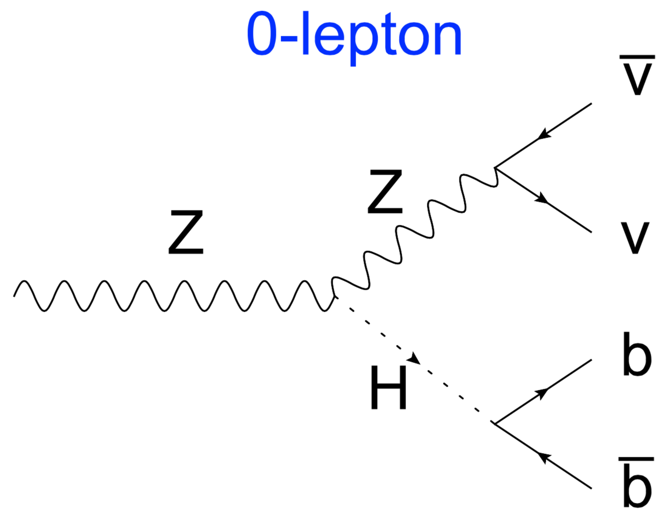
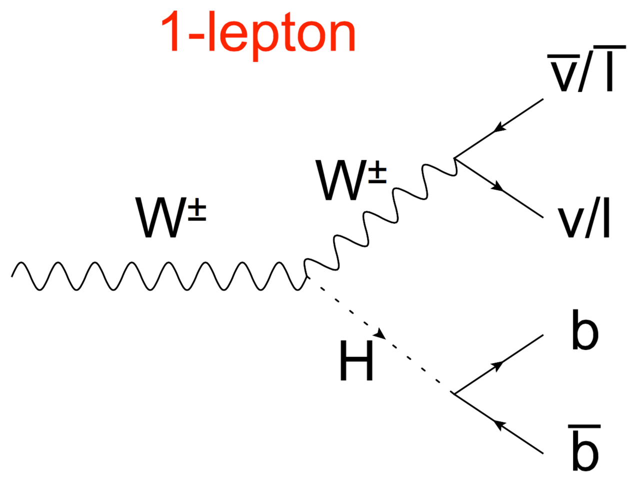
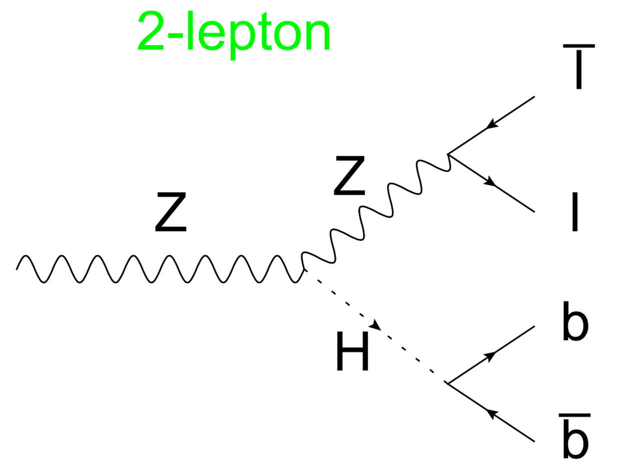
ICHEP Poster Session, Chicago, 06 August 2016

ATLAS SM VH(bb) Run 2 search



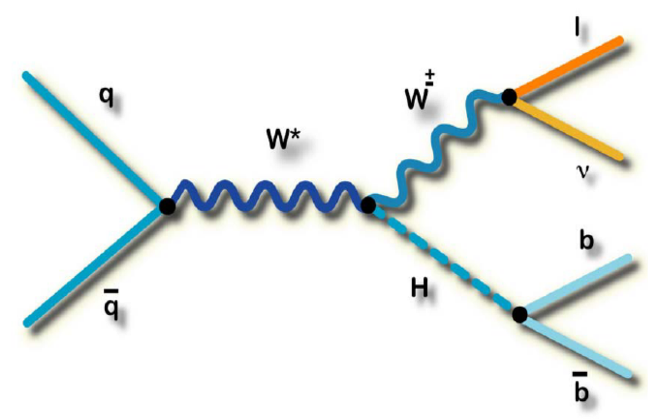




Context: Is this really the SM Higgs boson?
Goal: Observe H->bb decay and measure H-b coupling.
Task: ATLAS Run 1 and Run 2 data VH(bb) search.
Result Run 1: μ=0.51±0.40 (±0.31 stat. ±0.25 syst.)
Result Run 2: μ=0.21±0.51 (±0.36 stat. ±0.36 syst.)

