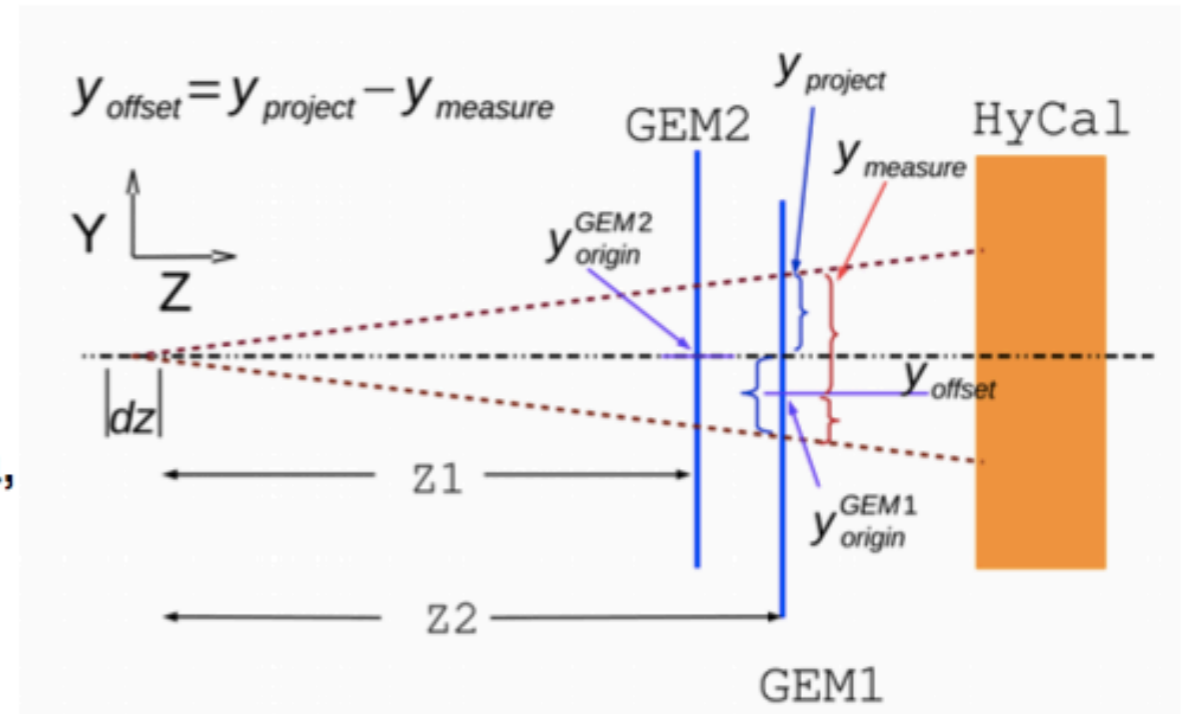


Method1 (old offset table), in each run:

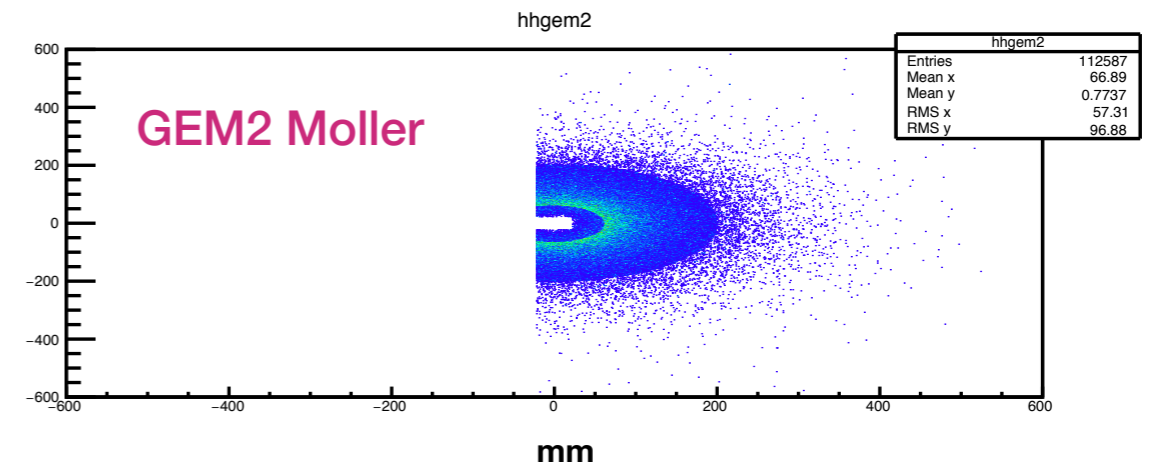
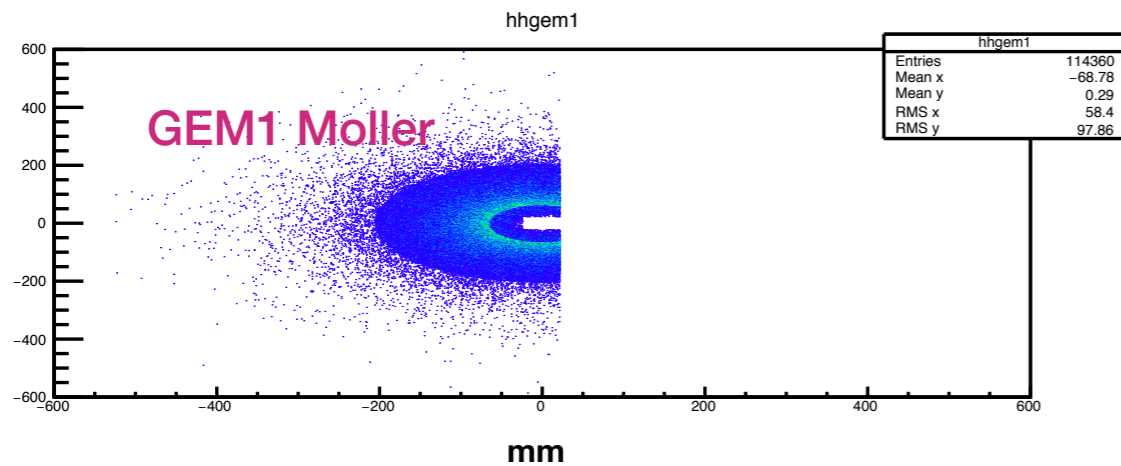
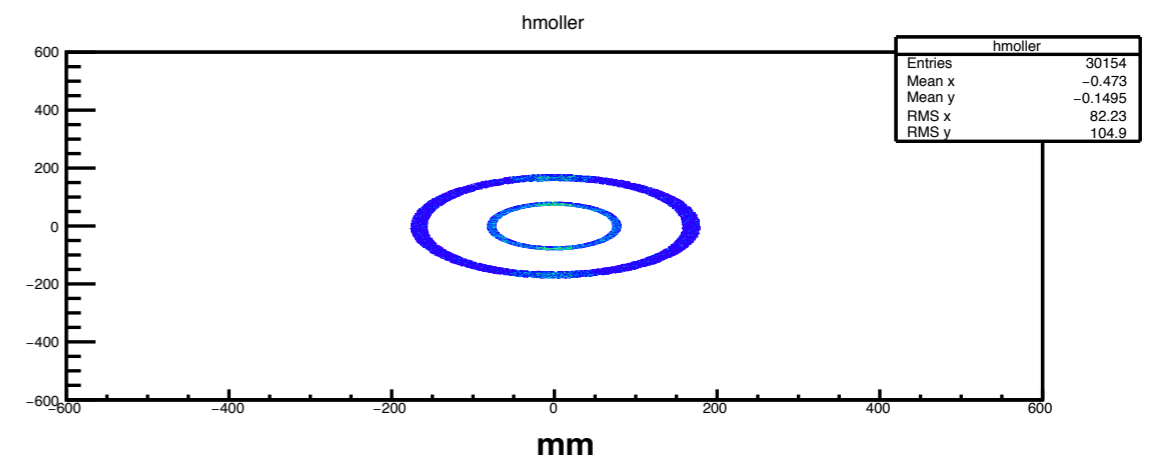
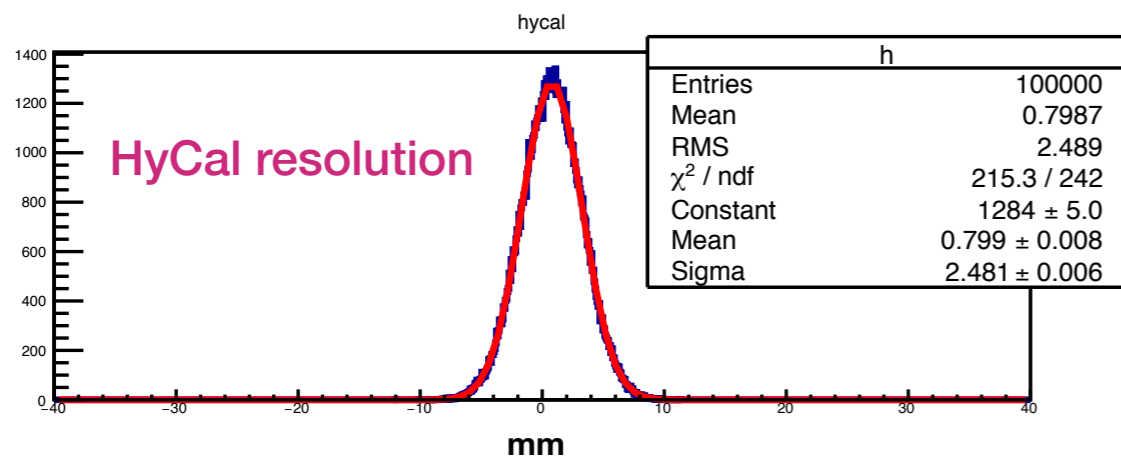
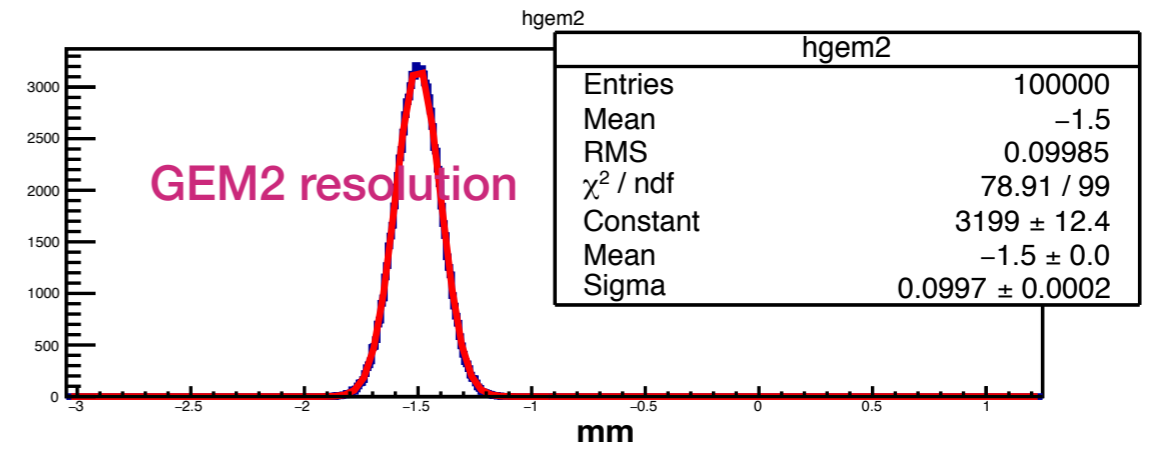
