

**JSPS Core-to-Core Program**  
**FY2013 Implementation Plan (Project No. :22001)**

Research Theme Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas  
Duration of Project from April 1, 2012 to March 31, 2015 (36months)  
Core Institution in Japan (Co-Chair) Graduate School of Frontier Sciences, University of Tokyo  
(Yasushi Ono)

**Implementing Organizations**

○ **Japan**

Japan	Core Institution	Graduate School of Frontier Sciences, University of Tokyo	
	Co-Chair (name and title)	ONO Yasushi, Professor	
	Cooperating Institutions	Advanced Institute of Science and Technology Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency National Astronomical Observatory Japan National Institute for Fusion Science Kyoto University	Number of Cooperating Institutions  5

○ **Partner Countries**

United States	Core Institution	Princeton Plasma Physics Laboratory, Princeton University	
	Co-Chair (name and title)	JI Hantao, Principal Research Physicist	
	Cooperating Institutions	University of Wisconsin University of Washington University of Chicago Swarthmore College University of New Hampshire University of Alabama Stanford University George Mason University University of California, Los Angeles	Number of Cooperating Institutions  9

Italy	Core Institution	Padova University	
	Co-Chair (name and title)	MARTIN Piero, Professor	
	Cooperating Institutions		Number of Cooperating Institutions
0			

United Kingdom	Core Institution	Culham Laboratory	
	Co-Chair (name and title)	GRYAZNEVICH Mikhail, Principal Research Physicist	
	Cooperating Institutions	University of London	Number of Cooperating Institutions
1			

Germany	Core Institution	Max-Planck Institute for Solar System Research	
	Co-Chair (name and title)	SOLANKI Sami K., Director	
	Cooperating Institutions		Number of Cooperating Institutions
0			

Spain	Core Institution	Astrophysical Institute of Canary Islands	
	Co-Chair (name and title)	BUENO Javier Trujillo, Director	
	Cooperating Institutions		Number of Cooperating Institutions
0			

### Objectives of Research Exchange (including the five years after the project finishes)

We started the international joint COE program for magnetic reconnection/ self-organization based on the past ten years' progress in laboratory merging experiments and their broad collaborations. Its emphasis is on international and interdisciplinary collaborations among laboratory experiments, observations and theories/ simulations of Japan, US, UK, Italy, Germany and Spain to solve their key physics such as a significant reconnection heating and active control of self-organization by beam injection. Our goal is to complete an interdisciplinary and international research field of magnetic reconnection/ self-organization for elucidating their physics using joint-researches, exchanges and education of young scientists.

## Results to the present

The international core-to-core program among laboratory experiments, observations and theories/ simulations has solved many key physics of magnetic reconnection and self-organization: 1) huge ion heating of reconnection in downstream, 2) electron heating localized at X-point, 3) anomalous resistivity for fast reconnection caused by magnetic fluctuations, 4) intermittent reconnection by plasmoid ejection, 5) self-organization controlled by neutral beam etc. Especially, Japan-UK collaboration found keV-class ion and electron heating in the downstream and X-point, respectively, in agreement with the recent particle simulations in NIFS etc. The lab-solar collaboration made the first simulation experiment of “light bridge”, solving the mechanism for their jet formation. Our project published more than 150 journal and conference papers including a number of invited / plenary talks. Our three core meetings: MR, IPELS, Hinode and the first plasma school were popular as top quality meetings, leading us to publishing two special issues of IOP journal: Physics of Plasmas as our conference summaries. Our “free-style study abroad” project successfully sent a number of young students/ scientists to US, UK, Italy and Germany in the best times for their international and interdisciplinary research activities.

## Summary of FY 2013 Exchange Plan

### **Joint Research**

Joint reconnection heating/ self-organization experiment with beam injection at TS-4 and UTST (U. Tokyo)  
Joint solar-lab. collaborative experiment of “light-bridge” simulation at TS-4 (U. Tokyo)  
Joint two-fluid reconnection experiment for electrostatic potential formation at MRX (Princeton U.)  
Joint high-field reconnection heating experiment under the highest-Reynolds number at MAST (Culham Lab.)  
Joint self-organization experiment controlled by beam injection at MST (Wisconsin U.)  
Joint self-organization experiment controlled by beam injection at RFX (Padova U.)  
Joint theory-lab. collaborative research of turbulences and self-organization at Wisconsin U.  
Joint solar-theory. collaborative researches at London Univ., Astrophys. Inst. Canary Islands  
Joint solar-lab. collaborative research at Max-Planck Inst.

### **Seminar**

IPELS2013 (Interrelationship between plasma experiments in laboratory and space) Conference (July 2013)  
Hinode 7 Conference (Nov. 2013)  
Young CMSO Seminars (June, June, Sept., Dec. 2013)  
East-Asian School and Workshop on Laboratory, Space, Astrophysical Plasmas (July 2013)

### **Researcher Exchanges**

Invited talk at Seismology of Stellar Coronal Flares, IAU Symposium 300, 5<sup>th</sup> Space Climate Symposium, AOGS 2013, 6<sup>th</sup> Coronal Loop Workshop, ISTW2013 and 2013 AGU Meeting of the America