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Sneutrino-antisneutrino mixing at future colliders

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Sneutrino-antisneutrino mixing occurs in a supersymmetric model where neutrinos have nonzero Majorana masses. This can lead to the sneutrino decaying into a final state with a “wrong-sign charged lepton”. In an $e^- \gamma$ collider, the signal of the associated production of an electron-sneutrino and the lighter chargino and the subsequent decays can be $e^- \gamma \rightarrow e^+ \tilde{\tau}_1^- \tilde{\tau}_1^- + \cancel{p\cancel{t}}$ where the $\tilde{\tau}_1$ s are long-lived and can produce heavily ionizing charged tracks. This signal is free of any Standard Model background and the supersymmetric backgrounds are small. Such a signal can be experimentally observable under certain conditions which are possible to obtain in an anomaly-mediated supersymmetry breaking (AMSB) scenario [1]. At the LHC, sneutrino-antisneutrino mixing can result in a like-sign dilepton signal either through direct sneutrino production or through squark and gluino production. The mixing can also be probed through sneutrino-slepton production. However, in an AMSB scenario, the number of like-sign dilepton signals through sneutrino oscillation is quite small, and backgrounds present a problem for the detectability [2].

[1] T. Honkavaara, K. Huitu, S. Roy, Phys. Rev. D73, 055011 (2006).

[2] D.K. Ghosh, T. Honkavaara, K. Huitu, S. Roy, in preparation.

Primary author: Mr HONKAVAARA, Tuomas (Helsinki Institute of Physics)

Co-authors: Dr GHOSH, Dilip (University of Delhi); Prof. HUITU, Katri (Helsinki Institute of Physics and University of Helsinki); Prof. ROY, Sourov (Indian Association for the Cultivation of Science)

Presenter: Mr HONKAVAARA, Tuomas (Helsinki Institute of Physics)

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