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Electrophobic scalar boson and muonic puzzles[1]

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A new scalar boson which couples to the muon and proton can simultaneously solve the proton radius puzzle and the muon anomalous magnetic moment discrepancy. Using a variety of measurements, we constrain the mass of this scalar and its couplings to the electron, muon, neutron, and proton. Making no assumptions about the underlying model, these constraints and the requirement that it solve both problems limit the mass of the scalar to between about 100 keV and 100 MeV. We identify two unexplored regions in the coupling constant-mass plane. Potential future experiments and their implications for theories with mass-weighted lepton couplings are discussed.

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