

Analysis Tools

--- *2010/2012 test beam data*

--- *laser test data*

Junping Tian (KEK)

Jun. 1 @ LCTPC-Asia Fact-to-Face Meeting, KEK

outline

- *framework: MarlinTPC & YokaRawMon*
- *common analysis & some comparison*
- *open questions & ongoing efforts*

MarlinTPC: reconstruction

developed within Marlin framework, processor based

input: converted raw data (slcio)

```
<processor name="MyAIDAProcessor" />  
<processor name="MyConditionsProcessor" />  
<processor name="MyTrackerRawDataToDataConverterProcessor" />  
<processor name="MyEventSelectionProcessor" />  
<processor name="MyPulseFinderProcessor" />  
<processor name="MyChannelMappingProcessor" />  
<processor name="MyRowBasedHitFinderProcessor" />  
<processor name="MyHitQualityRegisterProcessor" />  
<processor name="MyRowCutApplicationProcessor" />  
<processor name="MyTrackMakingKalmanFilterProcessor" />  
<processor name="MyLCIOOutputProcessor" />
```

*output: TPCTracks Collection
(input of analysis)*

processor parameters in reconstruction

- *PulseFinder*: Height (8), Length (3), Pre (2), Post (5), StartThreshold (4), End (4), PedWidth (1), PlateauCut (5), TimeCal (0--Inflexion)
- *HitFinder*: MinMaxPulse (12), TimeSpread (200), MinSize (1)
- *Tracking*: MinNHits (60), MaxDeltaChi2 (600)

open issues

- *pulse time definition: inflexion point; peak; start; center-of-gravity; fitting, etc.*
- *hit time definition: largest pulse; c-o-g, etc.*
- *track finder: kalman; triplet; cluptra, etc.*

MarlinTPC: analysis (A)

common processors, agreed on among GEM and MM groups

input: tracks from reconstruction

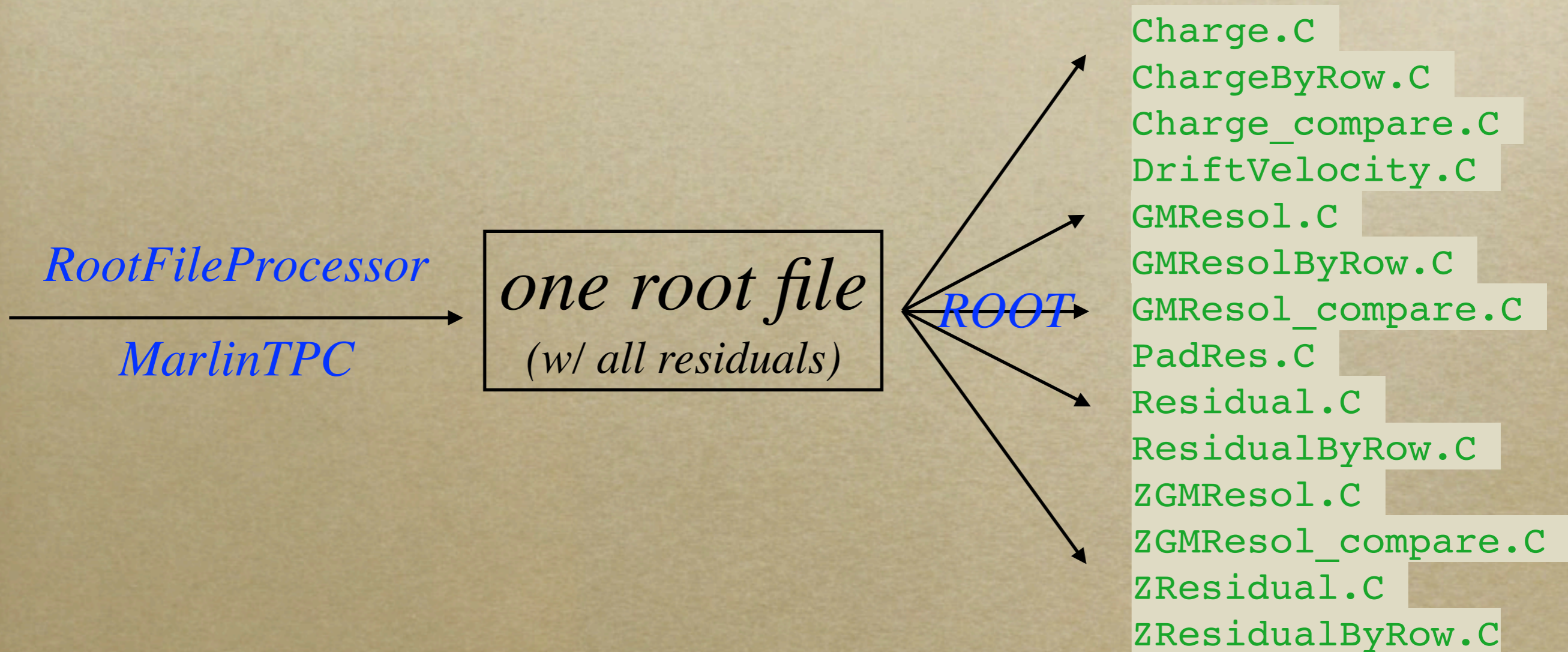
```
<processor name="MyGlobalFieldProcessor" />  
<processor name="MyAIDAProcessor" />  
<processor name="MyAnalysisCutSelectorProcessor" />  
<processor name="MyTrackParametersDistributionProcessor" />  
<processor name="MyHitQualityProcessor" />  
<processor name="MyTrackHitEfficiencyProcessor" />  
<processor name="MyChargeQualityProcessor" />  
<processor name="MyDistortionPerformanceProcessor" />  
<processor name="MyResolutionPerformanceProcessor" />  
<processor name="MyTripletResolutionPerformanceProcessor" />  
<processor name="MyPRFPerformanceProcessor" />
```

output: aida files with all performance/distortion plots

MarlinTPC: analysis (B)

based on RootFileProcessor, mainly used by Asian group

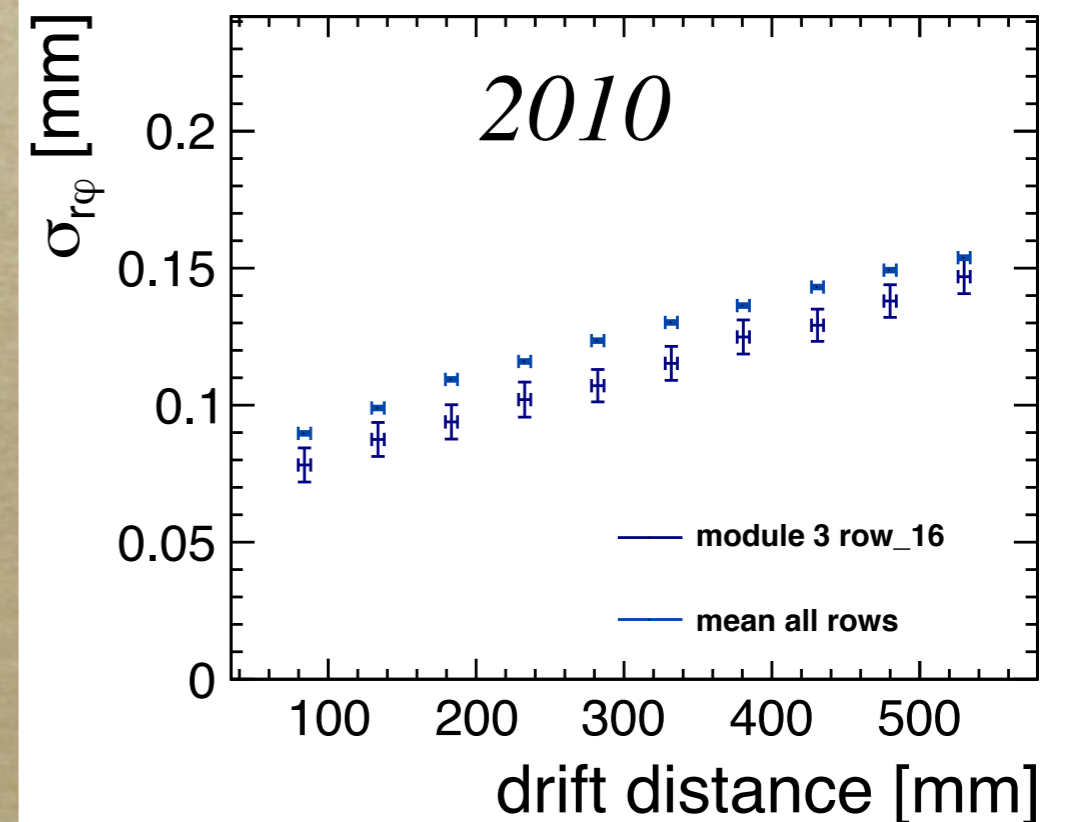
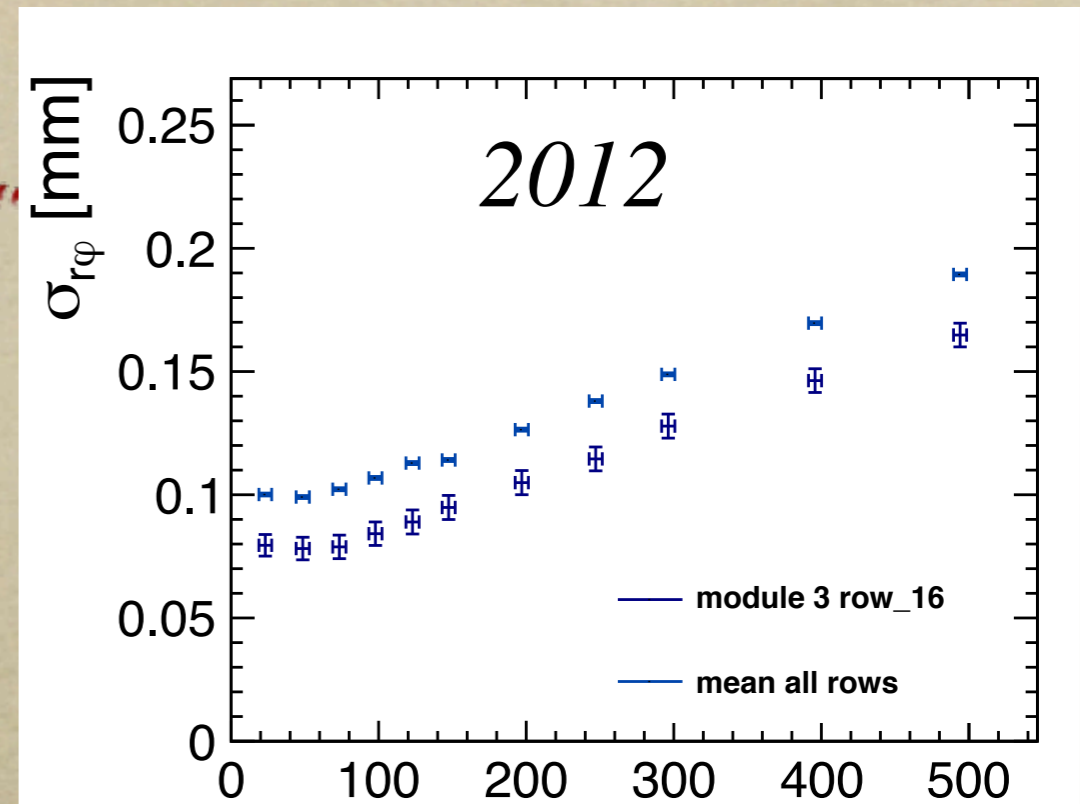
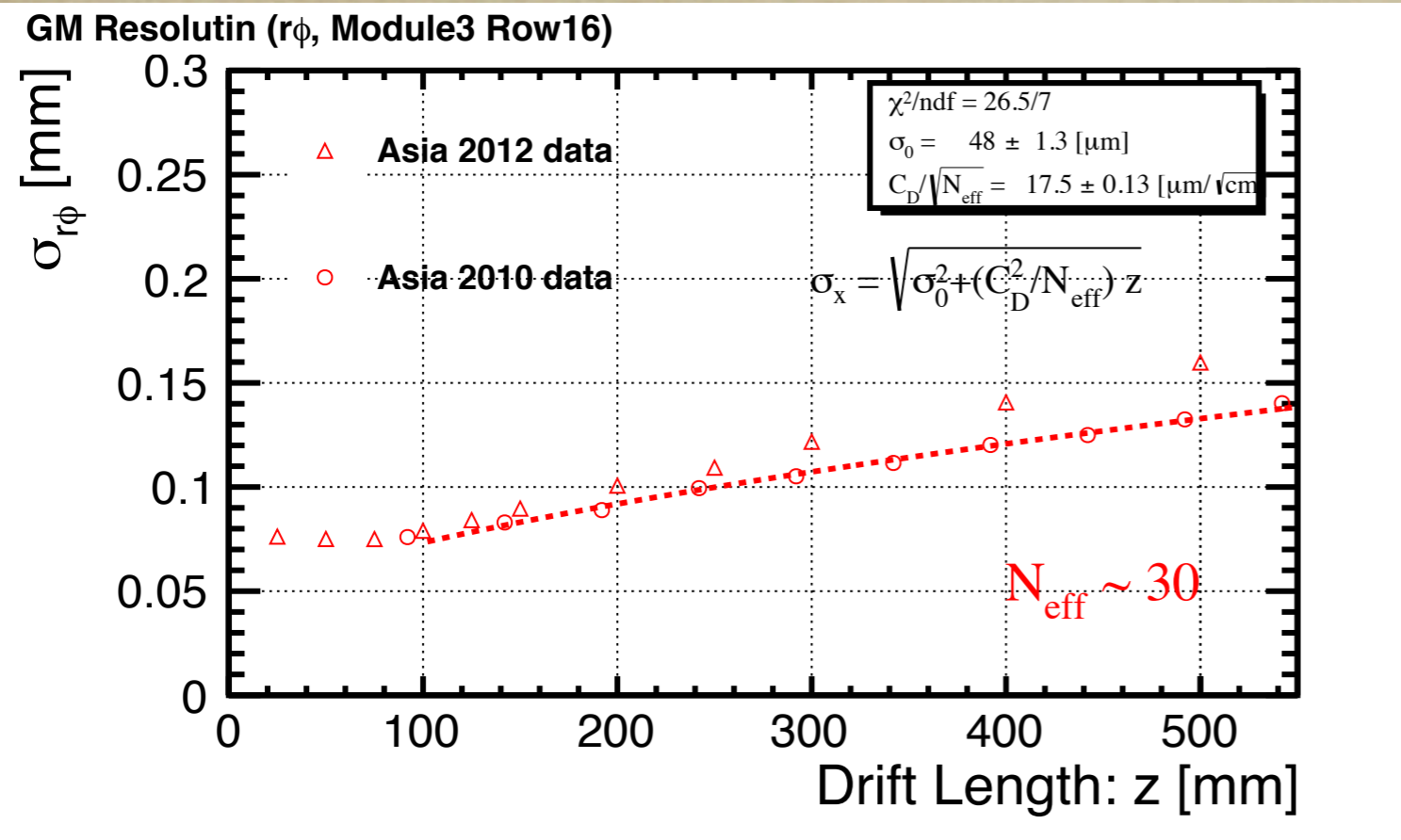
input: tracks from reconstruction



residuals are calculated by Kalman Filter, most proper way!

