

Curriculum Vitae

Name	: Mamta	Address (R)	: F-26/93, Sector - 7, Rohini,
Date of Birth	: March 23, 1969		: Delhi - 110 085, INDIA.
Current Position	: Associate Professor in Physics	E-mail	: <i>mamta.phy26@gmail.com</i>
Institution	: Department of Physics, Sri Guru Tegh Bahadur Khalsa College, University of Delhi. Delhi-110007.		: <i>mamta.dahiya@sgtbkhalsa.du.ac.in</i> : <i>mamtad@associates.iucaa.in</i>
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Education

1. Doctor of Philosophy (Physics) in 1997 from University of Delhi, Delhi
Title of Thesis : Triviality Bound on Higgs Mass – A variational Approach
Thesis Supervisors : Prof. S. Rai Choudhury and Prof. A. Mukherjee
2. Master of Science (Physics) in 1991 from St.Stephen's College, University of Delhi, Delhi (with 79.1% marks, Third position in University).
3. Bachelor of Science (Physics Hons.) in 1989 from St.Stephen's College, University of Delhi, Delhi (with 83.33% marks).

Research Area

1. Theoretical High Energy Physics,
2. Physics Education

Computing Skills

Language : Fortran, C++
Operating systems : Linux, Microsoft Windows

Teaching Experience

- Intensive (PhD Level):-

Faculty for the following Courses in Preparatory SERC School in Theoretical High Energy Physics for fresh PhD students, sponsored by Science and Engineering Research Board (SERB), Department of Science and Technology, Govt. of India:

- Particle Physics and Standard Model course in the school held at IISER Bhopal, in 2015.
- Particle Physics and Standard Model course in the school held at Tezpur University in 2013
- Particle Physics and Standard Model course in the school held at BITS-Pilani Goa, 2010
- Quantum Field Theory course in the school held at Delhi University in 1997.

- Undergraduate Level:-

More than 30 years experience of teaching Physics and Electronics major students at Delhi University (since 1993). During these years I have taught various courses including Mathematical Physics, Mechanics, Electrodynamics, Quantum Mechanics, Physics of materials, Digital Electronics, Computational Physics. I have also taken lab courses related to these.

Awards

CSIR-UGC JRF and NET in 1991

Current Research Interests:

- **High Energy Physics**

- To address recent discrepancies (such as the muon anomalous magnetic moment, W boson mass and the decay of B-hadrons).
- To investigate the potential of present and future colliders to probe the higher dimensional effective operators affecting the electro-weak, top and Higgs sector in the framework of EFT.
- To perform a robust analysis of the data from HEP experiments using machine learning techniques, in particular deep learning networks. The analysis will be used to extract the possible deviation (if any) from SM and also correlate among the observable kinematic variables.
- To study one of the most pressing problems of identification of the dark matter (DM) candidates that not only satisfies the cosmological constraint from the relic density but are also in compliance with the updated results from Direct and indirect detection experiments.

- **Physics Education**

To look for the concepts in Physics with which undergraduate students face difficulties and work on small projects with students to clarify these with simulations and simple experiments.

Funded Projects

- **Ongoing**

Co-Principal Investigator: Project titled 'New Physics Signatures at Small and Large Scales (CRG/2023/008234) sponsored by Scientific and Engineering Research Board (SERB), Department of Science and Technology, (DST) Govt. of India.(sanctioned in Jan 2024). Project Grant: Rs. 5 Lakhs for equipment plus 1JRF and 1 RA plus contingency, travel, consumables, SSR and overhead as per SERB norms.

- **Completed**

- (a) Co-Principal Investigator: Multi-Institutional Collaborative Project titled 'Probing New Physics Interactions' (CRG/2018/004889) sponsored by Scientific and Engineering Research Board (SERB), Department of Science and Technology, (DST) Govt. of India.(9 Dec 2019 - 8 Dec 2023). Project Grant: Rs. 79.6 Lakhs.
- (b) Principal Investigator: Project 'Signatures of new physics at present and future Colliders' sponsored by CSIR, Govt. of India, New Delhi. (2016-19). Project Grant: Fellowship of one RA/JRF/SRF plus Rs. 4.25 Lakhs.
- (c) Co-Principal Investigator: A collaborative project 'Physics beyond the Standard Model' involving five Institutions and sponsored by Department of Science and Technology, (DST) Govt. of India.(2008-2012). Project Grant: Rs. 62. Lakhs.
- (d) Co- Investigator : Physics beyond the Standard Model sponsored by DST (2002-06). Project Grant: Rs. Twelve Lakhs.

