

Run 8 S1-z dependence

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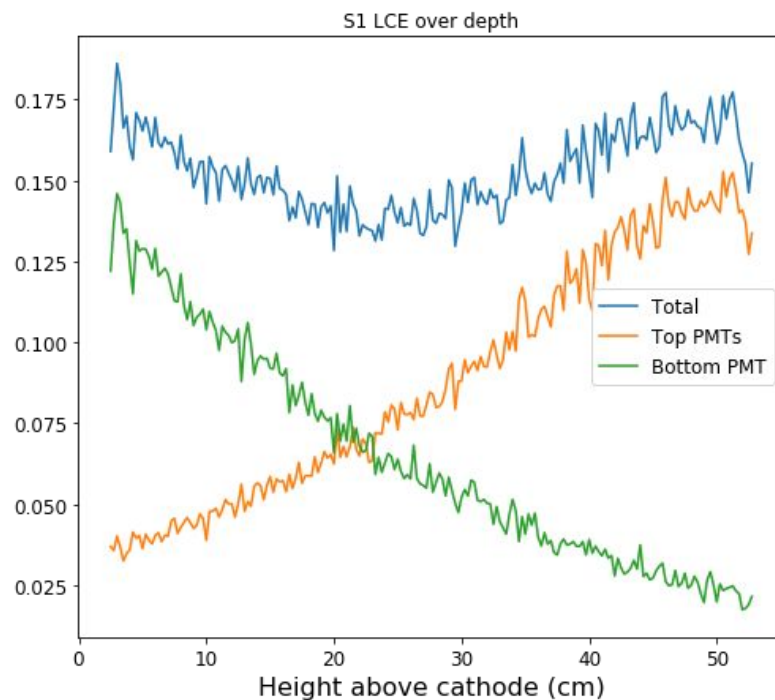
Today's update starts on [slide 12](#)

Data used

- /projecta/projectdirs/lz/data/afan/SueRQs/run8/pr10001/lzrd_sue_HT_20180317T005044/
 - Thoron
 - Cuts were defined using file 00050. It's in the middle and I assume that the Thoron source doesn't change significantly over this period (the rate may but the position in S1, S2, drift time space does not)

Expectations

- Thoron is a 6.4 MeV alpha which should give a maximum of about 5000 S1 and 1×10^6 S2 counts (assuming roughly LZ properties)
- Expect S1 depth dependence of a factor of 3 over the length of the detector
- Expect maximum drift time of 300 microseconds



From BACCARAT optical map

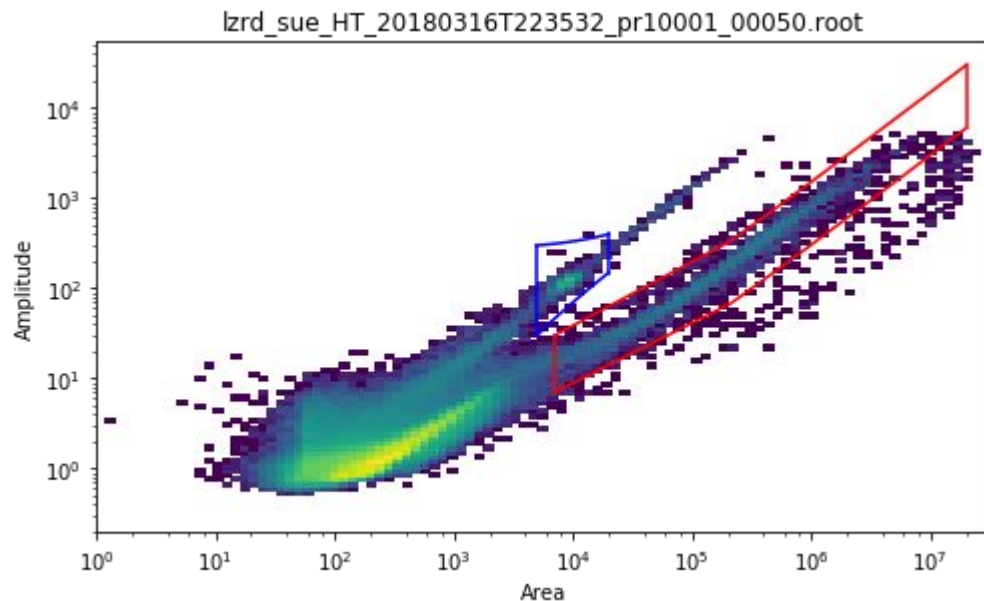
Cuts Applied

- A pulse within the event is inside a box in the amplitude / area plot.
 - I selected this in the field off data (just S1). The peak that Jacob showed a few weeks ago
- Another pulse must be within a box in amp. / area that includes S2s (only showed up in field on data) OR is classified as an S2 by LZap
- Has 1 S1 and ≥ 1 S2
- $0 \mu\text{s} < \text{S2-S1} < 500 \mu\text{s}$
- Only has 1 drift time meeting all of these qualifications

