

Teilchenphysik 2 — W/Z/Higgs an Collidern

Sommersemester 2019

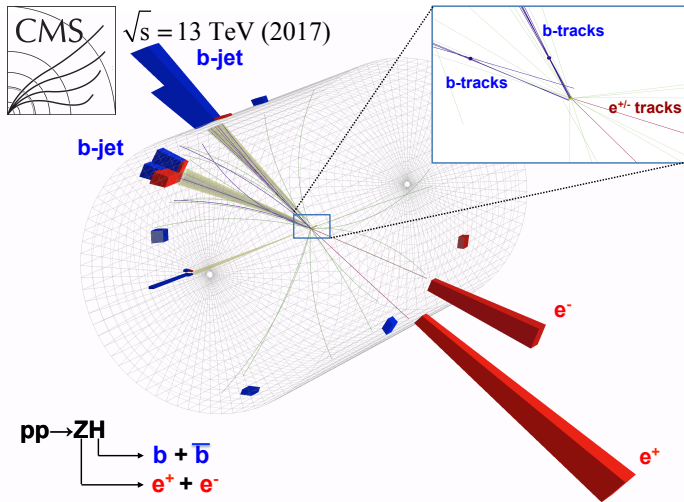
Matthias Schröder und Roger Wolf | Exercises No 6

INSTITUT FÜR EXPERIMENTELLE TEILCHENPHYSIK (ETP)



Observation of $H \rightarrow b\bar{b}$

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]

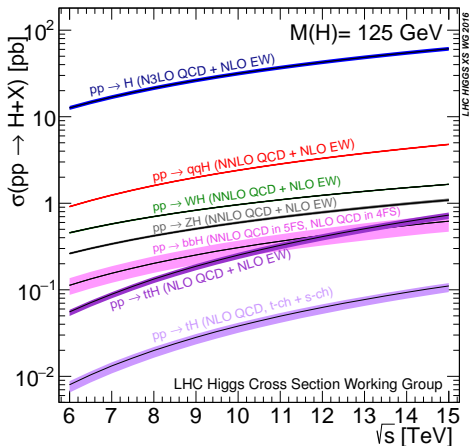


Observation of $H \rightarrow b\bar{b}$

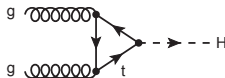
- Useful: listings of Higgs-boson production cross-section by LHC Higgs XS Working Group
- Total number of $H \rightarrow b\bar{b}$ events expected (13 TeV, $m_H = 125$ GeV):

prod. mode	σ [pb]	BR	Lum. [fb^{-1}]	N(evts)
ggF	48.6	58 %	41.3	$1164 \cdot 10^3$
VBF	3.8	58 %	41.3	$91 \cdot 10^3$
$V(0,1,2\text{leptons})H$	0.25	58 %	41.3	$6 \cdot 10^3$

Higgs-Boson Production at the LHC



Gluon-Gluon Fusion



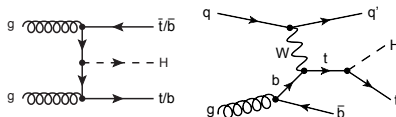
Vector Boson Fusion



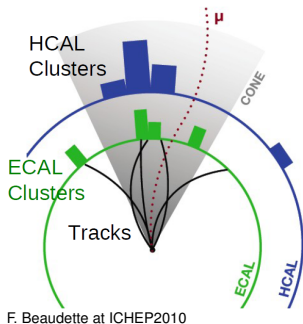
Associated Production with W and Z



Associated Production with t and b



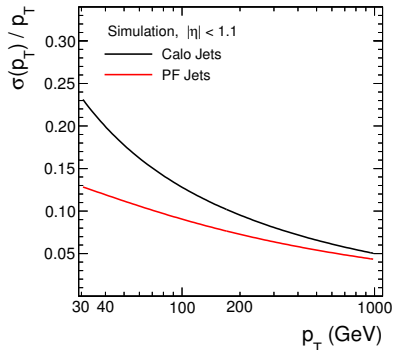
Particle-Flow Event Reconstruction



particle flow

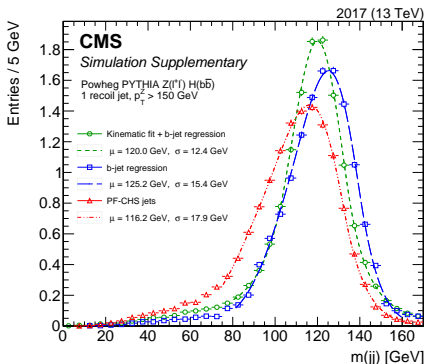
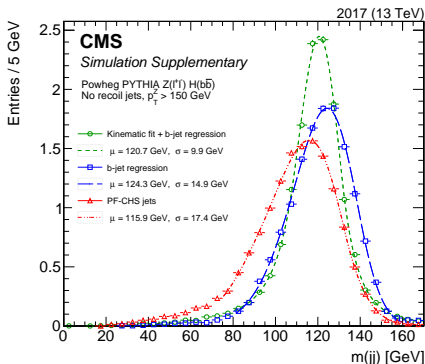
$$E_{\text{jet}} \approx E_{\text{tracks}} + E_{\gamma} + E_n$$

