Multijets
Present status and future plans

ATLAS Pisa Meeting
8 Set 2010

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Milestones

- 18th August: the first multijet CONF note was fully approved (for HCP)
- 2nd September: meeting was organized to discuss the goals/challenges within the multijet group for the analysis of the 2010 dataset

http://indico.cern.ch/conferenceDisplay.py?confId=105143

Multijet CONF note

- Data: first 17 nb^{-1} @ $\sqrt{s}$=7TeV (periods ABC)
- Main results can be found at:
  https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CONFNOTES/ATLAS-CONF-2010-084/
- First measurement of:
  - Inclusive jet multiplicity spectrum
  - Ratio of the n-jet cross section to the (n-1)-jet cross section
  - Differential cross section as a function of jet pT for leading and subleading jets up to 4
  - Differential cross section as a function of event HT
  - Ratio of the 3-jet cross section to the 2-jet cross section as a function of HT – can be used for fitting α_s

More Details – Rich Material

HCP Conference Note Analysis - wiki

https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HCPConfNoteAnalysis

Multi-jet Group - wiki

https://twiki.cern.ch/twiki/bin/view/AtlasProtected/MultiJetCrossSection

Multi-jet cross-section conference note - wiki

https://twiki.cern.ch/twiki/bin/view/AtlasProtected/MultiJetCrossSectionConfNote

Multijet cross section CONF note – Live-page

http://indico.cern.ch/conferenceDisplay.py?confId=97928

Multi-jet e-group archives

https://groups.cern.ch/group/atlas-multijet-cross-section/default.aspx

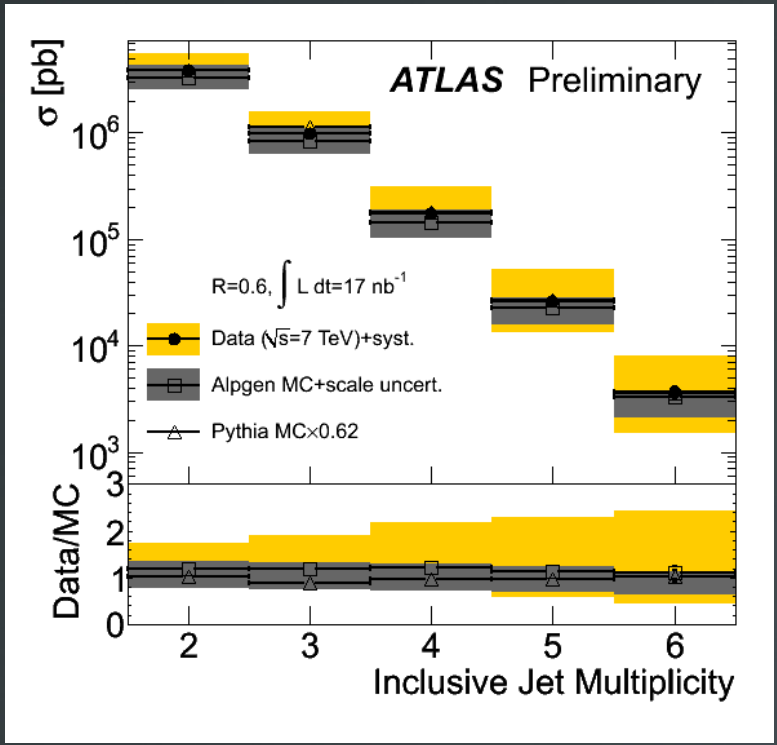
SVN repository

https://svnweb.cern.ch/trac/atlasgrp/browser/Physics/StandardModel/QCD/multijet/notes/ConfnoteSumme

