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RESEARCH DESCRIPTION

The LHC is the one of the most anticipated experiment of our times. However, it is also perhaps the most challenging experiments in terms of the interpretation of the data once it comes out. This is mainly because many different models could give similar signals at the LHC. This is true even if one considers just one framework of new physics like supersymmetry or extra-dimensions. This is called the LHC inverse problem. Most of the present day studies rely solely on the (expected) data from the LHC to reconstruct the new physics model. Furthermore they are restricted to models which are simplistic and classic. This is specifically true in the supersymmetric models.

We propose to use both direct and indirect methods together to understand the signatures from LHC. Using dark matter and flavour we believe would reduce drastically the degeneracies involved in the new physics frameworks like supersymmetric models. Further, we also propose to consider models like SUSY-GUTs and the Hybrid class of supersymmetry breaking. Preliminary work along this direction has already shown that dark matter patterns could be quite different in SUSY-GUTs compared to the popular mSUGRA model. In the case of Randall-Sundrum models, much work needs to be done in the classification of the models which could satisfy our three search strategies - flavour, dark matter and LHC.

This study would be new and would play a strong complimentary role to the LHC studies done else where in the country. Furthermore, hopefully it would also encourage further studies along these directions and for several other classes of models which have been left unexplored in the country - namely the Hybrid models and the SUSY-GUT models. Given that LHC is hopefully going to run for another 10 years or so, we hope to continue these studies as long as the LHC runs and would extract enough information about the new physics, using such complementarity.

SELECTED PUBLICATIONS

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Four Generations: SUSY and SUSY Breaking, Godbole, S. Vempati and A. Wingerter, JHEP 1003 (2010) 023.

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SUSEFLAV : A program for calculating supersymmetric spectra and lepton flavour violation, D. Chowdhury, R. Garani and S. Vempati, arXiv. 1109.3551 [hep-ph]