

LUX Run4 data quality assessment

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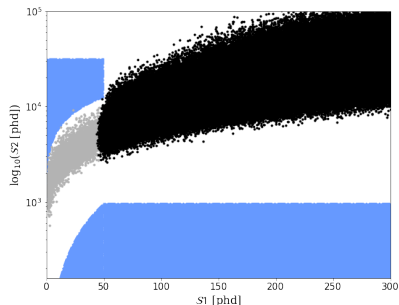
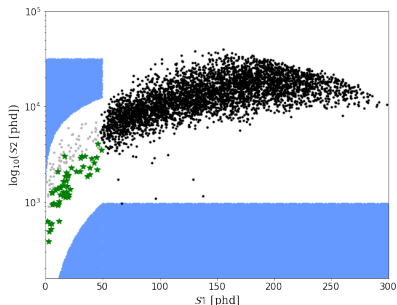
June 6, 2018

Outline

- 1 A short recap of pathological events
- 2 New “S1 requirement” ($S1 < 300$ phe) based on C-14 data
 - Motivation and context
 - Data selection and acceptance
- 3 Summary

“Lingering issues with LUX Run4 data in the extended energy range ($S1 > 50$ phd)”

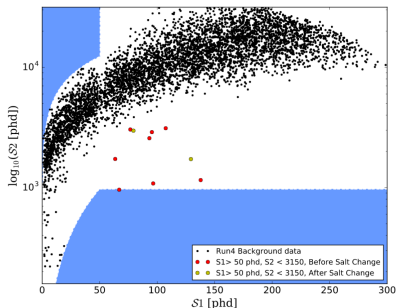
- This work has been contributed by many LUXers. I have participated in this analysis only since \sim Feb, 2018 (with courage).
- Left plot: LUX Run4 data in the extended energy range ($S1 < 300$ phd); right plot: the same cut of the left plot been applied to C-14 data. Both were plot by the scripts provided by Evan (Thanks.).



These pathological events turn out to be salted

- During Coimbra workshop, we got a comment from Matthew (Thanks) that those are likely to be salted events.
- Evan re-injected more salt events in another dataset and found more pathological events in the same area therefore concluded those are very likely to be salted events (Evan's talk).

The flawed original salt in first ~108 days of salted lifetime is plausible explanation for most events far below the recoil bands



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Motivation and context

Motivation

- Although the pathological events (mentioned above) very likely to be salt events, we anyway need to figure out a robust data selection method to remove these events; otherwise, PLR analysis would consider these as WIMP events. As a result, limit-setting will be hurt.
- In this analysis, we use a calibrating C-14 dataset to figure out a data selection of ER. " $0 < S1 < 350$ phd" can be reached, which is enough for current running EFT and IDM analysis.

Context

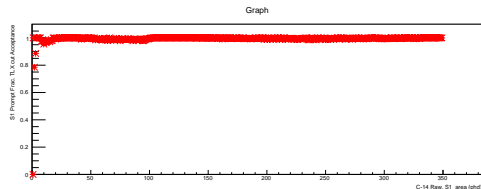
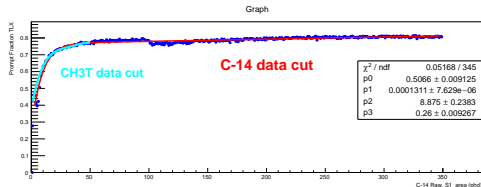
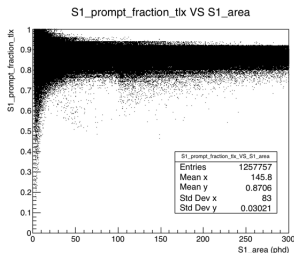
- CH3T dataset has a lower ER range of " $0 < S1 < 50$ phd". The data selection of C-14 is extrapolated from CH3T dataset (see next slides).
- DD data can be used for NR events selection.

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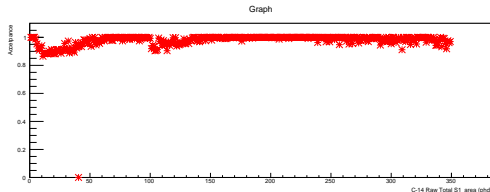
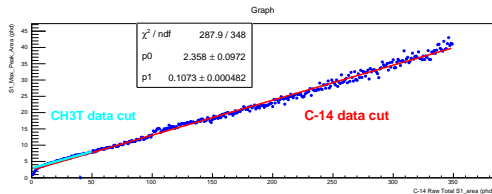
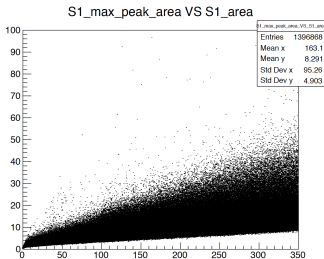
Data selection, acceptance for "prompt fraction TLX"

- We extrapolate from the same algorithm of CH3T data to C-14 data to get the new "prompt fraction TLX"
- Left picture: grabbing "S1 area" V.S. "S1 prompt fraction tlx", $S1 < 350$ phd from C-14 data.
- Right picture : Acceptance of "S1 prompt fraction tlx" (with Evan helped on the fit function. Doc on CH3T analysis).



Data selection, acceptance for "S1 max peak area"

- We extrapolate from the same algorithm of CH3T data to C-14 data to get the new "S1 max peak area"
- Left picture: grabbing "S1 area" V.S. "S1 max peak area", $S1 < 350$ phd from C-14 data.
- Right picture : Acceptance of "S1 max peak area" (Doc on CH3T analysis).



Summary

- Pathological events are likely due to salt.
- A couple of data selection and acceptances for new “S1 requirements” based on C-14 data have been accomplished.