CURRICULUM VITAE

Dr. Kapil Saraswat

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Contents

Basic Information

Dr. Kapil Saraswat
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Areas of scientific interest

- Neutrino interaction with nuclei;
- Data analysis of neutrino-nucleus scattering;
- Ge detector background simulation studies;
- Heavy quark production in proton-proton and nucleus-nucleus collisions;
- Heavy quark energy loss in QGP medium;
- Particle production mechanism in pp and Heavy ion collisions.

Academic and Professional Details

2.1 Positions Held

- **Post-Doctoral Fellow (TEXONO Group)**
  Institute of Physics, Academia Sinica,Taipei, Taiwan. March 2020 - Present

- **Post-Doctoral Fellow)**
  Department of Physics, Kumaun University, Nainital, India. Jan. 2019 - Feb. 2020

2.2 Education

Ph.D. Physics
Banaras Hindu University, Varanasi, India 2012-2018

- Thesis: *Study of Strongly Interacting Matter using Light and Heavy Hadron Production in Heavy Ion Collisions*
- Advisors: Prof. Venktesh Singh[1,2] and Prof. Prashant Shukla[3,4].
- [1]Department of Physics, Banaras Hindu University, Varanasi, India.
- [2]Department of Physics, Central University of South Bihar, Gaya, India.
- [3]Bhabha Atomic Research Centre, Mumbai, India.
- [4]Homi Bhabha National Institute, Mumbai, India.

Master of Science
University of Delhi, Delhi, India. 2007-2009

- Physics

- Specialization: Astrophysics and Plasma Physics.

Bachelor of Science
M. J. P. Rohilkhand University, Bareilly, India. 2004-2007

- Physics and Mathematics.

Intermediate
Board of High School and Intermediate Education Uttar Pradesh, Prayagraj, India. 2002-2004

High School
Board of High School and Intermediate Education Uttar Pradesh, Prayagraj, India. 2000-2002

2.3 Awards and Merits

- **MOST Postdoctoral Fellowship by Ministry of Science and Technology, Taiwan**
  Institute of Physics, Academia Sinica,Taipei, Taiwan. 2021

- **D. S. Kothari Postdoctoral Felloeship by University Grants Commission of INDIA**
  Kumaun University, Nainital, India. 2018

- **Senior Research Fellowship awarded by University Grants Commission of INDIA**
  Banaras Hindu University, Varanasi, India. 2014

- **Junior Research Fellowship awarded by University Grants Commission of INDIA**
  Banaras Hindu University, Varanasi, India. 2012

- **Qualified UGC-JRF (Junior Research Fellow) fellowship in CSIR-UGC exam**
  Conducted jointly by CSIR and UGC of INDIA 2010

2.4 National Level Exams

- **Joint CSIR-UGC National Eligibility Test**
  Qualified as Junior Research Fellow (UGC) December 2009

- **Graduate Aptitude Test in Engineering (GATE)**
  Qualified March 2010

- **Joint Entrance Screening Test (JEST)**
  Qualified March 2010

2.5 Technical Skills

- Hands on experience in analysis software such as ROOT.
- Programming C++.
- Hands on experience on Geant4 simulation.

2.6 Research work carried out during Ph.D.

The theme of my Ph.D. thesis was to study the **charged and strange particle production in proton-proton and heavy ion collisions at RHIC and LHC energies** and to study the **heavy quark energy loss in nucleus-nucleus collisions at RHIC and LHC energies**.

The heavy ion collisions at RHIC and LHC aim to create matter with high energy density required for the formation of Quark-Gluon Plasma (QGP). Quark Gluon Plasma is a thermalized state of deconfined quarks and gluons. The heavy ion collisions basically study the strongly interacting matter in bulk. The quark-gluon matter once formed, presumbly with local thermal equilibrium, expands, cools and undergoes a phase transition to hadronic matter. The hadronic matter continues to expand and once the mean free path of hadrons become bigger than the system size, they decouple from the system and move towards the detectors.

