

Problem on RICH Mirror alignment in Run4 and Run5

Taku Gunji

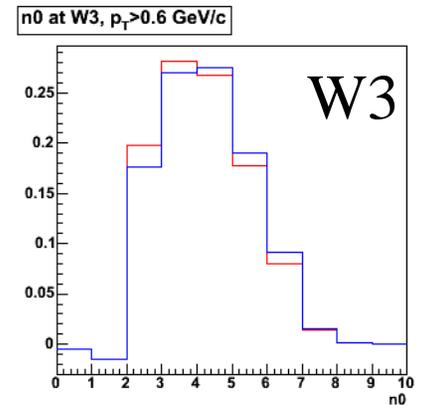
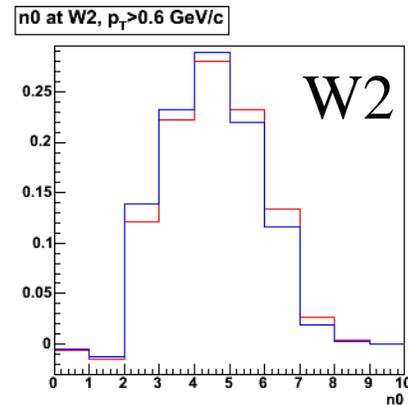
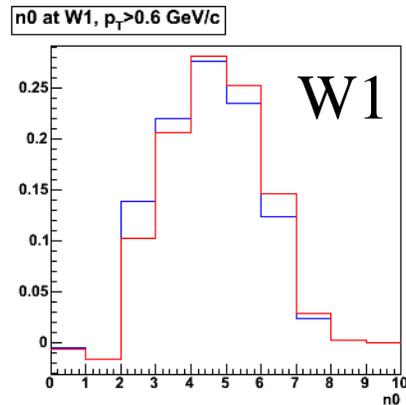
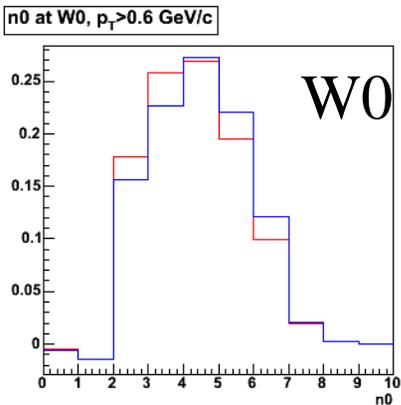
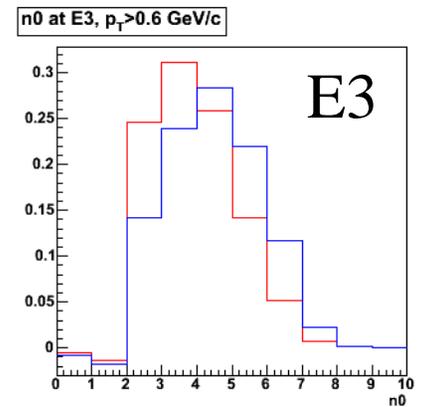
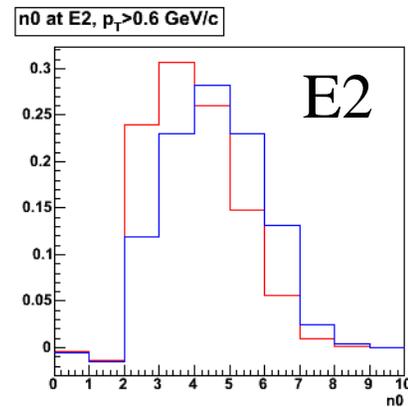
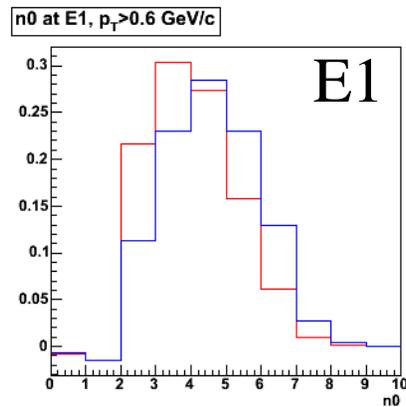
CNS, University of Tokyo

