RUN-II FIRST RESULTS

F. Conventi
E. Rossi

XI ATLAS Italia Workshop on Run2 First Results

4-6 November 2015
Europe/Rome timezone

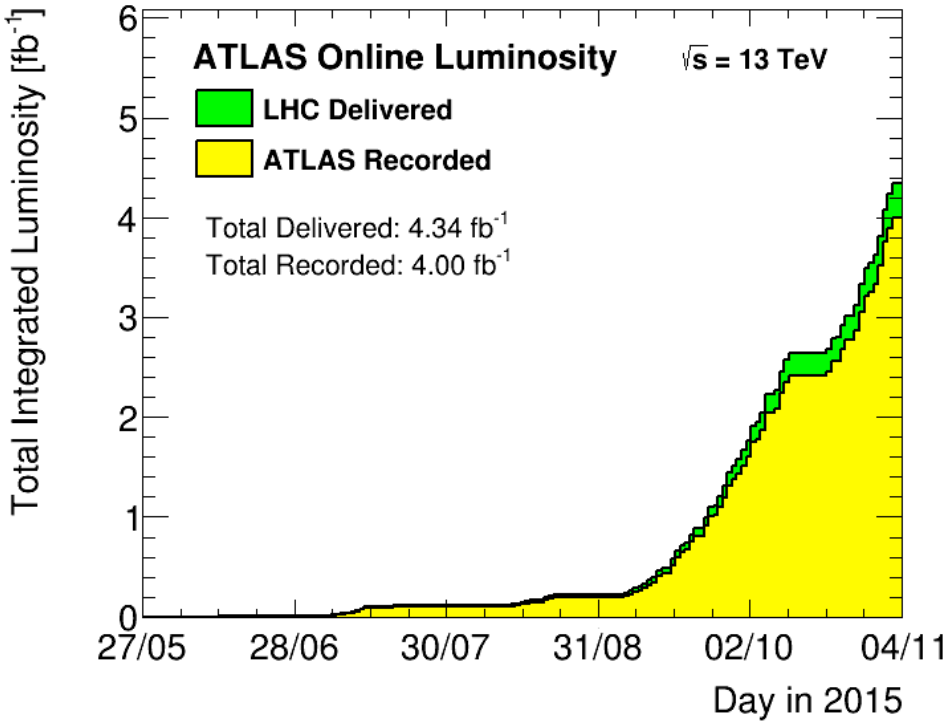
https://agenda.infn.it/conferenceDisplay.py?confId=10076

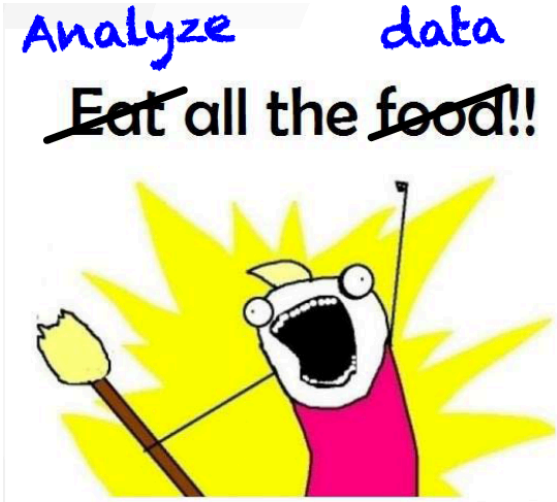
- Trigger and Performance (6)
- Standard Model (3)
- Higgs (8)
- Exotics and SUSY (8)
- Tutorial on Run-II analysis

Contributi Atlas-Napoli:

- **Higgs Properties: Elvira**
- **Higgs BSM: F. Conventi**
- **Monojet: Francesco Cirotto (& V. Fabiani)**
- **Tutorial Arturo**

2015 Run II: pp Data Taking





Promised 4 fb^{-1} delivered:

➡ ~200 pb^{-1} from IBL off

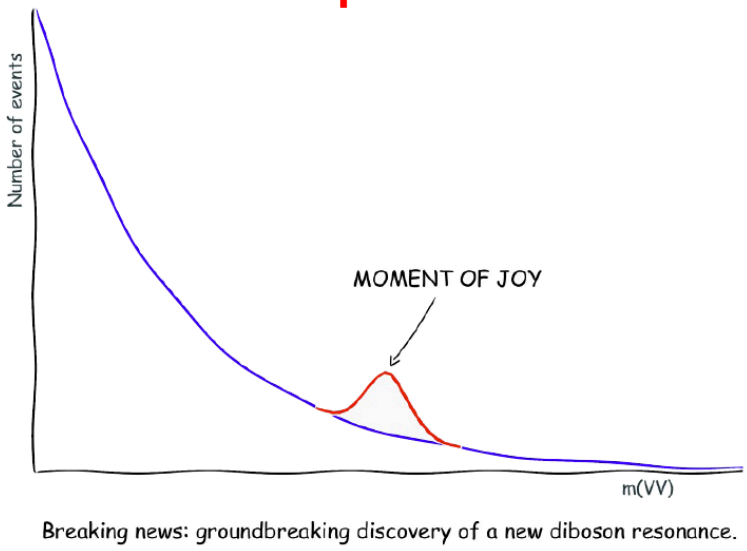
➡ ~50 pb^{-1} from TRT off

EOYE GRL ready:

➡ 3.34 fb^{-1}

➡ 3.57 fb^{-1} including IBL off

About 30 fb^{-1} expected for 2016!!

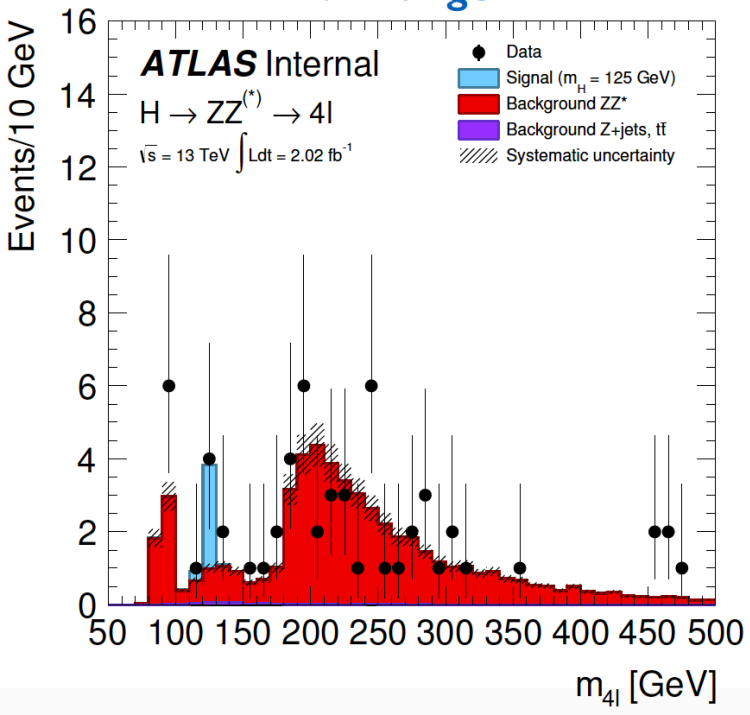


H→ZZ*→4l Analysis: Low mass search

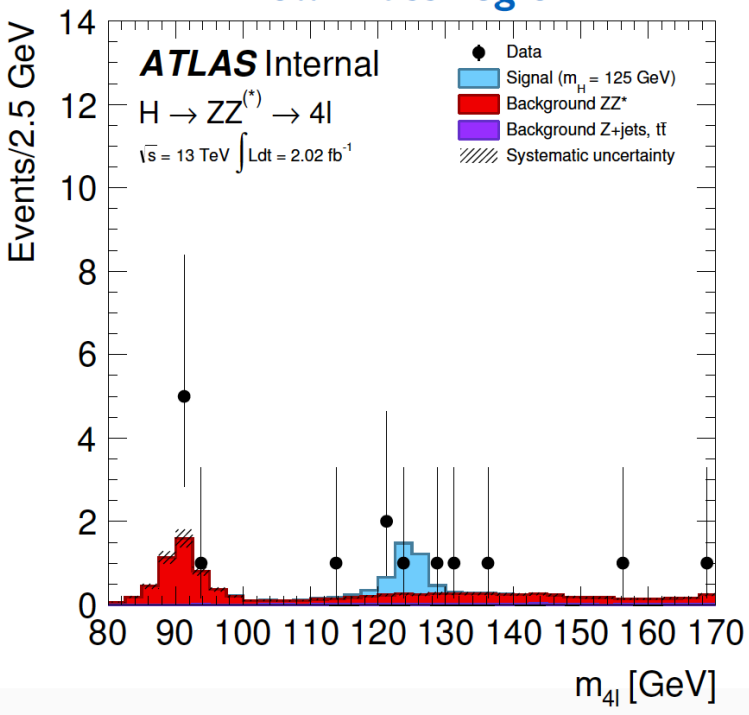
Luminosity 2.02 fb^{-1} → 4 events in [120, 130] GeV region

