Curriculum Vitae

Dr. Nirbhay Kumar Behera

Assistant Professor
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ACADEMIC QUALIFICATIONS

Ph.D. July 2008 - January 2015
Reaearch Area: Experimental High Energy Physics
Department of Physics, IIT Bombay, Powai, Mumbai-400076, India
Thesis Title: Study of higher moments of net-electric charge and net-proton number fluctuations in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV in ALICE at LHC.

M.Sc. July 2006 - May 2008
Specialisation in Particle Physics, First Division (77.1%)
Utkal University, Bhubaneswar

B.Sc. August 2003 - May 2006
Physics Hons., First Division with distinction (72.83%)
F.M.(auto) College, Balasore, Odisha

POSITIONS HELD

Assistant Professor June 2020 - continuing
Department of Physics, Central University of Tamil Nadu

Postdoctoral Fellow Aug 2019 - March 2020
Department of Physics, IIT Madras, India

Postdoctoral Fellow May 2015 - May 2019
Department of Physics, Inha University, Incheon, South Korea

Postdoctoral Fellow Dec 2014 - April 2015
Department of Physics, IIT Indore, India

RESEARCH INTEREST

My broad area of research is experimental high energy physics. My research mainly focuses on the area of ultra-relativistic heavy-ion collision experiments at the LHC, which aims to study the properties of Quark-Gluon Plasma (QGP). It includes the correlation-fluctuation study and measurement of heavy-flavor hadrons using the pp and heavy-ion collisions data at LHC energies. Conserved charge fluctuations measurements are one of the potential tools to map the QCD phase diagram. Multiplicity dependent measurements of heavy-flavors are proposed as a probe to study the particle production mechanism in hadron-hadron collisions. Similarly, measurements of heavy-flavor hadrons in the heavy-ion collision are used as a tool to study the energy loss mechanism of quarks inside the QGP medium.

Being an experimentalist, I have a particular interest in research and development of MAPS technology based CMOS pixel detectors used in collider experiments. MAPS technology based pixel sensor are the most advanced detector technology with broad applications in high energy physics to medical science in the future.

International Collaboration Electron Ion Collider Experiment, Brookhaven National Laboratory, NY, USA.

Ongoing Projects Nil

TEACHING EXPERIENCES AND COURSE TAUGHT

Assistant Prof. (Regular), CUTN

- Particle Physics (4 Credits), IMSc V Year (2022).
- Nuclear and Particle Physics (4 Credits), IMSc IV Year (2020-21, 2021-22, 2022-23).
- Numerical Methods and Computer Programming (4 Credits), IMSc. III Year (2020-21, 2021-22).
- Electricity and Magnetism (3 Credits), IMSc II Year (2020-21, 2021-22).
- Heat and Thermodynamics (3 Credits), IMSC II Year, (2020-21).
- Computational Laboratory-I (2 Credits), IMSc III Year (2020-21, 2021-22).
- Heat and Thermodynamics Laboratory (2 Credits), IMSc II Year (2021-22).

Teaching Assistantship

- Teaching assistantship in Numerical methods in Physics (PH5720) offered to BSMS and MSc 1st year students at IIT Madras (course offered by Ass. Prof. Dr. Prabhat R. Pujahari, IIT Madras), 2nd semester of 2019-20.
- Given three lecture classes and one tutorial class on detector physics for the course Introduction to nuclear and particle physics (PH5211) offered to BSMS, MSc, PhD students at IIT Madras (course offered by Ass. Prof. Dr. Prabhat R. Pujahari) of 1st semester of 2019-20.
- Guidance to master and PhD students at Inha University on beauty hardon analysis in pp and PbPb collisions. (May, 2015 - May 2019)
- Guidance to PhD student of University of Houston on Fluctuation analysis of net-particle distributions in PbPb collisions. (Dec, 2016 - continuing)
- Guidance and assistance in project work of two master students of Prof. B. K. Nandi of IIT Bombay, on "Elliptic flow measurement in heavy-ion collision experiments". (2013 - 2014)
- Four Years of Teaching assistantship (TA) in Nuclear Physics laboratory (M.Sc. level) and General Physics laboratory (B. Tech. level). (2009 - 2012)
- Instructor of muon life time measurement experiment in EHEP SERC school at IIT Bombay. (2009)

RESEARCH SUPERVISION

- Ph.D.- Nil
- PG Thesis- 5 (i) Anaswara Ramachandran, (ii) Sreeja R., (iii) Abdussamad M., (iv) Nebula S U, (v) Sana Jafar.
- UG Thesis- 2: (i) Boda Abhishek Naik, (ii) Arun R.
- Summer Internship- 3 : (i) Abudas Samad, (ii) Abhiram V, (ii) Amarendra Tiwari.

