Dimuon bump cross check

Reminder

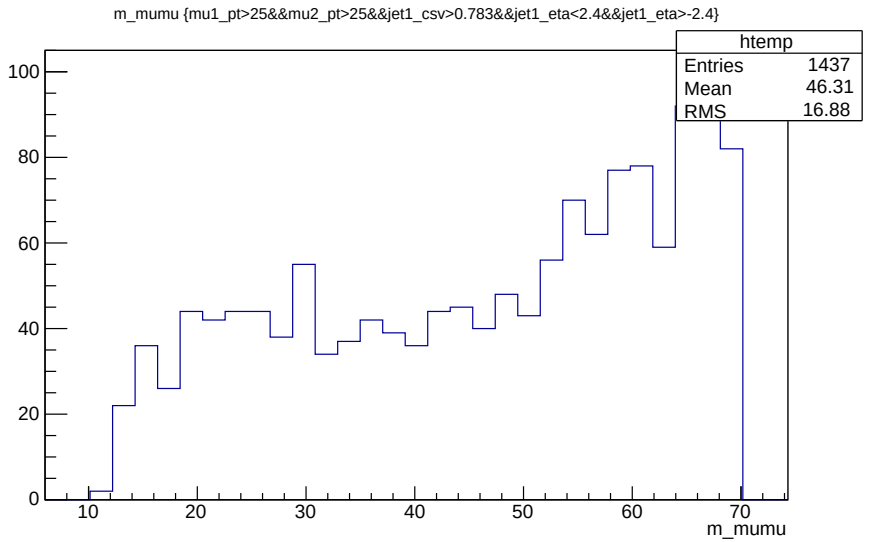
- Sasha showed a 5-6 sigma bump in the dimuon mass distribution last week
- Much effort is being put into cross-checking it in the higgs-exo group
- We have the full single mu primary dataset processed for our trigger efficiency studies

Ntuples

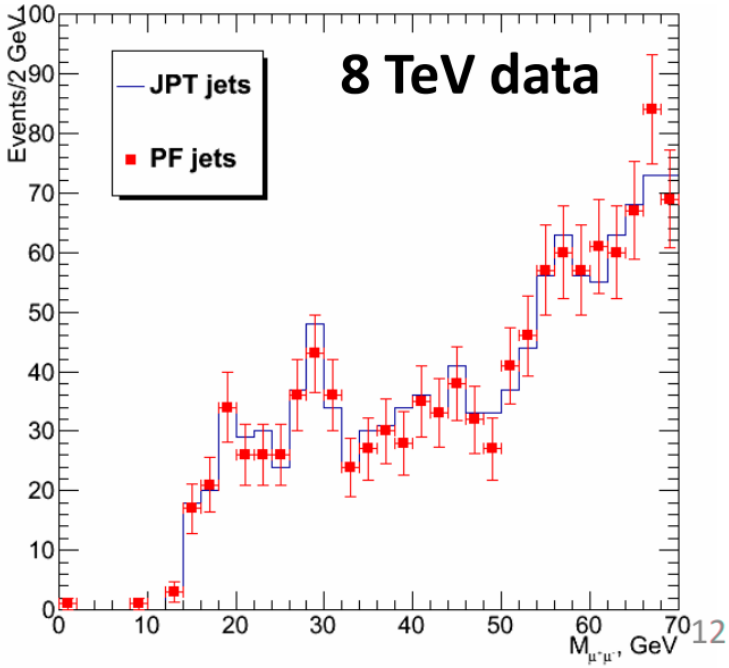
- Use common ntuple format of $H \to \tau\tau/inv$.
- Ntuples have no skimming so all events present
- Make Light trees requiring events pass data quality cuts and have two muons with $M_{\mu\mu} < 70$ GeV and a CSVL b jet
- All my plots are of dimuon mass in GeV

- Require: 2 μ with $p_T > 25$ GeV + jet 1 central and with CSV>0.783
- Right hand plot also has extra jet veto
- Both show 2-3 sigma bump

