



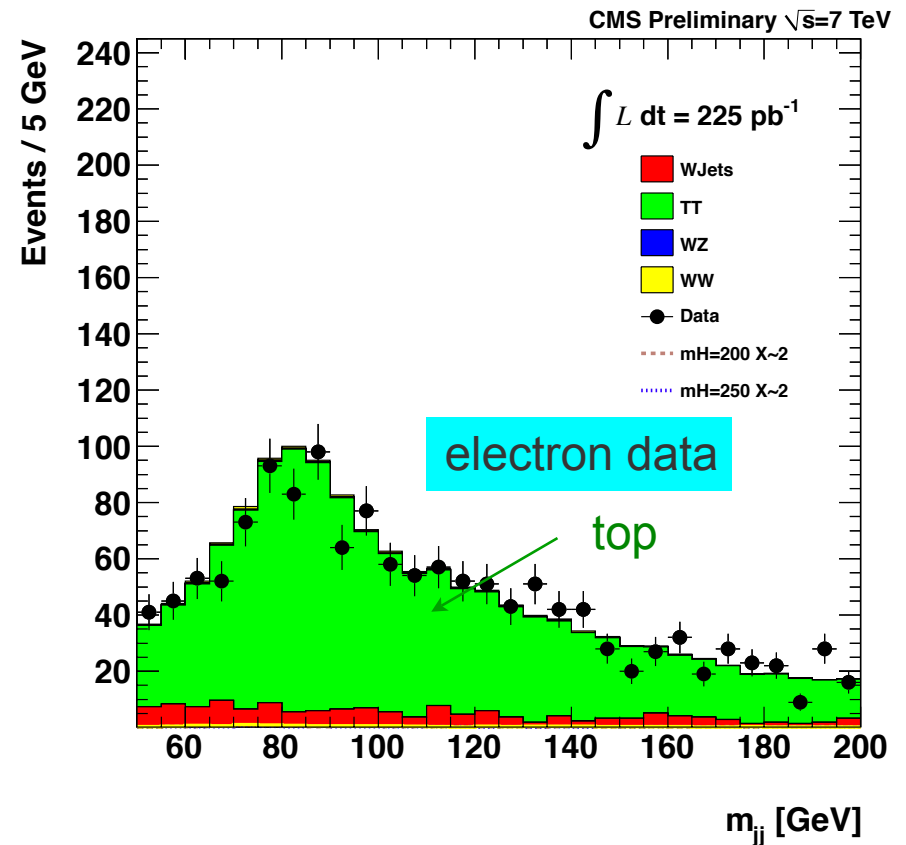
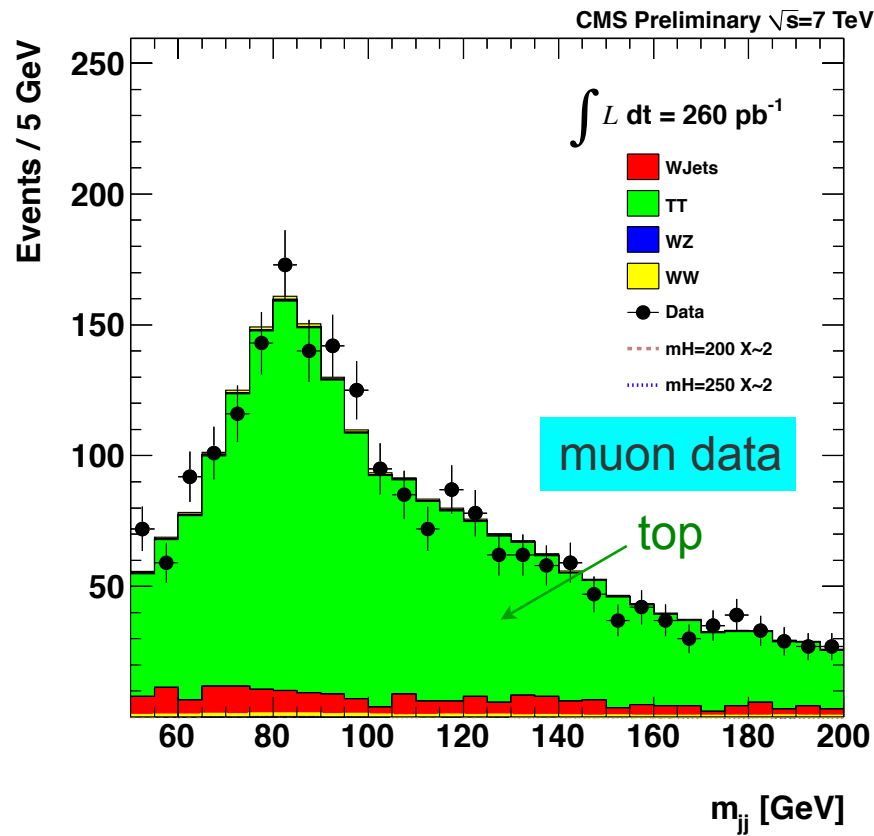
## Quick summary from analyzing 250 pb<sup>-1</sup> data

