

# Boosted W/Z in Early Data

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# Introduction

- Ultimately want to observe HW/HZ via jet structure
- Must build experimental confidence
- Know boosted SM particles are there
- Try to find them
- W/Z most relevant for HW/HZ analysis



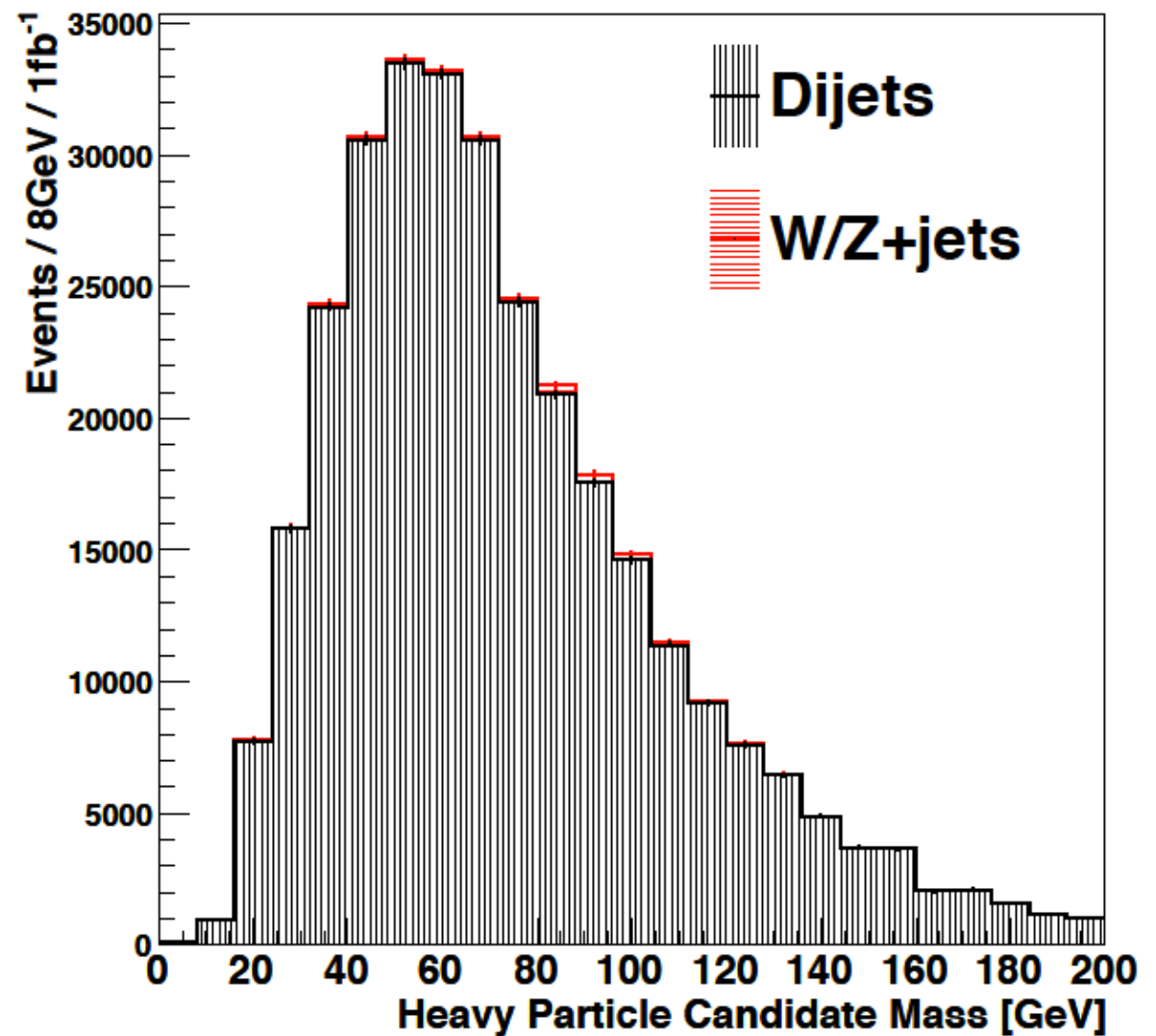
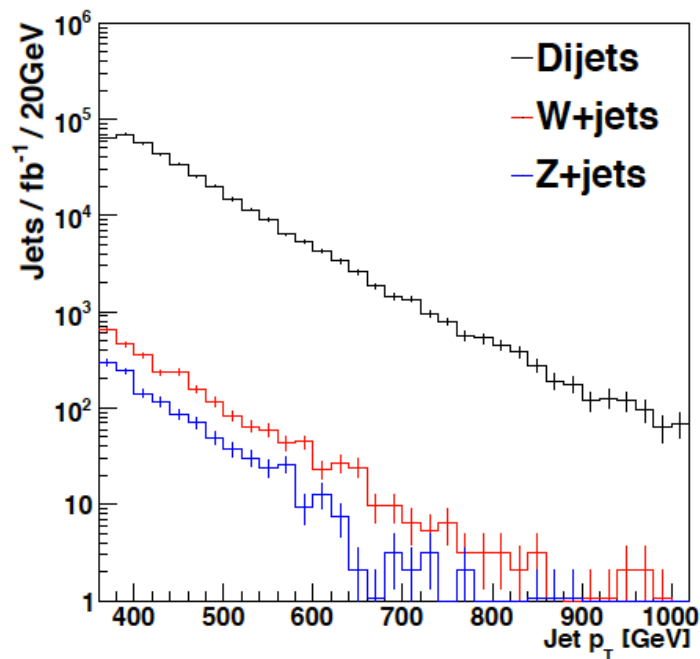
## Strategy

