Directional Dark Matter Detection with MIMAC.
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Many DM direction projects have given sensitive results in various DM mass regions using liquid-Xenon, liquid-Argon, Germanium, etc. However, these detections measure the nuclear recoil energy only, with no ability to identify the direction of these recoils. The neutron background around the detectors will produce the nuclear recoils in the same range of energy. When the neutrinos from the sun and the atmosphere will become the dominant background in the future, these DM direct detection experiments will reach a bottleneck and they will be unable to improve the detection sensitivity further.
In order to perform Directional DM detection, low energy nuclear recoil tracks have to be detected. The MIMAC collaboration has recently reported the first detection of 3D nuclear tracks coming from the Radon progeny confirming the possibility to perform this kind of measurement with an ionization quenching measurement on these heavy nuclei.
The nuclear recoils produced by monochromatic neutron fields have been measured by one MIMAC chamber, allowing the experimental determination of the electron-nuclear recoil discrimination at the same time that the angular distribution of the Fluorine recoils produced by the neutron elastic collision has been experimentally estimated.
A new facility called COMIMAC has been developed at the LPSC (Grenoble) to perform the 3D characterization of nuclear tracks of known kinetic energies. The first measurements performed by the Sino-French MIMAC collaboration will be reported.
The $1m^3$ detector with new low background detectors will be described, an intermediate step to build a large Micro-tpc Matrix having the directional signature for Dark Matter detection.

Daniel Santos
Directeur de Recherche (CNRS)
Laboratoire de Physique Subatomique et de Cosmologie
Grenoble-Alpes University (UGA) /CNRS-IN2P3 (France)

Daniel Santos is a senior researcher working at Laboratoire de Physique Subatomique et Cosmologie de Grenoble (France).
He worked on AMS phase-1 having the French responsibility on the Cherenkov aerogel counter (1996-1999).
He was Co-I of PLANCK-HFI (1999-2015) the ESA spatial mission on temperature anisotropies of the cosmological background.
He founded the MIMAC collaboration on Directional Dark Matter Detection.