Long Range Ion Tracking in XENON1T

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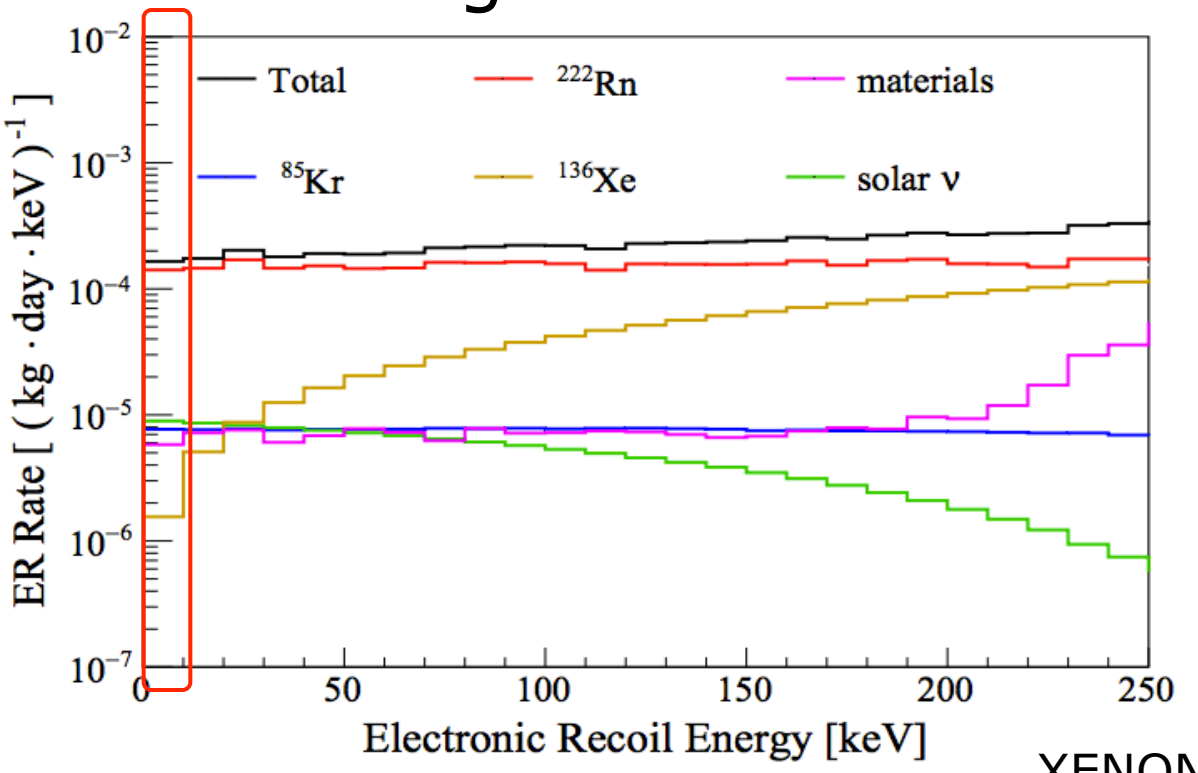
XENON1T Backgrounds

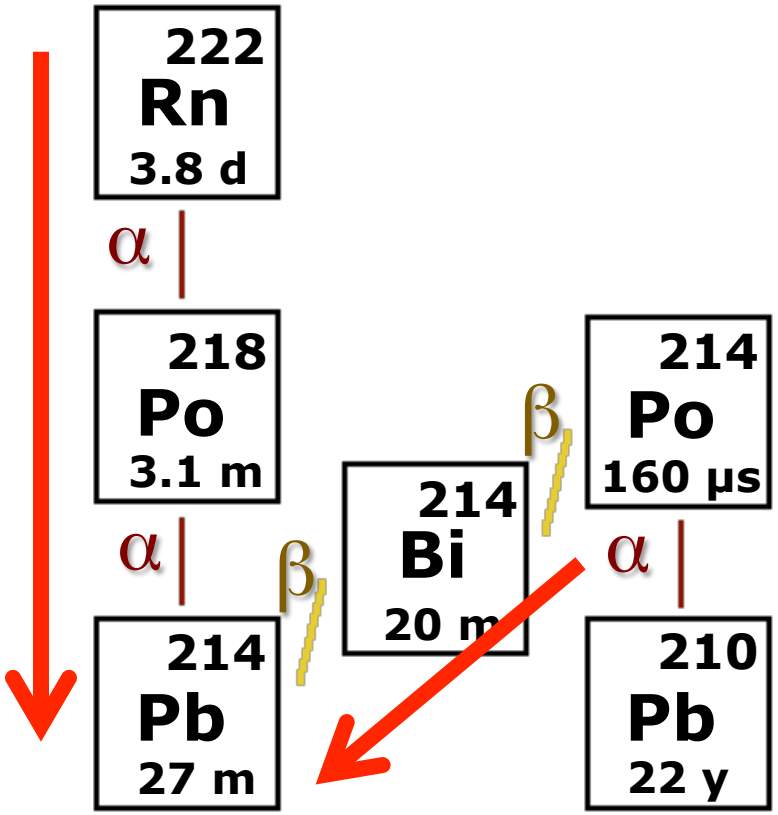
- WIMPs would interact at low energies.
- 85% of background: ^{222}Rn chain (^{214}Lead)



