

VBF Higgs to Invisible

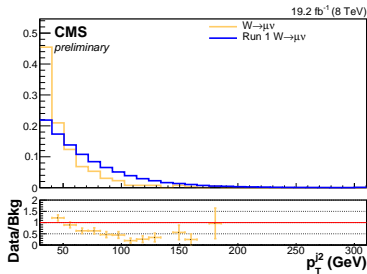
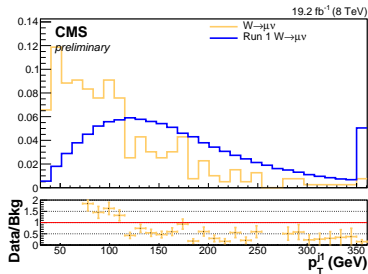
W MC Reminder

- ▶ W MC samples split by decay flavour
 - Lack of status 3 means we recursively look through status 22 W decay
- ▶ First control plots shown last week
 - Significant differences in shape between run 1 and run 2
 - Possible bias from Met Significance differences

Closer W Comparison

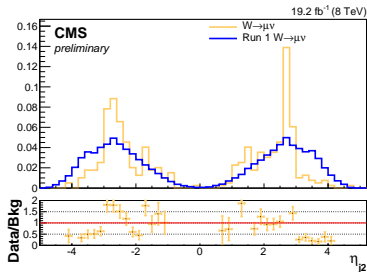
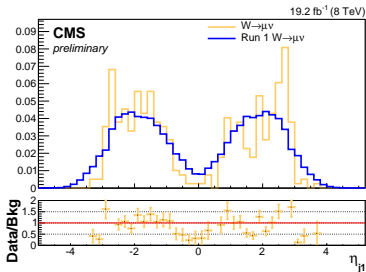
- ▶ Run 1 Met significance variable recalculated from light trees:
 - $\frac{MET}{\sqrt{\Sigma E_T}} > 3.0$
- ▶ Distributions still normalised to 1
- ▶ Same set of plots as for QCD and signal included for reference
- ▶ Selection as loose as possible:
 $\eta_{j1} \cdot \eta_{j2} < 0, \eta_{j1} < 4.7, \eta_{j2} < 4.7,$
 $p_T^{j1} > 30 \text{ GeV}, p_T^{j2} > 30 \text{ GeV}, \Delta\eta_{jj} > 3.6, MET_{sig} > 3.$
- ▶ Only $\mu\nu$ shown

W mu nu Comparison: run 1 vs run 2: Jet p_T

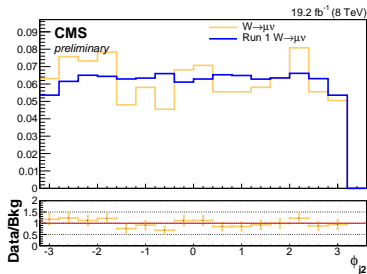
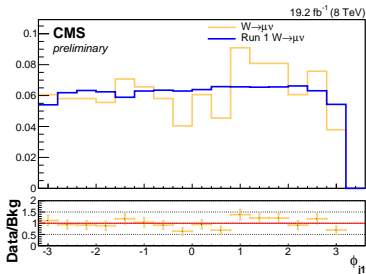


- Agreement better but still significant differences
- Especially for low values

W mu nu Comparison: run 1 vs run 2: Jet η

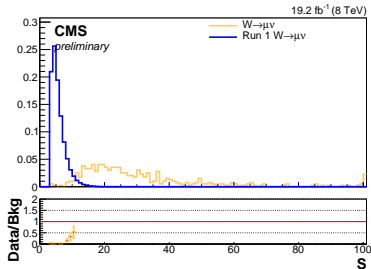
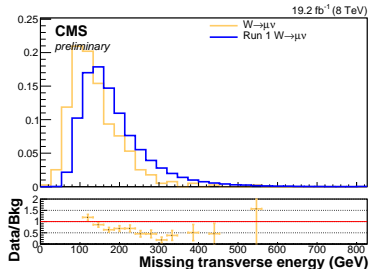


W $\mu\nu$ Comparison: run 1 vs run 2: Jet ϕ



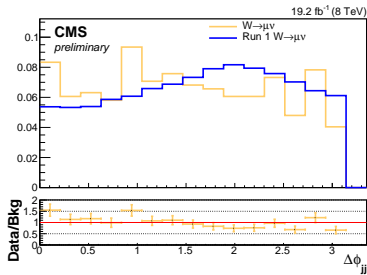
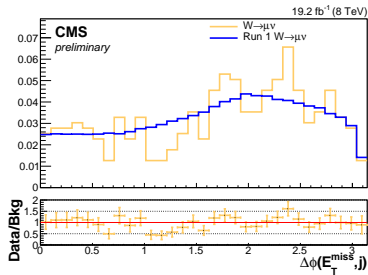
- ▶ ϕ distributions look similar within stat error