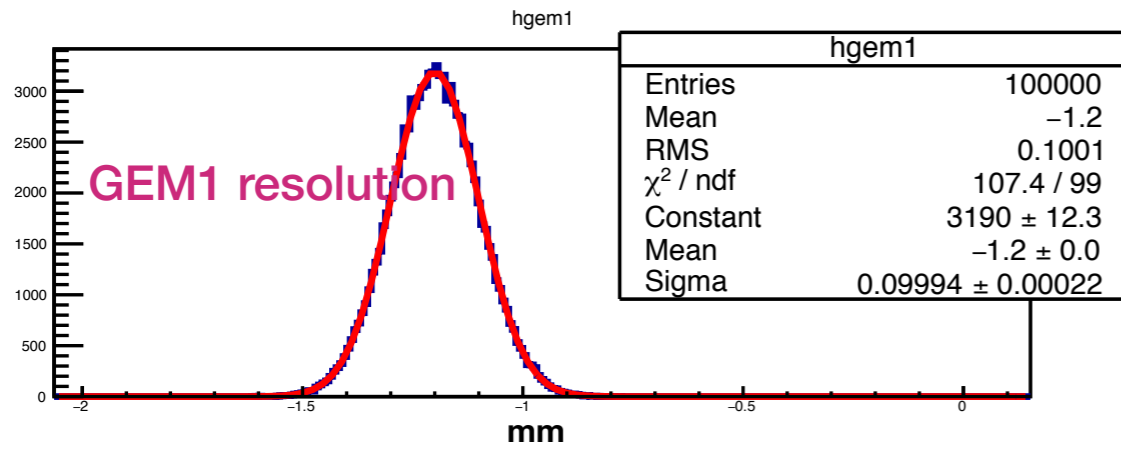
- Using overlap area, get detector offset (against 2nd GEM chamber)
- Correct offset
- Use ee2 events, in GEM2 coordinates, get beam center, (using the whole detection area, not limited to overlap area)
- Get offsets for each detector



