Errata

Erratum: Radiation zeros and a test for the g value of the τ lepton [Phys. Rev. D 29, 2652 (1984)]

M. L. Laursen, Mark A. Samuel, and Achin Sen

[S0556-2821(97)04217-3]

PACS number(s): 14.60.Fg, 13.35.Dx, 13.40.Em, 99.10.+g

The formula for yA in Eq. (8) has a typographical error. In the third line x^2y^2 should be x^2y. Thus Eq. (8) should read

$$\begin{aligned} yA = {} & \frac{8}{\Delta}[y^2(3-2y)+6xy(1-y)+2x^2(3-4y)-4x^3] \\ & +8[2x^3(1+2y)-xy(3-y-y^2)-x^2(3-y-4y^2)] \\ & +2\Delta[x^2y(6-5y-2y^2)-2x^3y(4+3y)] \\ & +2\Delta^2x^3y^2(2+y), \end{aligned}$$

$$\frac{A'}{4} = x^3y^2\Delta^2 + x^2y\Delta(2-2x-y)+2xy(1-x-y),$$

$$\frac{A''}{2} = x^2y^2\Delta(2x+y-2)+2x^2y(3-2y-2x).$$

The results of the paper are unchanged. The error was discovered by Sven von Dombrowski, whom we thank for pointing this out. This process is now of experimental interest at CLEO at CESR (Cornell) where approximately 1000 radiative τ events have been obtained.

0556-2821/97/56(5)/3155(1)/$10.00

Erratum: Production of leptoquark scalars in hadron colliders [Phys. Rev. D 40, 2869 (1989)]

Marc de Montigny and Luc Marleau

[S0556-2821(97)04117-9]

PACS number(s): 13.85.Qk, 99.10.+g

Equation (6) should read

$$\tilde{\sigma}_{gg}=\frac{\pi}{6\hat{s}}\left[\left(\frac{5}{8}+\frac{31}{4}\chi\right)\eta+(4+\chi)\chi\ln\left(\frac{1-\eta}{1+\eta}\right)\right].$$

This modifies slightly the gluon fusion contribution to the cross sections in the numerical estimates. For correct and more up to date estimates see Ref. [1]. The rest of the discussion remains unaffected.

[1] M. de Montigny, L. Marleau, and G. Simon, Phys. Rev. D **52**, 533 (1995).

0556-2821/97/56(5)/3156(1)/$10.00

Erratum: Rare decays of the top quark in the minimal supersymmetric model [Phys. Rev. D 49, 293 (1994)]

Chong Sheng Li, R. J. Oakes, and Jin Min Yang

[S0556-2821(97)04017-4]

PACS number(s): 14.65.Ha, 11.30.Pb, 12.10.Dm, 12.15.Ji, 99.10.+g

In Eq. (18), a term $O'^{L}_{ij}\tilde{M}_i\tilde{M}_jU_{i1}U^{*}_{j1}c_0$ should be added. In Eq. (27), 32 should be 32π. In Eq. (29), 1/2 should be 1/6. These typos do not affect the numerical results. We checked that the $tc\gamma$ and tcg vertices are gauge invariant; i.e., the form factor $F_1=0$ for both vertices.

0556-2821/97/56(5)/3156(1)/$10.00

Erratum: Supersymmetric scenarios with dominant radiative neutralino decay [Phys. Rev. D 55, 1399 (1997)]

Sandro Ambrosanio and Barbara Mele

[S0556-2821(97)04517-7]

PACS number(s): 14.80.Ly, 12.60.Jv, 99.10.+g

We have become aware that Eq. (3) in the original paper is not correct. Below are a few consequent revisions, which do not imply any changes in the numerical analysis, neither do they affect at all the conclusions of the paper.

