

leptoquark	decay	branching ratio	$\kappa 4\pi\alpha_{em}$
S_{1L}	$e^+\bar{u}$	50%	$\frac{g_{1L}^2}{2}$
S_{1R}	$e^+\bar{u}$	100%	$\frac{g_{1R}^2}{2}$
\tilde{S}_{1R}	$e^+\bar{d}$	100%	$\frac{\tilde{g}_{1R}^2}{2}$
S_3^+	$e^+\bar{d}$	100%	g_3^2
S_3^0	$e^+\bar{u}$	50%	$\frac{g_3^2}{2}$
R_{2L}^1	$e^-\bar{u}$	100%	$\frac{h_{2L}^2}{2}$
R_{2R}^1	$e^-\bar{u}$	100%	$\frac{h_{2R}^2}{2}$
R_{2R}^2	$e^-\bar{d}$	100%	$\frac{h_{2R}^2}{2}$
\tilde{R}_2^1	$e^-\bar{d}$	100%	$\frac{\tilde{h}_{2L}^2}{2}$

TABLE I. Leptoquarks that can be observed through their decays into a e^\pm and a jet and the correspondent branching ratios into this channel. We also show the relation between the leptoquark Yukawa coupling and the parameter κ used in PYTHIA.

Process	σ_{bare} (nb)	σ_{pair} (fb)
$q_i q_j \rightarrow q_i q_j$	$1.0 \cdot 10^2$	$4.8 \cdot 10^2$
$q_i \bar{q}_i \rightarrow q_k \bar{q}_k$	1.8	$1.2 \cdot 10^2$
$q_i \bar{q}_i \rightarrow gg$	1.6	2.3
$q_i g \rightarrow q_i g$	$6.2 \cdot 10^2$	$1.0 \cdot 10^3$
$gg \rightarrow q_k \bar{q}_k$	25.	$1.2 \cdot 10^3$
$gg \rightarrow gg$	$6.9 \cdot 10^2$	$5.5 \cdot 10^2$

TABLE II. Background processes included in the QCD class and their respective cross sections. To obtain σ_{bare} we required that the hard scattering process has $p_T > 100$ GeV; for σ_{pair} we further demanded that the e^\pm have $p_T > 50$ GeV.

Process	σ_{bare} (pb)	σ_{pair} (fb)	ϵ_{12}	ϵ_{123}
$q_i \bar{q}_i \rightarrow g\gamma$	74.	0.14	0	0
$q_i \bar{q}_i \rightarrow gZ$	95.	$9.2 \cdot 10^2$	1%	0.8%
$q_i \bar{q}_j \rightarrow gW^\pm$	$2.2 \cdot 10^2$	8.8	0	0
$q_i \bar{q}_i \rightarrow \gamma Z$	1.4	16.	0.6%	0.4%
$q_i \bar{q}_j \rightarrow \gamma W^\pm$	1.1	$6.6 \cdot 10^{-3}$	0	0
$q_i \bar{q}_i \rightarrow ZZ$	1.4	29.	0.8%	0.2%
$q_i \bar{q}_j \rightarrow ZW^\pm$	2.9	37.	1.2%	0.4%
$q_i \bar{q}_i \rightarrow W^+W^-$	6.8	38.	4.3%	4.3%
$q_i g \rightarrow q_i \gamma$	$6.1 \cdot 10^2$	3.5	0	0
$q_i g \rightarrow q_i Z$	$5.5 \cdot 10^2$	$5.4 \cdot 10^3$	0.8%	0.2%
$q_i g \rightarrow q_k W^\pm$	$1.4 \cdot 10^3$	$2.8 \cdot 10^2$	0.25%	0.25%

TABLE III. Background processes included in the electroweak class and their respective cross sections with the same cuts used in Table II. We also exhibit the fraction of events ϵ_{12} (ϵ_{123}) that survive the cuts C1 and C2 (C1, C2, and C3); see text.

Process	σ_{bare} (pb)	σ_{pair} (fb)	ϵ_{12}	ϵ_{123}
$q_i q_j \rightarrow tq_k$	40.	11.	0.85%	0.01%
$q_i \bar{q}_i \rightarrow t\bar{t}$	0.40	$2.0 \cdot 10^2$	0.40%	0.39%
$gg \rightarrow t\bar{t}$	$2.9 \cdot 10^2$	$1.4 \cdot 10^3$	75%	3.5%

TABLE IV. Background processes due to top quark production and their respective cross sections with the same cuts used in Table II. We also exhibit the fraction of events ϵ_{12} (ϵ_{123}) that survive the cuts C1 and C2 (C1, C2, and C3).

lq coupling	$M_{lq} = 500$ GeV	1000 GeV	1500 GeV	2000 GeV	2500 GeV
$e^\pm u$	$5.1 \cdot 10^2$	27.	4.1	0.98	0.29
$e^\pm d$	$2.9 \cdot 10^2$	14.	2.2	0.55	0.18

TABLE V. Total cross section in fb for the single production of a leptoquark that couples only to pair lq for several leptoquark masses. We required that the produced e^\pm have $p_T > 50$ GeV, and that the scattering process has $p_T > 100$ GeV.

process	$M_{lq} = 500 \text{ GeV}$	1000 GeV	1500 GeV	2000 GeV
$q\bar{q}$ fusion	86.	1.9	0.10	$2.7 \cdot 10^{-3}$
gg fusion	$4.9 \cdot 10^2$	6.3	0.25	$1.5 \cdot 10^{-2}$

TABLE VI. Total cross section in fb for the pair production of leptoquarks, requiring that the produced e^\pm have $p_T > 50 \text{ GeV}$, and that the hard scattering process has $p_T > 100 \text{ GeV}$.

$M_{lq} \text{ (GeV)}$	$\Delta M \text{ (GeV)}$
300	50
500	50
1000	150
1500	200
2000	200
2500	300

TABLE VII. Invariant mass bins used in our analyses as a function of the leptoquark mass.

leptoquark	$\mathcal{L} = 10 \text{ fb}^{-1}$	$\mathcal{L} = 100 \text{ fb}^{-1}$
S_{1L} and S_3^0	1.1	1.5
$S_{1R}, \tilde{S}_{1R}, R_{2L}^1, R_{2R}^2$, and \tilde{R}_2^1	1.3	1.7

TABLE VIII. 95% CL limits on the leptoquark masses in TeV that can be obtained from the search for leptoquark pairs for two integrated luminosities.