Method2, in each run:

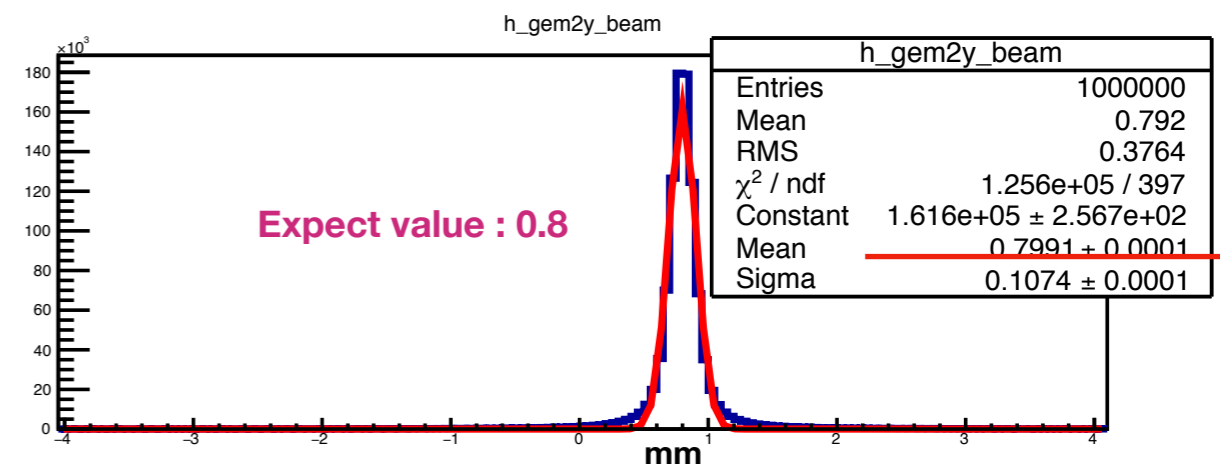
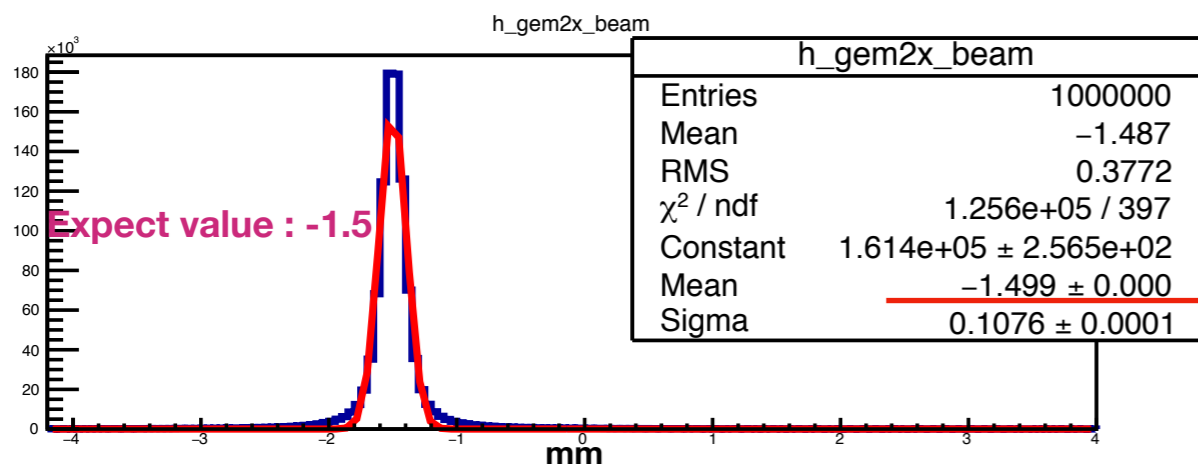
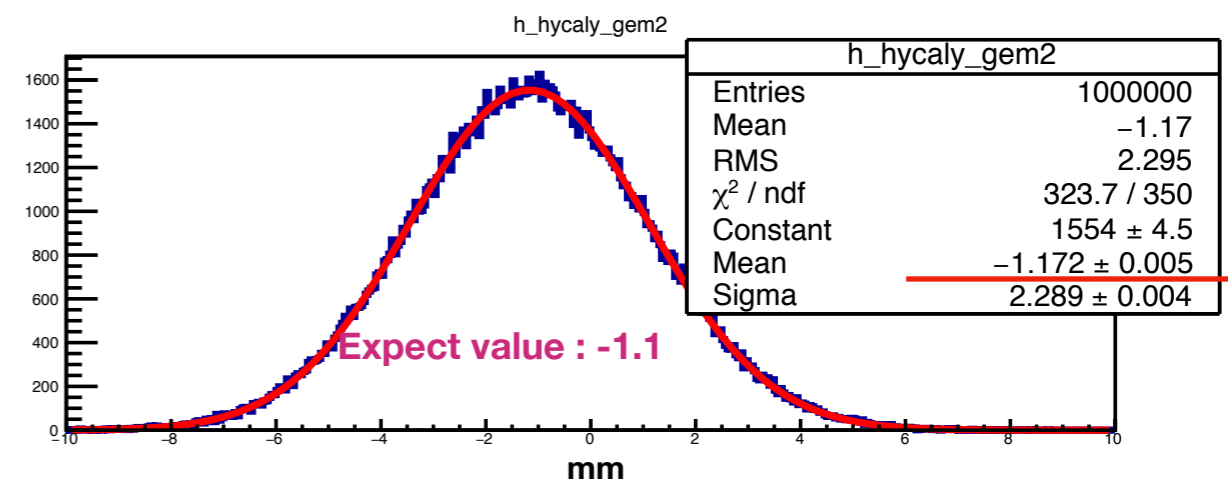
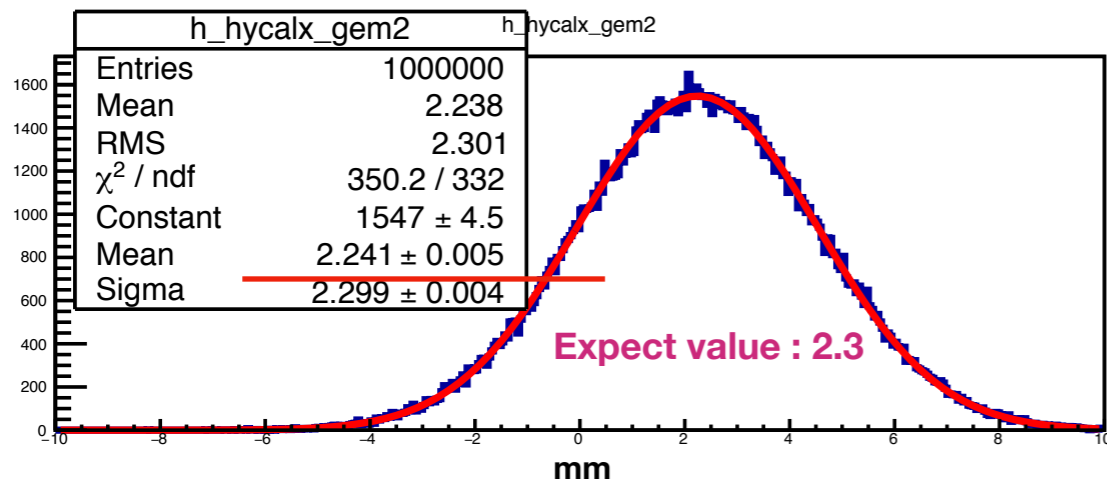
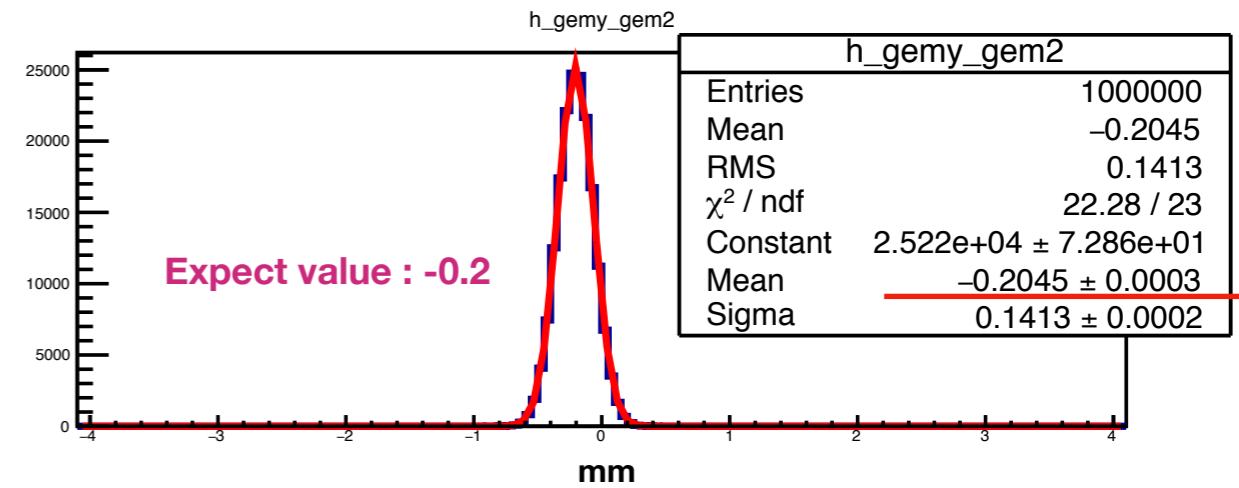
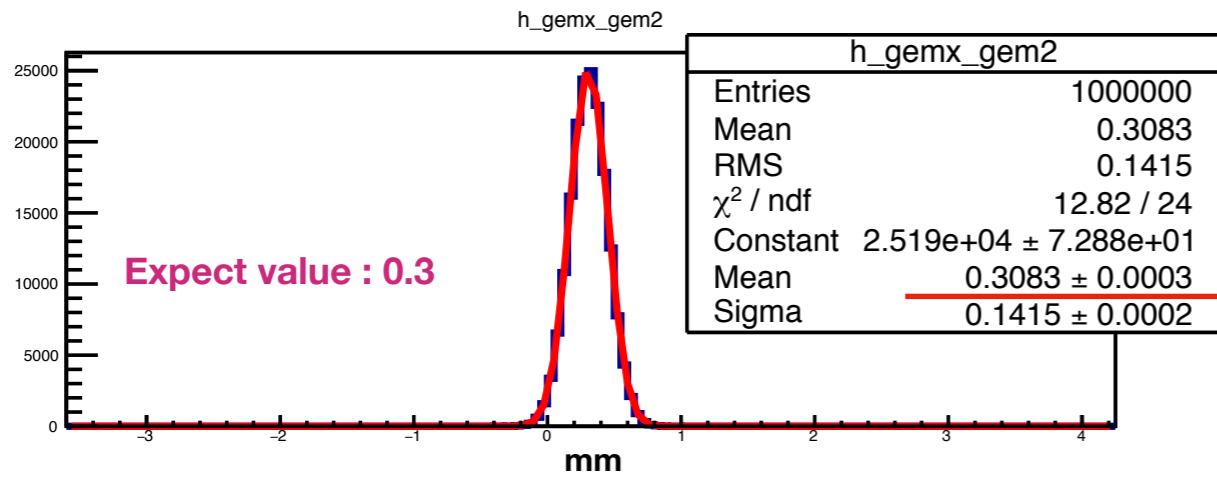
- In overlap area, use ee2 events get beam center,
- Get beam offset for each GEM detector, (can only use overlap area)
- In the whole detection area, use ee2 events to get HyCal offset against beam

