

Beam Off Asymmetry Analysis - Beam Off Wire Yields

M. McCrea

University of Manitoba

Rev.1, made August 28, 2017

2 pages removed, plots on pages 10(formerly 12), and 21
(formerly 23) corrected

August 25, 2017

Method

Time Bin Run Averages

- Summer Runs Asymmetries

- Summer Quiet Period

- Summer Noisy Period

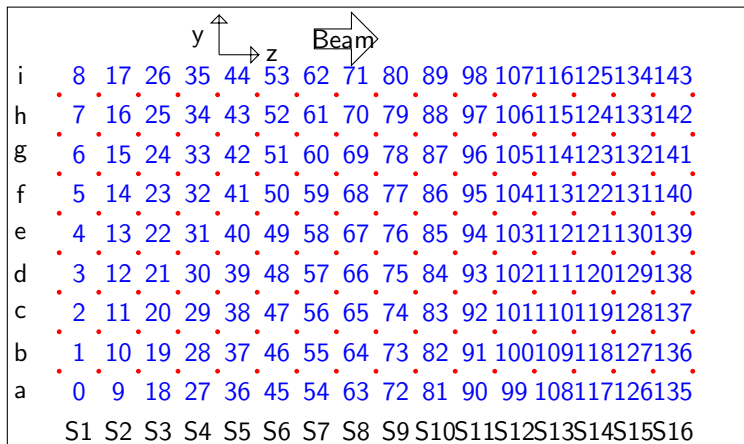
Single Pulse Wire Yields

- Summer Quiet Period

- Summer Noisy Period

Conclusions

Wire Numbering



- **HV** 17 HV Frames with 8 wires each
- **Signal** 16 signal Frames with 9 wires each

List of Runs

A list of good beam off runs has been provided by Kabir, and are now on the n3He wiki Instrumental Asym. webpage for reference by the group.

Summer Run List

Date Range	Initial Run	Final Run
2015-06-25	38081	38124
2015-06-26	38125	38215
2015-08-03	38216	38301
2015-08-04	38302	38416
2015-08-10	38417	38493
2015-08-11	38494	38657
2015-08-12	38658	38769

Tuesday Run List

Tuesday Run List

Date Range	Initial Run	Final Run
T1	17784	17834
T6	26461	26503
T10	45032	45054

Beam Off Asymmetry Calculation

The single wire instrumental asymmetries were calculated using a simple difference formula normalized by one volt to render it unitless.

$$A_{q,t} = \frac{w_{j,i=\text{even},t} - w_{j,i=\text{odd},t}}{1V} \quad (1)$$

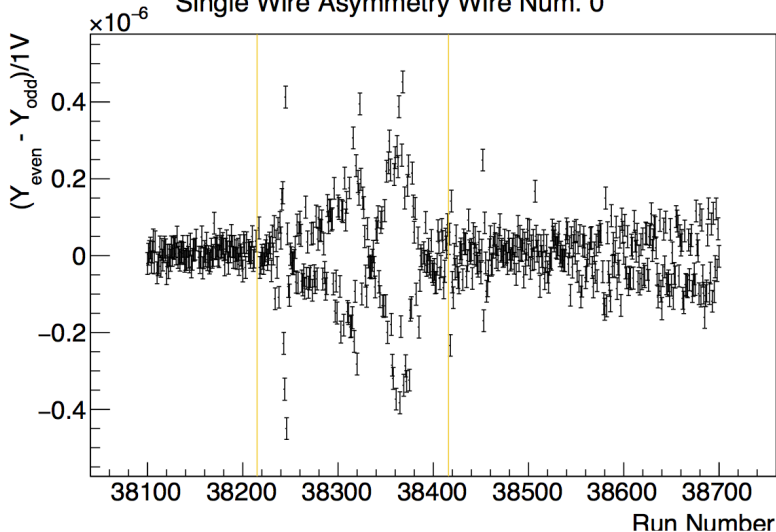
where j is the run number, i is the pulse number, q is the asymmetry number, and t is the time bin number. Pulse and asymmetry numbers are indexed starting at zero.

Note: Beam on physics asymmetries were calculated over time bins 5 – 44

For comparison to the beam on signals and asymmetry a normalization comparable to average beam on signal for each wires can be used, but this has not been used in this analysis as we are mainly examining trends in the asymmetry behavior to try to find its origin.

