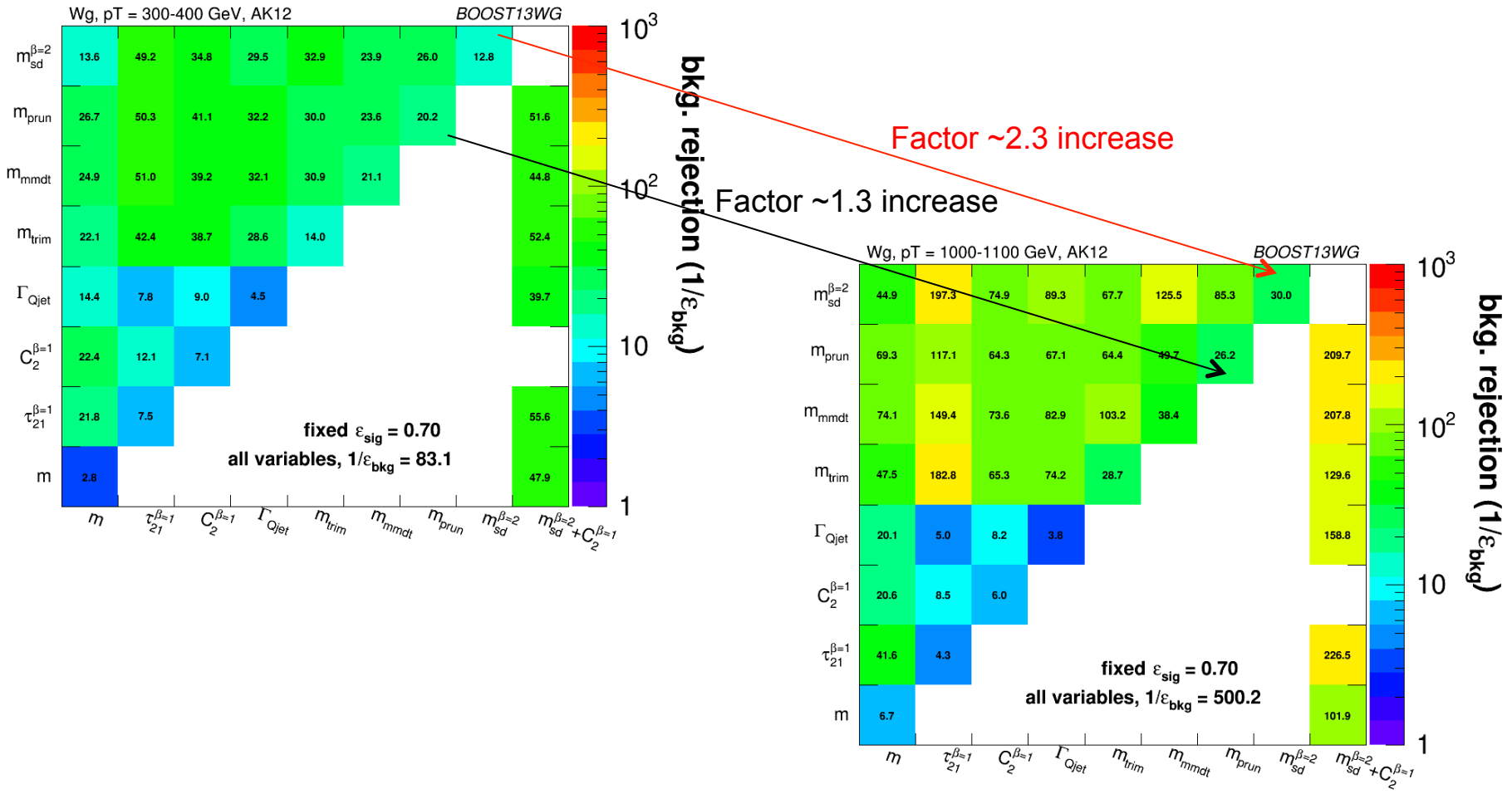
Groomed Mass

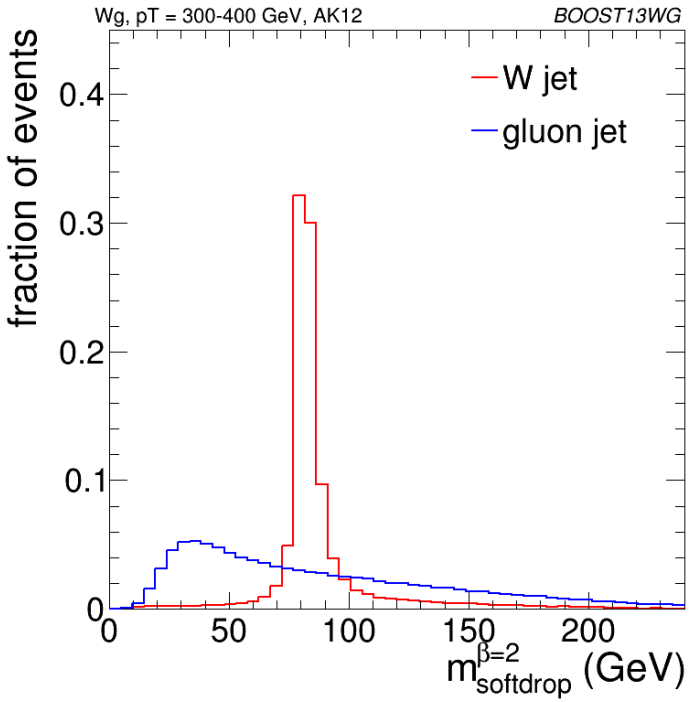
p_T/R Dependence

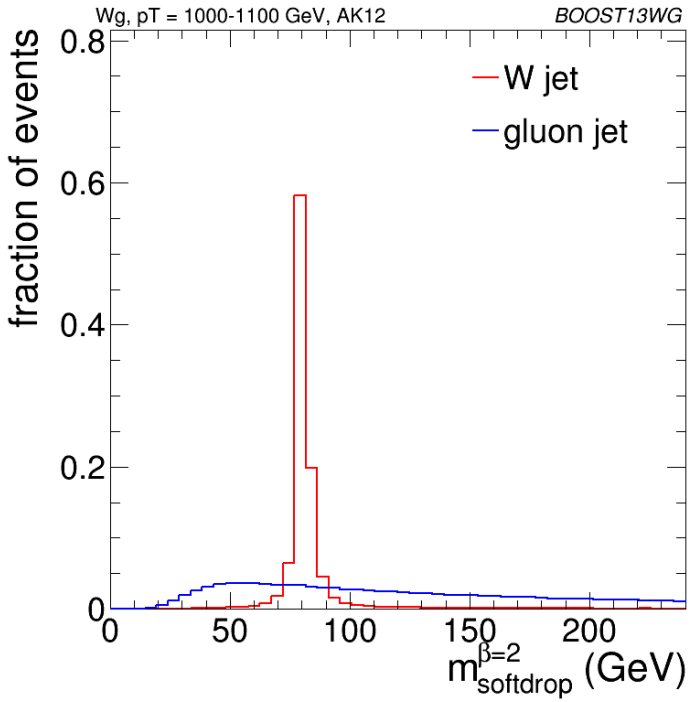
p_T dependence (fixed R=1.2)



- Why does background rejection of groomed masses increase with increasing p_T?

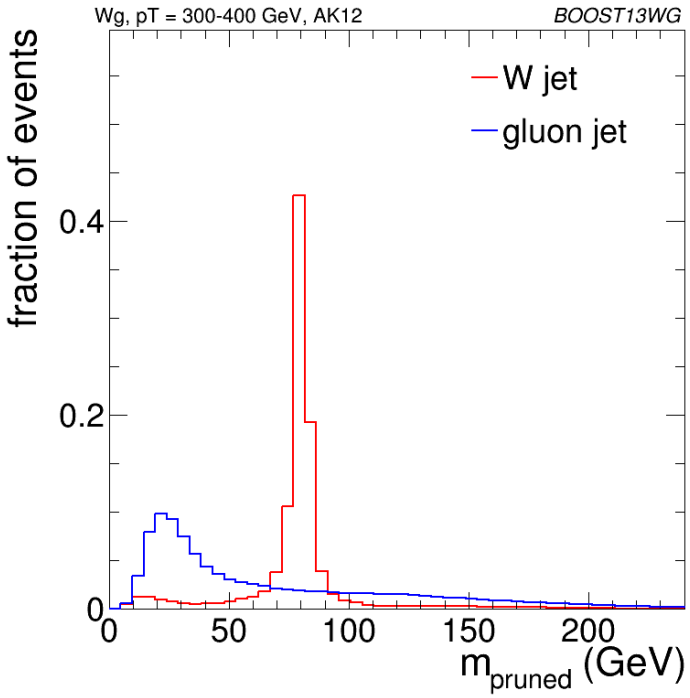
p_T dependence (fixed R=1.2)