Simulation test on validity of methods

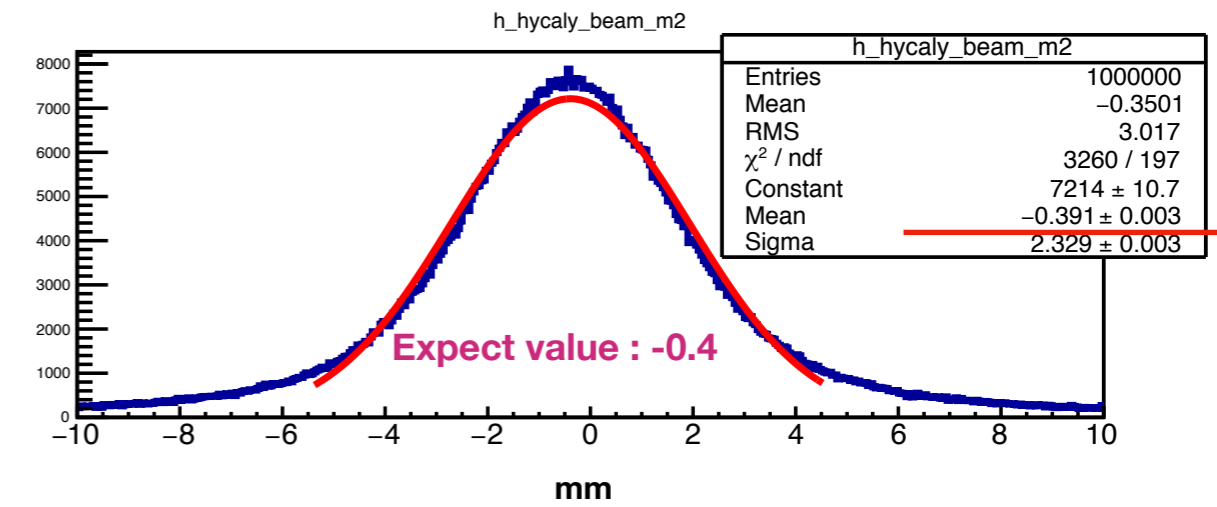
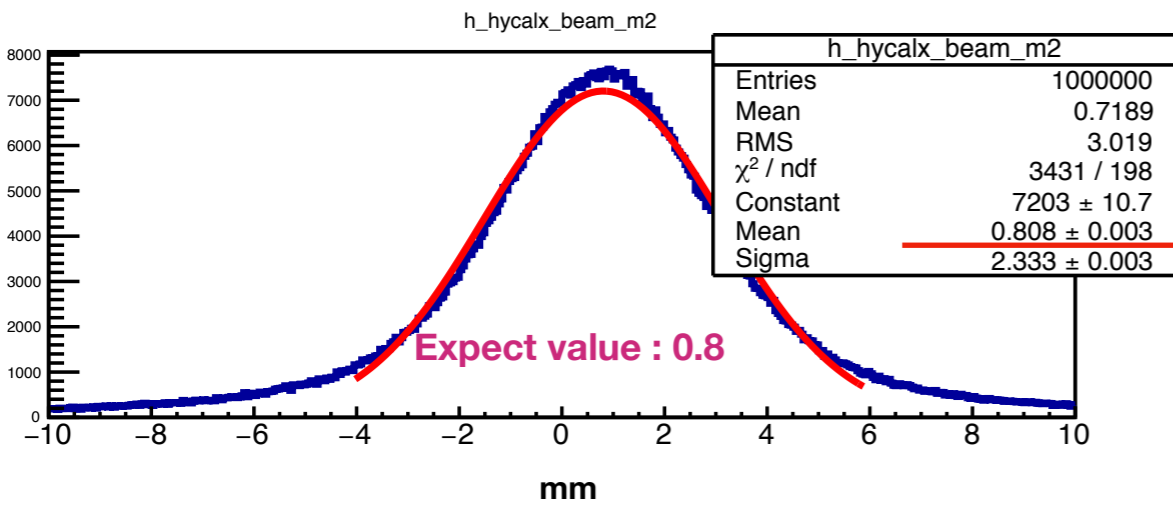
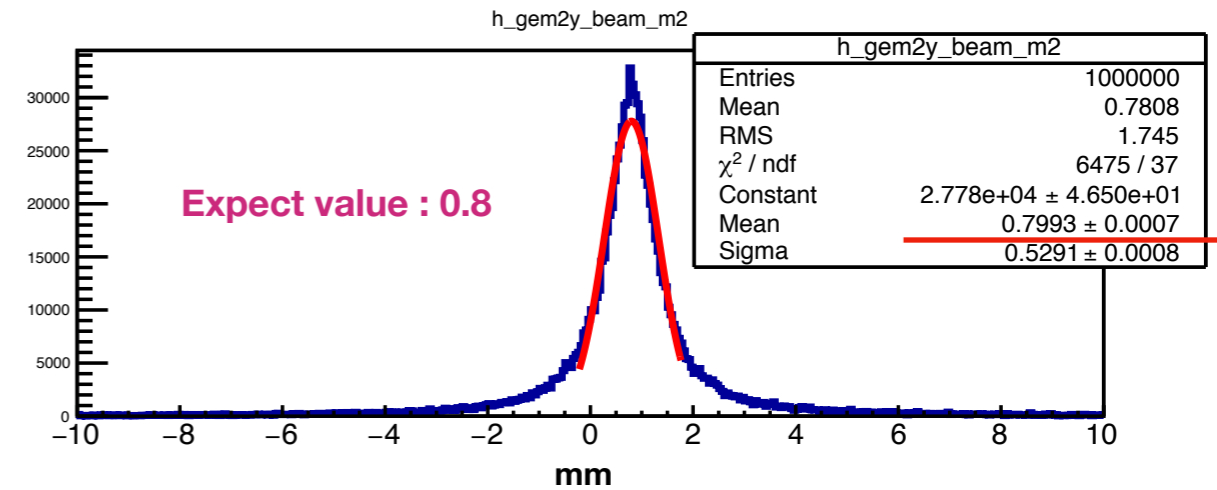
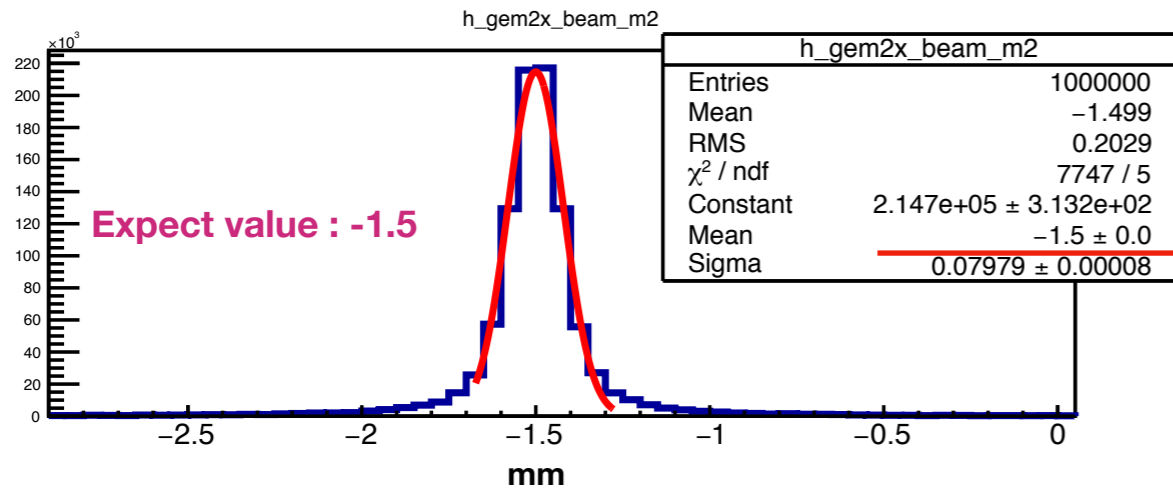
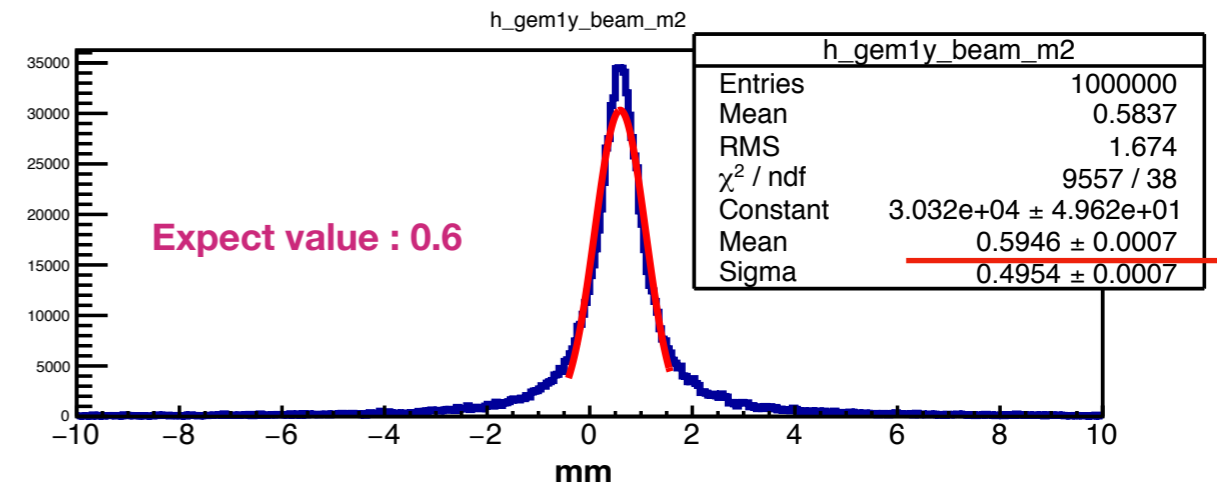
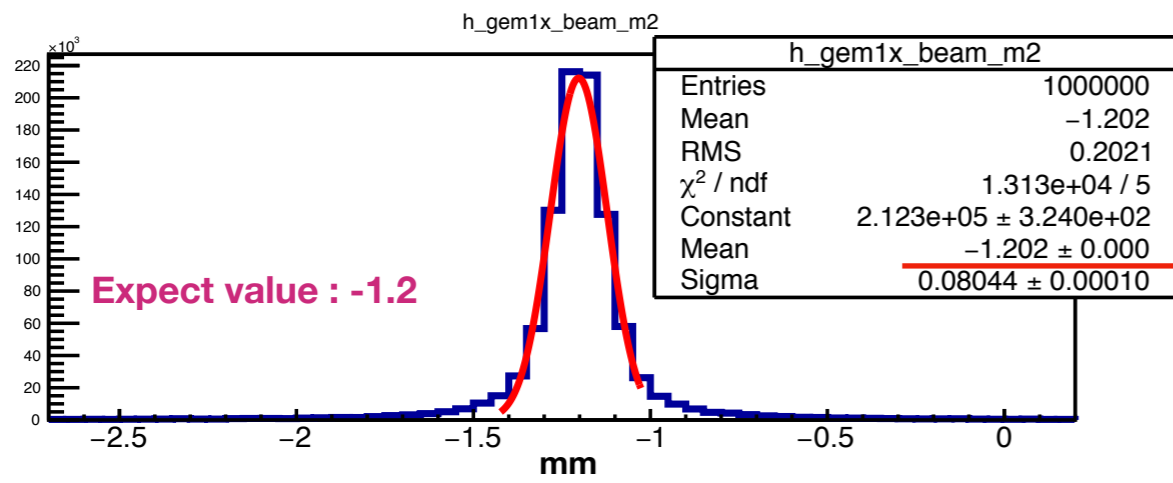


