

## Color-octet scalars in Dirac gaugino models with broken $R$ symmetry

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We present a phenomenological investigation of color-octet scalars (sgluons) in supersymmetric models with Dirac gaugino masses that feature an explicitly broken  $R$  symmetry ( $R$ -broken models). We have constructed such models by augmenting minimal  $R$ -symmetric models with a set of supersymmetric and softly supersymmetry-breaking operators that explicitly break  $R$  symmetry. We have found new features that appear as a result of  $R$  symmetry breaking, including enhancements to extant decay rates, novel tree- and loop-level decays, and improved cross sections of single sgluon production. We have also explored constraints on these models from the Large Hadron Collider. We find that, in general,  $R$  symmetry breaking quantitatively affects existing limits on color-octet scalars, closing loopholes for light CP-odd (pseudoscalar) sgluons while perhaps opening one for a light CP-even (scalar) particle. Altogether, scenarios with broken  $R$  symmetry and two sgluons at or below the TeV scale can be accommodated by existing searches.

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