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NEWS-G Light dark matter searches with a Spherical Proportional Counter

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NEWS-G (New Experiments With Spheres-Gas) proposes a new concept for the dark matter search, based on a spherical gaseous detector, the Spherical Proportional Counter (SPC). The detector has a large volume and single electron detection sensitivity and may be filled with light gaseous targets such as hydrogen, helium, and neon. The capabilities of the detector permit the extension of dark matter searches to candidates with a mass from 0.1 GeV to few GeV which are out of the range of liquid noble gas TPCs and complementary to some solid state detectors using heavier elements as targets. Dark matter searches in the low mass range are well motivated by the recent non-findings in the higher mass region and the richness of theoretical models that predict candidates in the low mass range, opening a window to non-standard model physics. NEWS-G already operates a SPC of this type (SEDINE), a 60cm diameter sphere, placed in the underground laboratory of Modane (France), which acts as the current main detector but also as a testing ground. The full-scale detector, 140 cm in diameter, will be installed in SNOLab (Canada) by March 2019. In this talk, I will present the first NEWS-G results with neon as target nuclei, which exclude at 90% confidence level (C.L.) cross-sections above $4.4 \cdot 10^{-37} \text{ cm}^2$ for a $0.5 \text{ GeV}/c^2$ WIMP based on 9.7 kg-days of exposure.

I will also discuss the status of the second phase of SEDINE based on helium gas mixtures along with the status of the NEWS-G/SNOLAB project and the prospects for the future.

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