Sabyasachi Chakraborty *(he/him/his)* — *Curriculum Vitae*

Contact Information

Department of Physics,
Indian Institute of Technology, Kanpur,
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Academic Employments

Assistant Professor — Aug. 2022 – onwards
Department of Physics,
Indian Institute of Technology, Kanpur, India.

Postdoctoral Fellow — Oct. 2021 – Jun. 2022
Department of Theoretical Particle Physics,
International School for Advanced Studies (SISSA), Trieste, Italy,
Mentor: Prof. Aleksandr Azatov.

Postdoctoral Fellow — Oct. 2018 – Aug. 2021
Department of High Energy Physics,
Florida State University, Tallahassee, USA,
Mentor: Prof. Takemichi Okui.

Postdoctoral Fellow — Oct. 2015 – Aug. 2018
Department of Theoretical Physics,
Tata Institute of Fundamental Research, Mumbai, India,
Mentor: Prof. Tuhin S. Roy.

Education

Ph.D in Theoretical High Energy Physics — Aug. 2010 – Oct. 2015
Theoretical Physics Department,
Indian Association for the Cultivation of Science, Kolkata, India.
(Degree awarded by University of Calcutta, India in July 2016.)
Title: Some aspects of the phenomenology of supersymmetric theories and the Large Hadron Collider.
Supervisor: Prof. Sourov Roy.

Masters of Science in Physics — Aug. 2008 – Jul. 2010
Department of Physics,
Indian Institute of Technology, Madras, India.

Bachelor of Science in Physics — Jul. 2005 – Jul. 2008
Department of Physics,
Presidency College, Kolkata, India.

Internships

Integrable Systems — Aug. 2009 – Jul. 2010
Indian Institute of Technology, Madras, India.
Advisor: Prof. Arul Lakshminarayan.

Neutrino oscillation with non-standard interactions — May. 2009 – Jul. 2009
Indian Association for the Cultivation of Science, Kolkata, India.
Advisor: Prof. Sourov Roy.

Non linear Differential Equations and Phase Portrait Analysis — May. 2006 – Jul. 2006
Indian Statistical Institute, Kolkata, India.
Advisor: Prof. B. S. Dandapat.

Areas of Specialisation

Intensity Frontier

- Axion/Dark Photon searches at B-factories,
- Phenomenology of Wess-Zumino-Witten terms,
- Heavy quark effective theory ($HQET$) applications to coherent pion production ($\nu C \to \nu C \pi^0$).

Cosmic Frontier

- Stellar cooling and Dark Matter capture in stellar objects,
- Phase Transition in the early Universe,
- KeV scale Sterile neutrino dark matter.

Theory Frontier

- Soft collinear effective theory ($SCET$) for gravity,
- Generalized supersoft Supersymmetry, Non-holomorphic operators in Supersymmetry,
- R-symmetric Supersymmetry.

Energy Frontier

- *Soft tracks*, a tool for compressed new physics scenarios, such as *MSSM* & *MUED*,
- New Physics searches at Hadron and Lepton colliders.

Softwares and Packages

Expertise with `Mathematica`, `Fortran` and `C++`,
Plotting packages: `Gnuplot` and `ROOT`,
Model implementations: `SARAH` and `Feynrules`,
Spectrum generators: `SPheno`, `SuSpect` and `NMSSMTools`,
Event generators: `MadGraph`, `CalcHEP`, `PYTHIA` and `NuWro`,
Dark matter: `micrOMEGAs`,
Collider analysis: `Delphes` and `TMVA` for multivariate analysis,
Phase Transition: `FindBounce`.

Fellowships

Post doctoral position, 2020
Accepted: SISSA, Italy,
Short Listed: INFN Frascati (Italy), Padova University (Italy).

Post doctoral position, 2018
Accepted: Florida State University, USA.
Short Listed: IFIC Valencia (Spain), Natal (Brazil), Hebrew University of Jerusalem (Israel).

Post doctoral position, 2017
Declined: NCTS, Taiwan.
Short Listed: Helsinki Institute of Physics (Finland) and Laboratoire de Physique Corpusculaire (France).

Post doctoral position, 2015
Accepted: Tata Institute of Fundamental Research, India.

