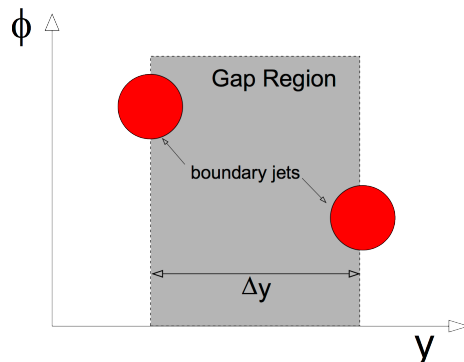


Central jet veto measurements in VBF topologies at ATLAS and CMS

Andrew Pilkington (Manchester) and James Robinson (DESY)

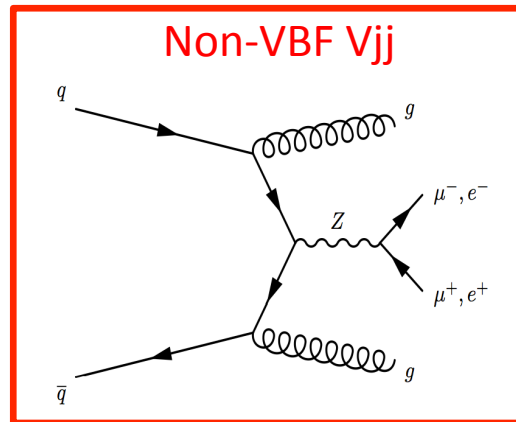
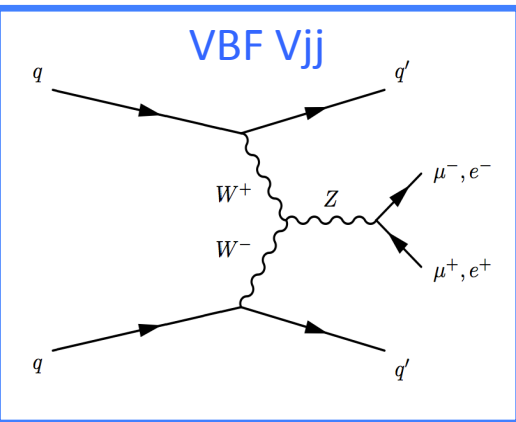


Overview:

- 1) dijet production
- 2) Z_{jj} production
- 3) W_{jj} production
- 4) H_{jj} production

Electroweak Xjj measurements at ATLAS and CMS

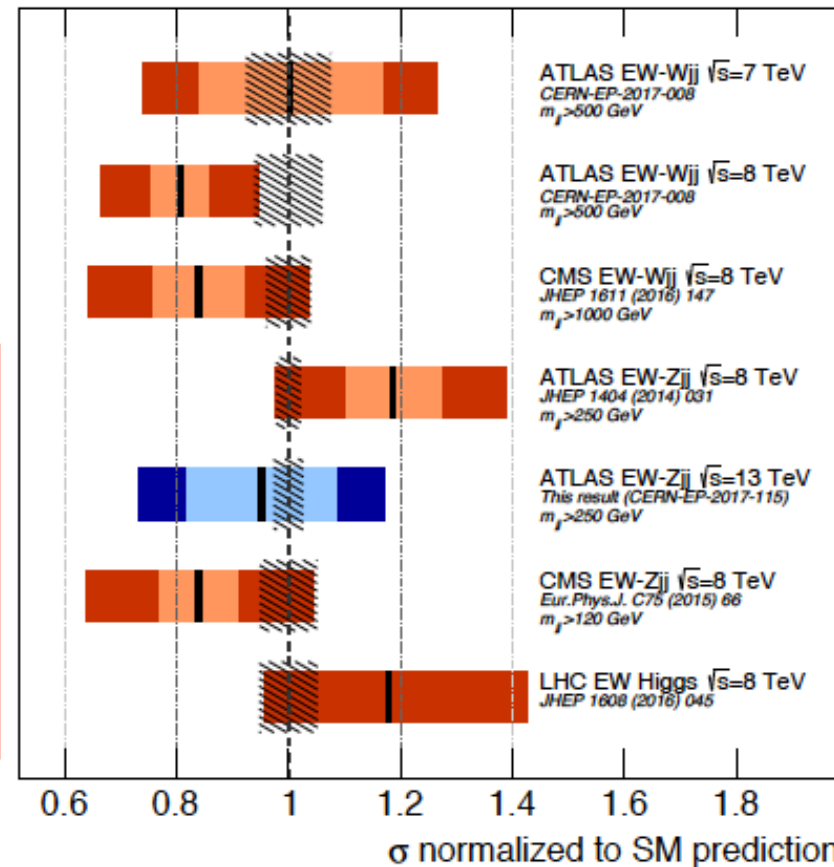
- Measurements of VBF topologies at ATLAS and CMS have become standard
- Each analysis relies (at some level) on vetoing additional jet activity to reduce non-VBF backgrounds
 - Detailed studies of central jet activity have been published: [covered in this talk](#)