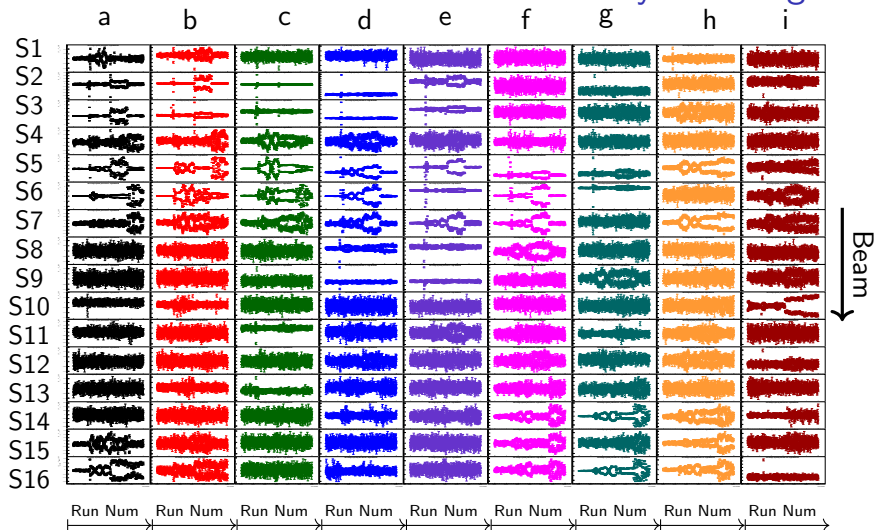
Summer Run Average Instrumental Asymmetry

Single Wire Asymmetry Wire Num. 0



Average asymmetry over all time bin bins in each run. Vertical Orange lines are separation between the 3 summer run periods.

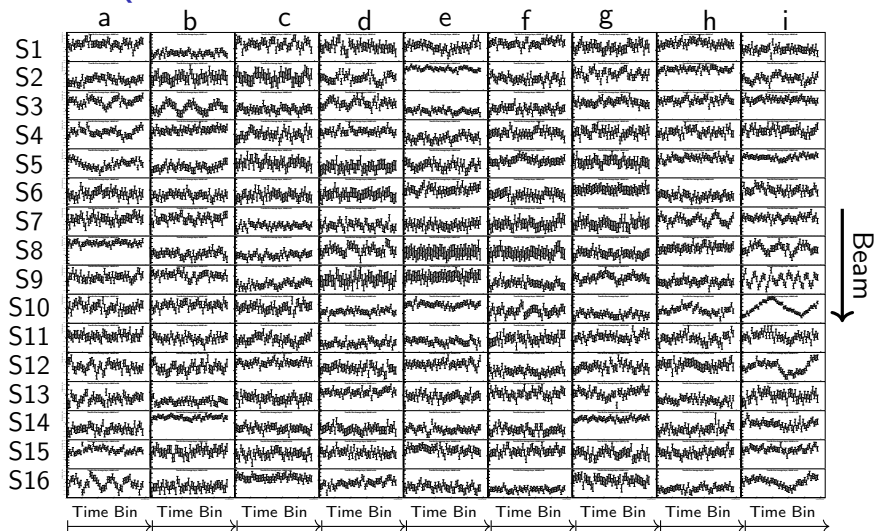
Summer Runs All - Panel Plot - individual y-axis ranges



Note: The y-axis is different for all plots.

Calculated for time bin range 5-44 inclusive, error bars are standard error from histogram RMS.

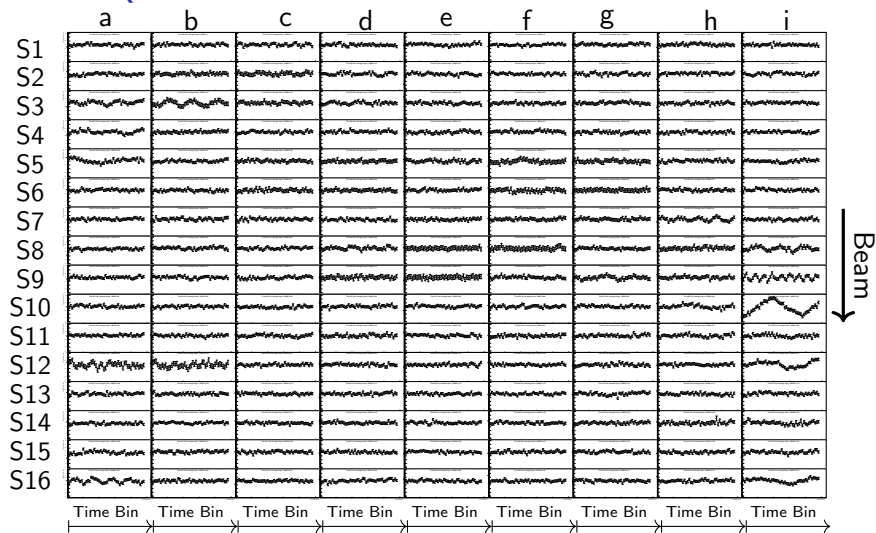
Summer Quiet Period - run 38085



Each sub plot is for a chamber wire, and shows the run average of the asymmetry for each time bin.

