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Probing the Frontiers of Physics Using Muons

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The absence of any signature for new physics beyond the standard model at the Large Hadron Collider has left the field of elementary particle physics in a quandary. We know there is new physics out there: where best to look for it? Searches for certain rare processes provide ultra-sensitive probes for new physics and can probe mass scales unobtainable by any conceivable accelerator, present or imagined. We show how such searches can probe mass scales unobtainable by direct searches at any conceivable particle accelerator and describe an experiment, Mu2e, that intends to use a novel technique to search for new physics through lepton flavor violation in muon decays with sensitivities a factor of 10,000 over existing limits.