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Exploring the Standard Model and Its Frontiers with the CONUS+ Experiment

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Coherent elastic neutrino–nucleus scattering (CEνNS), predicted by the Standard Model, occurs when the momentum transfer satisfies $qR \leq 1$, causing the entire nucleus to respond coherently and the cross section to scale approximately with N^2 (the number of neutrons). The CONUS+ experiment, located at the Leibstadt Nuclear Power Plant (Switzerland) and employing high-purity germanium detectors, reports evidence of CEνNS with reactor antineutrinos corresponding to an exposure of 327 kg·day and a statistical significance of 3.7σ. These data make it possible to probe the effective weak mixing angle at very low Q^2, providing a complementary precision test to high-energy measurements, and to constrain new-physics scenarios. The results from CONUS+ restrict possible phenomena such as non-standard neutrino–quark interactions (NSI), the existence of light mediators (scalar and vector), and electromagnetic properties of neutrinos—including their magnetic moment, effective charge radius, and possible millicharge. In addition, short-baseline active–sterile oscillations and sterile-state production are explored. This contribution will present the limits set by CONUS+ on the weak mixing angle and on the aforementioned new-physics scenarios, as reported in the scientific literature.

Author: BASTO GONZALEZ, Victor Saul (Universidad del Quindio)

Presenter: BASTO GONZALEZ, Victor Saul (Universidad del Quindio)

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