

# Beam Off Asymmetry Analysis - Preliminary Time Bin Run Average

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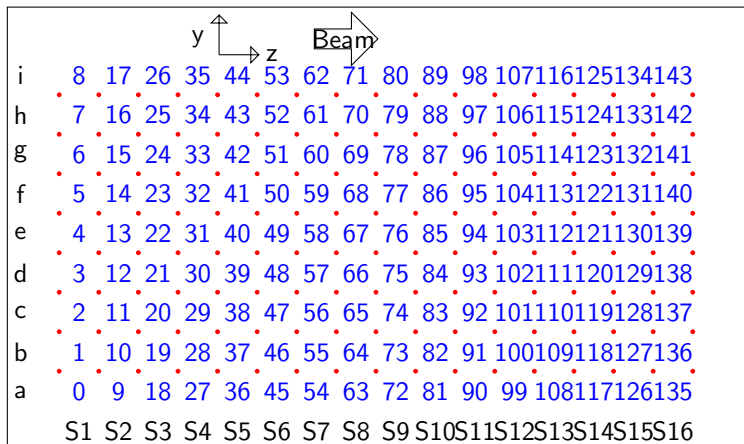
## Method

### Time Bin Run Averages

Summer Runs

Tuesday Runs

# 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

# Time Bin Run Averages

- ▶ Previous analyses have summed or averaged time bins in each recorded neutron pulse for analysing the beam off instrumental asymmetry
- ▶ The new analysis will examine the asymmetry in all 49 time bins individually

# Beam Off Asymmetry Calculation

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

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

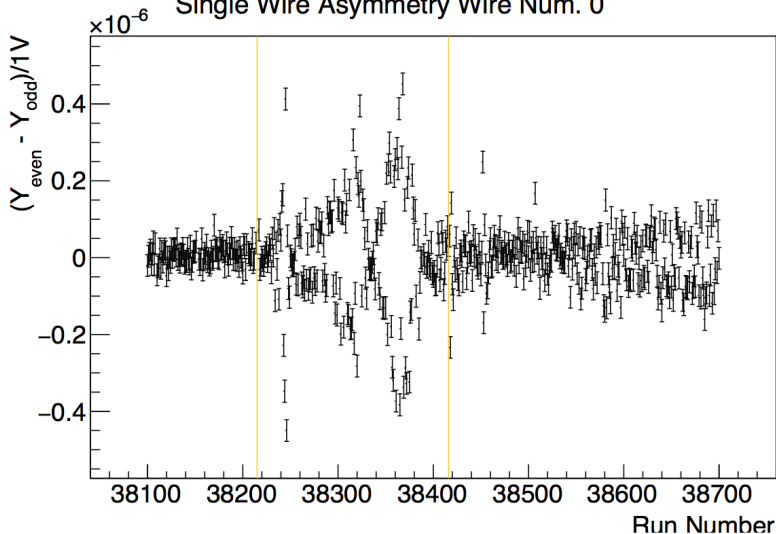
where  $j$  is the run number,  $i$  is the pulse number,  $q$  is the asymmetry number. Pulse and asymmetry numbers are indexed starting at zero.

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 wire 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