W muon Comparison: run 1 vs run 2: Met



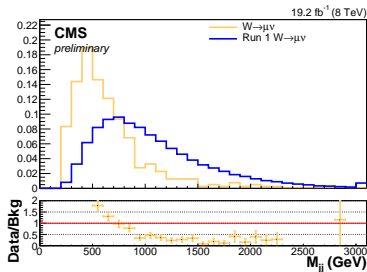
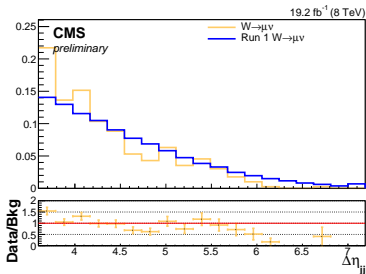
- ▶ Metnomu more similar
- ▶ Met significance variable difference now apparent

W muon Comparison: run 1 vs run 2: $\Delta\phi$ variables



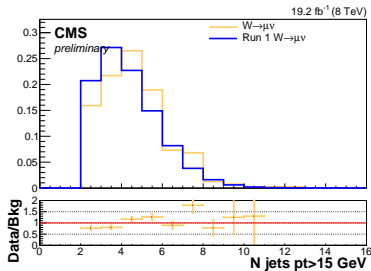
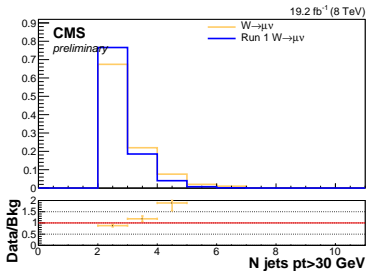
► Much more similar than last week

W mu nu Comparison: run 1 vs run 2: dijet variables



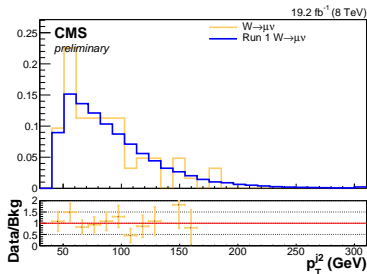
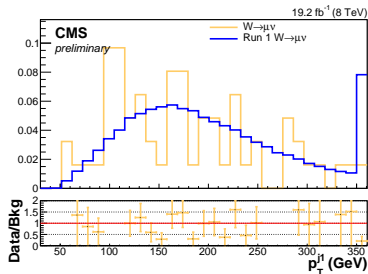
- M_{jj} distribution very different up to 800 GeV then similar

W $\mu\nu$ Comparison: run 1 vs run 2: N jets



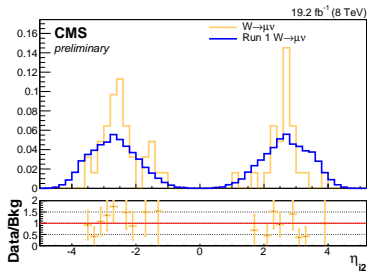
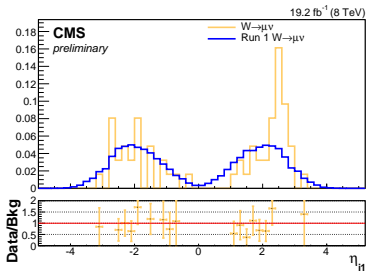
- ▶ Difference in M_{jj} and jet pt distributions at low values is interesting
 - Source needs to be investigated
- ▶ Check agreement with cuts at lower range of what was used in run 1
- ▶ Selection tightened slightly: $\eta_{j1} \cdot \eta_{j2} < 0$, $\eta_{j1} < 4.7$, $\eta_{j2} < 4.7$,
 $p_T^{j1} > 50 \text{ GeV}$, $p_T^{j2} > 45 \text{ GeV}$,
 $\Delta\eta_{jj} > 3.6$, $MET_{sig} > 3.$, $\frac{MET}{\sqrt{\Sigma E_T}}$, $M_{jj} > 800 \text{ GeV}$

W muon Comparison: run 1 vs run 2: Jet p_T



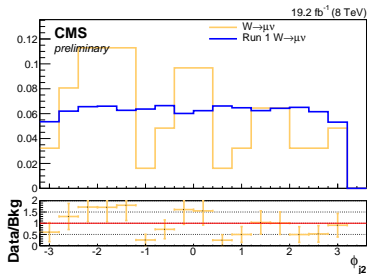
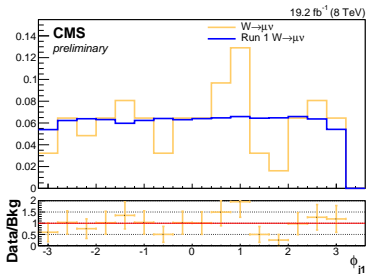
- Low stats but agreement much closer