Academic Bodies

- Member, Indian Association of Physics Teachers (IAPT)
- Research Associate, Regional Center for Accelerator based Particle Physics (RECAPP), Harish Chandra Research Institute (HRI), Allahabad. India.
- Research Associate, Inter-University Centre for Astronomy and Astrophysics, Pune, India since 2009.

Publications (Details Attached as Annexure I)

- Research Articles published in International Refereed Journals : 12
- Research Articles published in National Refereed Journals : 2
- Research Articles published in Proceedings : 6
- Contribution in Books : 2

PhD Guidance:

- Co-supervised thesis of Mr. Manvinder Pal Singh who is awarded degree in 2024. Title of the Thesis **“Dark Matter Scenarios in Extended Scalar Sector”**
- Helped train others (registered with others, in DU)
 - Mr. Hrishabh Bhardwaj (currently faculty in a college in Bareilly).
 - Dr. Md. Rashidul Islam (currently a faculty in Kolkata)
 - Dr. Mukesh Kumar (currently, faculty at University of Witwatersrand, Johannesburg, South Africa)

Dissertation Supervision :

- *“Study of Phase Transitions in Ising-like Models”*, 2023, Samarth Jain (currently at Ecole Normale Supérieure (ENS-PSL))
- *“Formation of Cooper Pairs – A Pedagogical approach”*, 2023, Suhas Adiga (currently at Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru.)
- *“Helicity Amplitude techniques for Scattering Amplitudes”*, Harsh Sharma (2021)
- *“Study of Monopoles”*, 2021 Hriday Narula (currently at TIFR Hyderabad)
- *“Path from Lagrangian to Feynman Rules”* , 2020 Harsh Bhardwaj (presently doing PhD at Peter Grünberg Institute for Functional Quantum Systems after completing M.Sc. Physics track in quantum technologies at RWTH Aachen University, Germany)
- *“Monte Carlo Simulations of three body decay processes”* in 2020 by Pulkit Kukreja (presently PhD student in Molecular Physics at the Fritz-Haber-Institut der Max-Planck-Gesellschaft after completing M.Sc. from University of Cologne)
- *“Quantum Mechanics of Nano-structures”* in 2018 by Tonmoy Mahanta

Science Academies’ Summer Research Fellowship Programme

1. Supervised a Project on *“Data Analysis in Cosmology”* by Ms. Srotoshi Ghosh from Presidency University, Kolkata.
2. Supervised a Project on *“Understanding statistical Tools in High Energy Physics”* in summer 2018 by Ms. Samridhi Garg, from Department of Physics, IIT, Roorkee.
3. Supervised a Project on *“Scattering and Decay of Particles –Partial Wave Analysis and Helicity Formalism”* in summer 2016 by Ms. S. Lekshmi, from Department of Physics, National Institute of Technology, Surathkal.
4. Co-Supervised a Project on *“Applications of Lie Algebra in Quantum Mechanics and Particle Physics”* in 2009-2010 by Sarvan Kourmilli from Department of Physics, University of Hyderabad.