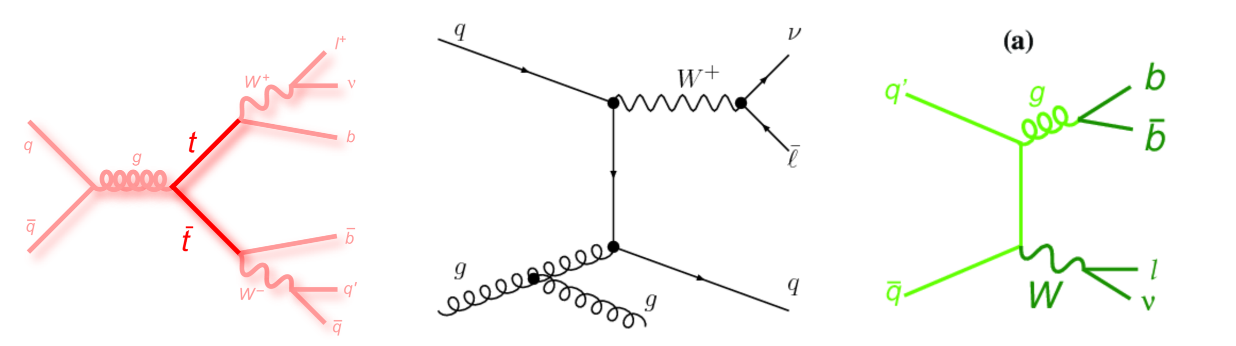
Run 1: JHEP 01 (2015) 069, 1409.6212; Run 2: ATLAS-CONF-2016-091

Overwhelming SM bb background, so need associated VH production.

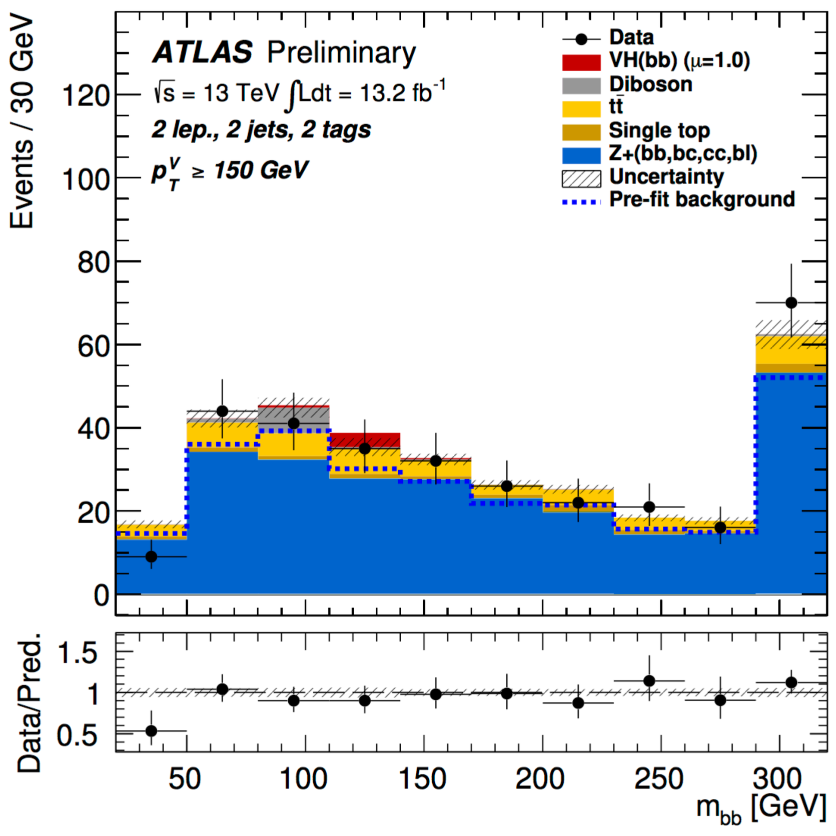


Top-quark and W+jets processes are the main backgrounds.