XENON1T: 1512.07501

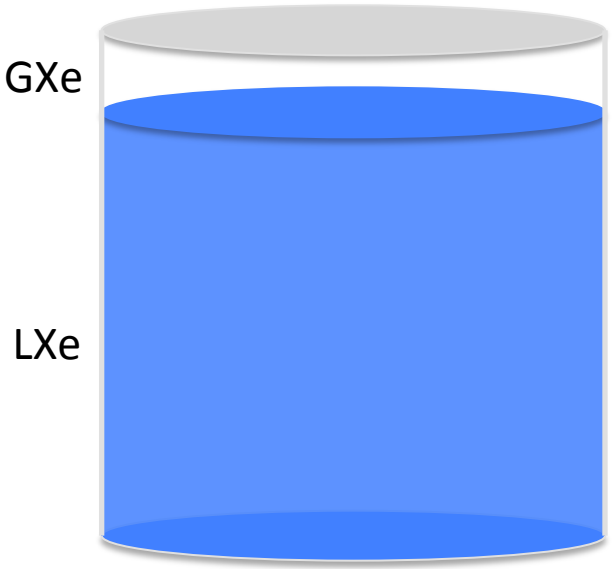
^{222}Radon Decay Chain

- Use the known events to find lead decays.

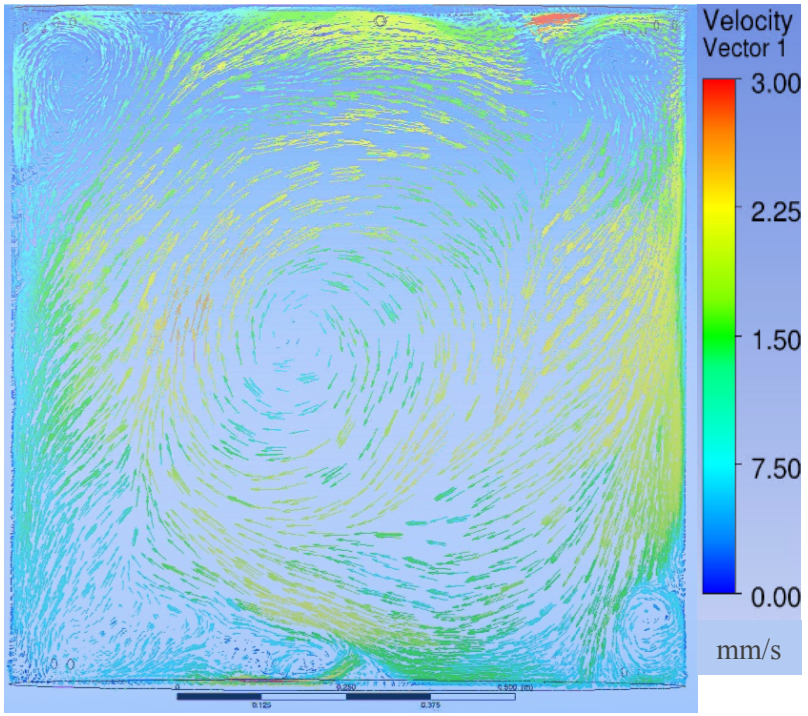


Convection

- Dual-phase detector
- Temperature gradient ~0.1K



ANSYS Simulation



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