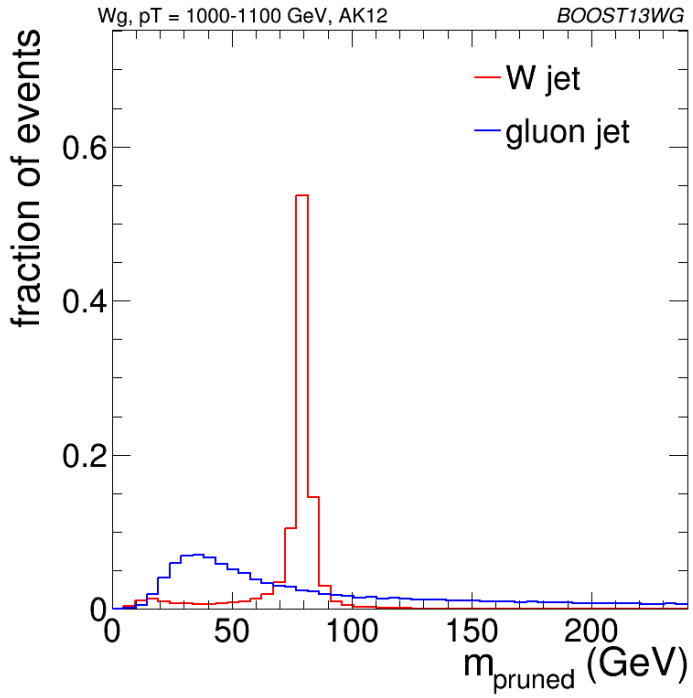




- Fraction of background in signal mass region looks similar (slightly hard to tell because of changing y-axis).
- But clearly a big improvement in the resolution of the signal peak at higher p_T. Does this drive the improved rejection? Why does resolution improve?

