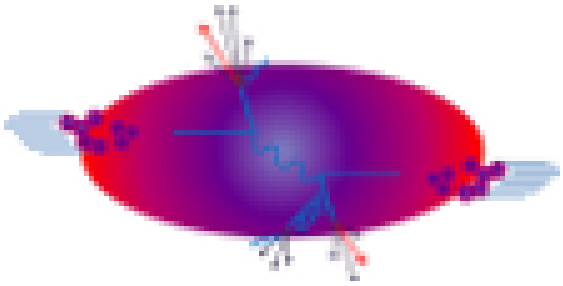
Jet reconstruction and spectroscopy at hadron colliders



Report of Contributions

https://indico.cern.ch/e/pisa-jet-workshop

Contribution ID: **4** Type: **not specified**

Welcome

Monday, 18 April 2011 09:00 (10 minutes)

Presenter: BELLETTINI, Giorgio (University and INFN, Pisa)

Contribution ID: **5** Type: **not specified**

Jets in their habitat

Monday, 18 April 2011 09:55 (45 minutes)

In the talk I will cover recent aspects of jet reconstruction at the LHC. As an introduction I will start by addressing the need for a robust set of jet definitions and the progress that has been achieved in that direction over the last years. Then I will discuss various techniques, built on that robust set of jet definitions, that have been developed to improve jet reconstruction. In particular, I will show that jet areas can be used as a way to handle pile-up contamination and motivate the use of jet substructure to tag boosted particles.

Presenter: SOYEZ, Gregory (CEA Saclay)

Session Classification: Overview Presentations

Contribution ID: **6** Type: **not specified**

Effects of calorimeter peculiarities on the Jet Energy Scale

Monday, 18 April 2011 09:10 (45 minutes)

It is well known that non-compensating calorimeters, such as the ones used in the general purpose experiments at the Tevatron and the LHC, offer particular problems for correctly reconstructing the energy deposited by single hadrons and jets. In this talk,
I will review these problems, discuss the remedies usually employed, and offer possible alternatives.

Presenter: WIGMANS, Richard (Texas Tech University)

Session Classification: Overview Presentations

Contribution ID: **7** Type: **not specified**

Overview of CMS performances and results with Jets

Monday, 18 April 2011 11:55 (45 minutes)

The performance of the Compact Muon Solenoid detector during the operation of the Large Hadron Collider with pp and HI collisions in 2010 will be reviewed. Selected results with emphasis on physics with jets will be presented, with an outlook to the 2011 data taking.

Presenter: TENCHINI, Roberto (University of Pisa)

Session Classification: ATLAS & CMS Overview

Contribution ID: **8** Type: **not specified**

Jet measurements in ATLAS

Monday, 18 April 2011 11:10 (45 minutes)

The ATLAS experiment at the Large Hadron Collider (LHC) features a multi-purpose detector system with nearly complete coverage of the solid angle around the proton-proton or heavy ion collisions. It collected nearly 40/pb of proton data in 2010, and resumed data taking in early Spring 2011.

In this talk all aspects of jet physics, starting from jet reconstruction and calibration from the detector signals and the evaluation of the jet reconstruction performance with collision data, to the measurement of Standard Model (SM) physics and first access to exclusions of physics beyond the SM with jet final states, are presented. Among those are recently published results for the jet and di-jet cross-sections, the azimuthal correlation between jets in di-jet production, and results from other SM final state analysis involving jets. In addition, first results for new phase space limits for exclusions of new physics using jet final states are shown. Last but not least, the first results from jets in heavy ion collisions are briefly presented.

Presenter: LOCH, Peter (University of Arizona)

Session Classification: ATLAS & CMS Overview

Contribution ID: **9** Type: **not specified**

Top quark physics at CDF

Tuesday, 19 April 2011 09:00 (40 minutes)

Top quark physics is one of the most important successes of the concluding Tevatron program. In this talk, a summary of the most recent measurements of top quark properties, including the mass
and its Winter 2011 average, will be presented. Some common techniques and discussion of major systematic uncertainties for top measurements will also be presented. Furthermore, the possibility to
use top samples for future improvement of the jet calibration and resolution for b and light jets will be
discussed as well.