Example: jet energy resolution at CMS
(2010 conditions)



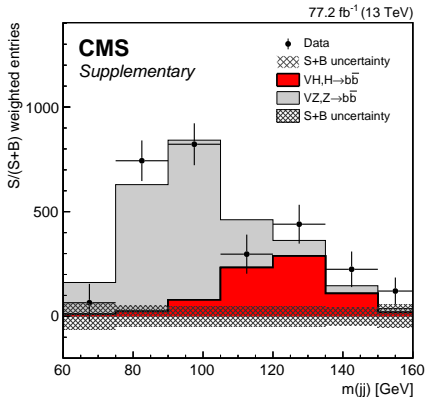
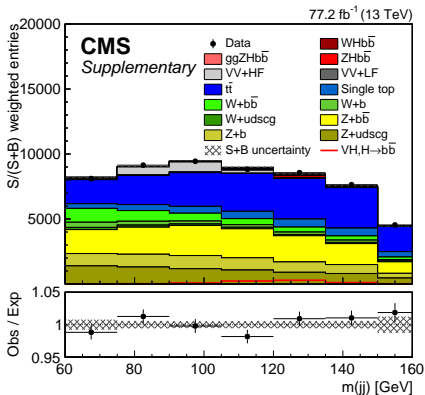
Calibration of $m(jj)$

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]



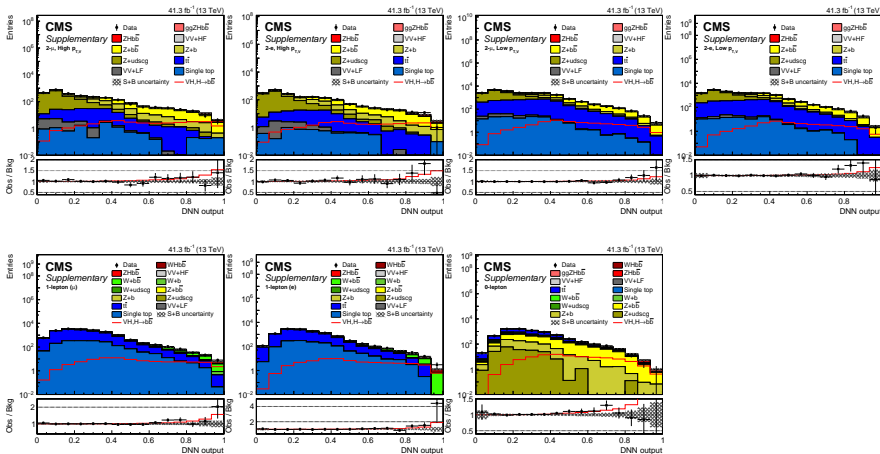
Alternative Analysis: Fitting $m(jj)$

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]



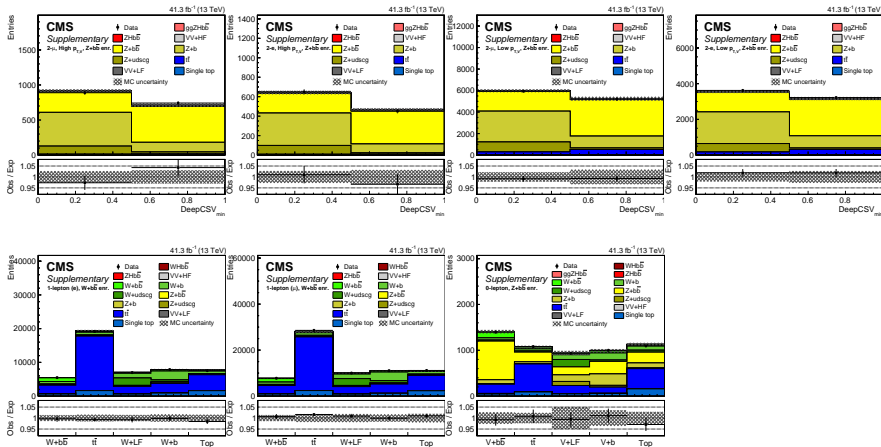
Classifier Output Signal Regions

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]



Control Region Distributions

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]



All Bins in Fit

[Phys. Rev. Lett. 121, 121801 (2018), supplemental material]

