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Quenching Factor Measurements for Germanium Detectors at Triangle Universities Nuclear Laboratory (TUNL)

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The Coherent Elastic Neutrino-Nucleus Scattering has been observed by the
COHERENT collaboration using a 14.6-kg CsI[Na] scintillator at Oak Ridge National Laboratory. This indicates a new way to build a compact neutrino detector and unlocks new channels to test the Standard Model. One challenge is to understand the neutrino-induced low energy nuclear recoils. It is commonly known that the signals from nuclear recoils can be quenched in many types of detectors, resulting in less light or ionization. This phenomenon is referred to as the "quenching factor". It is defined as the ratio of the signal yield from the nuclear recoils to the signal yield from comparable electron recoils with the same energy. The quenching factor highly depends on the detector materials, so different detectors require their own quenching factor measurements. The next step for the COHERENT experiment is to use different nuclear targets e.g. Ar and Ge. Aside from the COHERENT experiment, many dark matter experiments (CoGeNT, LUX, and etc.) trying to directly detect weakly inter- acting massive particles (WIMPs) also attempt to observe elastic scatterings between WIMPs and nuclei. In this work, we will present the quenching factor measurements for germanium detectors at TUNL in the [0.8,4.9] keVnr range.

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