

VBF Higgs to Invisible

HIG-14-038, AN-14-243

Reminder of status at the beginning of the week

- ▶ All objects have at least a basic recipe in our ntuples
- ▶ ak4 non-CHS jets and MET need most work
- ▶ First production of signal and QCD samples completed

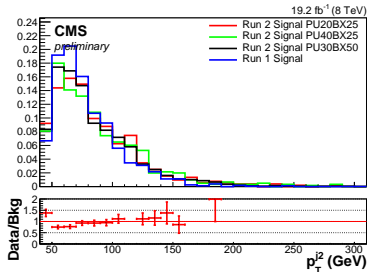
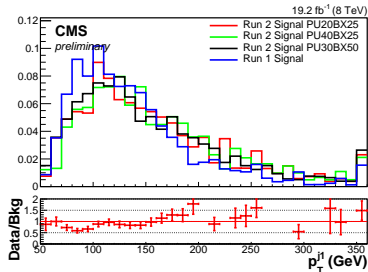
Technical Progress

- ▶ We have a new twiki [here](#)
- ▶ Change to storage of MET in ntuples necessitated separate run 2 LightTreeMaker and rerunning of ntuples
 - New production is May20
 - Light tree making scripts now use run2 light tree maker by default
- ▶ Light trees for run 2 signal samples now made

Signal comparison: run 1 vs run 2

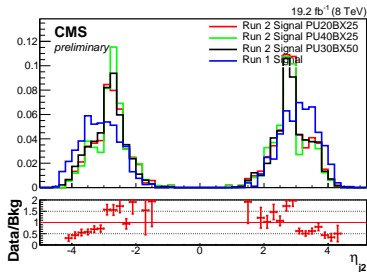
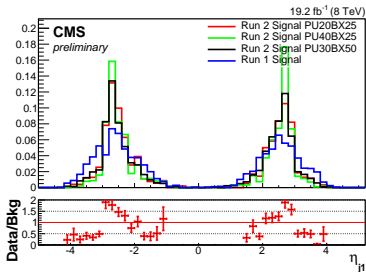
- ▶ Use $m_H=125$ GeV samples with a range of conditions
- ▶ Start with parked analysis signal region:
 $\eta_{j1} \cdot \eta_{j2} < 0, \eta_{j1} < 4.7, \eta_{j2} < 4.7,$
 $p_T^{j1} > 50 \text{ GeV}, p_T^{j2} > 45 \text{ GeV}, \Delta\eta_{jj} > 3.6, M_{jj} > 1200 \text{ GeV},$
 $MET > 90 \text{ GeV}, \text{mindphi}_{all} > 2.3, MET_{sig} > 4.$
- Plan to look at other regions as well
- ▶ Trigger weighting etc. as in parked analysis
- Obviously will need updating for real analysis
- ▶ All distributions normalised to 1
- ▶ Data/Bkg is Run 2 PU20BX25/Run 1

Signal comparison: run 1 vs run 2: Jet p_T



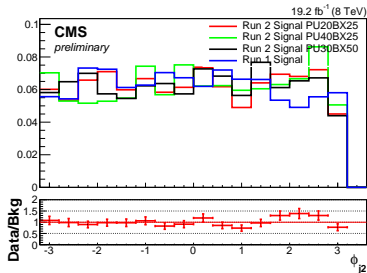
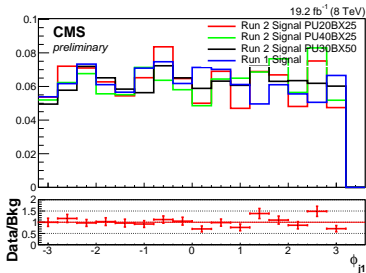
- Jets in run 2 (red, green, black) have generally higher p_T than those in run 1 (blue)