- ▶ Mu data: 38 pb pb<sup>-1</sup> (from 2010) + 221 pb<sup>-1</sup> (from 2011 A) = 260 pb<sup>-1</sup>
- ▶ Ele data: 36 pb pb<sup>-1</sup> (from 2010) + 191 pb<sup>-1</sup> (from 2011 A) = 225 pb<sup>-1</sup>
- ▶ Jets reconstructed after removal of **charge hadron from PU**
- ▶ PU energy subtracted using **L1FastJet correction**
- ▶ Lepton **isolation** also corrected using L1FastJet correction

# Hadronic W in top events: our starting point



In top events reconstruct clear W peak almost “out-of-box” with good resolution

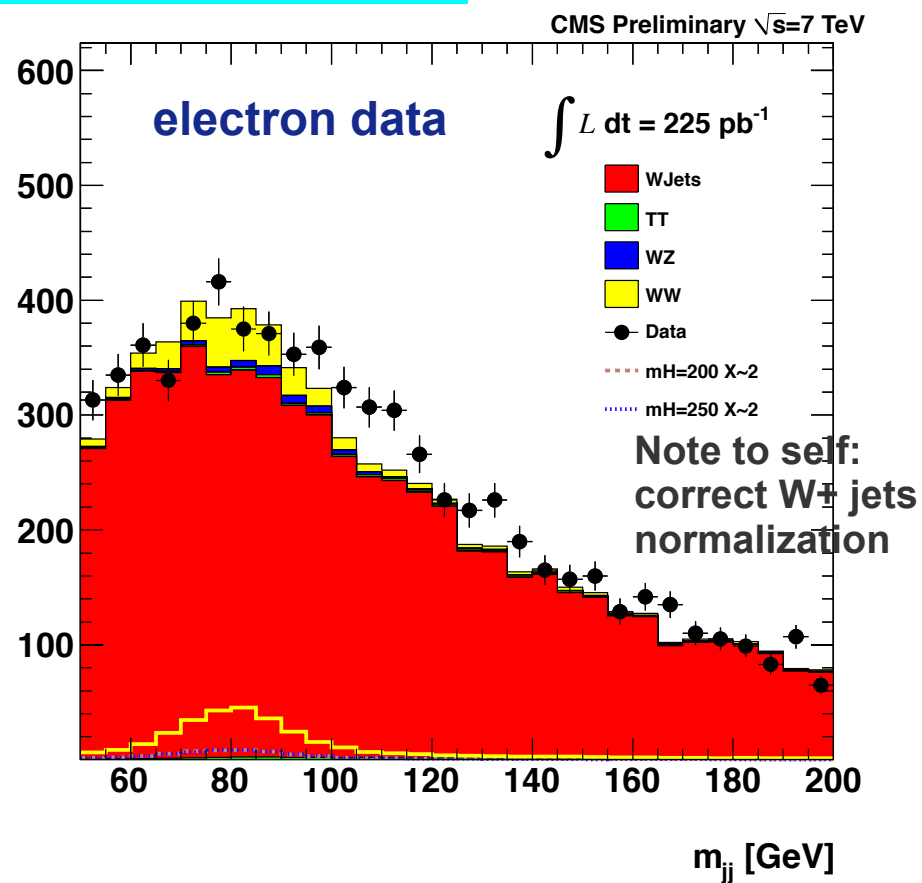
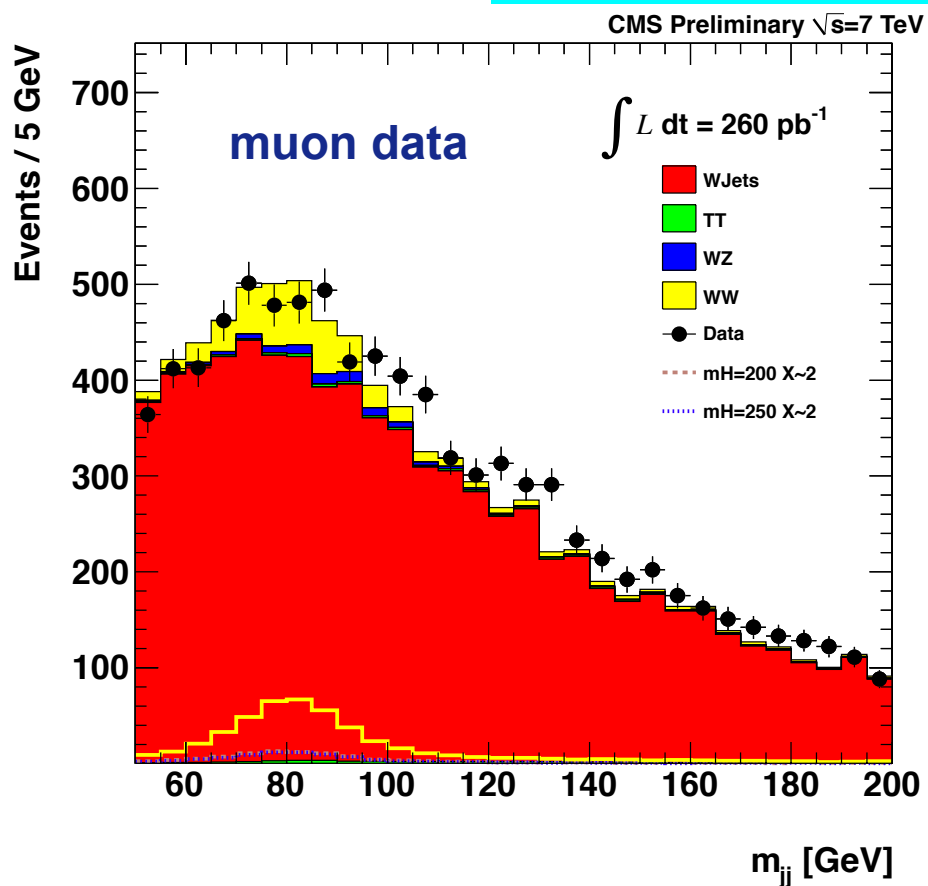