Higgs approval meeting 13/11/2015: https://indico.cern.ch/event/435069/

Full range



Low mass region



Signal is 125 GeV $m_{4l} \in [118, 129]$ GeV

Final state	Signal full mass range	Signal	ZZ^*	Z + jets, $t\bar{t}$	S/B	Expected	Observed
4μ	1.17 ± 0.12	1.09 ± 0.11	0.37 ± 0.04	0.02 ± 0.01	2.7	1.48 ± 0.12	1
$2e2\mu$	0.77 ± 0.18	0.69 ± 0.15	0.24 ± 0.05	0.02 ± 0.01	2.6	0.95 ± 0.16	1
$2\mu2e$	0.69 ± 1.12	0.63 ± 1.03	0.20 ± 0.42	0.02 ± 0.00	2.9	0.84 ± 1.11	2
$4e$	0.65 ± 1.23	0.57 ± 1.07	0.18 ± 0.42	0.02 ± 0.00	2.9	0.76 ± 1.14	0
Total	3.28 ± 2.53	2.97 ± 2.24	0.99 ± 0.88	0.08 ± 0.02	2.8	4.04 ± 2.41	4

$m_{4l} > 200$ GeV

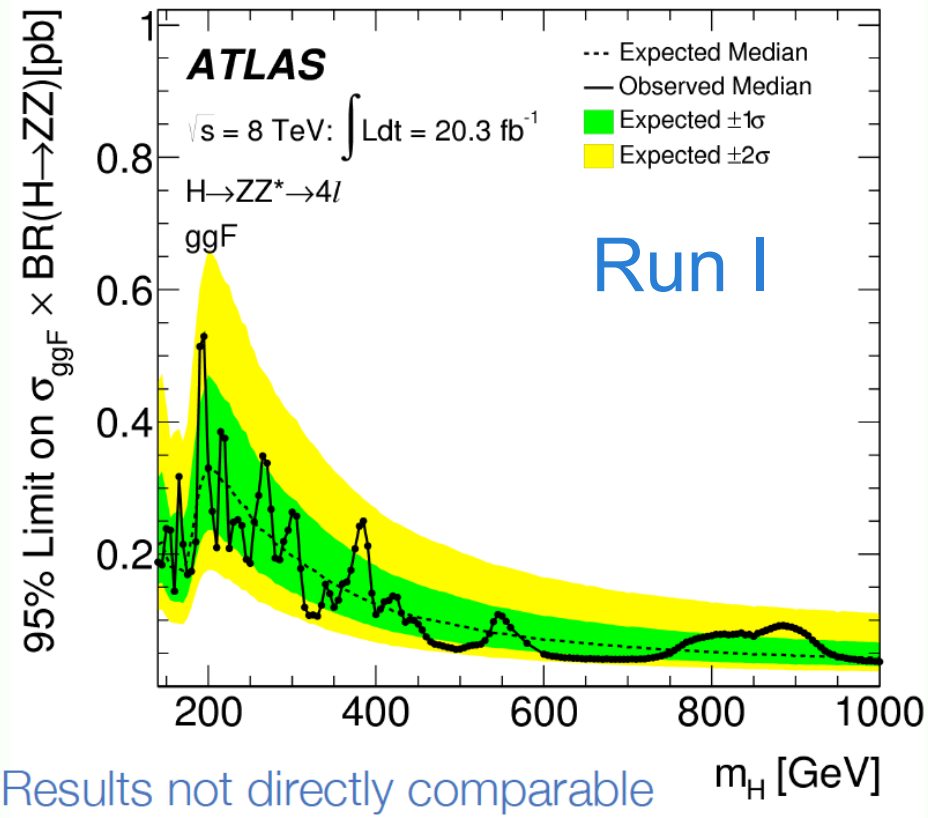
Final state	ZZ^*	Z + jets, $t\bar{t}$	Expected	Observed
4μ	11.53 ± 1.17	0.15 ± 0.09	11.68 ± 1.18	11
$2e2\mu$	8.75 ± 2.07	0.15 ± 0.09	8.90 ± 2.07	8
$2\mu2e$	9.59 ± 2.77	0.10 ± 0.02	9.70 ± 2.77	8
$4e$	7.52 ± 3.76	0.11 ± 0.02	7.64 ± 3.76	6
Total	37.37 ± 8.92	0.51 ± 0.13	37.88 ± 8.92	33

H→ZZ*→4l Analysis: High mass search

Luminosity 2.02 fb^{-1} → 4 events in [120, 130] GeV region

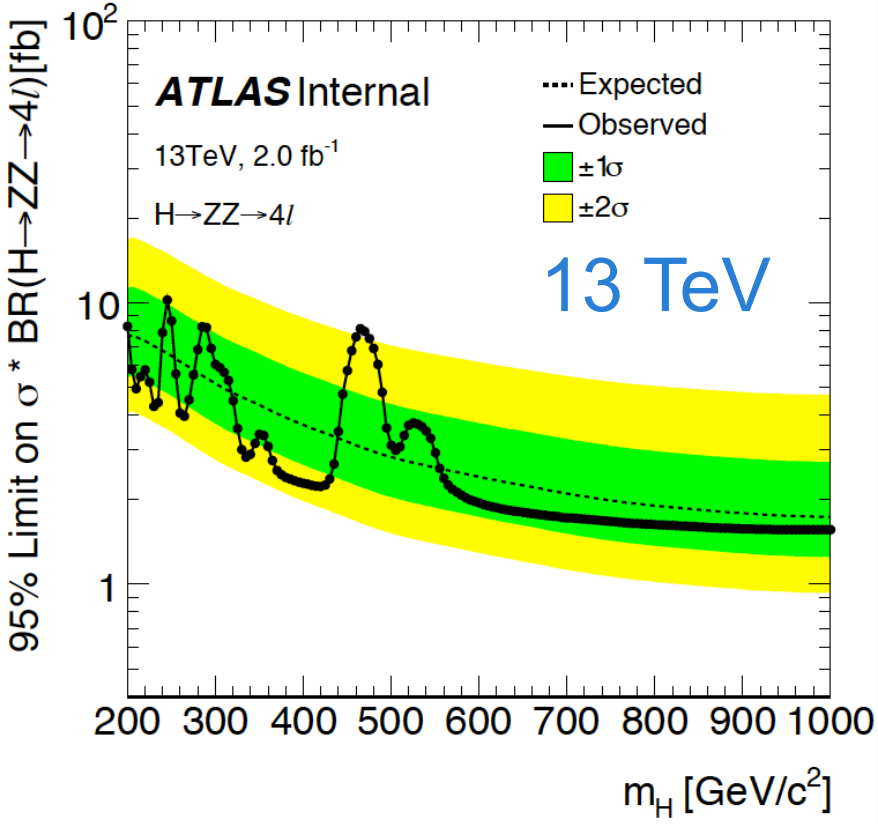
Higgs approval meeting 13/11/2015: https://indico.cern.ch/event/435069/

