

# Supersymmetry with trilinear R-parity violation at the LHC

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Adding trilinear R-parity violating terms to a supersymmetric scenario, has large implications for collider phenomenology. We show that a large fraction of parameter space yields a scenario reminiscent of the standard MSSM but where the neutralino instead of escaping the detector, decays to standard model particles. This would give rise to spectacular multi-lepton and/or multi-jet events.

Since the neutralino can decay through any of the 45 trilinear R-parity violating terms allowed by gauge invariance, this allows us to study the hierarchy of these couplings.

The prospects of measuring these hierarchies are in general good; especially in the case of the purely leptonic LLE type operators, here invariant mass distributions allow us to measure all relevant couplings. For the semileptonic LQD type operators, the prospects are in most cases also very good. The more problematic couplings to measure, are those involving tau flavour and the ones with a third-generation Q operator. The latter case leads to neutralino decay to neutrino plus jets, for which the conclusive identification of the operator is difficult.

The UDD type operators will typically give three jets, but may in some cases lead to interesting signals, such as a top plus jets if the operator is of top flavour and the neutralino is sufficiently heavy.

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