

Higgs Group Report

FCC-ee Physics Meeting

May 4th, 2015

Krisztian Peter & Markus Klute

FCC-ee Higgs Mini-workshop

➔ **When and where**

- ⦿ end of September (24-25/09) at CERN

➔ **Organizers**

- ⦿ Krisztian, Markus with help from Patrick and Alain

➔ **Highlevel goals**

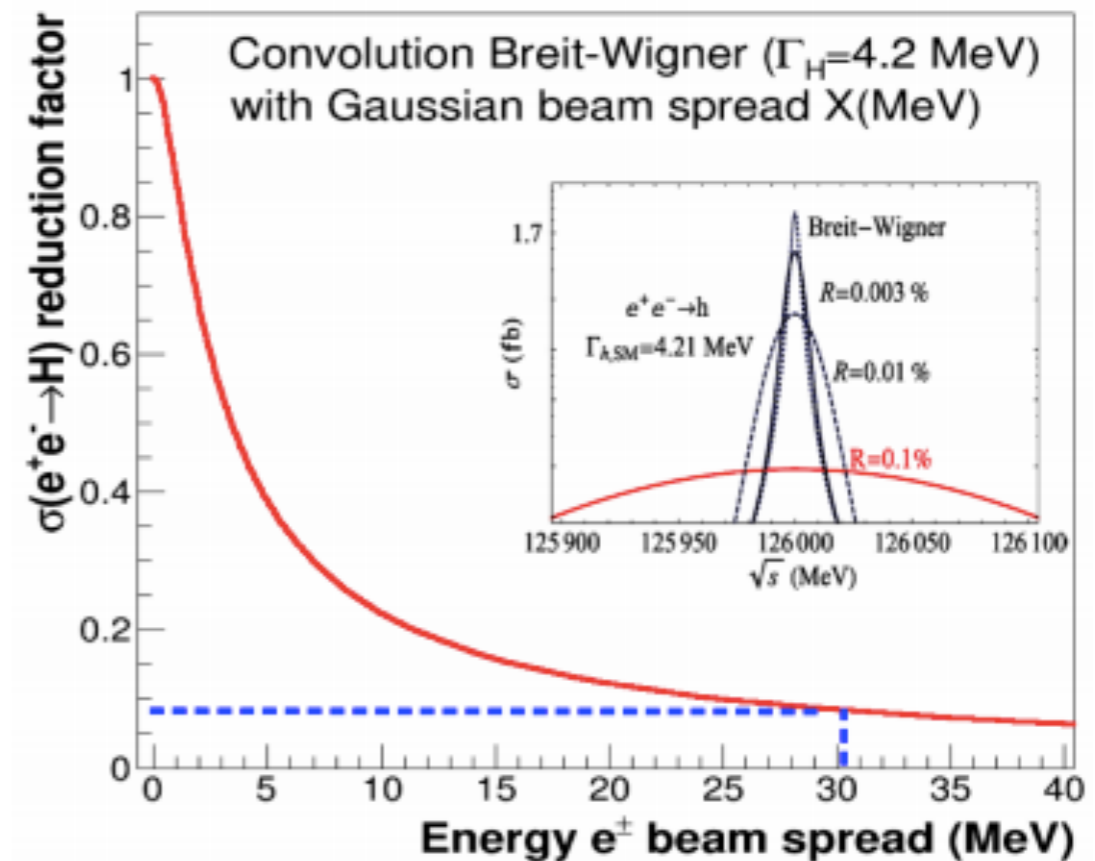
- ⦿ strengthen working group (connect experts and newcomer from theory and experiment)
- ⦿ identify experimental opportunities
- ⦿ develop workplan for the next 12-15 months

Feedback from Washington

- ➔ Document complementary of FCC-ee and FCC-pp,ep Higgs program
 - ⦿ we could devote 1/2 day of the workshop to the question
- ➔ How much “luminosity” is available for Higgs to electron couplings measurements
 - ⦿ Monochromators
 - ⦿ Polarization

Monochromatization

- ➔ Presentation by Angeles Faus-Golfes
 - discussed standard scheme and optimized scheme and concludes that implementation is not difficult (no showstopper)
 - monochromatization has never been experimentally tested
 - optimized scheme could gain in energy resolution keeping the luminosity fixed
- ➔ Needs to be followed closely