The Y-scale on plots is the different for each plot.

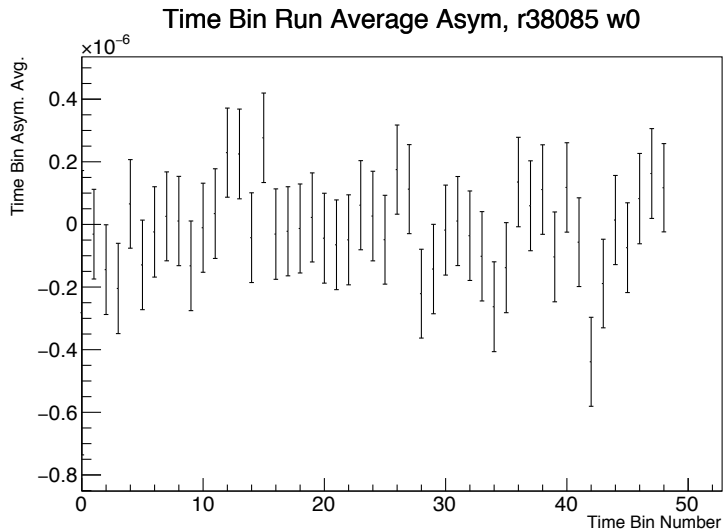
Summer Quiet Period - run 38085



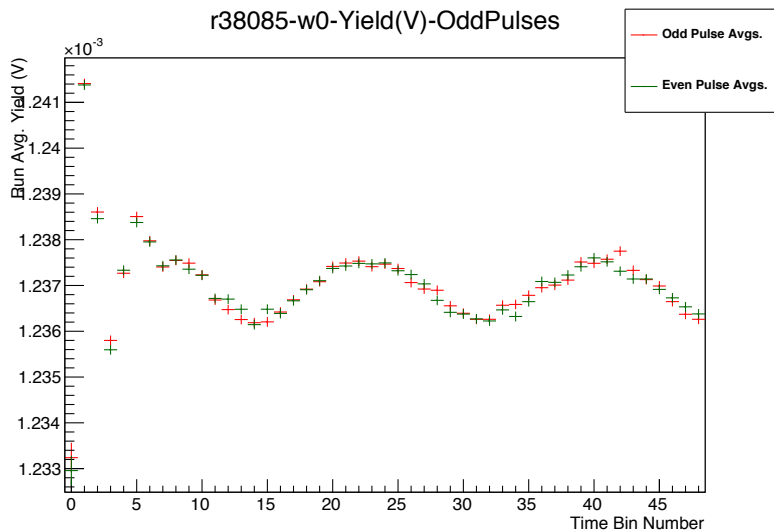
Each sub plot is for a chamber wire, and shows the run average of the asymmetry for each time bin.

The Y-scale on plots is the **same** for all plots on this page.