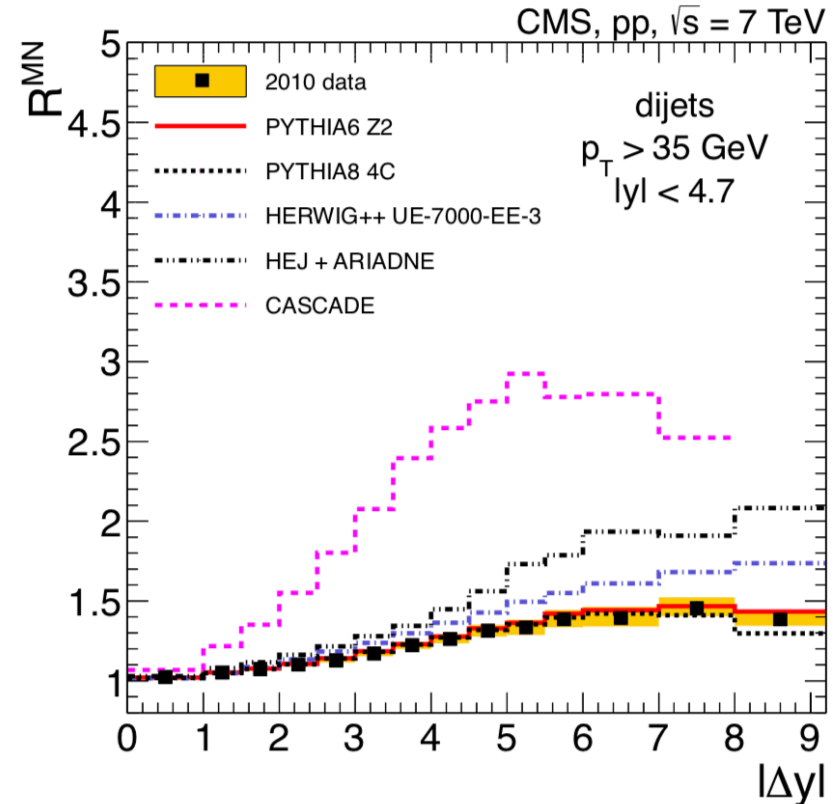
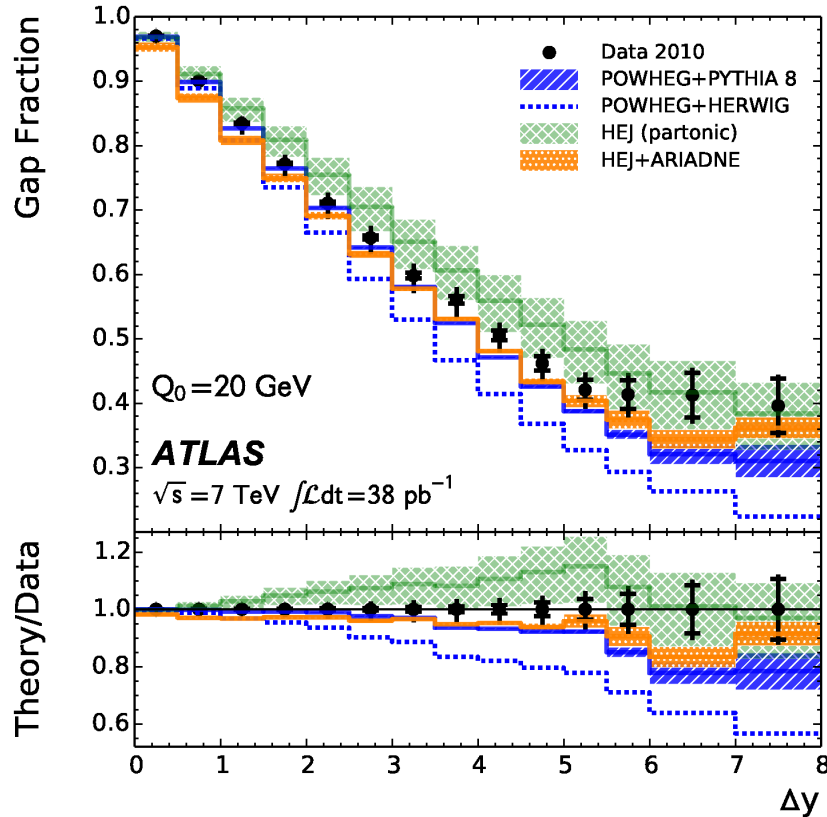
LHC electroweak Xjj production measurements

