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Reinterpretation of searches for supersymmetry in models with variable R-parity-violating coupling strength and long-lived R-hadrons

Many searches for supersymmetric particles are dedicated to either R-parity conserving (RPC) or R-parity violating (RPV) scenarios with prompt decays. However, a large range of coupling strengths are allowed, ranging from 0 (RPC limit) to theoretically estimated maximal values of order one. Varying these values over the entire possible range allows coverage of a rich phenomenology which can be mapped onto a simplified model spectrum. These simplified models represent a transition from RPC scenarios with decays into final states with SM particles and a stable lightest supersymmetric particle (LSP), via intermediate scenarios including long-lived LSP due to moderate values of RPV coupling strength resulting in displaced final states, to prompt RPV decays of the LSP or other SUSY particles into SM-only final states. A reinterpretation of a selection of ATLAS SUSY analyses in simplified models with varying RPV coupling strength is performed to identify any potential gaps between the phase space covered by the dedicated RPC and RPV SUSY search program.

Displaced signals, similar to final states in scenarios with moderate λ'' can also emerge from Split SUSY inspired models, where gluinos can be long-lived massive particles hadronising into colourless bound states - the so-called R-hadrons - before decaying into quarks and the LSP. Depending on the lifetime of the gluino, its signature is very similar to the promptly decaying gluinos. Hence, the reinterpretation of long-lived gluino signals in the context of the ATLAS RPC 0L (2-6 jets + MET) SUSY analysis is of particular interest.

This poster presents the results of the reinterpretation of published ATLAS SUSY searches, originally designed for scenarios with either RPC or RPV with prompt LSP decays, in models with variable RPV coupling strength and with variable R-hadron lifetime.

Parallel Session

Supersymmetry: Models, Phenomenology and Experimental Results

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