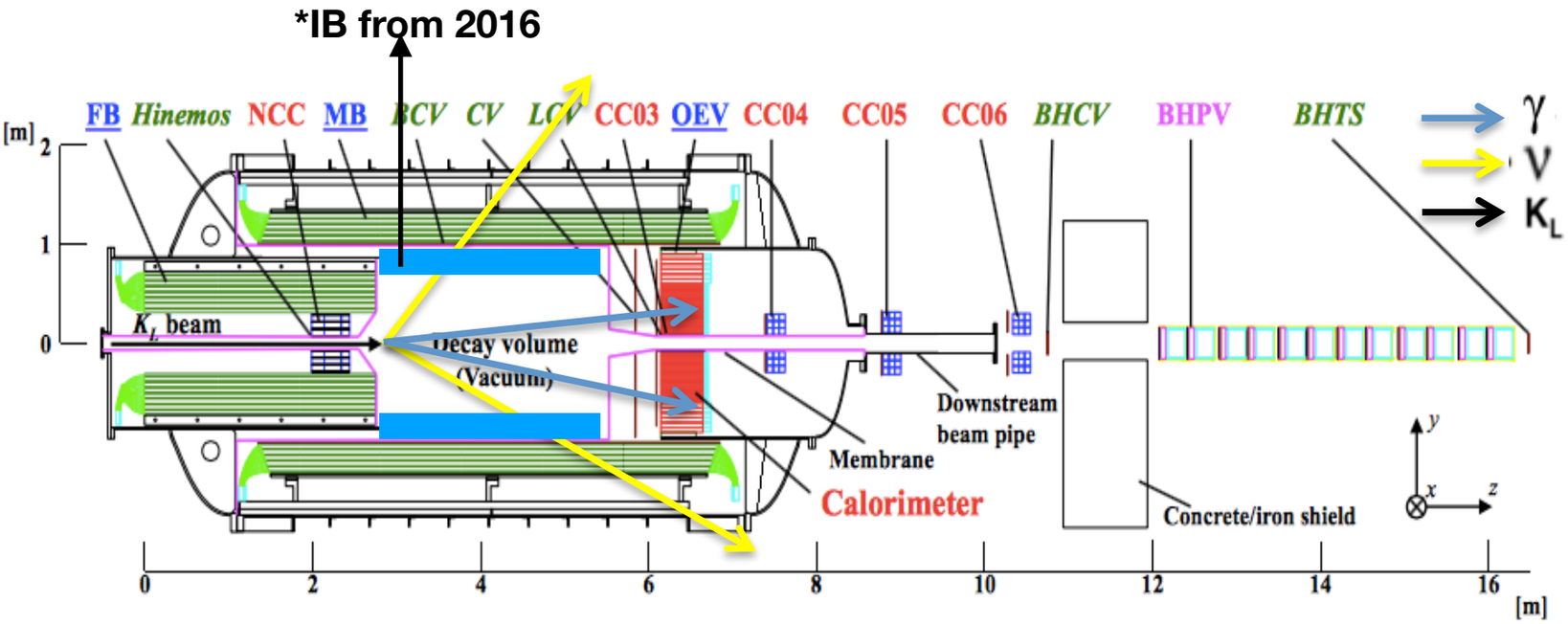
Present Status of KOTO

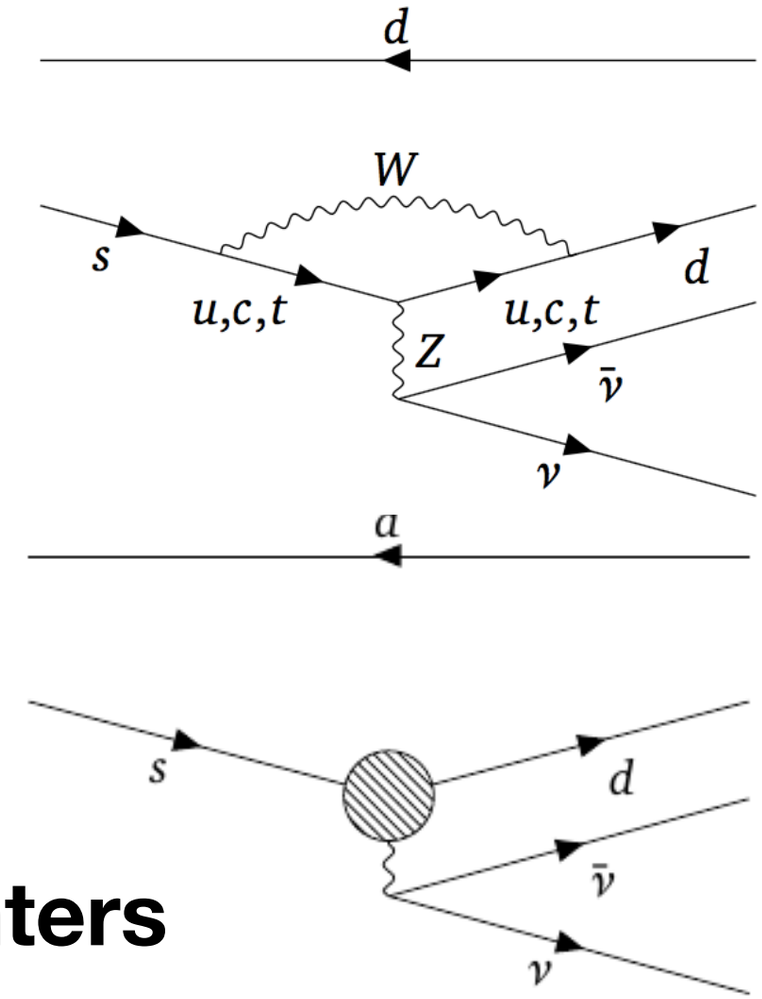
for the KOTO Collaboration
2018 KPS Spring Meeting

J-PARC KOTO Experiment

$Br(K_L \to \pi^0 \nu\bar{\nu}) = (3.0 \pm 0.3) \times 10^{-11}$ **predicted by S.M.**