Subsection II B should be revised as follows:

''When $\widetilde{\chi}_2^0$ and $\widetilde{\chi}_1^0$ tend to be degenerate in mass, the widths for the different $\widetilde{\chi}_2^0$ decay channels approach zero differently as the quantity $\epsilon\equiv(1-m_{\widetilde{\chi}_1^0}/m_{\widetilde{\chi}_2^0})$ vanishes. For the radiative decay, one has [6]

$$\Gamma(\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0\gamma) =\frac{g^2_{\widetilde{\chi}_1^0\widetilde{\chi}_2^0\gamma}}{8\pi}\frac{(m^2_{\widetilde{\chi}_2^0}-m^2_{\widetilde{\chi}_1^0})^3}{m^5_{\widetilde{\chi}_2^0}} \underset{\epsilon\to 0}{\sim} \frac{g^2_{\widetilde{\chi}_1^0\widetilde{\chi}_2^0\gamma}}{\pi}m_{\widetilde{\chi}_2^0}\epsilon^3, \quad (1)$$

where $g_{\widetilde{\chi}_1^0\widetilde{\chi}_2^0\gamma}\propto eg^2/16\pi^2$ is an effective coupling arising from the one-loop diagrams in Fig. 1 (in general a complicated function of all the masses and couplings to neutralinos of the particles circulating in the loops).

On the other hand, the three-body direct tree-level decays receive contributions from either Z^0-exchange graphs or sfermion-exchange graphs. The former ones, involving the Higgsino components only, in the limit of small ϵ and massless standard fermions f, lead to a total width of [6,17]

$$\sum_f \Gamma(\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0 f\overline{f})_{Z^0\ \mathrm{exch}} \underset{\epsilon\to 0}{\sim} \frac{g^4 C_w C_{\widetilde{H}}}{\pi^3}\frac{m^5_{\widetilde{\chi}_2^0}}{M_Z^4}\epsilon^5, \quad (2)$$

where $C_w\approx 10^{-2}$ and $C_{\widetilde{H}}$ is a number $\leqslant 1$, depending on the Higgsino content of the neutralinos (for pure Higgsinos, $f_{\widetilde{H}}=1$). Equation (2) implies a sum over colors and five (six) flavors of final-state quarks (leptons). A similar behavior is found for the sfermion-exchange graphs.[1] One has, for a single channel into a given $f\overline{f}$ pair, mediated by a left or right sfermion

$$\Gamma(\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0 f\overline{f})_{\widetilde{f}\ \mathrm{exch}} \underset{\epsilon\to 0}{\sim} \frac{g^4 C^{L,R}_{\widetilde{A}}}{\pi^3}\frac{m^5_{\widetilde{\chi}_2^0}}{m^4_{\widetilde{f}_{L,R}}}\epsilon^5, \quad (3)$$

where $C^{L,R}_{\widetilde{A}}$ is typically $\approx 10^{-2}$–10^{-1}, but can be slightly larger or much smaller, depending on the gaugino content of the neutralinos and on the specific channel considered. Yukawa couplings of the Higgsino components to $f\widetilde{f}$, as well as L-R mixings for the exchanged sfermions $\widetilde{f}$, are here coherently neglected, since we work in the massless f approximation and top (s)quarks are not involved in the problem, m_t being too heavy. As for the interference term of the Z^0- and sfermion-exchange graphs, we expect of course the same fifth-power behavior as in Eqs. (2) and (3). This implies that the ratio of the direct tree-level and the radiative decay widths tends to vanish as ϵ^2, when $\epsilon\to 0$ or $m_{\widetilde{\chi}_2^0}\to m_{\widetilde{\chi}_1^0}$. Note also that the presence of the small number C_w in Eq. (2) can partly compensate the additional factor of order α_{em} in Eq. (1). Hence, for neutralino masses of interest for present/near-future collider physics and for this work (where $m_{\widetilde{\chi}_{1,2}^0}\approx M_Z$), when $(m_{\widetilde{\chi}_2^0}-m_{\widetilde{\chi}_1^0})\sim 10$ GeV it is already possible for the radiative decay BR to receive a substantial factor of enhancement $\approx 10^2$, especially if the sfermion-exchange channels are suppressed for some dynamical reason.

