Is there any light sbottom?

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STF 12/7/00

- Introduction
- Existing limits
- Direct search
- conclusion

Introduction

not official under review by the collaboration

- CDF anomaly in jet data interpreted as sbottom production:

coffee discussion with CDF friends

R. Tenchini

$\tilde{b} \rightarrow c\, l\, \tilde{\nu}$ $\quad l=\mu,e$

About 1 ps of lifetime ($\pm$0.4 ps)
with a dominant vector matrix element

Sbottom mass around 3.6 GeV /c^2 !!!
Almost massless sneutrino !!!

What's about the existing limits?

Z width constraints

Most severe limits derives from invisible Z width measurements

(G.Ganis)

$\Gamma_{Z(inv)} = 498.8 \pm 1.5$

$\Gamma_{Z(inv)theo} = 501.6$

$\Gamma_{Z(inv\ extra\ SM)} < 1.7$ MeV

massless $\tilde{\nu}_L$ excluded (not a news)

This limit is overcame only if sneutrino mixing is assumed

$\tilde{\nu}_1 = \cos\theta \tilde{\nu}_L + \sin\theta\ \tilde{\nu}_R$

$\tilde{\nu}_2$ mass has to be above the Z width limit

Z width constrain $\cos\theta < 1/7$ for $m_\nu = 0$

More about sneutrino mixing

- Large mass splitting is needed to avoid LEP1 limits: possible only with SUSY see-saw (Yuval Grossman, Howard E. Haber Phys.Rev.Lett. 78 (1997) 3438-3441)

$$\Delta\tilde{m}_\nu \sim 2(\tilde{A}_\nu - \mu\cot\beta - B_N)m_\nu/\tilde{m}_\nu \qquad \tilde{m}_\nu = (\tilde{m}_{\nu 1}+\tilde{m}_{\nu 2})/2$$

B_N :SUSY breaking term associated to right-handed neutrino superfield

- LEP1 constraints can be used to check consistency with the ~1ps lifetime (width calculation done to be included in MSMLIB)

Z width constraints

Z width measurement constrain also sbottom production

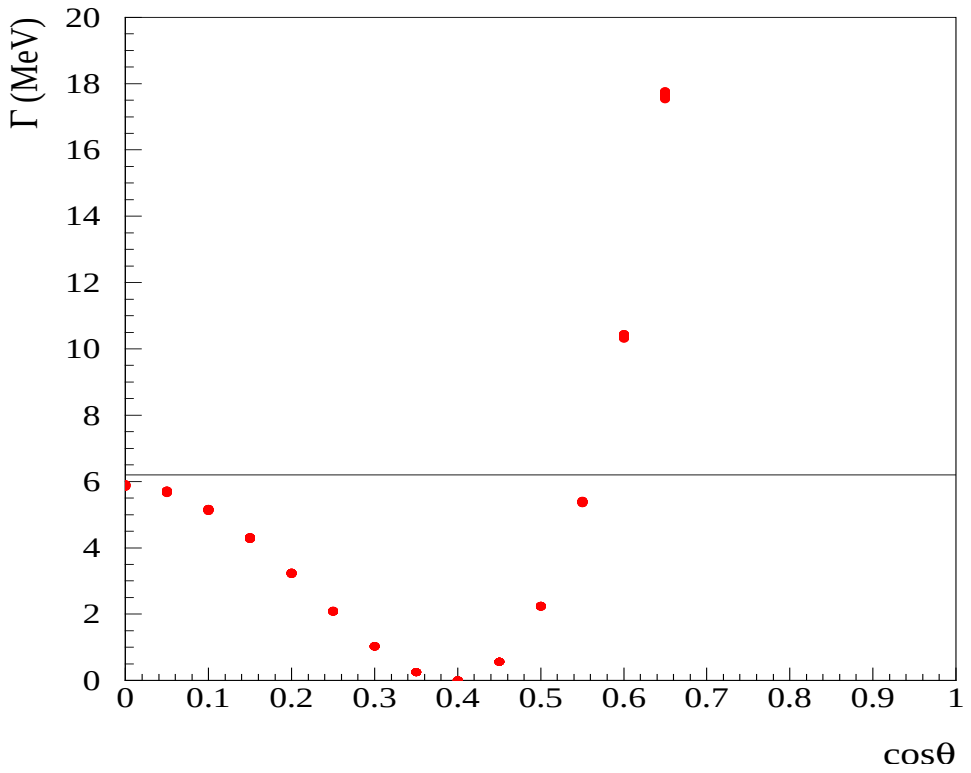
(G.Ganis)