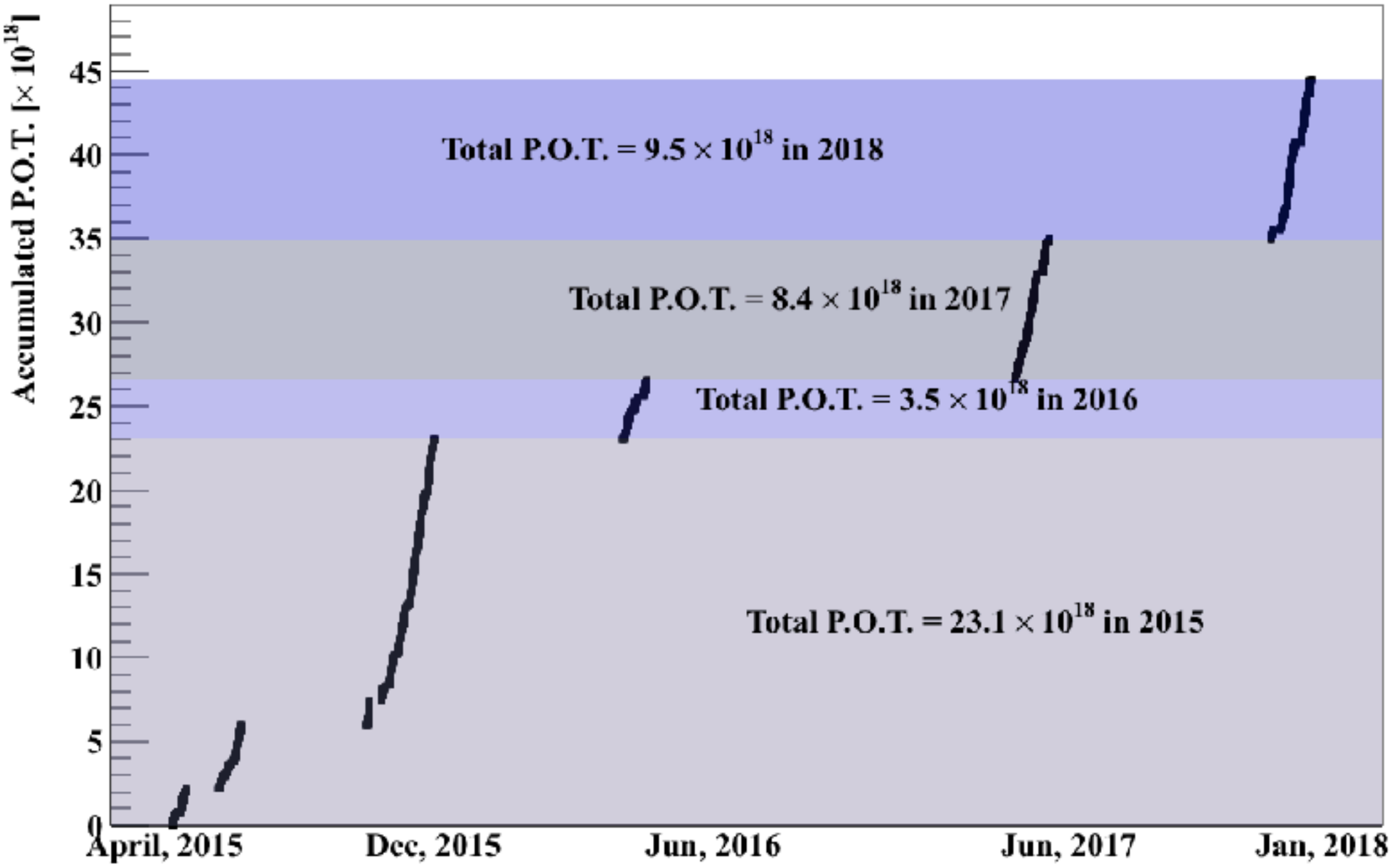
Clean mode to explore the New Physics





CsI Calorimeter and Hermetic Veto Counters

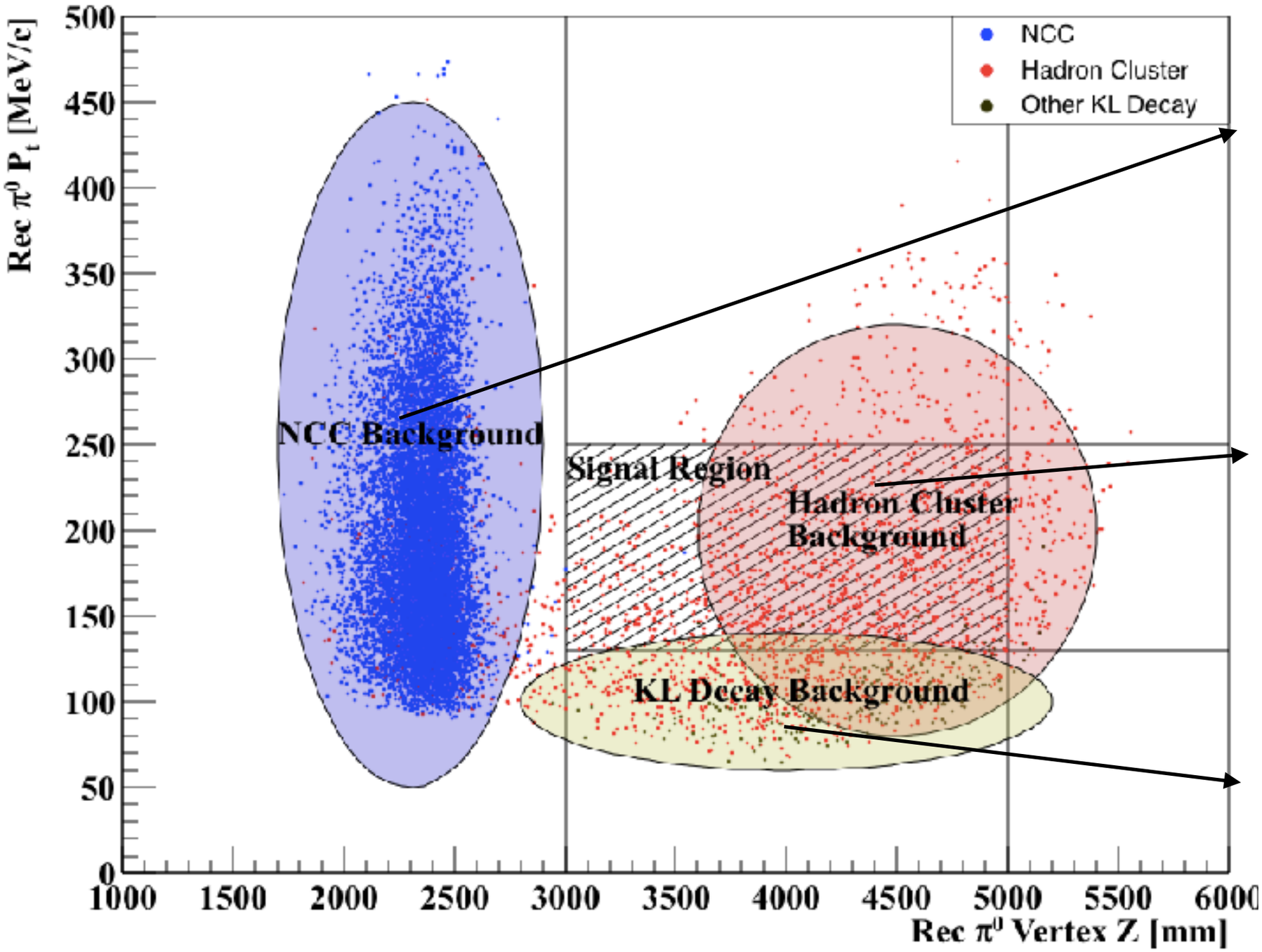
Accumulated Data

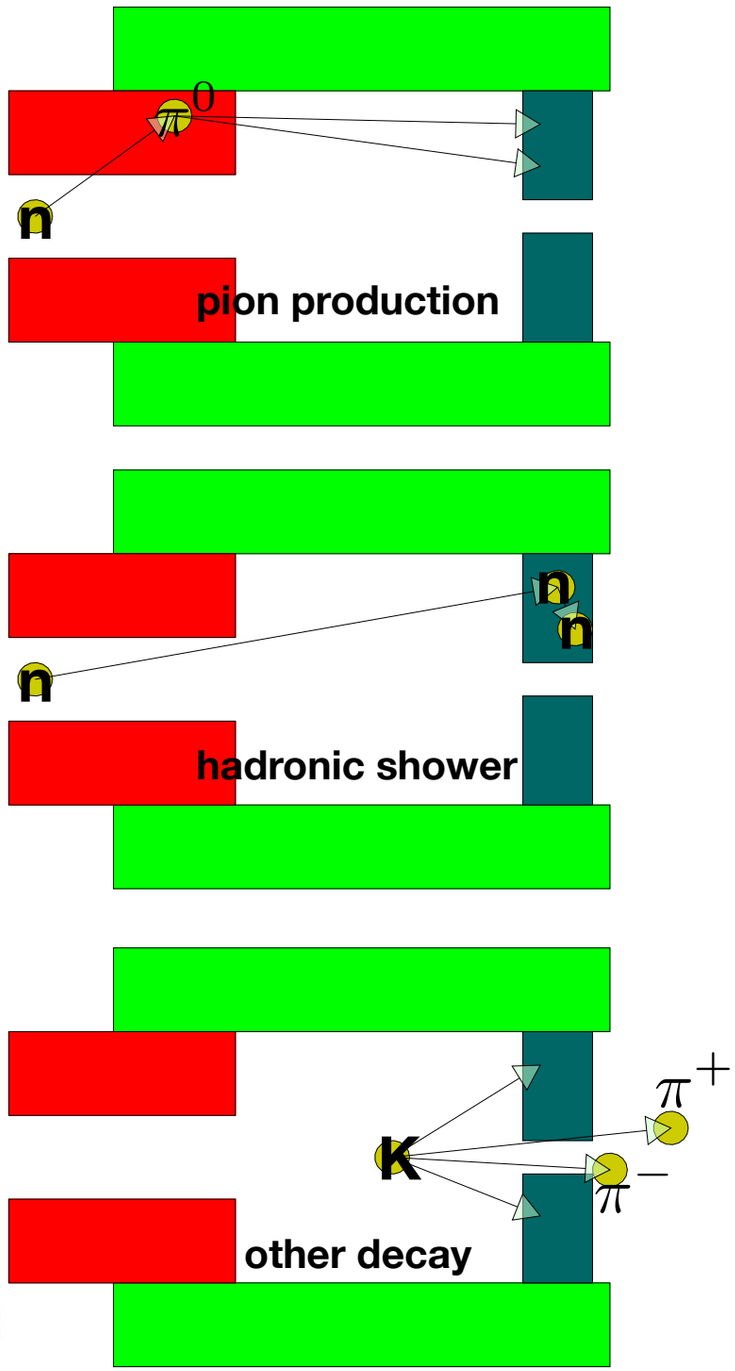


- P.O.T.(Proton On Target) $\propto$ number of incident kaons
- Total statistics will allow us to break Grossman-Nir bound

2015 Data Analysis

- Background estimation for understanding remaining event around signal box.



