

Testbeam Initial Tracking Studies

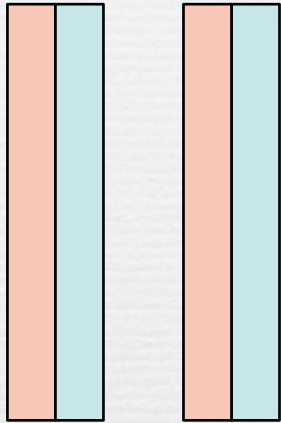
Karol Hennessy
Ronan McNulty

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UCD

Overview

- Setup and Configuration
- Residuals
- Alignment
- Resolution
- Conclusions

Setup

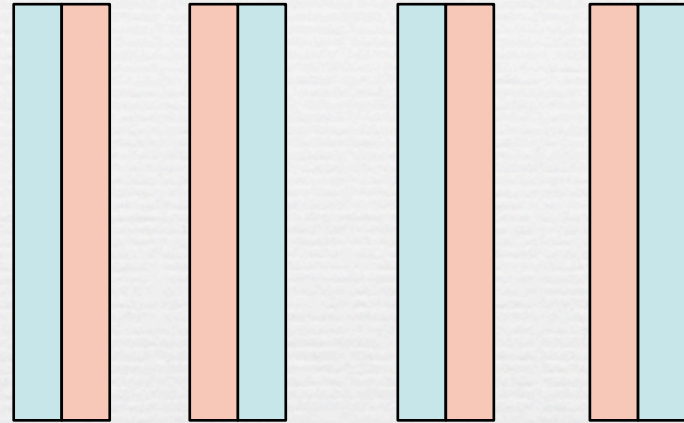


Z=200mm

260mm

1

2



600mm

650mm

700mm

750mm

3

4

5

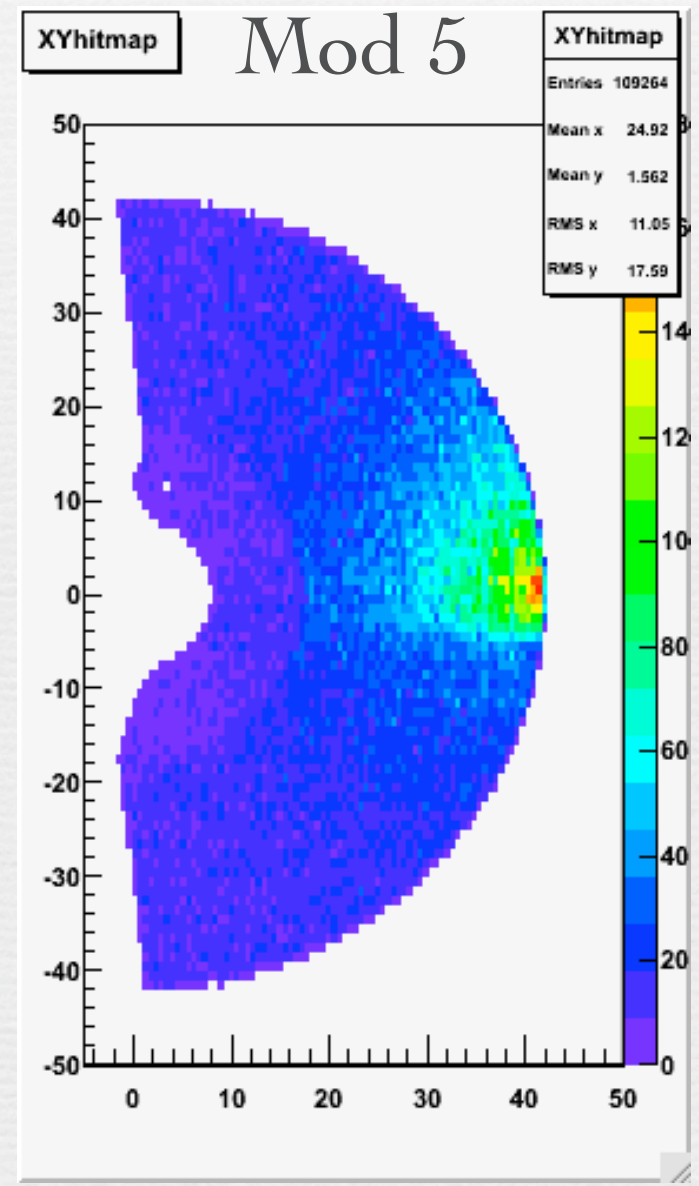
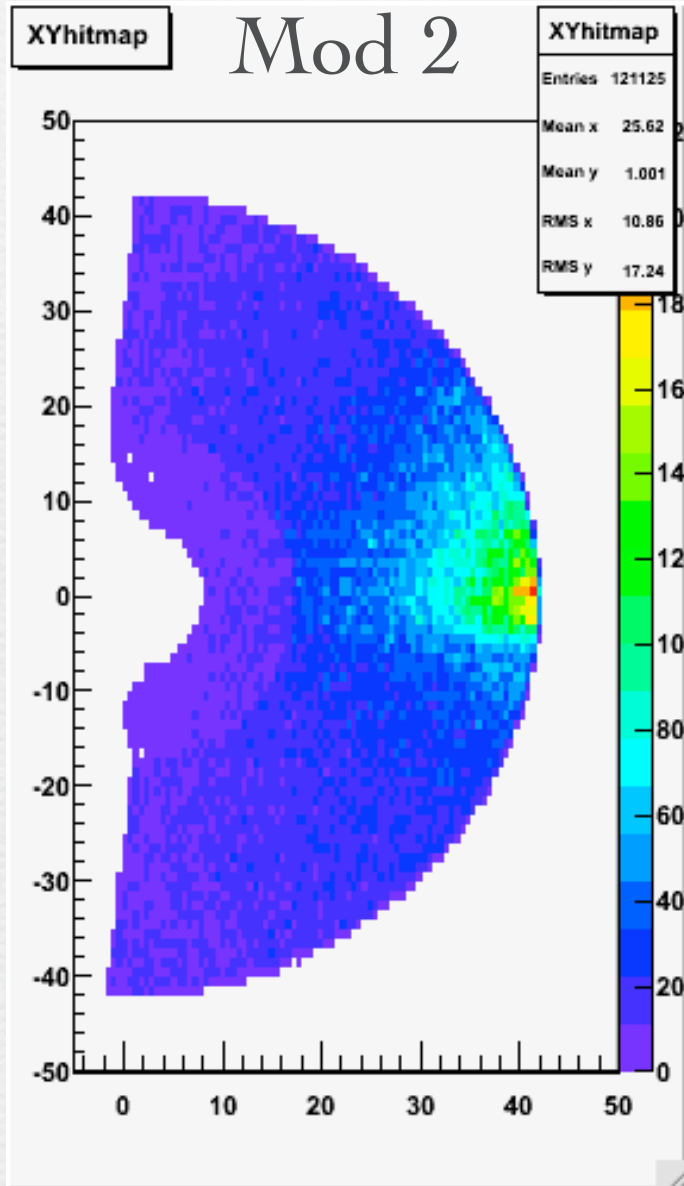
6

☞ Cable Configuration 2

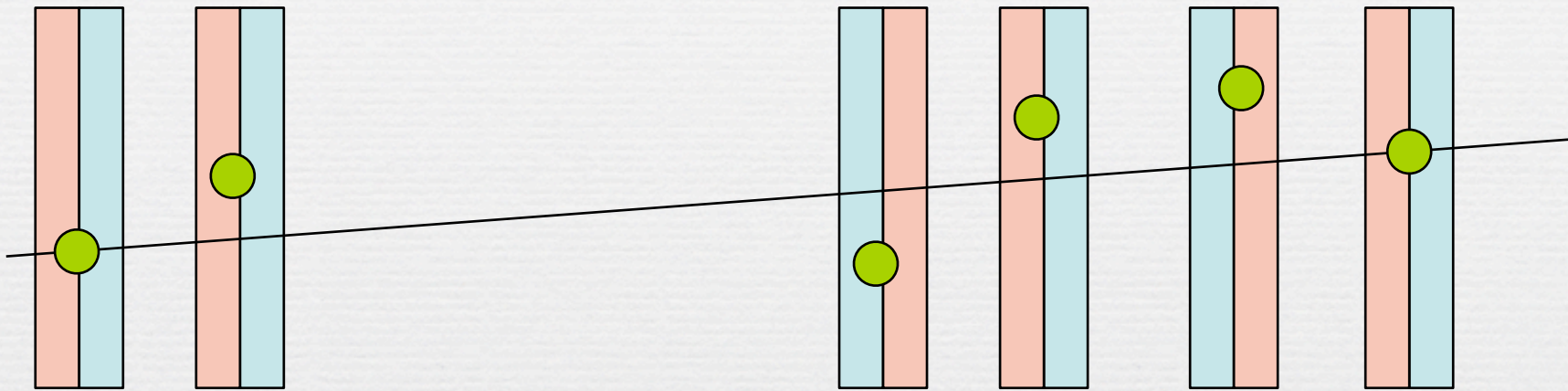
Data

- ACDC3 Testbeam
- Wide beam (for alignment)
- Taking strip limits in local frame to determine (x,y,z) points
- 100k Events
- Demand at least 1 cluster in each sensor

