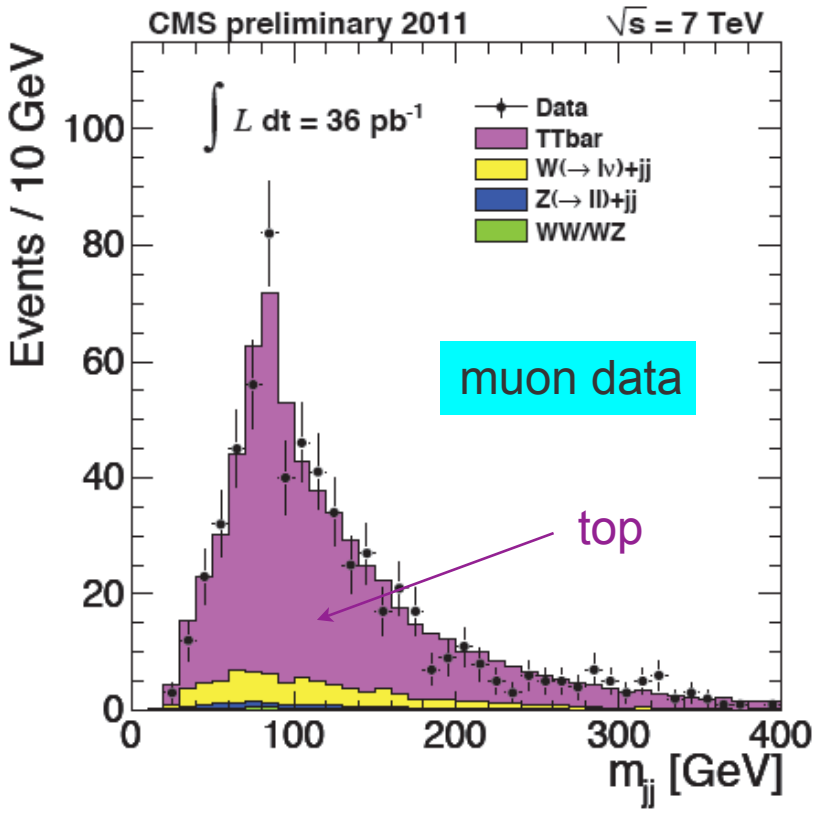
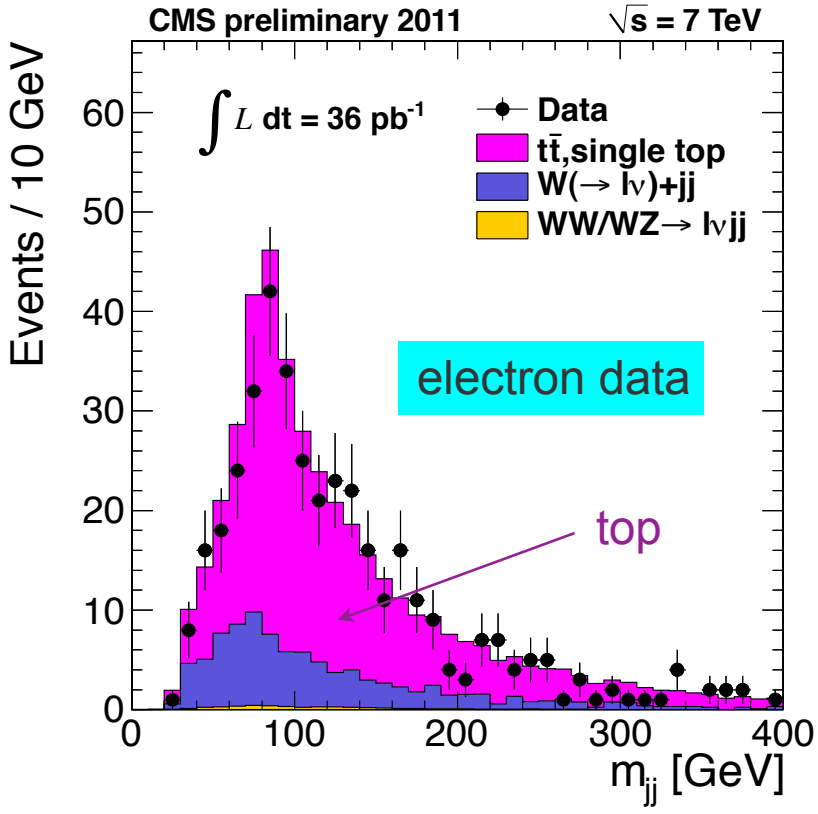
A quick summary of where we are

Hadronic W in top events ? 2010 data

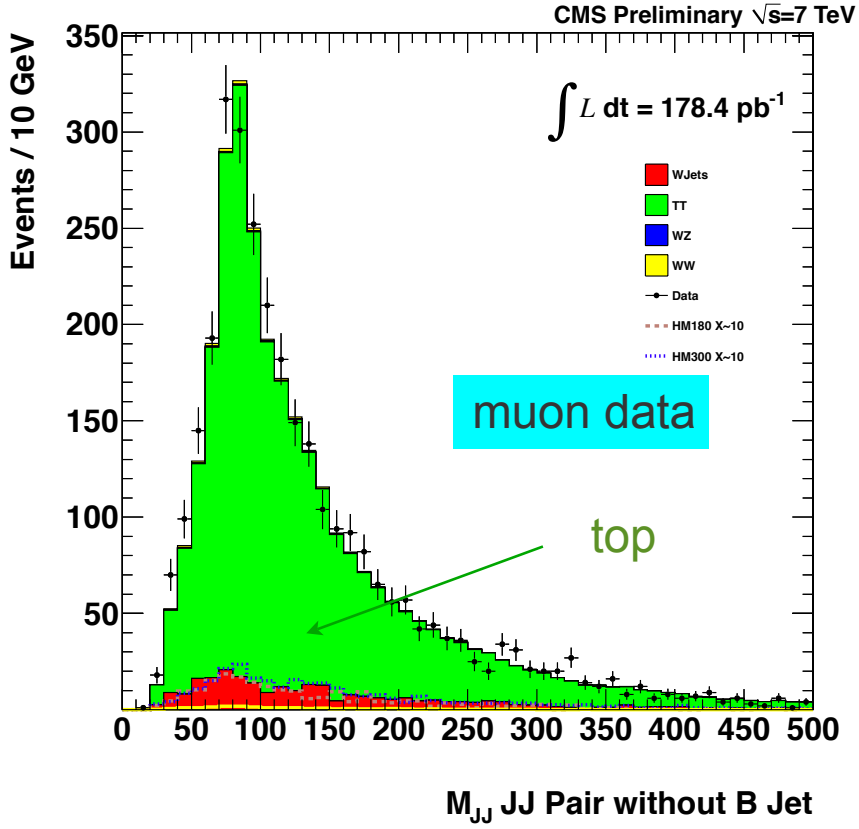
In top events reconstruct clear W peak almost “out-of-box” with good resolution

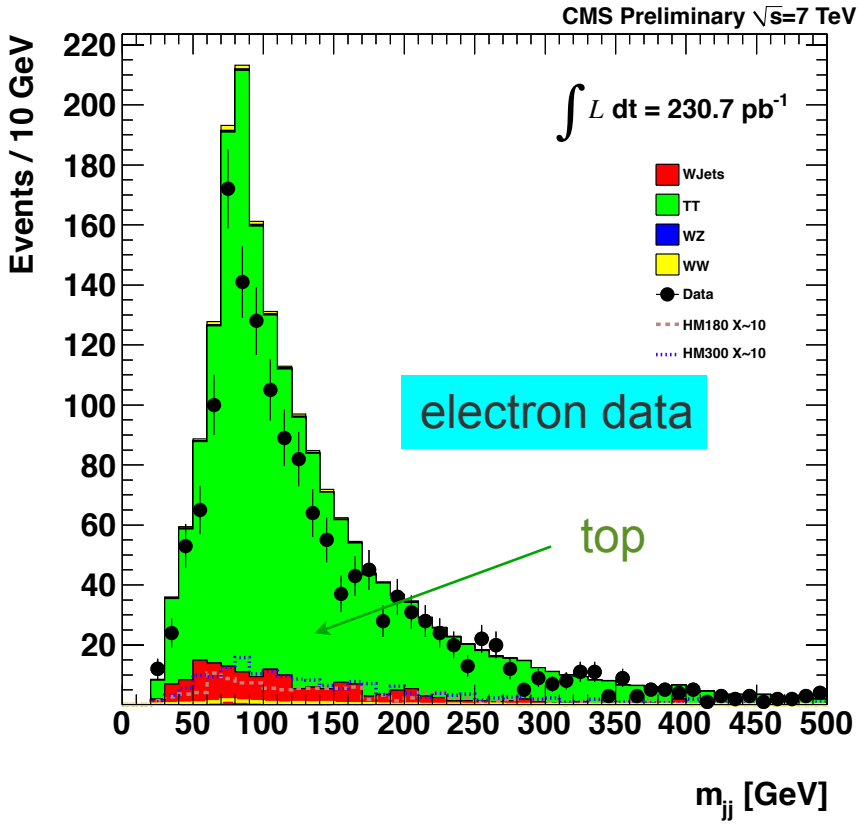




Just require ≥4 jets above p_T 25 GeV, ≥1 b tag and leptonic W (muon: p_T>20 GeV, MET>20 GeV; electron: E_T>25 GeV, MET>25 GeV). Then plot m_{jj} of the two jets which are not b-tagged. Keep all combinations.