n_0 distribution in Run4

- Reports from Fukutaro

- <https://www.phenix.bnl.gov/phenix/WWW/p/lists/phenix-heavy-l/msg05308.html>

South
North

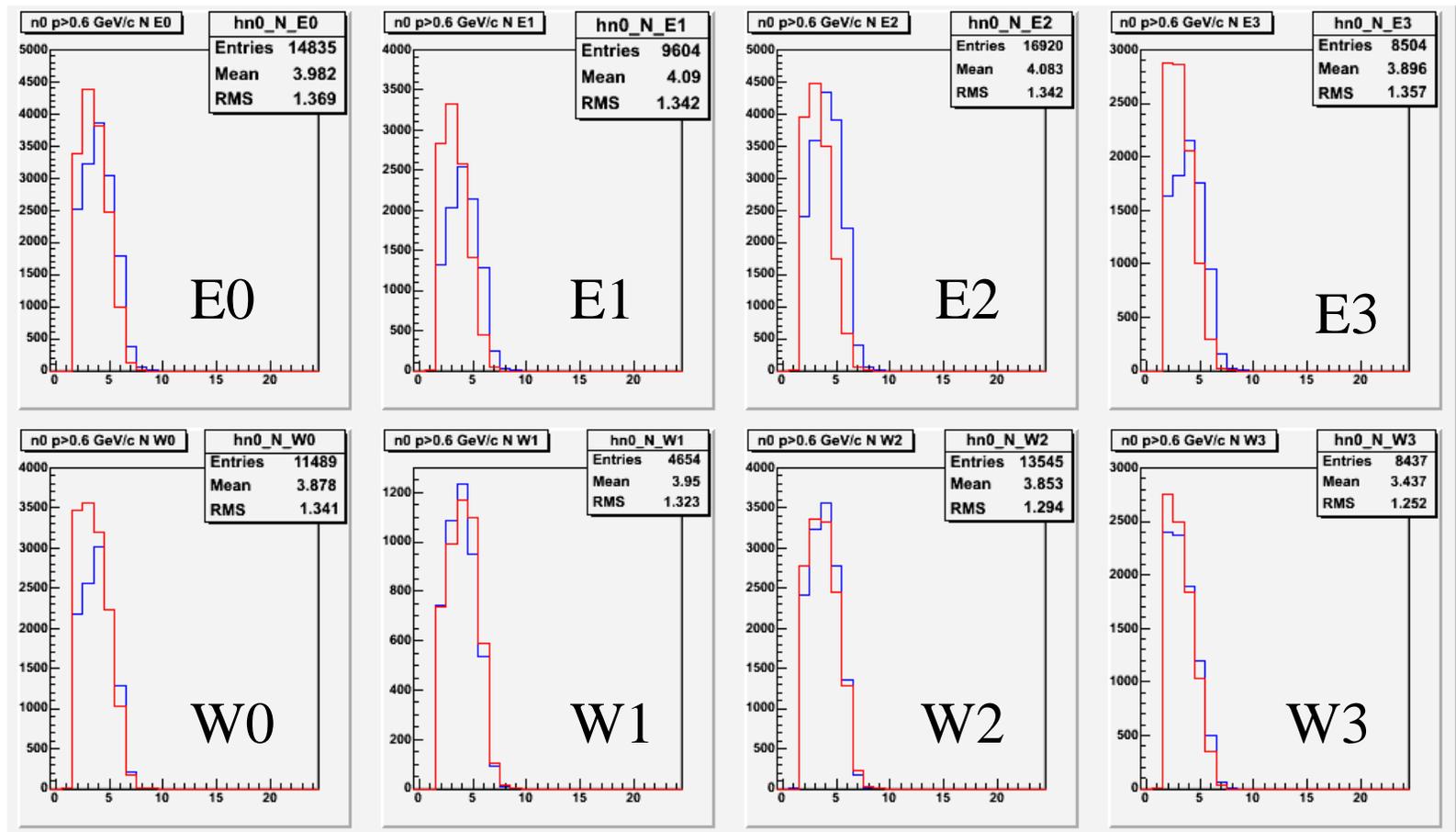


The observation is:
 n_0 is lower for ES. (n_1 is same for all sectors.)

n0 distribution in Run5

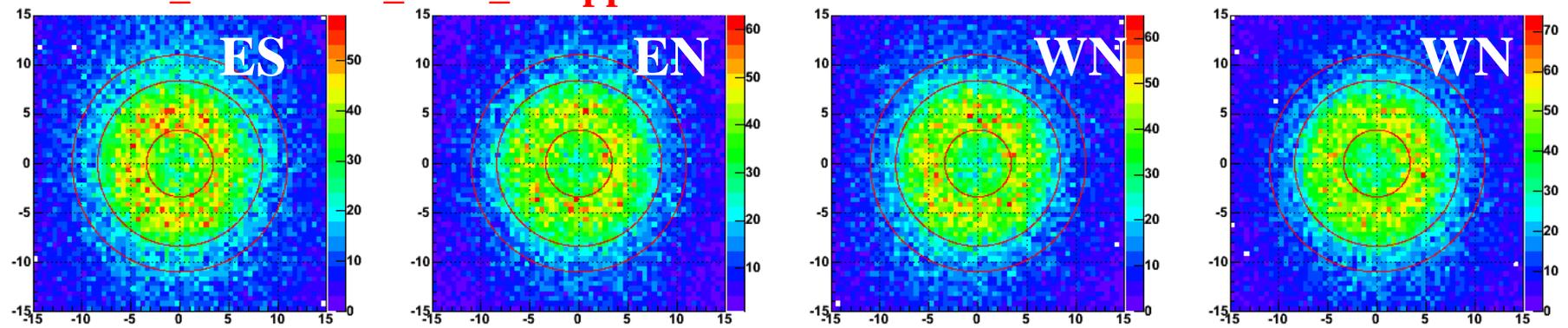
- Reports from Yasuyuki (pp), Takao and Susumu (CuCu)
 - <https://www.phenix.bnl.gov/phenix/WWW/p/lists/phenix-e-l/msg01114.html>
 - <https://www.phenix.bnl.gov/phenix/WWW/p/lists/phenix-e-l/msg01121.html>

South
North

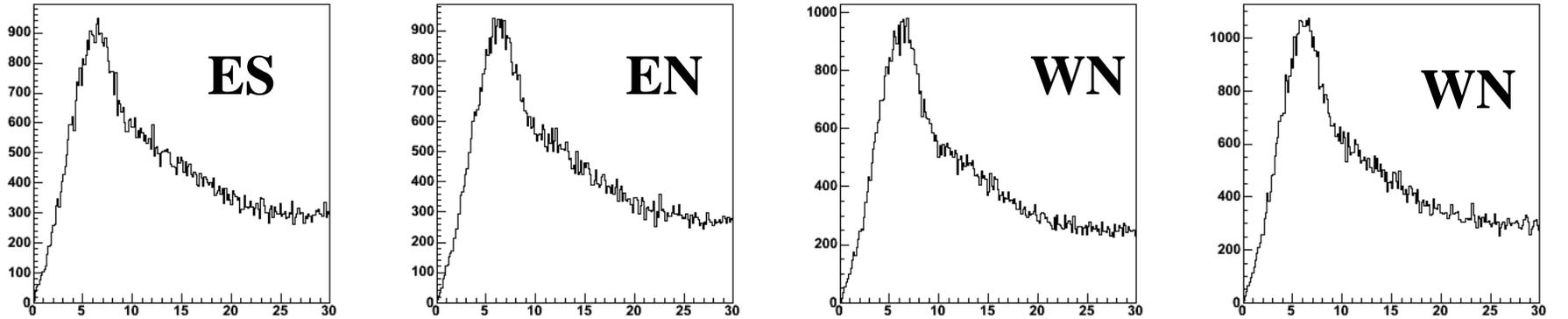


Mirror alignment in Run4

- CRK_Calib_run4AuAu_Lvl2_Central_v01_pro52.
- Calibration was done for all RICH Mirrors
 - 24 mirrors/arm&side
 - https://www.phenix.bnl.gov/WWW/p/draft/gunji/RUN4/Align/Mirror_Alignment_calibration_run4_314.ppt



