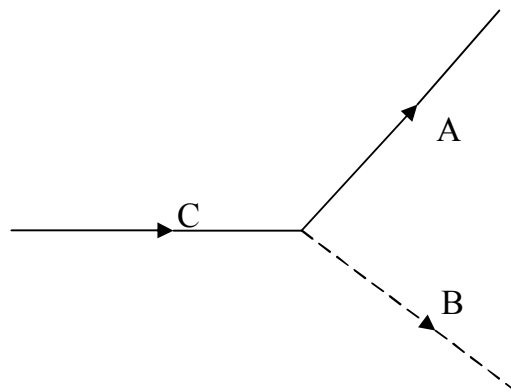


INFORMATION ON MASTER'THESIS

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2. Sex: Male
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5. Admission decision number: 3568/QD -CTSV Dated 31/12/2009
6. Changes in academic process: No
7. Official thesis title: ***“super particles decay process”***
8. Major: The theoretical physics and mathematical physics 9. Code: 604401
10. Supervisors: ***Dr. Pham Thuc Tuyen***. Department of theoretical physics, Hanoi University of Science.
11. Summary of the finding of the thesis:

In this thesis we have presented some calculations of some decay processes of gluino which is gluon super partner. We consider the decay of a gluino to up quark, down quark and their super partner. The results of such calculations, if fully implemented, which will contribute to the determination of the search region for super partners in accelerators.

We established first the method for calculating the decay rate for the processes of the form $C \rightarrow A + B$ with the first order approximation schemes:



$$\Gamma = \frac{\tilde{g}^2}{8\pi} |\vec{p}|$$

Where:

$$|\vec{p}| = \left[m_A^4 + m_B^4 + m_C^4 - 2m_A^2 m_B^2 - 2m_B^2 m_C^2 - 2m_C^2 m_A^2 \right]^{1/2} / 2m_C$$

Since then, set the formula of the gluino decay rate in the channel $\tilde{g} \rightarrow u\bar{u}_L$ and $\tilde{g} \rightarrow t\bar{t}$:

$$\Gamma(\tilde{g} \rightarrow u\bar{u}_L) = \frac{\alpha_s}{4} \left(1 + \frac{m_u^2}{m_{\tilde{g}}^2} - \frac{m_{\bar{u}_L}^2}{m_{\tilde{g}}^2} \right) k(m_u, m_{\bar{u}_L}, m_{\tilde{g}})$$

With the process $\tilde{g} \rightarrow t\bar{t}$, Because the fields $\tilde{t}_{l,2}$ which correspond to the mass eigenstates are given in terms of the unmixed fields $\tilde{t}_{R,L}$:

$$\begin{pmatrix} \tilde{t}_1 \\ \tilde{t}_2 \end{pmatrix} = \begin{pmatrix} \cos\theta_t & -\sin\theta_t \\ \sin\theta_t & \cos\theta_t \end{pmatrix} \begin{pmatrix} \tilde{t}_L \\ \tilde{t}_R \end{pmatrix}$$

So we need to calculate amplitudes for both processes $\tilde{g} \rightarrow t\bar{t}_L$ and $\tilde{g} \rightarrow t\bar{t}_R$. Thus the results obtained will be slightly different than the process $\tilde{g} \rightarrow u\bar{u}_L$

$$\Gamma(\tilde{g} \rightarrow t\bar{t}_l) = \frac{\alpha_s}{4} \left[\left(1 + \frac{m_t^2}{m_{\tilde{g}}^2} - \frac{m_{\bar{t}_l}^2}{m_{\tilde{g}}^2} \right) + 2(-1)^{\theta_{\tilde{g}}} \sin 2\theta_t \frac{m_t}{m_{\tilde{g}}} \right] k(m_t, m_{\bar{t}_l}, m_{\tilde{g}})$$

Where:

$$\alpha_s = \frac{g_s^2}{4\pi}$$

$$k(m_1, m_2, m_3) = \sqrt{[m_1^4 + m_2^4 + m_3^4 - 2m_1^2 m_2^2 - 2m_2^2 m_3^2 - 2m_3^2 m_1^2]} / 2m_3$$

The formulas for decay rate of gluino into a quark and anti-quark is reasonable, because they are identical with the formulas for decay rate of gluino into two particles has been calculated previously.

There are of course many such two-body modes: these channels may be repeated for all the other flavor.

The decay rate of gluino in the energy scale of LEP accelerator ($k \approx 100\text{GeV}$) corresponding to the lifetime of order $\sim 10^{-25}\text{s}$. If taking into account the different decay channels then the lifetime of gluino is greater and the ability to detect it will be bigger.

Because of the gluino decay rate depends on the difference of square of the quark and squark mass. From the calculation results of the reactions that we will have information about the level of supersymmetry breaking.

The decay processes are product of high-energy collisions at the LEP, LEP2 collider, including reaction e^+e^- pairs cancel after being accelerated to great speeds.

12. Practical applicability: calculate properties of super-particles as decay rate, lifetime ... with the different energy scales. From that basis we can predict the energy region which may occur super particles and the characteristics of super particles to help search for sparticles in the accelerator.

13. Further research directions: Research the models of supersymmetric extensions with $N \geq 2$ and extend supersymmetric to the theory that contains gravity.

14. Thesis-related publications: No

Date: December 18th, 2011

Signature:

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