Contribution ID: **43** Type: **not specified**

Precise predictions for trilinear Higgs couplings and $gg \to HH$

Friday 25 October 2024 15:50 (20 minutes)

Investigating the trilinear self-coupling of the discovered Higgs boson is
one of the main goals of particle physics in the near and far future. At the same time the quest for the existence of Higgs-like self interactions also provides a unique possibility in the search for new physics. BSM states can modify the trilinear Higgs coupling at the classical- or quantum-level, or contribute resonantly to processes that are sensitive to its extraction (and combinations thereof). Gluon fusion into two SM-like Higgs bosons offers the most promising possibility to scrutinize and eventually disentangle such scenarios in the future.

In this talk, we will introduce the framework
$hrefhttps://arxiv.org/abs/2305.03015$`anyH3` which allows to compute trilinear scalar couplings at the full one-loop level in arbitrary renormalisable QFTs as well as its extension `anyHH` providing fully differential predictions for $gg \to h_i h_j$. The latter incorporates corrections proportional to BSM couplings at next-to-leading order to the resonant part of the process. We show that such corrections are crucial in BSM scenarios that feature an SM-like Higgs boson in exact alignment to the SM Higgs.
Finally, we present an extension of the SM-like trilinear Higgs self-coupling calculation to two-loops in arbitrary renormalisable QFTs - enabling the study of non-resonant Higgs pair production up to next-to-leading order in BSM couplings.

Primary authors: WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); BAHL, Henning; BRAATHEN, Johannes (DESY); RADCHENKO SERDULA, Kateryna (DESY); GABELMANN, Martin (DESY); Dr PASSEHR, Sebastian (RWTH Aachen University)

Presenter: GABELMANN, Martin (DESY)

Session Classification: Contributed Talks