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Status of and plans for aMC@NLO

LPCC MC Workshop

CERN, 19/11/2012

First public version available since 8th Nov 2012 at:

`http://amcatnlo.cern.ch`

Works like MadGraph: there is no pre-defined list of processes, all is computed on the fly

Very high level of parallelization: with a sufficent number of CPUs, a process will take as long to compute as its most demanding contribution

(an integration channel of one partonic subprocess)

Computes QCD corrections to SM processes, with the exception of those that feature unstable coloured particles in the loops

These limitations will soon be removed, but already at present can be bypassed thanks to the modular structure of the code

(virtual computations – MadLoop – are completely independent)

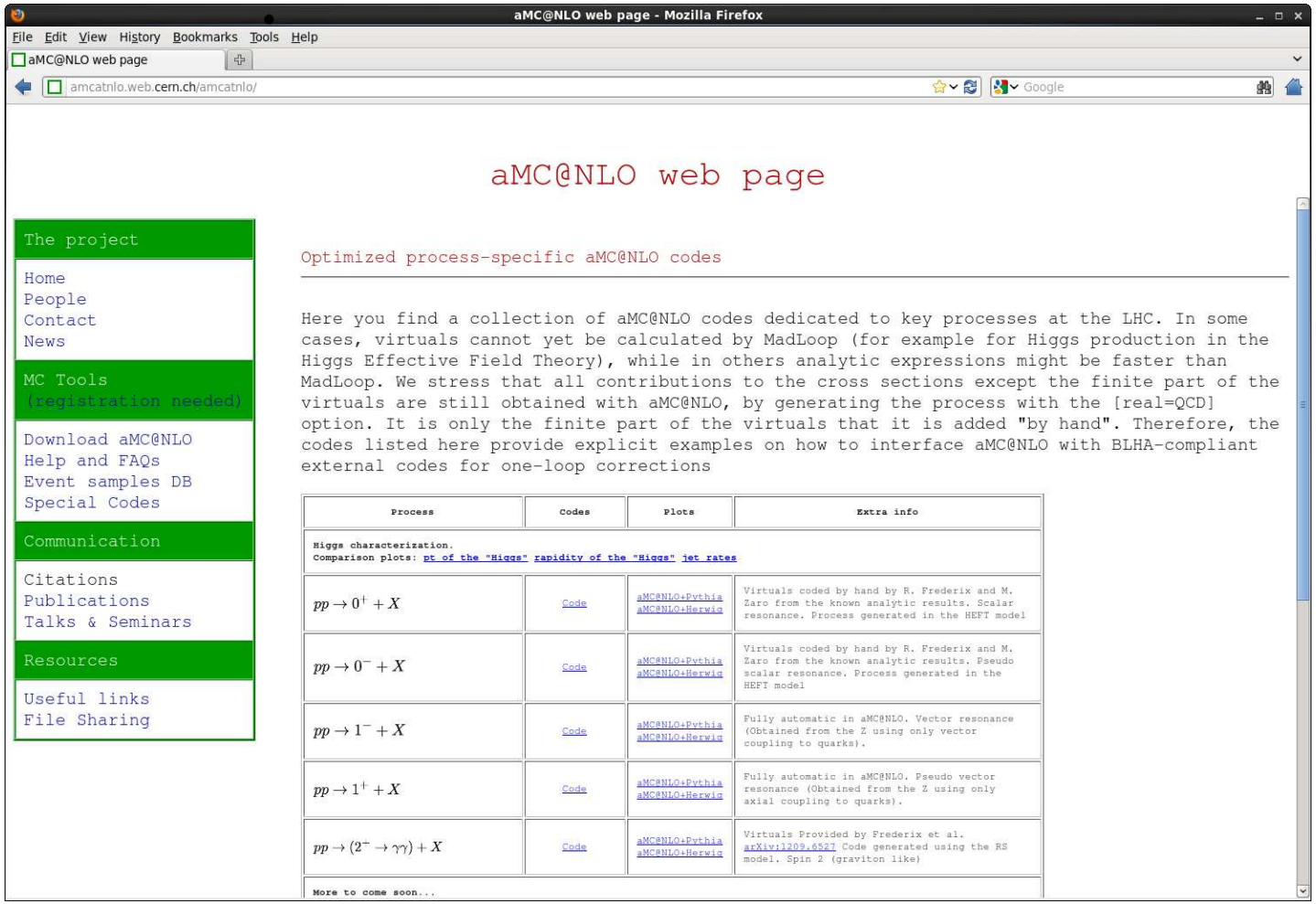
Examples are available on the aMC@NLO web page: follow