Note y-axis difference



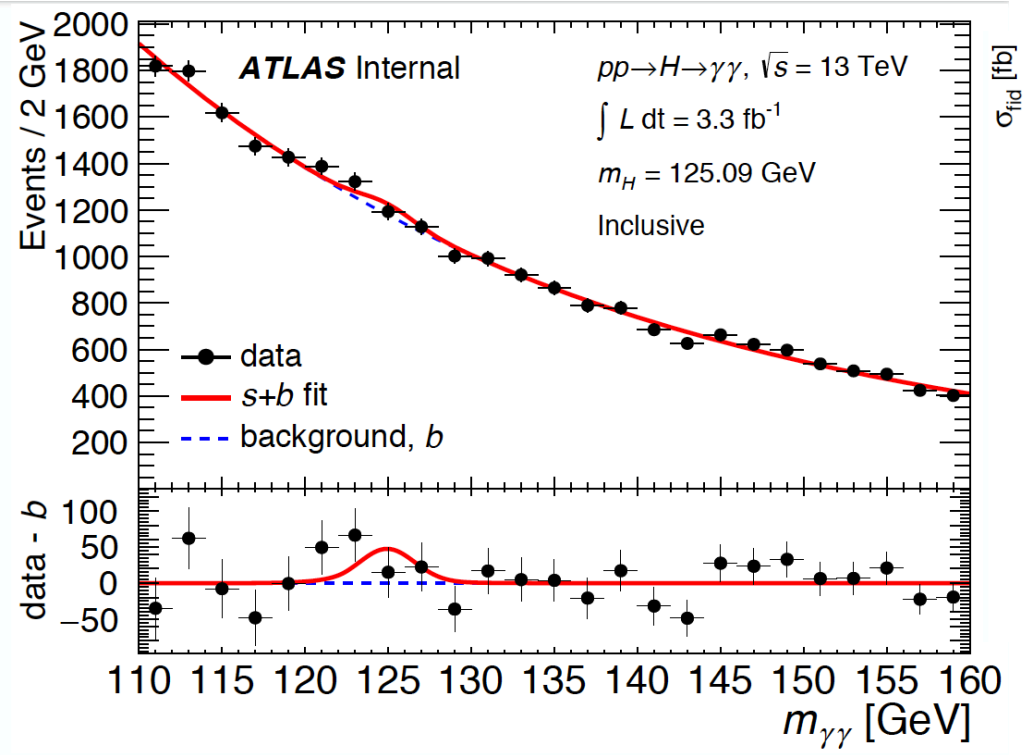
Results not directly comparable to run 1 - no categories at the moment

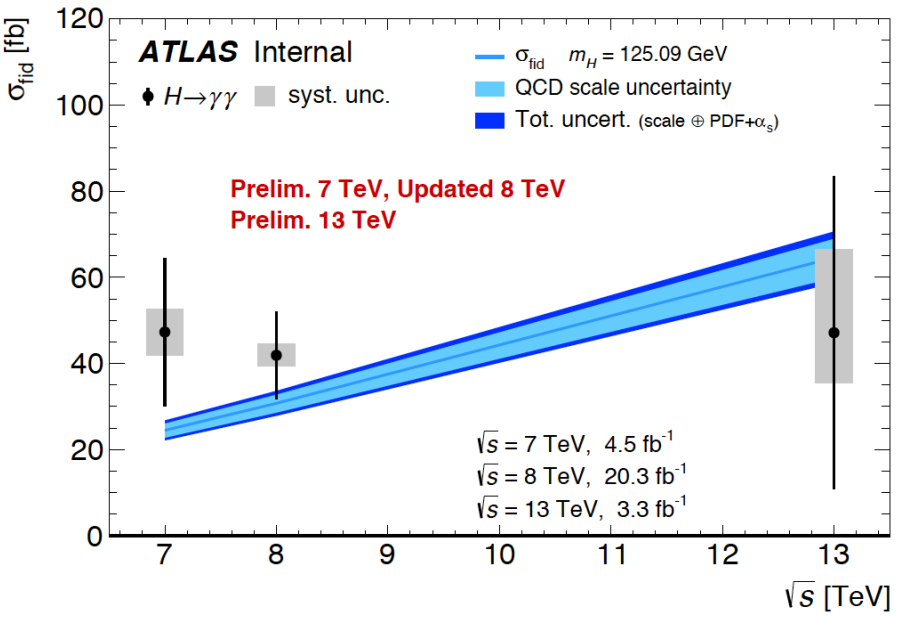
BR(H->4l)/BR(H->ZZ) ~0.0045



H→γγ Analysis

luminosity 3.3 fb^{-1}





Higgs approval meeting 13/11/2015: https://indico.cern.ch/event/435069/

Search for diboson resonances in the llqq final state at 13 TeV

ATL-COM-PHYS-2015-595: https://cds.cern.ch/record/2029464/

Analysis Overview

- Search for high mass resonance in boosted region
- *Combined effort between Higgs and Exotics group*
- Interpretation on W'→WZ, G*→ZZ, H→ZZ (narrow width and large width)

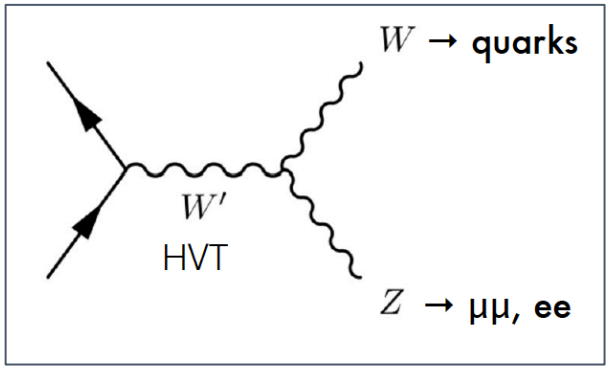
For the EOYE we focus on:

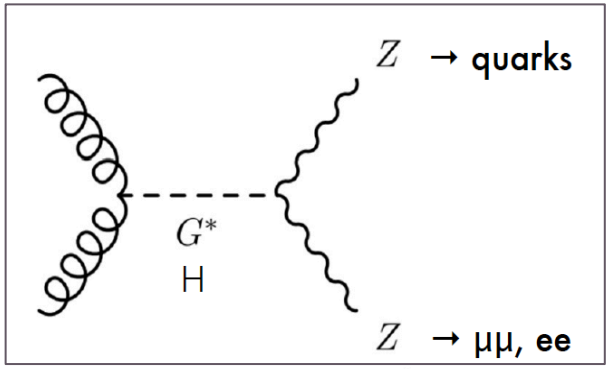
- Resonance mass > 1 TeV (boosted/merged regime)
- Merged jets ⇒ jet substructure studies
- Nearby leptons (ℓℓ from Z candidate) ⇒ lepton isolation and trigger studies
- Early analysis: surpass Run-I sensitivity ~5 fb^{-1}

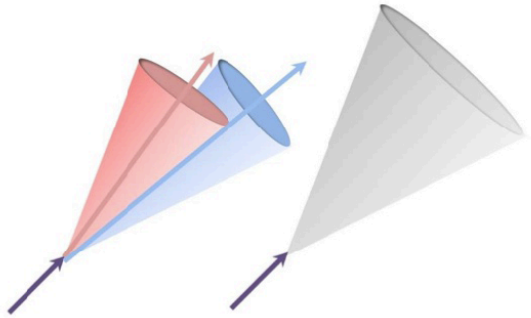
For Moriond:

- Both merged and resolved regime

ZV→ℓℓJ







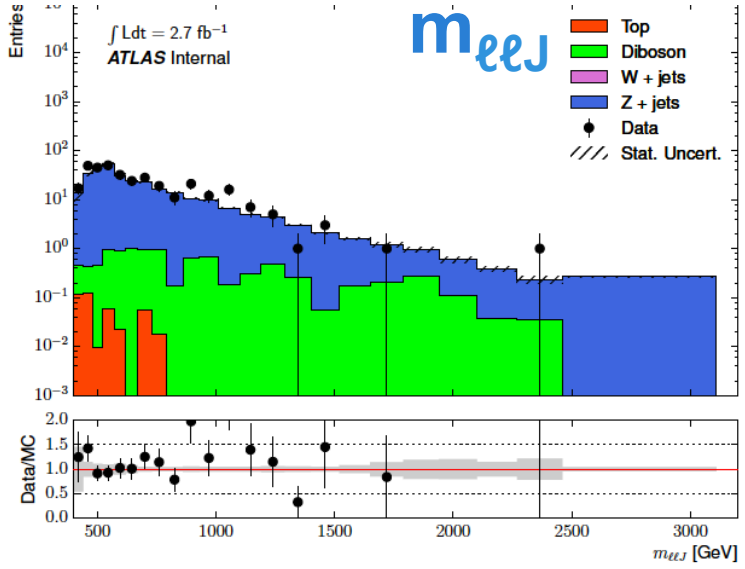
Boosted di-jet merging into mono-fat-jet (J) topology

