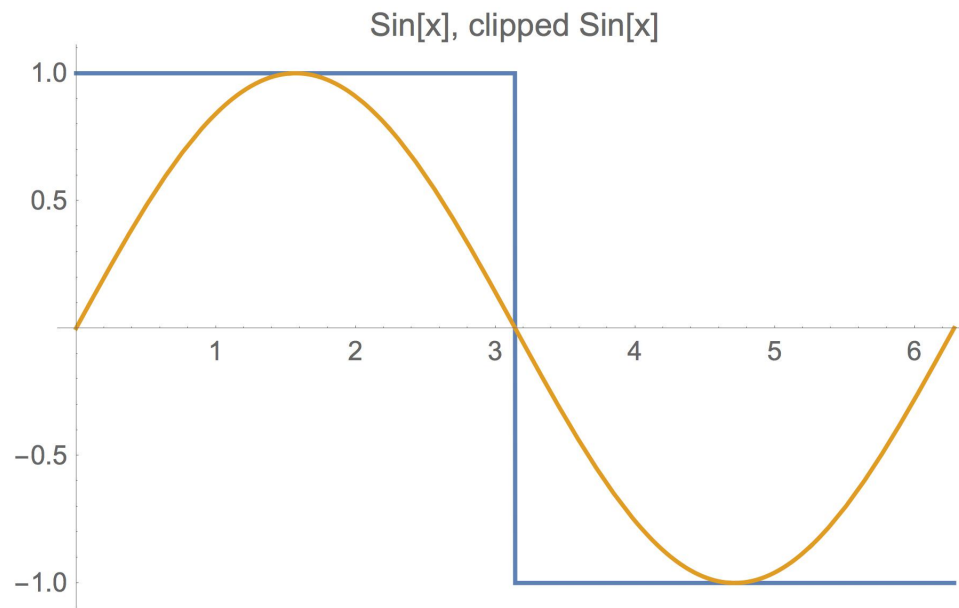# Strategy for data analysis
Sources of false 30 Hz signals

David Bowman

n-^{3}He analysis meeting 5/3/16

Distorting a Sin or Cos introduces harmonics of the fundamental frequency , but never sub-harmonics

Sin[x], clipped Sin[x]

$$ClippedSin[x] = \frac{4}{\pi}\left(Sin[x] + \frac{1}{3}Sin[3x] + \frac{1}{5}Sin[5x] + ...\right)$$

We have exploited this idea in n-^{3}He. We use a 60 Hz beam and search for a 30 Hz signal caused by flipping the neutron spin

The dropped pulses invalidate the above approach

Deliberately dropped pulses occur at .1 Hz. The 300th harmonic of .1 Hz is 30 Hz. Thus, We expect a false 30 Hz signal to be induced by dropping every 600th pulse, although we can't say how this might happen without further investigation.

Strategy: make a 600-tupple the fundamental unit of analysis. Follow Vince's idea of sorting on

A-type = drop, +, -, +, …

B-type = drop, -, +, -, …

Each run will contain all A-type or all B-type 600-tupples

Extract the 30 Hz signal from each run and calculate 30 Hz signals, SA and SB, averaged over many runs.

$$S\left(A\,or\,B\right)=\left\langle \frac{1}{598}\sum_{pairs}Y_{odd}-Y_{even}\right\rangle_{\text{Run-Average}}$$

Y_{odd} and Y_{even} are background-subtracted and intensity-normalized detector signals.

Then: PV=SA-SB and
False 30 Hz=SA+SB

Summary: 10 Hz dropped pulses may induce false PV
The above procedure eliminates this false PV

Open issues: Does it work? (Improved horns, Less ragged behavior vs. layer). Does the false PV manifest itself in an additive or multiplicative fashion?