`Special Codes`

at:

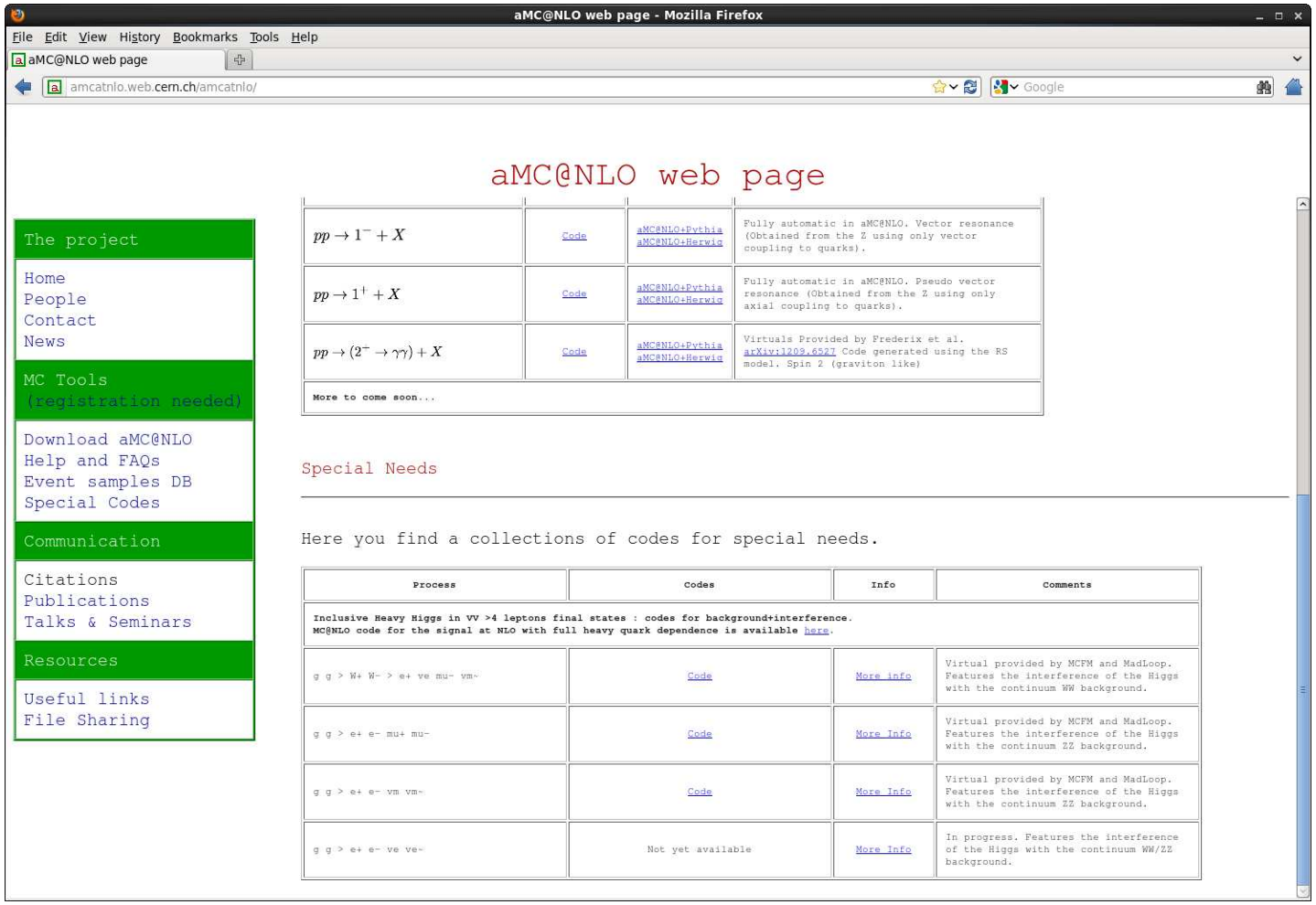
`http://amcatnlo.cern.ch`

Special codes I



Virtuals available from the literature ((pseudo)scalar, (pseudo)vector, graviton-like resonances), and included via BLHA interface

Special codes II



gg-induced $\mathcal{O}(\alpha_s^2)$ four-lepton processes, including SM-Higgs exchange (these are "loop squared"). How to use them? $\longrightarrow$