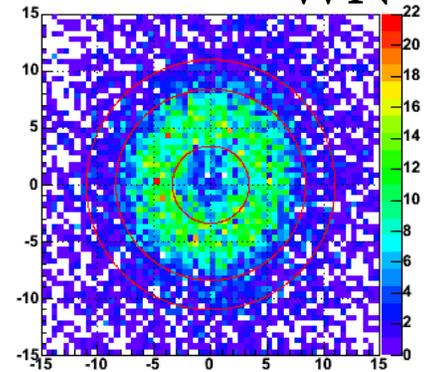
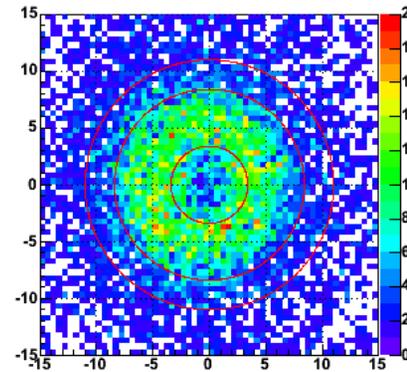
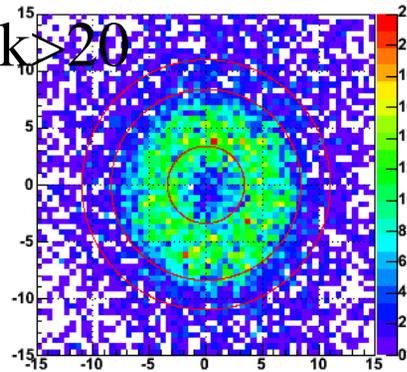
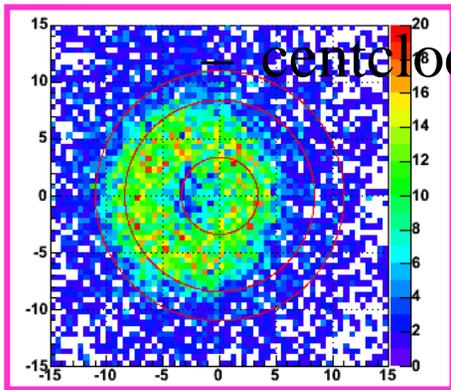
Ring radius



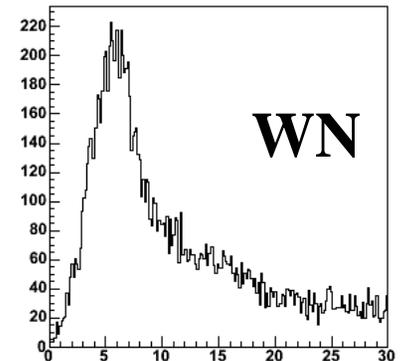
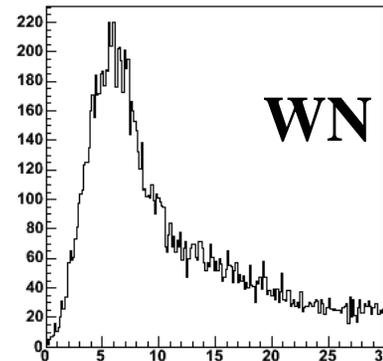
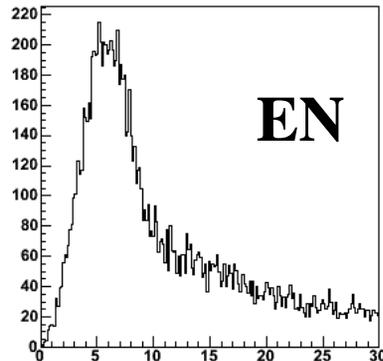
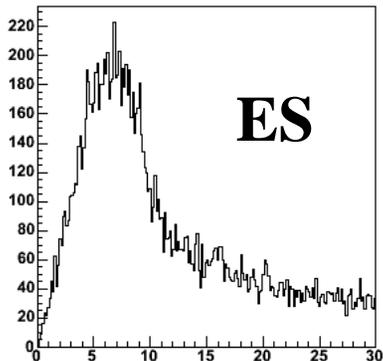
Reconstructed data (run118912)

- DST for the embedding study (+CNT from dcache)

ES – /phenix/data11/{adion,maya}/mergedDST



Ring radius



Ring Shape is different from the results of alignment calibration.

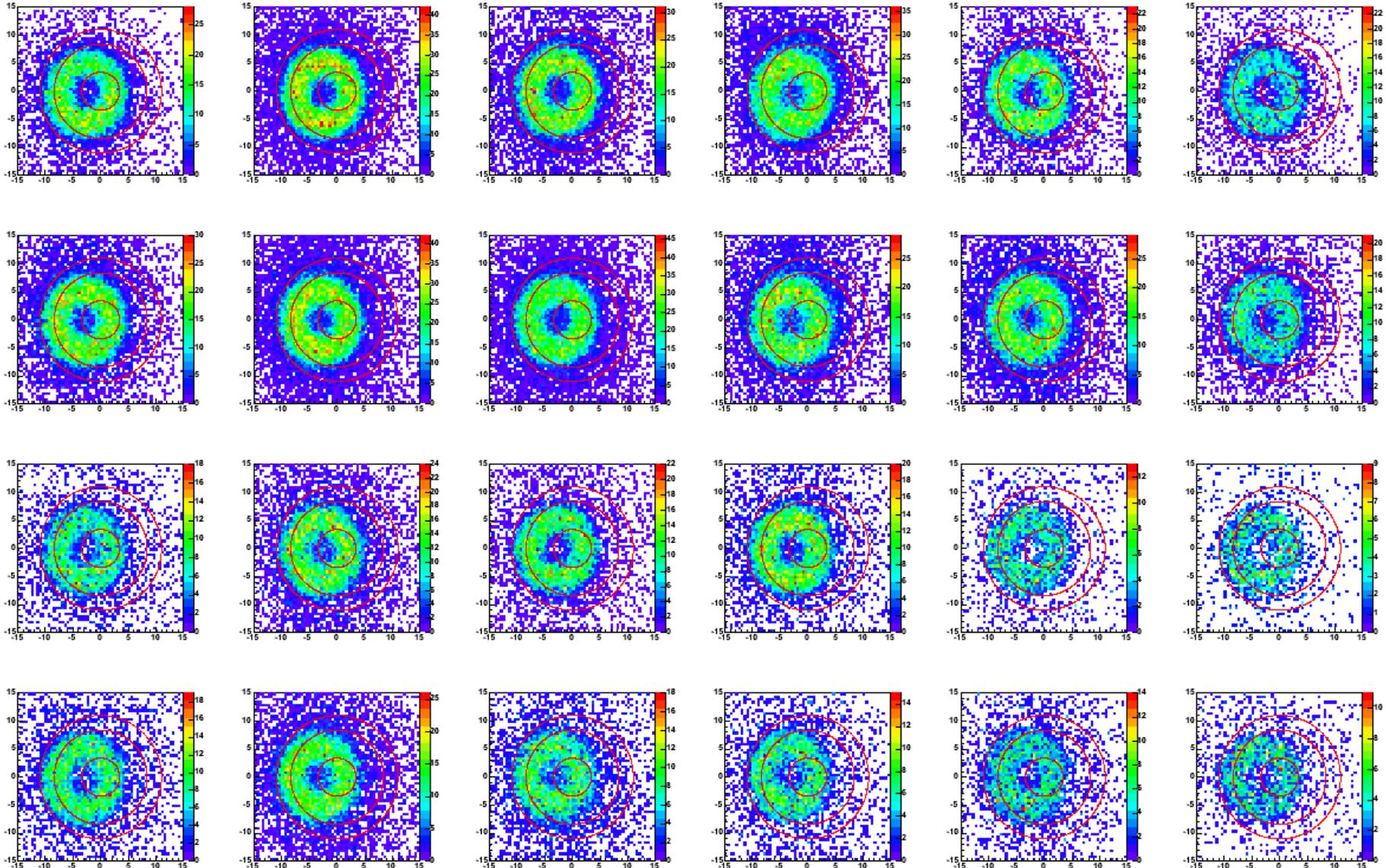
Why Ring Shape is different?

