

Directional Signatures in DRIFT - Part II

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Irish Legend



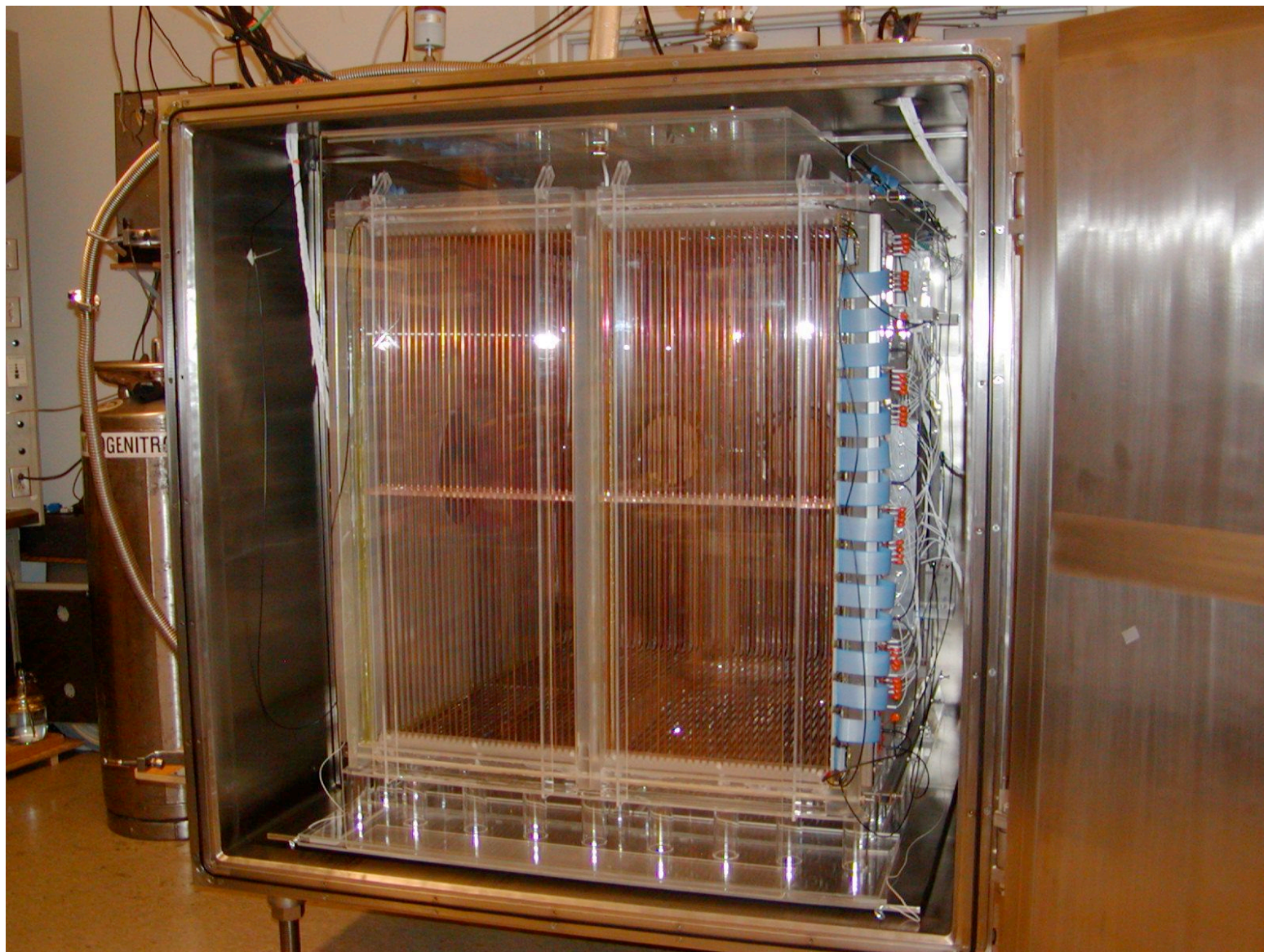
Head/Tail



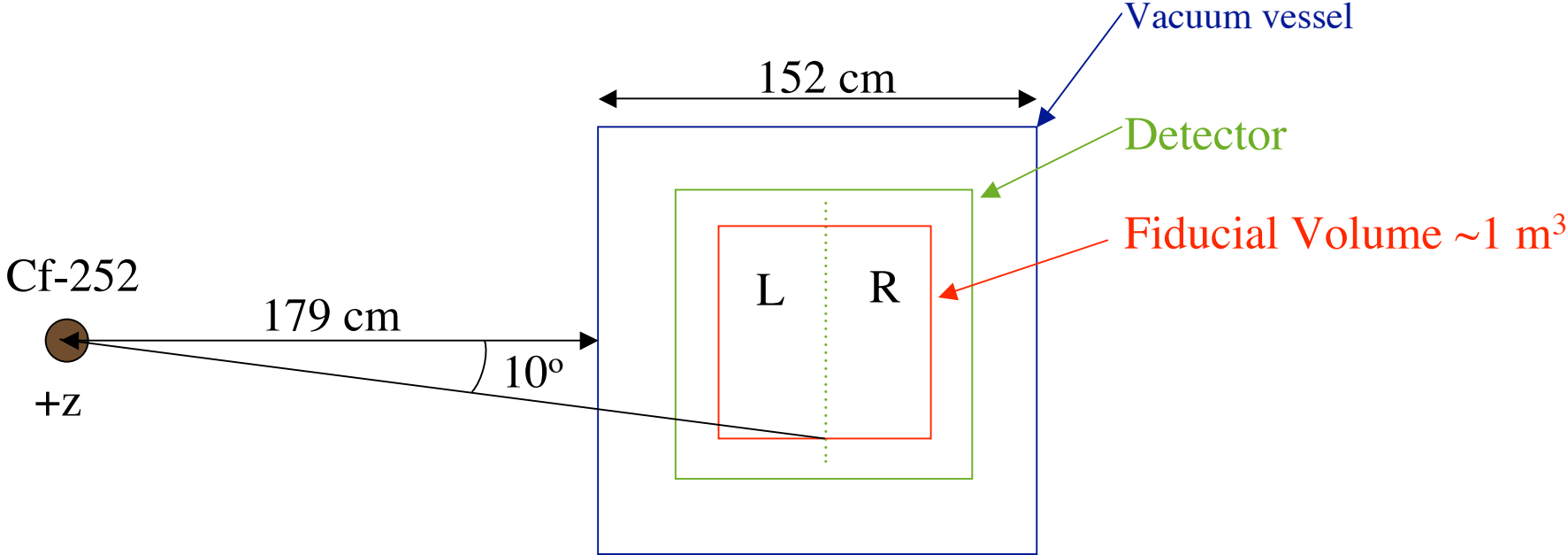
Head/Tail Experiment

- Not in competition with Dinesh's work. Dinesh is doing the right thing by making careful measurements of the head/tail effect with a fine grained detector.
- Still I have concerns.
- 1st Concern - Is there an effect?
- 2nd Concern - If it is there, is it of any use to a big TPC like DRIFT?

