VH -> bb Differential Cross Section Measurement

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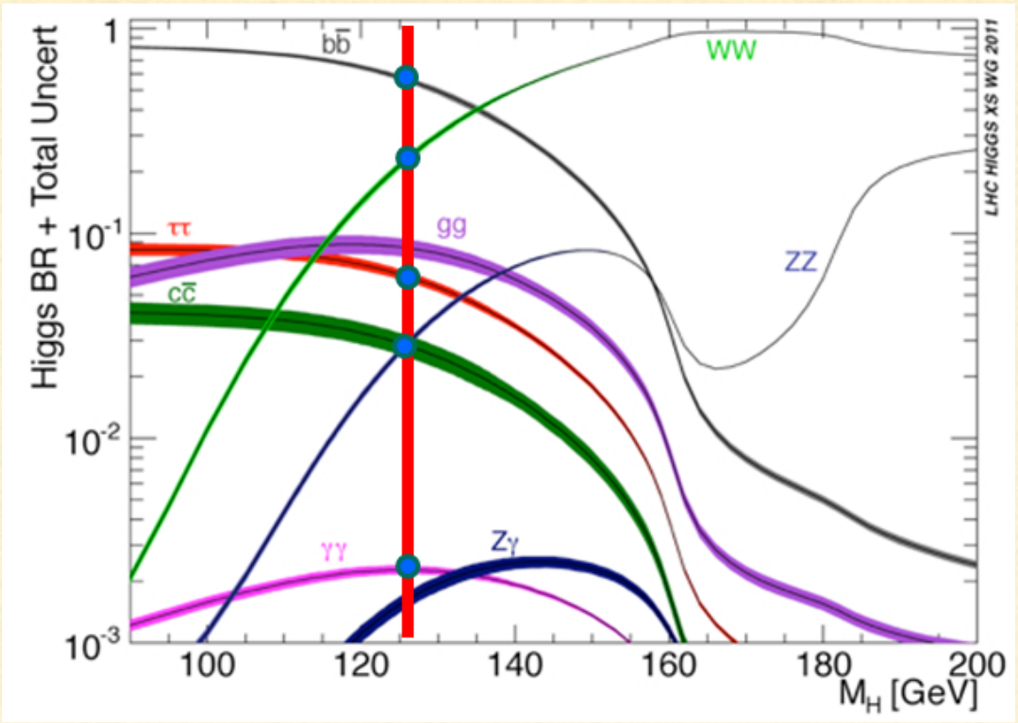
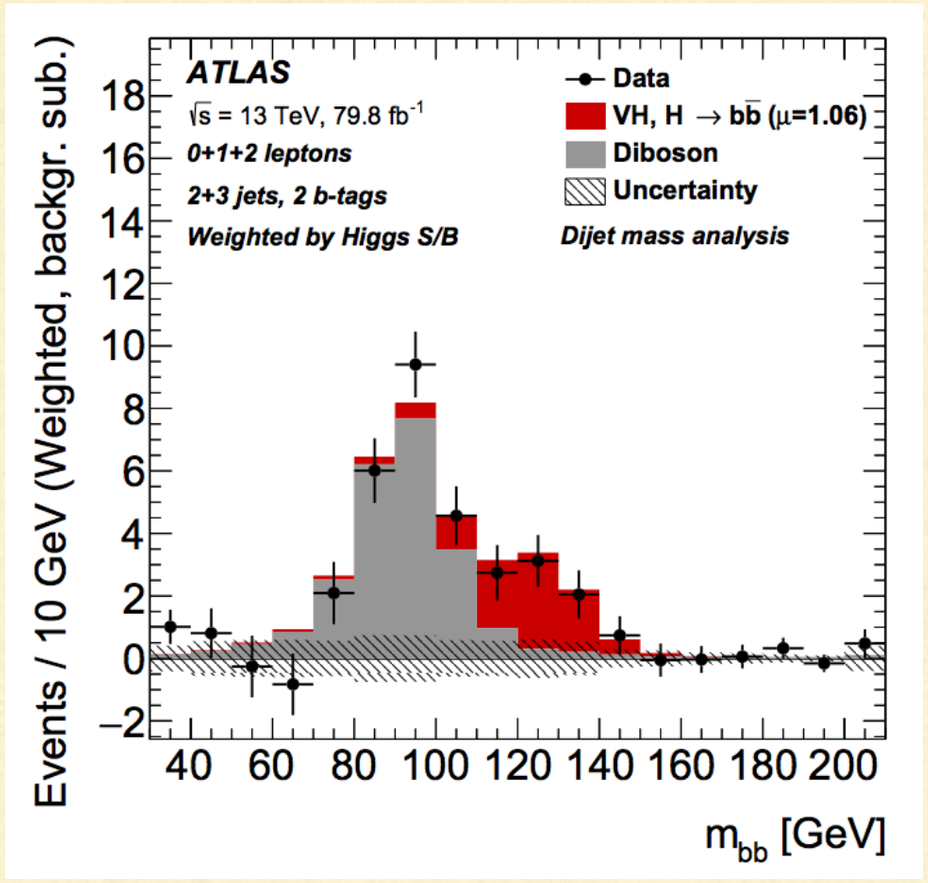
VH->BB OBSERVATION

