

Validation of on-orbit calibration of longitudinal position measurement

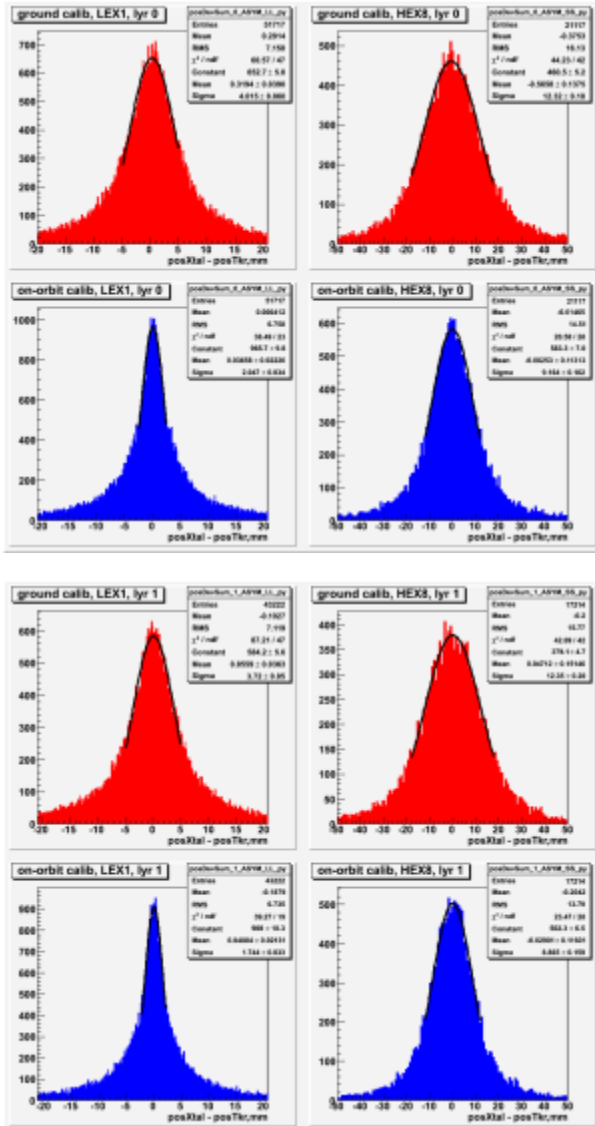
The on-orbit asymmetry calibration is based on 1.5 months of nomSciOps data collected by August 14, 2008 (~ 500runs: 236249505 - 240374588). The calibGenCAL executable genGCRCalib.exe used both gcr and digi root files. Only events and hits selected by GCRCalib are used. Addition selection cuts were applied:

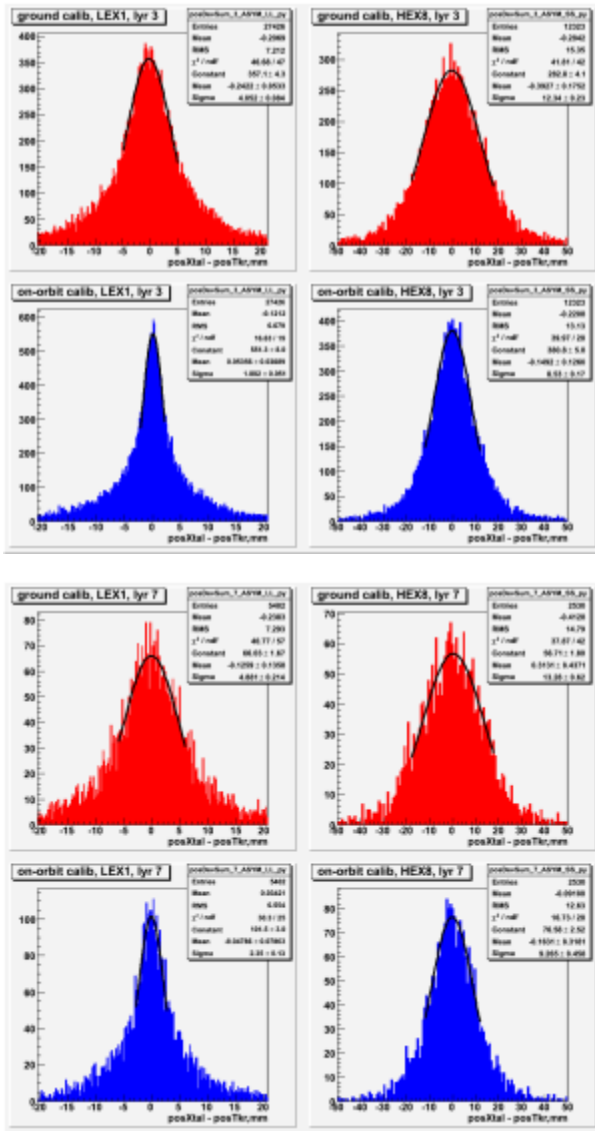
- ThkrNumTracks == 1
- tracker track quality cut (Tkr1Chisq)
- theta angle < 45 degrees
- xtal energy depositions between 200 MeV and 900 MeV
- only tracks crossing top and bottom surfaces of the crystal
- 3 cm excluded from each crystal end

Individual pedestal files were used for each run, these pedestal files were generated by the same executable.

To validate the asymmetry calibration obtained by the above procedure the deviation between longitudinal position measured by crystal asymmetry and extrapolated from tracker was plotted separately for each CAL layer and big and small diodes (LEX1 and HEX8 ranges).

The resulting validation histograms for layers 0,1,3 and 7 are shown on the following plots:

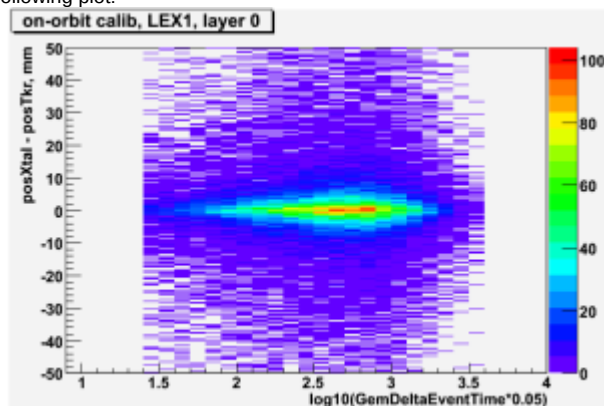




On the histograms for all layers the new asymmetry calibration definitely improves the position resolution:

- for LEX1 range resolution is ~4 mm for old calibration and ~2mm for new calibration
- for HEX8 range resolution is ~13 mm for old calibration and ~9 mm for new calibration.

There is significant population of events having much worse position resolution and creating non-gaussian tails. The origin of these effect is not clear. My initial suspect was shaped readout noise, but there is no correlation of position deviation with GemDeltaEventTime, as show on the following plot:



Another possible reason could be the bad tracker reconstruction causing the track to clip crystal corner and significantly increase the error in the pathlength correction and calculation of the mean position of the track segment inside the crystal.

In spite of this problem, the above validation clearly confirm the improvement in position measurement using new asymmetry calibration and validates the request to replace the old ground asymmetry calibration with the new on-orbit calibration in pipeline processing.