Council of Scientific and Industrial Research (CSIR)
Ranked 47, obtained Junior and Senior research Fellowships in 2010 and 2012 respectively.

Awards

CERN Summer School 2013
Participated in CERN-Fermilab Hadron Collider Physics Summer School, Geneva, Switzerland.

DST Travel Grant 2012
Participated in PSI Zuoz summer school, PSI, Switzerland.

DST Travel Grant 2012
Participated in the First Asia Europe Pacific School on High Energy Physics, Fukuoka, Japan.

Silver Medalist
Indian Institute of Technology, Madras, India, 2009.

Joint Admission to M.Sc (JAM)
Entrance for Masters degree, conducted by IITs and IISC, 2008.

Journal Referee

Physical Review D,
Modern Physics Letters A.

Students Mentored

1. Miguel Vanvlasselaer, SISSA, Italy,
2. Vazha Loladze, Florida State University, USA,
3. Arash Yunesi, Florida State University, USA.

Preprints

1. **Ultra-relativistic bubbles from the simplest Higgs portal and their cosmological consequences**
   Aleksandr Azatov, Giulio Barni, Sabyasachi Chakraborty, Miguel Vanclasselaer, Wen Yin
   Submitted in JHEP [arXiv:2207.02230 [hep-ph]].

Journal Publications

1. **Displaced Searches for Light Vector Bosons at Belle II**
   Triparno Bandyopadhyay, Sabyasachi Chakraborty, Sokratis Trifinopoulos
   JHEP 2205 (2022) 141 [arXiv:2203.03280 [hep-ph]].

2. **Heavy QCD Axion at Belle II: Displaced and Prompt Signals**
   Emilie Bertholet, Sabyasachi Chakraborty, Vazha Loladze, Takemichi Okui, Abner Soffer and Kohsaku Tobioka,
   Phys. Rev. D (Letter) 105 (2022) L071701 [arXiv:2108.10331 [hep-ph]].

3. **Composite neutrinos and the QCD axion: baryogenesis, dark matter, small Dirac neutrino masses and vanishing neutron EDM**
   Sabyasachi Chakraborty, Tae Hyun Jung and Takemichi Okui,
   Phys. Rev. D 105 (2022) 1, 015024 [arXiv:2108.04293 [hep-ph]].

4. **Heavy QCD Axion in $b \to s$ Transition: Enhanced Limits and Projections**
   Sabyasachi Chakraborty, Manfred Kraus, Vaja Loladze, Takemichi Okui and Kohsaku Tobioka,
   Phys. Rev. D, 104 (2021) 5, 055036 [arXiv:2102.04474 [hep-ph]].

5. **Solar origin of the XENON1T excess without stellar cooling problem**
   Sabyasachi Chakraborty, Tae Hyun Jung, Vazha Loladze, Takemichi Okui and Kohsaku Tobioka,
   Phys. Rev. D 102 (2020) 9, 095029 [arXiv:2008.10610 [hep-ph]].

6. **Topics in soft collinear effective theory for gravity: The diffeomorphism invariant Wilson lines and reparametrization invariance**
   Sabyasachi Chakraborty, Takemichi Okui and Arash Yunesi,
   Phys. Rev. D 101 (2020) 6, 066019 [arXiv:1910.10738 [hep-th]].

7. **Radiatively generated source of flavor universal scalar soft masses**
Sabyasachi Chakraborty and Tuhin S Roy,
Phys. Rev. D 100 (2019) 3, 035020 [arXiv:1904.10144 [hep-ph]].

8. **Fat jet signature of a Heavy Neutrino at Lepton Collider**
Sabyasachi Chakraborty, Manimala Mitra and Sujay Shil,
Phys. Rev. D 100 (2019) 1, 015012 [arXiv:1810.08970 [hep-ph]].

9. **Charting generalized supersoft supersymmetry**
Sabyasachi Chakraborty, Adam Martin and Tuhin S Roy,
JHEP 1805 (2018) 176 [arXiv:1802.03411 [hep-ph]].

10. **Constraining compressed versions of MUED and MSSM using soft tracks at the LHC**
Sabyasachi Chakraborty, Saurabh Niyogi and K. Sridhar,
JHEP 1707 (2017) 105 [arXiv:1704.07048 [hep-ph]].