- Detectors were given a fixed offset in simulation.
- Use simulation data to test if the two methods give the correct offset value

Method1 on simulation data

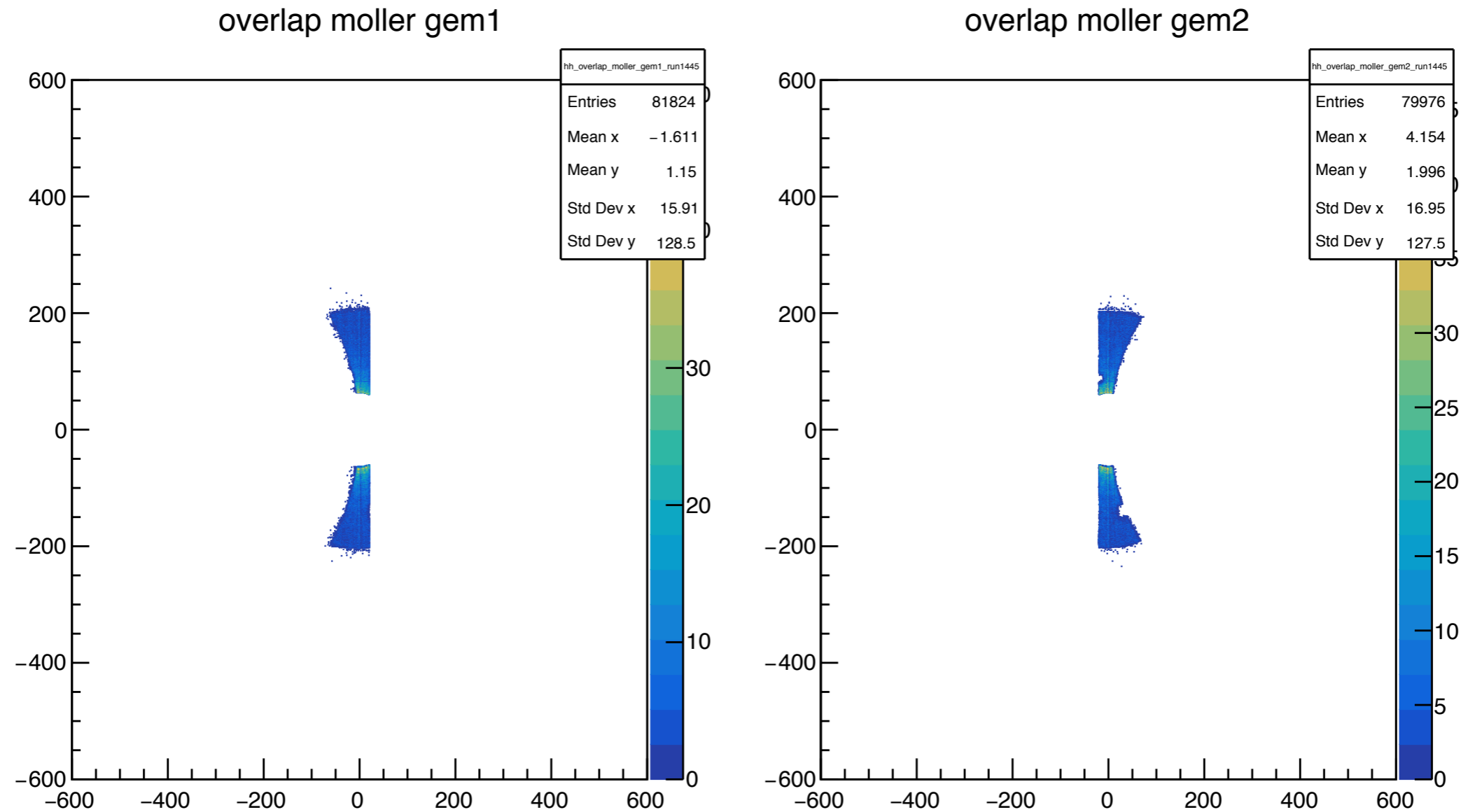


Method2 on simulation data



Compare to method1: distribution is wider

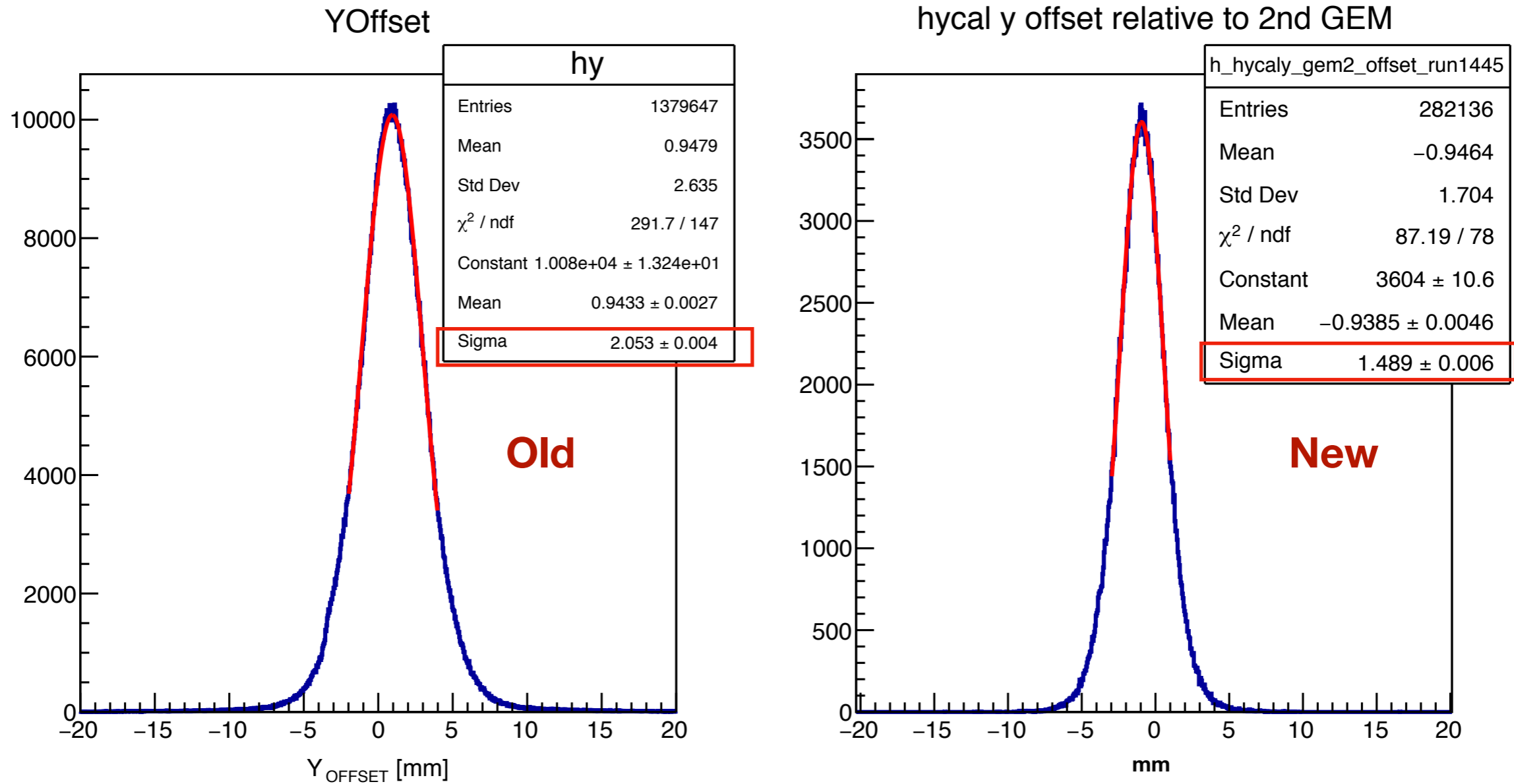
Data: overlap ee2 events



Change compared to previous:

- require two ee2 events to find instant beam position