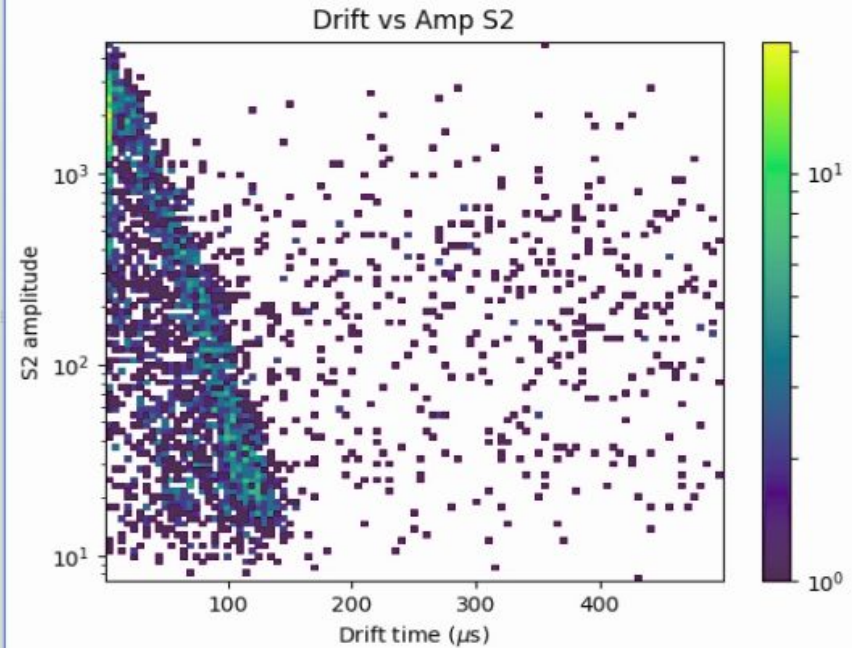
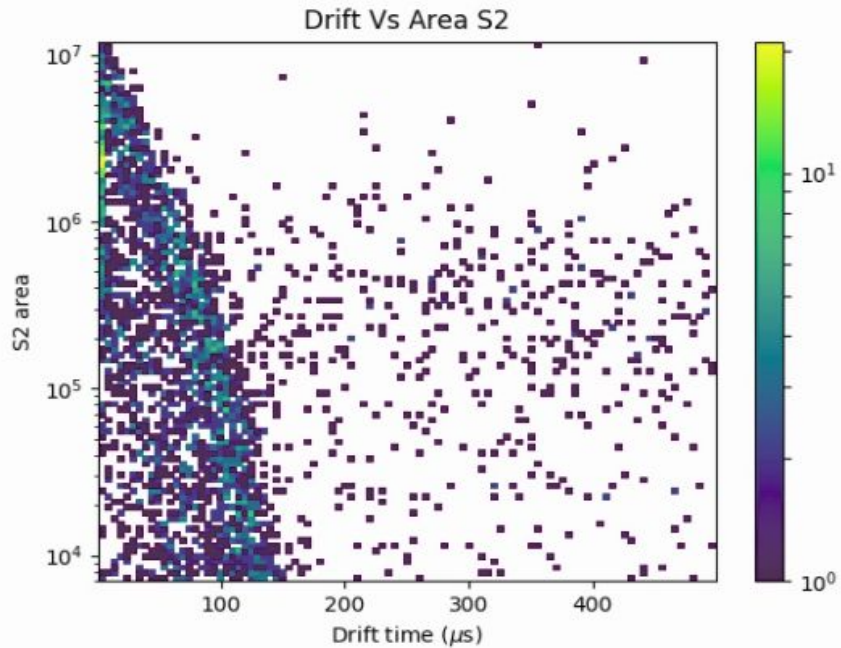
Thoron Cut

Blue outline is the S1 cut for thoron. Nice and compact. Implies little z dependence

Red outline is the S2 cut (for all events) hard to see a blob in s2 events



S2-Z dependence (long set with source off)

