Staging

Higgs and EW

ECM=250GeV, L=500fb-1

highlight 1: absolute Higgs couplings

ILC initial: $\delta g_{HZZ} = 0.75\%$

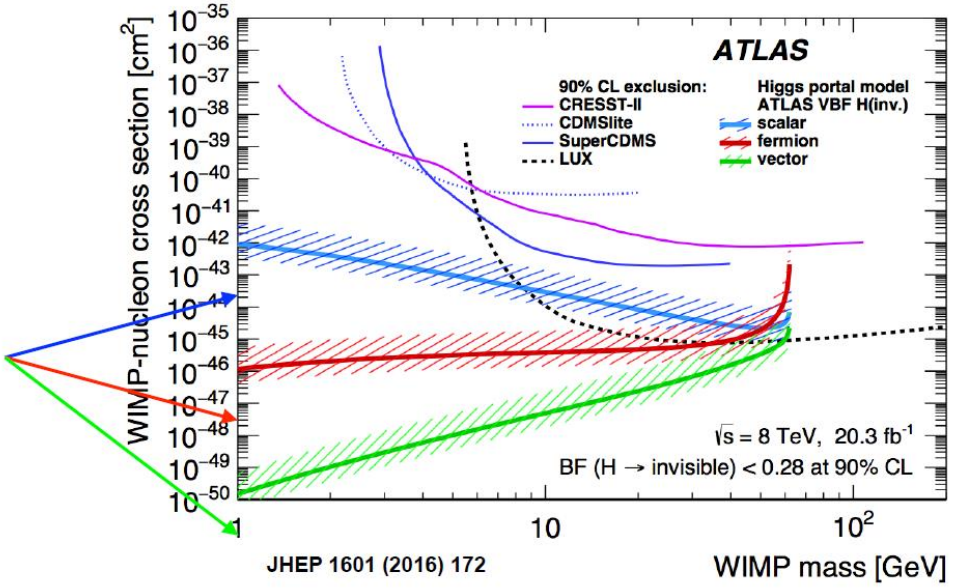
$$\Lambda > \sqrt{\frac{1\%}{\delta g_{HZZ}}} 1.74\text{TeV}$$

highlight 2: Higgs to invisible decay

ILC initial: BR(H—>inv.) < 0.59% (95% CL)

- initial sensitivity is already more than one order of magnitude higher than expectation after HL-LHC

ILC initial
x50 lower



highlight 3: Higgs CP mixing

through H—>τ⁺τ⁻ $L_{Hff} = -\frac{m_f}{v} H\bar{f}(\cos\Phi_{CP} + i\gamma^5 \sin\Phi_{CP})f$

ILC initial: $\Delta\Phi_{CP} \sim 7.6^\circ$

D.Jeans @ LCWS16

through HZZ/HWW $L_{HVV} = 2C_V M_V^2(\frac{1}{v} + \frac{a}{\Lambda})HV_\mu V^\mu + C_V\frac{b}{\Lambda}HV_{\mu\nu}V^{\mu\nu} + C_V\frac{\tilde{b}}{\Lambda}HV_{\mu\nu}\tilde{V}_{\mu\nu}$

(CP-odd)

ILC initial: $\Delta\tilde{b} \sim 0.01$ (for Λ=246GeV)

