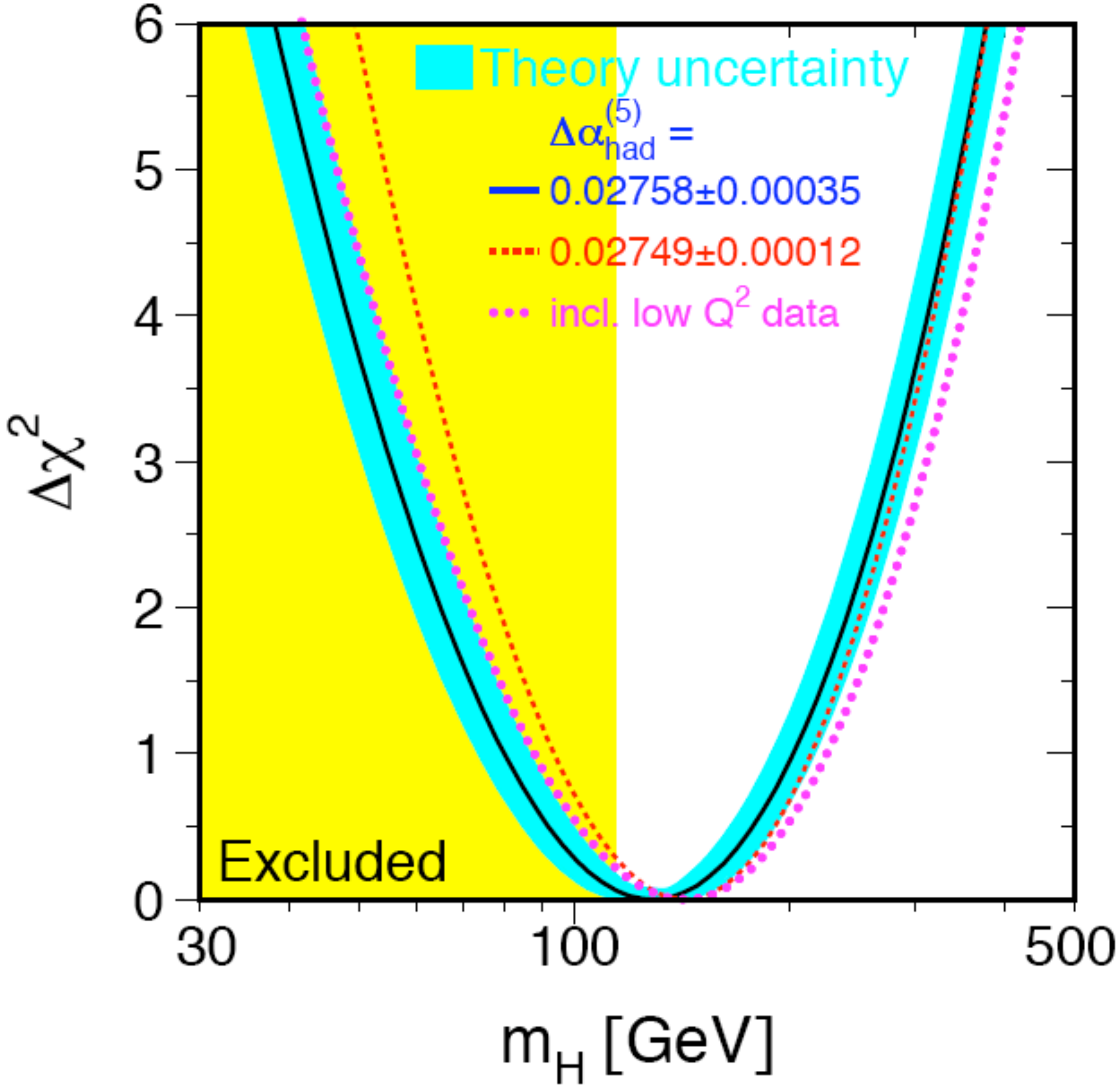
la massa dell'Higgs



- excluding $\mathcal{A}_\ell$(SLD):

$$m_H = 175^{+99}_{-66}\ \text{GeV}$$

- excluding $A^{0,b}_{FB}$(LEP):

$$m_H = 76^{+54}_{-33}\ \text{GeV}$$

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Altri confronti:

Data	$\widehat{s}^2_Z$	s^2_W	$\alpha_s(M_Z)$	M_H
All data	0.23119(14)	0.22308(30)	0.1217(17)	77^{+28}_{-22}
All indirect (no m_t)	0.23123(16)	0.22297(36)	0.1217(17)	104^{+130}_{-53}
Z pole (no m_t)	0.23121(17)	0.22312(59)	0.1198(28)	92^{+117}_{-46}
LEP 1 (no m_t)	0.23152(21)	0.22377(67)	0.1213(30)	173^{+241}_{-95}
SLD + M_Z	0.23067(30)	0.22216(54)	0.1217 (†)	25^{+23}_{-15}
$A_{FB}^{(b,c)}$ + M_Z	0.23193(28)	0.22489(75)	0.1217 (†)	326^{+224}_{-136}
M_W + M_Z	0.23095(28)	0.22265(55)	0.1217 (†)	49^{+37}_{-26}
M_Z	0.23133(7)	0.22337(21)	0.1217 (†)	117 (†)
polarized Møller	0.2331(14)	0.2252(14)	0.1217 (†)	117 (†)
DIS (isoscalar)	0.2345(17)	0.2267(17)	0.1217 (†)	117 (†)
Q_W (APV)	0.2291(19)	0.2212(19)	0.1217 (†)	117 (†)
elastic $\nu_\mu(\overline{\nu_\mu})e$	0.2310(77)	0.2232(77)	0.1217 (†)	117 (†)
SLAC eD	0.222(18)	0.213(19)	0.1217 (†)	117 (†)
elastic $\nu_\mu(\overline{\nu_\mu})p$	0.211(33)	0.203(33)	0.1217 (†)	117 (†)

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Altrte parametrizzazioni delle correzioni radiative

La formulazione delle correzioni radiative che abbiamo usato finora deriva in modo naturale dalle correzioni alle singole osservabili.
E' possibile riparametrizzare le correzioni in modo da isolare i termini di pura QED e QCD (essenzialmente il running delle costanti) dalle correzioni dovute alle masse dei fermioni.
Ci sono almeno due set, gli ε e i "parametri obliqui" STU

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I parametri ε (Altarelli-Barbieri)

definizioni:

$$\cos\vartheta_0 \sin\vartheta_0 = \frac{1}{M_Z}\sqrt{\frac{\pi\alpha(M_Z)}{G_F\sqrt{2}}}$$

$$\begin{aligned}
\epsilon_1 &= \Delta\rho \\
\epsilon_2 &= \cos^2\theta_0\Delta\rho + \frac{\sin^2\theta_0}{\cos^2\theta_0 - \sin^2\theta_0}\Delta r_{\mathrm{w}} - 2\sin^2\theta_0\Delta\kappa' \\
\epsilon_3 &= \cos^2\theta_0\Delta\rho + (\cos^2\theta_0 - \sin^2\theta_0)\Delta\kappa' \\
\epsilon_b &= \frac{1}{2}\Delta\rho_b\,.
\end{aligned}$$

$$\sin^2\theta_0 = \frac{1}{2}\left(1 - \sqrt{1 - 4\frac{\pi\alpha(m_{\mathrm{Z}}^2)}{\sqrt{2}G_{\mathrm{F}}m_{\mathrm{Z}}^2}}\right)$$

$$\sin^2\theta_{\mathrm{eff}}^{\mathrm{lept}} = (1+\Delta\kappa')\sin^2\theta_0$$

dipendenza dalle masse del top e dell'Higgs

$$\begin{aligned}
\epsilon_1 &= \frac{3G_{\mathrm{F}}m_{\mathrm{t}}^2}{8\sqrt{2}\pi^2} - \frac{3G_{\mathrm{F}}m_{\mathrm{W}}^2}{4\sqrt{2}\pi^2}\tan^2\theta_{\mathrm{W}}\ln\frac{m_{\mathrm{H}}}{m_{\mathrm{Z}}} + \ldots \\
\epsilon_2 &= -\frac{G_{\mathrm{F}}m_{\mathrm{W}}^2}{2\sqrt{2}\pi^2}\ln\frac{m_{\mathrm{t}}}{m_{\mathrm{Z}}} + \ldots \\
\epsilon_3 &= \frac{G_{\mathrm{F}}m_{\mathrm{W}}^2}{12\sqrt{2}\pi^2}\ln\frac{m_{\mathrm{H}}}{m_{\mathrm{Z}}} - \frac{G_{\mathrm{F}}m_{\mathrm{W}}^2}{6\sqrt{2}\pi^2}\ln\frac{m_{\mathrm{t}}}{m_{\mathrm{Z}}} + \ldots \\
\epsilon_b &= -\frac{G_{\mathrm{F}}m_{\mathrm{t}}^2}{4\sqrt{2}\pi^2} + \ldots\,.
\end{aligned}$$

ε_2 dipende solo da $\ln(m_t)$
ε_3 da $\ln(m_t)$ e da $\ln(m_H)$
ecc.