Organisation of Conferences/Workshops/Research Schools

1. Convener, National Symposium on Theoretical High Energy Physics held at S.G.T.B. Khalsa College, University of Delhi on December 20, 2019 and sponsored by Science and Engineering Research Board (SERB), Department of Science and Technology, New Delhi.
2. Director, XXXIII Main School on Theoretical High Energy Physics held at S.G.T.B. Khalsa College, University of Delhi from December 6 – 26, 2019 sponsored by Science and Engineering Research Board (SERB), Department of Science and Technology, New Delhi.
3. Organised a two days Workshop (in collaboration with Department of Physics, Delhi University) on High Energy Physics (HEP) Computational Tool “RIVET” at SGTB Khalsa college on 17th and 20th February, 2017 with Lectures and hands on training by Prof. Holger Schultz, Institute of Particle Physics, Durham, UK.
4. Academic Coordinator and member Organising Committee, ”Think Tank on Physics@LHC” held at Sariska, Rajasthan from December 5 – 9, 2011.
5. Director, Preparatory SERC School on Theoretical High Energy Physics held at S.G.T.B. Khalsa College, University of Delhi from September 23 to October 20, 2008 and sponsored by Department of Science and Technology, N. Delhi.
6. Program Coordinator and member Organising Committee, National Conference on 'Emerging Trends in Physics (ETP06)' held at S.G.T.B. Khalsa College, University of Delhi from September 20–23, 2006.
7. Member, Quest Organizing Committee from 1996–2007, co-convener of Quest Organizing Committee in 2003-04. QUEST is a prestigious undergraduate Science Aptitude Contest organized every year by Center for Science Education and Communication, University of Delhi.
8. Member, Organizing Committee of the XII Preparatory SERC School on Theoretical High Energy Physics held at S.G.T.B. Khalsa College, University of Delhi from September 22 to October 18, 1997 and sponsored by Department of Science and Technology, N. Delhi.
9. Member, Organising Committee of the Conference-cum-workshop on High Energy Physics and Computational Physics held at S.G.T. B. Khalsa College, University of Delhi from September 30 to October 13, 1996 and sponsored by UGC, CSIR and DST.

Other Academic/Administrative Activities:

1. Coordinated the workshops for the faculty members teaching physics in colleges of University of Delhi organised by the Department of Physics and Astrophysics on 3rd and 4th November, 2022 to discuss various issues pertaining to teaching-learning process for the new courses prepared under NEP 2020 for B.Sc(Hons.) Physics curriculum. Gave presentations for Mechanics (Theory) and Mathematical Physics – I (Practicals) during the workshop.
2. Actively participated in the preparation of syllabus for a large number of courses under NEP 2020 for B.Sc(H) Physics and B.Sc.(Physical Sc) at University of Delhi both as coordinator and member of committees formed for the purpose.
3. Member, Educational Instruments and Equipment Sectional Committee, PGD 22, Bureau of Indian Standards (BIS) since 2012.

4. Teacher in Charge, Department of Physics S.G.T.B. Khalsa College during academic session 2019-20.
5. Served on Steering Committee for the for LOCF Undergraduate Physics Courses revision undertaken by University of Delhi in 2019.
6. Member, LOCF Committee for all Mathematical Physics undergraduate courses constituted for course revision in 2019.
7. Member, Combined Moderation Committee for B.Sc(Hons) in Physics and B.Sc.(Program) since 2019.
8. Member, Finance Committee, APhO Cell (Asian Physics Olympiad) during 2011-12 and 2019 - 2023.
9. Contributed to the CSIR-NET Examination Process several times.
10. Executive member of Staff Association during 2013-14.
11. Member Finance Committee for 13th Asian Physics Olympiad held in Delhi during May 1 – 7, 2012.
12. Convener, Library Committee of Department of Physics S.G.T.B. Khalsa College for several academic sessions.
13. Convener, Physics Society for several academic sessions.
14. Served on Purchase and Maintenance Committee of Department of Physics S.G.T.B. Khalsa College for several academic sessions.
15. Member, panel of judges for INSPIRE National Science Exhibition during October 21-23, 2012 and August 14-16, 2011, at Pragati Maidan, New Delhi organised by Department of Science and Technology.

Participation in Conferences/Workshops/Research Schools

Details attached as Annexure II

Paper Presentations, Invited Lectures and Resource Persons

Papers presented at conferences/Seminars

- (a) **“Twin Anomaly in a minimal Extension of Inert 2HDM”** presented at 17th International Conference on Interconnections between Particle Physics and Cosmology (PPC 2024) held at IIT Hyderabad during 14-18 October 2024.
- (b) **“New Physics Contribution to Neutral Trilinear Gauge Boson Couplings,”** – presented at 2010 International Linear Collider Workshop (LCWS10 and ILC10), Beijing, 26 March – 30 March 2010.
- (c) **“Probing anomalous Higgs couplings at an e gamma collider using unpolarised beams”** – presented at 2006 International Linear Collider Workshop (LCWS06 and ILC06), I.I.Sc. Bangalore, India, 9 March - 13 March 2006
- (d) **“Pion Electromagnetic Form Factor in a BS Model”** – presented at X DAE Symposium in High Energy Physics held at TIFR, Mumbai, December 1992.