performance: *rφ*-resolution

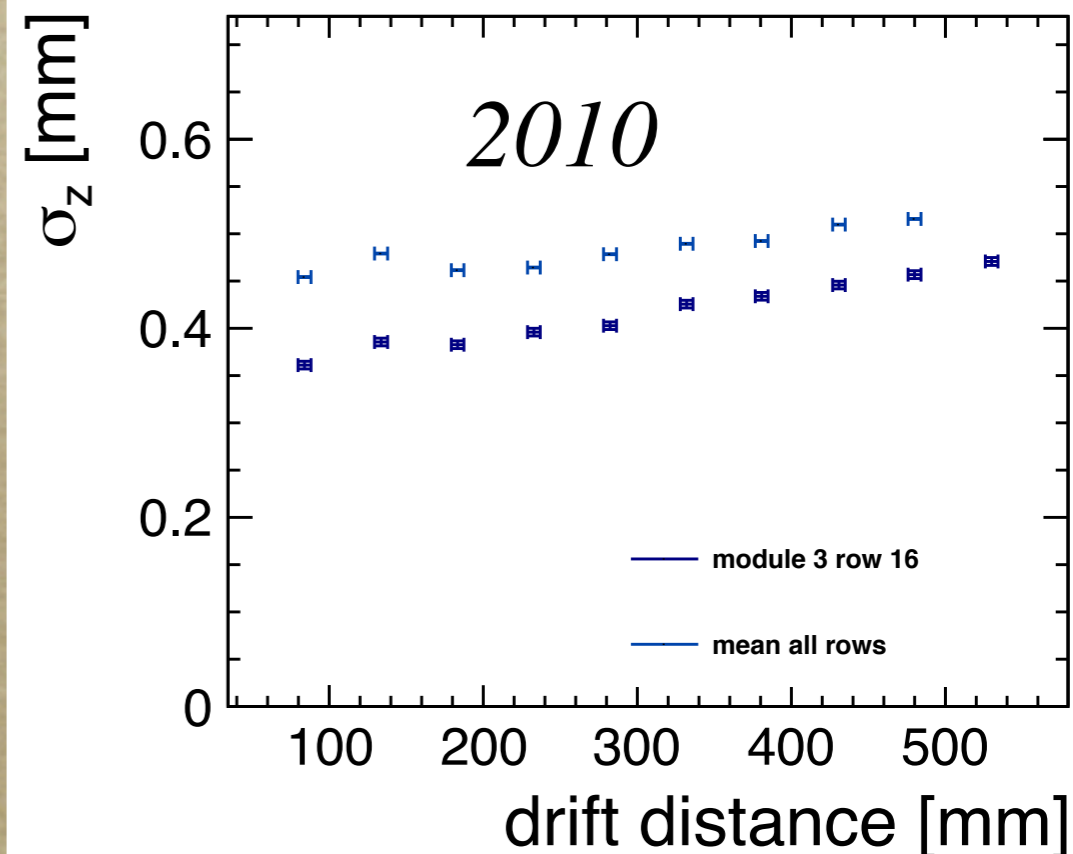
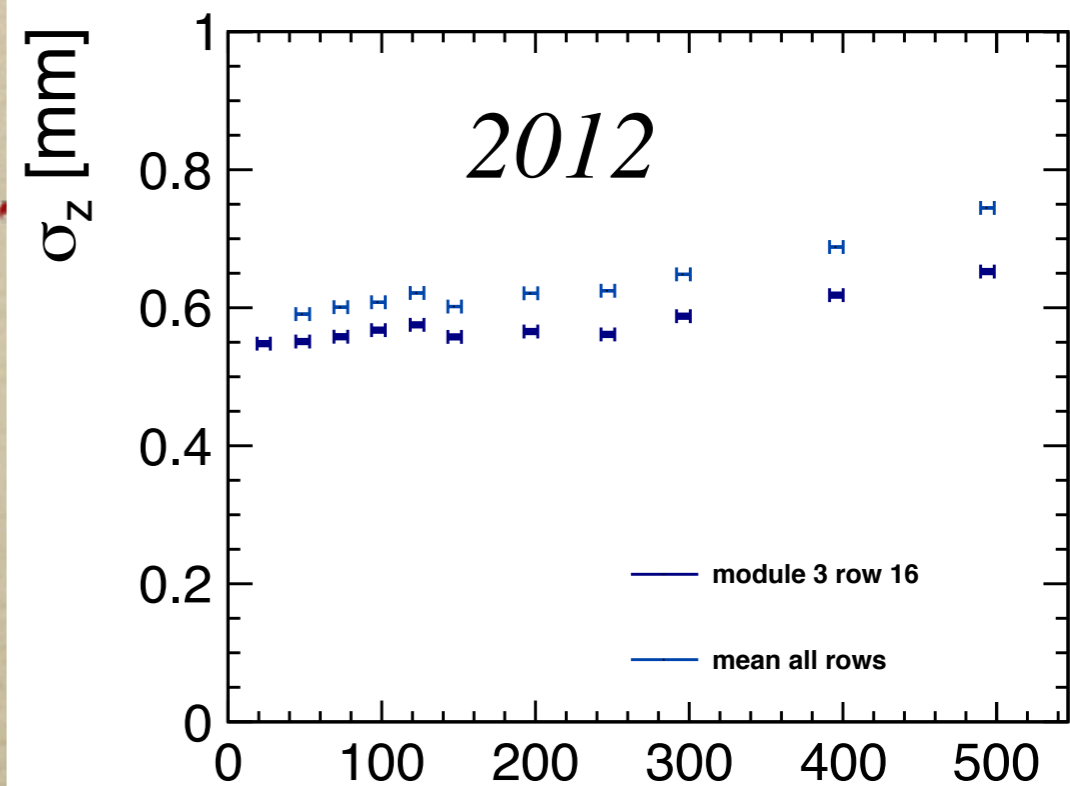
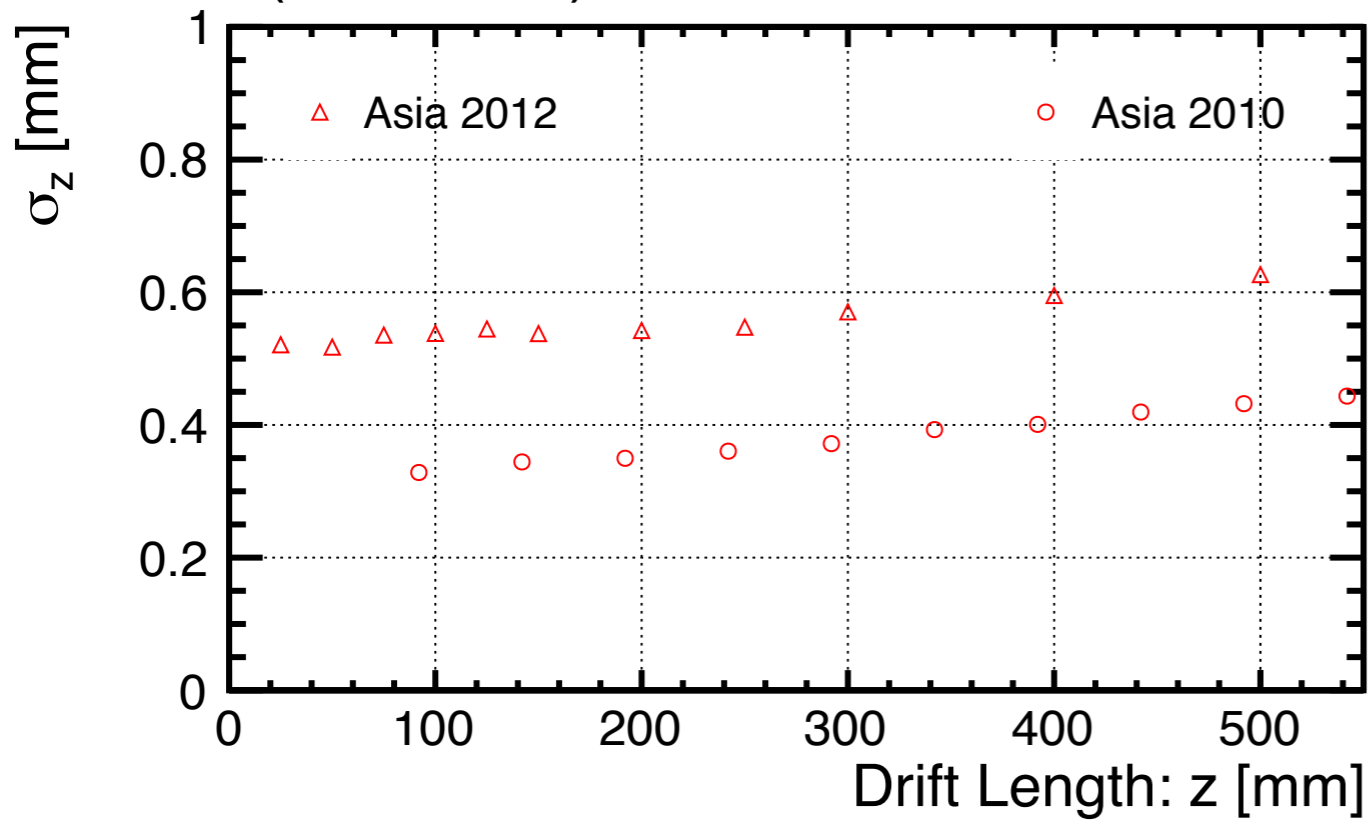
$B = 1T$



performance: *z-resolution*

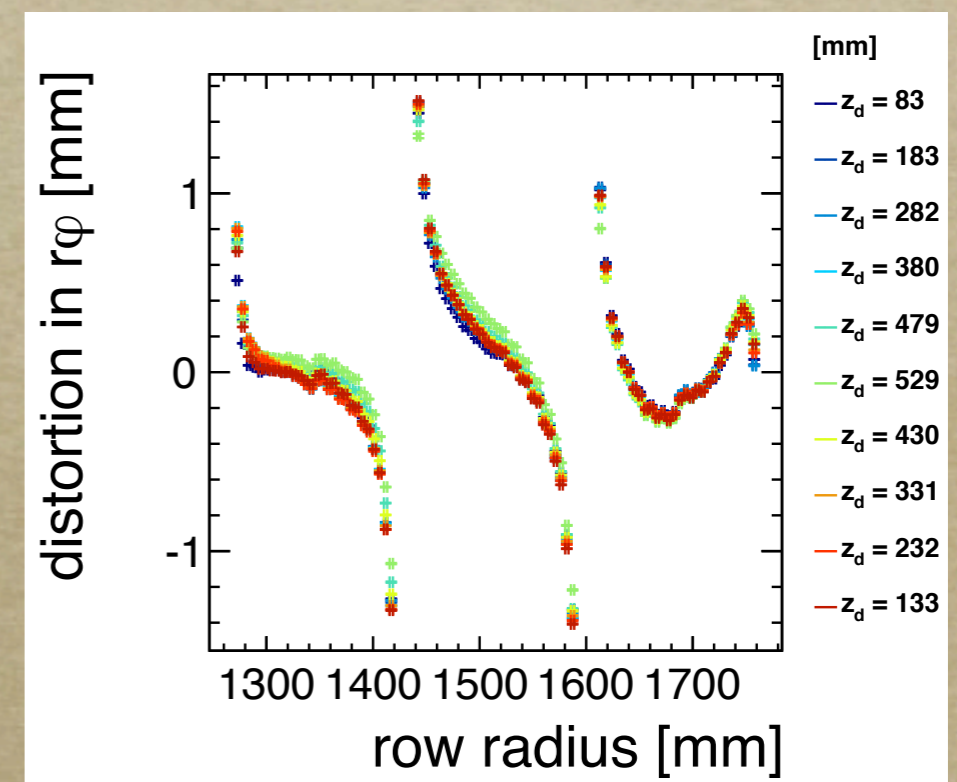
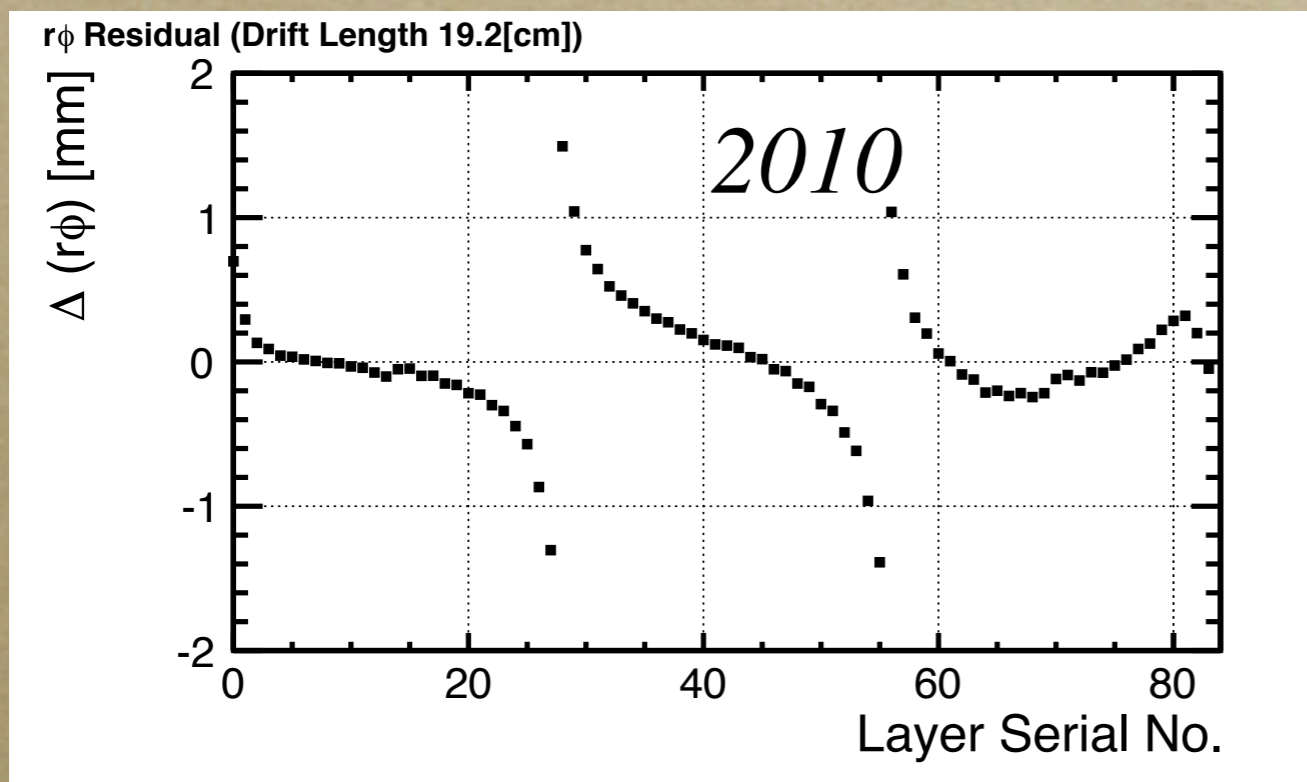
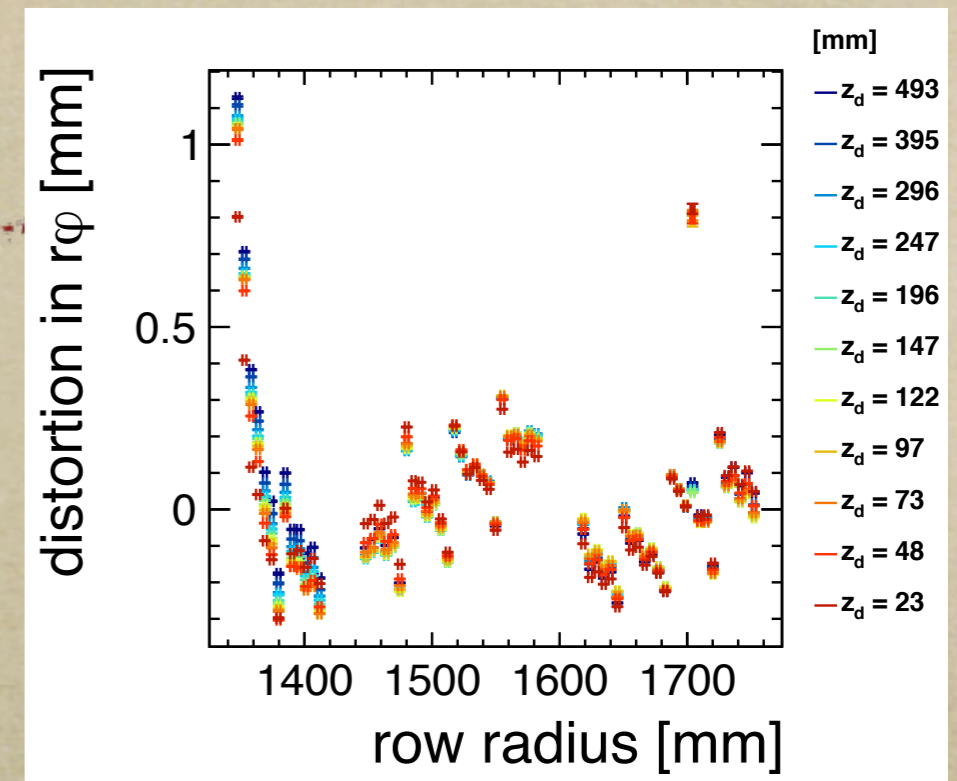
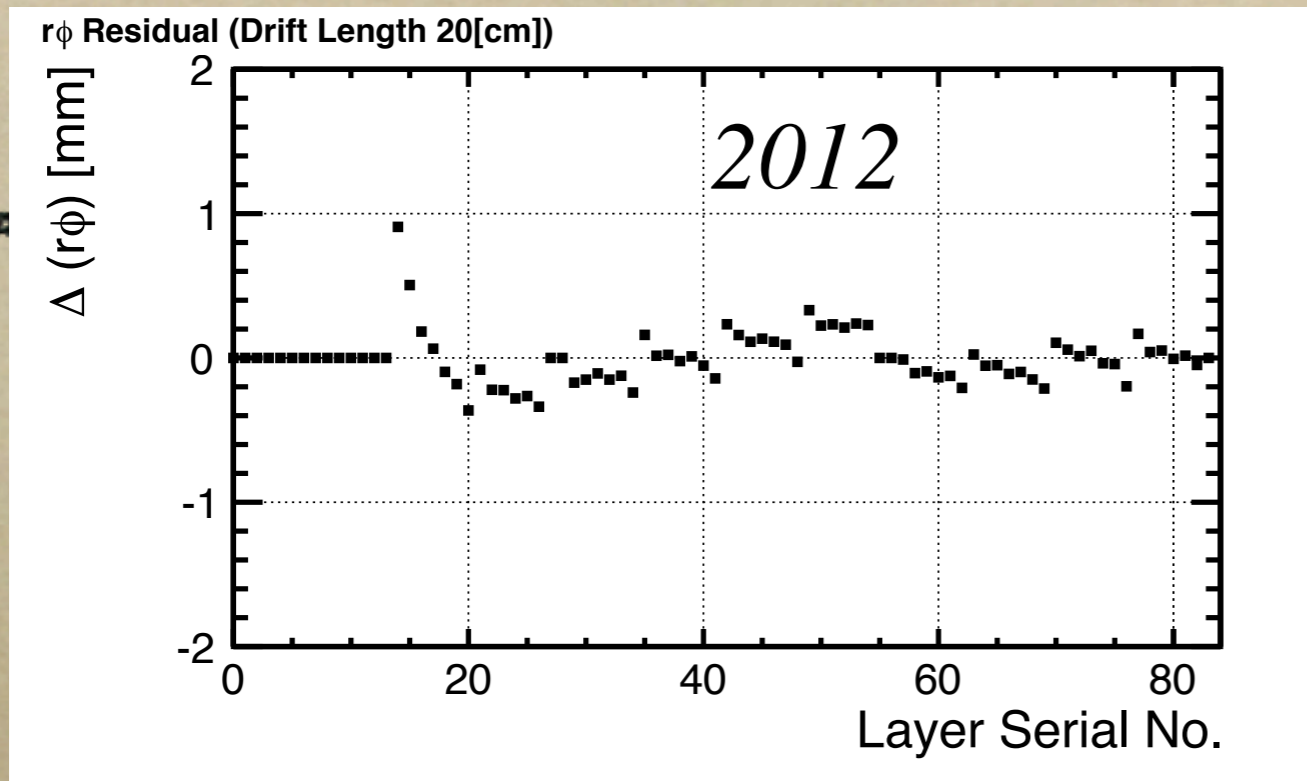
$B = 1T$

