

## THE INFORMATION OF MASTER THESIS

1. Student's name: **Nguyen Thi Yen**
2. Sex: Female
3. Date of birth: 04/01/1987
4. Place of birth: Khanh Thien – Yen Khanh - Ninh Binh
5. Decide to confirm student No: 3568/QĐ-CTSV December 31<sup>st</sup>, 2009 of Natural Science University- Hanoi National University.
6. Changes in training process:
7. Thesis Title:

### **“The sparticle’s scattering Process”**

8. Major (specialties): Theoretical Physic and Mathematical Physic.
9. Code: 60 44 01
10. Supervisor: Pham Thuc Tuyen, PhD. - Natural Science University- Hanoi National University.
11. Summarize the Thesis's outcomes:
  - Presented the basic concepts of Super Symmetry, or SUSY to conclude that Larginian interact between particles and particles ,particles and sparticles, and sparticles together.
  - Summarized the features of scattering problems, necessary formulas for calculation such as: S-matrix, the significant of S- Matrix, a full-scattering cross section , differential scattering cross section ...

$$S_{fi} = \delta_{fi} + i(2\pi)^4 \delta^4(p_f - p_i) \mathcal{M}_{fi} \quad (1)$$

$$\sigma = \int d\sigma = \frac{1}{4|p|W} \frac{1}{(4\pi)^2} \frac{|p|}{W} \int |\mathcal{M}_{fi}|^2 d\Omega \quad (2)$$

differential scattering cross section in centered block reference system :

$$\left. \frac{d\sigma}{d\Omega} \right|_{CM} = \frac{1}{(8\pi W)^2} |\mathcal{M}_{fi}|^2 \quad (3)$$

- Calculated a scattering process ( $e^+e^- \rightarrow \tilde{\gamma}\tilde{\gamma}$ ) in which, there were the participation of partner particles, that was the process of producing photino pair in the accelerator LEP, in which electron and positron would destroy each other.

The outcome of scattering process  $e^+e^- \rightarrow \tilde{\gamma}\tilde{\gamma}$  was:

+ Wrote the interactive Lagrangian for scattering process  $e^+e^- \rightarrow \tilde{\gamma}\tilde{\gamma}$ :

$$\mathcal{L}_{\text{int}} = \sqrt{2}g \sin \theta_w \left[ \tilde{\gamma} P_L e \tilde{e}_L^* + \bar{e} P_R \tilde{\gamma} \tilde{e}_R + \tilde{\gamma} P_R e \tilde{e}_R^* + \bar{e} P_L \tilde{\gamma} \tilde{e}_L \right] \quad (4)$$

+ Calculated S-Matrix

$$\sum_{\text{spin}} |M_b|^2 = \frac{4e^4}{(\tilde{M}_{eR}^2 - t)^2} (t - \tilde{M}_\gamma^2 - m_e^2)^2 \quad (5)$$

$$\sum_s |M_d|^2 = \left[ 4e^2 (u - \tilde{M}_\gamma^2 - m_e^2) \right] / (\tilde{M}_\gamma^2 - u)^2 \quad (6)$$

$$-2 \sum_s M_b M_d^* = \frac{-e^4}{2(\tilde{M}_{eR}^2 - t)(\tilde{M}_{eR}^2 - u)} \bar{u}(k_1)(1 + \gamma_5)u(p_1)\bar{v}(p_2) \quad (7)$$

$$(1 - \gamma_5)v(k_2) \times \bar{u}^*(k_2)(1 + \gamma_5)u^*(p_1)\bar{v}^*(p_2)(1 - \gamma_5)v^*(k_1)$$

$$-2 \sum_s M_b M_d^* = \left[ \frac{-4e^4 \tilde{M}_\gamma^2}{(\tilde{M}_{eR}^2 - t)(\tilde{M}_{eR}^2 - u)} \right]^2 \times \text{Tr} \left[ (1 - \gamma_5) \not{p}_1 \not{p}_2 \right] \quad (8)$$

$$= \left[ -8e^4 \tilde{M}_\gamma^2 (s - 2m_e^2) \right] / (\tilde{M}_{eR}^2 - t)(\tilde{M}_{eR}^2 - u)$$

+ Calculated the differential cross section of the scattering process  $e^+e^- \rightarrow \tilde{\gamma}\tilde{\gamma}$

$$\frac{d\sigma}{d\Omega} = \frac{\alpha^2}{4s} \left( \frac{s - 4\tilde{M}_\gamma^2}{s - 4m_e^2} \right)^{\frac{1}{2}} \times \left[ \left( \frac{t - \tilde{M}_\gamma^2 - m_e^2}{\tilde{M}_e^2 - t} \right)^2 + \left( \frac{u - \tilde{M}_\gamma^2 - m_e^2}{\tilde{M}_e^2 - u} \right)^2 + \frac{16m_e^2 \tilde{M}_\gamma^2 - 2s(\tilde{M}_\gamma^2 + m_e^2)}{(\tilde{M}_e^2 - t)(\tilde{M}_e^2 - u)} \right] \quad (9)$$

$$\frac{d\sigma}{d\Omega} = \frac{\alpha^2 s}{8\widetilde{M}_e^4} \left(1 - \frac{4\widetilde{M}_\gamma^2}{s}\right)^{\frac{3}{2}} (1 + \cos^2 \theta) \quad (10)$$

The selection the scattering process producing sparticles from the destruction  $e^+e^-$  pair is in the plan. At the present, although we have big colliders ( LHC), the data collected from the accelerator lepton (LEP) are still splendid and play an important role in searching and confirming the conclusions of SUSY. Moreover, the accelerators also reach a non-small energy scale (level 1  $TeV$ ), thus, all of theoretical calculation can be checked in these centers.

Clearly, the scattering cross section of process  $e^+e^- \rightarrow \tilde{\gamma}\tilde{\gamma}$  is not 0 and so, we have opportunities to study the effect of sparticles' existence if we think about the positive process.

We get the expression No 8 when we ignore the volume of electron. However, this expression is small and limited; it means the volume of selectron is not small. If the Super Symmetry existed, it was violated.

The dependence of scattering cross section on fraction  $\left(1 - 4\widetilde{M}_\gamma^2 / s\right)^{3/2}$  not  $\left(1 - 4\widetilde{M}_\gamma^2 / s\right)^{1/2}$  proves that, the state of  $\tilde{\gamma}\tilde{\gamma}$  is the state  $P$  which is suitable with conclusion that photino is particles with spin 1/2.

12. The capacity of applying in practical (If there is anyone)

13. The direction of following studies: (If there is anyone)

14. Published studies related to the Thesis:

*Month 12 Day 18 Year 2011*

**Student**

***Nguyen Thi Yen***