Invited Talks

- (a) **“Challenges and Opportunities @Heart of Matter – A Tribute to Rohini Godbole”** – Invited talk in seminar series ”Women in Nuclear Science” delivered at Department of Physics and Astrophysics, University of Delhi on 7th November 2024.
- (b) **“Unparticles at Colliders”** – presented at Associate Fest held at IUCAA, Pune from June 25–29, 2012.
- (c) **“Anomalous Higgs Couplings”** – TPSC Seminar at Physical Research Laboratory, Ahmedabad, India, December 2007.
- (d) **“Triviality Bound on Higgs Mass – A variational Approach”** at Harish Chandra Research Institute, Allahabad, December 1996.
- (e) **“Non-perturbative Approach to triviality Bound on Higgs Mass”** at Tata Institute of Fundamental Research, Mumbai, June 1996.

Resource Person

- (a) Coordinated workshop organised by the Department of Physics and Astrophysics for the faculty members teaching physics in colleges of University of Delhi on 3rd and 4th November, 2022 to discuss various issues pertaining to teaching-learning process for the new courses prepared under NEP 2020 for B.Sc(Hons.) Physics curriculum. Made presentations for Mechanics and Mathematical Physics – I courses during the workshop.
- (b) Invited Lectures on “Quantum Mechanics” and ”Mathematical Physics” at the Online Course on **“Learning Physics with Conceptual and Problem-based Approach”** organized by The National Academy of Sciences India (NASI) - Delhi Chapter during July 27, 2020 to October 11, 2020.
- (c) Faculty for the **“Particle Physics and the Standard Model”** Course at SERC Preparatory School in THEP (a Training School for selected Research Scholars) held during June 29 – 25, 2015 at IISER Bhopal.
- (d) Guest Faculty for the **“Particle Physics and the Standard Model”** Course at SERC Preparatory School in THEP (a Training School for selected Research Scholars) held during June 17 –July 13, 2013, Tezpur University.

- (e) Guest Faculty for the “**Particle Physics and the Standard Model**” Course at SERC Preparatory School in THEP (a Training School for selected Research Scholars) held during Oct. 20 – Nov. 15, 2010. BITS Goa.
- (f) Lecture on “**Vector Algebra**” at DAV In-service Master Training Programme, May 2005.
- (g) Hands on training sessions for “Microsoft Office – Use and Practice” at Faculty Development Programme “**Computer Applications**” organised by CPDHE, University of Delhi during April 15 – May 13, 2005.
- (h) Guest Faculty for the “**Quantum Field Theory**” Course at SERC Preparatory School in THEP (a Training School for selected Research Scholars) held during September 22 – October 19, 1997 at University of Delhi.

Annexure I : Publications

Contribution in Books

1. Contributed subject matter to the upcoming Indian adapted version of the previously published book titled “**Modern Physics**”, 4th Edition (2021) and authored by Kenneth S. Krane, Wiley, India.
2. Contributed subject matter to the Indian adapted version of the latest edition of book titled “**Introduction to Solid State Physics**” (2019) and authored by Charles Kittel, Wiley India