Hadronic W in top events: 2011 data

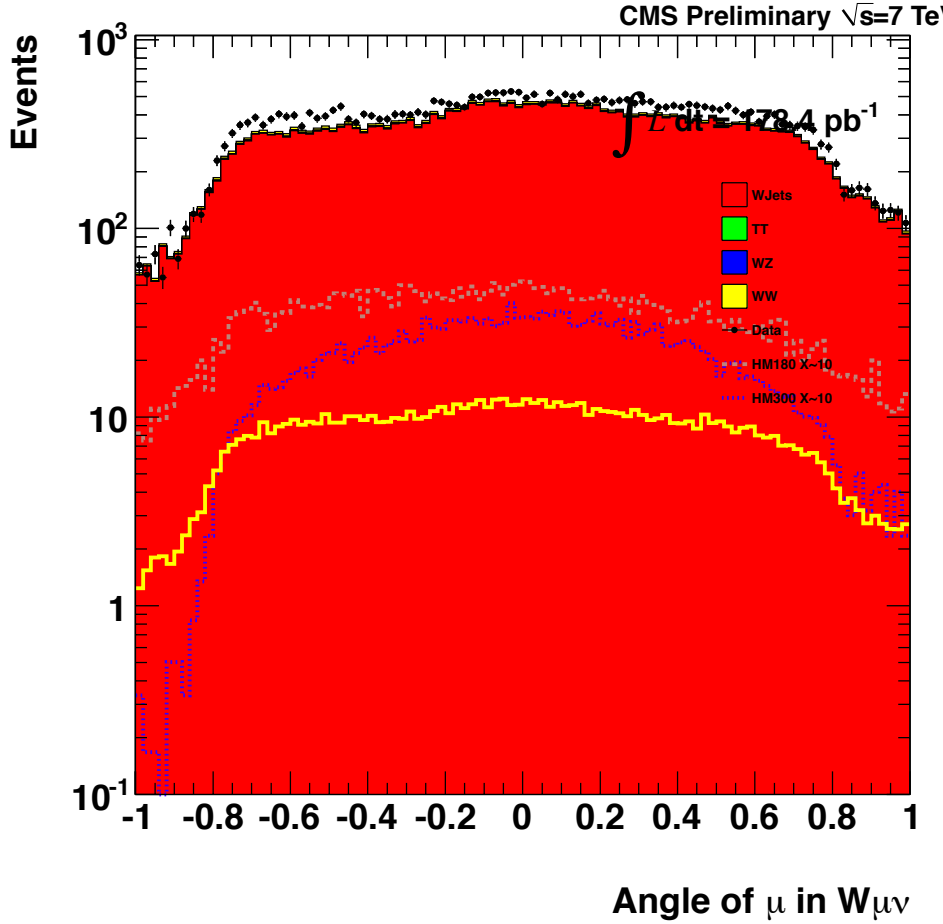




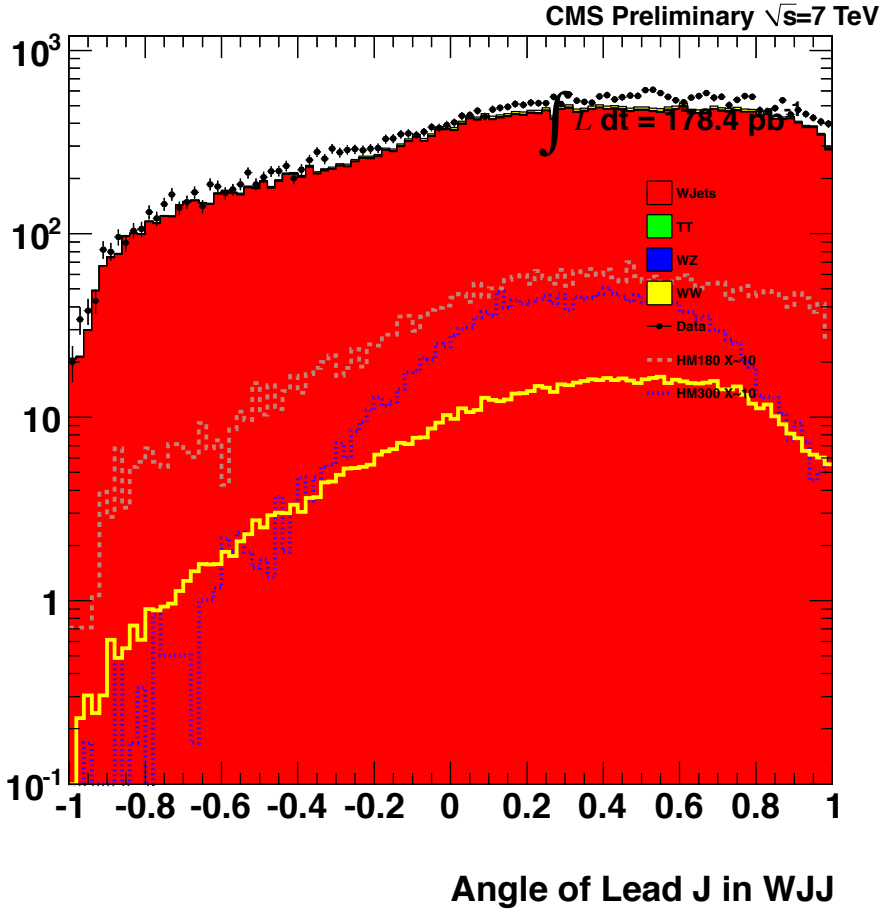
- Efficiency in data is smaller than in MC which makes MC normalization higher
- Had to scale up JEC by 10% for electron for now, muon data needs smaller correction