11. **Neutrino mixing and R_K anomaly in $U(1)_X$ models: a bottom-up approach**
Disha Bhatia, Sabyasachi Chakraborty and Amol Dighe,
JHEP 1703 (2017) 117 [arXiv:1701.05825 [hep-ph]].

12. **Natural emergence of neutrino mass and dark matter from R-symmetry**
Sabyasachi Chakraborty and Joydeep Chakrabortty,
JHEP 1710 (2017) 012 [arXiv:1701.04566 [hep-ph]].

13. **Chasing new physics in stacks of soft tracks**
Amit Chakraborty, Sabyasachi Chakraborty and Tuhin S. Roy,
Phys. Rev. D (Rapid) 94 (2016) 11, 111703 [arXiv:1606.07826 [hep-ph]].

14. **Diphoton resonance at 750 GeV in the broken R-symmetric MSSM**
Sabyasachi Chakraborty, Amit Chakraborty and Sreerup Raychaudhuri,
Phys. Rev. D 94 (2016) 3, 035014 [arXiv:1512.07527 [hep-ph]].

15. **Probing $(g-2)_\mu$ at the LHC in the paradigm of R-parity violating MSSM**
Amit Chakraborty and Sabyasachi Chakraborty,
Phys. Rev. D 93 (2016) 7, 075035 [arXiv:1511.08874[hep-ph]].

16. **Light top squarks in $U(1)_R$ lepton number model with a right handed neutrino and the LHC**
Sabyasachi Chakraborty, AseshKrishna Datta, Katri Huiti, Sourov Roy and Harri Waltari,
Phys. Rev. D 93 (2016) 7, 075005 [arXiv:1508.01875 [hep-ph]].

17. **Lepton flavor violating decay of 125 GeV Higgs boson to $\mu\tau$ channel and excess in $t\bar{t}H$**
Biplob Bhattacherjee, Sabyasachi Chakraborty and Swagata Mukherjee,
Mod. Phys. Lett. A, Vol. 31, No. 30 (2016) 1650174 [arXiv:1505.02688 [hep-ph]].

18. **$h \to \gamma\gamma$ in $U(1)_R$ lepton number model with a right handed neutrino**
Sabyasachi Chakraborty, AseshKrishna Datta and Sourov Roy,
JHEP 1502 (2015) 124, Err. JHEP 1509 (2015) 077 [arXiv:1411.1525 [hep-ph]].

19. **7 keV sterile neutrino dark matter in $U(1)_R$ lepton number model**
Sabyasachi Chakraborty, Dilip Kumar Ghosh and Sourov Roy,
JHEP 1410 (2014) 146, [arXiv:1405.6967 [hep-ph]].

20. **Higgs boson mass, neutrino masses and mixing and keV dark matter in an $U(1)_R$-lepton number model**
Sabyasachi Chakraborty and Sourov Roy,
JHEP 1401 (2014) 101, [arXiv:1309.6538 [hep-ph]].

21. **Non-standard interaction in neutrino oscillations and recent Daya Bay, T2K experiments**
Rathin Adhikari, Sabyasachi Chakraborty, Arnab Dasgupta and Sourov Roy,
Phys. Rev. D 86 (2012) 073010, [arXiv:1201.3047 [hep-ph]].

Conference Proceedings

1. **Addressing R_K and neutrino mixing in a class of $U(1)_X$ models**
Disha Bhatia, Sabyasachi Chakraborty and Amol Dighe,
PoS CKM 2016 (2017) 064.

2. **Some phenomenological studies of a $U(1)_R$ lepton number model with a right handed neutrino**
Sabyasachi Chakraborty,
J. Phys. Conf. Ser. 627, 012008 (2015).