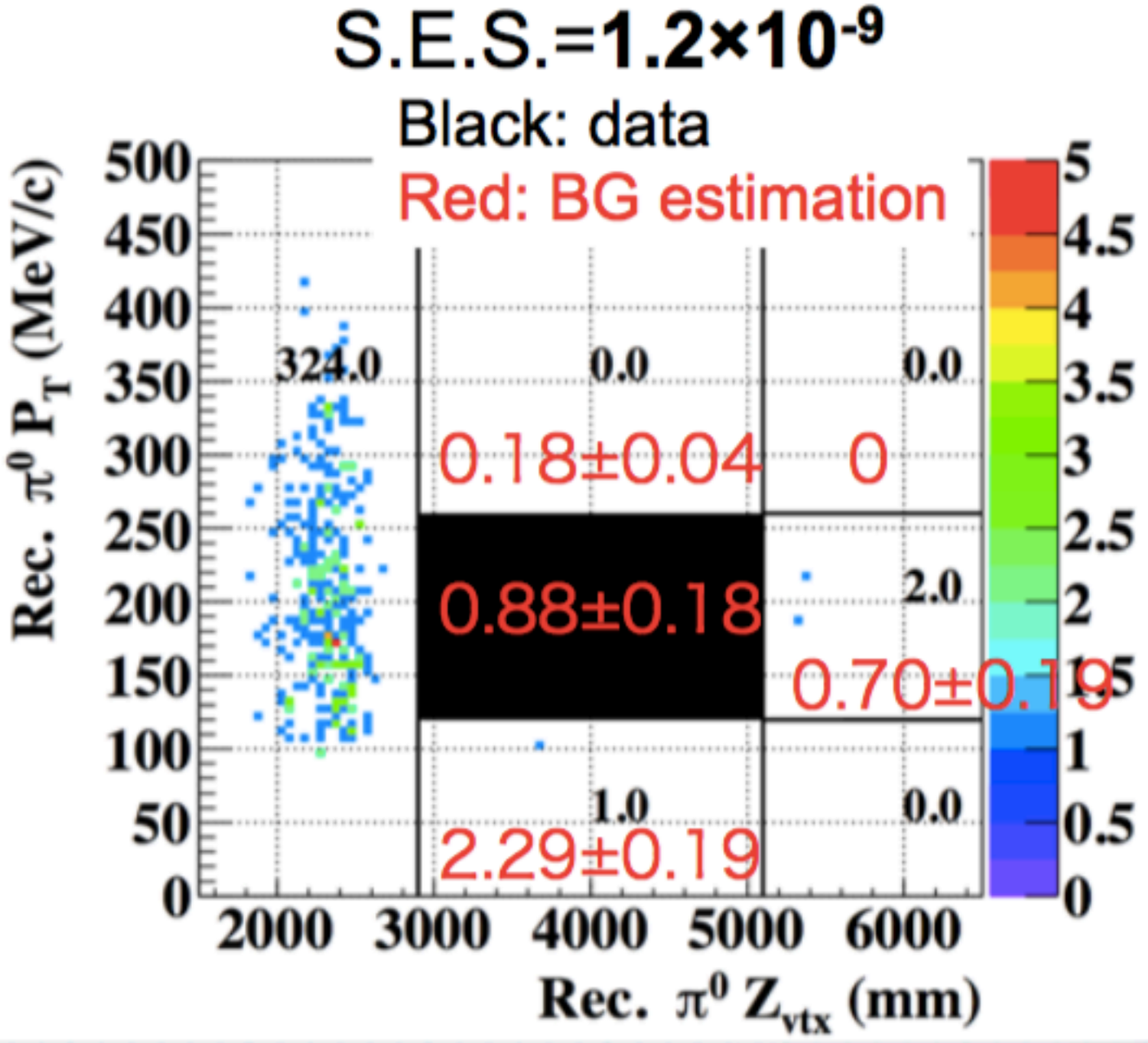


Background Estimation of 2015 Data

2018 PAC

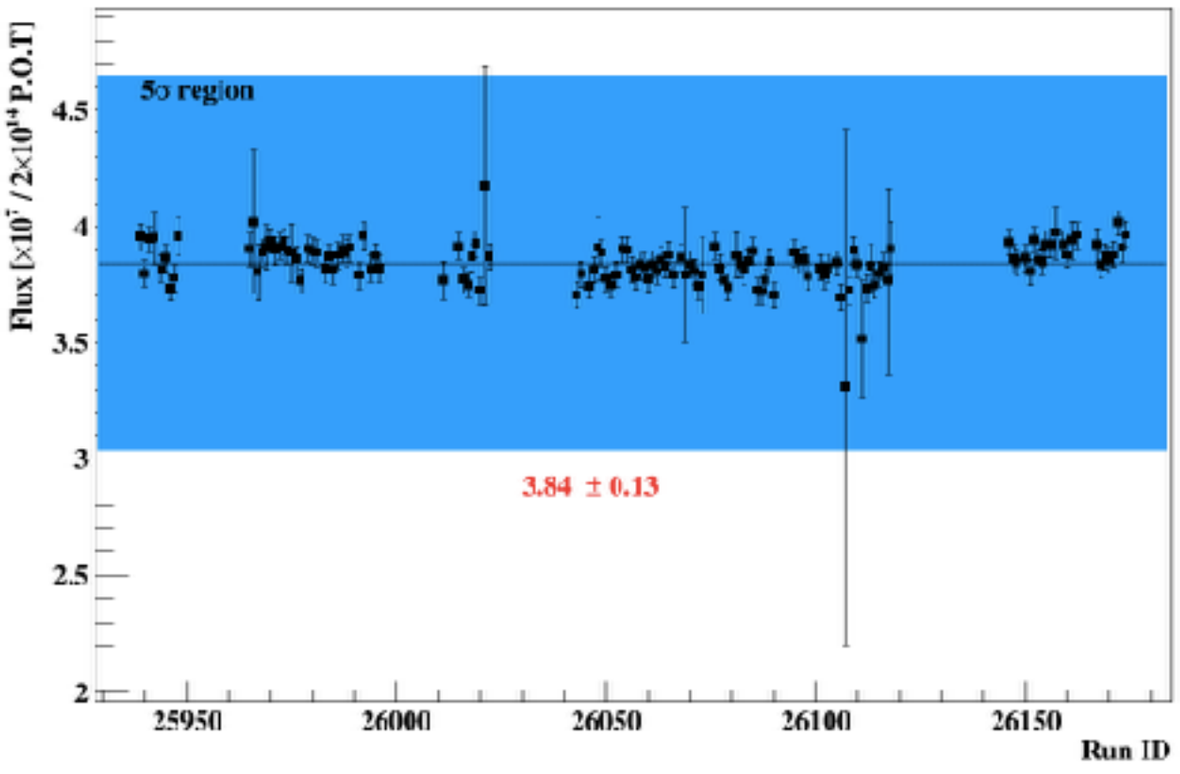
	New
KL->2pi0	0.07±0.07
KL->pi+pi-pi0	0.18±0.05
NCC	0.13±0.07
Hadron cluster	0.26±0.08
CV-pi0	<0.14
CV-eta	0.05
KL->2gamma	0.02±0.02
KL->3pi0 fast	<0.01
Masking Ke3	<0.094
Masking K3pi0	0.17±0.12
Sum	0.88±0.18

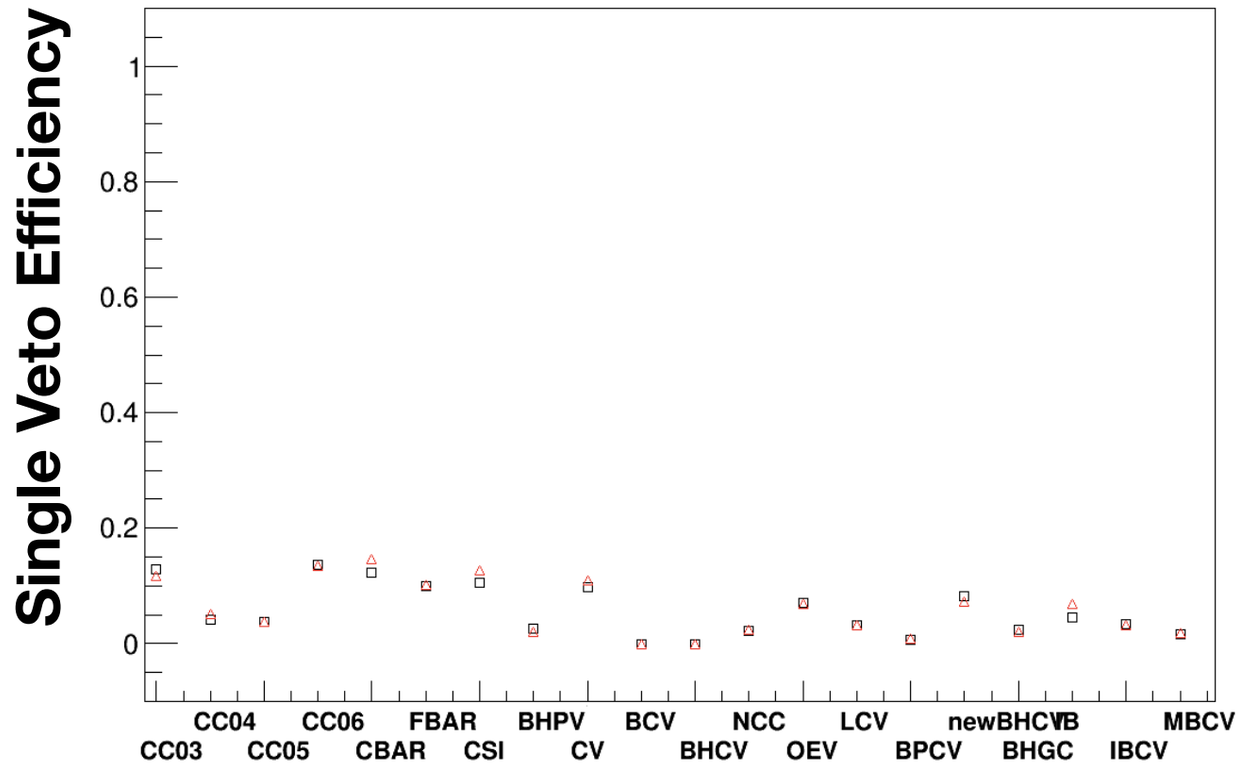
Orange : M.C. simulation
Orange+Blue : M.C. simulation with data-based normalization
Blue : Background estimation using special data