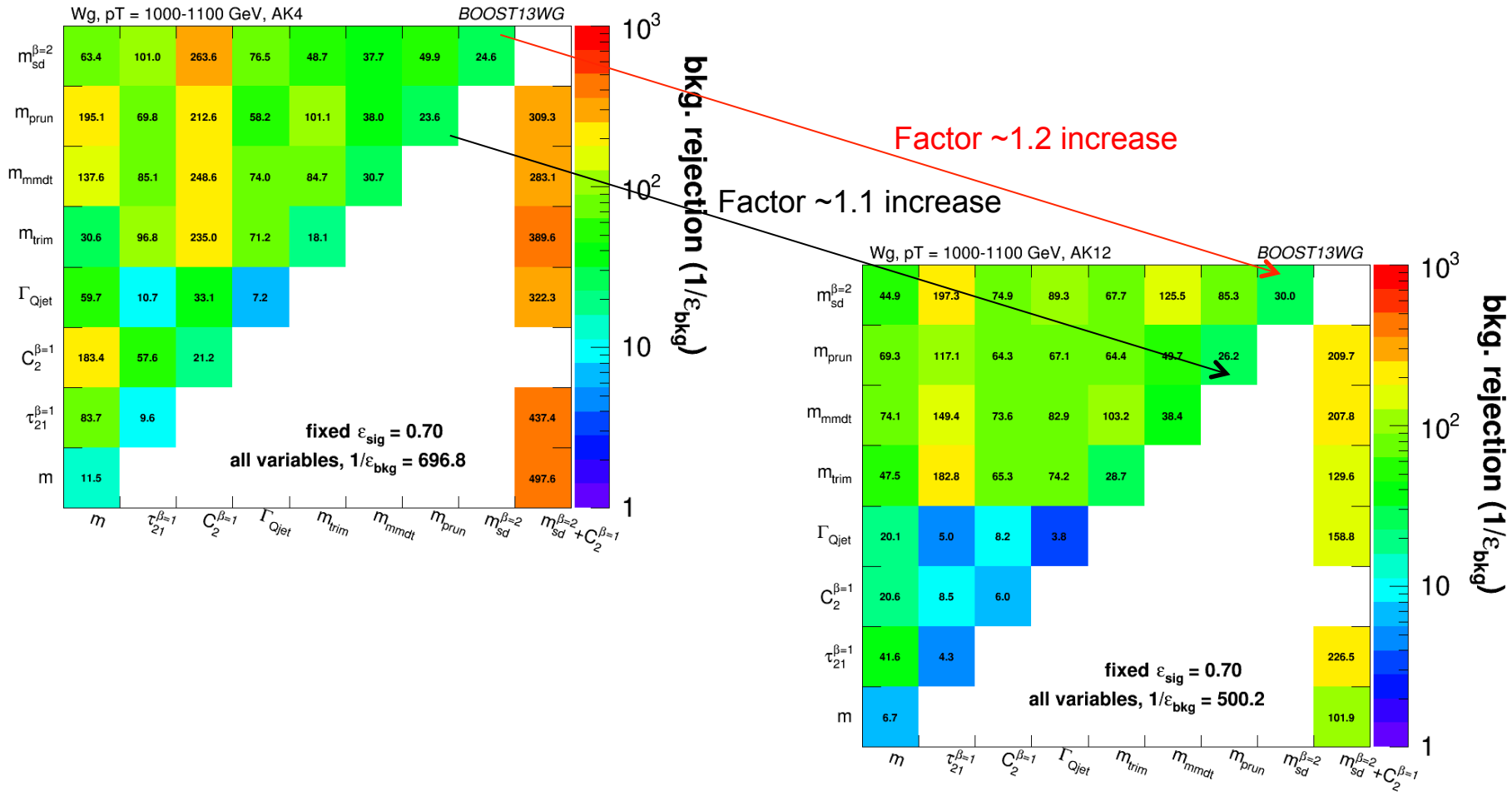
p_T dependence (fixed R=1.2)





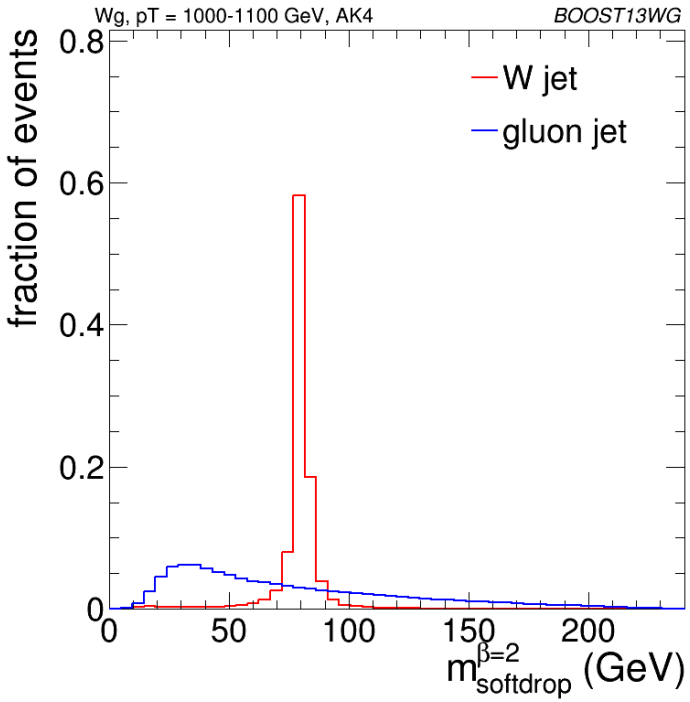
- See an improvement in resolution for pruning also, but improvement in rejection power only 1.3.
- Would be good to get these plots with a consistent y-axis range.
  - Look also at size of 70% window?
  - Fraction of background within this window? Fraction of background within a fixed signal window (to see how overall background level is changing)?

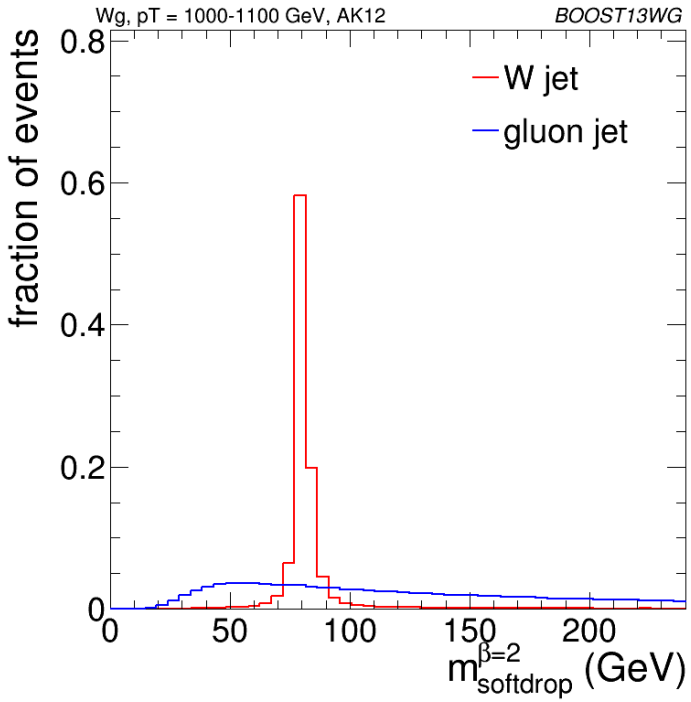
R dependence (1 TeV bin)



- Groomed mass performance remains ~constant w.r.t changing R.

