Central jet veto measurements in VBF topologies at ATLAS and CMS

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Overview:
1) dijet production
2) Zjj production
3) Wjj production
4) Hjj 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
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 Zjj and Wjj
  – 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 Vjj 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.