- We are not understanding high Vertex Z region and low Pt region

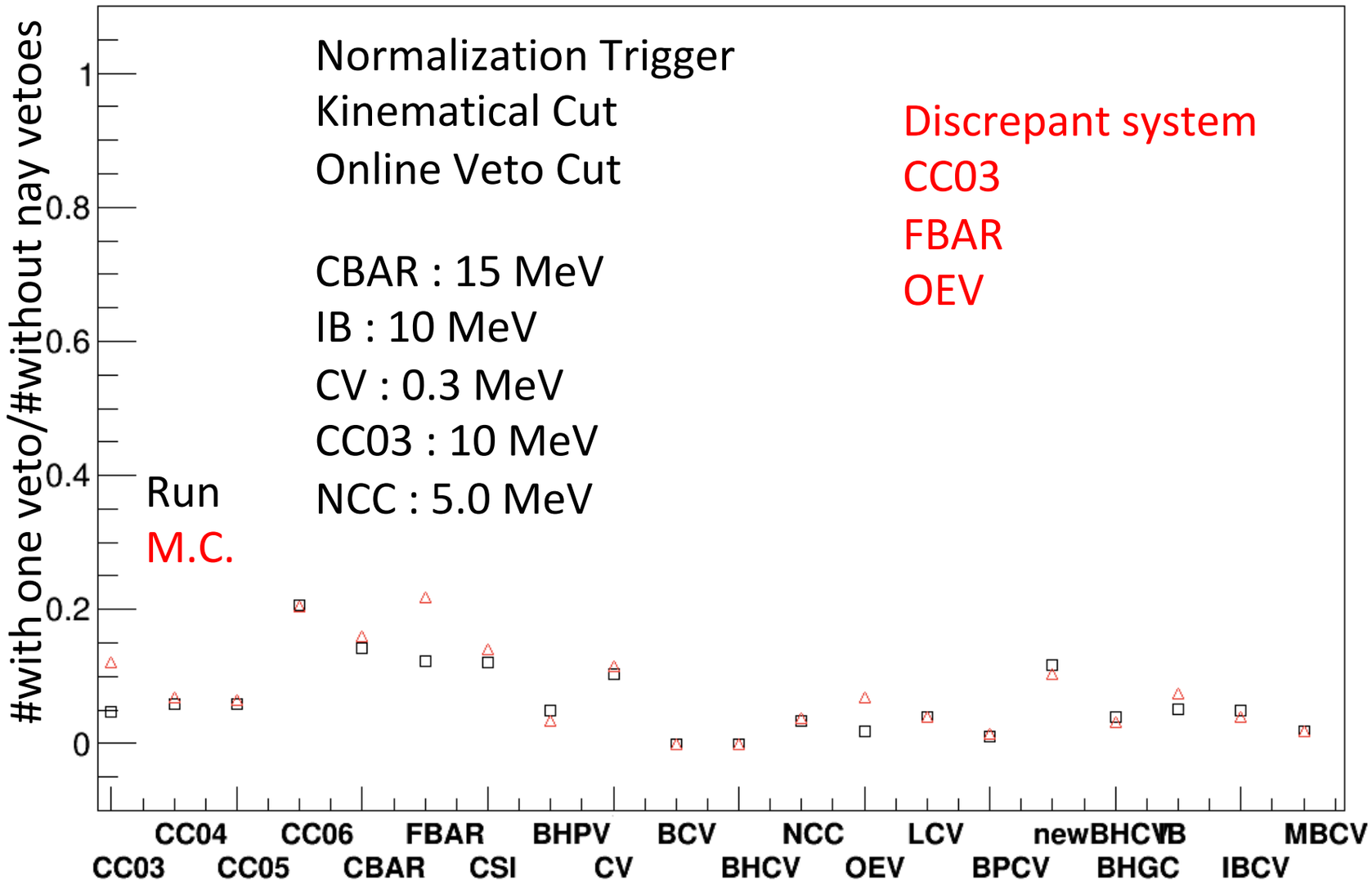
2016 and 2017 Data Analysis Status





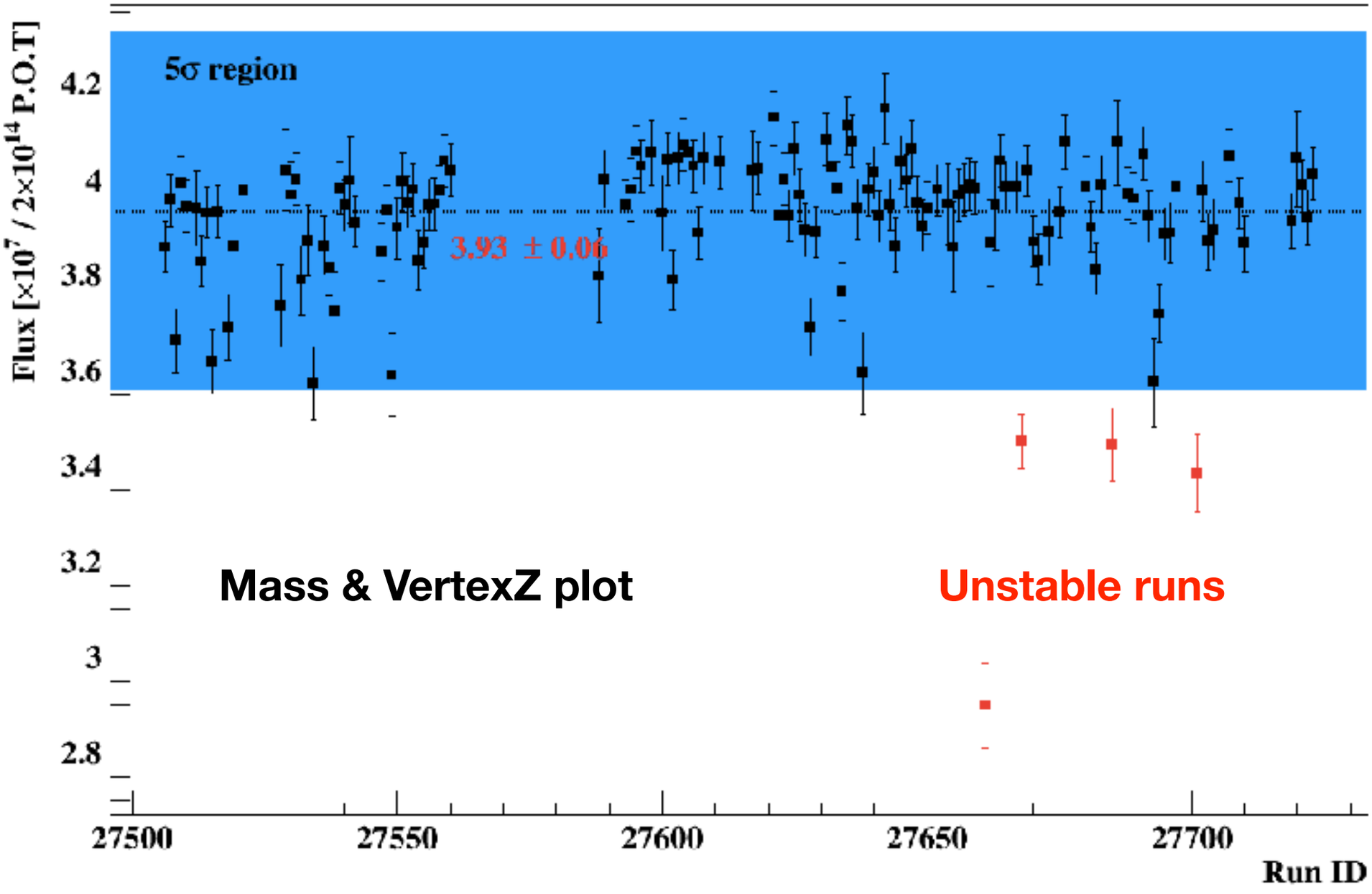
- Flux, Detector Veto efficiency, Quick PtZ
- Background estimation will be done