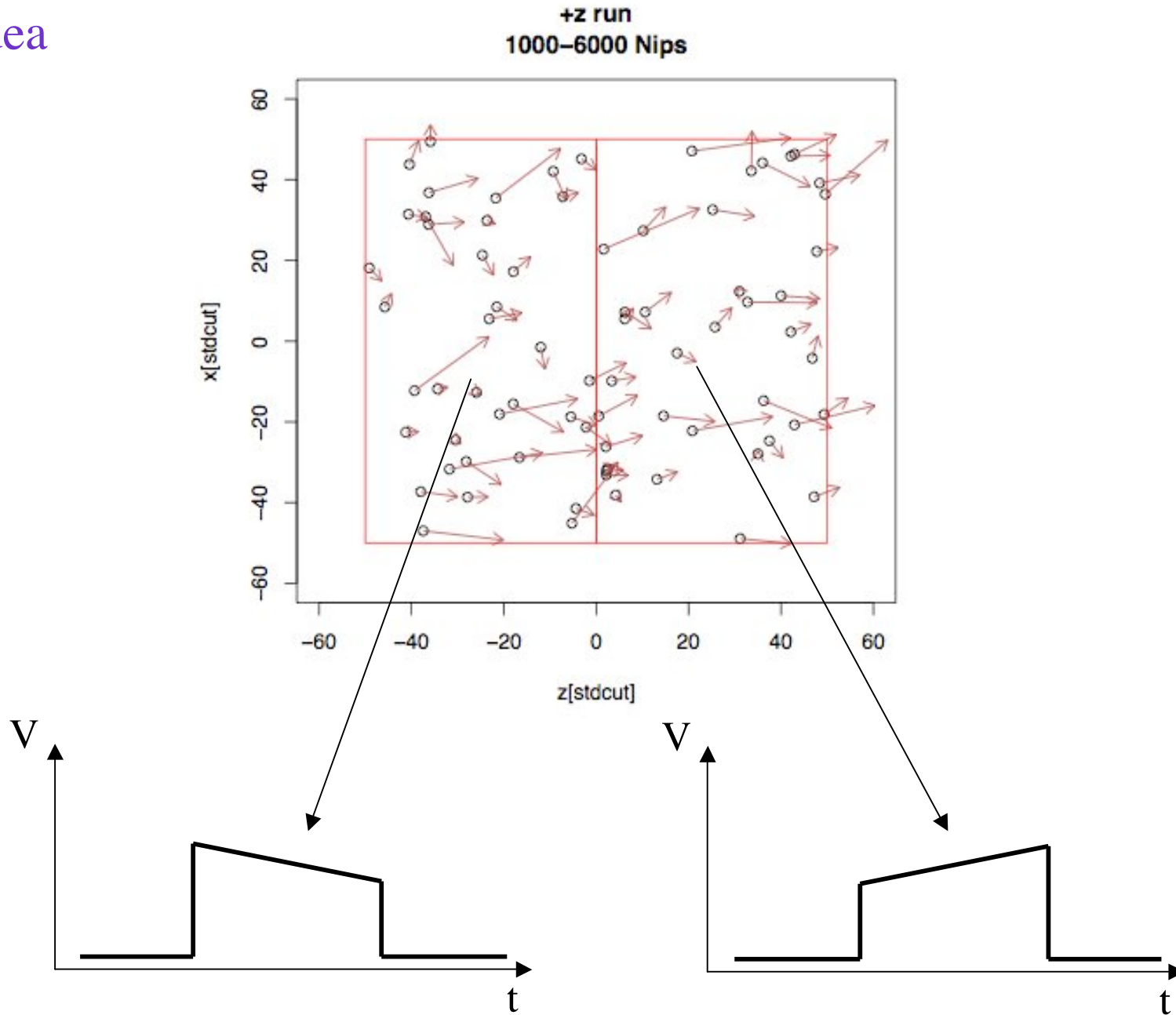
DRIFT-IIc



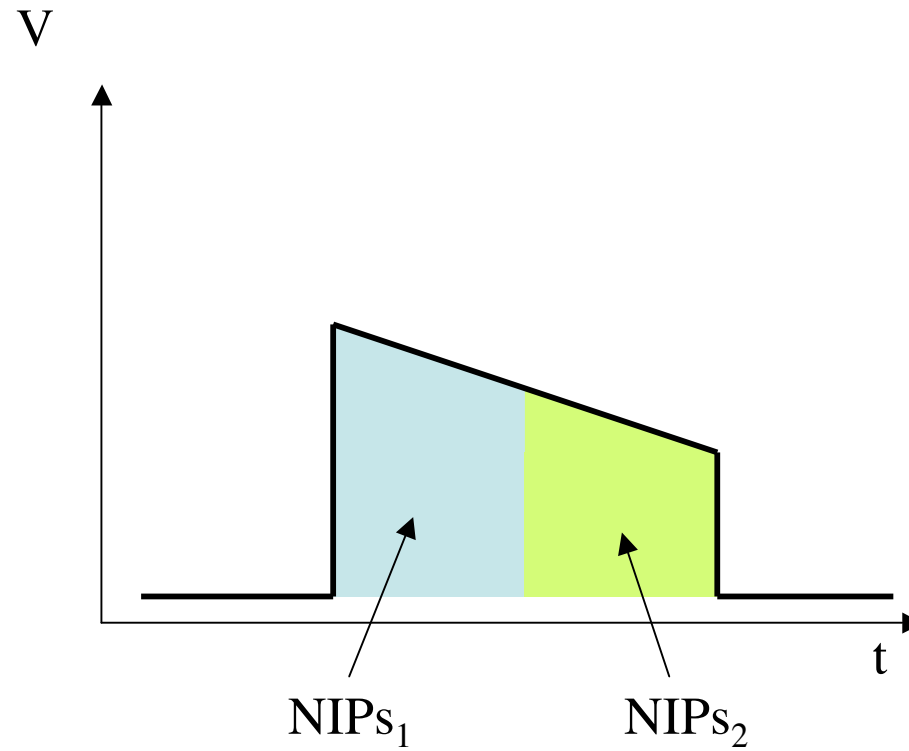
Geometry of the Exposures



The Idea



Asymmetry Analysis

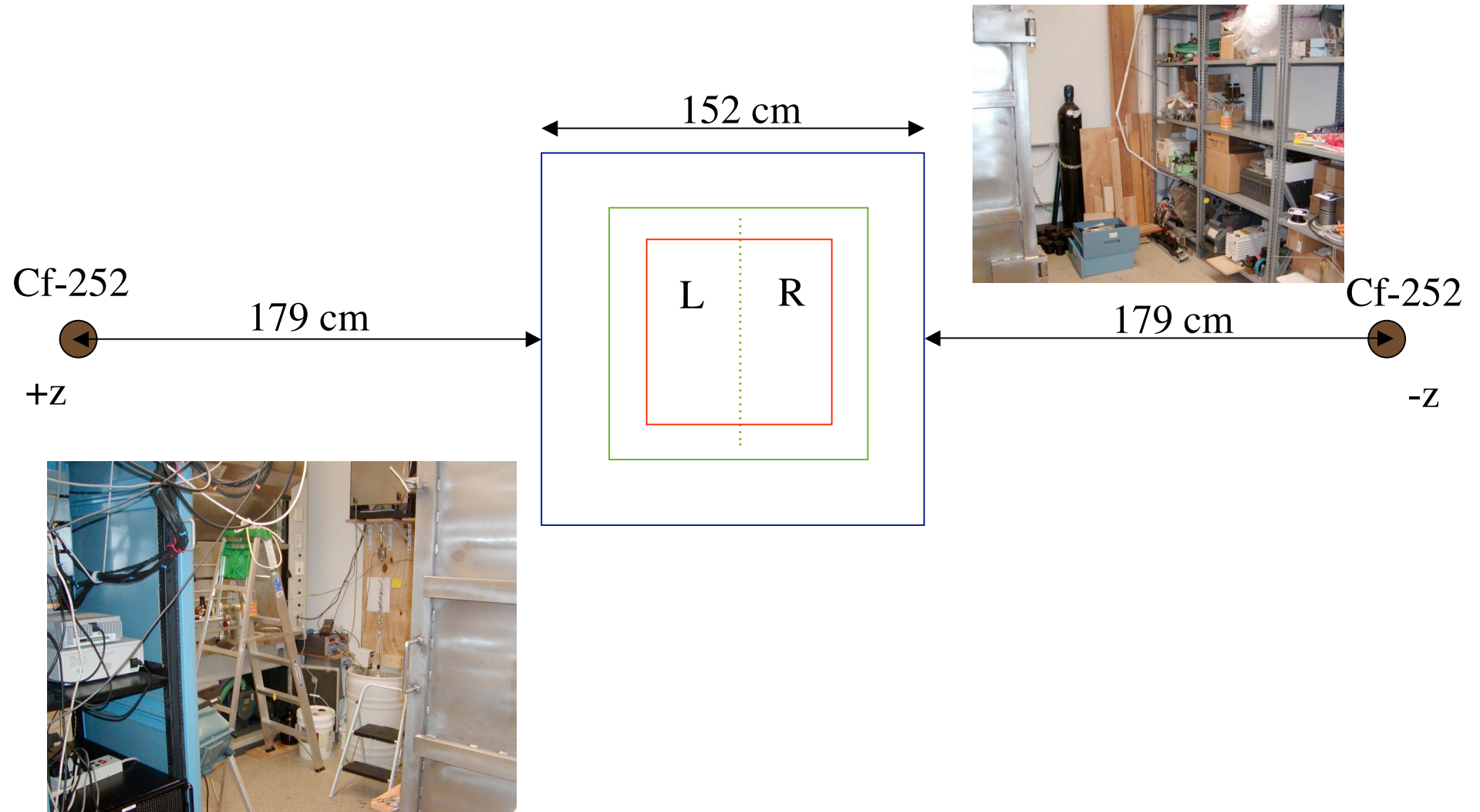


$$\text{Ratio} = \text{Nips}_1 / \text{Nips}_2$$

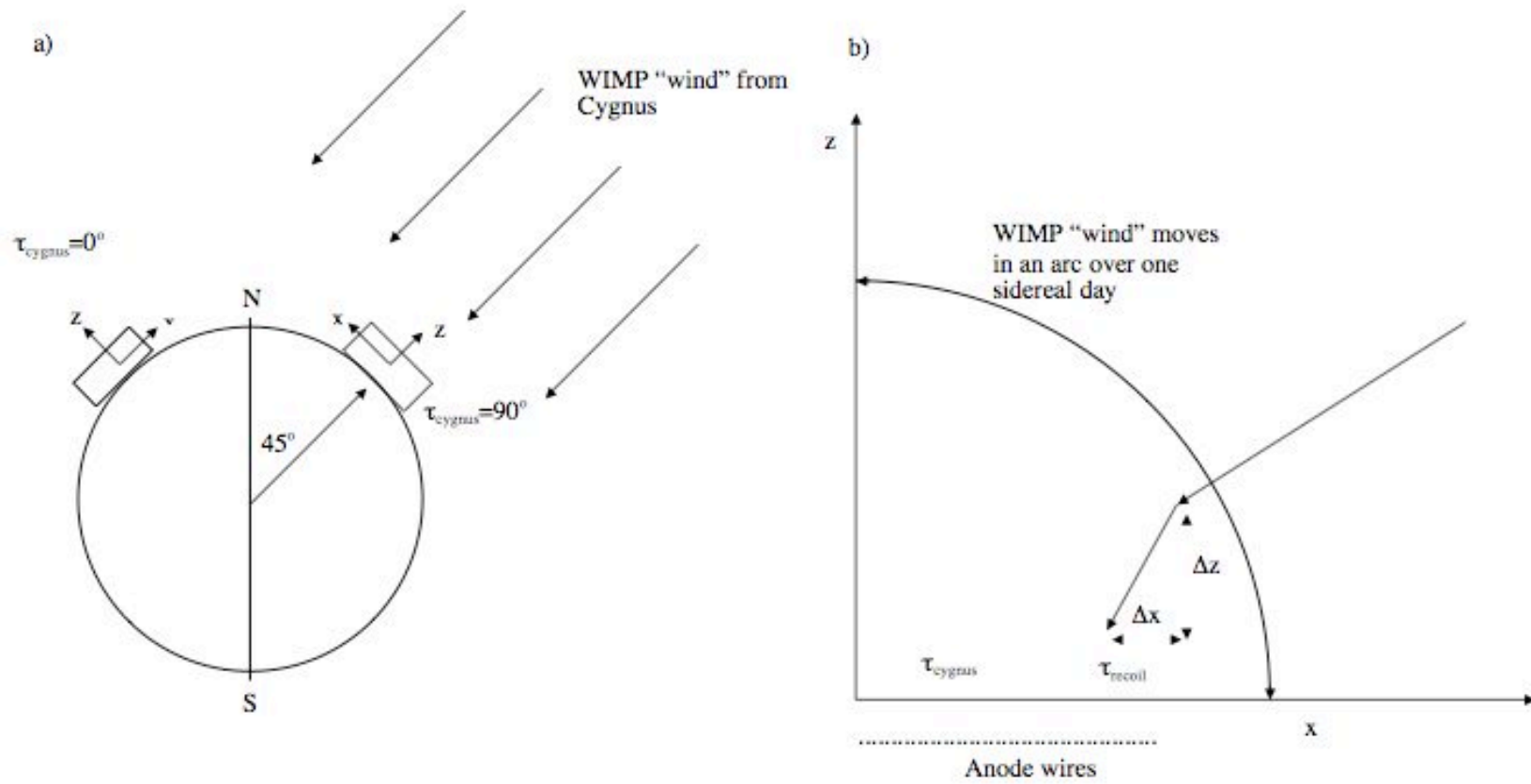
L => Ratio > 1

R => Ratio < 1

Geometry of the Exposures

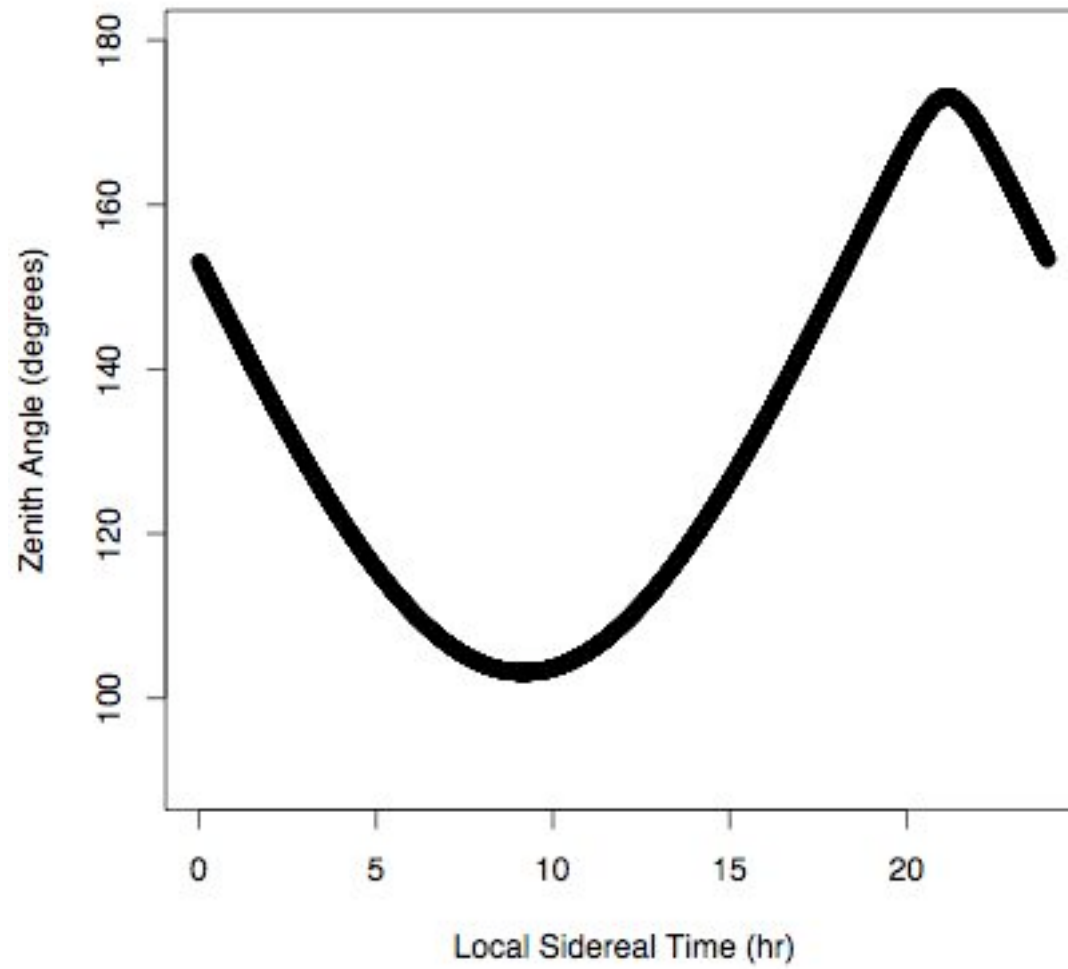


WIMP Recoils vs Neutron Recoils

