Santa Fe Jets and Heavy Flavor Workshop

Report of Contributions

https://indico.fnal.gov/e/sfjet16

Contribution ID: **50** Type: **not specified**

Welcome

Monday, 11 January 2016 09:00 (10 minutes)

Presenter: Dr VITEV, Ivan (Los Alamos National Laboratory)

Session Classification: Session 1

Contribution ID: **51** Type: **not specified**

An overview of jet studies in pp collisions at LHC

Monday, 11 January 2016 09:10 (30 minutes)

In this talk, we review the latest developments of jet finding techniques and corresponding experimental results from LHC Experiments.

Presenter: SALUR, Sevil (Rutgers University)

Session Classification: Session 1

Contribution ID: **52** Type: **not specified**

Production of Jets in Hadronic Collisions beyond NLO

Monday, 11 January 2016 09:40 (30 minutes)

In this talk we discuss the resummation of large logarithmic perturbative corrections to single-inclusive jet production at hadron colliders. The corrections arise near the threshold for the partonic reaction, when the incoming partons have just enough energy to produce the high-transverse-momentum final state. We show that these corrections are important on the way to precision jet phenomenology at the LHC.

Presenter: Mr HINDERER, Patriz (University of Tuebingen)

Session Classification: Session 1

Contribution ID: **53** Type: **not specified**

Dijet event shape at the LHC in SCET

Monday, 11 January 2016 11:00 (30 minutes)

We present the calculation of the unmeasured soft function necessary for the study of dijet production in pp collisions. The calculation is independent of the choice of the jet (sub-)structure measurement. While our results are valid for all 2 -> 2 channels, we compute explicitly for the qq -> qq channel the color-flow matrices and plot the NNLL resummed differential cross section. A boost invariant version of angularities is introduced and the jet substructure measurement is assumed for both jets. For resuming large logarithms we use SCET factorization formula where the independent components are evolved from the natural scale to a universal scale using the corresponding RGEs. The factorization formula involves the previously unstudied unmeasured beam functions which are present in finite rapidity cuts around the beams. In addition, we implement the recently introduced soft-collinear refactorization to resum logarithms of the jet size.

Presenter: Mr MAKRIS, Yiannis (Duke University)

Session Classification: Session 2

Contribution ID: **54** Type: **not specified**

Toward N^3LL resummation of a DIS event shape

Monday, 11 January 2016 12:00 (30 minutes)

Event shapes provide a key method of measuring jets in deep-inelastic scattering (DIS). This was done successfully by H1 and ZEUS and compared with theoretical calculations with next-to-leading-logarithmic (NLL) resummation.
We will present our progress for a high precision calculation of a event shape called DIS thrust, with next-to-next-to-next-to-leading-logarithmic resummation. We will also show a rigorous treatment of hadronization corrections. Perturbative resummation uncertainties in the cross section are reduced to the 2% level for a significant region of the HERA phase space in x and Q, thus allowing for new accurate measurements of $\alpha_s(m_Z)$.

Presenter: KANG, Daekyoung (Los Alamos National Lab)

Session Classification: Session 2

Contribution ID: **55** Type: **not specified**

The need for surface bias studies for correlation analyses

Tuesday, 12 January 2016 12:00 (30 minutes)

High momentum particle correlations, such as di-hadron, direct photon-hadron and jet-hadron correlations, have provided valuable insight into the properties of the Quark Gluon Plasma. High momentum hadrons as triggers are biased to have originated near the surface of the created medium. Direct photons can originate from anywhere within the medium. Fully reconstructed jets as a trigger can be tuned based on the parameters of the jet finding algorithm to originate from various pathlengths. However, complete understanding of how these parameters influence the pathlength must be explored through theoretical models and calculations. The comparison between these three types of correlations probe the pathlength dependence to the energy loss and comparison between the same correlations measured at RHIC and LHC will reveals the q-hat dependence of temperature. Experimental results to date have been limited by statistical precision and systematic uncertainties. However, with the start of Run 2 at the LHC underway and the future detector, sPHENIX, planned at RHIC, detailed comparison between different correlation measurements and from LHC and RHIC will be able to put strong constraints on models. While, surface biases studies have been done within the framework of some models, such as YaJEM and JEWEL, more theoretical models and analytical calculations should explore these features to shape our understanding of how these biases influence the observed quantities. This talk will review current experimental correlation results relevant to jets, anticipated results and the importance of understanding the biases with the guidance of theory to fully test models and develop a complete understanding of partonic energy loss in the QGP.

