Seminario, Terça 29/11/2022 16:00h

Local: Evento à distância, será transmitido pelo Zoom através do link https://us02web.zoom.us/j/82228892557?pwd=NEd5R3VJWXBaZXkyMXl1dC9vWTd1UT09

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Title: The DarkSide of the Universe

The existence of dark matter in the Universe is nowadays commonly accepted as the explanation of many astrophysical and cosmological phenomena, ranging from internal motions of galaxies to the large scale inhomogeneities in the cosmic microwave background radiation and the dynamics of colliding galaxy clusters. Cosmological and astronomical observations, supported by the recent results from the Planck satellite, indicate that dark matter, which forms the observed large-scale structures and galaxies, accounts for 27%, dark energy, responsible of the observed accelerated expansion of Universe, accounts for 68% while the remaining 5% is composed by ordinary baryonic matter.

Elementary particle physics offers an attractive solution to explain non-baryonic dark matter in the form of relic Weakly Interacting Massive Particles (WIMPs), formed in the early Universe and gravitationally clustered together with the standard baryonic matter. In our galaxy, dark matter might constitute a halo, extending far beyond the visible disk, whose properties are inferred from the rotational kinematics of the visible matter. WIMPs could then be directly detected, as the Earth passes through such a halo, by looking at the nuclear recoils produced by WIMP interactions with ordinary matter. Up to now none of the running, neither the already concluded, experiments were able to detect dark matter as a particle. In this scenario, dual-phase noble liquid Time Projection Chambers (TPC), detecting both ionization and scintillation lights produced by recoiling nuclei, offer the most promising experimental technique to reach the sensitivity required for the possible detection of a wea k signal coming from the interaction of dark matter with the ordinary one. Liquid argon (LAr), in particular, is one of the most promising targets for the search of WIMP-like dark matter. The correlation in the two signal channels provides a possible handle to also measure the recoil direction of the nuclei: if confirmed, this would allow inferring the incident direction of potential dark matter candidates. In this contribution, after a broad, and very general, introduction about dark matter and its detection methods, I will focus on the recent results about the DarkSide Collaboration and its mid/long term plan. Finally, an introduction on the Recoil Directionality (ReD) experiment and its recent results will be also presented.