Plots from μ data: the two Jackson angles

W→jj

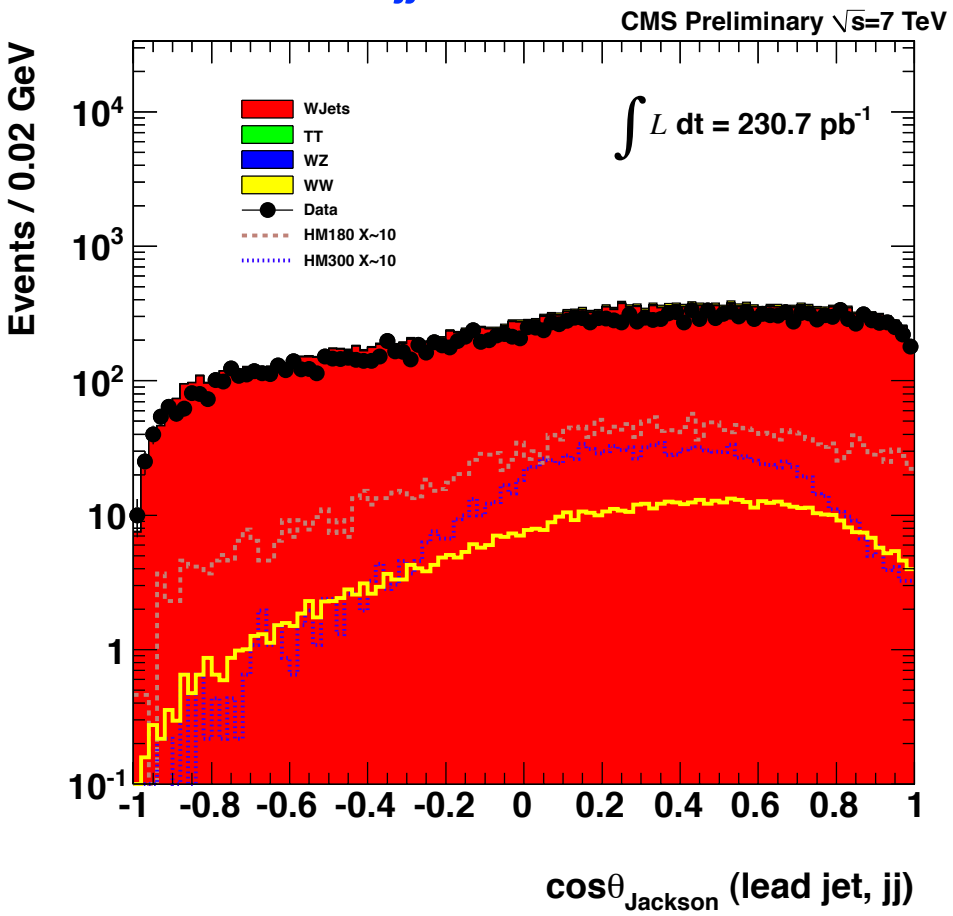


W→lν

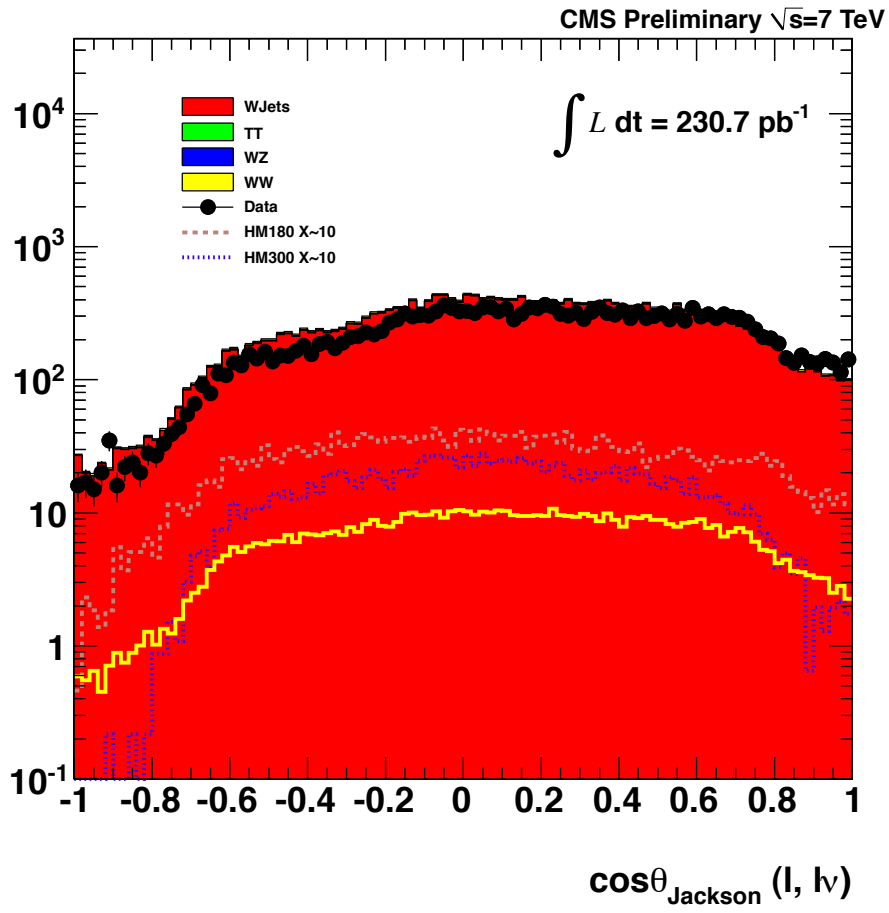


Plots from e data: the two Jackson angles

W→jj



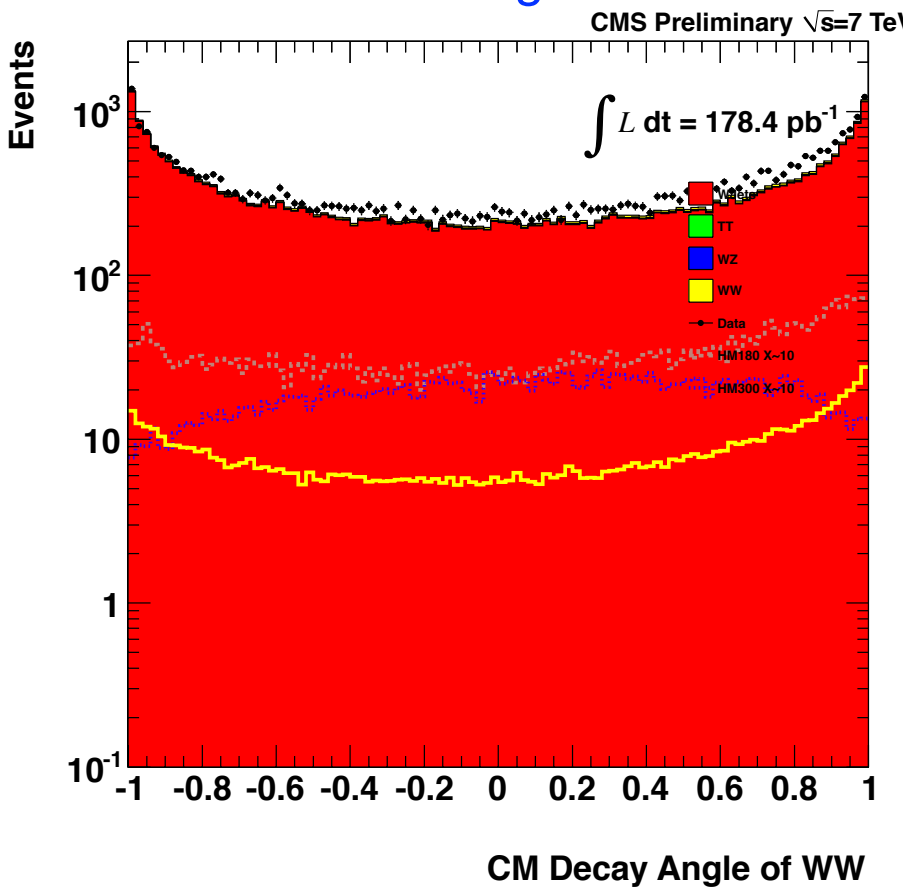
W→lν



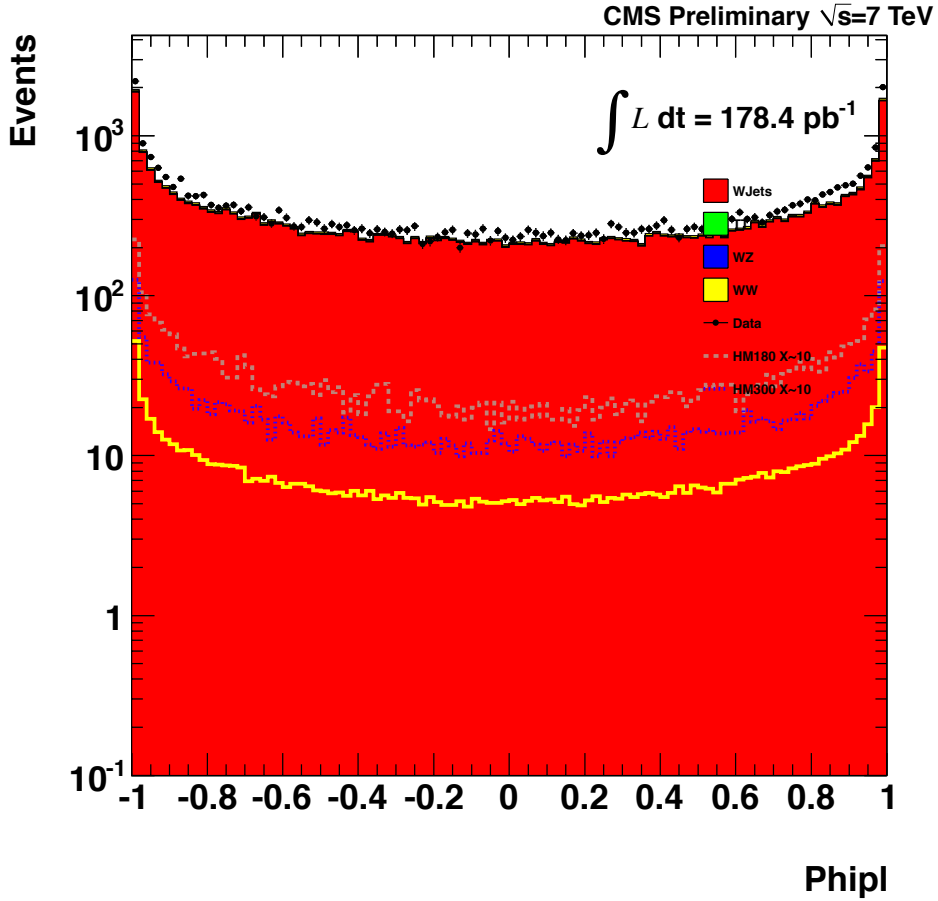
Good agreement between data and MC. Can cut: $-0.4 < \theta < 0.7$ in both.