Hits



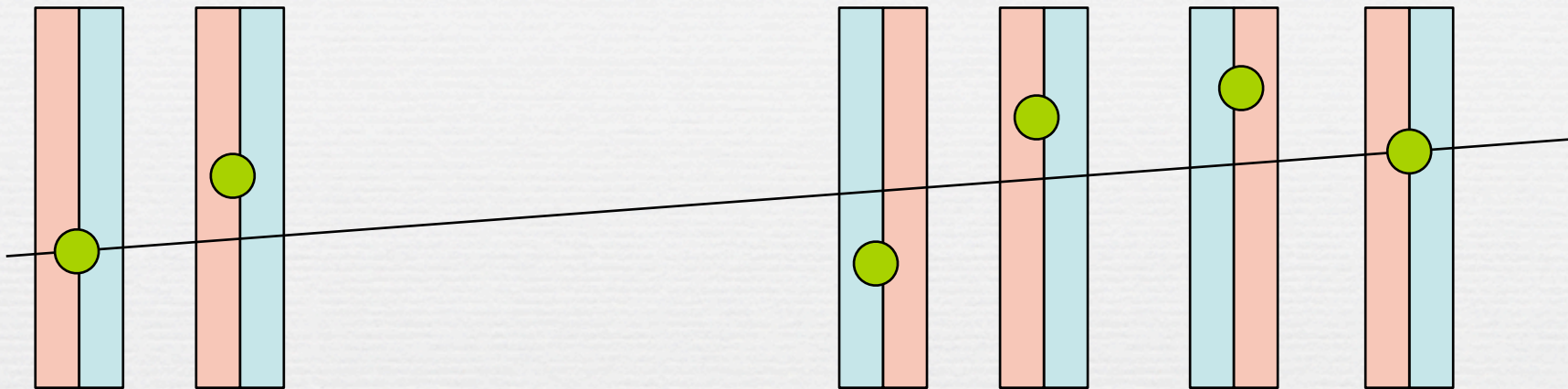
Residuals



Constrain through first and last points. This defines a (slightly skewed) frame. Plot residuals of all point to this line.

(We might expect Gaussian distributions)

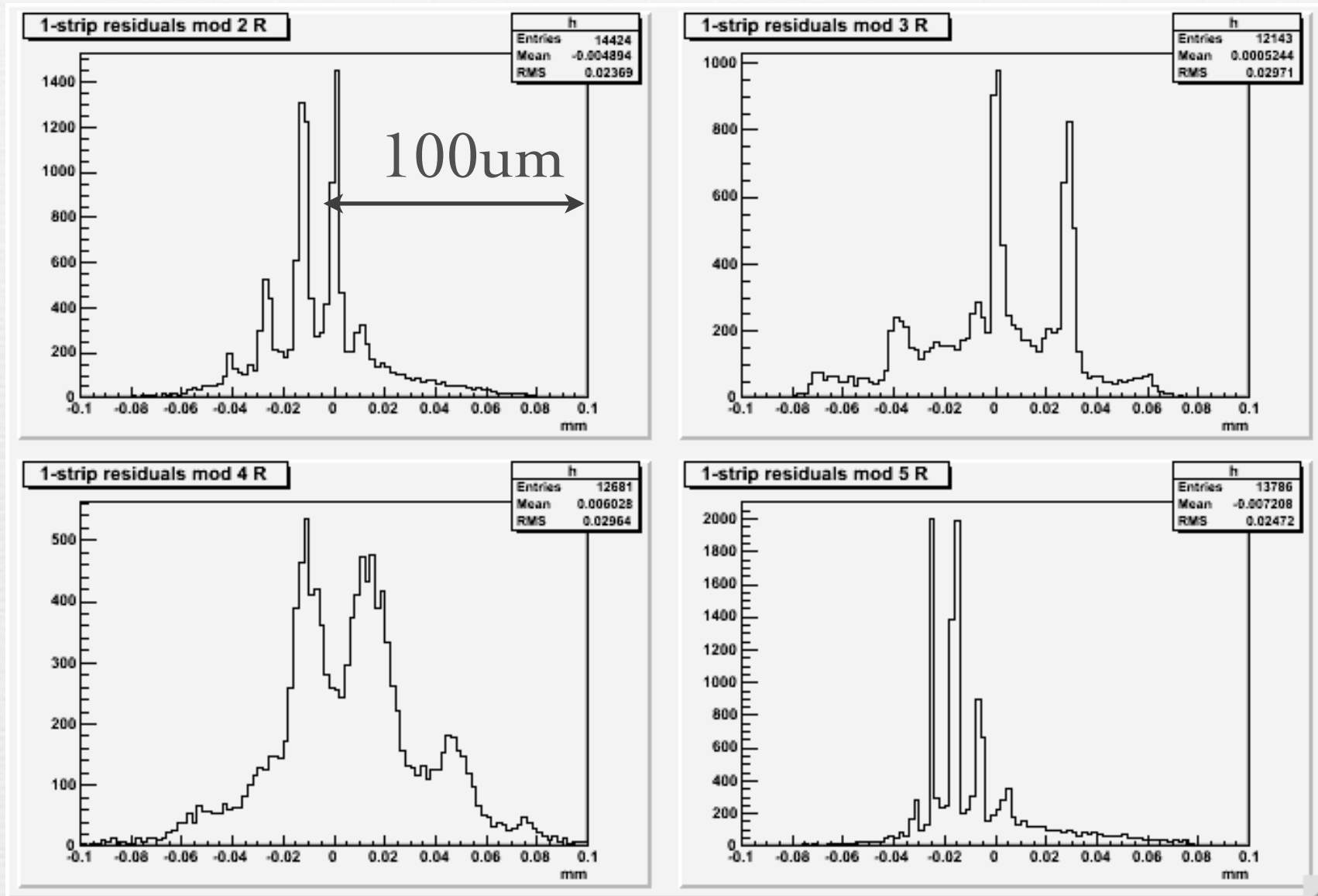
Alignment Procedure



- Almost no alignment required...
- Shift modules “by eye” until residuals centred on zero.