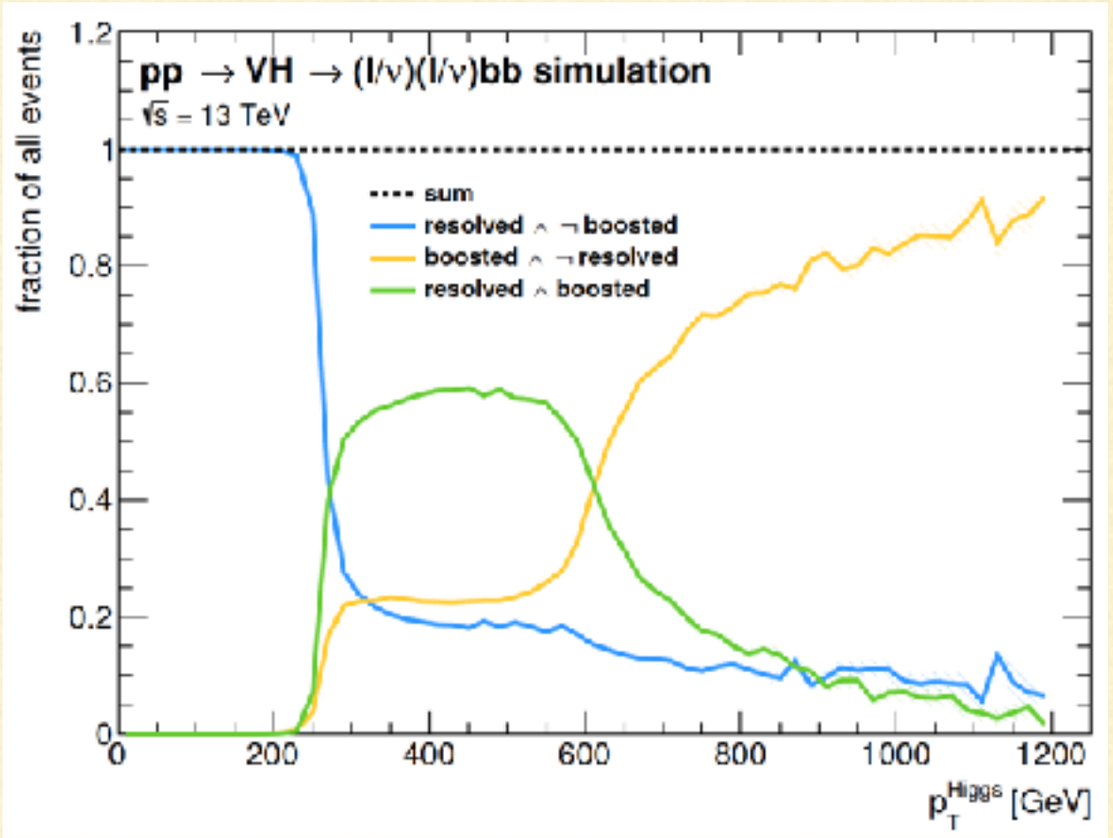


$$\mu_{VH}^{bb} = 0.98^{+0.22}_{-0.21} = 0.98 \pm 0.14(\text{stat.})^{+0.17}_{-0.16}(\text{syst.}).$$



H decays to bb 58% of the time.
Finally observed, and that's why we are taking a photo TODAY!
This confirms we've found the Higgs boson.
Here is the ATLAS paper

SO… NOW WHAT?