Summer Quiet Period - run 38085 - wire 0

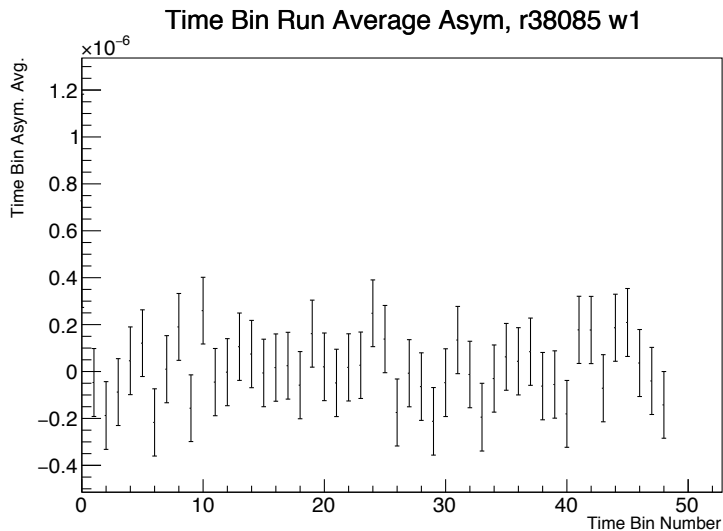


Summer Quiet Period - run 38085 - wire 0



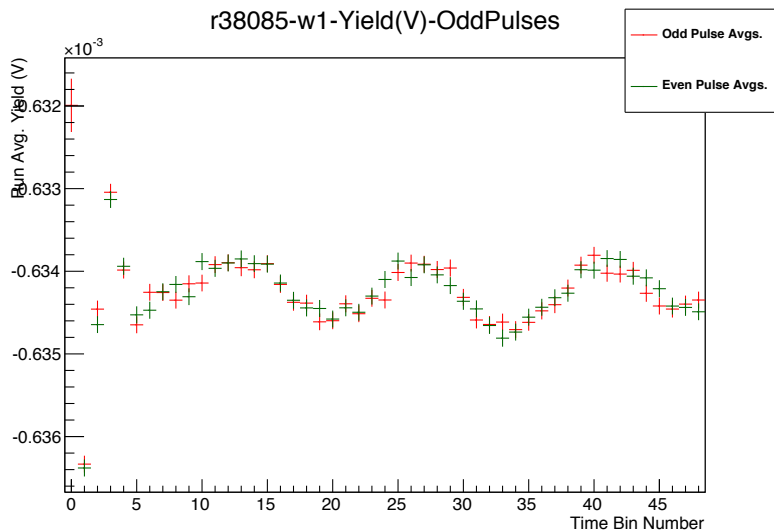
Time bin run averages of [wire yields](#) for even and odd numbered pulses.

Summer Quiet Period - run 38085 - wire 1



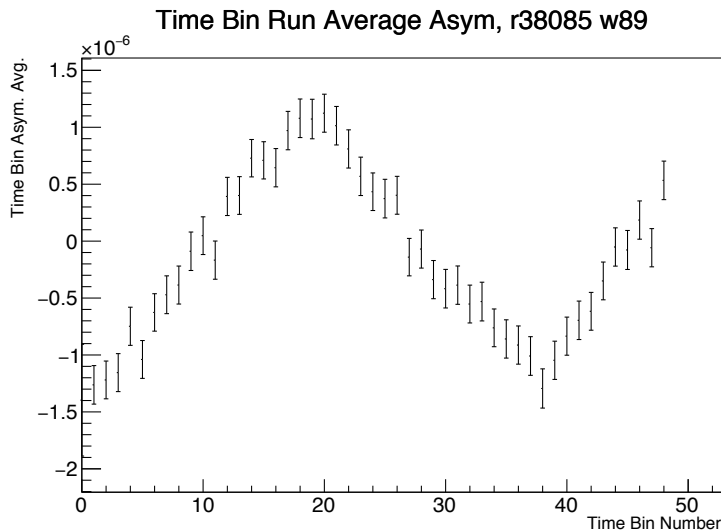
From the quite summer running period (runs 38081-38215)
immediately after beam off.

Summer Quiet Period - run 38085 - wire 1



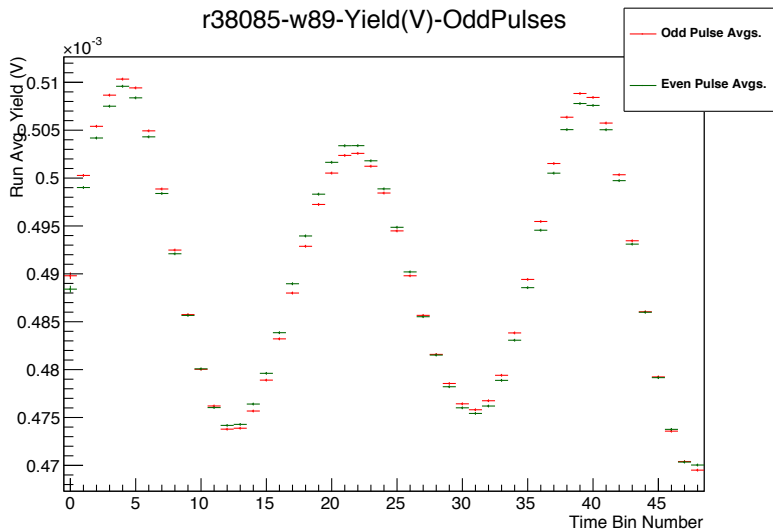
Time bin run averages of [wire yields](#) for even and odd numbered pulses.

