

## Revisiting jet vetos as handles on new physics

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The production of high-mass color-singlet systems in hadron collisions is universally accompanied by initial state QCD radiation that is predominantly soft with respect to the hard process scale and/or collinear with respect to the beam axis. At TeV-scale colliders, this contrasts with most backgrounds. Consequently, vetoing events with jets possessing large transverse momenta in searches for new color-singlet states can efficiently reduce non-singlet backgrounds, thereby increasing experimental sensitivity. To quantify this generic observation, we investigate the production and leptonic decay of extra gauge bosons at next-to-leading order (NLO) in QCD with parton shower (PS) matching. We demonstrate that jet vetoes applied to color-singlet processes can be reliably modeled at the NLO+PS level. We show how jet vetoes can increase the signal-to-noise ratios by roughly 10%-250% for  $W'$  boson searches (depending on the  $W'$  mass), and how dynamic jet vetoes can improve the sensitivity to sleptons independently of the integrated luminosity.

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