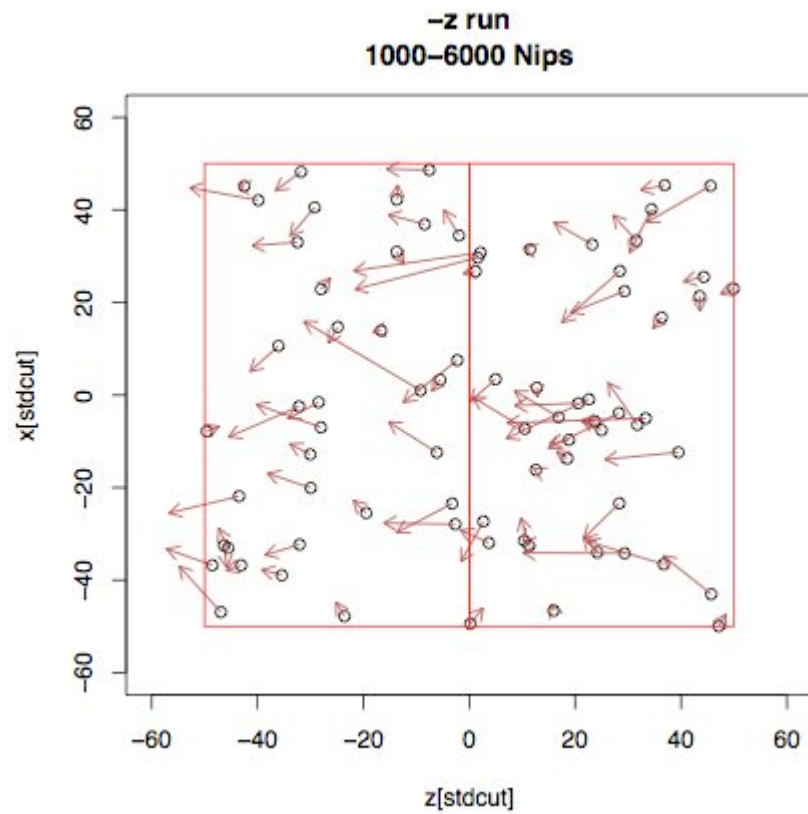


WIMP Recoils vs Neutron Recoils

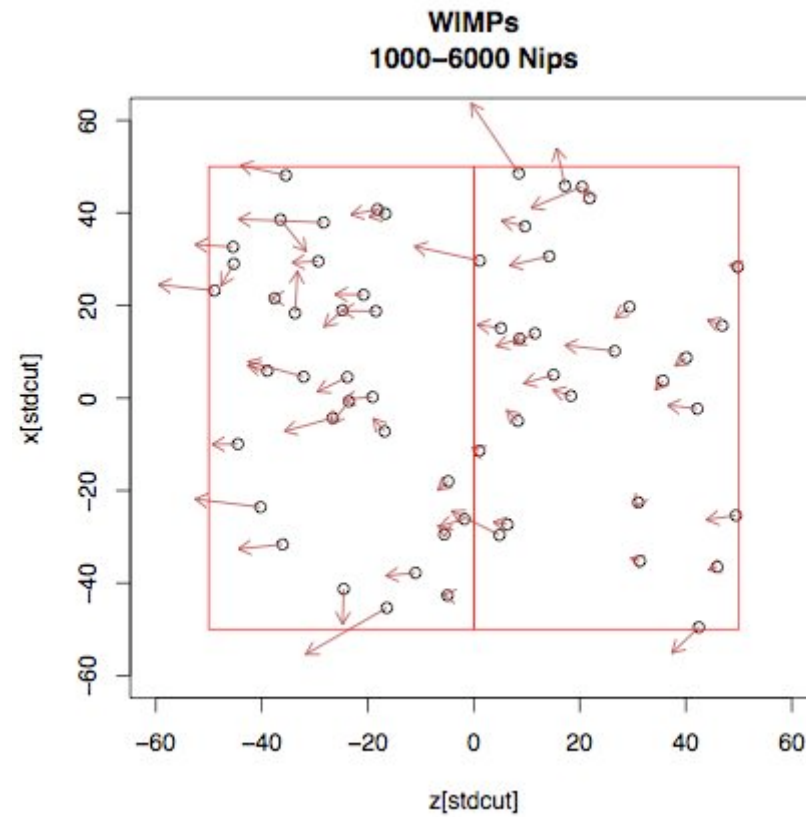
Zenith variations at Boulby



WIMP Recoils vs Neutron Recoils



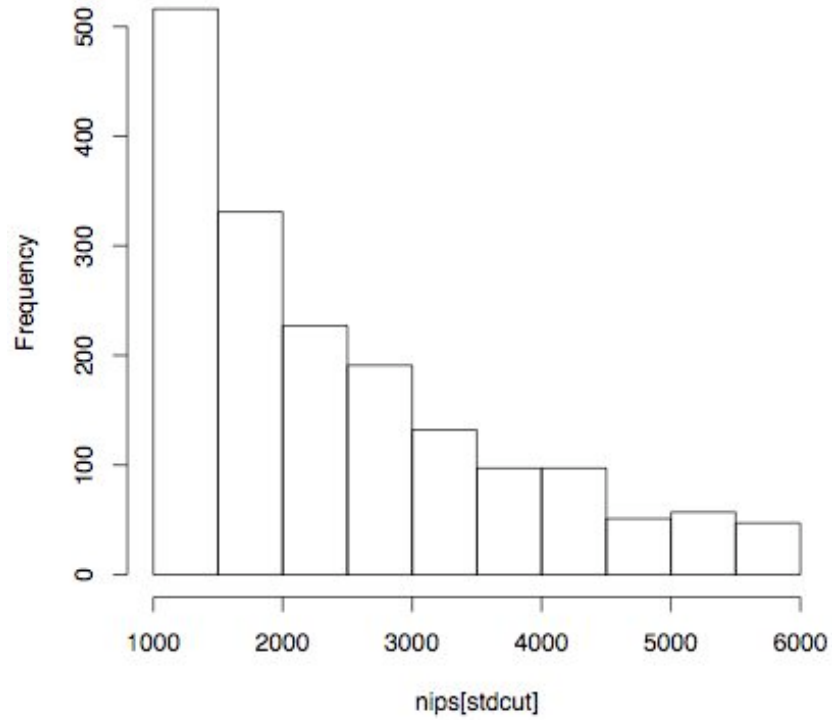
Cf-252 neutrons on S



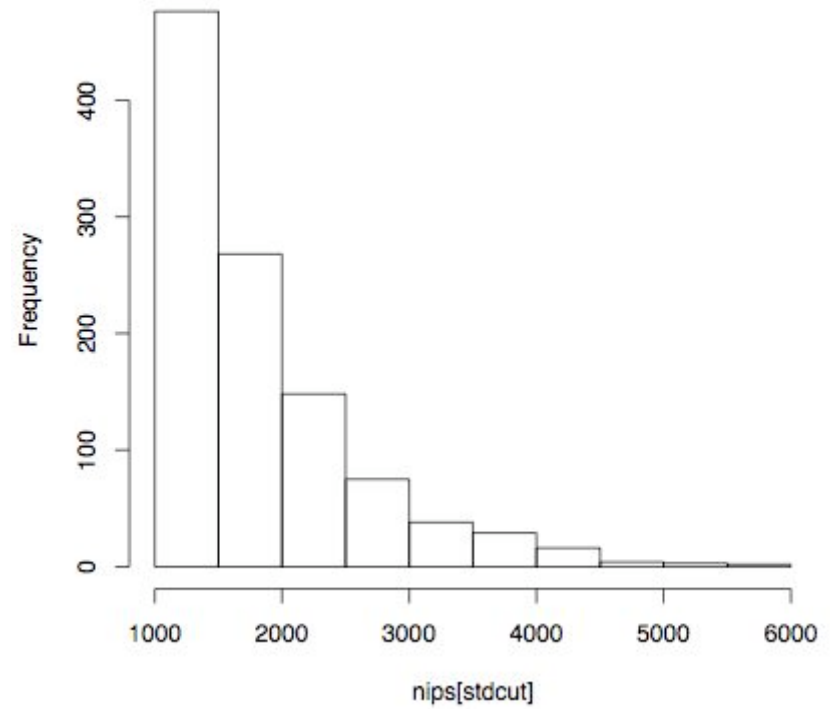
100 GeV WIMP on S

WIMP Recoils vs Neutron Recoils

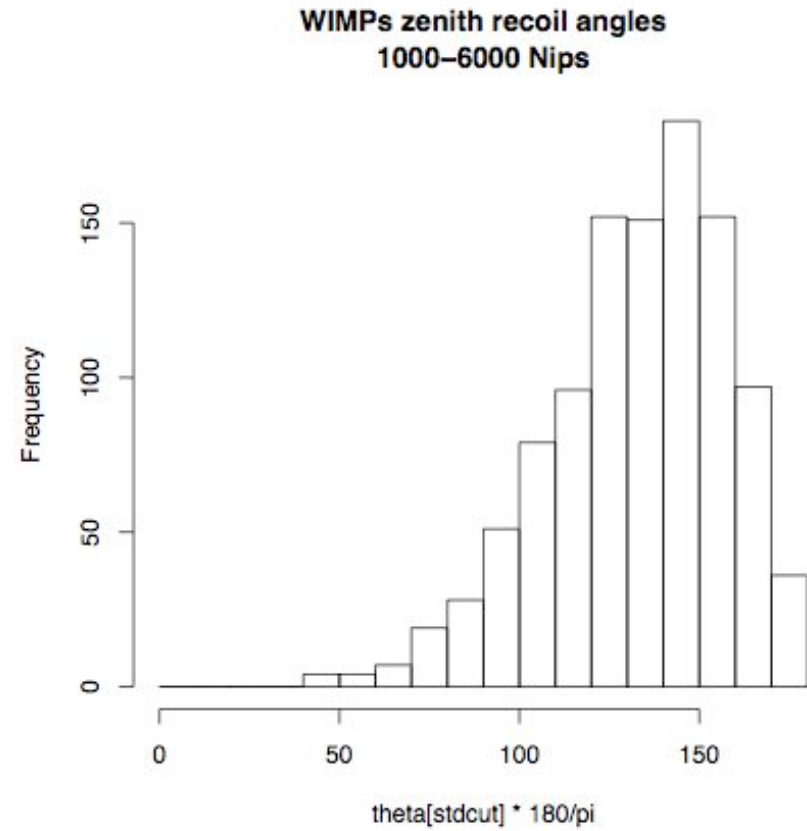
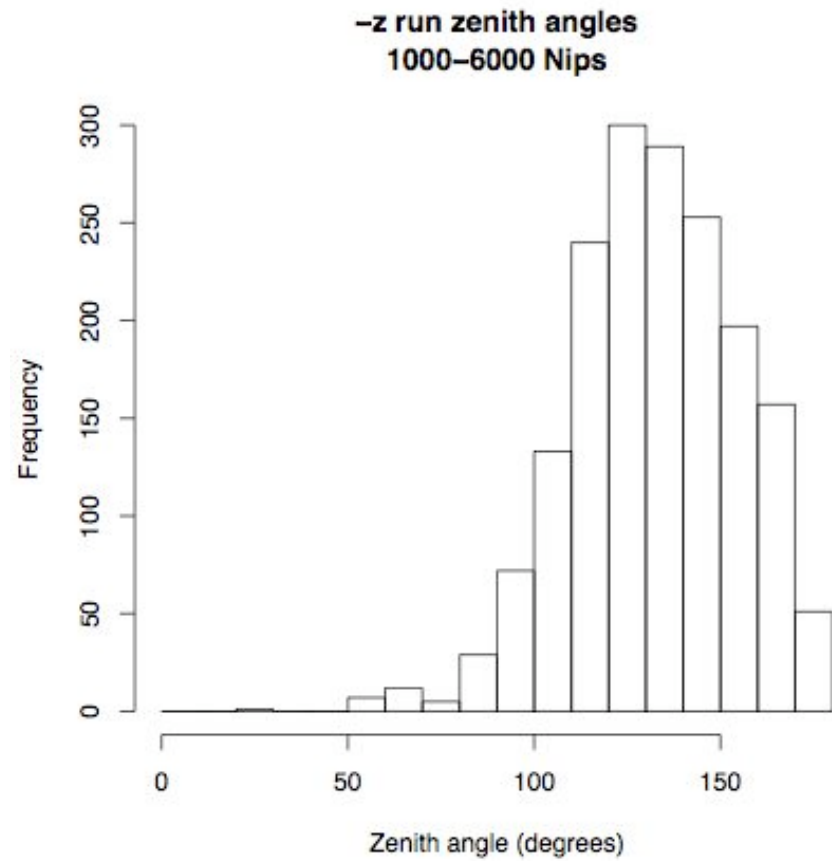
**-z run Nips Histogram
1000-6000 Nips**



