

R-parity violating sneutrino search in e-muon channel @ DZero

Three generations of leptons have been observed in the universal so far, namely charged electrons, muons and taus, and neutral neutrinos associated with each type

$$\begin{pmatrix} \nu_e \\ e^- \end{pmatrix} \quad \begin{pmatrix} \nu_\mu \\ \mu^- \end{pmatrix} \quad \begin{pmatrix} \nu_\tau \\ \tau^- \end{pmatrix}$$

Every lepton generation is described by a kind of additive flavour number, for example a value of +1 electronic number is assigned to the electron and the electronic neutrino, the anti-leptonic counterpart -1 and all the other particles 0. The lepton flavour number is assumed to conserve explicitly in the Standard Model of particle physics, for example, photon can convert into electron-positron pair $\gamma \rightarrow e^+e^-$, charge boson $W^+ \rightarrow e^+\nu_e$.

However, physicists believe that the Standard Model isn't complete, and any observation of lepton flavour violating or LFV interactions would be regarded as clear signal of new physics. In 1990s, the observation of neutrino oscillation implied LFV in neutral section of lepton family, and therefore inspired scientific motivation to search LFV in charge leptonic section.

In the framework of general R-parity violating supersymmetry or RPV extension of Standard Model, phenomenology group in University of Science and Technology of China (USTC) proposed a hypothesis that heavy sneutrino particles, 0-spin supersymmetric partners to "ordinary" neutrinos, could be singly produced at the Tevatron collider described by RPV coupling parameters λ' , and would promptly decay into electron-muon final states dominated by RPV couplings λ . For reference, see [Commun. Theor. Phys. 44\(2005\)107](#). The idea was first endorsed by CDF experiment, at Fermi National Accelerator Laboratory (FNAL). And a team of USTC physicists working on DZero experiment, another experiment on Tevatron collider at FNAL, have recently accomplished the search for sneutrino via high-mass pair of an electron and a muon with high transverse momentum. With about one inverse femtobarn of data taken by DZero experiment, no excess in highmass electron-muon pair from the Standard Model prediction is observed, and thus jointed constraints on sneutrino mass and RPV couplings are derived. This result is the most stringent direct limit to date, and was reported by [Fermilab Today Mar. 13,2008](#).