Presenter: CONNORS, Megan

Session Classification: Session 6

Contribution ID: **56** Type: **not specified**

Analysis of exclusive kT algorithm in electron-positron annihilation

Monday, 11 January 2016 11:30 (30 minutes)

We study the factorization of the diet cross section in electron positron annihilation using the generalized exclusive jet algorithm which includes the cone-type, the JADE, the kt, the anti-kt and the Cambridge/Aachen jet algorithms as special cases. In order to prove the characteristics of the jet algorithms in a unified way, we consider the generalized kt jet algorithm with an arbitrary weight of the energies, in which various types of the kt-type algorithms are included for specific values of the parameter. We analyzed the kt algorithm from the limiting behavior of the parameter. The kt algorithm breaks the factorization since the jet and the soft functions are infrared divergent and are not defined for specific values of the parameter. In our paper, we gave a phenomenological analysis using the resummed and the fixed-order results, but, in this talk, I will concentrate on the generalized jet algorithm and its characteristics.

Presenter: KIM, Inchol

Session Classification: Session 2

Contribution ID: **57** Type: **not specified**

Predictions for p+Pb Collisions at the LHC

Monday, 11 January 2016 14:00 (30 minutes)

Presenter: VOGT, Ramona (LLNL and UC Davis)

Session Classification: Session 3

Contribution ID: **58** Type: **not specified**

Heavy Flavor Production in pp, pPb and PbPb collisions with CMS detector

Monday, 11 January 2016 14:30 (30 minutes)

One of the most important testing ground for the theoretical understanding of jet quenching is the parton flavor dependence of the in-medium energy loss and CMS has excellent capability to study heavy quark jets and mesons in heavy ion collisions. In this summary talk, studies of non-prompt J/psi, B and D meson production in pp, pPb and PbPb collisions at various of collision energies are summarized. The prospect of the LHC Run II data analysis will also be presented.

Presenter: Prof. LEE, Yen-Jie (Massachusetts Institute of Technology)

Session Classification: Session 3

Contribution ID: **59** Type: **not specified**

Quenching of heavy flavors at the LHC

Monday, 11 January 2016 15:00 (30 minutes)

Theoretical and experimental advances in understanding light jet/hadron production and modification in Pb+Pb reactions have been a highlight of the LHC heavy ion program. At the same time, the detailed mechanisms of heavy quark propagation and energy loss in dense QCD matter are not yet fully understood. With this motivation, we present theoretical predictions for the nuclear-induced attenuation of the differential cross section for inclusive b-jet production in heavy ion collisions and comparison to CMS data [1]. We find that the attenuation is comparable to the one observed for light jets in the large transverse momentum region. We then extend this study to photon and B-meson tagged b-jet to enhance the sample of events with heavy quarks produced at the early stages of the collision. Theoretical predictions for the quenching of such tagged b-jet events at the LHC and the QGP-induced modification of the related momentum imbalance and asymmetry are presented [2]. We find these tagged b-jets have a much more direct connection to the b-quark energy loss. To facilitate further constrain of the flavor origin of final state observed heavy flavor particles, we present our calculation for heavy meson production inside jets by using Soft Collinear Effective Theory [3]. We find that the jet fragmentation function for heavy meson production is very sensitive to the gluon-to-heavy-meson fragmentation function, which can be used to clarify which aspects of heavy flavor dynamics are probed in heavy ion reactions at the LHC.

[1]. J. Huang, Z. Kang and I. Vitev, Phys. Lett. B726, 251.
[2]. J. Huang, Z. Kang, I. Vitev and H. Xing, Phys. Lett. B750, 287.
[3]. Y. Chien, Z. Kang, F. Ringer, I. Vitev and H. Xing, arXiv: 1512.06851.

Presenter: Dr XING, HONGXI (Los Alamos National Laboratory)

Session Classification: Session 3

Contribution ID: **60** Type: **not specified**

Quarkonium production: results from LHC run-1

Monday, 11 January 2016 16:00 (30 minutes)

The study of quarkonium production in nuclear collisions is an essential tool to investigate the properties of the medium. After extended investigations at SPS and RHIC energies, the LHC experiments have collected, during run-1, a wealth of new data on charmonium and bottomonium production in both Pb-Pb and p-Pb collisions. Among other results, strong indications for the observation of charm quark recombination and for the sequential suppression of the Upsilon resonances have been obtained. In this talk I will review the LHC results, with an emphasis on what we learned from the comparison with RHIC data and with theoretical models, and on remaining open questions. Finally, prospects for the LHC run-2, now in progress, will be shortly presented.

