

**The 4th International
Workshop on QCD
Collectivity at the Smallest
Scales**

Report of Contributions

Contribution ID: 1

Type: **not specified**

charmonium collective flows in nuclear collisions: (directed, elliptic, triangular) flows

Thursday 27 June 2024 16:20 (20 minutes)

We employ a detailed transport model coupled with realistic hydrodynamics in heavy-ion collisions to study the anisotropic flows of charmonium, including directed flow, elliptic flow, and triangular flows. The directed flow (v_1) of J/ψ is induced by the rapidity-odd initial energy density, which arises from the rotation of the quark-gluon plasma (QGP). Meanwhile, the elliptic flow (v_2) of J/ψ primarily depends on two factors: the initial spatial energy density in the nuclear collision region and the degree of thermalization of charm kinetics. The triangular flow of J/ψ originates from the triangular flows of charm quarks, which acquire anisotropic flows from the surrounding bulk medium with fluctuating initial energy densities. These anisotropic flows (v_1, v_2, v_3) of J/ψ contribute to our understanding of the detailed evolutions of charm and charmonium in the fluctuating and rotational QGP.

Author: CHEN, Baoyi (Tianjin University)**Co-authors:** ZHAO, Jiaying (Tsinghua University); ZHUANG, Pengfei**Presenter:** CHEN, Baoyi (Tianjin University)

Contribution ID: 3

Type: **not specified**

Welcom

Monday 24 June 2024 09:00 (15 minutes)

Presenter: CHEN, Zhenyu (Shandong University (CN))

Contribution ID: 4

Type: **not specified**

Opening talk

Contribution ID: 5

Type: **not specified**

Experimental overview - RHIC

Monday 24 June 2024 09:15 (50 minutes)

Presenter: WANG, Fuqiang (Purdue University (US))

Contribution ID: 6

Type: **not specified**

Experimental overview - LHC

Monday 24 June 2024 10:40 (50 minutes)

Presenter: ZHOU, You (Niels Bohr Institute (DK))

Contribution ID: 7

Type: **not specified**

Dynamical core-corona initialization in small colliding systems

Monday 24 June 2024 14:00 (40 minutes)

Presenter: HIRANO, Tetsufumi

Contribution ID: 8

Type: **not specified**

Hydro Overview 2

Monday 24 June 2024 14:40 (40 minutes)

Presenter: SONG, Huichao

Contribution ID: **9**

Type: **not specified**

EPOS Overview

Monday 24 June 2024 15:40 (40 minutes)

Presenters: WERNER, Klaus (subatech); WERNER, Klaus

Contribution ID: **10**

Type: **not specified**

AMPT Overview

Monday 24 June 2024 16:20 (40 minutes)

Presenter: LIN, Zi-Wei (East Carolina University)

Contribution ID: **11**

Type: **not specified**

Discussion

Monday 24 June 2024 17:20 (40 minutes)

Contribution ID: **12**

Type: **not specified**

PYTHIA Overview

Tuesday 25 June 2024 09:00 (40 minutes)

Presenter: LÖNNBLAD, Leif (Lund University (SE))

Contribution ID: **13**

Type: **not specified**

Initial State Overview

Tuesday 25 June 2024 09:40 (40 minutes)

Presenter: GARCIA-MONTERO, Oscar

Contribution ID: **14**

Type: **not specified**

Collectivity in DIS/photo-production/UPC

Tuesday 25 June 2024 10:40 (40 minutes)

Presenter: LEWIS, Nicole (Rice University (US))

Contribution ID: 15

Type: **not specified**

Collectivity in $e+e^-$ (remote)

Tuesday 25 June 2024 11:20 (40 minutes)

Presenter: LEE, Yen-Jie (Massachusetts Inst. of Technology (US))

Contribution ID: **16**

Type: **not specified**

Collectivity in jets: exp

Tuesday 25 June 2024 14:00 (40 minutes)

Presenter: BATY, Austin Alan (University of Illinois Chicago)

Contribution ID: 17

Type: **not specified**

Collectivity in jets: theory (remote)

Tuesday 25 June 2024 14:40 (40 minutes)

Presenter: ZHAO, Wenbin (Wayne State University)

Contribution ID: **18**

Type: **not specified**

Understanding non-flow in small systems talk1

Tuesday 25 June 2024 16:00 (25 minutes)

Presenter: Mr FENG, Yicheng (Purdue University)

Contribution ID: **19**

Type: **not specified**

Understanding non-flow in small systems talk2

Tuesday 25 June 2024 16:25 (25 minutes)

Presenter: LIM, Sanghoon (Pusan National University (KR))

Contribution ID: 20

Type: **not specified**

Understanding non-flow in small systems talk3

Tuesday 25 June 2024 16:50 (25 minutes)

Presenter: JIA, Jiangyong (Stony Brook University (US))