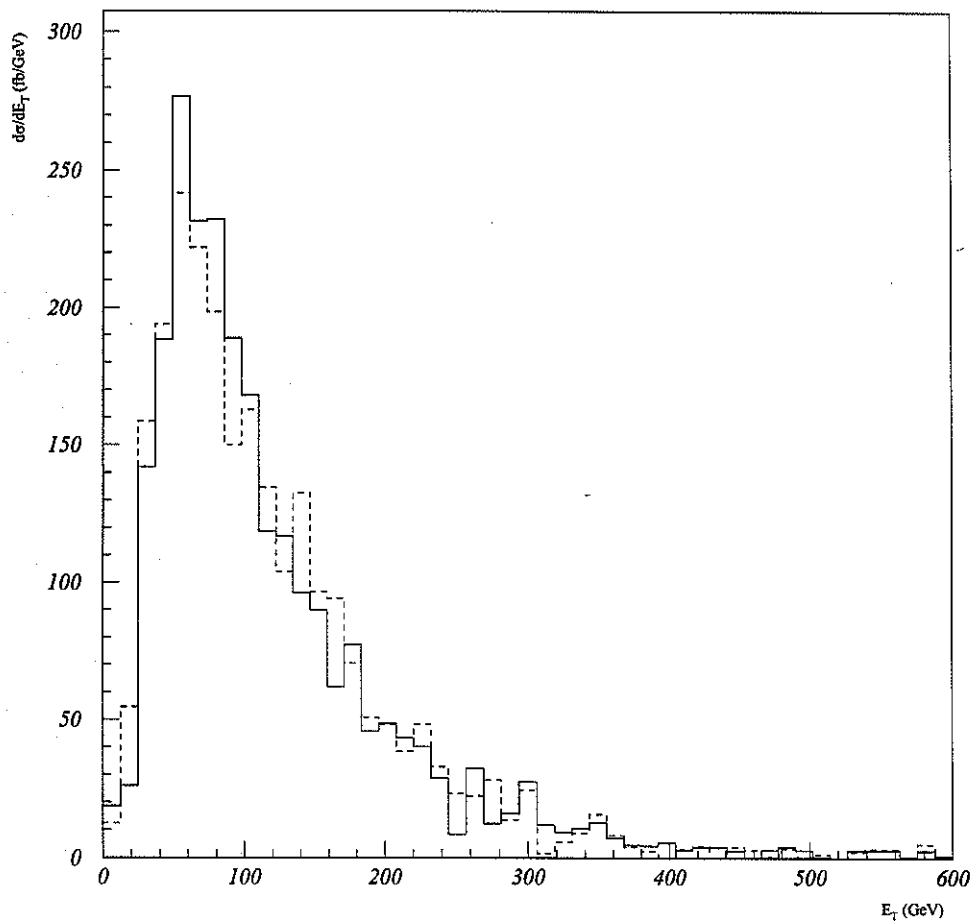


FIG. 1. Hadronic transverse energy deposited in a cone of size $\Delta R = 0.7$ around the direction of the e_1 (solid line) and the e_2 (dashed line) in QCD events.

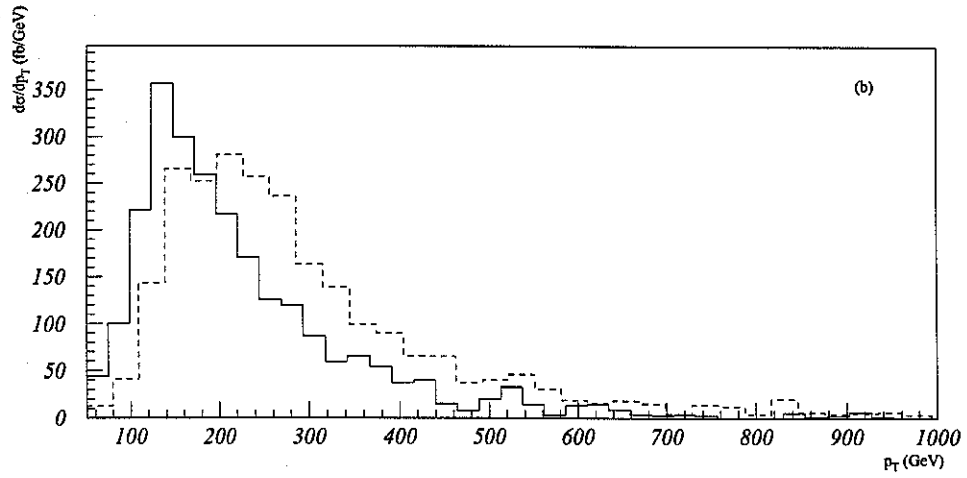
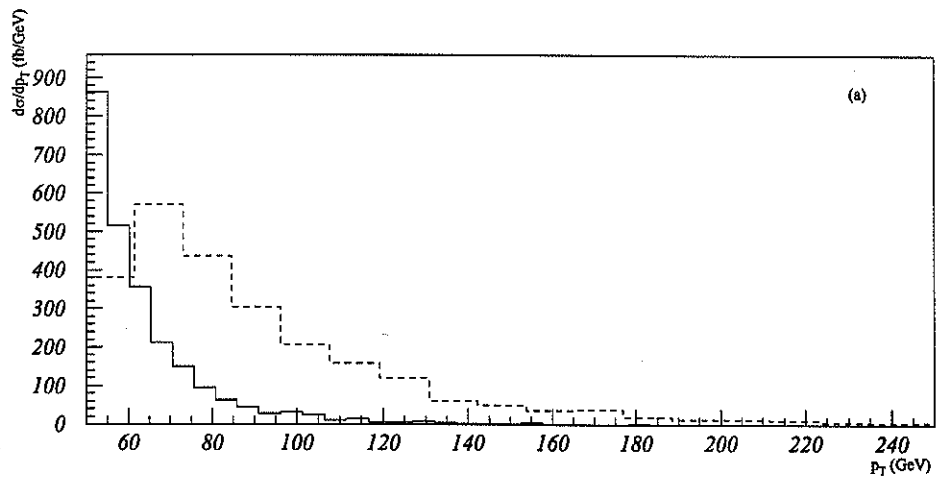


FIG. 2. For QCD events: (a) the dashed (solid) line stands for the p_T distribution of e_1 (e_2); (b) the dashed (solid) line stands for the p_T distribution of j_1 (j_2).