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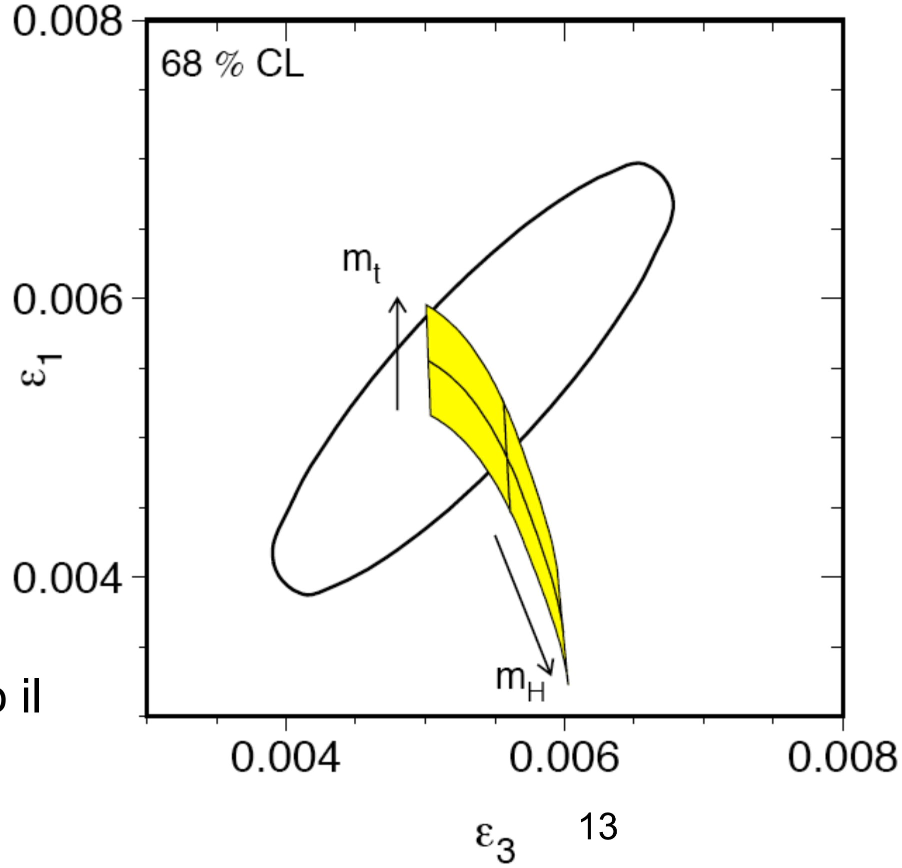
relazione con le quantità misurate

$$\frac{m_W^2}{m_Z^2} = \frac{m_W^2}{m_Z^2}|_B(1+1.43\epsilon_1-1.00\epsilon_2-0.86\epsilon_3),$$
$$\Gamma_l = \Gamma_l|_B(1+1.20\epsilon_1-0.26\epsilon_3),$$
$$A_l^{FB} = A_l^{FB}|_B(1+34.72\epsilon_1-45.15\epsilon_3),$$
$$\Gamma_b = \Gamma_b|_B(1+1.42\epsilon_1-0.54\epsilon_3+2.29\epsilon_b).$$

(dove B sta per l'improved Born approximation che include QCD e QED)

LEP-SLC + M_W

$\Delta\alpha^{(5)}_{\rm had}(m_Z^2)$	0.02758 ± 0.00035
$\alpha_S(m_Z^2)$	0.1185 ± 0.0039
m_Z [GeV]	91.1873 ± 0.0021
ϵ_1	$+0.0054\pm0.0010$
ϵ_2	-0.0089 ± 0.0012
ϵ_3	$+0.00534\pm0.00094$
ϵ_b	-0.0050 ± 0.0016