E. Rossi A. Sanchez

X→ZZ→llqq preliminary results

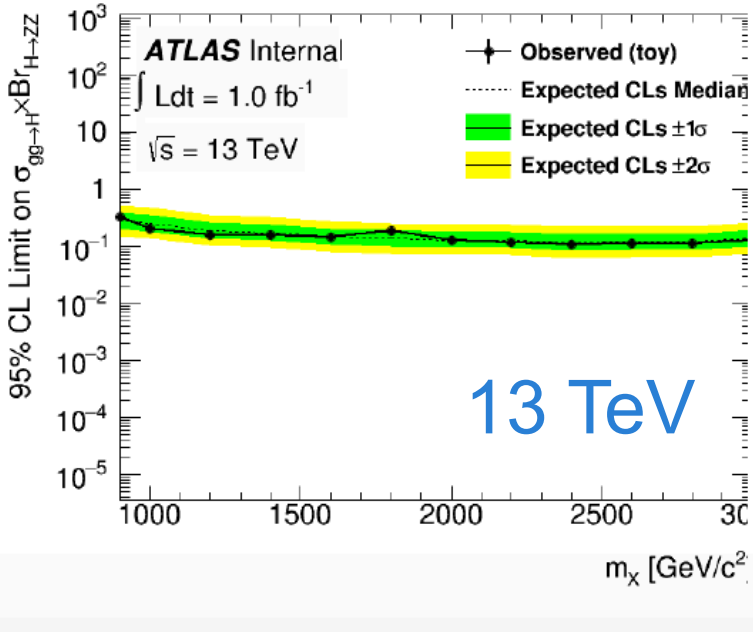
E. Rossi A. Sanchez

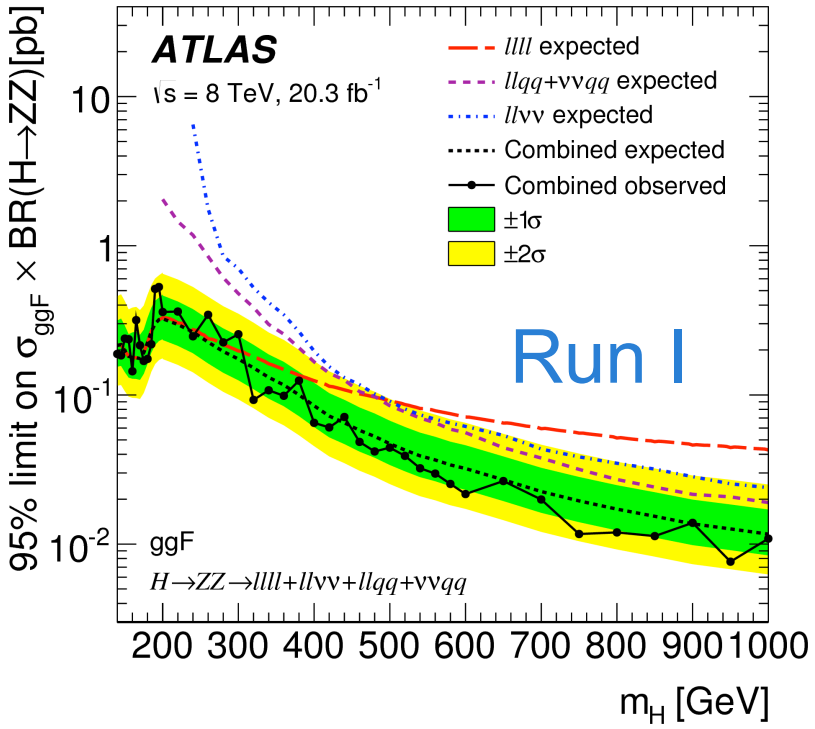
Z+jets control region with 2.7fb^{-1}



Exclusion Limits for Narrow and Large width approximation

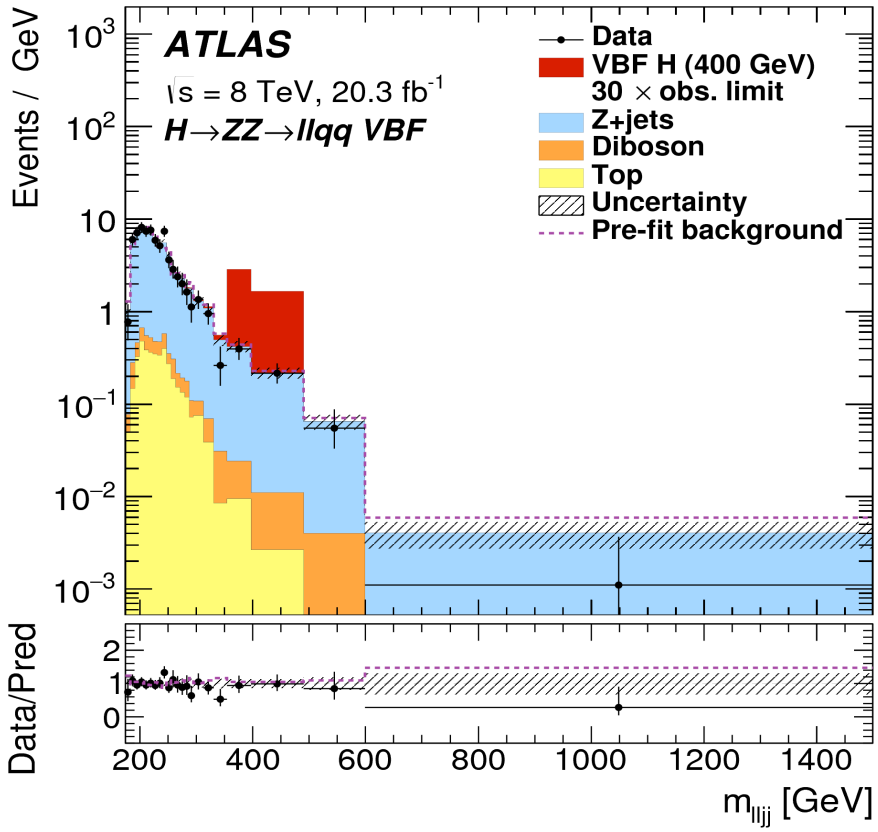
Early analysis: surpass Run-I sensitivity ~5 fb^{-1}