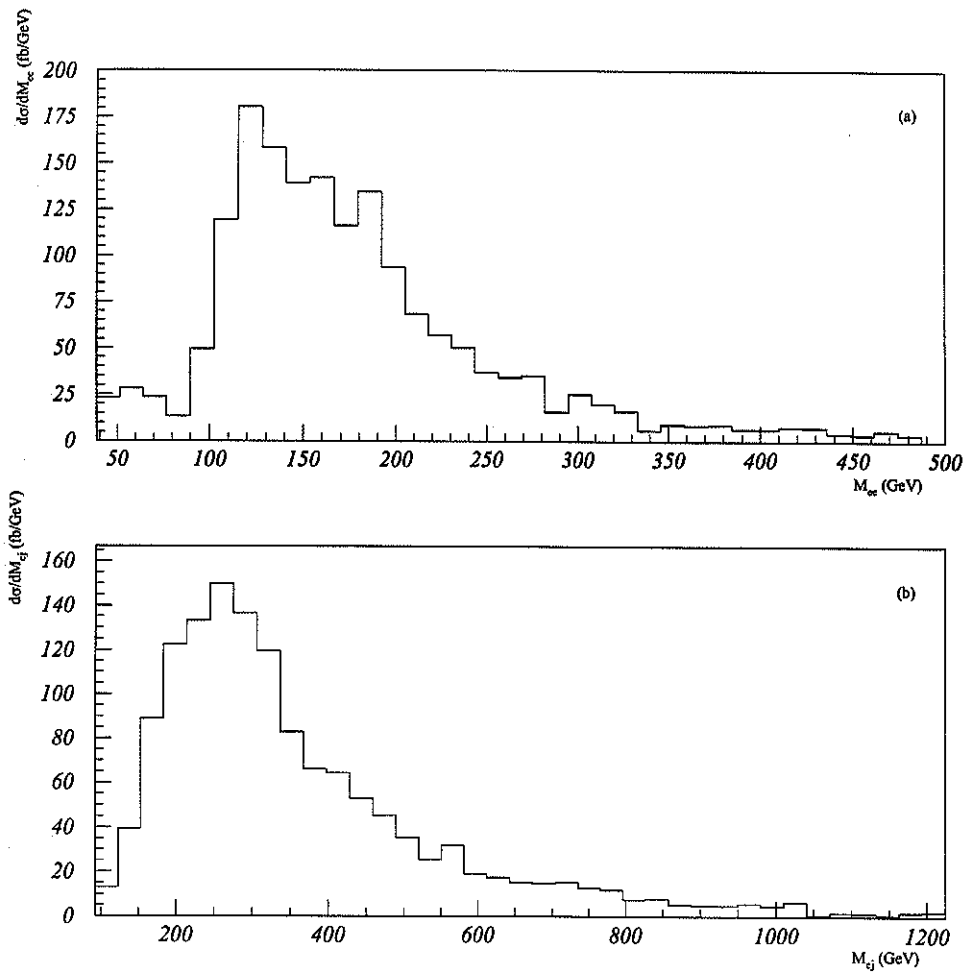


FIG. 3. For QCD events: (a) $e_1 e_2$ invariant mass distribution; (b) e^\pm -jet invariant mass spectrum adding the 4 possible combinations.

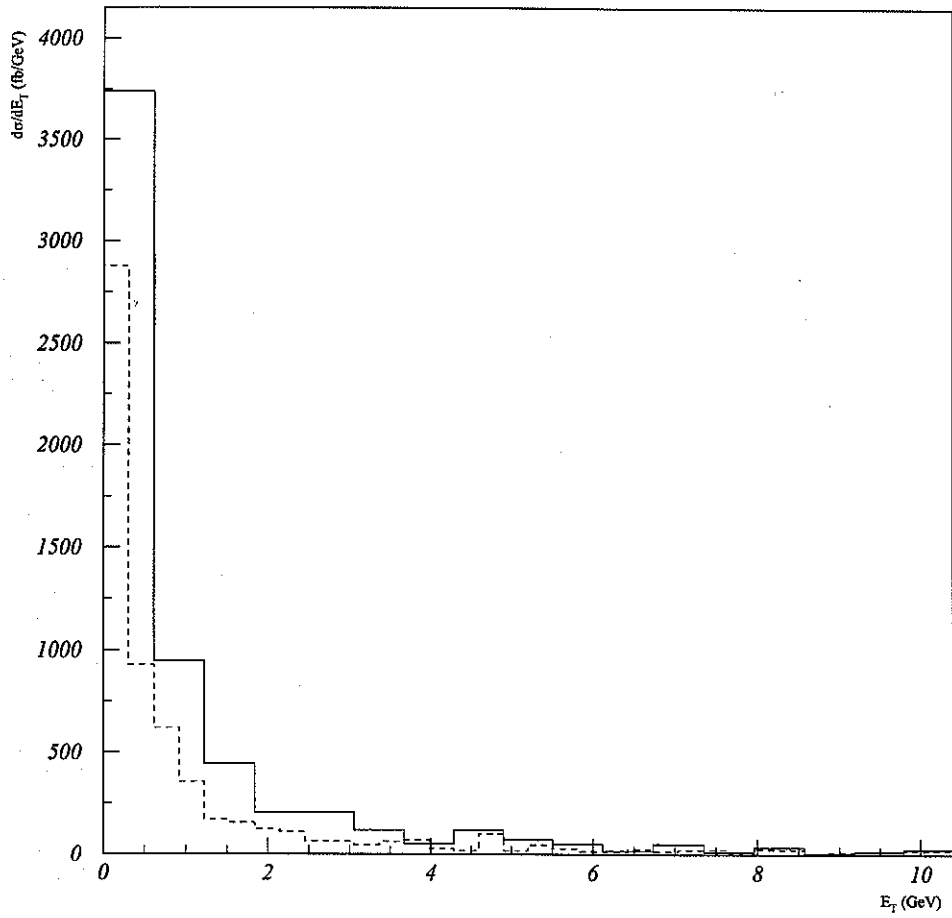


FIG. 4. The same distributions of Fig. 1 for electroweak events.