Just require  $\geq 4$  jets above  $p_T$  25 GeV, 2 b-tags and leptonic W (muon:  $p_T > 25$  GeV, electron:  $E_T > 30$  GeV,  $MET > 20$  GeV). Plot  $m_{jj}$  of the two jets which are not b-tagged. Keep all combinations.

# Di-jet mass in W+jj events: W/Z peak



Just a single cut:  $|\Delta\phi(W, W) - \pi| < 0.3$

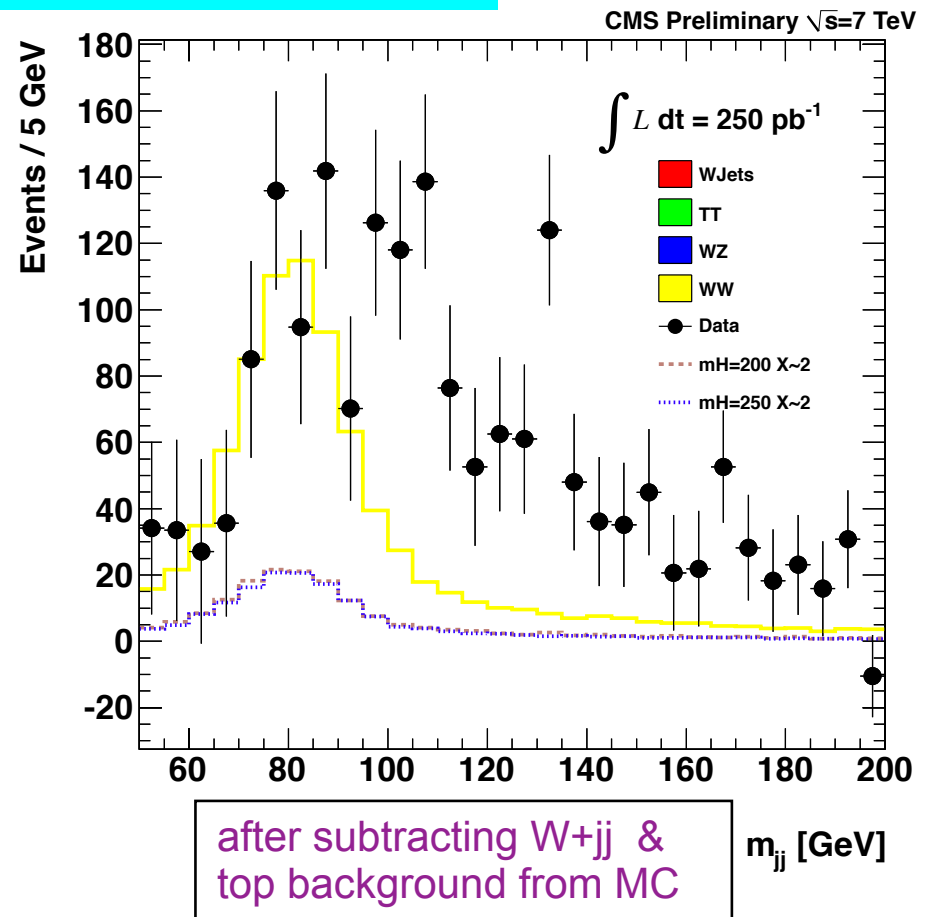
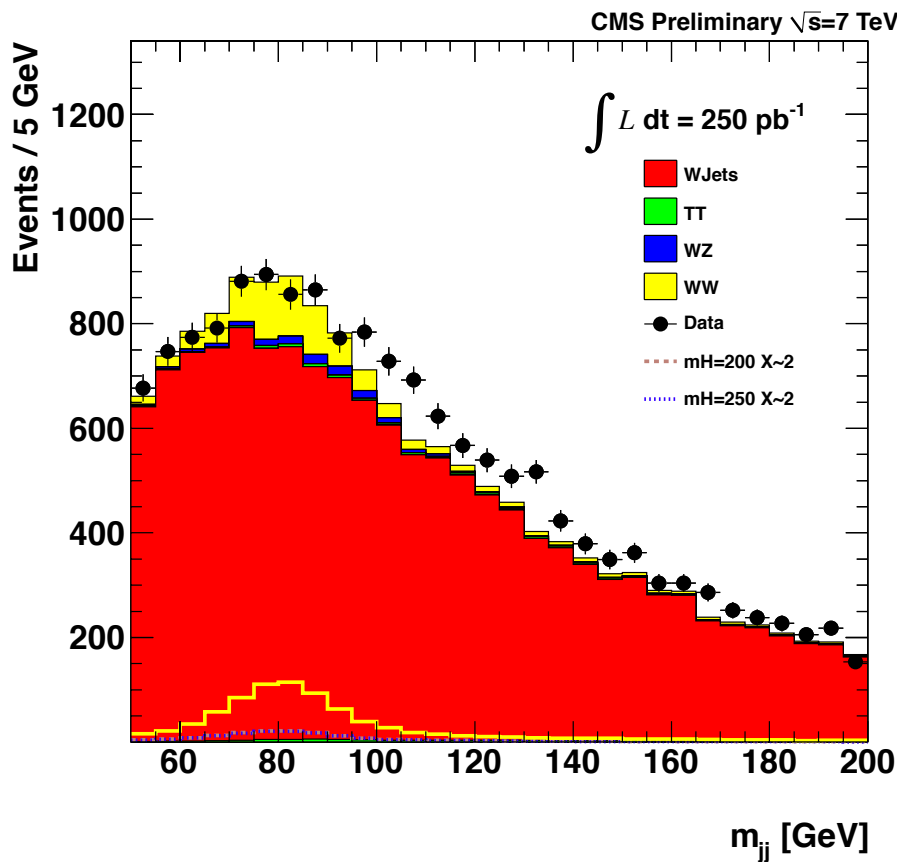