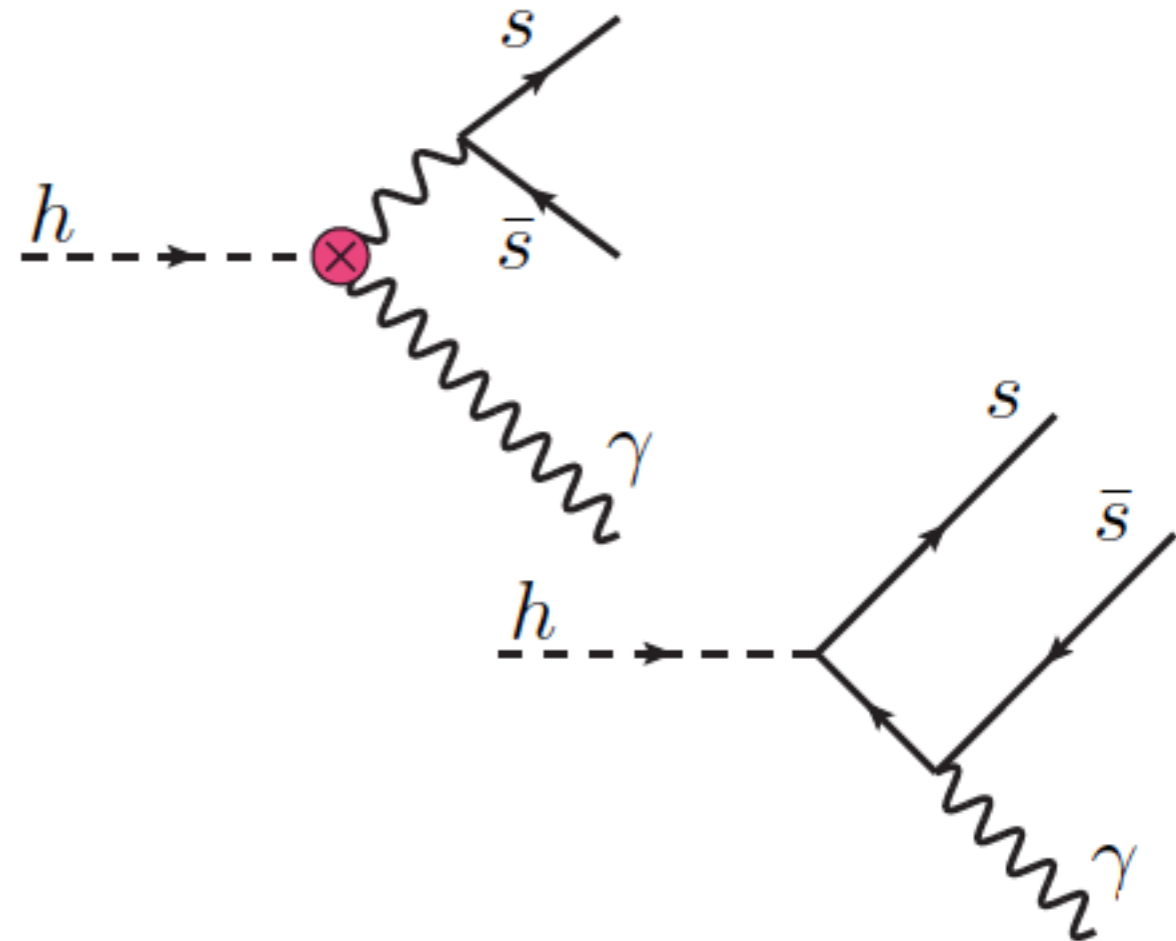


Exclusive Higgs boson decays

- ➔ First and second generation couplings accessible
 - ⦿ Yukawa coupling
 - ⦿ Sensitivity due to interference

$$\frac{\text{BR}_{h \rightarrow \rho \gamma}}{\text{BR}_{h \rightarrow b \bar{b}}} = \frac{\kappa_\gamma [(1.9 \pm 0.15)\kappa_\gamma - 0.24\bar{\kappa}_u - 0.12\bar{\kappa}_d]}{0.57\bar{\kappa}_b^2} \times 10^{-5}$$

