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# Probing Higgs Couplings with High pT Higgs Production

*Wednesday 28 May 2014 14:30 (20 minutes)*

Possible extensions of the Standard Model predict modifications of the Higgs couplings to gluons and to the SM top quark. The values of these two couplings can, in general, be independent.
We discuss a way to measure these interactions by studying the Higgs production at high $p_T$ within an effective field theory formalism. We also propose an observable $r_\pm$ with reduced theoretical errors and suggest its experimental interpretation.

## Summary

The current data on the Higgs coupling shows a strong degeneracy in the best fit solutions for the Higgs couplings in the $(c_t, c_g)$ space. We propose to use the $pp \to h + j$ process to resolve this degeneracy. Indeed the Higgs interaction with gluons generated by the loops of the Standard Model top quark and the dimension five operator have different $p_T$ dependence and this can be used to measure the effective Higgs couplings to tops and gluons.

To estimate the LHC potential we have looked at the 4 lepton final state. Due to the very small rate of the signal this measurement can become possible only with very high luminosity at the LHC. The expected constraints on $c_t$ look, so far, inferior compared to the prospects in the direct measurements of the $t\bar{t}h$ coupling (ATLAS projections for the 3000 fb$^{-1}$ predict the determination of the top Yukawa coupling with a $\sim 10\%$ accuracy). However $h + j$ can be used to reduce errors on the $c_g$ coupling when combined with the $c_t$ measurements from $t\bar{t}h$ production. Exploring other Higgs decay final states can also largely increase the precision of the $(c_t, c_g)$ measurements.

We also propose an observables with reduced theoretical errors, $r_\pm$, which can be used as alternative discriminant of new physics signal. We show that theoretical and experimental errors can be disentangled in $r_\pm$.

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