Presenter: Dr SCOMPARIN, Enrico (INFN Torino - Italy)

Session Classification: Session 4

Contribution ID: **61** Type: **not specified**

Open and Hidden Heavy Flavor at PHENIX

Monday, 11 January 2016 16:30 (30 minutes)

The PHENIX Collaboration has examined charm and bottom quark production in p+p, p+A, and A+A collisions at RHIC for the past 15 years. While much has been learned, our understanding of the effects apparent in nuclear collisions is constantly evolving. Recent instrumentation upgrades have led to a greatly increased capability for heavy quark measurements at PHENIX, namely the separation of charm and bottom contributions and observations of excited charmonia at forward and backward rapidity. This presentation will discuss recent PHENIX results on open heavy flavor and quarkonia, with an emphasis on new heavy quark measurements in small systems and their interpretation.

Presenter: Dr DURHAM, Matt (LANL)

Session Classification: Session 4

Contribution ID: **62** Type: **not specified**

Heavy flavor in medium

Wednesday, 13 January 2016 11:00 (30 minutes)

The interactions of heavy quarks in medium are believed to encode valuable information about the properties of the quark–gluon plasma (QGP). Recent experimental results suggest a strong coupling between heavy quarks and the QGP medium which require non-perturbative interactions. Current lattice-QCD provide valuable information but are not easily analytically continued to real-time physics. This leads us to seek for a solvable model that keeps the most relevant features of heavy-quark (HQ) in the QGP that can reveal underlying mechanisms. We first investigate the problem of defining and extracting a static potential HQ potential in QGP from Lattice-QCD computations of the singlet free energy, using the in-medium T-matrix formalism [1]. A main outcome of the approach is a rather long-range force which is larger than one would estimate from both the free and internal energies. As an initial application we utilize the potential to calculate HQ transport coefficients using the 3D relativistic heavy-light T-matrix. A strong coupling at low momentum is found to transition into a weakly coupled regime at high momentum. The implementation of this new HQ transport coefficient with our collaborator into Langevin simulations for heavy quarks in heavy-ion collisions shows interesting connections between the potential and the resulting elliptic flow [2]. Thus our model can effectively establish a relation between the experimental observables and the underlying in-medium color force as extracted from first-principles lattice calculations.

[1] Shuai Liu, Ralf Rapp, NPA941
[2]Min He, Shuai Liu, Ralf Rapp, in prep.

Presenter: LIU, Shuai (Texas A&M)

Session Classification: Session 10

Contribution ID: **63** Type: **not specified**

ATLAS jet quenching measurements from Run 1 at the LHC

Tuesday, 12 January 2016 09:00 (30 minutes)

In relativistic heavy ion collisions a hot and dense medium of unscreened color charges is produced. Jets arising from hard scattering processes occurring in the early stages of the collisions become attenuated as they propagate through this medium, and thus jets are a crucial tool in characterizing the medium's properties. Connecting experimental results to a theoretical picture and quantitative extraction of medium transport coefficients has proved challenging. The energy loss is expected to depend on the structure of the jet's parton shower, which can vary significantly on a per jet basis. Showers initiated by gluons, light quarks and heavy quarks are expected to be affected differently by the presence of the medium. In this talk I will present a comprehensive series of measurements involving jets performed by the ATLAS Collaboration during Run 1 at the LHC. This series includes measurements of single jet and hadron suppression, jet fragmentation functions and dijet momentum correlations. I will discuss the complementarity of these observables and how the transverse momentum and rapidity dependence investigated in these measurements may be used to elucidate the role of the structure of the parton shower in the energy loss. Finally, I will discuss how the conclusions of the Run 1 measurements, along with improved experimental capabilities, will bear on future measurements at the LHC.

Presenter: Dr ANGERAMI, Aaron (Columbia University)

Session Classification: Session 5

Contribution ID: **64** Type: **not specified**

Jet quenching from QCD evolution

Tuesday, 12 January 2016 09:30 (30 minutes)

Recently an effective field theory for jets in the dense QCD matter has been developed and applied for jet quenching phenomenology. This Soft Collinear Effective Theory with Glauber gluons allows for calculation of medium-induced splitting kernels beyond the approximations made in the traditional energy loss. In this talk we review such results and their incorporation in the QCD evolution equations in order to consistently go beyond the traditional energy loss approach for jet quenching phenomenology. RHIC and LHC data will be compared with the predictions of the new method as well as the energy loss approach.

