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Proton decay from quark and lepton compositeness

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Within a chiral SU(15) gauge theory in which the Standard Model fermions are bound states of massless preons, we show that proton-decay operators are likely induced at the compositeness scale, $\Lambda_{\rm pre}$. Our estimate of the limit imposed by searches for proton decays is $\Lambda_{\rm pre} > 10^4$ TeV, dependent on an 8-prebaryon operator induced by SU(15) dynamics and the mass of a composite vectorlike quark. The latter has a lower limit related to the mass of a composite vectorlike lepton, which in turn is required by LHC searches to be above 1 TeV. We point out that exotic proton decay modes, into a π^+ and a heavy right-handed neutrino, could be observed using the Super-Kamiokande or DUNE detectors.

Authors: ASSI, Benoit; DOBRESCU, Bogdan (Fermilab)

Presenter: ASSI, Benoit

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