Call H whatever diagrams feature Higgs exchange, and R all the others

Study impact of interference by comparing

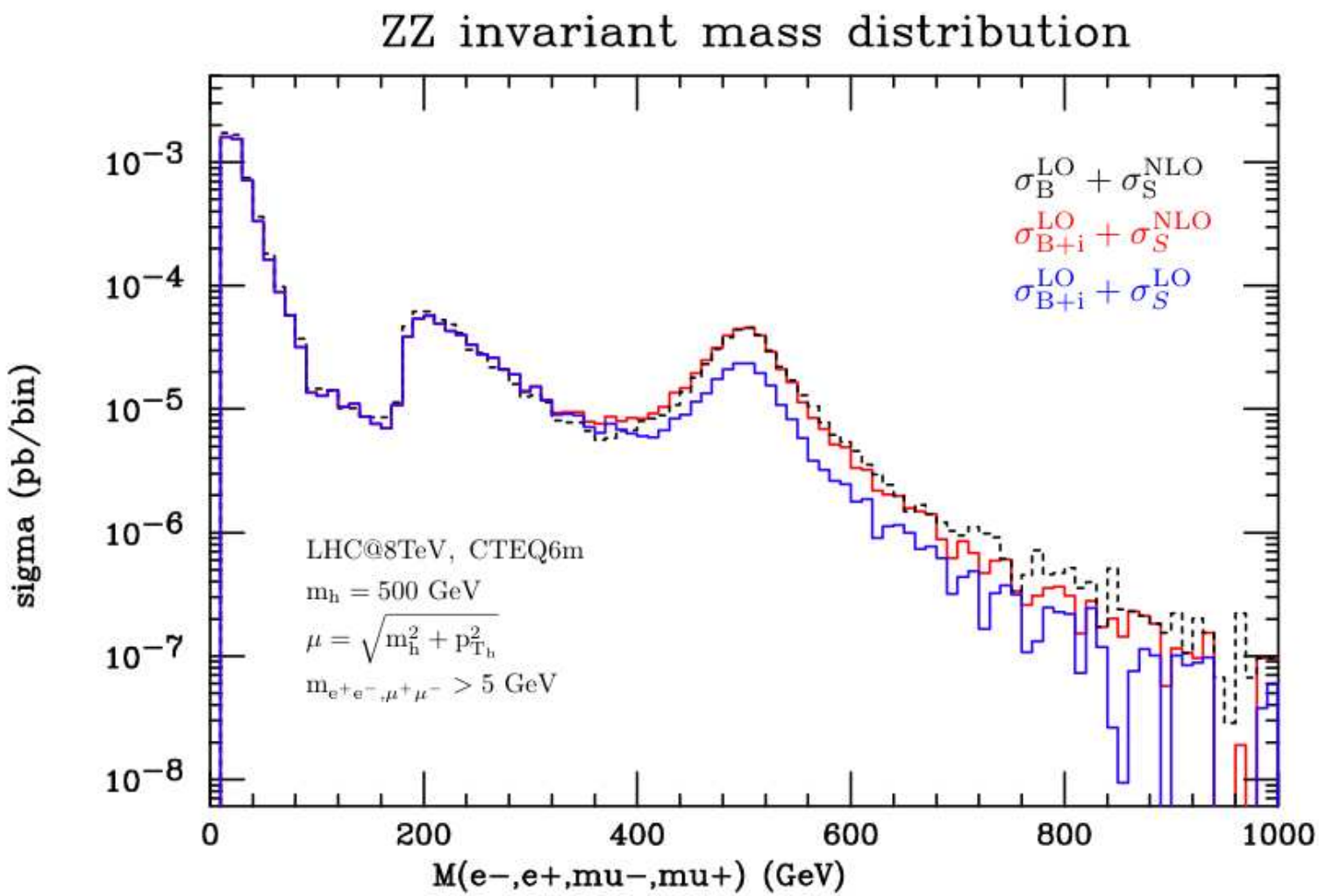
$$|H+R|^2 \qquad\qquad |H|^2+|R|^2$$

Each of these three terms can be obtained with the special codes