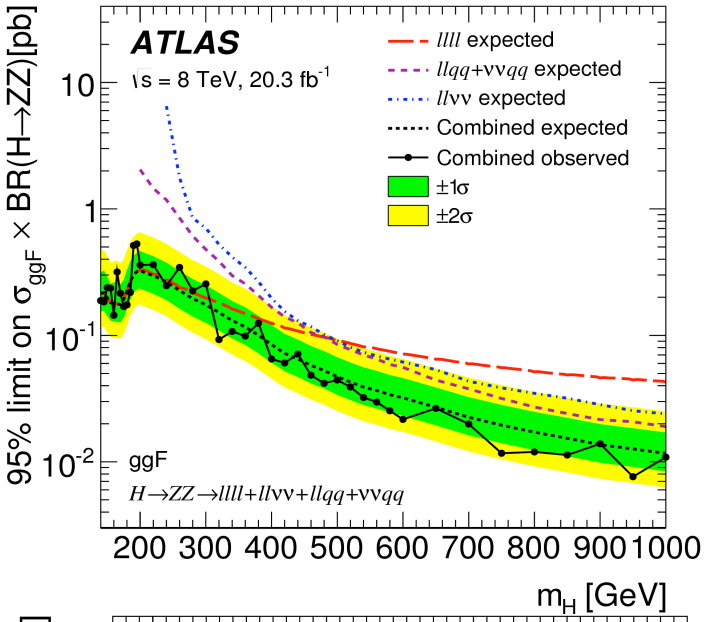


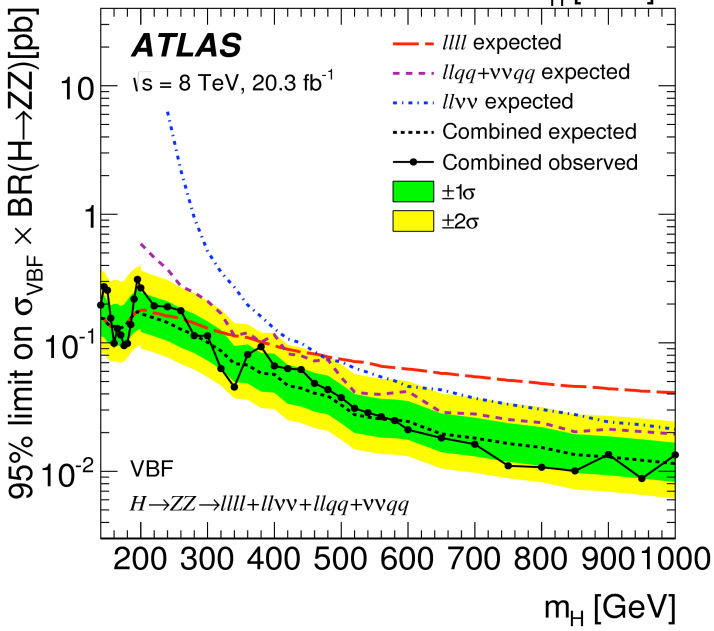


X→ZZ→llqq Moriond 2016 plans

- Merged 1j channel
- Add Resolved channel
- Split analysis ggF/VBF selection

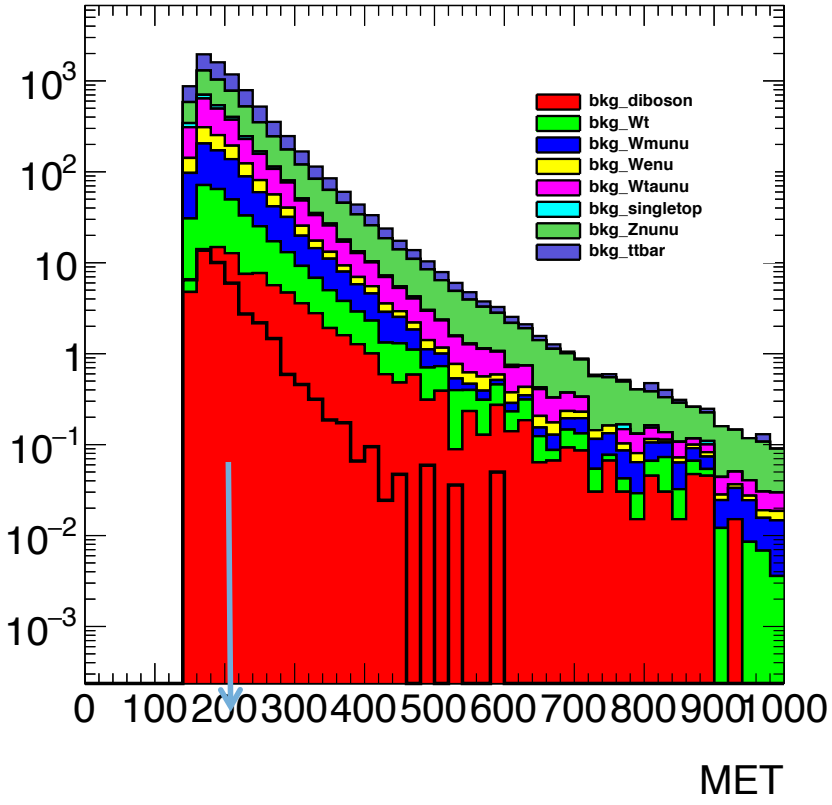




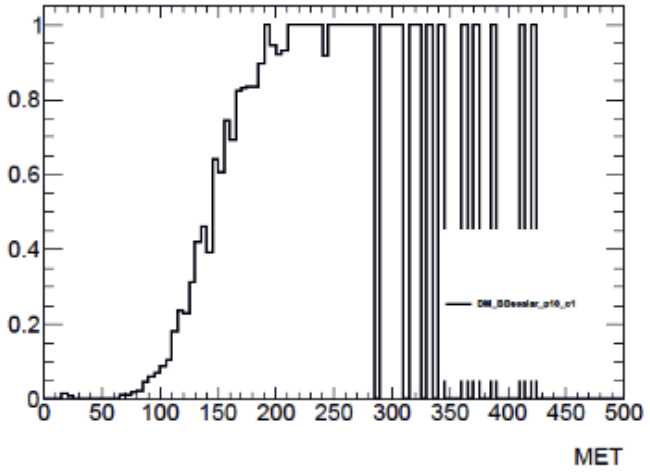


BSM Search in bjet + MET final state

- Inclusive search for BMS models: Invisible Higgs, DarkMatter, ADD
- Basic selection: require at least 1 bjet + MET + veto leptons
- Backgrounds: Z(vv) + jets, tt, W(lv)+jets



HLT Trigger:
Lowest unprescaled item is XE70 (plateau@ 180-200 GeV)
New trigger item for 2016 data taking?
Use MET+JET trigger? (xe80j80)



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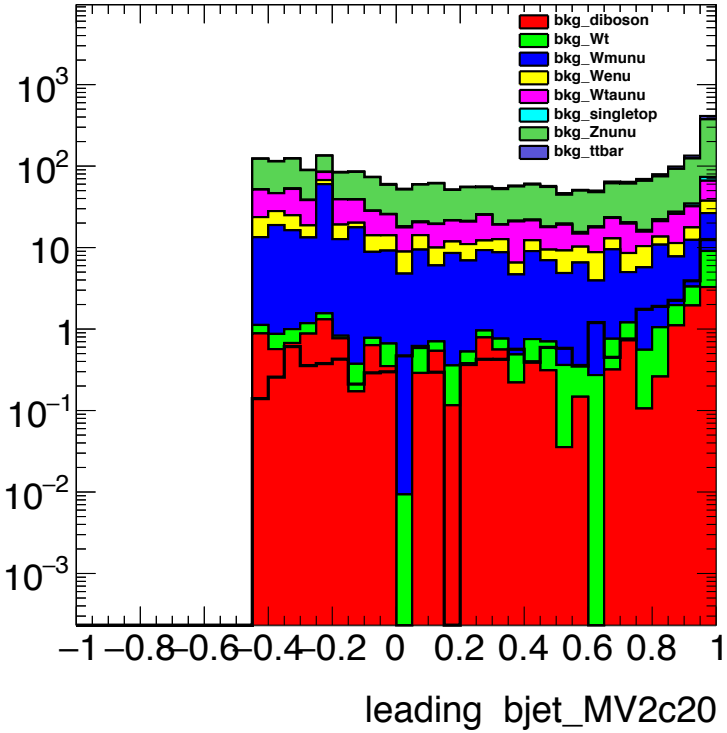
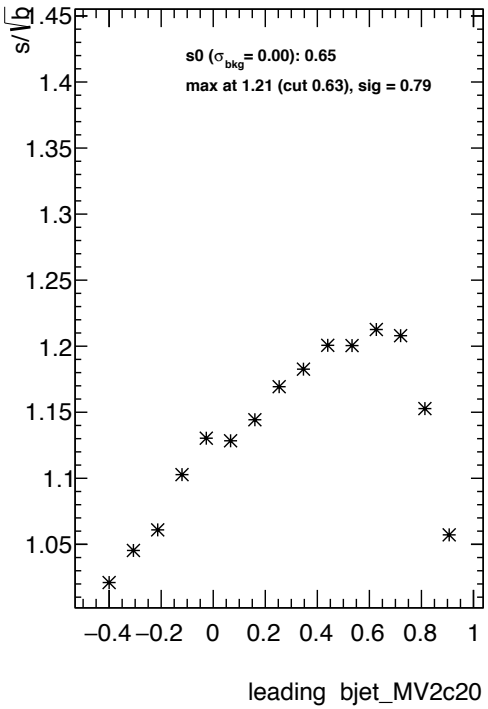
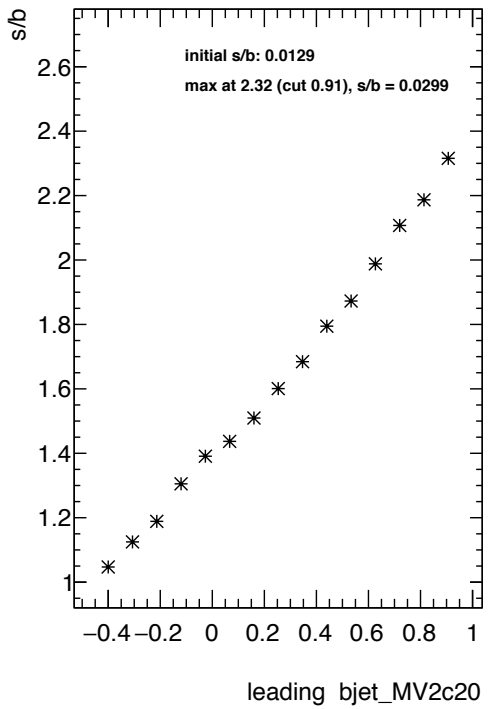