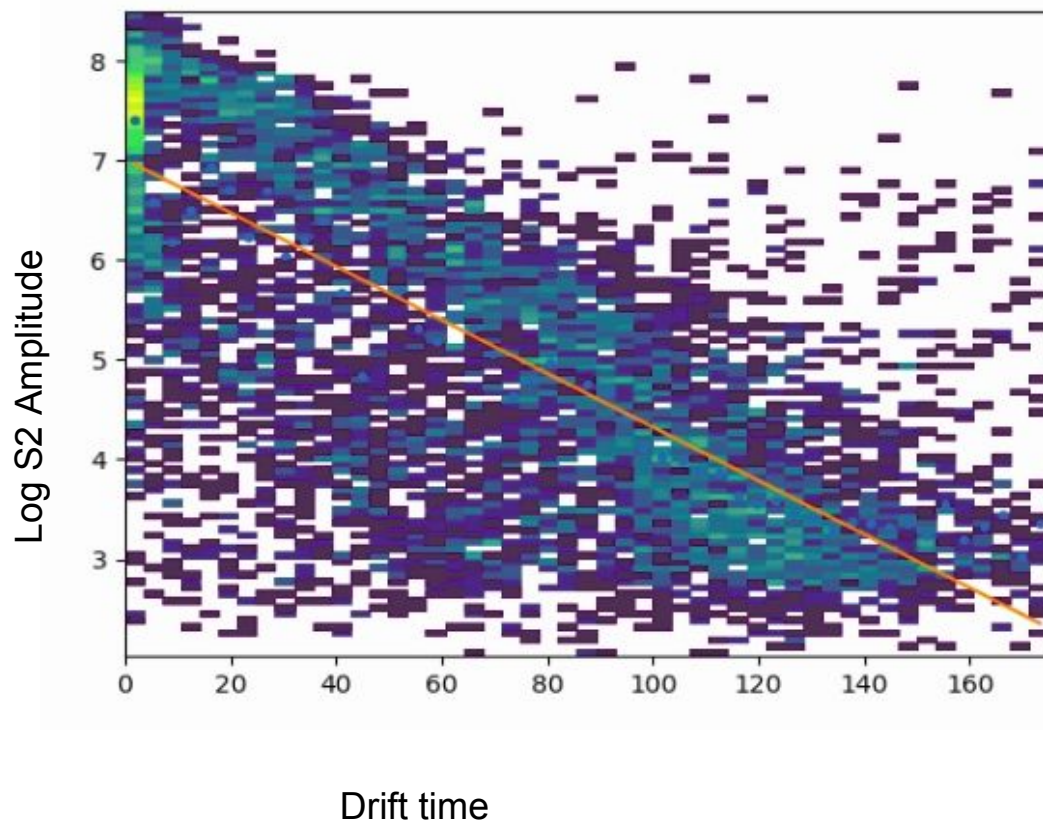


Electron Lifetime

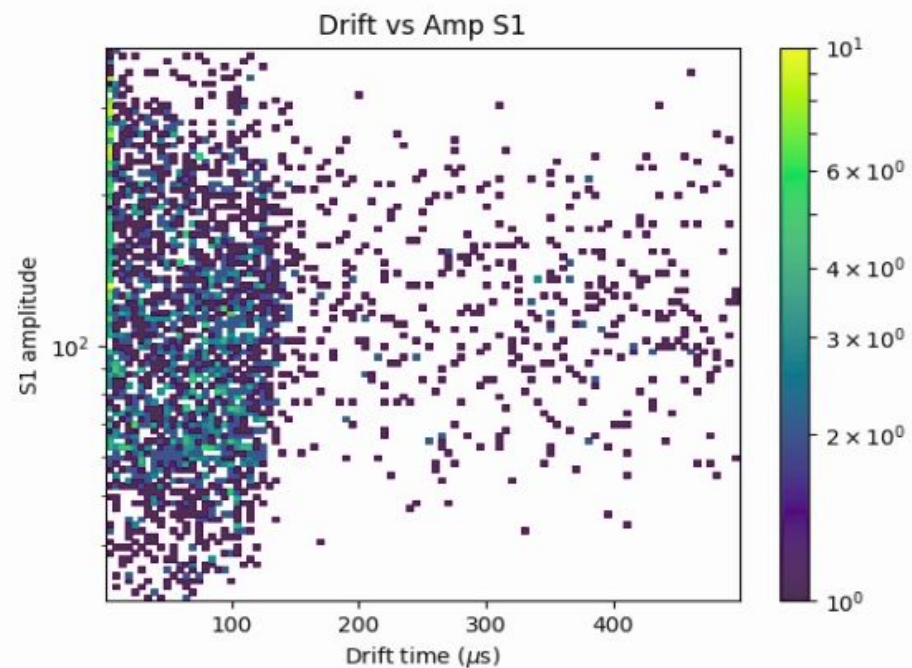
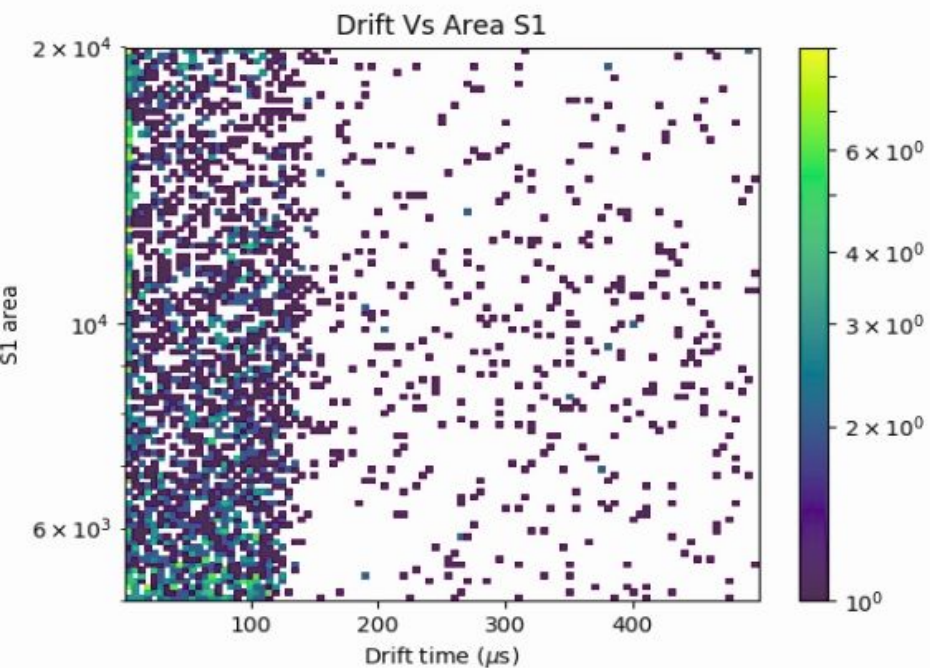
Apologies for the terrible plot
The fit is bad because the noise is just barely below the signal

