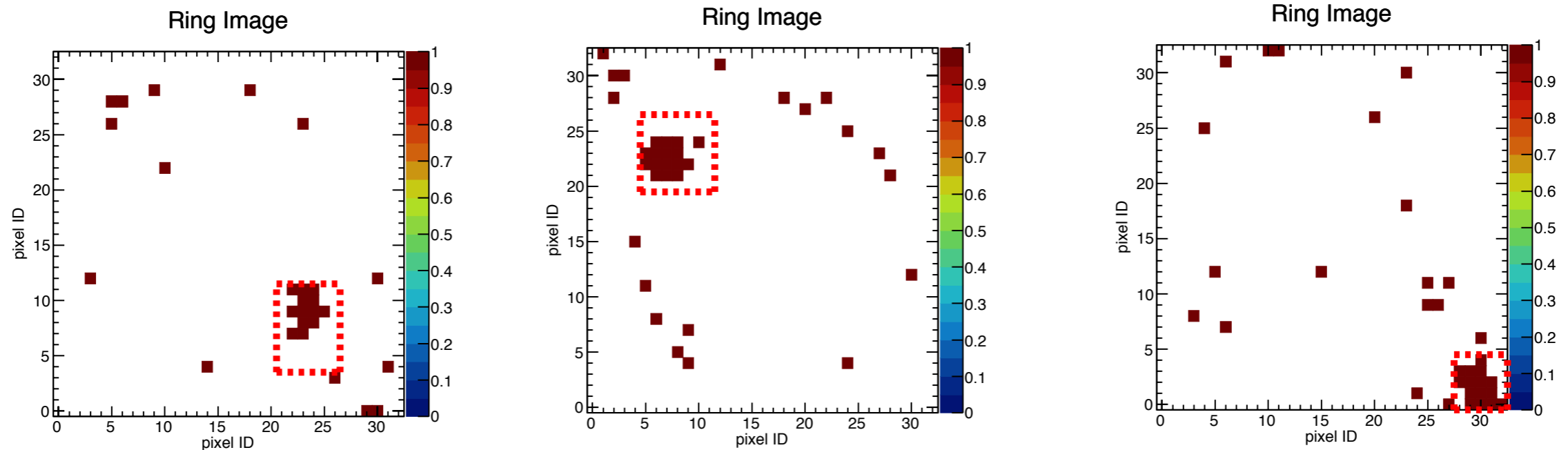




Test Beam Calibration Update with Beam Finder

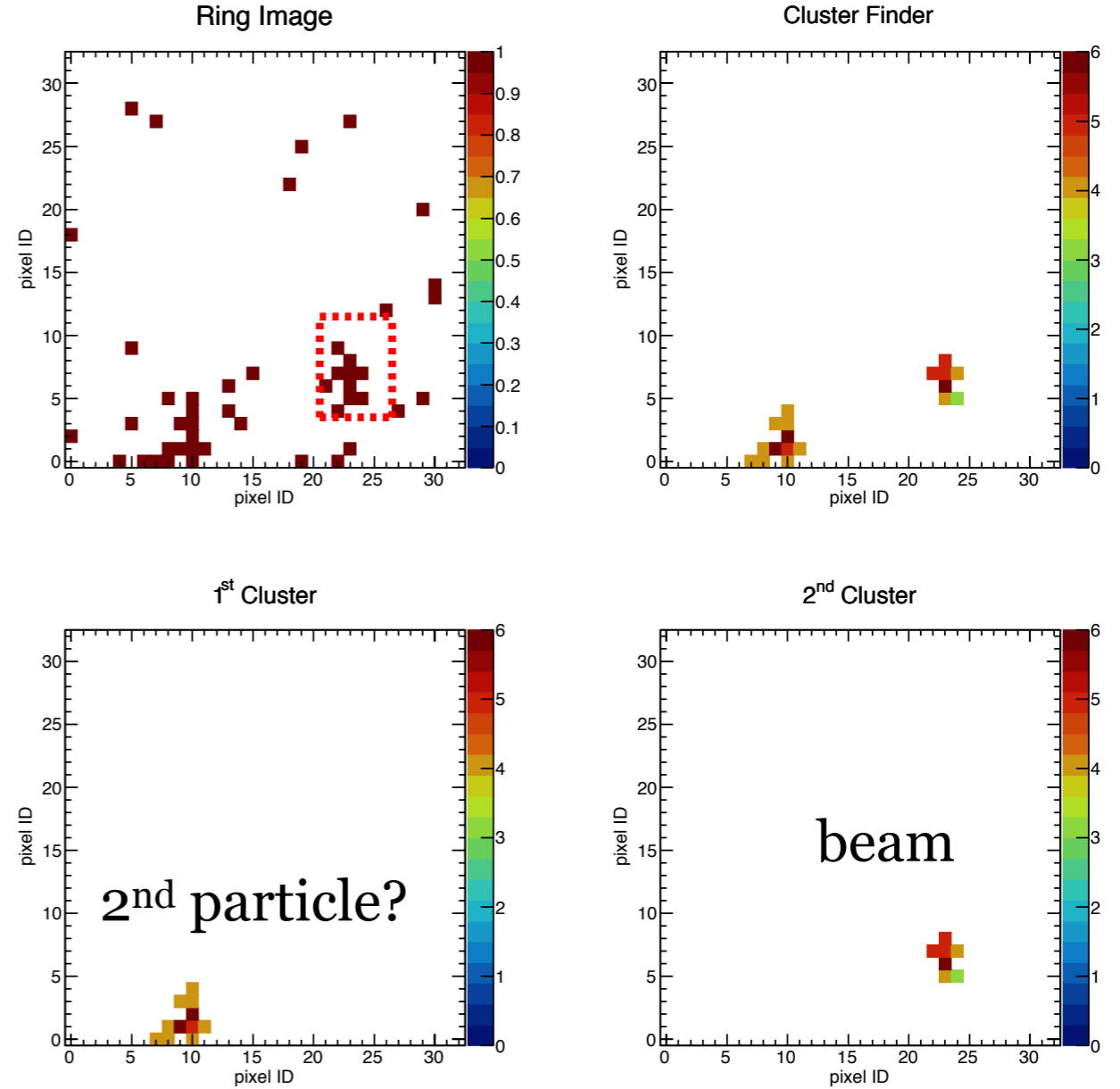
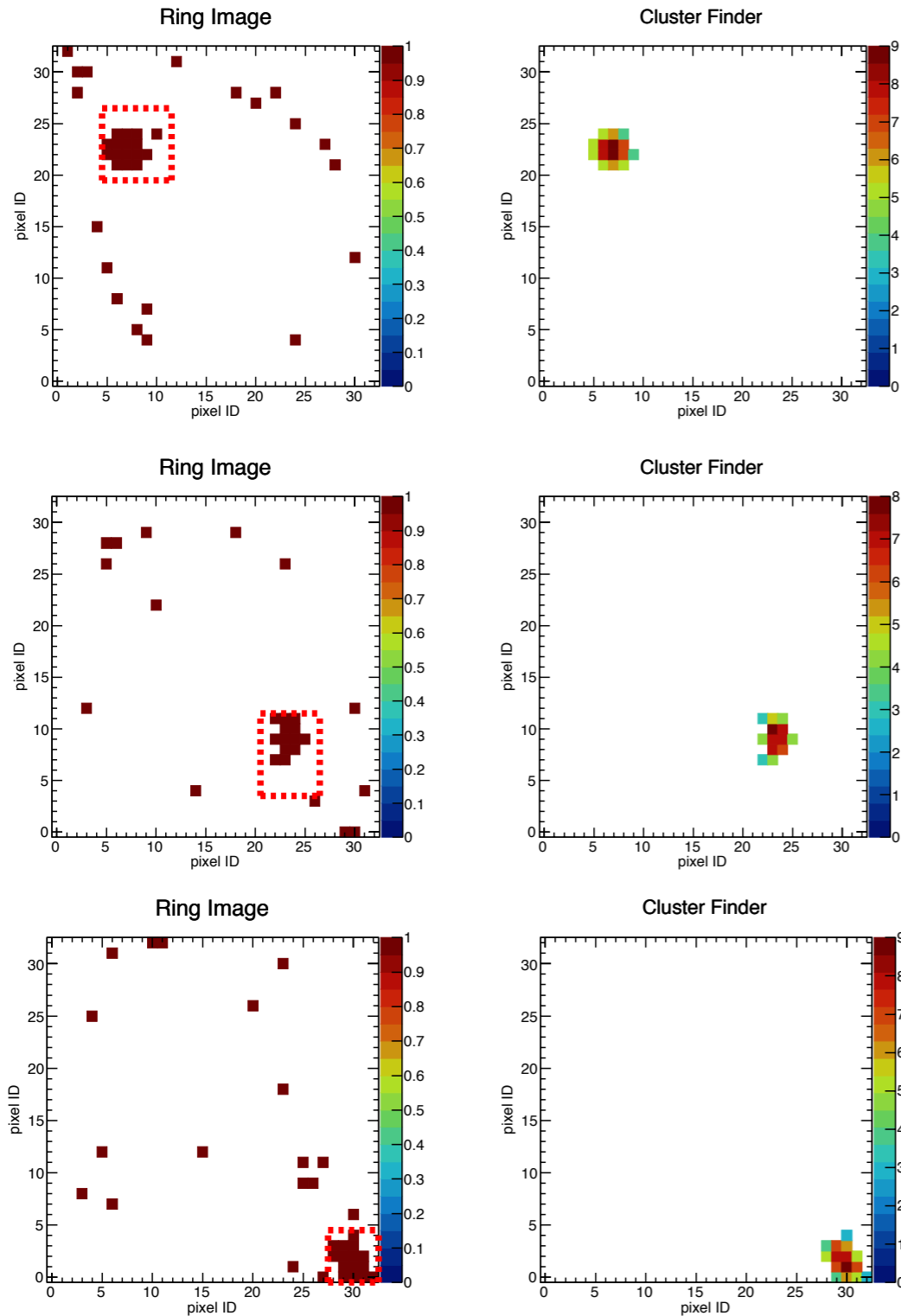
Xu Sun
Georgia State University

Beam Finder Algorithm



1. when beam hits one of PMTs, a large area of pixels got signal => cluster
2. pick one fired pixel (original ranking is 0) => calculate distance to the rest of pixels
3. if one pixel is within 3 pixels (5×5 cluster finding) => increase original ranking by 1
4. repeat 2-3 to all fired pixels => save all pixels with a ranking higher than 4 ==> all clusters with at least 5 adjacent pixels will be saved
5. pick the pixel with highest ranking => calculate the distance to the rest of saved pixels
6. if one pixel is within 5 pixels (make sure 2 5×5 adjacent cluster merged to 1 cluster) => group with the picked pixel ==> cluster 1
7. repeat 5-6 until all pixels got grouped => only save 3 clusters at most
8. can be also used for 3×3 clusters search