ATLAS

■ Stat. uncertainty
 ■ Total uncertainty
 Theory uncertainty

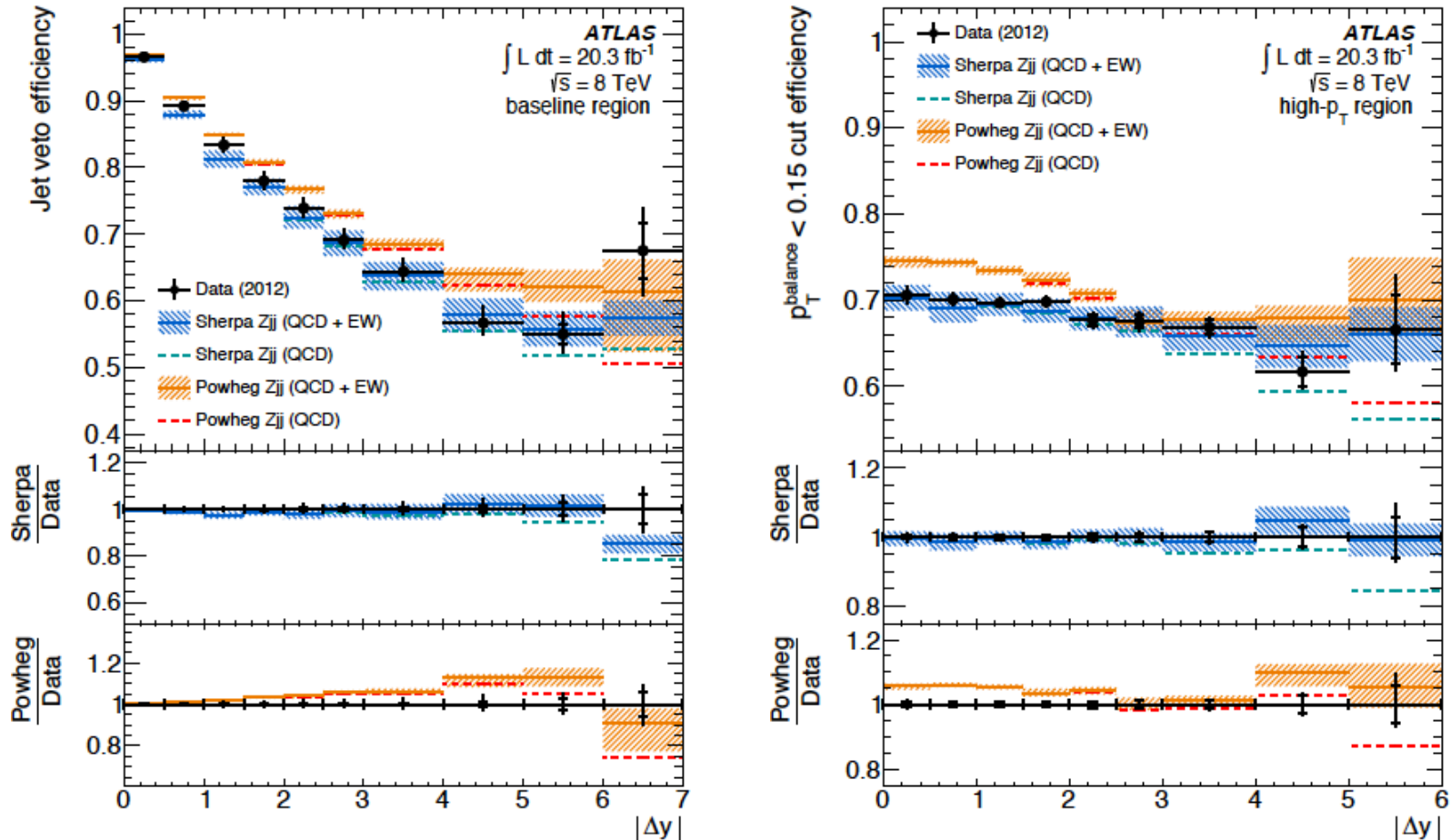


Central jet activity in wide-angle dijet production



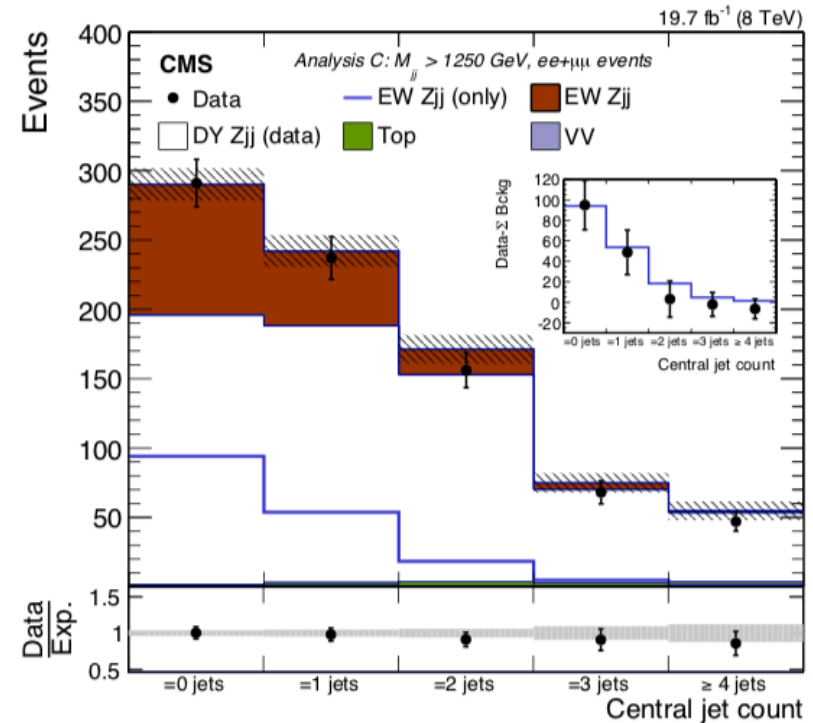
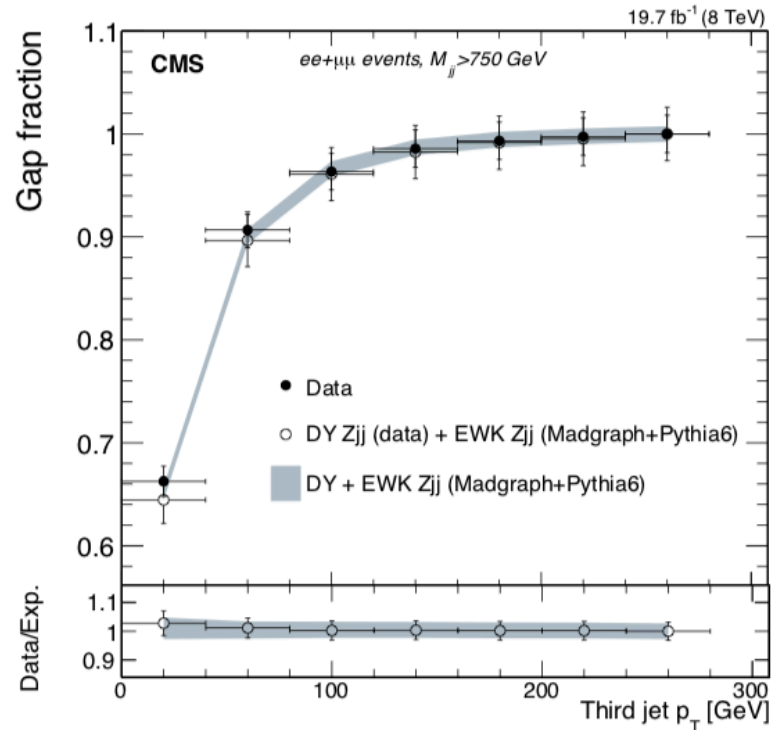
- Measurements include: jet veto efficiency, average number of in-gap jets, angular correlations between tagging jets
 - as a function of dijet rapidity span, average p_T of tagging jets
 - for different choices of tag jets (high- p_T or forward/backward) and jet veto threshold