- CrkGeometryObject is called in alignment code and reconstruction code (CrkPID.cc).
- UseSurvey function in CrkGeometryObject is used in reconstruction code but is not used in alignment calibration.
 - This defines the position of the sphere mirrors of RICH.
 - The position of the Mirror is different in alignment calibration and reconstruction chain.
- Actions to recover this problem
 - Production of Run5 CuCu will start soon.
 - Update the alignment parameters with UseSurvey option.
 - Production was completed for Run4 and Run5 pp.
 - Tuning the data in simulation to match the real data (Run4, Run5 pp)

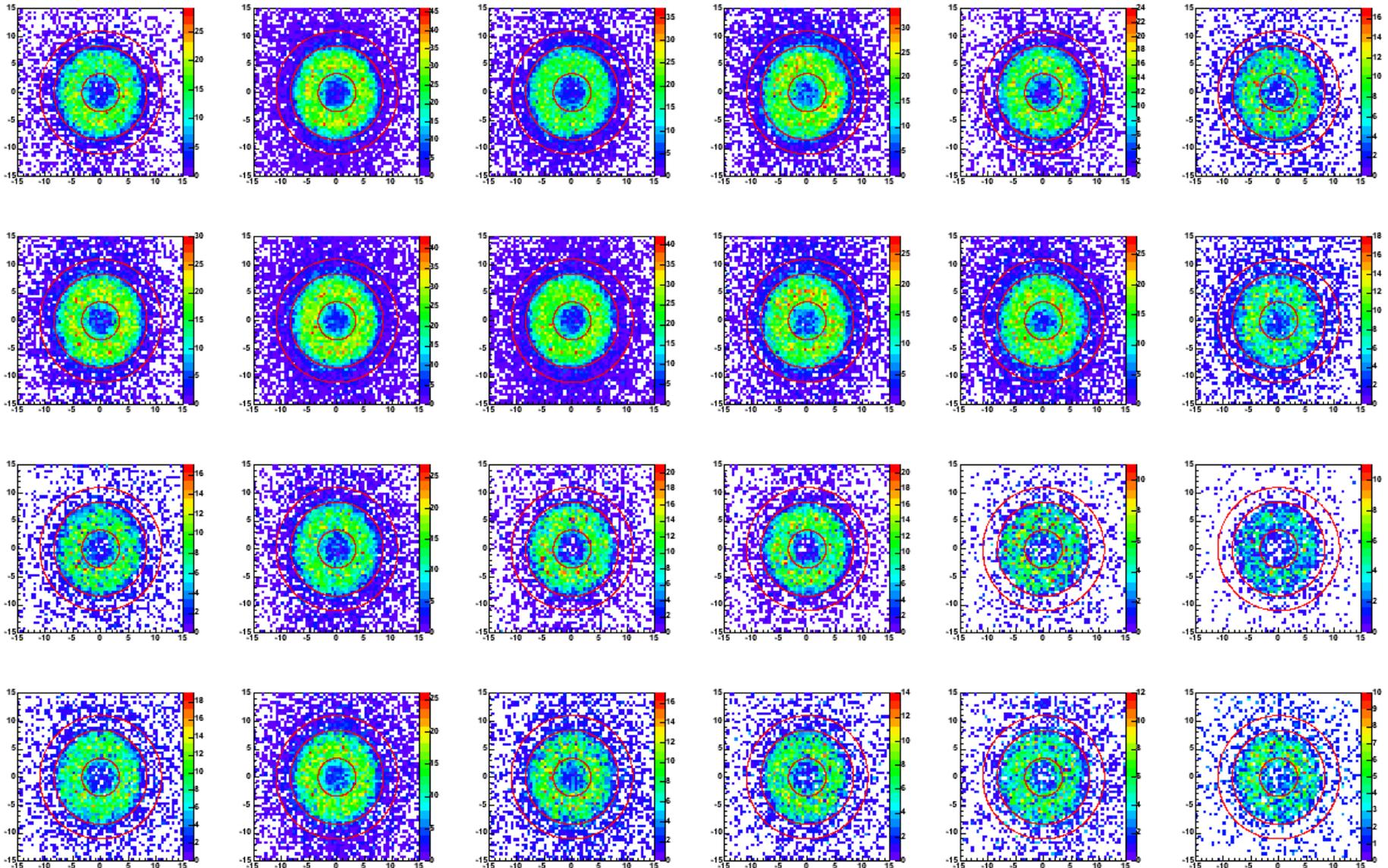
Re-calibration of Mirror alignment for Run5 CuCu

- Done by Susumu.
- Used data
 - RUN-5 Cu+Cu 200 GeV Level-2 filtered DIELEC data (pro.70)
 - CNT
 - DST_CRK
- eID cut
 - $n_0 \geq 0$ && $0.5 < \text{mom}/\text{GeV} < 5$. && 2σ PC3 matching && $0.7 < \text{ecore}/\text{mom} < 1.5$
- **UseSurvey option in CrkGeometryObject**
 - Alignment code was modified to use UseSurvey function.
 - Alignment calibration was done with this function.