In the thesis, **we present a study of transverse momentum ($p_{\rm T}$) spectra of unidentified charged particles in pp collisions at RHIC and LHC energies from $\sqrt{s}$ = 62.4 GeV to 13 TeV using Tsallis/Hagedorn functions**. The power law of Tsallis/Hagedorn form gives excellent description of the hadron spectra in the range $p_{\rm T}$ = 0.2 to 300 GeV/c. The power index n of the $p_{\rm T}$ distributions is found to follow a function of the type $a + b/\sqrt{s}$ with asymptotic value $a = 5.72$. The parameter T governing the soft bulk contribution to the spectra remains almost same over wide range of collision energy. We also provide a Tsallis/Hagedorn fit to the $p_{\rm T}$ spectra of hadrons in pPb and different centralities of PbPb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV. The data/fit shows deviations from the Tsallis distibution which become more pronounced as the system size increases. We suggest simple modifications in the Tsallis/Hagedorn power law function and show that the above deviations can be attributed to the transverse flow in low $p_{\rm T}$ region and to in-medium energy loss in high $p_{\rm T}$ region.

The theoretical analysis of the $p_{\rm T}$ spectra of the strange hadrons in different multiplicity events produced in pp collision at $\sqrt{s}$ = 7 TeV, pPb collision at $\sqrt{s_{\rm NN}}$ = 5.02 TeV and PbPb collision at $\sqrt{s_{\rm NN}}$ = 2.76 TeV is presented in the thesis. Both the single and differential freeze-out scenarios of the strange hadrons K^0_s, Λ and Ξ^- are considered while fitting using a Tsallis distribution, which is modified to include transverse flow. The $p_{\rm T}$ distributions of these hadrons in different systems are characterized in terms of the parameters namely, Tsallis temperature (T), power (n) and average transverse flow velocity (β). It is found that for all the systems, transverse flow increases as we move from lower to higher multiplicity events. In case of the differential freeze-out scenario, the degree of thermalization remains unchanged for events of different multiplicity classes in all the three systems. The Tsallis temperature increases with the mass of the hadrons and also increases with the event multiplicity in pp and pPb system but shows slight variation with the multiplicity in PbPb system. In case of the single freeze-out scenario, the difference between small (pp, pPb) and large (PbPb) systems becomes more evident. The high multiplicity PbPb events show higher degree of thermalization as compared to the events of pp and pPb systems. The temperature variation trend in PbPb with event multiplicity is opposite to what is found in the pp and pPb systems.

We study the **production and evolution of charm and bottom quarks in hot partonic medium produced in heavy ion collisions. The energy loss of heavy quark (charm and bottom) due to elastic collisions and gluon radiation in hot and dense medium is calculated in the thesis**. The collisional energy loss has been obtained using QCD calculations. The radiative energy loss is calculated using reaction operator formalism and generalized dead cone approach. We rederived the energy loss expression using same assumptions as generalized dead cone approach but obtained slightly different results. We also improved the model employed to calculate the path length and the system evolution. The nu-

clear modification factors $R_{\rm AA}$ including shadowing and energy loss are evaluated for B and D mesons and are compared with the measurements in PbPb collision at $\sqrt{s_{\rm NN}}$ = 2.76 TeV and with the D meson and Heavy flavour (HF) electrons measurements in AuAu collision at $sqrts_{\rm NN}$ = 200 GeV. The nuclear modification factors $R_{\rm AA}$ as a function of the transverse momentum including shadowing and the energy loss are calculated for D^0 and B^+ mesons in PbPb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV and for D^0 mesons at $\sqrt{s_{\rm NN}}$ = 2.76 TeV and are compared with the recent measurements. The radiative energy loss calculated by reaction operator formalism added with collisional energy loss describes the RHIC HF electron suppression in high $p_{\rm T}$ range. It also describes the LHC measurement of B meson suppression but overestimates the suppression of D meson. The radiative energy loss from generalized dead cone approach describes the charm suppression at both RHIC as well as LHC energies and requires energy loss due to collisions to be added in order to describe the bottom suppression at LHC. The radiative energy loss from generalized dead cone approach alone is sufficient to produce D^0 meson $R_{\rm AA}$ at both the energies. The radiative energy loss from reaction operator formalism plus collisional energy loss gives good description of D^0 meson $R_{\rm AA}$. For the case of B^+ meson, the radiative energy loss from generalizeddead cone approach plus collisional energy loss gives good description of the CMS data. The radiative process is dominant for charm quark while for bottom quark both radiative and elastic collisions are important.

