Summary and Prospect of software session

2015/01/30

M.Miura

6th HK open meeting

1. Current status of software group

- Convener: M.Miura (ICRR), C. Walter (Duke), F. Di Lodovico (QMUL)
- Member: 51 persons
  - Japan: 18
  - US: 10
  - UK: 12
  - Canada: 8
- Regular meeting: Thursday (JST)/Wednesday (US) in every two weeks.

2. WCSim

- Modularize photo-sensor part and digitizer part.
  - ➢ Can prepare several photo-sensor options.
  - ➢ Available for DAQ+electronics studies.
- WCSim is ready to study optimization of detector setup.

3. Reconstruction tools

- fiTQun
  - Tuned scattering table and solve momentum shift problem.
  - It works reasonable for default HK setup.
- Bonsai-fit
  - 1st version for WCSim can work.
  - Performance was a little bit worse than SK-II. Need more study
- May need tune for each detector setup.

4. Computing

- Release the latest version of software (WCSim v1.2.0, fiTQun v4r2).
- Generate Hyper-K (base design) beam events and reconstruct by fiTQun:
  - ν mode: 100 k
  - anti-ν mode: 100k

  Please check and give feedback → physics group.
- Getting ready for mass production.
- Developing generalized neutrino event generator, adopt to various geometries, flux models, cross section models.

5. Prospect

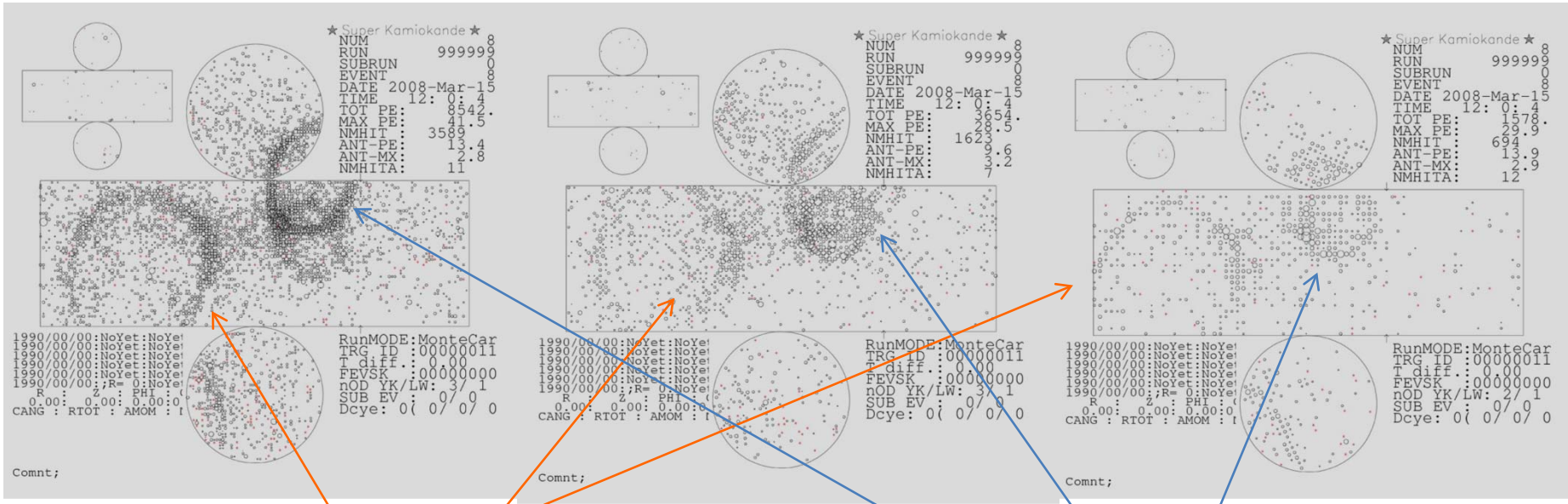
- New candidates of detector setup from cavity&tank group
  - Cylindrical shape, like SK.
  - No segmentation.
  - Reduce photo-coverage 20%/1.6→~13%
  - Use smaller photo-sensor, 20 inch→12~13inch

(Reminder: shown in NNN2010)

I have studied effects of photo-coverage (using 20inch PMT, change PMT density) on proton decay analysis (based on skdetsim&apfit).