GM Resolutin (Module3 Row16)

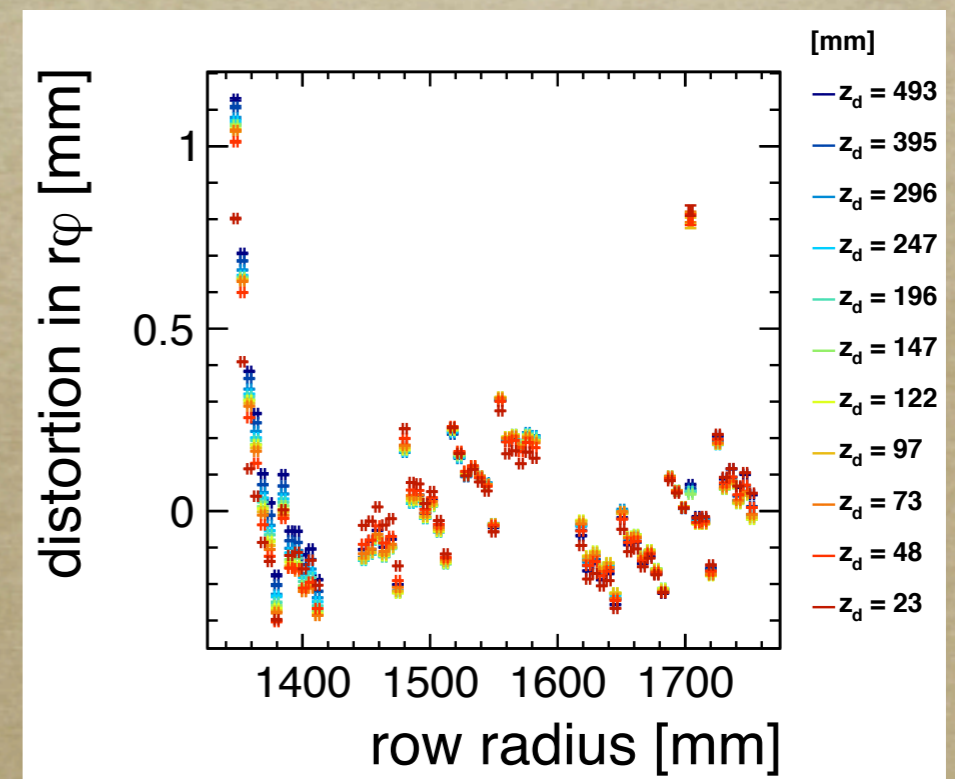
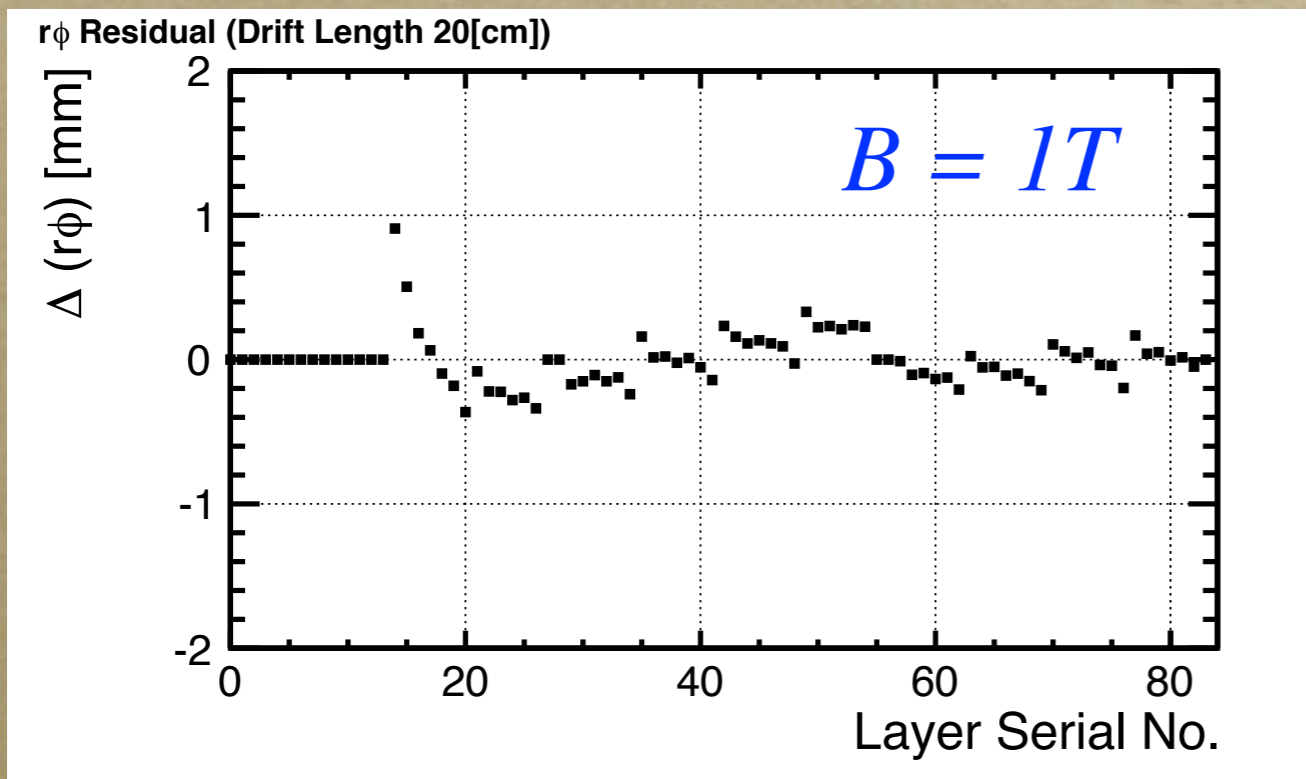
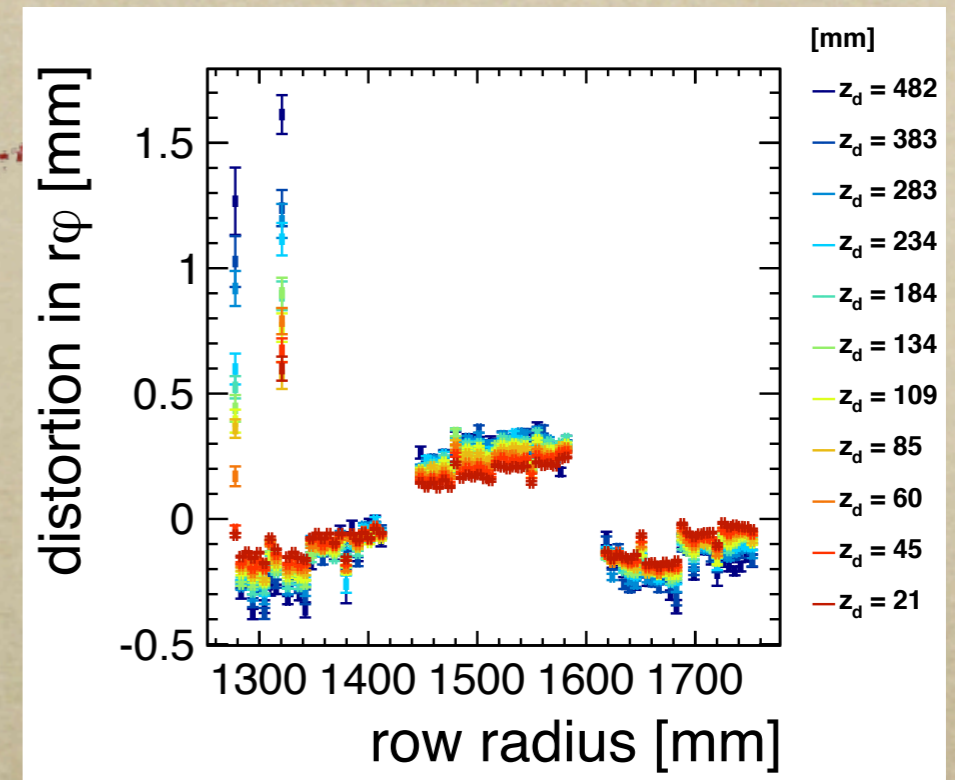
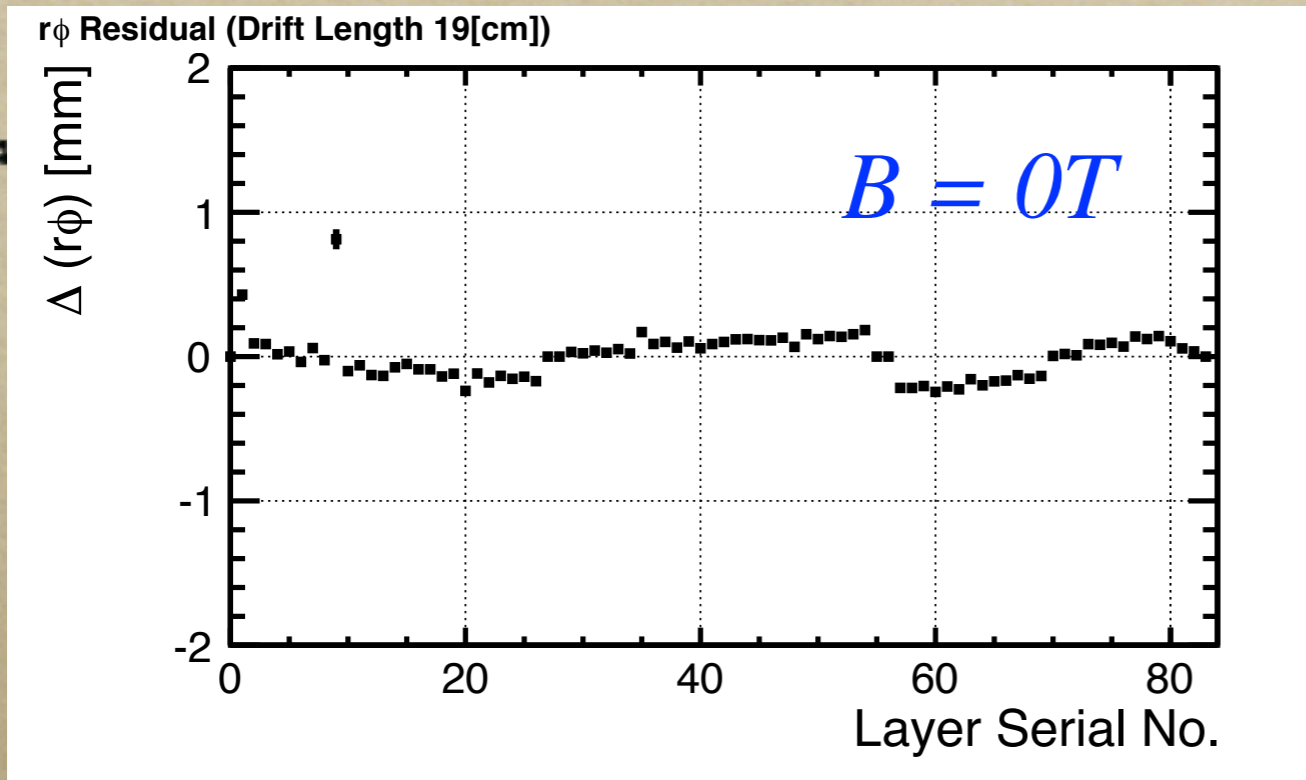


distortion: $r\phi$ -residual by row

$B = 1T$



field shaper on Asia GEM at 2012 worked well; wrong HV set at 2010

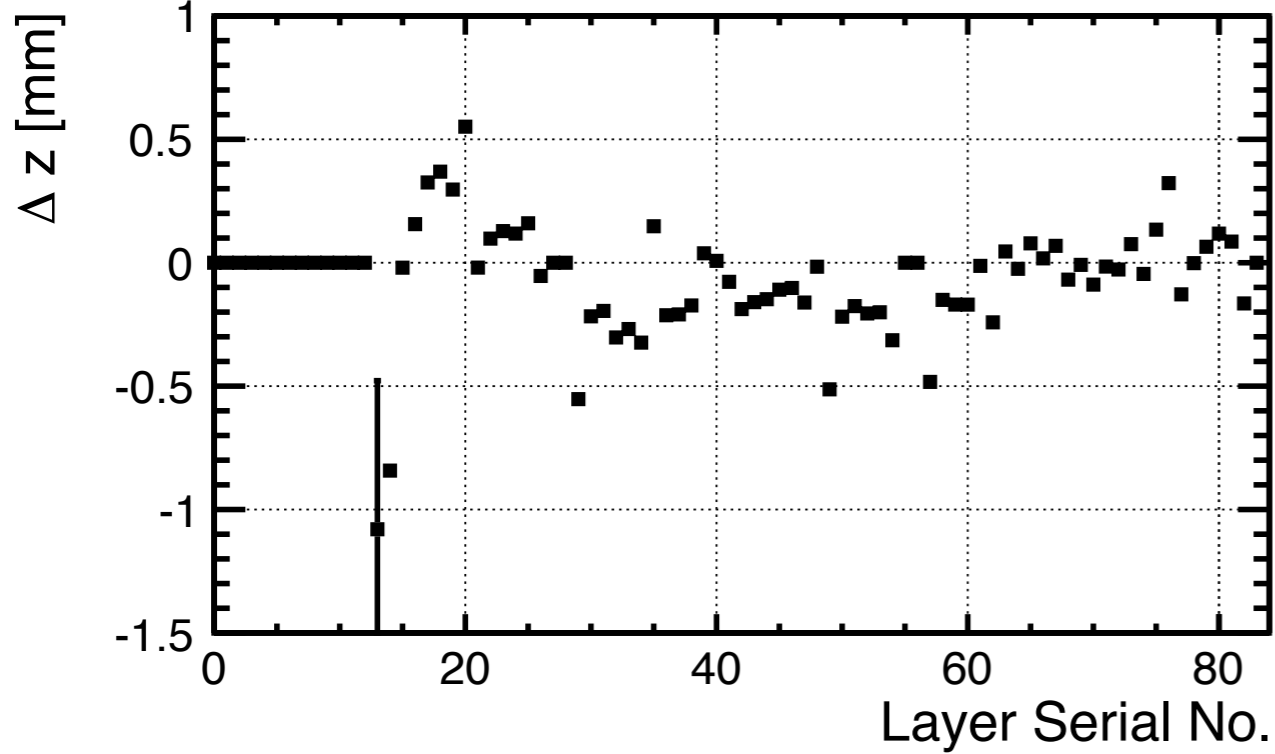


with field shaper, distortion between module boundary almost disappeared!

