Dark matter in a SUSY left-right theory

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A Left-Right symmetric model: QLR


SU(3)_C × SU(2)_L × SU(2)_R × U(1)_{B-L}

Symmetry breaking

Two steps breaking

SU(2)_R × U(1)_{B-L} → U(1)_Y

Low energy phenomenology

Many changes w.r.t. the CMSSM

Interesting perspectives for LFV (see Esteves et al. JHEP 1012 (2010) 077)

Deformed spectrum and invariant mass combinations. On the right:

Flavour contributions can reduce the \( \tau \) mass and enhance the \( \tilde{\chi}^0_1 - \tilde{\tau} \) coannihilation x-section. This leads to new DM regions where flavour effects are essential to obtain the correct relic density, see Chowdhury et al. arXiv:1104.4467.

\[
\begin{align*}
\text{m}_{\tilde{\chi}^0_1}^2 &= m_{\tilde{\tau}}^2 (1 - \delta) - m_\mu \tan \beta, \\
\delta &= \frac{\Delta \kappa}{m_{\tilde{\chi}^0_1}^2 m_{\tilde{\tau}}^2}
\end{align*}
\]

The QLR model has potentially large LFV in the R slepton sector and thus the DM constraint can also be fulfilled using the flavoured coannihilation solution.

On the left: \( \text{Br}(\mu \to e\gamma) \) and \( \Omega_{\text{DM}} h^2 \) in the \( m_0 - M_{1/2} \) plane.

A strong fine-tuning is required to reduce \( \text{Br}(\mu \to e\gamma) \) below the MEG limit (\( \text{Br} < 2.4 \cdot 10^{-12} \)).

Intermediate scales between the GUT and SUSY scales can have a very strong impact on the low energy spectrum and lead to a DM phenomenology totally different from the one in the CMSSM. In the QLR model we found that some standard DM regions can disappear due to the stronger running of gaugino mass parameters. We also found regions in parameter space where the correct relic density is obtained thanks to flavoured coannihilation.

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