

(Possible and Definite)  
Problems with the LP1 GEAR File for the Asian GEM Modules

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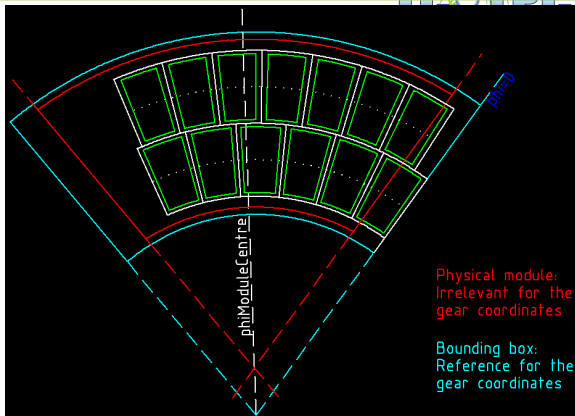


22. 11 2012

## Problem 1:

The offsets in the rows are not adapted

- Offsets are 0 and 1/2 pad pitch
  - Offsets are measured wrt. bounding box
- ⇒ Pads are outside the physical module



## Problem 2:

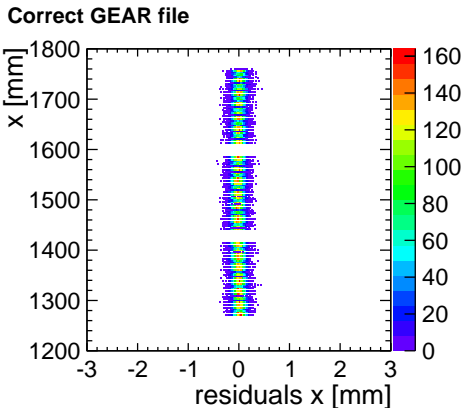
The module offset of the lower and upper row are interchanged

- Copy and paste error
- **All** descriptions (not only Asian GEM modules) based on my examples are affected

Simulation study:

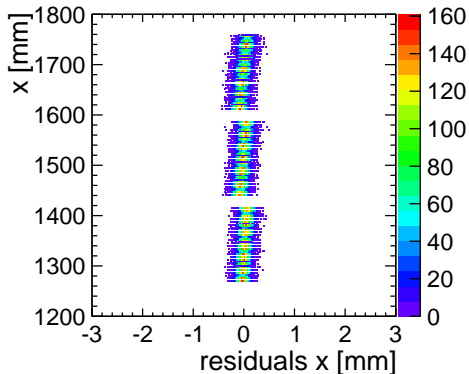
- Simulation and digitisation with a changed GEAR file
- Reconstruction with the GEAR file from the repository

Cross check: Simulation and reconstruction with the same GEAR file



Approximately like the row offset problem

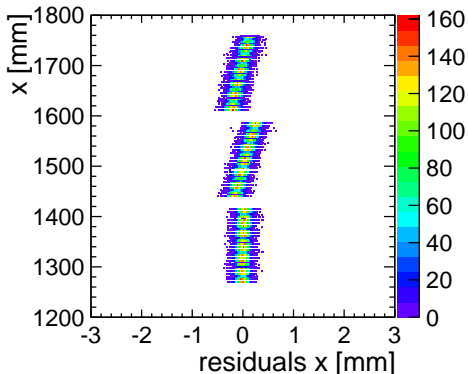
## Wrong module angle



- Linear change of the residuals with radius
- About the same effect in all modules

padHeight (metal) = 5.26 mm  $\rightarrow$  rowHeight (pitch) = 5.26 mm

## Wrong row height

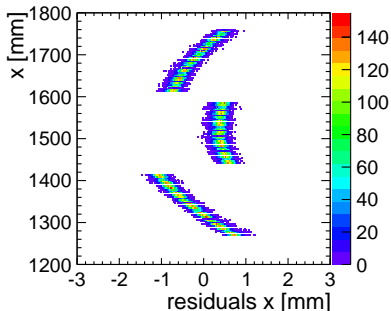


- Effect becomes asymmetric between modules
- Looks similar to the distortions we are seeing

Suspicious: The gap at the edge of the different rows is

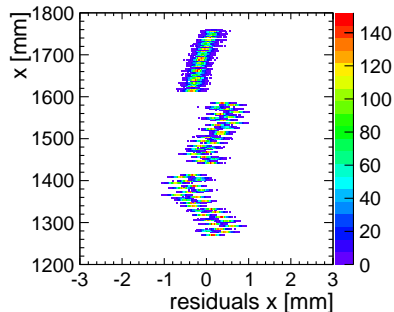
- neither the same angle
- nor the same absolute distance