Summer Quiet Period - run 38085 - wire 89



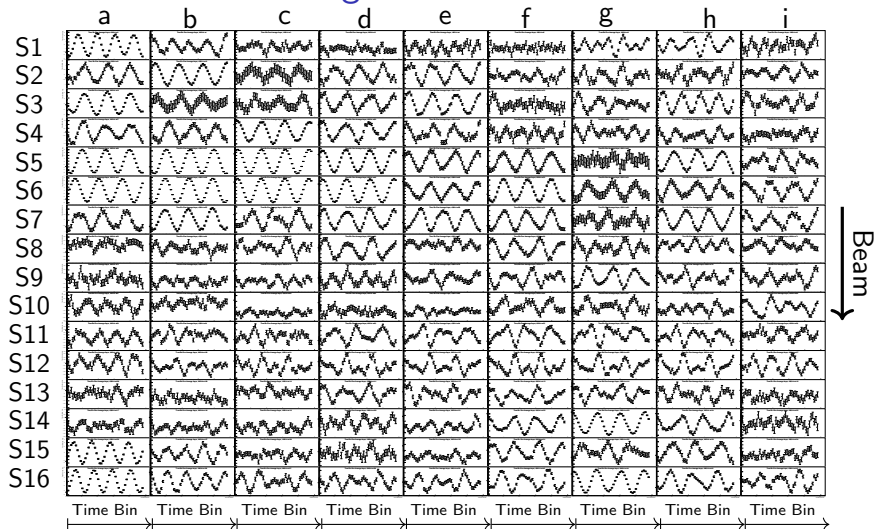
From the quite summer running period (runs 38081-38215)
immediately after beam off.

Summer Quiet Period - run 38085 - wire 89



Time bin run averages of **wire yields** for even and odd numbered pulses.

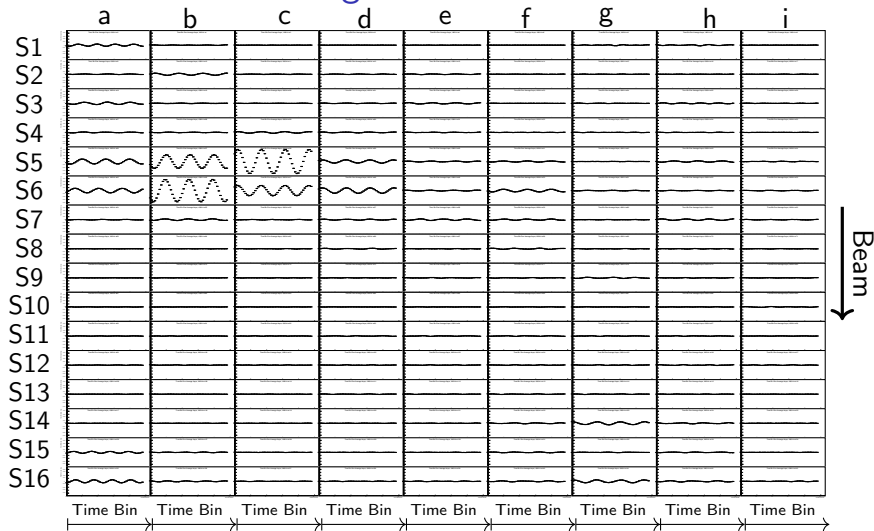
Second Summer Running - run 38314



Each sub plot is for a chamber wire, and shows the run average of the asymmetry for each time bin.

Noisy summer running. Y Scale on plots is different for each plot.

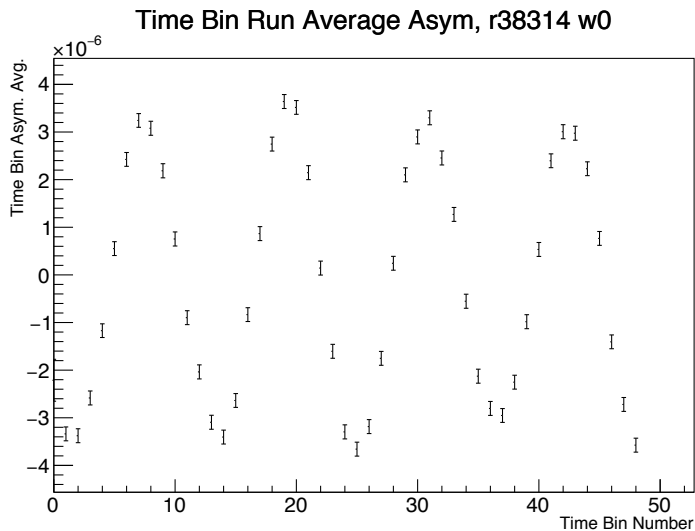
Second Summer Running - run 38314



Each sub plot is for a chamber wire, and shows the run average of the asymmetry for each time bin.