W+jets normalization *ad hoc*, will have template fit a few slides later

# Di-jet mass in W+jj events: e, $\mu$ combined

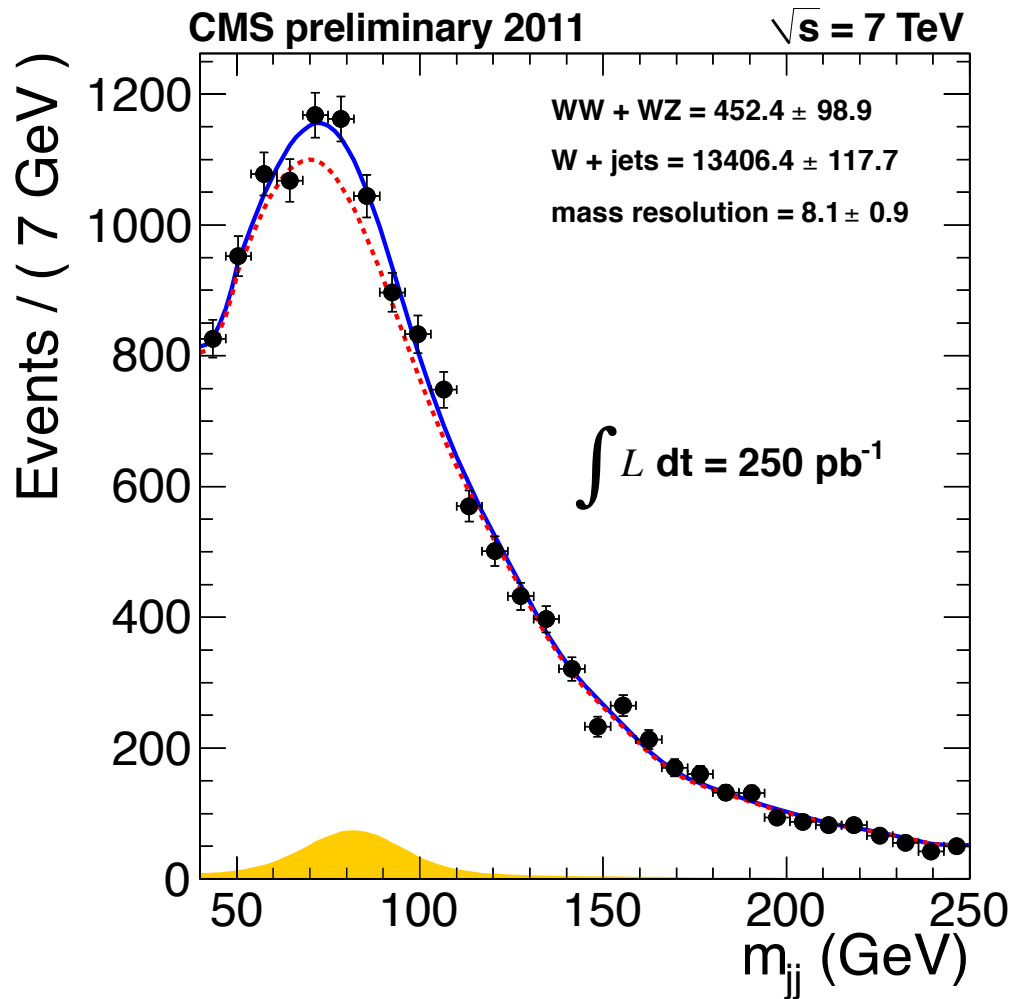


Just a single cut:  $|\Delta\phi(W, W) - \pi| < 0.3$



Clearly, the resolution is somewhat worse in data. But there seem to be more events in data than NLO prediction for WW+WZ. Similar to 2010 data.

