The Power of Automated Numerics: Application of HELAC-NLO in pp → ttbb

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Research Interests
- Phenomenology of the Standard Model at present and future colliders and Monte Carlo simulations of the physical processes
- Fixed order multi-leg automatic LO and NLO calculations
- Development of system based on HELAC-PHEGAS, HELAC-1LOOP, CUTTOOLS, ONELOOP, HELAC-DIPOLES

Virtual Corrections
- One-loop n particle amplitude
- Amplitude can be expressed in basis of known integrals such as 4-, 3-, 2-, 1-point scalar integrals
- In order to calculate one loop amplitude three main building blocks are needed
- Evaluation of numerator function N(q) – HELAC-1LOOP
- Determination of coefficients via reduction method – OPP and CUTTOOLS
- Evaluation of scalar functions – ONELOOP

Collection of possible contributions

Features of HELAC-PHEGAS
Monte Carlo generator

http://helac-phegas.web.cern.ch/helac-phegas/

First Application: NLO QCD corrections to pp → ttbb
- Irreducible background to ttH production where Higgs boson decays into a bb pair
- NLO corrections to 2 → 4 processes current technical frontier
- Differential cross sections at the LHC for pp → ttbb
- Invariant mass distribution, transverse momentum and rapidity distribution of bb pair. Transverse momentum of b quark
- \( K = 1.77 \)

Mini-workshop on fixed order multi-leg automatic NLO calculations
- Organizer of the Helmholtz Alliance workshop
- 2nd–3rd of June 2009, Wuppertal University
- 33 Participants. Experts in the field!
- Physicists from Belgium, France, Germany, Greece, Netherlands, Poland, Spain, Switzerland, United Kingdom and United States

Publications