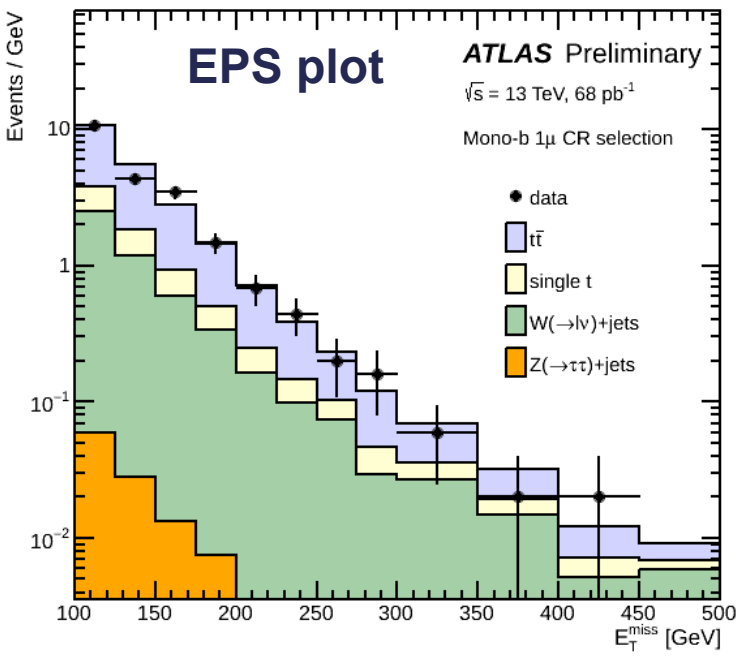


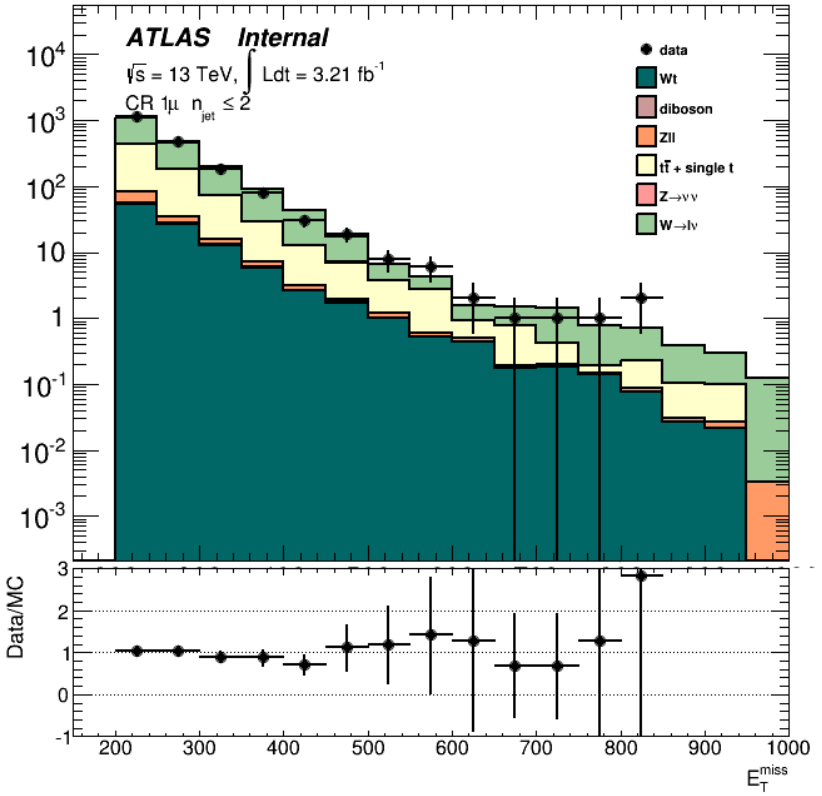


BSM Search in bjet + MET final state

Approved plot since EPS 2015
https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PLOTS/EXOT-2015-007/

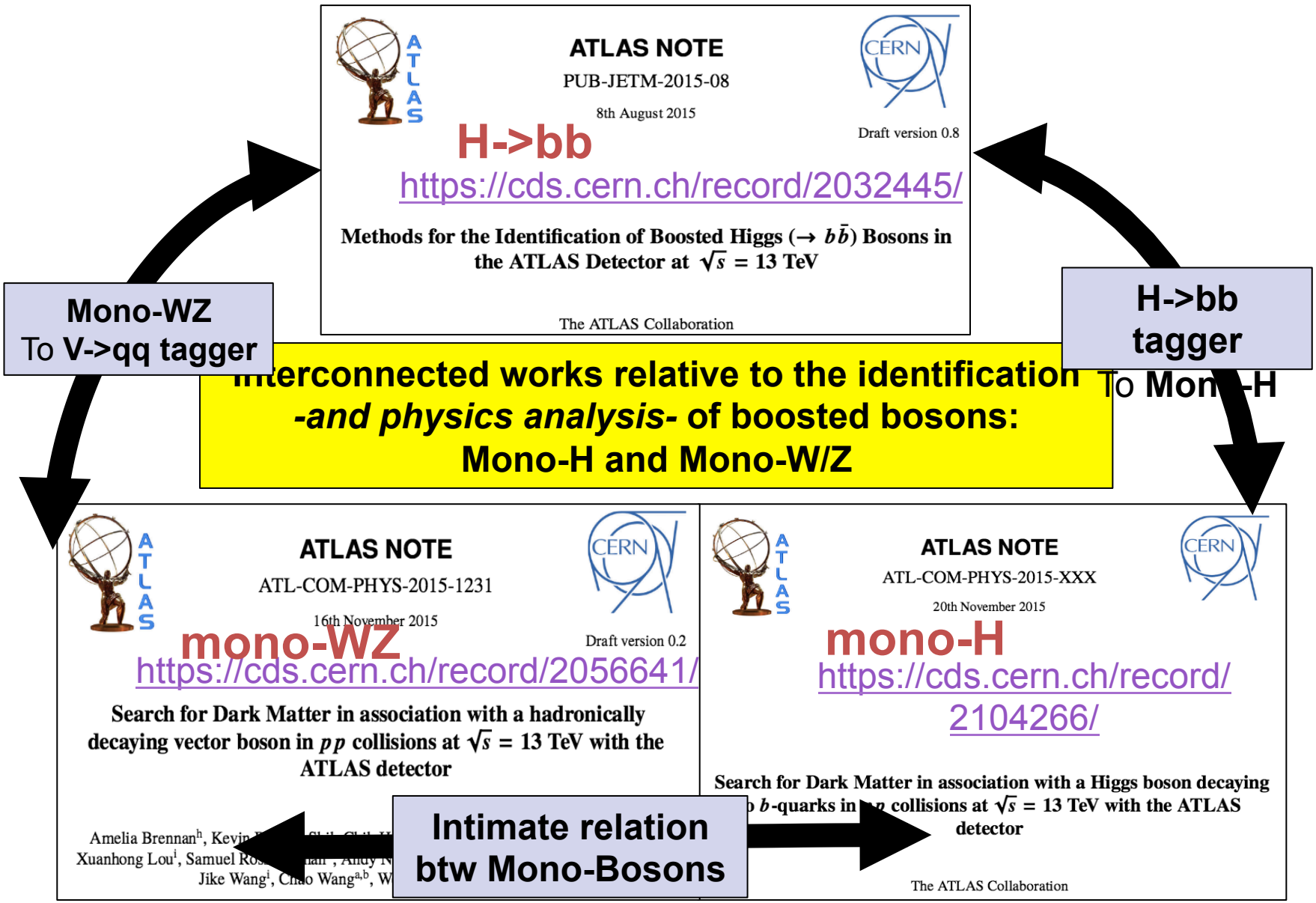
Control region definition for top background and W+jets is almost ready





