

# Radiogenic Neutrons and External Gamma-ray Backgrounds at LEGEND-1000

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Neutrinoless double beta decay ( $0\nu\beta\beta$ ) is a rare decay process and is considered as the most promising way to prove the Majorana nature of neutrinos, that is neutrinos are their own antiparticles. The Large Enriched Germanium Experiment for Neutrinoless Double Beta Decay (LEGEND) aims to build a phased  $^{76}\text{Ge}$ -based  $0\nu\beta\beta$  decay experimental program with the discovery potential of a half-life beyond  $10^{28}$  years. The first (second) phase of LEGEND will deploy 200 (1000) kg of high purity germanium detectors made from germanium enriched to at least 90\% in  $^{76}\text{Ge}$ . In order to achieve an unprecedented background goal of  $1 \times 10^{-5}$  cts/keV kg yr at the Q-value of 2039 keV, backgrounds are being carefully investigated in LEGEND-1000. Both ambient neutrons from the laboratory room and neutrons generated by  $(\alpha, n)$  reactions and fissions in apparatus materials are important backgrounds. Similarly, gamma rays from far-way components such as the stainless-steel cryostat are also important. In this poster, we will discuss our Monte-Carlo (MC) simulation study of these neutrons and gamma rays at LEGEND-1000.

**Primary author:** PAUDEL, Laxman Sharma (University of South Dakota)

**Presenter:** PAUDEL, Laxman Sharma (University of South Dakota)

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