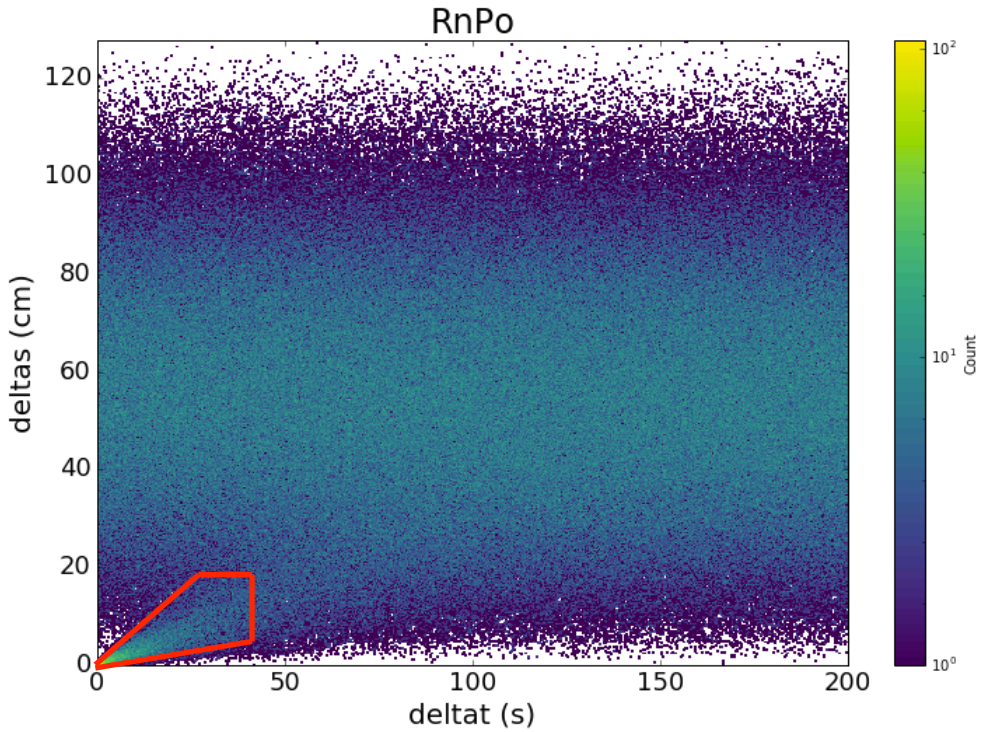
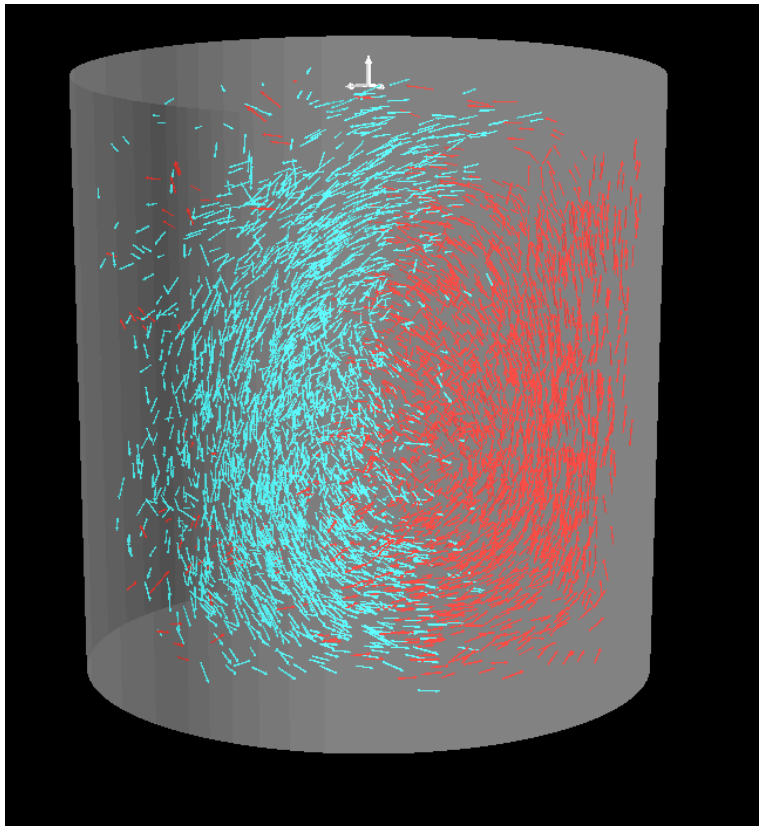
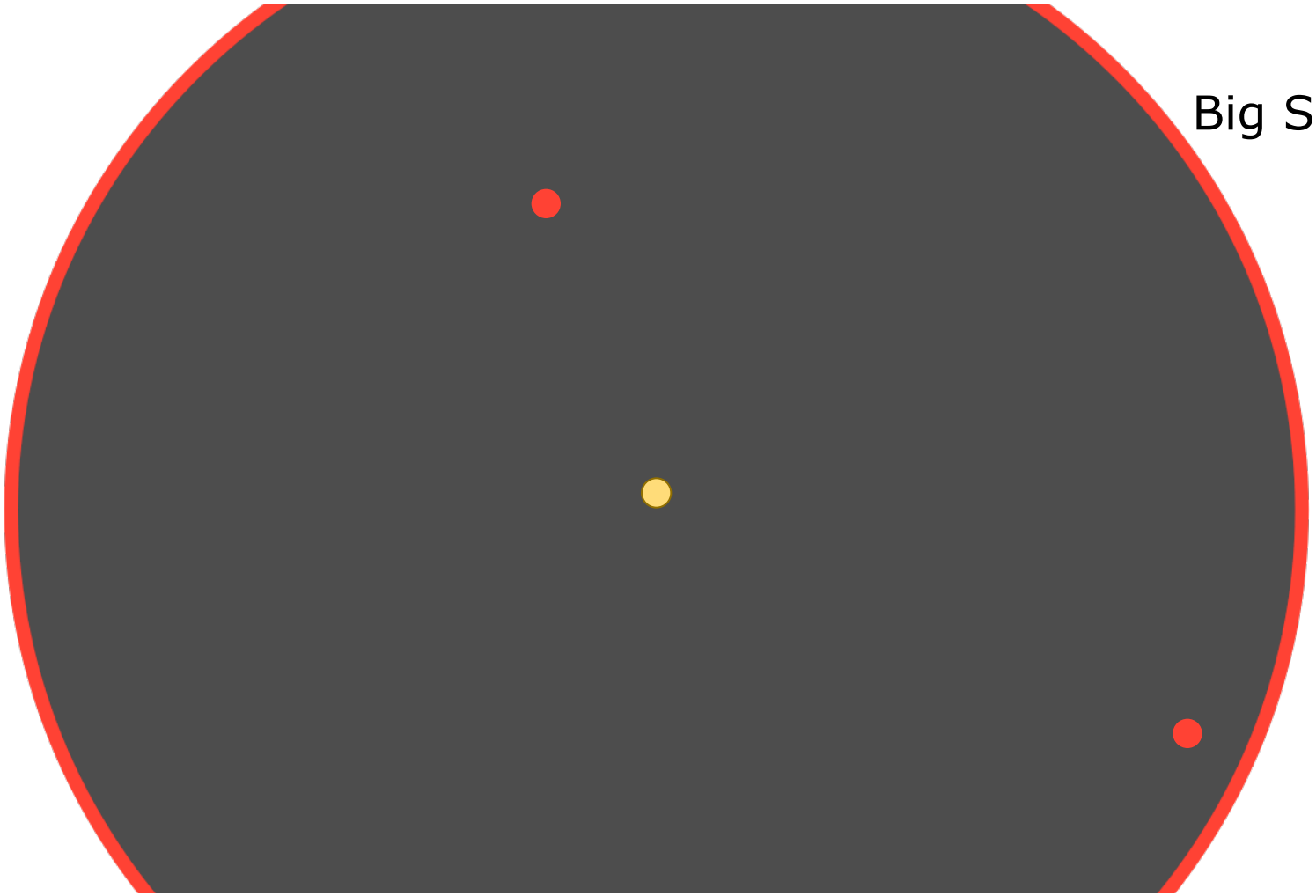
Convection Map: Data

