

In the weekly n-³He meeting on 11/14/16 we discussed the problem of synchronization of the accelerator T_0 pulses and the 30 MHz free-running oscillator pulses. Here is a draft section on synchronization.

Synchronization of the T_0 pulses and the 30 MHz ADC clock oscillator.

The accelerator provides a periodic T_0 pulse train that has a frequency of 60 Hz and occurs at a fixed delay relative to the time at which protons strike the spallation target. The ADC apparatus is controlled by a 30 MHz oscillator (clock) that determines the times at which the signals from the detectors are digitized. Because there is no fixed relationship between the phases of these two pulse trains, it is necessary to synchronize the clock pulses to the T_0 pulses. For each T_0 pulse, the next clock pulse to occur is chosen to initiate the digitization process.

As discussed in section X we chose to operate the ADC at 50 KHz. The ADC digitizes data for a range of time that is slightly less than 1/60 sec. For each of 50 display time bins, sixteen 20 μ sec samples are averaged to obtain yields for each of 50 .32 msec wide display bins. The total time digitized for each T_0 pulse is 50 x .32 msec or 16.0 msec. These are the data that show the detector yield vs. neutron arrival time and can be analyzed to determine asymmetries.

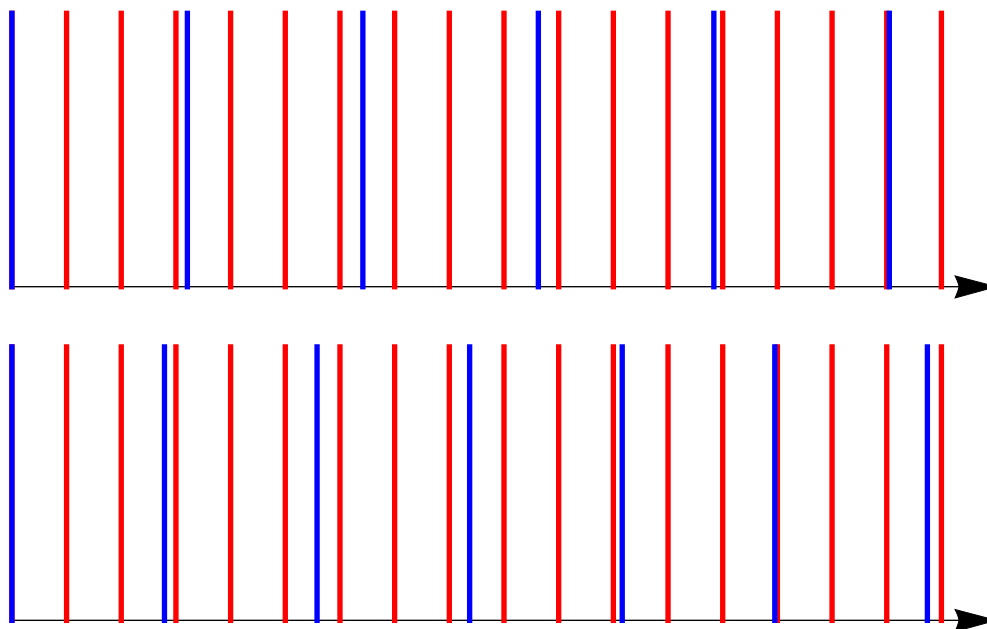
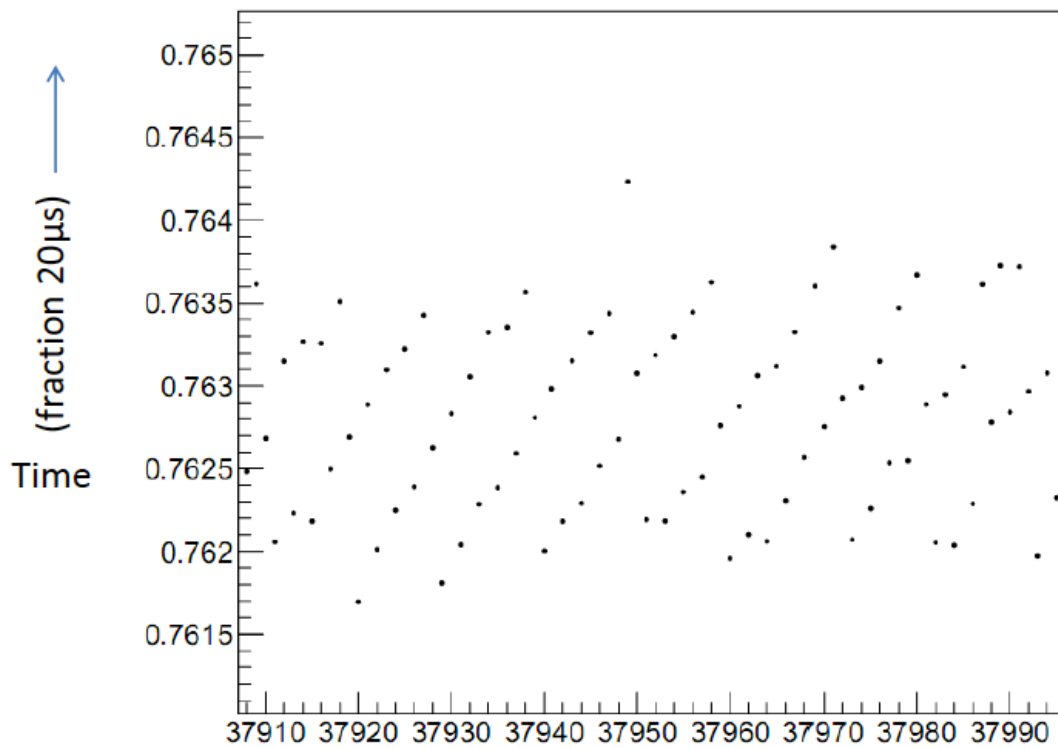
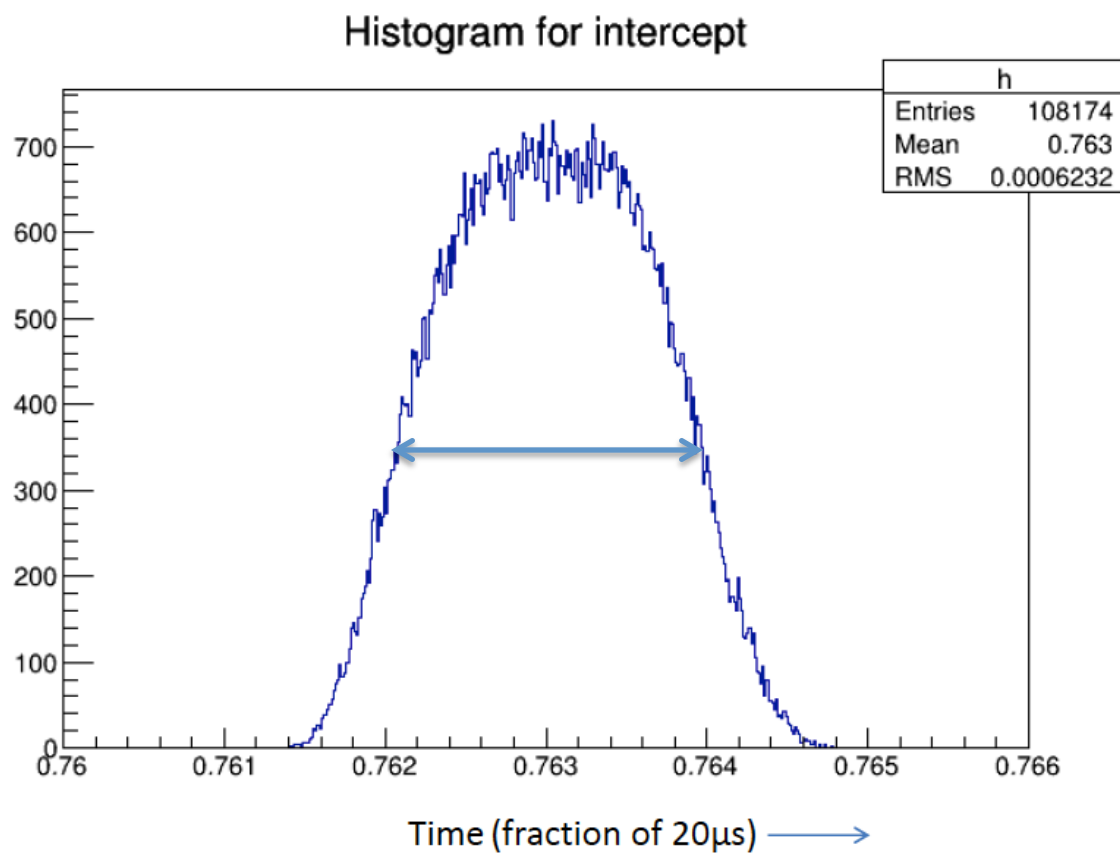


Figure 1. The arrows show increasing time. The red vertical lines show the 30 MHz t_0 clock pulses. The blue lines show the T_0 pulses. In the upper graph, the T_0 period is slightly longer than 3 times the t_0 period.



Convert x axis to nsec.

FWHM is 38.1 nsec

Period of 30 MHz signal is 33.3 nsec

Timing noise is 12.1 nsec Why?

Revised outline

Introduction (JDB)

- Description of experiment – diagram

- Spin flipper

- Detector - Current mode

- Statistical uncertainties

- Systematic uncertainties

 - From spin interactions

 - From electromagnetic coupling of spin flipper signal

- Requirements for false asymmetries (JDB)

 - Statistical uncertainties from preamp noise \ll counting stat

 - False asymmetries $< 3 \cdot 10^{-9}$

- Preamp and DAQ requirements

DAQ (CC)

- Current mode

- Synchronization , (JDB draft)

Description of preamps (DB, CB, VC, and JDB)

Description of shielding, grounding, and measures to reduce coupling of spin flipper signal

Results – limits on false asymmetries (VC, LC, and I)

- Windows off tune up

- Beam off runs of full apparatus

- Comparison of shot and electronic noise (figure)

Conclusion

- We did it