Selected Talks

1. **Heavy QCD axion in B-Factories: Constraints and Projections**
   - *Webinar*, Majorana-Raychaudhuri Seminars, Kolkata-Salerno Joint Activity – Jul. 2022,
   - *Webinar*, National Institute of Science Education and Research, Bhubaneswar, India – Jan. 2022,
   - *Webinar*, Indian Institute of Science Education and Research, Kolkata, India – Nov. 2021,
   - *Webinar*, Harish-Chandra Research Institute, Allahabad, India – Sep. 2021,
   - *Webinar*, Indian Institute of Technology, Kanpur, India – Aug. 2021,
   - *Webinar*, Indian Institute of Technology, Bombay, India – Apr. 2021,
   - *Webinar*, Institute of Mathematical Sciences, Chennai, India – Mar. 2021,
   - *Webinar*, KEK, Tsukuba, Japan – Mar. 2021,
   - *Webinar*, Physical Research Laboratory, Ahmedabad, India – Jan. 2021.
2. **Physics at the Fundamental Frontiers (Colloquium)**
   - *Webinar*, National Institute of Science Education and Research, Bhubaneswar, India – Jan. 2022,
   - *Webinar*, Harish-Chandra Research Institute, Allahabad, India – Sep. 2021,
   - *Webinar*, Indian Institute of Technology, Roorke, India – Jul. 2021,
   - *Webinar*, Indian Institute of Technology, Kanpur, India – Jul. 2021,
   - *Webinar*, Indian Institute of Technology, Bombay, India – Apr. 2021,
   - *Webinar*, Physical Research Laboratory, Ahmedabad, India – Dec. 2020.
3. **MiniBooNE anomaly and Heavy Quark Effective Field Theory**
   - *WHEPP*, Indian Institute of Technology, Guwahati, India – Dec. 2019.
4. **Soft Collinear effective theory for Gravity**
   - *Seminar*, University of Washington, St. Louis, USA – Nov. 2019.
5. **New sources for scalar soft masses in supersymmetry**
   - *Pheno2019*, University of Pittsburgh, USA – May 2019,
   - *Seminar*, Indian Institute of Technology, Kharagpur, India – September 2018,
   - *Free meson seminar*, Tata Institute of Fundamental Research, Mumbai, India – August 2018,
   - *Seminar*, Physical Research Laboratory, Ahemdabad, India – August 2018,
   - *Seminar*, University of Calcutta, Kolkata, India – June 2018,
   - *Seminar*, Indian Association for the Cultivation of Science, Kolkata, India – June 2018.
6. **Charting Generalized Supersoft Supersymmetry**

- *Is SUSY hiding under the bunker*, Indian Institute of Science, Bangalore, India – May 2018,
- *BSMblues*, Tata Institute of Fundamental Research, Mumbai, India – January 2018,
- *WHEPP*, Indian Institute of Science Education and Research, Bhopal, India – December 2017,
- *SUSY-17*, Tata Institute of Fundamental Research, Mumbai, India – December 2017.

7. **Soft tracks: Tool and Applications**
   - *Seminar*, Florida State University, Tallahassee, Florida, USA – October 2018,
   - *WHEPP*, Indian Institute of Science Education and Research, Bhopal, India – December 2017,
   - *SUSY-17*, Tata Institute of Fundamental Research, Mumbai, India – December 2017,
   - *Free meson seminar*, Tata Institute of Fundamental Research, Mumbai, India – Jul 2017,
   - *Seminar*, Indian Association for the Cultivation of Science, Kolkata, India – June 2017,
   - *Seminar*, Korea Institute for Advance Study, Seoul, Korea – March 2017,
   - *Looking for BSM Physics*, CHEP, Indian Institute of Science, Bangalore – December 2016,
   - *Seminar*, Harish-Chandra Research Institute, Allahabad, India – October 2016 .
8. **R_K Anomaly in $U(1)_X$ models: A Bottom-up Approach**
   - *WHEPP*, Indian Institute of Science Education and Research, Bhopal, India – December 2017.
9. **Origin of Neutrino Masses and Dark Matter from R-Symmetry**
   - *Strings to LHC-IV*, Tata Institute of Fundamental Research, Chalsa, India – March 2017,
   - *Seminar*, Korea Institute for Advanced Study, Seoul, Korea – March 2017.
10. **Jet Substructure in SUSY**
    - *Jets@LHC*, International Centre for Theoretical Science, Bangalore, India – January 2017.
11. **Diphoton Excess in the Broken R-Symmetric MSSM**
    - *750 GeV Excess@LHC under scrutiny*, ICTS, Bangalore, India – May 2016.
12. **Supersymmetry with R-Symmetry**
    - *TPSC lecture*, Indian Institute of Technology, Kanpur, India – November 2016,
    - *Free meson seminar*, Tata Institute of Fundamental Research, Mumbai, India – February 2016,
    - *Seminar*, CHEP, Indian Institute of Science, Bangalore, India – March, 2015,
    - *LHCDM-2015*, Indian Association for the Cultivation of Science, Kolkata, India – February 2015.
13. **Higgs, Neutrino Masses and keV Dark Matter in $U(1)_R$ Lepton Number Model**
    - *DAE Conference*, Indian Institute of Technology, Guwahati – December 2014,
    - *IWTCP-2* Buon Ma Thuot, Vietnam – August 2014,
    - *Seminar*, Helsinki Institute of Physics, Finland – August 2013.
14. **Non-standard Interaction in Neutrino Oscillation**
    - *DAE Conference*, Visva-Bharati University, Santiniketan – January 2013,
    - *PSI Zuoz Summer School*, Zuoz, Switzerland – August 2012,
    - *Seminar*, Indian Association for the Cultivation of Science, Kolkata, India – July 2012.