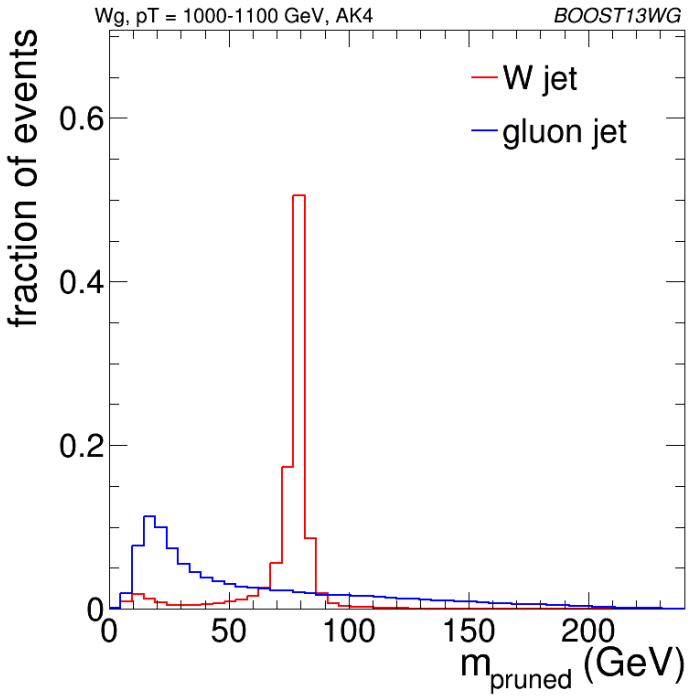
R dependence (p_T 1 TeV bin)

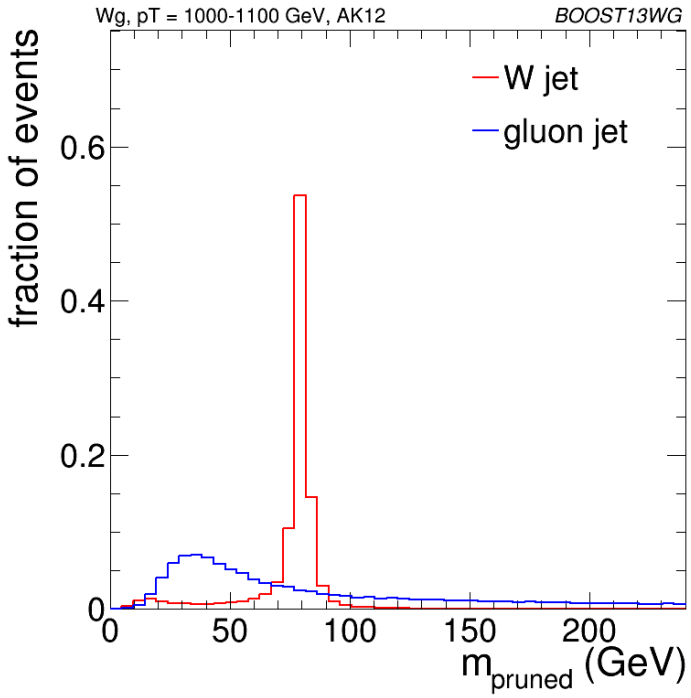




- Signal peak looks very similar.
- Background shifts to higher mass, but remains at very similar level in the region of the signal.

R dependence (p_T 1 TeV bin)