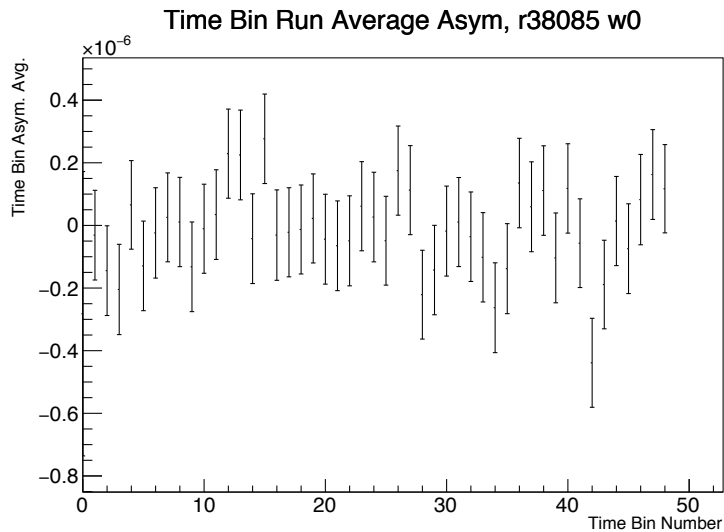
Single Wire Asymmetry Wire Num. 0



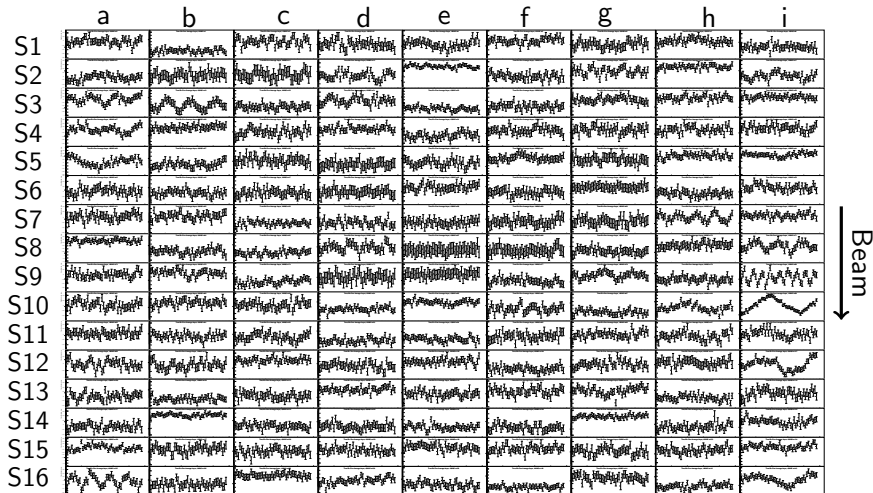
Average asymmetry over all time bin bins in each run. Vertical Orange lines are separation between the 3 summer run periods.



# First Summer Running - run 38085 - wire 0



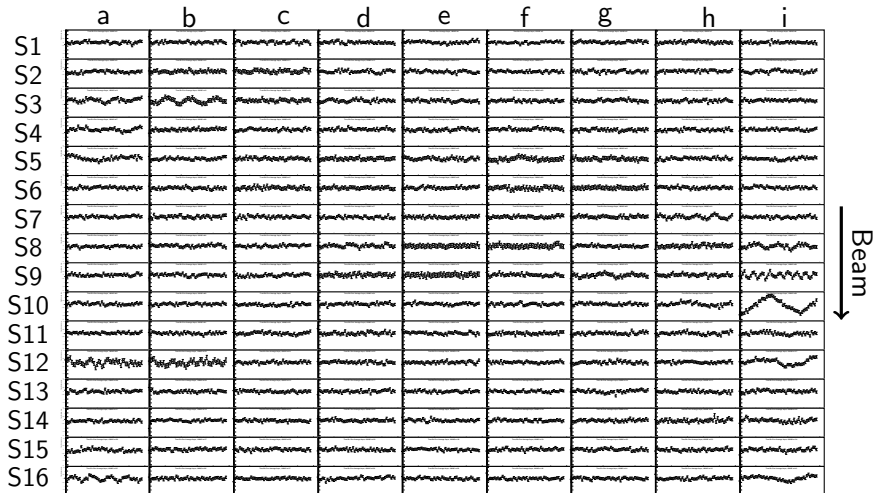
# First Summer Running - run 38085



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

Quiet summer running. Y Scale on plots is different.