Beam Cluster



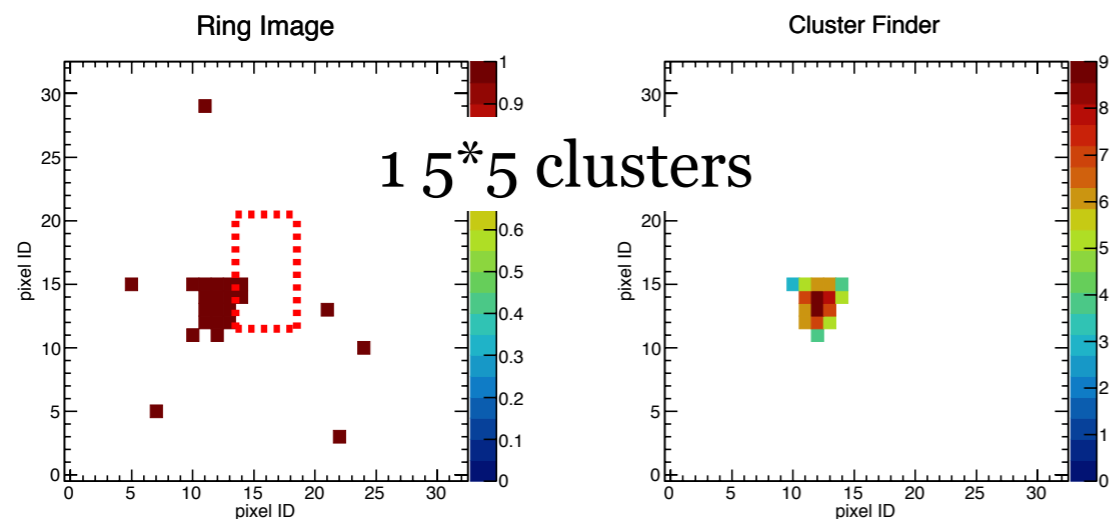
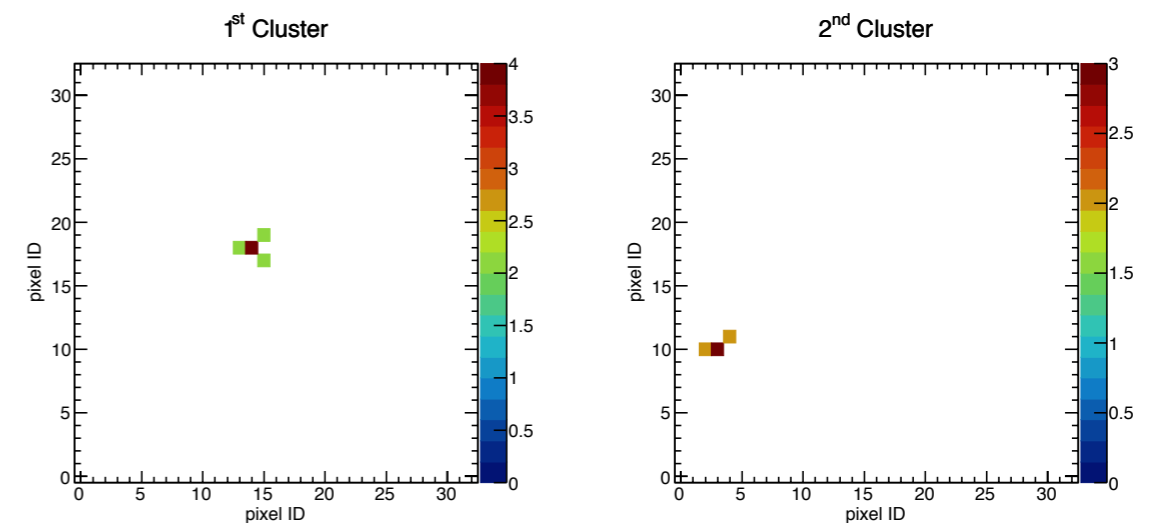
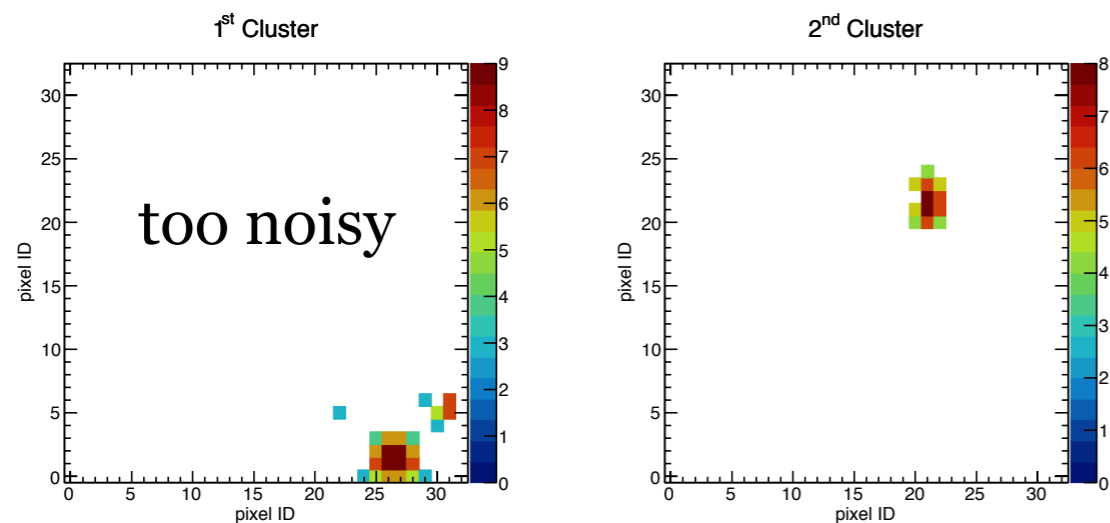
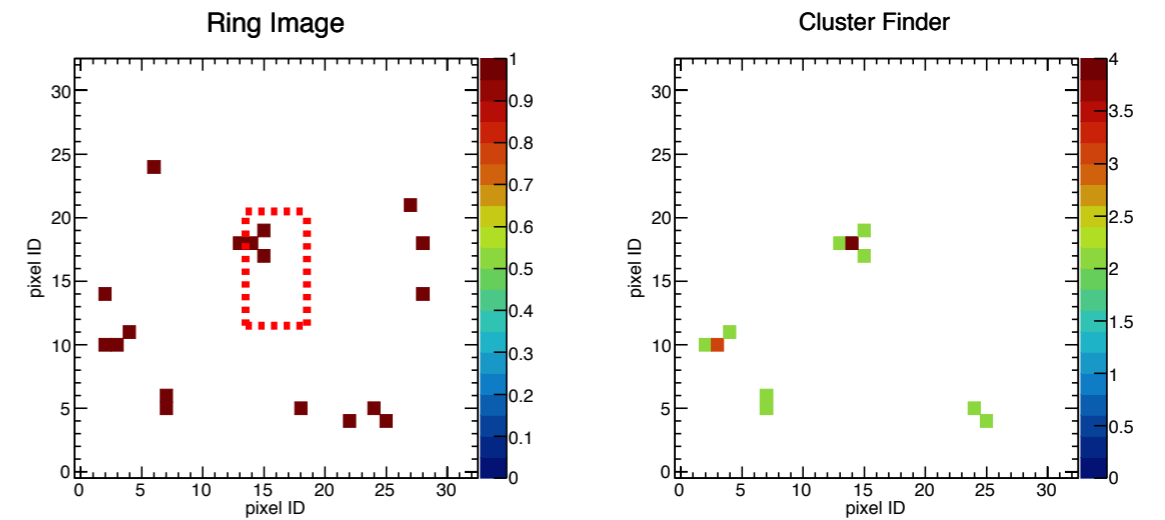
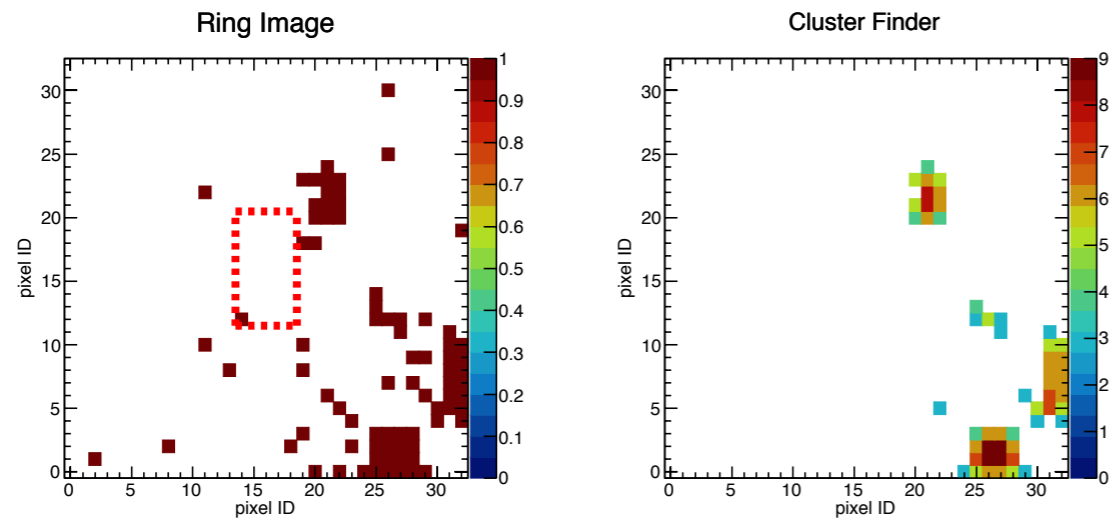
if an event have more than 3 clusters => considered too noisy

