§78. Promotion of All-Japan ST Research Program

Takase, Y., Ono, Y. (Frontier Sci. Univ. Tokyo), Maekawa, T., Kishimoto, Y. (Energy, Kyoto Univ.), Nagata, M. (Eng., Hyogo Univ.), Zushi, H. (RIAM, Kyushu Univ.), Ozeki, T. (Fusion Res. Dev., JAEA), Komori, A., Nagayama, Y., Horiuchi, R.

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 (AJSTRP) 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-Drectional 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 AJSTRP and to coordinate its activities. The activities of the ST Subcommittee are published on the AJSTRP website at NIFS, http://www.nifs.ac.jp/kenkyo/icr/st.html.

AJSTRP 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 promote the activities of AJSTRP, making maximum utilization of NIFS Bi-Directional Collaboration, actively involving various ST research groups.

Two (Eighth and Ninth) meetings of the ST Subcommittee were held during FY2010. The Eighth Meeting was held at Kyushu University on August 30, 2010. The Ninth Meeting was held at the University of Tokyo on October 29, 2010. The Ninth meeting was attended by Dr. M. Peng (Oak Ridge National Laboratory, U.S.A., member of ST Subcommittee), and focused on discussions concerning international collaboration, including the possibility of using lithium wall conditioning in future steady-state ST such as a Component Test Facility.

Two new ST experiments QUEST (Kyushu Univ.) and UTST (Univ. Tokyo) have started operation since the establishment of the AJSTRP. Discussion of a more concrete research strategy beyond the general goals of "high beta" and "steady state" has started. Research status and plans of ST groups were reported and discussed. It was confirmed that Japan should contribute by innovative research (such as CS-less start-up, ultra-high beta ST formation by plasma merging, etc.) utilizing the versatility of university-scale experiments, and the extension of novel ideas in collaboration with NSTX and MAST. In order to accomplish these goals, more active collaborations among research groups in Japan are crucially important, but these require improvements in collaboration framework. To alleviate the serious shortage of research budget and manpower, each group should share expertise (such as Thomson scattering from Univ. Tokyo, data acquisition and analysis from NIFS, gyrotron from Univ. Tsukuba) and miximize utilization of limited resources.

The ST Subcommittee has the function of coordinating contributions to the IEA Implementing Agreement (IA) from Japan. The Executive Committee for the IEA IA on ST met in Daejeon, Korea on October 4, during the IAEA Fusion Energy Conference (FEC). Participants from Japan were A. Komori and Y. Takase. Results of this meeting were reported and discussed at the Ninth meeting of the ST Subcommittee. Y. Takase will serve as the Chairman of the Executive Committee from April 2011. Since the IA will expire in June 2012, application for extension must be prepared during 2011. EBW plasma start-up experiments are being carried out on MAST using a high-power (200 kW) long-pulse (0.3 s) 28 GHz gyrotron transferred from ORNL, as the first trilateral (US-UK-JA) collaborative project under this IA. Japan leads the world in this research, and Japanese contribution is very important. The results of these experiments have a large impact on the design of burning ST devices such as a volumetric neutron source and a commercial fusion reactor. Two more collaboration topics were discussed, steady-state operation and future applications of ST. Experiments will continue at higher power and longer pulse length after repair of transmission components.

An important activity of the IEA IA is to organize the International ST Workshop (ISTW). ISTW is held every other year (on years in which IAEA FEC is not held), The next ISTW will be held in Japan during September 27-30, 2011 hosted by NIFS. This workshop will be held jointly with IAEA Technical Meeting and US-Japan ST Workshop.

Up to now, collaboration with the US has been proposed and performed individually under the framework of the Japan-US Cooperation Program. It is important to strengthen activities under this program (with NSTX in particular). The ST Subcommittee will coordinate these activities as required. It was reported that EBW current drive on QUEST is being considered in the US as a US-J collaboration project. Possibilities of collaborating on steady-state particle control and current drive control were discussed. Collaborations with MAST are being supported by the NINS Project "Study of turbulence, magnetic islands, and magnetic field lines in magnetically confined plasmas".