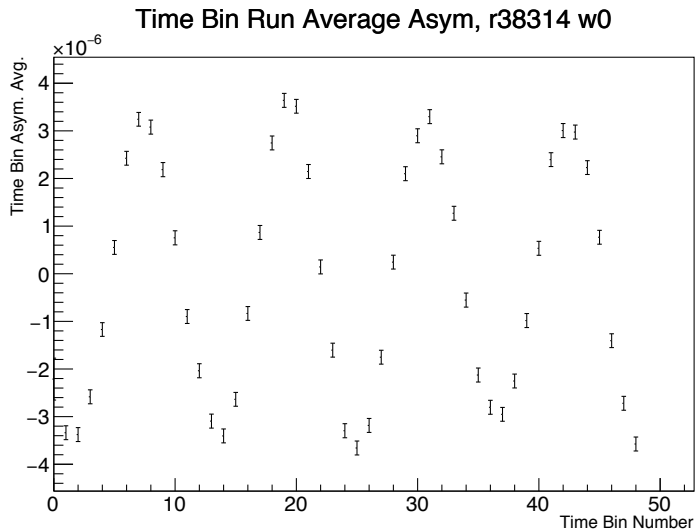
# First Summer Running - run 38085



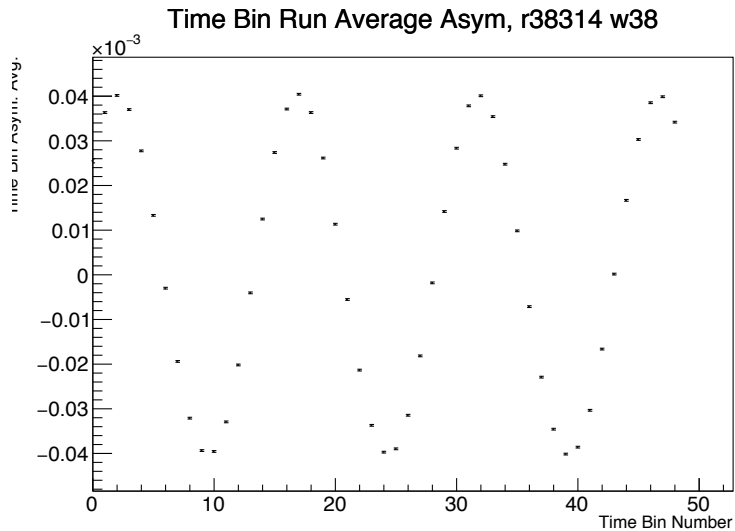
Each sub plot is for a chamber wire, and shows the run average of the asymmetry for each time bin.

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

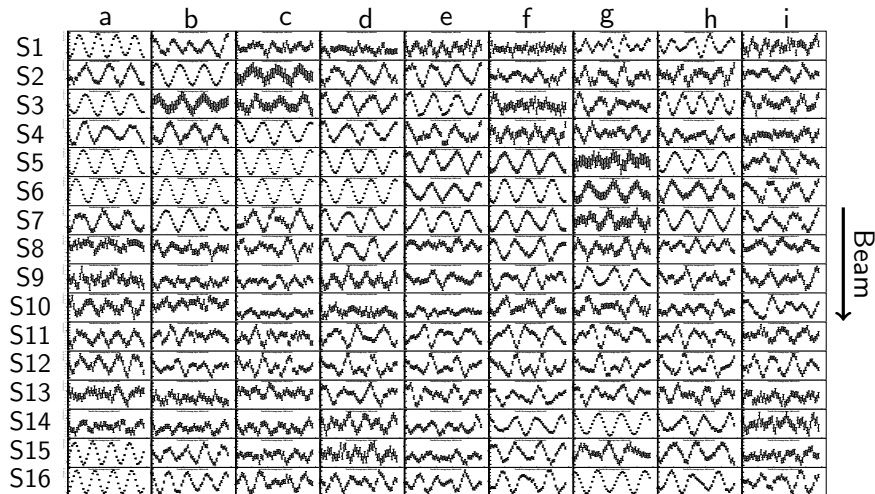
## Second Summer Running - run 38314 - wire 0