W mu ν Comparison: run 1 vs run 2: Jet η



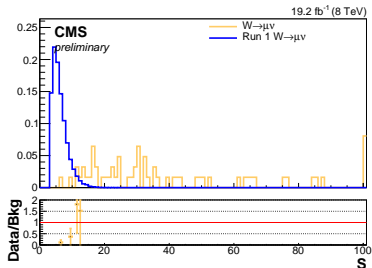
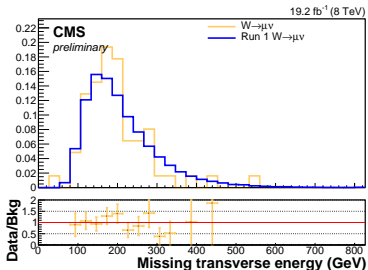
► Ears still apparent

W mu nu Comparison: run 1 vs run 2: Jet ϕ



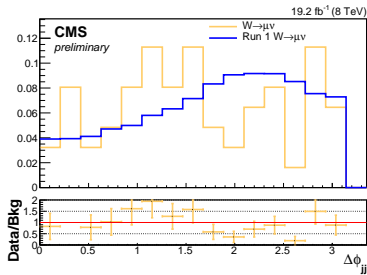
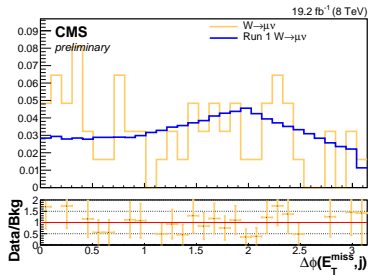
- ▶ ϕ distributions look similar within stat error

W mu ν Comparison: run 1 vs run 2: Met



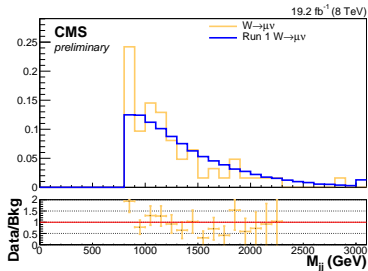
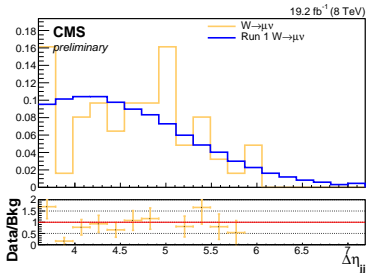
► Met now similar to run 1

W muon Comparison: run 1 vs run 2: $\Delta\phi$ variables



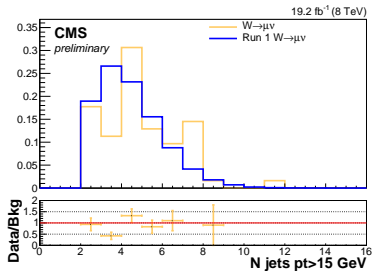
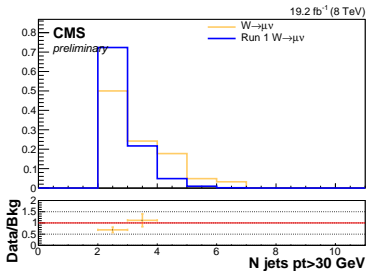
► Still similar

W mu nu Comparison: run 1 vs run 2: dijet variables



► Very similar

W $\mu\nu$ Comparison: run 1 vs run 2: N jets



Phenomenology progress

- ▶ Implementing $H \rightarrow \text{inv}$ parked analysis in Scorpion framework
- ▶ MET significance variable causing issues
 - Delphes sum of energy has a minimum pt cut for contributions
 - Therefore lower than sum of all energy in the event giving higher values of MET significance
- ▶ Possible solutions:
 - Rerun storing full sum of energy: discussing with Jim
 - Calculate Met from objects above pt threshold, compare to met from all objects, scale sum of energy in event accordingly
- ▶ Skype meeting planned for later in the week with theorist Matt Buckley

Summary

- ▶ Further investigation of W control plots
- ▶ Angular variables look very similar after like for like Met sig comparison
- ▶ Differences seen especially in p_T and MET decrease with slightly tighter M_{jj} and jet p_T cuts
- ▶ Gen information now included in light trees
- ▶ Phenomenology work progressing
- ▶ PGR symposium next Tuesday: Which DM plot to show?

Backup