From this fit the electron lifetime is about $40 \mu\text{s}$

Does that seem reasonable?
Seems low to me

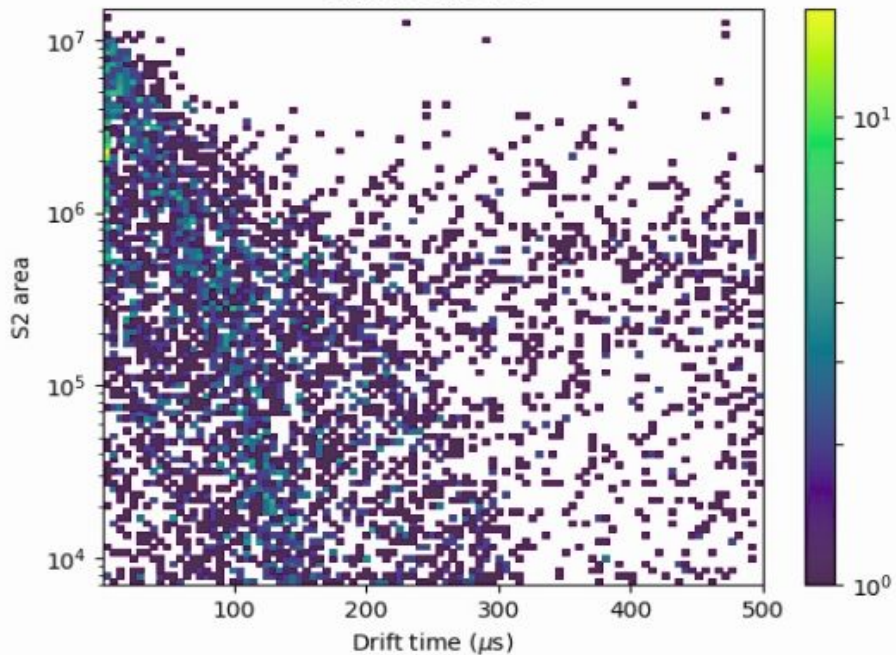


S1-Z dependence

