9. Activities of Rokkasho Research Center

At Rokkasho village in Aomori Prefecture, the International Fusion Energy Research Centre (IFERC) project and International Fusion Materials Irradiation Facility/Engineering Validation and Engineering Design Activities (IFMIF/EVEDA) project have been conducted under the Broader Approach (BA) agreement between the EU and Japan. The roles of the Rokkasho Research Centre (RCE) of NIFS are to assist NIFS and universities to cooperate with those activities, and to prepare the environment for promoting various collaborative research including technology between activities at Rokkasho and at universities. As cooperation activities, the head of the Rokkasho Research Centre of NIFS is undertaking tasks as the IFERC project leader, and the Rokkasho Research Center of NIFS has been set inside of the QST Rokkasho Fusion Institute, where IFERC and IFMIF/EVEDA projects are located. Also, a staff member of the Rokkasho Research Centre of NIFS is working as a member of the Joint Special Team for a Demonstration Fusion Reactor (DEMO) design, which is the organization for establishing technological bases required for the development of DEMO as an all-Japan collaboration.

In order to complement ITER and to contribute to an early realization of the DEMO reactor, the IFERC project implements the three sub-projects DEMO Design and R&D Coordination Centre composed of DEMO Design Activities (DDA) and DMEO R&D activities, the Computational Simulation Centre (CSC), and the ITER Remote Experimentation Centre (REC). The mission of DEMO Design and R&D Coordination Centre is to coordinate/implement scientific and technological DEMO activities in DEMO design leading to DEMO pre-conceptual Design and R&D of common DEMO technology. The mission of CSC is to provide a state-of-the-art supercomputer and to exploit high performance and large-scale fusion simulations, in order to analyze experimental results, to prepare ITER operational scenario, to predict ITER performance, and to contribute to DEMO design physics and technology. The mission of REC is to prepare ITER remote experiments and to verify the functions by using JT-60SA and EU tokamaks. The IFERC project itself is implemented on schedule as originally planned. However, update of the IFERC project plan with the extension until the end of December 2019 was approved at the 18th BA Steering Committee meeting in April 2016 in order to ensure the smooth transition to BA phase II.

In 2016, DDA mainly concentrated on two tasks: 1) design sensitivity studies and integration of component design and R&D for DEMO pre-conceptual design, and 2) further work on critical design issues that were identified to be resolved in the 1st intermediate report compiled in February 2015. The 2nd Intermediate Report including the results of the above two tasks is under preparation aiming at completion in early 2017. The main goals of the report are to specify the DEMO technical prerequisites and high level requirements, to identify and address the main design and technical challenges in physics, engineering, and technology, and to identify the critical R&D activities to be undertaken to overcome the major design and technical issues identified. The DEMO R&D activities in the five task areas (T1: SiC_f/SiC composites, T2: Tritium technology, T3: Material engineering, T4: Advanced Neutron multiplier, and T5: Advanced Tritium breeders) have been carried out successfully in accordance with the Work Programme 2016 and Procurement Arrangements (PAs). As to the EU/JA joint collaboration, the surface analyses of JET-ILW carbon dust particles were successfully implemented in T2. As for T1, long term corrosion test on compatibility of SiC/SiC composites with liquid Pb-Li metal was completed. The reduced activation ferritic/martensitic steel F82H has successfully demonstrated its stable potential, with the real scale production technology in T3. As for T4, beryllides (Be12V) show strong potential for use in high-temperature environments. $Li_{2+x}TiO_{3+y}$ pebble with Li_2ZrO_3 exhibited good tritium release properties in T5.

The CSC activity has progressed in full accordance with the project plan and with the schedule of the various PAs. The activity was performed by the IAs with the Standing Committee. The Integrated Project Team (IPT) of CSC including the HPC team continuously and dedicatedly supports users and operation of Helios, leading to

stable operation with a high availability ratio of over 95%, high utilization rate of 85-95% after the 4th quarter of 2012, and 639 (accumulated number as of February 2017) peer-reviewed papers published or accepted in scientific journals. The last simulation cycle was completed in December 2016, leading to dismantling of the Helios system in January 2017, as planned.

Based on the overall plan of REC, development of the software for REC is successfully continued in collaboration with the Satellite Tokamak Programme in the QST Naka site. Environmental preparation of REC room including network is extensively implemented and aiming at completion in March 2017. Some verification tests of REC function have been implemented, including successful fast data transfer test with ITER in collaboration with NII and NIFS shown in the figure below.

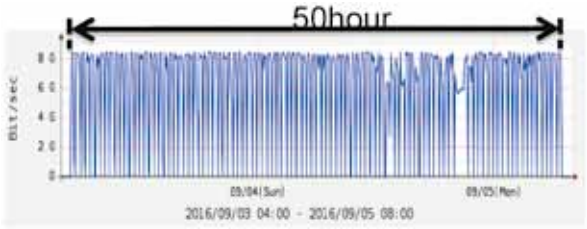

Fig. 1 In total, 50TB was sent per day.

In addition, the Rokkasho Research Centre performs communication work with the organizations related to ITER-BA, the Aomori prefectural office, and the Rokkasho village office, and publicity work so to have local residents understand nuclear fusion research.

(N. Nakajima)

Bird's-eye view of IFERC site at Rokkasho village. The site is viewed from East to West.