Silicon update

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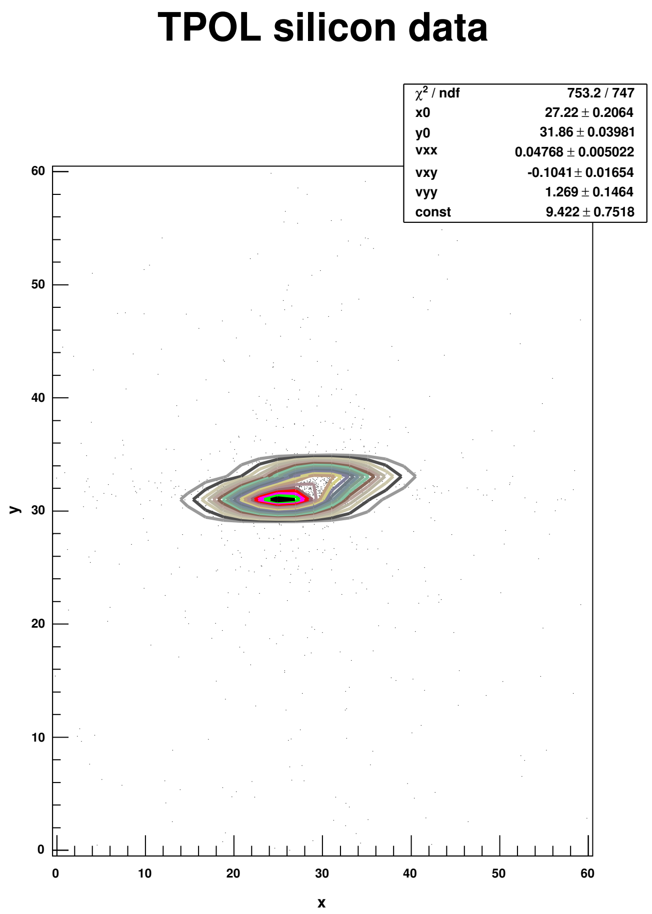
Studies in progress



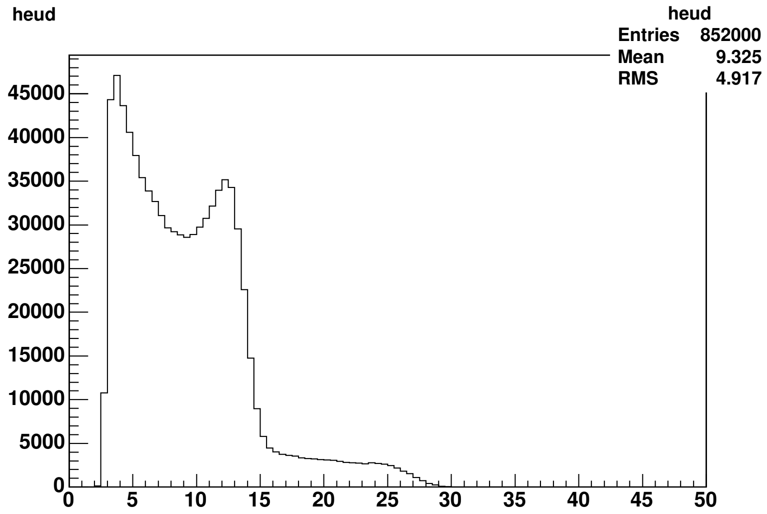
- Previously showed can fit double Gaussian ellipse to single cluster events in silicon and extract beam parameters: x_0, y_0, σ_x, σ_y and α

- Can also fit y(η) function to silicon data.
- Now want to check the following things:
  - Effect of laser on/off and Pockels cell 0/1 on x_0, y_0 and y(η)
  - Effect of calorimeter energy range on x_0, y_0 and y(η)
  - Effect of η range on y(η) fit
  - Effect on changing FED clock skew on no. of APV errors
  - Check pedestal subtraction with data from a RAW silicon run
  - Look at cluster charge vs. calorimeter energy and see if a cut can be made