T.Ogawa @ LCWS16

highlight 4: Higgs mass and total width

ILC initial: Δm_H~30MeV, $\delta\Gamma_H$~8.8%

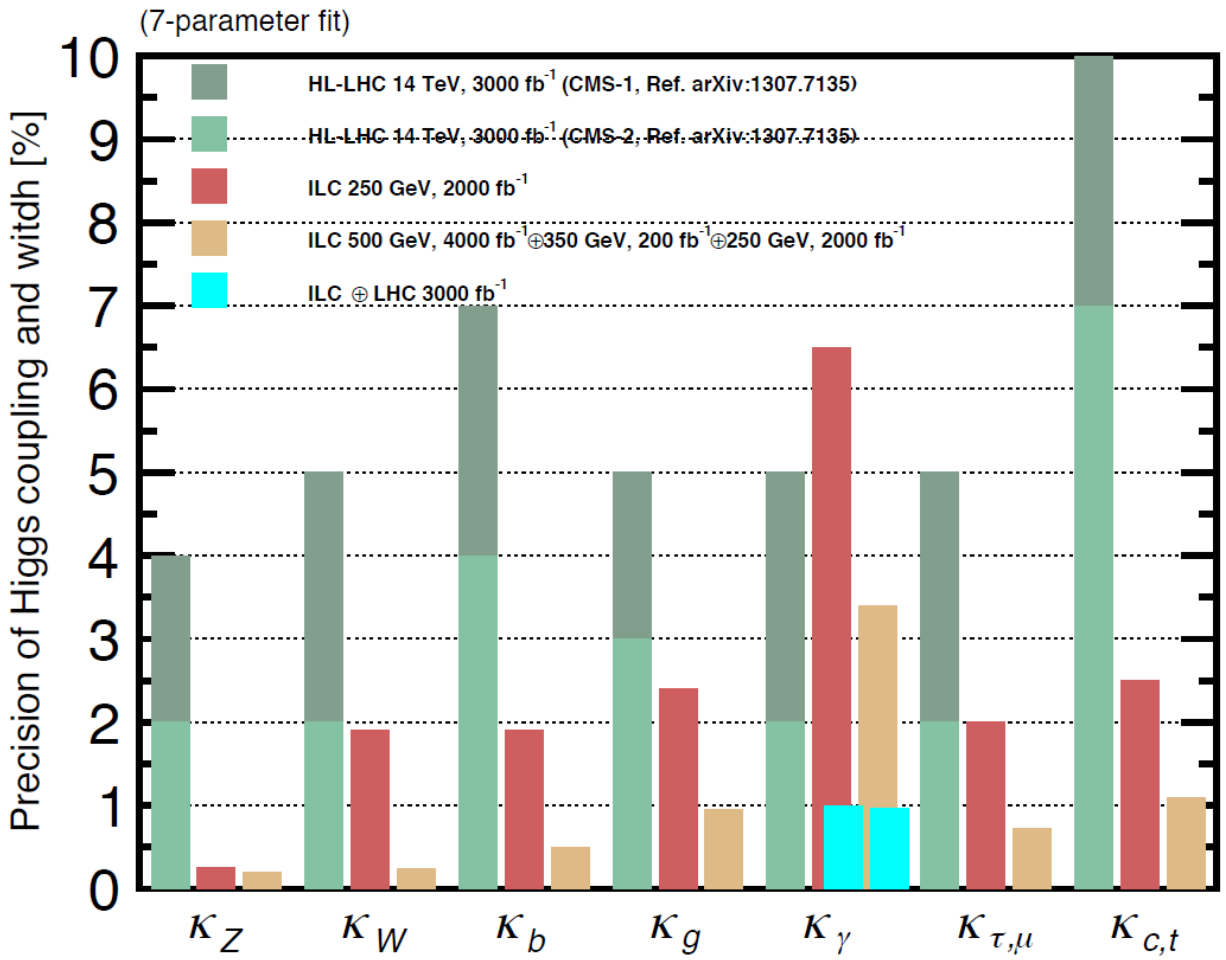
highlight 5: Higgs decays to bb/cc/gg

ILC initial: δBR_b~1%

- first direct measurement of Hcc coupling ~ 5%
- first direct measurement of Hgg coupling ~5%