Measurement of jet veto efficiency in VBF Z production: ATLAS



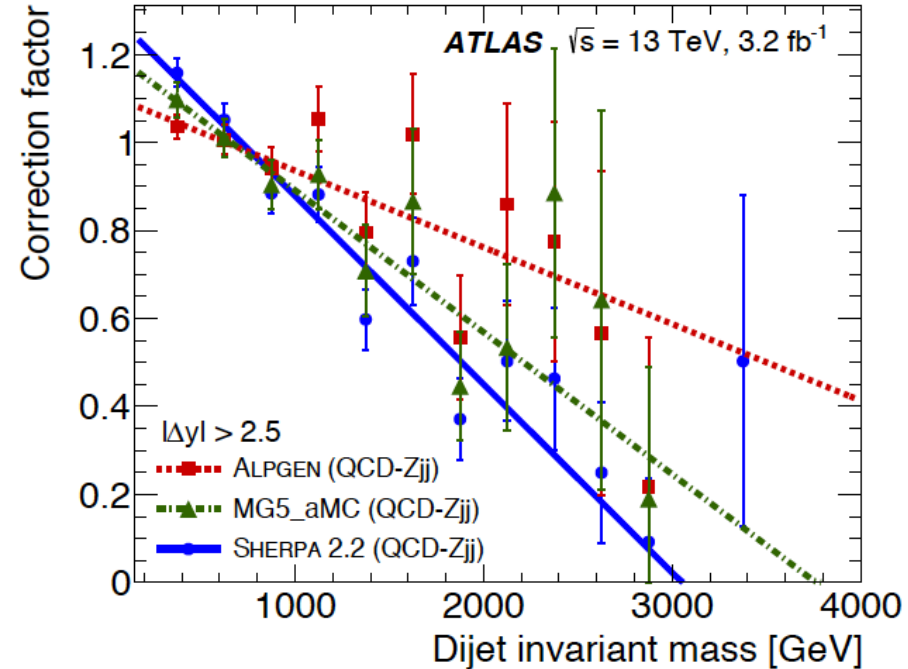
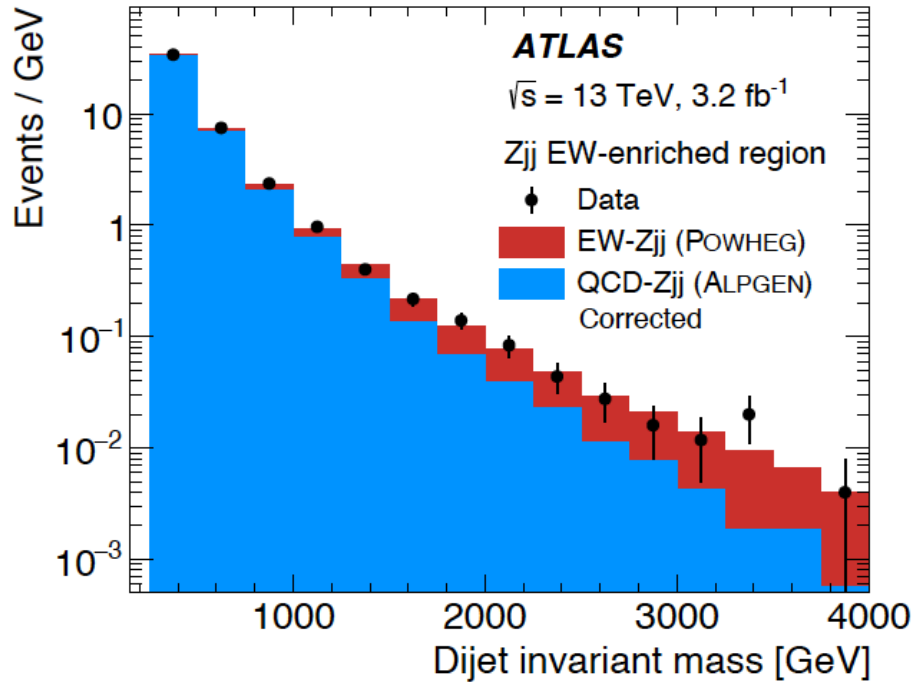
- Measurements include jet veto efficiency, number of in-gap jets, p_T -balance between Z-boson and dijet-system, azimuthal angle between jets:
 - As a function of dijet invariant mass and dijet rapidity separation
 - In multiple phase space regions with different sensitivity to VBF process

