LHRS Analysis for d_2^n

Data Quality, LHRS β, and A_1^n Statistical Error

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11/18/10

Outline

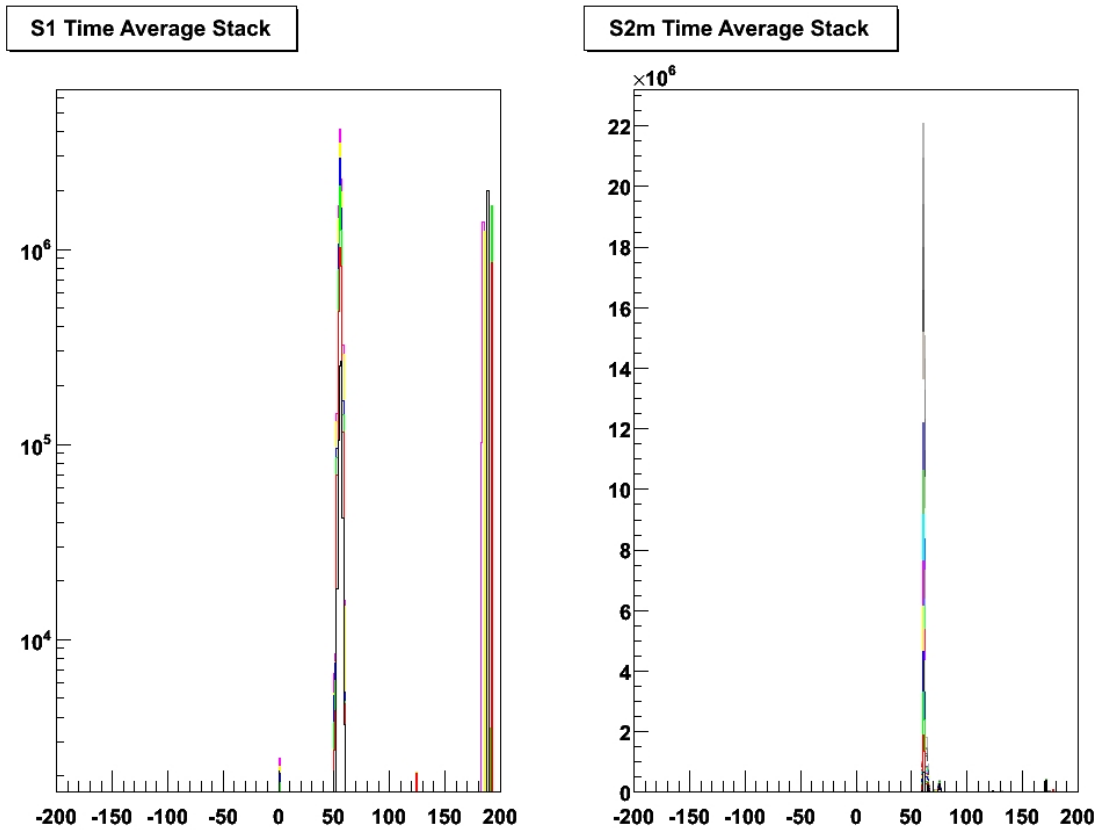
Manual Calculation of β (1)
Method

- To construct β:
  1. Apply all cuts (GC, PR, VDC for good e^-)
  2. For each event: See if there's a hit in S2m within 61 ± 5 ns
  3. When we find a hit for a given paddle (k) in S2m, we then look for a correlated hit in one of the S1 paddles (j) within 55 ± 5 ns
  4. When these two conditions are satisfied, we fill the S1 and S2m time average histograms, in addition to the time difference, and the paddle number histograms
     - If items 2 or 3 are not satisfied, we do not fill the histograms
- New Conditions: In addition to requiring both L and R PMTs to fire, we also require the L and R TDC times to be within 55 ± 5 ns

Manual Calculation of β (2)