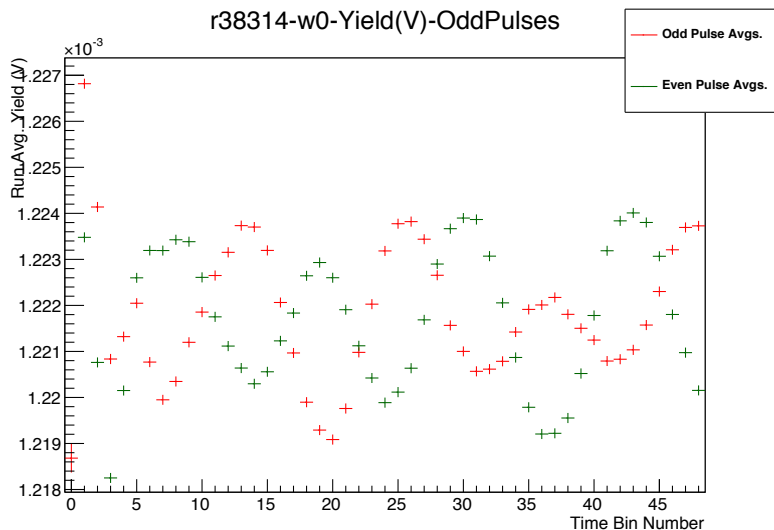
Noisy summer running. Y Scale on plots is the **same**.

Summer Noisy Period - run 38314 - wire 0



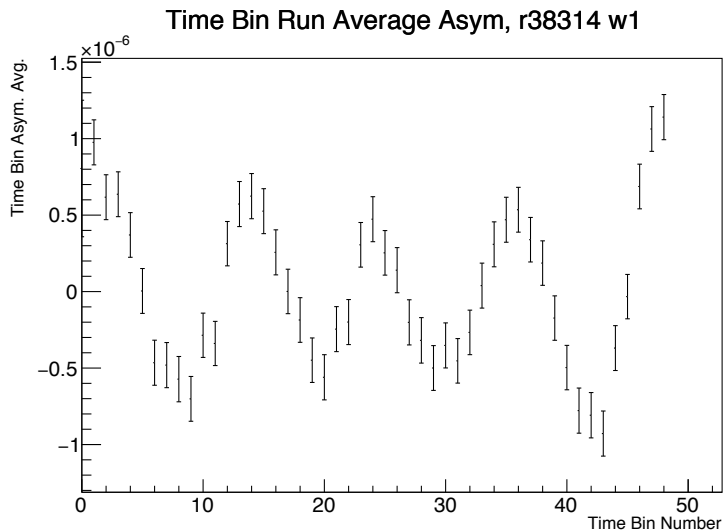
Wire 0 is one of the mid range noisy wires from the noisy summer running period (runs 38216-38416).

Summer Noisy Period - run 38314 - wire 0



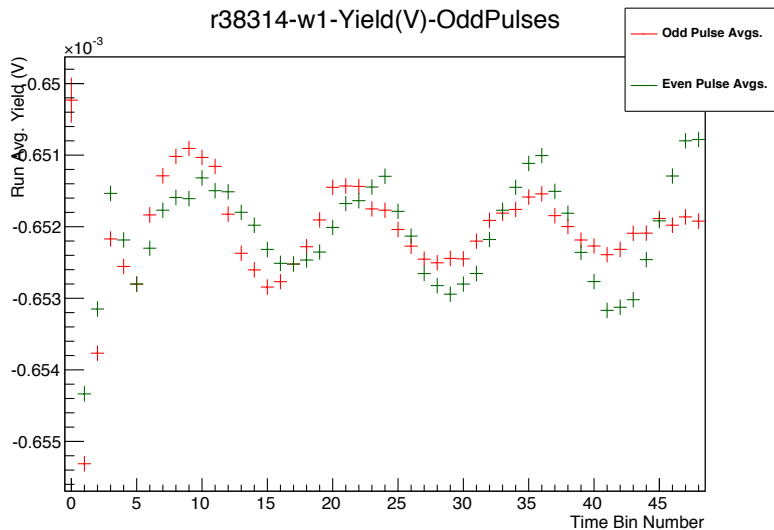
Time bin run averages of [wire yields](#) for even and odd numbered pulses.