Beam Clusters in Calibration Runs



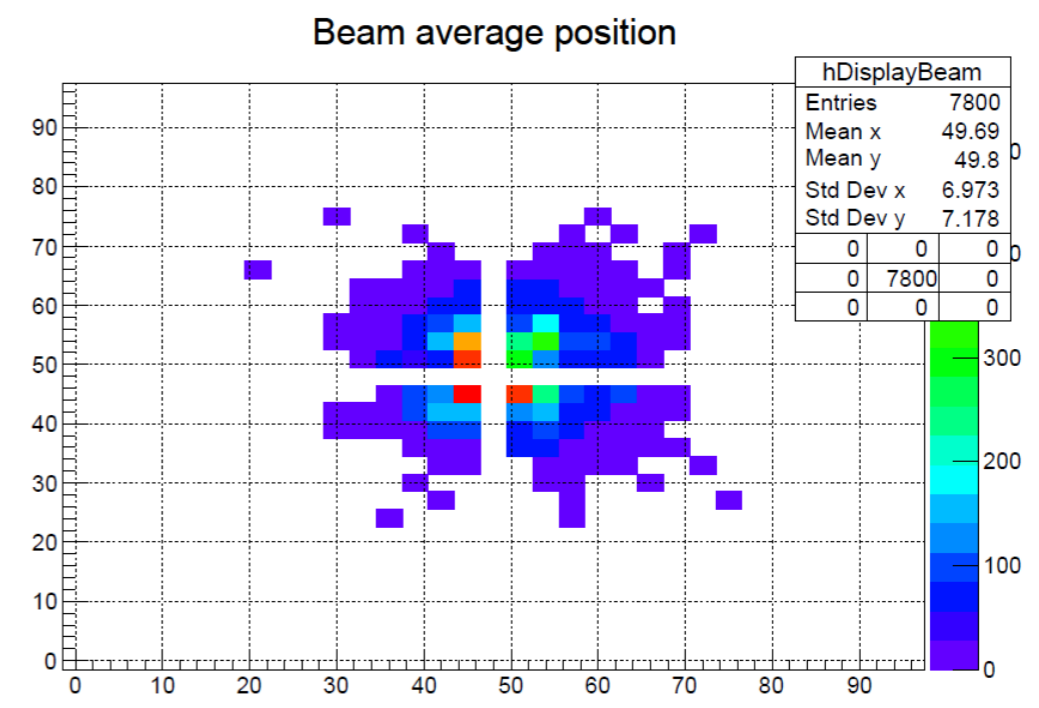
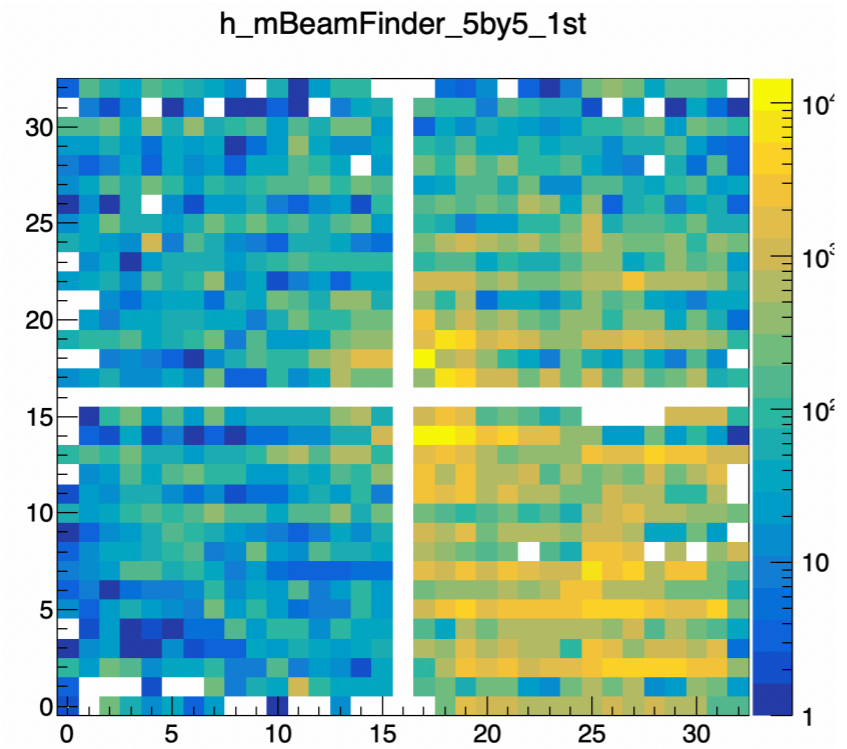
3 5*5 clusters