## Second Summer Running - run 38314 - wire 38



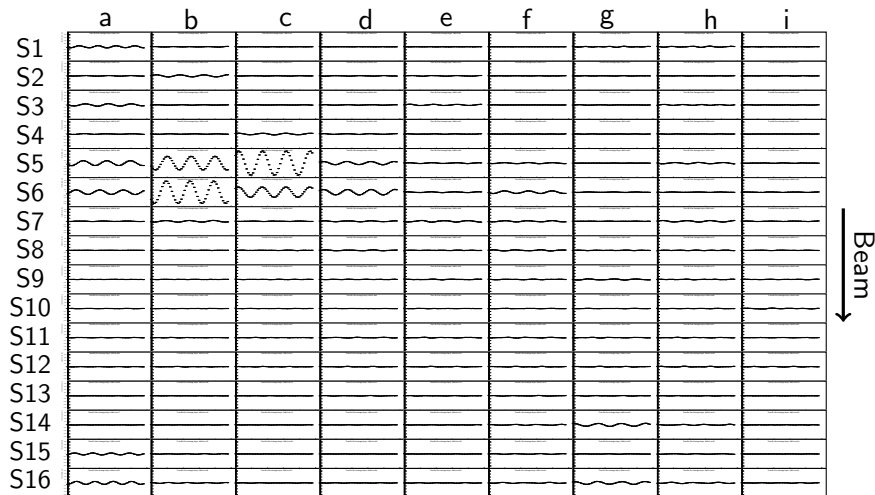
## Second Summer Running - run 38314



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

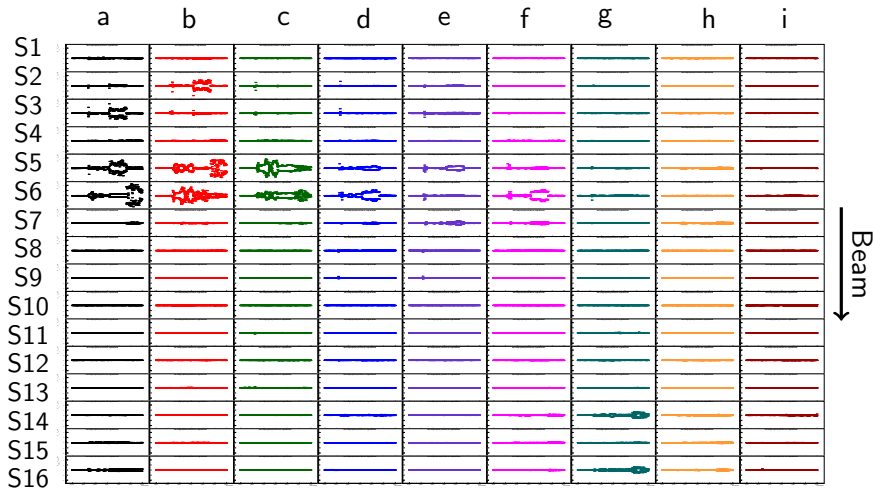
Noisy summer running. Y Scale on plots is different.

## 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**.



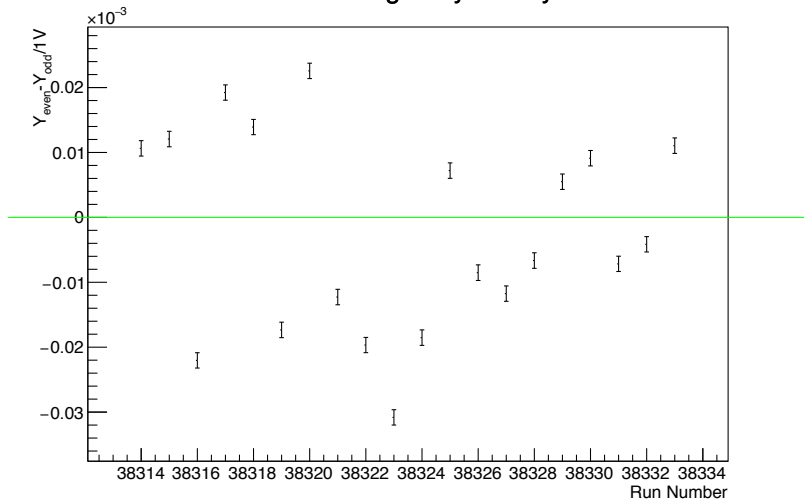
Noisy summer running. Y Scale on plots is the **same**.

