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PRODUCTION OF SCALAR ELECTRONS AND Z^0-BOSON USING THE MSSM.

BY

MOHAMMED HASAN MOHAMMED SOLEIMAN

(B. Sc. in Physics)

THESIS

Submitted to Faculty of Science, Cairo University,
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ABSTRACT

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The main goals of this thesis are;

a] Solving the parameter space of the minimal supersymmetric extension of the standard model (MSSM) up to s-lepton sector.

b] Calculation of the interaction cross-section as a function of the center of mass energy (CME) for the process;

$$e^+e^- \rightarrow \tilde{e}_j^{\,+}\tilde{e}_j^{\,-}Z^0$$

Where j= 1 is the ordering-number of physical s-leptons.

The parameter space has been investigated at tree level in the frame of few physical assumptions as well as some proven arguments. The solution of the parameter-space is progressed according to a scheme that is suggested in this work. Mass spectrum of physical states SUSY partners as well as the transformation matrices are obtained up to slepton sector for two numerical instances, one instance at low value of $Tan\,\beta$, and the other at high value of $Tan\,\beta$. Specifically at $Tan\,\beta$ =3, and $Tan\,\beta$ =20.

The interaction cross-section is calculated over several interaction channels for the above process. The most probable channel is found to be that contains neutralinos $\chi_j^{\,o}$, $j=1,2,3,4$ and\or charged sleptons L_k, $k = 1,\ldots,6$. The interaction cross section is found to be about 274.3588 *pbarn* at the center of mass energy about 395.87 *GeV* for $Tan\,\beta$ =3.0, and 117.719 *pbarn* at the center of mass energy about 381.64 *GeV* for $Tan\,\beta$ =20.0. The neutralino masses are restricted by the model itself to be in the range from 43.5 *GeV* up to 206.9 *GeV*.

The Key words:

(1) Supersymmetry (SUSY)

(2) Minimal Supersymmetry Standard Model (MSSM)

(3) Parameter-space

(4) Higgs-Sector

(5) Chargino-Sector

(6) Neutralino-Sector

(7) Scalar-Leptons (sleptons)-Sector

(8) Physical mass

(9) Mass-Spectrum

(10) Interaction Channels

(11) Mass of the Least Supersymmetric Particle (M_{LSP})

(12) Partial Cross-section

(13) Feynman diagram-Multiplicity

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