My Plot

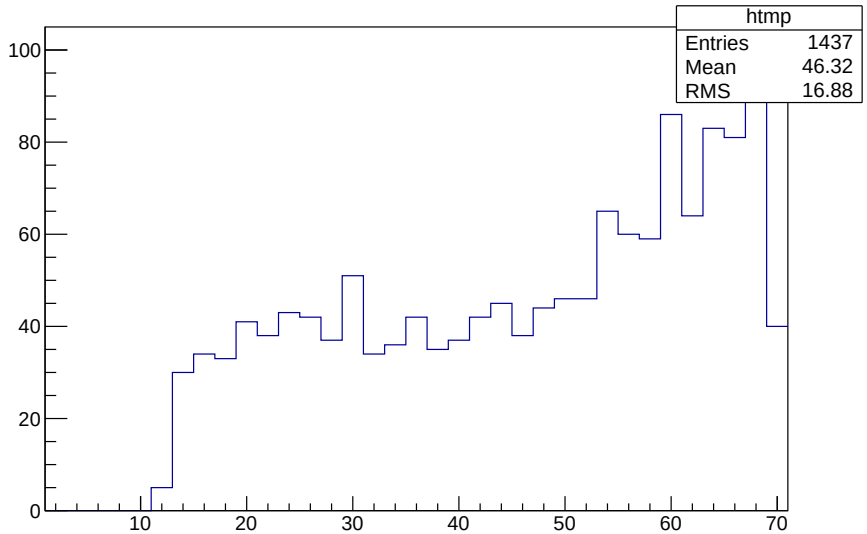


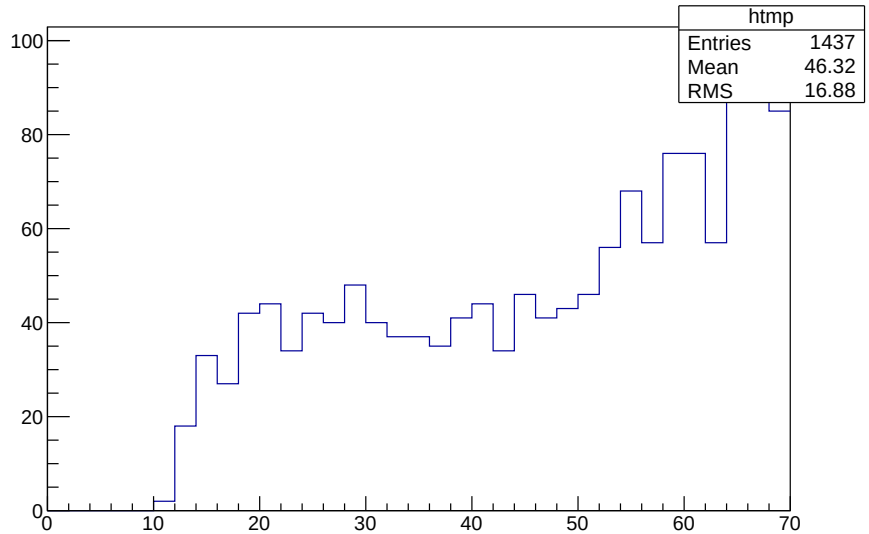
September 1st 2014 plot



Same binning

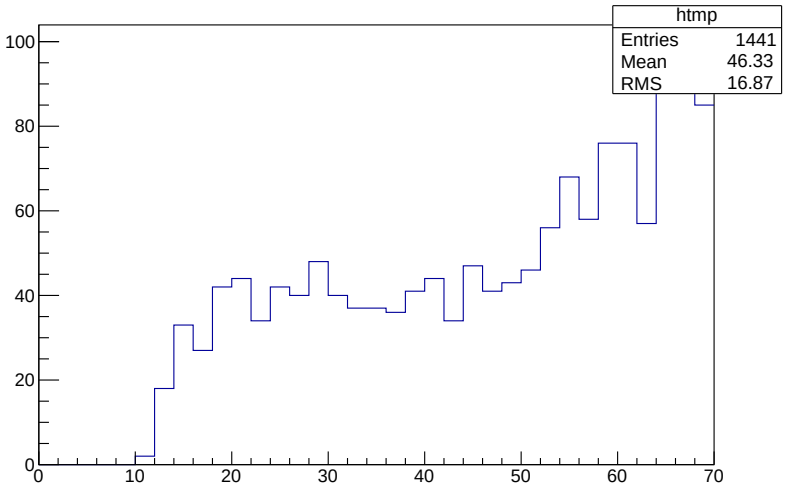
- Previous slide binning was slightly different to September 1st
- Change to same 2 GeV bins:
  - Left bins starting at 0, right starting at 1
- Significance very sensitive to minor details