Note: the wires with the largest asymmetry had the largest amplitude sine wave in prior plots.



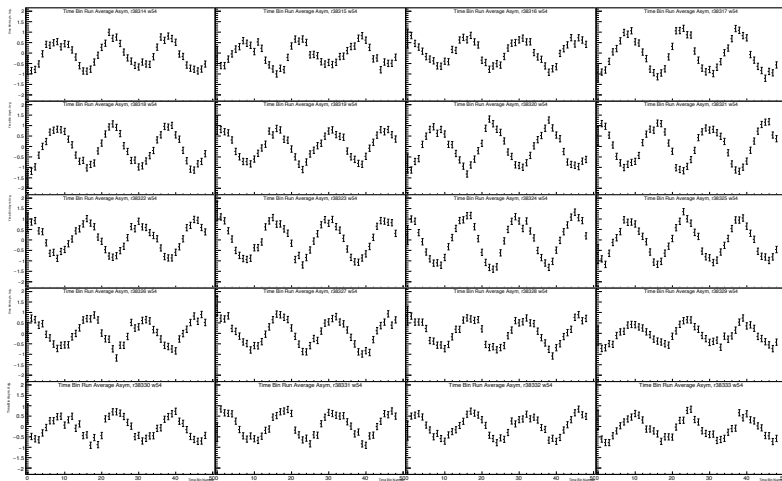
## Second Summer Running - Wire 0 runs 38314-38333

Run Average Asymmetry



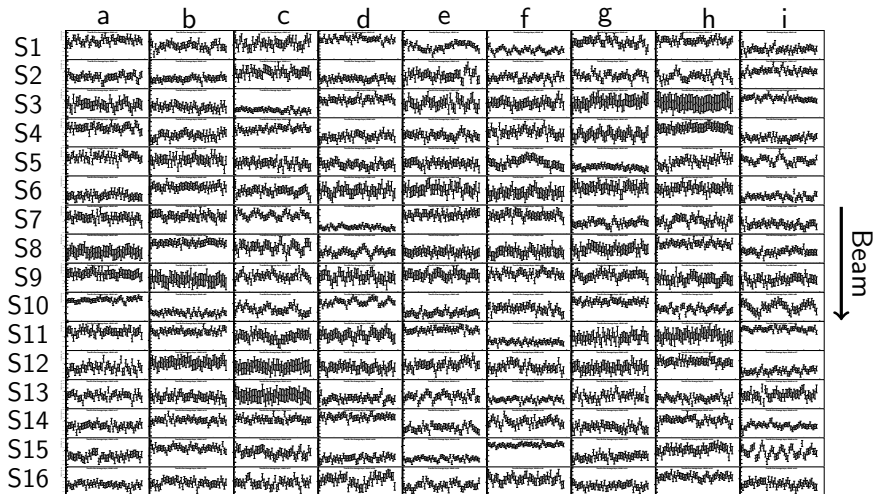
Wire 0 run averages over time bin range 5-44 and run range 38314-38333.

# Second Summer Running - Wire 0 runs 38314-38333



Wire 0 time bin run averages over run range 38314-38333.

## Tuesday 6 - Panel Plot - identical y-axis ranges



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

# Conclusions

- ▶ Sine wave shapes in time bin averages seems to be a signature of the summer noise runs
- ▶ These sine waves are not seen in the initial quiet period at the start of summer running
- ▶ These sine waves are not seen on most Tuesday runs, and when they are seen have smaller amplitudes
- ▶ Data processing is ongoing to see if third day of summer running moves from noisy to quiet over time has sine waves changing over time