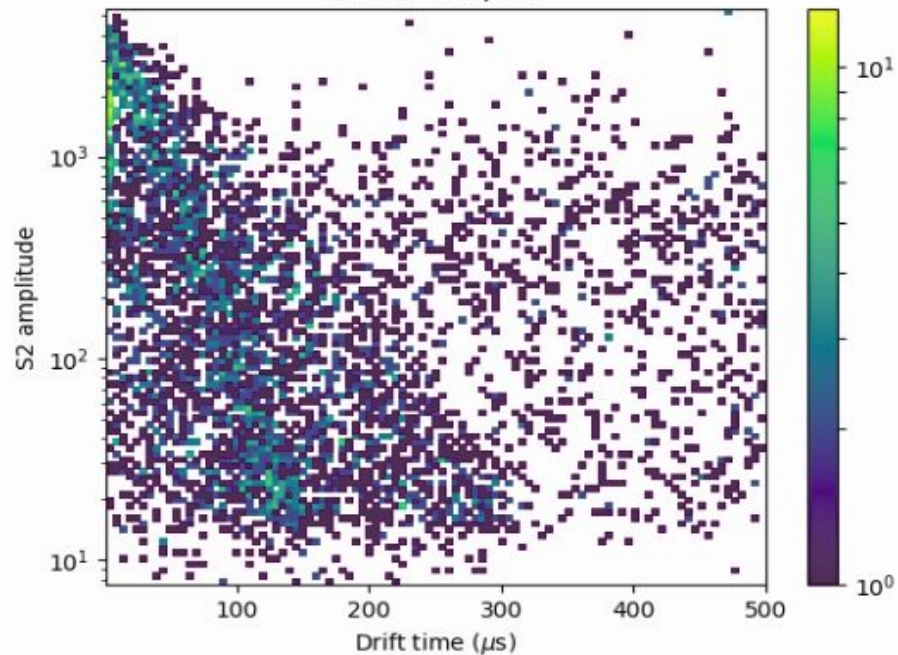


S2 z dependence (thoron source on)

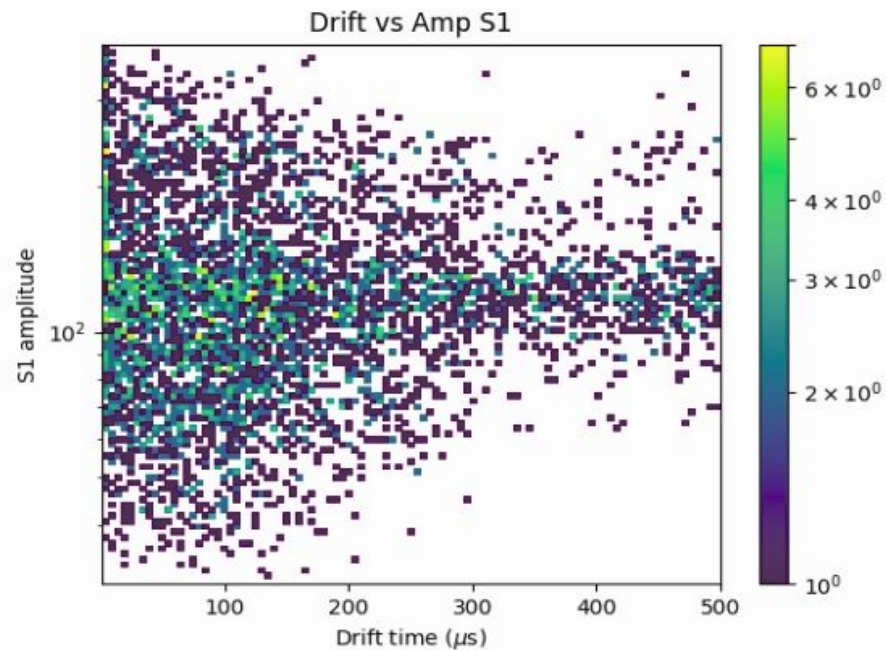
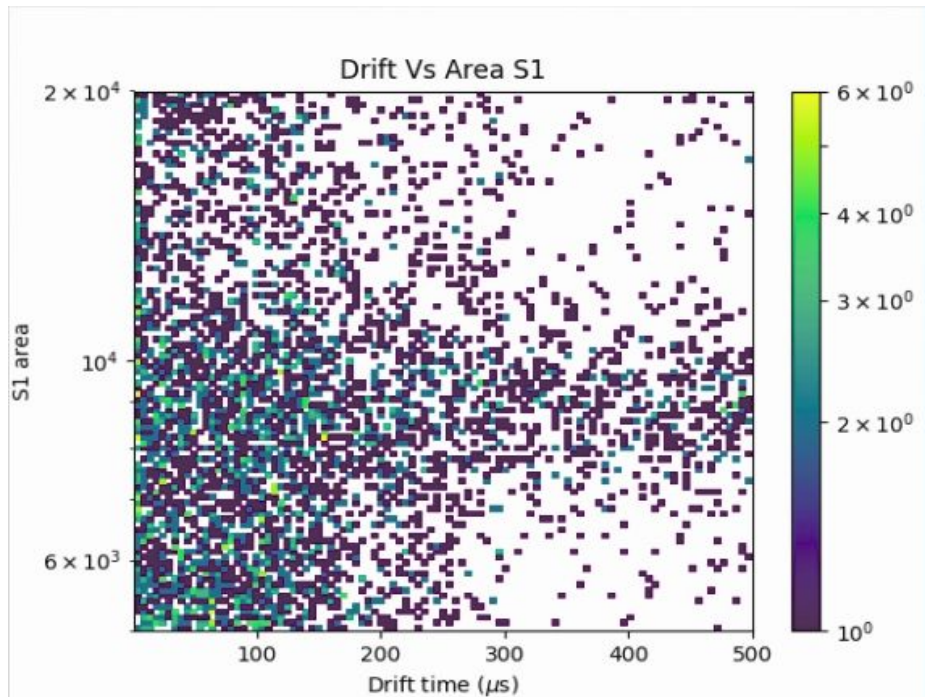
Drift Vs Area S2