- Diboson cross-section not much bigger than HW/HZ
- Can we access the hadronic W/Z in W/Z+jets?
- Try the filtering analysis from HW/HZ studies
  - Hadron level
  - Herwig: W+jets, Z+jets, dijets
  - Rivet (<http://projects.hepforge.org/rivet/>)
  - Reject all events with a 30 GeV e or  $\mu$
  - $1\text{fb}^{-1}$  at 7TeV



# Starting with...

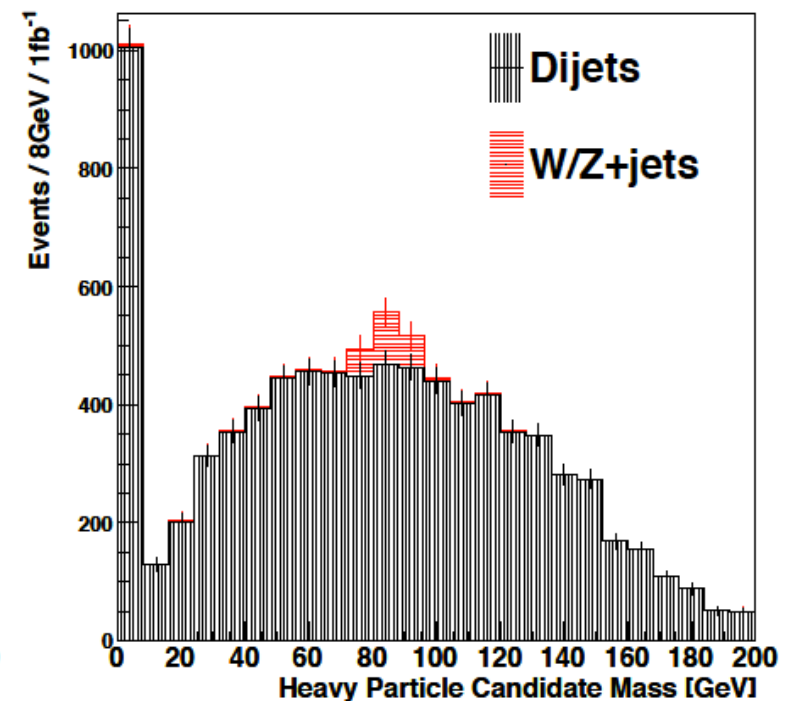
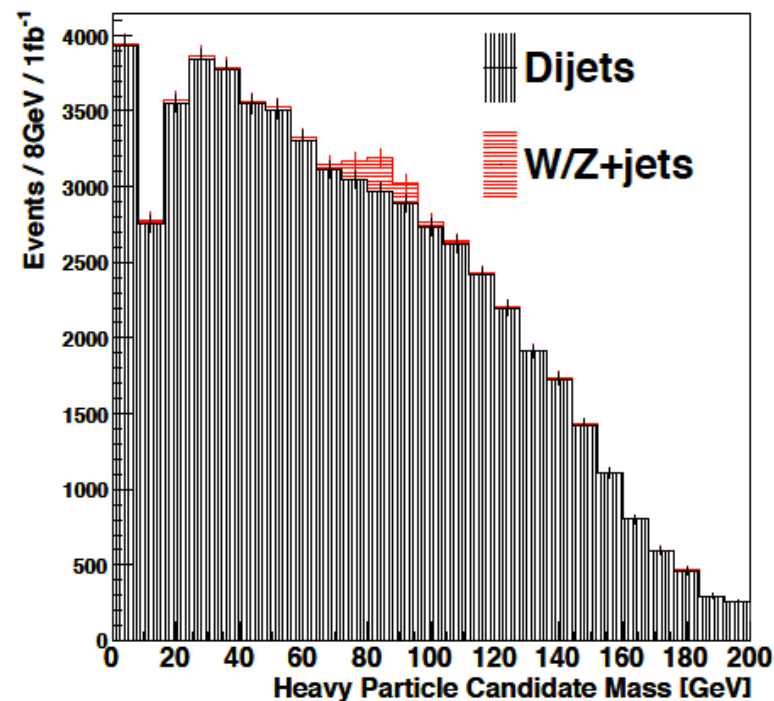
- C/A jets with  $R=0.7$
- With  $p_T > 400$  GeV





