7. 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 10 years. The main objective has been to support and to advance the KSTAR experiment through the collaborative development of diagnostics and heating facilities. The summary report of the collaboration was discussed to prepare until JCM in 2015. KSTAR experiment successfully continued from 2008 and has been achieved many excellent results. Another important aspect of this collaboration is human resource development for future fusion research.

I. KSTAR collaboration

This collaboration consists of development projects for diagnostics and heating systems for the KSTAR experiment which were successfully completed during the 2013 Japanese fiscal year (JFY).

1. Plasma Heating Systems

The Korea-Japan workshop on the physics and Technology of Heating and Current Drive was held at Fukui in the period of 20-22, January 2014. Many physics, theoretical and technical 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

NIFS researcher visited NFRI for the EC seminar and had a discussion on the gyrotron behavior on the KSTAR environment. NIFS supported the development of the in-line polarization monitor for the use of the KSTAR ECRH experiments.

2. Diagnostic Systems

NIFS and KSTAR groups discussed the measurement of KSTAR plasmas, modification of a diagnostics systems for better performance and development of new diagnostics systems. A preparatory work was carried out for the 7th JA-KO seminar on advanced diagnostics for steady state fusion plasma.

2-1 Bolometer Systems

For resistive bolometer system, design of bolometer arrays for the divertor of KSTAR was continued. JA expert from NIFS continued the analyzing the foil calibration, and prepared the brightness program.

2-2 Edge Thomson Scattering System

NIFS continued the collaboration on the 10 Hz YAG Laser. As for polychromators, one NIFS expert visited NFRI to discuss the KSTAR Thomson scattering system. KO experts visited NIFS in December to attend the 23rd International Toki Conference, where the Thomson scattering result of 2013 KSTAR experiment campaign was discussed.

2-3 ECE Radiometer System

One NIFS expert attended the KO-JA collaboration meeting on KSTAR diagnostics held in June 2013 at NFRI. Both Parties discussed further collaboration in the area of ECE diagnostics.

2-4 New Diagnostic System Development

1) CES

The loan period of the lens spectrometer from NIFS for toroidal CES system was extended for the measurement of ion temperature and rotation at the pedestal region and a new NIFS lens spectrometer for the poloidal CES system (32ch) was transferred to NFRI in February 2014. The experts from NIFS visited KSTAR in August 2013 to join the experiment based on the CES measurements.

2) Neutron and Energetic-ion Diagnostics

A neutron energy spectrometer (NES) prototype has been developed in collaboration with NIFS and Nagoya University (NU), providing slowing-down properties of neutral-beam injected energetic ions. Experts from NU and NIFS visited NFRI to operate NES on KSTAR. Nuclear emulsion that functions neutron camera and spectrometer was also applied to KSTAR deuterium plasmas. In addition to neutron diagnostics collaboration, joint work on scintillator-based fast-ion loss probe is steadily ongoing.

II. Human Resource Development

The total number of researchers that were exchanged between Japan and Korea in JFY 2013 were 57 from Japan to Korea and 67 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 in Fukui
- 9th Workshop on KO-JA Fusion Material and Engineering Toward Next Generation of Fusion Devices in Hokkaido Univ.
- Workshop on Modeling and Simulation of Magnetic Fusion Plasmas in Kyoto
- Workshop on Tritium Management for fusion Reactor and its Related Researches in Shizuoka
- Workshop on fusion blanket structural materials in KAIST

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