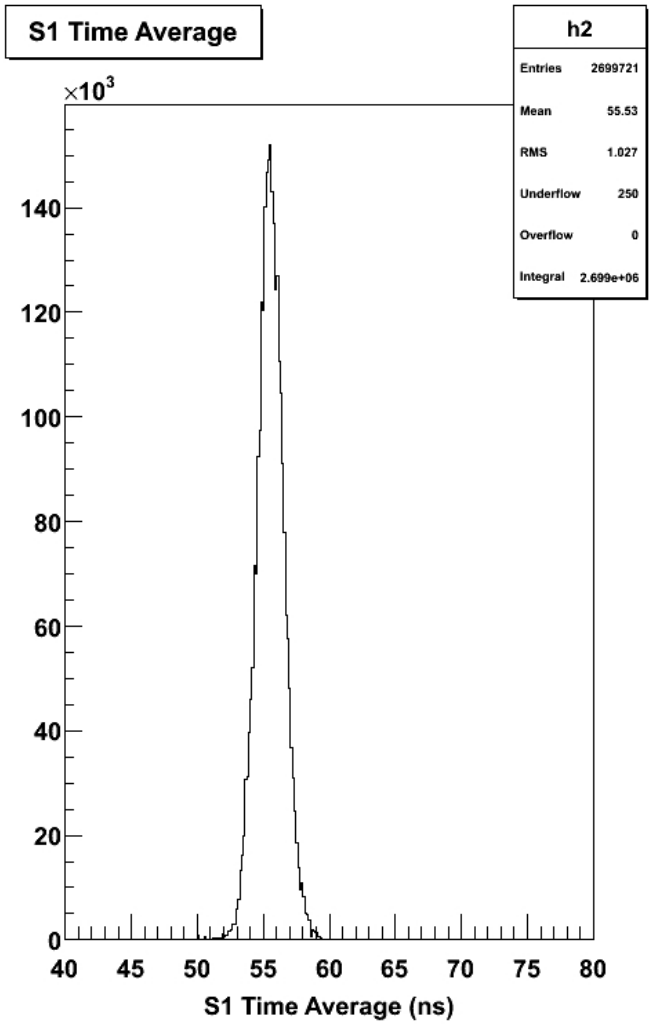
Results: First Run

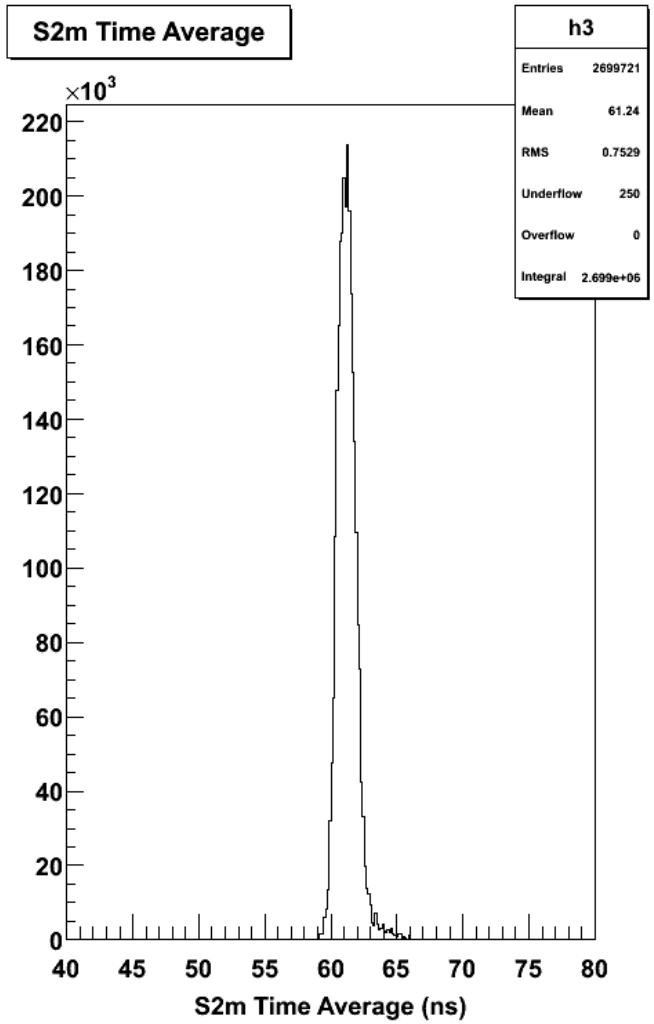
- At first, each paddle had entries at ~ 200 ns (like the data does)



Manual Calculation of β (3)