Presenter: VELEV, George (FNAL)

Session Classification: Top Quark Physics with Jets

Contribution ID: **10** Type: **not specified**

Use of the jet mass in the reconstruction of hadronic W and Z boson decays in the D0 experiment

Tuesday, 19 April 2011 10:50 (25 minutes)

Use of the jet-mass variable can significantly improve the reach of searches for high-mass diboson resonances. Traditional searches for this process have focused on the purely leptonic final state to reduce contamination from the large QCD jet background. We show that the significance to diboson
resonances can be enhanced when considering events with one or two leptons and at least one high
transverse momentum jet, whose reconstructed mass is consistent with a W or Z boson decay. We will
present the jet mass as a strong discriminating variable between QCD jets and W/Z boson initiated jets and the level to which this quantity is modeled by Monte Carlo simulations. We will illustrate this approach using the search for WW and WZ resonances with 5.4 fb-1 of DZero data.

Primary author: GADFORT, Thomas (BNL)

Presenter: GADFORT, Thomas (BNL)

Session Classification: W/Z and Higgs

Contribution ID: **11** Type: **not specified**

Methods and algorythms in CDF for diboson production in hadronic final states

Tuesday, 19 April 2011 11:40 (25 minutes)

A benchmark for Higgs discovery at the Tevatron is the diboson production in hadronic final states. Before every finding of the Higgs we have to show that we can re-discover this known Standard Model process. The same set of techniques used for Higgs can be tried on dibosons to see their effectiveness: jet reconstruction algorythms, b tagging methods, background reduction methods etc. I will review in this talk the latest set of methods and algorithms used to search for dibosons in hadronic final states.

Presenter: RUSU, Alexandru (Fermilab)

Session Classification: W/Z and Higgs

Contribution ID: **12** Type: **not specified**

Some remarks on new physics with jets

Tuesday, 19 April 2011 14:30 (45 minutes)

I make some remarks about using jets to search for new physics at hadron colliders.

Presenter: BARBIERI, Riccardo (Scuola Normale Superiore, Pisa)

Session Classification: Inputs from Theory

Contribution ID: **19** Type: **not specified**

Jet reconstruction and measurements in CMS

Monday, 18 April 2011 14:30 (25 minutes)

We present a summary of jet reconstruction and measurements of jet performance at CMS from the 2010 run. Examples of jet commissioning, and measurements of jet energy corrections and jet resolution along with their systematic uncertainty are shown. We also present studies of tagging boosted top quarks and W bosons using specialized jet algorithms.

Presenter: STADIE, Hartmut (Universität Hamburg)

Session Classification: Jet Energy Scale and Resolution

Contribution ID: **20** Type: **not specified**

In-situ measurements of the Jet Energy Scale in ATLAS

Monday, 18 April 2011 14:55 (25 minutes)

Hadron jets are the most commonly observed objects in p-p collisions at the Large Hadron Collider at CERN. Because of this, they are part of the final state of almost any process, and are an important probe in searches for extensions of the Standard Model.

A precise knowledge of the energy calibration for jets is difficult to ascertain for a number of reasons, and is a necessary ingredient in the ATLAS experimental program. We will present in-situ techniques and results for the jet energy scale at ATLAS using recent collision data. We have demonstrated an understanding of the necessary jet energy corrections to within ˜ 4% in the central region of the calorimeter.

Presenter: SCHOUTEN, Doug (Simon Fraser University (SFU))

Session Classification: Jet Energy Scale and Resolution

Contribution ID: **21** Type: **not specified**

Jet Energy Scale measurement at D0

Monday, 18 April 2011 15:20 (25 minutes)

Presenter: PETRILLO, Gianluca (University of Rochester)

Session Classification: Jet Energy Scale and Resolution

Contribution ID: **22** Type: **not specified**

Inclusive jet cross section measurement in ATLAS

Monday, 18 April 2011 16:10 (25 minutes)

The inclusive jet cross section has been measured in proton-proton collisions at a centre-of-mass energy of 7 TeV using the ATLAS detector at the LHC. The full 2010 dataset has been used, consisting of a total integrated luminosity of 37 pb-1 . The anti-kt algorithm is used to identify jets with two jet radius parameters, R = 0.4 and R = 0.6. Jet shapes measurements are performed to validate the models for parton shower, fragmentation into hadrons, and the underlying event contributions contained in the event generators. The inclusive jet cross section measurement is presented as a function of jet transverse momentum and rapidity, for jets with transverse momentum from 20 GeV to 1.5 TeV in a rapidity range |y| < 4.4. The data are compared to expectations based on next-to-leading order QCD corrected for non-perturbative effects. In addition to a validation of the theory in a new kinematic regime, the data also provide sensitivity to parton distribution functions in a region where they are currently poorly constrained.

