

Inter-University Centre for Astronomy and Astrophysics
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November 28, 2024

Prof. Enrique Lopez-Rodriguez and members of the search committee
Department of Physics and Astronomy
University of South Carolina, Columbia, SC, USA

Dear members of the search committee,

I am writing to express my interest in the postdoctoral research position in the Extragalactic Magnetism Group at the University of South Carolina. My expertise in developing and analyzing hydrodynamical cosmological simulations, combined with my interest in understanding the evolution of magnetic fields and their interplay with baryonic processes, aligns closely with the goals of this position. I am particularly excited by the opportunity to contribute to the group's cutting-edge cosmological MHD simulations and to collaborate on projects characterizing the role of magnetic fields and dust in galaxies and CGM.

During my PhD at IUCAA, I extensively analyzed cosmological hydrodynamical simulations (such as IllustrisTNG, EAGLE, CAMELS) to investigate the impacts of galactic astrophysical processes on the evolution of dark matter haloes. Additionally, I designed and performed controlled numerical experiments to model the interplay of galaxies with their host dark matter haloes. I am proficient in simulation tools like GADGET, MUSIC, and VELOCIRAPTOR, and I am eager to further develop my expertise in MHD codes such as Athena++ and GIZMO to contribute effectively to this position's research objectives.

My long-term research interests focus on understanding the evolution of baryonic components, including magnetic fields, within galactic and circumgalactic environments over cosmic time. The research in your group—investigating dust properties, cosmic ray transport, and magnetic field evolution using high-resolution simulations—perfectly complements my goals. By integrating these studies with mock observations (e.g., ALMA, JWST, SKA), I aim to bridge the gap between theoretical modeling and observational data, a step crucial for advancing the field. The work I propose to undertake as part of your group would have direct applications to my long-term research goals, particularly in understanding the co-evolution of galaxies and their magnetic environments.

In addition to contributing to the group's research, I look forward to supporting the supervision of students and collaborating with other members of the Extragalactic Magnetism Group. I am also enthusiastic about contributing to grant writing and proposal development, leveraging my experience preparing observing proposals and research narratives to support future projects.

Thank you for considering my application. I am excited about the opportunity to bring my expertise in cosmological simulations to your group and to contribute meaningfully to its research endeavors.

I look forward to the possibility of discussing my research plans further.

Sincerely,
Premvijay Velmani,
Senior Research Scholar,
IUCAA Pune, India