- Previously require the two ee2 events to be time neighbors, like event #N and event #(N+1)
- Now also require to be time adjacent, but need not to be close, like event #N and event #(N+m), $m \geq 1$

Data: HyCal clustering improvement

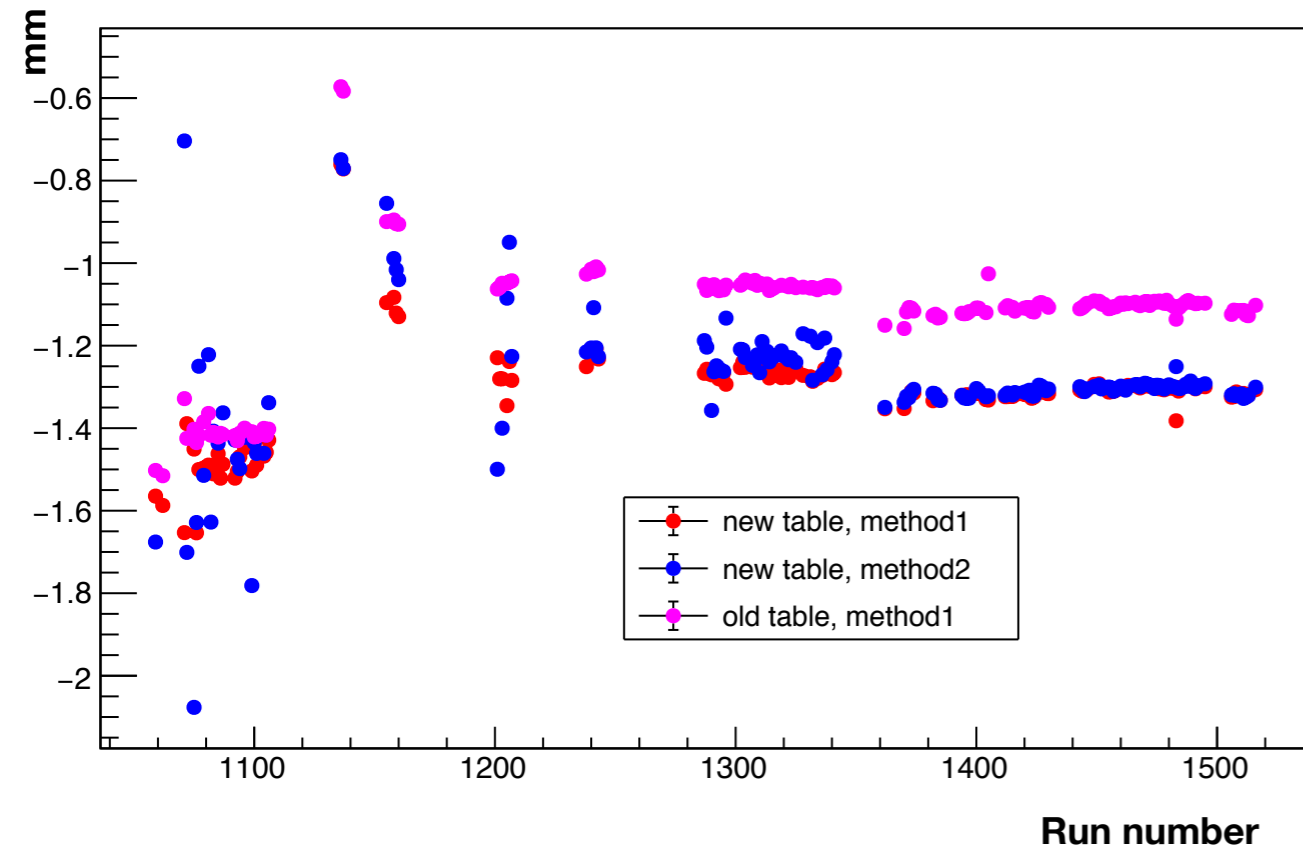


HyCal detector offset relative to GEM2

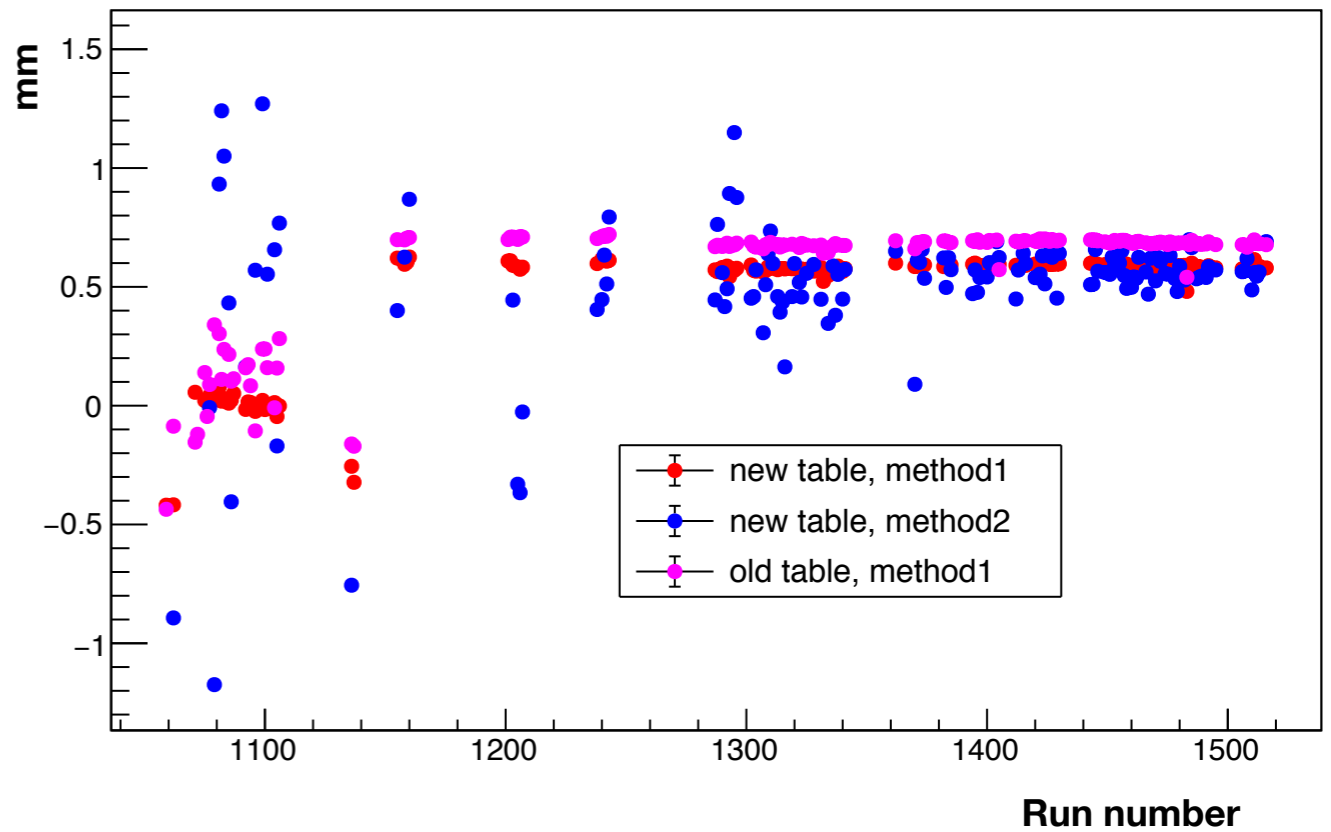
Due to improvement in HyCal clustering, compared to before, distribution width is smaller