Plots from μ data: WW kinematics - I

Jackson angle

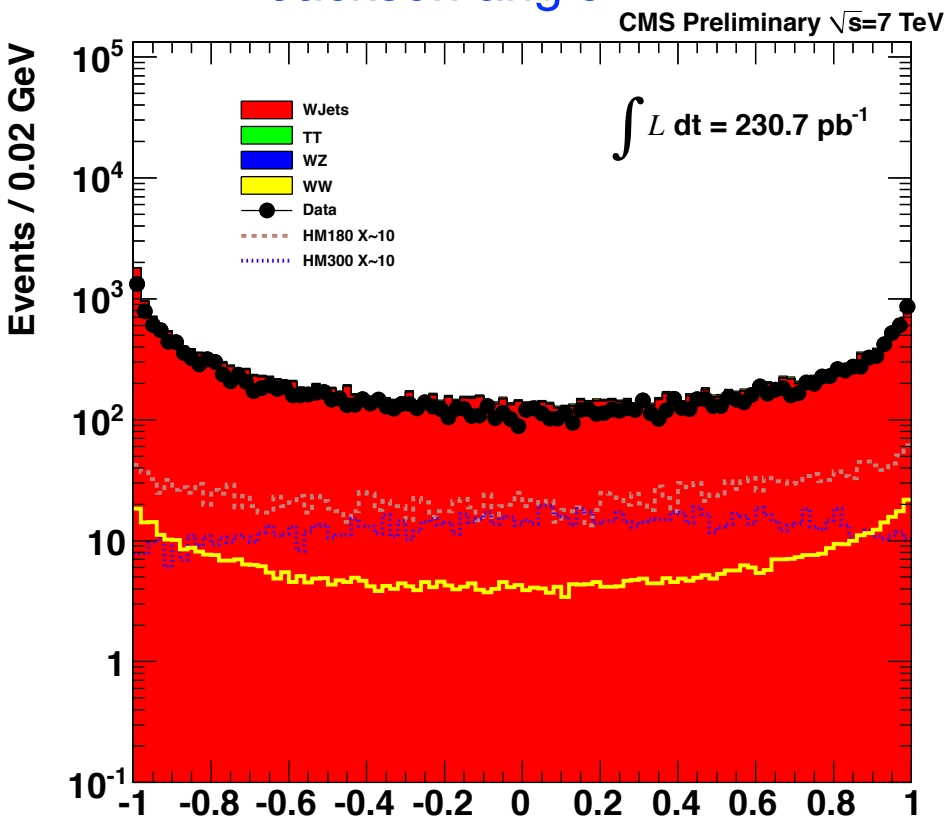


Angle between decay planes

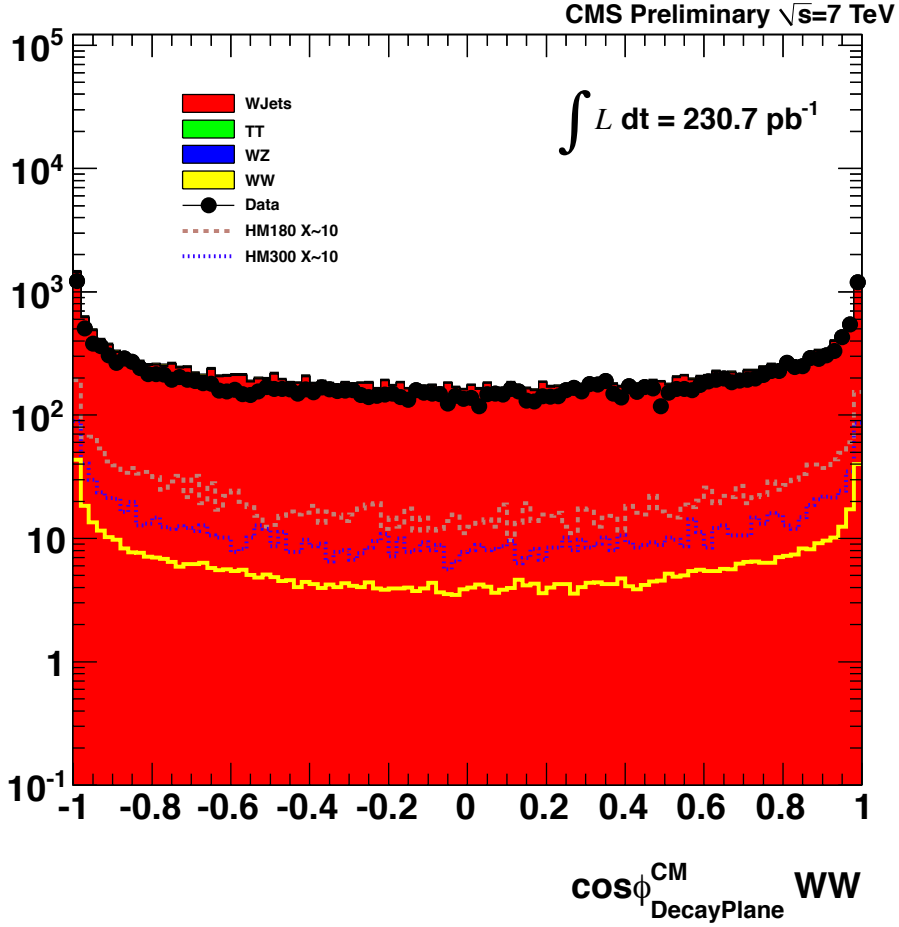


Plots from e data: WW kinematics - I

Jackson angle



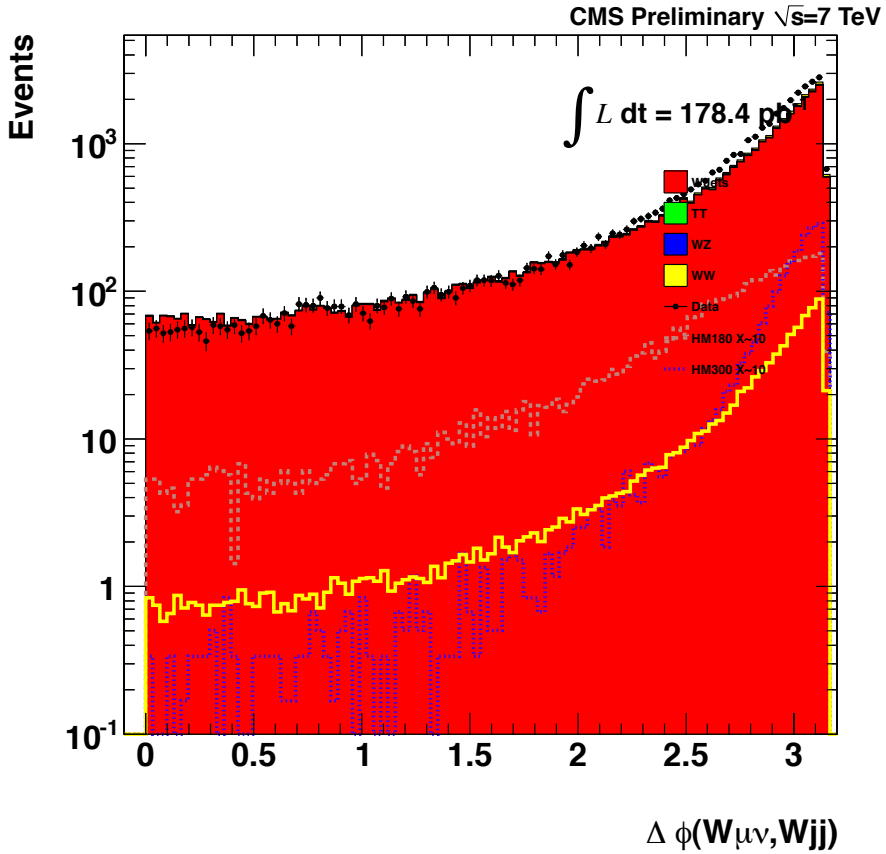
Angle between decay planes



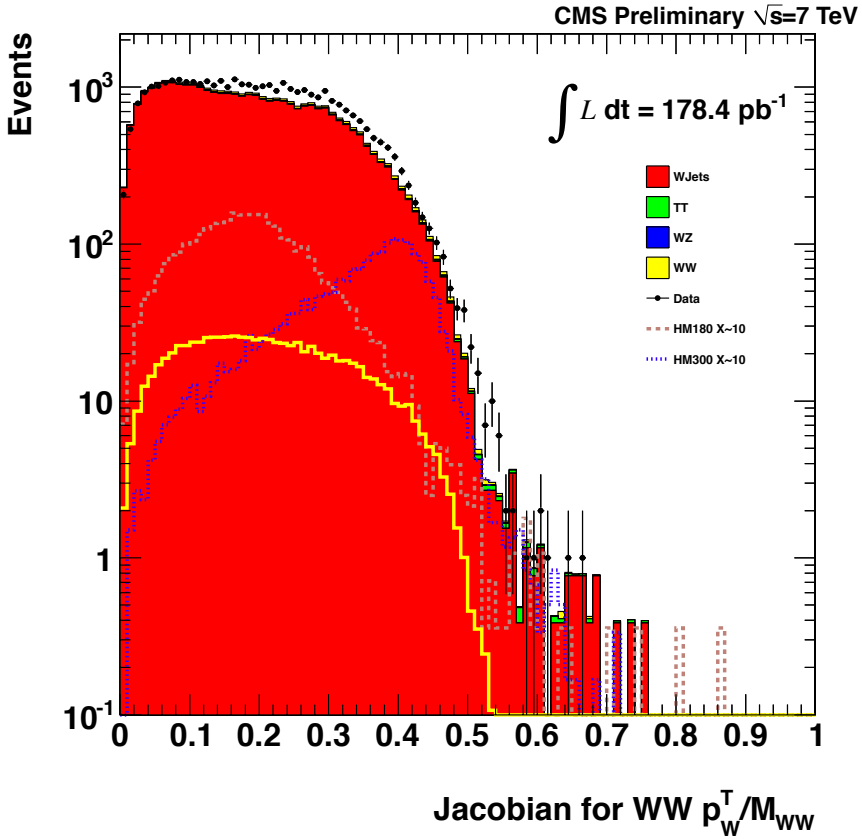
Good agreement between data and MC. But no obvious place to cut :(