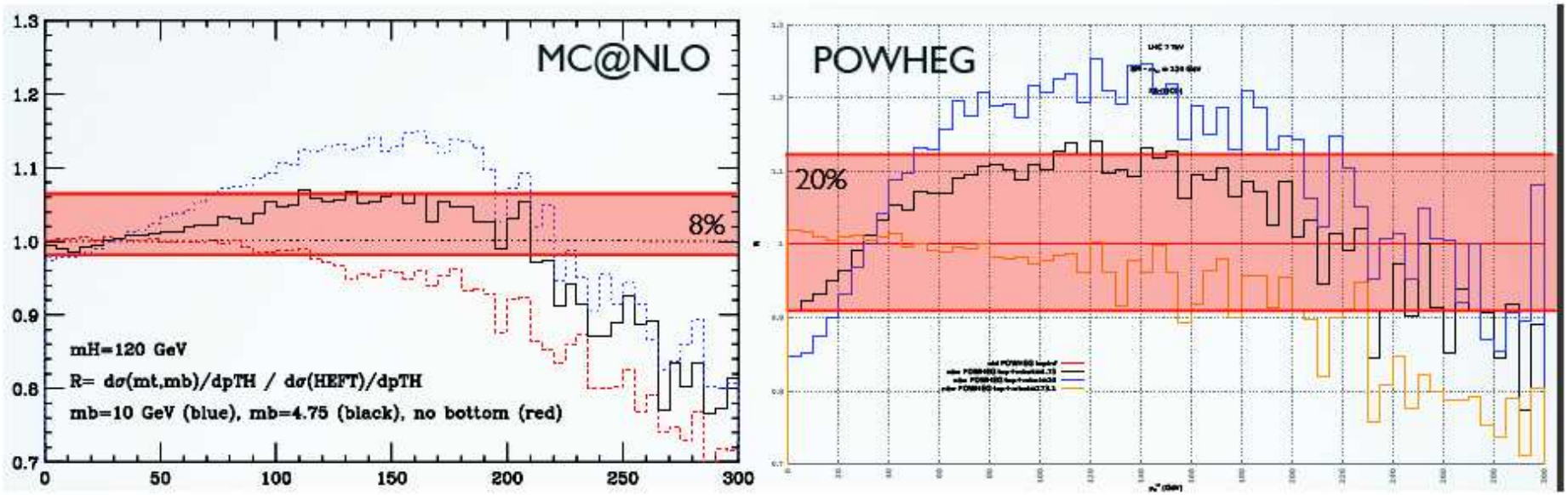
For a phenomenologically-realistic simulation, define:

$$|H+R|^2-|H|^2+|H|^2_{\mathcal{O}(\alpha_S^3)}$$

that is, add the "signal" at the NLO. This should be computed with MC@NLO v4.08 or higher, since this features exact m_t and m_b dependences