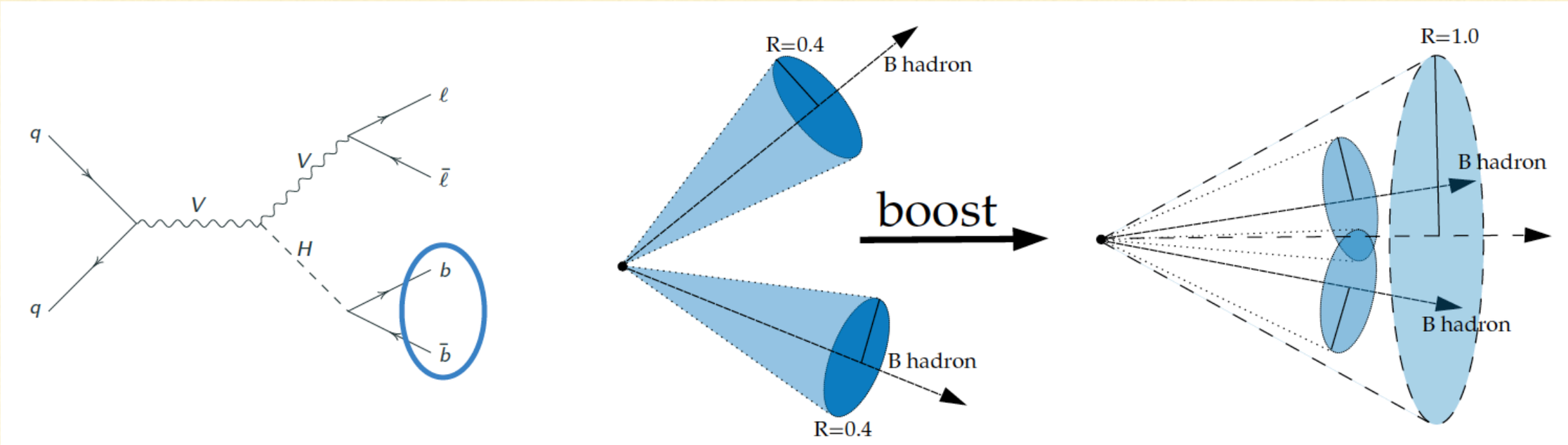
From Brian Moser

- Entering precision era.
- Current analysis only focuses on Resolved region. No fat jets are considered.
- VH is very sensitive at high-pT for BSM searches. Background drops faster than signal at high-pt.

	0 lepton	1 lepton	2 lepton	combined
all	16.86 ± 0.11	48.8 ± 0.2	5.7 ± 0.1	71.4 ± 0.2
resolved	6.11 ± 0.05	17.01 ± 0.08	1.79 ± 0.04	24.91 ± 0.11
boosted	9.16 ± 0.06	24.02 ± 0.10	2.33 ± 0.05	35.51 ± 0.12
boosted ∧¬resolved	4.38 ± 0.04	11.79 ± 0.07	1.15 ± 0.04	17.33 ± 0.09
resolved ∨ boosted	10.49 ± 0.07	28.80 ± 0.11	2.95 ± 0.06	42.24 ± 0.14