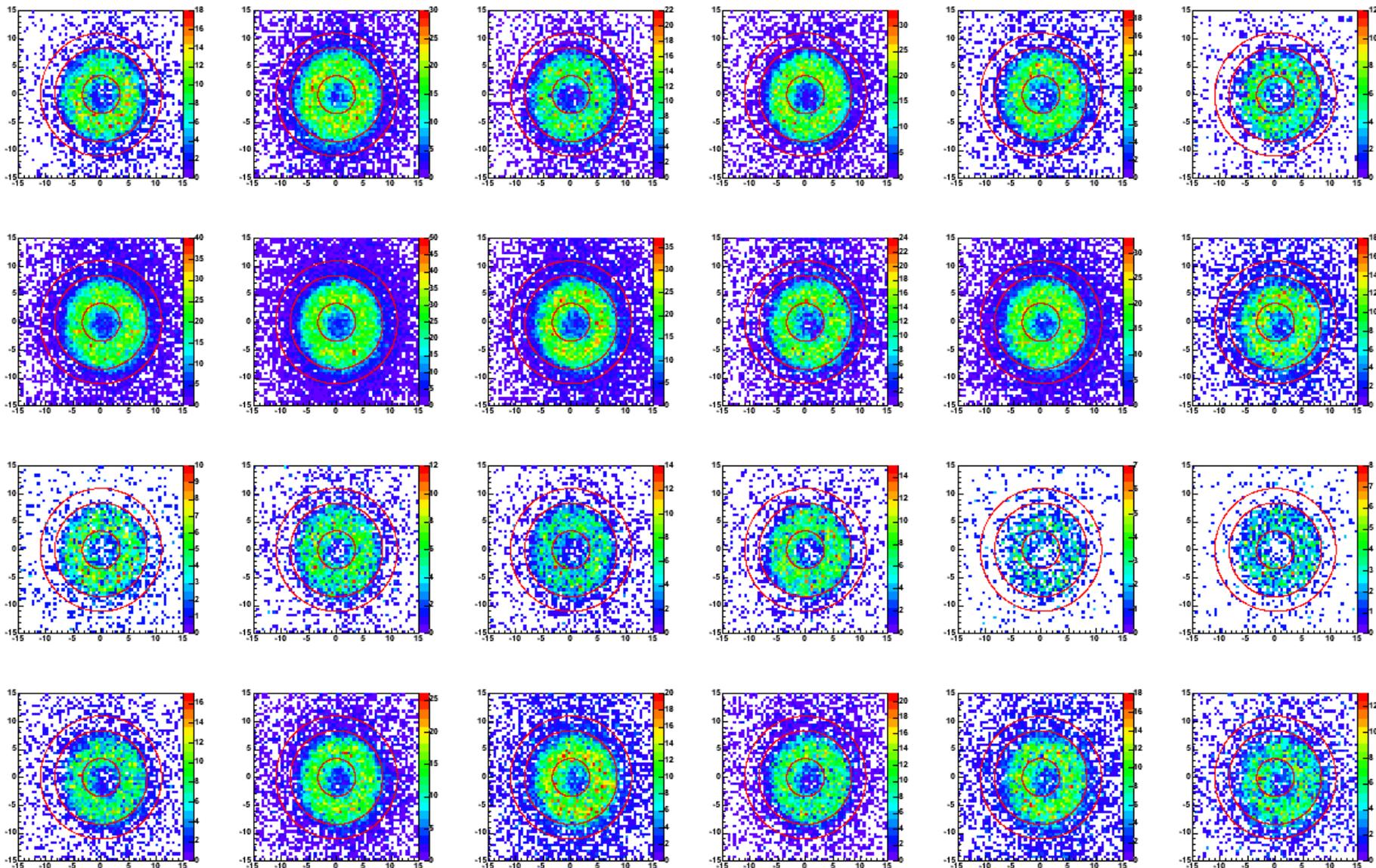
ES with previous parameters



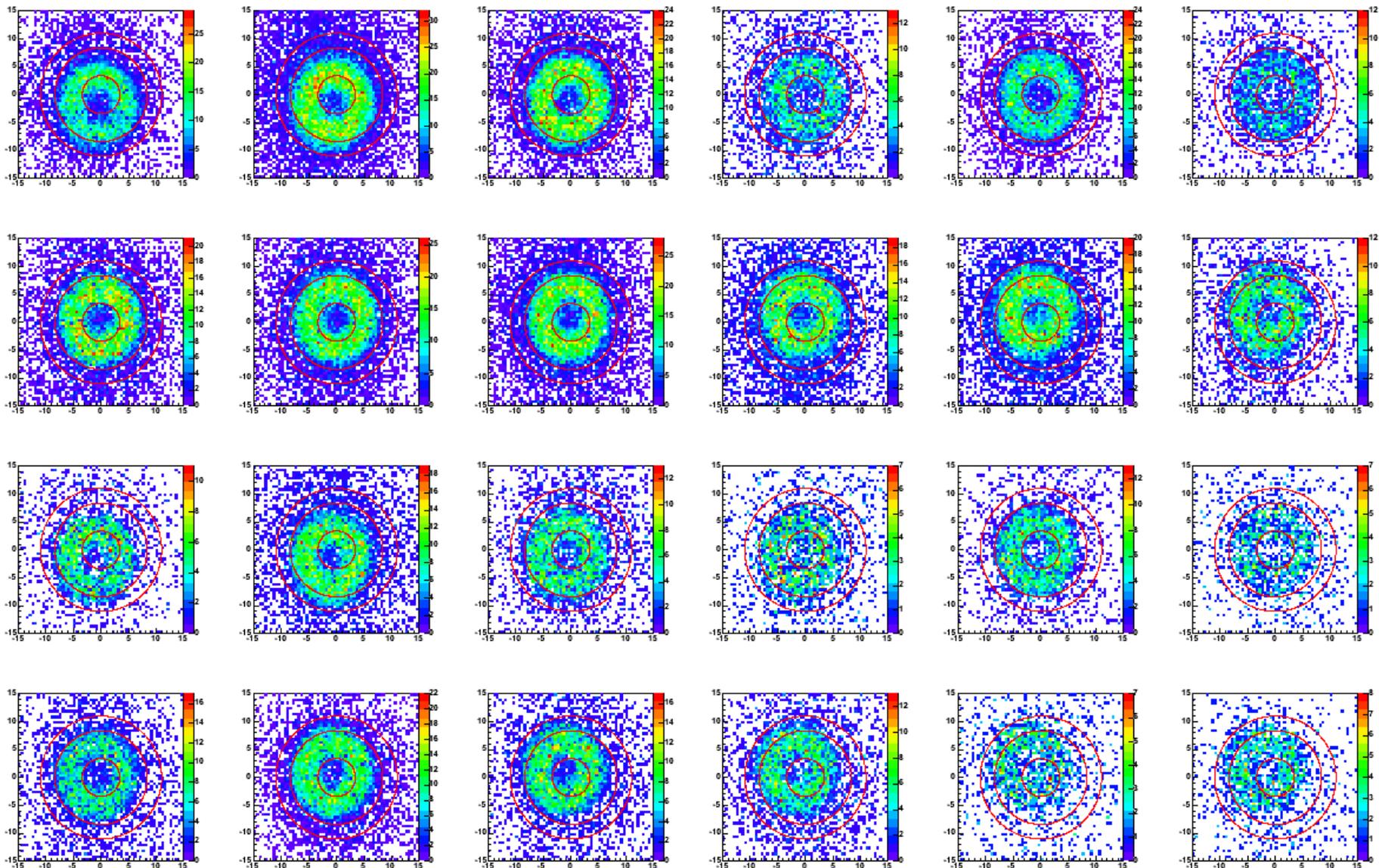
ES with new parameters



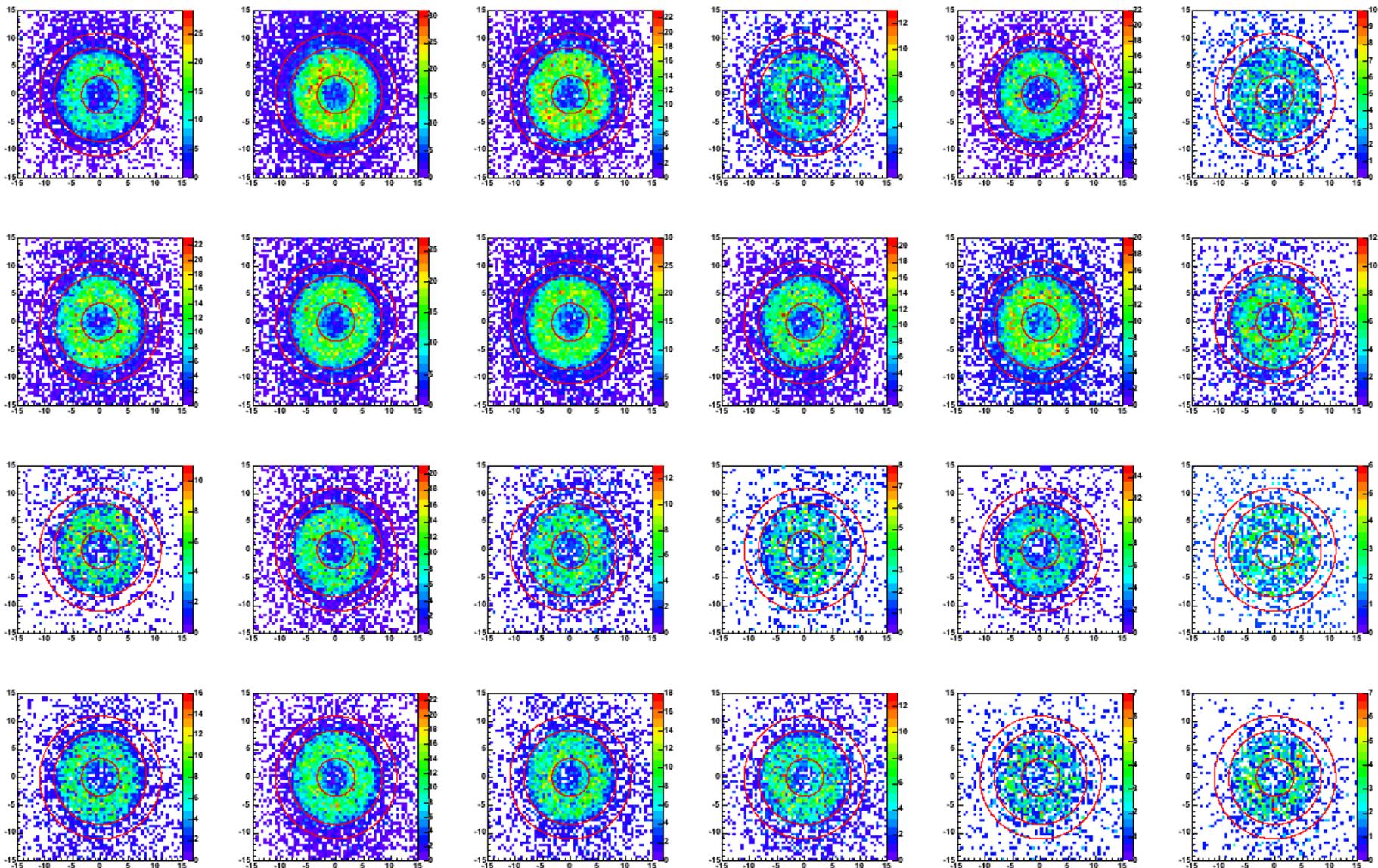
EN with previous parameters



