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Statistical Analysis of Non-Standard Neutrino Interactions and Leptophilic Gauge Extensions in CONUS+

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The first observation of coherent elastic neutrino–nucleus scattering (CEνNS) with reactor antineutrinos by the CONUS+ collaboration has established a new precision probe of neutrino interactions at low energies. Using the recently released CONUS+ dataset, we study the sensitivity of reactor CEνNS measurements to non-standard neutrino interactions (NSI) and to the leptophilic gauge extension $U(1)_{L_e-L_\mu}$, deriving exclusion regions at 90% confidence level from the measured recoil spectrum.

The CONUS+ observation is fully consistent with Standard Model expectations, reinforcing the predictive power of CEνNS while constraining new neutrino interactions. Our results provide competitive and complementary limits to those obtained by other CEνNS and low-energy neutrino experiments, highlighting the potential of reactor-based measurements as precision tools for neutrino physics and searches for physics beyond the Standard Model.

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