

Directional detection of Dark Matter with a nuclear emulsion based detector

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Direct dark matter searches are promising techniques to identify the nature of dark matter particles. A variety of experiments have been developed over the past decades, aiming at detecting Weakly Interactive Massive Particles (WIMPs) via their scattering in a detector medium. Exploiting directionality would give a proof of the galactic origin of dark matter making it possible to provide a clear and unambiguous signal to background separation. In particular, the directionality appears as the only way to overcome the neutrino background that is expected to finally prevent standard techniques to further lower cross-section limits. The directional detection of Dark Matter requires very sensitive experiment combined with highly performing technology. The NEWSdm experiment, based on nuclear emulsions, is proposed to measure the direction of WIMP-induced nuclear recoils and it is expected to produce a prototype in 2017. We discuss the discovery potential of a directional experiment based on the use of a solid target made by newly developed nuclear emulsions and read-out systems reaching sub-micrometric resolution.

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