2.7 Research work during Post-Doctoral period at Kumaun University

I was working as a Post-Doctoral fellow at Department of Physics, Kumaun University, Nainital, India for the period January 2019 to February 2020. During this period, I worked on the project **"Heavy quark energy loss and heavy meson spectra in pPb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV"**. In the project, first we calculate the differential cross section of the heavy mesons in proton-proton and proton-lead collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV using pQCD model and make a comparision with $B^{+,0}$, $D^{+,0}$ and average D mesons measurements of the CMS and ALICE experiment. The pQCD calculation with the k factor redproduces the transverse momentum ($p_{\rm T}$) spectra of the measurements. We use the simple hydrodynamic picture for the medium evolution during which the $p_{\rm T}$ spectra of heavy quarks are modified due to the collisional energy loss, radiative energy loss and fluctuations. We calculate the collisional energy loss using Peigne and Peshier formalism. We calculate the radiative energy loss using the generalised dead cone aproach and reaction operator formalism. To calculate the fluctuations, we use the CMT formalism. We calculate the nuclear modification factor ($R_{\rm pPb}$) as a function of the $p_{\rm T}$ by including shadowing, energy loss and fluctuations. The effect of the energy loss (both collisional and radiative) and fluctuations on $R_{\rm pPb}$ is negligible as comapred to shadowing $R_{\rm pPb}$. The D and B meson $R_{\rm pPb}$ are consistent with unity within uncertainties in the measured transverse momentum regions. No significant modification is observed in proton-lead collisions as compared to proton-proton collisions pQCD calculations scaled by the mass number of the nucleus. This study provide a baseline for the study of in-medium charm and bottom quark energy loss in PbPb collisions.

2.8 Research work during Post-Doctoral period at Academia Sinica

I am working as a Post-Doctoral fellow at the Institute of Physics, Academia Sinica in Taipei, Taiwan, since March 2020. During this period, I am working on the following project

- Neutral Current neutrino-nucleus scattering plays an important role to understand the various atmospheric as well as cosmological processes. I focused to calculate the cross-

section of the neutrino-nucleus neutral current quasi elastic scattering (νN-NCQES) as a function of the recoil kinetic energy of the recoil nucleon ($T_{\rm N}$). νN-NCQES cross-section ($d\sigma/dT$) of solar and atmospheric neutrinos can provide the correction in the "Neutrino Floor" for the searching of the Weakly Interacting Massive Particles (WIMPs). I have used Relativistic Plane Wave Impulse Approximation (RPWIAI to calculate $d\sigma/dT$. I have also calculated the different types of the form factors, structure functions and 4-vector products of the kinematic variables. The upper and lower components of the bound state wave function ($g(r)$ and $f(r)$) obtained from the Dirac equation for harmonic oscillator potential is used to calculate $d\sigma/dT$.

- Neutrinoless double-beta decay ($0\nu\beta\beta$) is a radioactive process in which two neutrons inside a nucleus transform into two protons emitting two electrons. Enriched ^{76}Ge high-purity Ge detectors are one of the best candidates for the experimental searches of $0\nu\beta\beta$. Ge detectors are fascinating to study various rare event searches due to there high energy resolution and crystal purity. High purity Ge detectors are ideal choice in the searches of $0\nu\beta\beta$. I prepared basic simulation design of 1 ton Ge crystal array using Geant4. The design includes 343 ^{76}Ge-enriched detectors which are arranged into 49 strings. Each detector is of mass of 3 kg and made identically, with a diameter of 90 mm and height of 90 mm. Each string array consist of copper holder, spacer and Silicon plates. High voltage (HV) and signal cables are installed along the length of the string array. Front-end electronics (FEE-ASICS), ASICS ultem, ASICS Phos-Br, HV ultem and HV Phos-Br are installed on the Silicon plates. The whole arrangements is immersed in liquid nitrogen filled copper cryostat of diameter and height of 14 m each. This arrangement is also kept in the vacuum box of 1 cm thickness. I also studied the effects of Uranium and Thorium impurity and their decay chains in various components of detector arrays on the ambient background. I studied the background for the four scenarios such as swimming pool with liquid nitrogen inactive, swimming with liquid nitrogen active, vacuum box with liquid nitrogen inactive and vacuum box with liquid nitrogen active. Our background results are compared with the background report of proposed Legend-1Ton collaboration.