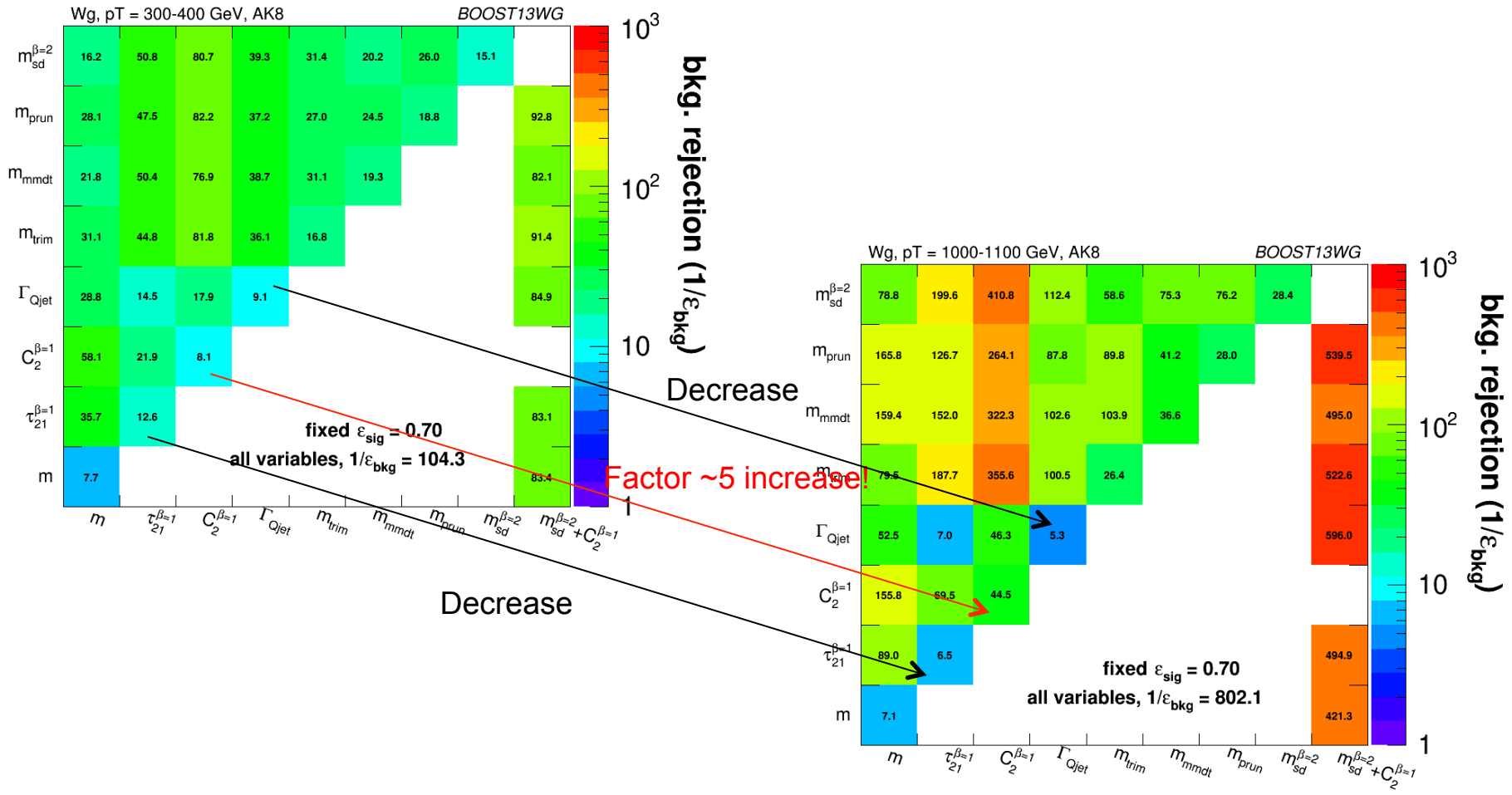


- Signal peak looks very similar.
- Background shifts to higher mass, but remains at very similar level in the region of the signal.

Substructure Variables

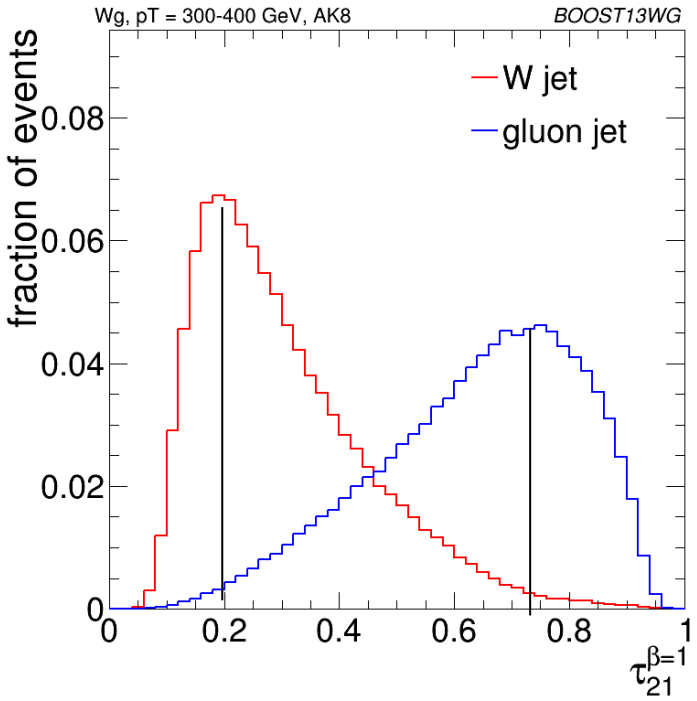
p_T/R Dependence

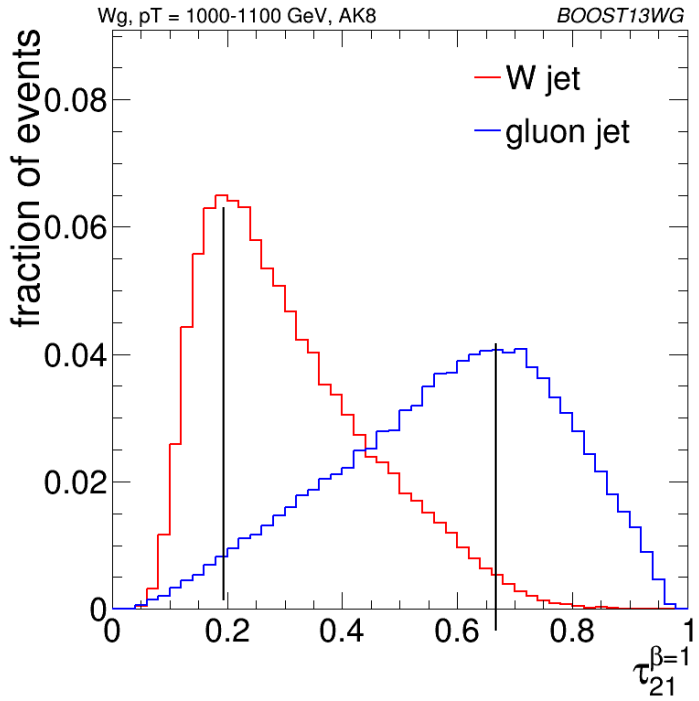
p_T dependence (fixed R=0.8)



- Why this different behaviour w.r.t pT?

