Fisica del LEP nel 98 e 99

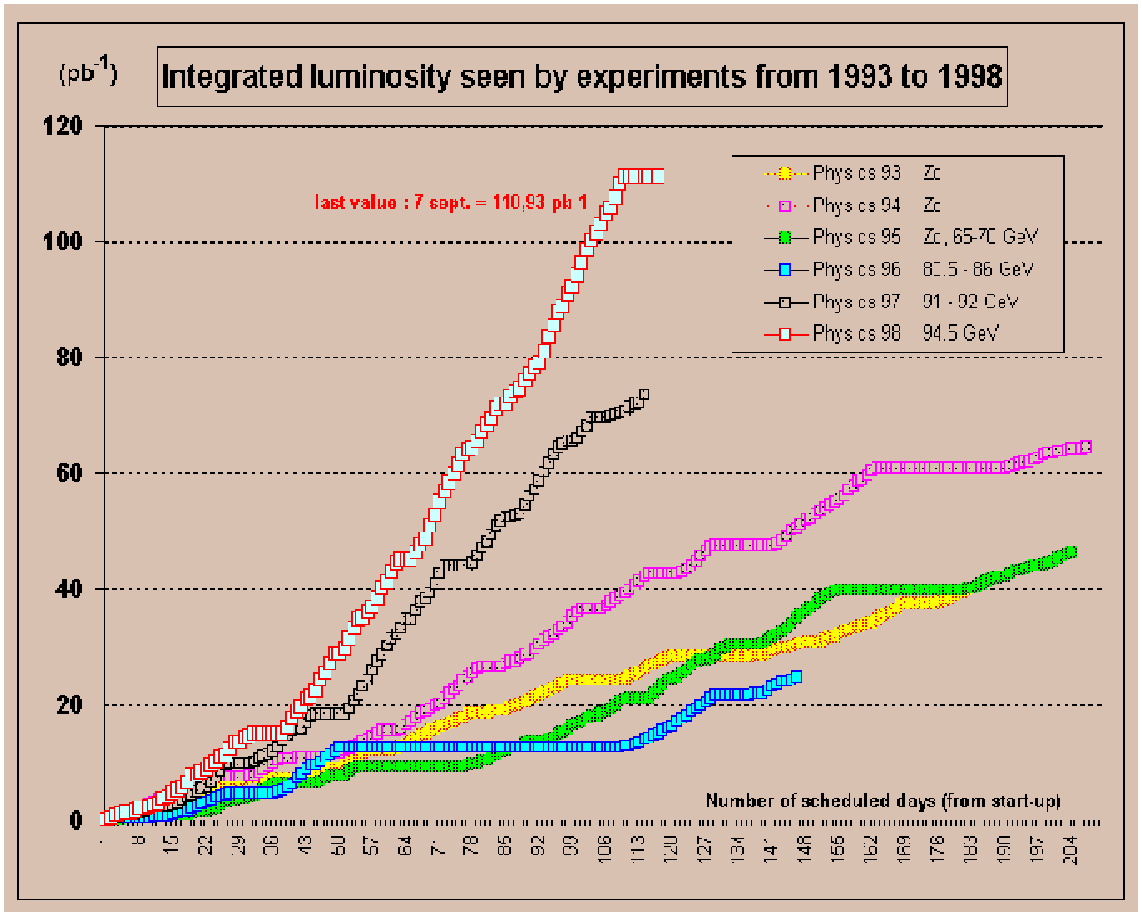
Franco Simonetto

Universita' e INFN di Padova

- Prestazioni di LEP
- Risultati ALEPH+DELPHI+L3+OPAL
  - fisica del B (LEP I)
  - fisica e.w. (LEP I + LEP II)
  - ricerca nuove particelle (LEP II)
- Prospettive 1999 - 2000

Ringrazio

L. Di Ciaccio,C.Dionisi,S.Marcellini,R.Tenchini
D.Treille,P.Roudeau,F.Parodi,W.De Boer



- macchina secondo schedula
- $\sqrt{s} = 189$ GeV
- 7 Settembre: $\mathcal{L}_{int} \;=\; 110\ pb^{-1}$
- Fine Run : $\rightarrow \;\; \mathcal{L}_{int} \;\geq\; 150 pb^{-1}$

1998: miglior anno di LEP

- ICHEP98

$\sqrt{s}$ (GeV)	$\int \mathcal{L}dt$ (pb^{-1})
91	160
130$\div$ 136	12
161$\div$ 172	20
183	55
189	40

- $\sim$ 300 contributi ADLO :

E.W. I+II	τ I	b, c I	Ricerche II	QCD $(+\gamma\gamma)$ I+II
84	44	48	68	70

- $\sim$ 30 % da LEP I

- $\sim$ 50 invited talks (parallele,mini-riviste,plenaria)

Partecipazione Italiana

- Contributo significativo $\forall$ settore di analisi
- Responsabilita' (lista incompleta):
  - ALEPH $\sigma(e^+e^- \to WW)$, M_W (jj), SUSY;
    Parametri della Z; nuovo tracking (LEP I)
  - DELPHI ricerche con γ isolati, M_W;
    fisica del B; Bhabha
  - L3 ricerche con γ isolati, Higgs;
    decadimenti rari del B, P_τ
  - OPAL $\int \mathcal{L}dt$ LEP I & LEP II
- Invited talks $\sim$ 10 / exp. nel 98
- LEP W.G.:
  - Elettrodebole (5)
  - B: Oscillazioni (2), τ (2), V_{cb} (4) NEW!
  - SUSY (4), Higgs (4)

Fisica b, c

- LEP I : $\sim 8(7) \times 10^5$ $b\bar{b}$ $(c\bar{c})$ /exp
- b-tagging : Π 90%, ϵ 60%
- topologia “semplice”
- sopra soglia per Λ_b, B_s

$$\boxed{\text{Risultati } \textit{competitivi / dominanti} \text{ wrt } \Upsilon(4S)\text{, CDF ...}}$$

- settore vivace. EPS97 $\Leftrightarrow$ ICHEP98 :
  - B.R.$(b \to 0, 1, 2$ charm$)$ (ALEPH,DELPHI)
  - B.R.$(b \to \ell^-, c \to \ell^+, b \to \bar{c} \to \ell^+ X)$ (DELPHI,OPAL)
  - vite medie $\tau(B_s), \tau(\Lambda_b)$
  - B.R.$(b \to s\gamma\ )$ (ALEPH)
  - B.R.$(g \to b\bar{b}\ )$ (ALEPH,DELPHI)
  - primi limiti su CP$(\bar{B}^0)$ (DELPHI,OPAL)
  - frammentazione $b \to B_q$, $c \to D_q$, spettroscopia $B^{*(*)}$, $D^{*\prime}$
  - oscillazioni $D^0\bar{D}^0$ e decadimenti DCS (ALEPH)
  - $\frac{\Delta\Gamma}{\Gamma}(B_s)$ (ALEPH,L3)
  - vincoli su matrice C.K.M.:

$$\boxed{\begin{array}{ccc} V_{tq} & \Leftrightarrow & \Delta m_q \\ V_{cb} & \Leftrightarrow & \mathrm{B} \to D^* \ell\nu \\ V_{ub} & \Leftrightarrow & \mathrm{b} \to u\ell\nu \end{array}}$$

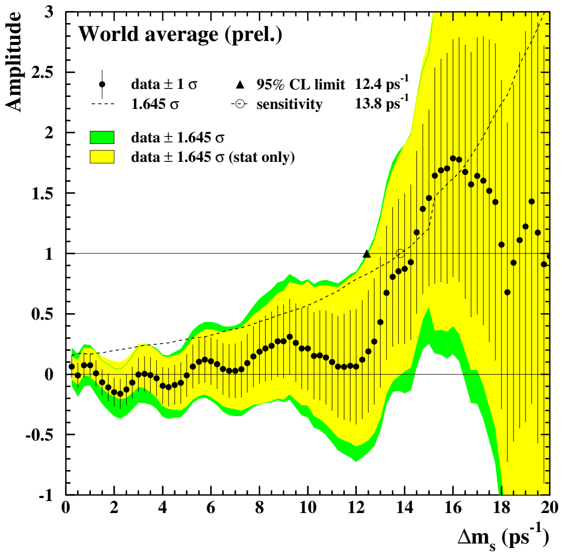
- $\Delta(m_q) \propto |V_{tq}|^2$ $\qquad \sigma(th.) \sim 20\%$
- $\frac{\Delta m_d}{\Delta m_s} \propto \frac{|V_{td}|}{|V_{ts}|}^2$ $\qquad \sigma(th.) \sim 6\%$
- B_d^0 ($\sim$ EPS 97):

$$\boxed{\Delta m_d \;=\; 0.471 \pm 0.016\ ps^{-1}}$$

- B_s^0 (ICHEP 98):

$$\boxed{\Delta m_s \;>\; 12.4\ ps^{-1}}$$

  - 97 : 10.2 ps^{-1}
  - ALEPH : rianalisi canale $\ell\ell$
  - DELPHI: rianalisi
    + decadimenti esclusivi
  - +SLD,CDF <u>*nuovo*</u> *!!!*
  - (LEP :$\Delta m_s \;>\; 11.5\ ps^{-1}$)
  - Modello Standard:
    $\Delta m_s = 9.5 \div 17 ps^{-1}$ 68 % CL
    M.P.V. $= 13\ ps^{-1}$