- Neutrinos and dark matter are the most abundant particles in the universe after photon. Neutrinos and dark matter are weakly interacting particles and non-luminous in the nature. These particles have no electric charge. The properties of neutrino and dark matter are very useful to increase the knowledge of the evolution of the universe. I am working on Taiwan Experiment on Neutrino (TEXONO) to probe the neutrino-nucleus elastic scattering at Kuo-Sheng Reactor Neutrino Laboratory (KSNL). In TEXONO experiment, I was broadly involved in DAQ monitoring and data analysis of 500 gram electrocooled pPCGe (p-type Point Contact High Purity Germanium) detector, placed inside the low-background facilities at KSNL. We have achieved a threshold of < 200 eV with more than $\sim 278/98$ kg-days reactor ON/OFF data. The two detector configuration (500g pPCGe and 1500 g pPCGe detcetor) is in use for high statistics with smooth data taking. The reactor ON-OFF (residual) data would provide the essence of unknown neutrino physics. pPCGe detector faces the contamination of bulk events in the sensitive sub-keV region with anomalous surface events. In data analysis, currently I worked at the bulk surface correction by ratio method pulsar as a source of bulk as well as surface events. I also simulate the Ge detector covered with NaI(Tl) anti-compton detector for the study of ^{133}Xe γ lines contribution as a background in the low energy (sub-keV) region using Geant4 simulation package.

List of Publications

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1. **Constraining heavy quark energy loss using B and D meson measurements in heavy ion collision at RHIC and LHC energies**,
Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
Nucl. Phys. **A943**, 83 (2015), [arXiv:1507.06742 [nucl-th]].

2. **Coherent pion production in neutrino-nucleus scattering**,
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Phys. Rev. **C93**, 035504 (2016), [arXiv:1602.07820 [hep-ph]].

3. **Energy loss of heavy quarks and B and D meson spectra in PbPb collisions at LHC energies**,
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Nucl. Phys. **A961**, 169 (2017), [arXiv:1702.05733 [hep-ph]].

4. **Strange hadron production in pp, pPb and PbPb collisions at LHC energies**,
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Eur. Phys. J. **A53**, 84 (2017), [arXiv:1702.05734 [nucl-th]].

5. **Charged current quasi elastic scattering of muon neutrino with nuclei**,
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Indian J. Phys.**92**, 249 (2018), [arXiv:1606.06916 [hep-ph]].

6. **Transverse momentum spectra of hadrons in high energy pp and heavy ion collisions**,
Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
J. Phys. **Comm.2**, 035003 (2018), [arXiv:1706.04860 [hep-ph]].

7. **Charged current quasi elastic scattering of muon anti-neutrino off ^{12}C**,
Deepika Grover, Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
Chin. Phys. **C42**, 123104 (2018), [arXiv:1807.08911 [hep-ph]].

8. **Charged current deep inelastic scattering of ν_μ off ^{56}Fe**,
Deepika Grover, Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
Phys. Rev. **C98**, 065503 (2018), [arXiv:1808.00287 [hep-ph]].

9. **Understanding partonic energy loss from measured light charged particles and jets in PbPb collisions at LHC energies**,
Prashant Shukla, Kapil Saraswat*,
J.Phys.**G 47**, 125103 (2020), [arXiv:2105.06364 [hep-ph]].

10. **Medium effects of charged particles in Xe+Xe collisions at $\sqrt{s_{\rm NN}}$ = 5.44 TeV using modified Tsallis distribution**,
Pramod Kumar, P. K. Khandai, Kapil Saraswat* and V. Singh,
Int.J.Mod.Phys.**A 36**, 2150059 (2021).

11. **Studies of quantum-mechanical coherency effects in neutrino-nucleus elastic scattering**,

V. Sharma, L. Singh, H. T. Wong, M. Agartioglu, J. W. Chen, M. Deniz, S. Kerman, H. B. Li, C. P. Liu, **Kapil Saraswat***, M. K. Singh and V. Singh (Texono Collaboration), Phys. Rev.**D103**, 092002 (2021), [arXiv:2010.06810 [hep-ex]].