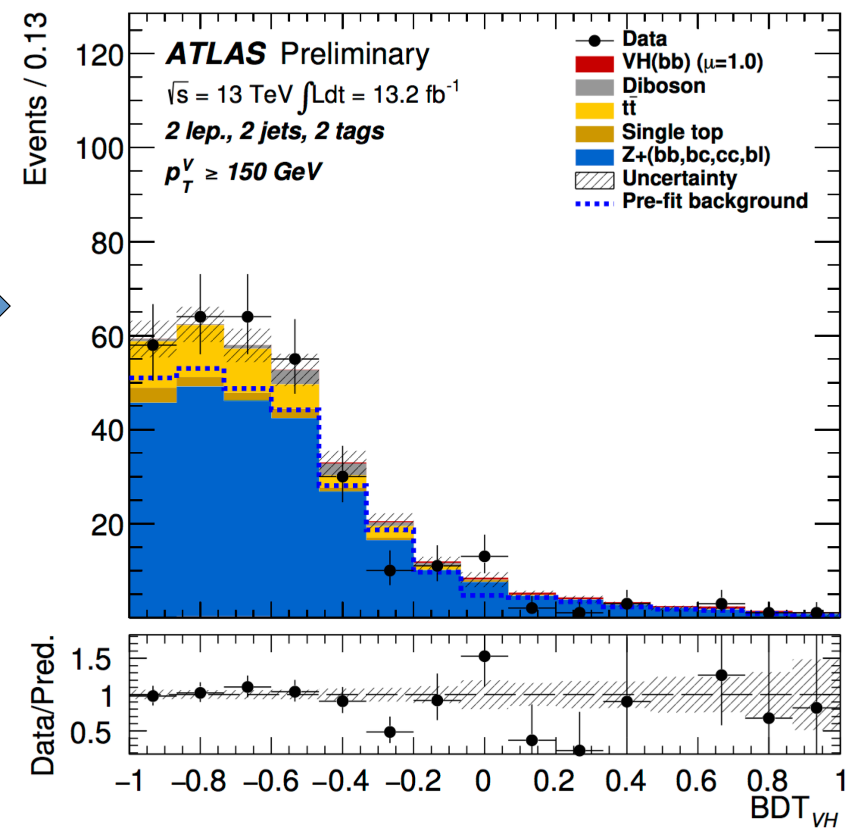
Reducible: Irreducible:



The best signal to bkg discriminant is the di-b-jet invariant mass (m_{bb}).



To discriminate further we use a multivariate technique (m_{bb} + others).



To improve sensitivity, we divide into many categories.

To validate the analysis we also search for VZ(bb).

	0-lepton	1-lepton	2-lepton
Nr jets	2, 3	2, 3	2, ≥3
Nr b-tags	2	2	2
p_T^V	≥150 GeV	≥150 GeV	≥150 GeV <150 GeV

To improve the measurement of the best discriminant variable (m_{bb}), we use four consecutive jet energy corrections.