$$\boxed{\text{Segnale a 15 ps}^{-1}?(2\sigma)}$$

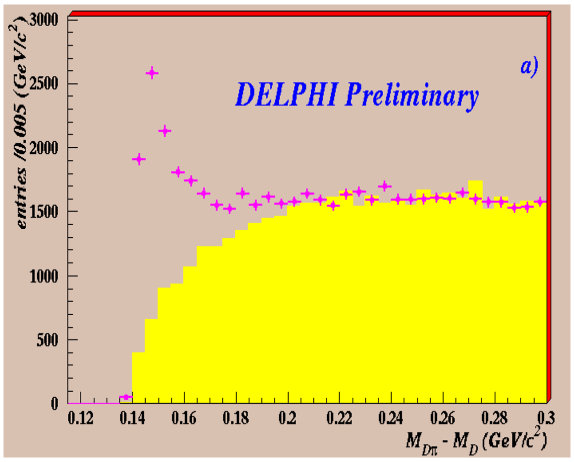
$b \to \ell\nu c$

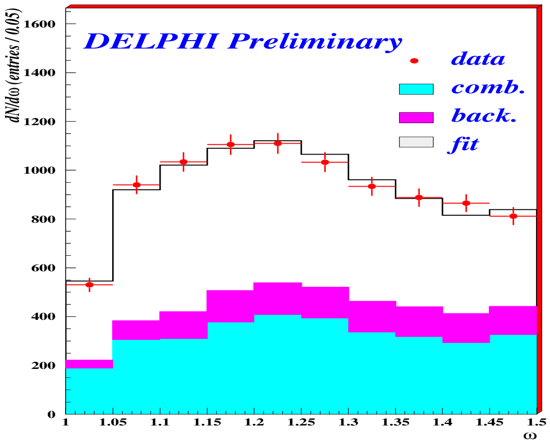
- BR $\propto$ $|V_{cb}|^2$
- nuove misure di DELPHI,OPAL
- migliora consistenza con $\Upsilon(4S)$

BR^{LEP}	10.89±0.24 %
BR^{CLEO}	10.45±0.21 %

$B \to D^*\ell\nu$

- estrapola $d\Gamma$ al limite cinematico $\omega(= v_B \cdot v_{D*}) \to 1$
- HQET: $\sigma^{th.}(V_{cb}) \sim 3\%$
- DELPHI $\sim$ 7000 D^* parzialmente ricostruiti (ICHEP 98)
  (ALEPH,OPAL,CLEO 500÷1000 evts)





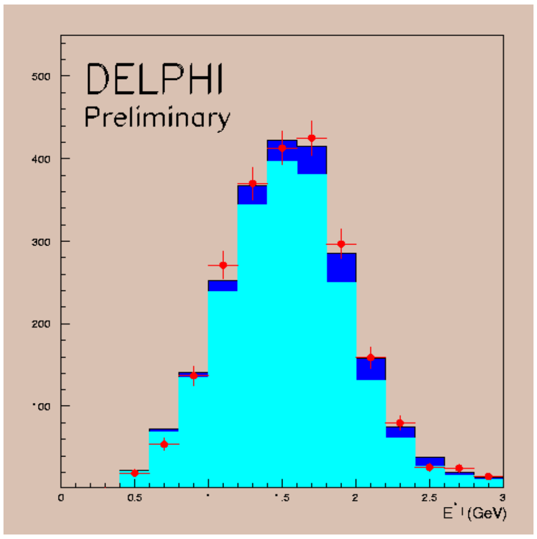
$$|V_{cb}| = (40.6 \pm 1.2)\ 10^{-3}$$

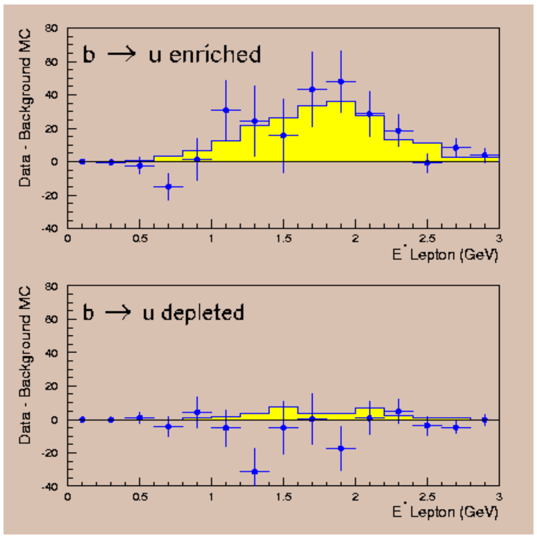
- B.R. $(b \to u \ell \nu) \ \propto |V_{ub}|^2$
- $\frac{b \to u}{b \to c} \ \sim \ \mathcal{O}(1\%)$
- $\Upsilon(4S)$:

  cinematica (p_ℓ)+ $B \to \pi(\rho, \omega)\ell\nu$ $\qquad \sigma(B.R.)^{th} \ \sim \ 30\%$
- LEP (ALEPH,DELPHI,L3):

  $M_{had} < 1.5 \ GeV$ + veto $(D_{vert}$, K) $\qquad \sigma(B.R.)^{th} \ \sim \ 10\%$
- S/N $\sim \ 0.05 \div 0.1$

  $\Rightarrow$ campioni di controllo $(b \to u)$





exp	$(\frac{\lvert V_{ub}\rvert}{\lvert V_{cb}\rvert})^2 (\%)$
$\Upsilon(4S)$	8.0 ± 2.0
ALEPH	9.6 ± 2.4
DELPHI	10.4 ± 2.1
L3	
Media	9.3 ± 1.4

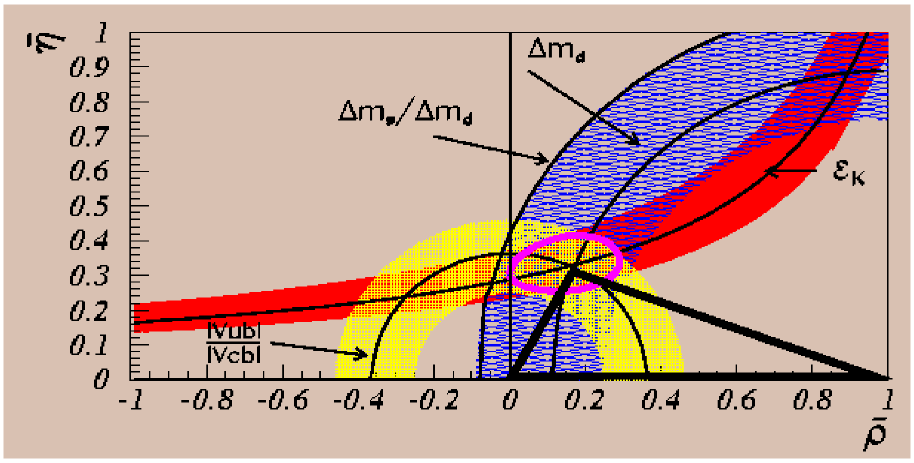
- 3 generazioni + unitarieta' $\Rightarrow$ 4 parametri $\lambda,\ \mathcal{A},\ \rho,\ \eta$

$\lambda \quad = 0.2205 \pm 0.0018 \quad (= sin(\theta_c))$
$|V_{cb}| = \mathcal{A}\lambda^2$
$\rho, \eta \ \Rightarrow$ CP

Misure	$V_{CKM} \times$ Altro	Vincolo
$b \to u / b \to c$	$\lvert V_{ub}/V_{cb} \rvert$	$\bar{\rho}^2 + \bar{\eta}^2$
Δm_d	$\lvert V_{td}\rvert^2 f^2_{B_d} B_{B_d} f(m_t)$	$(1-\bar{\rho})^2 + \bar{\eta}^2$
$\frac{\Delta m_d}{\Delta m_s}$	$\left\lvert \frac{V_{td}}{V_{ts}} \right\rvert^2 \frac{f^2_{B_d} B_{B_d}}{f^2_{B_s} B_{B_s}}$	$(1-\bar{\rho})^2 + \bar{\eta}^2$
ϵ_K	$f(A, \bar{\eta}, \bar{\rho}, B_K)$	$\propto \bar{\eta}(1-\bar{\rho})$

- Unitarieta' CKM :

$$\boxed{V_{ud}V^*_{ub} + V_{cd}V^*_{cb} + V_{td}V^*_{tb} \ = \ 0}$$

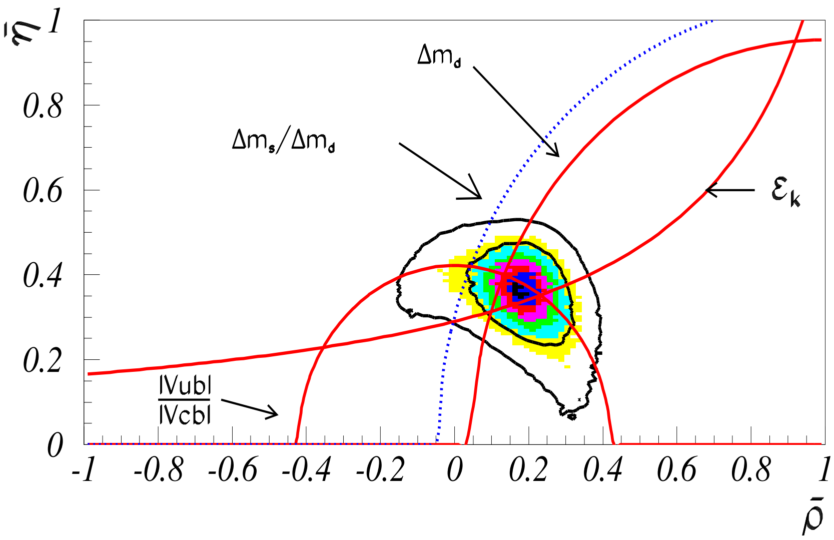


- CP :

$$\eta \neq 0$$
$$\text{Area}(\triangle) \neq 0$$

- $V_{cb}, V_{ub}, \Delta m_q$ vincolano (ρ, η) *indipendentemente* da ϵ_κ
- $\Rightarrow$ *Test* di compatibilita' $B \Leftrightarrow K$