Plots from μ data: WW kinematics - II

Angle between leptonic and hadronic W in the lab frame

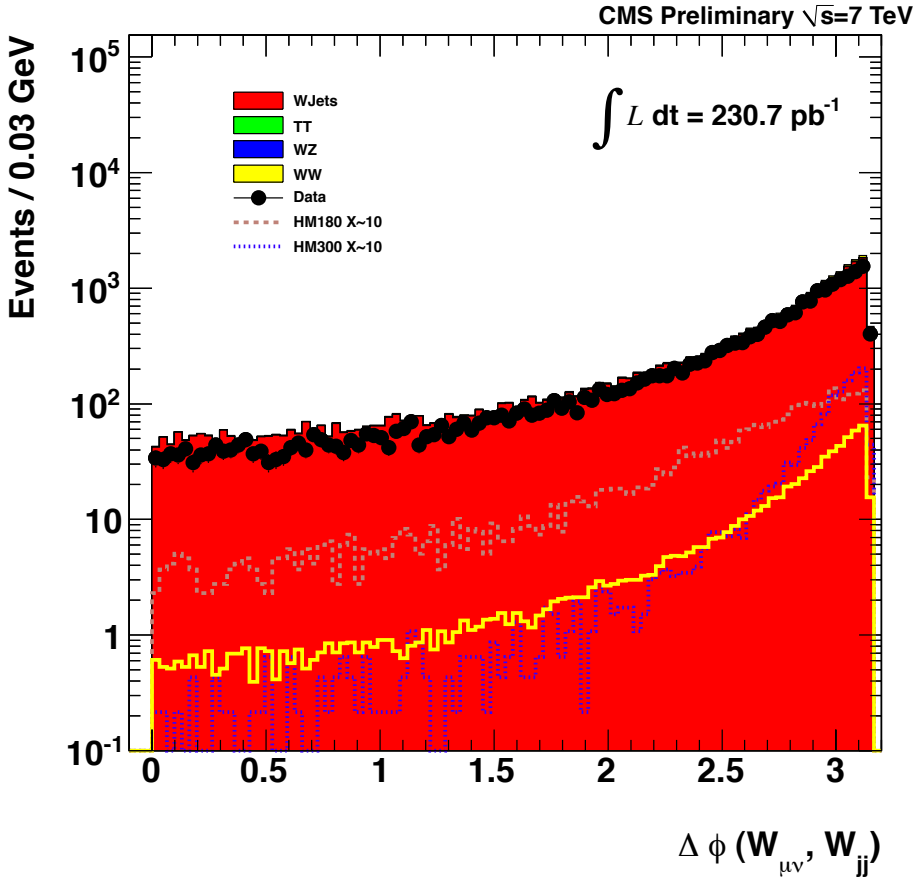


Jacobian

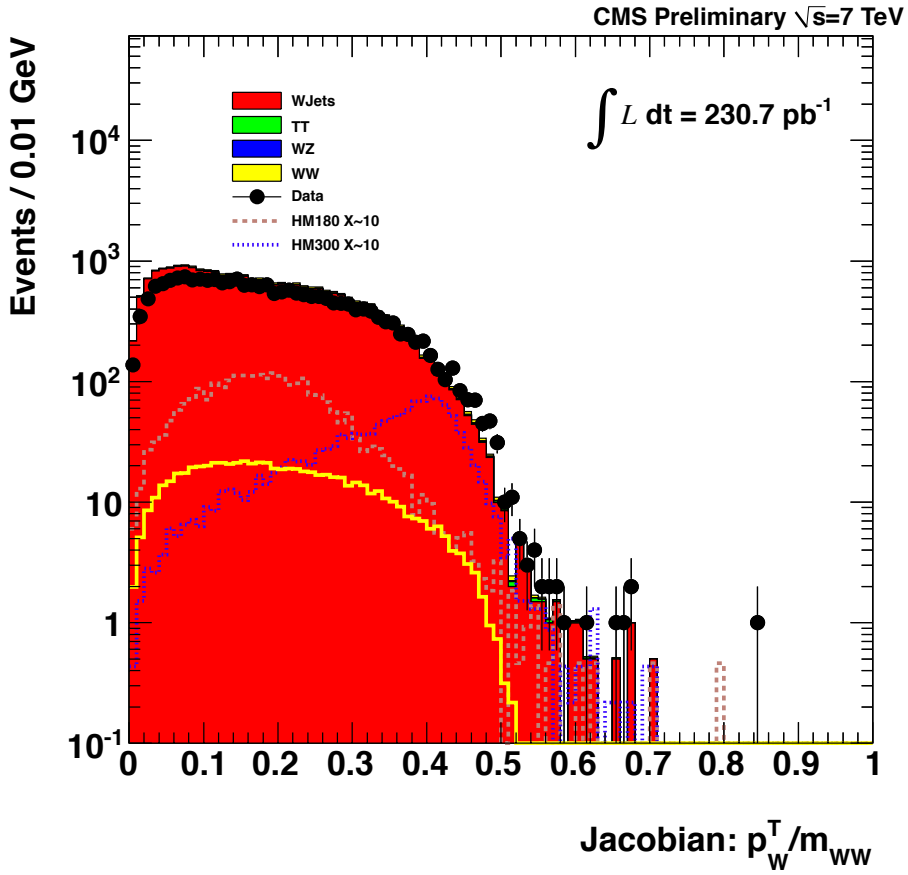


Plots from e data: WW kinematics - II

Angle between leptonic and hadronic W in the lab frame

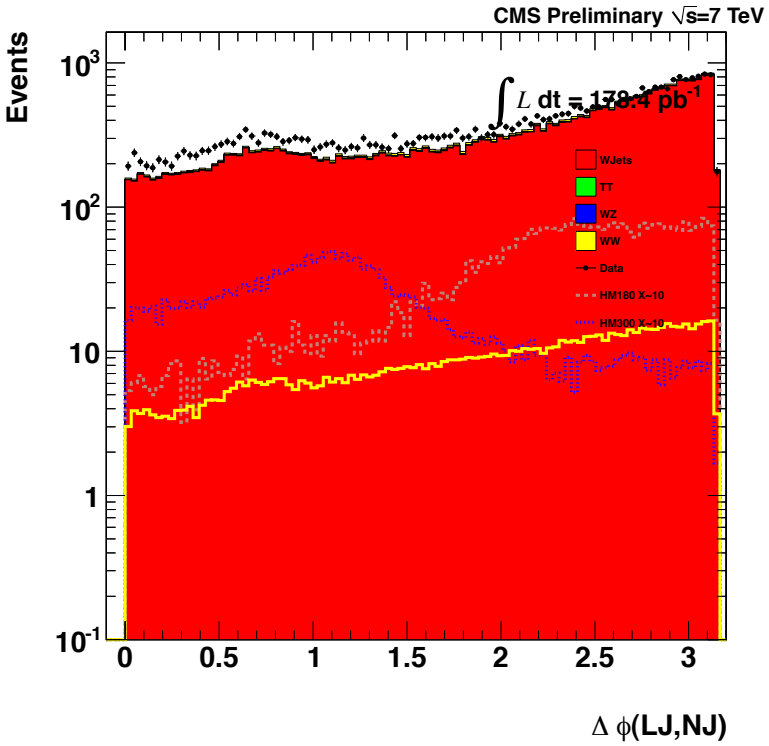


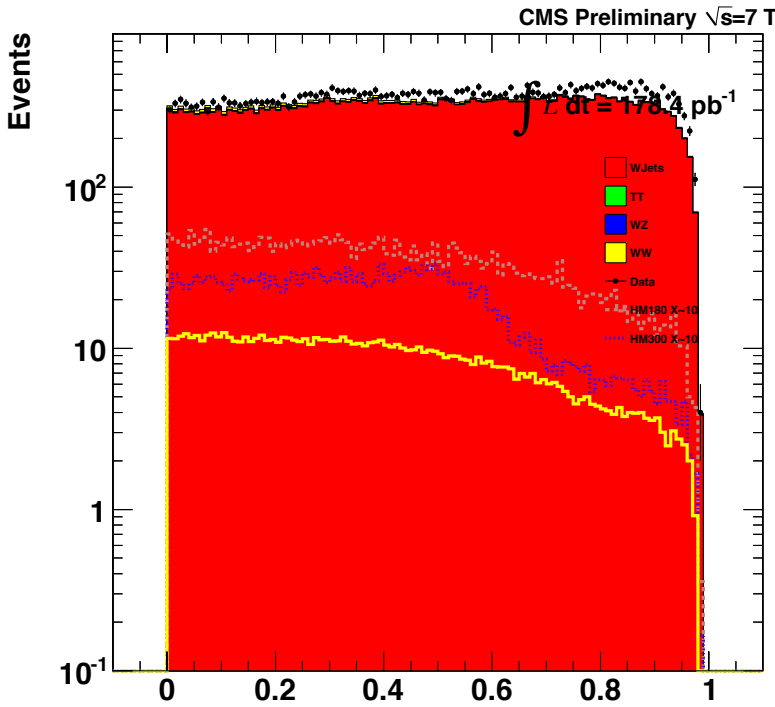
Jacobian

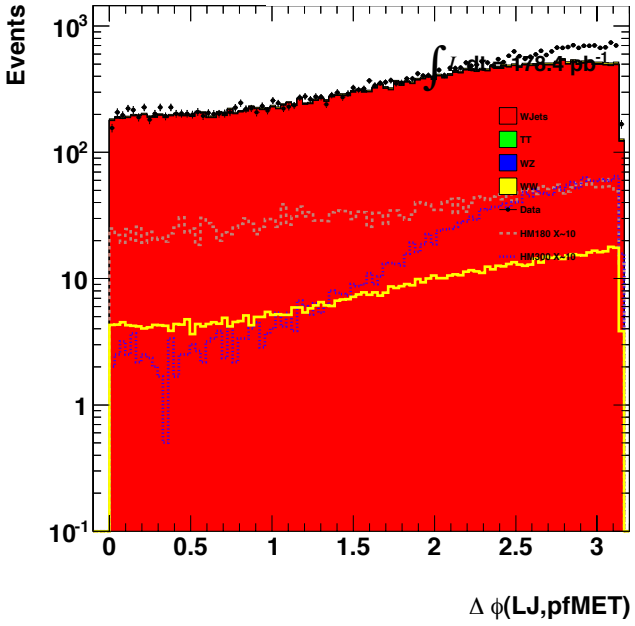


Need to cut hard on Δϕ (>2.94). Some reasonable cut on Jacobian (>0.15).

