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Quenching factor measurements for the NEWS-G experiment

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The NEWS-G experiment is a dark matter experiment based on gaseous detectors, located at SNO lab. The experiment aims to detect WIMPs by measuring nuclear recoils in noble gases using a spherical proportional counter (SPC) detector, which offers high sensitivity due to its unprecedented low energy threshold. Accurate measurement of the recoil energy requires knowledge of the quenching factor (QF), which quantifies the reduction of ionization due to nuclear recoils compared to electromagnetic interactions. We have already conducted quenching factor (QF) measurements at TUNL using a mixture of Ne + CH₄ gas at 2 bar. As part of our future plans, we intend to measure the QF using various gas mixtures and different detector parameters. To facilitate these in-beam QF measurements, we recently carried out a tabletop experiment at Queen's University to study SPC detector characteristics for different detector parameters. Plan for another campaign at TUNL for QF measurement is ongoing and a possibility of conducting such an experiment at UdeM is also underway.

In this talk, the highlights of the tabletop experiment will be presented. In addition, the past measurement, current status, and the future plans of the NEWS-G collaboration in measuring QF with SPC will be summarized.

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