Division of Transdisciplinary Sciences

Department of Advanced Energy

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Yasushi Ono Laboratory	Dr. Yasushi ONO Dr. Hiroshi TANABE	Our main research fields are Plasma Physics and Engineering, especially development of fusion reactor, alternative energy sources, space and solar plasmas and plasma applications. The present fusion research already realized fusion power output larger than the input power as an exhaustless energy without any global warming gas. Its key question is whether we can develop economic ultra-high-beta confinement, where the beta is the plasma thermal pressure confined by the unit magnetic field: b=P/(B2/2μ0). We have been developing a number of new ideas related with spherical torus confinements: Spherical Tokamak (ST) and Field-Reversed Configuration (FRC) using the TS-3, TS-4 and UTST devices. We are also solving keys for the magnetic confinement, especially, reconnection of magnetic field lines that convert magnetic energy into plasma kinetic energy. We developed a new laboratory experiment of magnetic reconnection using torus plasma merging and realized significant ion heating over 0.25keV in TS-3 and 1keV in MAST based on UK-Japan collaboration. We are developing a new high-magnetic field ST merging/ reconnection experiment TS-U with reconnecting magnetic field Brec > 0.3-0.5T, based on our scaling law of reconnection heating energy proportional to Brec2. This scaling law indicates that the high-B rec ST merging will heat ions to the burning plasma regime without using any additional heating facility. We are now promoting the international world-wide reconnection collaboration program CMSO for physics, application of	Plasma Experiment, Fusion, Spherical Tokamak (ST), Field-Reversed Configuration (FRC), Magnetic Self-Organization	We, plasma research groups propose annual interdisciplinary schools and workshops of plasma astrophysics based on bidirectional exchanges of research staffs, graduate and undergraduate students. This new approach focuses on interrelationship of laboratory plasma experiments, space/ astrophysical plasma observations and numerical/ theoretical plasma studies and their applications based on the international and interdisciplinary collaborations. Our annual school and workshop will be held in Tokyo area for graduate and undergraduate students. Mutual visits of faculty members and graduate and undergraduate students will be encouraged and realized. Our initiative will provide a new interdisciplinary and balanced education of plasma astrophysics in both the undergraduate and the graduate schools. This program involves laboratory experiments, space observations and numerical / theoretical studies of plasma astrophysics. Our activities will generate a joint consortium of departments of advanced energy, complexity, space-astrophysical science, physics and electrical engineering. We believe that our annual school and workshop will provide new opportunities of international and interdisciplinary lectures, discussions and experiments to all plasma-course students.

		merging and reconnection and also for international and interdisciplinary plasma education of young scientists among MRX (Princeton U.), MST (Wisconsin Univ.) and MAST (Culham lab.) etc.		
Yoshida/Nishiura Laboratory	Dr. Masaki NISHIURA	Our group has a new concept fusion plasma machine (RT-1; ring trap 1) to study plasma physics and to understand their behaviors for thermonuclear fusion and interstellar plasmas. The RT-1 is a unique fusion plasma device to produce the dipole magnetic field for plasma confinement by a levitation of a superconducting coil. Plasma physics is one of good research subjects to study the nonlinear science and collective phenomena.	Physics, Engineering, Magnetosphere plasma, Nuclear fusion	In our laboratory you experience recent plasma experiments and developments of advanced diagnostic system. After brief introduction of physics principles that we want to study, electrical circuits and analysis code are developed for plasma diagnostics. In some cases, we use a computer simulation to understand the phenomena. Laboratory people support your project kindly.