SCHOOLS

1. **Vietnam School of Physics**, Qui-Nhon, Vietnam, Oct. 2014,
2. **CERN-Fermilab Hadron Collider Physics Summer School**, Geneva, Switzerland, Mar. 2013,
3. **Asia Europe Pacific School on High Energy Physics**, Fukuoka, Japan, Oct. 2012,
4. **XXVII SERC Main School on Theoretical Physics**, SINP, India, Sep. 2012,
5. **PSI Zuoz Summer School**, Paul Scherrer Institute, Switzerland, Aug. 2012.

Workshops and Conferences

1. **Workshop on High Energy Physics Phenomenology (WHEPP)**, IIT Guwahati, Dec. 2019,
2. **Aspen Center for Physics**, Colorado, USA, Aug. 2019,
3. **Pheno 2019**, University of Pittsburgh, USA, May. 2019,
4. **SUSY: the best bunker to hide?**, Indian Institute of Science, May. 2018,
5. **Blueprints beyond the Standard Model**, Tata Institute of Fundamental Research, Jan. 2018,
6. **Workshop on High Energy Physics Phenomenology (WHEPP)**, IISER Bhopal, Dec. 2017,
7. **SUSY17**, Tata Institute of Fundamental Research, India, Dec. 2017,
8. **Jets@LHC**, International Centre for Theoretical Studies, India, Jan. 2017,
9. **Looking for BSM Physics**, Indian Institute of Science, India, Dec. 2016,
10. **Indo-French Conference Meeting**, Indian Institute of Science, India, May. 2016,
11. **Pheno@IISERM**, IISER Mohali, India, Mar. 2016.
12. **Workshop on High Energy Physics Phenomenology (WHEPP)**, IIT Kanpur, Dec. 2015,
13. **LHCDM-2015**, Indian Association for the Cultivation of Science, India, Feb. 2015,
14. **DAE Conference**, IIT Guwahati, India, Dec. 2014,
15. **IWTCP-2**, Buon Ma Thuot, Vietnam, Aug. 2014,
16. **Current trends in Particle Physics**, University of Kalyani, India, Mar. 2014,
17. **Sangam@HRI**, Harish-Chandra Research Institute, Allahabad, India, Mar. 2013,
18. **DAE Conference**, Visva-Bharati University, Santiniketan, India, Jan. 2013,
19. **Physics at the early run of LHC**, IACS, Kolkata, India, Mar. 2011,
20. **International Workshop on Dark matter in the LHC era**, SINP, Kolkata, India, Jan. 2011.

References

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Indian Association for the Cultivation of Science, Kolkata, India.
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Date of Birth

January 8$^{\text{th}}$, 1987.

Languages	Bengali (mother tongue), Hindi, English (TOEFL-iBT Score: 99, Reading-26, Listening-22, Writing-25, Speaking-26)
Interests	Sports, Politics, Western Classical Music.
Family	Wife: Swatilekha Bhattacharya, Assistant Professor, Vidyasagar University, Midnapore, West Bengal.
Webpage	iNSPIRE ORCiD