	1	2	3	4	5	6
X (μm)				-10	-25	
Y (μm)		-20	+20	+65		
Rot(mrad)			0.9		0.7	

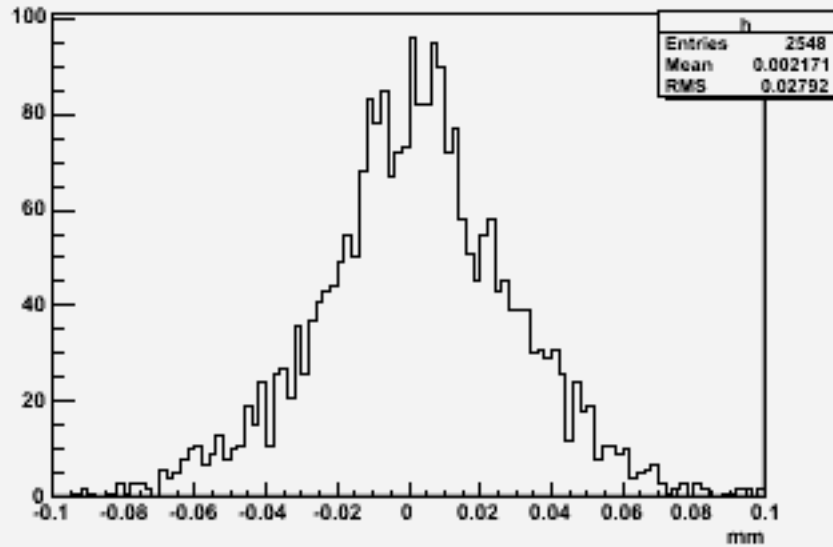
1-strip Residuals ΔR



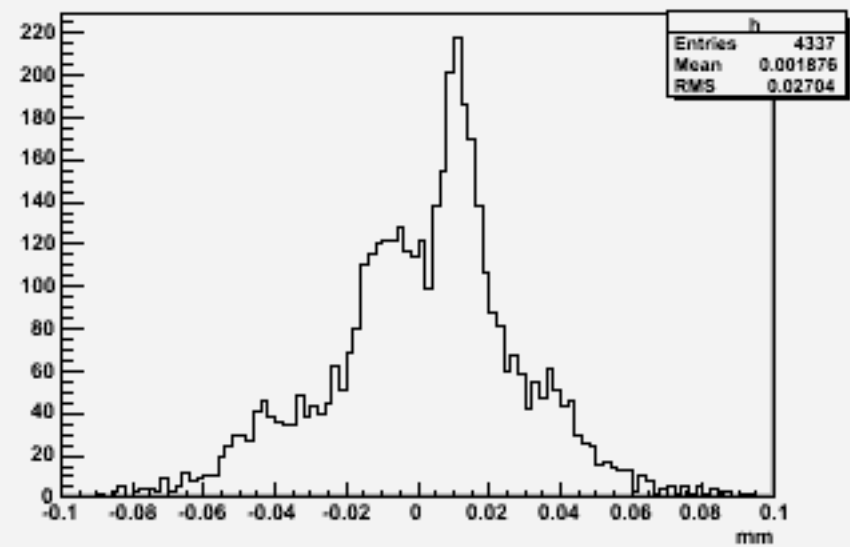
Not Gaussian! Implications for Millipede?

2-strip Residuals ΔR

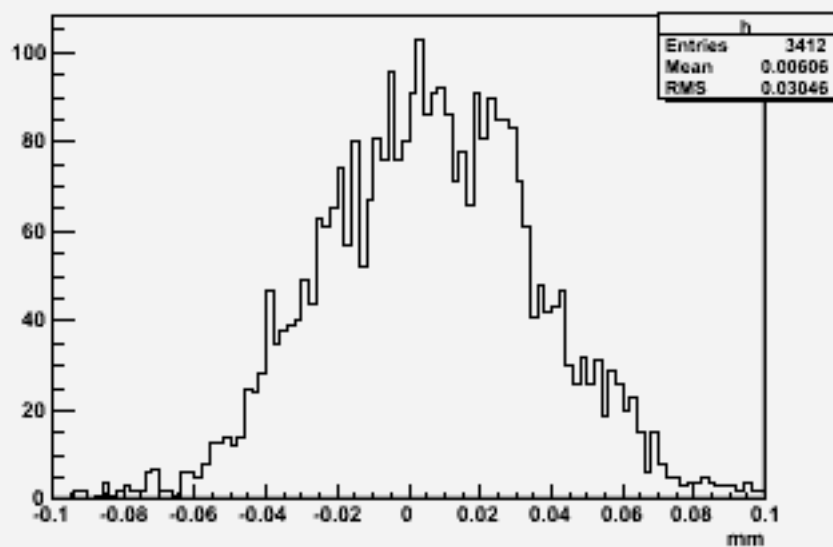
2-strip residuals mod 2 R



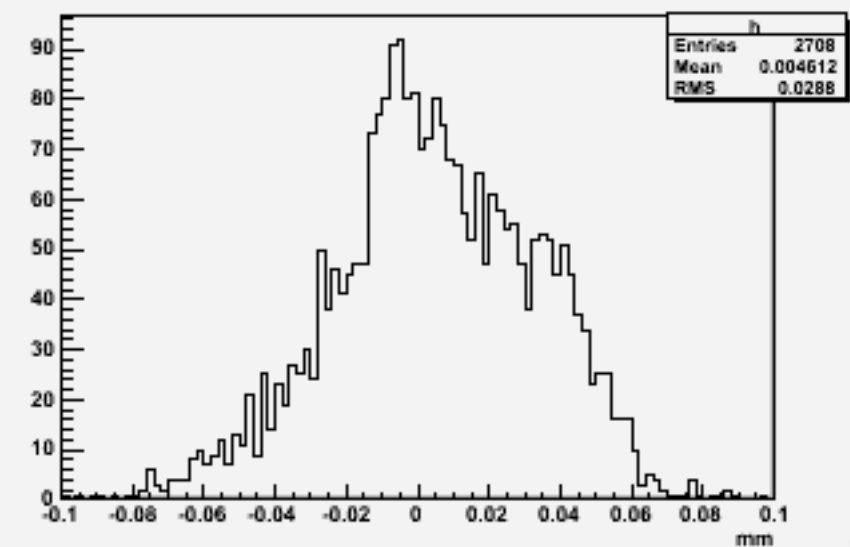
2-strip residuals mod 3 R



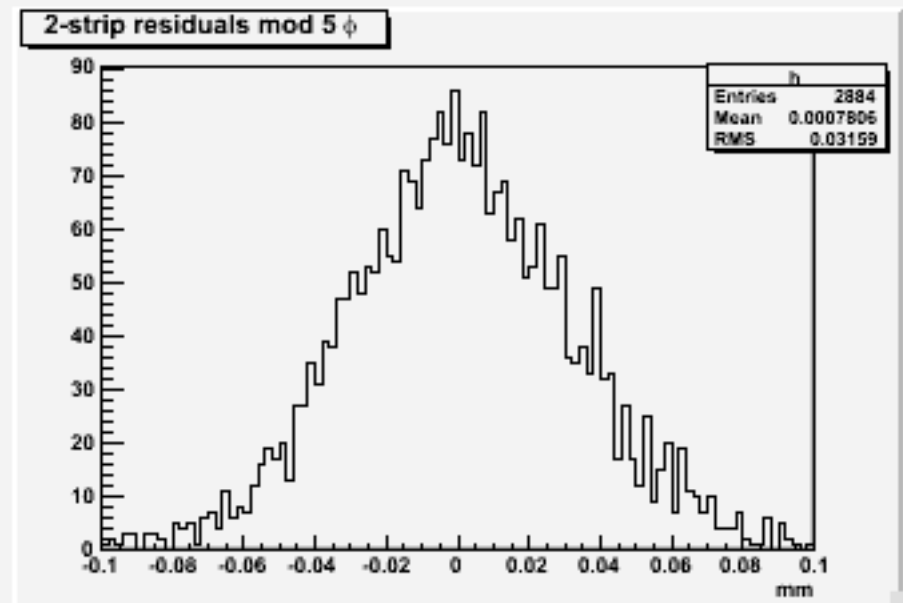
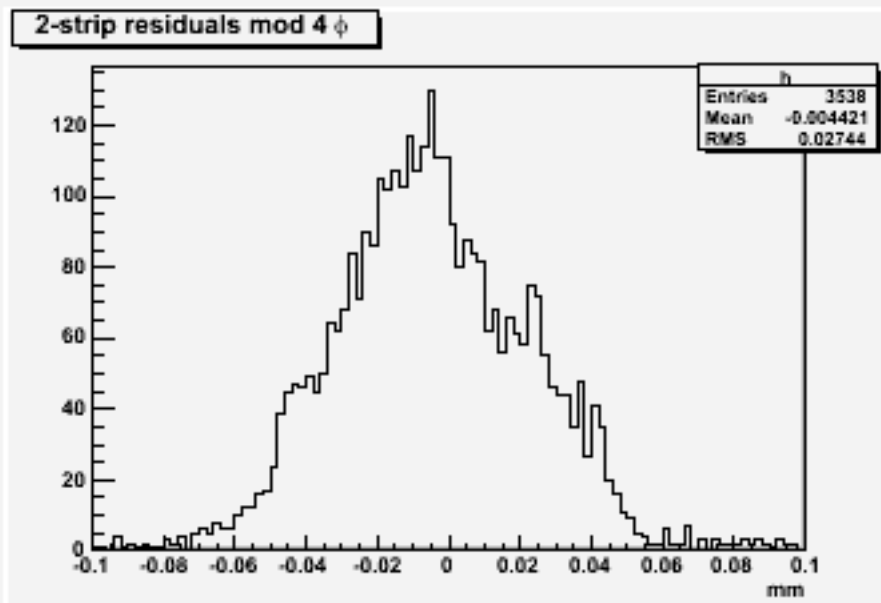
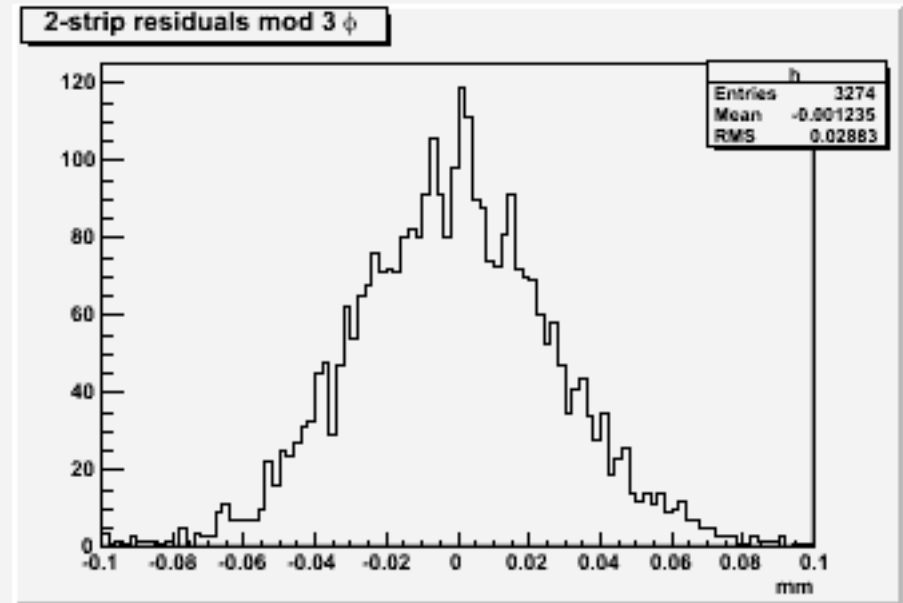
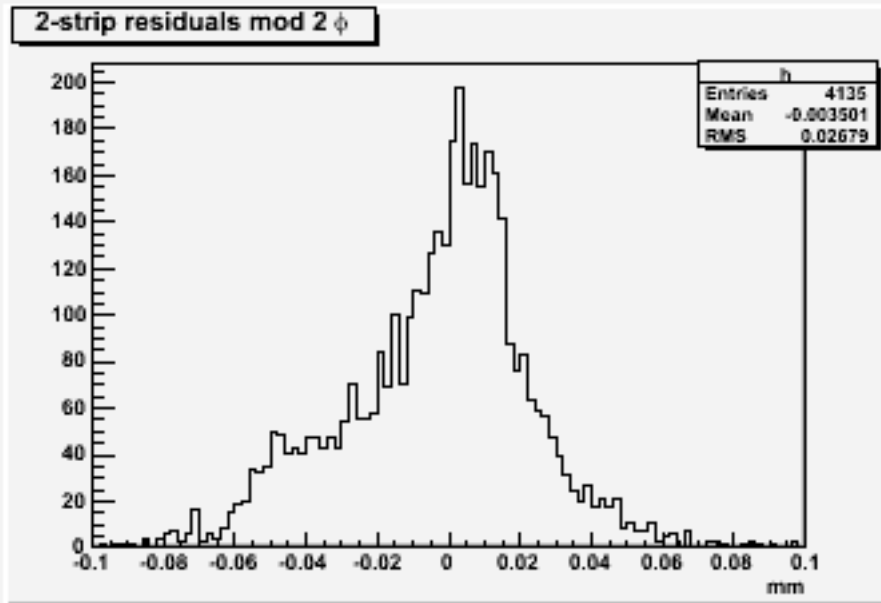
2-strip residuals mod 4 R



