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New Covariant Constraints for New Forces of Nature JEFFREY TITHOF, YURI KAMYSHKOV, University of Tennessee, MIKHAIL VYSOTSKY, ITEP — Four fundamental interactions exist (strong, weak, electromagnetic, and gravity) which are well modeled by modern physics, but can additional interactions exist in nature? I will present results from our work in reanalyzing data from the previously published neutron-proton scattering experiment "Measurement of np Elastic Scattering at High Energies and Very Small Momentum Transfers" (Nuclear Physics, B232 (1984) 365-397). The 4-momentum transfer distribution for scattered neutrons is fit by taking into account a strong interaction Regge-like term, a Schwinger scattering term (which is the scattering of the magnetic moment of the neutron on the proton and electron electric charges), and a term describing the new force in a covariant form. Constraints on the new force were obtained from a statistical chi-square analysis of the theoretical fit to the experimental data. New constraints were analyzed for the new forces described by covariant amplitudes, corresponding to scalar, pseudoscalar, vector, or axial vector exchange particles. Findings are that new vector and axial vector light particle exchanges are strongly bounded by high energy data and the analogous bound for a scalar particle is weaker. For a pseudoscalar exchange, bounds cannot be set from present data. Our limits are compared with similar searches in several other experiments.

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