

Determining VBF QCD Multijet background using the dijet balance jet energy resolution method

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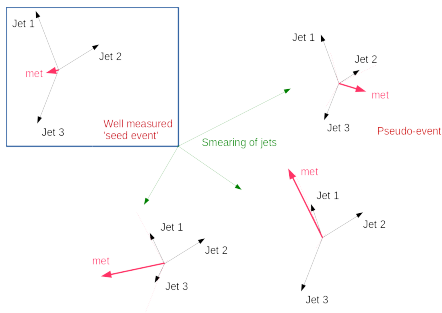
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QCD Multijet Background

This background is less well understood than other missing energy backgrounds as the missing energy is not down to 'real' physics, like neutrinos, where it can be estimated accurately from theory. If an extra jet isn't picked up because it goes down the beam pipe for example, the other jets will be reconstructed incorrectly when trying to conserve momentum.



The idea behind jet smearing is create 'pseudo-data' which mimics events where the missing energy in an event mostly arises from the mis-measurement of jets.

Jet energy resolution smearing method

This is a data-driven method to find the mis-measured jet background of ~~E_T~~ searches.

- Generate a large sample of jet seed events from MC, where jets are 'well-measured'. This is achieved by ensuring the reconstructed jet p_T is as close as possible to the truth jet p_T . (Already have access to MC and data inputs in the format necessary for this multijet smearing method.)
- Use the resolution from JER dijet balance studies for p_T^{avg} and η bins.
- Smear MC jet event 4-vectors according to a Gaussian with this resolution a large number of times to produce pseudo-data events.
- Pass these pseudo-data events through the analysis cuts to produce the distributions.

Going to look at the existing code from the VBF Higgs invisibles group to see whether this is easily implementable, or whether it is best to implement it myself (Need to decide this week).

Summary

This pseudo-data distribution should give an accurate measurement of the expected multi-jet background.

Plans

- Reach point in JER studies where the resolution is known well for each (p_T^{avg}, η) bin.
- Write procedure to input well measured MC jet event samples and smear them many times according to the resolution.
- Pass these smeared samples through the analysis cuts to produce the background distribution.

Should have main body of code set up by end of week. First outputs next week, end of April / early May for first results.