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Publication date

2018

Document Version

Other version

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Other

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Citation for published version (APA):

Aalbers, J. (2018). *Dark matter search with XENON1T*.

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Dark Matter Search with XENON1T

Jelle Aalbers, University of Amsterdam

PhD defense, June 19th 10:00, 2018

Propositions

1. Without dark matter, the night sky would be dark, and there would be no one to see it.
2. Constraints on the WIMP-nucleon cross-section have improved by four orders of magnitude in a decade, mostly thanks to noble liquid TPCs.
3. Accurate signal models depend circularly on accurate signal processing tools.
4. The asymptotic approximation for the likelihood-ratio test static distribution is inappropriate for low-background searches with a short exposure.
5. Background-free searches can get >30% better sensitivity by intentionally adding a background of 0.69 expected events.
6. LXe researchers tend to overestimate the impact of uncertainties on the nuclear recoil response, and underestimate that of shifts in signal scales (g_1 and g_2).
7. The two-sigma statistical spread of null results of rare-event searches usually spans about an order of magnitude. Accounting for percent-level systematics on such results can only be motivated by a quixotic fetishism for feigned accuracy.
8. When looking for your keys under the lamppost, there is no need to get drunk first. This is simply rational behaviour.
9. Nature need not heed our ape-brain's sense of aesthetics. The theory of everything is quite possibly a hideous tangle of spaghetti code.
10. However, the fact that century-old theories still hold in contemporary experiments with orders of magnitude better precision, is surprising and perhaps unsettling.