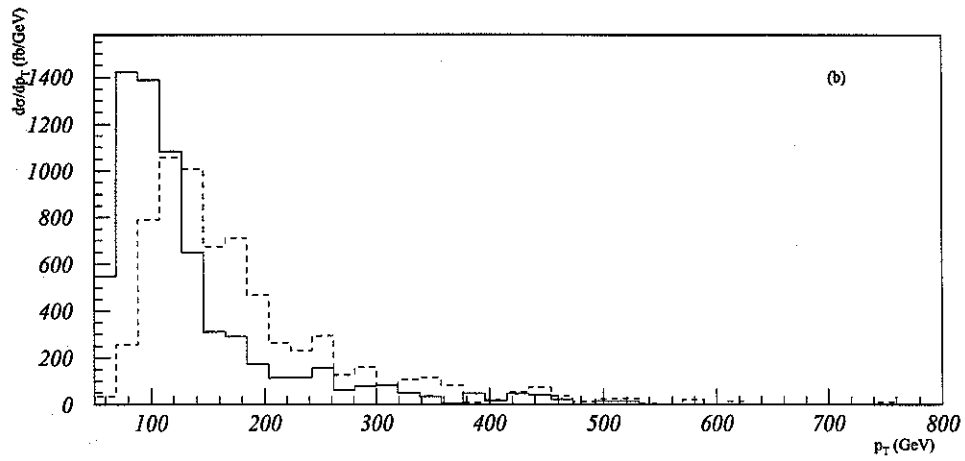
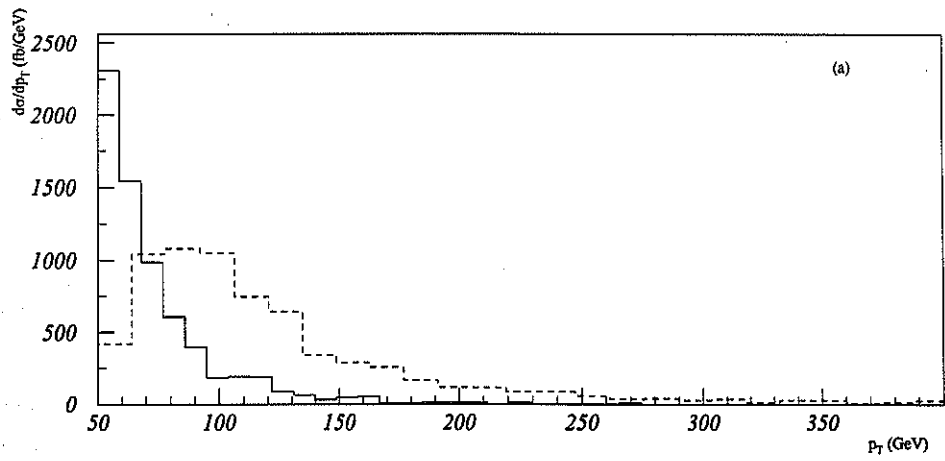


FIG. 5. The same distributions of Fig. 2 for electroweak events.

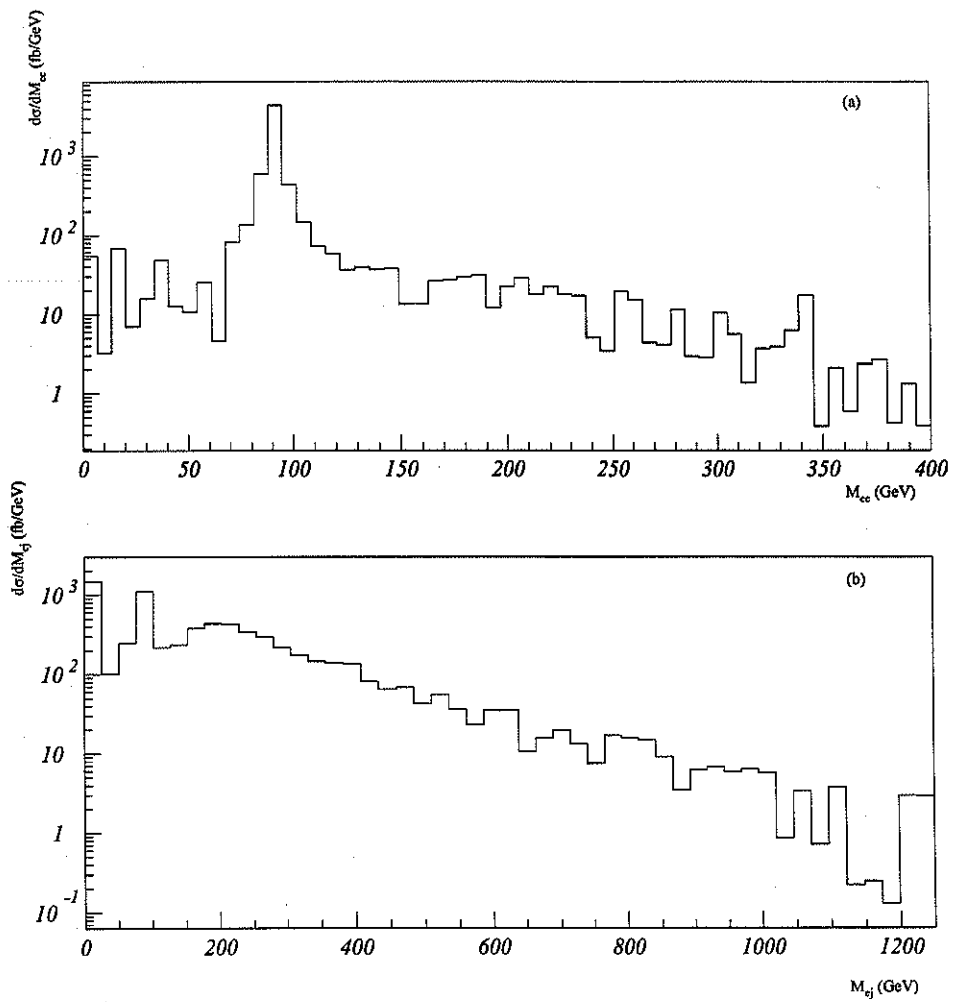


FIG. 6. The same distribution of Fig. 3 for electroweak events.