**WIMPs Nips Histogram
1000-6000 Nips**



WIMP Recoils vs Neutron Recoils

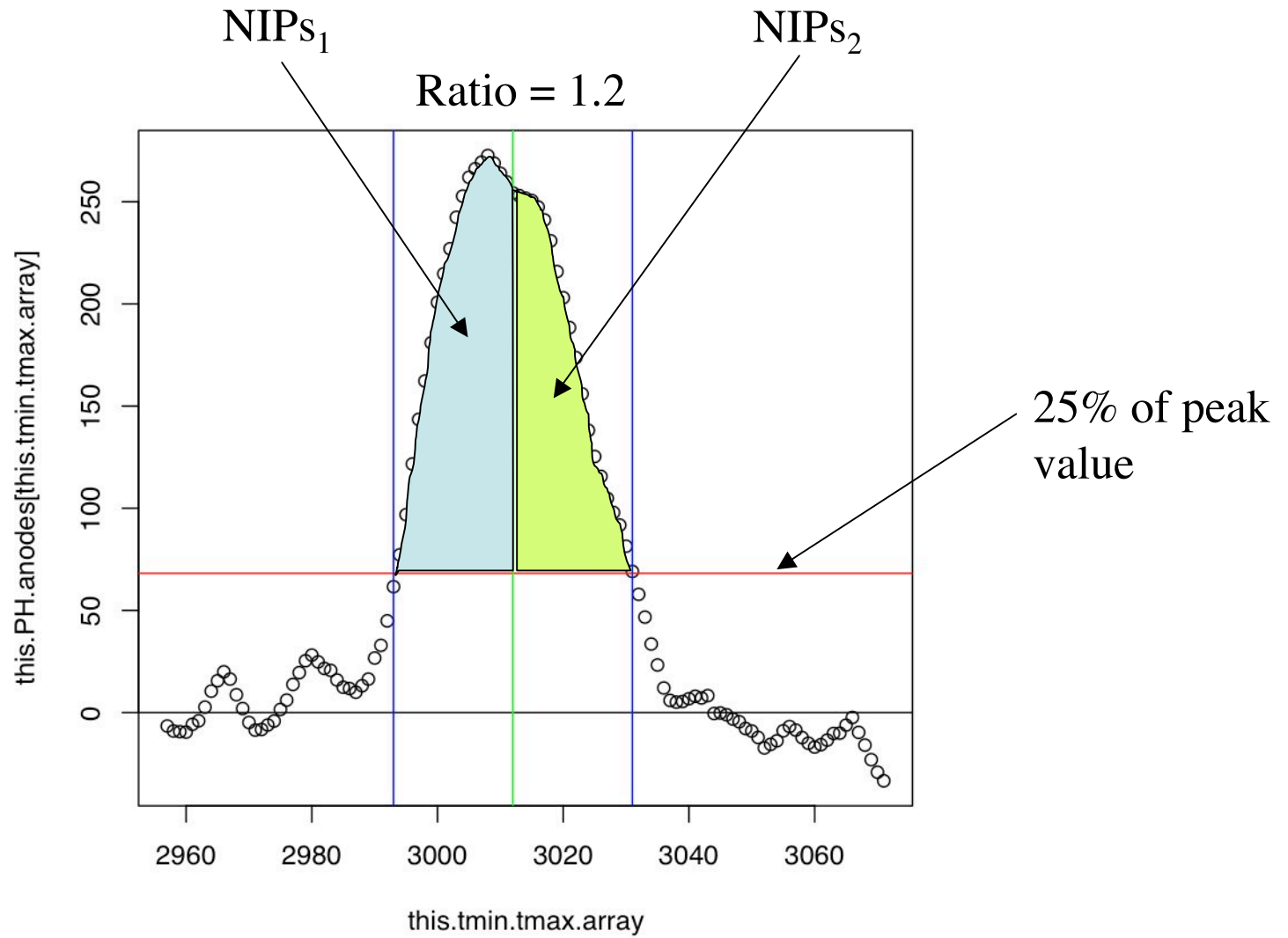


Analysis

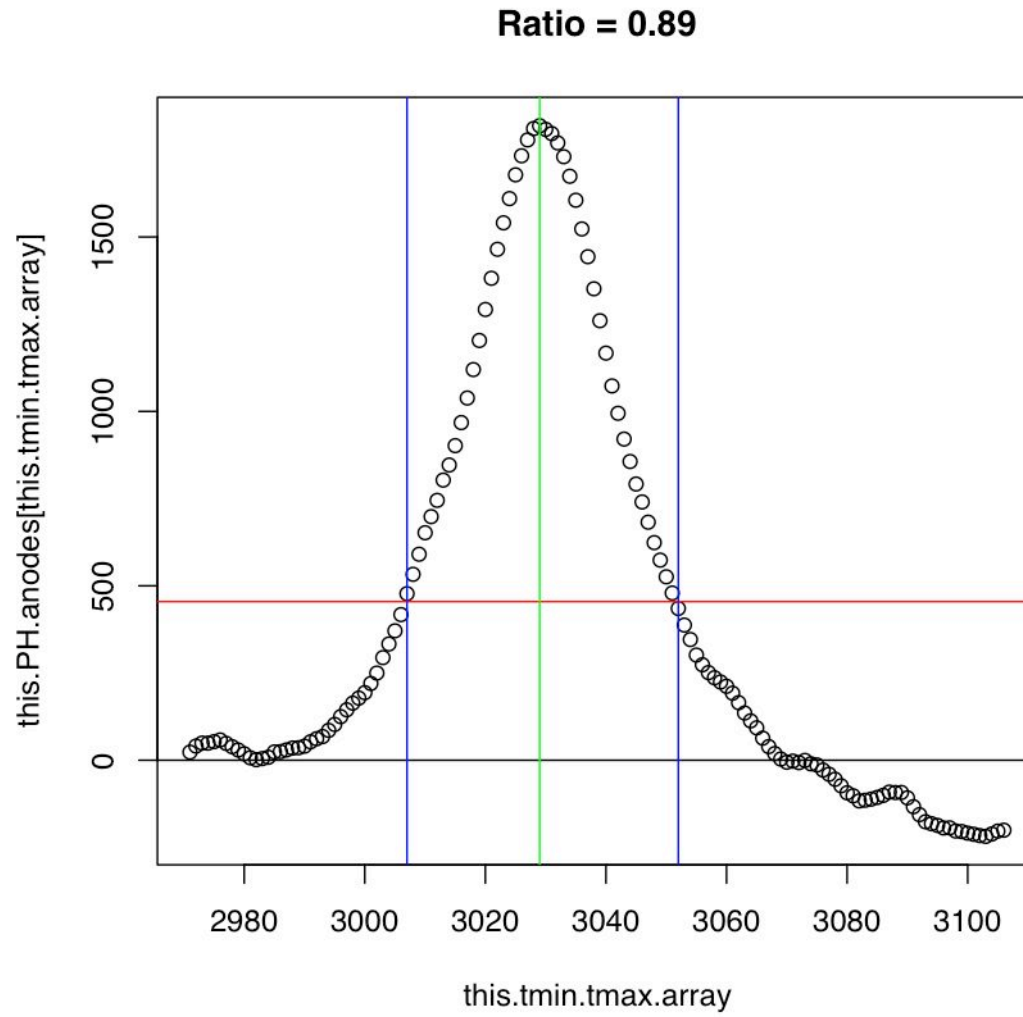
- The analysis procedure was identical to DRIFT-IIa, see upcoming analysis paper, with three exceptions.
- The analysis parameters were different because of different noise and gain characteristics.
- The trigger threshold was set to 200 on individual lines for these runs.
- The *MissingNipsCut*, *OtherSideCuts* and *PreIonizationCuts* were turned off due to high interaction rates.
- Events passing all of the cuts with $1000 < \text{NIPs} < 6000$ were accepted.