At this point, it is important to stress that, when neutralinos are degenerate within less than about 10 GeV, the asymptotic formulas given above for $\Gamma(\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0 f\overline{f})_{Z^0,\widetilde{f}\ \mathrm{exch}}$ are no longer a valid approximation when m_f cannot be neglected with respect to $(m_{\widetilde{\chi}_2^0}-m_{\widetilde{\chi}_1^0})$, as in the case, e.g., $f=b$ or τ.

However, in the subtle kinematical regions around the various heavier m_f ''thresholds,'' the $\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0 f\overline{f}$ channels with lighter f's will dominate over the ones with $f=b,\tau,\ldots$. Hence, neglecting m_f everywhere and using Eqs. (2) and (3) summed over all nontop flavors, will have the net result of an overestimate of the total width for the $\widetilde{\chi}_2^0$ tree-level decays and an underestimate of $B(\widetilde{\chi}_2^0\to\widetilde{\chi}_1^0\gamma)$. The latter simplified treatment of the problem (which is the one we will adopt in all the following numerical analyses), however, is here justified by at least two good motivations. First, we have already seen that for $m_{\widetilde{\chi}_{1,2}^0}\approx M_Z$ and when

[1]As can be inferred, for instance, from the treatment of analogous channels for the gluino decay to a photino plus a quark pair, in Ref. [1].

0556-2821/97/56(5)/3157(2)/$10.00

$m_{\tilde{\chi}_2^0} - m_{\tilde{\chi}_1^0} \sim 10$ GeV $\simeq 2m_b$, that is close to the heaviest m_f ''threshold,'' the radiative decay BR can already receive a $\approx 10^2$ enhancement factor. This factor can be extracted directly from Eqs. (2) and (3), which in this region are still a reliable approximation. Second, considering values for neutralino masses and the difference $(m_{\tilde{\chi}_2^0} - m_{\tilde{\chi}_1^0})$ with a precision at the level of a few GeV or less, for a given set of input parameters, is not fully sensible when neglecting radiative-correction effects on the spectrum, as we do in this paper. (A more extensive discussion of this problem can be found at the end of this section.)

Having the above caveats in mind, we will not be concerned in the rest of the paper with fine behavior and subtle kinematical effects for neutralino mass differences at the level of several GeV or less. Nevertheless, we expect that the numerical analyses to be performed in the following are valid in most of the interesting cases. Even for very small $(m_{\tilde{\chi}_2^0} - m_{\tilde{\chi}_1^0})$, our identification of the parameter space regions where this can happen, and the result of a large $B(\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 \gamma)$ (with approximately the numerical value we will indicate) keep holding.

Regarding the cascade decays through light charginos, they are at least as kinematically suppressed as the normal direct three-body decays. Indeed, when $\epsilon \to 0$, the width of each of the two steps of the cascade decay has a fifth-power asymptotic behavior for $\epsilon_{1,2} \to 0$, where $\epsilon_{1,2} = (1 - m_{\tilde{\chi}_1^\pm}/m_{\tilde{\chi}_2^0})$, $(1 - m_{\tilde{\chi}_1^0}/m_{\tilde{\chi}_1^\pm})$. Furthermore, $\epsilon_{1,2} < \epsilon$, since $m_{\tilde{\chi}_1^0} < m_{\tilde{\chi}_1^\pm} < m_{\tilde{\chi}_2^0}$ must hold, for the cascade to take place. On the other hand, some of the channels for this class of decays will not be suppressed by possibly small couplings like the C's, in Eqs. (2) and (3). As for situations with very small neutralino or chargino mass differences, similar remarks as for the direct case above hold here.

Finally, the two-body decay into Higgs bosons cannot take place when the mass difference between the two lightest neutralinos is less than a few tens of GeV, because of the current experimental limits on m_{h^0} and m_{A^0} [19].

The conditions described in Subsecs. II A and II B can be translated into requirements on the SUSY parameters...'' then the published original text should be resumed, starting from two sentences before Eq. (4).