EM → JES → GSC → Muon → Resolution

"Raw" energy | Jet energy scale | Global sequential | Muon-in-jet | pT spectrum

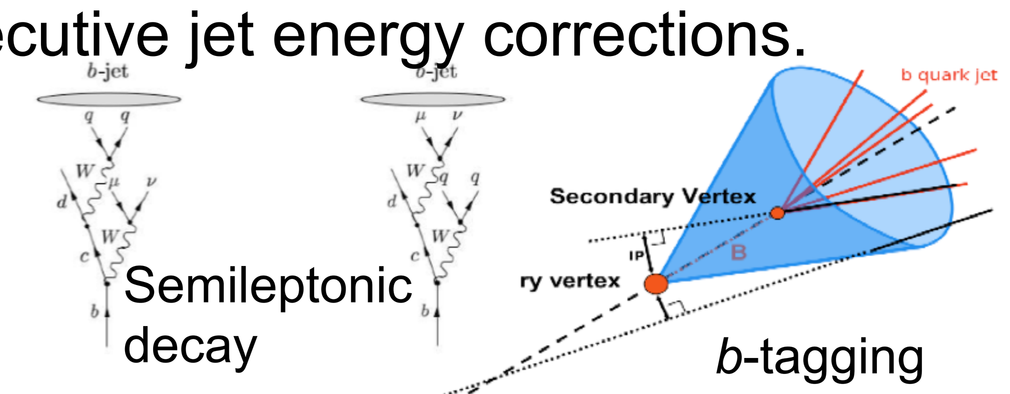
Event selection

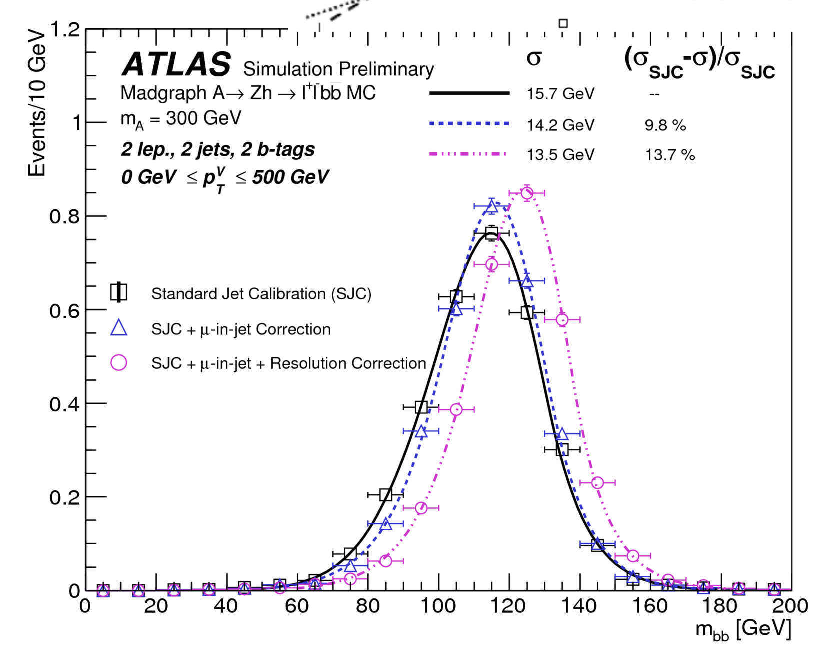
Designed for all jets.
Two official calibrations derived to improve the scale and resolution of all jets.

Eur. Phys. J. C75 (2015) 17
Eur. Phys. J. C73 (2013) 2306

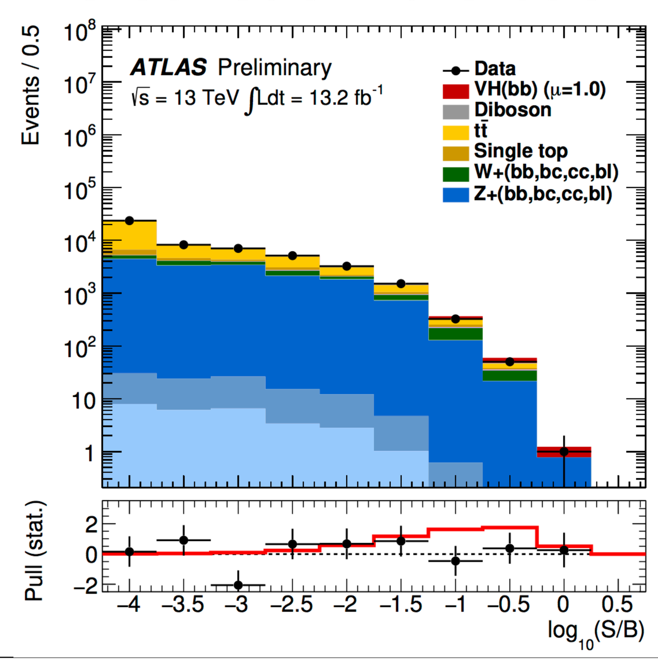
Designed for b jets.
For jets that contain a reconstructed muon p_T>4 GeV, dR(μ,jet)<0.4 from semileptonic decays (about 12% of b-tagged jets).

