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Searching for Physics Beyond The Standard Model: signals from R-parity breaking supersymmetry

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Supersymmetry is a very well motivated framework for physics beyond the standard model. Most of the analyses are carry out in R-parity conserving models, as for instance the Minimal Supersymmetric Standard Model (MSSM). In this context the lightest supersymmetric particle (LSP) is a good dark matter candidate. However, the fact that neutrino are massive, the absent of direct detection signals of dark matter, and the absent of missing energy signals at the LHC, motivates models without R-parity. In this context the expected signals at the LHC are more involved, for instance displaced-vertex analysis for LHC data are required.

We analyze possible detectable signals at the LHC for different LSP in R-parity breaking models, as also dark matter candidates detectable by indirect detection searches. We mainly work in the context of the mu-from-nu Supersymmetric Standard Model, or $\mu\nu$ SSM. This model includes right-handed neutrinos in the spectrum, opening the possibility of very interesting interpretations including a relation between R-parity breaking and neutrino physics.

Primary author: Dr LOPEZ-FOGLIANI, Daniel E. (IFIBA (UBA-CONICET))

Presenter: Dr LOPEZ-FOGLIANI, Daniel E. (IFIBA (UBA-CONICET))

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