2018 Data Quality



- Status of detectors

Flux Measurement

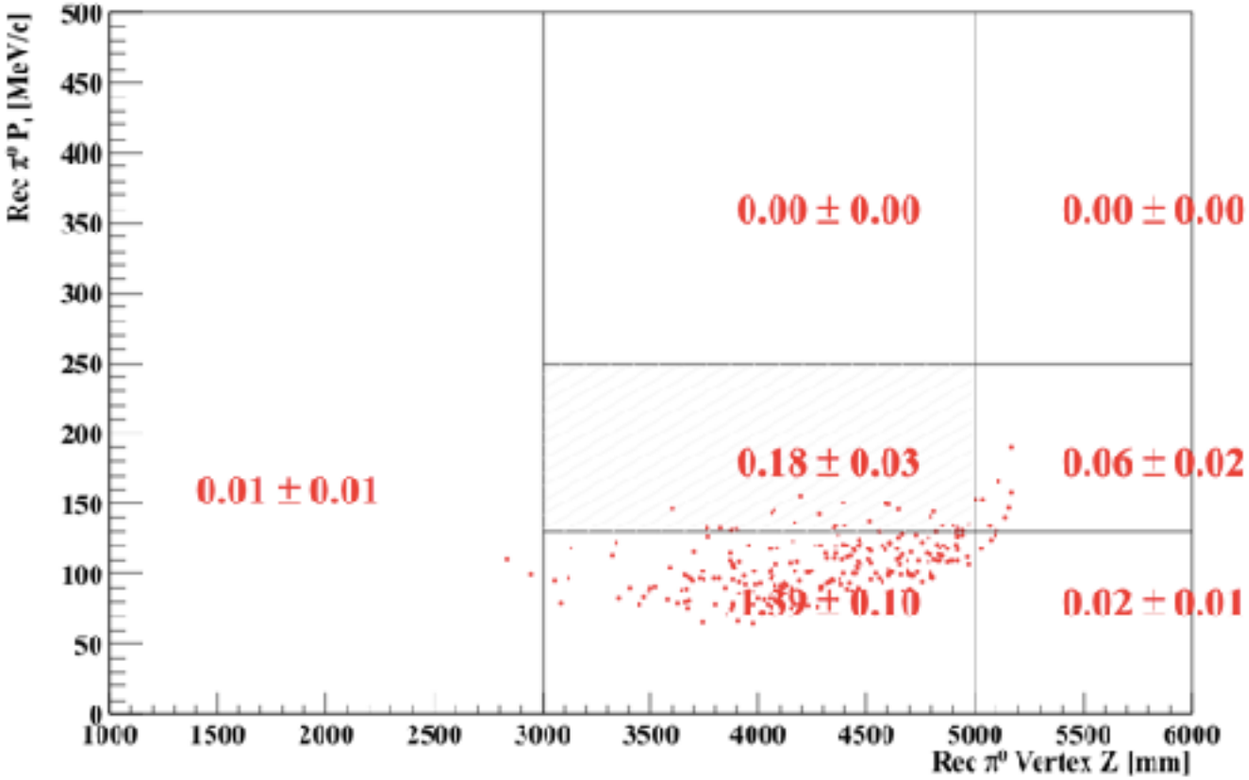


Current Issues of KOTO

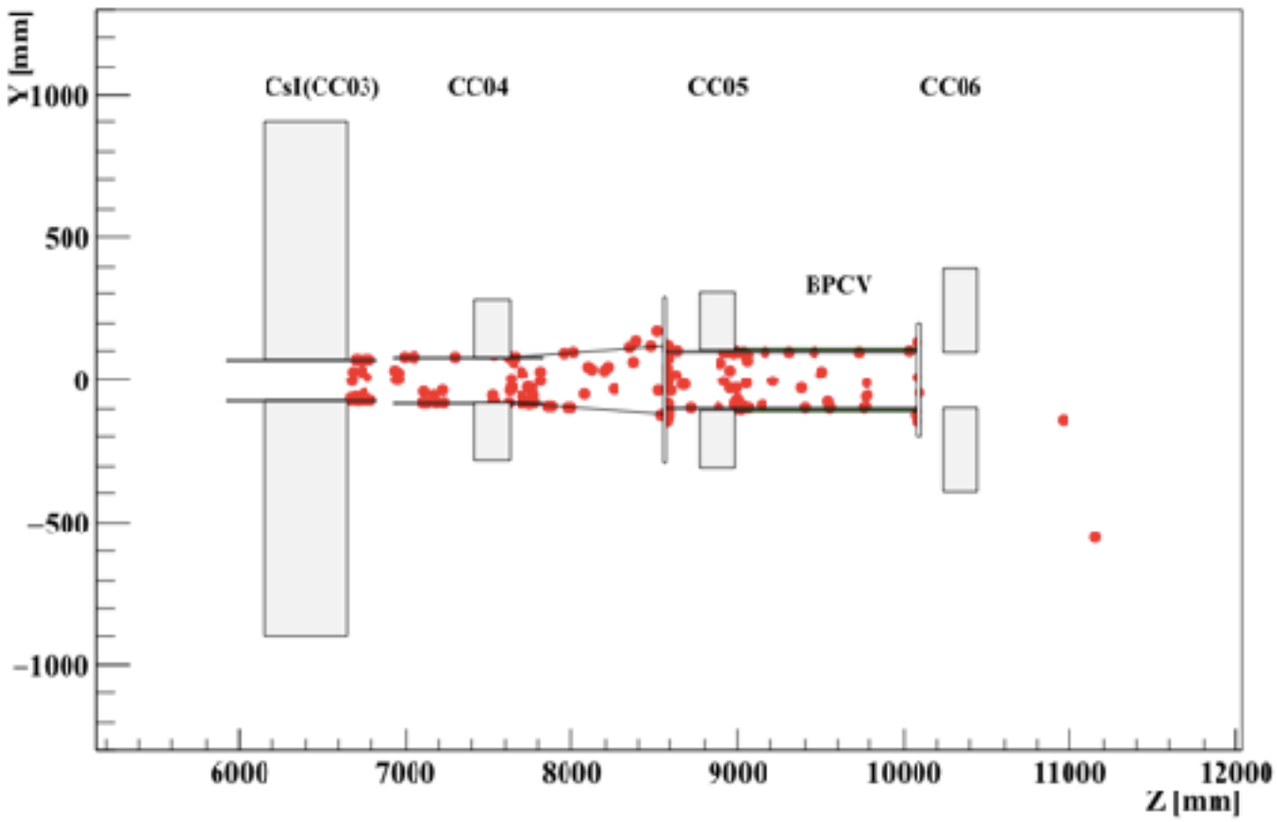
- Accidental activity
- Background from $K_L \to \pi^+\pi^-\pi^0$ decay mode
  - Installation of new detector at downstream
- Hadron cluster in CsI Calorimeter
  - Installation of front-end readout for CsI Calorimeter

