WIMPs and Dark Matter

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Abstract:

WIMPs are an essential part of most Dark Matter theories today, and are a candidate for what Dark Matter actually is. Because of this, I have spent majority of these past 5 weeks researching it, theories that involve it, and experiments that are attempting to detect it.

Introduction:

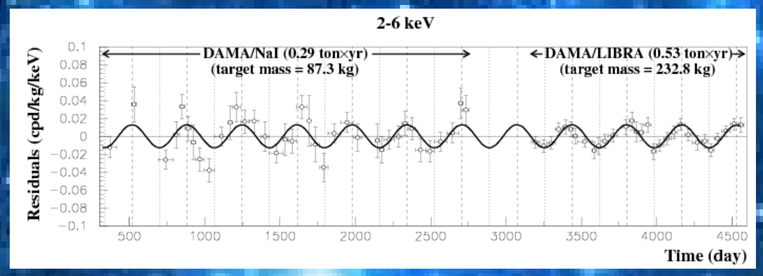
Dark Matter is a topic that is hypothesised by modern physics in order to account for mass that we have not been able to detect. This mass must be present in every galaxy to account for discrepancies in observed mass and what their mass should be based of calculations concerning the observed speed of their rotation.

WIMPs:

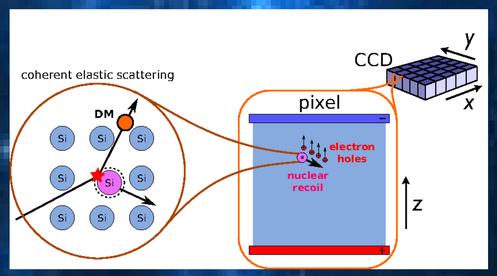
Weakly Interacting Massive Particles are a candidate for what Dark Matter is and are currently defined as being only susceptible to the weak and gravitational force. They are Cold Dark Matter, which means they are slow moving which would explain the pattern of galaxy formation throughout the universe that we see today.

Experiments:

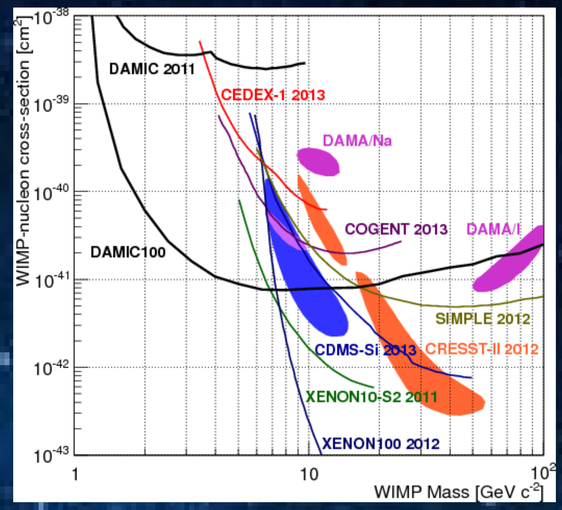
Current day experiments such as DAMA/LIBRA, XENON100, and DAMIC aim at the direct detection of WIMPs through particle collisions and Weak Force interactions between WIMPs and the material the experiments are using for detection.



The DAMA/LIBRA experiment has gotten very interesting results in its detection of Dark Matter, as it has recorded an annual modulation in its data, which no other experiment has detected.



This image illustrates how the CCDs in the DAMIC experiment detect Dark Matter collisions. As DM interacts with nucleus of the Silicon through the weak force a flash of charge is produced, which is then recorded as an event.



The Dark Matter in CCDs (DAMIC) experiment is sensitive to masses lower than what any other experiment has been able to detect, which is lower than 10GeVs. This is because it is using CCDs (Charged Coupled Devices) for detection, which have a low electronic readout noise.

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