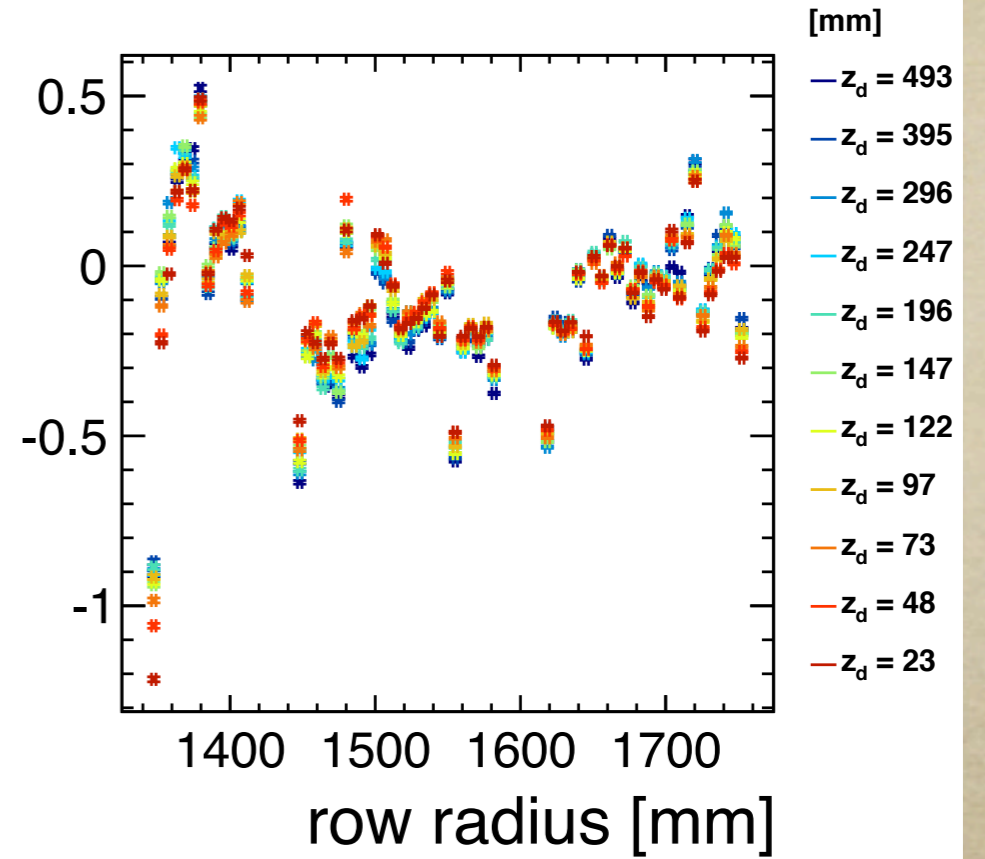
distortion: *z*-residual by row

$B = 1T$

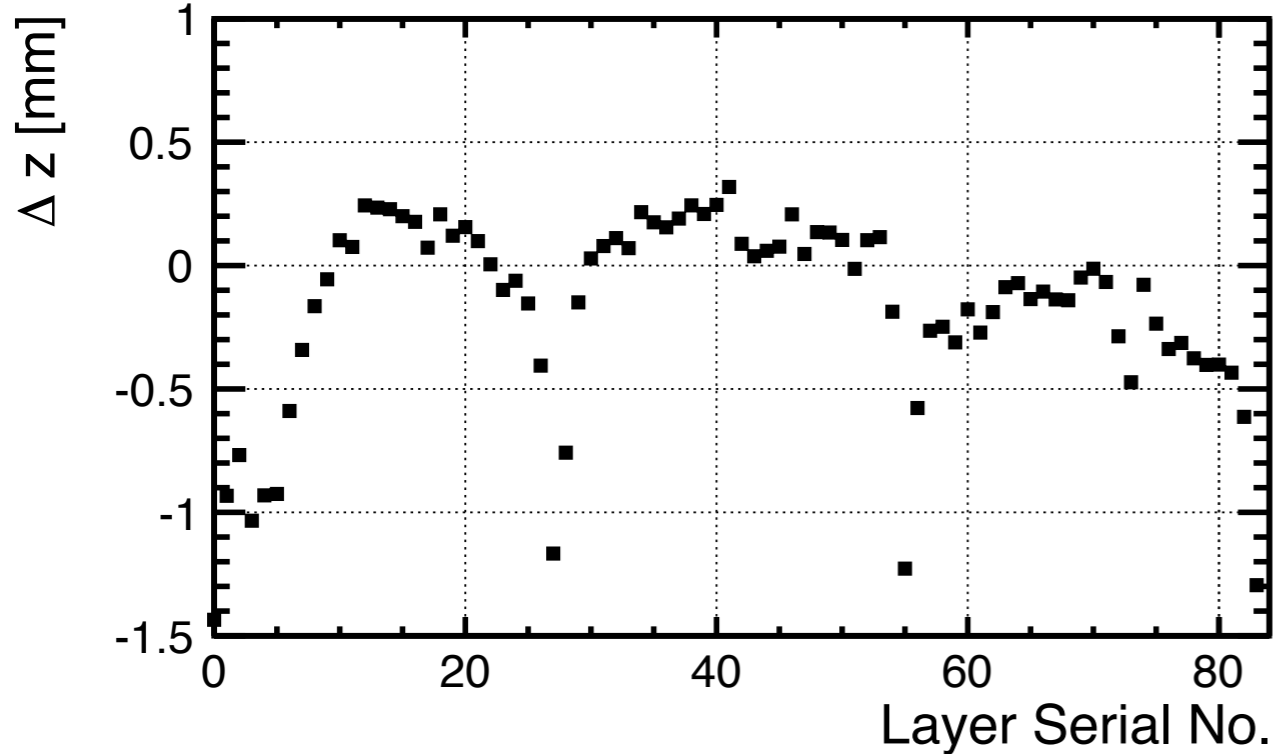
Z Residual (Drift Length 20[cm])



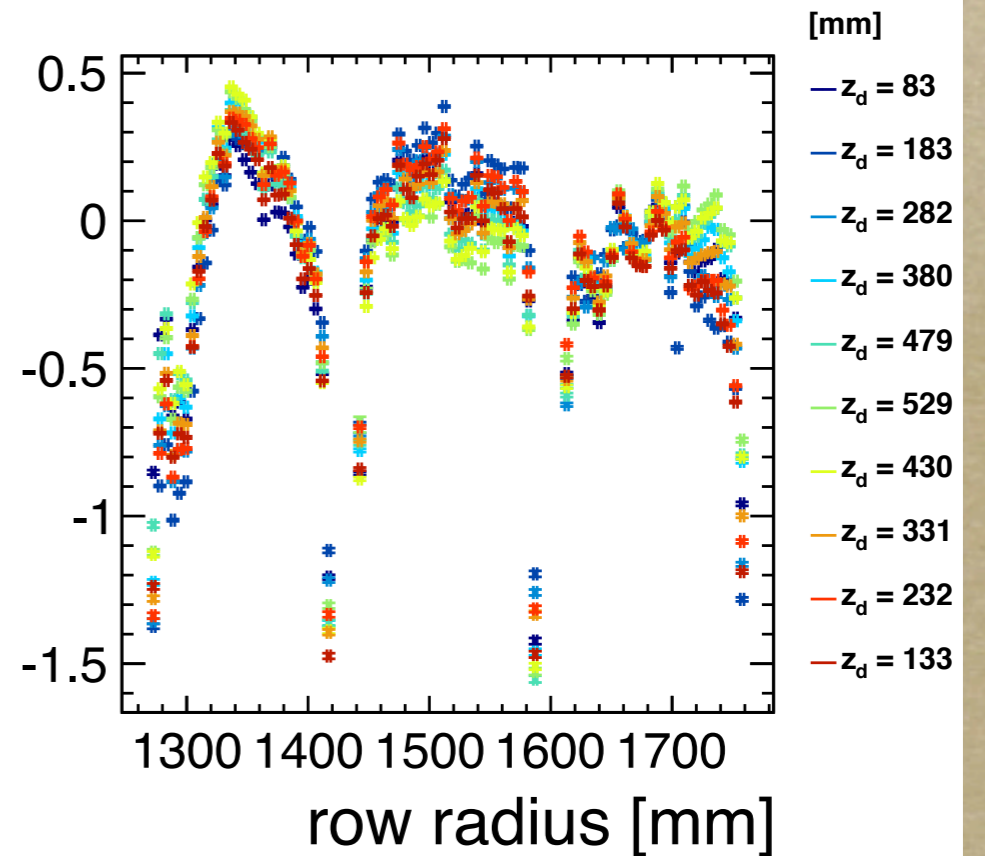
distortion in z [mm]



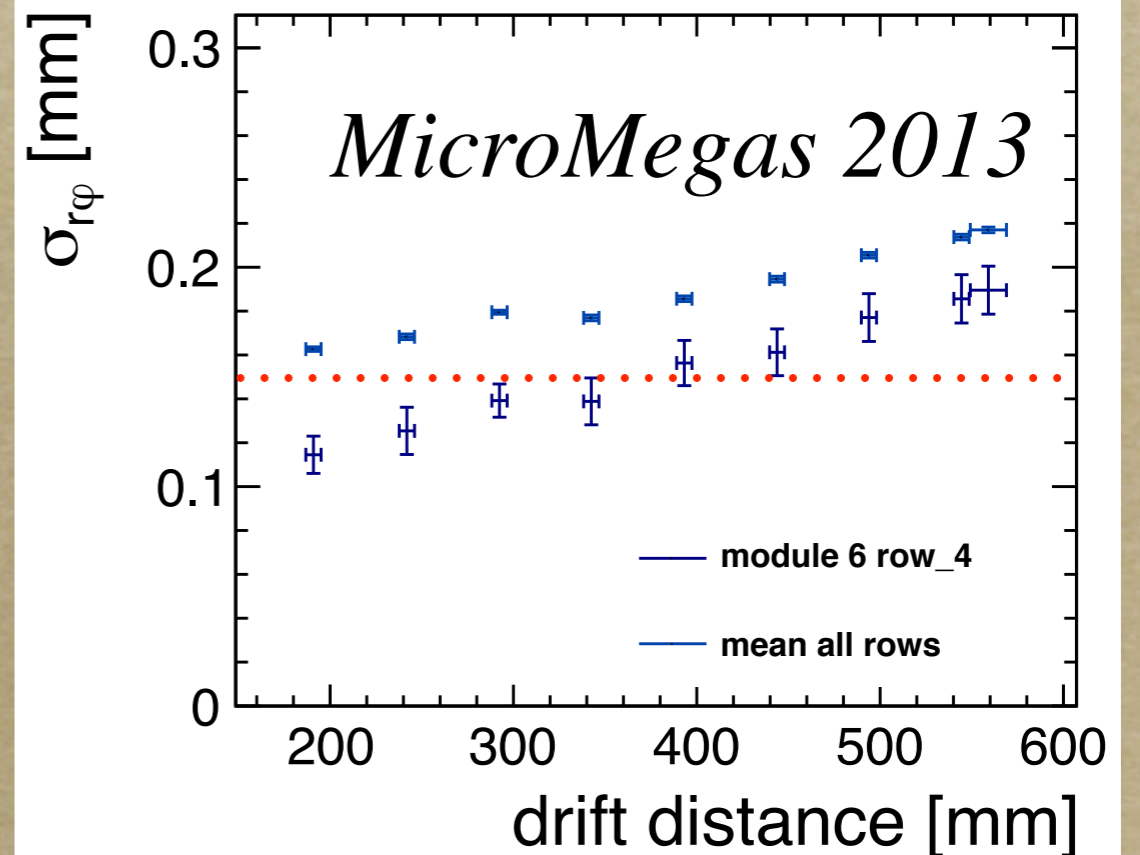
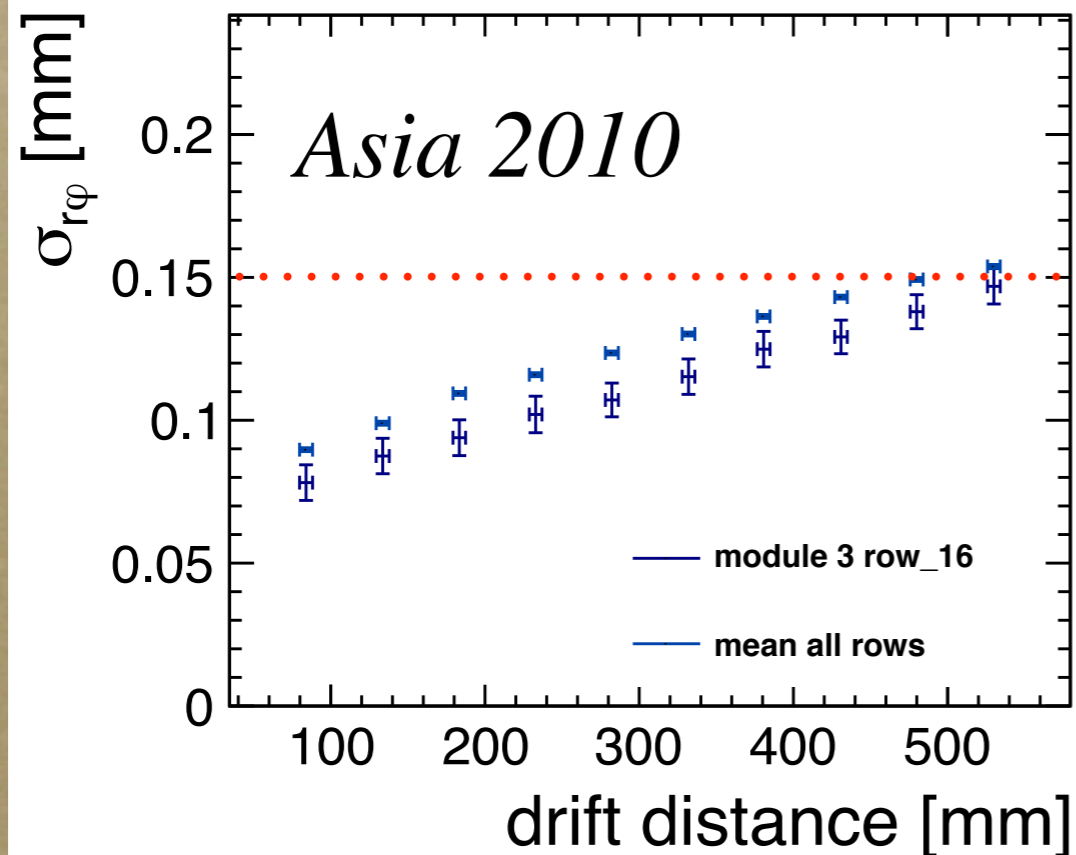
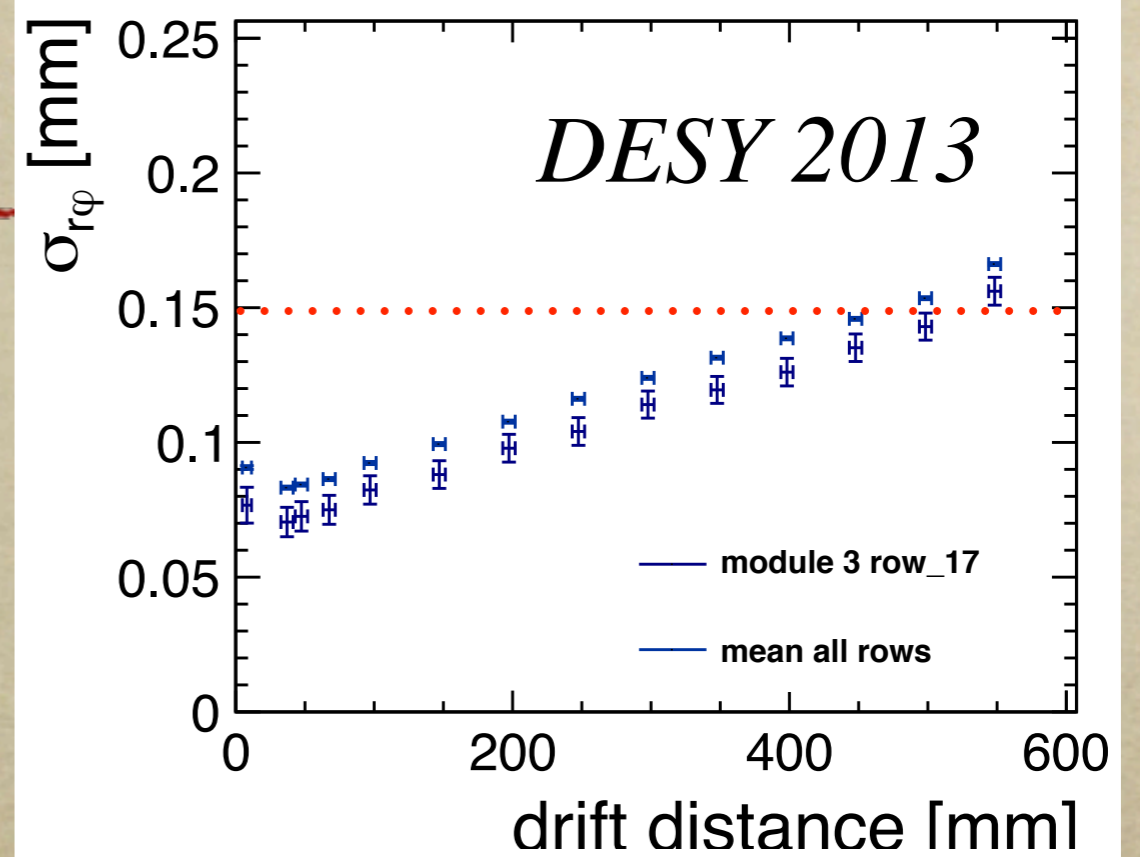
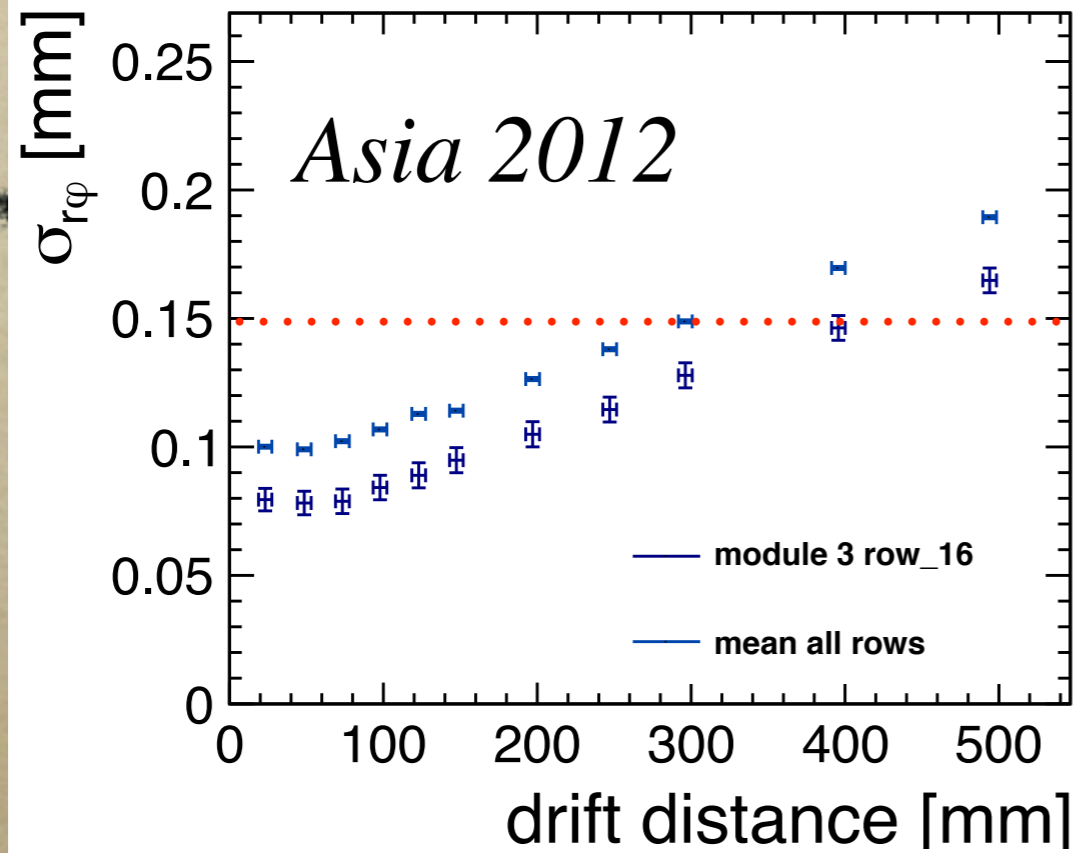
Z Residual (Drift Length 19.2[cm])