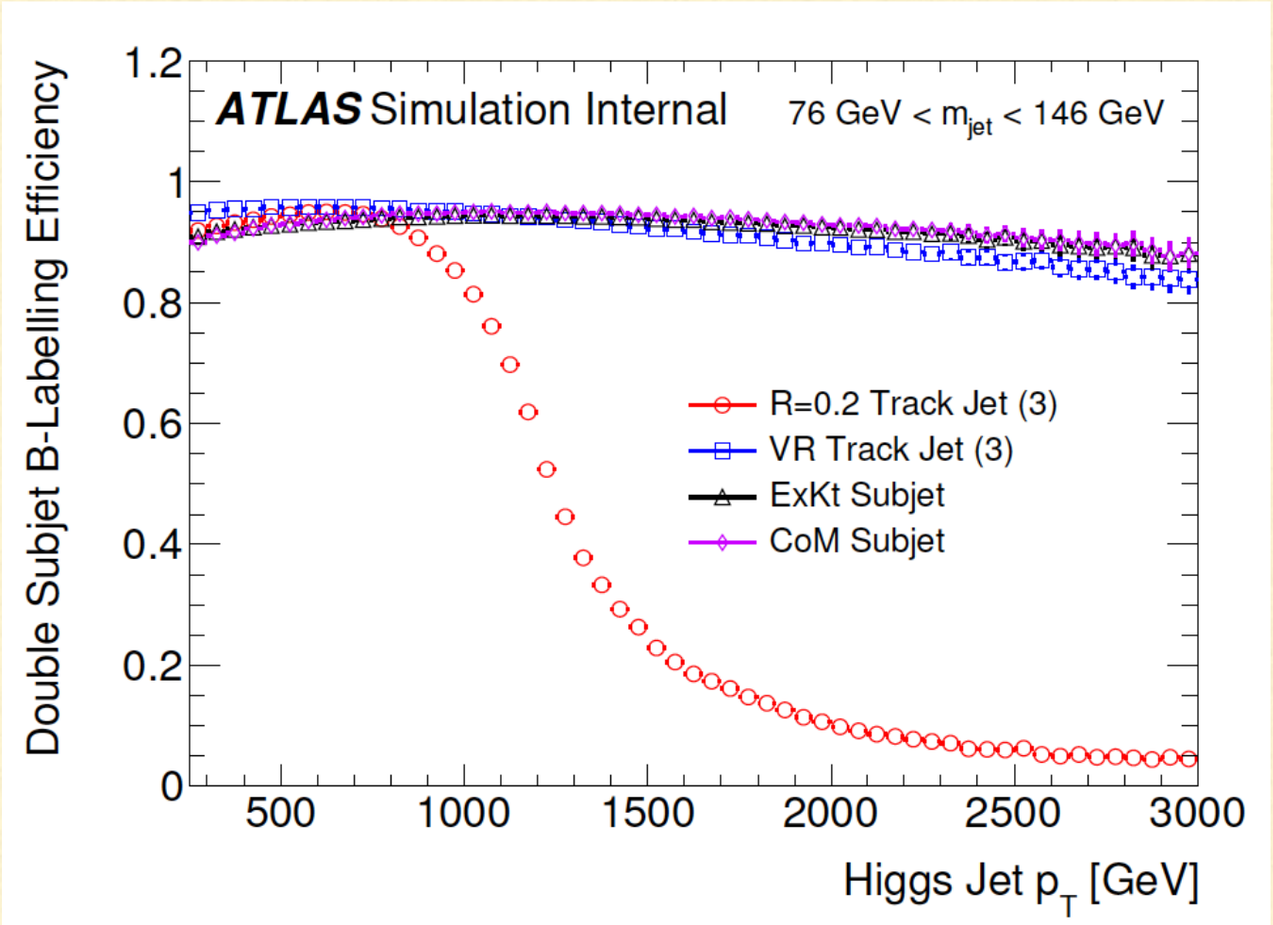
For Higgs pT > 500 GeV

WHY RESOLVED ANALYSIS FAILS AT HIGH PT?



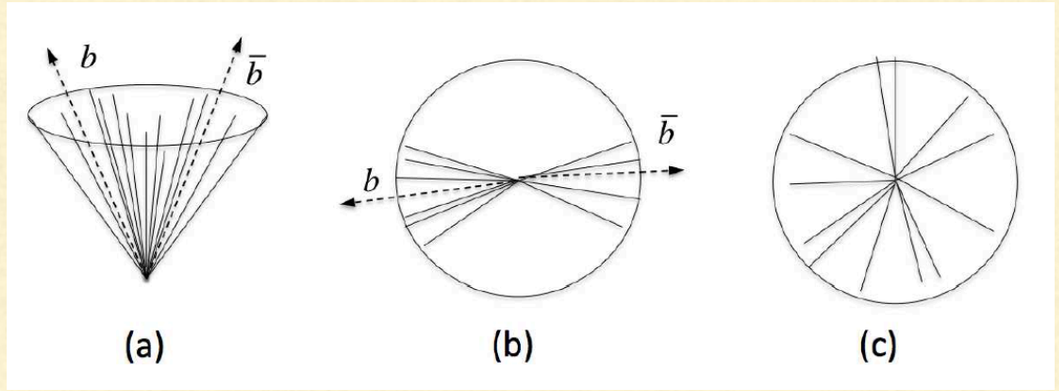
- Resolved analysis required jets with R=0.4
- At high-pT the two jets of the events collimate. A fat jet with R=1.0 is then reconstructed and its sub-jets with R = 0.2.