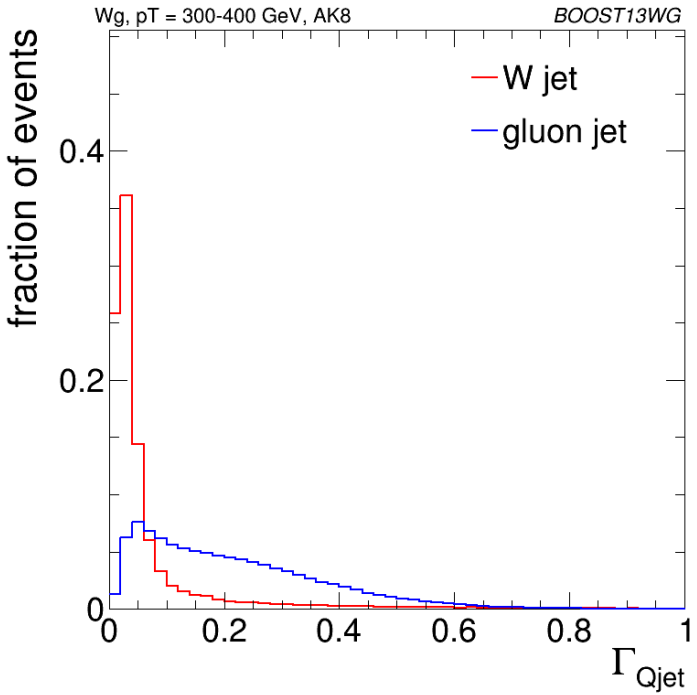
p_T dependence (fixed R=0.8)

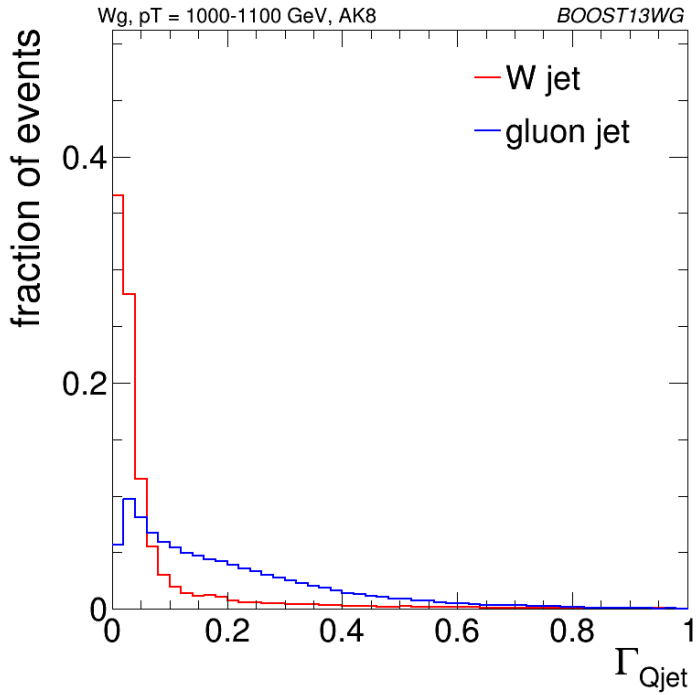




- Overlap increases – seems to be because QCD peak migrates to smaller Tau21 at higher pT (signal remains the same).
- Why does QCD appear more 2-prongy at higher pT?
  - Greater chance of a hard radiation?

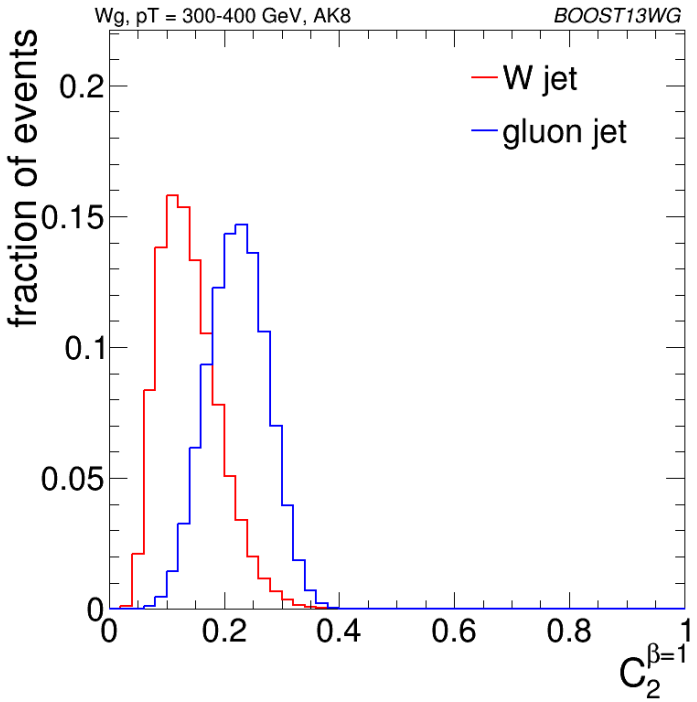
p_T dependence (fixed R=0.8)

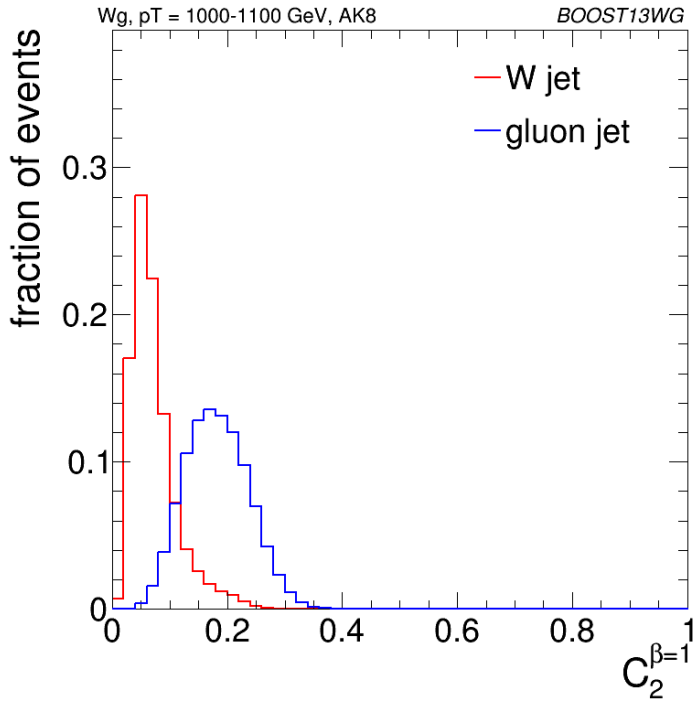




- Both signal and background are shifting lower here…not clear to me what is going on.