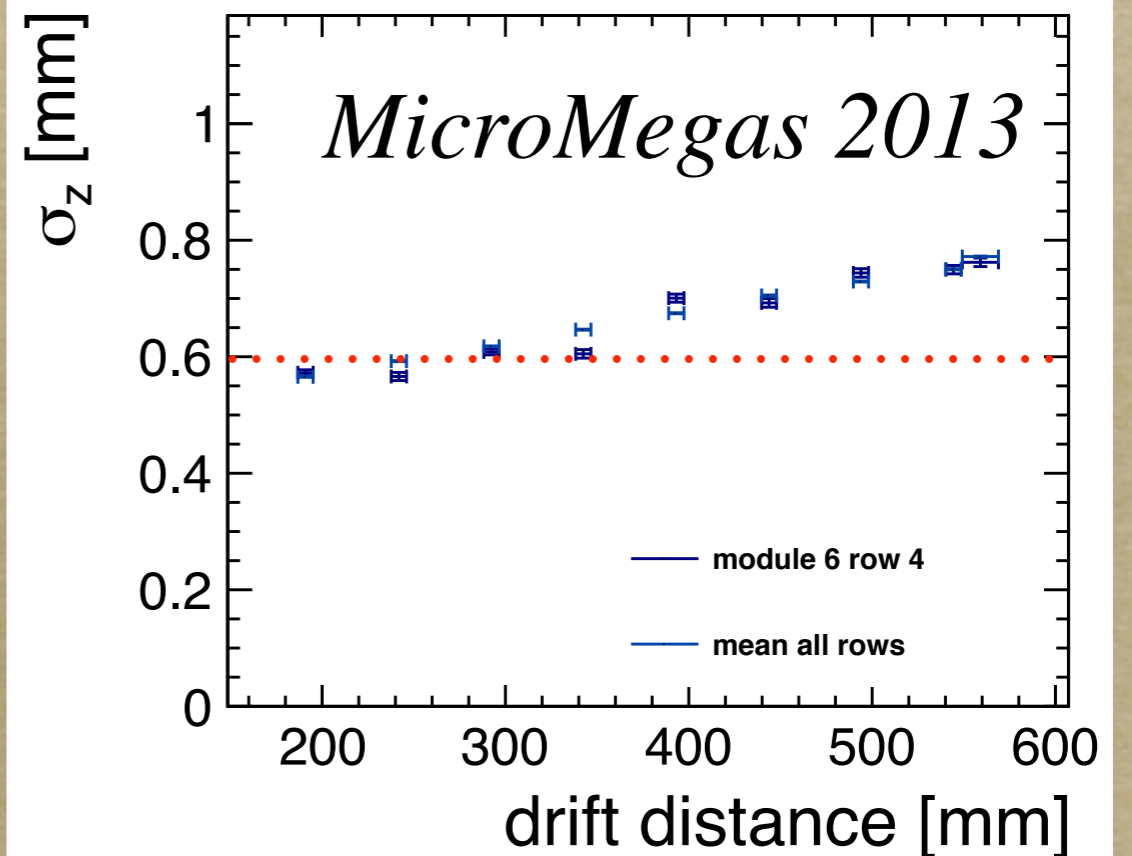
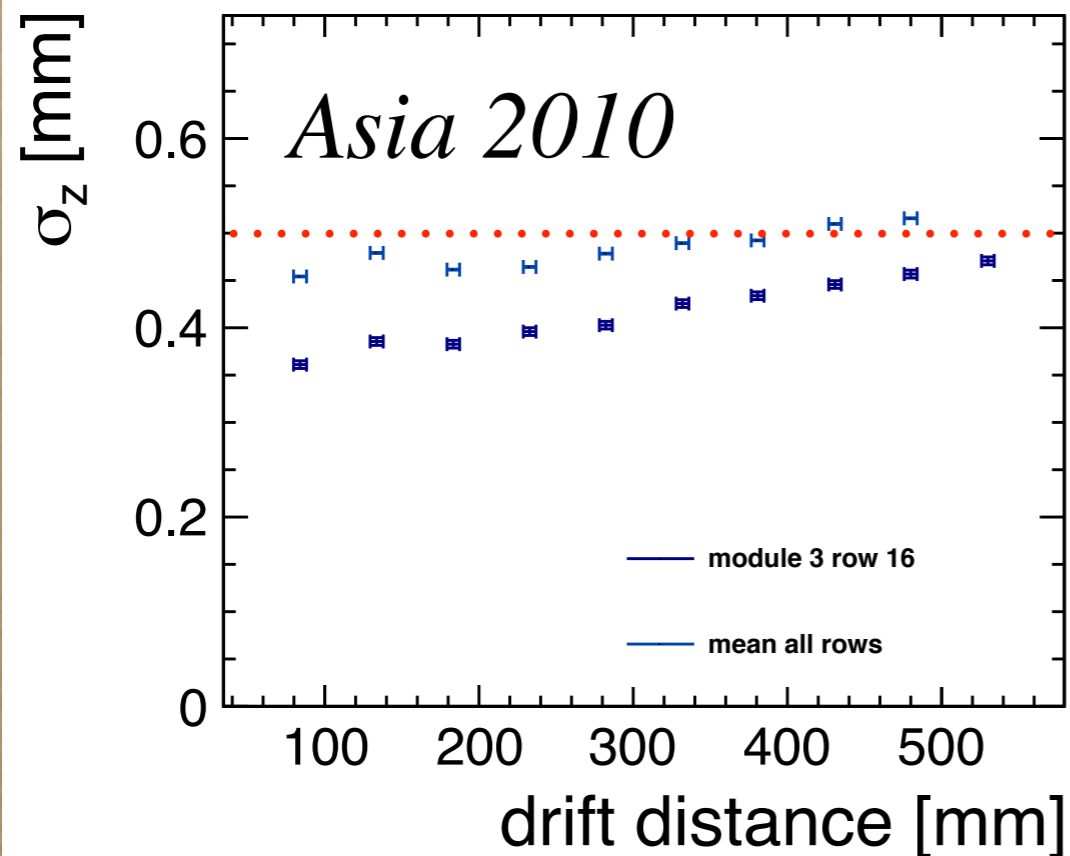
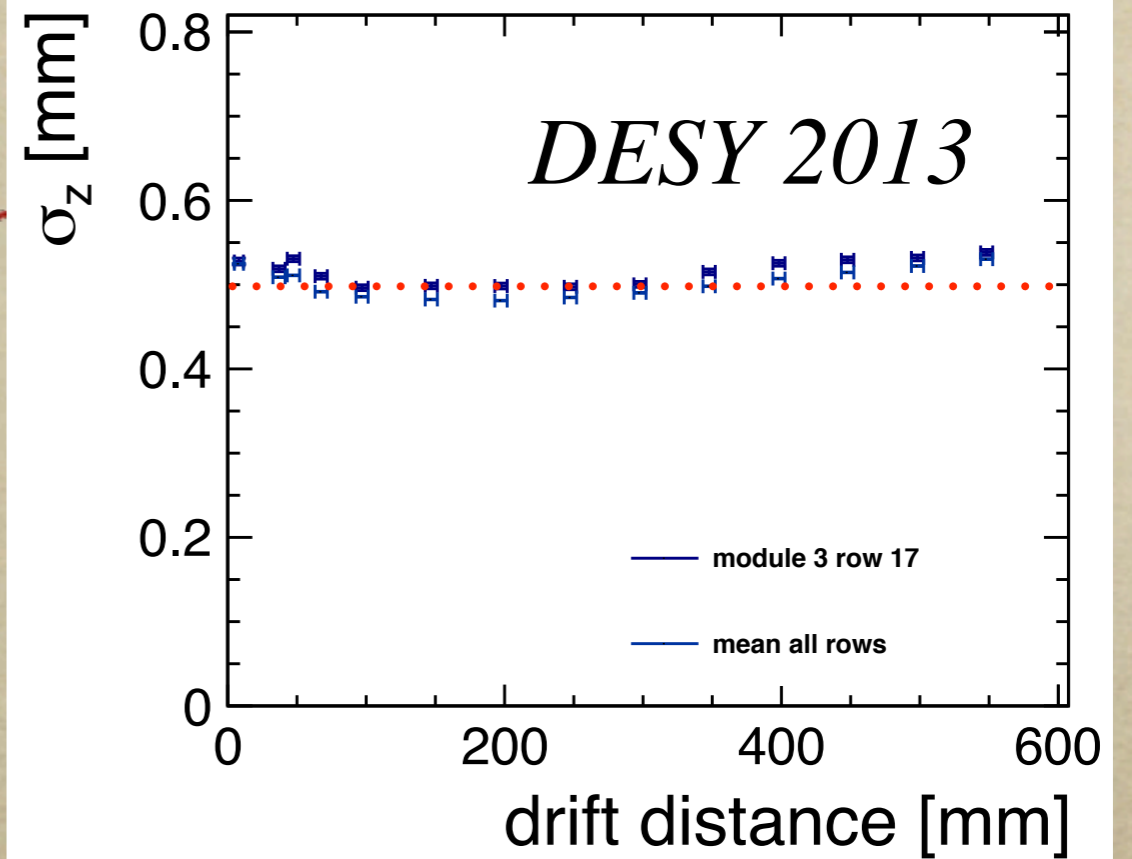
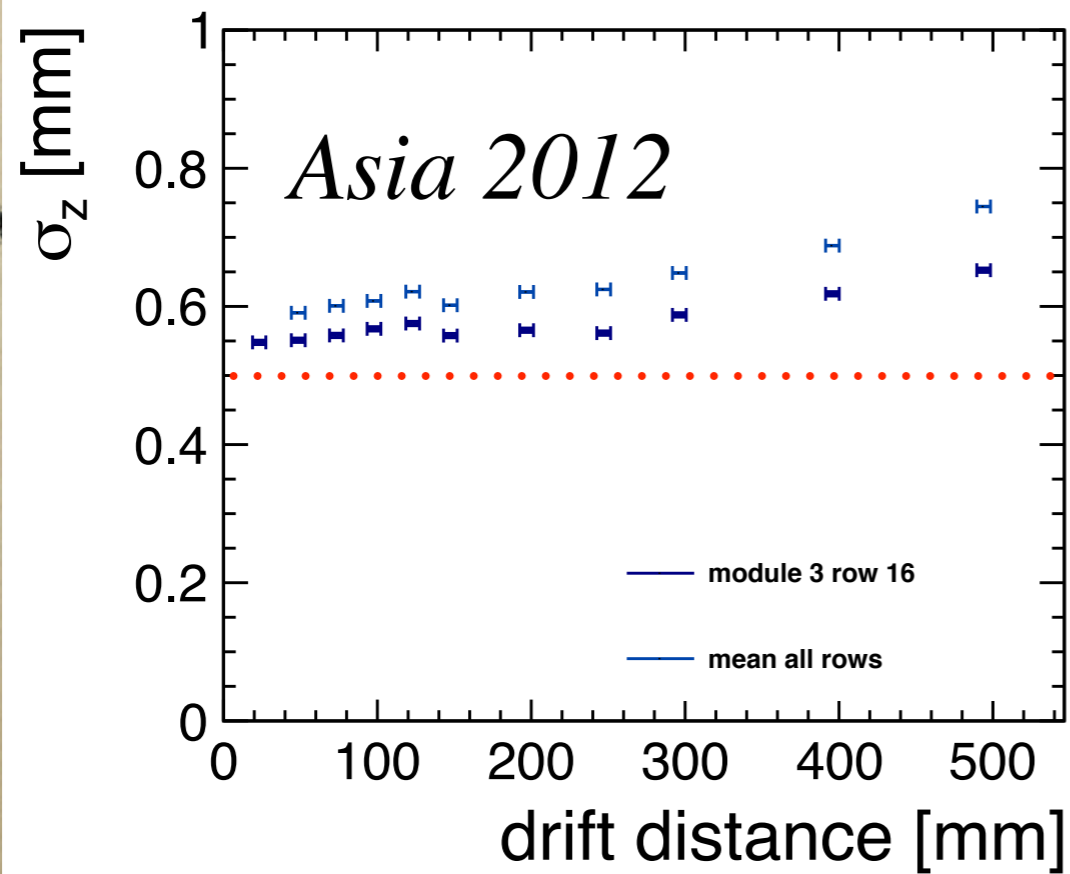
distortion in z [mm]