Contribution ID: **21**

Type: **not specified**

Discussion

Tuesday 25 June 2024 17:15 (45 minutes)

Contribution ID: 22

Type: **not specified**

OO and nuclear structure in small systems

Wednesday 26 June 2024 08:30 (40 minutes)

Presenter: HUANG, Shengli

Contribution ID: 23

Type: **not specified**

Impact of nuclear structure on collectivity in small collision systems

Wednesday 26 June 2024 09:10 (25 minutes)

Presenter: ZHANG, Chunjian (Stony Brook University)

Contribution ID: 24

Type: **not specified**

Theory overview of nuclear structure in small system

Wednesday 26 June 2024 09:55 (40 minutes)

Presenter: GIACALONE, Giuliano (Universität Heidelberg)

Contribution ID: 25

Type: **not specified**

Speed of sound: exp

Wednesday 26 June 2024 10:55 (25 minutes)

Presenter: BERNARDES, Cesar (UNESP - Universidade Estadual Paulista (BR))

Contribution ID: 26

Type: **not specified**

Speed of sound: theory2

Wednesday 26 June 2024 11:45 (25 minutes)

Presenter: NIJS, Govert Hugo (CERN)

Contribution ID: 27

Type: **not specified**

Speed of sound: theory1

Presenter: GARDIM, Fernando (USP)

Contribution ID: 28

Type: **not specified**

Flow decorrelation in small systems

Thursday 27 June 2024 09:00 (40 minutes)

Presenter: SEKIGUCHI, Yuko (University of Tokyo (JP))

Contribution ID: **30**

Type: **not specified**

3D modeling of small system collisions from RHIC to LHC

Thursday 27 June 2024 09:40 (40 minutes)

Presenter: SHEN, Chun (Wayne State University)

Contribution ID: 32

Type: **not specified**

Multiparticle vn at high pT in small system from CMS

Thursday 27 June 2024 11:20 (30 minutes)

Presenter: SINGH, Rohit Kumar (Indian Institute of Technology Madras (IN))

Contribution ID: 33

Type: **not specified**

Jet quenching in small sized systems: exp

Thursday 27 June 2024 10:40 (40 minutes)

Presenter: JACOBS, Peter Martin (Lawrence Berkeley National Lab. (US))

Contribution ID: **34**

Type: **not specified**

Heavy flavor production and collectivity in small system: exp

Thursday 27 June 2024 14:00 (40 minutes)

Presenter: XIE, Wei (Purdue University (US))

Contribution ID: 36

Type: **not specified**

Jet quenching and RAA in small systems: theory

Thursday 27 June 2024 11:50 (40 minutes)

Presenter: KOLBE, Isobel (University of the Witwatersrand (ZA))

Contribution ID: **38**

Type: **not specified**

Discussion

Thursday 27 June 2024 16:40 (1h 20m)

Contribution ID: 40

Type: **not specified**

Anisotropic flow and the valence quark skeleton of hadrons

Friday 28 June 2024 09:00 (40 minutes)

Presenter: ZHANG, Hong

Contribution ID: **41**

Type: **not specified**

Connection to EIC

Presenter: Dr TU, Zhoudunming (BNL)

Contribution ID: 42

Type: **not specified**

EicC Overview

Friday 28 June 2024 11:00 (40 minutes)

Presenter: ZHAO, yuxiang

Contribution ID: 43

Type: **not specified**

Closing remarks

Friday 28 June 2024 11:40 (20 minutes)

Presenter: CHEN, Zhenyu (Shandong University (CN))

Contribution ID: 44

Type: **not specified**

Study of Upsilon(1S) flow in CMS

Thursday 27 June 2024 14:40 (20 minutes)

The second-order Fourier coefficients (v_2) are expected to reflect the overlap region of colliding heavy ions. However, a non-zero v_2 has been observed in high-multiplicity pp and pPb collisions where overlap does not exist. The CMS experiment collected data at a nucleon-nucleon center-of-mass energies 5.02 and 8.16 TeV for PbPb and pPb collisions, respectively. The dimuons were used to reconstruct the $\Upsilon(1S)$ mesons. The Q-vector method is used for PbPb collisions while the long-range two-particle correlation technique is used for pPb collisions. The measurement of the $\Upsilon(1S)$ v_2 is reported for both heavy ion and small collision systems. The results are discussed in the context of collectivity and modification of heavy quark dynamics.