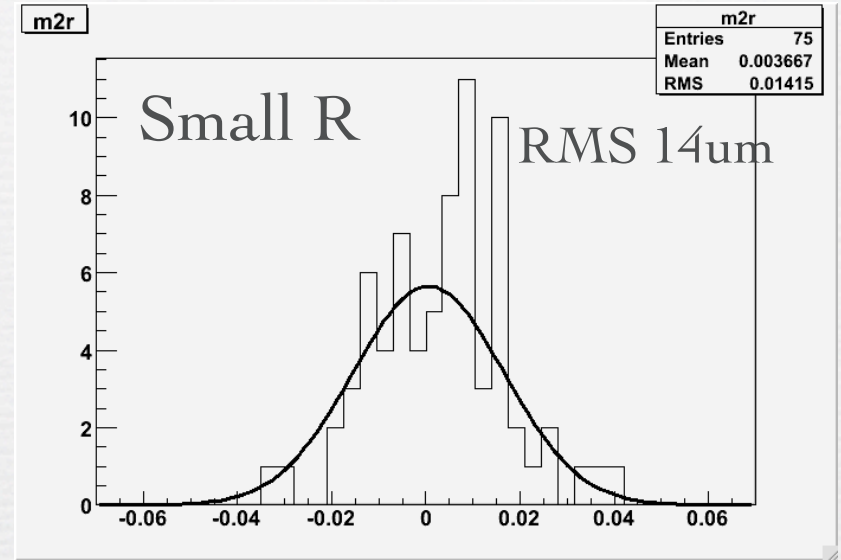
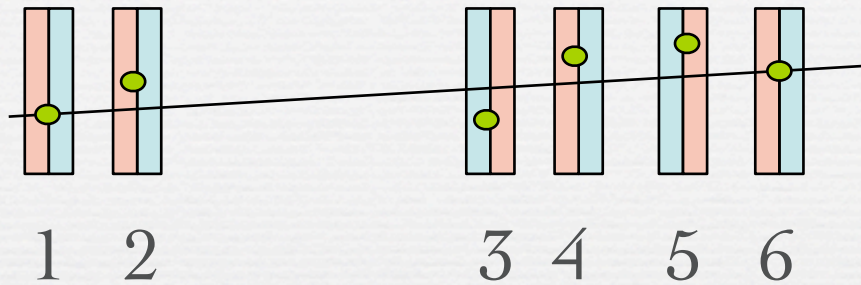
2-strip residuals mod 5 R