As a consequence of the above, the following slight changes should also be made:

Page 1403, line 45. The sentence ''In a sense . . . [cf. Eq. (3)].'' should read: ''In a sense, this is an optimization of the *kinematical*-suppression mechanism, since such a dynamical suppression of the contributions from the sfermion-exchange diagrams allows the fifth-power asymptotic behavior of the tree-level decay width and the ϵ^2 enhancement of $B(\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 \gamma)$ to get always effective for values of $(m_{\tilde{\chi}_2^0} - m_{\tilde{\chi}_1^0})$ at the level of 10 GeV or less [cf. Eqs. (1)–(3)].''

Page 1403, line 67. The paragraph should end as follows: '' . . . which drastically restricts the photon energy and also corresponds to a critical kinematical region, as discussed above.''

Page 1403, line 69. The paragraph should begin as follows: ''Note that, for nearly degenerate Higgsinos, the radiative corrections may actually spoil the enhancement mechanism or, at least, render the tree-level analysis rather inaccurate, even if one takes into account finite m_f effects.''

Page 1406. Sec. IV should begin as follows: ''As anticipated in Sec. II, when $\tilde{\chi}_1^0$ and $\tilde{\chi}_2^0$ are almost degenerate and $(m_{\tilde{\chi}_1^0} - m_{\tilde{\chi}_2^0})$ is smaller than about 10 GeV, for $m_{\tilde{\chi}_{1,2}^0} \approx M_Z$, the radiative decay is enhanced by a large, purely kinematical factor. The latter can actually turn out to be an overall factor, especially when the contribution of the sfermion exchange to the $\tilde{\chi}_2^0$ tree-level decays is suppressed. Hence, one has an optimization of this ''kinematical'' enhancement for heavy scalar masses and/or small gaugino components in $\tilde{\chi}_1^0$ and/or $\tilde{\chi}_2^0$, as can be inferred by comparing Eqs. (2) and (3). Indeed, after summing over flavors and colors in Eq. (3), if (some of) the $C_{\tilde{A}}^{L,R}$ are not far from 1 and/or (some of) the $\tilde{f}_{L,R}$ are not much heavier than about M_Z, the sfermion-exchange channels and the interferences can dominate in this regime. The net effect of this can be to slow down or even prevent the introduction of an effective kinematical enhancement, so that $B(\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 \gamma)$ might get large, if ever, only for neutralino mass differences smaller than a few GeV, which we know to be a potentially dangerous region to explore, at least in our approximations. Given the above considerations, the next step is to find out where in the SUSY-parameter . . . '' then the published original text should be resumed, starting from two sentences before Eq. (13).

Other minor revisions and typo corrections:

Page 1400, line 57. $\tilde{\chi}_1^0 \to \tilde{G}_\gamma$ was actually $\tilde{\chi}_1^0 \to \tilde{G}\gamma$, in the original text.

Page 1410, line 57. At the end of the paragraph add: ''Also, it is now possible to achieve interesting degeneracy scenarios for which the gaugino-mass unification holds and $M_{1,2}$ are in a range of interest for present collider physics.''

Page 1416, line 31. $(m_t/m_t)^2$ was actually $(m_{\tilde{t}}/m_t)^2$, in the original text.

Finally, it should be noted that the paper cited in Ref. [10] was already published, in Phys. Rev. D **55**, 1372 (1997), that is immediately before the paper here in discussion.

Erratum: Baryon magnetic moments and proton spin: A model with collective quark rotation [Phys. Rev. D 55, 2644 (1997)]

Massimo Casu and L. M. Sehgal

[S0556-2821(97)04317-8]

PACS number(s): 12.39.Jh, 12.38.Aw, 13.40.Em, 13.88.+e, 99.10.+g

(i) In the line below Eq. (1), and in Eq. (3), ''$\delta_{\rm EJ}$'' should read ''$9\,\delta_{\rm EJ}$.''

(ii) In Table I, in the column labeled ''Model AI,'' the entry ''$\mu_u = 2.17 \pm 0.09$'' should read ''$\mu_u = 2.39 \pm 0.06$.''

These misprints do not affect any result of the paper.

0556-2821/97/56(5)/3159(1)/$10.00