Monte Carlo simulation of production of squarks in proton-proton collisions to $\sqrt{s}$ =7 TeV

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Abstract

I present a study in order to determine the possibility of finding supersymmetric signals in p-p collisions at 7 TeV in the center of mass as could be to get in LHC experiments. I perform an analysis, in the *mSUGRA* model, of squarks with muons of different sign in the final state, jets and missing transverse energy. I compare with simulated events of *QCD* and $t\bar{t}$ with the same final states, using cuts and filters in order to reduce the background of the *Standard Model* and determine the fraction between the noise and the signal for the detection of squarks. I employ the mass region LM2 and use the Pythia and Geant4 packages, which allow to simulate the p-p collisions and a typical detector in the LHC experiments.

mSUGRA Parameters and Signal Simulated

Values of mSUGRA parameters in the range of mass LM2 [?]

m_0 (GeV)	$m_{1/2}$ (GeV)	tanβ	sign(μ)	A_0
185	350	35	+	0

Simulated signals and background

Signal	Number of Events	σ(pb)	Luminosity (pb^{-1})
SUSY LM2	150000	0.8565	175131.34851
QCD	500000	25470	19.63094
$t\bar{t}$	200000	94.3	2120.89077

Analysis of Jets

Kinematics cuts to selection of jets

Variable	Cut
p_T	$\geq$ 30 GeV
$\|\eta\|$	$\leq$ 2.4
Electromagnetic Fraction	$\geq$ 0.1

Número de jets

Sketch of the proof

Our proof is a generalization of a method used in unpublished notes by Ph. Laurençot and S. Mischler [6], inspired by the proof of uniqueness of solutions to the Becker-Döring equation in [7].

It is known that, under common assumptions, *there is always* at least weak convergence to a certain equilibrium state; the problem reduces to show that for an initial density under the critical one solutions converge *strongly* to the equilibrium *with the same density*. To prove this, it is enough to show that the tails of the solutions are small enough, so that strong convergence holds. The following estimate, roughly stated here, is the key of our proof:

Main estimate

If $c = \{c_j\}_{j\geq 1}$ is a solution to the generalized Becker-Döring equations with density below the critical one, then there is some sequence r_i (which tends to zero as $i \to \infty$) such that the tails of the solution have mass below r_i; this is,

$$\sum_{k=i}^{\infty} k c_k(t) \leq r_i$$

for all times t after some time t_0.

The proof of this consists mainly of an estimate obtained by differentiating the quantity $H_i := (G_i - r_i)_+$ (the positive part of $G_i - r_i$), proving with a differential inequality that it must remain zero for all times starting from a certain t_0.

References

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