# Di-jet mass in W+jj events: **template fit**



(e,μ data combined)

Shape derived from MC.  
Fit for the normalization.

The di-boson yield scales well from what we had in 2010 data. In  $36 \text{ pb}^{-1}$  we had  $\sim 80\text{--}90$  di-boson events.

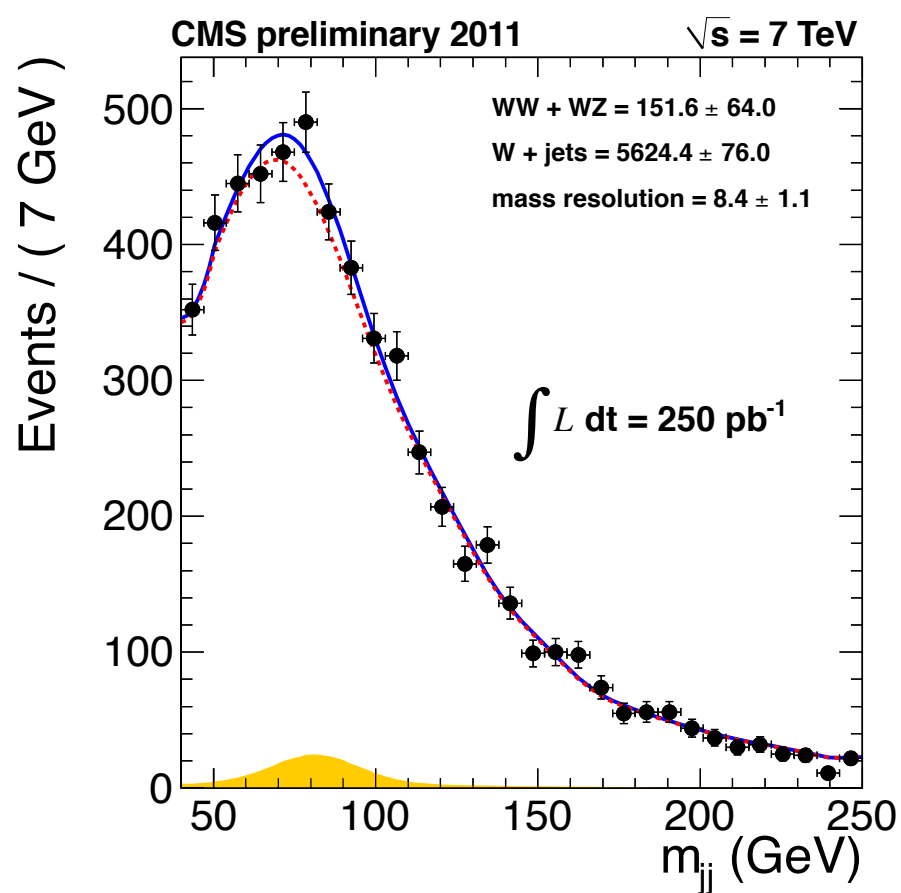
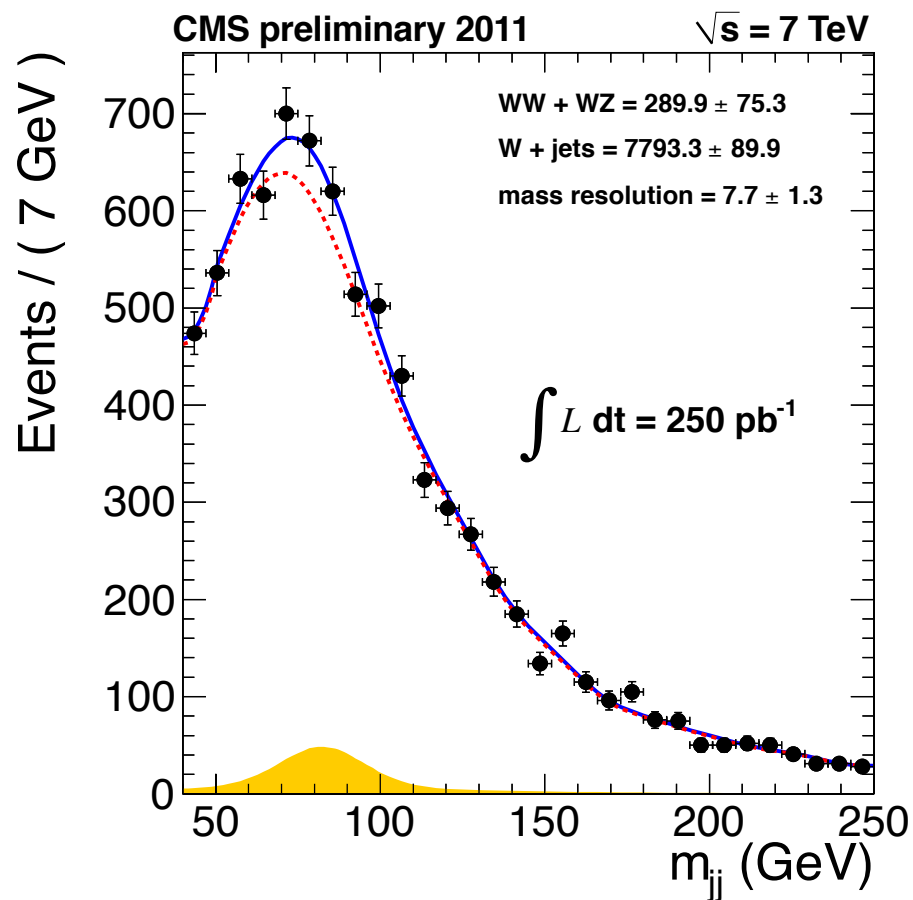
on the next slide: separate template fits for μ and ele data