2 3*3 clusters

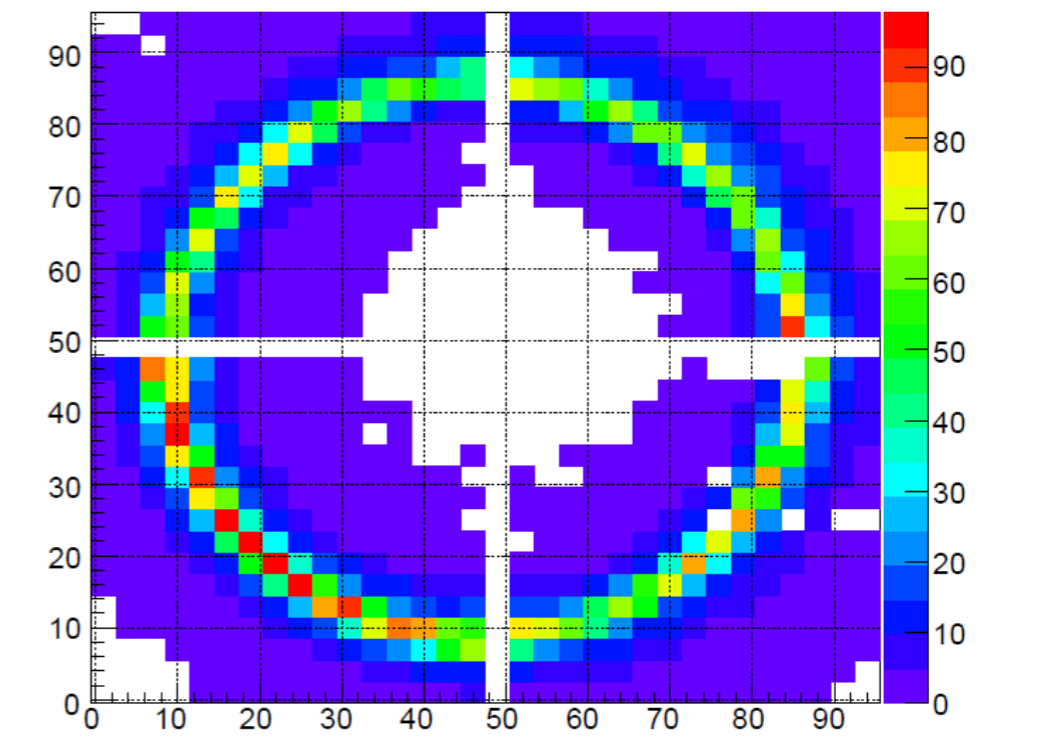
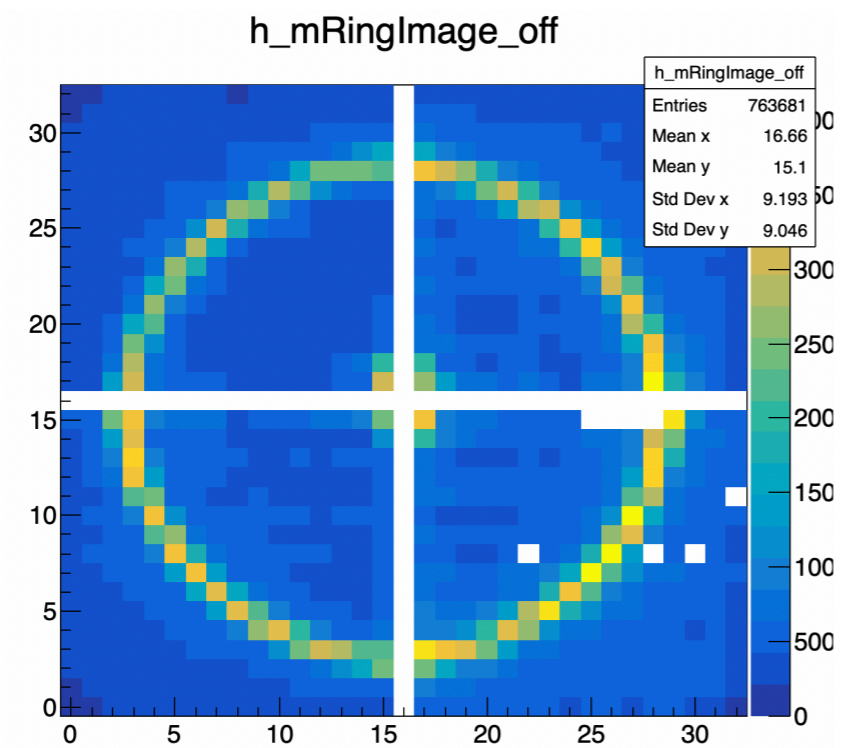


