5. Japan-Korea Fusion Collaboration Programs

NIFS and the National Fusion Research Institute (NFRI) in Korea have been collaborating in several areas of magnetic fusion research for 9 years. The main objective has been to support and to advance the KSTAR experiment through the collaborative development of diagnostics and heating facilities. KSTAR successfully achieved its first plasma in 2008 and is advancing step by step each year. Another important aspect of this collaboration is human resource development for the ITER project and future reactor design work.

I. KSTAR collaboration

This collaboration consists of development projects for diagnostics and heating systems for the KSTAR experiment which were successfully completed during the 2012 Japanese fiscal year (JFY).

1. Plasma Heating Systems

The Korea-Japan workshop on the physics and Technology of Heating and Current Drive was held in Busan, Korea in the period of 28-31, January 2013. Many technical and theoretical issues were discussed by experts of both countries from various universities and institutes.

1-1 Radio Frequency Systems

NIFS researchers visited and discussed about the ICRF experiment in KSTAR. KSTAR researchers participated in the ICRF experiment in LHD. Both Parties continued collaboration and exchange of personnel and technical knowledge for the development of ICRF and technologies, in particular information for a high power and CW transmitter development.

1-2 Microwave Systems

Both parties discussed high power microwave transmission technology. NIFS supported the development of the in-line polarization monitor for the use of the KSTAR ECRH experiments. NIFS researchers participated in the pre-ionization and the current start-up experiment by ECRH in KSTAR.

2. Diagnostic Systems

The 6th JA-KO Seminar on advanced diagnostics for steady-state fusion plasma was held 23 -25 August, 2012 in Jeju. A total of 19 lectures were given, 10 by lecturers from Japan and 9 by lecturers from Korea. Young researchers and students participating in the seminar totaled 51 with 18 from Japan and 33 from Korea.

2-1 Bolometer Systems

- 1) For resistive bolometer system, design of bolometer arrays for the divertor of KSTAR was continued.
- 2) For imaging bolometer system, KSTAR experts in NFRI have installed the imaging bolometer system in KSTAR after the optical calibration and calculated the geometry

matrix using the program developed by NIFS. NIFS experts performed the calibration of foil. NIFS experts visited NFRI three times for data analysis preparation assistance in August, for KSTAR experiments participation in October and for the operation results discussion in February, 2013.

2-2 Edge Thomson Scattering System

NIFS continues to loan NFRI a YAG laser. As for polychromators, one NIFS expert visited NFRI in June to discuss the KSTAR Thomson scattering system. And NIFS experts visited NFRI to participate in calibration of the KSTAR Thomson scattering system. KSTAR experts visited NIFS in December to attend the 22nd International Toki Conference, where the 2012 KSTAR experiment campaign results of the Thomson scattering was presented.

2-3 ECE Radiometer System

One NIFS expert attended the KO-JA collaboration meeting on KSTAR diagnostics held in June 2012 at NFRI. Both Parties discussed further collaboration in the area of ECE diagnostics.

2-4 New Diagnostic System Development

1) CES

Significant improvements on time resolution and data quality of the toroidal CES system (32ch) has been achieved by introducing a new lens spectrometer developed in NIFS.

2) Neutron Diagnostics

A neutron energy spectrometer (NES) has been developed in collaboration with NIFS and Nagoya University. NES was exported to NFRI in July, 2012. Immediately after that, NES was installed onto KSTAR by researchers of Nagoya University, NIFS.

II. Human Resource Development

The total number of researchers that were exchanged between Japan and Korea in JFY 2012 were 115 from Japan to Korea and 13 from Korea to Japan. Workshops and Seminar of various fields were held in each country:

- Workshop on Physics and Technology of Heating and Current Drive
- 8th Workshop on KO-JA Fusion Material and Engineering Toward Next Generation of Fusion Devices
- Workshop on Modeling and Simulation of Magnetic Fusion Plasmas
- Workshop on Tritium behavior in fusion reactor and its recovery and removal technique
- The 6th Japan-Korea Seminar on Advanced Diagnostics for Steady-State Fusion Plasma on August 22nd – 25th, 2012

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