# Di-jet mass in W+jj events: **template fit**



**muon data**

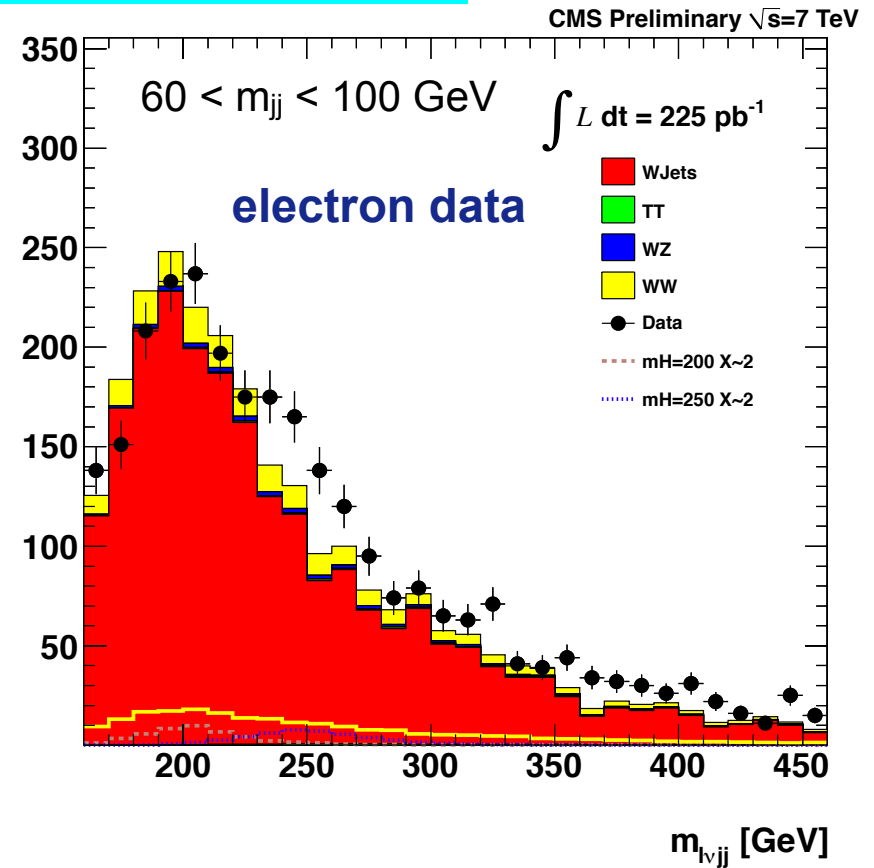
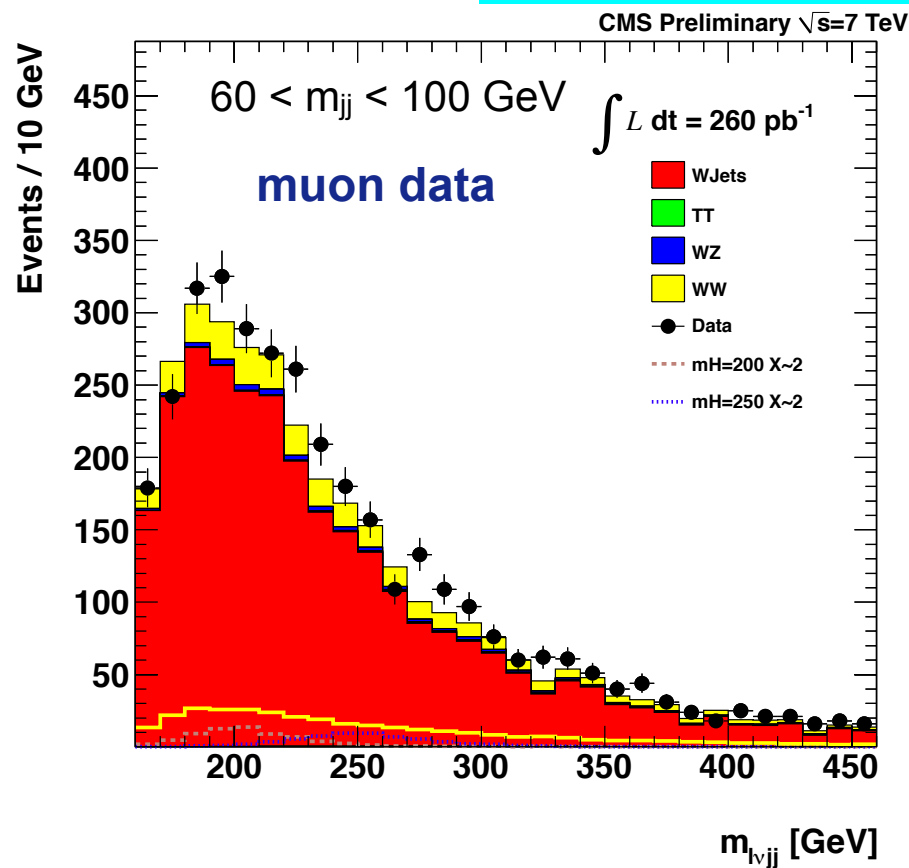
**electron data**



