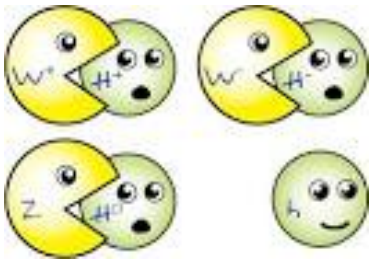
HiggsTools

ESR ①②†

† Twelve is a superfactorial

HiggsTools Kick-Off Meeting 2−4 April 2014 London

PROJECT: **36** month ESR (phd student):
Node: TORINO
Title: **VV** scattering and Higg-like couplings @ LHC as a probe of EWSB†
Co-supervisors: *C. Mariotti* (EXP, CMS), *G. Passarino* (TH)



3-month stay in Freiburg, improving skills in NLO calculations

3-month stay at ETH, complementary (experimental) training

A good quality (theoretical) control over the background is required
understanding of the pile-up is mandatory

† if we find evidence for physics beyond the SM, how can one determine the underlying theory?

① The main focus of the project will be on the gauge invariant definition and extraction of pseudo-observables like

- $\mathbf{VV}$ -scattering cross-section and partial waves ($J = 0, 1$), especially in the high mass region.

② A good understanding of these POs, in particular the couplings, is essential to creating solid predictions, especially in a BSM scenario.

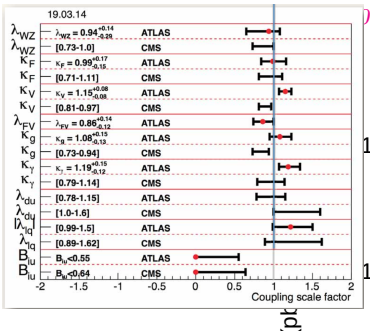
Project handling requires development of sophisticated tools to convert experimental data into idealized but theoretically sound quantities. The principal goals of the project are

① to improve the LO environment, gradually extending it to NLO-level

② to develop a strategy for measuring deviations from the SM, based on using the "full" SM, including all available QCD and EW higher-order corrections, and supplementing it with $d = 6$ local operators.

If the LHC boson alone contributes to **EWSB $V_L V_L$** -scattering does not grow at high energies

- New Physics also means that the LHC boson is not alone but
- NP non-observability at **1 *TeV*** tells us that the rest is heavy. Then the scattering could get strong for a range of energies, until the high-energy UV physics starts unitarizing
- LHC experiments can/could reveal this interesting possibility suppose the Higgs coupling to **WW** is $\sqrt{\delta}$ of the SM value



Partially-strong scattering: THDM

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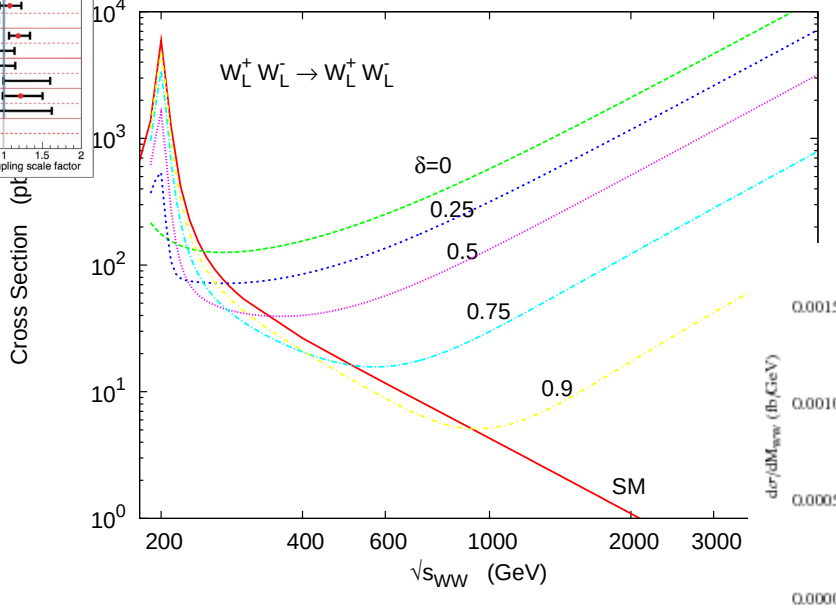
Energy growing behavior tamed above M_H



Cheung, Chiang, Yuan

growing behavior expected if there is space enough between M_h and M_H