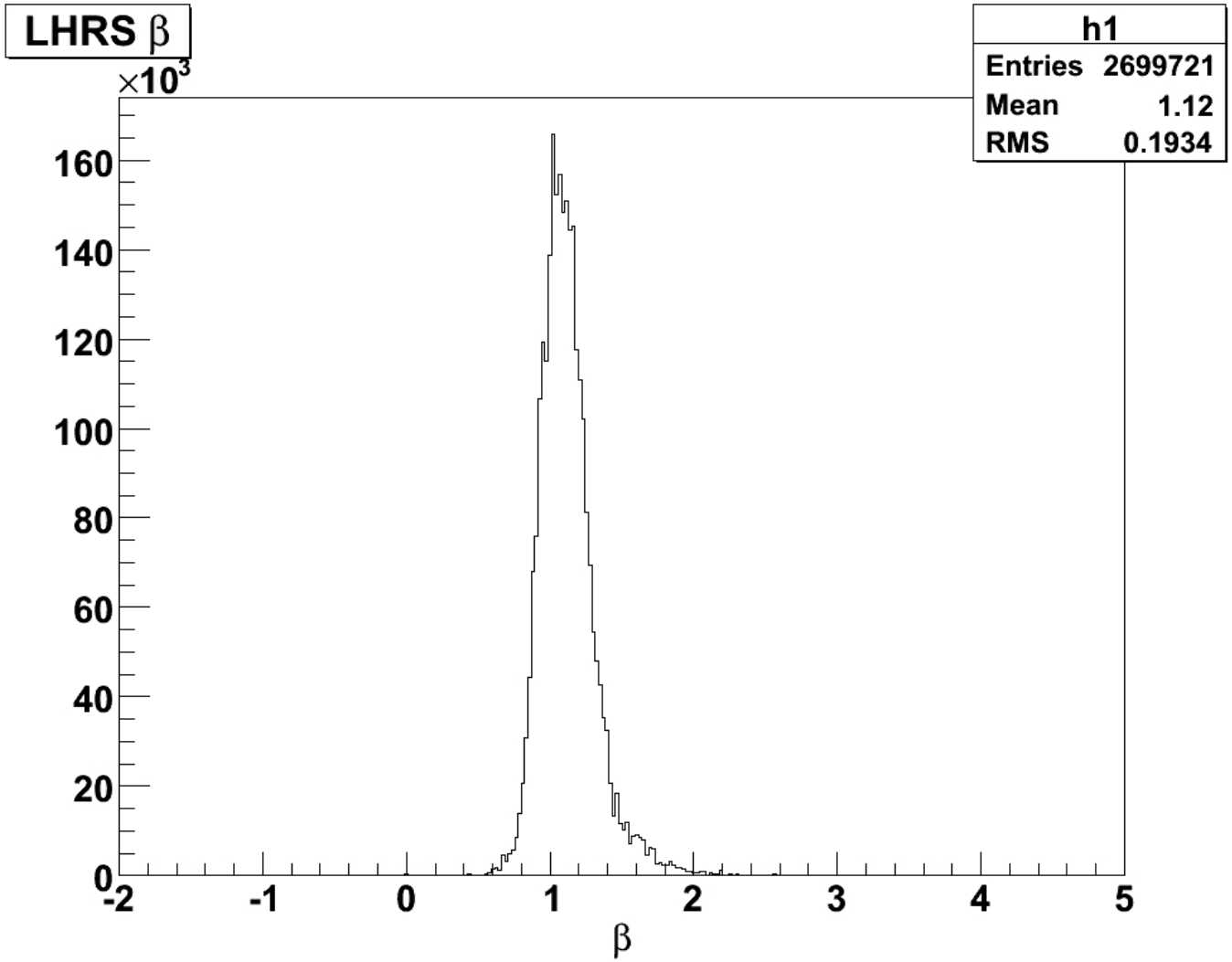
Results: First Run





Manual Calculation of β (4)