# 4-body invariant mass in W+jj events: $m_{l\nu jj}$



Just a single cut:  $|\Delta\phi(W, W) - \pi| < 0.3$

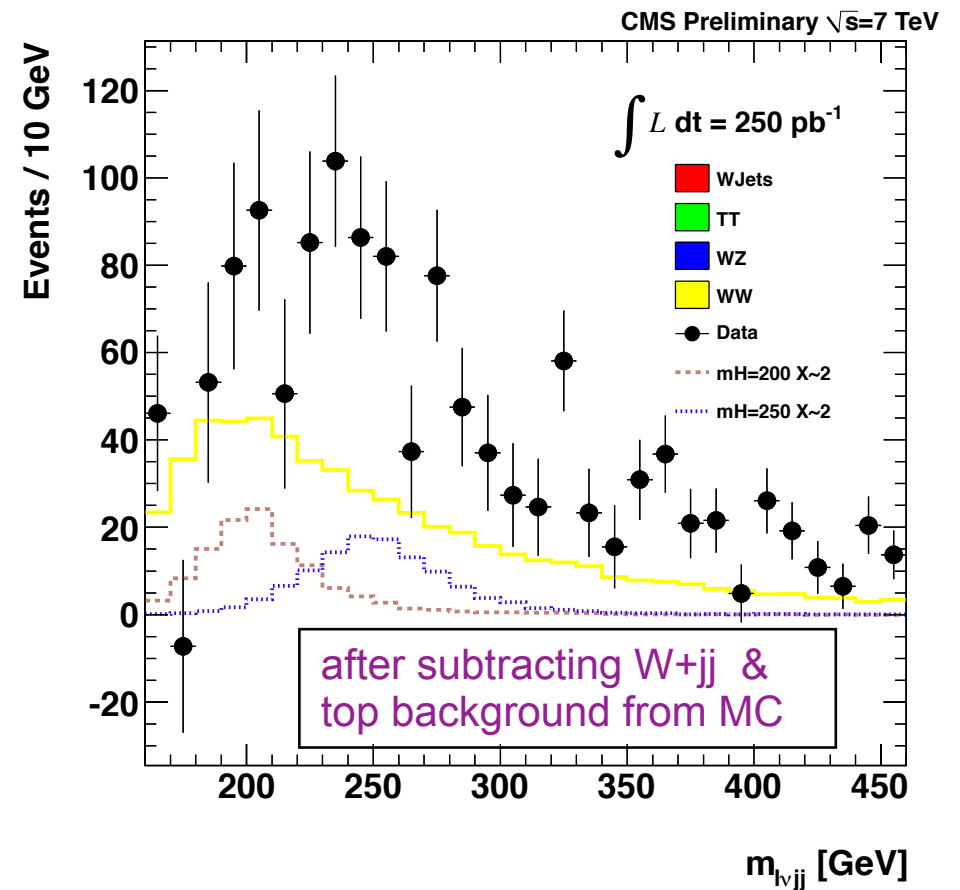
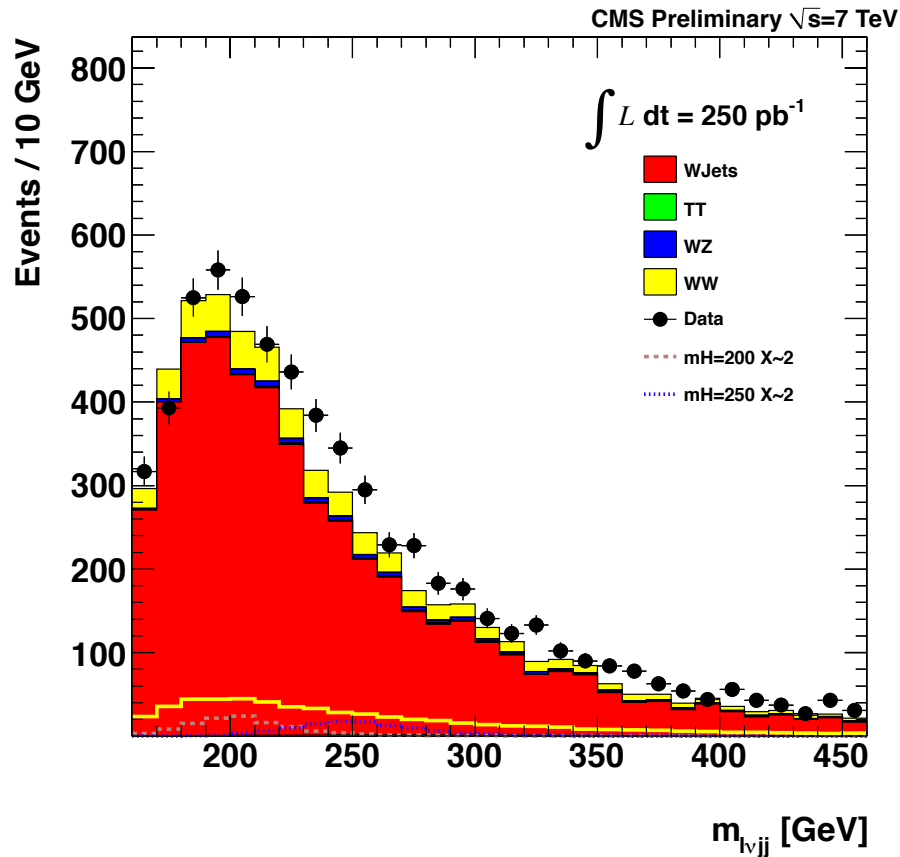