12. **Theoretical analysis of p_T spectra of light-flavor hadrons in $p+p$ collisions at $\sqrt{s}=7$ TeV under differential and single freeze-out scenarios**, Pramod Kumar, P. K. Khandai, **Kapil Saraswat*** and V. Singh, Int.J.Mod.Phys.**A36**, 2150160 (2021).

13. **Studies of earth shielding effect to direct dark matter searches at the China Jinping Underground Laboratory**, Z. Z. Liu, **Kapil Saraswat*** *et al.* (CDEX Collaboration), Phys. Rev.**D105**, 052005 (2022), [arXiv:2111.11243 [hep-ex]].

14. **Study of Charm and Bottom Quark Energy Loss and Associated Meson $R_{\rm AA}$ Spectra in Proton-Lead Collisions at $\sqrt{s_{\rm NN}}=5.02$ TeV**, **Kapil Saraswat***, Deependra Singh Rawatat and H.C. Chandola, Nucl. Phys. **A1022**, 122441 (2022).

15. **Constraints on sub-GeV Dark Matter Boosted by Cosmic Rays from CDEX-10 Experiment at the China Jinping Underground Laboratory**, R. Xu, **Kapil Saraswat*** *et al.* (CDEX Collaboration), [arXiv:2201.01704 [hep-ex]].

List of Papers Published in Conference and Proceedings

---

1. ^{57th}DAE Symposium on Nuclear Physics 2012 at Department of Physics and Astrophysics, University of Delhi, Delhi, India, **"China Jin-Ping Deep Underground Laboratory: Status and Plan"**, Arun Kumar Soma,Manoj Kumar Singh,Lakhwinder Singh,Vivek Sharma,**Kapil Saraswat***, Venktesh Singh,V. S. Subrahmanyam,Henry Tsz-king Wong, DAE Symp. Nucl. Phys. **57** (2012) 640.

2. ^{57th}DAE Symposium on Nuclear Physics 2012 at Department of Physics and Astrophysics, University of Delhi, Delhi, India, **"Extracting Physics from P+ PCGe Detector near Noise Edge"**, Venktesh Singh,Manoj Kumar Singh,Lakhwinder Singh,Vivek Sharma,Nishant Singh Chouhan,**Kapil Saraswat***,V. S. Subrahmanyam,Henry Tsz-king Wong, DAE Symp. Nucl. Phys. **57** (2012) 866.

3. ^{57th}DAE Symposium on Nuclear Physics 2012 at Department of Physics and Astrophysics, University of Delhi, Delhi, India, **"Study of Surface Resistivity of Resistive Plate Chamber Detectors"**,

Manoj Kumar Jaiswal,Vivek Sharma,Nishant Singh Chouhan, **Kapil Saraswat***, Venktesh Singh,Vajapeyjula Srinivasa Subrahmanyam,
DAE Symp. Nucl. Phys. **57** (2012) 968.

4. ^{57th}DAE Symposium on Nuclear Physics 2012 at Department of Physics and Astrophysics, University of Delhi, Delhi, India,
"Trigger Detector Study for Resistive Plate Chamber Detectors",
Nishant Singh Chouhan,Vivek Sharma,Manoj Kumar Jaiswal,**Kapil Saraswat***, Venktesh Singh,Vajapeyjula Srinivasa Subrahmanyam,
DAE Symp. Nucl. Phys. **57** (2012) 970.

5. ^{58th}DAE International Symposium on Nuclear Physics 2013 at Bhabha Atomic Research Centre, Mumbai, India,
"Study of VECC Prototype INO ICAL using cosmic ray muon and g4beamline",
Kapil Saraswat*, Lakhwinder Singh,Prashata Kumar Khandai,Manoj Kumar Jaiswal,Lovika Moudgil,O. R. Rahul,Vikas Dixit,Venktesh Singh,V. S. Subrahmanyam,
DAE Symp. Nucl. Phys. **58** (2013) 970.

6. ^{59th}DAE Symposium on Nuclear Physics 2014 at Banaras Hindu University, Varanasi,
"Constraining Heavy Quark Energy Loss Using B and D Mesons in Heavy Ion Collision",
Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
DAE Symp. Nucl. Phys. **59** (2014) 766.