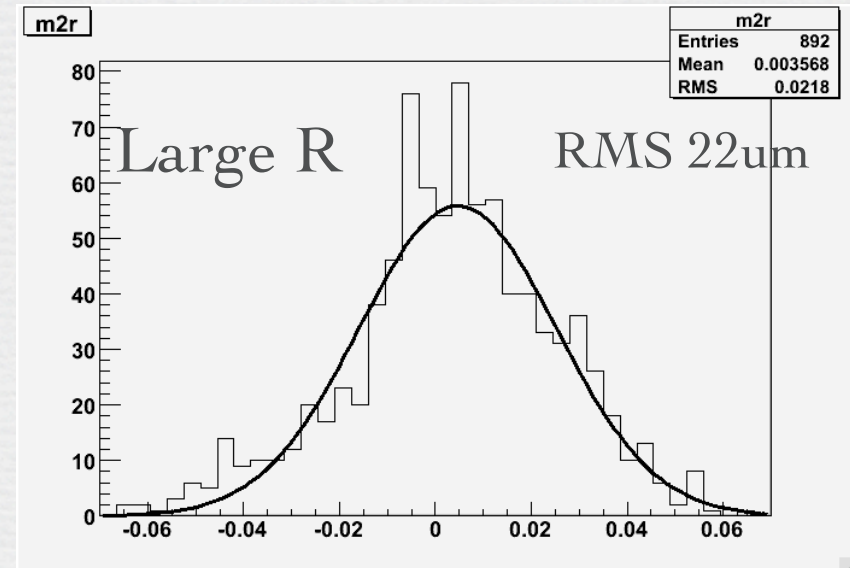
2-strip Residuals $R(\Delta\phi)$



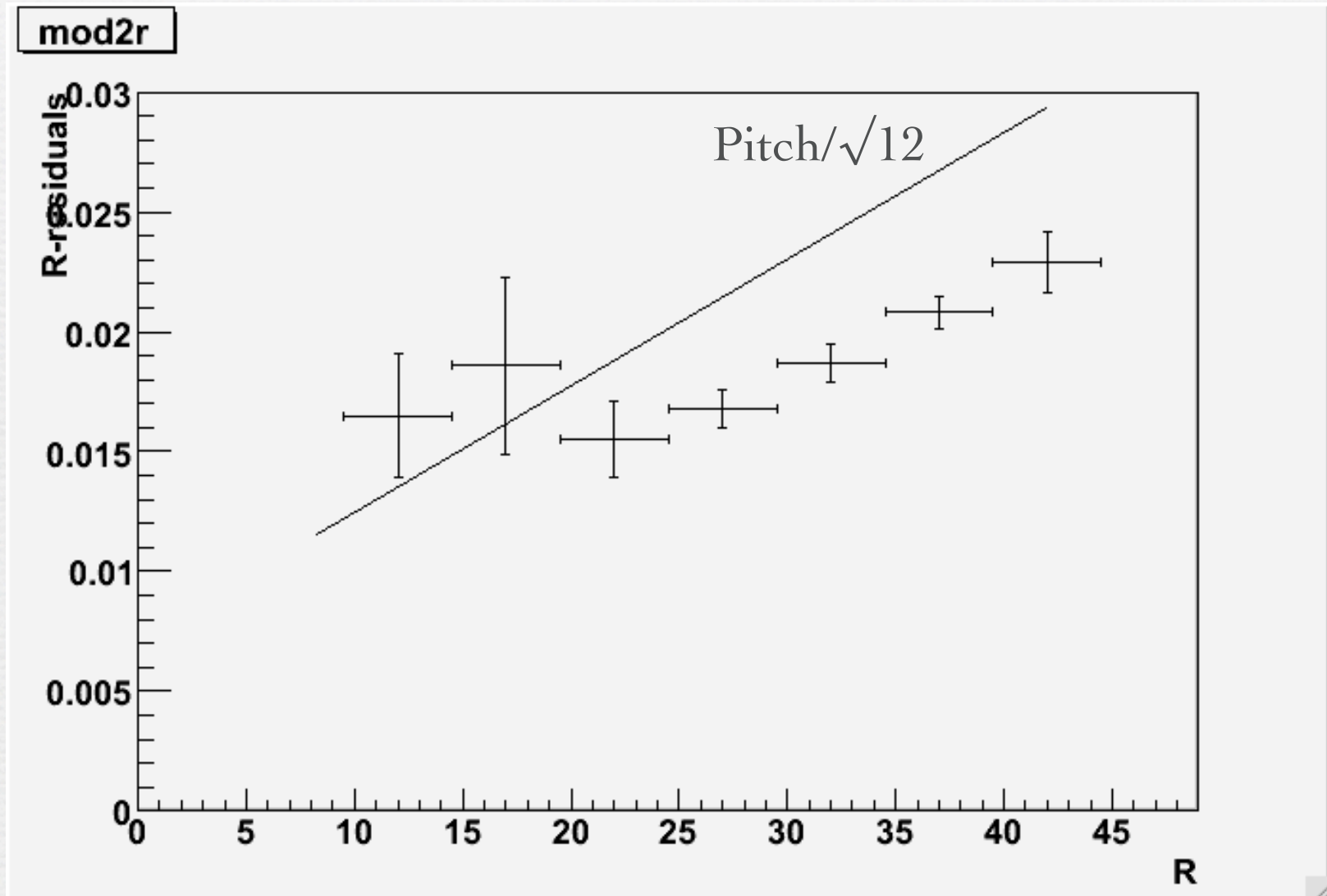
Residual->Resolution



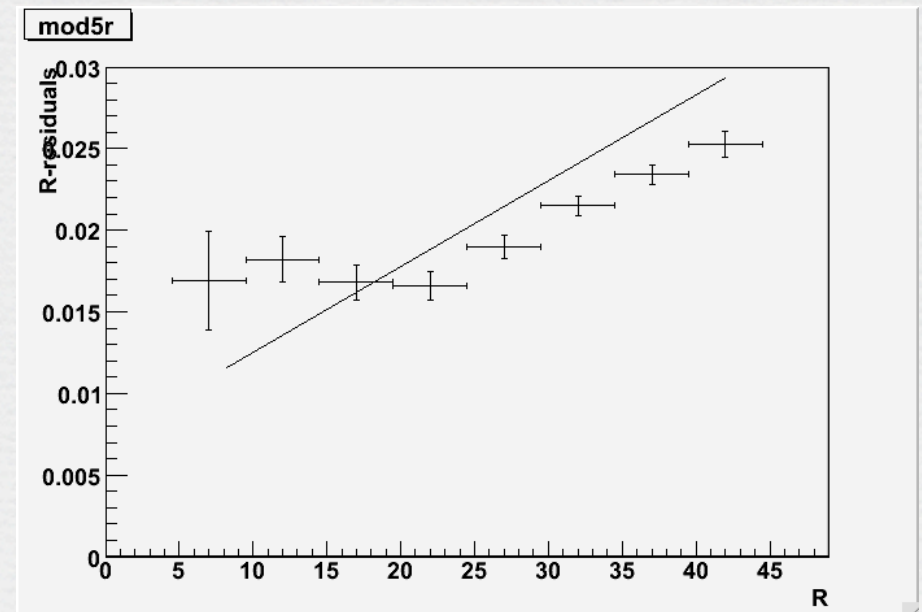
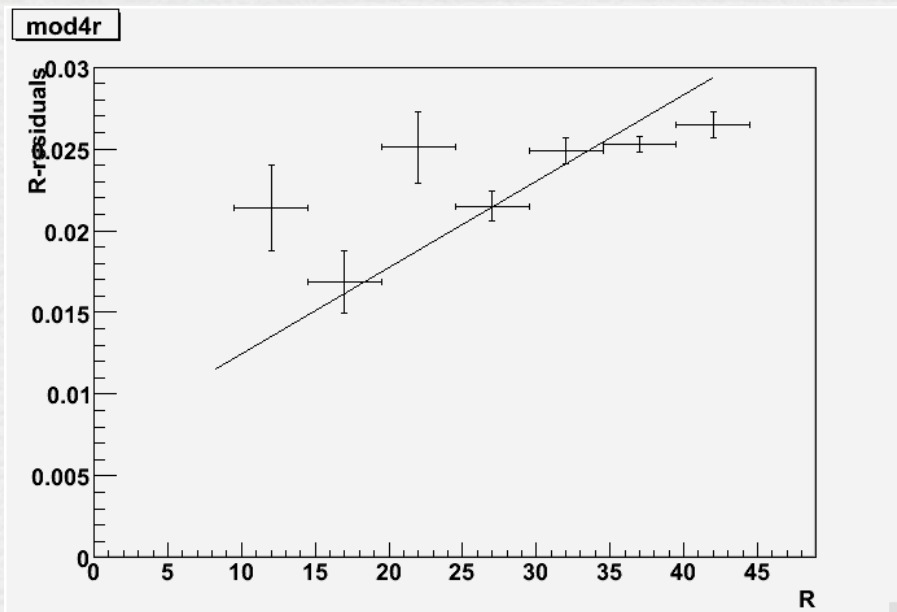
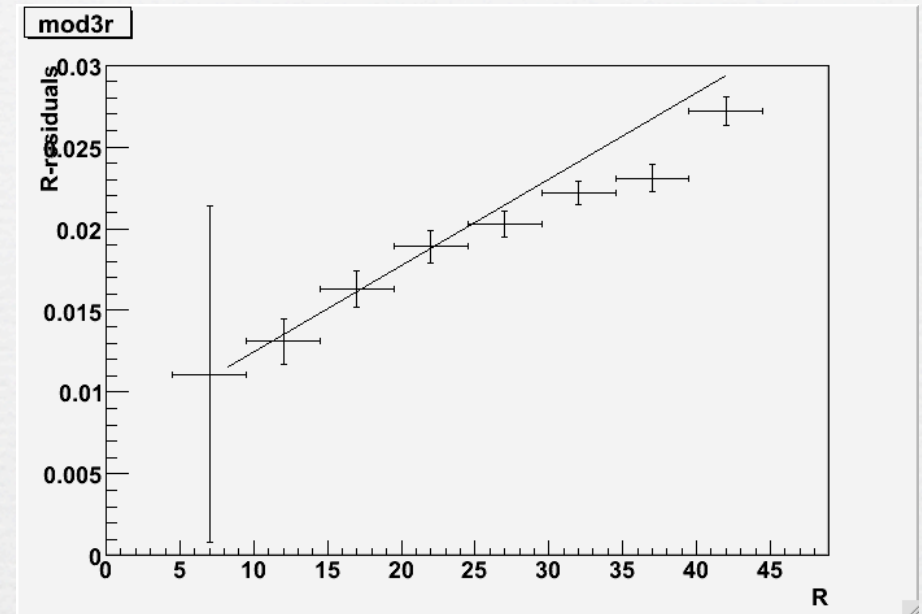
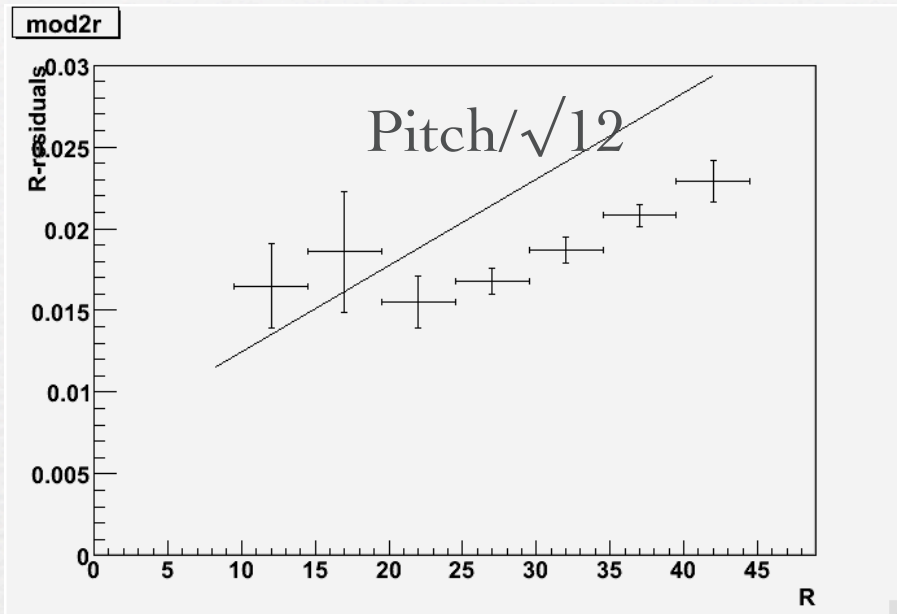
- ☞ $\sigma_{\text{residual}} = \sigma_{\text{int}} \oplus \sigma_{\text{ext}}$
- ☞ Resolution σ_{int}
- ☞ σ_{ext} is the error of extrapolation = $A \sigma_1 \oplus B \sigma_6$