- for calibration analysis require no 5*5 and 3*3 clusters

Beam Cluster Distribution

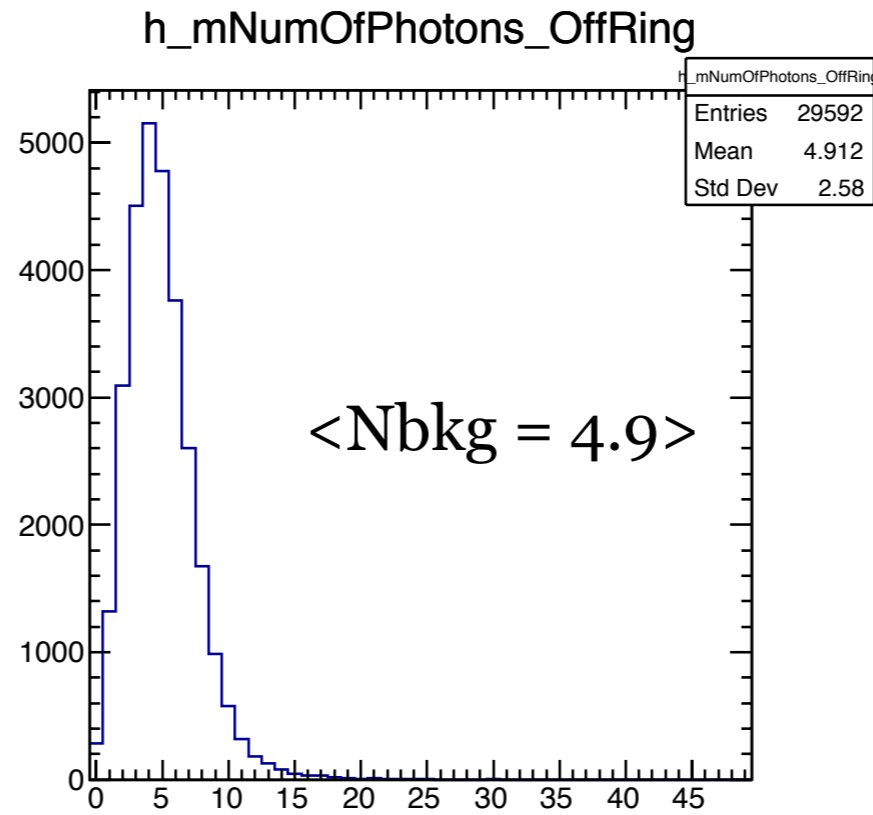
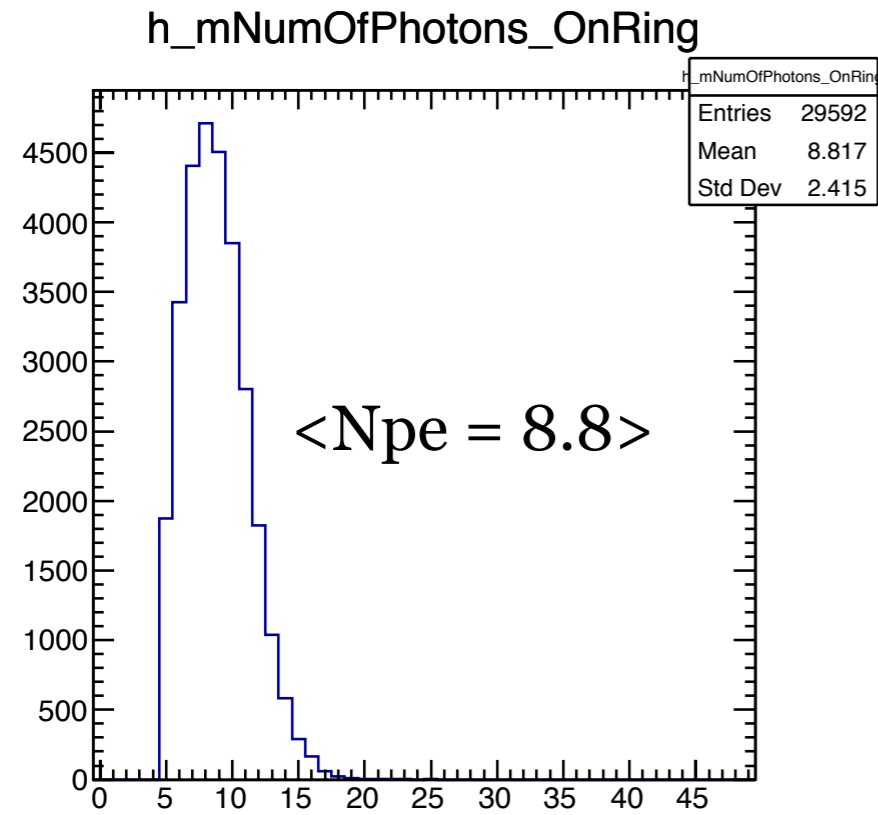