Both interference and NLO effects on "signal" are clearly visible

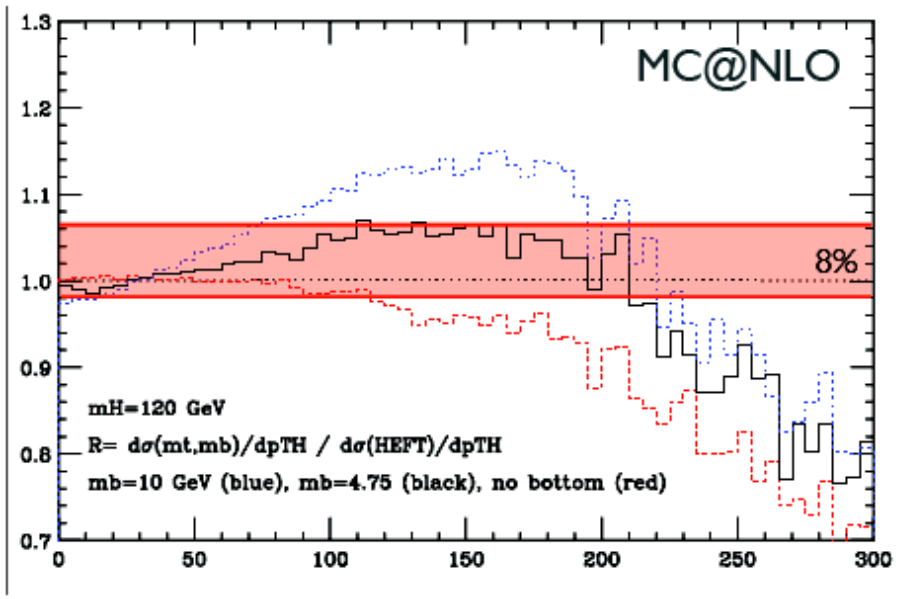


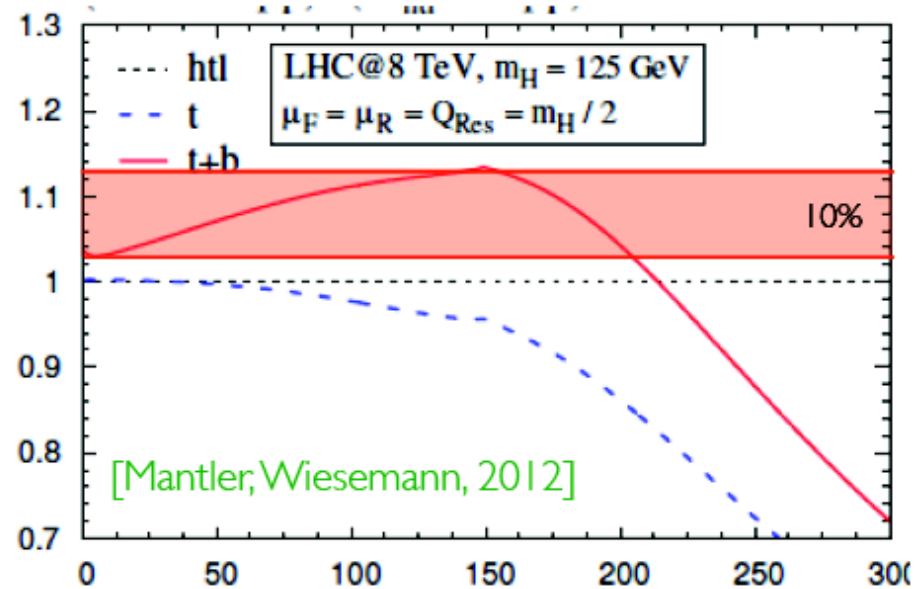
m_t and m_b effects, relative to HEFT, in $gg \to H^0$ at $\mathcal{O}(\alpha_s^3)$

MC@NLO v4.08

POWHEG 1111.2854 (Bagnaschi, Degrassi, Slavich, Vicini)

The two codes use the same matrix elements. Absolute normalization disregarded in this comparison





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Analytic resummation 1210.8263 (Mantler, Wiesemann)

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Take-home message

aMC@NLO is even more flexible than it appears. It can be conveniently combined with existing calculations or tools for virtual matrix elements, in order to enlarge its present scope

This should be rather straightforward, thanks to standardization (BLHA). Please share with us your experience (and troubles)

