

§1. Planning of the All-Japan ST Research Program

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Based on the recommendation of the Fusion Research Working Group and the conclusions of the “Kyushu University Plasma Boundary Dynamics Experimental Device Review Committee”, spherical tokamak (ST) research in Japan was reorganized in 2005 as All-Japan ST Research Program supported by NIFS Bi-Directional Collaboration, and a new ST device QUEST was constructed at Kyushu University to fulfill one of the missions of this program, steady state operation. The formal establishment of the NIFS Bi-Directional Collaboration Research Promotion Expert Subcommittee for ST Research (ST Subcommittee) in November 2006 marked a great progress. The ST Subcommittee makes plans for activities in the entire field of ST research, coordinates collaborative efforts among different research groups, discusses any issues related to ST research, and reports to NIFS Bi-Directional Collaboration Committee as necessary. Since then, this Subcommittee has been working to establish the research plan of All-Japan ST Research Program and to coordinate its activities. The activities of the ST Subcommittee are published on the All-Japan ST Research Program website at NIFS, <http://www.nifs.ac.jp/kenkyo/icr/st.html>.

All-Japan ST Research Program promotes creative and innovative research at universities and other institutions. To maintain international competitiveness and to make significant contributions internationally, it is crucial to integrate all resources, including experimental research using existing devices in addition to the new ST, as well as theoretical and computational research. The purpose of this collaborative research is to plan and support the activities of All-Japan ST Research Program, making maximum utilization of NIFS Bi-Directional Collaboration, actively involving various ST research groups.

Two (Fourth and Fifth) meetings of the ST Subcommittee were held during FY2008. The Fourth Meeting was held at Fukuoka International Convention Center on September 12, 2008, immediately after the 14th International Congress on Plasma Physics (ICPP). The main topics of discussion were research collaboration on QUEST, other domestic collaborations, and international collaborations. After three years of construction at Kyushu University, the QUEST device started plasma operation in 2008. Since experimental research on QUEST will be carried out based on nation-wide collaboration, “QUEST Data Usage and Publication Agreement” was prepared, drawing upon documents used on NSTX, MAST, and Alcator C-Mod. Signing of the Agreement and compliance are prerequisites of becoming

an authorized member of QUEST Research Team with the privileges of data usage and publication of results. QUEST experimental data are stored at NIFS, and can be accessed via the SNET or on the web in abbreviated form. Rules regarding authorship and review processes for journal publications and conference presentations are also defined in this Agreement. Collaborations among different ST groups other than Kyushu University are essential for the success of All-Japan ST Research Program, and need to be encouraged. However, at present there is no framework to support such collaborations. Because both financial and human resources are scarce, it is important to minimize duplication of efforts, and use common tools such as diagnostic equipments and analysis codes. Collaborations among experiment, theory, and reactor design are also very important in defining the goals and strategies of All-Japan ST Research Program. Possibilities of international collaboration on NSTX regarding EC+HHFW start-up, on MAST regarding reconnection physics and EBW startup were discussed. In particular, the EBW experiment is a UK-US-JA three-way collaboration under the IEA Implementing Agreement on ST established in February 2007.

The Fifth Meeting was held at the Kashiwa Campus of the University of Tokyo on February 16, 2009. Before the Subcommittee meeting, Dr. Aaron Sontag of ORNL gave a seminar entitled “Non-Solenoidal Plasma Startup in the Pegasus Toroidal Experiment.” This seminar was open to public, and was attended by many students in addition to the Subcommittee members. Dr. Martin Peng, who was visiting Japan under US-Japan collaboration, attended the meeting and provided useful input from an international point of view. In particular, he recommended developing an alternative back-up plan for QUEST, in case the planned RF current drive scenario did not work as expected. Possibilities discussed at the meeting include scenarios using plasma guns, inboard converted EBW (as in MAST), and helicon wave.

The ST Subcommittee has the function of coordinating contributions to the IEA Implementing Agreement from Japan. The Executive Committee for IEA IA was held in two sessions, the first in Frascati on October 9, just after the International ST Workshop, and the second in Geneva on October 12, just before the IAEA Fusion Energy Conference. Participants from Japan were Prof. O. Motojima and Y. Takase (Executive Committee members). Multilateral collaborations have become possible under this framework, and international collaborations will be strengthened as a result. It is therefore very important to define clearly the role of Japanese ST research in the world, and to come up with a concrete strategy for Japanese ST research. As the first formal collaborative project under IEA IA on ST, plasma start-up experiments are planned as trilateral (US-UK-JA) collaboration. Japan leads the world with this research, and Japan is expected to make a large contribution. It is also important to strengthen the existing bilateral collaboration with the US.