

Revealing the nature of dark matter with XENON100

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Searches for dark matter are motivated by various astronomical and cosmological observations. Direct detection experiments using liquid xenon have shown a great potential to probe the existence of WIMPs (Weakly Interacting Massive Particles) via elastic scattering off target nuclei.

The XENON100 experiment is located at the Gran Sasso underground laboratory in Italy and operates with an active volume of 62 kg liquid xenon.

The detector uses the two-phase TPC (Time Projection Chamber) technology where the produced light and charge are detected by means of two photomultiplier arrays.

So far the data released provides no evidence for dark matter. The resulting exclusion limits on the WIMP-nucleon cross section for spin-dependent and -independent interactions rule out already theoretically favoured regions of the cross section and WIMP mass parameter space. Furthermore, the data has been recently interpreted in terms of axion-like particle interactions and a corresponding exclusion limit has been derived.

In order to improve the experimental sensitivity by two orders of magnitude, the construction of XENON1T started in summer 2013.

After an introduction to dark matter, this talk will focus on the direct dark matter searches with the XENON100 detector. The results released over the last years will be summarised. Furthermore, XENON1T will be briefly presented including the current status and schedule.