Summer Noisy Period - run 38314 - wire 1



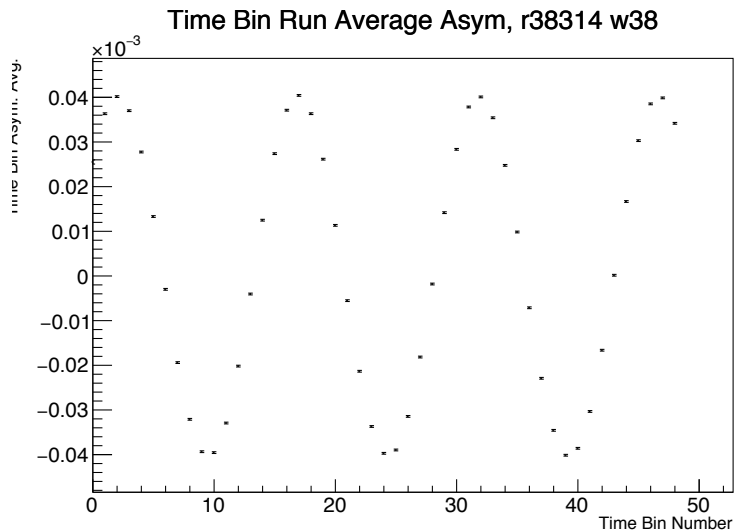
Wire 1 is low noise wire from the noisy summer running period (runs 38216-38416).

Summer Noisy Period - run 38314 - wire 1



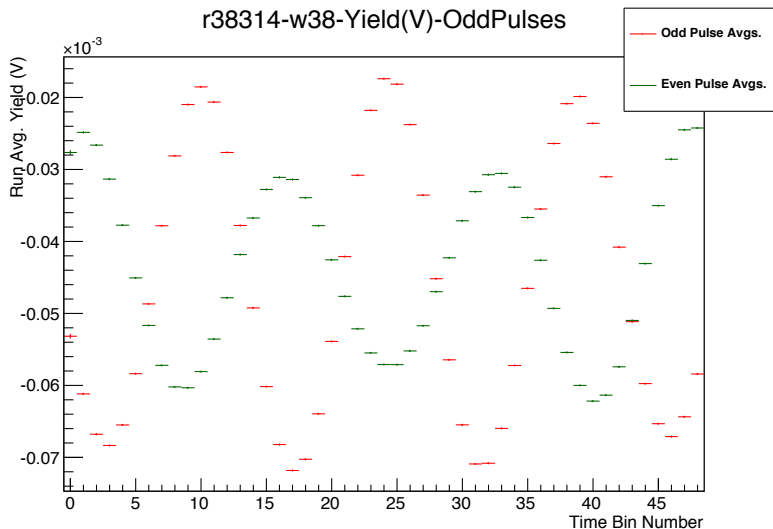
Time bin run averages of [wire yields](#) for even and odd numbered pulses.

Summer Noisy Period - run 38314 - wire 38



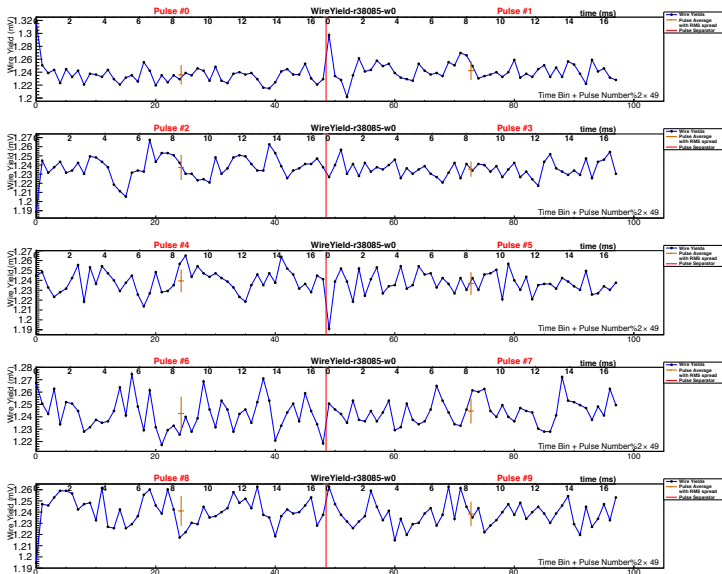
Wire 38 is a high noise wire from left side of S5-S6 planes. This run is from the noisy summer running period (runs 38216-38416).