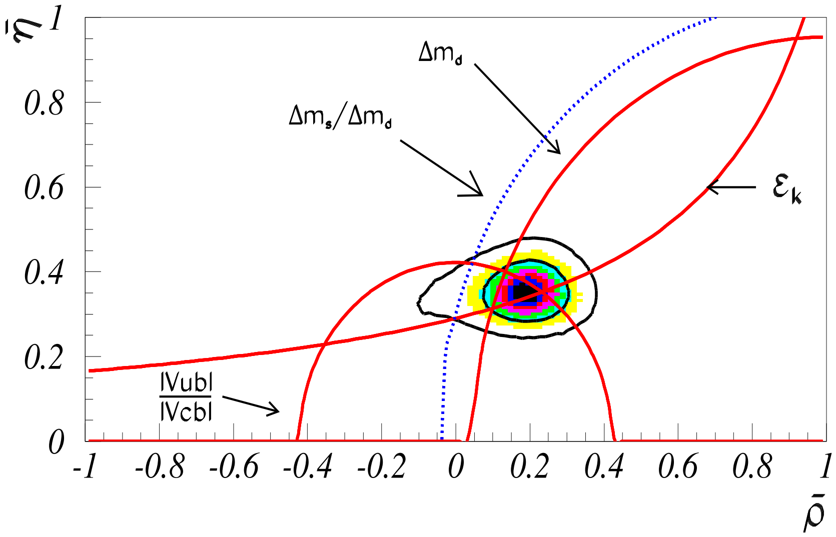
Barbieri,Hall,Stocchi,Weiner hep-ph/9712252



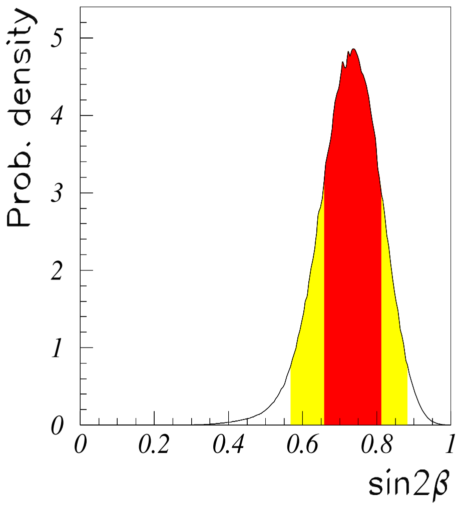
- *Risultati*
  - $\rho < 0$ sfavorito
  - $\eta > 0$ 96% CL
  - *perfetto accordo* $B \Leftrightarrow \epsilon_K$

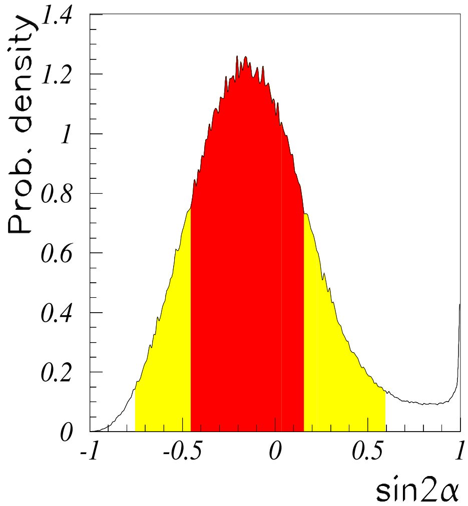
- *Interpretazioni*
  - Modello Standard : *esauriente* descrizione CP
  - teoria SuperWeak pura : *altamente* sfavorita

$(V_{ub}/V_{uc} \sim 0.06)$



determinazione indiretta angoli α, β, γ





$$\sin(2\beta) = 0.73 \pm 0.08$$
$$\sin(2\alpha) = -0.15 \pm 0.30$$
$$\gamma = (62 \pm 10)^o$$

Misure Elettrodeboli: Z^0

- Calibrazioni finali per i run di LEP I:

$$\begin{aligned} \sigma(M_Z) &= 1.5 \text{ MeV} \\ \sigma(\Gamma_Z) &= 1.5 \text{ MeV} \end{aligned}$$

- Ri-analisi dati sperimentali
- OPAL (Bologna): nuova misura precisa di luminosita'

$$\sigma(\mathcal{L})/\mathcal{L} = 3.3 \times 10^{-4} \text{ MeV}$$

- assumendo universalita' $e\ \mu\ \tau$

$$\begin{aligned} M_Z &= 91186.7 \pm 2.1\ MeV \\ \Gamma_Z &= 2493.9 \pm 2.4\ MeV \\ \sigma^0_{had} &= 41.491 \pm 0.058\ nb \\ R_\ell &= 20.765 \pm 0.026 \\ A^{0,\ell}_{fb} &= 0.01683 \pm 0.00096 \end{aligned}$$

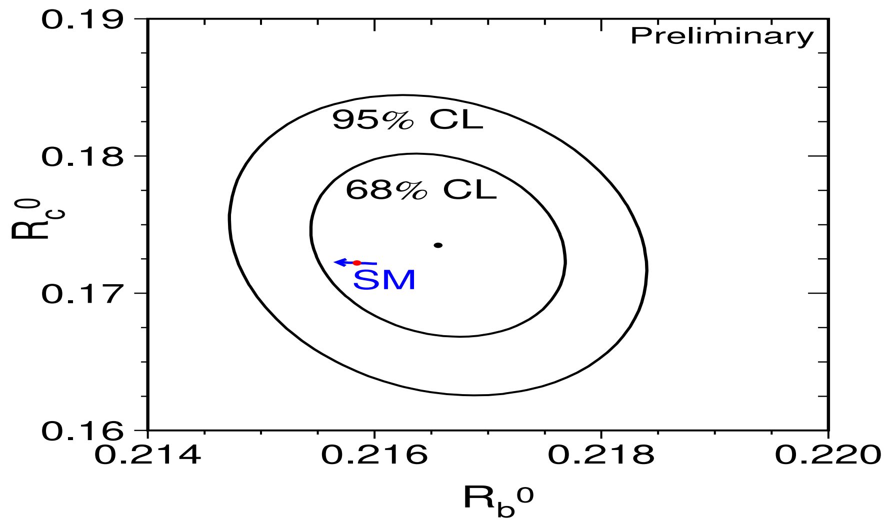
da cui :

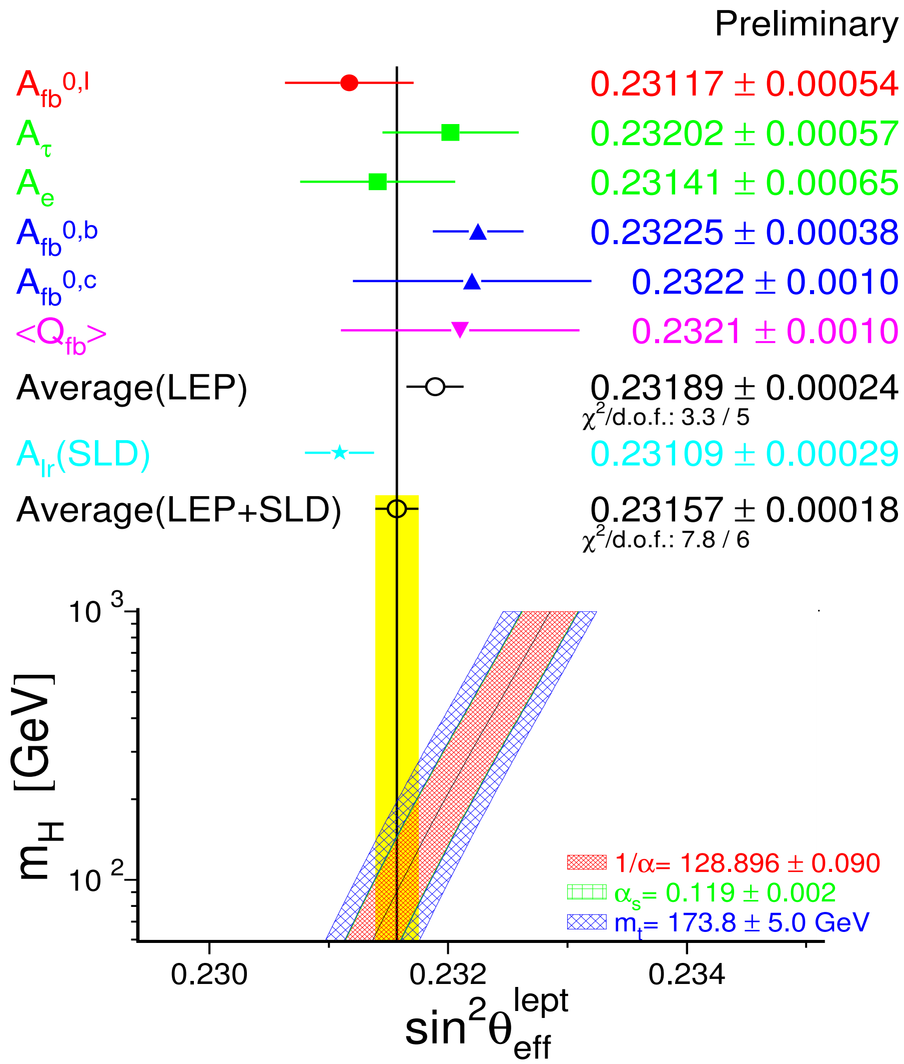
$$\begin{aligned} \alpha_s(M_Z^2) &= 0.124 \pm 0.004 \pm 0.002(M_H) \\ \Delta\Gamma_{inv} &= 2.8 MeV (95\% C.L.) \\ N_\nu &= 2.994 \pm 0.011 \end{aligned}$$