Physics-wise

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- Switch between MC- and ME-dominated regions accessible through inputs to some extent (new in aMC@NLO)

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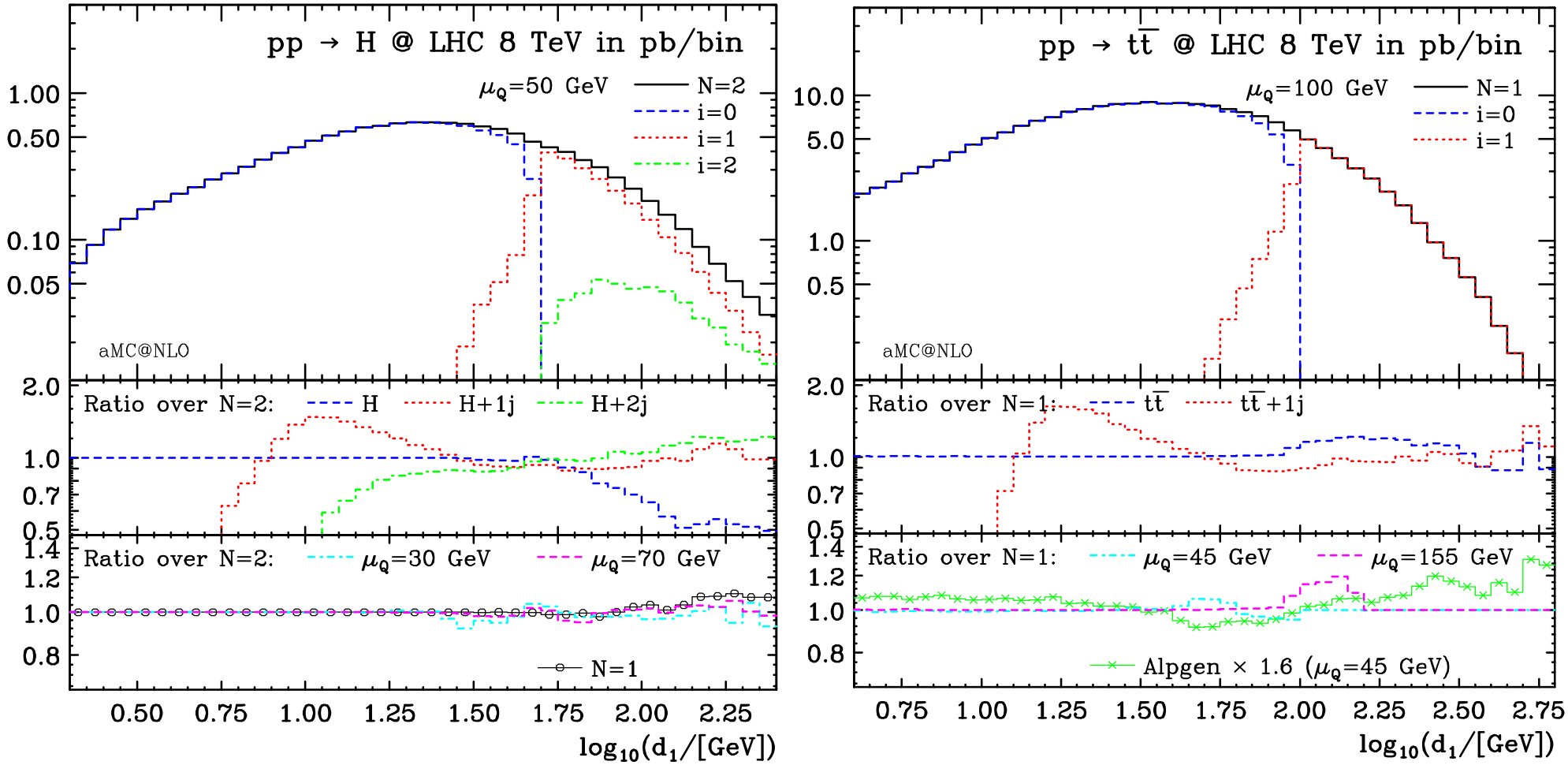