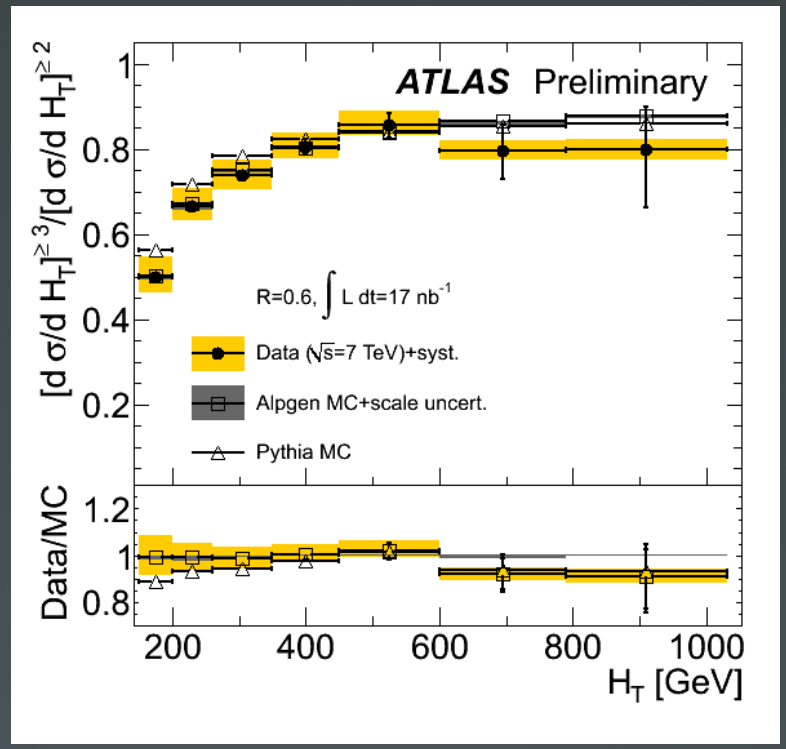
CONF note in CDS: ATL-COM-PHYS-2010-571, 15 p., http://cdsweb.cern.ch/record/1280721

COM note in CDS: ATL-COM-PHYS-2010-572, 70 p., http://cdsweb.cern.ch/record/1280722

