Harihara Sudhan Kumar

Sendai ·Miyagi ·Japan kumar.harihara.sudhan.r7@dc.tohoku.ac.jp

Profile

I am a PhD candidate in Aerospace Engineering focused on plasma interaction. My research interests include (but not limited to) sustainable engineering, electric propulsion for space exploration, and internet privacy. With a solid foundation in theoretical, simulation, and experimental plasma physics, I am eager to use my research, writing, and presentation skills in a demanding R&D setting. I am also enthusiastic about the opportunity to acquire new skills and engage in interdisciplinary projects.

Education

2020/10–2023/09 PhD in Aerospace Engineering - JSPS Fellow

Tohoku University Sendai, Japan

- Purpose: To study the effect of laser pre-pulse on ion acceleration from an ultra-thin (< 10 nm) graphene target.
- Proposed/Fabricated a novel target concept and carried out the corresponding experiment in the JKAREN laser facility.
- Developed an algorithm to bridge molecular dynamics (MD) simulation of the laser pre-pulse with the particle-in-cell (PIC simulation) of the main pulse.

2018/10–2020/09 M.S. in Aerospace Engineering - MEXT Scholar

Tohoku University Sendai, Japan

- Developed a theoretical gyro-kinetic model to explain the presence of a plasma double layer in a novel thruster concept called the Traveling Magnetic Field Thruster.
- Build a computational 1D PIC electrostatic thruster model using C++ and validated the theoretical findings.
- Carried out further validation using a dimensionality reduction algorithm called Dynamic Mode Decomposition and conclusively proved the results from theory and simulation.
- GPA: 3.2/4.0

2013/06–2017/04 B.Tech. in Aerospace Engineering

Amrita School of Engineering Coimbatore, India

- Carried out ANSYS fluid simulations on film cooling of rocket nozzles to study the coolant-exhaust interaction.
- Used RANS with $k - \omega$ turbulence model to study the mixing of the coolant with the exhaust gas while monitoring the evolution of the boundary layer.
- GPA: 3.12/4.0

Work Experience

2015/08–2017/04 Student Research Assistant

Nanomaterials Research Lab., Amrita Uni. Coimbatore, India

- Developed a simulation model for the cold spray deposition of microparticles on a metallic target using a CD nozzle in ANSYS.

2015/06–2015/07 Student Intern

Hindustan Aeronautics Limited Bengaluru, India

- Performed experiments to visualize the effect of vibrations on the hydraulic fluid transport in helicopters.

2015/12 In-plant Trainee

Reinforced Plastic Industries Bengaluru, India

» Carried out a theoretical study on carbon fibre hybrids and manufactured carbon fibre targets for ballistic research.

Skills

Python, Plasma modeling	
Laser plasma, EM simulation	
Molecular Dynamics, C++, MATLAB	
Processing, FORTRAN, OpenMP, MPI	

Publications

» **Kumar H S**, Prasad K, Kothurkar N K, and Srikrishnan, Studies on Supersonic Cold Spray Deposition of Microparticles using a Bell-Type Nozzle, *Surface Coatings Technology* **383**, pp. 125244, 2020.

» **Kumar H S**, Takahashi M, and Ohnishi N, Numerical Simulation of Particle Acceleration in Traveling Magnetic Field Thruster, *Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology Japan* **18**, pp. 317–322, 2020.

» **Kumar H S**, Takahashi M, Kato C, Oshio Y, and Ohnishi N, Kinetic Theory of Double Layers Driven by Temperature Anisotropy in a Non-Homogeneous Magnetic Field, *Journal of Applied Physics* **130**, 163303, 2021.

» Kuramitsu Y, Minami T, ..., **Kumar H S**, Ohnishi N, ..., Fukuda Y, Robustness of Large-Area Suspended Graphene under Interaction with Intense Laser, *Sci Rep* **12**, 2346, 2022.

Conferences

» **Kumar H S**, Takahashi M, and Ohnishi N, Numerical Simulation of Particle Acceleration in Traveling Magnetic Field Thruster, *32nd International Symposium on Space Technology and Science*, **2019-b-076 (190133)**, 2019, Fukui, Japan.

» **Kumar H S**, Takahashi M, and Ohnishi N, Numerical Simulation and Theoretical Analysis of Particle Acceleration in Traveling Magnetic Field Thruster, *36th International Electric Propulsion Conference*, **IEPC-2019-795**, 2019, Vienna, Austria.

» **Kumar H S**, Takahashi M, Kato C, and Ohnishi N, Interaction Between a Soliton and a Double Layer in a Traveling Magnetic Field System, *62nd Annual Meeting of the APS Division of Plasma Physics*, **JO-05-00002**, 2020, Online.

» **Kumar H S**, Takahashi M, Kato C, and Ohnishi N, Investigating the Existence of a Double Layer and Multiple Soliton Solutions in a Traveling Magnetic Field System, *Reiwa 2nd Space Transportation Symposium*, 2020, Online.

» **Kumar H S**, Takahashi M, Kuramitsu Y, Minami T, and Ohnishi N, A Coupling Simulation Integrating Molecular Dynamics and Particle-in-Cell Methods for Accurate Intense Laser-Target Simulations, *13th International Conference on High Energy Density Laboratory Astrophysics*, 2022, Lisboa, Portugal.

Languages

» Tamil (Native)

» English (Fluent) TOEFL - 111/120

» Japanese (Intermediate)

Other

» (2017/08) Winner of One-Size-Fits-All: X-ray Plate Adapter Challenge by General Electric Oil & Gas.

» (2017/10 – 2022/03) Recipient of MEXT scholarship.

» (2018/10 – 2022/03) Treasurer of TEDxTohokuUniversity.

» (2022/04 – present) Recipient of JSPS Doctoral fellowship.