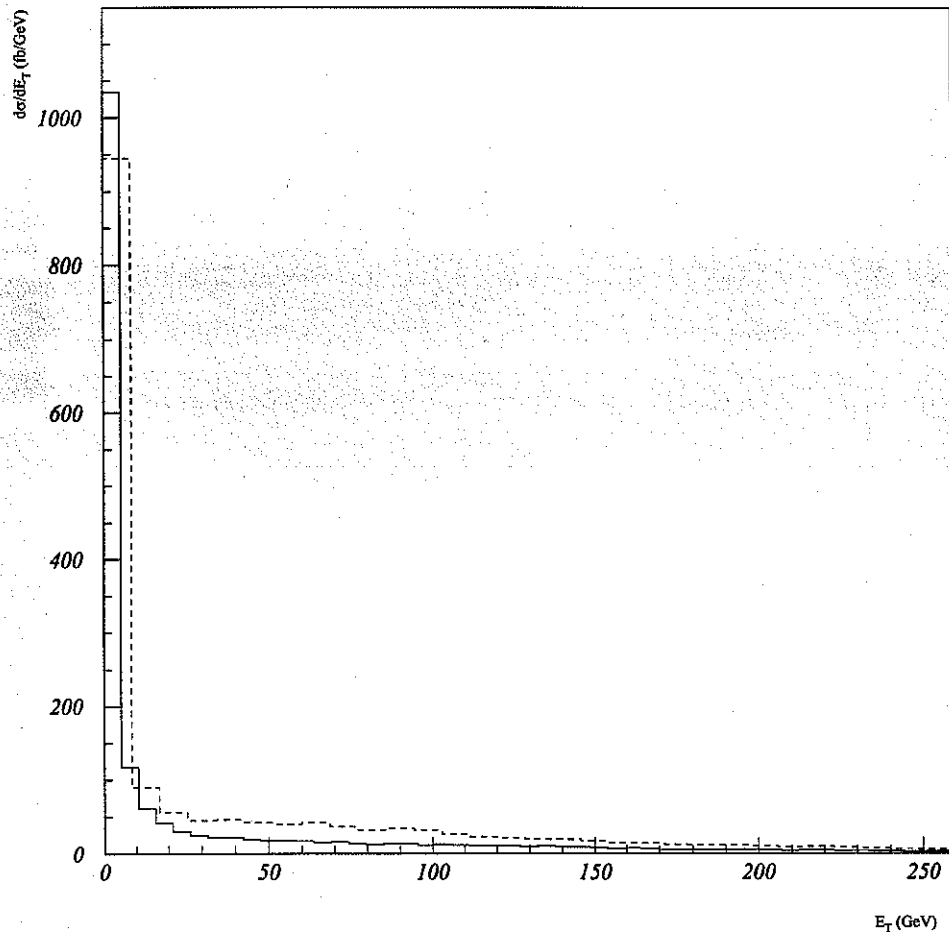


FIG. 7. The same distribution of Fig. 1 for top production.

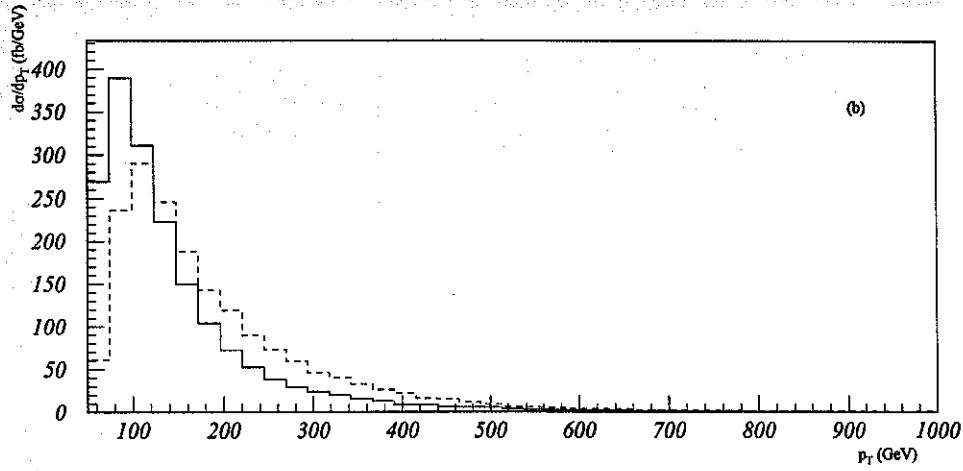
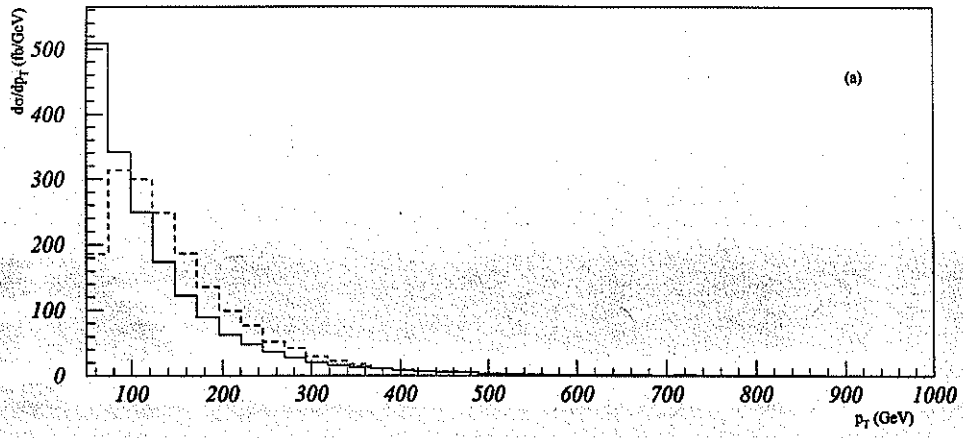


FIG. 8. The same distribution of Fig. 2 for top production.

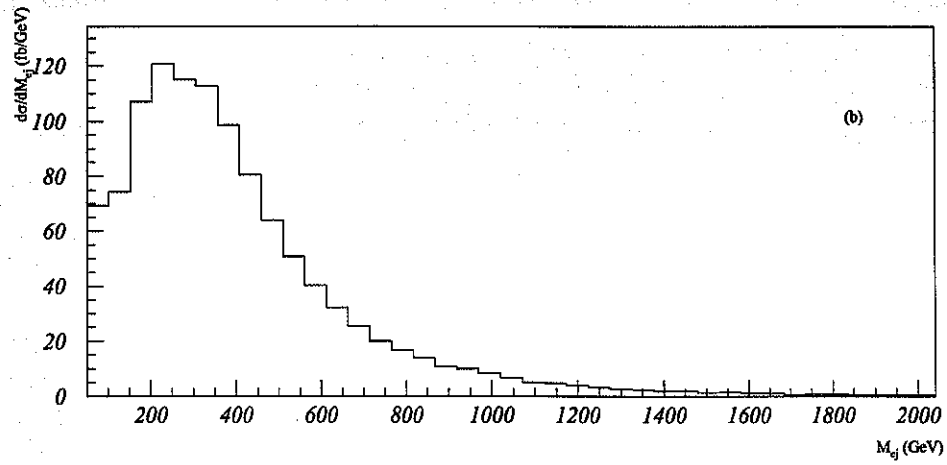
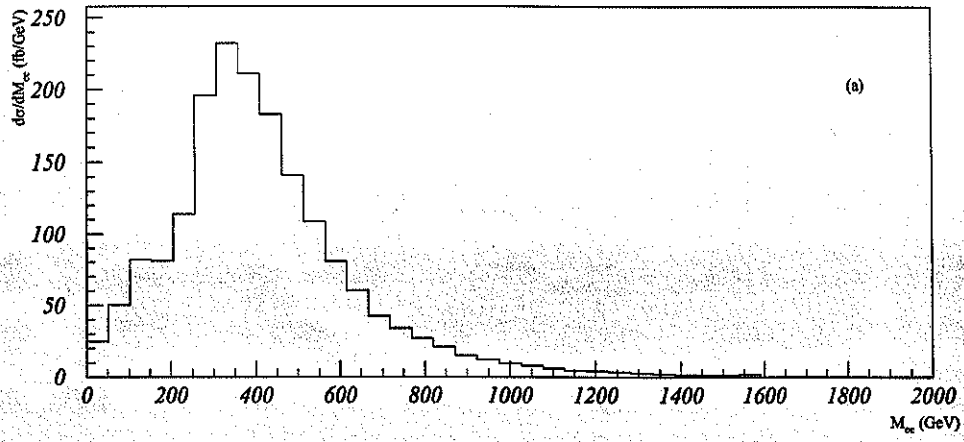


