

Dr. Nilanjana Kumar

Assistant Professor
Centre for Cosmology and Science Popularization
SGT University, Delhi NCR, India

+91 8427669814
nilanjana.kumar@gmail.com

EXPERTISE Experience in Particle Physics and High energy Physics with knowledge in various extensions of Standard Model, expertise in model building and simulations in collider phenomenology. Experience in teaching B.Sc. and M.Sc. students.

RESEARCH INTERESTS

Phenomenological aspects of Beyond Standard Model Physics, Collider physics
Exotic physics in Composite Higgs, Little Higgs Models
Expertise in LHC and ILC collider phenomenology, Flavor physics
Early universe cosmology, Dark Matter, Baryogenesis

RESEARCH EXPERIENCE **Ph.D in Physics : Northern Illinois University (NIU)** August 2016
Dekalb, IL, USA

Thesis: *“Phenomenological studies of extensions of the Standard Model”*
Advisor: Stephen P. Martin

Postdoc D.S.Kothari Postdoctoral Fellow, 2019-2022
Department of Physics and Astrophysics, University of Delhi, India

Postdoc Theoretical Physics Division 2019
Institute of Mathematical Sciences, Chennai, India

Postdoc Theory Division 2017-2018
Saha Institute of Nuclear Physics, Kolkata, India

Postdoc Theory Division, Institute of Physics(IOP) 2016
Bhubaneswar, India

PUBLICATIONS Journal Publication: **12** Reports and Proceedings: **3** Review: **1** arXiv: **1**

ACHIEVEMENTS AND AWARDS Recipient of **Startup Research Grant(SRG)** as PI by SERB DST, 2022
D.S.Kothari Postdoctoral Fellowship by UGC, (2018-2021)
Outstanding Teaching Assistant award during Ph.D. by Physics department and Northern Illinois University, 2015
All India Rank 142 in National Eligibility Test in Physics in India, 2009
Awarded by Indian Association of Physics Teachers in National Graduate Physics Examination, 2006
Best Talent among undergraduate students in nationwide Physics Talent Search by Indian Physics Association, 2005
Awarded 1st prize in district level seminar by Department of Youth Services, INDIA, for recitation on Biological Revolution -Benefits and Concerns, 2001

EARLY
EDUCATION

The Institute of Mathematical Sciences, Chennai, India

Post M.Sc Coursework as JRF, 2010 Physics, 2010, GPA: 8/10

University of Calcutta, Kolkata, India

M.Sc, Physics, August 2009, GPA: 7.2/10(1st class)

- Masters Project: Study of Quantum Computation and Quantum Cryptography

Bethune College, University of Calcutta, Kolkata, India

B.Sc., Physics (Major), May 2007, GPA: 6.1/10(1st class)

VISITS AND
OTHER
ENGAGEMENTS

Part of **Science Popularization** program at CCSP, SGT University. Delivered a talk "*LHC:A machine to detect particles and more..*", 2022

Member of **International Linear Collider Working Group3** and a part of "ILC Report to snowmass collaboration".

Invited speaker at ILC working group workshop, 2022-

Invited speaker and visitor at APCTP, South Korea, 2019

Project Student at HRI, India under Prof. Amitabha Roychoudhury, 2010

Visiting student at Indian Physics Association for Physics Talent Search, 2005

CONFERENCE
PRESENTATIONS

University of Calcutta, **invited speaker**

"Exotic particles at future collider experiments", 2022

ILC WG3 mini-workshop on BSM at ILC,

"Alternative Searches for Quintuplet fermions at ILC", 2022

PHENO 2020, University of Pittsburgh, USA,

"Collider signatures of multicharged fermions".

APCTP, South Korea, **invited speaker** in APCTP Mini-Workshop 2019- "Recent topics on dark matter, neutrino, and their related phenomenologies": talk titled *"Effects of Higher Dimensional Operators on Higgs couplings"*

ANOMALIES 2019, IIT Hyderabad, India, *Effects of Higher Dimensional Operators on Higgs Couplings*.