$p \rightarrow e^+\pi^0$ MC

40 %　　20 %　　10 %

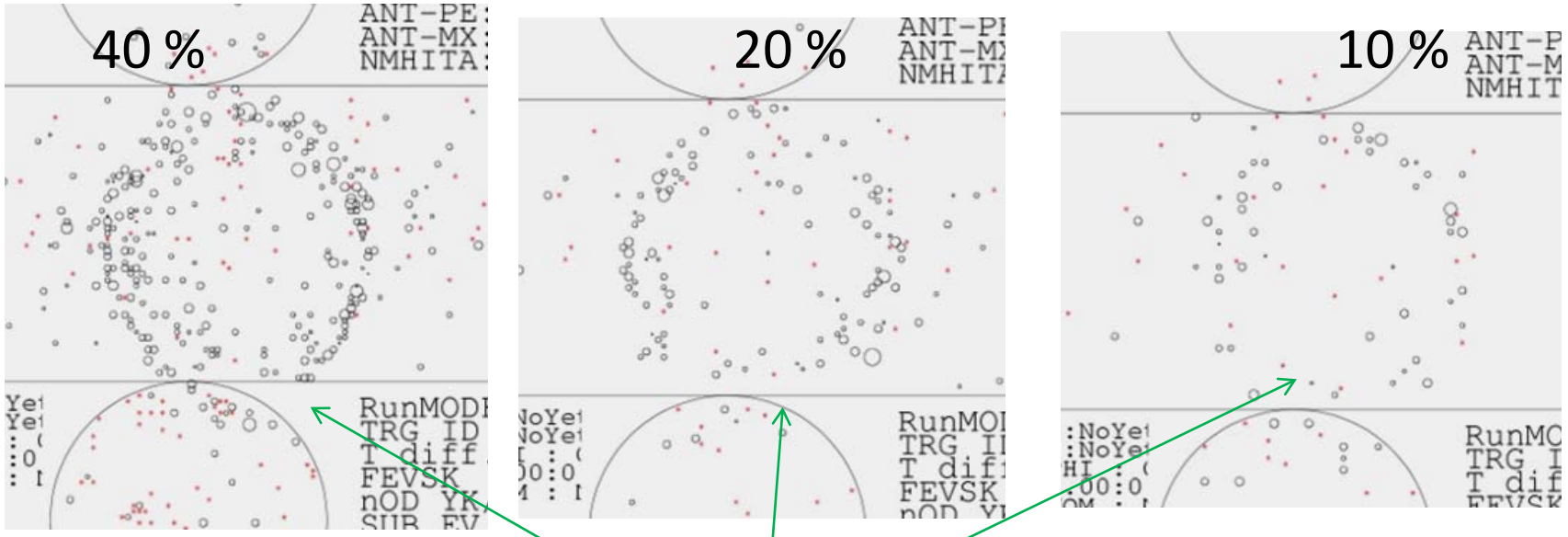


Electron ring

π^0 rings

Efficiency: 45 %@40% P.C. → 28 %@10% P.C.

$p \rightarrow \nu K^+ : K^+ \rightarrow \nu \mu^+$



μ ring (236 MeV/c, Evis~50 MeV)

Efficiency: 8.2%@40% P.C. → 3.6 %@10% P.C.

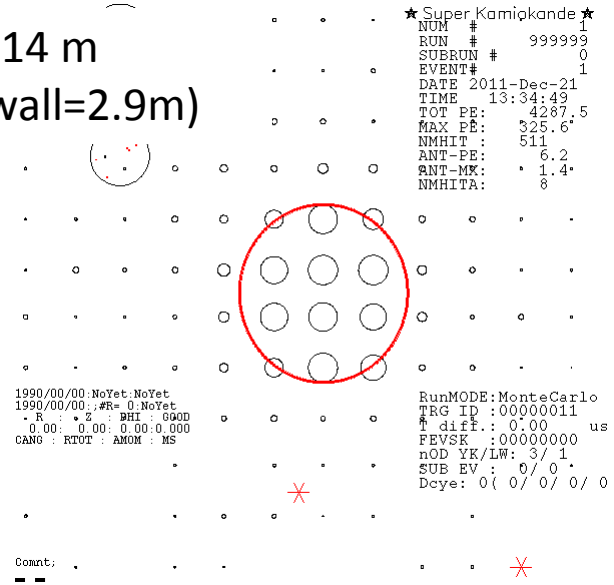
PMT density has large impact on physics.

NOTE: In these study, just change number of 20 inch PMT.