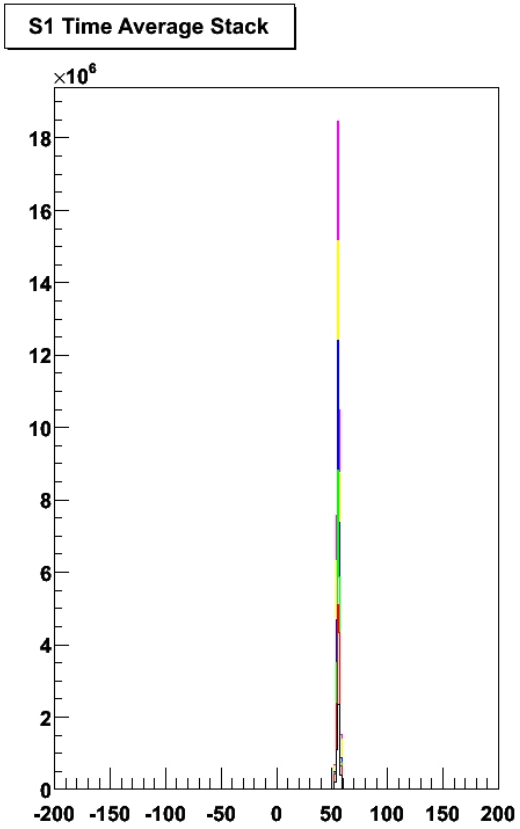
Results: First Run

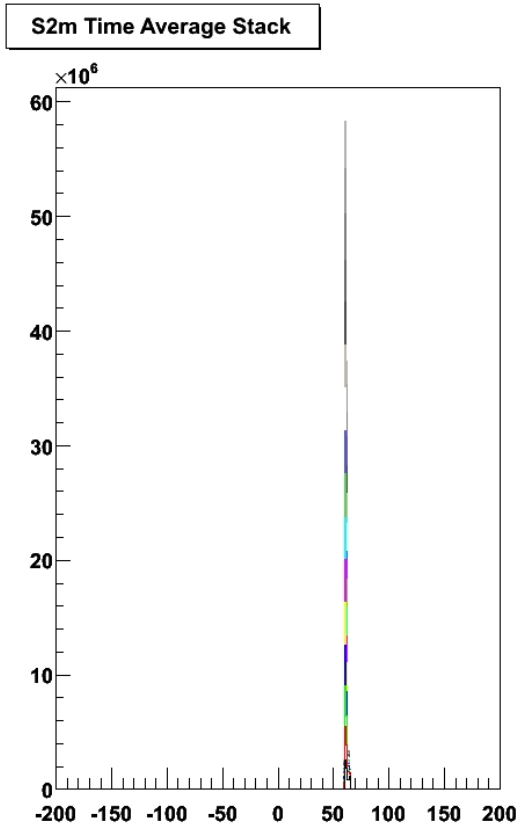


Manual Calculation of β (5)

Results: With New Condition

- With the new condition on each paddle:

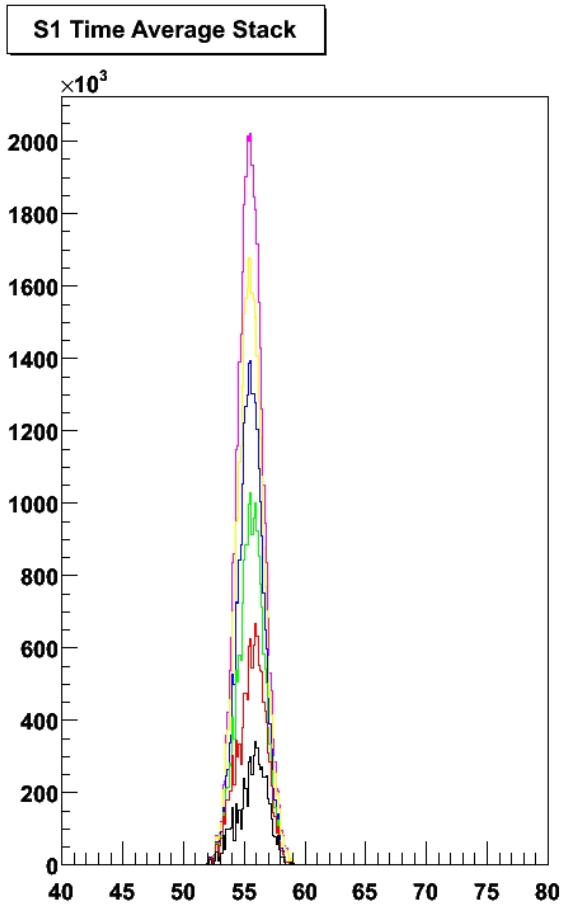


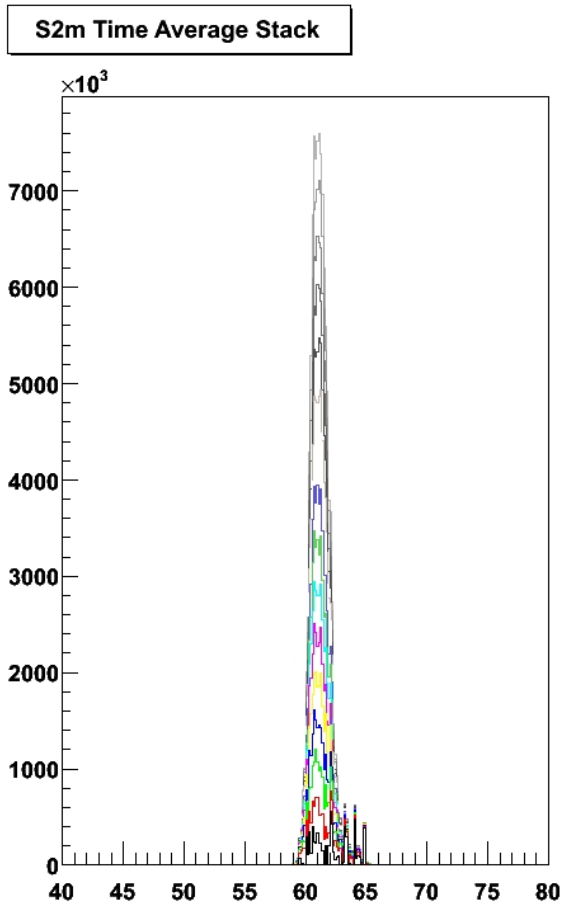


Manual Calculation of β (6)

Results: With New Condition

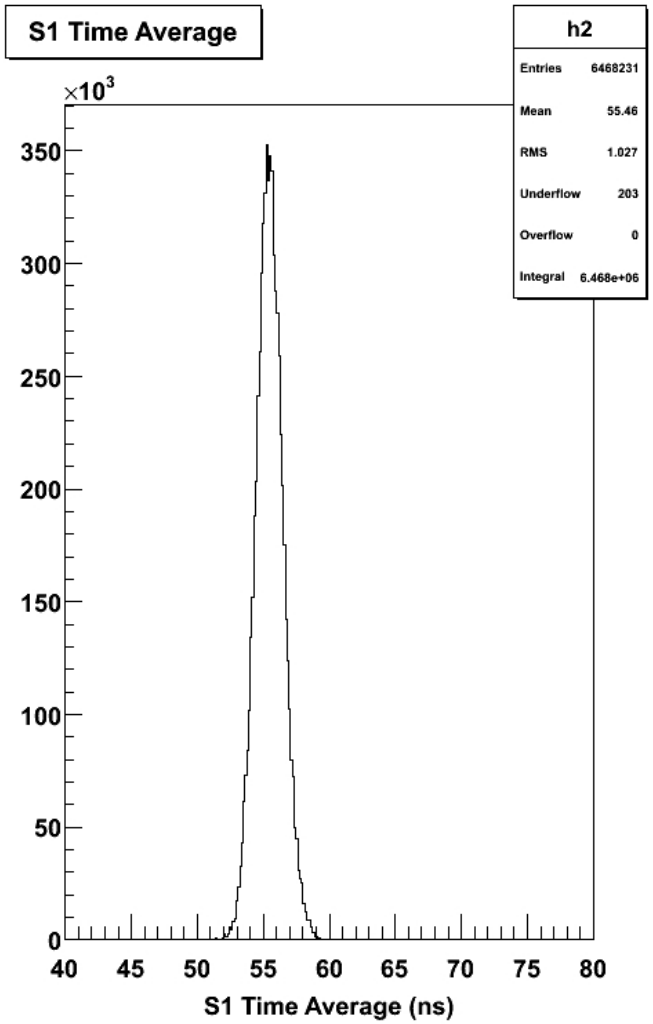
- Zoomed in:

