



Contribution ID: 15

Type: **Oral Presentation**

Directional Dark Matter Search with Nuclear Emulsion

Monday 26 August 2019 16:50 (20 minutes)

A variety of experiments have been developed over the past decades, aiming to detect Weakly Interactive Massive Particles (WIMPs) via their scattering in a detector medium. The sensitivity of these experiments has improved with a tremendous speed due to a constant development of the detectors and analysis methods. Detectors that are able to reconstruct the direction of the nucleus recoiling against the scattering WIMP are opening a new frontier to possibly extend Dark Matter searches beyond the neutrino background. Exploiting directionality would also give a proof of the galactic origin of dark matter making it possible to have a clear and unambiguous signal to background separation. The NEWSdm experiment, based on nuclear emulsions, is proposed to measure the direction of WIMP-induced nuclear recoils. We discuss the potentiality, both in terms of exclusion limits and potential discovery, 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. We also report results of the test exposure conducted in Gran Sasso last year.

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Session Classification: Parallel Session