IIT Chennai, Chennai, India, 2019

"Realization of the Higgs coupling beyond the Standard Model"

IMHEP 2019, IOP Bhubaneswar, India, 2019

"Higgs couplings in Georgi -Machacek Model"

DAE-BRNS Symposium, IIT Madras, Chennai, India, 2018

"Flavor violation at 13 TeV LHC in ($\mu^+\tau^- + b$ -jet) events"

IMSC, Chennai, India, 2018

"Confronting LHC data with Composite Higgs Theories"

SUSY 2017, TIFR, Mumbai, India, 2017

"Unique collider signatures of a left-right symmetric model with minimal DM"

SINP, Kolkata, India, 2017

"Confronting LHC data with composite Higgs models"

CAN-DARK, ICTS, Bangalore, India, 2017

"Collider signature of a left-right symmetric model"

SINP, Kolkata, India, 2016

"Solving the problems in MSSM Effective Potential due to Goldstone Bosons"

IOP, Bhubaneswar, India, 2016
"A study on the prospects of Vectorlike Leptons at LHC"
 Northern Illinois University, IL, USA, 2016
"Phenomenological studies of minimal extensions of Standard Model"
 University of Calcutta, India, 2015
"Prospects of Vectorlike Leptons at LHC"
 PHENO 2015, University of Pittsburgh, USA,
"Vectorlike Leptons at LHC"
 PHENO 2014, University of Pittsburgh, USA,
"LHC search for di-Higgs decays of stoponium and other scalar resonances in events with two photons and two bottom jets"

WORKSHOP AND SCHOOL 2022, Particle Physics:Phenomena, Puzzles, Promises, ICTS, Bengaluru, India
 2019, WHEPP XVI, IIT Guwahati, Assam
 2018, SANGAM@HRI workshop, Harishchandra Research Institute, India
 2018, Indo French conference, IISER Pune, India.
 2017, Aspects of Early Universe Cosmology, SINP, Kolkata.
 2016, Pedagogical School on Neutrinos and LHC physics at IOP, Bhubaneswar.
 2013, Prospects in Theoretical Physics (PiTP) summer program on LHC Physics in Institute for Advanced Study, Princeton, USA
 2009, Conference on LHC and New Frontiers of Particle Physics organized by University of Calcutta

TEACHING EXPERIENCE **Teaching as AP** 2022-
 SGT University
 B.Sc Thermal Physics and Statistical Mechanics

Teaching Assistant 2019
 University of Delhi
 M.Sc Statistical Mechanics, Computer language)

Teaching Assistant 2011-2016
 Northern Illinois University, USA
 Electricity and Magnetism, Mechanics (Outstanding TA award)

Part Time Physics Instructor 2009
 BRSC College, Kolkata, India
 Mathematical Physics, Nuclear Physics

PROJECT STUDENTS **Shreesh Sahai**
 B. Tech + M. Tech Integrated Nuclear Science and Technology
 Amity Institute of Nuclear Science and Technology, Amity University, Noida
 Project for Master's Thesis

Gaadha Lekshmi S
 Master in Physics
 Department of Physics, SVNIT, Surat, Gujrat

Project for Master's Thesis

- OTHER INFORMATION
- Member of NICAAD(2012-2016), Project leader of QuarkNet in 2011
 - I like to be involved in academic group activities and cultural programs.
 - I do have interest in literature, painting, travel and photography.
 - Date of Birth: 8th October, 1986, Nationality: Indian
 - Spouse: Dr. Mayukh Raj Gangopadhyay

