

Testing the Stueckelberg Extension of the Standard Model with CDF and D0 Data

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An extension of the Standard Model of electro-weak interactions by an extra abelian gauge boson is given, in which the extra gauge boson and the hypercharge gauge boson couple to an axionic scalar in a form that leads to a Stueckelberg mass term which is of topological origin. The theory leads to a massive Z prime whose couplings to fermions are uniquely determined and suppressed by small mixing angles. Such a Z prime could have a low mass and appear at colliders as a sharp resonance. The model also predicts a new unit of electric charge which in units of the electronic charge is in general irrational, in the coupling of the photon with hidden matter that is neutral under the Standard Model gauge group. It is shown that the Stueckelberg model satisfied the LEP electroweak constraints with the same precision as the Standard Model. The cumulative CDF and D0 data of nearly 475 inverse pico barns in the dilepton channel can be used as a probe of the Stueckelberg extension. It is shown that the signal from the Stueckelberg Z prime manifests in the region where the graviton of warped geometry is already excluded by the electroweak precision data and thus the Stueckelberg Z prime signal will be distinct. Prospects for its discovery at the Tevatron and at the LHC will be discussed.