Presenter: Dr OVANESYAN, Grigory (UMass)

Session Classification: Session 5

Contribution ID: **65** Type: **not specified**

Gamma hadron and jet correlations with the STAR experiment

Tuesday, 12 January 2016 10:00 (30 minutes)

For more than a decade, heavy-ion collisions have allowed us to study the Quark Gluon Plasma (QGP) created in these collisions, where relevant degrees of freedom are partonic rather than hadronic. In the initial stage of the collision, high energy nucleon collisions produce high transverse momentum partons, which fragment and hadronize into a spray of particles that we call a jet. Jets are a well calibrated probe of the QGP as the initial production cross-section should scale by the number of nucleon-nucleon collisions, so that the initial production and structure of the jets are known. Measurements of the fragmentation and yield modification of jets in heavy ion collisions will offer insight into the question of how partons lose energy in the QGP. Photon-jet observables have the advantage that the correlation between the kinematics of the photon and the initially produced partons is stronger than the correlation between the reconstructed jets and the initial partons. The photon also does not interact with the QGP, thus the initial parton kinematics are known. I will report on the results of photon enhanced and pion enhanced hadron azimuthal correlations measured by the STAR experiment in central Au+Au and pp collisions at 200 GeV. I will discuss the prospects of photon enhanced - fully reconstructed jet correlations from the recent high statistics Au+Au data set recorded by STAR in 2014.

Presenter: Prof. REED, Rosi (Wayne State University)

Session Classification: Session 5

Contribution ID: **66** Type: **not specified**

Jet substructures and cross sections in proton and heavy ion collisions

Tuesday, 12 January 2016 11:00 (30 minutes)

Jet substructures and cross sections provide crucial information about the jet formation mechanism. Their precise calculations are necessary for the understanding of the properties of the medium jets pass through. The calculations involve the resummation of large logarithms which can be performed using renormalization group techniques in soft-collinear effective theory. In heavy ion collisions, the jet-medium interactions are mediated by Glauber gluon exchanges which induce extra radiation. This causes the jet cross section suppression and jet broadening. I will discuss the framework and compare the calculations with the jet modification measurements in lead-lead collisions at the LHC with very good agreement.

Presenter: Dr CHIEN, Yang-Ting (Los Alamos National Laboratory)

Session Classification: Session 6

Contribution ID: **67** Type: **not specified**

Jets in p+Pb Collisions

Tuesday, 12 January 2016 11:30 (30 minutes)

High energy proton lead collisions at the LHC allow us to study the effects of the nucleus on hard/soft interactions. These give us a handle on the initial state effects by taking advantage of asymmetry in the collision system. I will summarize the results on the nuclear modification factors for inclusive and heavy flavor tagged jets based on Run1 data collected in 2013 for pPb collisions at \sqrt{s_{pA}}= 5.02 TeV and an outlook to the future.

Presenter: Mr KUNNAWALKAM ELAYAVALLI, Raghav (Rutgers University)

Session Classification: Session 6

Contribution ID: **68** Type: **not specified**

Jet-hadron correlations examined with Monte Carlo models

Tuesday, 12 January 2016 16:30 (30 minutes)

Employing publicly available Monte Carlo models of jet modification in a partonic medium, we study jet-hadron correlations in heavy ion collisions at RHIC and LHC energies. In particular, we discuss the medium-induced broadening of the away-side peak. The surface bias, i.e. a trigger-dependent modification of the spatial distribution of hard scattering vertices, will be addressed as well.

Presenter: Dr LAPIDUS, Kirill (Yale University)

Session Classification: Session 8

Contribution ID: **69** Type: **not specified**

Precision QCD: working with heavy quarks at high scales & high orders

Tuesday, 12 January 2016 14:00 (30 minutes)

Searches for new physics will increasingly depend on identifying deviations from precision Standard Model predictions. At higher energies and higher precision, the heavy quarks play an increasingly prominent role. Recent theoretical developments improve our ability to address the multi-scale problem and properly incorporate heavy quark masses across the full kinematic range. This includes a Hybrid Variable Flavor Number Scheme (H-VFNS) for heavy flavors, and the extension of the ACOT scheme for heavy quark production to N2LO and N3LO. We review these developments with respect to upcoming measurements, and identify areas where additional efforts are required.