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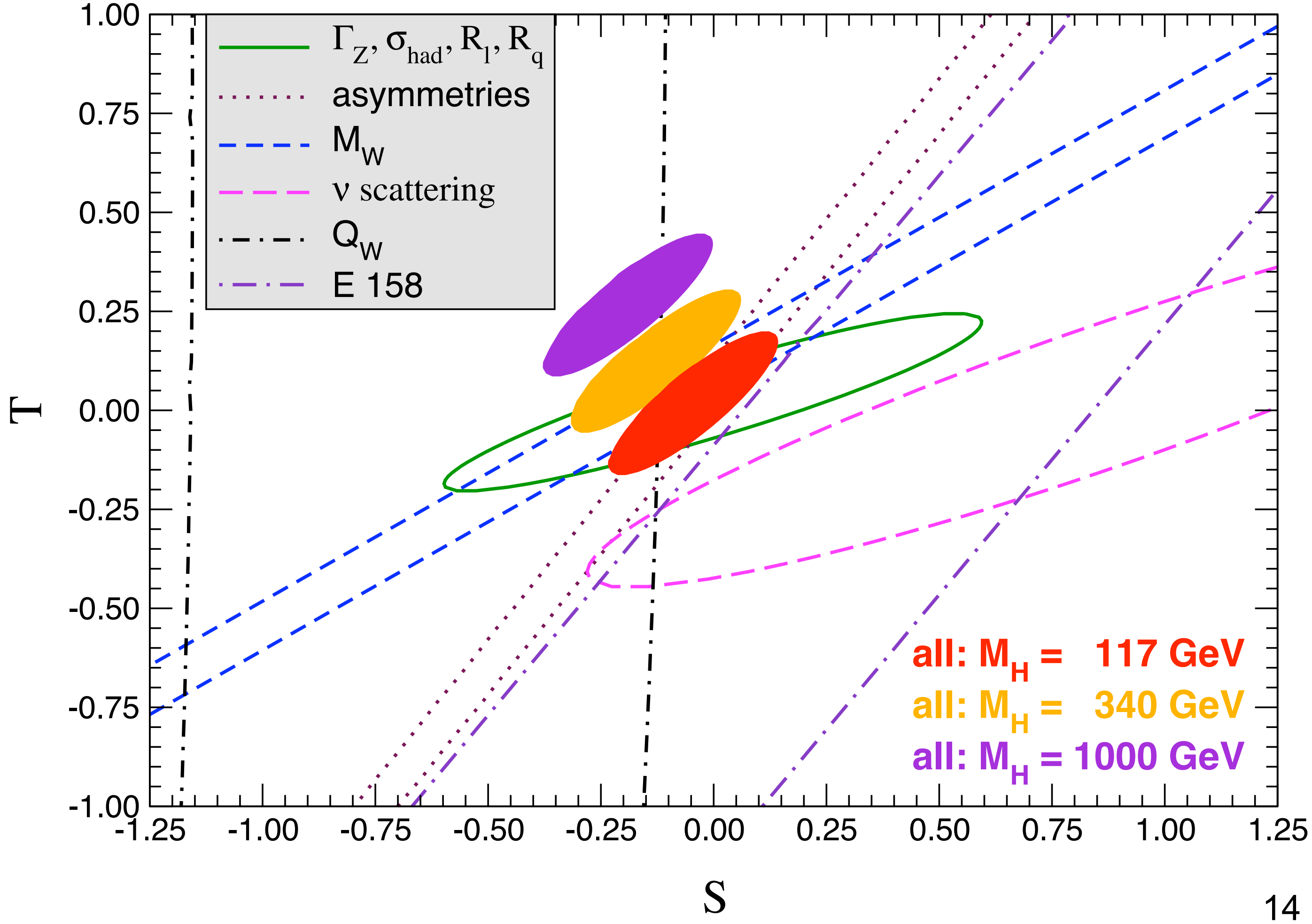
La differenza da zero dimostra di nuovo il ruolo delle correzioni radiative e.w.

S T U



$\Gamma_Z, \sigma_{had}, R_l, R_q$
asymmetries
M_W
ν scattering
Q_W
E 158
all: M_H = 117 GeV
all: M_H = 340 GeV
all: M_H = 1000 GeV
T
S
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.00
-0.75
-0.50
-0.25
0.00
0.25
0.50
0.75
1.00
1.25
14