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Recent advancements on the NEWS-G spherical proportional counter sensors

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NEWS-G is an innovative experiment aiming to shine a light on the dark matter conundrum with a novel gaseous detector, the spherical proportional counter. It uses light gases, such as hydrogen, helium, and neon, as targets, to expand dark matter searches to the sub-GeV/ c^2 mass region. NEWS-G produced its first results with a detector -60 cm in diameter- installed at LSM (France), excluding cross-sections above $4.4 \cdot 1037 \text{ cm}^2$ for 0.5 GeV/ c^2 dark matter using neon gas. Currently, a larger -140 cm in diameter- more advanced detector is being built at LSM and a first run is under way there, before its installation at SNOLAB (Canada) at the end of the year. The detector operation will be challenging in terms of gain, electric field intensity and stability of operation, along with the demand for high radiopurity levels. In this talk, I will present new advancements in instrumentation for the spherical proportional counter relying on resistive materials, greatly limiting spark rate and intensity, permitting high gain operation in high pressure. Furthermore, I will present the recent developments on the multi-anode sensor (ACHINOS) that permits high gain operation combined with an increased electric field.

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