## Wrong pad pitch



- The wrong pitch adds curvature to the residual distribution

## Original pitches



- Staggering problem (offsets?)
- "S-shape" as seen in the data

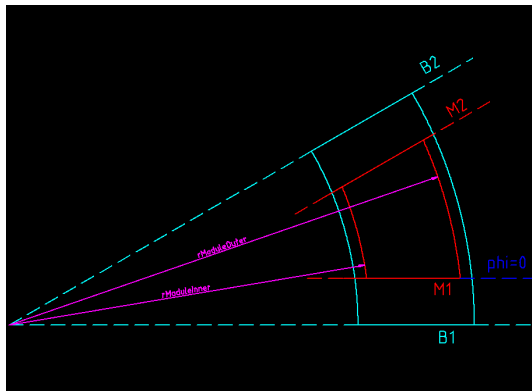
# Wrong Coordinate Origin?



## Module construction

- All radii are measured to the coordinate origin of the bounding box
- M1 and M2 are shifted for mechanical clearance

Where to put the local origin?



## Module construction

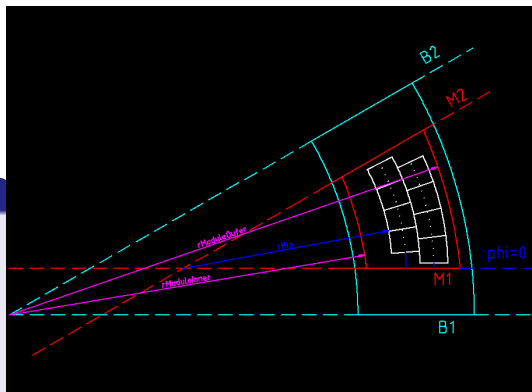
- All radii are measured to the coordinate origin of the bounding box
- M1 and M2 are shifted for mechanical clearance

Where to put the local origin?

## What might have happened:

### Pad plane construction

- Radii are measured to the intersection of the physical module edges.
- Pad rows are no longer concentric to the module
- Pad planes in the same module row are no longer concentric

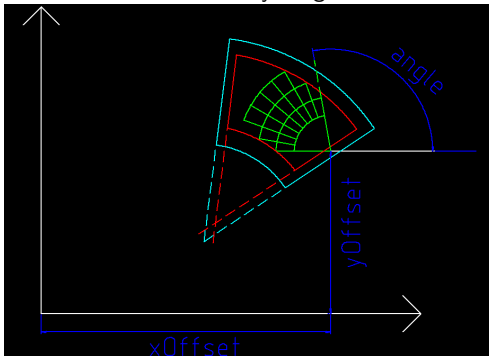




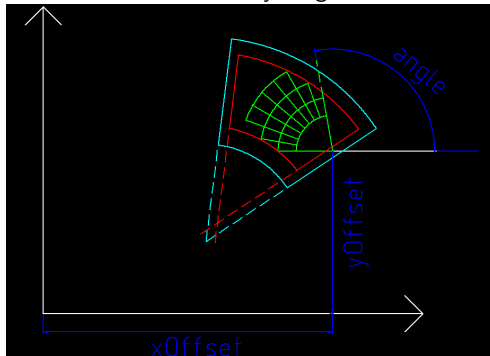
# GEAR Can Do It!



Fortunately you can describe almost everything with GEAR.



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Unfortunately the KalmanFilter will break if you shift the local origin.

- Only concentric pad planes in the same row can be described!
- Works for one module per row with small patches
- Needs major work in the Kalman geometry and the pattern recognition to work for 7 modules (but in principle is possible with the new design).

Definitive problems with the current Asian GEM GEAR files

- Offsets of the individual rows
- Module offsets for the upper and lower row exchanged

Indications for Problems

- Row height
- Pad pitch
- Wrong local coordinate origin

New "How To" document with detailed description

- Please recheck **all** parameters with the technical drawings of the pad plane (and the LP1 drawings)!
- Determine where the centre of your pad rows is located!
- Determine where the pads are aligned!
- Please give feedback what is unclear or missing in the documentation.



# Backup

In the GEAR file the module row offsets -172.5 mm and 171.615 mm are interchanged.

## Wrong module offsets