Presenter: Prof. OLNESS, Fredrick (SMU)

Session Classification: Session 7

Contribution ID: **70** Type: **not specified**

Heavy flavor production at LHCb

Tuesday, 12 January 2016 14:30 (30 minutes)

LHCb provides unique kinematical coverage in the forward region at the LHC. I will discuss heavy flavor production measurements made by LHCb in Run 1, along with prospects for Runs 2 and 3. Topics will include charm and beauty cross sections; vector boson + heavy flavor jets; and production of top, quarkonia, di-b-jet, and di-c-jet.

Presenter: WILLIAMS, Mike (MIT)

Session Classification: Session 7

Contribution ID: **71** Type: **not specified**

Open heavy-flavor measurements at RHIC with the STAR experiment

Tuesday, 12 January 2016 15:00 (30 minutes)

Presenter: Prof. YE, Zhenyu (UIC)

Session Classification: Session 7

Contribution ID: **72** Type: **not specified**

Production and polarization of heavy quarkonia at collider energies

Production of heavy quarkonia is arguably one of the most fascinating subjects in strong interaction physics. It offers unique perspectives into the formation of QCD bound states. However, since the discovery of J/psi more than 40 years ago, theorists still have not been able to fully understand its production mechanism. In this talk, I will present recent new developments in understanding the production and polarization of heavy quarkonia at collider energies.

Presenter: Prof. QIU, Jianwei (Brookhaven National Laboratory)

Contribution ID: **73** Type: **not specified**

Open heavy-flavour measurements with ALICE at the LHC

Tuesday, 12 January 2016 16:00 (30 minutes)

The large interest in open heavy-flavour physics in heavy-ion collisions is proven by the many results obtained at both RHIC and LHC energies. Heavy quarks are produced in the early stages of heavy-ion collisions and their abundance is not expected to change throughout the evolution of the system. Hence, they behave as self-generated probes that traverse the hot and dense medium losing energy via subsequent elastic scatterings and/or gluon radiation. The combination of high precision tracking, particle identification and excellent vertexing capabilities offered by ALICE makes it well suited to measure decays of particles containing heavy quarks in a wide momentum region and in different rapidity ranges. We discuss the ALICE heavy-flavour measurements with both exclusive reconstruction of prompt D mesons, and semi-inclusive leptonic decays of charm and beauty hadrons, for pp, p-Pb and Pb-Pb collisions. The D-meson yields as a function of charged-particle multiplicity in pp and p-Pb collisions, expected to be sensitive to the interplay between hard and soft QCD processes, will be discussed and compared to models. Results on angular correlations of D mesons with charged hadrons in pp and p-Pb collisions, relevant to extract information on the heavy-quark fragmentation, will be shown and compared to PYTHIA predictions. The nuclear modification factor measured for D mesons, electrons and muons from heavy-flavour hadron decays and electrons from beauty hadron decays will be presented for p-Pb and Pb-Pb collisions. The results indicate a strong suppression of the yields of heavy-flavour particles at high transverse momentum in central Pb-Pb collisions, due to hot nuclear matter effects. The measurements of the azimuthal anisotropy of heavy-flavour hadron decay electrons, muons and charmed mesons are also reported and suggest a non zero elliptic flow, v2, in semi-central Pb-Pb collisions. The nuclear modification factor and elliptic flow results are compared to in-medium energy-loss models.

Presenter: BRUNA, Elena (INFN-GSI)

Session Classification: Session 8

Contribution ID: **74** Type: **not specified**

Cross Sections and Spin Observables for Forward Jet Production

Wednesday, 13 January 2016 09:00 (30 minutes)

Forward particle production can be observed to large Feynman x at $\sqrt{s}$ >60 GeV in colliding beam experiments at RHIC. Large transverse single spin asymmetries (SSA) have been measured for pion production at large x_F and to surprisingly large transverse momentum values. As an intended prelude for SSA measurements of forward Drell-Yan production of low-mass dileptons (AnDY), we measured cross sections and SSA for large-x_F jets. This talk will provide a comprehensive review of the inclusive-jet measurements and also dijet measurements by AnDY, for transversely polarized proton collisions at $\sqrt{s}$=500 GeV. Prospects for extending such measurements to heavy-ion collisions are also presented. Subsequent development of the calorimetry provides clear prospects for future efforts.