Publicatons in Journals

1. “**W mass and muon $g - 2$ in an inert 2HDM extended by a singlet complex scalar,**”
Hrishabh Bharadwaj, Mamta Dahiya, Sukanta Dutta and Ashok Goyal, accepted for publication in Physical Rev D. [arXiv:2407.00181 [hep-ph]].
2. “**Toy Model to Explain Cooper Pair Formation**”
Suhas Adiga, P. Arun and Mamta Dahiya, submitted for publication to “The Physics Educator”
3. “**Investigating perturbative unitarity in the presence of anomalous couplings,**”
M. Dahiya, S. Dutta and R. Islam, Phys. Rev. D **93**, no. 5, 055013 (2016) [arXiv:1311.4523 [hep-ph]].
4. “**Constraining Unparticles from Top Physics at TeVatron**”,
M. Dahiya, S. Dutta and R. Islam, Phys. Rev. D **86**, 115022 (2012) [arXiv:1206.5447 [hep-ph]].
5. “**Wither pure science in India: A survey of graduate physics students of a representative University of Delhi College,**”
Kuldeep Kumar, Mamta, P.Arun and Jaswinder Singh, Current Science **99(9)**, p1196 (2010).
6. “**New Physics Contribution to Neutral Trilinear Gauge Boson Couplings,**”
S. Dutta, A. Goyal and Mamta, The European Physical Journal C **63**, 305 (2009) [arXiv:0901.0260 [hep-ph]].
7. “**Considerations for Anderson-Bridge Experiment**”
P. Arun, Kuldeep Kumar and Mamta Resonance, March 2010, p-244. [arXiv:0804.3932]
8. “**Role of polarization in probing anomalous gauge interactions of the Higgs boson**”
S. S. Biswal, D. Choudhury, R. M. Godbole and Mamta, Phys. Rev. D **79**, 035012 (2009) [arXiv:0809.0202 [hep-ph]].
9. “**Unparticles and Muon Decay**”
D. Choudhury, D. K. Ghosh and Mamta Phys. Lett. B **658**, 148 (2008) [arXiv:0705.3637 [hep-ph]]
10. “**Anomalous Higgs couplings at an e gamma collider**”
D. Choudhury and Mamta Phys. Rev. D **74**, 115019 (2006) [arXiv:hep-ph/0608293]
11. “**Triviality bound on lightest Higgs mass in next to minimal supersymmetric model**”
S. R. Choudhury, Mamta and S. Dutta Pramana **50**, 163 (1998) [arXiv:hep-ph/9512422]

12. **“Variational approach to Higgs mass bound”**
S. R. Choudhury and Mamta Int.J.Mod.Phys. **A12**, 1847-1859 (1997)
13. **“Quark model analysis of radiative pion decay”**
S. R. Choudhury, A. Essagholian, and Mamta Int.J.Mod.Phys. **A9**, 157-165 (1994)
14. **“Pion Electromagnetic Form Factor in a BS Model”**
S. R. Choudhury, A. Essagholian, and Mamta Europhysics Letters **23**, 475 (1993)

Publications in Proceedings (Since 2007 only):

1. **“Twin Anomaly in a minimal Extension of Inert 2HDM”** presented at ”17th International Conference on Interconnections between Particle Physics and Cosmology (PPC 2024) ” held at IIT Hyderabad during 14-18 October 2024.
2. **“Working group summary: Neutrinos and beyond Standard Model ”**
Report of the working group on neutrinos and beyond the Standard Model in WHEPP-XI, Anjan S Joshipura et al.
Pramana – Journal of Physics, **76**, May 2011, pp. 699–705.
3. **“Neutral Trilinear Gauge Boson Couplings in Little Higgs Models”**,
S. Dutta, A. Goyal and Mamta,
Proceedings of 2010 International Linear Collider Workshop (LCWS10 and ILC10), Beijing, 26 March – 30 March 2010[arXiv:1007.3097 [hep-ph]].
4. **“ILC Reference Design Report: ILC Global Design Effort and World Wide Study”**,
J. (.). Brau *et al.* [ILC Collaboration] ,
Published in: CERN Yellow Reports: Monographs DOI: 10.2172/929487, 10.5170/CERN-2007-006
Report number: ILC-REPORT-2007-001, AAI-PUB-2007-002, BNL-79150-2007, CERN-2007-006, CHEP-A07-001, CLNS-07-1991, COCKCROFT-07-04, DESY-07-046, FERMILAB-TM-2382, JAI-2007-001, JINR-E9-2007-039, JLAB-R-2007-01, KEK-REPORT-2007-2, LBNL-62867, LNF-07-9-NT, SLAC-R-857
 - Volume 1 - Executive Summary
 - Volume 2 - Physics at the ILC.
 - Volume 3 - Accelerator
 - Volume 4 - Detectors
5. **“Effects of polarisation on study of anomalous VVH interactions at a Linear Collider”**
S. S. Biswal, D. Choudhury, R. M. Godbole and Mamta
Proceedings of 2007 International Linear Collider Workshop (LCWS07 and ILC07), Hamburg, Germany, 30 May - 3 Jun 2007
eConf: <http://www.slac.stanford.edu/econf/C0705302/> (HIG07) [arXiv:0710.2735 [hep-ph]]
6. **“Probing anomalous Higgs couplings at an e gamma collider using unpolarised beams”**
D. Choudhury and Mamta,
Proceedings of 2006 International Linear Collider Workshop (LCWS06 and ILC06), I.I.Sc. Bangalore, India, 9 March - 13 March 2006
Pramana **69**, 795 (2007).

