## Mott Run 1 Analysis Update

What I am working on...

- Automating analysis and averaging of sets of runs
- .short vs .long output (complete)
- averaging script (in progress)
- Passing code user-inputted Time-of-Flight cuts (in progress)
- Same T1 - T2 range for all detectors
- Fixed delta-T ( = T2-T1), detector-dependent T1, T2
- Passing code user-inputted Energy cuts


## Automating Analysis

- FullAnalysis --> .long and .short textfiles, un-cut plots
- Sample for run 7999, Foil 15, 1.00 um, Low detector threshold on wiki
- .bash files used to run FullAnalysis on multiple runs
- Averager script takes .short files from command line specified runs --> weighted averages of asymmetries and error

Thickness Study ~80 runs total
~2 hours to analyze all 80
$\sim 2$ minutes a run

## Sample Full Study Analysis : Thickness

- 10 different foils, 8 unique thicknesses, $\sim \mathbf{8 0}$ runs
- Time of Flight cuts hardcoded - 48 ns to 58 ns , same for all detectors



Run 7999 ToF Plots



## Sample Full Study Analysis : Thickness

- Energy cuts determined from fit of exponential + gaussian (ie background + gaussian) to un-cut energy spectra data
- For low-threshold - fit in range of 2000:12000; hi- 4500:12000

Run 7999 - Foil 15, 1 um, Low Run 8059 - Foil 15, 1um, High Run 8059 - Foil 15, 1 um, Low




## Sample Full Study Analysis : Thickness

- Geometric weighted average for physics asymmetry - sign corrected based on Half-Wave Plate ( $\mathrm{In}=1$, Out $=\mathbf{- 1}$ )
- 3 runs failed peak-finding in Energy spectra fits - all three hi-threshold 0.05 um foil running ( $\mathbf{2}$ for foil 12, 1 for 13)
- ~10 runs failed to fit background (still used in averaging)



| Foil <br> \# | Thick <br> ness <br> (um) | \# of <br> Runs | Detec <br> Thres <br> hold | Up/Down Mott <br> Asymmetry | Up/Down <br> Detector <br> Asymmetry | Up/Down Beam <br> Asymmetry | Left/Right Mott <br> Asymmetry | Left/Right <br> Detector <br> Asymmetry | Left/Right <br> Beam <br> Asymmetry |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 15 | 1.00 | 6 | Low | $33.765 \pm 0.0803$ | $-0.308 \pm 0.0907$ | $0.097 \pm 0.0907$ | $0.508 \pm 0.0859$ | $1.343 \pm 0.0859$ | $0.012 \pm 0.0859$ |
| 3 | 0.87 | 6 | Low | $34.584 \pm 0.0784$ | $-0.087 \pm 0.0891$ | $-0.099 \pm 0.0891$ | $0.716 \pm 0.0841$ | $0.678 \pm 0.0841$ | $0.029 \pm 0.0841$ |
| 4 | 0.75 | 6 | Low |  |  |  |  |  |  |
| 2 | 0.625 | 6 | Low |  |  |  |  |  |  |
| 5 | 0.50 | 6 | Low |  |  |  |  |  |  |
| 14 | 0.35 | 6 | Low |  |  |  |  |  |  |
| 8 | 0.35 | 4 | Hi | $39.183 \pm 0.0836$ | $0.162 \pm 0.0987$ | $0.042 \pm 0.0987$ | $0.590 \pm 0.0914$ | $1.348 \pm 0.0914$ | $-0.064 \pm 0.0914$ |
| 1 | 0.225 | 6 | Hi | $40.965 \pm 0.0730$ | $0.469 \pm 0.0877$ | $-0.011 \pm 0.0877$ | $0.583 \pm 0.0812$ | $-0.596 \pm 0.0812$ | $0.081 \pm 0.0812$ |
| 12 | 0.05 | 6 | Hi | *originally 8 |  |  |  |  |  |
| 13 | 0.05 | 7 | Hi | *orginally 8 | runs, discarded 1 |  |  |  |  |
| 15 | 1.00 | 10 | Hi | $33.686 \pm 0.0519$ | $0.401 \pm 0.0585$ | $0.040 \pm 0.0585$ | $0.557 \pm 0.0554$ | $2.445 \pm 0.0554$ | $-0.023 \pm 0.0554$ |
| 15 | 1.00 | 10 | Low | $33.634 \pm 0.0616$ | $-0.477 \pm 0.0694$ | $-0.099 \pm 0.0694$ | $0.483 \pm 0.0659$ | $1.391 \pm 0.0659$ | $0.020 \pm 0.0659$ |

- Last two rows are the "stability" runs on foil 15 , split between hi and low threshold and averaged together