Presenter: Dr BLAND, leslie (Brookhaven National Laboratory)

Session Classification: Session 9

Contribution ID: **75** Type: **not specified**

Hadronic matrix elements in (1+2)-dimensions: recent developments

Hadronic matrix elements with longitudinal and transverse dependence play an important role in a wide variety of QCD related phenomena. Among other things, such quantities are required to address certain issues in hadronic spin physics, to make predictions for the transverse momentum dependent spectrum of the Higgs boson production at the LHC, to obtain three-dimensional hadronic tomography and for jet broadening (and other observables) of jets traversing a hot and dense medium. In my talk I will review the main subtle issues regarding transverse momentum dependent (TMD) functions, how they are resolved and certain properties obtained for the newly defined TMD functions. Especially I will consider generalized TMDs, TMD parton distribution functions and the jet quenching parameter q-hat. Time allows, I will discuss some of the intriguing remaining open questions that span most of the topics mentioned above.

Presenter: Dr IDILBI, Ahmad (Penn State/)

Contribution ID: **76** Type: **not specified**

Rapidity evolution of gluon TMDs from small to moderate x

Wednesday, 13 January 2016 09:30 (30 minutes)

I will discuss rapidity factorization approach and show how it can be used in analysis of evolution of gluon transverse momentum dependent (TMD) distribution functions. I will introduce an evolution equation which describes a smooth transition between linear evolution at x~1 and non-linear one at x«1.

Presenter: Dr TARASOV, Andrey (JLab)

Session Classification: Session 9

Contribution ID: **77** Type: **not specified**

B and J/psi mesons in jets using SCET

Wednesday, 13 January 2016 10:00 (30 minutes)

We use the framework of Soft-Collinear Effective Theory (SCET) to study the production of B and J/psi mesons in jets. We focus on jets where the angularity, a class of jet-shape variable, of one of the jets is measured. Using factorization formulae provided by SCET, we calculate the next-to-leading-log-prime (NLL') resummed cross-section for e+e- $\longrightarrow$ 2 jets where one of the jets contains a B meson and e+e- $\longrightarrow$ 3 jets where a gluon jet contains a J/psi. We express our analytic cross-sections in terms of fragmenting jet functions (FJF), which give the probability that an identified hadron in a jet carries a fraction z of the energy of a jet with measured angularity tau_a. FJF's can in turn be written as convolutions of renormalization-group-evolved fragmentation functions (FF) and perturbatively calculable matching coefficients. We calculate these matching coefficients to next-to-leading-order (NLO) accuracy for the jets where angularity is measured. We compare our analytic distributions for z and tau_a with predictions from the Pythia and Herwig Monte Carlo event generators. For B meson production we find consistency between analytic and Monte Carlo results. For J/psi production, we discuss how the Monte Carlo must be modified in order to properly treat the fragmentation of g -> J/psi in 3 jet events

Presenter: BAIN, Reginald (Duke University)

Session Classification: Session 9

Contribution ID: **78** Type: **not specified**

Bottom quark production at RHIC with the STAR experiment

Wednesday, 13 January 2016 11:30 (30 minutes)

Because of their large masses and long lifetimes, heavy quarks are dominantly produced from initial hard parton scattering processes and can experience the whole evolution of the Quark Gluon Plasma (QGP) created in high-energy heavy-ion collisions. For this reason, heavy quarks have been suggested as excellent probes of the properties of the QGP. Theoretical models based on existing data predict that bottom quarks will lose less energy than charm quarks in the QGP, which makes bottom quarks a particularly useful tool for studying the mass dependence of parton-QGP interactions, and thus QGP properties. The azimuthal correlation between either J/Psi or non-photonic electrons (electrons from open heavy flavor decays) and hadrons from the same collision can be used to study bottom production in p+p collisions at sqrt(s) = 200 GeV with the STAR experiment. By making use of difference in the shape of the azimuthal correlations for different sources, the ratios of b-> J/Psi to prompt J/Psi and b-> e to c-> e were extracted. These results cover a larger transverse momentum range and have better precision than previous measurements and will provide a more precise baseline for examination of heavy quark production in heavy-ion collisions. For heavy-ion collisions, the newly installed Heavy Flavor Tracker (HFT) will allow access to b-> J/Psi and b-> e production information. The HFT can precisely measure track impact parameters, and thus allows a separation between prompt and non-prompt J/Psi through measuring their decay lengths. A similar method will also allow separation of b-> e and c-> e, due to the longer lifetime of open bottom hadrons. We will present prospects for HFT measurements of bottom production in heavy-ion collisions alongside the results for p+p collisions.