Annexure II

Participation in Conferences/Workshops/ Symposium/Schools (Since 2005 only)

1. **17th International Conference on Interconnections between Particle Physics and Cosmology (PPC 2024)** held at IIT Hyderabad during 14-18 October 2024.
2. Online Workshop on **"Numerical and Analytical Relativity NAR 2024"** organized by the Department of Applied Sciences, Indian Institute of Information Technology, Allahabad, from 20th to 22nd March 2024.
3. **Annual Seminar on "Statistical Methods and Applications in Interdisciplinary Areas (SMAIA- 2024)"** organised by Department of Statistics, University of Delhi during March 8-9, 2024.
4. **"Phoenix-2023"**, an international conference organised at IIT Hyderabad during Dec 18-20, 2023.
5. **"Course on Astronomical data analysis using Python"** held online from the November 08 - December 18, 2021 organized by the Teaching Learning Centre (TLC) of IUCAA.
6. Online National Workshop on **"Challenges of Teaching Physics Laboratory Courses in Online Mode"** organised by Kalindi College, University of Delhi during January 23 - 25, 2021.
7. **International Meeting on High Energy Physics**, January 17 – 22, 2019 held at Institute of Physics, Bhubaneswar.
8. **XXII DAE-BRNS High Energy Physics Symposium**, December 12-16, 2016 held at University of Delhi.
9. **Workshop on "LHC and Dark Matter"** held at Association for the Cultivation of Science, Kolkata from February 9-13 2015.
10. **"Particle Physics at the crossroads:Edinburgh–India Symposium"** held at Delhi from February 15–17, 2013 and cohosted by University of Edinburgh and University of Delhi.
11. **"Associate Fest"** held at IUCAA, Pune from June25–29, 2012 and delivered a talk on "Unparticles at Colliders".
12. **"Twelfth Workshop on High Energy Physics Phenomenology"** (WHEPP XII) held at Mahabaleshwar during January 9 – 15 2012.
13. **"Think Tank on Physics@LHC (Monte Carlo and Jet Physics"** held at Sariska, Rajasthan from December 5 – 9, 2011.
14. Training Program entitled **"C and C++ Programming Language"** held at University of Delhi, Delhi from June 8 – 15, 2011.
15. **"International Linear Collider Workshop LCWS10"** held at Institute of High Energy Physics, Beijing from March 26 to March 30, 2010.
Presented the paper "New Physics Contribution to Neutral Trilinear Gauge Boson Couplings."
16. **"Workshop on High Energy Physics Phenomenology"** (WHEPP XI) held at Physical Research Laboratory, Ahmedabad during January 2–12, 2010.

17. Conference on “**LHC and New Frontiers of Particle Physics**” held at the Department of Physics, University of Calcutta, Kolkata during December 7–9, 2009.
18. Conference on “**Signalling the Arrival of the LHC Era**” held at The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy from December 8–13, 2008.
19. Workshop on “**Advanced Topics in Data Analysis in Cosmology and Gravitational Wave Astronomy**” held at IUCAA Reference Center, University of Delhi from October 4–14, 2006.
20. **National Conference on Emerging Trends in Physics (ETP06)** held at S.G.T.B. Khalsa College, University of Delhi from Sept. 20–23, 2006.
21. **International Linear Collider Workshop LCWS06** held at IISc., Bangalore from March 9 to March 13, 2006.
Presented the paper “Probing anomalous couplings at an $e\gamma$ collider using unpolarised beams.
22. Seminar on attracting Young People to Careers in Science organised by IPA, IAPT and IPS and held at IIT, Delhi in March 2005.
23. Workshop on Quantum Computers held at School of Physical Sciences, Jawaharlal Nehru University, from March 10 to March 15, 2005 and sponsored by the Indian Academy of Science, Bangalore.