

Initial beam off asymmetry analysis

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June 23 , 2017

Run List

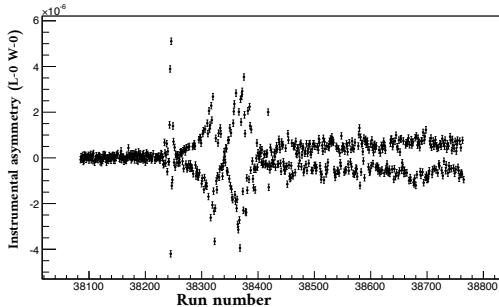
Method

Initial Results

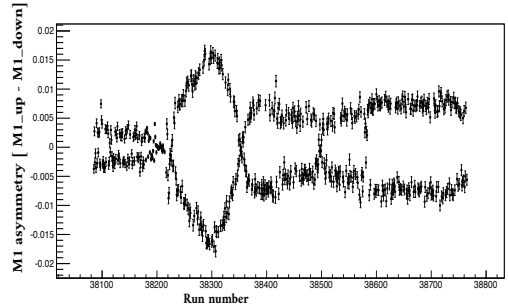
CSV File

Future Tasks

Summer runs: instrumental wire asymmetry vs M1 asymmetry

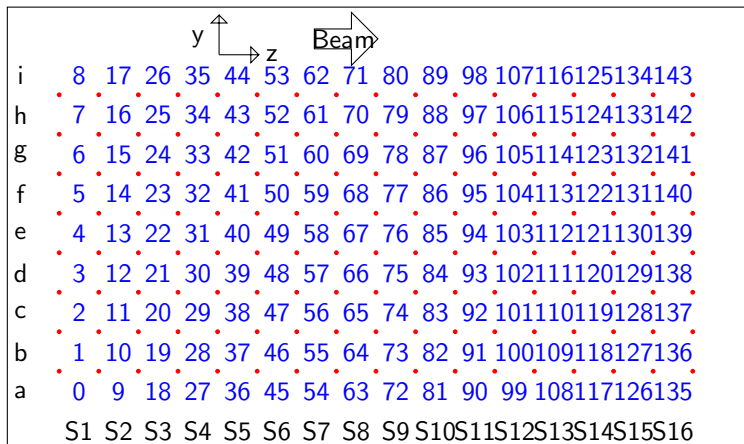


(e) Wire (instrumental) asymmetry



(f) M1 asymmetry (with no beam)

Wire Numbering

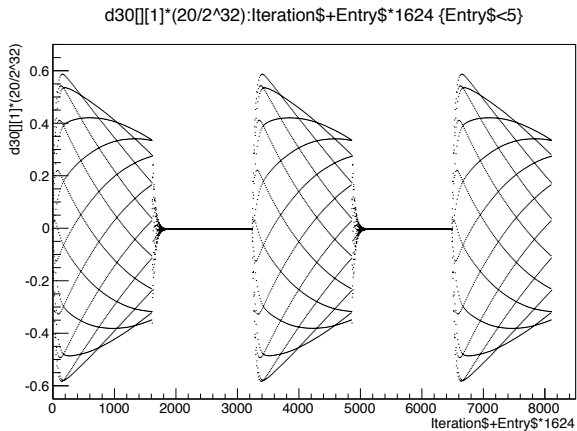


- **HV** 17 HV Frames with 8 wires each
- **Signal** 16 signal Frames with 9 wires each

List of Runs

- ▶ the list of runs is yet to be determined
- ▶ A list of all beam off runs has been obtained from Kabir
- ▶ This list needs to be separated according to summer maintenance, tuesdays, and random beam off runs during data taking

Spin Flipper Series



Spin Flipper On/Off

A simple pulse average is taken for pulse i in run j for the absolute value of the spin flipper:

$$x_{j,i} = \frac{1}{1624} \sum_{k=1}^{1624} abs(s_{j,i}(k)), \quad (1)$$

which gives a distinct signal for spin flipper on of 0.28 and off of 0.008.

Pulse Average

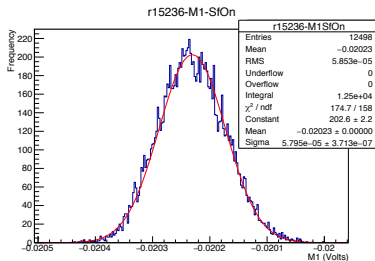
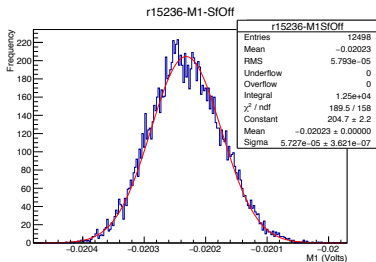
For the beam monitor and wires a simple pulse average is taken for pulse i in run j as:

$$x_{j,i} = \frac{1}{N} \sum_{k=1}^N s_{j,i}(k), \quad (2)$$

with $N = 49$ time bins for the target chamber wires and $N = 1624$ for the beam monitor, k is the time bin index, and $s_{j,i}(k)$ is the recorded signal in time bin k .