REFERENCES **Stephen P. Martin**

Distinguished Professor

Department of Physics

Northern Illinois University, Illinois, US

E-mail: spmartin@niu.edu

Debajyoti Choudhury

Senior Professor

Department of Physics and Astrophysics

university of Delhi, Delhi

E-mail: debajyoti.choudhury@gmail.com

Anirban Kundu

Professor

Department of Physics

University of Calcutta, Kolkata, India

E-mail: akphy@caluniv.ac.in

Gautam Bhattacharyya

Senior Professor

Theory Division

Saha Institute of Nuclear Physics, Kolkata

E-mail: gautam.sinp@gmail.com

PUBLICATIONS

Published papers : 12

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1. **N. Kumar**, V.Sahdev,
“Alternative signatures of the quintuplet fermions at LHC and future linear colliders”,
Phys. Rev. D **105**, no.11, 115016 (2022) [arXiv:2112.09451 [hep-ph]]
 2. **N. Kumar**, T. Nomura and H. Okada,
“N. Kumar, T. Nomura and H. Okada, “A multi-charged particle model with local $U(1)_{\mu-\tau}$ to explain muon $g - 2$, flavor physics, and possible collider signature”,
Chin. Phys. C **46**, 043106 (2022) [arXiv:2002.12218 [hep-ph]]
 3. D. Choudhury, K. Deka and **N. Kumar**,
“Looking for a vectorlike B quark at the LHC using jet substructure,”
Phys. Rev. D **104**, no.3, 035004 (2021)[arXiv:2103.10655]
 4. **N. Kumar** and S. Sadhukhan, “Emergent 2HDM in LSS Little-Higgs: Musings from Flavor and Electroweak Physics”,
Phys. Rev. D **103**, 055011 (2021) [arXiv:2007.15626 [hep-ph]].

5. **N. Kumar**, T. Nomura and H. Okada, “**Scotogenic neutrino mass with large $SU(2)_L$ multiplet fields**”,
Eur. Phys. J. C **80**, no.8, 801 (2020) [arXiv:1912.03990 [hep-ph]]
6. D. Choudhury, N. Kumar, A. Kundu,
“**Search for opposite sign muon-tau pair and a b-jet at LHC in the context of flavor anomalies**”
Phys. Rev. D **100**, no. 7, 075001 (2019)[arXiv:1905.07982 [hep-ph]]
7. A. Banerjee, G. Bhattacharyya, N. Kumar,
“**Impact of Yukawa-like dimension-5 operators on the Georgi-Machacek model**”
PHYSICAL REVIEW D **99**, 035028 (2019)[arXiv:1901.01725[hep-ph]]
8. A. Agarwalla, K. Ghosh, N. Kumar and A. Patra,
“**Same-sign Multilepton Signatures of an $SU(2)_R$ Quintuplet at the LHC**”
10.1007/JHEP01(2019)080[arXiv:1808.02904[hep-ph]]
9. A. Banerjee, G. Bhattacharyya, N. Kumar and T. S. Ray,
“**Constraining Composite Higgs Models using LHC data**”
10.1007/JHEP03(2018)062 [arXiv:1712.07494 [hep-ph]]
10. N. Kumar and S. P. Martin,
“**Resummation of Goldstone boson contributions to the MSSM effective potential**”
Phys. Rev. D **94**, no. 1, 014013 (2016) [arXiv:1605.02059 [hep-ph]]
11. N. Kumar and S. P. Martin,
“**Vectorlike leptons at the Large Hadron Collider**”
Phys. Rev. D **92**, 115018 (2015) [arXiv:1510.03456 [hep-ph]]
12. N. Kumar and S. P. Martin,
“**LHC search for di-Higgs decays of stoponium and other scalars in events with two photons and two bottom jets**”
Phys. Rev. D **90**, no. 5, 055007 (2014) [arXiv:1404.0996 [hep-ph]]

Reports and Proceedings: 3

1. N. Kumar, “**Flavor violation at LHC in events with two opposite sign leptons and a b-jet** ”,
arXiv:2011.12810 [hep-ph]
Springer Proc.Phys. 261 (2021) 239-243, XXIII DAE High Energy Physics Symposium Proceedings
2. I. Adachi *et al.*, “**The International Linear Collider: Report to Snowmass 2021**”,
arXiv:2203.07622 [physics.acc-ph], Contribution to “2022 Snowmass Summer Study”.

3. J. de Blas *et al.* [Muon Collider], “**The physics case of a 3 TeV muon collider stage**”,
arXiv:2203.07261 [hep-ph], Contribution to “2022 Snowmass Summer Study”.
(To be Published in EPJC)
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Review Article : 1

1. N. Kumar, “**A Brief Review on Jet Substructure in Connection with Collider Phenomenology** ”,
arXiv:2211.10651 [hep-ph]
-

Papers communicated in journals: 1

1. M. R. Gangopadhyay, **N. Kumar**, A. Mukherjee and M. K. Sharma,
“**Composite pseudo Nambu Goldstone Quintessence**”, arXiv:2205.15249
[astro-ph.CO].