- DELPHI, OPAL : nuove misure di R_b *(prel.)* ;
- ALEPH, DELPHI: nuove misure di P_τ *(prel.)* ;
- DELPHI: nuove misure di $A^b_{f.b.}$ *(prel.)* ;
- risultati:

$$
\begin{aligned}
R_b &= (21.66 \pm 0.07)\% \\
R_c &= (17.35 \pm 0.44)\% \\
A^{0,b}_{fb} &= 0.0990 \pm 0.0021 \\
A^{0,c}_{fb} &= 0.0709 \pm 0.0044 \\
\mathcal{A}^{(\tau)}_{\ell} &= 0.01452 \pm 0.0034
\end{aligned}
$$

- ottimo accordo con Modello Standard



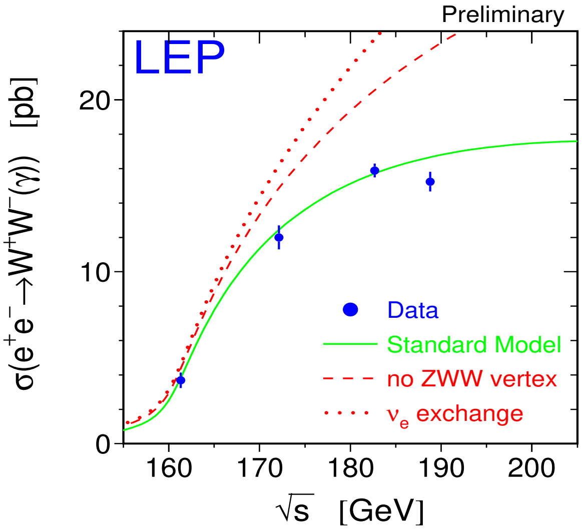


- $\sim$ 2 σ LEP-SLD ($\sim$ 2.5σ $A_{fb}^{0,b} - \mathcal{A}_{lr}^{SLD}$)
- fit al Modello Standard ($LEP\ I + SLD$):

$$M_W \;=\; 80.332 \pm 0.037\ GeV/c^2$$

Misure ad alta energia *(Prel.)*

- sezioni d'urto (161→ 189 GeV)



$$\sigma(e^+e^- \to f\bar{f})$$
$$\sigma(e^+e^- \to WW)$$
$$\sigma(e^+e^- \to ZZ)$$
$$\sigma(e^+e^- \to We)$$

- larghezza e rapporti di decadimento della W

$$\Gamma_W = 2.31 \pm 0.33\ GeV$$
$$B.R.(W \to \ell\nu) = (10.4 \pm 0.3)\%$$
$$B.R.(W \to had) = (68.8 \pm 0.8)\%$$

- T.G.C.:

$$\Delta\kappa_\gamma = 0.13 \pm 0.14$$
$$\Delta g_1^Z = 0.00 \pm 0.08$$
$$\lambda_\gamma = 0.03 \pm 0.07$$

- massa W :

$$\boxed{M_W}$$

Misura di M_W:

- W prodotta in coppie
- si utilizzano tutti gli stati finali:

W^+W^-	$B.R.(\%)$	Π (%)	ϵ (%)
$\rightarrow q\bar{q}'q\bar{q}'$	46	80	80
$\rightarrow q\bar{q}'\ell\bar{\nu}'$	44	90	80
$\rightarrow \ell\nu\ell\bar{\nu}'$	10	90	70

- misura: $M_W = M^{inv}_{jet-jet(\ell-\nu)}$
- 4 (+1) Vincoli cinematici:

$$\Sigma_i E_i = \sqrt{s}; \quad \Sigma_i \vec{P}_i = 0; \quad (M_{W_1} = M_{W_2})$$

$$\boxed{E(LEP) \;\Rightarrow\; \sigma(M_W) \;\sim\; 20\ \mathrm{MeV}}$$

- Non (ancora) utilizzati dati @ 189 GeV

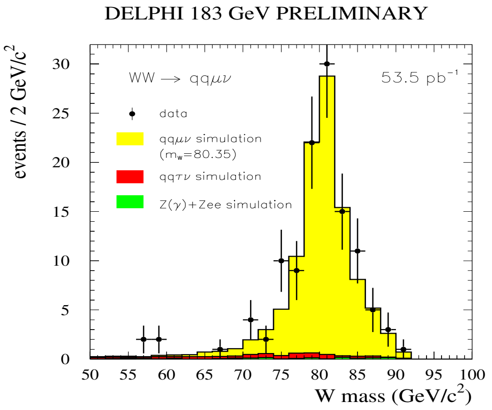
- $\sim$ 300/400 evt./exp.
- $\vec{P}_\nu$ da cinematica: $\to$ 1C/2C fit
- sistematiche correlate:

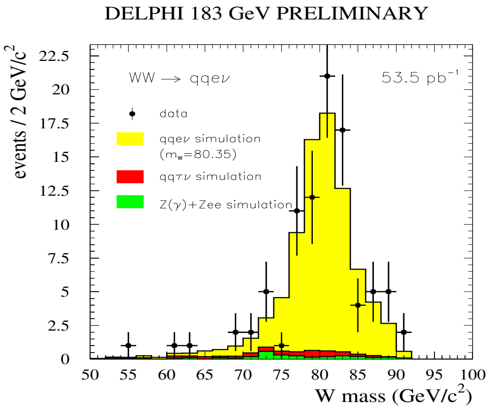
E(LEP) $\sim$ 20 MeV

I.S.R. $\sim$ 15 MeV

adronizzazione $\sim$ 20 MeV

$$\Rightarrow \ \sigma(corr.) \ \sim \ 40 \text{ MeV}$$





M_W da canale Adronico: $WW \rightarrow q_1\bar{q}_2q_3\bar{q}_4$

- $\sim$ 300/400 evt./exp.
- 4C/5C fit
- 3 possibili combinazioni jet-jet per evento:

  cinematica, χ^2,Q_{jet}

- correlazioni di Stato Finale

  $c\tau(W) \ \leq \ \lambda(q \rightarrow Had.)$

  $$\begin{array}{ll} \textit{Bose Einstein} & \Rightarrow \Delta(M_W) = -50MeV \\ \textit{Riconnessione di Colore} & \Rightarrow \Delta(M_W) \leq \ 40MeV \end{array}$$

$$\boxed{\Rightarrow \sigma(BE \oplus CR) \ \sim \ 90 \text{ MeV}}$$

- sperimentalmente, cfr. canale semileptonico e adronico:

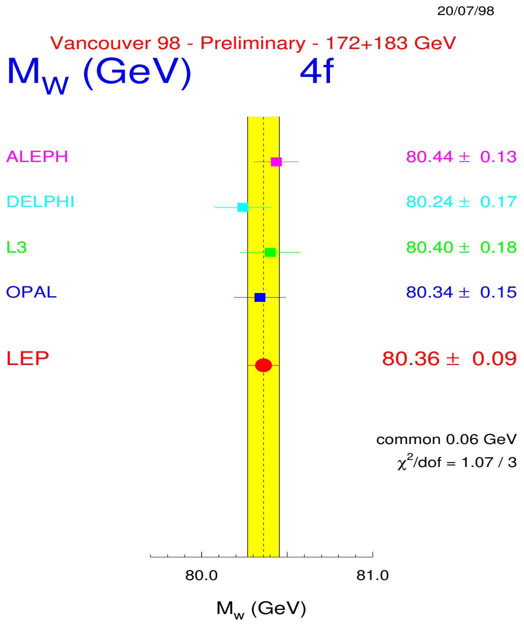
  nessun effetto entro gli errori

- si puo' ridurre con $\sqrt{\mathcal{N}}$

Risultati

$$\boxed{M(W)^{LEP}_{diretto} = 80.37 \pm 0.09 \text{ GeV}}$$

- *buona consistenza tra esperimenti*
- *sistematico correlato 60 MeV*
- *LEP competitivo con TEVATRON*
- σ *(diretta)* $\sim$ σ *(indiretta)*