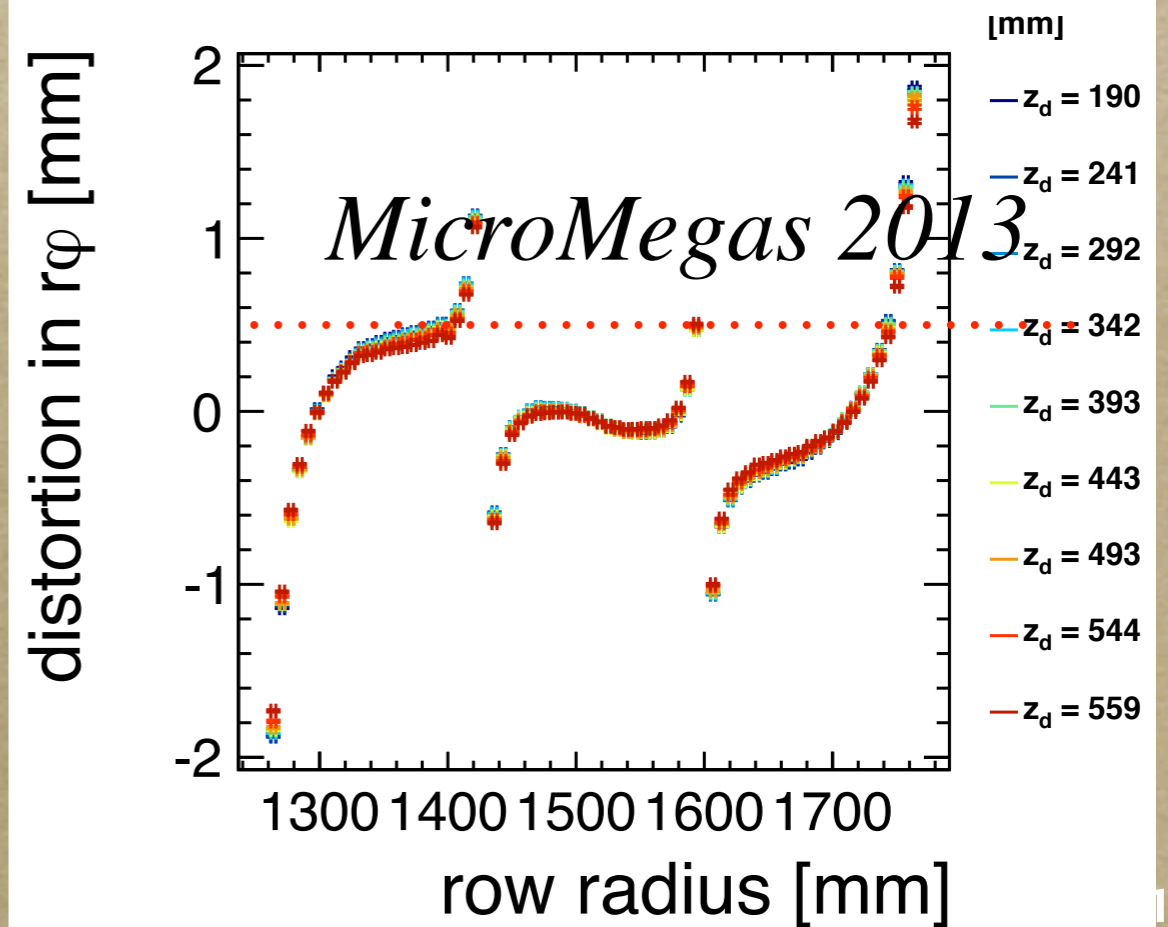
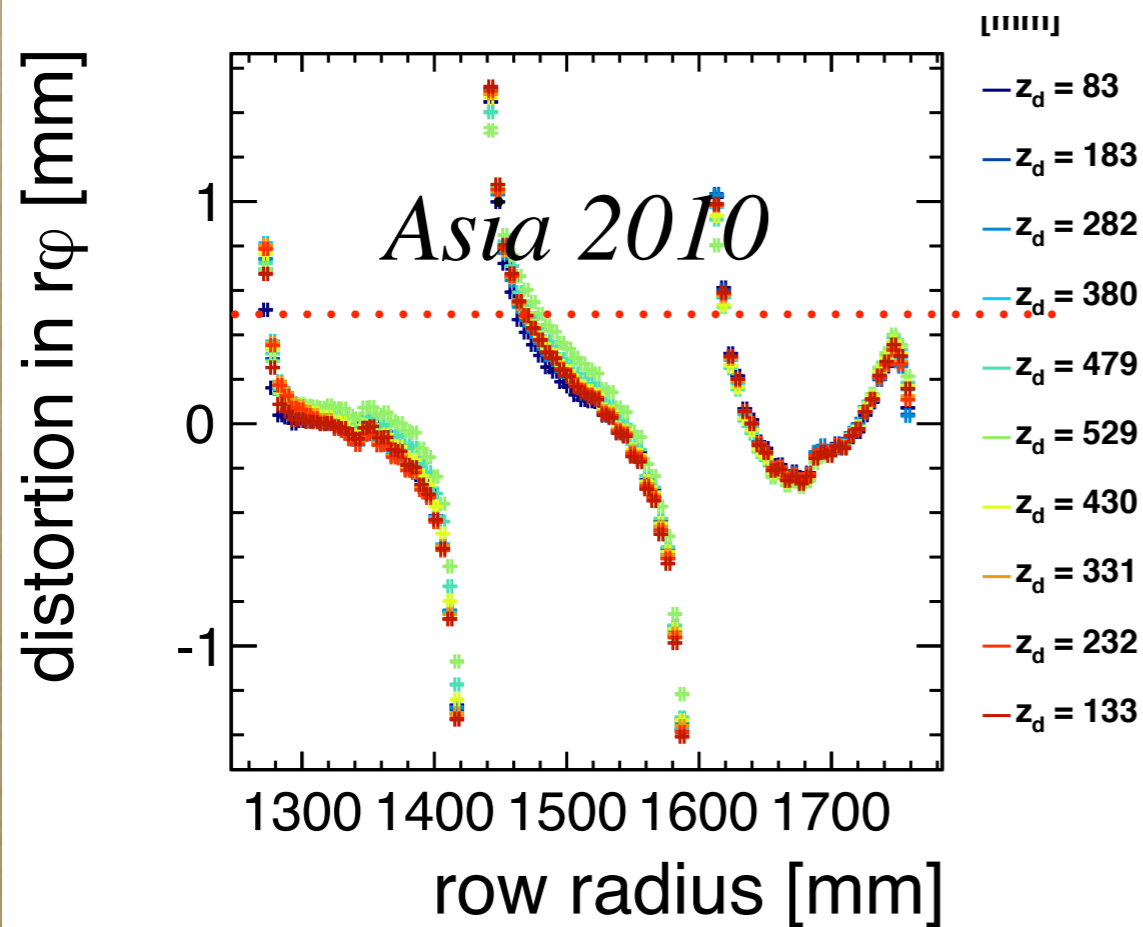
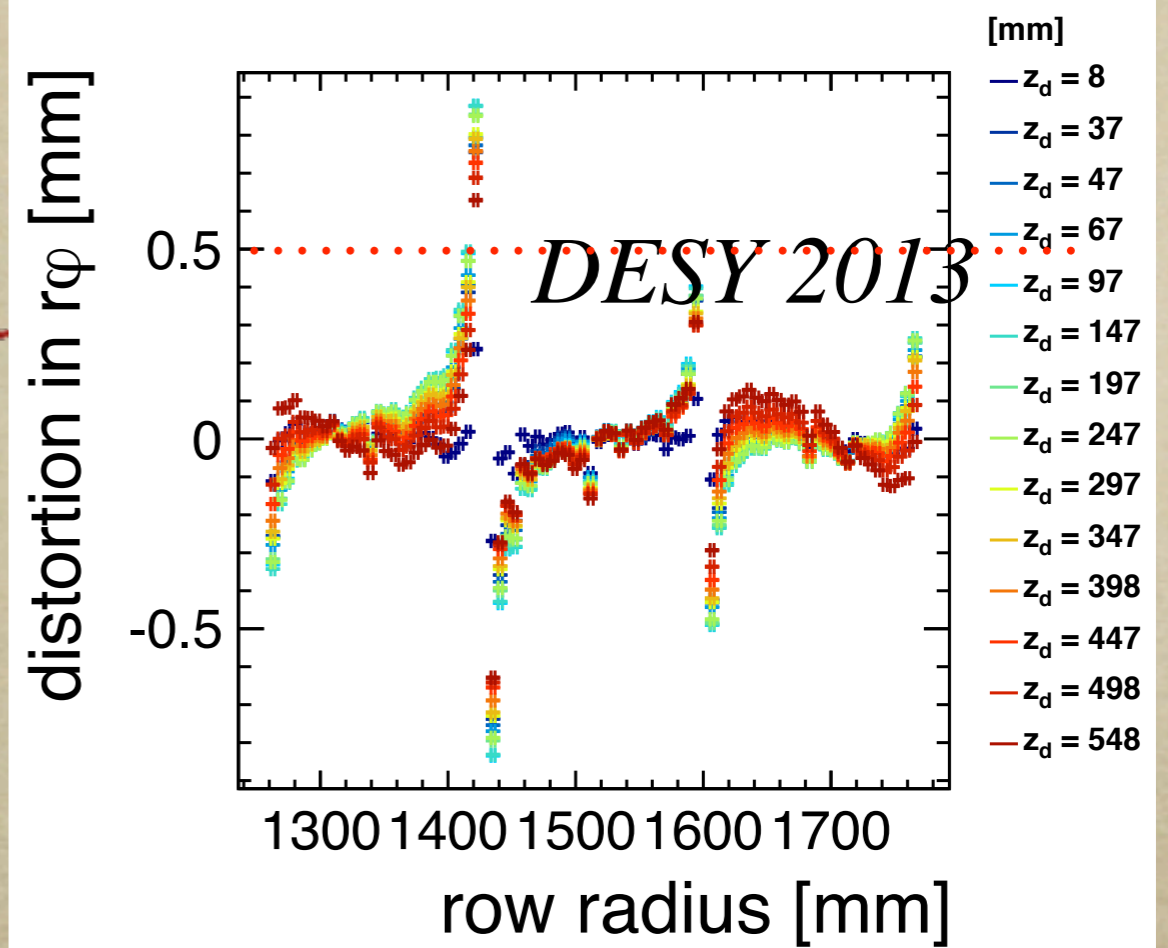
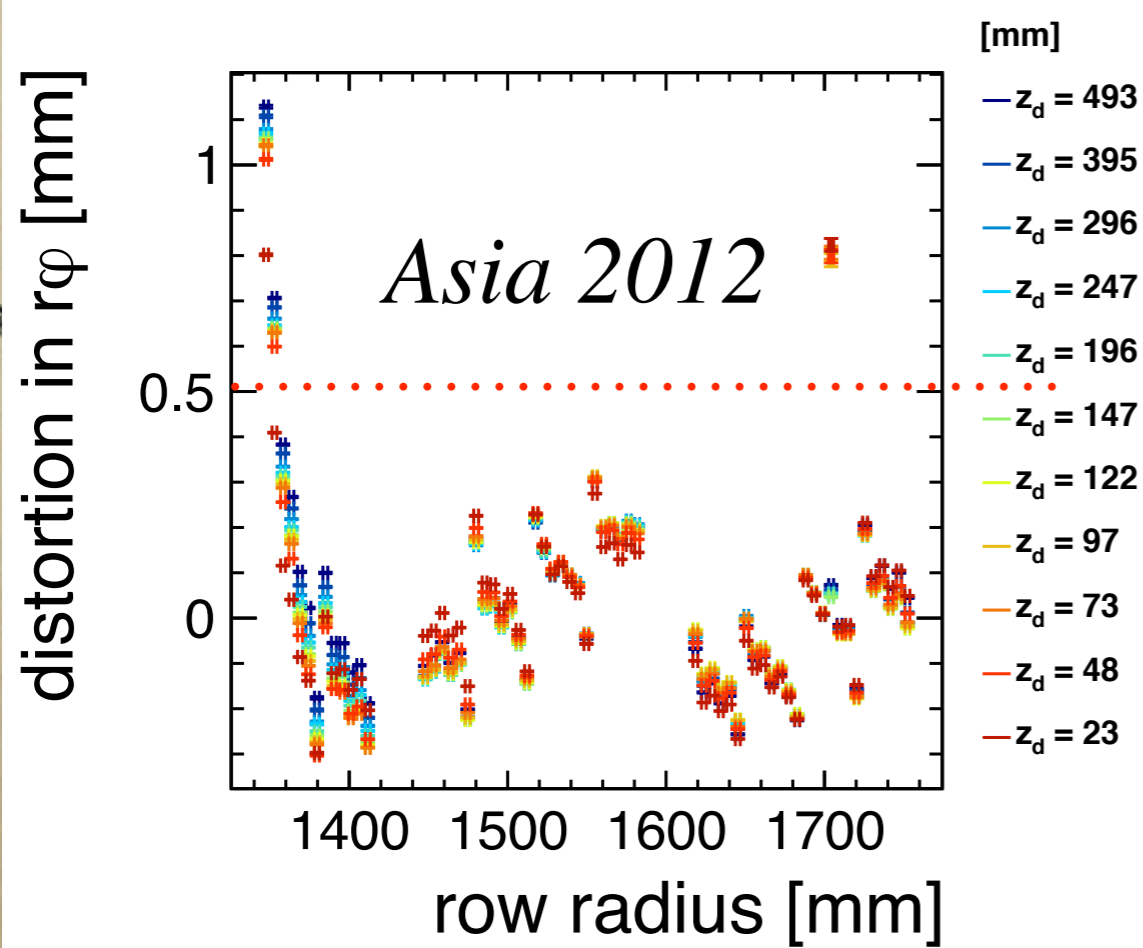
comparison between groups (from svn, preliminary!)



