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RPV from Discrete R Symmetries

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With LHC not observing superpartners,
minimal supersymmetric versions of the Standard Model (SM) are very constrained.
We consider supersymmetric extensions of the SM in which the
usual R or matter parity gets replaced by another R or non–R discrete symmetry
that explains the observed longevity of the nucleon and solves the μ problem of
MSSM. Such R-parity violating scenarios may lead to interesting phenomenology
and explain why superpartners have not been observed yet.
In order to identify suitable symmetries, we develop a novel method of
deriving the maximal Abelian Z(R)N symmetry that
satisfies a given set of constraints (such as those from anomaly freedom and phenomenology).
We identify R parity violating (RPV) and conserving models that are consistent with
precision gauge unification and also comment on their compatibility with a unified
gauge symmetry such as the Pati–Salam group. We shall also provide a counter–
example to the statement found in the recent literature that the lepton number
violating RPV scenarios must have μ term and the bilinear κ L Hu operator of
comparable magnitude. Finally, we will briefly comment on how
baryogenesis and certain baryon number violating processes may arise
within such simple models.

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