Dark Matter

Engineering the search for the elusive particles composing the universe T. Mollano '25.5, T. N. Tsekerides '26, Prof. G. K. Giovanetti







How do you detect it?



Evidence for this "dark matter" includes the large scale structure of the universe and the rotation curves of spiral galaxies.

However, we may be able to directly detect interactions of dark mat-

ter with liquid noble gasses using a

time projection chamber (TPC)

Most of the universe appears to me made of matter, which doesn't interact with light or E&M fields.

What is DarkSide-20k?

DarkSide-20k is a massive liquid argon TPC under the Gran Sasso mountain in Italy. Filled with 50 tons of argon, it will allow for large exposures that will either detect dark matter or eliminate a large paramter space of possible candidates.



What are we doing at Williams?

In order to broaden DarkSide's search into lower mass models, we must understand the nature of the background noise found at high sensitivities. To do so, we are creating our very own LAr TPC!



Improving Diagnostic Tools

We've created a number of sensing and control systems, which are fed into a Raspberry Pi, allowing us to centrally operate the whole system. Data is also sent to a server for remote storage and access.



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Argon Condensation System







We also constructed a cryogenic camera system for monitoring argon condensation quality.





This work supported by the National Science Foundation and the Research Corporation for Scientific Advancement, and Viewers Like You. Thank you!