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The Leptoquark Hunter's Guide: Pair Production

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Leptoquarks occur in many new physics scenarios and could be the next discovery at the LHC. In this talk we point out that a model-independent search strategy covering all possible leptoquarks is possible and has not yet been fully exploited. To be systematic we organize the possible leptoquark final states according to a leptoquark matrix with entries corresponding to nine experimentally distinguishable leptoquark decays: any of {light-jet, b-jet, top} with any of { neutrino, e/mu; tau}. The 9 possibilities can be explored in a largely model-independent fashion with pair-production of leptoquarks at the LHC. We review the status of experimental searches for the 9 components of the leptoquark matrix, pointing out which 3 have not been adequately covered. We plead that experimenters publish bounds on leptoquark cross sections as functions of mass for as wide a range of leptoquark masses as possible. Such bounds are essential for reliable recasts to general leptoquark models. To demonstrate the utility of the leptoquark matrix approach we collect and summarize searches with the same final states as leptoquark pair production and use them to derive bounds on a complete set of Minimal Leptoquark models which span all possible flavor and gauge representations for scalar and vector leptoquarks.

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