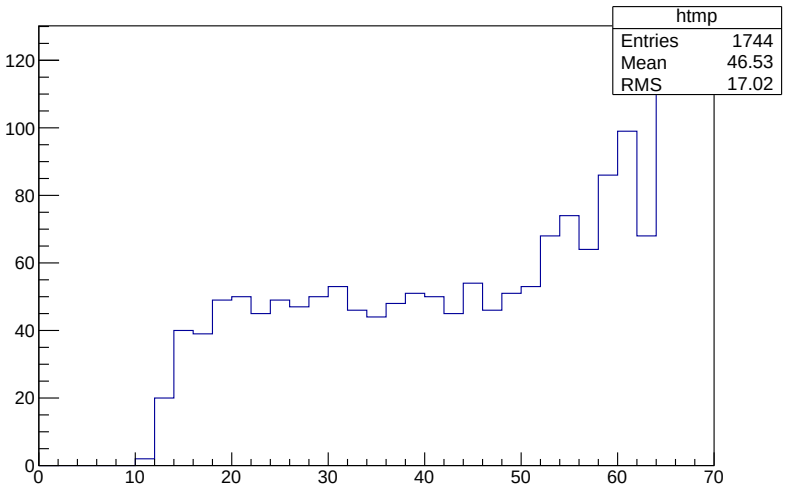
Adding cuts - additional central jet veto

- Start adding the other cuts present in Sasha et al analysis
- First go from requiring jet 1 central and with CSV$>$ 0.783 to requiring that there is one and only one central jet and it has CSV$>$0.783



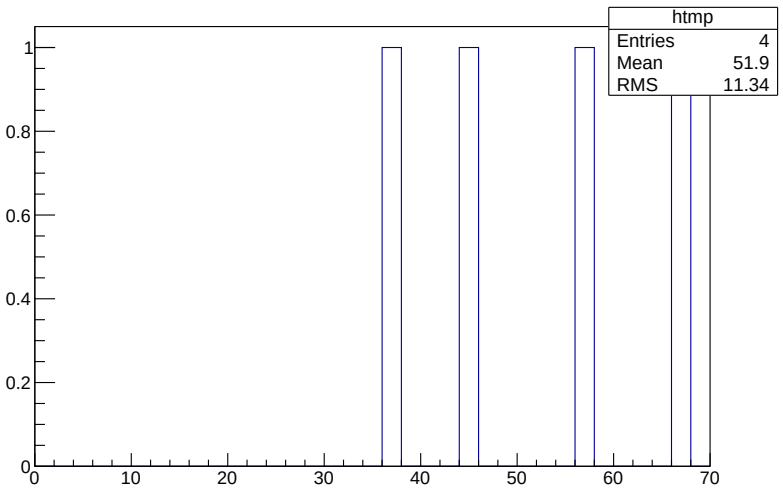
Adding cuts - b tag threshold

- Next noticed that 0.783 is medium WP for CSVV1 not CSV
  - Change threshold to CSVM threshold=0.679



Adding cuts - forward jet

- Add requirement of at least one forward jet $p_T > 30$ GeV
- Almost all events removed
- Could point to forward jet ID difference



Caveats

- All prepared very quickly
- Small number of files had xrootd issue when reading
  - Shouldn't cause big effect unless all of bump is in a few runs coincidentally missed

Summary

- ~3 sigma bump seen last year appears to be present in my ntuples too
- Moving cuts towards Sasha et als appears to reduce the bump
- Further investigation with Sasha needed

Backup