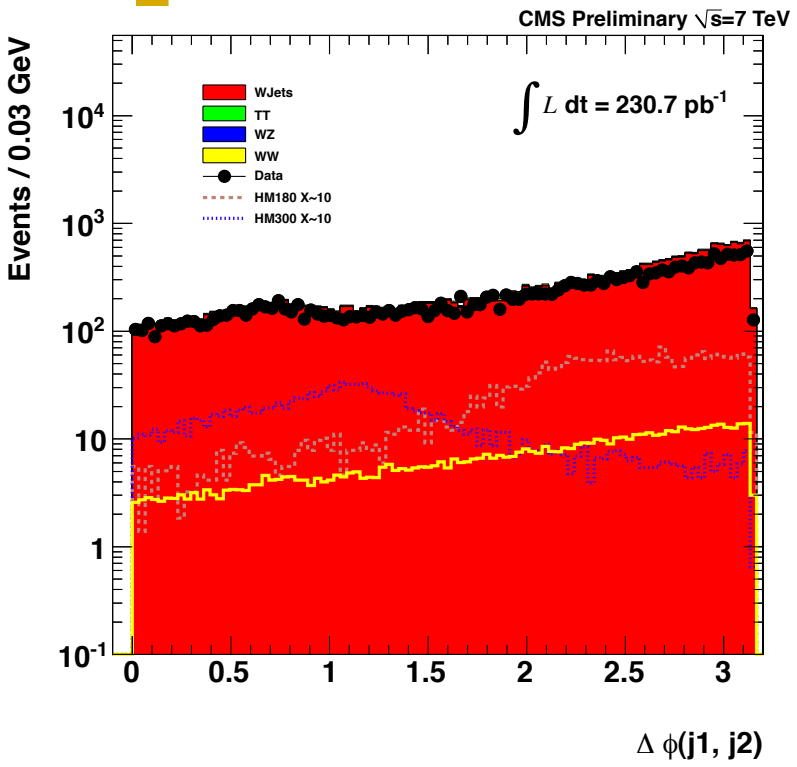
μ data: Space separation

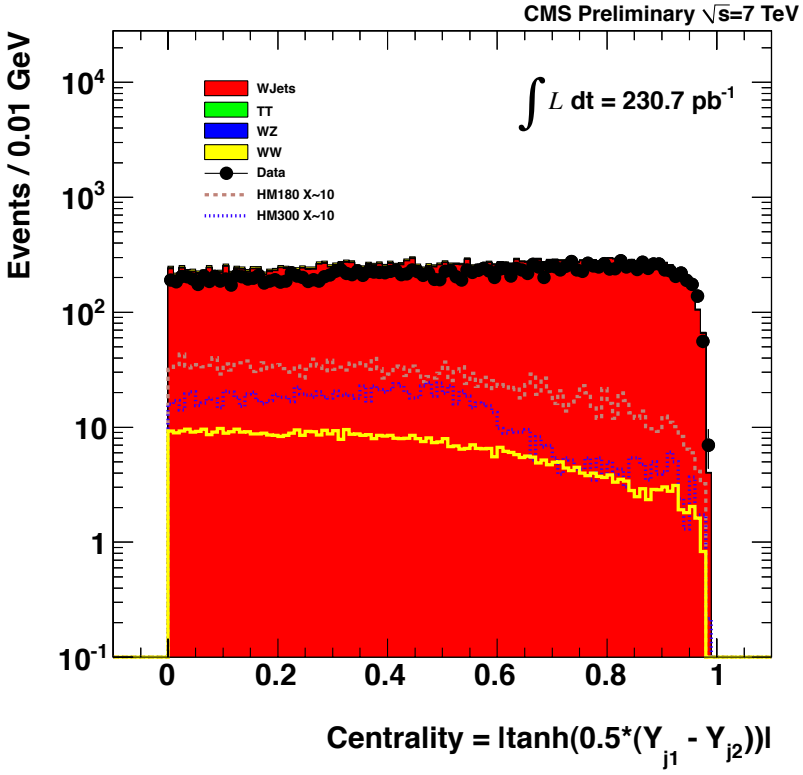


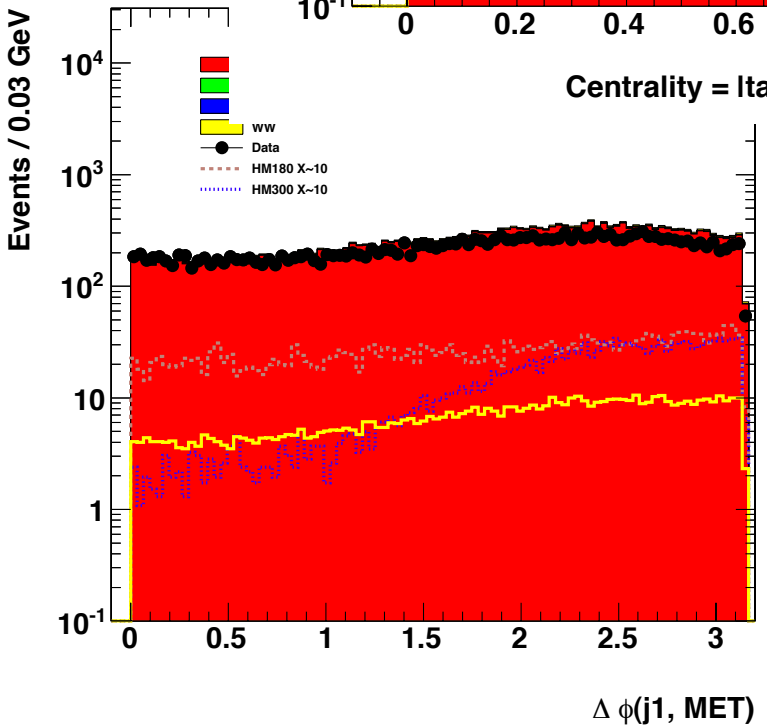




e data: Space separation

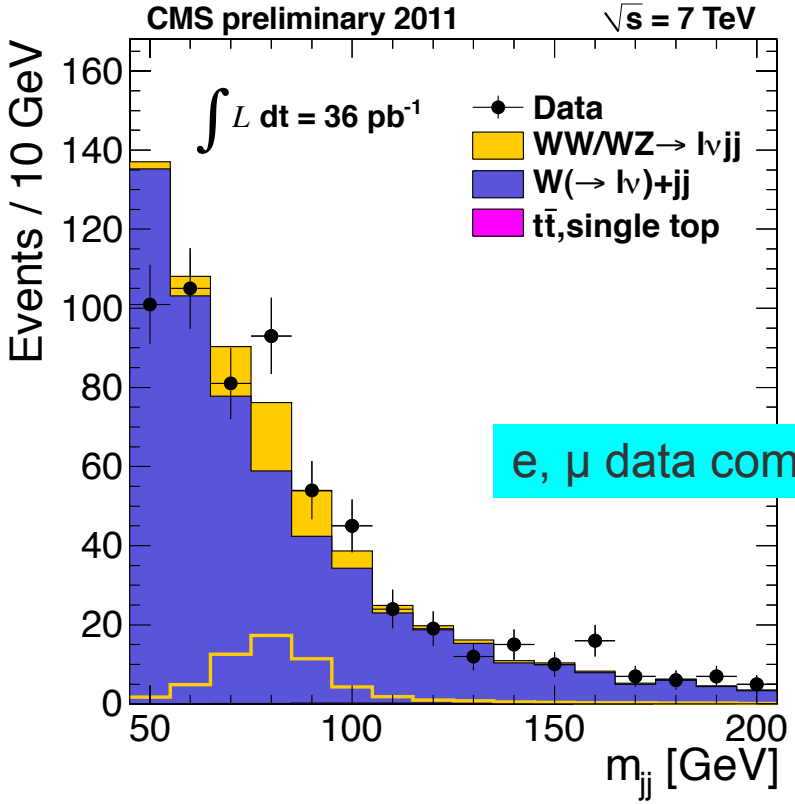




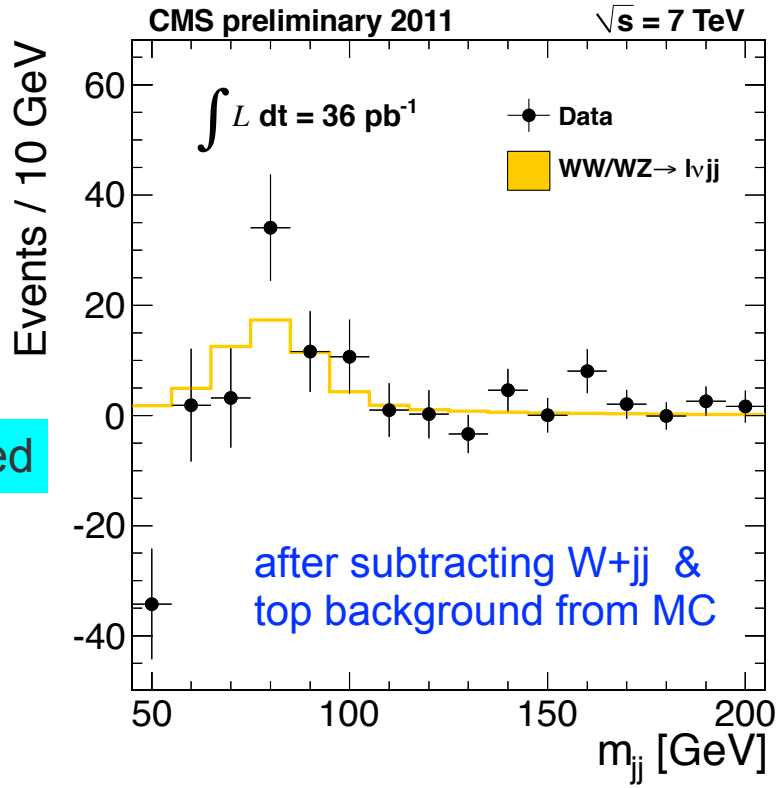


Centrality cut (<0.5) can help.
Similarly a mild cut on Δϕ (j1, MET), say, > 0.5.

W/Z peak in W+jj events: 2010 data



e, μ data combined

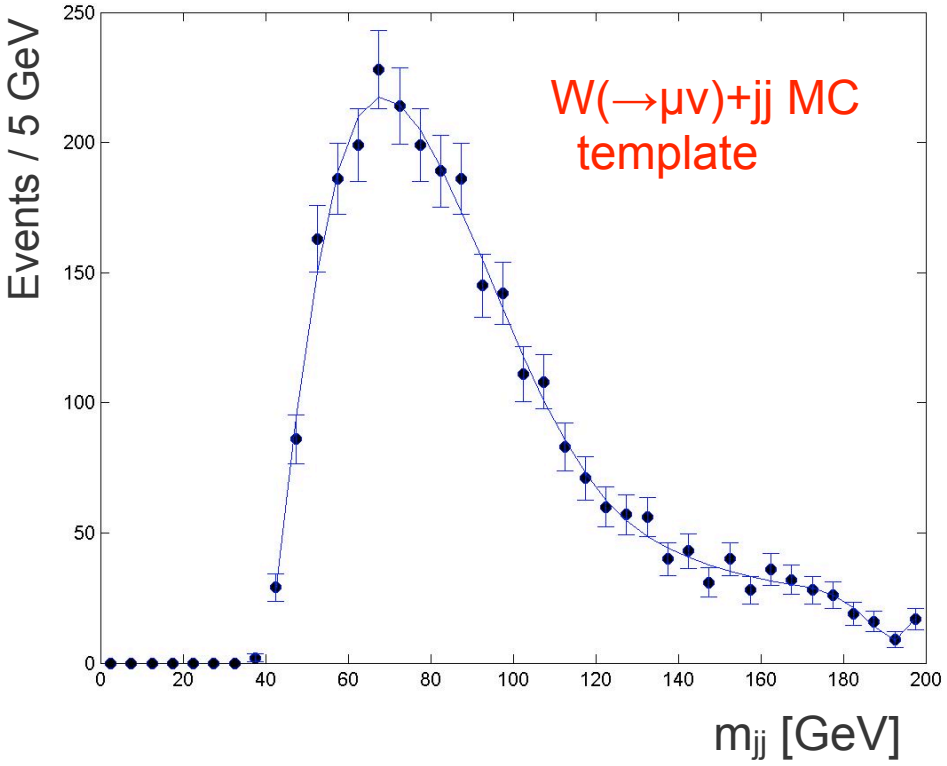


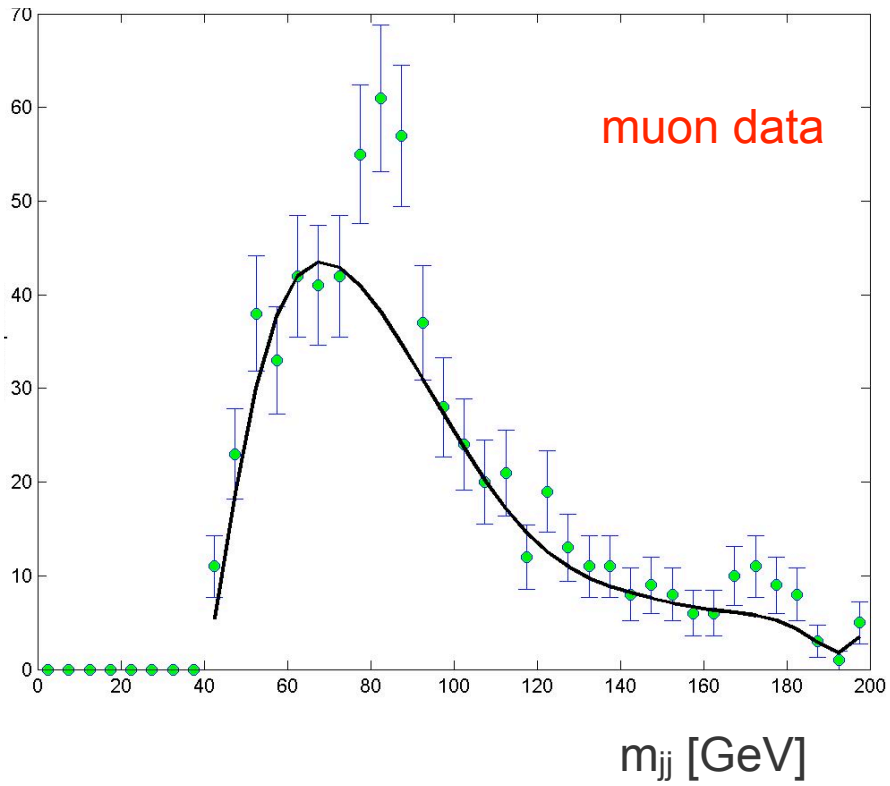
After applying top veto and few simple kinematic cuts see clear peak from hadronic W and Z. Cannot resolve between the two.

observed events in data = 600, MC predicts:
W+jj = 554, Ttbar + single top = 2, WW + WZ = 58

After some optimization Dan had better S/B

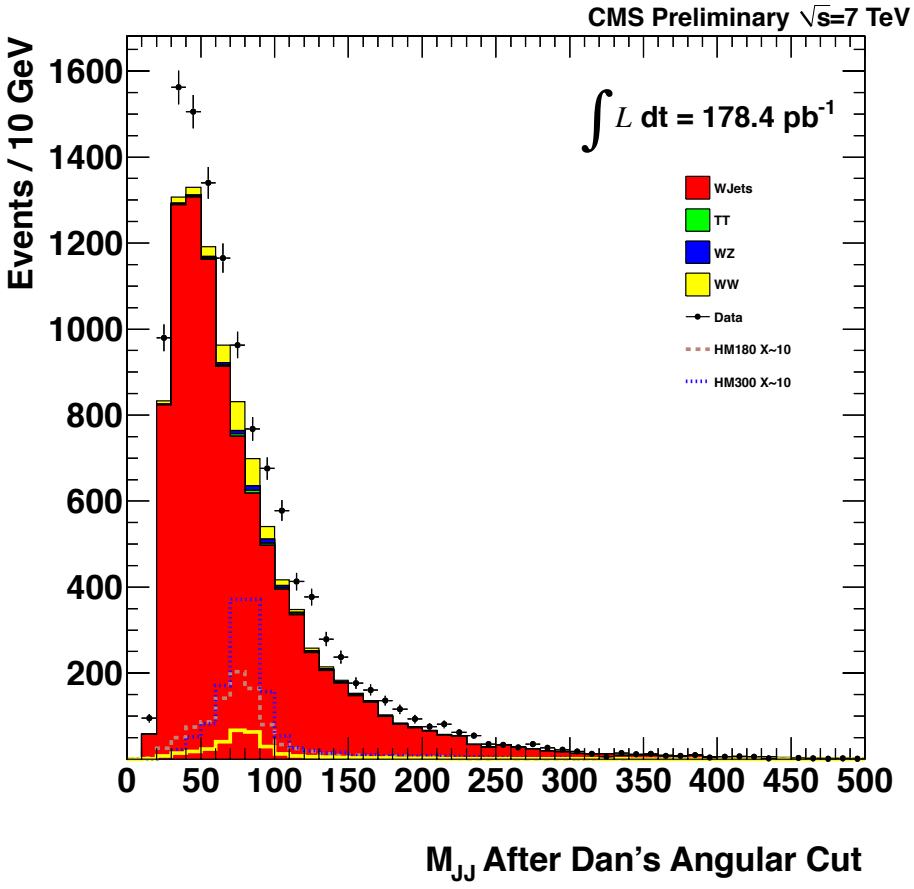
Exploit the angular variables (*e.g.*, angle between the decay planes, Jackson angle etc.) to suppress W+jets bkg.