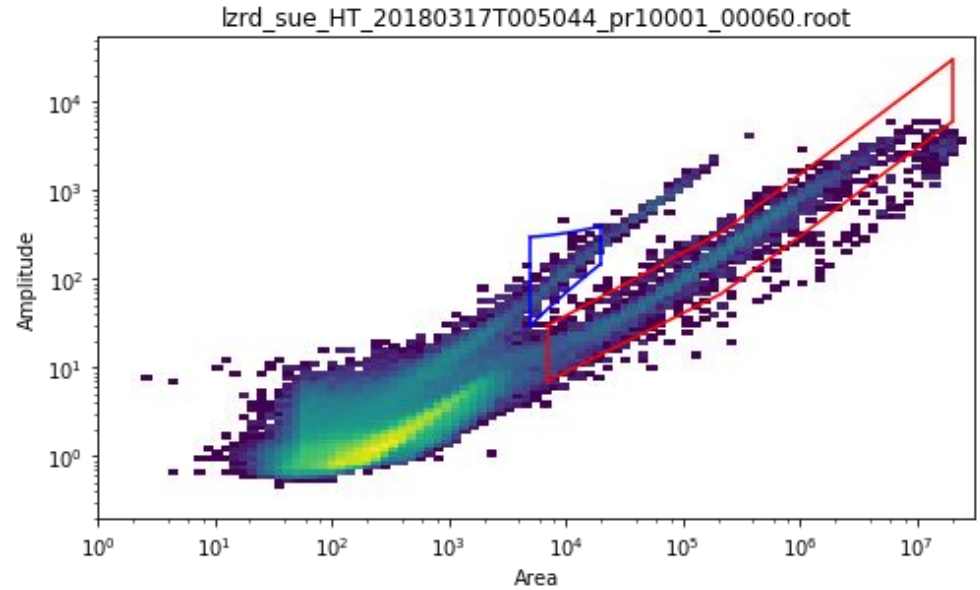
Drift vs Amp S2



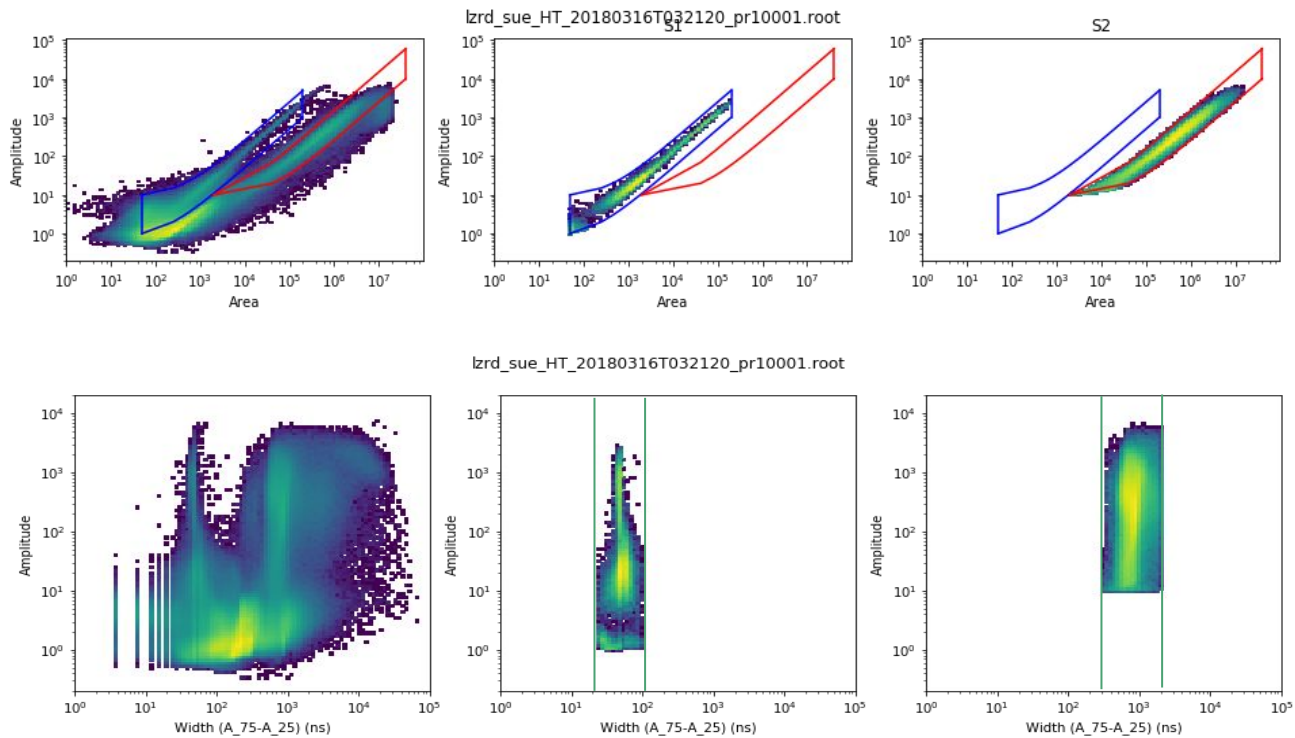
S1 z dependence (thoron source on)