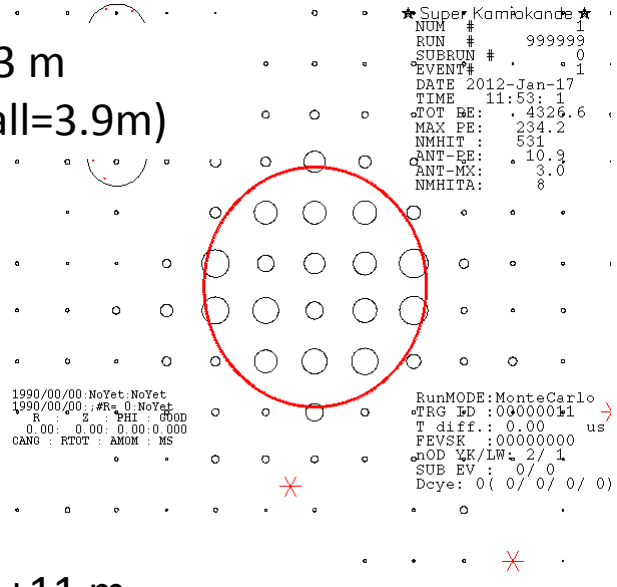
Never studied seriously to use smaller PMTs keeping number of PMT.

Display of 10 % case (e 1GeV/c)

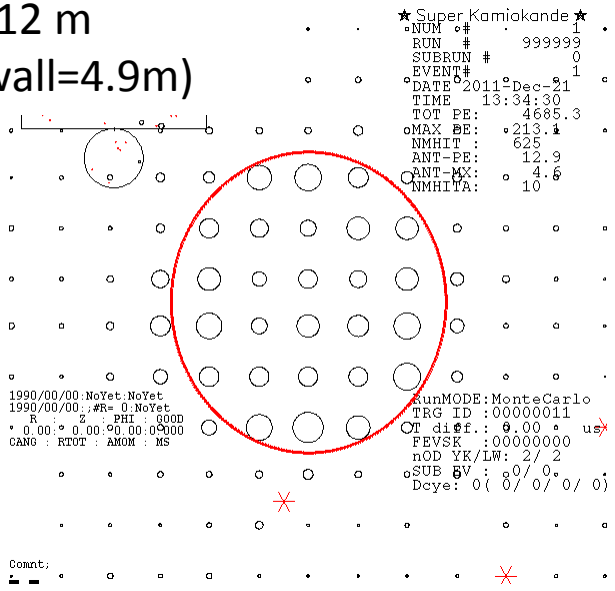
X=+14 m
(towall=2.9m)



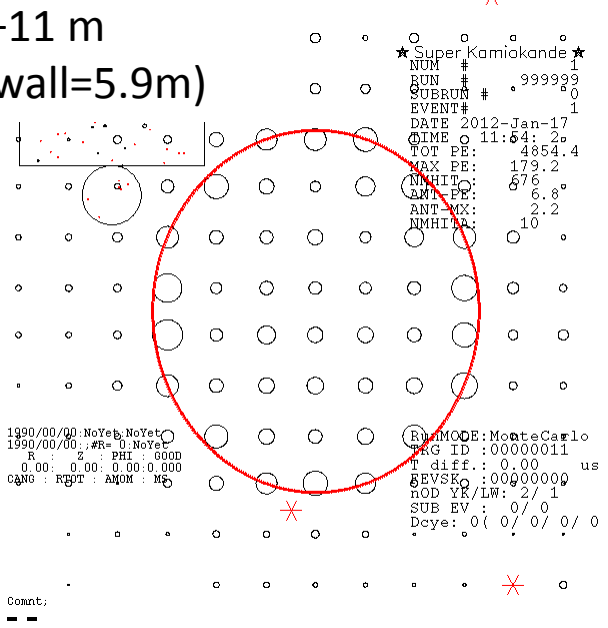
X=+13 m
(towall=3.9m)



X=+12 m
(towall=4.9m)



X=+11 m
(towall=5.9m)



What we should compare

① Shape of tank: egg-shape vs cylinder

- Guess almost same performance.
- Simple cylinder shape is preferred by software.
- WCSim, fiTQun, and Bonsaifit are ready for this study.

② Detector size

- Egg shape: 5 compartments vs 1 large tank
- Cylinder: 100x69m, 80x64m 60x74m
- WCSim, fiTQun, and Bonsaifit are ready for this study.