Measurement of jet veto efficiency in VBF Z production: CMS



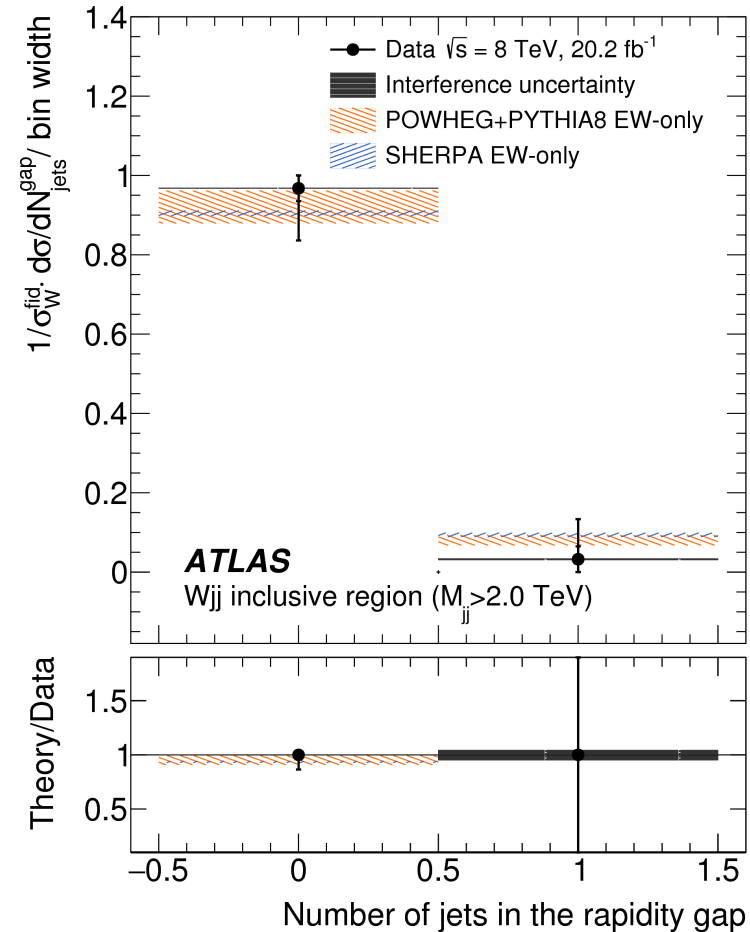
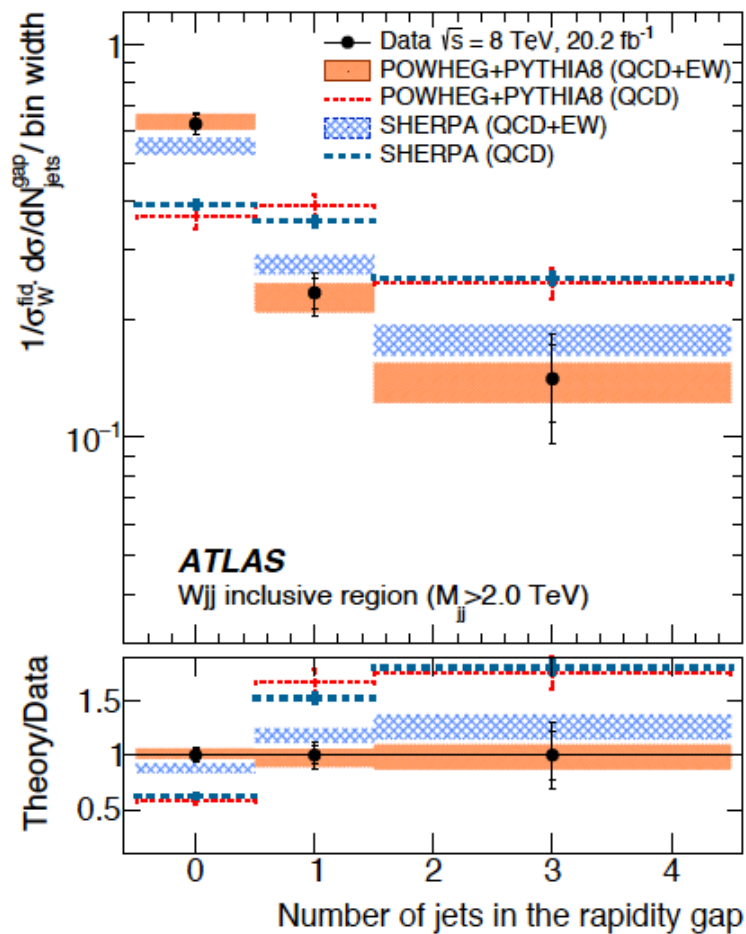
- Detector-level studies of jet veto efficiency in non-VBF dominated regions
 - As a function of jet veto threshold, sum- H_T of jets
- Detector-level studies of central jet multiplicity in VBF-enhanced regions

