Abstract

When R-parity is conserved, the Lightest Supersymmetric Particle (LSP) is stable and can be considered as a candidate for Dark Matter (DM). Motivated by R-parity violation assisted leptogenesis scenario, we revisit DM problem within models that violate R-parity by a tiny amount. When the R-parity is broken, the LSP is no longer stable and can decay to the standard model particles. If the LSP is neutralino or slepton, even a tiny amount of R-parity violation will lead to a relatively rapid decay of the LSP so it cannot be a suitable DM candidate anymore . We consider the scenarios in which gravitino is LSP. The decay rate of the gravitino will be doubly suppressed by inverse powers of the Planck mass and the tiny R-parity violating parameters. Thus, the gravitino lifetime is typically much longer than the age of the universe. We explore the parts of the parameter space for which the total gravitino abundance corresponds to the observed dark matter abundance. We determine the part of parameter space for which the decay of Next to Lightest Supersymmetric Particle (NLSP) does not affect the prediction for big bang nucleosynthesis. We also evaluate the gravitino lifetime and contrast it with various bounds.