Data offset compare

gem1x compare



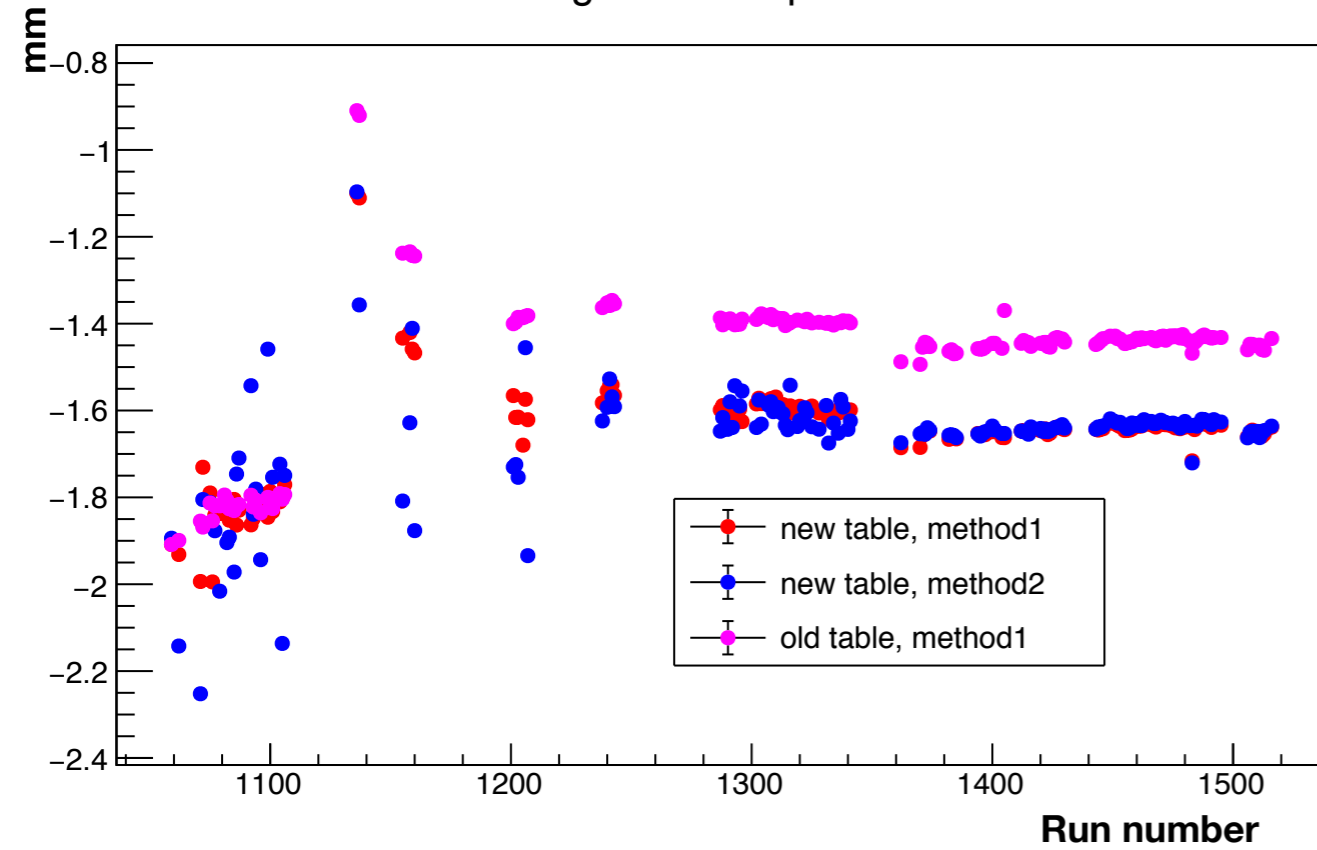
gem1y compare



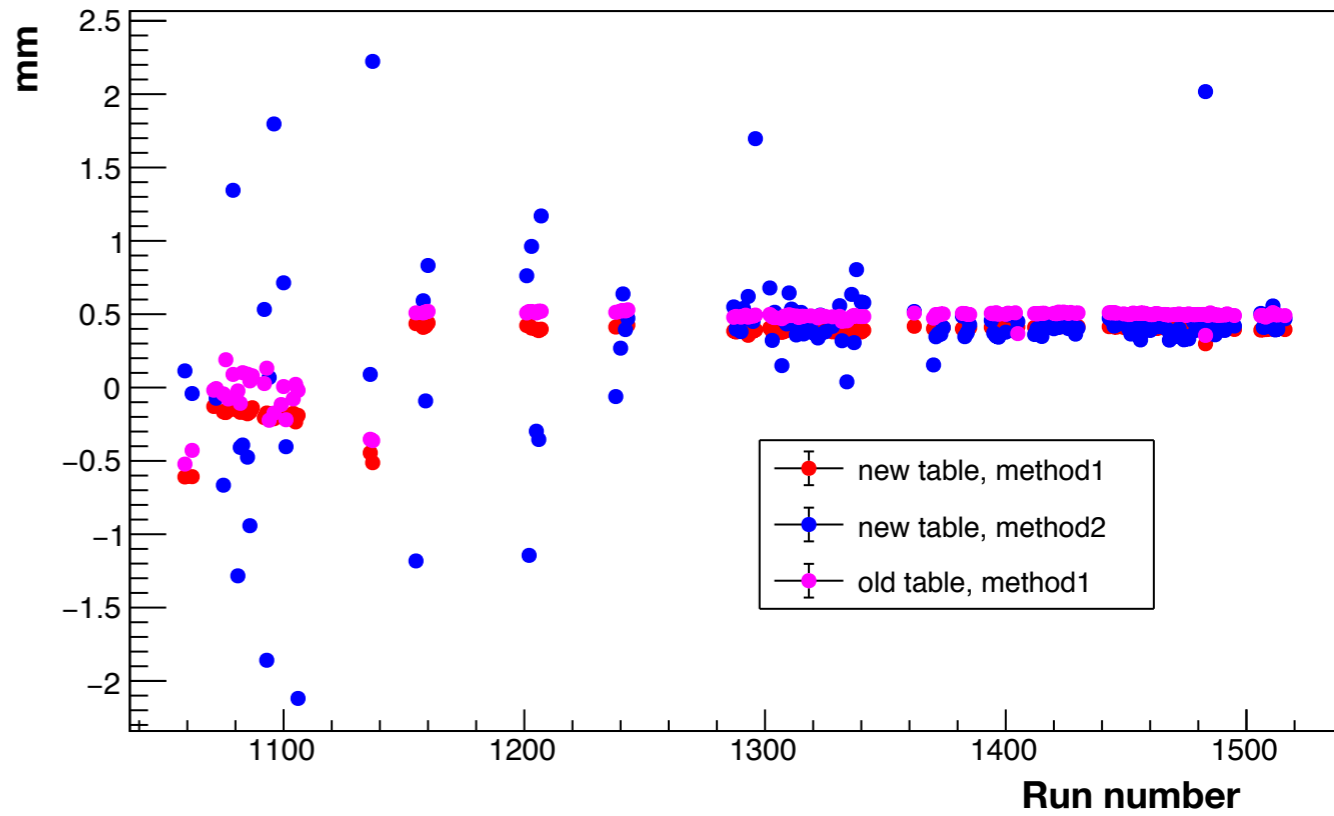
- New HyCal clustering, new Z calibration
- Method1 and method2 overlaps
- 0.1 mm - 0.2 mm difference compared to old table