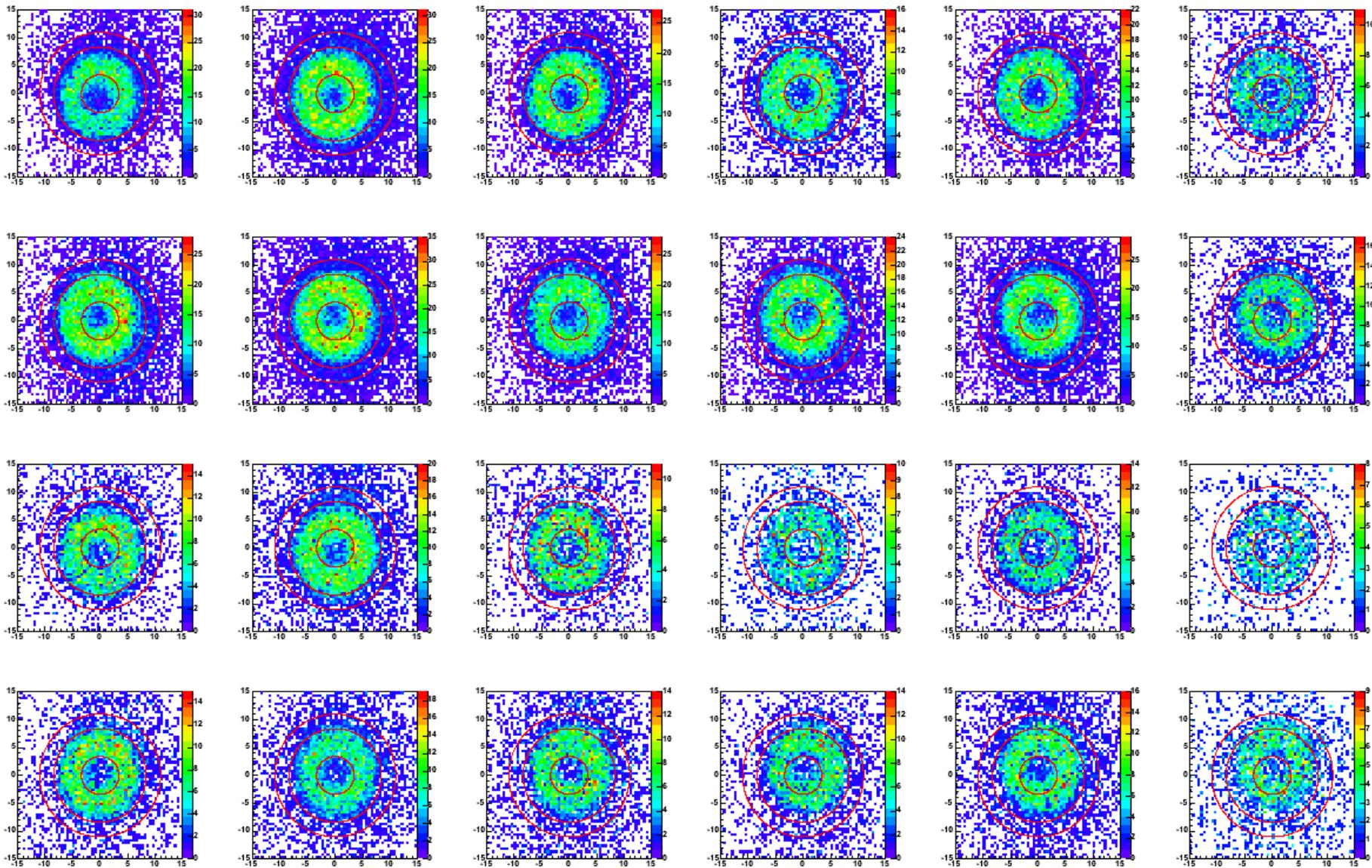
WS with previous parameters



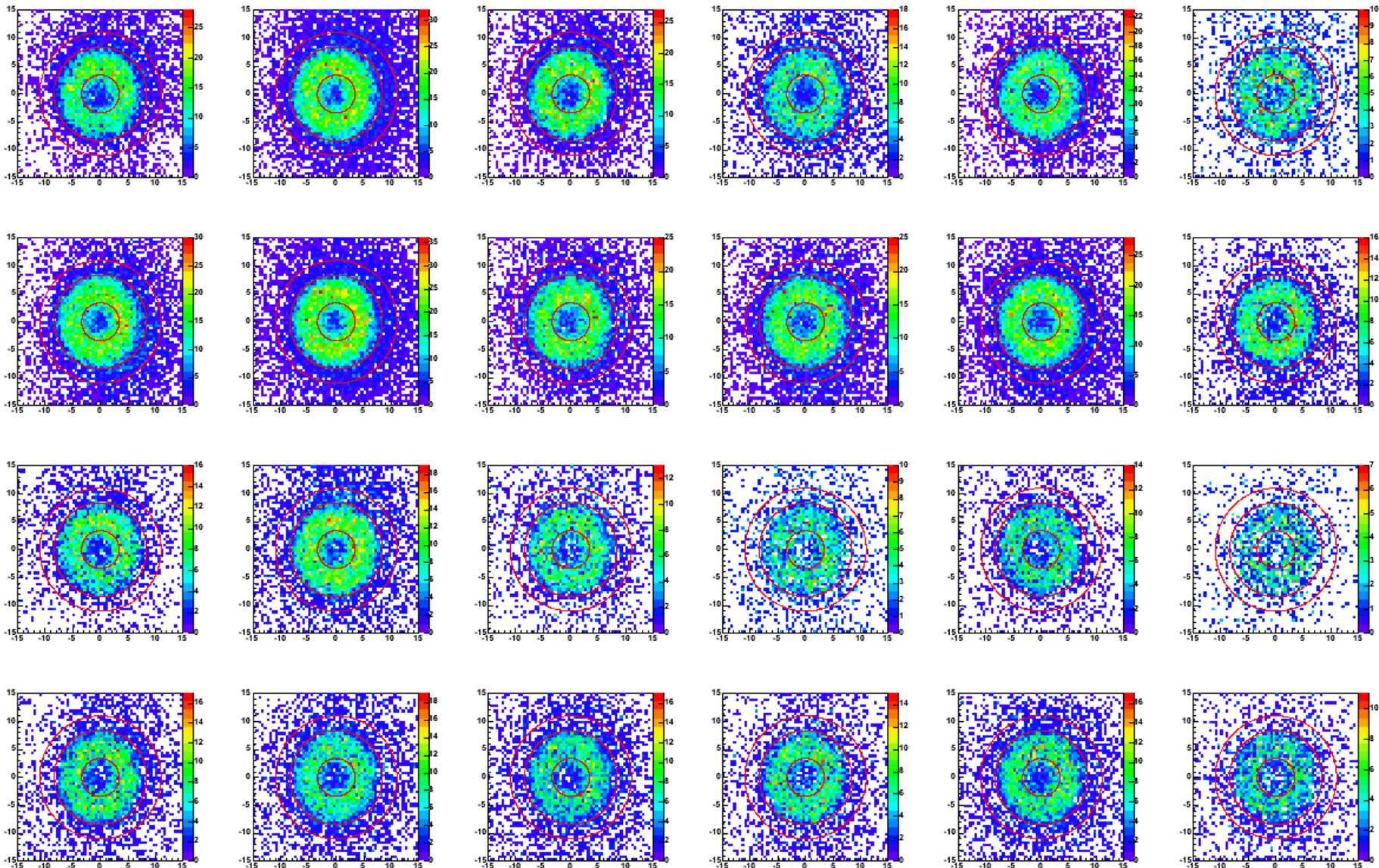
WS with new parameters



WN with previous parameters



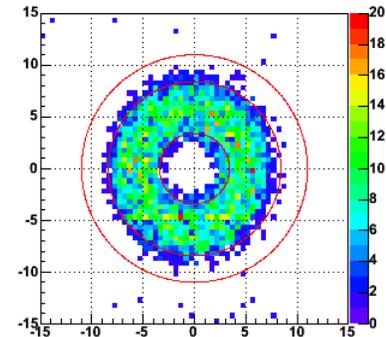
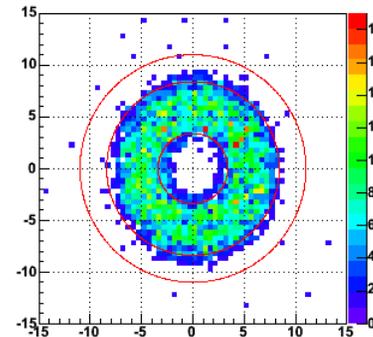
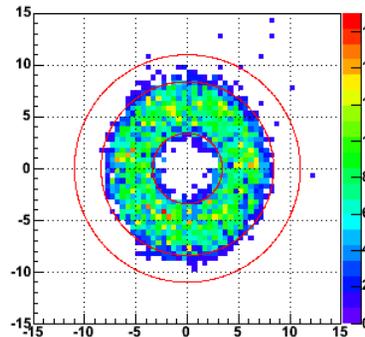
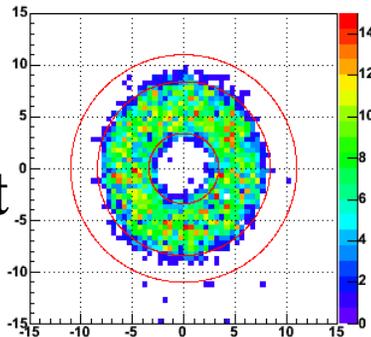
WN with new parameters



Simulation Tuning

- This is on going.
- UseSurvey for simulation makes the n_0 distribution different as real data.