## Now with filtering

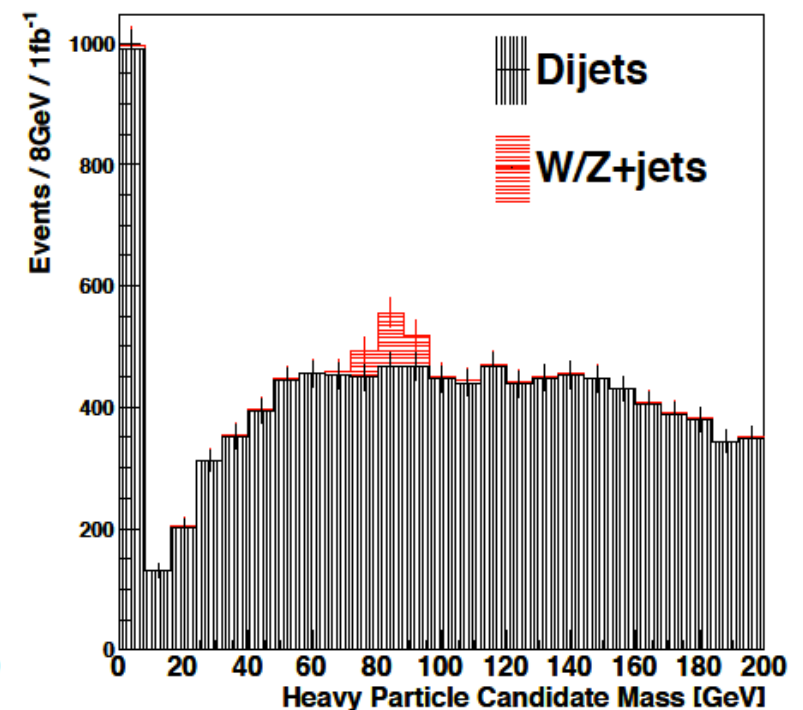
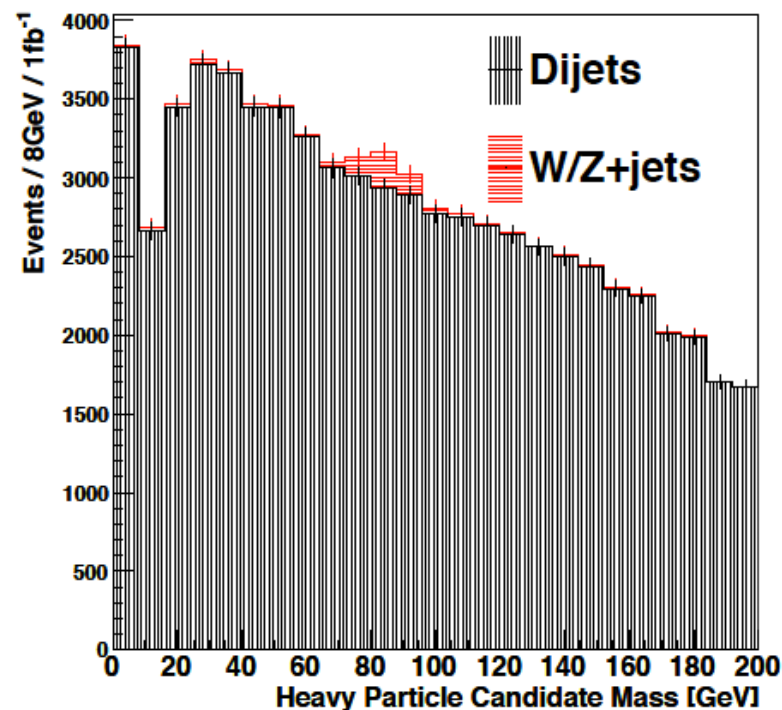
- Apply filtering,  $y_{\text{cut}2} = 0.09$
- HW/HZ analysis took  $\mu=2/3$ , here take  $1/3$  (left) or  $1/5$  (right)
- Naïve significance around  $5\sigma$  with  $1\text{fb}^{-1}$