7. ^{59th}DAE Symposium on Nuclear Physics 2014 at Banaras Hindu University, Varanasi,
"Interaction of neutrinos with matter in low and intermediate energy region",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **59** (2014) 798.

8. ^{60th}DAE Symposium on Nuclear Physics 2015 at Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam,
"Heavy quark energy loss in PbPb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV",
Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
DAE Symp. Nucl. Phys. **60** (2015) 730.

9. ^{60th}DAE Symposium on Nuclear Physics 2015 at Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam,
"Coherent pion production in ν-Nucleus interaction",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **60** (2015) 848.

10. ^{7th}International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP) 2015 at Variable Energy Cyclotron Center, Kolkata,
"Energy loss of B and D mesons in PbPb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV",
Kapil Saraswat*,Prashant Shukla and Venktesh Singh,
PoS **ICPAQGP2015** (2015) 082, arXiv:1511.05349 [hep-ph].

11. ^{61th}DAE Symposium on Nuclear Physics 2016 at Saha Institute of Nuclear Physics, Kolkata,
"Strange hadron production in high multiplicity pp collision at $\sqrt{s}$ = 7 TeV",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **61** (2016) 780.

12. ^{61th}DAE Symposium on Nuclear Physics 2016 at Saha Institute of Nuclear Physics, Kolkata,
"Quasi elastic sacttering of neutrino with nuclei",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **61** (2016) 866.

13. XXII DAE-BRNS HIGH ENERGY PHYSICS SYMPOSIUM 2016 at University of Delhi, Delhi,
"Charged and Neutral coherent pion production in neutrino-nucleus scattering",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Springer Proc. Phys. **203** (2018) 697, [arXiv:1805.11836 [hep-ph]].

14. XXII DAE-BRNS HIGH ENERGY PHYSICS SYMPOSIUM 2016 at University of Delhi, Delhi,
"Freeze out of strange hadrons in pp, pPb and PbPb collisions at LHC energies",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
Springer Proc. Phys. **203** (2018) 701, [arXiv:1805.11832 [hep-ph]].

15. ^{62th}DAE Symposium on Nuclear Physics 2017 at Thapar University, Patiala,
"Heavy quark energy loss and heavy meson spectra in heavy ion collisions at LHC energies",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **62** (2017) 850.

16. ^{62th}DAE Symposium on Nuclear Physics 2017 at Thapar University, Patiala,
"Charged particle production in pp and heavy ion collisions",
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
DAE Symp. Nucl. Phys. **62** (2017) 856.

17. ^{62th}DAE Symposium on Nuclear Physics 2017 at Thapar University, Patiala,
"Charged current deep inelastic scattering of muon neutrino with Iron nuclei",
Deepika Grover, **Kapil Saraswat***, Prashant Shukla,Venktesh Singh,
DAE Symp. Nucl. Phys. **62** (2017) 972.

18. ^{62th}DAE Symposium on Nuclear Physics 2017 at Thapar University, Patiala,
"Study of strongly interacting matter using light and heavy hadron production in heavy ion collisions",
Kapil Saraswat*,
DAE Symp. Nucl. Phys. **62** (2017) 1202.

19. ^{63th}DAE International Symposium on Nuclear Physics 2018 at Bhabha Atomic Research Centre, Mumbai,
"Identified charged particle production in proton-proton collisions at $\sqrt{s}$ = 13 TeV",
Pramod Kumar, **Kapil Saraswat***, Prashant Shukla and Venktesh Singh,
DAE Symp. Nucl. Phys. **63** (2018) 966.

20. ^{63th}DAE International Symposium on Nuclear Physics 2018 at Bhabha Atomic Research Centre, Mumbai,
"Nuclear modification factor and energy loss of charged particles and jets in PbPb collisions at $\sqrt{s_{\rm NN}}$ = 2.76 TeV",

Kapil Saraswat*, Prashant Shukla and Venktesh Singh,
DAE Symp. Nucl. Phys. **63** (2018) 980.

21. ^{63th}DAE International Symposium on Nuclear Physics 2018 at Bhabha Atomic Research Centre, Mumbai,
"Quasi elastic scattering of anti-muon neutrinos off ^{12}C",
Deepika Grover, **Kapil Saraswat***, Prashant Shukla and Venktesh Singh,
DAE Symp. Nucl. Phys. **63** (2018) 1032.