FIG. 9. The same distribution of Fig. 3 for top production.

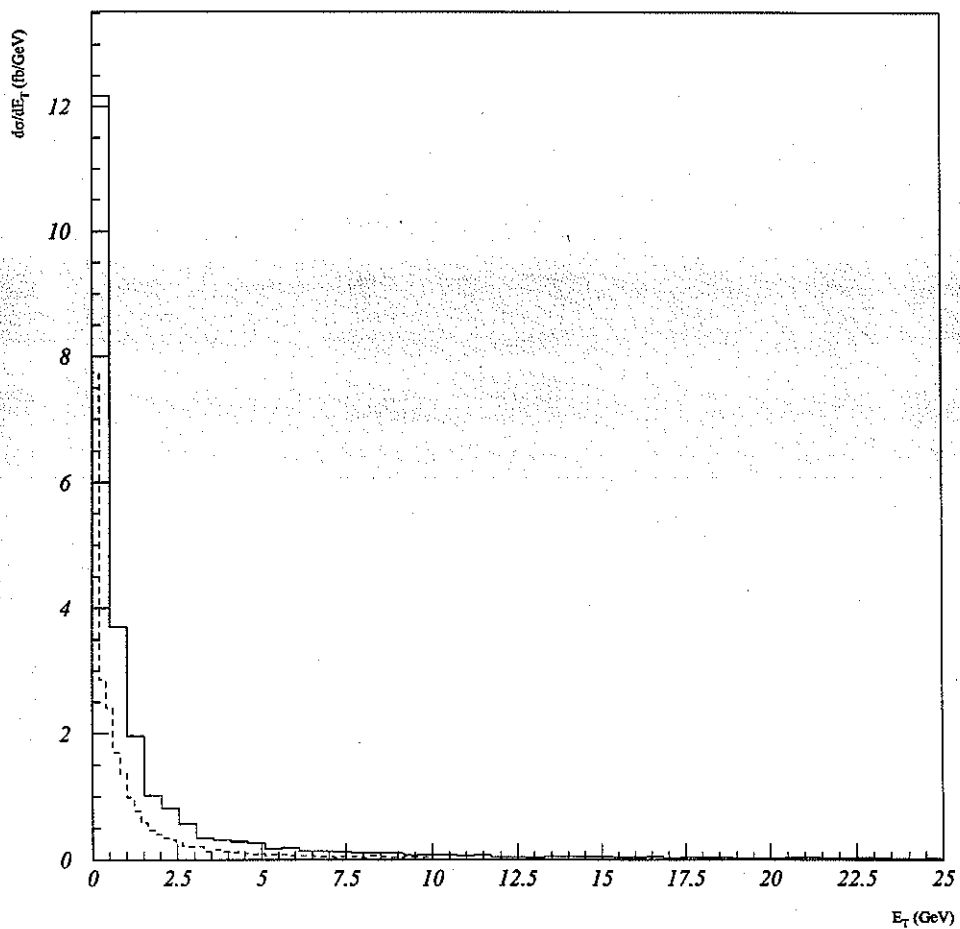


FIG. 10. The same distribution of Fig. 1 for the single production of $e^+\bar{u}$ leptoquarks of mass 1 TeV.