Summer Noisy Period - run 38314 - wire 38



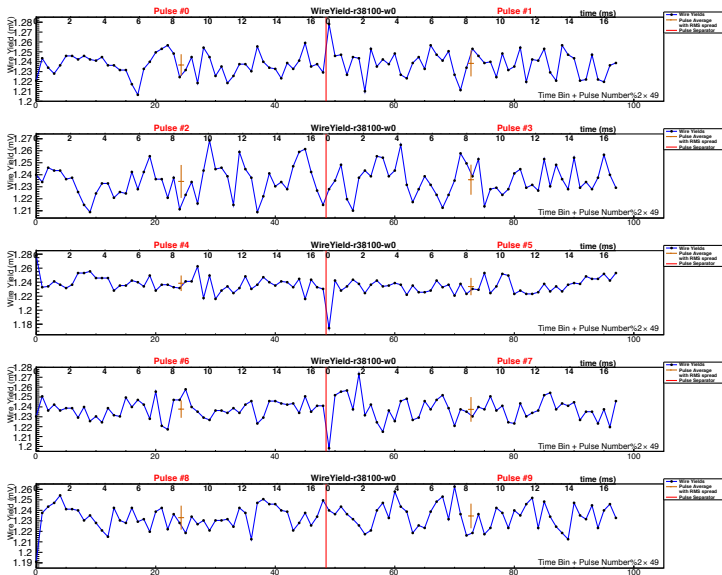
Time bin run averages of [wire yields](#) for even and odd numbered pulses.6).

Summer Quiet Period - run 38085 - wire 0



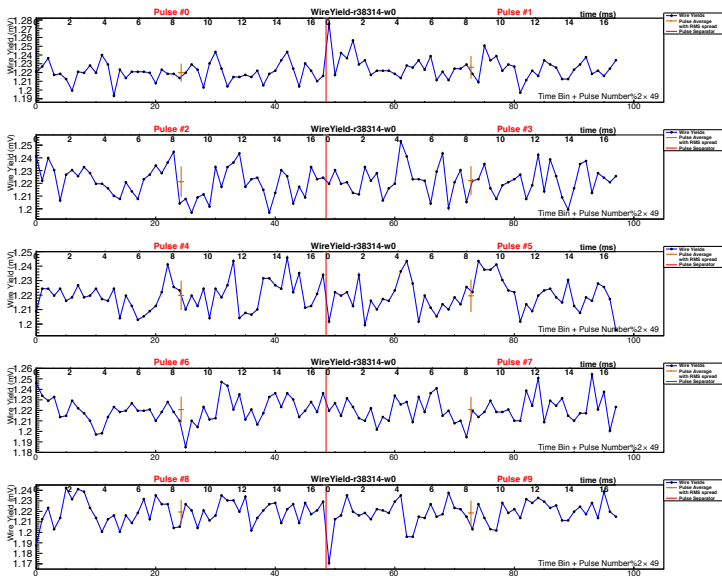
Wire yields for wire 0 over ten consecutive pulses.

Summer Quiet Period - run 38100 - wire 0



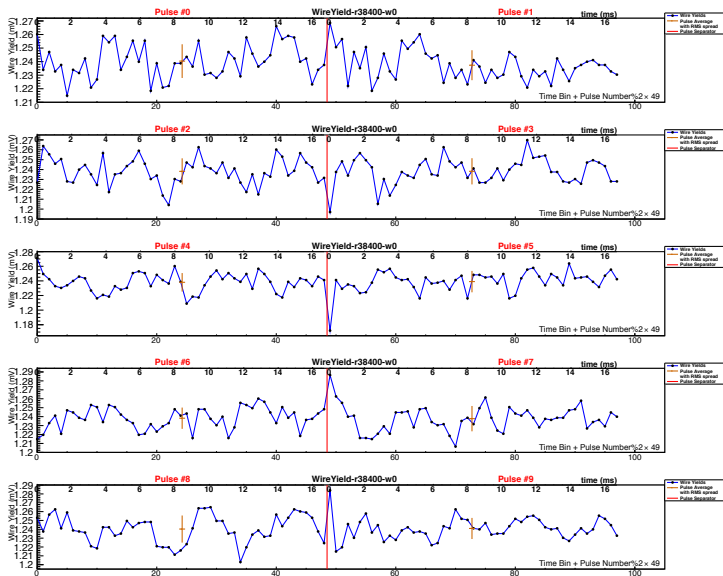
Wire yields for wire 0 over ten consecutive pulses.

Summer Noisy Period - run 38314 - wire 0



Wire yields for wire 0 over ten consecutive pulses.

Summer Noisy Period - run 38400 - wire 0



Wire yields for wire 0 over ten consecutive pulses..

Conclusions

- ▶ Sine wave shapes in time bin average asymmetries seem to be a signature of the summer noise runs as they are only present during the noisy summer running.
- ▶ Most run periods have approximately sine wave wire yields.
- ▶ The high noise periods have the odd and even pulses out of phase to a greater or less degree
- ▶ No obvious pattern in the individual pulses without averaging.