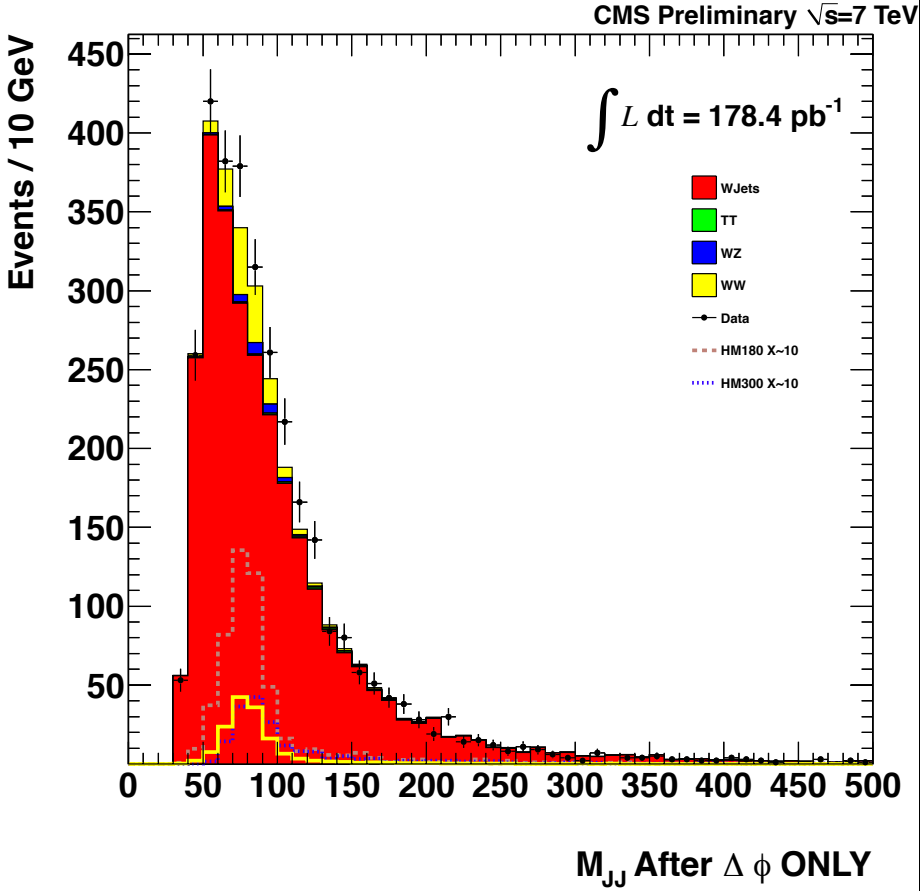


The fit after all cuts is to the Wjj MC shape. The evidence remains for a W signal in the μ data with ~ 60 ± 20 events above a smooth background.