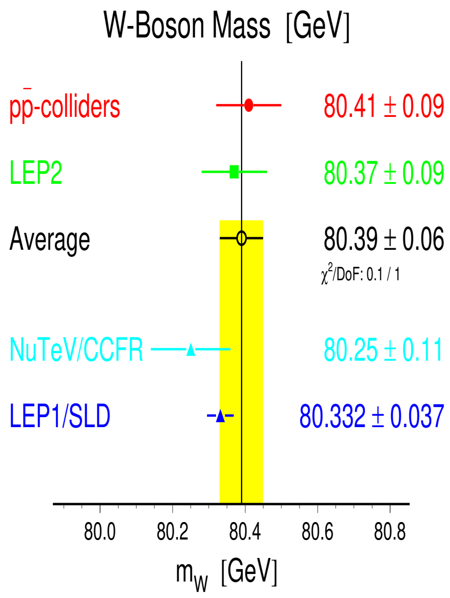
Prospettive

- *Misure dirette LEP 1998 → 2000:*

$$\sigma(stat.) = \pm\, 25 \text{ MeV}$$
$$\sigma(syst.) = \pm\, ?$$

- *statistica (+ teoria + cal. E(LEP))*

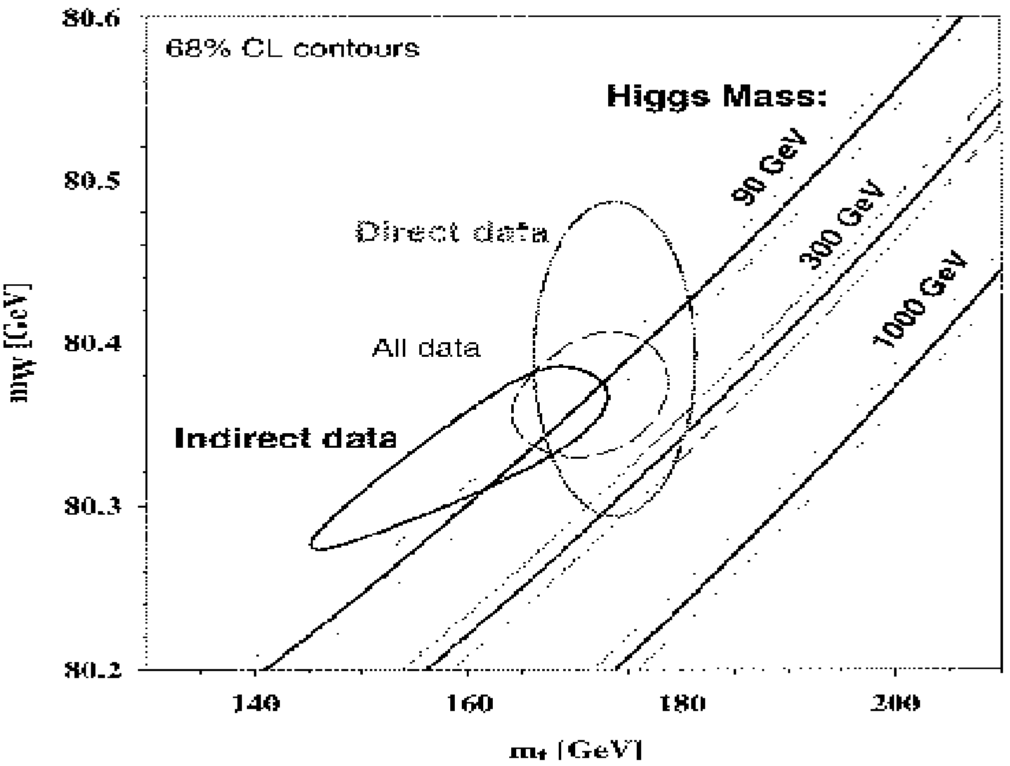
$$\downarrow \sigma(LEP\ II) \sim \pm\, 40 \text{ MeV}$$



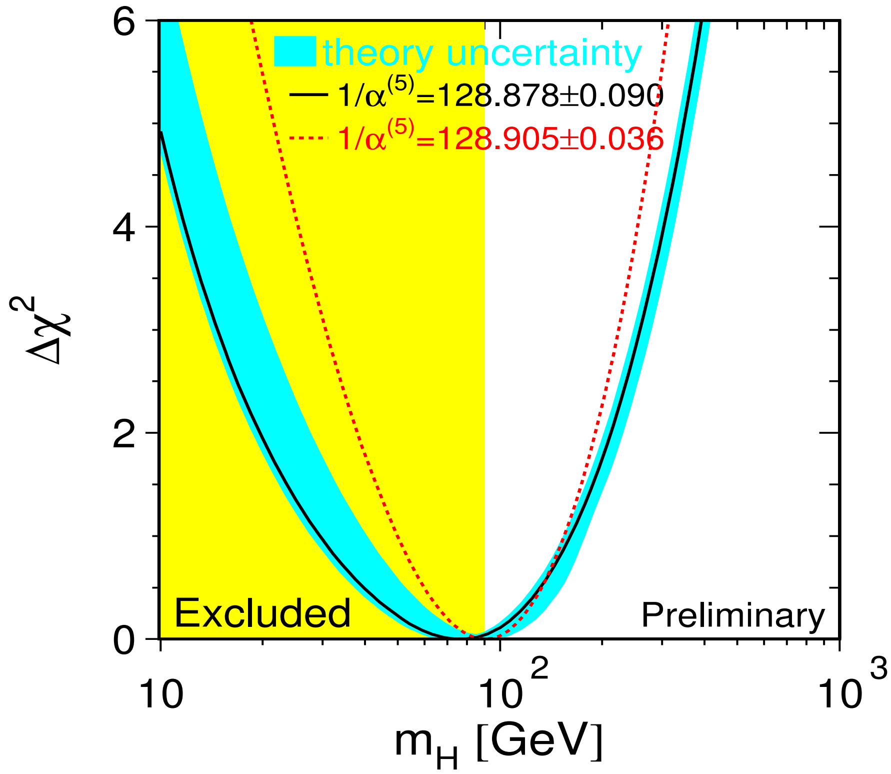
- Fit Globale al Modello Standard con input
  - parametri della Z^0 a LEP + SLC
  - misure di M_W a LEP + CDF
  - + M_{top} (CDF+D0), ν scattering (NuTeV+CCFR)
  - $1/\alpha(M_Z) = 128.89 \pm 0.09$
- Buona consistenza tra i risultati:

$$\boxed{\chi^2/dof = 16.4/15}$$

- ... Vincoli su M_{Higgs} ...



$$M_H = 84^{+91}_{-51}\ GeV$$
$$M_H < 280\ GeV\ @\ 95\%\ C.L.$$



- limite a Gerusalemme $M_H < 420 GeV$:
  - LEP II + A_{lr}^{SLD} + A_{fb}^{b} + P_τ ...
  - calcolo correzioni E.W. secondo ordine (De Grassi)
  - ... ma non usa (ancora) nuovo valore $1/\alpha(M_Z) = 128.92 \pm 0.04$

- Higgs entro la portata di LEP ?

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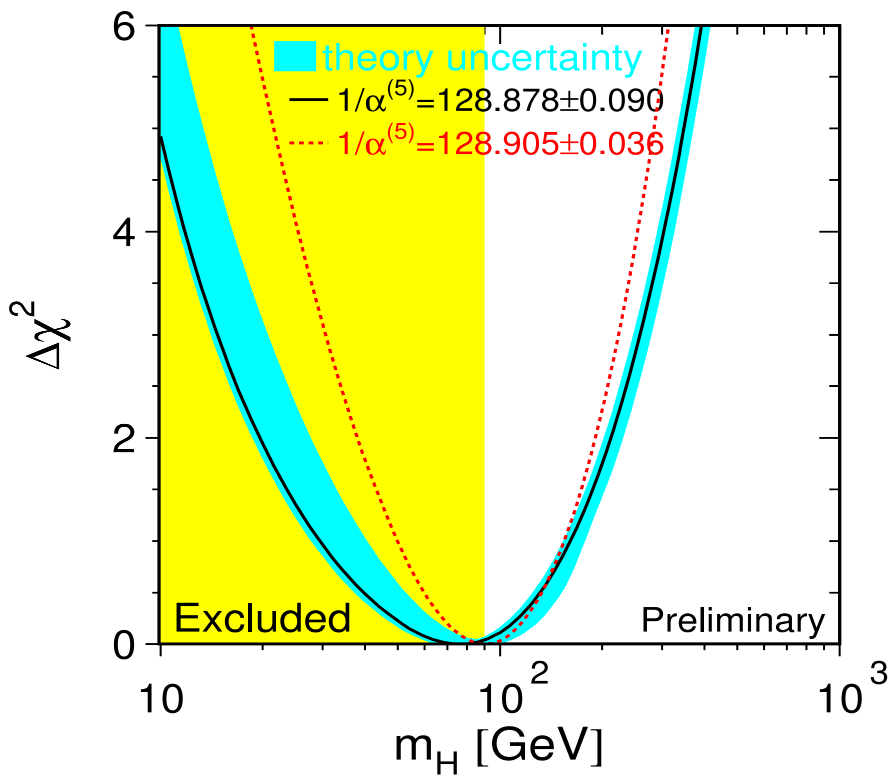

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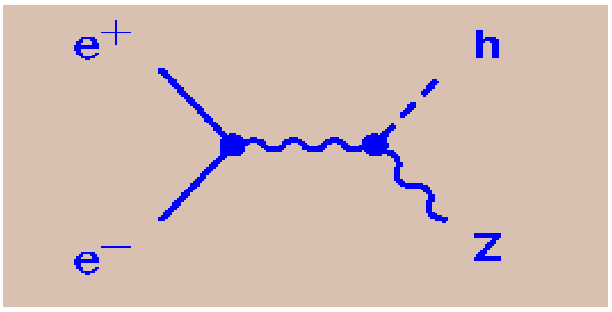
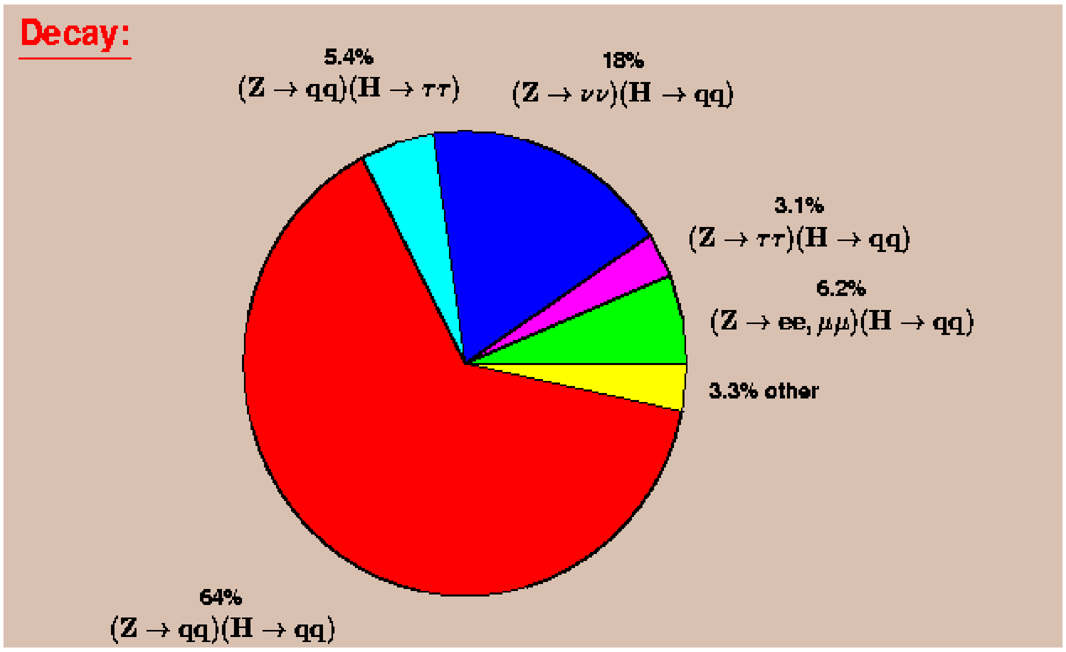
Produzione