Effect of laser on/off and Pockels cell 0/1 on x_0, y_0 and $y(\eta)$

- Looked at a few runs taken together totalling 852,000 events
- Is the Bremstrahlung beam shifted with respect to the Compton beam?
- Looked at laser on data separately from laser off data, but insufficient data in laser off state to perform either fit - need more events
- As Pockels cell changes from 1 to 0 (change of circular polarisation) with laser on, both x_0 and y_0 decrease slightly, but by amounts only just greater than the statistical errors:
  - x_0 changes from 28.22 ± 0.07 to 28.07 ± 0.07
  - y_0 changes from 31.82 ± 0.02 to 31.76 ± 0.02
- Need to somehow subtract the Bremstrahlung from the laser on data to leave just the Compton beam to see if this is really an effect or just statistical fluctuations

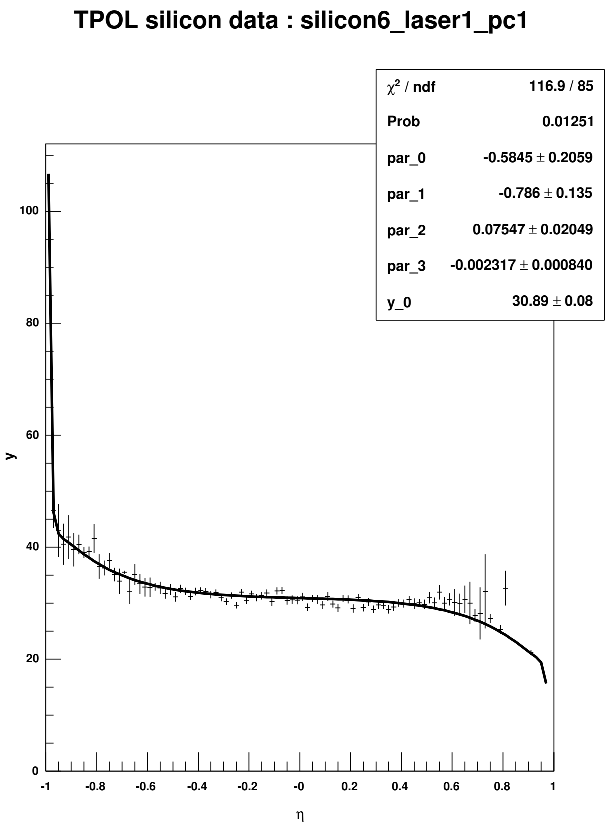
Effect of calorimeter energy range on x_0, y_0 and $y(\eta)$



- Originally calorimeter energy range was [10,16]
- Now also look at:
  - [0,40] - whole range
  - [0,5]
  - [0,10]
  - [0,16]
  - [10,40]
  - [16,40] - too few events
- x_0 increases from 27.96±0.08 in [0,10] to 28.17±0.07 in [10,40] - difference is just greater than the statistical errors
- y_0 approximately constant, within statistical errors
- The fit parameters for $y(\eta)$ vary by just more than their statistical errors for different energy ranges, but don't follow a trend
- Need to look at more statistics to be sure if any trends exist
- What is / should be the optimum energy range?

Effect of η range on y(η) fit

$$y(\eta) = y_0 + \ln\frac{1+\eta}{1-\eta} \times (P_0 + P_1(\ln\frac{1+\eta}{1-\eta})^2 + P_2(\ln\frac{1+\eta}{1-\eta})^4 + P_3(\ln\frac{1+\eta}{1-\eta})^6)$$



- Looked at 5 runs with 100k events and one sample with 852k events (above plot)

- Found each fit parameter approx the same for each run fitted over whole η range
- As decrease η range (from $\pm$1.00 to $\pm$0.75 in steps of 0.01) the parameters either increase or decrease (only one sample remained constant over different η ranges)
- Direction of change varied from run to run
- As the fit parameters changed get extra bends and spikes in y(η) curve
- χ^2/ndf approximately 1 for all ranges
- Seems need to fit over whole η range to get the bends at the extremes of the y(η) curve

Effect on changing FED clock skew on no. of APV errors

- Need to match SEQSI clock timing of trigger signal with silicon latency, otherwise get APV error

Clock skew	Number of events	number of errors
0	10,000	250
1	10	too many errors
2	1000	0
3	1000	0
4	1000	0
5	1000	0
6	1000	0
7	1000	600
8	1000	0
9	11	too many errors

- 4 (the current value) seems OK, but need to check again with more stats to establish stable data-taking point

Summary

- Need to look at all things again with more statistics
- Have not yet checked pedestal subtraction and clustering with data from a RAW silicon run, although have the data now to look at
- Have not yet looked at cluster charge vs. calorimeter energy to see if a cut can be made
- Have a summer student, Rahul, who will be working on the java interface for the silicon