Imperial College London

VBF Higgs to Invisible - Update

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P. Dunne

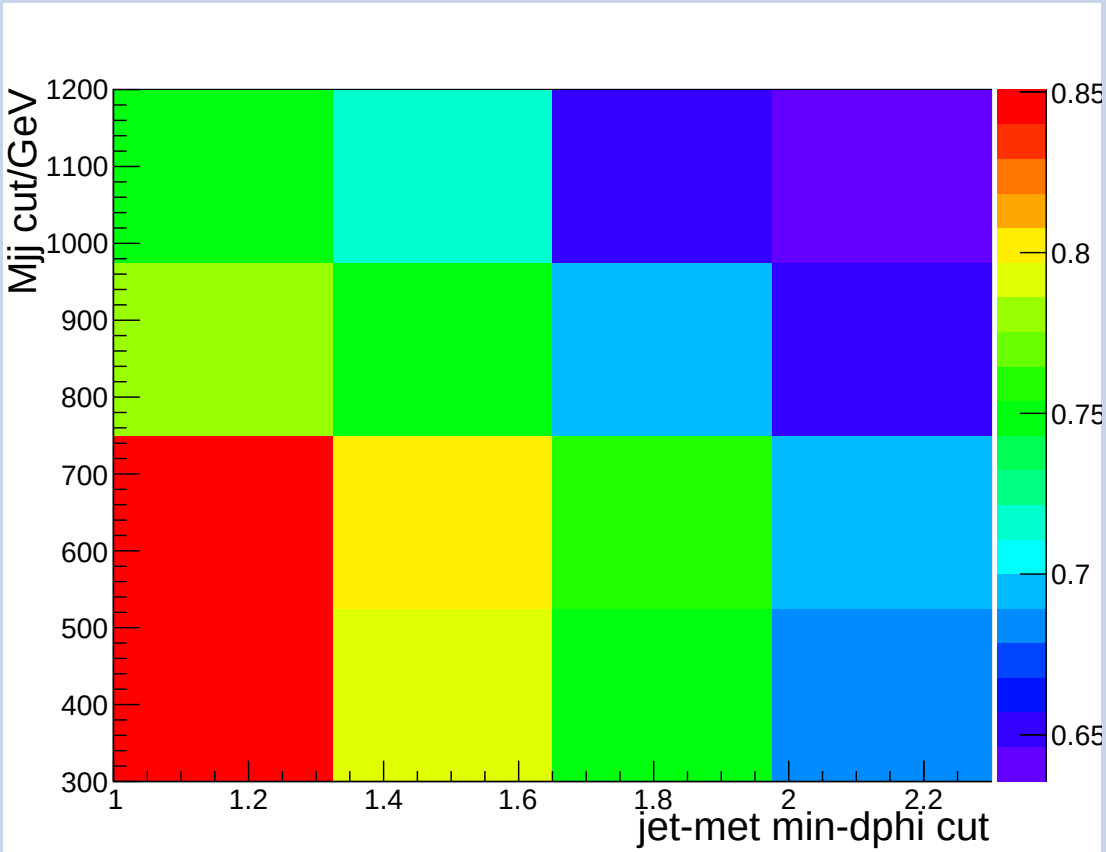
Overview

- Preapproval conditions answered before Christmas
- Further study of single mu data suggested
  - Study variation of control region scale factors as cuts are varied
  - Use single mu data to study region below our trigger turn on

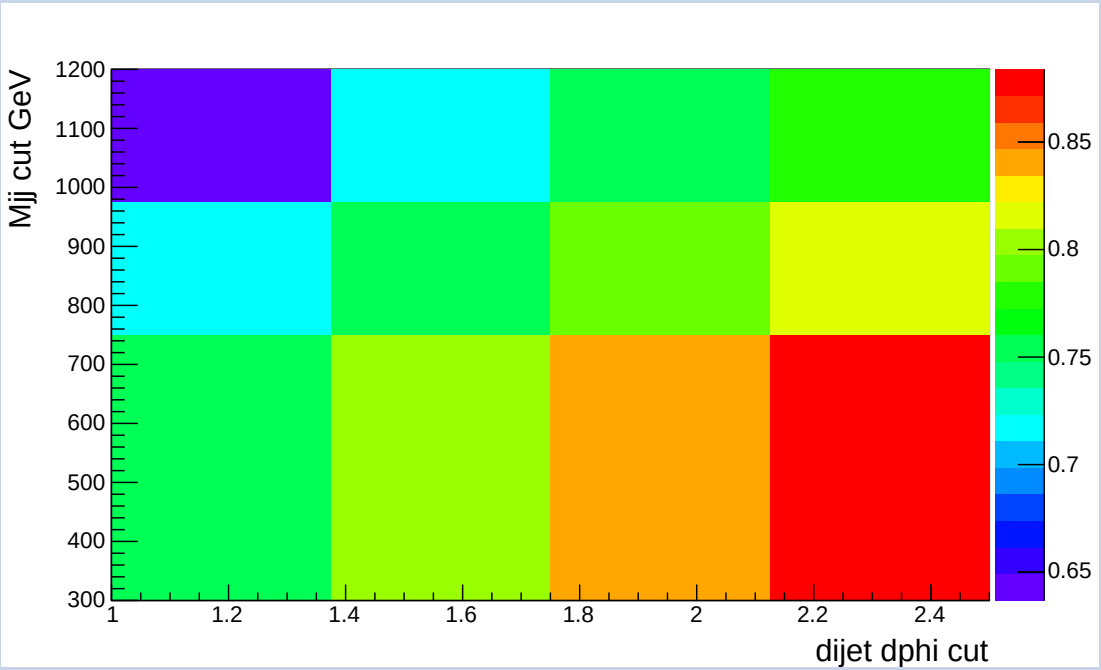
Study Procedure

- Want to study source of $\frac{N_{Data}-N_{Bkg}}{N_{MC}}$ factors in control regions being < 1
  - Hard to loosen several cuts due to trigger constraints
  - Use single mu trigger
- Study munu region:
  - Require 1 tight muon with $p_T > 25$ GeV
  - Assume trigger fully efficient for jets
- Perform a grid search through variables we cut on:
  - jet 1 and 2 p_T, M_{jj}, jet-met min-dphi, met, met significance
- In following plots all cuts are as for the munu region unless stated otherwise:
  - jet 1 $p_T > 50$ GeV, jet 2 $p_T > 45$ GeV, $M_{jj} > 1200$ GeV, jet-met min-dphi> 2.3, met, met significance> 4

- met and jet 1 p_T cuts have no discernable effect on scale factor:
- jet 2 p_T and met significance have small effect: couple of percent
- Main effect from M_{jj} and jet-met min-dphi
  - Plot shows scale factor as a function of the cut on these variables:



- Check whether it is only met phi causing scale factor variation
- Replace jet-met min-dphi cut with dijet dphi
  - nb dijet dphi is a less than cut so cut tightens with lower values
- Effect still seen and scale factor size is the same



Conclusion

- M_{jj} and jet-met min-dphi seem to be the main variables causing < 1 scale factors
- Have swapped jet-met min-dphi for dijet dphi to see whether it is the jet or met phi which is most mismodelled
  - dijet dphi cut leads to same scale factor to jet-met min-dphi cut
- This suggests the issue is not made worse by using met phi

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