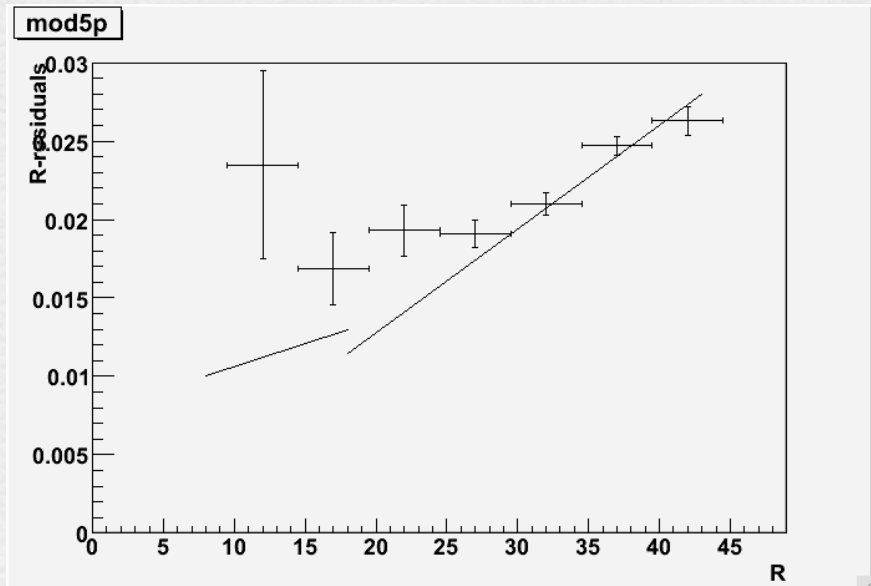
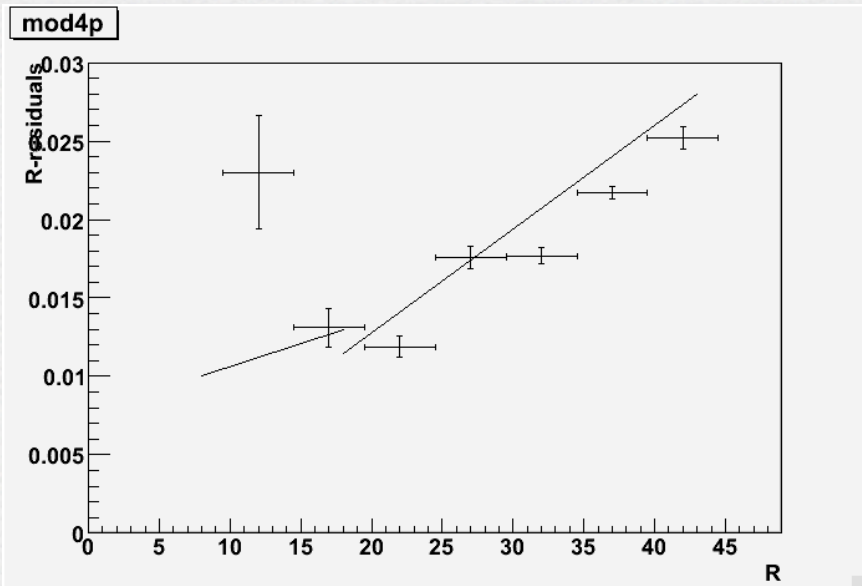
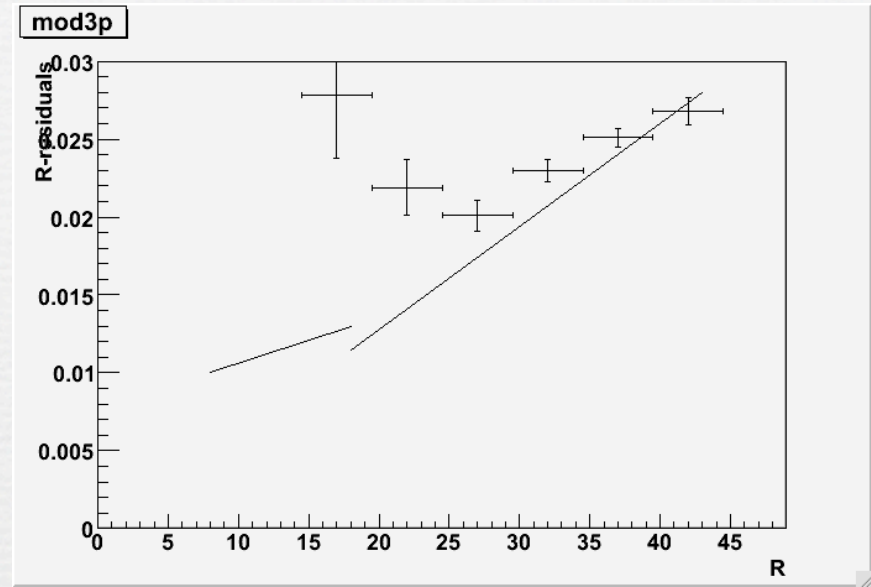
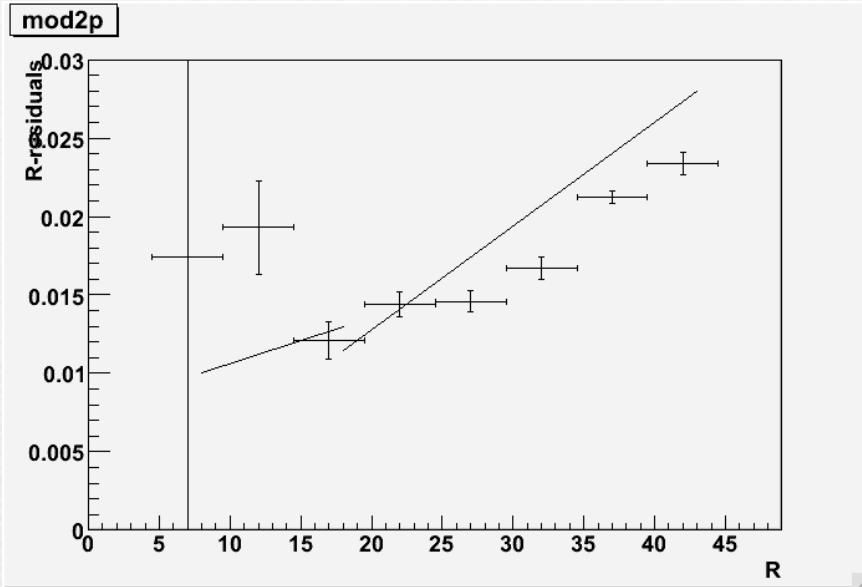
Module 2: R-Resolution v R