Signal comparison: run 1 vs run 2: Jet η



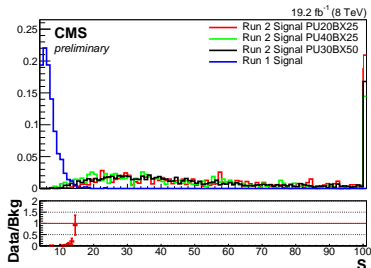
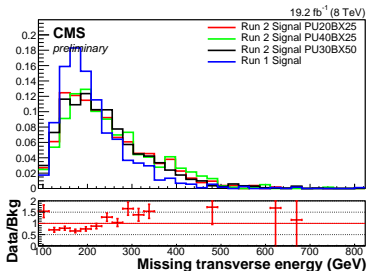
- ▶ Run 2 jet η has spike from 2.5-3
- ▶ These “ears” are a known feature also seen by $H \rightarrow \gamma\gamma$ and are due to barrel-endcap transition and end of tracker coverage
- ▶ Better calibration expected in 7_4_2

Signal comparison: run 1 vs run 2: Jet ϕ



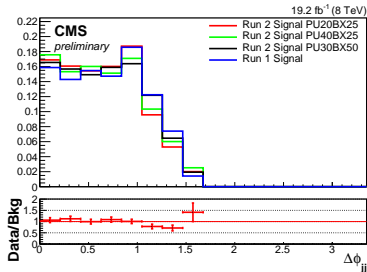
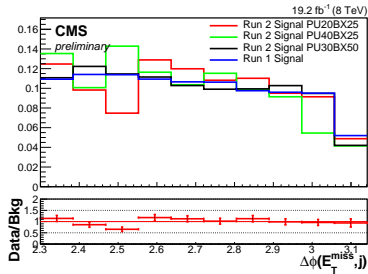
► ϕ distributions look comparable

Signal comparison: run 1 vs run 2: Met



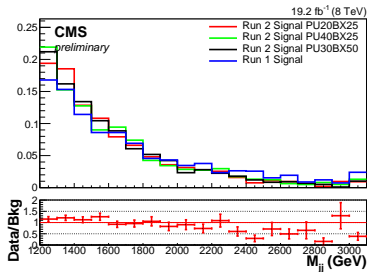
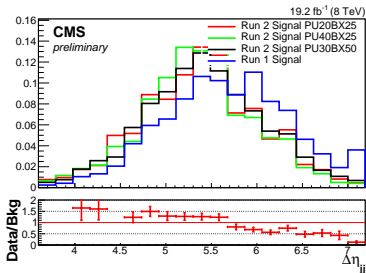
- ▶ Met higher for run 2
- ▶ Met significance is a different variable in miniAOD to the one we used in run 1...

Signal comparison: run 1 vs run 2: $\Delta\phi$ variables



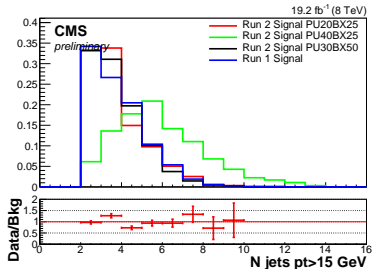
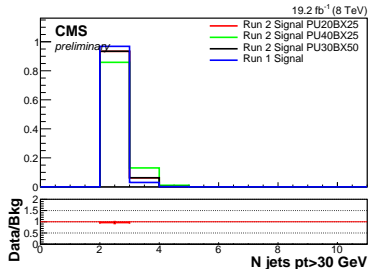
- ▶ NB already cutting on jet-met $\Delta\phi$
- ▶ None the less distributions look quite similar

Signal comparison: run 1 vs run 2: dijet variables



- ▶ $\Delta\eta_{jj}$ smaller for run 2: could be due to η “ears”
- ▶ M_{jj} also lower for run 2
 - Jet p_T is higher in run 2, so must have less angular separation
 - $\Delta\phi_{jj}$ similar to run 1 so likely to be caused by lower $\Delta\eta_{jj}$

Signal comparison: run 1 vs run 2: N jets



- Especially in right hand case higher pileup samples have a lot more jets per event as expected

Summary

- ▶ First signal MC comparisons between run 1 and run 2 performed
- ▶ Jet η “ears” problem seen
 - to be improved in CMSSW_7_4_2

Next steps

- ▶ Look at QCD samples:
 - Only have PU20BX25
 - They are standard inclusive samples so won't model fake met
- ▶ Look at other regions:
 - e.g. parked analysis pre-selection region

Backup