Run	Rate
+z	0.49 Hz
-z	0.70 Hz
background	0.0026 Hz = 224 day ⁻¹

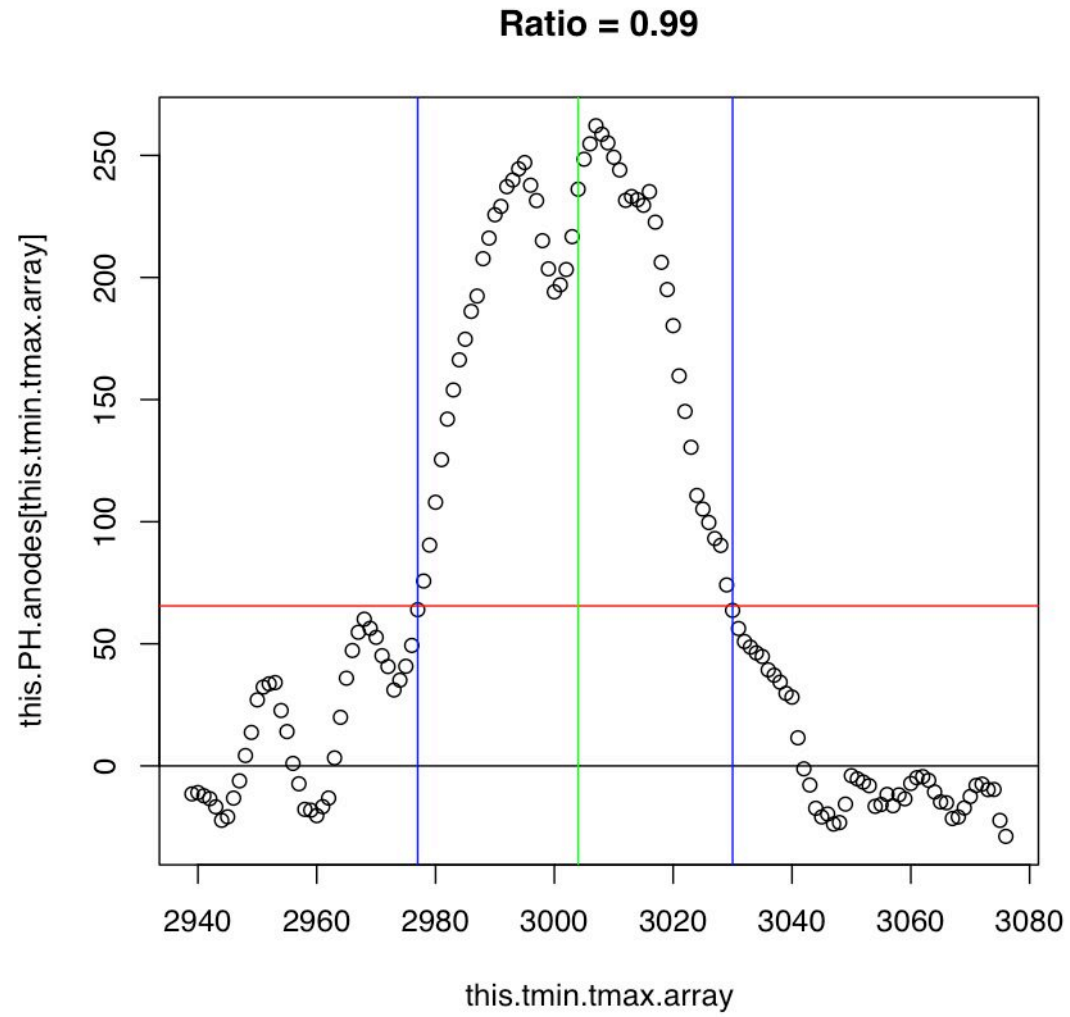
Real Head/Tail Analysis



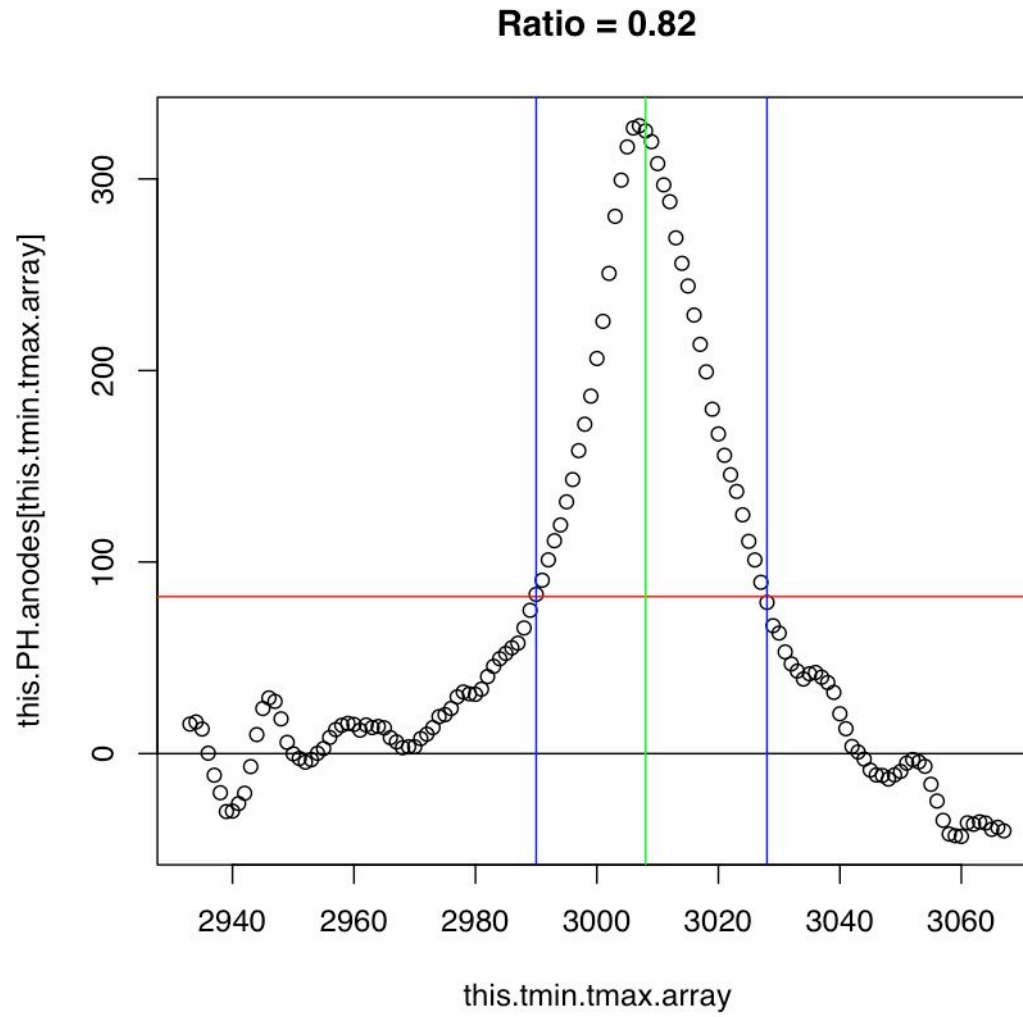
Example 1



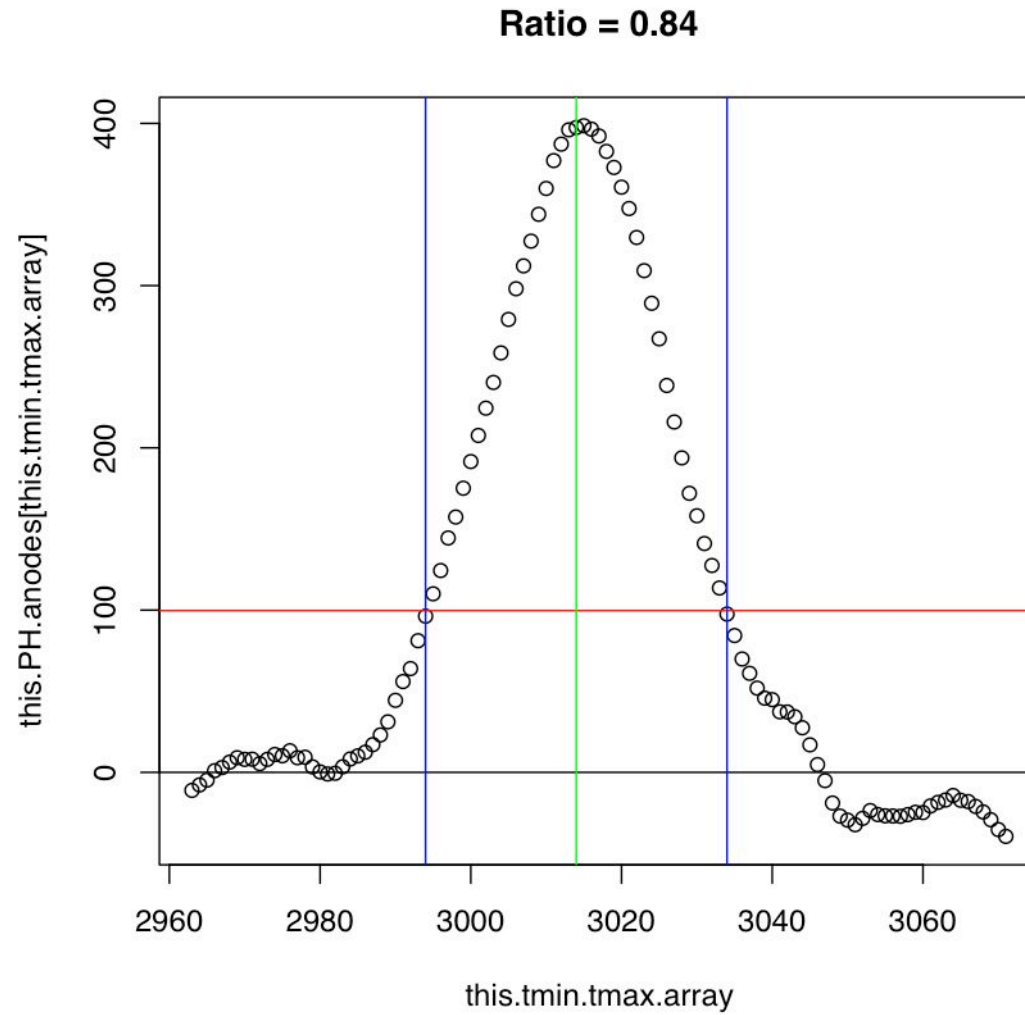
Example 2



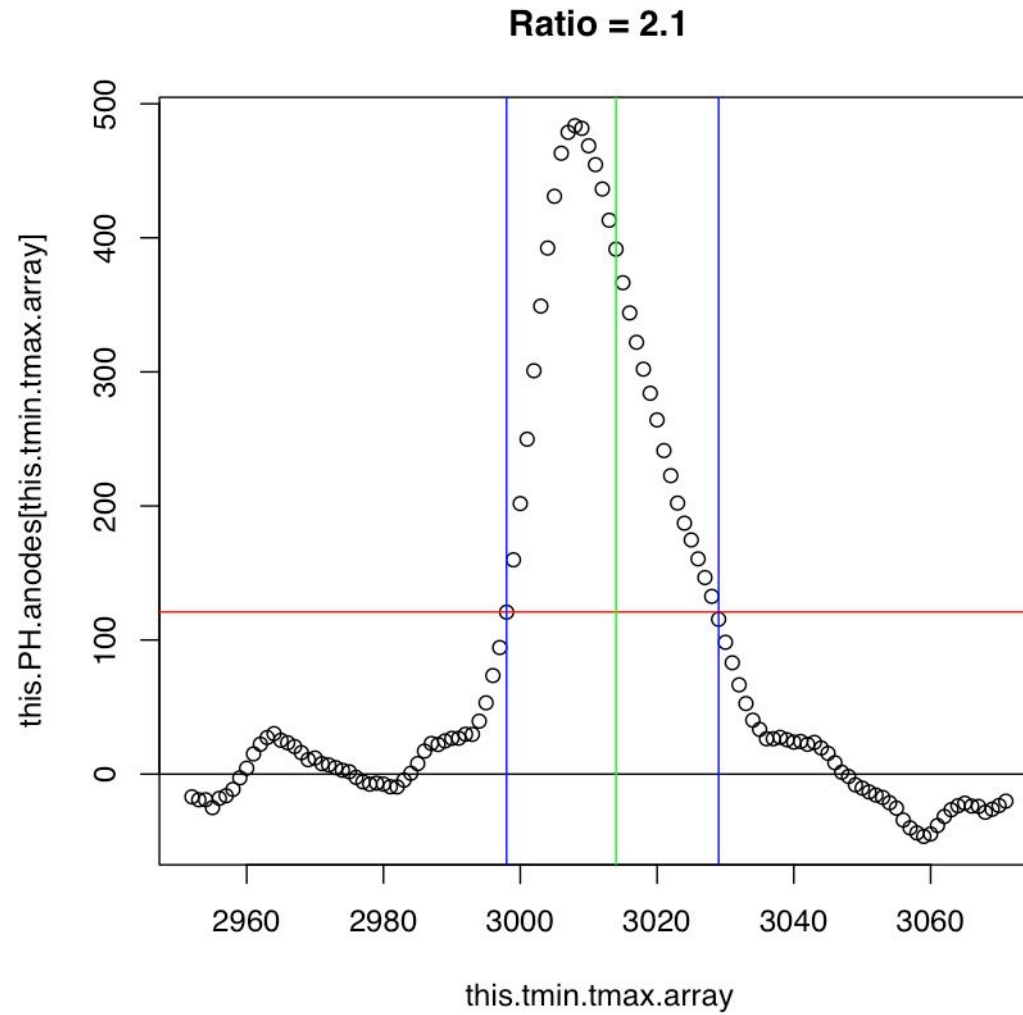
Example 3



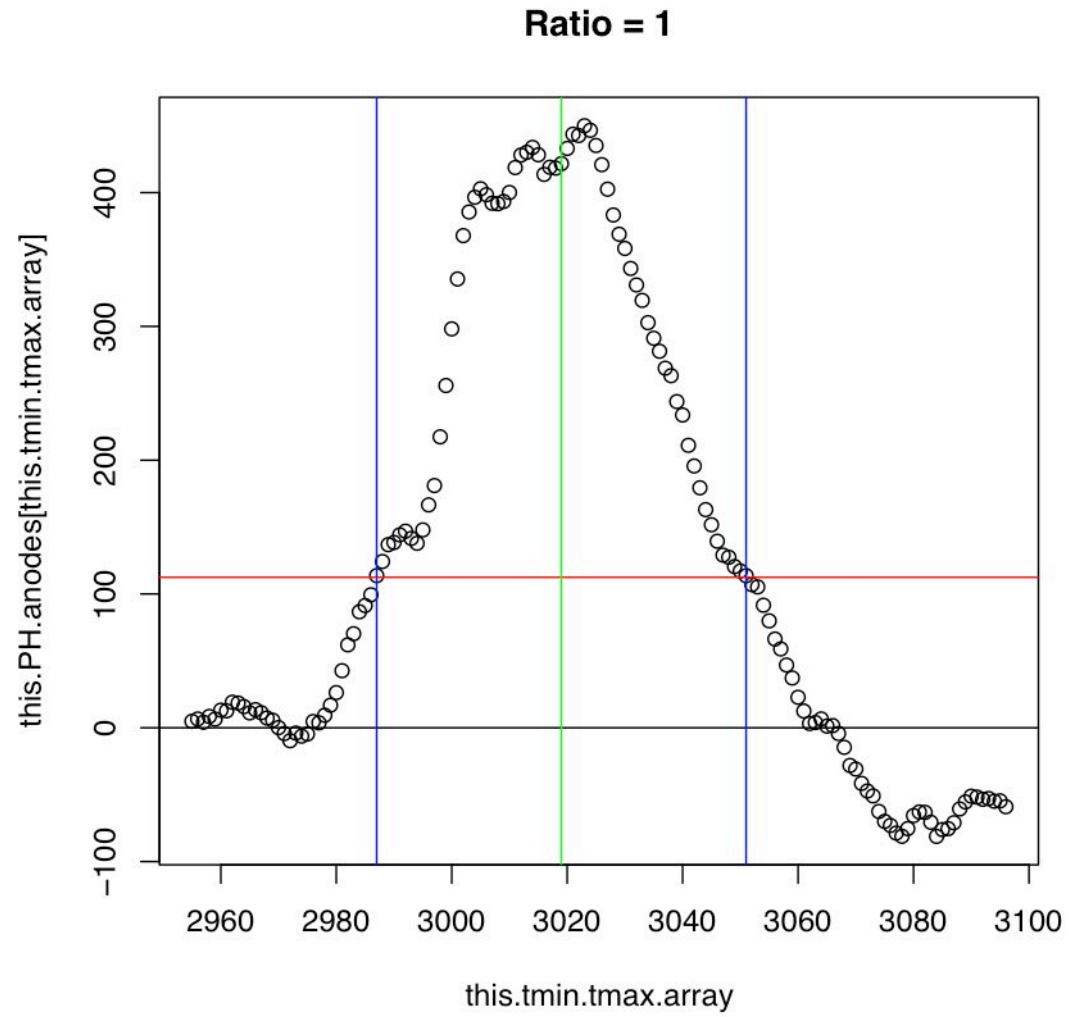
Example 4



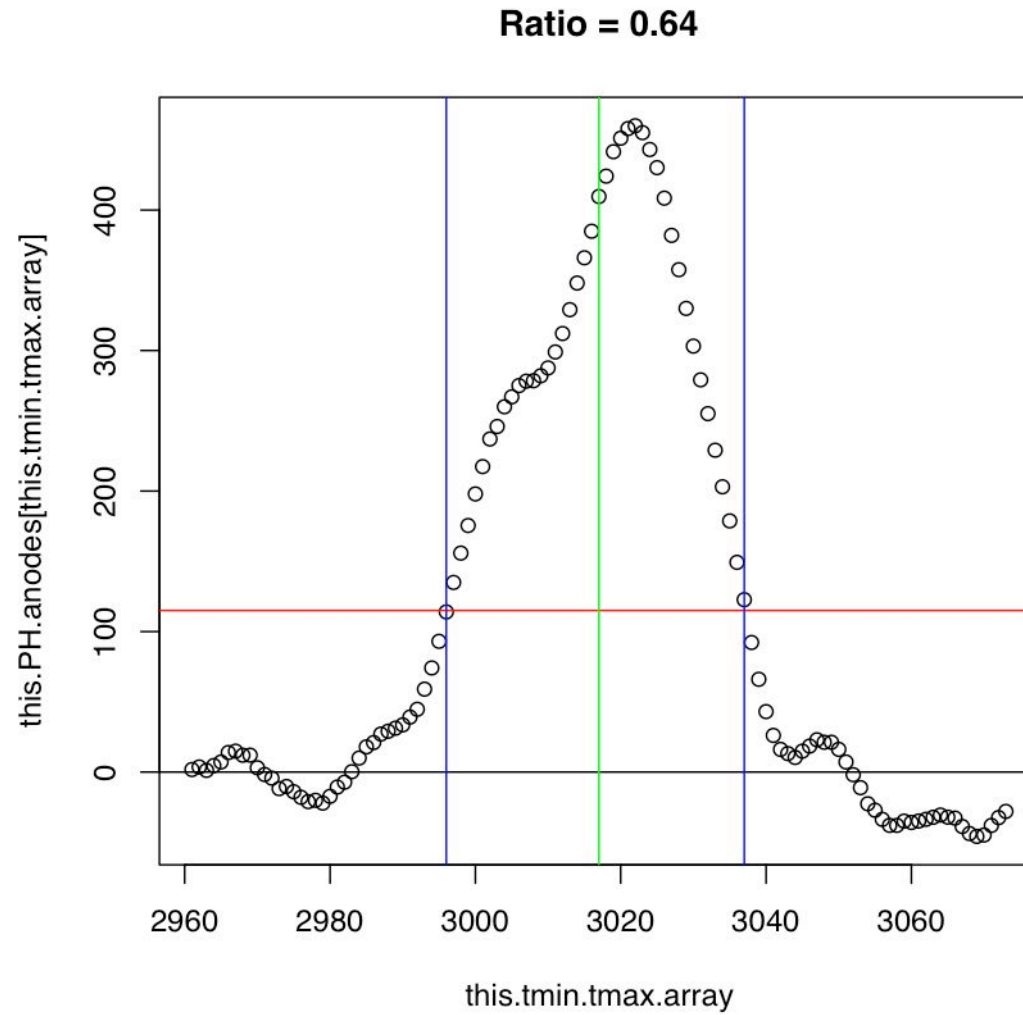
Example 5