Marco's algorithm

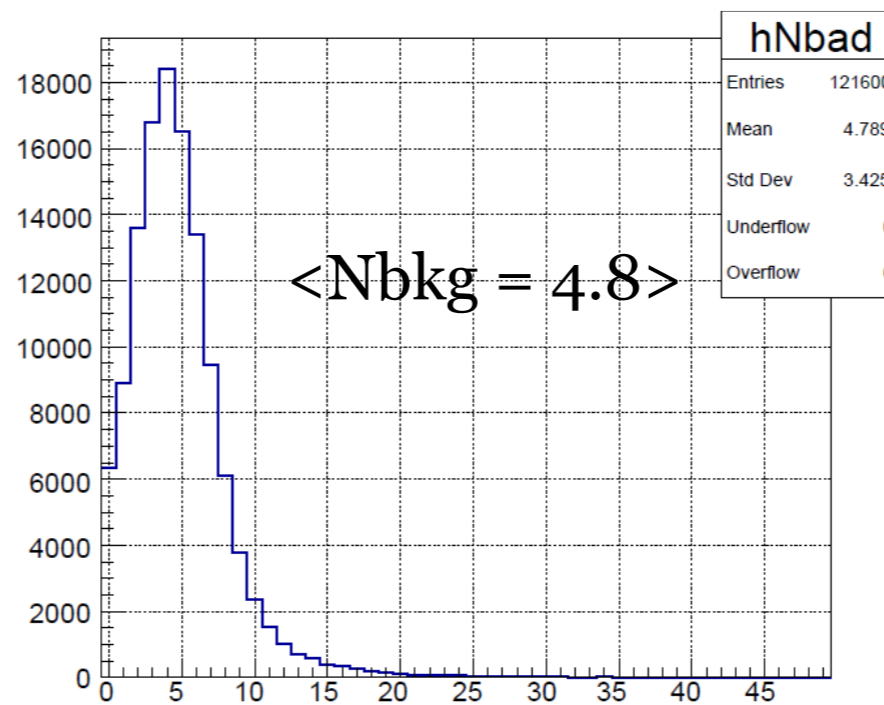
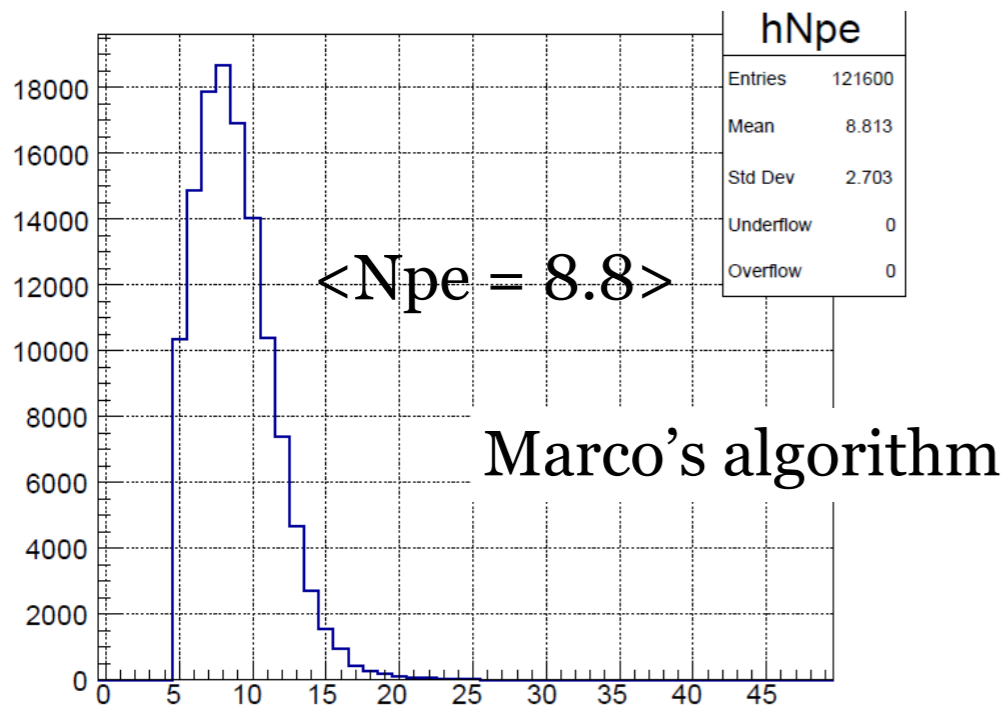


no 5*5 and 3*3 clusters

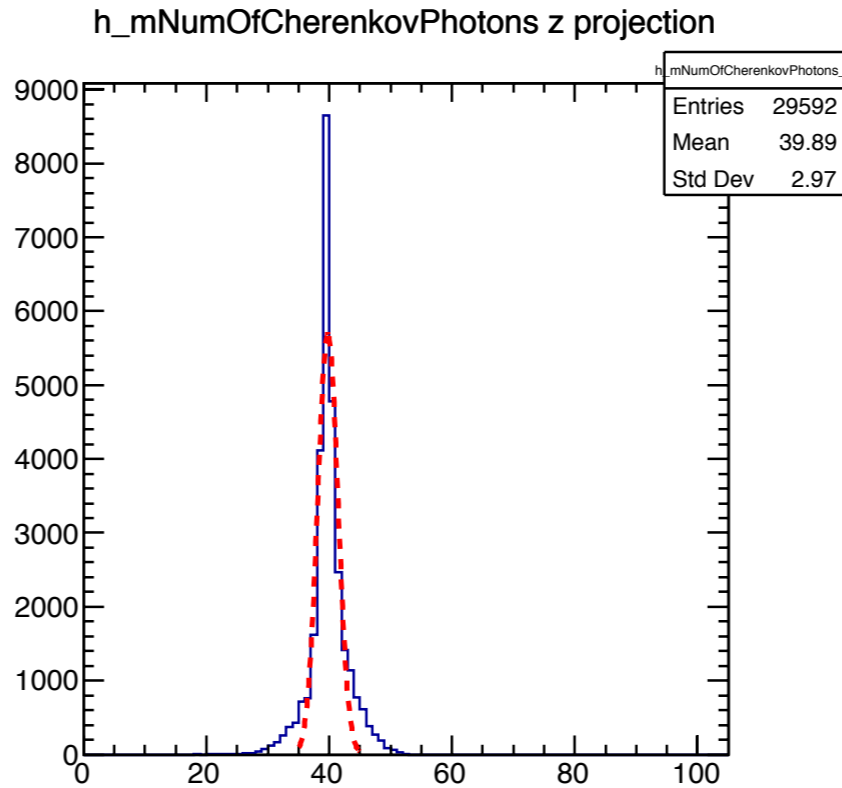
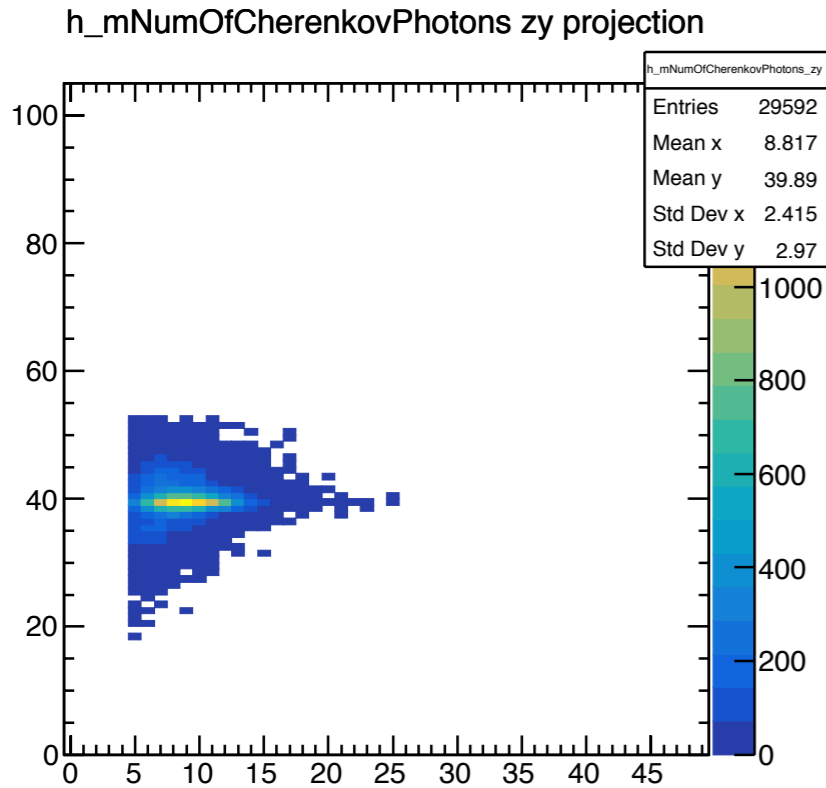
Number Of Photons