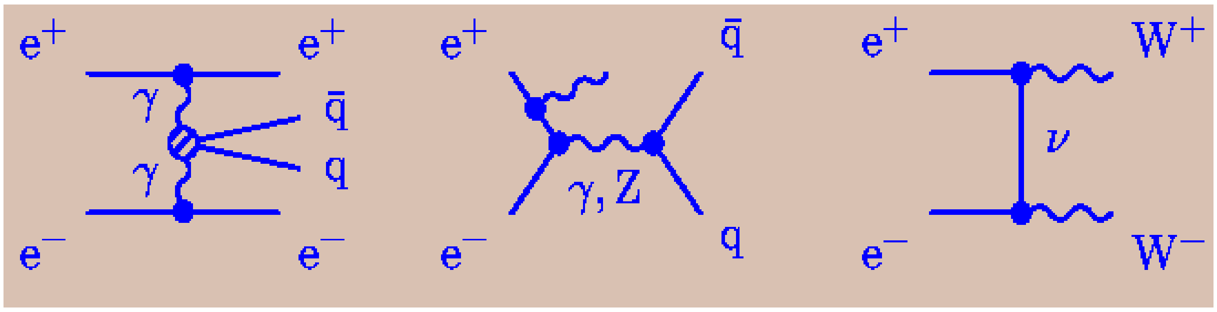
Decadimenti

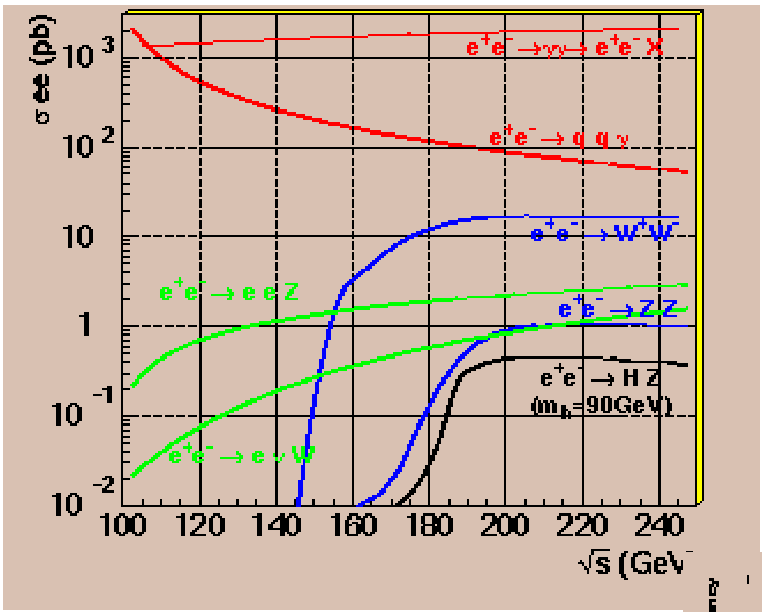


$$(h \to b\bar{b})(Z \to X) \quad + \quad (h \to \tau\tau)(Z \to q\bar{q})$$

$$\boxed{\Rightarrow \quad \sim 90\ \%\ \text{Stati Finali}}$$

Fondi





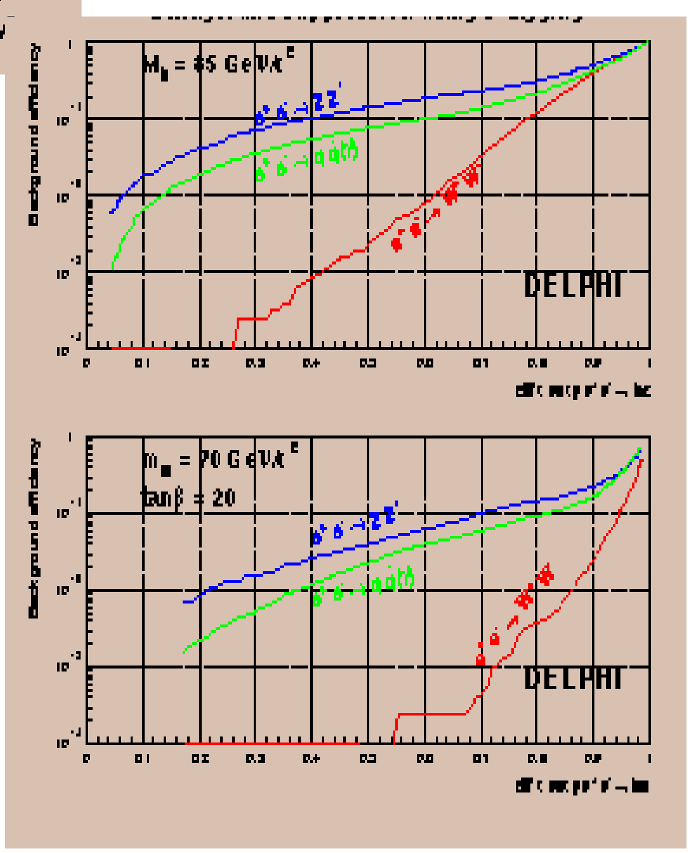
Tagli topologici

$E_{vis}, \sqrt{s'},\ no\ \gamma, \ldots$

$\ell\ell jj,\ E_{miss} + jj,\ jjjj$

+ b-tagging

$+\ M^{inv}_{jj}$



$\epsilon(hZ)\ \sim\ 30 \div 60\%$

$\epsilon(WW)\ <\ 1\%$

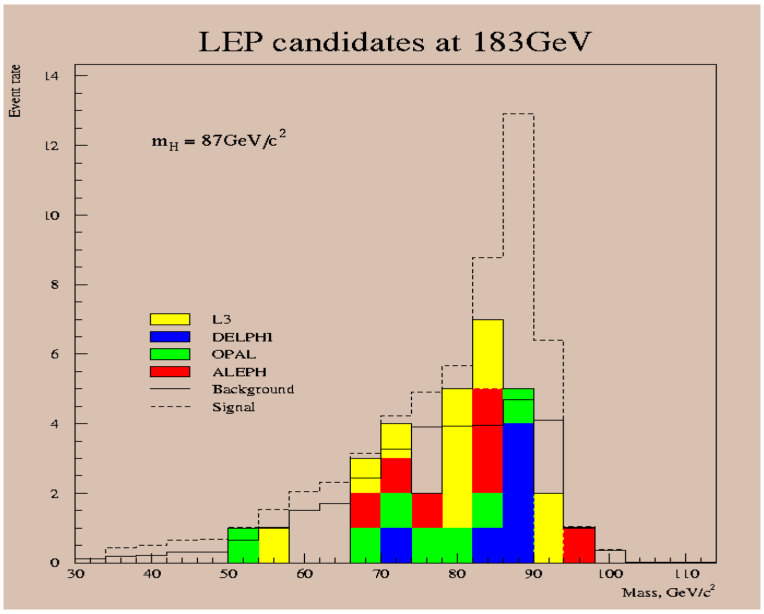
Irriducibile ZZ',

$(Z \to b\bar{b})(Z' \to X)$

$\sqrt{s} = 183\ Gev$ (*Prel.*):

Exp.	$\mathcal{N}_{obs.}$	$\mathcal{N}_{exp.}$
ALEPH	7	7.2
DELPHi	6	7.5
L3	18	24.2
OPAL	9	8.9

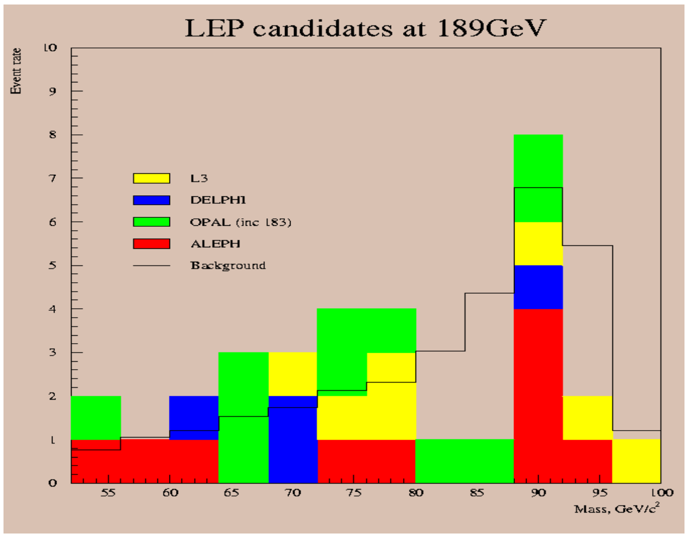
Combinato ADLO :



$$\boxed{M_h > 89.8\ GeV\ @\ 95\% C.L.}$$

$\sqrt{s} = 189\ Gev$ (**MOLTO** *Prel.*):

