

ARENA OF MATTERS

A collection of research essays



Editor:

Dr Mahmuda Begum



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Lakhimpur Girls' College



*Lakhimpur Girls' College,
Khelmatj, Lakhimpur, Assam*

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MESSAGE

I am pleased to note that the Department of Physics, Lakhimpur Girls' College is going to publish a book entitled "Arena of Matter: A Collection of research Essays". This book will cover research works in different areas of Physics. Researchers from various universities across the globe have contributed their articles into this book. I hope this book will be definitely helpful for the researchers to enhance their knowledge in recent trends in Physics.

I congratulate the Department of Physics, Lakhimpur Girls' College and the entire team of this book on this occasion and wish them all the success for the book.




Dr. Surajit Bhuyan
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Preface

Physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about Nature. Physics is very important to understand the world around us, the world inside us, and the world beyond us. Physics generates fundamental knowledge needed for the future technological advances that will continue to drive the economic energies of the world. Physics contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries. In the recent times, intensive research and development is devoting in Physics which includes multidisciplinary field such as plasma physics, nanoscience, condensed matter physics, bioscience etc.

Arena of Matter: A Collection of research Essays-is a book which will act as a platform for the recent research works of Physics. Different researchers across the globe have contributed in this book. I hope this book will provide readers a broad overview of the latest advances on physics research. I also believe this book would be a good reference for academic researchers. I would like to express my

sincere gratitude to Dr. Surajit Bhuyan, Principal, Lakhimpur Girls' College for guiding us to publish this book. I sincerely acknowledge the valuable suggestions and support received from Department of Physics, Lakhimpur Girls' College for publishing the book.

I would like to express my most profound regard for all authors for their contributions to this book and Purbayon Publication, Guwahati, for publishing this book. Thanks to all the contributors and supporters of this book.

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A review on phase space holes in plasmas

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Abstract: *The density mitigation in a certain localized region forming a ring shaped vortices in phase space may lead to the formation of Phase space holes in plasma. These highly nonlinear structures are inherently present in plasma and are perfect examples of self-organization. Trapping of plasma particles in the potential well of wave is responsible for the formation of such self-organized nonlinear structures.*

1. Introduction:

Plasma, the fourth state of matter, is an assembly of neutrals and charged particles and can be considered as highly ionized gas which showing the two distinctive features - (i) collective behavior and (ii) charge neutrality. It is evident that almost 99 % of the matter in the Universe is in the Plasma state. The collective motion of plasma species may lead to the origin of wave phenomena in plasma. An ample amount of collective wave modes are found due to the inter-connection between particles and fields propagating in a periodic

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