ECM=250GeV, L=2000fb-1

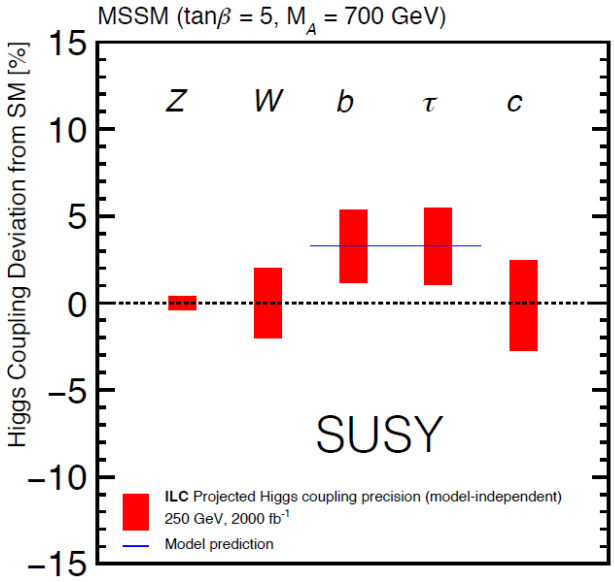
comparison (synergy) with LHC

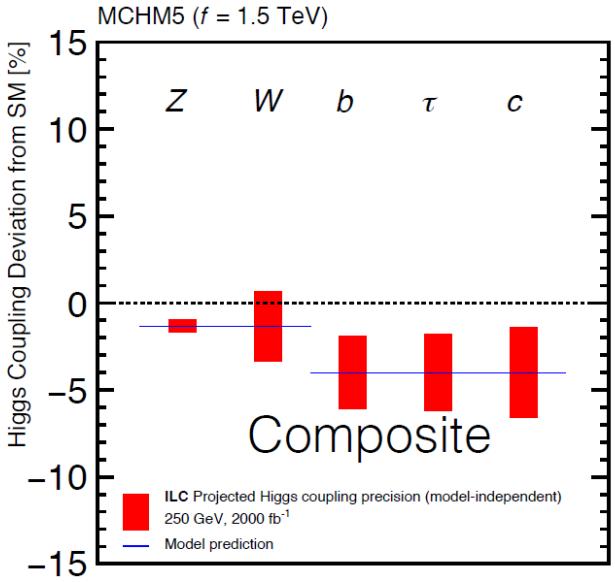


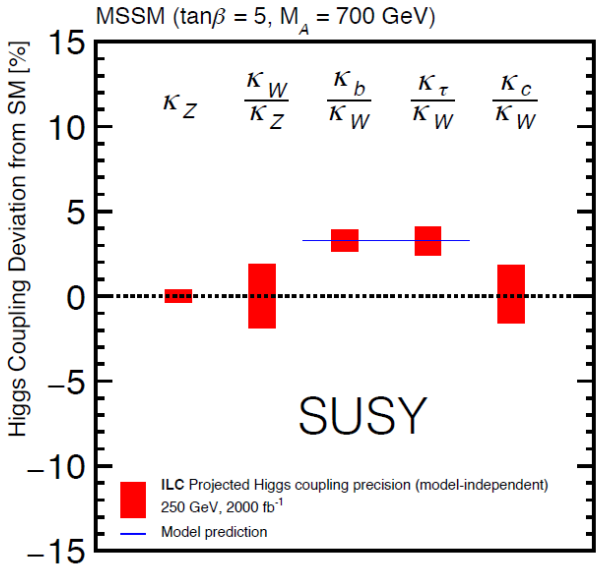
Higgs rare decays

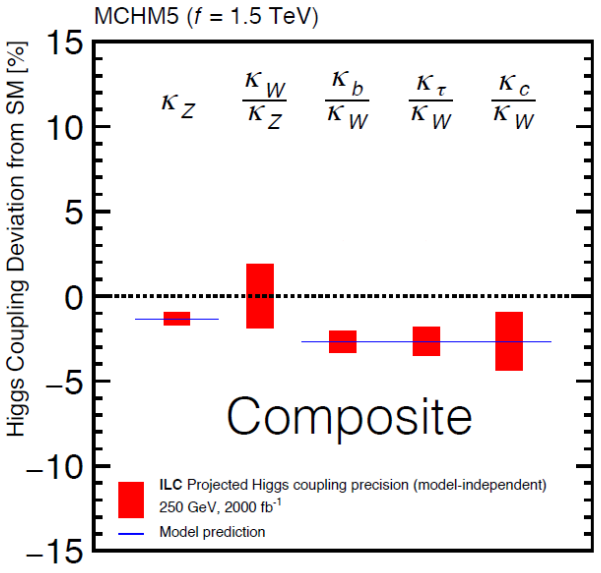
modes	physics implication	Δg/g @ ILC
H—>γγ	sensitive to new heavy particles, typically O(10%) deviations	~1% (+LHC)
H—>γZ		5% (preliminary)
(H—>gg)		~2%
H—>μμ	one useful point to test $y_f \propto m_f$; test mass generation mechanism for 2nd & 3rd gen. leptons (κ_μ/κ_τ), and for 2nd lepton & quark (κ_μ/κ_c)	~13% (5%?)
H—>invisible	test Higgs portal dark matter model	BR<0.31% (95% C.L.)