Use of central jet veto to extract the VBF Z component



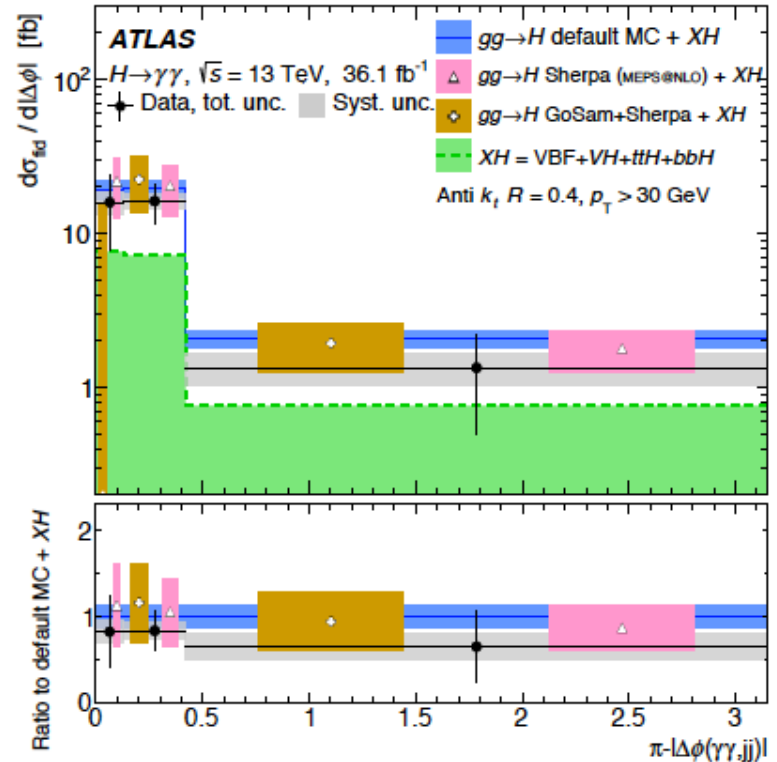
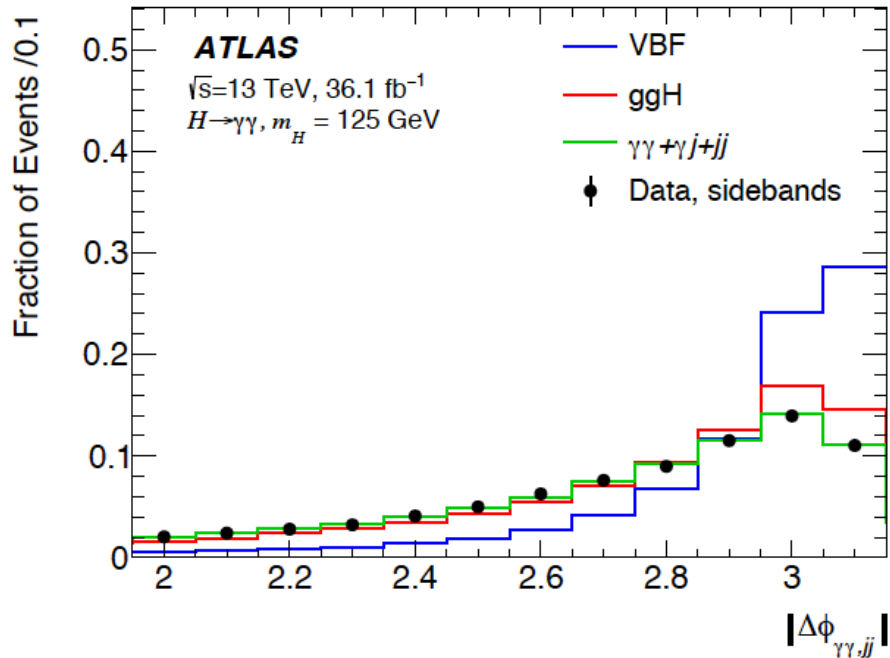
- Signal region defined by applying a central jet veto
- Control region defined by reversing this veto:
 - Data-driven constraint on dijet invariant mass spectrum for non-VBF backgrounds
 - Huge reduction in theory/experimental uncertainties

Measurement of central jet activity in VBF W production: ATLAS



- Huge set of measurement, including number of in-gap jets, azimuthal angle between jets
- First differential cross sections for VBF processes (including central-jet activity)

Constraints on central jet activity in VBF Higgs production



- VBF studies in ATLAS/CMS extract VBF components using BDT, input variables include those that are sensitive to central-jet activity (i.e. angle between Higgs and dijet system)
- First measurements sensitive to central-jet activity in Higgs events are being published
 - currently limited in sensitivity, will improve dramatically with larger datasets

Summary

- Huge range of measurements of central-jet activity in VBF topologies
 - Dijet production with up to 9 units of rapidity separation
 - Measurements of central-jet activity in Z_{jj} and W_{jj}
 - First differential measurements of VBF processes
 - First measurements of Higgs production
- Jet veto measurements can be used to constrain theoretical modelling uncertainties:
 - of non-VBF backgrounds in V_{jj} analyses
 - (and of initial-state radiation in top-antitop events [see e.g. EPJC 72 (2012) 2043])
- Rivet routines and detector-corrected data are available for most measurements for use by wider theory community.