LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS (LEPP)

Theory Seminar

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B-physics anomalies: The bridge between R-parity violating Supersymmetry and flavoured Dark Matter

In recent years, significant experimental indications that point towards Lepton Flavour Universality violating effects in B-decays, involving $b \to c\tau\nu$ and $b \to s\ell^+\ell^-$ have been accumulated. A possible New Physics explanation can be sought within the framework of R-parity violating Supersymmetry, which contains the necessary ingredients to explain the anomalies via both leptoquark, tree-level exchange and one-loop diagrams involving purely leptonic interactions. In addition, an approximate U(2)^2 flavour symmetry, that respects gauge coupling unification, successfully controls the strength of these interactions. Nevertheless strong constraints from leptonic processes and Z boson decays exclude most of the relevant parameter space at the 2σ level. Moreover, R-parity violation deprives Supersymmetry of its Dark Matter candidates. Motivated by these deficiencies, we introduce a new gauge singlet superfield, charged under the flavour symmetry and show that its third-generation, scalar component may participate in loop diagrams that alleviate the above-mentioned tensions, while at the same time reproduce the observed relic abundance. We obtain an effective solution to both anomalies that is also fully consistent with the rich Flavour and Dark Matter phenomenology.

Wednesday, September 18, 2019
2:00pm
401 Physical Sciences Building