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Probing Muon g-2 with Sleptons at LHC and Dark Matter Experiments

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Inspired by the latest measurement of muon anomalous magnetic moment (muon g-2) by FermiLab we explore the implications about muon g-2 of supersymmetric grand unified theories (GUTs) in a class with non-universal gaugino masses at the GUT scale. The discrepancy between the Standard Model (SM) predictions and the experimental results in muon g-2 can be solved by the contributions from the supersymmetric particles, and the fundamental parameter space compatible with the muon g-2 solution typically favors light sleptons (<~ 800 GeV), charginos (<~ 900 GeV) and LSP neutralino (<~ 600 GeV). In addition to resolve the muon g-2 problem, these mass scales for sleptons, charginos and neutralinos are in reach of LHC currently, and it is expected to have a stronger impact from LHC-Run3. We find that the chargino mass can be probed up to about 600 GeV, and LHC-Run3 is expected to test chargino up to about 700 GeV. Even though there is no direct impact on the slepton masses, these experiments are able to probe the sleptons up to about 350 GeV. However, these scales depend on the handedness of light slepton states, and one can still realize solutions with lighter charginos when the lighter slepton is mostly right-handed. The strongest impact from chargino-neutralino productions is observed when LSP is Bino-like and the chargino is Wino-like, which leads to chargino-neutralino coannihilation scenario, even though the NLSP may happen to be a lighter slepton state. The spectra of SUSY particles involving relatively light chargino, slepton together with LSP neutralino yield also interesting results which can be tested at the current dark matter experiments. In this talk, we present prospects in probing the muon g-2 resolution together with sleptons and charginos at the upcoming LHC experiments and confront it with the current and projected results from the direct dark matter detection experiments.

Abstract

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