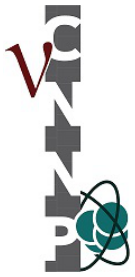

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EDELWEISS: searching for low-mass dark matter particles with germanium low-temperature detectors

Monday, 24 February 2020 14:20 (20 minutes)

EDELWEISS is a direct dark matter search experiment aiming at the detection of WIMPS and other candidates as the composition of the galactic dark matter halo. The EDELWEISS detection method is based on arrays of germanium mono-crystals operated at temperatures around or below 20 mK. Energy deposited in the crystals by particle interactions are read out simultaneously by thermal sensors, which collect the phonon component of the signal, and by surface electrodes, which collect the ionization component. This hybrid detection method is extremely powerful for background reduction. The EDELWEISS devices are operated in a low-radioactivity heavily-shielded dilution refrigerator installed in the deepest European underground laboratory in Modane (France). Recently, results have been achieved also with an extremely low-noise set up installed above ground. The versatile and highly performing technology adopted by EDELWEISS opens new possibilities to detect signals induced by either electrons or nuclear recoils. EDELWEISS has developed a rich program to look for DM candidates with masses below 1 GeV and down to the MeV range (EDELWEISS SubGeV program), in a region of the parameter space where low-temperature detectors are extremely competitive. There is an increasing interest in this mass range motivated by the lack of evidence of new physics at LHC (e.g. SUSY), which pushes to look beyond the standard WIMP dark matter scenario

Detectors are operated in two modes, according to the voltage magnitude applied to the ionization electrodes. In the low-voltage mode, discrimination between nuclear and electron recoils is maintained, with threshold down to 50 eV (electron equivalent) in prospects. In the high-voltage mode, detection of single electron-hole pair in massive detectors is possible.

We will report both on the promising technological advancements in these detection regimes and on recent results about low-mass candidates. In particular, we will present results on Axion-Like Particles in the keV range and will report the attainment of the first sub-GeV spin-independent dark matter limit based on a germanium target. The search has been extended to Strongly Interacting Particles (SIMP) down to masses of 45 MeV by exploiting the Migdal effect. Results on SIMPs with spin-dependent interactions will also be presented.

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