ADMINSTRATIVE EXPERIENCES

1. Internal Member of Board of Studies (BoS), Department of Physics, Central University of Tamil Nadu (2020-2023)
2. Department in-charge for NAAC Criteria-V, (2020-continuing)
3. Department Academic Audit committee member (2020-21, 2021-2022)
4. Admission committee member for Ph.D. and I.MSc. students. (2020-continuing)
5. Department seminar-webinar coordinator (2020-21)
6. Department perturbation club coordinator (2021-22, 2022-2023)
7. Scrutiny Committee member for guest faculty recruitment (2022)

WORKSHOP ORGANIZED as

1. Organizing Secretary: National webinar on Recent Trends in Physics (RTP - 2021), March 25-26, 2021, Department of Physics, Central University of Tamil Nadu, Thiruvarur.

FACULTY TRAINING PROGRAM ATTENDED

1. Faculty Induction Program, Batch-XII, 9th Nov - 8th Dec 2022, UGC-HRDC, University of Madras, Chennai, Tamil Nadu.
2. International Faculty Development Programme, 30th March 2021, Central University of Tamil Nadu, Thriruvarur.

TRAINING PROGRAMS ATTENDED

1. Silicon chip series test and hybrid integrated circuit (HIC) assembly for silicon pixel chip at Pusan National University, Busan, South Korea, 2018.
2. Characterization of silicon pixel detector for ALICE ITS detector upgrade at the LHC, CERN, Geneva, 2016.
3. Training on data acquisition system (DAQ) of alice experiment at the LHC, CERN, Geneva, 2016.
4. Training on data acquisition system (DAQ) of alice experiment at the LHC, CERN, Geneva, 2012.
5. Experimental detector control system training of ALICE experiment of LHC at CERN, Geneva, 2011.
6. Experimental detector control system training of STAR experiment at RHIC, BNL, 2011.
7. Experimental detector control system of STAR experiment at RHIC, BNL, 2010.
8. VII SERC school on experimental high energy physics-2009 at IIT Bombay, 2009.

AWARDS AND HONORS

1. Institute Postdoctoral Fellow (2019) by IIT Madras
2. Postdoctoral Fellowship from Inha University, Incheon, South Korea from May 2015 to May 2019.
3. Research Assistantship (RA) awarded in IIT Bombay for PhD programme. (July 2008-June 2014)
4. **National level awards and honours:** (i) Junior Research Fellowship (JRF) awarded by Council of Scientific and Industrial Research (CSIR), Government of India, **(ii)** Qualified National Eligibility Test (NET) 2008 by UGC-CSIR, India and **(iii)** Qualified Graduate Aptitude Test Examination (GATE) 2008 conducted by Ministry of Human Resource Development, India. (2008), **(iv)** Merit scholarship from Government of Odisha in 2002, , **(iv)** Awarded in district level for achievement in High School certificate examination-2000.

VISITS TO OUTSIDE INSTITUTION

1. Visiting researcher at Pusan National University, Busan, South Korea (2018).
2. Visiting researcher at CERN, Geneva (Average of 1 months every year, 2011-2018).
3. Visiting researcher at Brookhaven National Laboratory, New York in 2010 for 3 months and in 2011 for 2 months.
4. Visiting researcher at SUBATECH, Nantes, France, June- July 2009.

JOURNAL PUBLICATIONS

I have total **267** publications in international peer reviewed journals. Only a selected list of publications is given here. Complete list of publication can be found in **https://orcid.org/0000-0002-1999-9876**

1. J. Adam *et al.* [ATHENA], "ATHENA detector proposal — a totally hermetic electron nucleus apparatus proposed for IP6 at the Electron-Ion Collider," JINST **17**, no.10, P10019 (2022) doi: **https://doi.org/10.1088/1748-0221/17/10/P10019**
2. **N. K. Behera** and M. J. Kweon, "Constructing probability density function of net-proton multiplicity distributions using Pearson curve method," Eur. Phys. J. A **58**, no.3, 43 (2022) doi: **https://doi.org/10.1140/epja/s10050-022-00696-9**.