Default



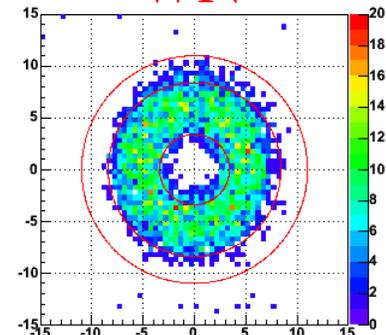
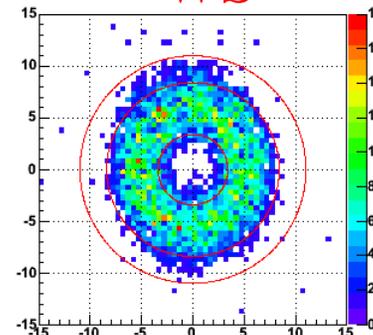
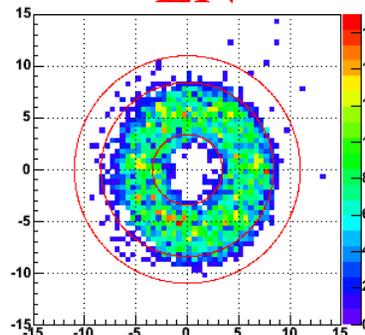
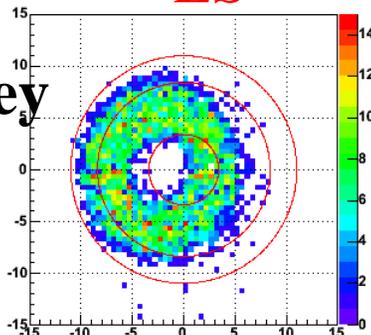
ES

EN

WS

WN

UseSurvey

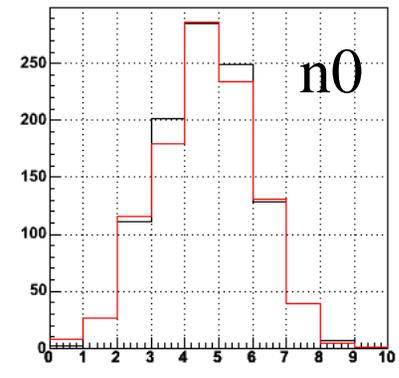
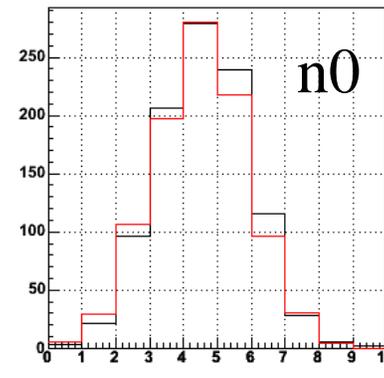
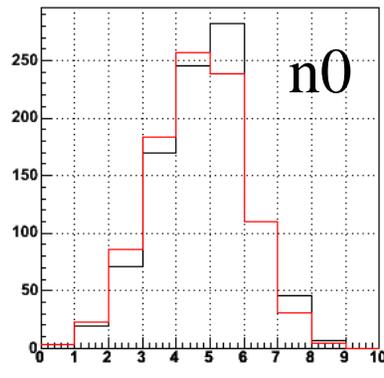
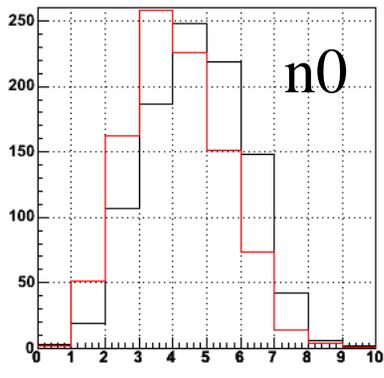


n0 comparison in simulation

- n0 and n1 distribution with and without UseSurvey.

Without UseSurvey

With UseSurvey

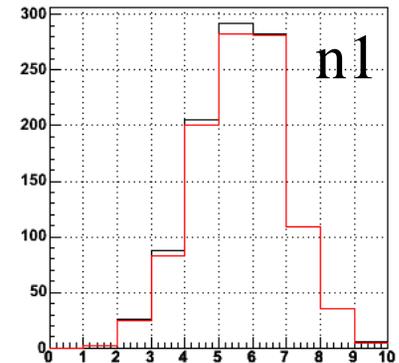
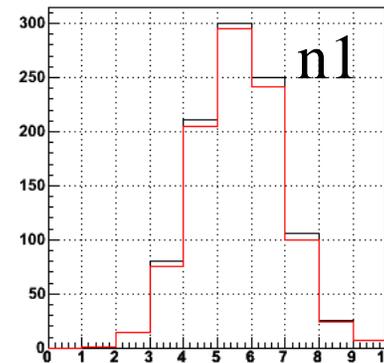
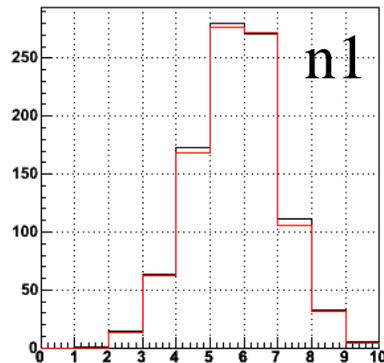
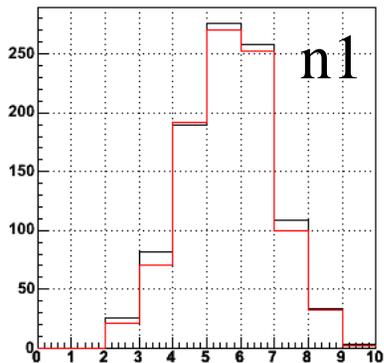


ES

EN

WS

WN



Similar tendency as seen in real data.

Summary & Outlook

- Problem is understood.
 - Mirror position is different in alignment calibration and in reconstruction due to the use of UseSurvey Option.
- UseSurvey should be used in alignment calibration as used in reconstruction.
- All the alignment calibration codes were updated and committed into CVS.
- Susumu finished working on re-alignment of RICH Mirror for Run5 Cu+Cu and calibration parameters were already committed.
 - Ready for the production of Run5 CuCu.
- Taku is working on the tuning of RICH in simulation.