- Matching ^{222}Rn and ^{218}Po events



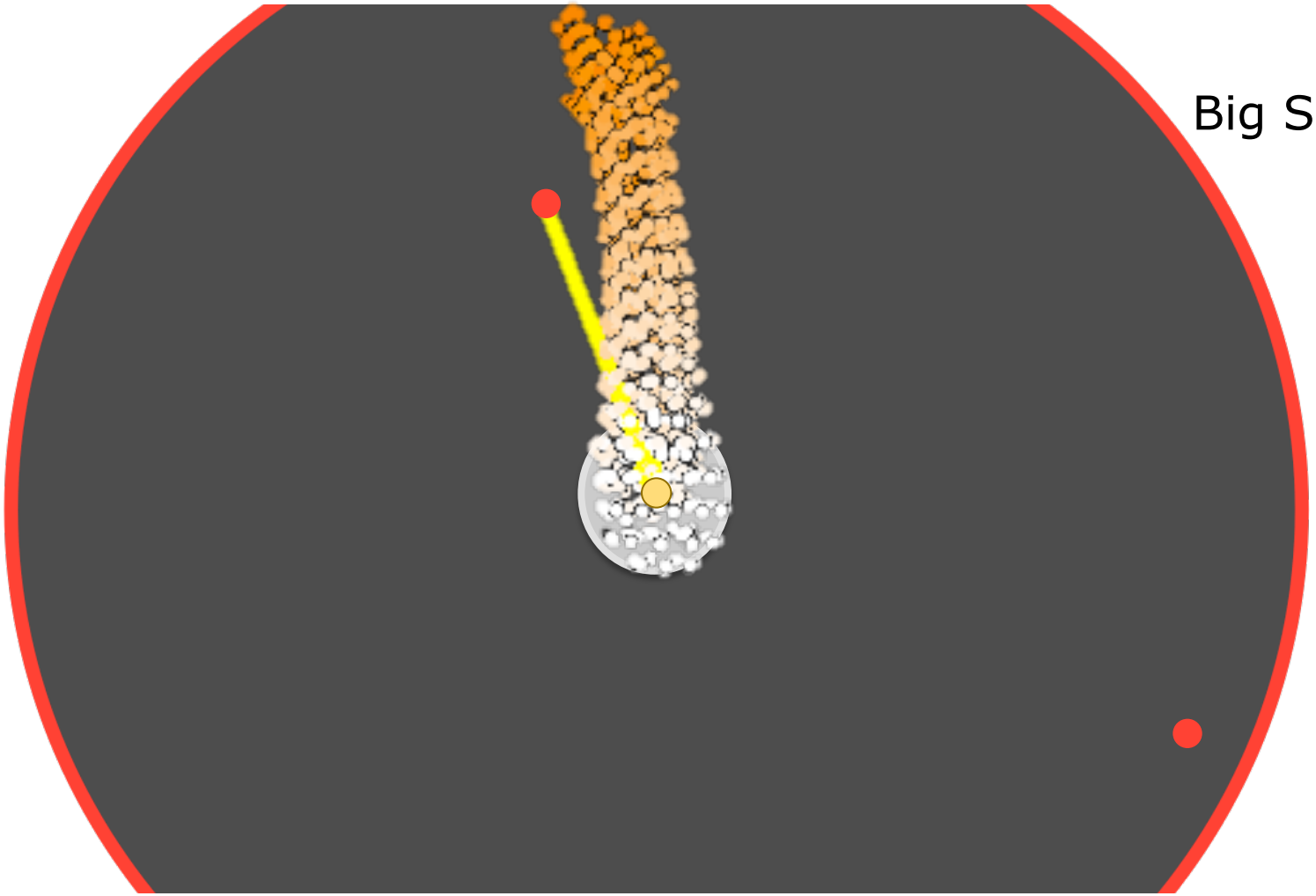


Tracking



Big Sphere
vs.
Cloud

Tracking

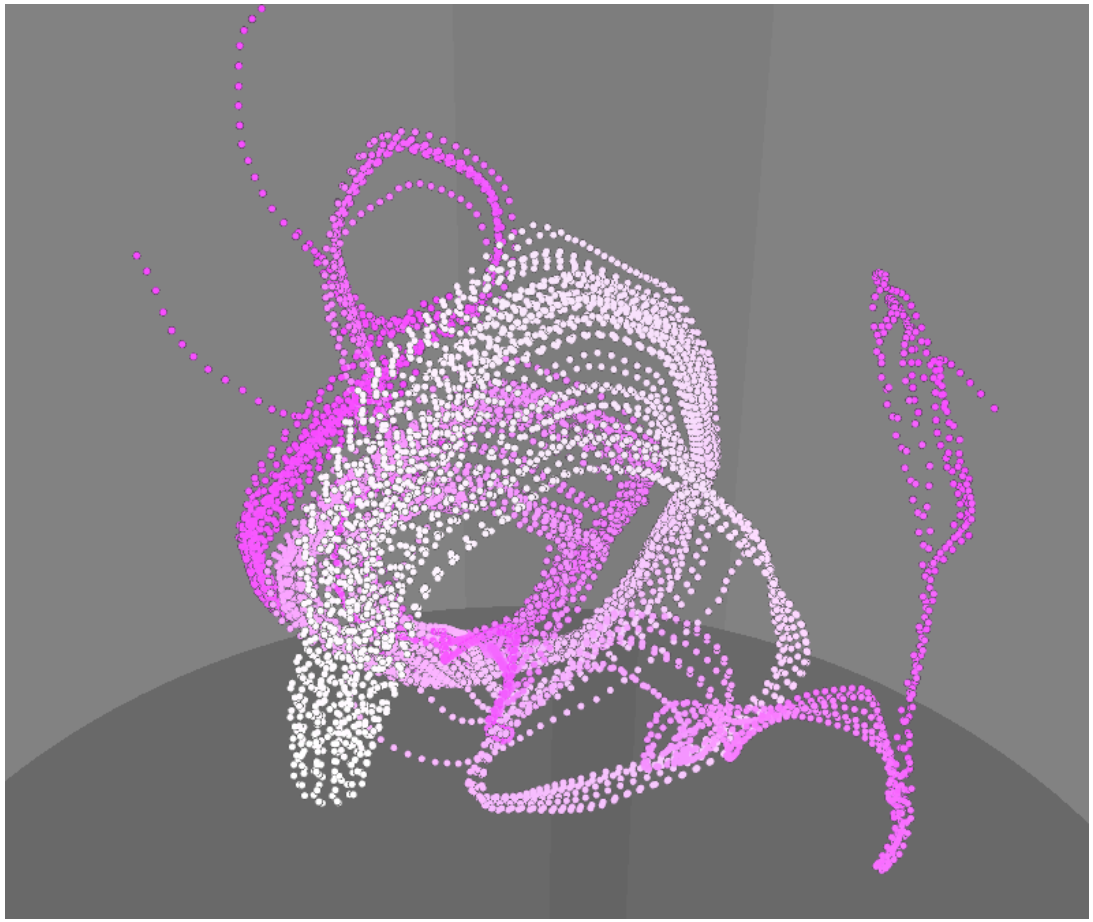


Big Sphere
vs.
Cloud

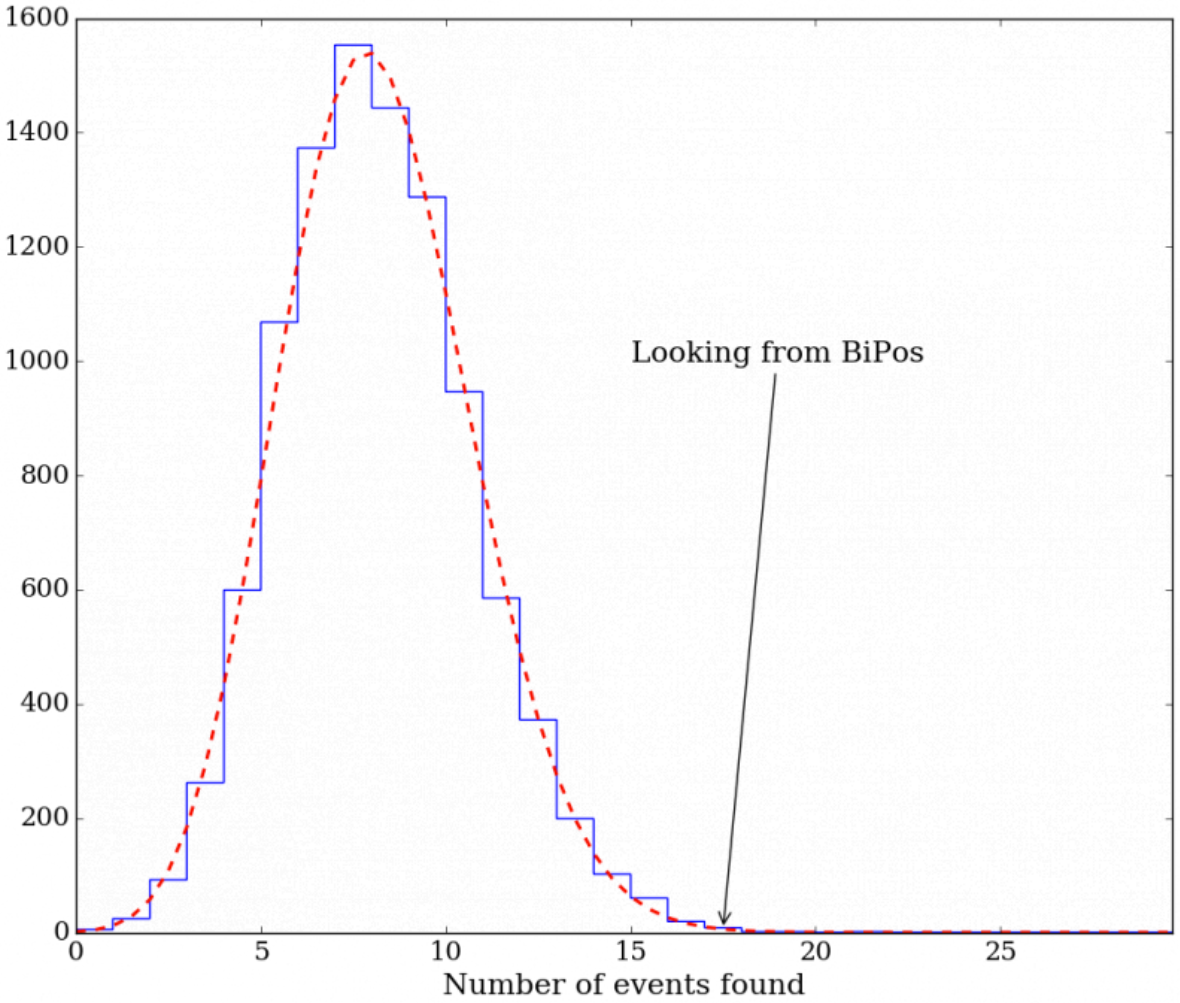
Summary