# Tuning...

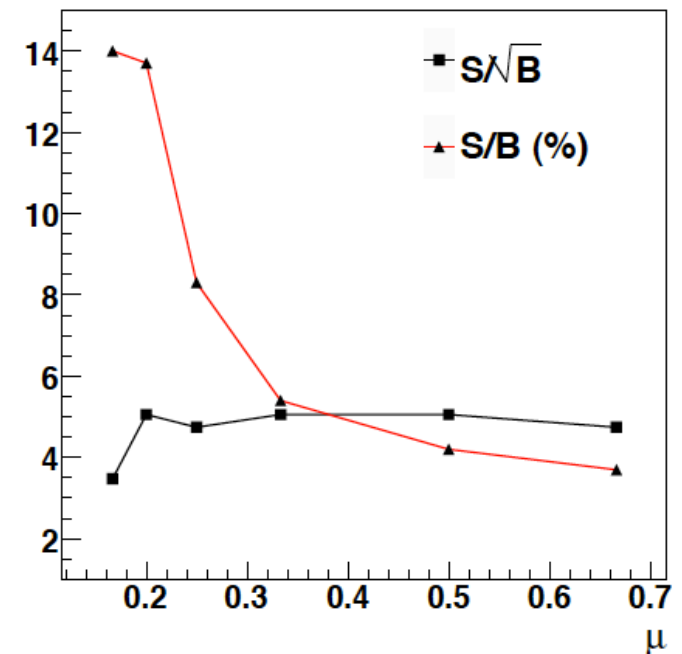
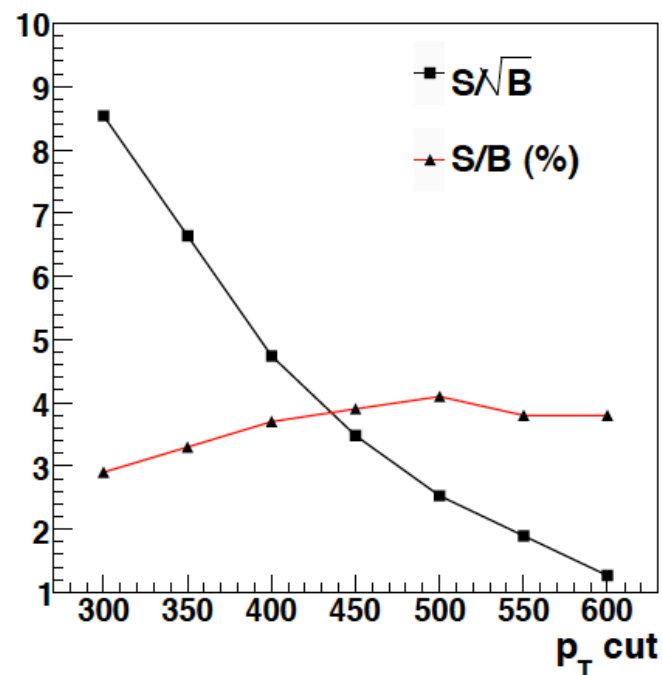
- C/A jets now with  $R=1.2$  with  $p_T > 400$  GeV
- Again filtering,  $y_{\text{cut}2} = 0.09$
- Again take  $\mu=1/3$  (left) or  $1/5$  (right), similar significance





# Tuning...

- Lots of freedom in terms of rate and shape just by tuning parameters
- Very different to HW, being very strict seems to pay off...
- Lower in  $p_T$  is better but need to understand the trigger...





## Overall

- Seems very feasible at hadron level
- Significances around  $5\sigma$  in  $1\text{fb}^{-1}$  (LO, stat. only)
- Basically tested with ATLAS simulation via HW/HZ analysis
- So don't see any reasons for this not to work
- Approach so far very basic, can do better
- So can probably start taking this seriously with  $100\text{pb}^{-1}$



## Beyond

- Once measured becomes an important calibration channel
- Can also exclude other resonances
- Graduate to smaller cross-sections
  - $Z \rightarrow b\bar{b}$ ,  $WW$ ,  $WZ$ ,  $ZZ$  and obviously  $H$  ultimately
- Work in concert with top studies



## Conclusions

- W/Z+jets analysis is target for early data
- HW/HZ approach works very well with only minimal tuning
- Intend to do this in 2010/2011  
(ATL-COM-PHYS-2010-115)