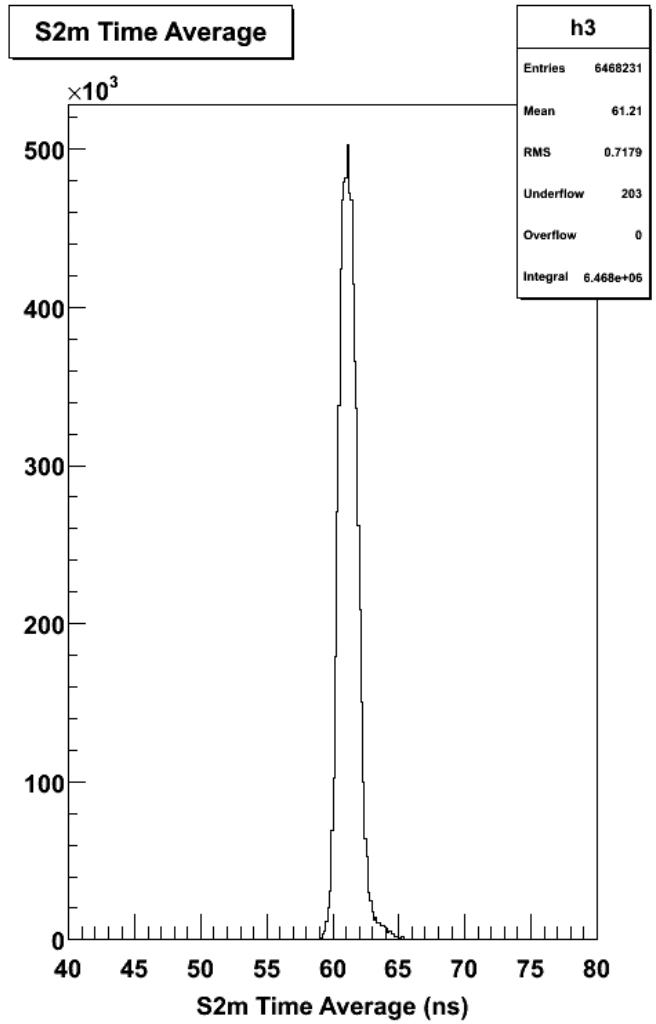




Manual Calculation of β (7)