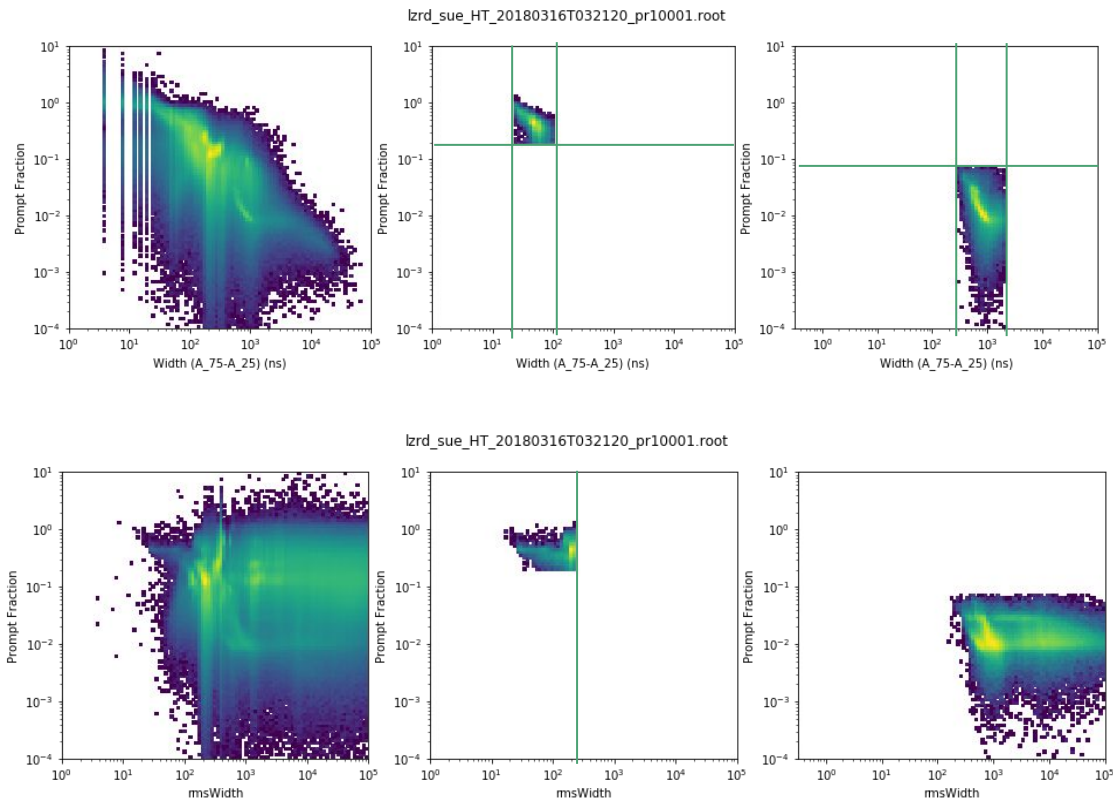
Source off Amp Area plot



Cuts defined



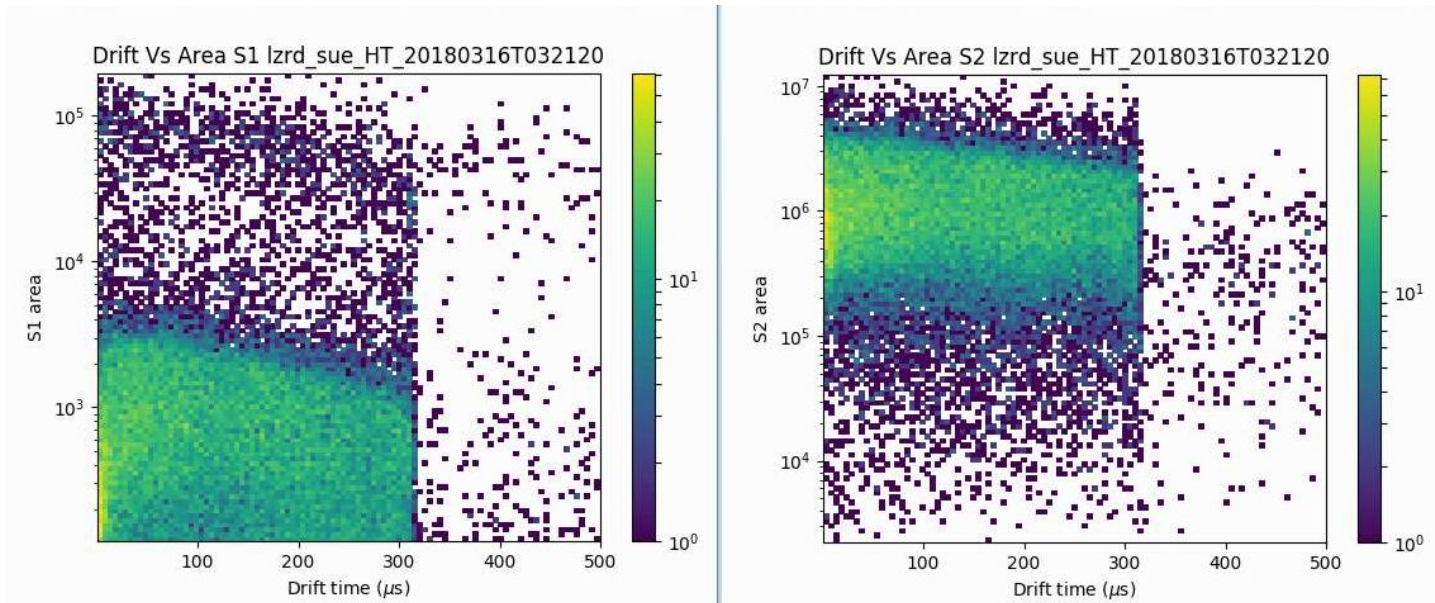
Cuts Continued



“No source baseline, with fields”

Looks good,
electron lifetime
very high, $\gg 300$
microseconds

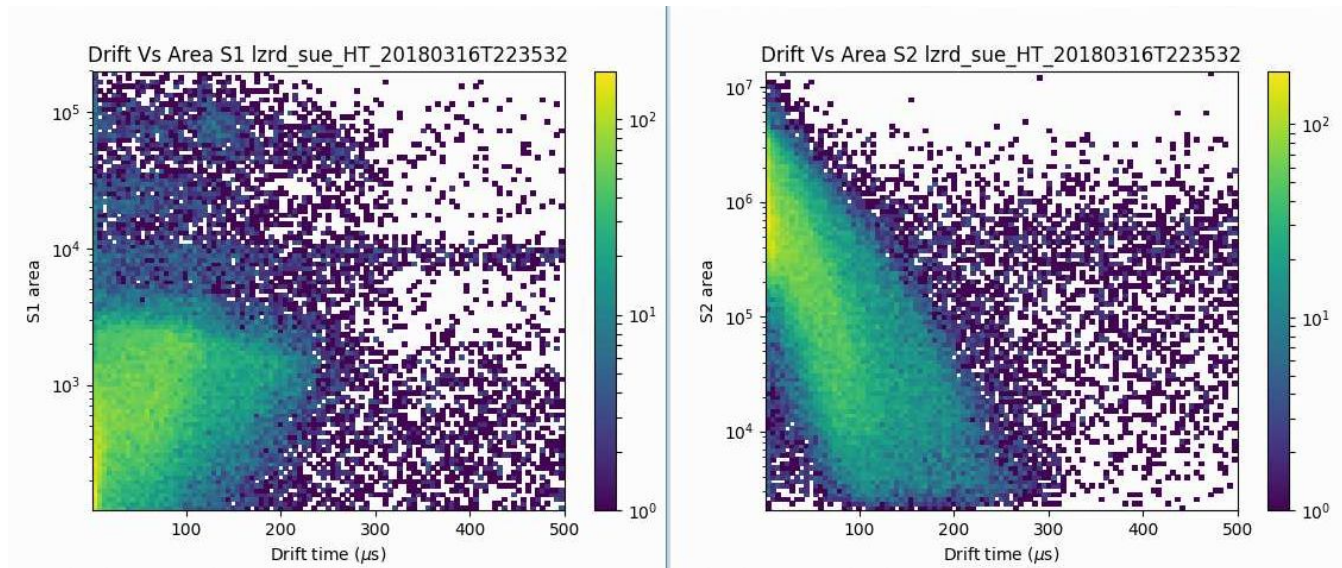
Cutting any lower
in S1 area
introduces
significant noise



“Thoron injection started and stopped within”

Data taken about
20 hours later.
Used exact same
cuts and analysis.
Electron lifetime
 ~ 40 microseconds.

Possibly a
downward trend in
lifetime



“Long set after injection finished”

Still has low
electron lifetime.
Looks more
“steady”