- Endeavor to track individual ions of ^{222}Rn decay chain around detector
- Identify ^{214}Pb decays and remove them from low energy Dark Matter candidates
- Currently limited by incomplete understanding of convection

Tracking 10min



Big Sphere Works



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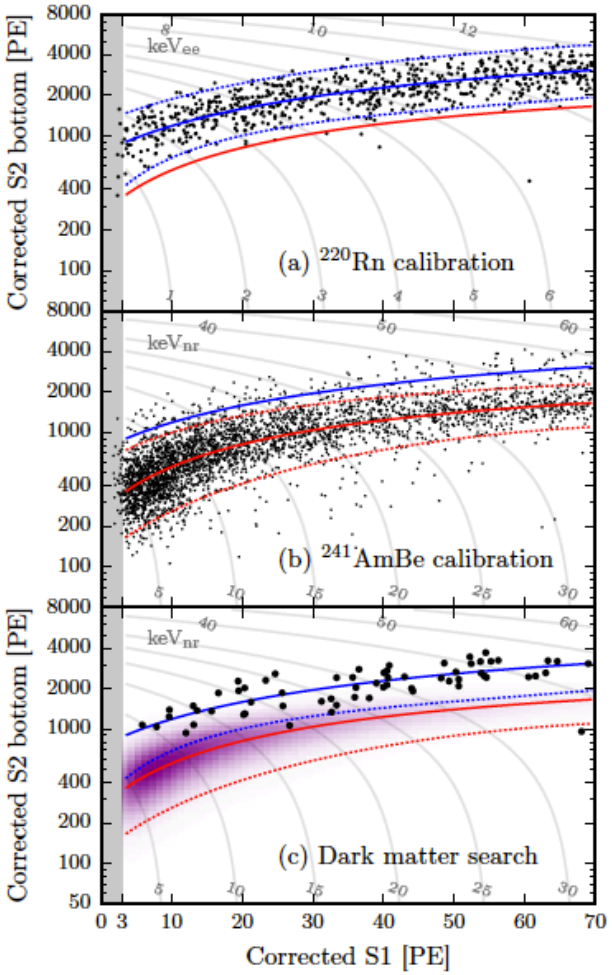
Electronic vs. Nuclear Recoil

- Dark Matter Nuclear Recoil
- ER calibration ^{220}Rn
- NR calibration ^{241}AmBe
- Some low energy events are indistinguishable as ER or NR.



XENON1T: 1705.06655