

Status of summary table of Higgs couplings

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Update

- H \rightarrow invisible: new full simulation study (A. Ishikawa).
- Global fit: replace the free parameter Higgs total width as sum of partial width

Summary table of Higgs measurements @ ILC

250 GeV: 250 fb⁻¹
 500 GeV: 500 fb⁻¹
 1 TeV: 1000 fb⁻¹

$M_H = 125 \text{ GeV}$
 $P(e^-, e^+) = (-0.8, +0.3) @ 250, 500 \text{ GeV}$
 $P(e^-, e^+) = (-0.8, +0.2) @ 1 \text{ TeV}$

Canonical

ECM	@ 250 GeV		@ 500 GeV		@ 1 TeV
luminosity · fb	250		500		1000
polarization (e ⁻ , e ⁺)	(-0.8, +0.3)		(-0.8, +0.3)		(-0.8, +0.2)
process	ZH	vvH(fusion)	ZH	vvH(fusion)	vvH(fusion)
cross section	2.6%	-	-	-	-
	$\sigma \cdot \text{Br}$	$\sigma \cdot \text{Br}$	$\sigma \cdot \text{Br}$	$\sigma \cdot \text{Br}$	$\sigma \cdot \text{Br}$
H ^{->} bb	1.2%	10.5%	1.8%	0.66%	0.32%
H ^{->} cc	8.3%		13%	6.2%	3.1%
H ^{->} gg	7.0%		11%	4.1%	2.3%
H ^{->} WW*	6.4%		9.2%	2.4%	1.6%
H ^{->} $\tau\tau$	4.2%		5.4%	9.0%	3.1%
H ^{->} ZZ*	19%		25%	8.2%	4.1%
H ^{->} $\gamma\gamma$	29-38%		29-38%	20-26%	7-10%
H ^{->} $\mu\mu$	-		-		31%
ttH, H ^{->} bb	-		28%		6.0%
H ^{->} Inv. (95% C.L.)	< 0.80% --> < 0.95%				-

being updated by new studies with $m_H = 125 \text{ GeV}$

total width constraint

$$\Gamma'_0 = \sum_i \Gamma'_i = \sum_i \frac{g'^2_i}{g'^2_i|_{\text{SM}}} \Gamma'_i|_{\text{SM}}$$

$$\Gamma_0 = \sum_i g_i^2 \text{Br}_i|_{\text{SM}}$$

Γ'_0, g'_i are the absolute values;

Γ_0, g_i are the normalized values (divided by SM values)

$$\Delta\Gamma_0 = \sum_i 2g_i \Delta g_i \text{Br}_i|_{\text{SM}}$$

remaining 9 free parameters

global fit with constraint (I)

250 GeV: 250 fb-1
 500 GeV: 500 fb-1
 1 TeV: 1000 fb-1

MH = 125 GeV
 P(e-,e+)=(-0.8,+0.3) @ 250, 500 GeV
 P(e-,e+)=(-0.8,+0.2) @ 1 TeV

Canonical

coupling $\Delta g/g$	250 GeV		250 GeV + 500 GeV		250 GeV + 500 GeV + 1 TeV	
	grey	color	grey	color	grey	color
HZZ	1.3%	0.73%	1.3%	0.48%	1.3%	0.44%
HWW	4.8%	4.7%	1.4%	0.39%	1.4%	0.21%
Hbb	5.3%	4.7%	1.8%	0.93%	1.5%	0.52%
Hcc	6.8%	6.3%	2.9%	2.5%	2.0%	1.4%
Hgg	6.4%	6.1%	2.4%	2.0%	1.8%	1.1%
H $\tau\tau$	5.7%	5.2%	2.4%	1.9%	1.9%	1.3%
H $\gamma\gamma$	18%	17%	8.4%	8.3%	4.1%	3.8%
Htt	-	-	14%	14%	3.2%	2.9%
H $\mu\mu$	-	-	-	-	16%	16%
Γ_0	11%	9.6%	5.9%	2.0%	5.6%	1.2%

grey: Higgs total width as free parameter

color: replace Higgs total width as shown in previous slide

adding total width constraints, improvement is significant

global fit with constraint (I)

250 GeV: 1150 fb⁻¹
 500 GeV: 1600 fb⁻¹
 1 TeV: 2500 fb⁻¹

MH = 125 GeV
 P(e⁻,e⁺)=(-0.8,+0.3) @ 250, 500 GeV
 P(e⁻,e⁺)=(-0.8,+0.2) @ 1 TeV

LumiUP

coupling $\Delta g/g$	250 GeV		250 GeV + 500 GeV		250 GeV + 500 GeV + 1 TeV	
	grey	color	grey	color	grey	color
HZZ	0.61%	0.34%	0.61%	0.24%	0.61%	0.22%
HWW	2.3%	2.2%	0.67%	0.21%	0.65%	0.12%
Hbb	2.5%	2.2%	0.90%	0.51%	0.74%	0.31%
Hcc	3.2%	3.0%	1.5%	1.3%	1.1%	0.83%
Hgg	3.0%	2.8%	1.3%	1.1%	0.93%	0.67%
H $\tau\tau$	2.7%	2.4%	1.2%	0.98%	0.99%	0.72%
H $\gamma\gamma$	8.2%	8.1%	4.5%	4.4%	2.4%	2.3%
Htt	-	-	7.8%	7.8%	2.0%	1.8%
H $\mu\mu$	-	-	-	-	10%	10%
Γ_0	5.4%	4.5%	2.8%	1.1%	2.7%	0.69%

grey: Higgs total width as free parameter

color: replace Higgs total width as shown in previous slide

coupling constraint

$$g_c = g_t$$

$$g_s = g_b$$

$$g_\mu = g_\tau$$

remaining 7 free parameters

global fit with constraint (II)

250 GeV: 1150 fb⁻¹
 500 GeV: 1600 fb⁻¹
 1 TeV: 2500 fb⁻¹

MH = 125 GeV
 P(e⁻,e⁺)=(-0.8,+0.3) @ 250, 500 GeV
 P(e⁻,e⁺)=(-0.8,+0.2) @ 1 TeV

LumiUP

coupling $\Delta g/g$	250 GeV + 500 GeV + 1 TeV	
HZZ	0.22%	0.22%
HWW	0.12%	0.12%
Hbb (Hss)	0.31%	0.30%
Hcc (Htt)	0.83%	0.76%
Hgg	0.67%	0.67%
H $\tau\tau$ (H $\mu\mu$)	0.72%	0.71%
H $\gamma\gamma$	2.3%	2.3%
Γ_0	0.69%	0.68%

adding coupling constraints, change is rather small