Presenter: VIVES VAQUE, Francesc (Inst. de Fisica de Altas Energias (IFAE))

Session Classification: QCD Results

Contribution ID: **23** Type: **not specified**

Measurement of multi-jet cross-sections in proton-proton collisons at 7 TeV center-of-mass energy

Monday, 18 April 2011 16:35 (25 minutes)

Inclusive multi-jet production is studied using the ATLAS detector for pp collisions with a center-of-mass of 7 TeV. The data sample corresponds to an integrated luminosity of 2.43 pb-1, using the first pp data collected by the ATLAS detector in 2010. Results on multi-jet cross sections and angular distributions are presented and compared to both LO plus parton-shower Monte Carlo predictions and NLO QCD predictions.

Presenter: ZINONOS, Zinonas ((University and INFN, Pisa))

Session Classification: QCD Results

Contribution ID: **24** Type: **not specified**

Jet and multijet results from CMS

Monday, 18 April 2011 17:00 (30 minutes)

Various jet measurements based on the 2010 data collected by the CMS experiment at a center-of-mass energy of 7 TeV are presented. Results from inclusive jet cross-sections, dijet mass spectra, dijet angular distributions, hadronic event shapes and the ratio of the 3 jet to 2 jet production cross-sections will be illustrated.

Presenter: KOUSOURIS, Konstantinos (Fermilab)

Session Classification: QCD Results

Contribution ID: **25** Type: **not specified**

CMS new physics searches with jets

Monday, 18 April 2011 17:30 (25 minutes)

We discuss the results of searches for various new physics phenomena with jets from the pp collisions at 7 TeV delivered by LHC and collected with the CMS detector in 2010. Final states with di-jets, multi-jets, jets+MET and jets+leptons are explored. In in many cases the searches set the most stringent limits on possible new physics phenomena.

Presenter: DUGGAN, Daniel (Rutgers University)

Session Classification: Searches and New Physics with Jets

Contribution ID: **26** Type: **not specified**

Searches for new physics with jets in ATLAS

Monday, 18 April 2011 17:55 (25 minutes)

We present the latest results of searches for new physics beyond the Standard Model with jets in the final state using the ATLAS detector. These analysis are performed with the full LHC 2010 data from proton-proton collisions at center-of-mass energy of 7TeV. The results are based on the integrated luminosity between 33 to 37 pb-1 depending on the analysis. No significant discrepancy is found with the expected Standard Model predictions. However, new limits on various models are set beyond the reach of previous experiments.

Presenter: SALVACHUA, Belen (ANL)

Session Classification: Searches and New Physics with Jets

Contribution ID: **27** Type: **not specified**

Supersymmetry searches in multijet evets with CMS

Monday, 18 April 2011 18:20 (25 minutes)

Presenter: D'AGNOLO, Raffaele Tito (Scuola Normale Superiore and INFN, Pisa)

Session Classification: Searches and New Physics with Jets

Contribution ID: **28** Type: **not specified**

Top mass reconstruction in ATLAS

Tuesday, 19 April 2011 09:40 (25 minutes)

The top-quark mass is a fundamental parameter of the Standard Model. After the discovery of the top quark, the measurements of its properties were of substantial interest. Within the framework of the SM, the top-quark mass can be used in combination with other electroweak precision measurements to constrain the mass of the yet unobserved Higgs boson. In the new era of the Large Hadron Collider (LHC), the first top quarks have been produced in Europe in proton-proton collisions at a center-of-mass energy of 7 TeV. The top-quark mass measurement of ATLAS in the so called lepton+jets channel with 35 pb−1 integrated luminosity will be presented. In this early data-taking period the largest uncertainty on this measurement comes from the knowledge of the jet energy scale. It will be shown how this uncertainty is determined and which methods are used for measuring the top-quark mass.

Presenter: NEUSIEDL, Andrea (University of Mainz)

Session Classification: Top Quark Physics with Jets

Contribution ID: **29** Type: **not specified**

Top quark and ttbar mass measurements at CMS

Tuesday, 19 April 2011 10:05 (25 minutes)

We present measurements of the top quark mass and of the ttbar invariant mass using the 2010 data collected by the CMS detector in pp collisions at a center-of-mass energy of 7TeV, amounting to a total integrated luminosity of 36 pb-1.

