Deep Underground Physics

WP5 status: Future experiments

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Aim of WP 5

- draw up a scientific roadmap for the French community, in conjunction with international partners, by forging links between theoretical physicists, particle physicists, nuclear physicists, astrophysicists and cosmologists
- establish a scientific and technological watch on physics, detectors and experiments, and underground laboratories.

Actions taken

The double beta decay (0vbb) and dark matter direct detection (DM) experiments were followed and presented at various meetings:

CUPID (0vbb), DAMIC-M (DM), DarkSide-20k (DM), LZ* (DM & 0vbb), MADMAX (DM), nEXO (0vbb), NEWS-G* (DM), Oscura (DM), PandaX-III* (0vbb), R2D2* (0vbb), SuperNEMO* (0vbb), Tesseract (DM), XENONnT* (DM & 0vbb), XLZD (DM & 0vbb)

Experiments with a star * are now taking data data and being followed by WP1.

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Joint plenary meetings with thematic IRNs

Goal: support the patterning of this research in France and also in Europe!

- **IRN Neutrino in November 2021 in Paris**, with a joint day focusing on common themes: 0vbb and neutrino physics in general, as well as detection techniques. Contributions as « Magnetic moment anomaly of the neutrino », « Towards reliable nuclear matrix elements » and « CUPID » for neutrinoless double beta decay, accompanied the prospects for experimental collaborations.

- **IRN Terascale in October 2022 in Nantes**, with a joint day focusing on common themes: dark matter (experimentally and theoretically), both from the point of view of direct or indirect detection, as well as its effects on cosmic inflation. The day began with cross-presentations from the GDR DUPhy and IRN Terascale, as well as research specific to each GDR: the indirect search for matter and its production at the LHC.

WP5 as a link between the DUPhy community and the Laboratoire Souterrain de Modane

- At the October 2022 session in Nantes there was a half-day discussion on projects interested in using/installing LSM.

- The GDR DUPhy plenary meeting at the LSM in June 2023 should also be seen as a WP5 action to enable all those involved to get to know this French nugget, which already has a functional infrastructure and a perfectly operational environment.

WP5 was a natural opportunity to present the forthcoming international projects, which are structuring the community, to the French partners.

Although overtures for participation were made explicit, there has been little real movement of researchers towards these projects for the time being.

Perspectives

Closer links with the IRN Neutrinos and Terascale to better prepare, for example, the structuring reports commissioned by the European Commission and whose DUPhy members are motivated by physics but also competent in the detection techniques specific to low background physics.

We will also be able to increase the number of contacts with European collaborators, through the Canfranc (Spain), Gran Sasso (Italy) and Boulby (UK) underground laboratories, for example.