Data offset compare

gem2x compare



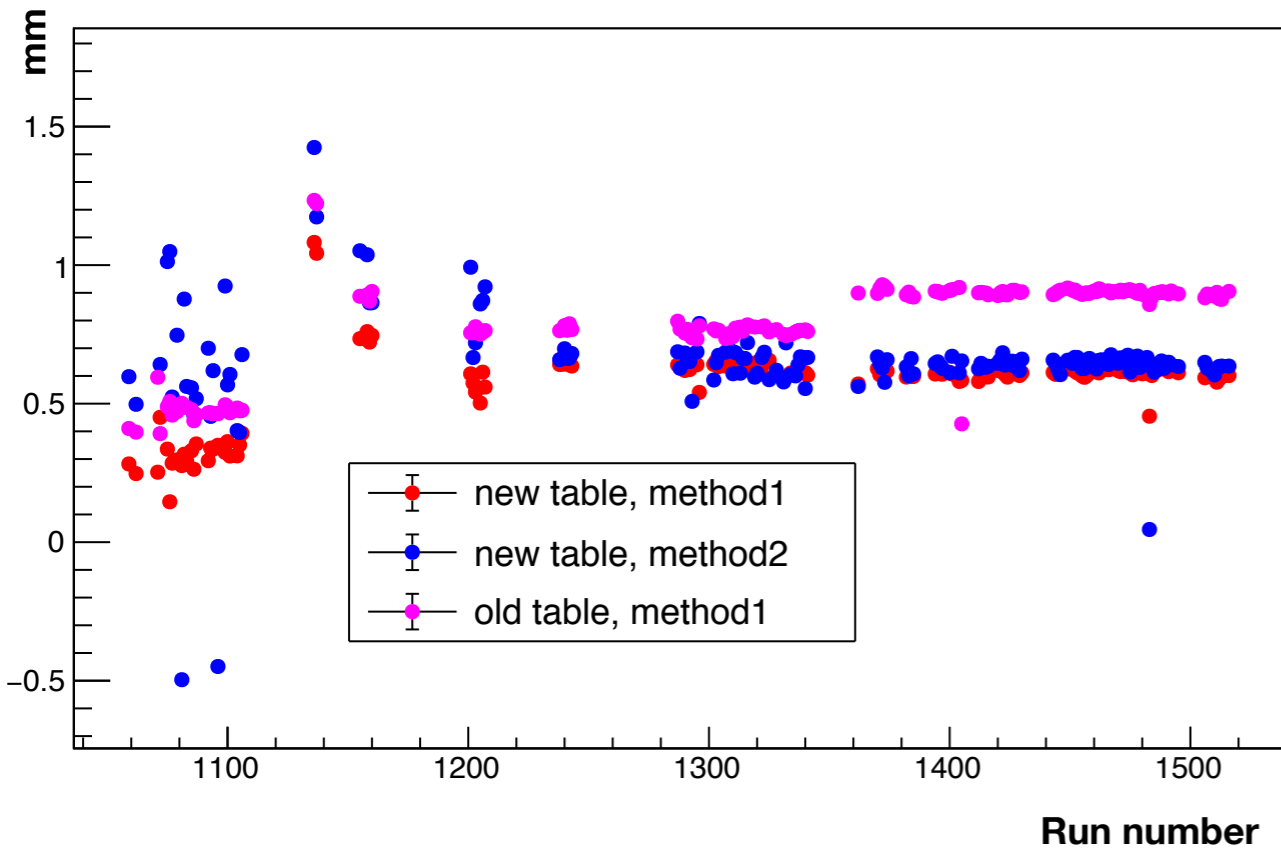
gem2y compare



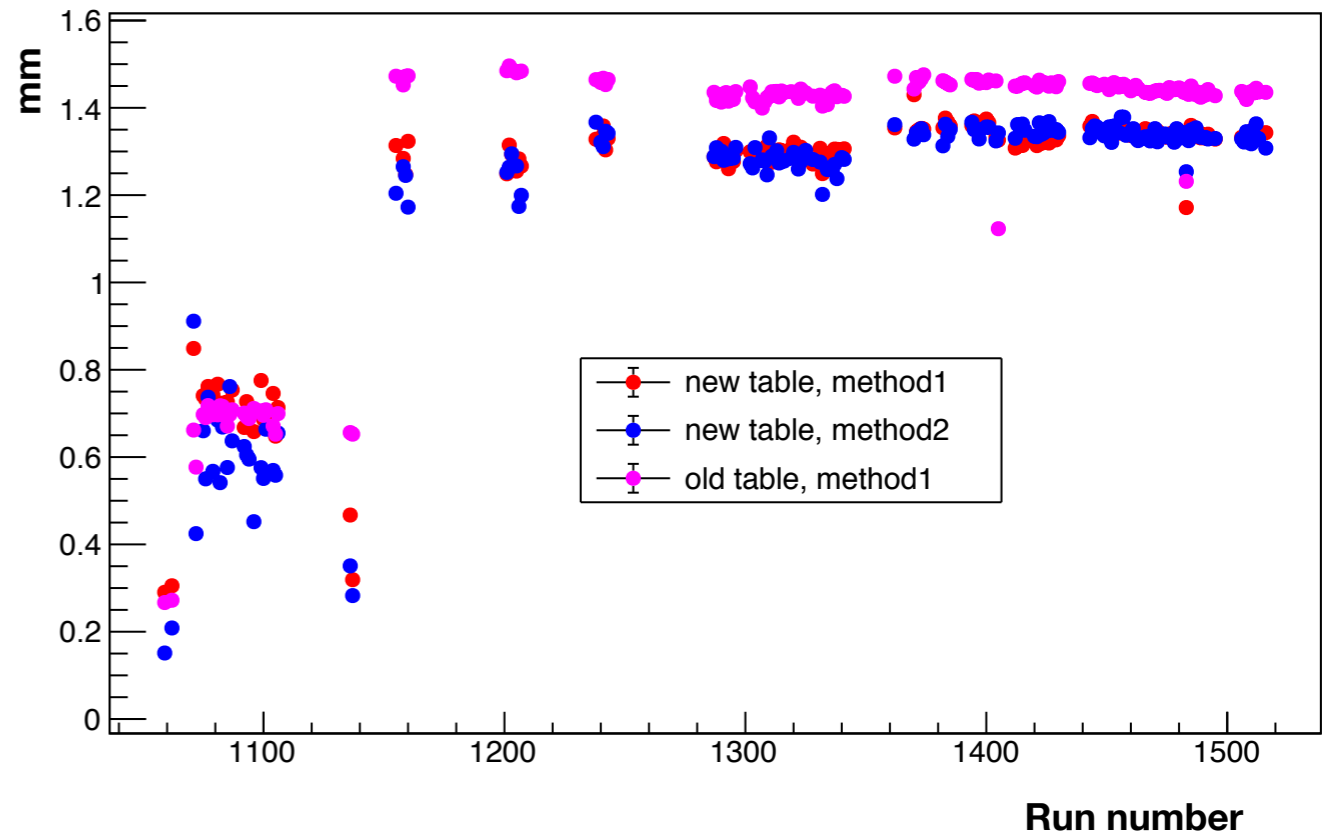
- **New HyCal clustering, new Z calibration**
- **Method1 and method2 overlaps**
- **0.1 mm - 0.2 mm difference compared to old table**

Data offset compare

hycal x compare



hycal y compare



- **New HyCal clustering, new Z calibration**
- **Method1 and method2 overlaps**
- **0.1 mm - 0.2 mm difference compared to old table**

- M1 has 10 times larger statistics than M2
- M1 has similar distribution width on both X and Y direction
- M2 Y direction distribution width 4 times larger than X direction
- Offset value from both methods agree, M2 with larger fluctuation
- Generate offset table using M1