THE NEWS-SNO PROJECT

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The existence of Dark Matter (DM) in our Universe and even its precise contribution to the energy density of the universe is nowadays well established [1], however, its exact nature still remains unknown.

The goal of the NEWS-SNO (New Experiments with Spheres in SNOLAB) project [2,3] is to search for particle candidates in mass regions not yet accessible by existing experiments. The planned NEWS-SNO detector consists of a spherical TPC (time-projection-chamber) out of ultrapure copper filled with up to 10bar of He, Ne and CH_4 gas mixtures which is read out with one small central sensor set at high voltage. The radial dependency of the applied electric field is employed to allow for a large drift volume combined with a large amplification (avalanche). This leads to a detector threshold in the sub-keV level as well as the possibility of fiducialisation. This simple detector design with a limited number of materials, allows to reach extremely low radioactive backgrounds. In this way background-free data taking in the 10s of kg .days exposure region can be expected.

Thanks to the very light nuclear mass of the targets as well as the detector's very low energy threshold, the detection of SI interacting WIMPS down to 0.1 GeV/c2 is aimed at. In figure 1, an example of projected sensitivities of NEWS-SNO to very light dark matter particles as, e.g., motivated in millicharged models (see [3]) is shown.

Changing the nature and/or mixture of gas, the pressure, the applied high voltage or the sensor, respectively, are different handles that could be used to check a potential dark matter like signal.

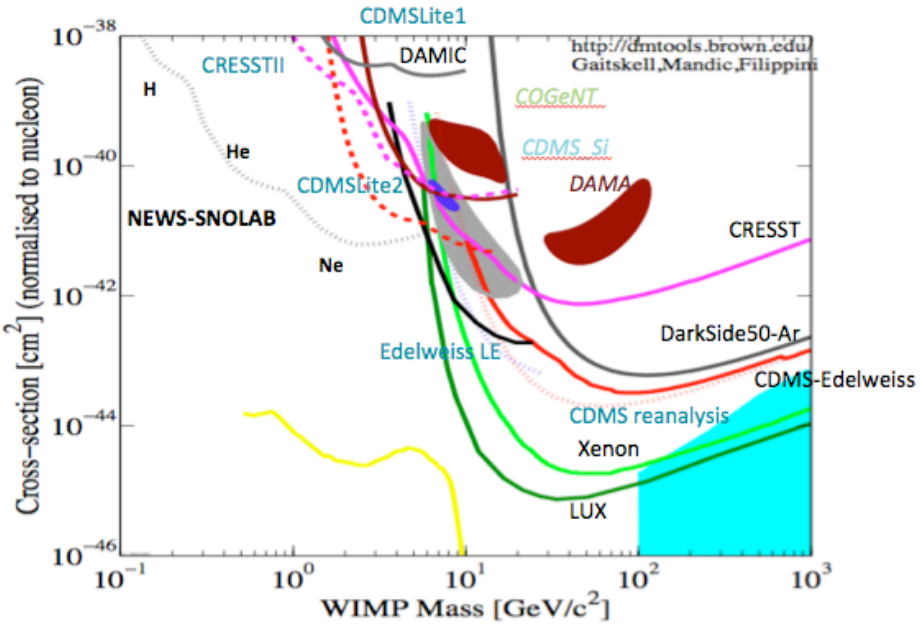

Figure 1: SI cross section of Dark Matter scattering off of nucleons. The planned sensitivity of the NEWS-SNO project for spin independent couplings WIMPs (grey) is shown together with current experimental limits. The three curves labeled H, He, Ne correspond to the sensitivities obtained from three different nuclei Hydrogen (non-flammable He/CH_4 mixture 90%He/10%CH_4), Helium (98%He/2%CH_4) and Neon (98%Ne/2%CH_4).

[1] K. A. Olive *et al.* (Particle Data Group), Chin. Phys. C, **38**, 090001 (2014) and 2015 update
[2] Gerbier, G. *et al.,* arXiv:1401.7902 [astro-ph.IM]
[3] Profumo, S., arXiv:1507.07531 [hep-ph]