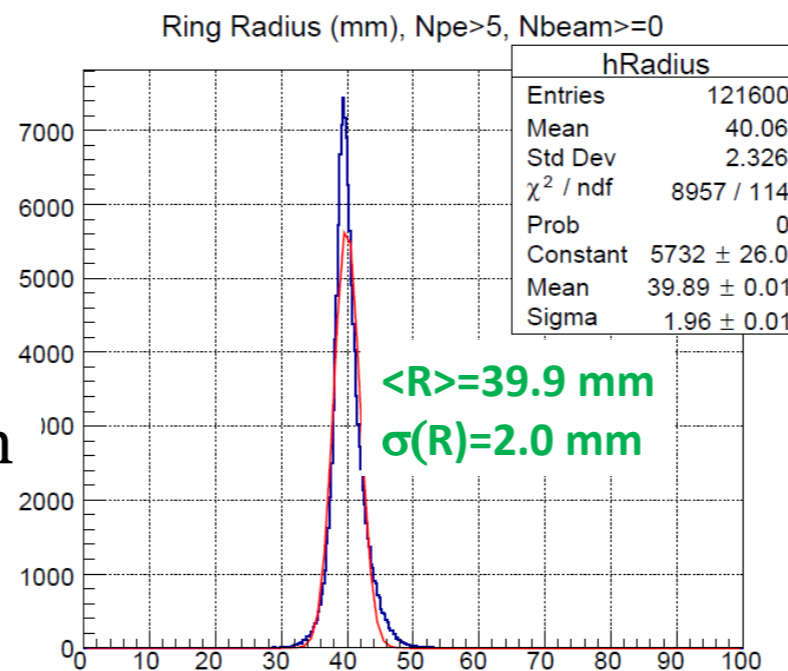
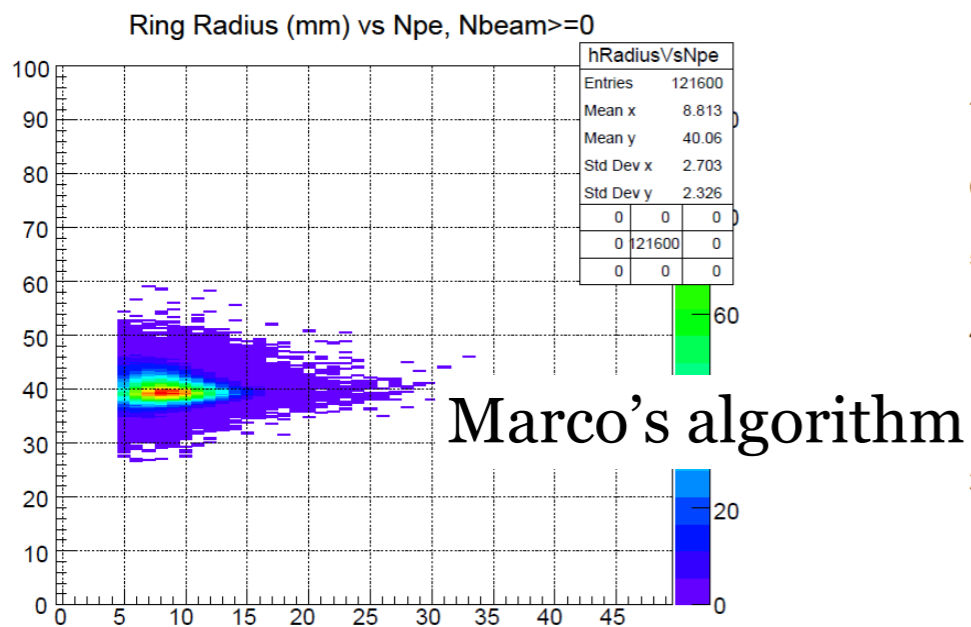
- Number of photon electrons are consistent
- Number of noise electrons are consistent
- Will use same number of noise electrons in simulation



Ring Radius



$$R = 39.8 \pm 1.7 \text{ mm}$$



- require ring center from Hough Transformation is located in the center of mRICH
- radius are consistent

Summary and Outlook



- Beam Finder developed => code need some polishing
- => [git@github.com:sunxuhit/BeamTest_mRICH.git](https://github.com:sunxuhit/BeamTest_mRICH.git)
- Number of photon electrons, noise electrons and ring radius are consistent with Marco
 - Need to understand Marco's cluster algorithm
 - Update simulation to match data
 - Extract angular resolution for September Meeting
 - Start to investigate Position Scan (mRICH principle) and Threshold Scan (noise level) data with PMTs