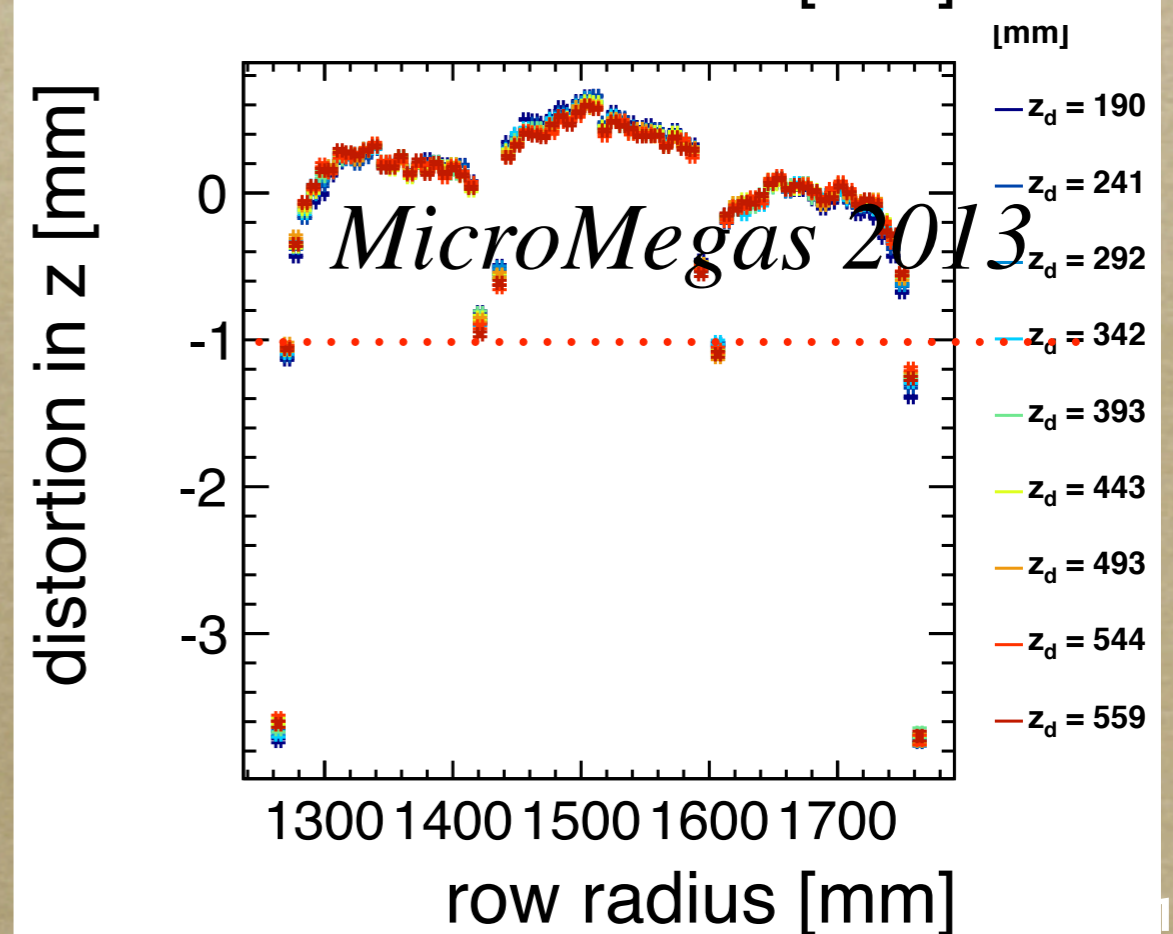
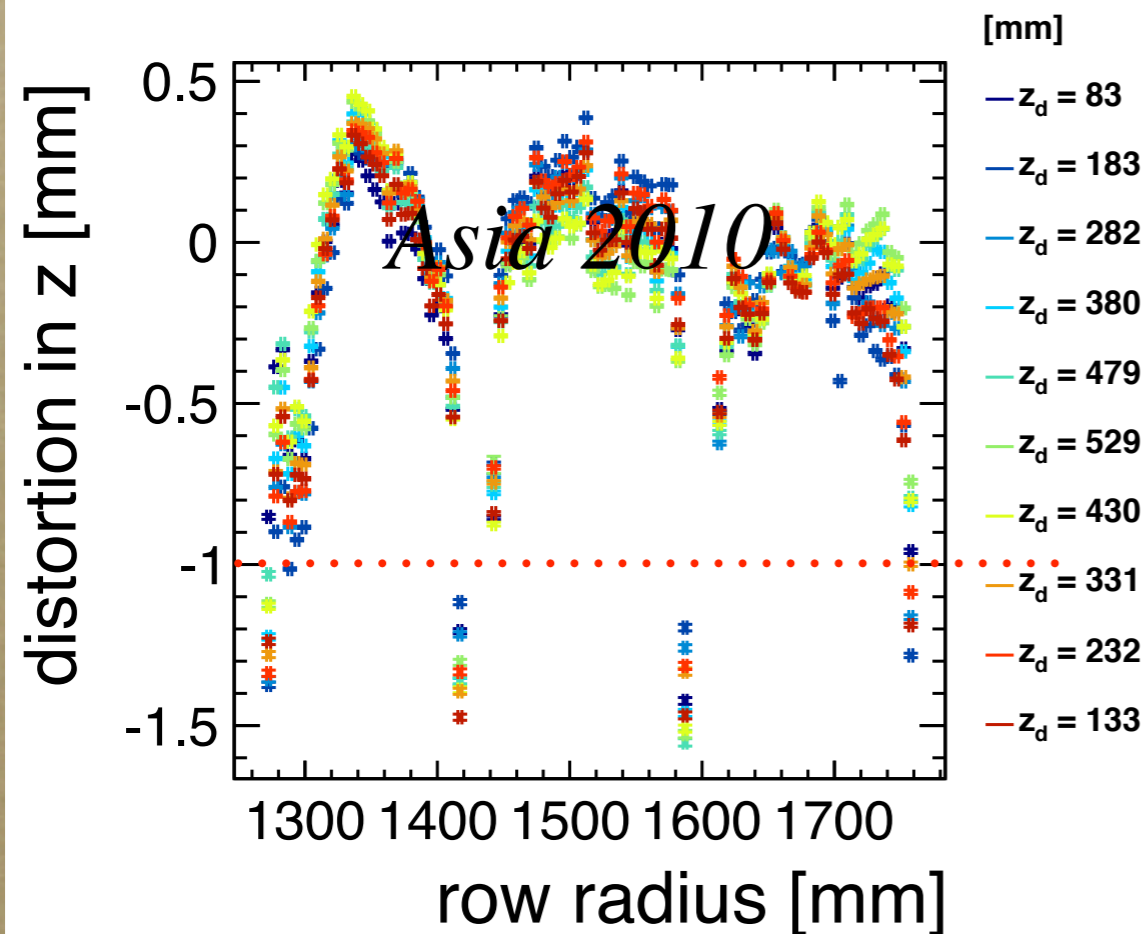
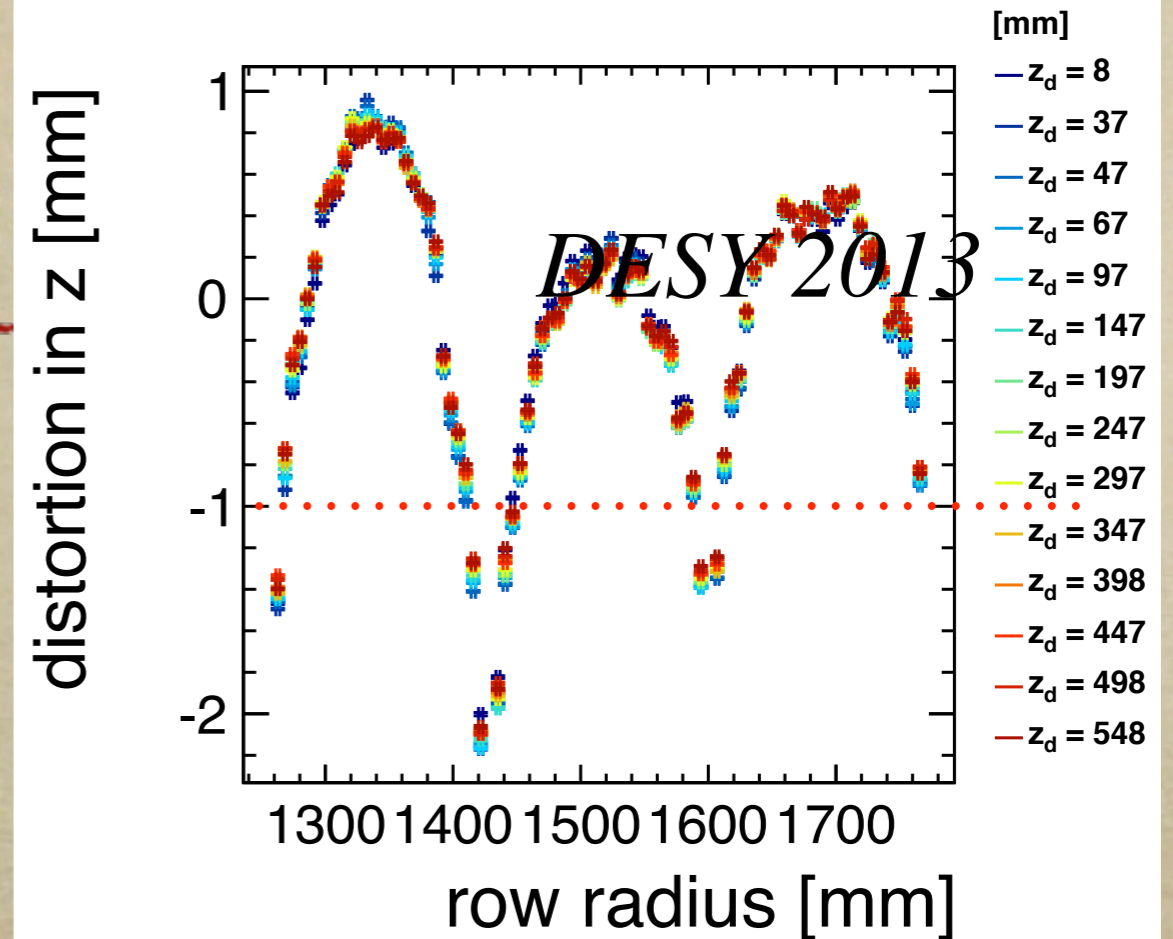
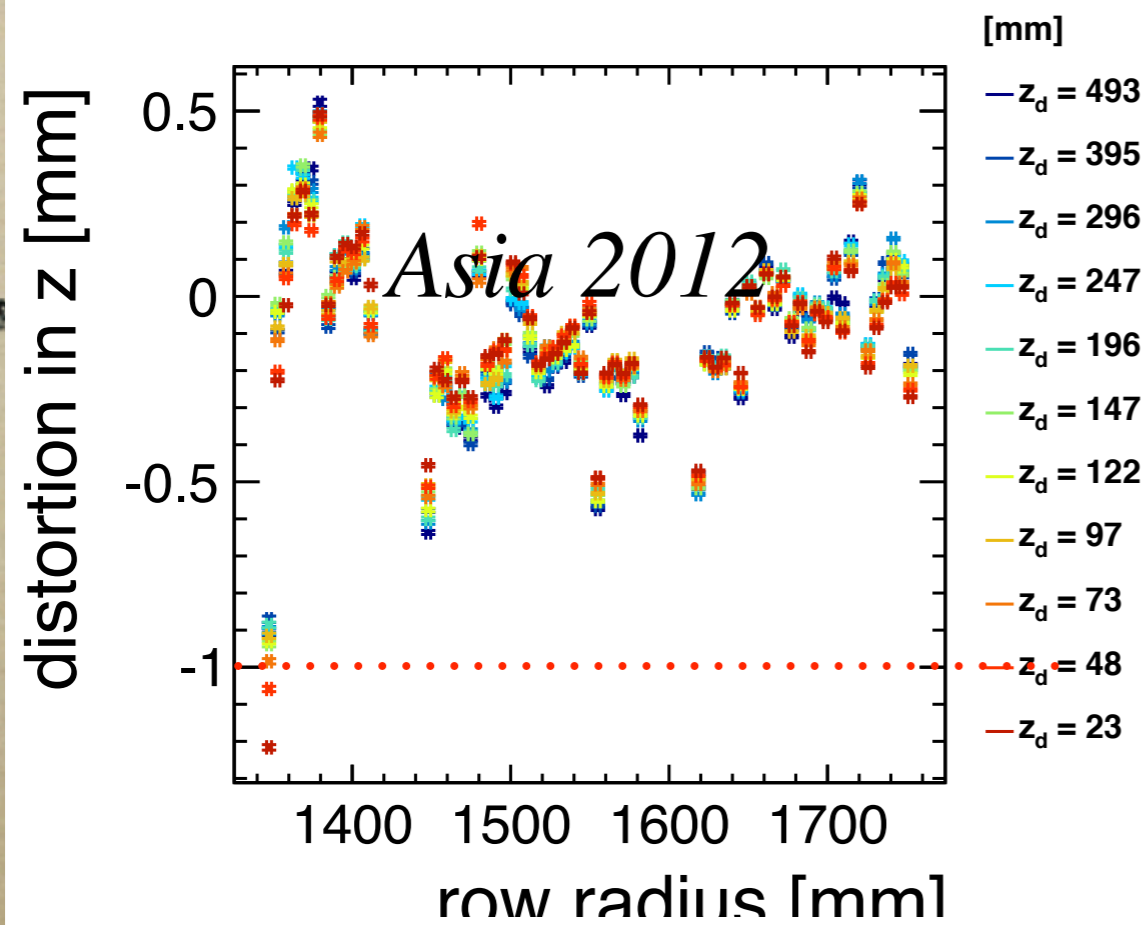
comparison between groups (from svn, preliminary!)



comparison between groups (from svn, preliminary!)



comparison between groups (from svn, preliminary!)



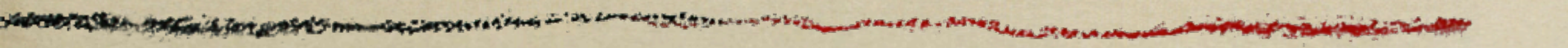
YokaRawMon

input: converted raw data (root)

- ▶ *no dependence with Marlin*
- ▶ *developed based on ROOT*
- ▶ *tracking based on KalTest*
- ▶ *simple reconstruction algorithms*
- ▶ *compact and fast*
- ▶ *real time full information event display*
- ▶ *particularly useful for debugging*

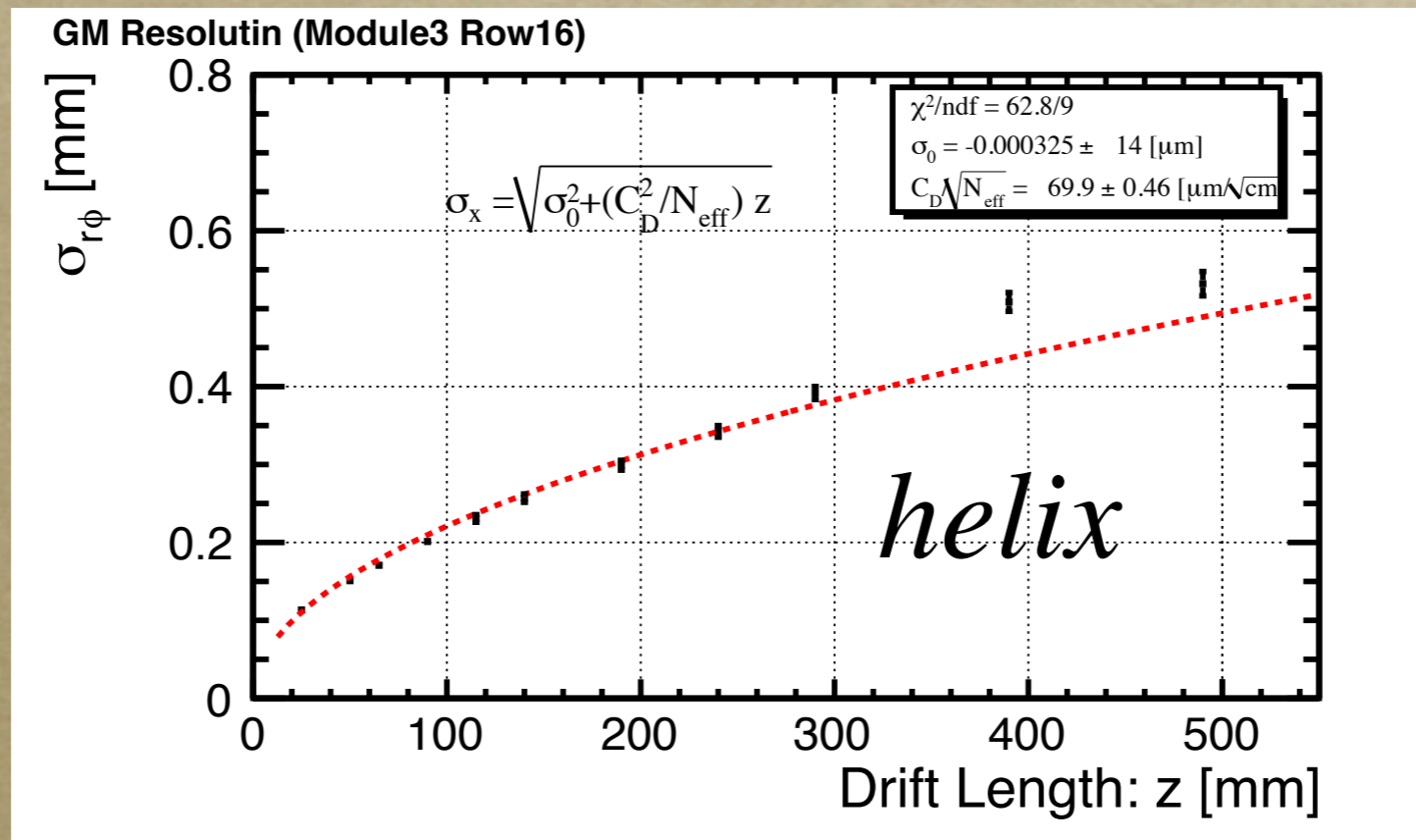
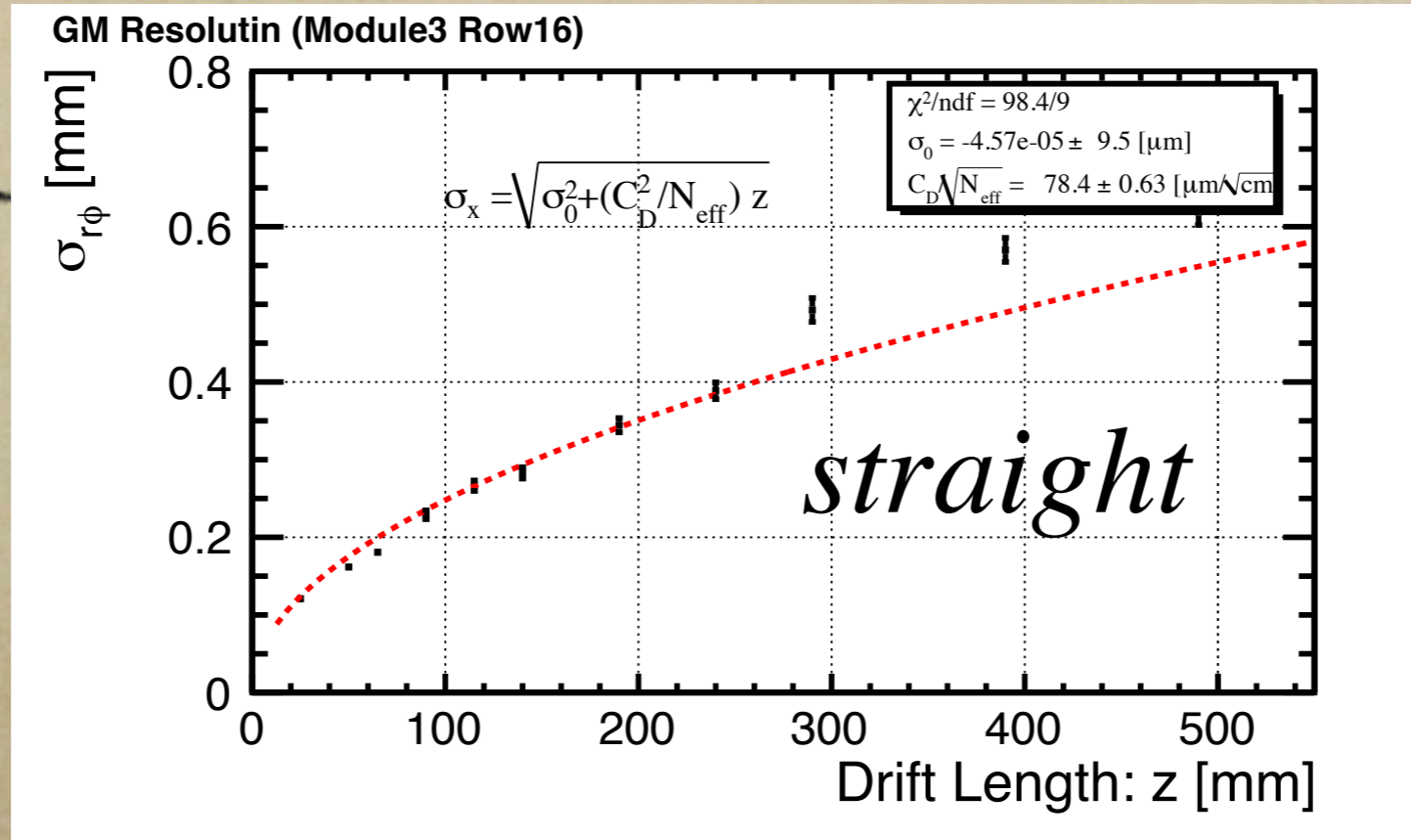
ongoing effort