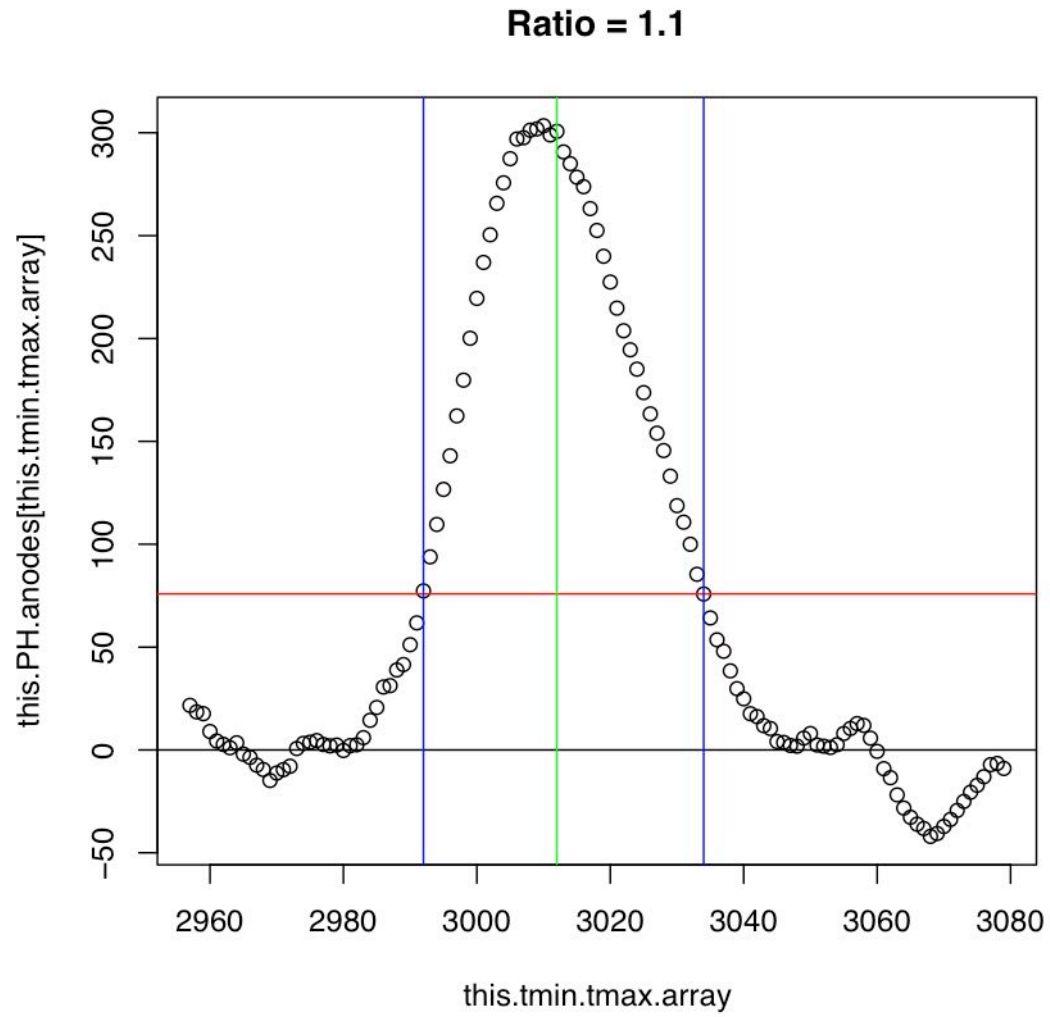
Example 6



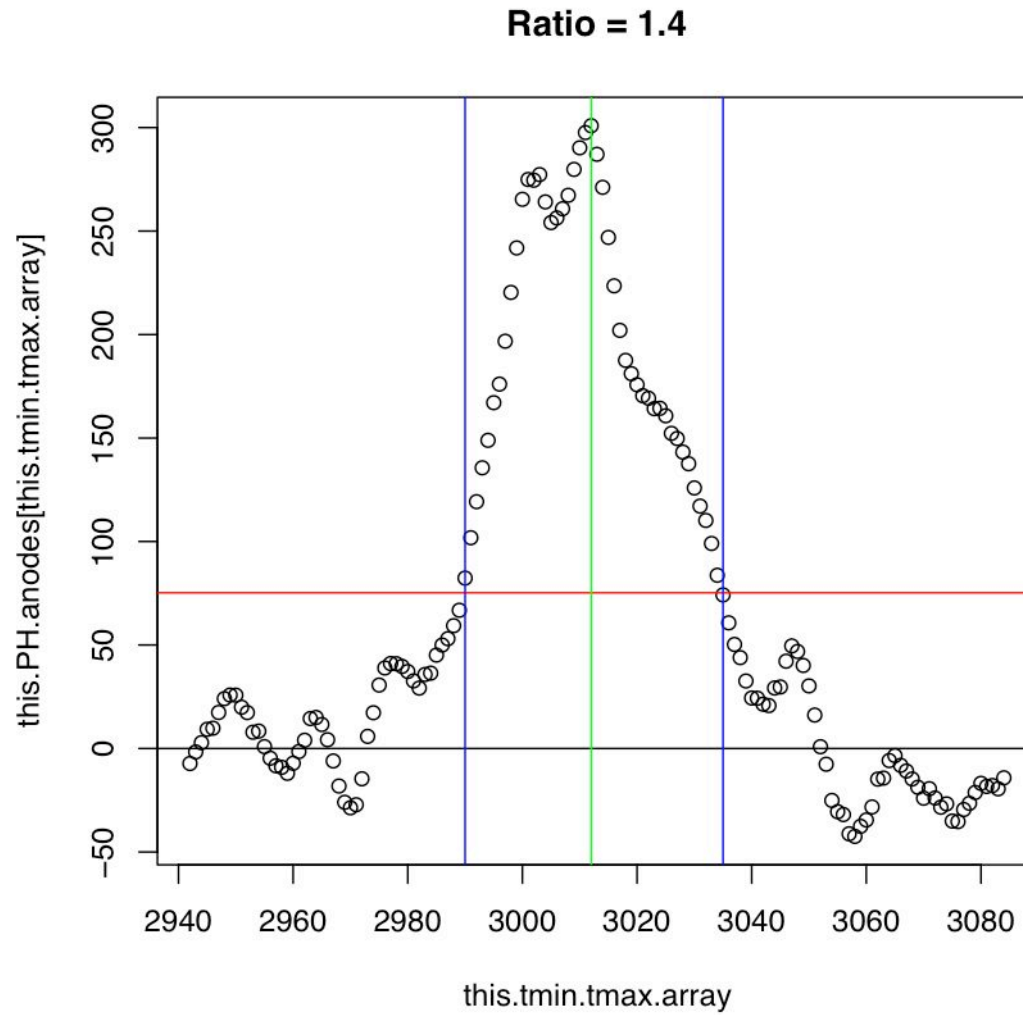
Example 7



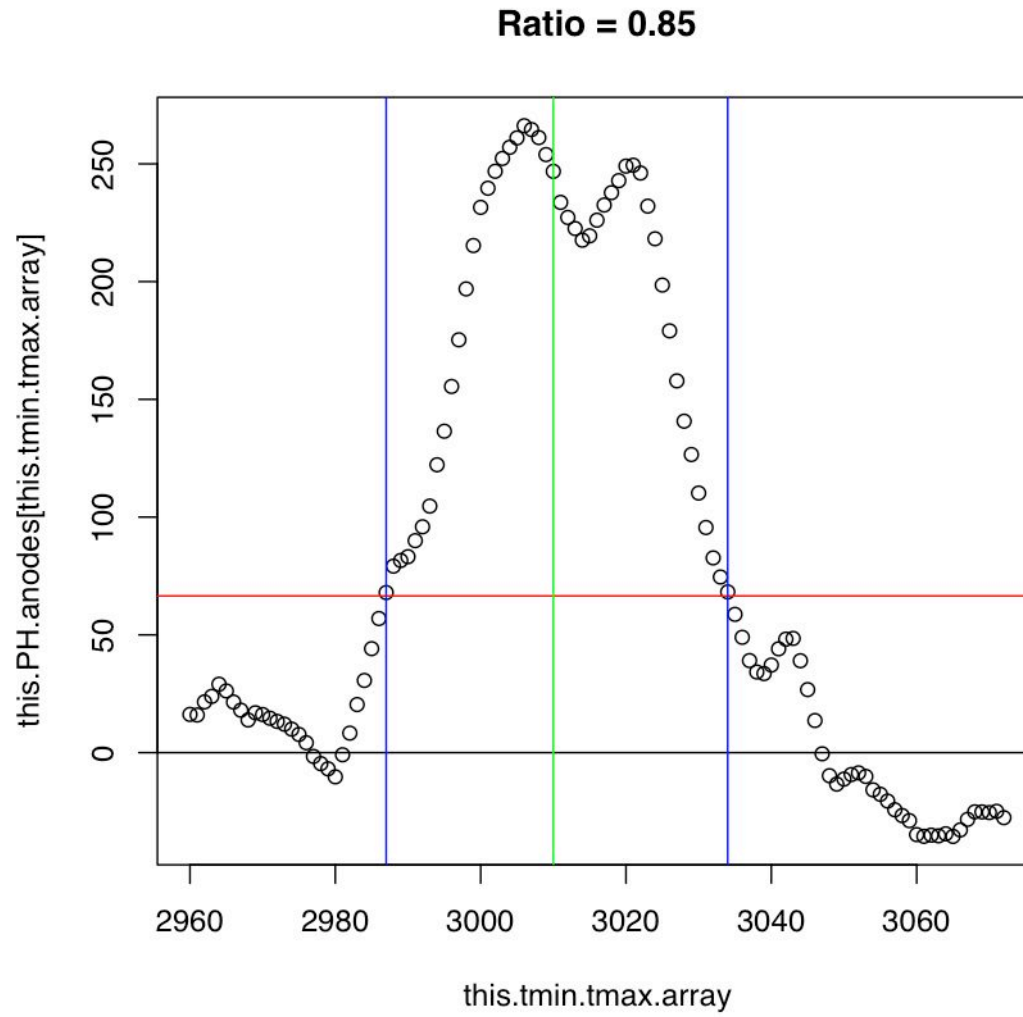
Example 8



Example 9



Example 10



Left-Right Analysis Results

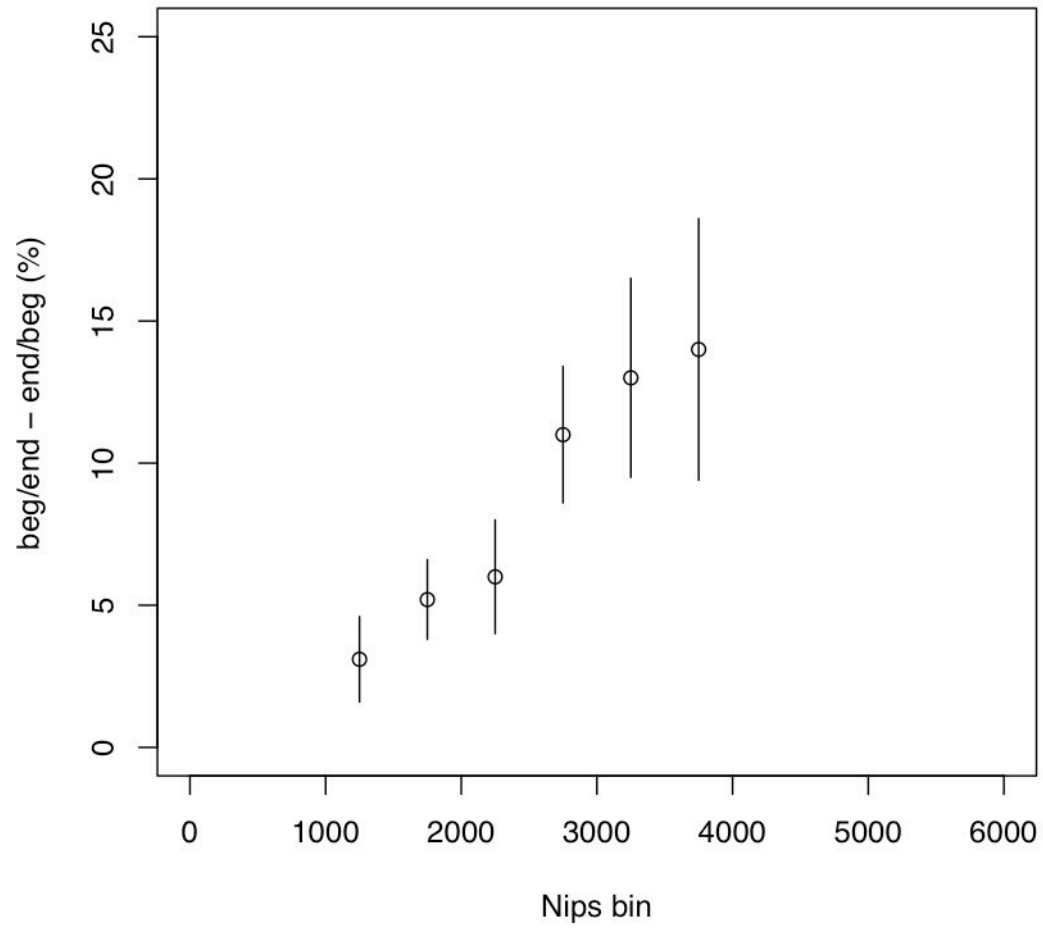
	Average Ratio 1000-6000 Nips Left	Average Ratio 1000-6000 Nips Right
+z (left to right)	1.111 +/- 0.008 Beg/End	1.062 +/- 0.008 End/Beg
