

VBF Higgs to Invisible

HIG-14-038, AN-14-243

Overview

- ▶ PAS and AN drafts with ARC
 - Most of their requests have been done
 - Some plot cosmetic issues are being fixed
- ▶ Studies of the source of the $W \rightarrow e\nu$ vs $W \rightarrow \mu\nu$ difference will be presented today

Problem

- ▶ We predict almost twice as many $\mu\nu$ events than $e\nu$ events
- ▶ Data driven scale factors are different but compatible at just over 1σ
- ▶ Significant difference in NSMC (24% difference)
- ▶ Suggested by Phil Harris that we separate events by gen lepton inside/outside acceptance
 - If difference is due to ID we should see no difference outside acceptance

Inside/outside acceptance check

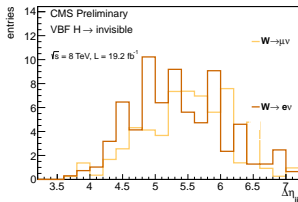
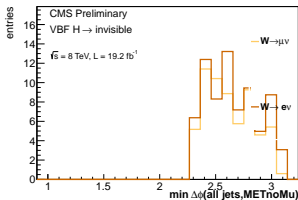
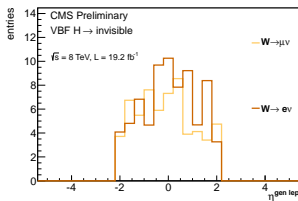
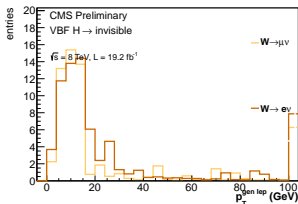
- ▶ Check MC yield in signal region from $W \rightarrow e/\mu\nu$
 - i.e. we veto any reconstructed leptons
- ▶ Split into events with gen lepton inside acceptance ($|\eta| < 2.1$) and outside acceptance ($|\eta| > 2.4$)

Process	Inside acceptance	Outside acceptance
$W \rightarrow e\nu$	73.7 ± 6.8	30.2 ± 4.9
$W \rightarrow \mu\nu$	61.5 ± 6.8	74.4 ± 7.3

- ▶ Inside acceptance results are as expected:
 - Slightly more $e\nu$ events
 - This is because electron ID efficiency is lower so fewer events are vetoed
- ▶ Outside acceptance results not as expected

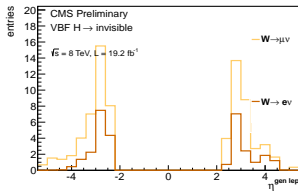
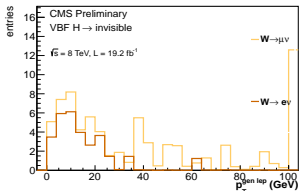
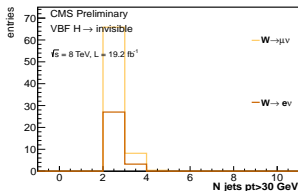
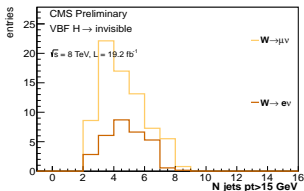
Shape checks inside acceptance

- Shape agreement is also reasonably good inside acceptance



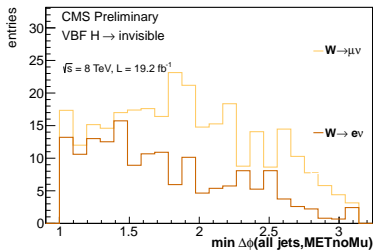
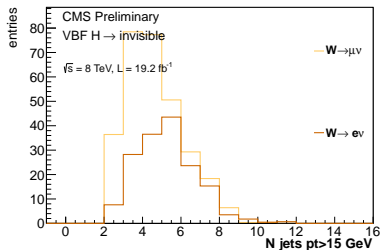
Outside acceptance

- Outside acceptance $e\nu$ events have a lot more jets
- No $e\nu$ events with high pt gen leptons



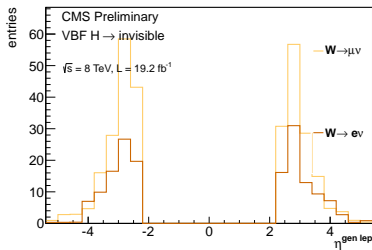
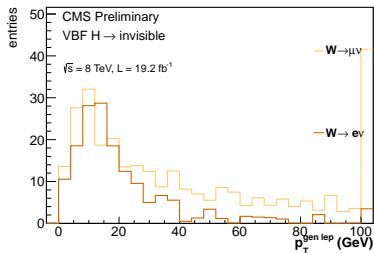
Outside acceptance

- ▶ Seems outside acceptance electrons are more likely to be reconstructed as jets than muons
- Extra jets then cause event to fail jetmetdphi cut
- ▶ Loosen jetmetdphi cut to 1



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Summary

- ▶ PAS and AN draft with ARC for review
 - A couple of plot cosmetic issues are being fixed
- ▶ $W \rightarrow e\nu$ vs $W \rightarrow \mu\nu$ difference is mostly for outside acceptance events
 - Unreconstructed electrons are reconstructed as jets more often than muons are
 - These then fail our jetmetdphi cut

Backup