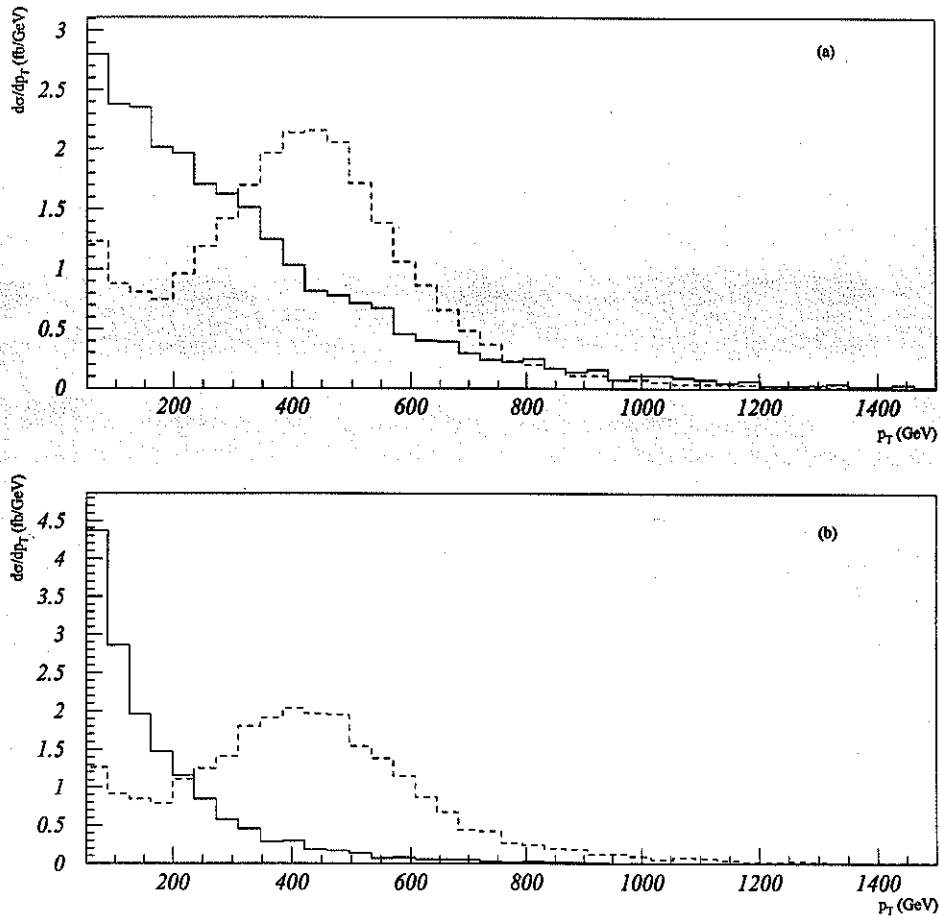


FIG. 11. The same distribution of Fig. 2 for the single production of $e^+\bar{u}$ leptoquarks of mass 1 TeV.

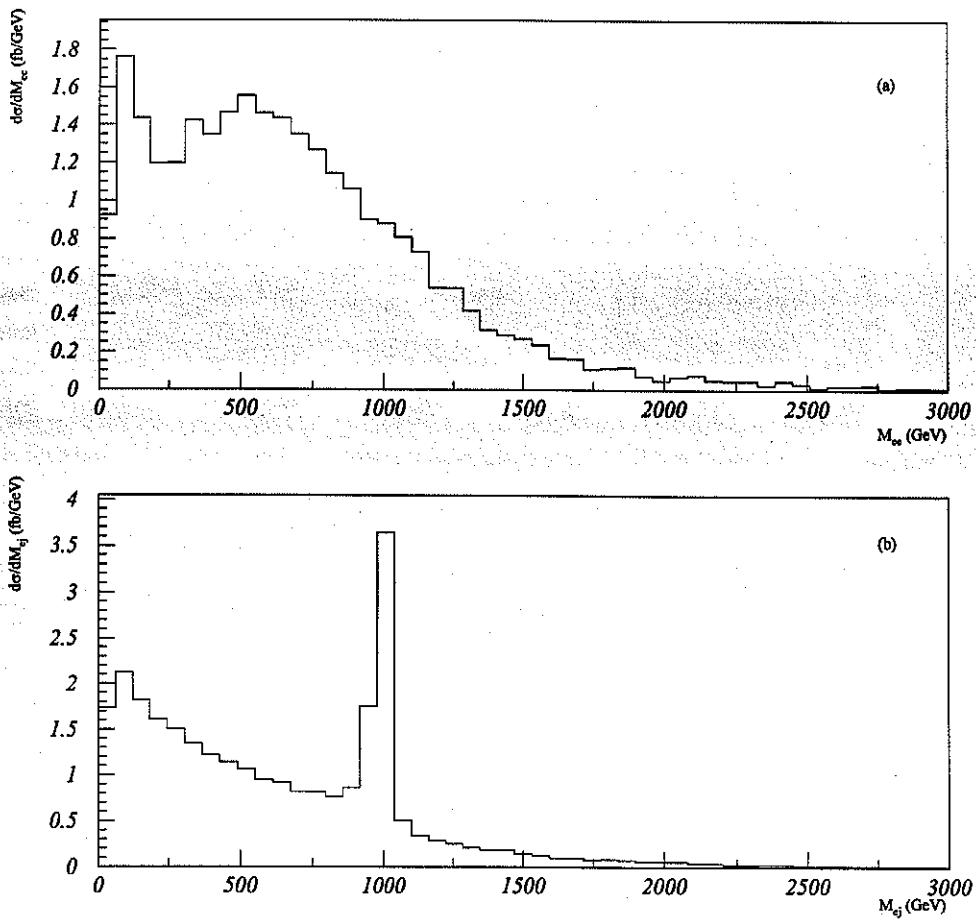


FIG. 12. The same distribution of Fig. 3 for the single production of $e^+ \bar{u}$ leptoquarks of mass 1 TeV.

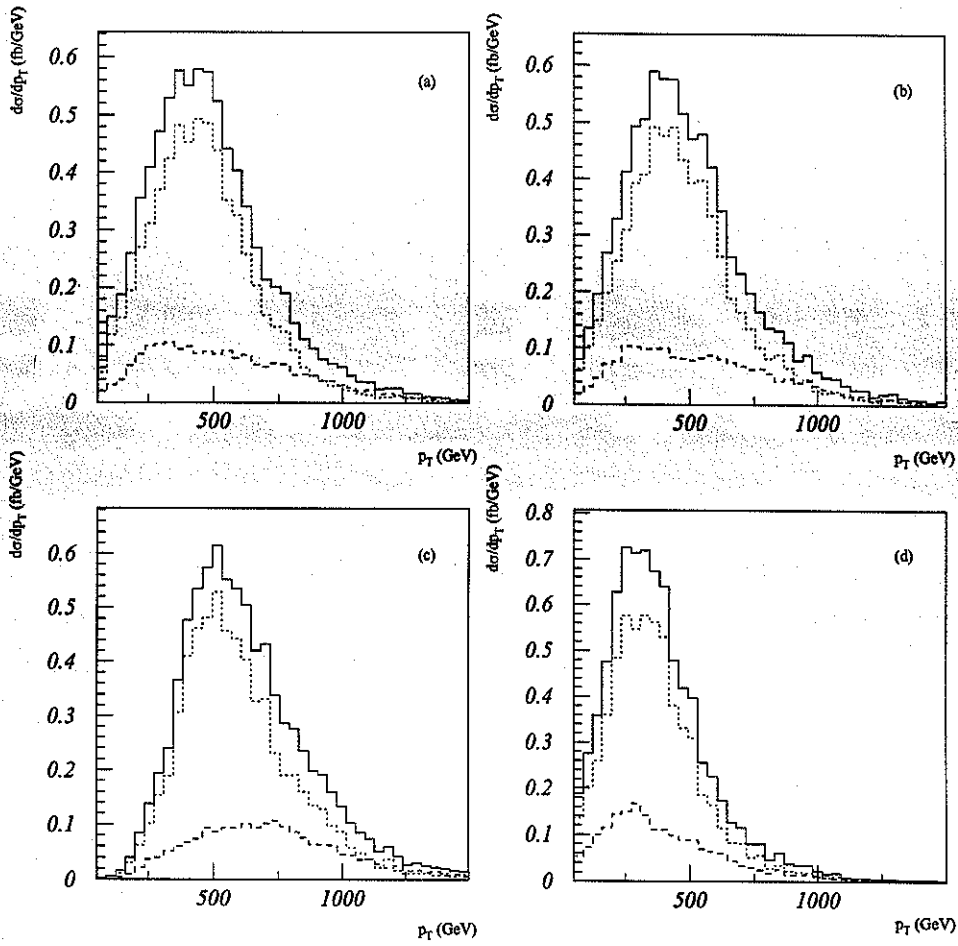


FIG. 13. p_T distribution of (a) e_1 ; (b) e_2 ; (c) j_1 ; (d) j_2 ; in the pair production of $e^+ \bar{u}$ leptoquarks of mass 1 TeV. The dashed (dotted) line stands for the $q\bar{q}$ - (gg -) fusion contribution while the solid line represents the total distribution.