Author: LEE, Kisoo (Korea University (KR))**Presenter:** LEE, Kisoo (Korea University (KR))

Contribution ID: 45

Type: **not specified**

Speed of sound: theory1

Wednesday 26 June 2024 11:20 (25 minutes)

Presenter: Dr VAN DER SCHEE, Wilke (CERN)

Contribution ID: 46

Type: **not specified**

Study of quarkonia suppression in pO and OO with SHINCHON MC

Thursday 27 June 2024 15:40 (40 minutes)

Presenter: KIM, Yongsun (Sejong University (KR))

Contribution ID: 47

Type: **not specified**

Collectivity in small systems from a multi-phase transport model point of view

Monday 24 June 2024 17:00 (20 minutes)

The striking collectivity like behavior found in high-multiplicity proton-proton (pp) collisions and ultra-peripheral collisions (UPC) at the LHC challenges our conventional wisdom on the formation of the quark-gluon plasma (QGP). A microscopic explanation to the origin of collectivity in these collision systems at rather small scales will help us understand the mechanism that leads to the QGP-like signals in small systems. In our recent work, we have coupled PYTHIA8 initial conditions with sub-nucleon spatial fluctuations to the final state parton and hadron interactions and quark coalescence of the string melting AMPT model to study the small system collective effects. In this approach, the AMPT initial condition originally provided by HIJING is replaced by the PYTHIA/Angantyr model and includes the sub-nucleon structure for the struck nucleon and photon. We have found that the collective flow features in small collision systems can be well described by the AMPT model with sub-nucleon spatial fluctuation, indicating its importance for the small system evolution. In this talk, we will present these model results and comparisons to the experimental data.

Author: Dr ZHENG, Liang (China University of Geosciences (CN))

Presenter: Dr ZHENG, Liang (China University of Geosciences (CN))

Contribution ID: 48

Type: **not specified**

Measurements of quarkonia suppression in small system in CMS with LHC Run2 data

Thursday 27 June 2024 15:00 (20 minutes)

Quarkonium production in small systems has been extensively studied in LHC and RHIC to understand the suppression effects which may be described by the existence of a small QGP droplet. To further elaborate, it is necessary to obtain experimental data where models can describe the suppression from the hot medium effect and the cold nuclear matter effect. In this talk, we present recent studies of quarkonia in CMS using pp and pPb collision data taken from LHC in Run 2. We will focus on the nuclear suppression R_{pPb} for charmonia and bottomonia and compare our results with theoretical model predictions.

Author: LEE, Soohwan (Korea University (KR))

Presenter: LEE, Soohwan (Korea University (KR))

Contribution ID: 49

Type: **not specified**

Unraveling QGP and jet physics via perturbing attractors

Friday 28 June 2024 09:40 (40 minutes)

The rapid longitudinal expansion characteristic of heavy-ion collisions leads to universal attractor behavior of the resulting drop of Quark-Gluon Plasma already at very early times. Assuming approximate boost invariance, we incorporate transverse dynamics and parton evolution by linearizing the Mueller-Israel-Stewart theory around the attractor. This yields a system of coupled ordinary differential equations which describe the proper-time evolution of perturbations encoding the transverse structure of the initial and jet energy deposition across a wide range of geometric configurations and parton energy loss scenarios. The late-time asymptotic behavior of the solutions is described by transseries which manifest the stability of the attractor against transverse perturbations, as well as a dominant power-law series attributed to the parton source. Although most of the physically relevant initial information resides in the exponentially suppressed transseries corrections to the evolution along the attractor, they are not yet negligible at freeze-out. These findings advocate for a simple numerical approach to QGP dynamics which accounts for the transverse dynamics and jet-medium interactions via a finite set of Fourier modes. Physical observables can be expressed in terms of the asymptotic data evaluated at freeze-out. We demonstrate the efficacy of this approach in describing key observables such as collectivity across various system scales, as well as the consequential effects of jet wakes.

Authors: AN, Xin (National Center for Nuclear Research); SPALIŃSKI, Michał

Presenter: AN, Xin (National Center for Nuclear Research)

Contribution ID: 50

Type: **not specified**

Mapping of the nuclear structure on the small and medium-sized systems via collectivity

Wednesday 26 June 2024 09:35 (20 minutes)

Presenters: ZHAO, Xinli (Shanghai Institute of Applied Physics, Chinese Academy of Scien); ZHAO, Xinli

Contribution ID: 51

Type: **not specified**

Multi-particle cumulants from transverse momentum conservation and flow

Friday 28 June 2024 10:20 (20 minutes)

Presenter: PEI, Jialin (Fudan University)

Contribution ID: 52

Type: **not specified**

Investigating the elliptic anisotropy of hard probes in small collision systems

Tuesday 25 June 2024 15:20 (20 minutes)

Presenter: TANG, Siyu (Central China Normal University CCNU (CN))

Contribution ID: 53

Type: **not specified**

Hyperon polarization in pPb collisions

Monday 24 June 2024 11:30 (25 minutes)

Presenter: LI, Chenyan (Shandong University (CN))

Contribution ID: 54

Type: **not specified**

Banquet

Thursday 27 June 2024 19:00 (4 hours)