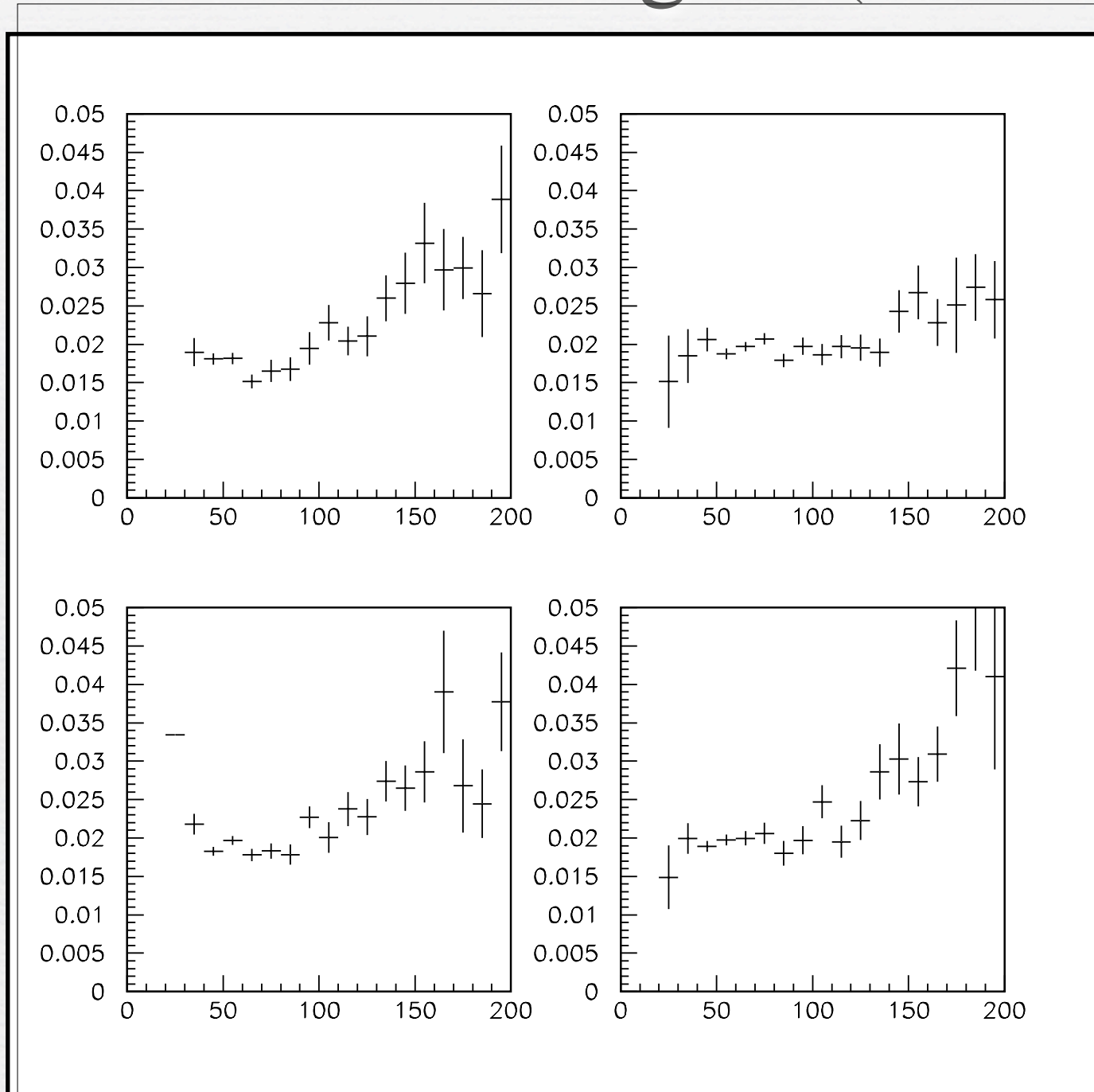
ΔR -Resolution v. R



R($\Delta\phi$)-Residual v. R



Resolution v. Signal(ADC)

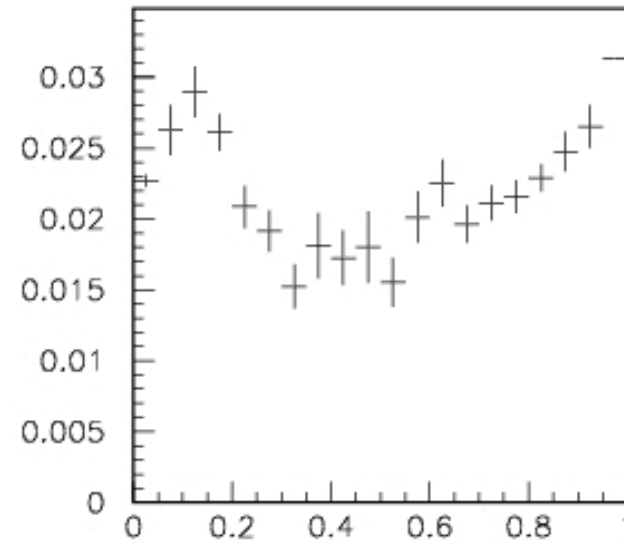
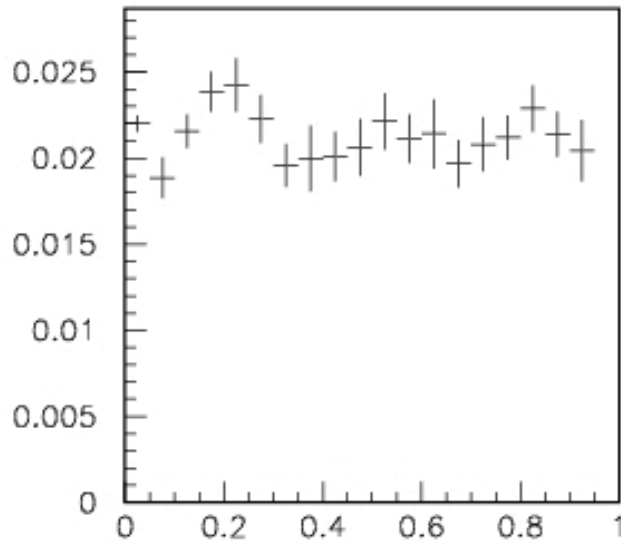
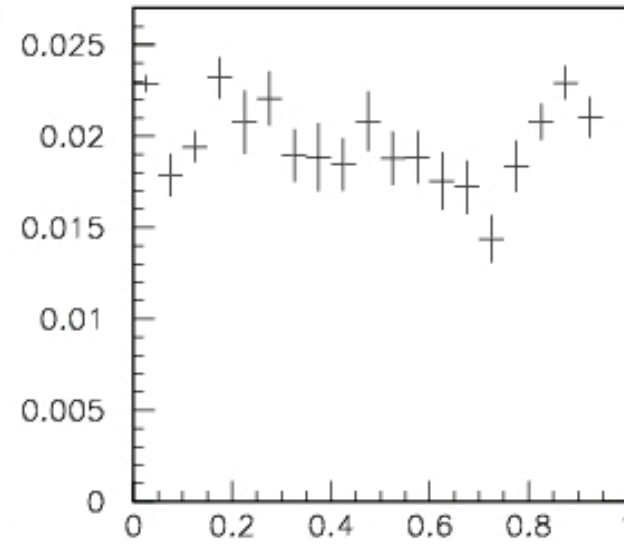
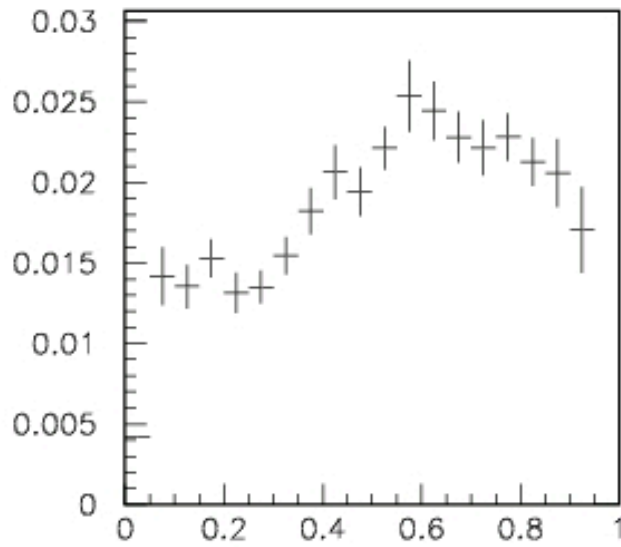


