Contribution ID: **28** Type: **not specified**

A Simplified Dark Matter Model for Muon g-2 with Scalar Lepton Partners at the TeV Scale

Friday 10 September 2021 14:20 (20 minutes)

The E989 experiment at the Fermi National Laboratory (FNAL) reported a 4.2-sigma discrepancy between the measured magnetic dipole moment of the muon, and the prediction from the Standard Model (SM). Addressing this anomaly could require a proper accounting of QCD hadronic vacuum polarizations, or it might be a signal of new physics. In this talk, we shall take the latter approach and propose a minimal BSM framework, inspired by the MSSM. The extra particles and ingredients in our scheme are: (i) a Majorana fermion, which we shall refer to as the bino; (ii) left- and right-handed scalar particles, analogous to the sleptons, that couple, respectively, with the SU(2) second generation lepton doublet and right handed muon; (iii) a gaugino-like interaction between the bino, the sleptons, and the muon; and (iv) mixing with the left- and right-handed smuons through a trilinear coupling with the SM Higgs. The BSM contribution to this g-2 anomaly then proceeds at one loop level. Analogous with the R-parity in the MSSM, the model is invariant under a $\mathbb{Z}_2$ symmetry in which the SM/BSM states are even/odd. The bino, being the lightest BSM particle that is neutral under SM interactions, is a good DM candidate. We demonstrate that, in order to satisfy the g-2 anomaly, the viable mechanism for bino DM to reproduce the observed DM relic density is through coannihilations, which requires the next lightest BSM particle to be nearly degenerate with the bino; depending on the Higgs-slepton trilinear coupling, the bino mass can be as high as ˜TeV. Meanwhile, noting that the expected direct detection signal is mainly driven by anapole DM-nucleon interactions, we show that limits from future generation detectors are sensitive only for relative mass splittings below the percent level. Apart from the phenomenological constraints on this scenario, we have obtained limits from theoretical considerations. We show that more stringent limits on our framework, while respecting g-2 and the relic density limit, can be obtained from requiring a long-lived metastable electroweak vacuum than from perturbative unitarity.

Authors: ACUÑA, Jan Tristram (SISSA); STENGEL, Patrick (SISSA); ULLIO, Piero (SISSA)

Presenter: ACUÑA, Jan Tristram (SISSA)

Session Classification: CoCo