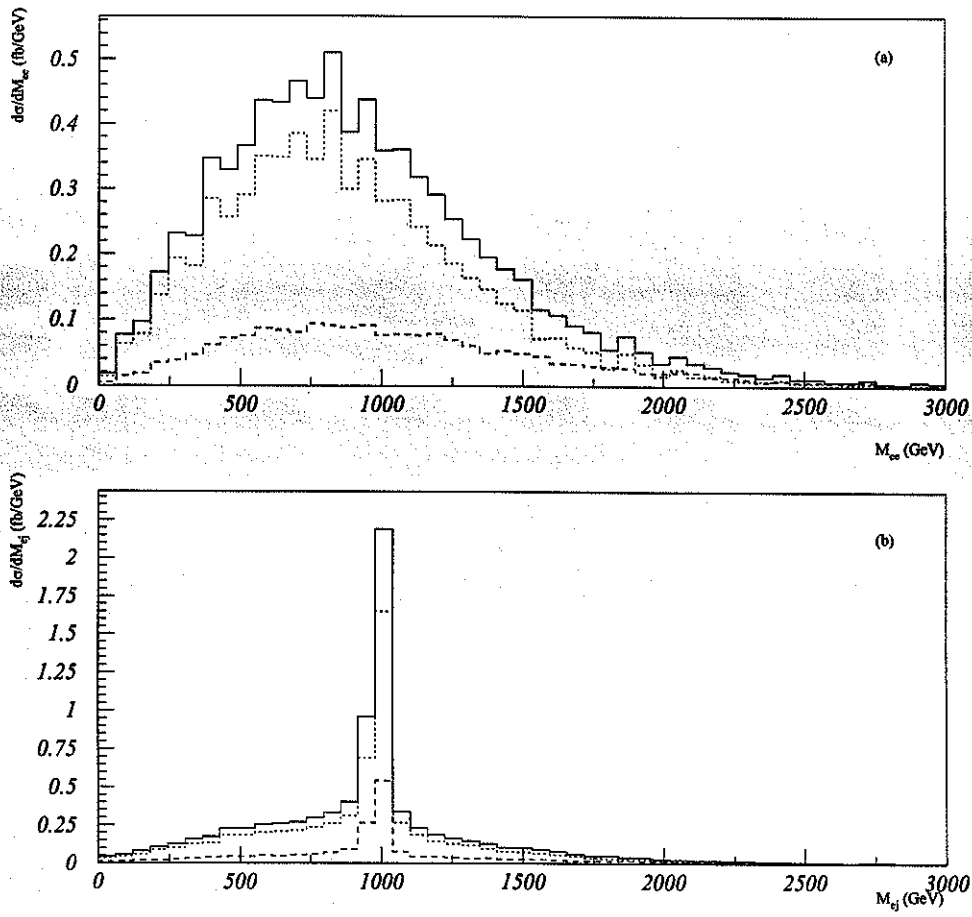


FIG. 14. (a) e^+e^- invariant mass distribution; (b) e^\pm -jet invariant mass spectrum adding the 4 possible combinations for pair production of $e^+\bar{u}$ leptoquarks with mass $M_{lq} = 1$ TeV. We use the conventions of Fig. 13.

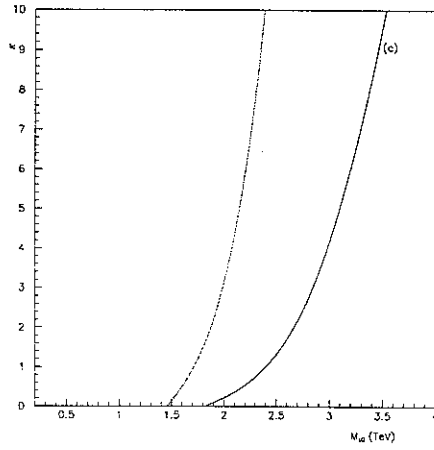
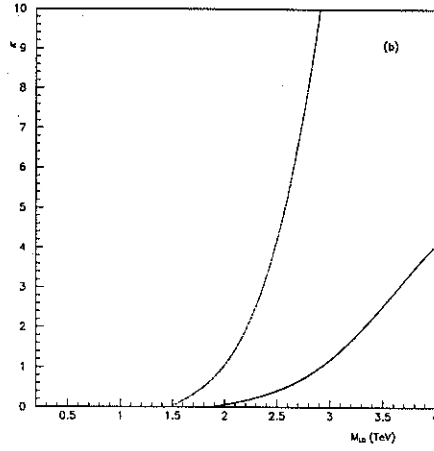
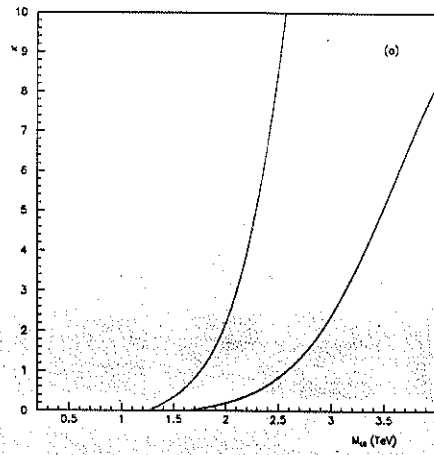


FIG. 15. 95% excluded regions in the plane κ - M_{lq} from the single leptoquark analysis for an integrated luminosity of $10/100 \text{ fb}^{-1}$ (solid/dotted line) and the leptoquarks: (a) S_{1L} and S_3^0 ; (b) S_{1R} , R_{2L}^1 , and R_{2R}^1 ; (c) S_3^+ , R_{2R}^2 , \tilde{R}_2^1 , and \tilde{S}_{1R} .