Conclusions

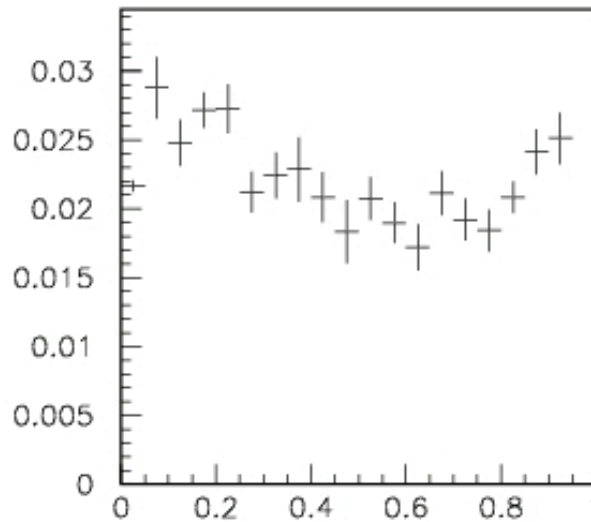
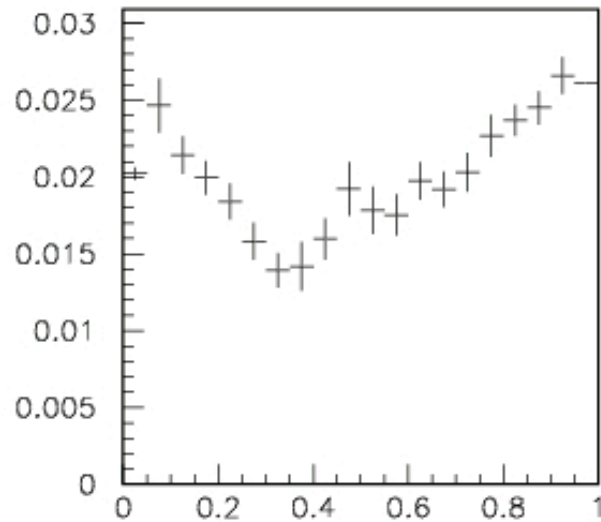
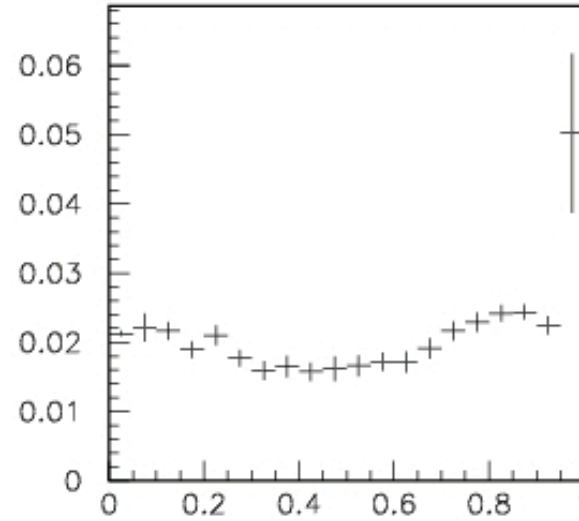
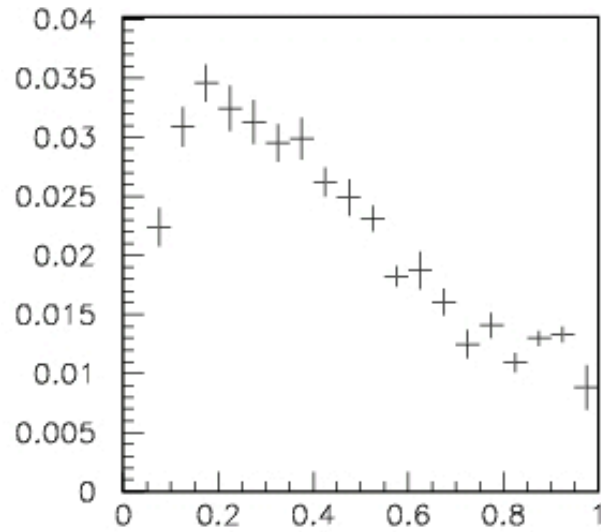
- ❧ Minimal alignment needed
- ❧ Detector is providing truly excellent resolution.
- ❧ One-hit clusters make distributions discrete and non-gaussian.
- ❧ Can use resolution as diagnostic to understanding silicon behaviour (S/N, eta, clusters etc.)

backup

R-residuals v eta



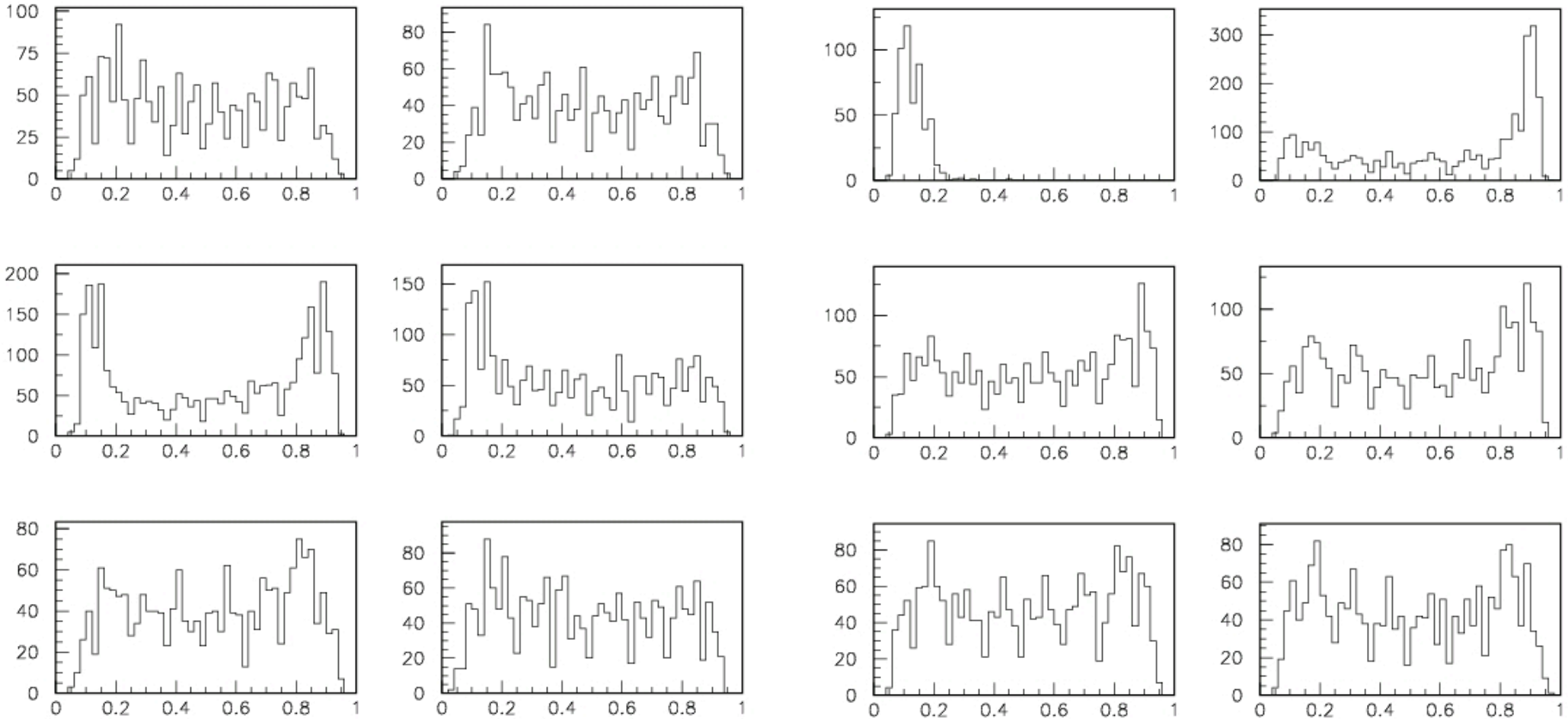
Rf residuals v eta



Work needed to look at cluster definitions?

Cross-talk?

Eta distributions



Furthermore, 80% of clusters are one-hit cluster ???