Dr. Mithun Karmakar

Curriculum Vitae

Personal Information

Name *Mithun Karmakar*

Designation *Assistant Professor*

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Education

Degree	Year	College	University
B. Sc.	2009	Narasinha Dutta College	University of Calcutta
M. Sc.	2011	University College of Science and Technology	University of Calcutta
Ph. D.	2018	Saha Institute of Nuclear Physics	Homi Bhabha National Institute (HBNI)

Research Area

Plasma Wave Breaking and Phase Mixing.

The breaking phenomena of nonlinear plasma waves or oscillations (e.g. Electron plasma wave, Upper-hybrid modes) in cold two or three component plasma. The studies on phase mixing process which is one of the possible mechanisms for breaking of plasma wave.

Plasma Based Particle Accelerator.

Plasma wake field excitation process by relativistic electron beam (Plasma Wake Field Accelerator) or a proton beam (Proton Driven Plasma Wake Field Accelerator) or laser pulse (Laser Wake Field Acceleration). Theory and simulation (Particle in Cell) on plasma based particle accelerator.

Whistler Wave Dynamics.

Theory and simulation to study standing wave formation in the superposition of counter propagating whistler waves.

Teaching Experience

2011-2013 , Guest Lecturer in Physics at Ramsaday College, University of Calcutta.

2019 , Invited Lecturer in Physics at St. Xaviers College, Ahmedabad. Course level: Advanced B. Sc.

National Eligibility Test

2013 **Qualified National Eligibility test in June 2013**.
As certified by the CSIR-UGC (Council of Scientific and Industrial Research- University Grants Commission), India

2013 **Qualified Graduate Aptitude Test Examination (GATE) in Physics**.

Research Experience

Post M. Sc.

2013–2014, *Started working as Junior Research Fellow at Saha Institute of Nuclear Physics*, Kolkata.

During one year Post M. Sc. course, following subjects were covered: Quantum Mechanics, Statistical Mechanics, Mathematical and Computational Methods, Nonlinear Complex Plasmas.

Project:.

A project work has been pursued on "Charge Fluctuation Dynamics in Strongly Coupled Dusty Plasma" during Post-M. Sc. course work.

Research Work

2014–2018 **Joined Plasma Physics Division at SINP**, *in August' 1*, under the supervision of Prof. Nikhil Chakrabarti.

Doctoral Degree

2018 **Senior Research Fellow**, *Plasma Physics Division*, Saha Institute of Nuclear Physics, Kolkata, West Bengal, India.

I have obtained Doctoral degree (Ph.D.) from Homi Bhabha National Institute (HBNI) in Physical Sciences. Thesis Title: NONLINEAR PLASMA WAVE EXCITATION AND ITS BREAKING PHENOMENA.

Post Doctoral Experience

2018-2021 **Post Doctoral Fellow**, *Basic Theory and Simulation Division*, Institute for Plasma Research, Gandhinagar, Gujarat, India.

Supervisor: Prof. Sudip Sengupta

Specialization

1. **Lagrangian Fluid Technique** to find exact space-time dependent solution for the nonlinear plasma wave dynamics in non-relativistic and relativistic situations.
2. Handling with the **Elliptic** integrals and functions.
3. **Pseudo Potential Method** to understand the nonlinear wave breaking phenomena and solitary wave studies.
4. Perturbative Mathematical techniques e.g. **Homotopy method**, **Bogoliuboff and Kryloff method of averaging**, **Lindstedt-Poincart method** etc. to solve nonlinear plasma dynamical

problems.

Computer skills

Languages C, Fortran

Computational Softwares Matlab, Mathemetica

Computational techniques Particle in Cell simulation, Fluid simulation by LCPFCT algorithm

Languages

Bengali **Writing and Speaking** *(Mother-tongue)*

English **Writing and Speaking**

Hindi **Writing and Speaking**

Conferences / Workshops/ Schools

2014 **Plasma-2014**, Poster entitled "Drift Waves in arbitrary Mass ratio Plasma" was presented at the 29th National Symposium on Plasma Science and Technology and International Conference on Plasma Science and Nano-technology on 8-11 December, 2014.
Mahatma Gandhi University Kottayam, Kerala, India.

2015 **Plasma-2015**, Poster entitled "Wave-breaking amplitudes of relativistic upper-hybrid oscillations in a cold magnetized plasma" was presented in Seminar on 30th National Symposium on Plasma Science and Technology, on December 1-4, 2015.
Saha Institute of Nuclear Physics, Kolkata, India.

