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# Measurement of the single electron response of Spherical Proportional Counters for the NEWS-G light dark matter search experiment

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The NEWS-G collaboration employs Spherical Proportional Counters (SPCs) to search for low-mass dark matter. Their excellent sensitivity to the minute energy depositions expected from light dark matter scattering make SPCs fundamentally well-suited for this task, but demands exquisite understanding of the detector response at the level of single electron/ion pair events. A novel UV laser calibration system has been developed to address this need, allowing for precision measurements of the single electron response of SPCs, which are presented here. Additionally, this calibration system is shown to be ideal for several other key tasks, including measuring the trigger efficiency of SPCs, and monitoring detector stability in real time. The UV laser was also used together with a low energy Ar-37 source to measure the mean ionization energy in a Ne + 2% CH4 gas mixture, demonstrating its future applicability for measuring fundamental gas properties. Bolstered by these results, the UV-laser calibration system will play a crucial role in the next phase of the NEWS-G experiment at SNOLAB.

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