$K_L \to \pi^+\pi^-\pi^0$ Background

Normalized to 2015 Data

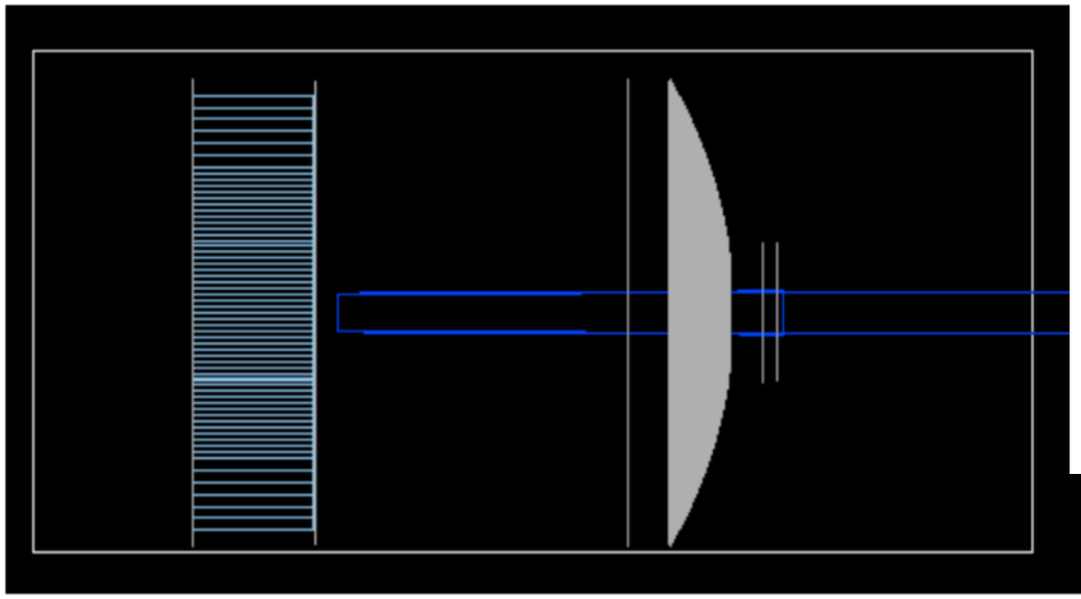


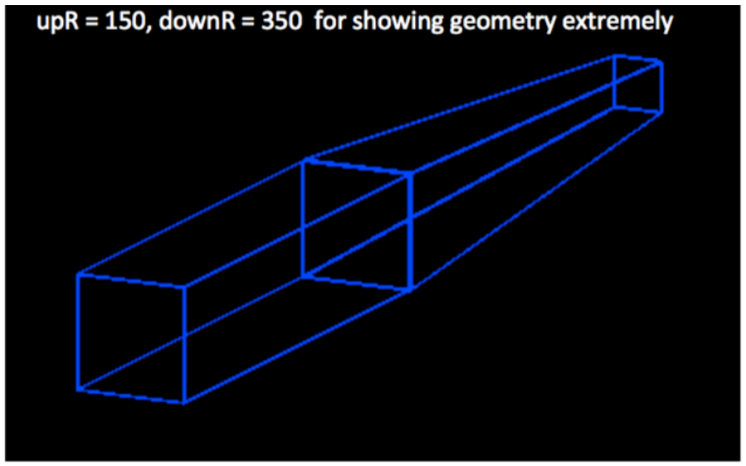
Dead Points of charged pions



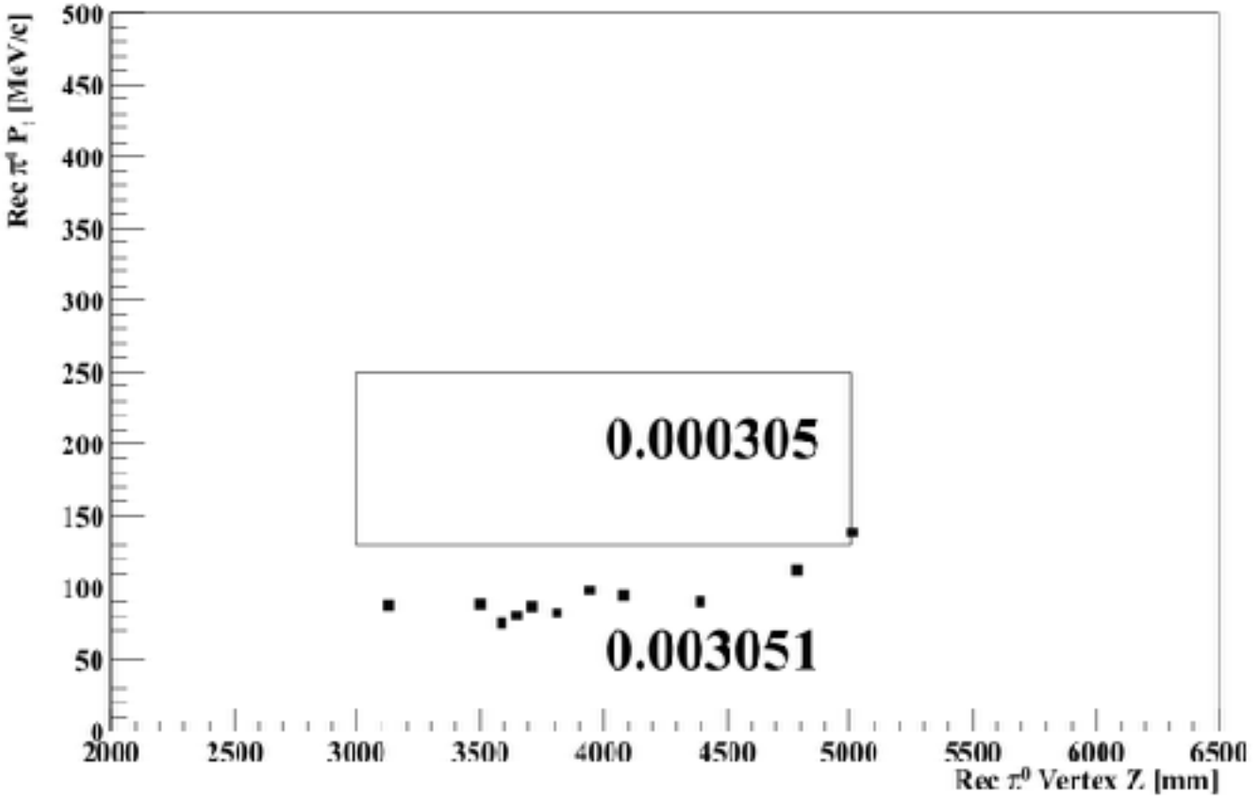
- Backgrounds come from dead material at downstream.
  - Beam pipe with active material will be installed(BePiCV)

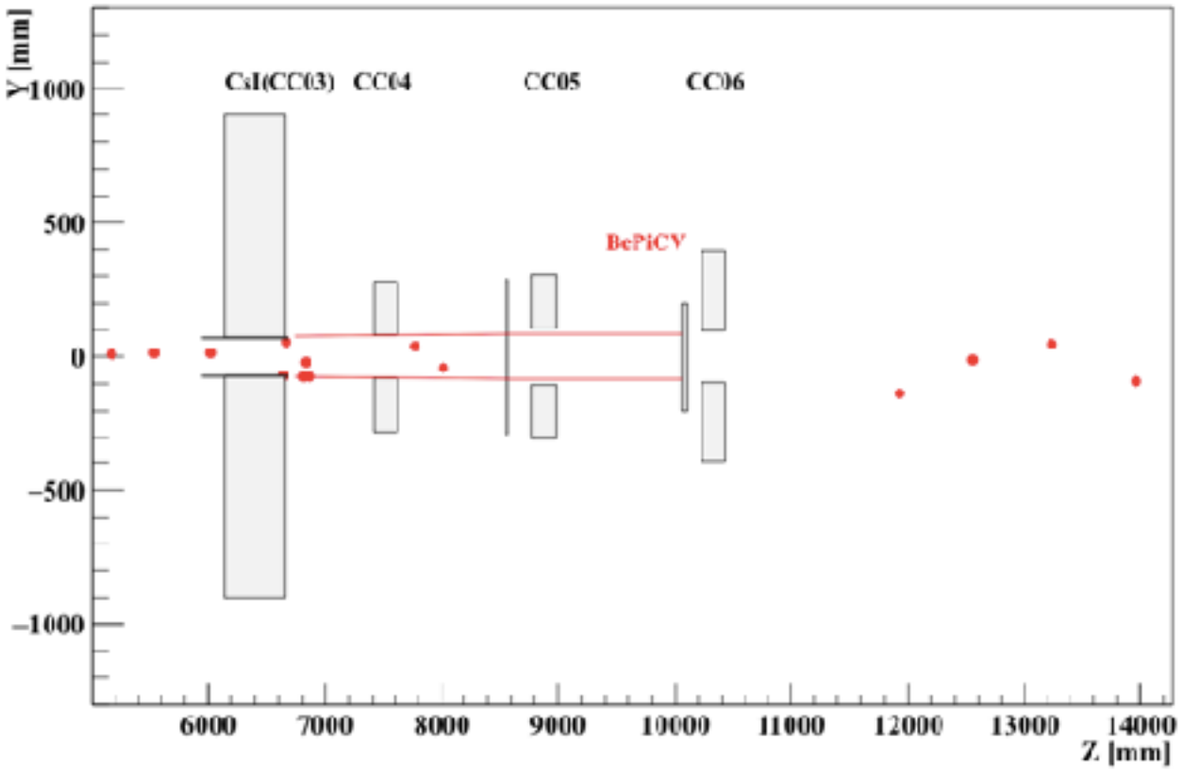
Status of BePiCV
(Beam Pipe Charged Veto)