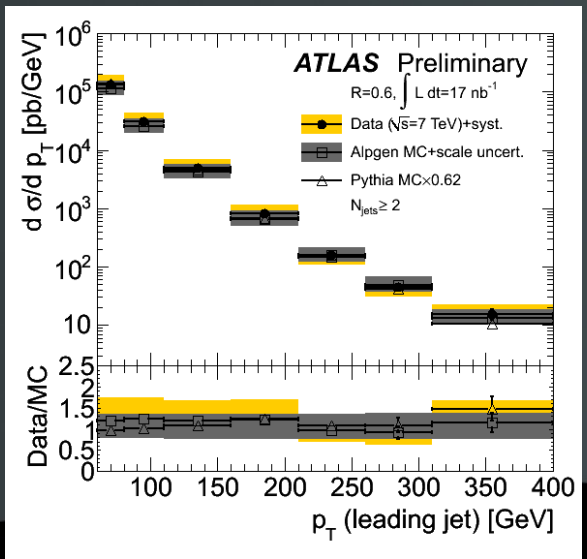
Some results

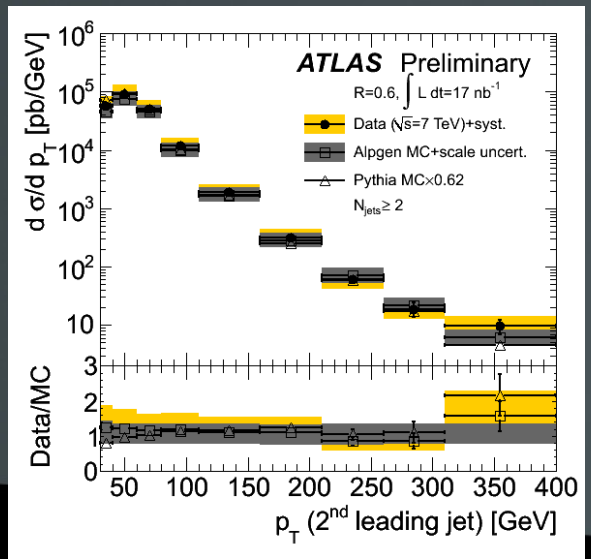


Inclusive jet multiplicity



Ratio HT3/HT2





1st and 2nd jet pT

Next steps 1

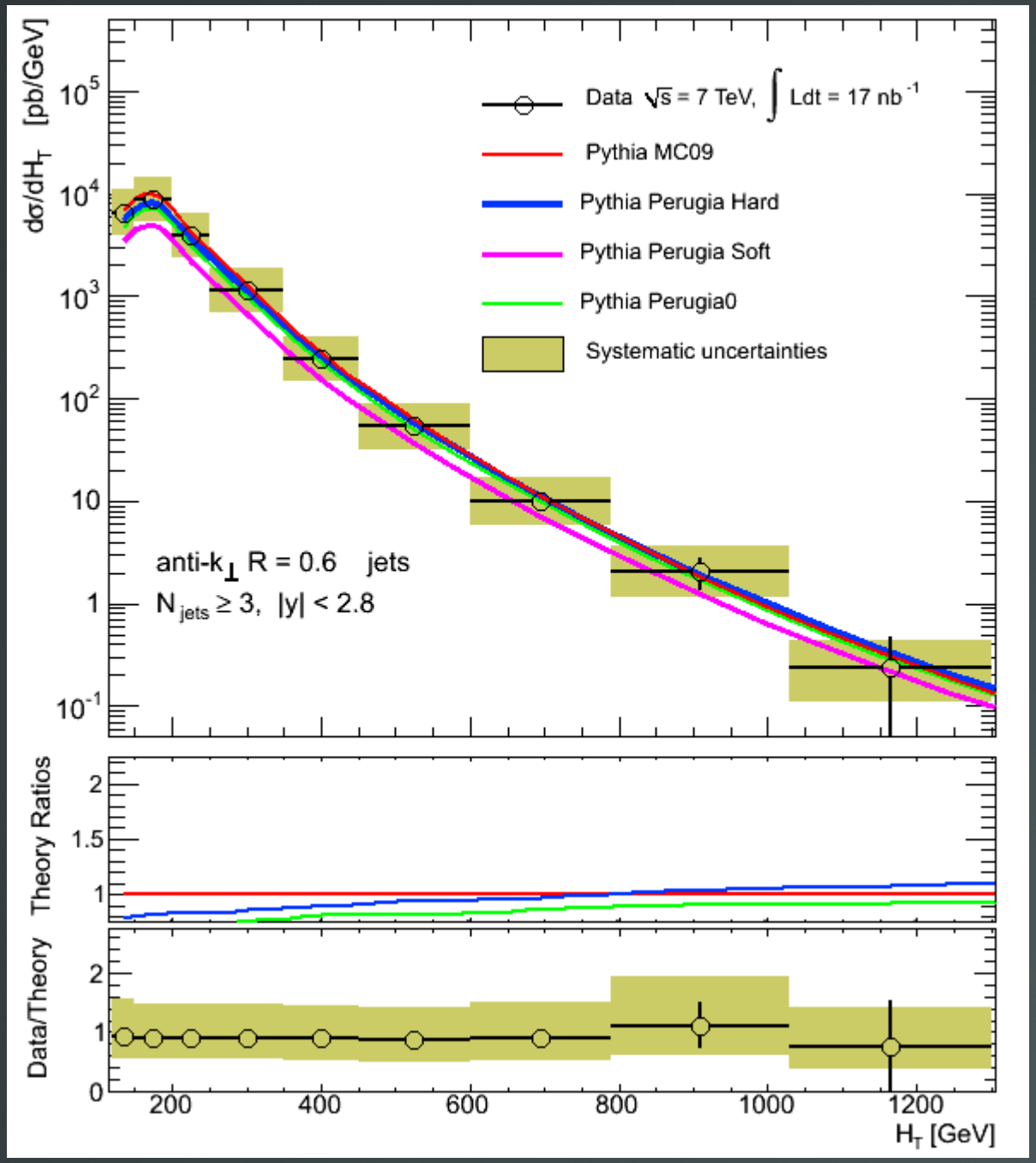
Studies with Rivet using several Pythia tunings

- MC09, Perugia0, Perugia Hard, Perugia Soft
- Use Pythia MC09 as baseline for comparisons

Purpose

- Check sensitivity to the soft QCD effects, such as
- UE and particularly at low pT
- Understand if the differences between Data and
- Pythia can be explained by UE differences
- Compare predictions of Pythia with different tunings to data

Example



Rivet module prepared by

Paolo Francavilla ✓

Next steps 2

Study other tunings of 2-to-2 MCs as well

- Pythia Professor
- Pythia Perugia2010
- Herwig++
- New ATLAS Tunes

We can use these simulation to derive a bin-by-bin non perturbative correction for some of the observables

Next steps 3

NLO Calculations

- Measurements in the 2-jet and 3-jet bin can be calculated to NLO
- Cross-section ratios are particularly interesting for fitting to α_s
- Use APPLgrid/NLOJET++ for the NLO
  - useful for PDF, alpha_s and muR muF scale variation)
  - Paolo is running a test module since a week now

Goals

- Make an advanced analysis for winter conferences and a finalized analysis for a paper soon after
- Use full data10 sample
- Use global jet triggers
- Use multi jet triggers
- Use jets with different cone parameter (0.4, les impact of UE effects)
- Hit the PU effect with the JVF variable
- Try to reduce the JES systematics
- NLO predictions
- Invent new multijet observables

Plans for VBF Higgs

- 10-100 pb^{-1} data
- VBF H (low masses)
  - → bbbar: ~ 90 %
  - → $\tau+ \tau-$: ~ 10 %
- Select 4-jet final states
- For central jet pairs
  - Use b-tagging to
  - Use tau recontruction+identification
  - Measure all properties of central and forward jets