

“Outlier” Modules in Recent Pixel Alignments

Gero Flucke

DESY

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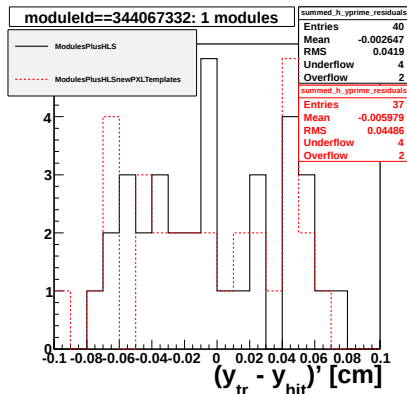
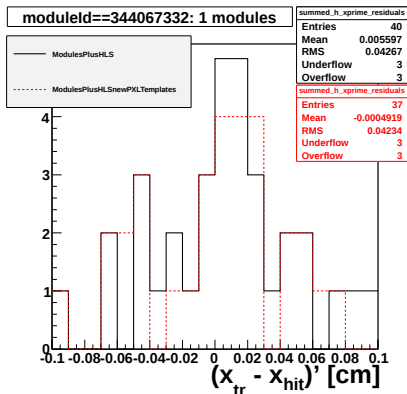
Reminder

- Two new Pixel module level alignments:
 - ModulesPlusHLS:
used in rereco of data until June technical stop
 - ModulesPlusHLSnewPXLTemplates:
used since restart of data taking
- Differences (see Devdatta's [geometry comparisons](#)):
 - $\pm 2 \mu\text{m} \Delta r\phi$ for inwards/outwards pointing BPIX modules
 $\Rightarrow$ expected due to Lorentz angle (LA) change,
 - few FPIX modules show up to $200 \mu\text{m}$ position difference
 $\Rightarrow$ unexpected, investigated here.

Idea

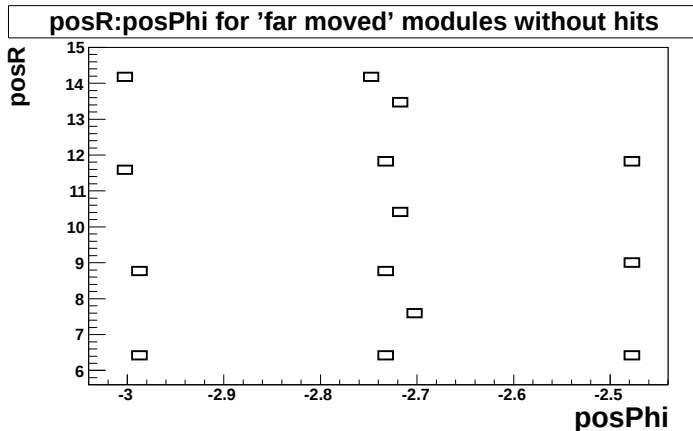
- Look at residual distributions of modules with $\Delta r\phi > 50 \mu\text{m}$.
- Thanks to J. Moisisio for running on large sample of 10 M MinBias events.

Residual Distribution(s)



- No hits except on one module (shown above)!
- Even for that module: Not very conclusive: $RMS \approx 400 \mu m$.

Where are the Other Modules?



- Rather localised in ϕ .
- Then 'all' radii.

```
tree->Scan("moduleId:entries:posZ:posR:posPhi", selection)
```

```
*****
```

```
* moduleId * entries * posZ * posR * posPhi *
```

```
*****
```

```
* 344067332 * 37 * -48.27671 * 6.0145025 * 0.5899102 *
```

```
* 344077572 * 0 * -47.17706 * 6.3369970 * -2.989208 *
```

```
* 344077576 * 0 * -47.18166 * 8.8112430 * -2.994804 *
```

```
* 344077580 * 0 * -47.15864 * 11.685977 * -2.999739 *
```

```
* 344077584 * 0 * -47.15866 * 14.168323 * -3.002136 *
```

```
* 344078596 * 0 * -47.78496 * 6.3949298 * -2.734057 *
```

```
* 344078600 * 0 * -47.77268 * 8.8677063 * -2.738171 *
```

```
* 344078604 * 0 * -47.75961 * 11.739969 * -2.739899 *
```

```
* 344078608 * 0 * -47.74615 * 14.214952 * -2.742173 *
```

```
* 344078852 * 0 * -48.49070 * 7.5866346 * -2.701795 *
```

```
* 344078856 * 0 * -48.46484 * 10.519647 * -2.715955 *
```

```
* 344078860 * 0 * -48.45117 * 13.446739 * -2.722902 *
```

```
* 344079620 * 0 * -48.39811 * 6.4500422 * -2.478131 *
```

```
* 344079624 * 0 * -48.38008 * 8.9228830 * -2.480959 *
```

```
* 344079628 * 0 * -48.35419 * 11.797394 * -2.482344 *
```

```
*****
```

Conclusions/Remarks

- Different module positions cause no major discrepancy of otherwise equivalent alignment results:
 - Concerns only rarely hit modules.
- Origin probably the three 'real' outlier modules moved back 'back hand'.
- These may be caused by low statistics, 4 aligned degrees of freedom and the 'entries 1' cut in pede.
- Probably better to avoid using presigma or larger 'entries' cut.