## Phenomenology 2025 Symposium



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## **Exploring Low-Scale Quark-Lepton Unification**

Tuesday 20 May 2025 17:00 (15 minutes)

We propose an  $E_6$  inspired Pati-Salam (PS) model that naturally accommodates multi-TeV leptoquark gauge bosons, X, with a softly broken discrete  $Z_2$  symmetry. Standard Model (SM) fermions are  $Z_2$ -even in this framework, whereas exotic fermions are  $Z_2$ -odd. An interesting feature of the model is that the PS gauge bosons are  $Z_2$ -odd, enabling them to couple exclusively between ordinary and exotic fermions, except in the down-type sector, where mixing arises due to the soft breaking of  $Z_2$ . This structure leads to helicity suppression of meson decays at the tree level, with unsuppressed contributions appearing only at the oneloop level, which allows a lower PS breaking scale. Such a scale offers exciting collider prospects, particularly for probing leptoquark gauge bosons, as well as the distinctive signature of a vector-like down-type quark carrying a fractional baryon number of  $-\frac{2}{3}$ .

## Mini Symposia (Invited Talks Only)

## Plenary (Invited talks only)

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