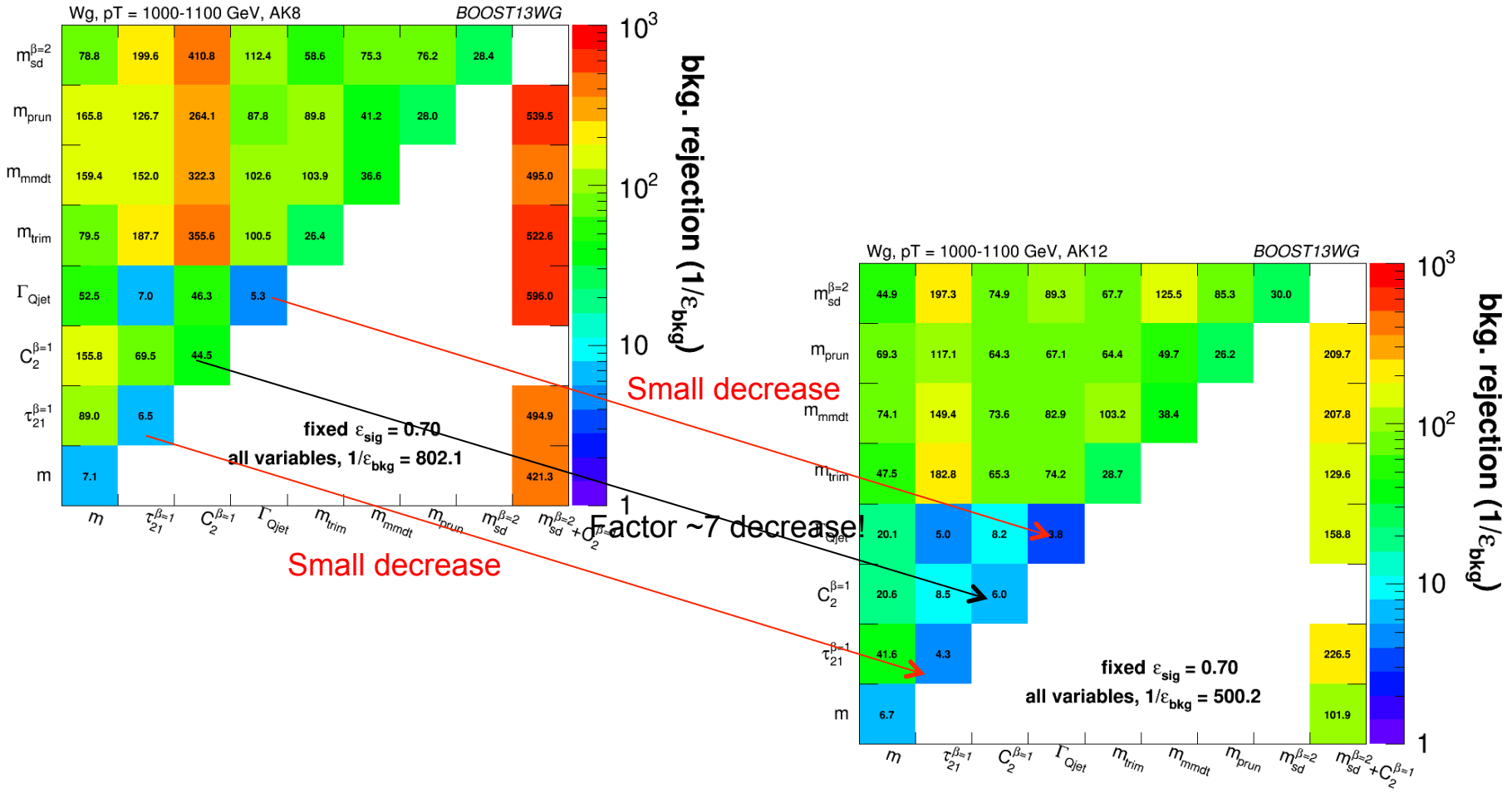
p_T dependence (fixed R=0.8)





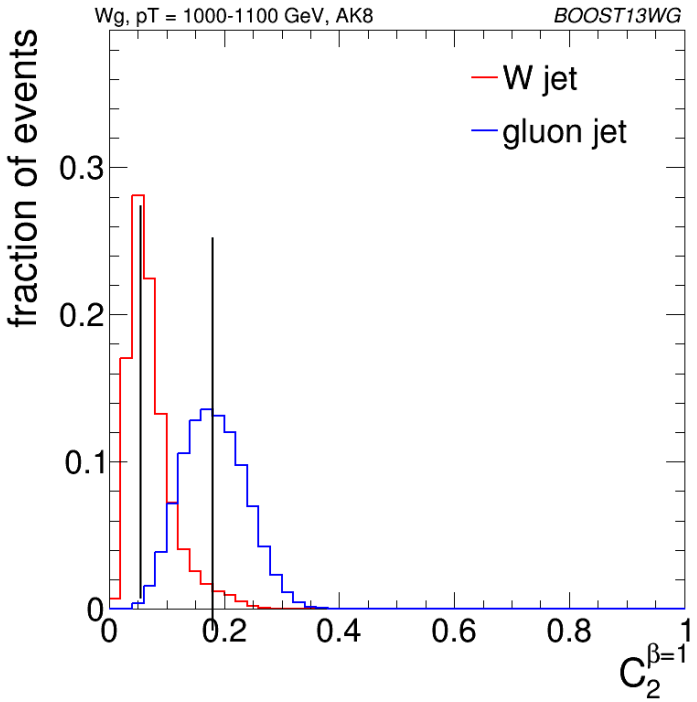
- Big decrease in overlap here at higher pT. Why? Is this expected?