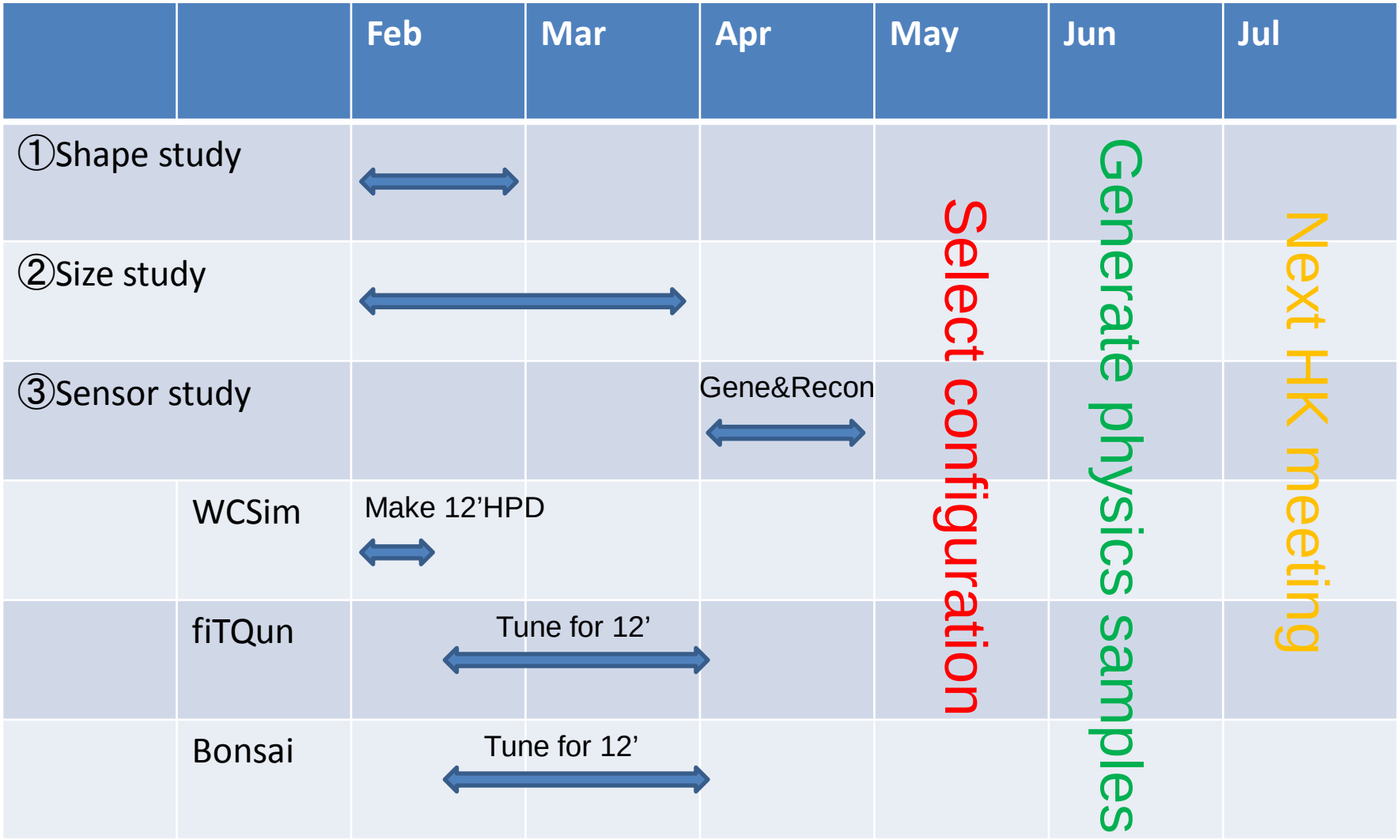
③ Photo-sensor: 20inch vs 12inch HPD(high QE) with same photo-coverage as 20inch case.

- WCSim: Need prepare another photo-sensor, but easy.
- fiTQun: Need re-tune scatter photon distribution.
- Bonsaifit: It may work (?)

How to study

- Study basic performance (vertex, momentum, PID, ring counting) by particle gun. Then choose shape, volume, and photo-sensor configuration.
- Generate physics sample for candidate configuration.

Time line


Feb
Mar
Apr
May
Jun
Jul
①Shape study
②Size study
③Sensor study
Gene&Recon
WCSim
Make 12'HPD
fiTQun
Tune for 12'
Bonsai
Tune for 12'
Select configuration
Generate physics samples
Next HK meeting