-z (right to left)	1.039 +/- 0.010 End/Beg	1.105 +/- 0.006 Beg/End

Beg-End Results

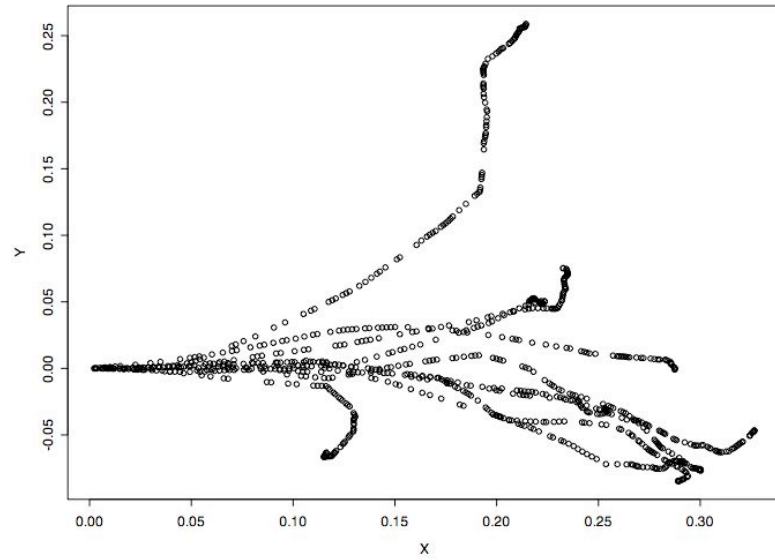
	Average Ratio 1000-6000 Nips Left
Beg/End	1.108 +/- 0.005
End/Beg	1.051 +/- 0.006

Beg/End - End/Beg as a function of energy

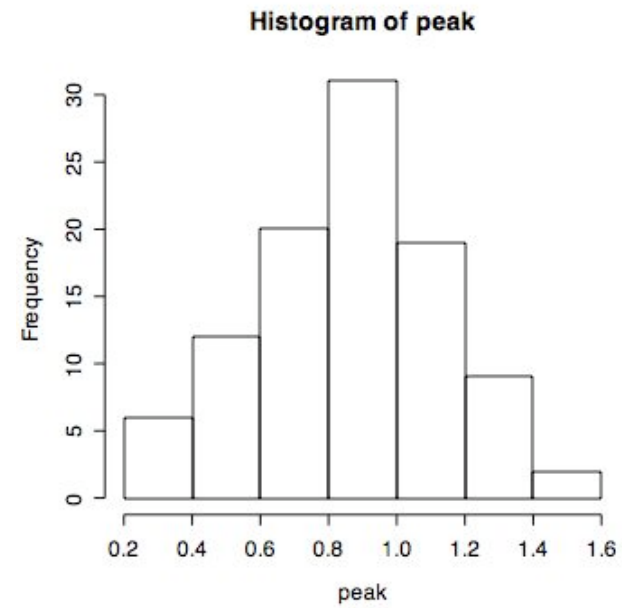
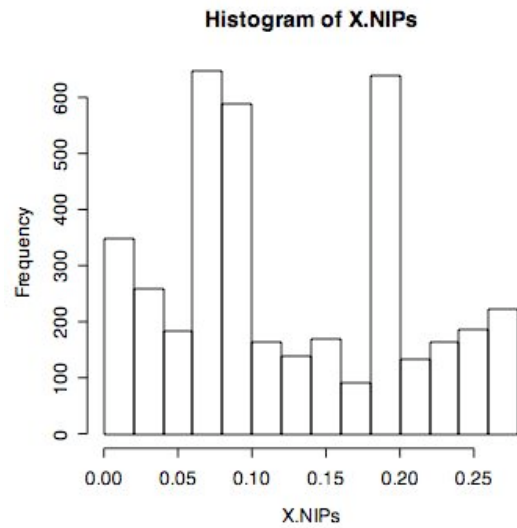
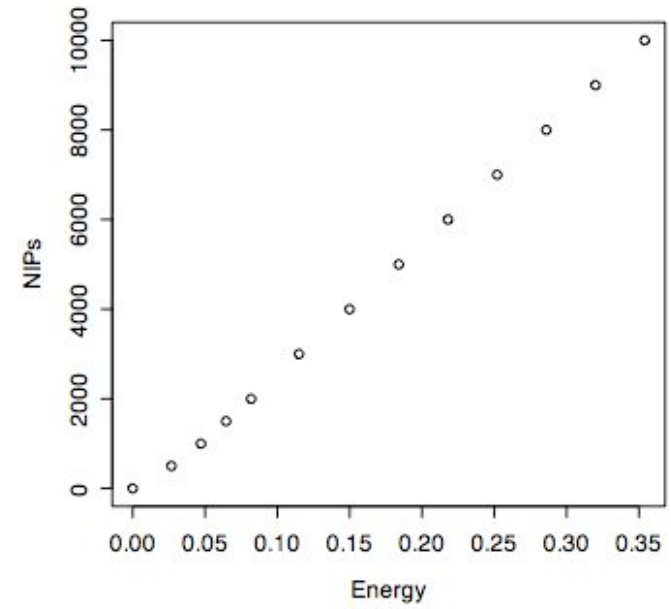
Nips ratio as a function of Nips