Exp.	$\mathcal{N}_{obs.}$	$\mathcal{N}_{exp.}$
ALEPH	10	8.0
DELPHi	4	4.8
L3	22	18.0
OPAL	4	8.6



- $\mathcal{L}(int) \sim 40\ pb^{-1}$/exp $\quad M_h > 88 \div 93.6$ GeV
- nessuna combinazione (ICHEP98)

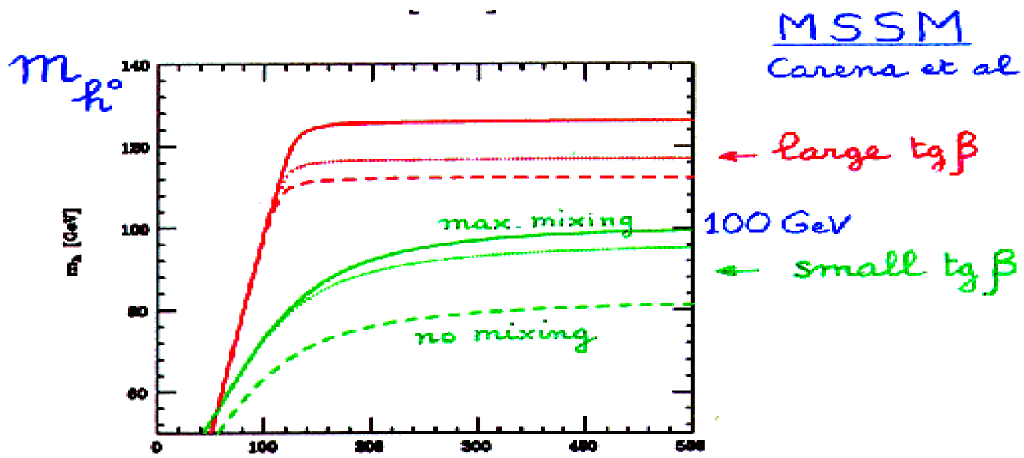
- Invisible $h \to \tilde{\chi}^0\tilde{\chi}^0, \mathcal{MM}$

  $$M_h \;>\; 84.3\; GeV\; (DELPHI)$$

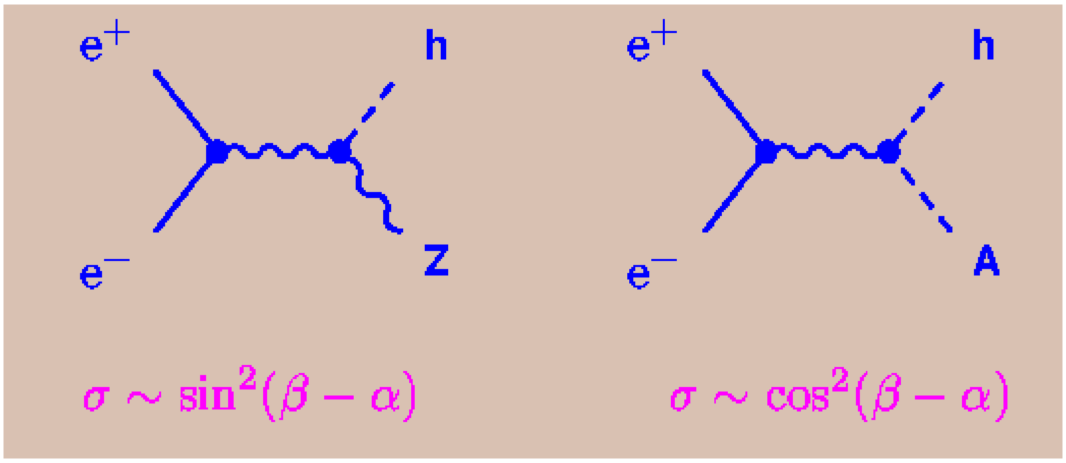
- Bosofilico $h \to \gamma\gamma$

  $$M_h \;>\; 92.6\; GeV\; (OPAL)$$

- MSSM
  - 2 doppietti $\to$ 5 bosoni: $h, H^0, H^\pm, A$
  - h leggero : $M_h = f(M_A, tg\beta, ...) < 120$ GeV $\Leftarrow$ *LEP?*



  - produzione



  - decadimenti

$$\mathrm{A} \to b\bar{b}\;;\; \mathrm{h} \to b\bar{b}/AA$$

$$\Rightarrow\; b\text{–tagging}$$

Nessun eccesso wrt fondi $\rightarrow$ limiti

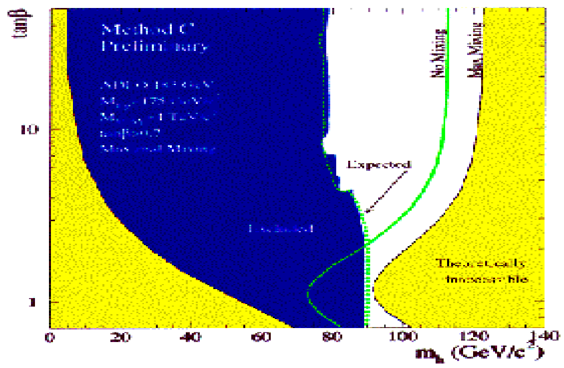
σ,B.R.,ϵ = f($m_0, m_{1/2}, \mu, A_t, tg\beta, M_A$)

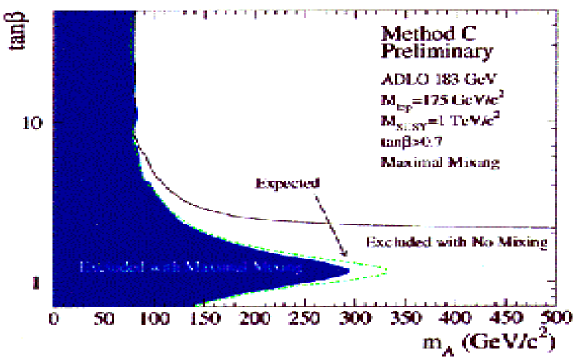
- Metodo di "benchmark"
  - fissa gli altri parametri $\Leftrightarrow$ min / max $\tilde{t}$ mixing
  - esclude nel piano $(M_{h(A)}, tg\beta)$
  - @ 183 GeV :

$$M_h > 77 \text{ GeV},\ M_A > 78 \text{ GeV}\ (tg\beta > 0.8)$$
$$tg\beta > 2.1\ (\tilde{t} \text{ mix minimale})$$

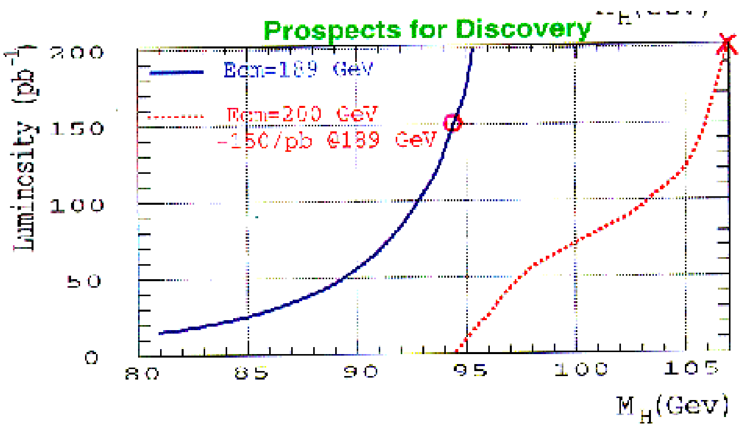
  - @ 189 GeV (40 pb^{-1}):

$$M_{h,A} > 74 \div 80\ GeV$$





- Metodo di "scan"
  - esplora spazio parametri (6-dimensionale)
  - per ogni insieme parametrizza σ,B.R.,ϵ ,etc.
  - impone vincoli teorici + limiti da altre analisi
  - *conferma* risultati precedenti
  - $\sim 10^{-4(-3)}$ insiemi "patologici" a basso (alto) $tg\beta$



200 pb^{-1} @ 200 GeV (+ 150 pb^{-1} @ 190 GeV)

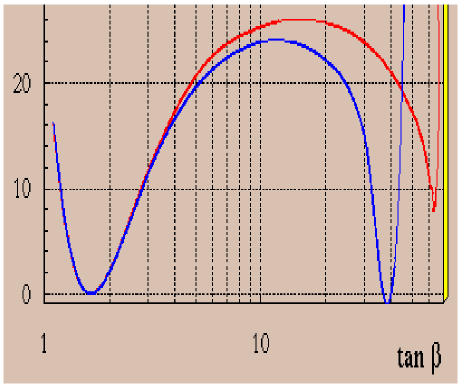
- Scoperta $M_h < 107 GeV$ (5 σ)
- Esclusione $M_h < 109 GeV$ (95 % C.L.)

esclude MSSM con $tg\beta < 2$

- vincoli a SUGRA
  ($m_{GUT}, \alpha_{GUT}, b-\tau, b \to s\gamma, \Omega h^2, \ldots$)

$$tg\beta \;=\; 1.65 \pm 0.3$$

(W.de Boer hep-ph/9808448, Phys.in Coll. 1998)



LEP II : severo test di SUGRA minimale

SUSY

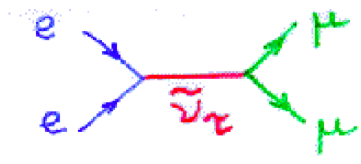
- $H^{\pm}$
  - rilevante per NMMSM
  - $\rightarrow c\bar{s}/\tau\bar{\nu}$ $\qquad M_{H^{\pm}} > 60 GeV$
  - limite LEP (2000) $< M_W$