- ➔ Also interesting to FCC-hh program
- ➔ Alternative $H \rightarrow MV$ decays should be studied ($V = \gamma, W, \text{ and } Z$)
- ➔ **Interesting experimental study**

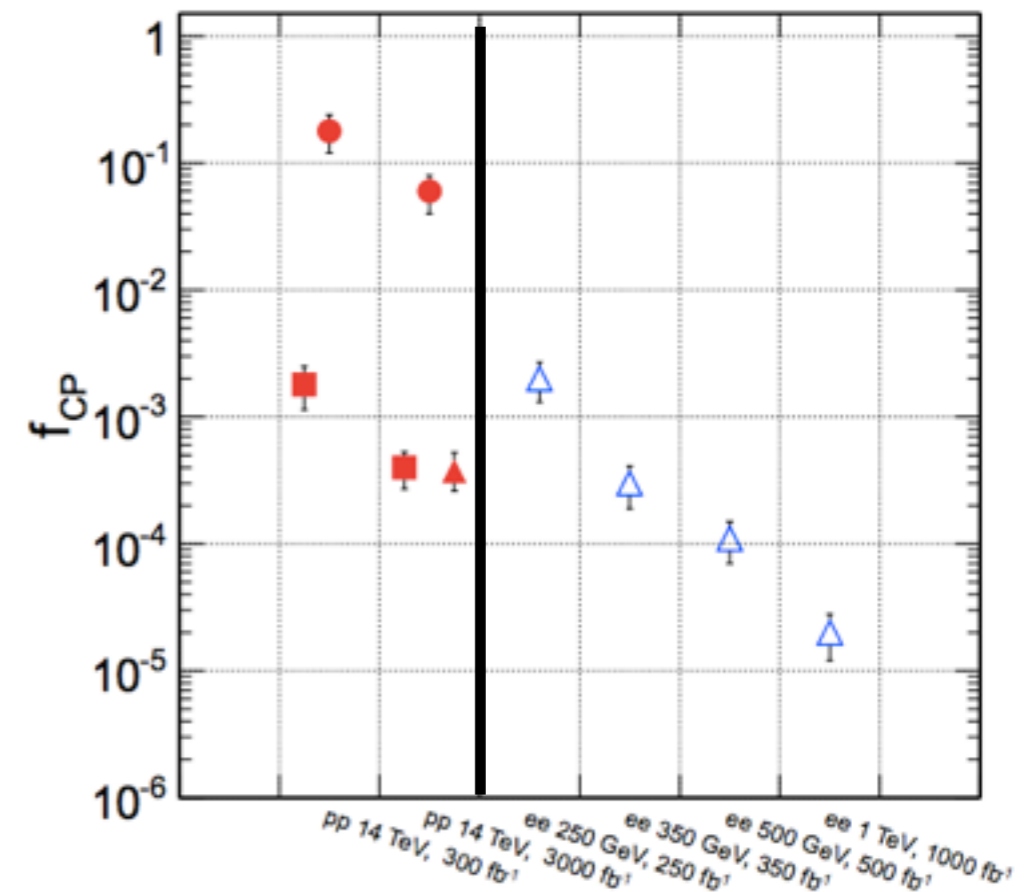


- $H \rightarrow J/\psi \gamma$ ➔ y_c
- $H \rightarrow \phi \gamma$ ➔ y_s
- $H \rightarrow \rho \gamma$ ➔ y_u, y_d
- $H \rightarrow \omega \gamma$ ➔ y_u, y_d

CP Measurements

- ➔ CP violation can be studied by searching for CP-odd contributions; CP-even already established
- ➔ Snowmass Higgs paper <http://arxiv.org/abs/1310.8361>
- ➔ Higgs to Tau decays of interest
- ➔ More detailed presentation by Felix Yu <http://arxiv.org/abs/1308.1094>
- ➔ Workshop at UM Amherst on “CP Nature of the Higgs boson” last weekend. We will follow up.

for HVV couplings



$$\mathcal{L}_{hff} \propto h\bar{f}(\cos \Delta + i\gamma_5 \sin \Delta)f$$

Colliders	LHC	HL-LHC	FCCee (1 ab ⁻¹)	FCCee (5 ab ⁻¹)	FCCee (10 ab ⁻¹)
Accuracy(1σ)	25°	8.0°	5.5°	2.5°	1.7°