2015 **APFA-2015**, Poster entitled "Wave-breaking Amplitudes of Relativistically Strong Electrostatic Waves in Cold Electron-positron-ion Plasmas" was presented in 10th Asia Plasma and Fusion Association Conference (APFA- 2015) in December-2015.
Institute for Plasma Research, Gandhinagar.

2017 **IPAC17**, Poster entitled "Plasma Wakefield Acceleration in a Cold Magnetized Electron Beam Driven Plasma" was presented in 8th Inter-national Particle Accelerator Conference(IPAC17) held on 14-19 May, 2017.
Bella Center, Copenhagen, Denmark.

2018 **IOP**, Poster entitled "Phase Mixing of Large Amplitude Relativistic Electron Plasma Oscillation With Inhomogeneous Ion Background" was presented in 45th IOP Plasma Physics Conference held 9-12 April 2018 and also made a small visit to Dr. Ioannis Kourakis of Queen's University.
Queen's University Belfast, Belfast, UK

2018 **ICTP**, Attended "Joint ICTP-IAEA College on Plasma Physics" during 29th October-9th Novenber, 2018 held at ICTP, Trieste, Italy.

2020 **Oral presentation**, 4th Asia Pacific Conference on Plasma Physics on Oct. 26 to Oct. 31, 2020, as eConference.

Talks/ Invited Talks

Technical University of Denmark, Copenhagen, Denmark. 10-12 May, 2017
Title: Plasma Wakefield Acceleration in a Cold Magnetized Electron Beam Driven Plasma
Invited by: **Prof. Jens Juul Rasmussen of DTU**

Saha Institute of Nuclear Physics, Kolkata, India May, 2018
Title: Excitation and Breaking of Nonlinear Plasma Wave
Event: **Director's Colloquium**

Jadavpur University, Kolkata, India August, 2018
Title: Nonlinear Plasma Wave Excitation and its Breaking Phenomena
Event: **M. R. Gupta Memorial Lecture**

Jadavpur University, Kolkata, India February, 2020
Title: Excitation of plasma wake wave by relativistic proton beam
Event: **oral presentation for the Parvez Guzdar Memorial Award in the 3rd National Seminar on Nonlinear and Complex Phenomena, held during 18 to 19 February 2020**

Publications

Publications in peer reviewed Journals:
citations: 39 **h-index**: 4 **i10-index**: 1

1. *Wave-breaking amplitudes of relativistic upper-hybrid oscillations in a cold magnetized plasma.* **Mithun Karmakar**, Chandan Maity and Nikhil Chakrabarti, **Physics of Plasmas 23**, 064503 (2016).
2. *Relativistic wave-breaking limit of electrostatic waves in cold electron-positron-ion plasmas.* **Mithun Karmakar**, Chandan Maity, Nikhil Chakrabarti, and Sudip Sengupta **The European Physical Journal D 70(6)**, 1–6 (2016).
3. *Plasma wakefield excitation in a cold magnetized plasma for particle acceleration.* **Mithun Karmakar**, Nikhil Chakrabarti, and Sudip Sengupta, **Physics of Plasmas**, **24**, 052111 (2017).
4. *Phase-mixing of large amplitude electron oscillations in a cold inhomogeneous plasma.* **Mithun Karmakar**, Chandan Maity, Nikhil Chakrabarti, and Sudip Sengupta, **Physics of Plasmas 25**, 022102 (2018).
5. *Relativistic electron plasma oscillations in an inhomogeneous ion background* **Mithun Karmakar**, Chandan Maity and Nikhil Chakrabarti, **Phys. Scr. 93**, 065601 (2018).
6. *Existence of electron acoustic solitary waves in relativistic limit.* Sayanee Jana, **Mithun Karmakar**, and Nikhil Chakrabarti, **Phys. Plasmas 25** , 092101 (2018).
7. *Phase mixing of lower hybrid modes in cold plasmas* Sourav Pramanik, Chandan Maity and **Mithun Karmakar**, **Phys. Plasmas 26**, 082111 (2019).
8. *Excitation of plasma wakefields by intense ultrarelativistic proton beam* **Mithun Karmakar**, Bhavesh Patel, Nikhil Chakrabarti, and Sudip Sengupta, **Contribution to Plasma Physics**, **e202000215 ctpp.202000215** (2021).

Communicated Papers:

1. *Excitation of Electrostatic Standing Wave in the Superposition of Two Counter Propagating Relativistic Whistler Waves.* **Mithun Karmakar**, Sudip Sengupta, and Bhavesh Patel, **arXiv:2104.00440** (2021).