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 performing 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 generate mock observations though cosmological MHD simulations. Also understanding the properties of dust and cosmic rays is closely connected with my current research plan of understanding the astrophysical impacts on the dark matter haloes.

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.

As part of my research, I have performed cosmological simulations producing galaxies, dark matter haloes, and other large-scale cosmological quantities using codes such as GADGET, MUSIC, ROCKSTAR, and VELOCIraptor. Additionally, I have worked on a mini-project with Prof. Hector Marin, inferring cosmological parameters from eBOSS and in generating mock DESI datasets. I am eager to further develop my expertise in performing high resolution cosmological simulations and analysing properties of dust, etc in the galaxies and CGM along with their interaction with the magnetic field. I also look forward to generating high quality mocks for radio (with SKA, etc) and infrared (with JWST, etc) observations.

In direct continuation of my current research, I also have well-defined long-term research plans as detailed in my research statement that will make significant contributions to understanding and modeling the astrophysical impacts on dark matter haloes. The work I propose to undertake as part of the group about understanding the properties of dust, etc would have direct applications to my long-term research goals in understanding their impacts on dark matter haloes.

In addition to contributing to the group's research, I look forward to supervise students providing them with specific research projects and also to collaborate with other members of the Extragalactic Magnetism Group. I am also enthusiastic about contributing to grant writing grants and observation proposals targeting specific research questions.

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 expertise and research plans further.

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