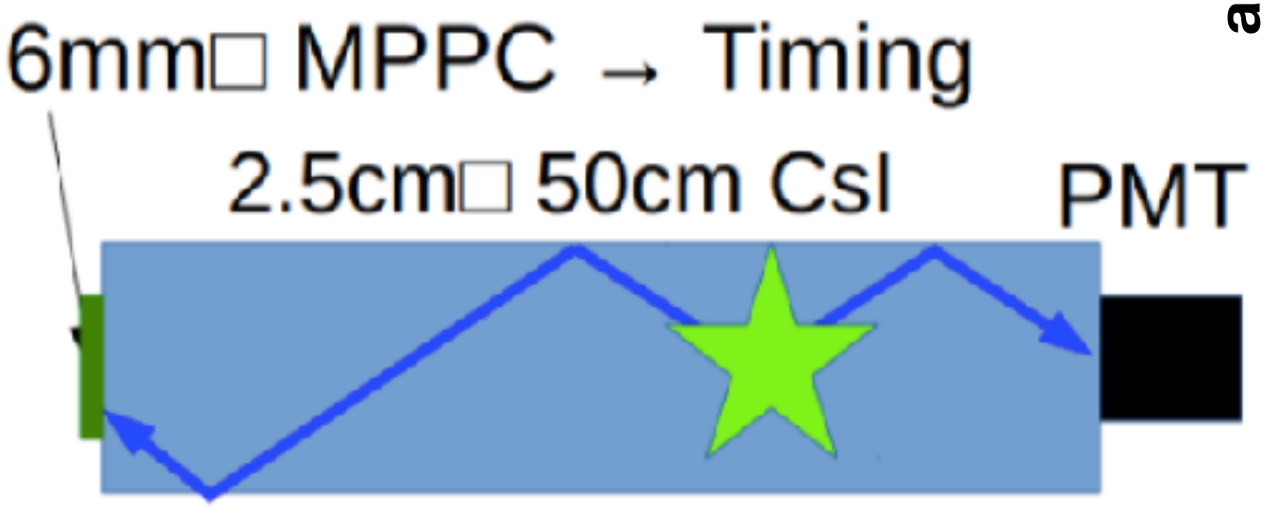


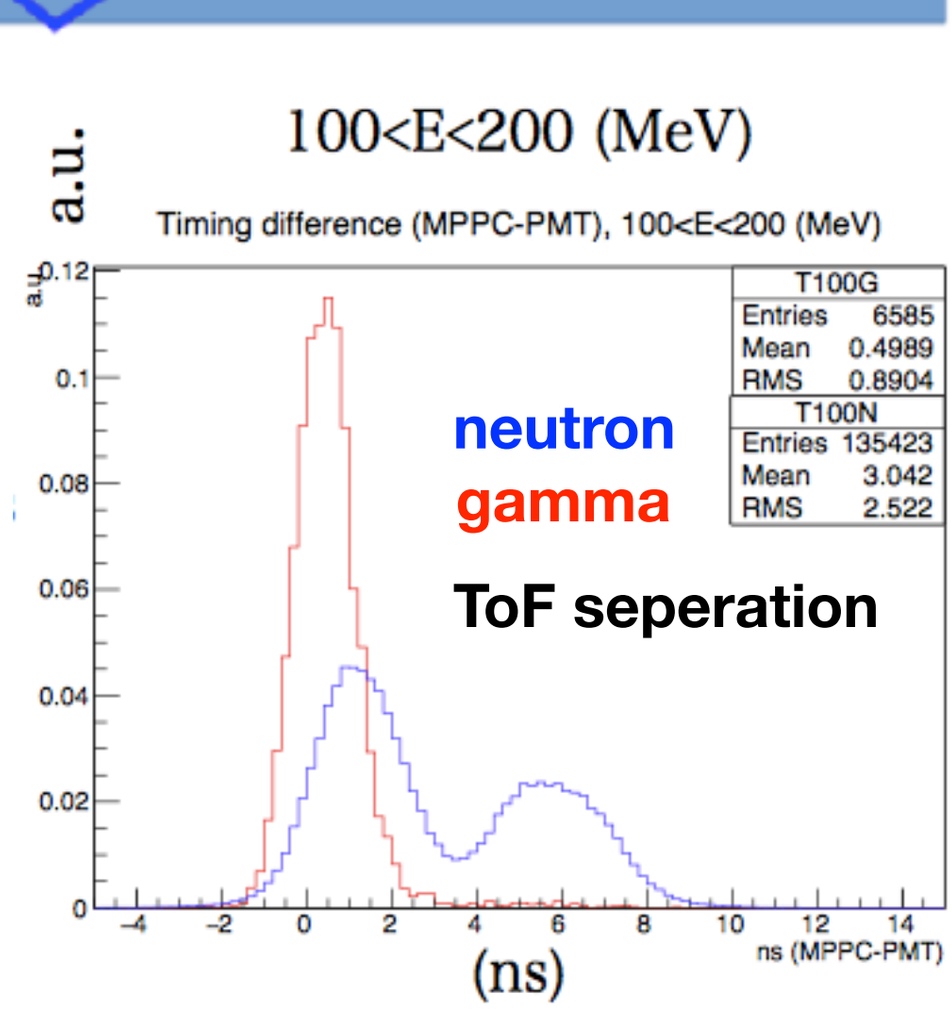
5mm-thickness scintillator

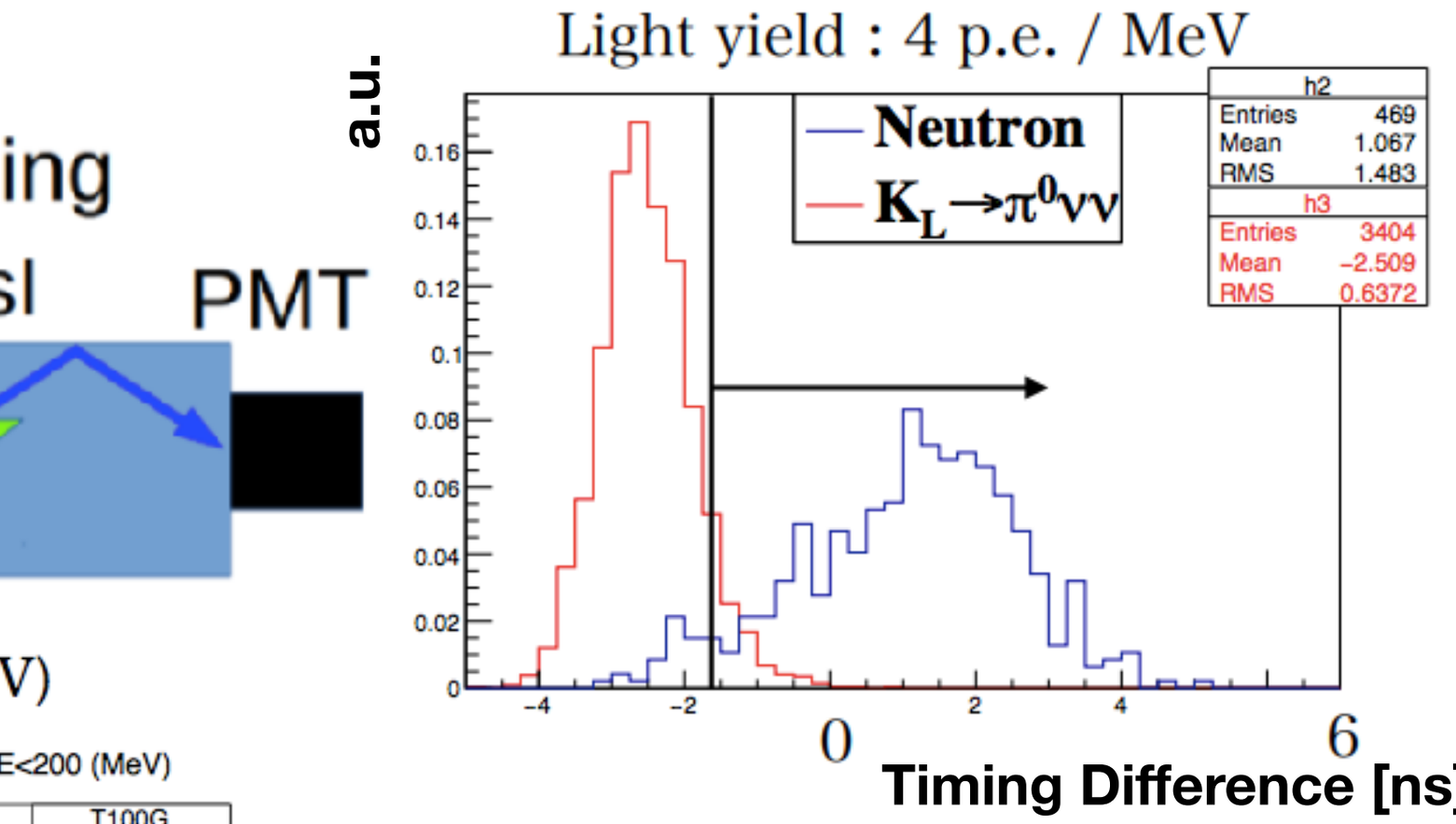




Front Readout of CsI Calorimeter

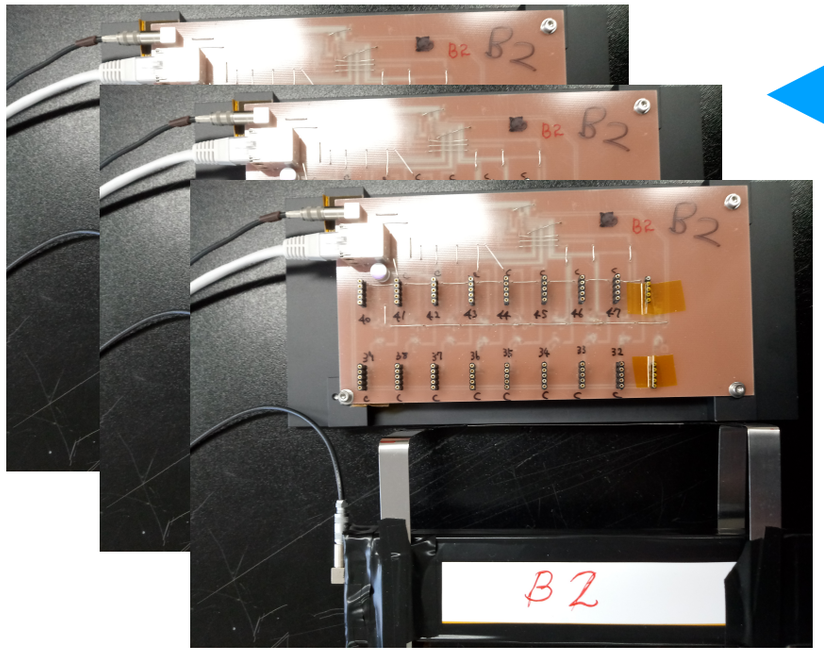


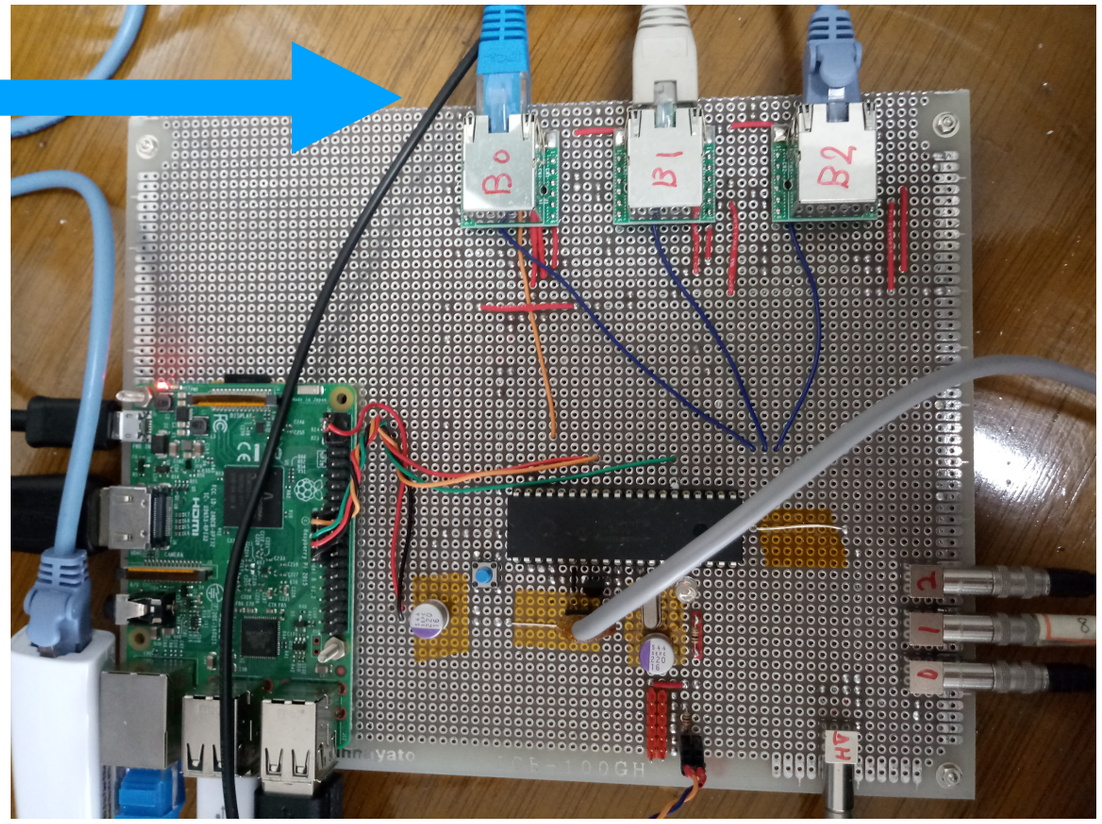


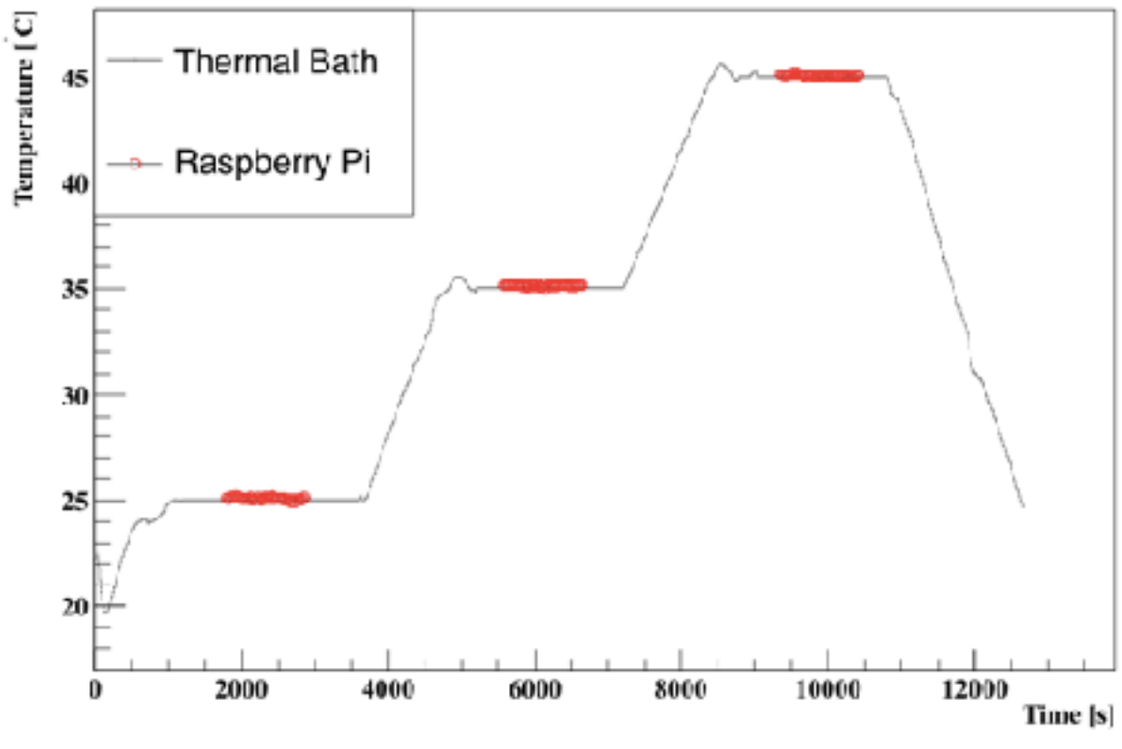


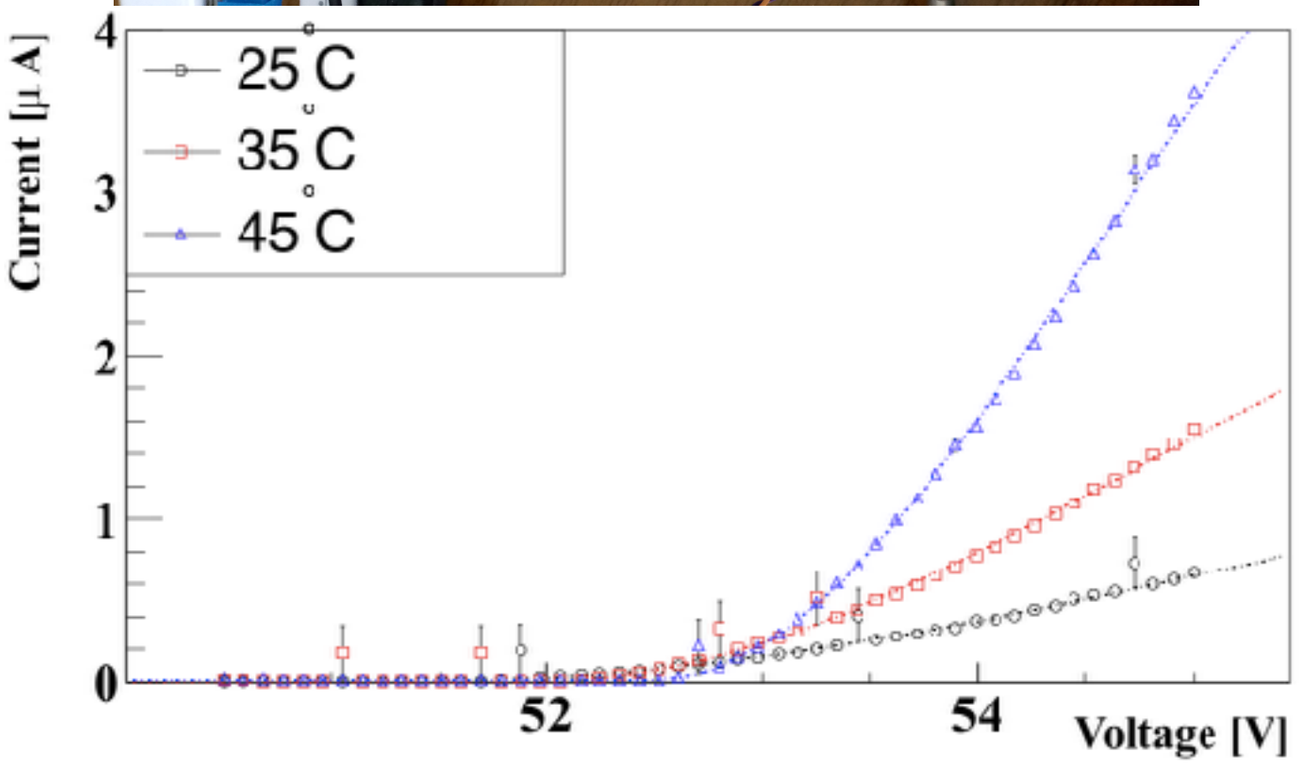
- S13360-6050CS
- To reduce hadron cluster background

IV Curve Measurement of MPPCs









Summary

- With 2015 data, 1.2e-9 single event sensitivity is achieved
- Analysis of 2016 and 2017 data is ongoing.
- Data taking at Jan, 2018 was well done without serious problem.
- R&D for upgrade of subsystems is ongoing and the upgrade will be implemented in this year.