One obvious problem: we do not have large enough W+jets MC. Large fluctuation on the tail, possible mis-modeling near kinematic threshold.

# 4-body invariant mass: $e, \mu$ combined



Just a single cut:  $|\Delta\phi(W, W) - \pi| < 0.3$



Hard to model the excess, therefore trying various improvements to template fit.



# Next steps (1)

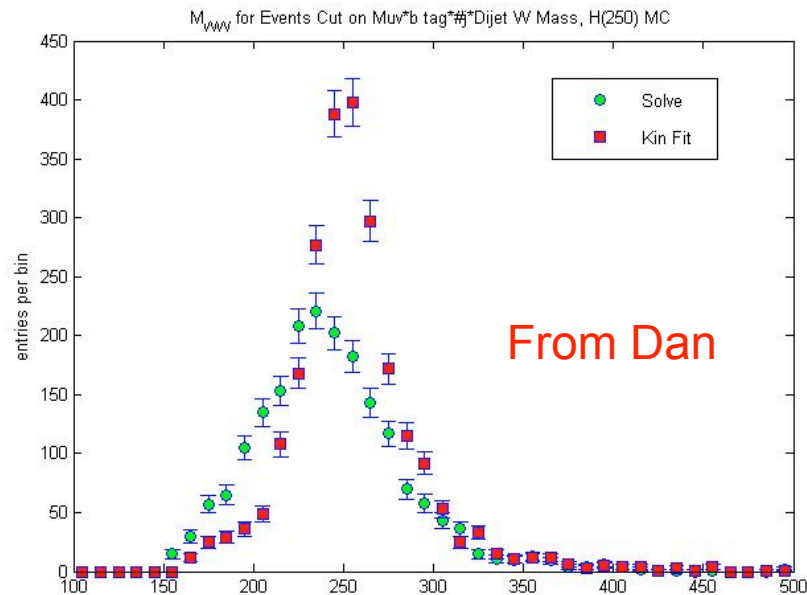


Machinery almost ready to use various Higgs mass templates and set limit in the same format as 2l2v analysis

current strategy:

- 1.) Exclude the probe region in order to perform a template fit to  $m_{lvjj}$  for W+jets and di-boson
- 2.) Once we are happy, freeze this shape and fit including more components (i.e., various Higgs masses)
- 3.) Set limit or significance

Need to use kinematic fit



## Next steps (2)



- ◆ Working on data-driven shape for  $W$ +jets & QCD backgrounds: by (a) relaxing the selection criteria, (b) using anti-selection. We will try both: one method will cross check the other.
- ◆ Also working on the usability of top events in data for extracting  $W \rightarrow jj$  shape (after applying suitable resolution smearing etc).
- ◆ Pratima and Andre have been ramping up in the effort.
- ◆ Alexx Perloff has been working very closely with me: trying to understand the flavor correction effect in jets, optimizing cuts, feasibility of using color-correlation in  $W \rightarrow jj$  etc.