$\Gamma z = 2494.4 \pm 2.4$

Γz theo=2493.8

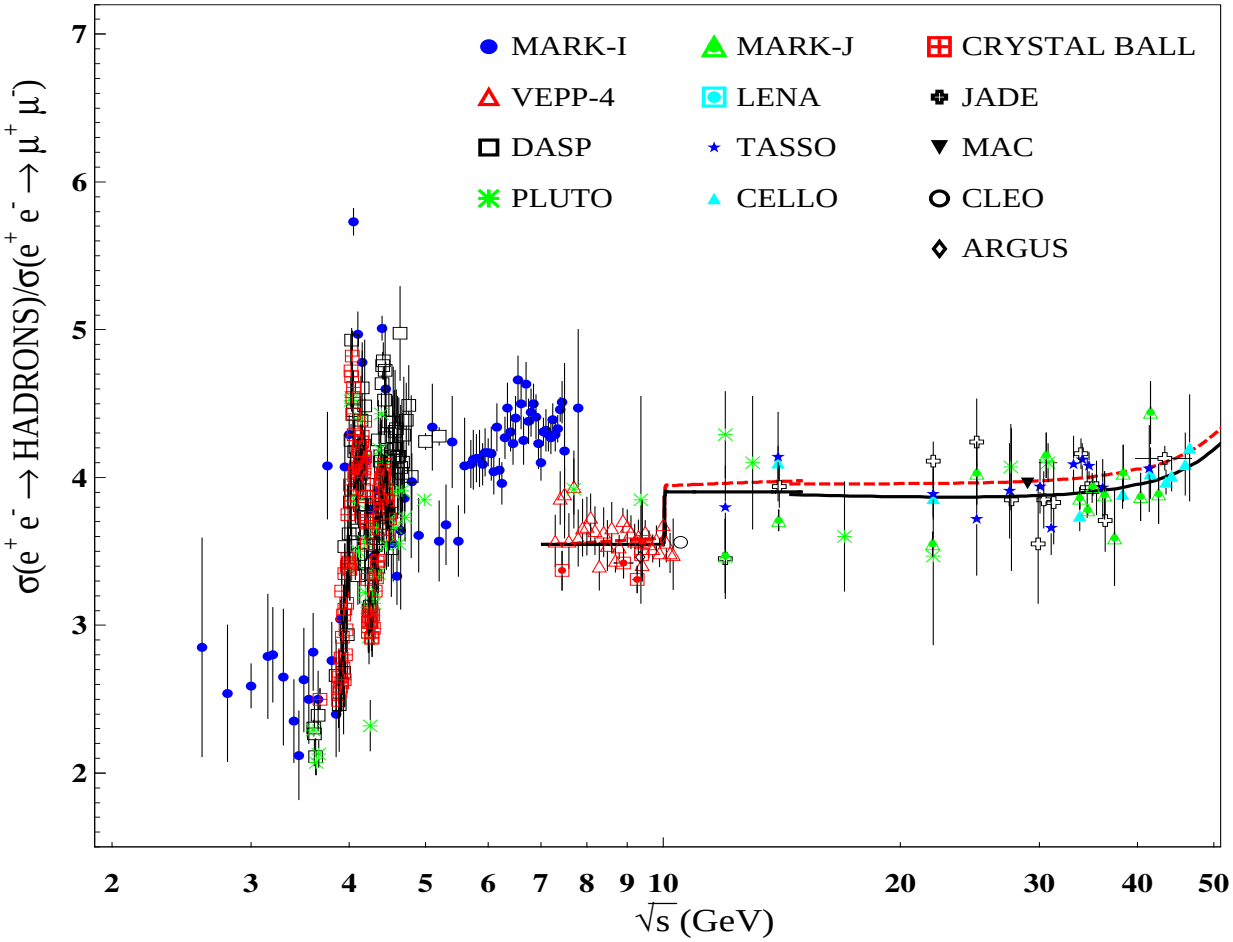
Γz(extra SM) < 6.2 MeV

limit for the sbottom mixing angle for a mass of 3.6 GeV



Cross section measurement constraints

Low energy data:

—— SM

- - - · SM + sbottom (Z dec.)