Theory



+

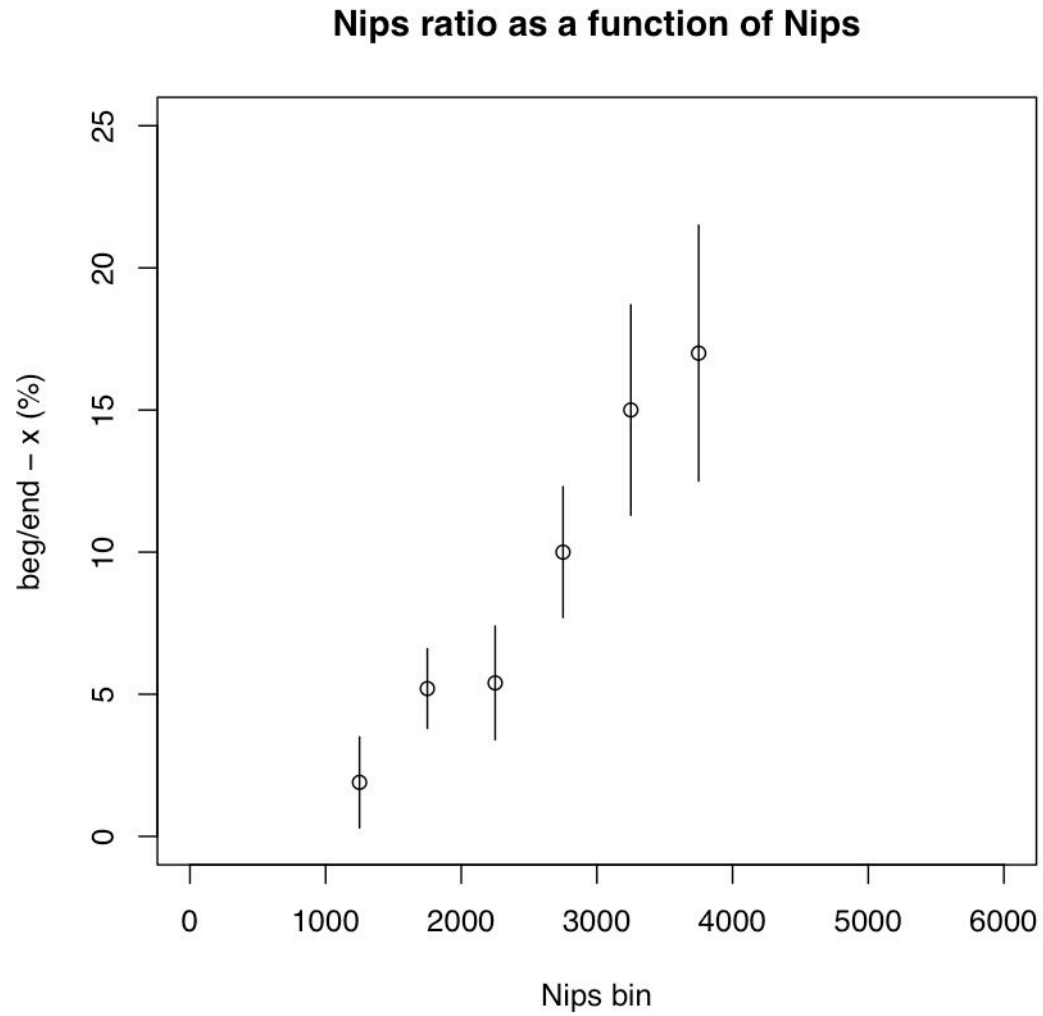


Conclusions

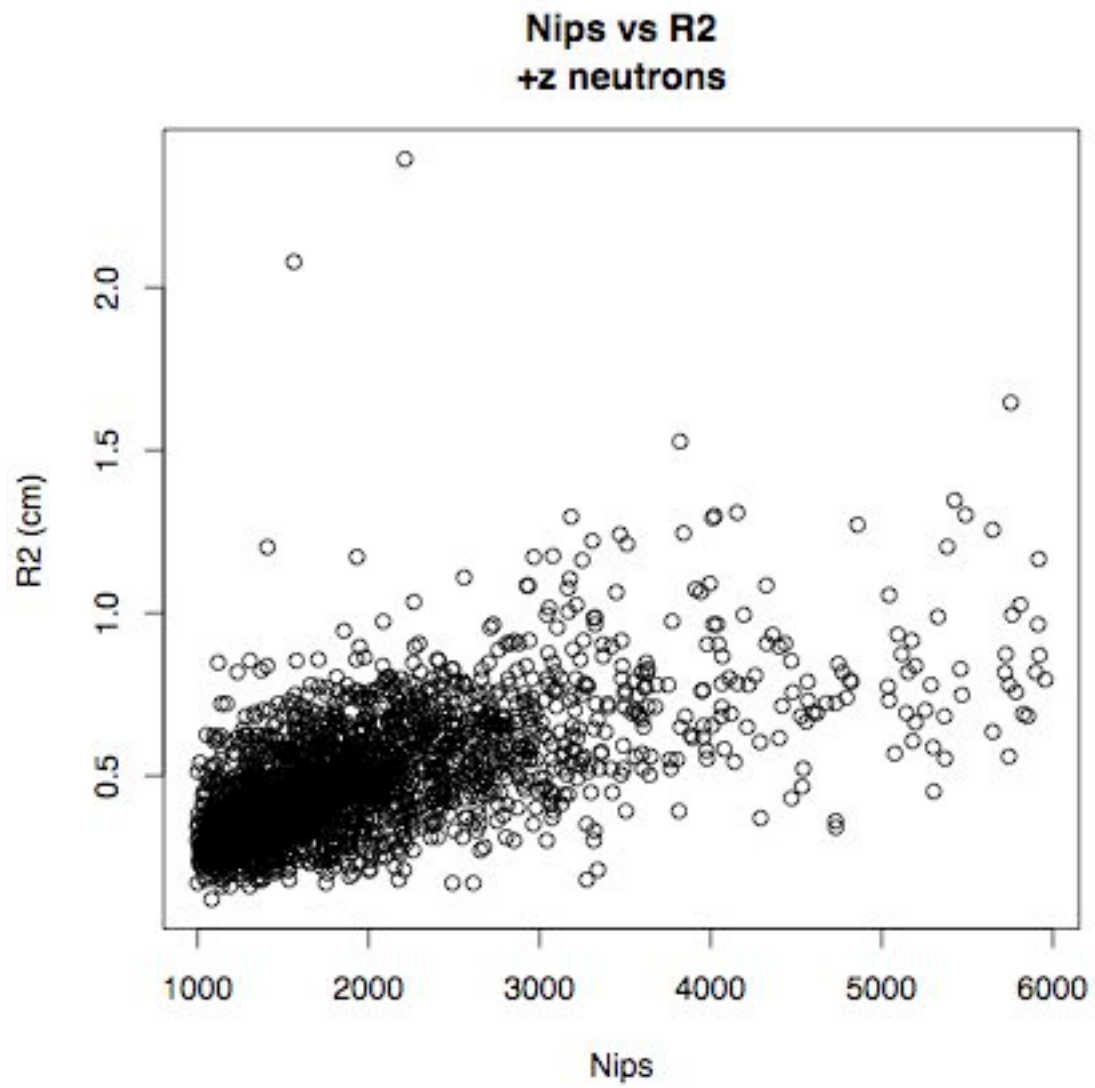
- The head/tail effect is definitely there!
- As with the Δx and Δz directional signatures it has always been there so we can re-analyze old data to look for it if needed.
- It is likely to be dependent on diffusion only to 2nd order.
- It is likely that the strength of the signature can be improved with more analysis work.
- Need help with the theory!

The End

End/Beg - X as a function of energy

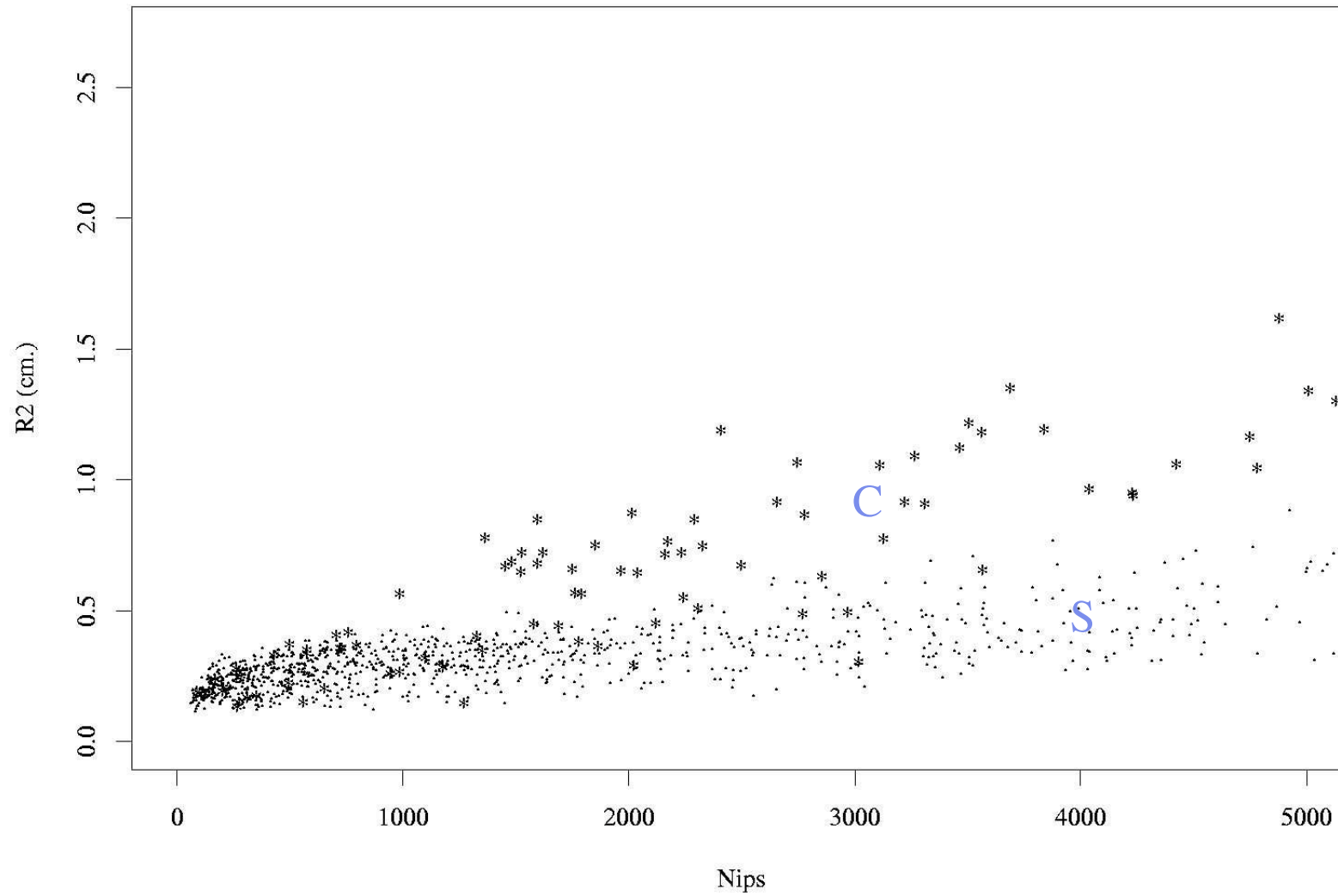


Nips vs R2

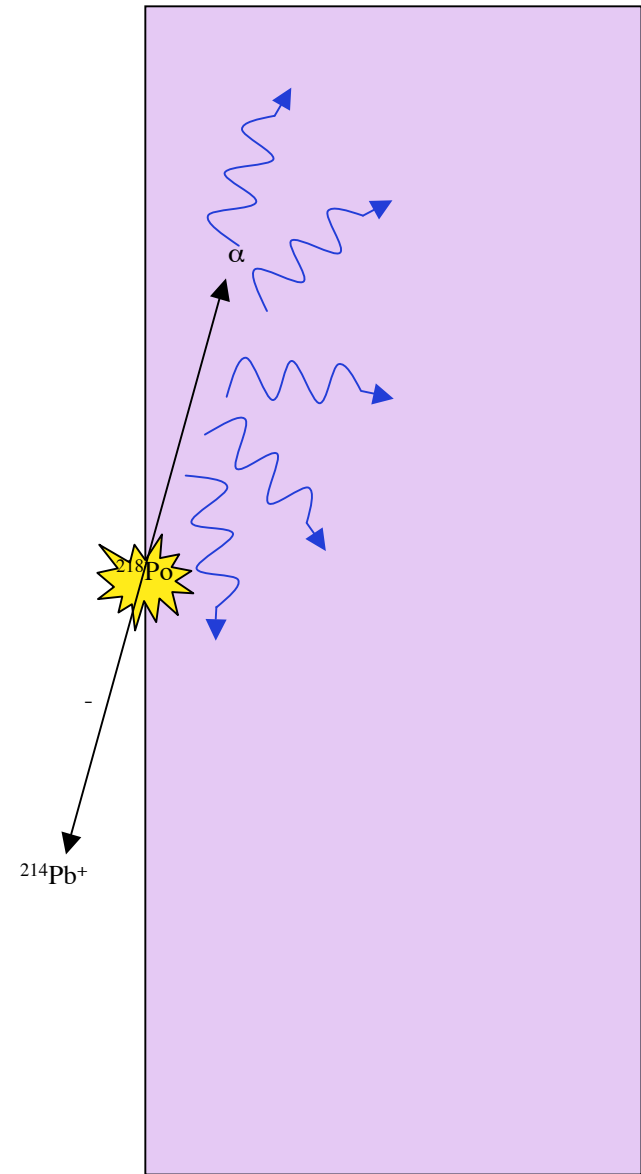
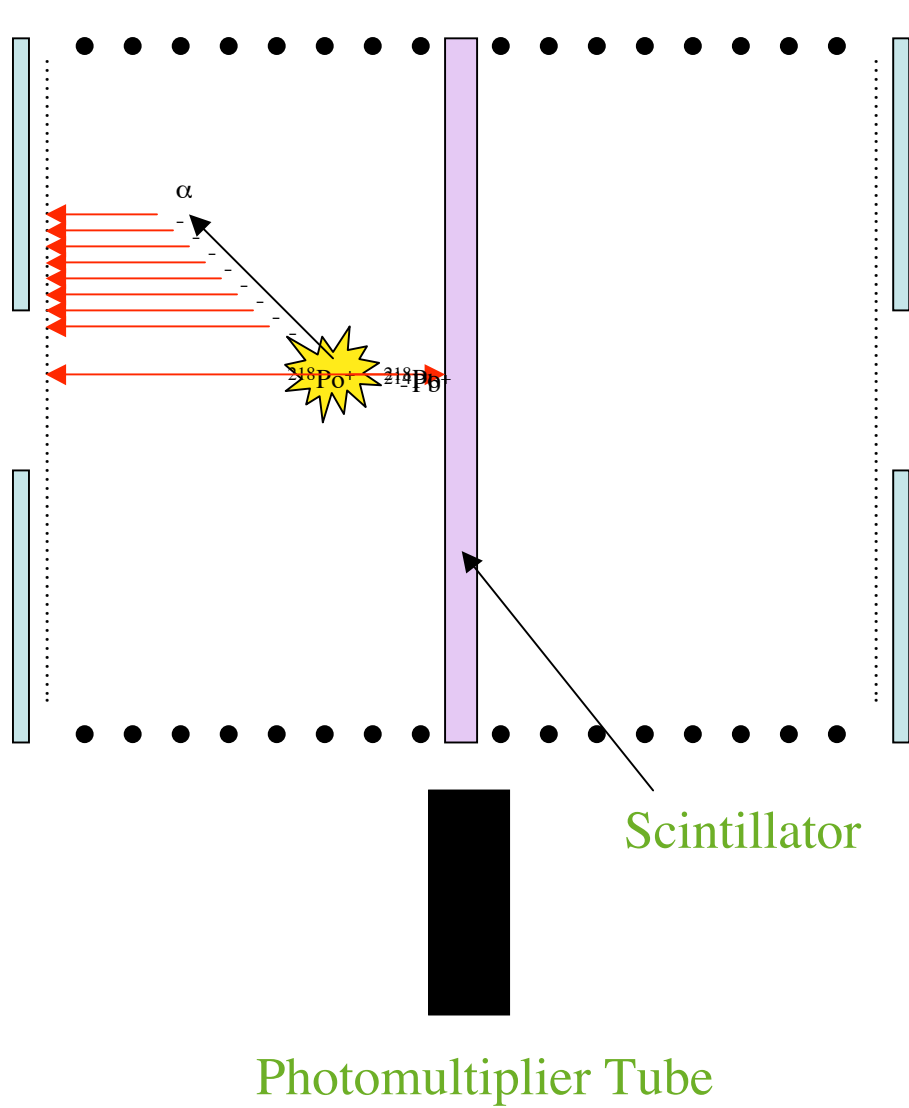


Neutron Recoil Theory

Monte Carlo



Active Removal of RPRs



Miners



Miners, take 2