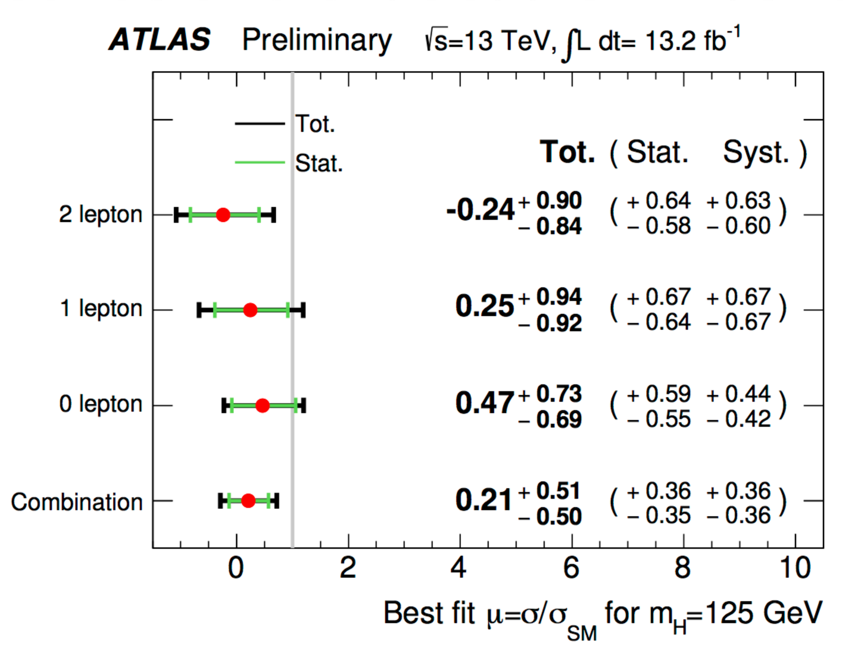
For all jets, derived from the p_T spectrum of H->bb at 125 GeV.

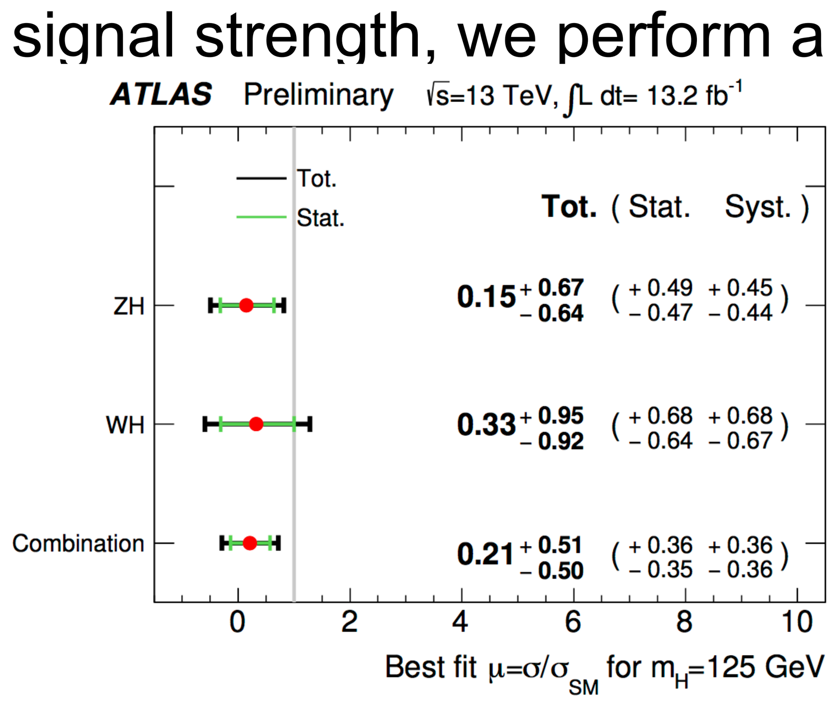




To constrain the backgrounds and extract the limit and signal strength, we perform a simultaneous fit over all categories.







Diboson VZ validation:
BDTs trained for VZ.
μ_{VZ} = **0.91 ±0.17 $^{+0.32}_{-0.27}$**
stat. syst.
Observed significance is 3.0 standard deviations (s.d.), while 3.2 is expected.

Conclusion: Signal strength **μ=0.21±0.51 (±0.36 stat. ±0.36 syst.)**.
Stat. and systematic uncertainties have equal impact on analysis.

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