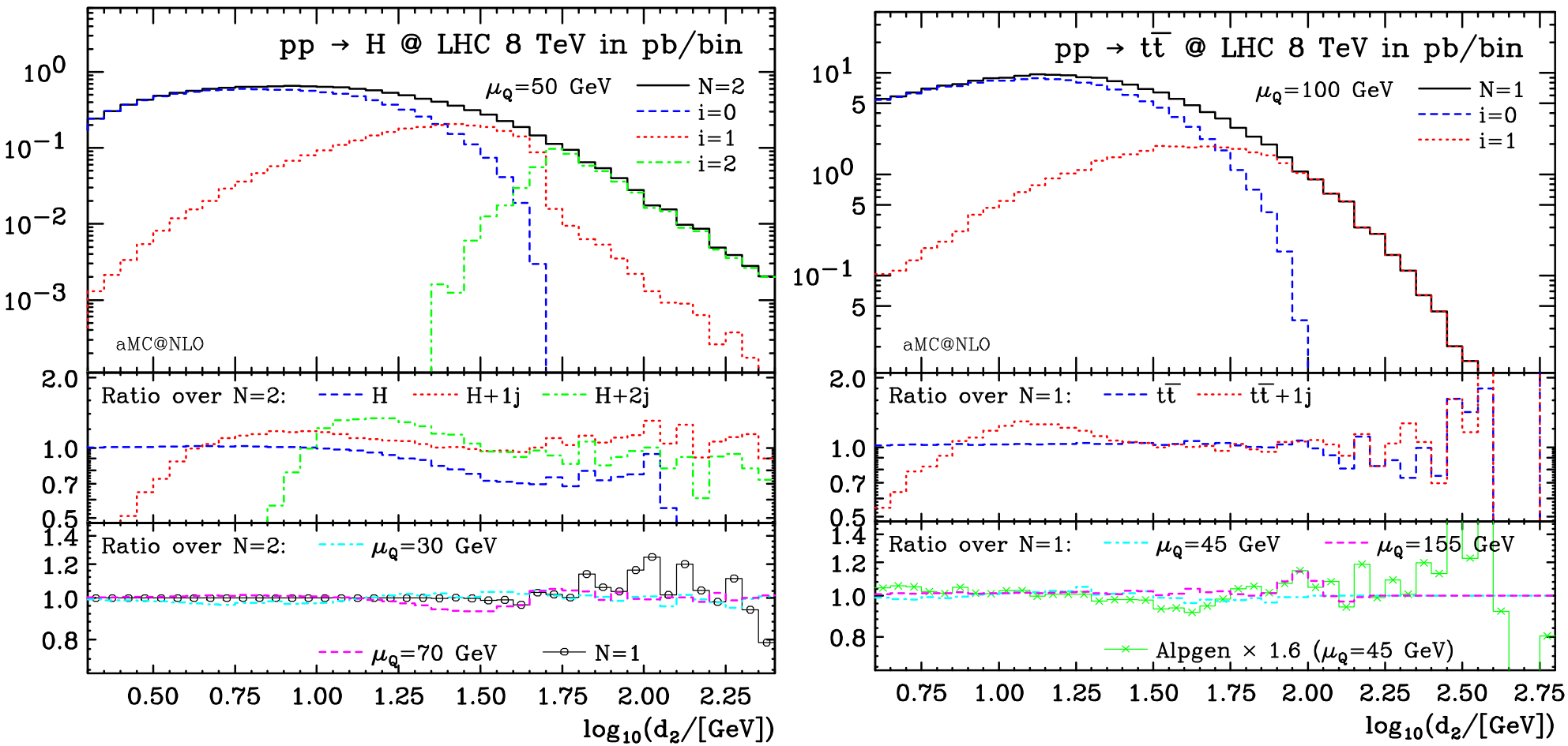


$0 \to 1$ rates in H^0 and $t\bar{t}$ production



$1 \to 2$ rates in H^0 and $t\bar{t}$ production

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- Automation of loop-induced (finite) processes