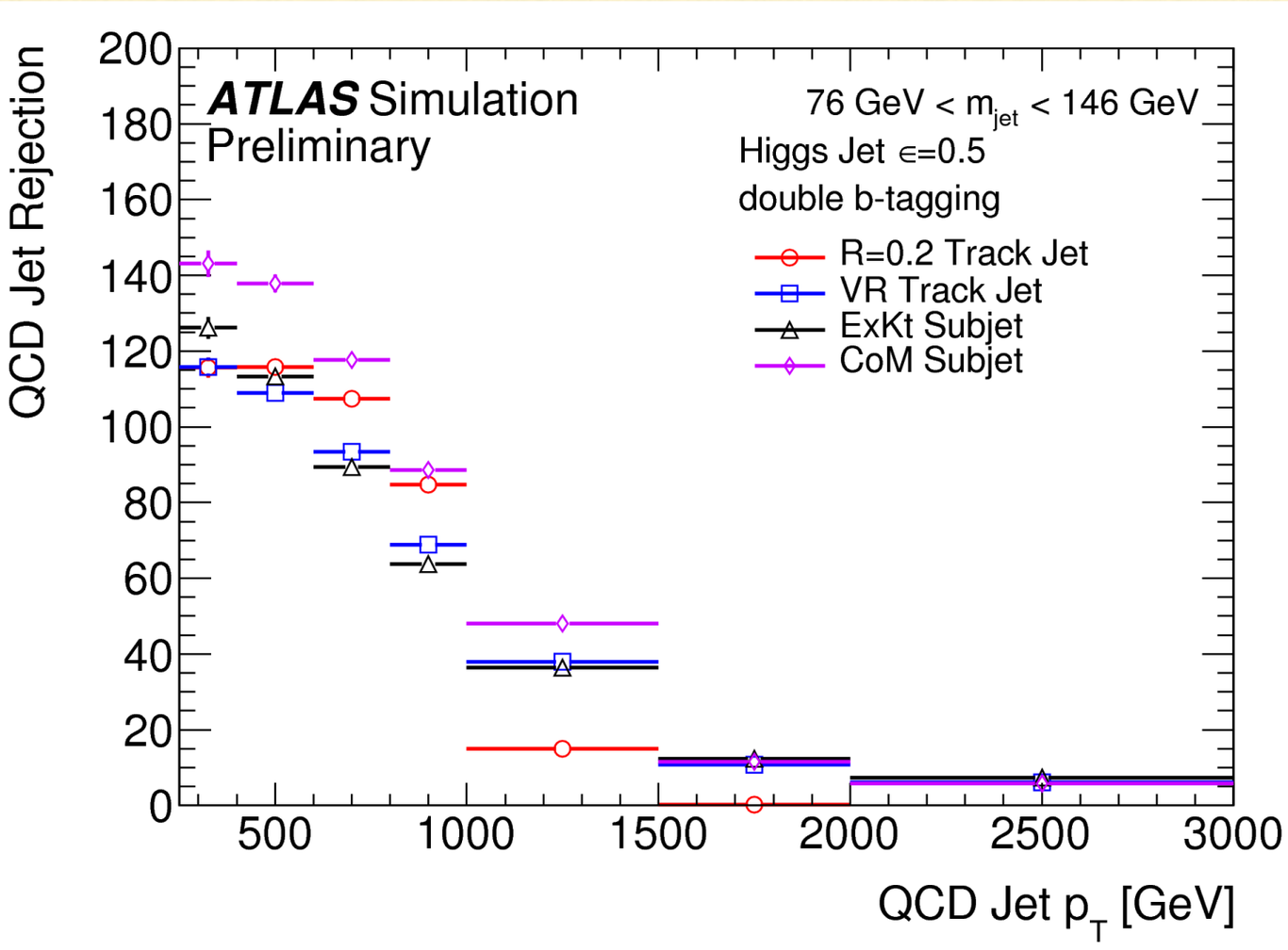
ANTI-KT2 AND COM



- The technique used at the moment is AntiKt2, but at high-pT the separation between sub-jets is less than 0.2.
- A new technique which does better is required.
- We all know here is CoM

COM METHOD





- CoM performs better than AntiKt2 and other methods for double-b tagging and QCD jet rejection.
- => Include an extra pT-bin in the VHbb analysis for boosted (using CoM) selection.

CURRENT STATUS

- VHbb samples only have AntiKt2 and VR information. One lepton does not have any b-tagging sub-jets information (error in Derivation).

- CoM will be included in the next set of VHbb derivation effort (HIGG5D1, HIGG5D2 and HIGG2D4). Timeline: soon(-ish).

- Since samples are not ready yet, working mostly on getting all the technical (CxAODFramework, MVA training, and WSMaker -for fit) adapted for the measurement. Using AntiKt2 for the moment (impossible for one lepton right now).