- SUGRA + R_p
  - $M_{\tilde{\ell}} \; > \; 72(\tilde{\mu},\tilde{\tau}), 85(\tilde{e})$
  - $M_{\tilde{t}} \; > \; 80 \div 85 \; GeV \; (\theta \; mix)$
  - $M_{\tilde{\chi}^{+}} \; > \;$ 90 Gev
  - $M_{\tilde{\chi}_1^0}(LSP) \; > \; 26 \; GeV \;\; \forall \;\; m_0, tg\beta$

- SUGRA $\ominus$ R_p
  - LSP instabile ,($\tilde{\chi}^0$ visibile)
  - sensibilita' conforntabile con R_p cons.:

    DELPHI: $M_{\tilde{\chi}_1^0} \; > \; 25 \; GeV \;\; \forall \;\; m_0, tg\beta$
  - accoppiamenti $e^+e^-\tilde{f}$, $\lim(m_{\tilde{f}}, \lambda)$

    L3: $\tilde{\nu}$

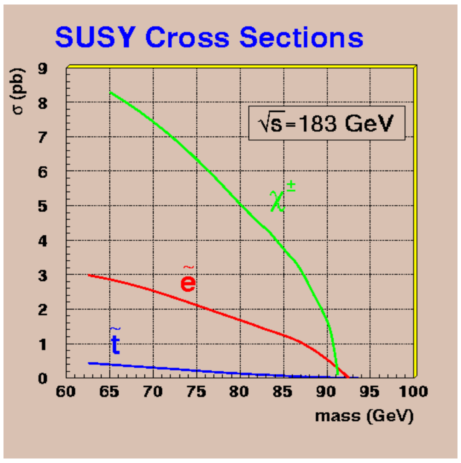


- $\geq 1\gamma$ isolati
  - $e^+e^- \rightarrow XX, \;\; X \rightarrow \gamma Y, \;\; Y$ invisibile
  - GMSB: X $=\tilde{\chi}_1^0$ (NLSP), Y $=\tilde{G}$, $\tilde{G}$ leggero

    cfr evento CDF $q\bar{q} \rightarrow ee\gamma\gamma\tilde{G}\tilde{G}$

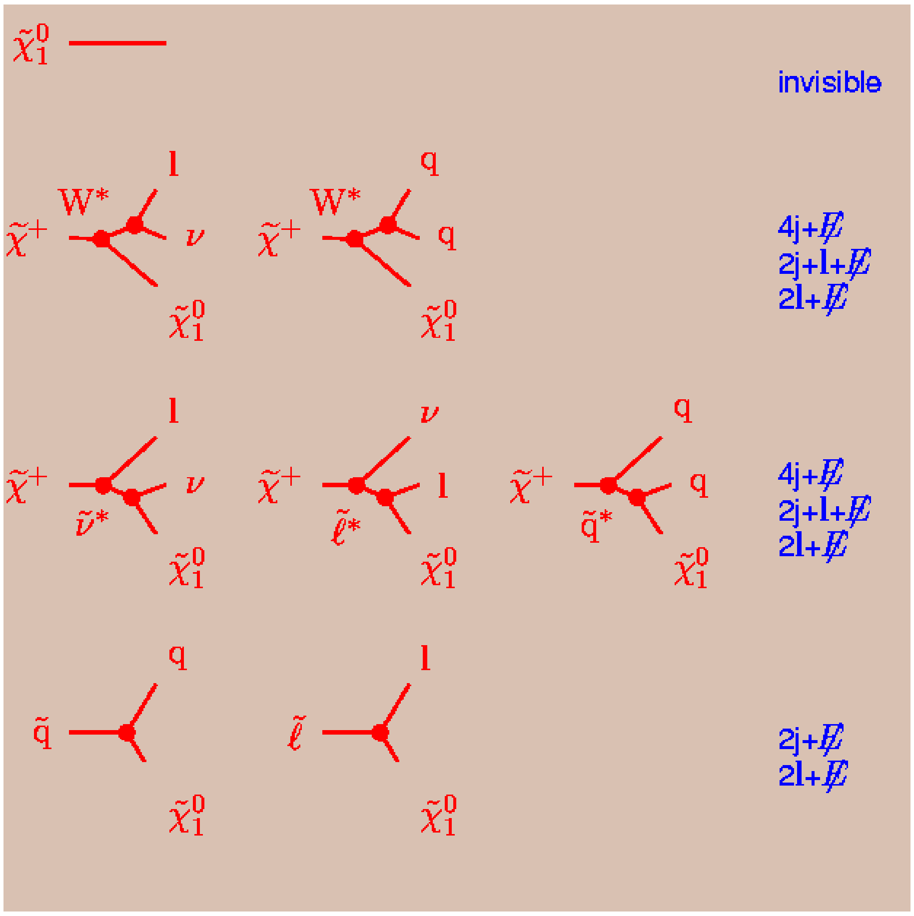
SUSY: R_p conservata

- $R_p = (-1)^{3B+L+2S} = \begin{cases} +1 & S.M. \\ -1 & SUSY \end{cases}$
- SUSY prodotte in coppia
- LSP stabile (e invisibile)
- $\Delta M \;=\; M_{SUSY} - M_{LSP}$:



- $< 150\ MeV \;\Rightarrow\; L_{decay} > 1m \qquad \Rightarrow$ dE/dX, RICH
- $< 500\ MeV \;\Rightarrow\; L_{decay}\ 0.1 \div 1.m \qquad \Rightarrow$ kinks
- $< \;\; 3\ GeV \;\Rightarrow\; L_{decay}\mathcal{O}(\mu m)m \qquad \Rightarrow \gamma$ da ISR
- $> \;\; 3\ GeV \qquad \Rightarrow\; E_{miss}$

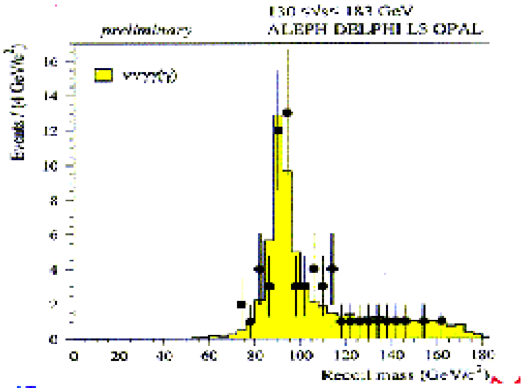
- E_{miss}: topologie



Esempio: Gauge Mediated SUSY Breaking

- $\sqrt{F} \rightarrow$ scala SUSY S.B.
- $\tilde{G}$ LSP, $\tilde{\chi}_1^0$ (NLSP): $\begin{cases} M_{\tilde{G}} \simeq 2.5\, ev \times (\frac{\sqrt{F}}{100 TeV})^2 \\ B.R.(\tilde{\chi}_1^0) \rightarrow \tilde{G}\gamma \simeq 100\% \end{cases}$

$$\boxed{e^+e^- \rightarrow \tilde{\chi}_1^0\tilde{\chi}_1^0 \rightarrow \gamma\gamma\tilde{G}\tilde{G}}$$

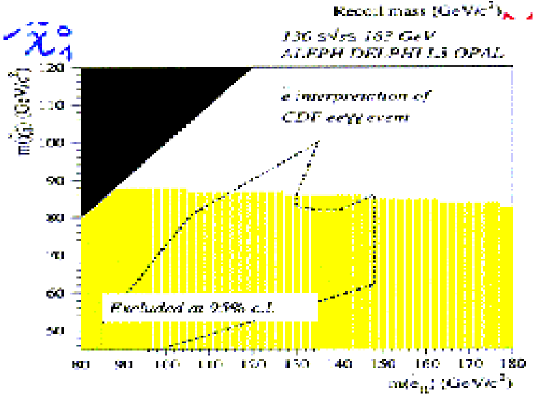


- fondo dominante: $e^+e^- \rightarrow \nu\nu\gamma\gamma$
- tagli: acoplanarita',M_{rec}
- esclude scenario

  $q\bar{q} \rightarrow \tilde{e}\tilde{e} \rightarrow$

  $ee\tilde{\chi}_1^0\tilde{\chi}_1^0 \rightarrow ee\gamma\gamma\tilde{G}\tilde{G}$

  per evento CDF



$$\boxed{e^+e^- \rightarrow \gamma\tilde{G}\tilde{G}}$$

- Modello di Brignole Feruglio Zwirner:
  - $\tilde{G}$ superleggero
  - $M_{SUSY} >> \sqrt{s}$
  - produzione via ISR : $\sigma = \dfrac{\alpha s^3}{320\pi^2 F^4} I(E_\gamma, ...)$
  - fondo (irriducibile) : $e^+e^- \rightarrow \nu\nu\gamma$
  - limite (ALEPH,DELPHI,L3):

$$M_{\tilde{G}} > 6.6 \div 8.3\ 10^{-6} \text{ ev}$$

Prospettive 1999 (2000)

LEP I

- Pubblicazioni finali parametri Z^0 e dei contributi a ICHEP98
- Fisica heavy flavours:

  nuovi canali ($b \to sg$,$D_s \to \tau\nu$)

  oscillazioni B_s
- ALEPH : nuovo tracking , reanalisi A^b_{fb}, P_τ, $B_s \Leftrightarrow \bar{B}_s$

LEP II

- Macchina

  1999 100 pb^{-1} $\sqrt{s} = 192$ GeV (200 da Luglio ?)

  2000 100 pb^{-1} $\sqrt{s} = 200$ GeV

  progetto installazione spettrometro $\Rightarrow$ $\sigma(E^{LEP}) = 10$ MeV
- Fisica (1998 - 2000)

  $\sigma(M_W)^{stat} = \pm 25$ MeV

  $\sigma(M_W)^{tot.} = \pm 40$ MeV ?

  SUSY $\sim$ 100 GeV

  Higgs $\sim$ 110 GeV