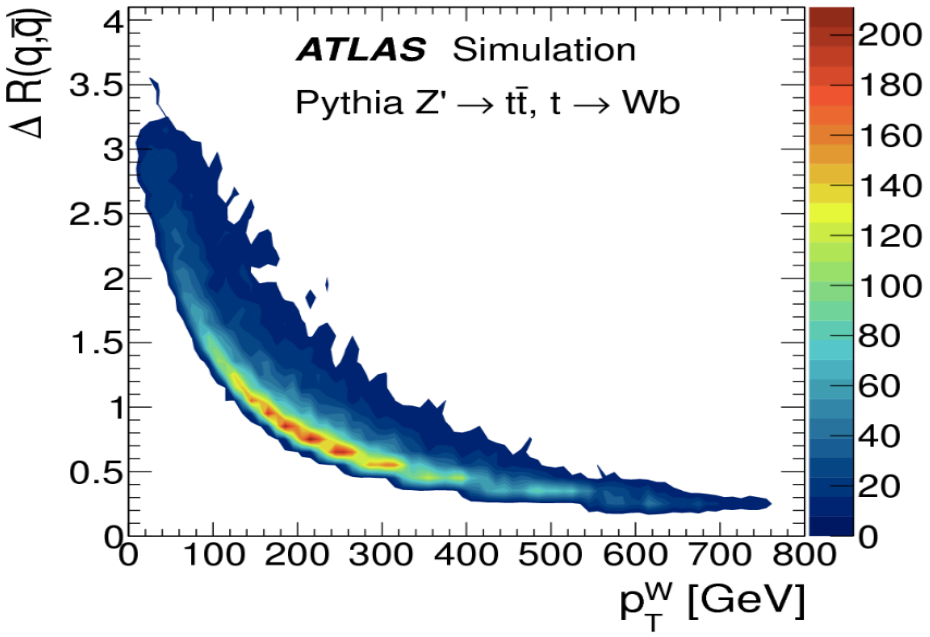
Mono-V analyses

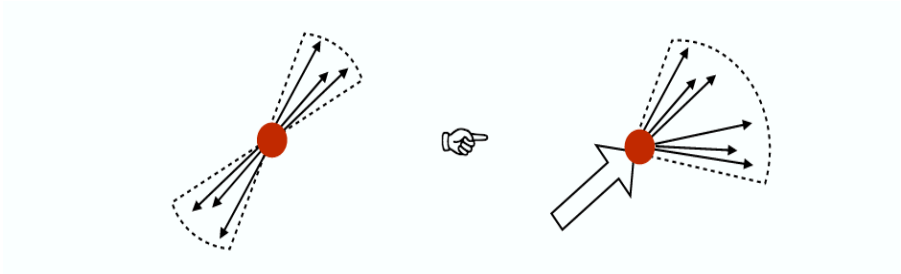
A. Sanchez



Mono-V analyses

A. Sanchez

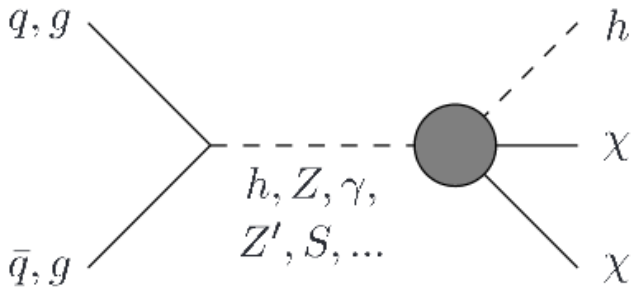


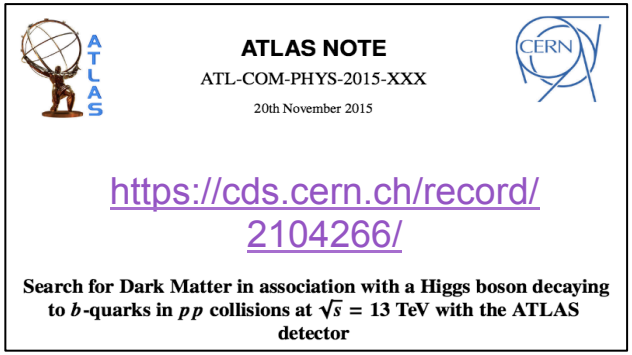


Boosted Objects identification is very important for the Mono-H search and other SM or BSM analyses using Higgs boson(s)

A truth level study showing the separation of the two daughter partons coming from the decay of a W boson as a function of the boson transverse momentum.