- ❑ *finalize test beam data analysis based on common processors: almost done for 2010 and 2012 $B=1T$ data.*
- ❑ *proper tracking with Kalman Filter for $B=0T$: done by Bo Li, now being checked with data.*
- ❑ *analyze laser test data with MarlinTPC (w/ event display): Saga, Mai & Katsumasa, etc.*
- ❑ *alignment with Millepede.*
- ❑ *distortion correction.*
- ❑ *pulse time study.*

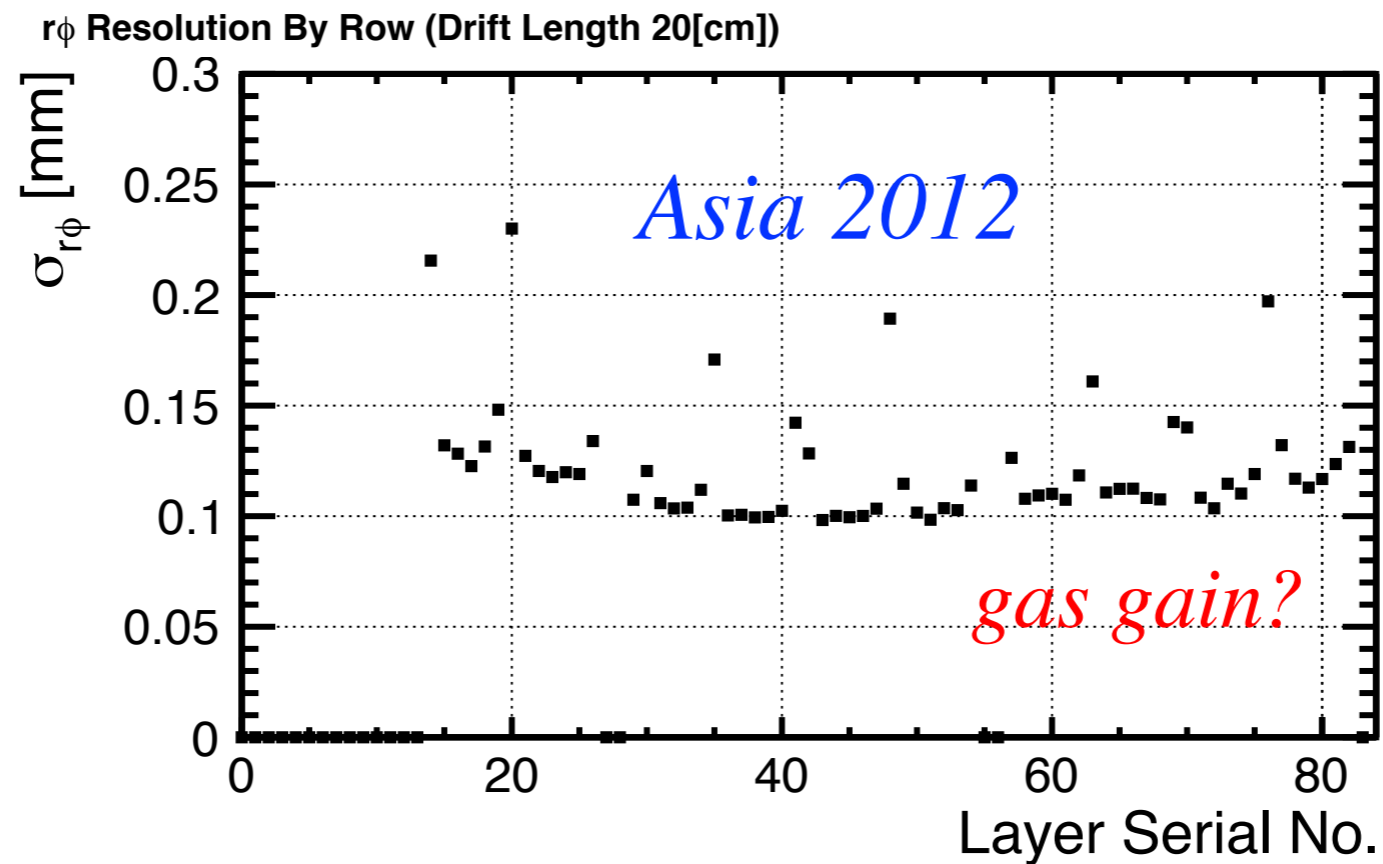
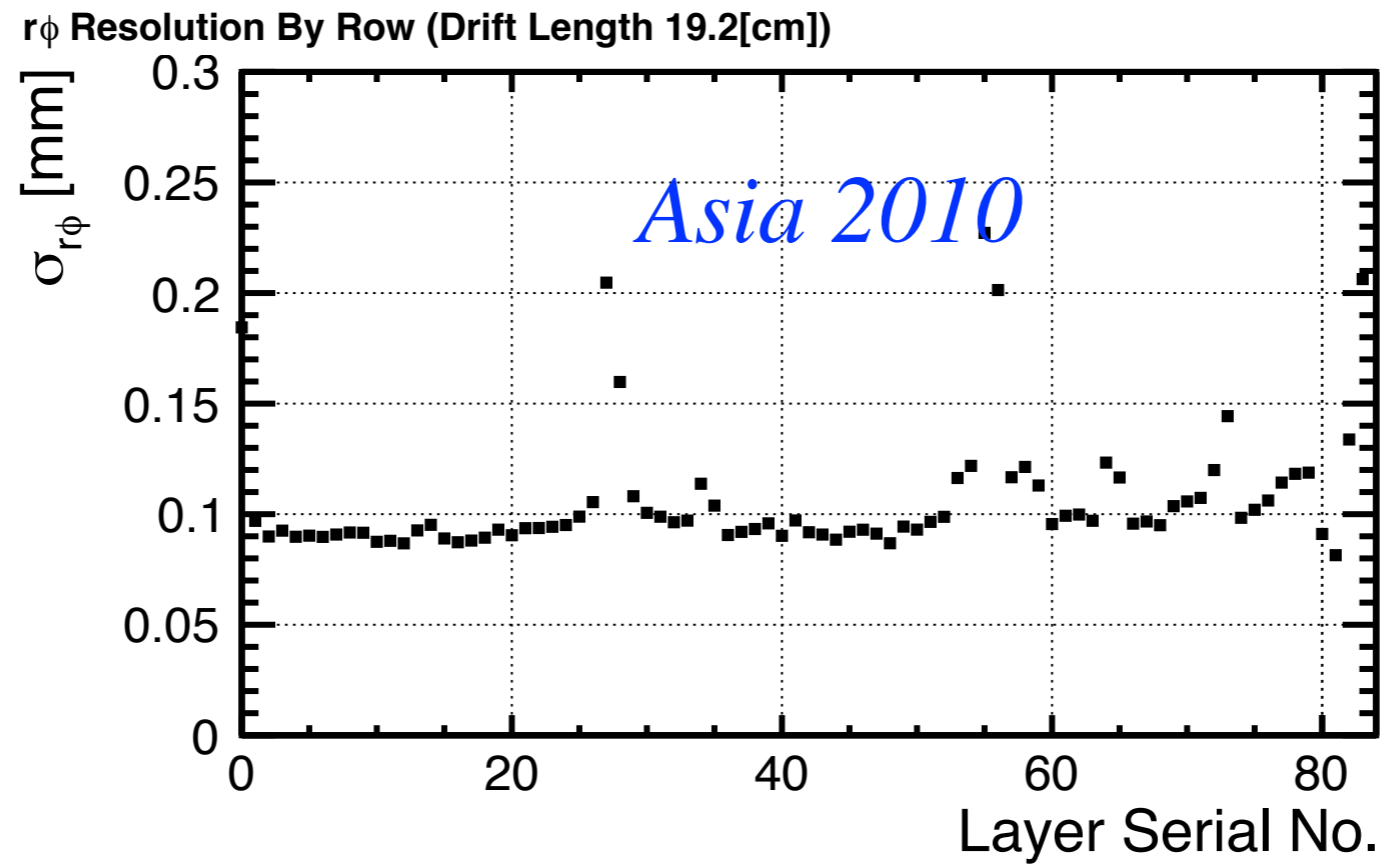


back up

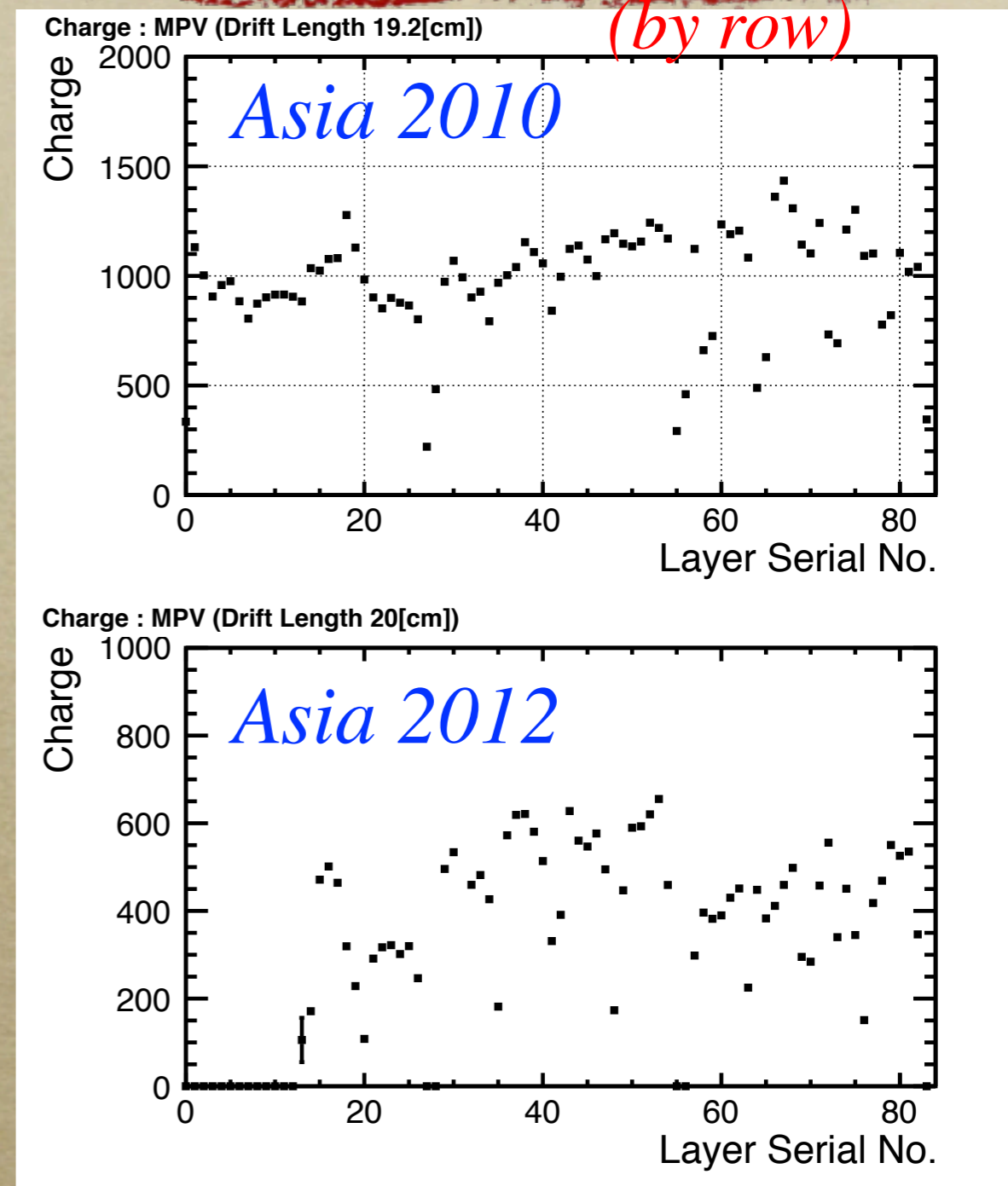
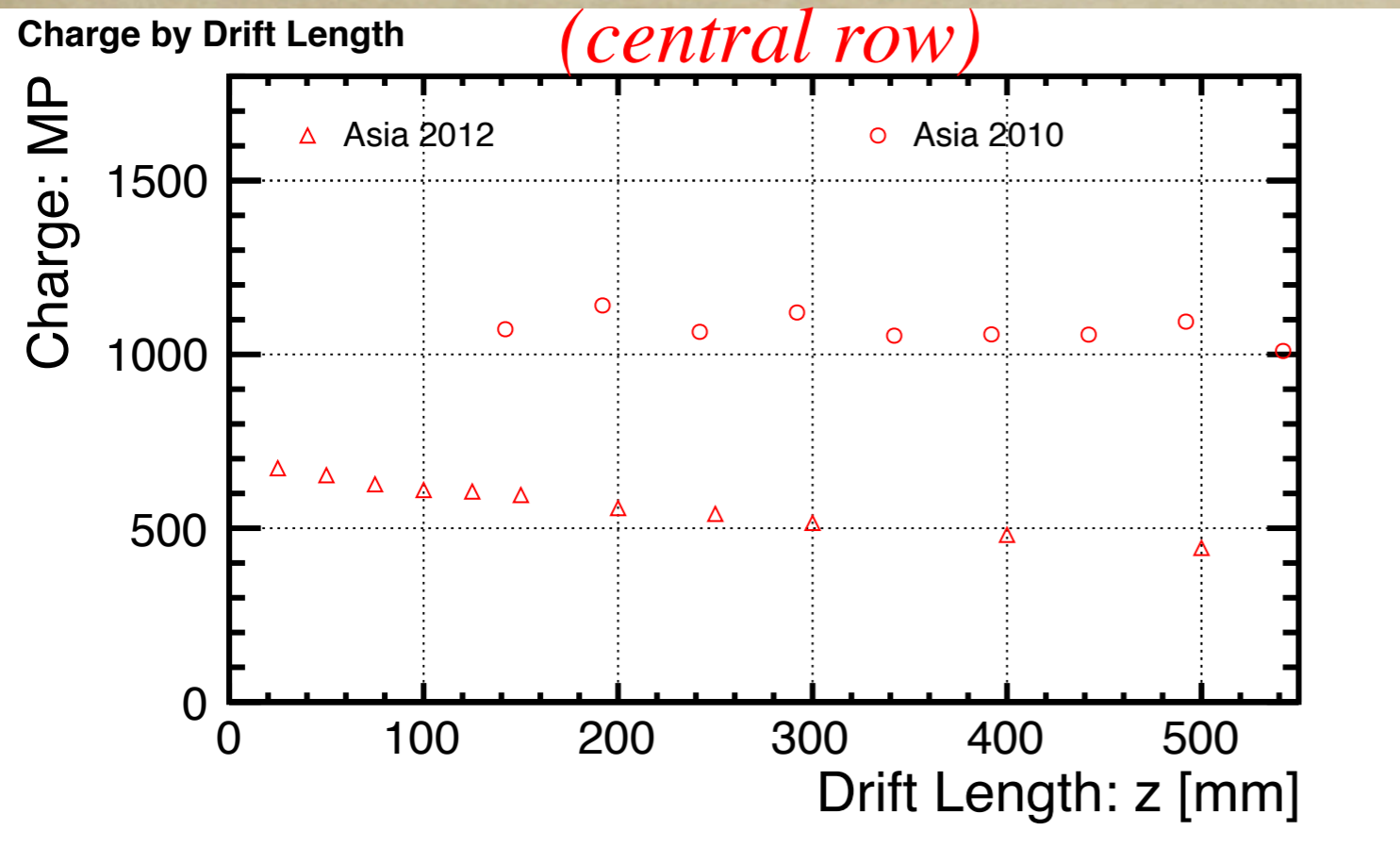
performance: *rφ-resolution* ($B = 0T$)



performance: $r\phi$ -resolution by row



Charge



apparent charge loss in Asia 2012 data