Presenter: CHIERICI, Roberto (CNRS/IPNL)

Session Classification: Top Quark Physics with Jets

Contribution ID: **30** Type: **not specified**

W/Z + jets with the CMS detector

Tuesday, 19 April 2011 11:15 (25 minutes)

We present a study of jet production in association with W and Z bosons in proton-proton collisions at ECM=7 TeV using the full 2010 data set collected by CMS corresponding to an integrated luminosity of 36+-4 pb-1. The production of vector bosons with jets provides a stringent and important test of perturbative QCD calculations, and is an important background in searches for new physics and for studies of the top quark. Jet reconstruction in this particular final state topology is also made more difficult by the presence of leptons from the vector boson decay in the final state. A precise measurement of the cross section and an understanding of lepton and jet kinematics is therefore essential. We report the normalized inclusive rates of jets produced as well as the ratios sigma(V+(n+1) jets)/sigma(V+n jets) and with a jet threshold of 30 GeV. We also present the first test of the Berends-Giele scaling at 7 TeV.

Presenter: NESPOLO, Massimo (University and INFN, Padova)

Session Classification: W/Z and Higgs

Contribution ID: **31** Type: **not specified**

Search for diboson production in the lepton + MET + bb channel in b-jet in final states

Tuesday, 19 April 2011 12:05 (20 minutes)

Studying diboson associated production in a final state with a lepton, neutrino, and bb-pair is important since the event topology of this process is the same as expected for associated production of a W and a Standard Model light-Higgs boson. Thus, we consider the search for Diboson production as a preliminary step towards the Higgs discovery. Here we present a search for WW/WZ in events with a lepton, missing transverse energy, and b-quark jets. A first attempt to improve the QCD and W+jets background modeling in this sample will be presented. In addition a new multivariate tagger to distinguish b-quark jets from light-quark jets is introduced. This study is an application of one of the diboson search methods discussed by V. Rusu. We expressly require events with a leptonically decayed W, and search for associated b-jets.

Presenter: TROVATO, Marco (INFN, Pisa)

Session Classification: W/Z and Higgs

Contribution ID: **32** Type: **not specified**

Vector boson productions and Higgs search in CMS

Tuesday, 19 April 2011 12:25 (25 minutes)

A review of CMS Higgs Boson searches with discovery and exclusion prospects for the coming LHC data is given. Measurements of related electroweak (di-)boson productions are also presented.

Presenter: PIEDRA, Jonatan (IFCA)

Session Classification: W/Z and Higgs

Contribution ID: **33** Type: **not specified**

Experineces on QCD Monte Carlo simulations: a user point of view on the inclusive jet cross-section simulations

Tuesday, 19 April 2011 15:15 (30 minutes)

In the last couple of years important progresses in the simulation of the QCD high pT processes have been carried out. In this talk, a review of the tools and techniques historically used to simulate QCD cross sections will be presented from a user point of view. The benchmark process selected for the discussion is the inclusive jet cross section. The talk will focus on the uncertainties of the Next to Leading Order (NLO) cross sections, on the strategies adopted to correct for the non perturbative effects such as the hadronization and the underlying event, and the new techniques derived during the last years to incorporate in a coherent way the NLO matrix elements in the Monte Carlo generators.

Presenter: FRANCAVILLA, Paolo (University and INFN, Pisa)

Session Classification: Inputs from Theory

Contribution ID: **34** Type: **not specified**

LHC bounds on extra-large dimensions

Tuesday, 19 April 2011 15:45 (30 minutes)

We will discuss the new dominant bounds that can be derived on the coefficient of the effective operator generated by tree-level graviton exchange in large extra dimensions from pp -> jj data at LHC: M_T > 2.1TeV (ATLAS after 3.1/pb of integrated luminosity), M_T > 3.4 TeV (CMS after 36/pb). We clarify the role of on-shell graviton exchange and compare the full graviton amplitude to data, setting bounds on the fundamental quantum-gravity scale.

Presenter: LODONE, Paolo (Scuola Normale Superiore, Pisa)

Session Classification: Inputs from Theory

Contribution ID: **35** Type: **not specified**

Summary talk

Tuesday, 19 April 2011 16:40 (40 minutes)

Presenter: RODA, Chiara (University and INFN, Pisa)

Session Classification: Summary and Discussion

Contribution ID: **36** Type: **not specified**

Open discussion

Tuesday, 19 April 2011 17:20 (1h 40m)

Session Classification: Summary and Discussion

Contribution ID: **37** Type: **not specified**

Invariant Mass Distribution of Jet Pairs Produced in Association with a W boson in proton-antiproton Collisions at sqrt(s)=1.96 TeV

Monday, 18 April 2011 14:00 (30 minutes)

Presenter: ANNOVI, Alberto (Istituto Nazionale Fisica Nucleare (INFN) - Laboratori Nazionali di Frascati)

Session Classification: Jet Energy Scale and Resolution