https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/PERF-2012-02/



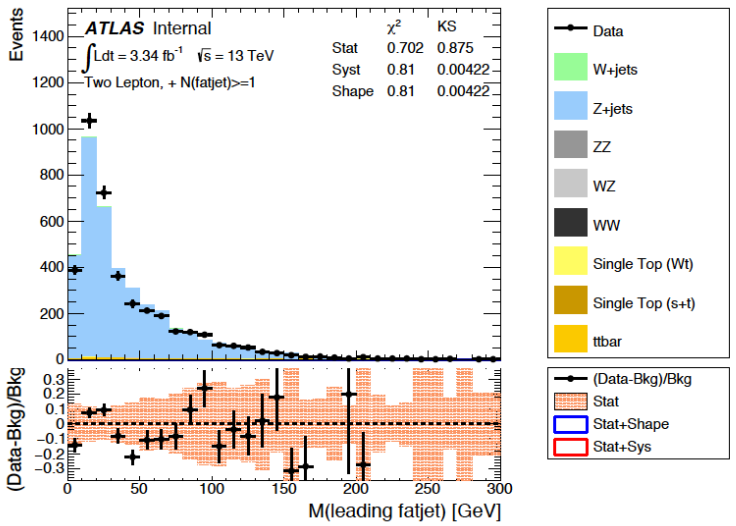


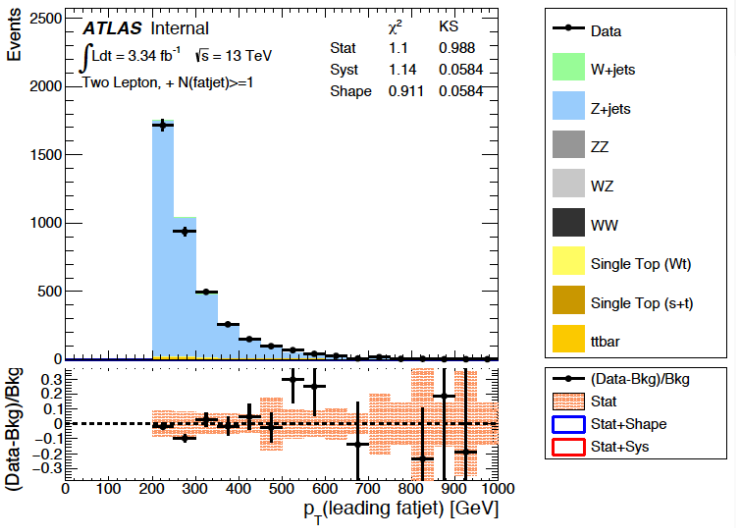
Last updated plot for monoV analysis

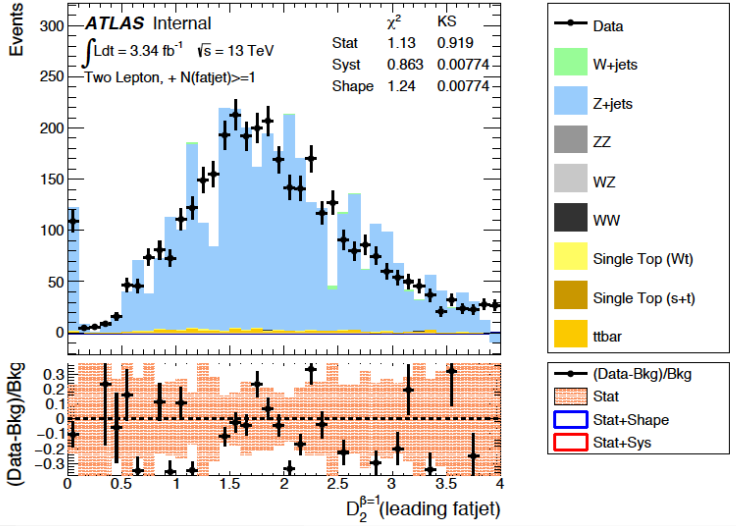
→ thanks to Arturo

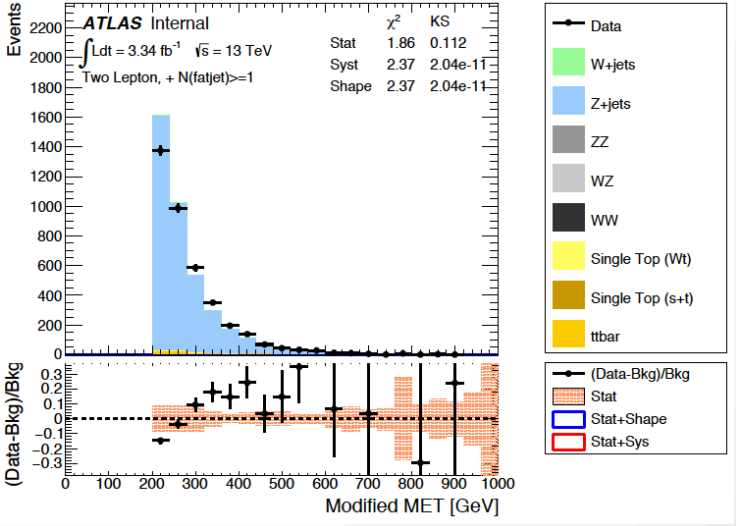
Final luminosity ~ 3.32fb^{-1}

2 Lepton – Z+jets CR









BACKUP

The H->bb (*and* W/Z->qq) Tagger

ATLAS NOTE

PUB-JETM-2015-08

8th August 2015

Draft version 0.8

https://cds.cern.ch/record/2032445/

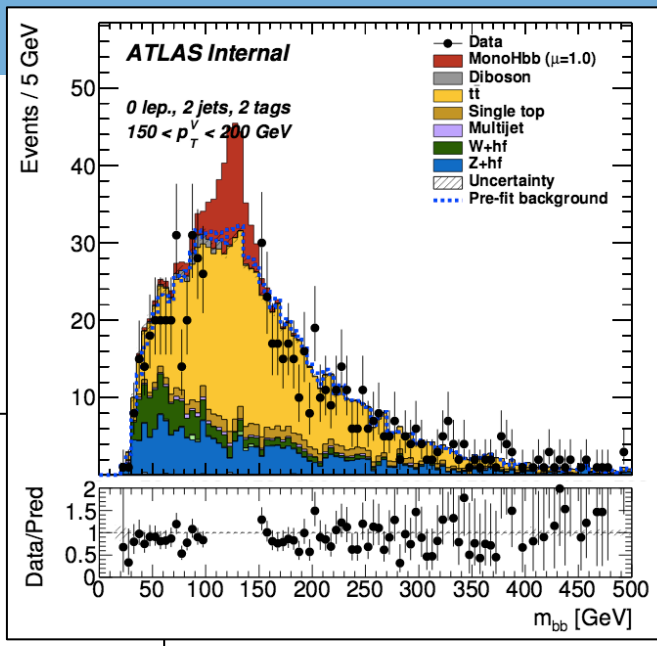
Methods for the Identification of Boosted Higgs ($\rightarrow b\bar{b}$) Bosons in the ATLAS Detector at $\sqrt{s}$ = 13 TeV

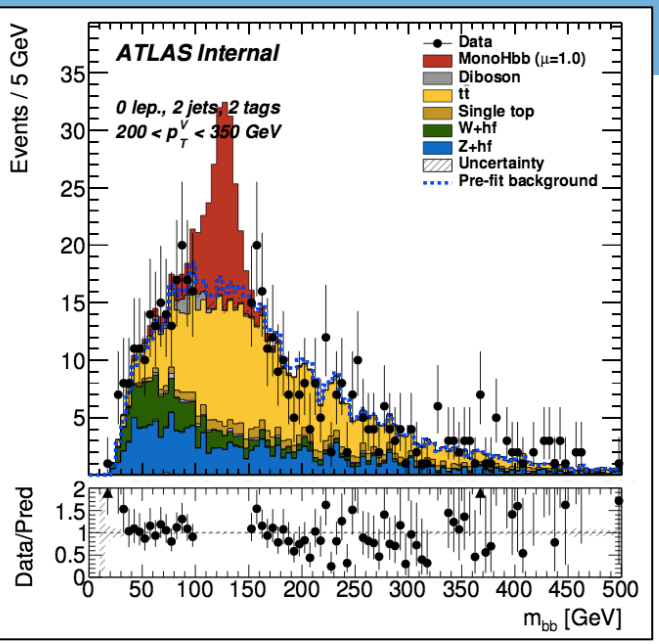
The ATLAS Collaboration

	Loose	Medium	Tight
Higgs-jet efficiency	0.41 ±0.00 (stat.) ±0.07 (syst.)	0.32 ±0.00 (stat.) ±0.06 (syst.)	[illegible] (syst.)
Multi-jet rejection			
Inclusive	260 ±20 (stat.) ±50 (syst.)	460 ±50 (stat.) ±80 (syst.)	800 ±120 (stat.) ±180 (syst.)
Light-flavor	$O(10^5)$	$O(10^5)$	$O(10^6)$
cl	$O(10^3)$	$O(10^3)$	$O(10^4)$
bl	$O(10^2)$	$O(10^2)$	$O(10^3)$
bc	$O(10)$	$O(10)$	$O(10^2)$
cc	250 ±60 (stat.) ±140 (syst.)	480 ±170 (stat.) ±260 (syst.)	1200 ±500 (stat.) ±800 (syst.)
bb	11 ±1 (stat.) ±2 (syst.)	19 ±2 (stat.) ±4 (syst.)	31 ±5 (stat.) ±8 (syst.)
Hadronic top rejection			
Inclusive	67 ±3 (stat.) ±17 (syst.)	110 ±10 (stat.) ±30 (syst.)	160 ±10 (stat.) ±50 (syst.)
bl	360 ±60 (stat.) ±230 (syst.)	660 ±140 (stat.) ±440 (syst.)	810 ±200 (stat.) ±570 (syst.)
bc	24 ±1 (stat.) ±6 (syst.)	39 ±2 (stat.) ±11 (syst.)	53 ±4 (stat.) ±16 (syst.)

Higgs-jet efficiencies, and rejections for the multi-jet and hadronic top backgrounds, are listed for the three tagger selections. Statistical and systematic uncertainties are listed separately. Similar working points have been developed for the identification of boosted (e.g. mono) W and Z bosons.

Boosted Objects identification is very important for the MonoH search and other SM or BSM analyses using Higgs boson(s)





ATLAS NOTE

ATL-COM-PHYS-2015-XXX

20th November 2015

https://cds.cern.ch/record/2104266/

Search for Dark Matter in association with a Higgs boson decaying to b-quarks in pp collisions at $\sqrt{s}$ = 13 TeV with the ATLAS detector

The ATLAS Collaboration

Plots of the invariant mass of the two signal jets for the 0 lepton signal region for 2 tag event

This analysis in intended to be a paper and even when the status is behind the Mono-W/Z, they share a lot of material, samples, code, manpower,… something that help a lot in its