deviations pattern for Higgs couplings









Higgs total width

(standard method at e+e-; model independent)

$$\Gamma_H = \frac{\Gamma_{HZZ}}{\mathrm{Br}(H \to ZZ^*)} \propto \frac{g^2_{HZZ}}{\mathrm{Br}(H \to ZZ^*)}$$

—>Br(H->ZZ*) very small

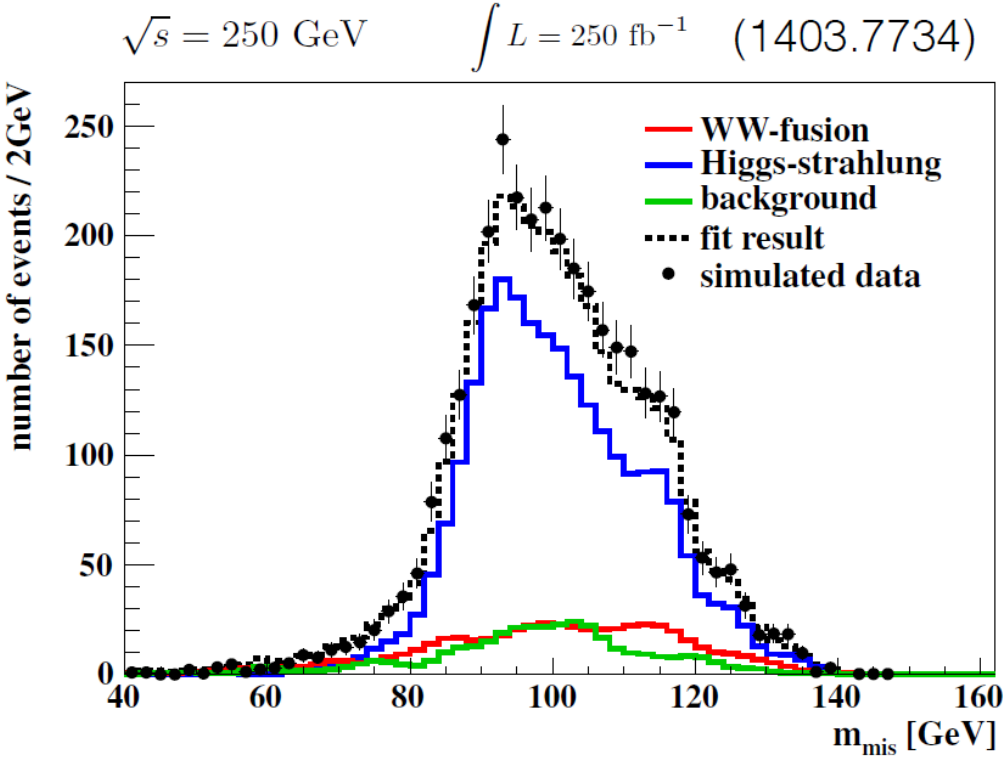
$$\Gamma_H = \frac{\Gamma_{HWW}}{\mathrm{Br}(H \to WW^*)} \propto \frac{g^2_{HWW}}{\mathrm{Br}(H \to WW^*)}$$

—> better option

κ_W is determined using WW-fusion $\nu_e\nu_e H$, which is at 250 GeV statistically limited

$\delta\Gamma_H$	500 fb-1	2000 fb-1
model independent	8.8%	4.4%

measurement for WW-fusion $\nu_e\nu_e H$



$\sigma_{\nu e \nu e H}$ ~ 14 fb —> 2000 signal $\nu\nu bb$ events

can we do better than 10%?

new idea is being tried out —> stay tuned

Higgs total width: new method

Fujii, Tian

if we assume custodial symmetry holds in BSM as well,

$\kappa_W / \kappa_Z = 1$,

then we can relax the requirement of $\nu_e\nu_e H$ measurement

$\delta\Gamma_H$	500 fb-1	2000 fb-1
model independent	8.8%	4.4%
$k_W/k_Z = 1$ holds up to 0.5%	5.5%	2.9%

Higgs Exotic Decay

- $H \rightarrow \mu\tau$, sb
  - O(0.1%)の精度必要
  - General MSSM: $Br < 1.0 \times 10^{-4}$