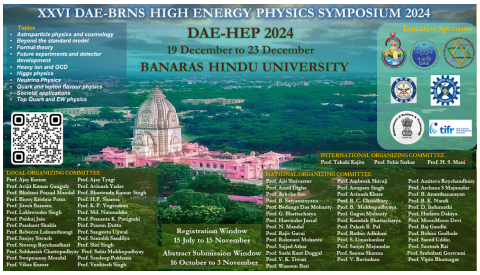

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Improved Exclusion Limits for Leptoquarks by incorporating additional production channels and associated BSM searches at the HL-LHC

Leptoquarks (LQs) offer a promising framework for exploring physics beyond the Standard Model (BSM). These particles, inspired by higher gauge theories like Pati-Salam and Grand Unified Theories, are currently being probed at the LHC, primarily through pair production (PP). Our study improves the LHC exclusion limits by including additional production modes like single productions, t-channel LQ exchange, and its interference with the Standard Model background, sometimes providing more substantial constraints than PP alone. We also account for model-independent production through mixed QCD-QED processes, which can significantly shift the exclusion limits based on the electric charge of the LQs. Furthermore, since LQs often arise alongside other BSM particles, such as vector-like fermions and right-handed neutrinos, we investigate the potential for strong production of these particles along with LQs at the HL-LHC, offering new perspectives on collider search strategies.

Field of contribution

Phenomenology

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