

8. Activities of Rokkasho Research Center

At Rokkasho village in Aomori Prefecture, the International Fusion Energy Research Centre (IFERC) project and the 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 from June 2007, in order to complement ITER and to contribute to an early realization of the DEMO reactor. The roles of the NIFS Rokkasho Research Center (RCE) established in May 2007 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 NIFS RCE is undertaking tasks as the IFERC Project Leader (PL) from September 2010. Also, the head of the NIFS RCE is working as the leader of the general coordination group of the Joint Special Team for a Demonstration Fusion Reactor (DEMO) design, which is the organization set in May 2015 for establishing technological bases required for the development of DEMO as an all-Japan collaboration.

The activities of IFERC project in 2019 JFY were devoted to completing the planned activities and the EU/JA contributions to IFERC project in BA Phase I. Hereafter, the outline is described very briefly:

The joint activities of DEMO Design Activity (DDA) began in 2010. The DDA in 2019 FY concentrated on compiling the Final Report of DDA, and on the design activities in order to complete the Final Report. The Final Report describing common conclusions and different approaches on design options for key design issues was issued in February 2020 as a comprehensive summary of DDA in BA Phase I. Integrating critical requirements into reduced systems codes has led to a similarity in the design configurations identified by EU and JA. These activities are also presented in the IAEA Fusion Energy Conferences (IAEA FEC) and other international conferences such as Symposium on Fusion Technology (SOFT) and International Symposium on Fusion Nuclear Technology (ISFNT), and more than 550 peer reviewed papers are published in the major academic journals in this field such as “Fusion Engineering and Design” and “Nuclear Fusion”.

The results of the original DEMO R&D Activity composed of 5 generic task areas were reported in the Final Report of DEMO R&D Activity in December 2017. In the extension phase from June 2017 to March 2020, some activities such as Materials Properties Handbook of the structural materials of blanket and database of the functional materials of blanket were conducted with DDA, and their activities are reported in the Final Report of DDA. In parallel, the JET-ILW tile and dust analysis was conducted from 2014 to 2019, and the results were summarized in the Final Report of JET tile and dust analysis issued in December 2019. Besides implementing DEMO R&D activity, the peer review was held in 2012 and 2018 in order to assess the activity and accelerate the communication with DDA. These DEMO R&D activities are presented in IAEA FEC, SOFT and ISFNT as well as DDA, and more than 300 peer reviewed papers are published in the major academic journals in this field such as “Fusion Engineering and Design”, “Journal of Nuclear Materials” and “Nuclear Materials and Energy”.

After successfully implementing the operation of Helios supercomputer from 2012 to 2016 with a very high availability and a very high usage rate, which was reported in the Final Report of CSC issued in October 2017, IFERC HPC follow-up Working Group continues the activity in view of the CSC activity in BA Phase II. Based on the very recent re-investigation to PIs of Helios users, more than 640 peer reviewed papers are published in the academic journals of plasma and fusion research including reactor materials and technology such as “Physics of Plasmas”, “Nuclear Fusion”, “Plasma Physics and Controlled Fusion” and “Fusion Engineering and Design”. Also, about 20 papers are published in the journals with high impact factor such as “Physical Review Letters”, “Nature Communications” and “Physics Reports (Review Section of Physics Letters)”.

REC activity was implemented based on the Overall plan of REC created in October 2012 and approved by BA SC in November 2012. The overall activity is summarized in the Final Report of REC issued in December 2019, where the preparation, execution, and discussions and summary of Remote Participation with WEST experiment, which was successfully implemented in November 2018 with public visitors/audiences, are included as one of the significant results of REC activity. Also, REC activities are presented in the IAEA FEC, and 8 peer reviewed papers are published in the fusion related academic journals such as “Fusion Engineering and Design”.

As described above, all the planned activities of IFERC project and all the contributions by both EU and JA have been completely accomplished within BA Phase I from June 2007 to March 2020 (the almost final situation was reported in the symposium of the 36th Annual Meeting of the JSPF in November 2019), which leads to IFERC project in BA Phase II from April 2020 to March 2025.

The head of NIFS RCE is also undertaking the role of the leader of the general coordination group of the Joint Special Team for a DEMO design. Since the collaboration among many researchers from NIFS and other institutions and technicians from companies is indispensable for the conceptual design of DEMO reactor, the head of the NIFS RCE tries to work as a coordinator.

In summary, the NIFS RCE contributes widely not only to the success of ITER but also to the realization of fusion energy through the continuous efforts mentioned above.

Cover page of the presentation in the symposium of the 36th Annual Meeting of JSPF

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