W/Z peak in W+jj events: 2011 data: μ

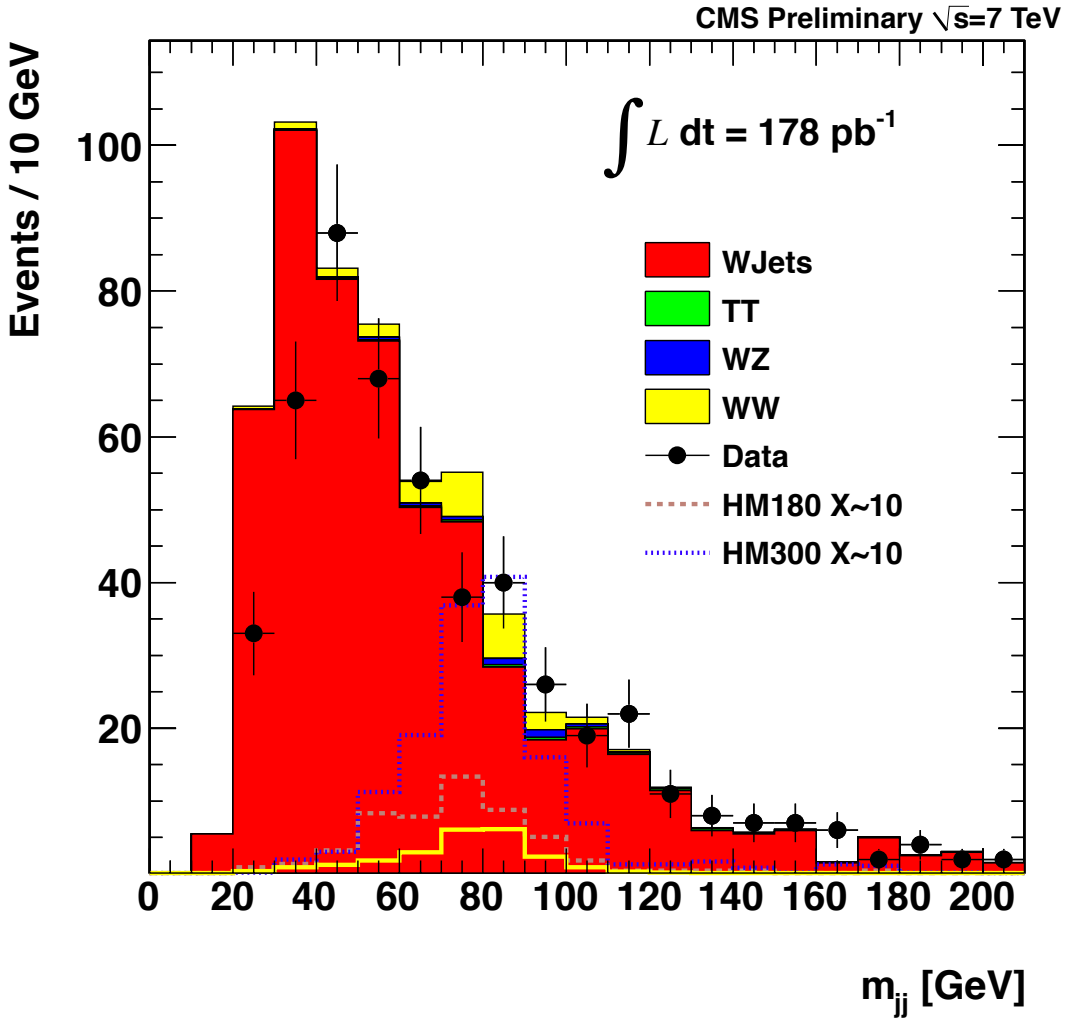


M_{JJ} After Dan's Angular Cut



M_{JJ} After $\Delta\phi$ ONLY

W/Z peak in W+jj events: 2011 data: ele

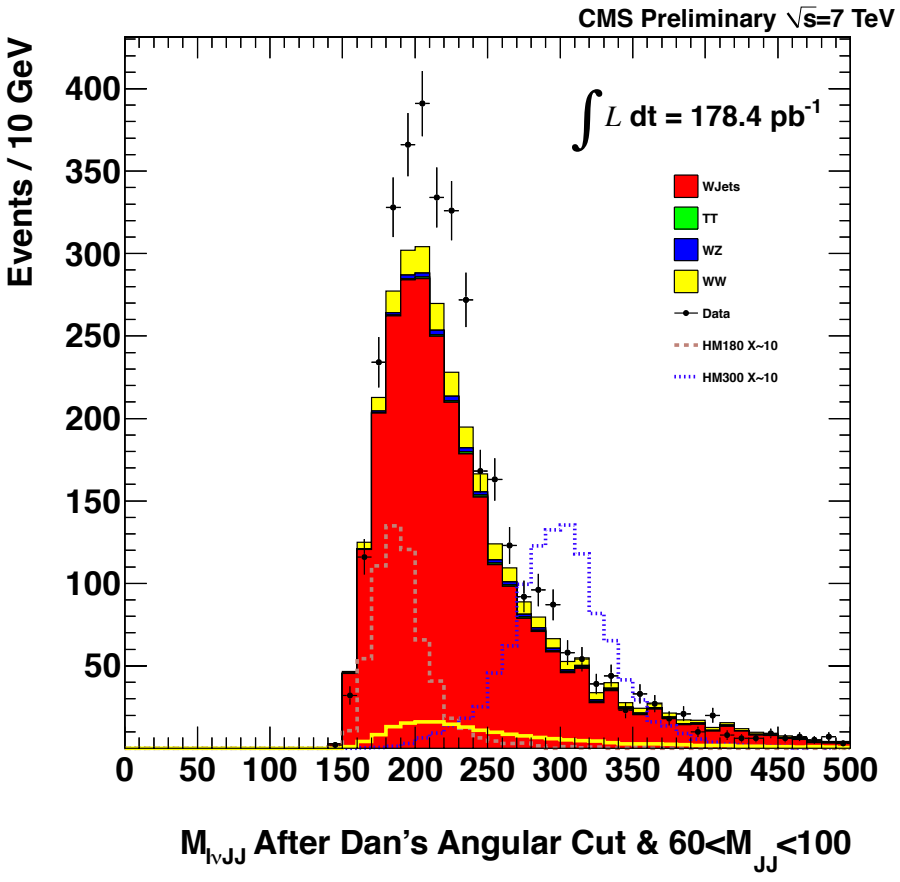


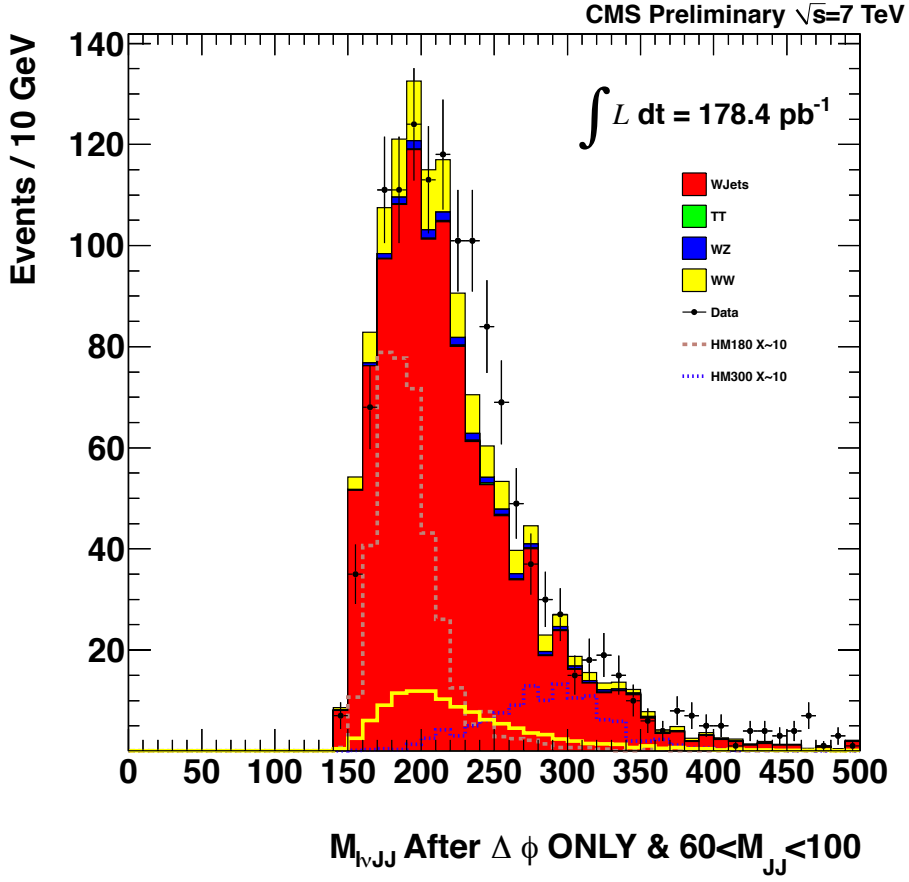
MC is normalized high because (I think) that selection efficiencies are higher in MC than in data.

Summary of all cuts I applied:

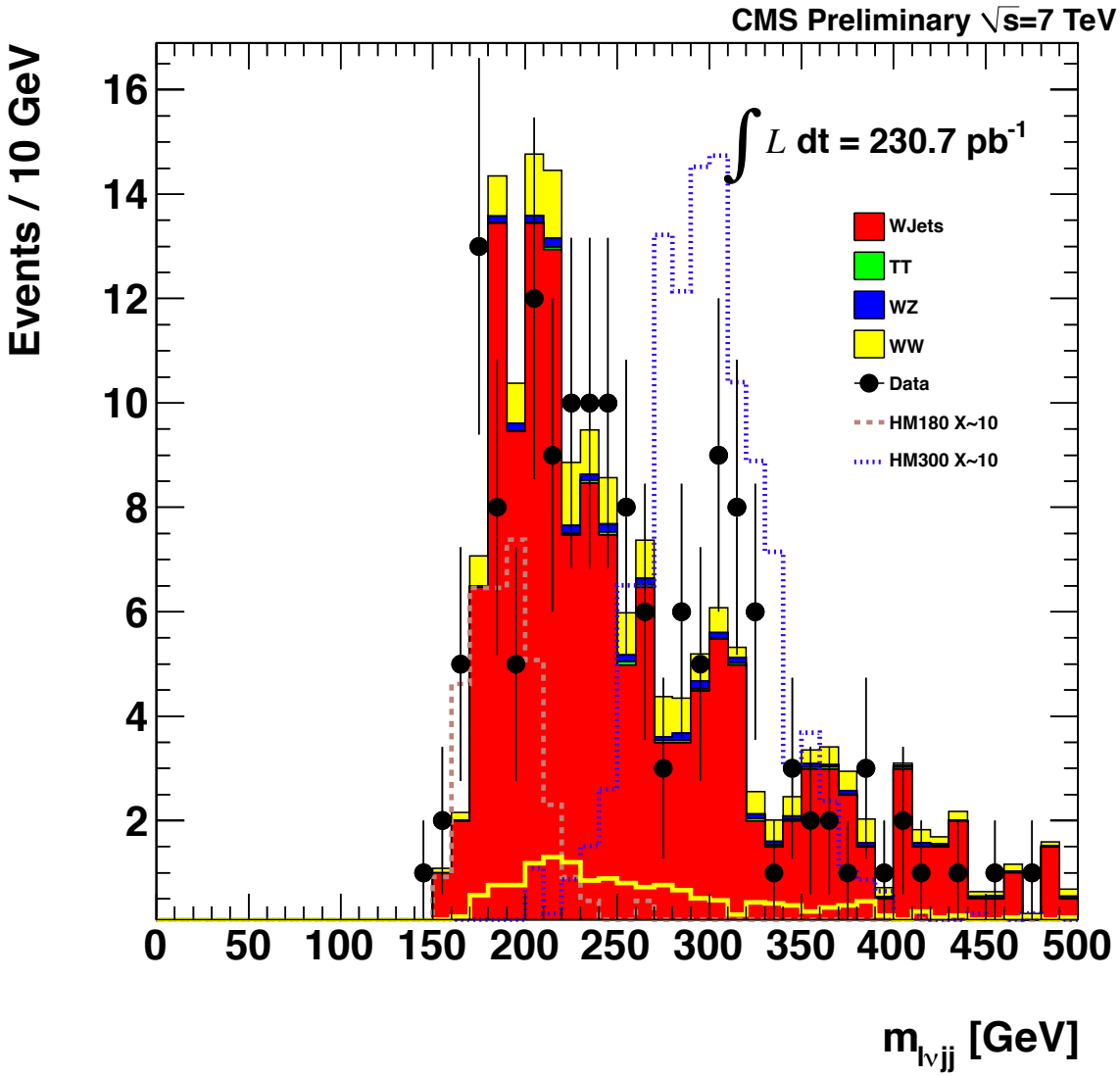
- $-0.4 < \theta < 0.7$ for cuv and cjj
- $|\Delta\phi(W, W) - \pi| < 0.2$
- centrality < 0.5
- $\Delta\phi$ (j1, MET) > 0.5
- $|\cos\phi$ of decay plane$| < 0.8$
- cos(W, W+jj) > 0.5
- Jacobian > 0.15

$m_{l\nu jj}$ distribution: 2011 data: μ





$m_{l\nu jj}$ distribution: 2011 data: ele



Same cuts as on previous slide and

- $60 < m_{jj} < 100$ GeV

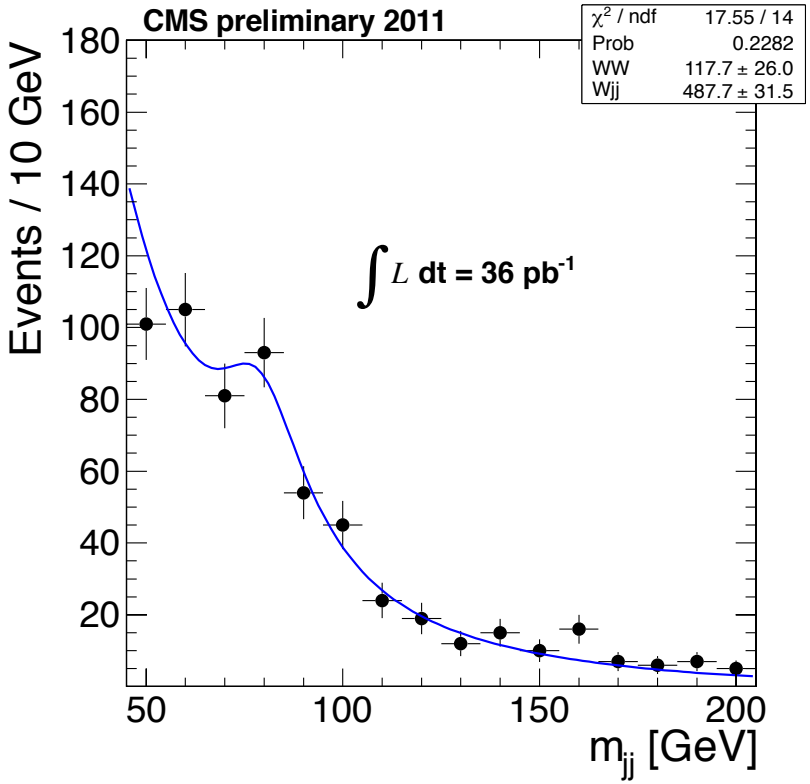
W+jets MC is normalized higher for the same reason as described before

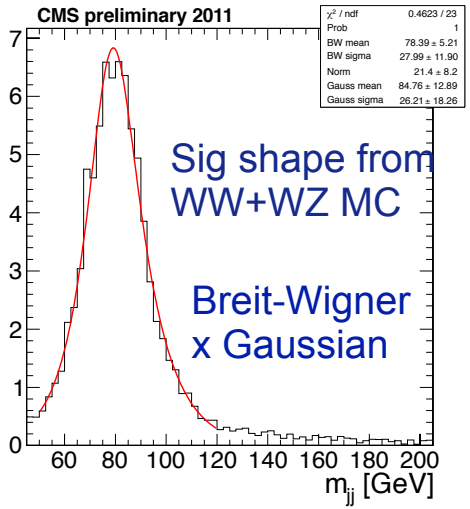
BACKUP SLIDES

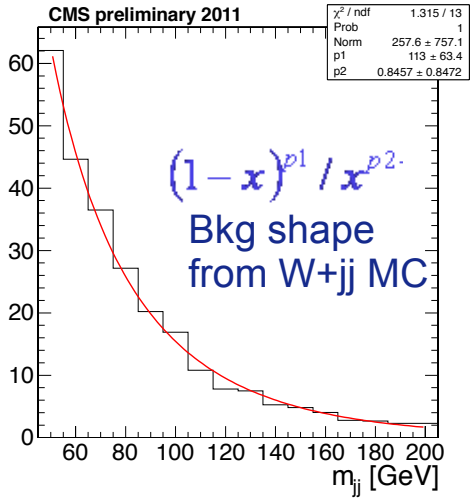
CMS data: WW+WZ signal estimation

(e,μ data combined)

Shape derived from MC.
Fit for the normalization.







WW + WZ yield = 118 ± 26 (stat)
W+jets yield = 488 ± 32 (stat)

Clear evidence of diboson production in lνjj final state in CMS

Any excess between 120−160 GeV is not significant, but is consistent with CDF result.