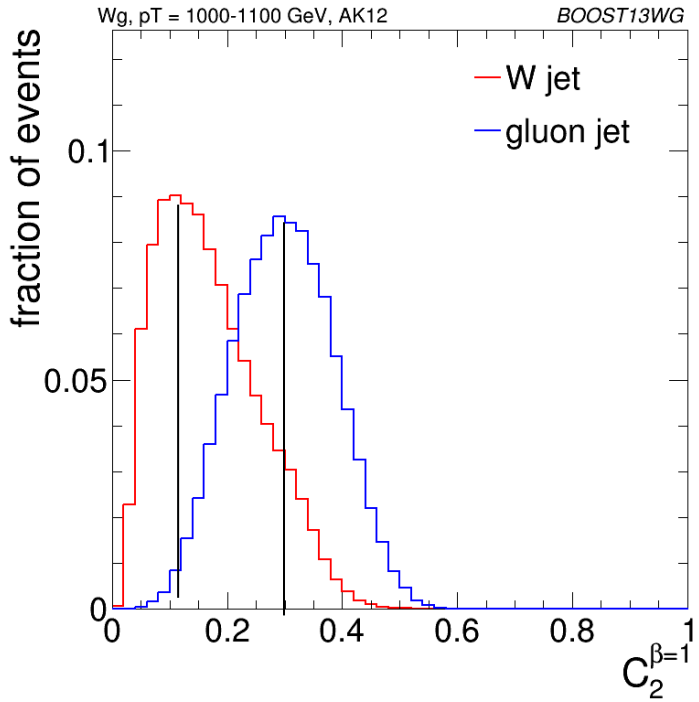
R dependence (1 TeV bin)



- Why this different behaviour w.r.t R?

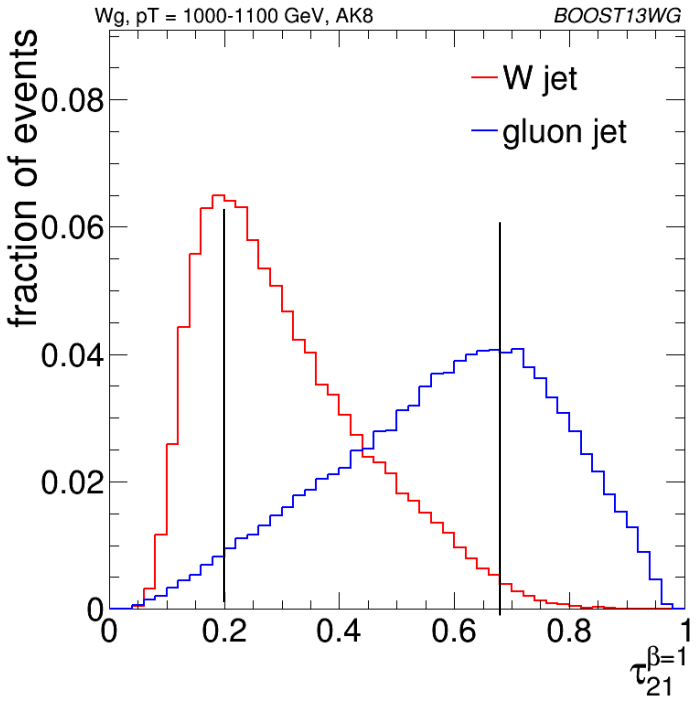
R dependence (p_T 1 TeV bin)

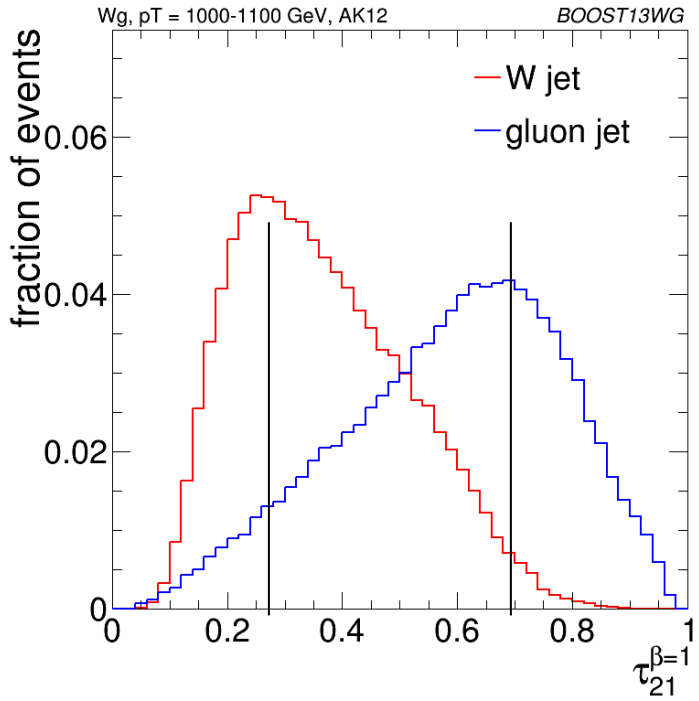




- Both signal and background shift to the right, and overlap increases a lot.
- Explain that as being due to increased susceptibility of larger jet radius to soft physics.

R dependence (p_T 1 TeV bin)





- Overlap increases slightly because with larger jet radius signal starts to look less 2-prongy (more smearing by soft stuff).
  - But clearly not as susceptible to this as C2.
- QCD seems to remain largely unchanged – smearing doesn't make much difference to an already 1-prongy distribution.