3. R. Abdul Khalek, A. Accardi, J. Adam, D. Adamiak, W. Akers, M. Albaladejo, A. Albataineh, M. G. Alexeev, F. Ameli and P. Antonioli, *et al.* "Science Requirements and Detector Concepts for the Electron-Ion Collider: EIC Yellow Report," Nucl. Phys. A **1026**, 122447 (2022) doi: **https://doi.org/10.1016/j.nuclphysa.2022.122447**.
4. **N. K. Behera**, R. K. Nayak and S. Dash, "Baseline study for net-proton number fluctuations at top energies available at the BNL Relativistic Heavy Ion Collider and at the CERN Large Hadron Collider with the Angantyr model," Phys. Rev. C **101**, no.6, 064903 (2020) doi: **https://doi.org/10.1103/PhysRevC.101.064903**.
5. S. Acharya *et al.* [ALICE], "Elliptic Flow of Electrons from Beauty-Hadron Decays in Pb-Pb Collisions at $\sqrt{s_{NN}} = 5.02$ TeV," Phys. Rev. Lett. **126**, no.16, 162001 (2021) doi: **https://doi.org/10.1103/PhysRevLett.126.162001**.
6. **Principal author, (ALICE internal terminology: PC member)** S. Acharya *et al.* [ALICE], "Global baryon number conservation encoded in net-proton fluctuations measured in Pb-Pb collisions at $\sqrt{s_{\rm NN}} = 2.76$ TeV," Phys. Lett. B **807**, 135564 (2020), doi: **https://doi.org/10.1016/j.physletb.2020.135564**.
7. **Contributing author of CERN Yellow Report**, Z. Citron, A. Dainese, J. F. Grosse-Oetringhaus, J. M. Jowett, Y. J. Lee, U. A. Wiedemann, M. Winn, A. Andronic, F. Bellini and E. Bruna, *et al.* "Report from Working Group 5: Future physics opportunities for high-density QCD at the LHC with heavy-ion and proton beams," CERN Yellow Rep. Monogr. **7**, 1159-1410 (2019), **https://doi.org/doi:10.23731/CYRM-2019-007.1159**.
8. **N. K. Behera**, S. Dash, B. Naik, B. K. Nandi and T. Pani, "Charged particle multiplicity and transverse energy distribution using Weibull-Glauber approach in heavy-ion collisions,". Phys. Rev. C **96**, 054906 (2017), doi: **https://doi.org/10.1103/PhysRevC.96.054**
9. A. Nath Mishra, R. Sahoo, P. Sahoo, P. Pareek, **N. K. Behera** and B. K. Nandi, "Energy and Centrality dependence of $dN_{ch}/d\eta$ and $dE_T/d\eta$ in Heavy-Ion Collisions from $\sqrt{s_{NN}} = 7.7$ GeV to 5.02 TeV," Eur. Phys. J. A **52**, no. 10, 319 (2016), doi: **https://doi.org/10.1140/epja/i2016-16319-3**.
10. R. Sahoo, A. N. Mishra, **N. K. Behera**, B. K. Nandi, "Charged Particle and Photon Multiplicity, and Transverse Energy Production in High-Energy Heavy-Ion Collisions", Advances in High Energy Physics, Volume 2015, 612390. doi: **https://doi.org/10.1155/2015/6**
11. B. Abelev *et al.* [ALICE Collaboration], "Net-Charge Fluctuations in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV," Phys. Rev. Lett. **110**, no. 15, 152301 (2013). doi: **https://doi.org/10.1103/PhysRevLett.110.152301**.
12. **N. K. Behera**, R. Sahoo and B.K. Nandi "Constituents quark scaling of strangeness enhancement in heavy-ion collisions", Adv. High Energy Phys. **2013**, 273248 (2013), doi: **https://doi.org/10.1155/2013/273248**.

EXPERIMENTAL ANALYSIS NOTES

1. **N. K. Behera**, S.P. Pathak and R. Bellwied, ALICE Analysis note on "Second cumulants of net-proton multiplicity distributions in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV in ALICE at the LHC", **internal ID: ANA-437**.
2. **N. K. Behera**, S.P. Pathak and R. Bellwied, ALICE Analysis note on "Study of higher order cumulants of net-particle multiplicity distributions in Pb–Pb collisions at $\sqrt{s_{NN}} = 2.76$ and 5.02 TeV in ALICE at the LHC", **internal ID: ANA-736**.
3. Jiyeon Kwon, **N. K. Behera** and MinJung Kweon, ALICE Analysis note on "Measurement of electrons from beauty-hadron decays in pp collisions at $\sqrt{s} = 13$ TeV" (Internal ID to be assigned)
4. Jonghan Park, Martine Volkl, **N. K. Behera** and MinJung Kweon, ALICE Analysis note on "Measurement of the electrons from beauty-hadron decays in the 30–50% central Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE", **internal ID: ANA-897**.
5. P. Pujahari, N. K. Behera, CMS Analysis note on"Net-charge fluctuations measurement in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV", (On going)

CONFERENCE PRESENTATIONS

Oral presentations at international conferences:

1. **Contributing talk** "ALICE Inner Tracking System upgrade at the LHC," in XXIII DAE-BRNS High Energy Physics Symposium 2018, IIT Madras, India. (10 -14 Dec, 2018)
2. **Plenary talk** "Net-particle number fluctuations measurement in Pb-Pb collisions at ALICE" in 7th Asian Triangle Heavy-Ion Conference (ATHIC 2018), University of Science and Technology of China (USTC). (3 - 6 Nov, 2018)
3. **Contributing talk** "Higher order cumulants of net-particle distributions measured with ALICE at the LHC", in Korean Physical Society Fall conference at Changwon, South Korea. (24th - 26th Oct 2018)
4. **Plenary talk** "Cumulants of net-proton number fluctuations from ALICE at the LHC" in XIII Workshop on Particle Correlations and Femtoscopy, Henryk Niewodnicza?ski Institute of Nuclear Physics PAN, Krakow, Poland. (22 - 26th May 2018)
5. **Contributing talk** "Higher moments fluctuations of identified particle distributions from ALICE" in 27th international conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2018), Venice, Italy. (14 - 19 May 2018)
6. **Contributing talk** "Constructing probability density function of net-proton multiplicity distributions using Pearson curve method" in Korean Physical Society Fall conference at GyeongJu, South Korea. (25 - 27 Oct 2017)
7. **Contributing talk** "Charged particle multiplicity and Transverse energy distribution using Weibull-Glauber approach in Heavy- Ion collisions" in Korean Physical Society spring conference at Daejeon, South Korea. (19 - 21 April 2017)
8. **Plenary talk** "Characterization of pixel sensor chip at Inha" in 8th ALICE ITS upgrade, MFT and O2 Asian workshop, Bangkok, Thailand. (5 - 6 December 2016)
9. **Plenary talk** "Sensor characterization of ITS pixel chip" in 7th ALICE ITS upgrade, MFT and O2 Asian workshop, Jakarta, Indonesia. (26 - 28 July 2016)
10. **Contributing talk** "Higher order cumulants of net-particle distributions in Pb+Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV in ALICE at LHC" in Korean Physical Society spring conference at Daejeon, South Korea. (20 - 22 April 2016)
11. **Plenary talk** "Sensor characterization of ITS pixel chip" in 6th ALICE ITS upgrade, MFT and O2 Asian workshop, Yonsei University, Seoul, South Korea. (7 - 9 December 2015)
12. **Invited plenary talk** "Recent results on event-by-event fluctuations in ALICE at the LHC" in International conference on Critical Point and Onset of Deconfinement (CPOD), University of Bielefeld, Germany. (17 - 21 Nov 2014)
13. **Invited seminar** Seminar on "Jet Physics at RHIC" at Subatech, Nantes, France. (6th July, 2009)

Poster presentations:

1. "Production of electrons from beauty-hadron decays in pp collisions at the LHC with ALICE" in 27th international conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2018), Venice, Italy, 14-19th May, 2018.
2. "Constructing probability density function of net-proton multiplicity distributions using Pearson curve method", in 27th international conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2018), Venice, Italy, 14-19th May, 2018.
3. International conference of Physics and Astro-Physics of Quark Gluon Plasma (ICPAQGP - 2015) at VECC, Kolkata, India, Feb. 2015.
4. DAE nuclear physics symposium, December 2011, India.
5. DAE International nuclear physics symposium, December 2009, India.

PROCEEDINGS IN INTERNATIONAL AND NATIONAL CONFERENCES

1. N. K. Behera [ALICE], "ALICE Inner Tracking System upgrade at the LHC", XXIII DAE High Energy Physics Symposium, Spinnger Proceedings in Physics 261.
2. N.K. Behera for ALICE collaboration, "Cumulants of net-proton number fluctuations from ALICE at the LHC", XIII Workshop on Particle Correlations and Femtoscopy, Henryk Niewodnicza?ski Institute of Nuclear Physics PAN, Krakow, Poland 2018. Submitted to Acta Physica Polonica B.
3. N.K. Behera for ALICE collaboration, "Higher moment fluctuations of identified particle distributions from ALICE", International conference on Ultra-relativistic Nucleus-Nucleus Collisions (Quark Matter 2018), Venice, Italy. Nucl.Phys. A, **982**, 851−854 (2019).
4. Proceedings on Recent results on event−by−event fluctuations in ALICE at the LHC," PoS CPOD **2014**, 018 (2015).
5. "Constituents quarks and enhancement of multi-strange baryons in heavy-ion collisions". Nuclear Physics symposium, Nuclear Phys. **56**, 1012 (2011).
6. "Constituents quarks and multi-strange baryon production in heavy-ion collisions" in International symposium on Nuclear Physics, Nuclear Phys. **54**,594 (2009).

COMPUTATIONAL SKILL

- Analysis framework development: (a) ALICE: beauty-hadron measurement in pp 13 TeV, net-particle fluctuation analysis in PbPb 2.76 TeV, (b) STAR: ρ^0 and Δ^{++} resonance analysis.
- Event Generator: Pythia, HIJING, UrQMD, AMPT, THERMINATOR
- Programming Language: Fortran, C++, Python
- Operating system: Linux, Windows, Mac OS.
- Scripting: Shell script.
- Toolkit: ROOT, StRoot, AliRoot, Mathematica.
- Publishing: MS Office, Latex