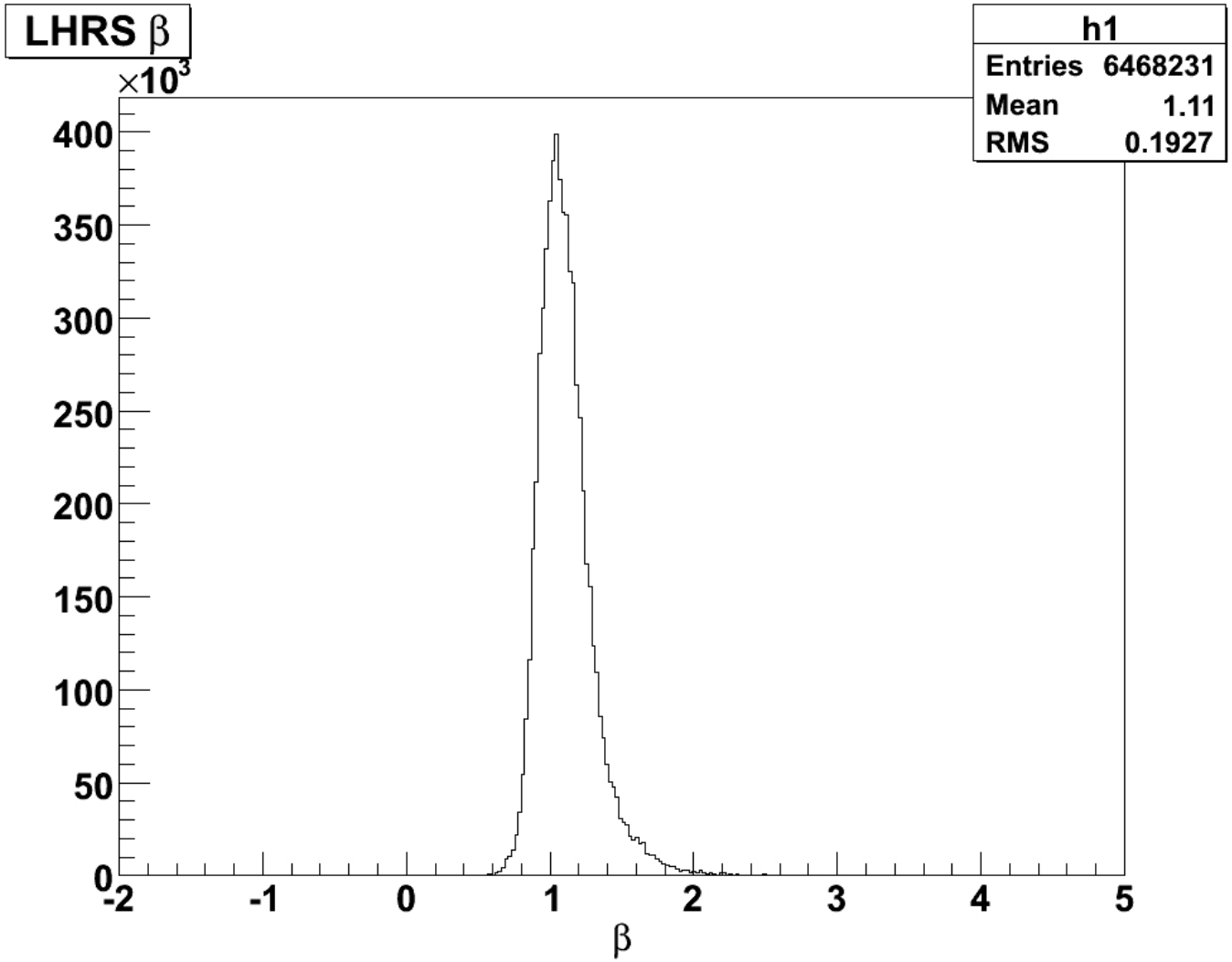
Results: With New Condition





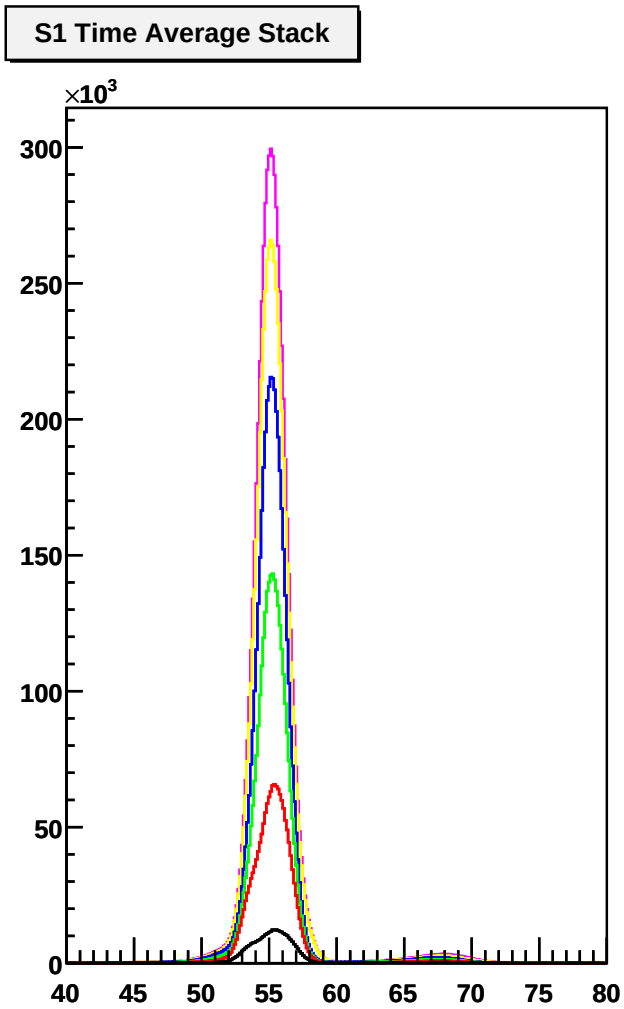
Manual Calculation of β (8)

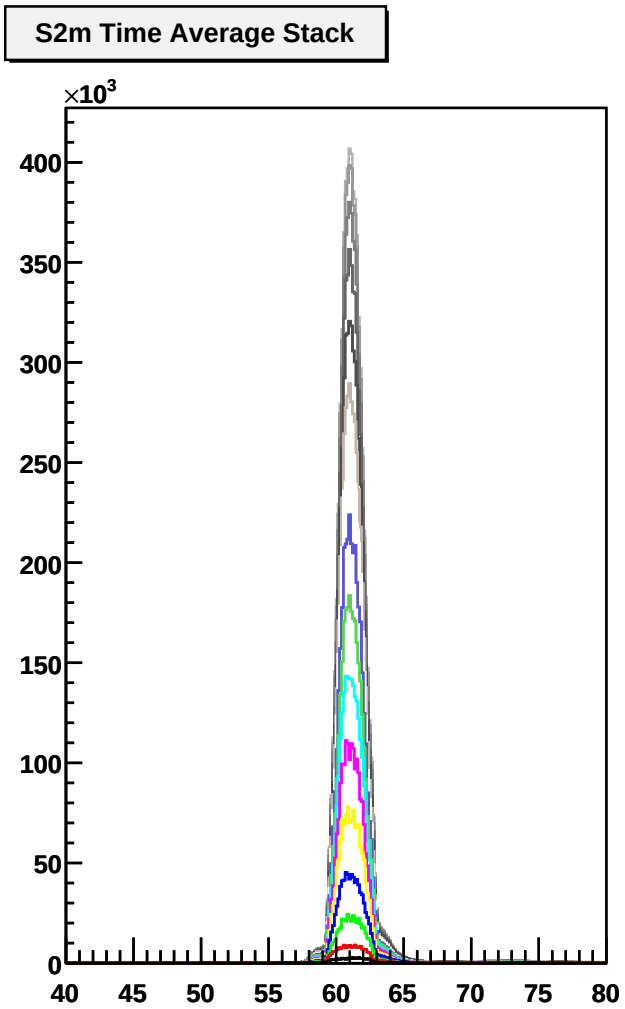
Results: With New Condition



Manual Calculation of β (9)