22. ^{64th} DAE Symposium on Nuclear Physics 2019 at University of Lucknow, Lucknow,
"Heavy quark energy loss and heavy meson spectra in pPb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV",
Kapil Saraswat*, Prashant Shukla and H. C. Chandola,
DAE Symp. Nucl. Phys. **64** (2019) 716.

23. ^{64th} DAE Symposium on Nuclear Physics 2019 at University of Lucknow, Lucknow,
"Centrality dependence of Identified charged Particle Production in Pb+Pb collisions at $\sqrt{s}$ = 2.76 TeV",
Pramod Kumar, **Kapil Saraswat*** and Venktesh Singh,
DAE Symp. Nucl. Phys. **64** (2019) 750.

24. ^{64th} DAE Symposium on Nuclear Physics 2019 at University of Lucknow, Lucknow,
"Deuteron production in Au + Au collisions at RHIC energies",
P. K Khandai and **Kapil Saraswat***,
DAE Symp. Nucl. Phys. **64** (2019) 778.

25. ^{65th} DAE Symposium on Nuclear Physics 2021 at Bhabha Atomic Research Centre, Mumbai,
"Study of medium modifications in Xe+Xe collisions at $\sqrt{s_{\rm NN}}$ = 5.44 TeV",
P.K. Khandai, P. Kumar, **K. Saraswat***, V. Singh,
DAE Symp. Nucl. Phys. **65** (2021) 632.

26. ^{65th} DAE Symposium on Nuclear Physics 2021 at Bhabha Atomic Research Centre, Mumbai,
"Effect of energy loss on nuclear modification factor of heavy mesons in pPb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV",
Kapil Saraswat*, Deependra Singh Rawat, H. C. Chandola,
DAE Symp. Nucl. Phys. **65** (2021) 676.

27. ^{65th} DAE Symposium on Nuclear Physics 2021 at Bhabha Atomic Research Centre, Mumbai,
"Characteristic Behavior of Color Flux-Tubes in Dual QCD",
Deependra Singh Rawat, H. C. Chandola, **Kapil Saraswat***,
DAE Symp. Nucl. Phys. **65** (2021) 710.

Chapters in Books

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1. **Charged and Neutral coherent pion production in neutrino-nucleus scattering**,
Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh,
"Springer Proceedings in Physics book series",
Springer Proc. Phys. **203** (2018) 697, [arXiv:1805.11836 [hep-ph]].

2. **Freeze out of strange hadrons in pp, pPb and PbPb collisions at LHC energies**, Kapil Saraswat*,Prashant Shukla, Vineet Kumar and Venktesh Singh, **"Springer Proceedings in Physics book series"**, Springer Proc. Phys. **203** (2018) 701, [arXiv:1805.11832 [hep-ph]].

List of Attended Schools and Workshops

- **Workshop on High Energy Physics @ Sangam 2013** at Harish Chandra Research Institute, Allahabad.

- **Winter School on High Energy Physics 2013** at Banaras Hindu University, Varanasi.

- **Winter School on Nuclear, Particle and Accelerator Physics 2014** at Banaras Hindu University, Varanasi.

- **Workshop on Light from Dark Side of the Universe 2015** at Banaras Hindu University, Varanasi.

- **Winter School on Beyond the Standard Model Physics 2016** at Banaras Hindu University, Varanasi.
- **A Workshop on Neutrino Physics : Theory and Experiments 2019** at Banaras Hindu University, Varanasi.

Talks and Poster Presentations

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1. **Poster**,
   "Constraining Heavy Quark Energy Loss Using B and D Mesons in Heavy Ion Collision",
   59^{th} **DAE Symposium on Nuclear Physics 2014** at Banaras Hindu University, Varanasi.
2. **Oral**,
   "Interaction of neutrinos with matter in low and intermediate energy region",
   59^{th} **DAE Symposium on Nuclear Physics 2014** at Banaras Hindu University, Varanasi.
3. **Poster**,
   "Heavy quark energy loss in PbPb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV",
   60^{th}**DAE Symposium on Nuclear Physics 2015** at Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam.
4. **Oral**,
   "Coherent pion production in ν-Nucleus interaction",
   60^{th}**DAE Symposium on Nuclear Physics 2015** at Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam.

5. **Oral**,
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