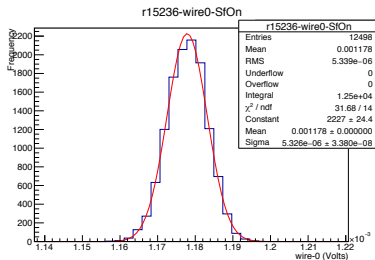
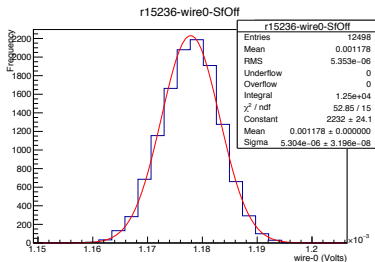
Run Results- M1 Monitor

These pulse averages are then filled into histograms separated by spin flipper on, and spin flipper off.



Run Results - wire 0

These pulse averages are then filled into histograms separated by spin flipper on, and spin flipper off.



CSV File Structure

```
run_num/I:sf_state/I:sf_const/D:sf_const_err/D:sf_mean/D:sf_mean_err/D:sf_Sigma/D:sf_Sigma_err/D:M1_const/D:M1
#Created from SpinFlipperState.C at Fri Jun 23 11:25:08 2017by M. McCrea
#run_num, sf_state, sf_const, sf_const_err, sf_mean, sf_mean_err, sf_Sigma, sf_Sigma_err, M1_const, M1_const_e
15081,1,1086.64,12.225,0.286786,1.13581e-07,1.04287e-05,6.89118e-08,71.064,1.22833,-0.0198401,2.13036e-06,0.00
15081,0,270.059,3.09773,0.00828393,3.98589e-07,3.77942e-05,2.5343e-07,49.0781,0.914357,-0.0197703,4.01856e-06,
15235,1,869.749,9.61592,0.28707,1.32025e-07,1.30349e-05,8.16372e-08,152.459,1.67373,-0.020124,7.2883e-07,7.542
15235,0,252.955,2.94918,0.00829884,3.78817e-07,3.41382e-05,1.821e-07,150.671,1.68358,-0.0201219,7.57505e-07,7.
15236,1,721.654,7.86365,0.287118,1.02697e-07,1.37526e-05,6.64421e-08,202.57,2.22867,-0.0202307,5.30675e-07,5.7
15236,0,156.165,2.16757,0.00828816,5.33824e-07,3.92584e-05,2.6016e-07,204.675,2.24415,-0.0202318,5.25081e-07,5
15764,1,691.465,8.23362,0.286839,1.73965e-07,1.45692e-05,1.07689e-07,25.1066,0.326497,-0.0193449,5.2892e-06,0.
15764,0,262.755,3.41688,0.00835733,4.84998e-07,3.67428e-05,3.24648e-07,24.8133,0.323612,-0.0193385,5.15153e-06
17004,1,943.892,9.88107,0.260711,1.16247e-07,1.21728e-05,6.58734e-08,22.3907,0.320122,-0.0185579,5.77767e-06,0
17004,0,168.397,2.04818,0.051021,6.99563e-07,6.143e-05,5.50485e-07,22.4152,0.316801,-0.0185478,5.63046e-06,0.0
17055,1,642.742,6.82382,0.260658,1.64177e-07,1.64399e-05,8.00778e-08,13.2846,0.198192,-0.0181181,1.02083e-05,0
17055,0,145.698,1.8235,0.0510195,6.74195e-07,5.47455e-05,3.83961e-07,13.555,0.20518,-0.018145,1.01664e-05,0.00
17169,1,429.908,5.10224,0.260673,2.57502e-07,2.1769e-05,1.49481e-07,22.9211,0.351972,-0.0183671,5.5886e-06,0.0
17169,0,214.556,3.58778,0.0510156,4.9435e-07,3.01804e-05,3.57891e-07,22.9554,0.355382,-0.0183498,5.62362e-06,0
17170,1,481.067,5.27631,0.260665,2.20065e-07,2.14065e-05,1.21412e-07,127.9,1.49825,-0.0190113,9.50617e-07,8.71
17170,0,148.036,1.86059,0.0509641,7.23817e-07,5.86039e-05,4.97185e-07,129.009,1.50483,-0.0190109,9.36435e-07,8
```

- ▶ 2 rows per run
- ▶ First line is leaf list so for using
TTree::ReadFile(" filename.csv");

- ▶ Adjust summary file production
- ▶ Verify csv summary vs data
- ▶ Verify that beam off noise is gaussian
- ▶ Determine is each run starts spin flipper on consistently (probably does, fast analysis)
- ▶ Process more runs into the summary file (slow, takes time and cpu power)
- ▶ plot SF on and SF off values vs. run number
- ▶ histogram SF on and SF off values and compare
- ▶ Form Beam Off Asymmetry for pulse pairs on each wire using, no cuts

$$A = \frac{Y_i^{\text{sfon}} - Y_{i+1}^{\text{sfoff}}}{1V} \quad (3)$$