Comparisions to Data: Alignment of Average Times per Paddle





A_1^n Projected Statistical Errors (1)

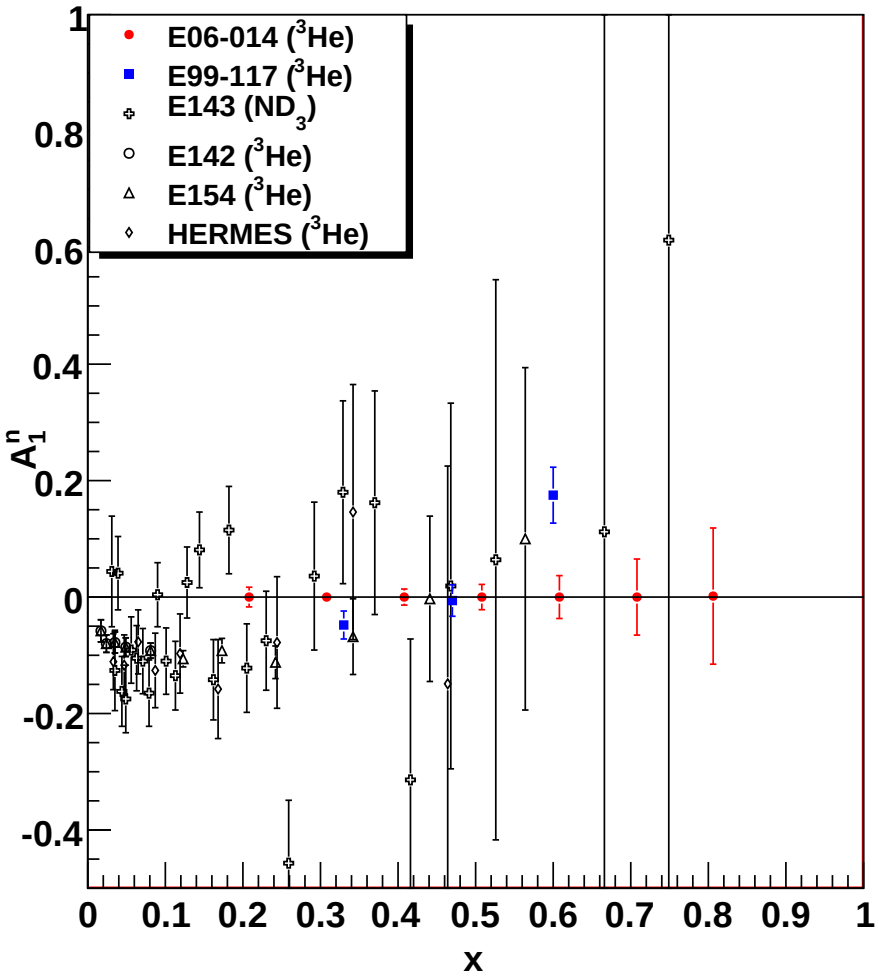
New Binning in x (5-pass)

- Initially, the plan was to add three more data points
  - This yields a binning in x in steps of $0.01 \Rightarrow$ very low statistics per bin
- Solution: bin in x in steps of $0.1 \Rightarrow$ less data points, but higher statistics per bin

Kinematics for the New x Bins (5-pass)			
p (GeV)	x	Q^2 (GeV^2)	W (GeV)
0.60	0.208	2.07	2.96
0.85	0.308	2.92	2.73
1.07	0.408	3.69	2.49
1.28	0.508	4.40	2.27
1.47	0.608	5.06	2.04
1.64	0.708	5.66	1.79
1.80	0.808	6.21	1.54

A_1^n Projected Statistical Errors (2)

Comparison to World Data



Summary

- LHRS β:
  - Fixed the bugs in the code, results are strikingly similar to the way the analyzer calculates β
- A_1^n Statistical Error:
  - Uniform binning in x yields good statistical errors
- Data Quality:
  - Coding for checking data and skim procedure is ongoing...

What's Next?

- LHRS β:
  - Fine-tune S1 paddle time alignment?
- A_1^n Statistical Error:
  - Calculate errors for 4-pass data
  - Add cuts (once BigBite shower calibration is complete)
- SAMC:
  - Got it running – currently writing code to plot data
- Data Quality:
  - Continue work on `DataCheck` and `Skim` code
    - Start developing detector/HV trip code