Presenter: Mr MILLER, Zachariah (University of Illinois at Chicago; STAR)

Session Classification: Session 10

Contribution ID: **79** Type: **not specified**

Large angle energy flow in medium modified jets

Monday, 11 January 2016 17:00 (30 minutes)

The advent of the LHC opened up new perspectives for jet-quenching physics. For the first time, high enough energies are reached in heavy-ion experiments to produced jets in large numbers, and the unprecedented detector capabilities of ALICE, ATLAS and CMS, not only extend the kinematic range for the measurements previously performed at RHIC, but also allow to explore a variety of new jet-quenching observables. In this talk, I address the question of the angular broadening of jets in the presence of a dense QCD matter. I start by discussing the fundamental mechanisms underlying the formation of gluon cascades induced by multiple interactions of high energy jets with the quark-gluon plasma. Then, the rate equation that describes the evolution of the energy and angular distribution of the in-medium gluon shower is presented and solved. Two remarkable phenomena emerge. First and foremost the energy spectrum (of jet constituents) exhibits a scaling behavior characterized by a constant flow of energy towards low momenta akin to wave turbulence. As a result, energy is rapidly transported from the energy containing partons to low momentum gluons before it dissipates into the medium. Second, medium-induced gluon cascades develop and transport energy at parametrically large angles with respect to the jet axis. This picture is in semi-quantitive agreement with a recent CMS analysis of the missing energy in asymmetric dijet events where the energy balance is recovered at large angles and very soft particles.

Presenter: Prof. MEHTAR-TANI, Yacine (INT, University of Washington)

Session Classification: Session 4

Contribution ID: **80** Type: **not specified**

Unraveling medium effects in heavy ion collisions with Zeal

We propose a new observable, called zeal, to analyze events with jets in heavy ion collisions. The observable measures how a thermal medium affects the multiplicity and distribution of energetic particles in a jet. Using few known models for energy loss and jet quenching, we demonstrate its capability to distinguish the physics of these models.

Presenter: Dr SHARMA, Rishi (TIFR)

Contribution ID: **81** Type: **not specified**

Jet physics at CMS

Wednesday, 13 January 2016 14:30 (30 minutes)

Presenter: Prof. ROLAND, Gunther (MIT)

Session Classification: Session 11

Contribution ID: **82** Type: **not specified**

SCET_++: A new soft-collinear mode for small-R jets

Monday, 11 January 2016 10:10 (30 minutes)

Using a new version of Soft Collinear Effective Theory, SCET_++, with a new "soft-collinear" mode, we achieve the resummation of logarithms of jet radii R in jet rates and jet thrust cross sections beyond leading-log accuracy. We extract two and three-loop anomalous dimensions necessary for resummation of (global) logs of R to NNLL and N3LL accuracy.

Presenter: Dr HORNIG, Andrew (LANL)

Session Classification: Session 1

Contribution ID: **83** Type: **not specified**

Future jet and heavy flavor measurements in US: sPHENIX

Wednesday, 13 January 2016 15:00 (30 minutes)

Presenter: Dr MORRISON, David

Session Classification: Session 11

Contribution ID: **84** Type: **not specified**

Summary and outlook

Wednesday, 13 January 2016 15:30 (10 minutes)

Presenter: ORGANIZERS

Session Classification: Session 11

Contribution ID: **85** Type: **not specified**

(Semi)automated Resummation for multijet processes with MadGraph

Wednesday, 13 January 2016 14:00 (30 minutes)

Some of the most arduous and error-prone aspects of precision resummed calculations are related to the partonic hard process, having nothing to do with the resummation. In particular, interfacing to parton-distribution functions, combining various channels, and performing the phase space integration can be limiting factors in completing calculations. Conveniently, however, most of these tasks are already automated in many Monte Carlo programs. In this talk, I will show how such programs can be used to produce all necessary process dependent information for resummed calculations, needing only universal factors as input. Examples of a particular implementation using MadGraph for multi-jet e+e- and pp collisions are presented.

Presenter: Dr FREYTSIS, Marat (Harvard University)

Session Classification: Session 11