IFERC Newsletter

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International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

Meeting

21st IFERC Project Committee (IFERC PC-21) meeting

1. General

After the 4th DEMO review meeting in the morning of 25th October, 2017, the 21st International Fusion Energy Research Centre (IFERC) Project Committee (IFERC PC-21) meeting was held at Rokkasho on 25th-26th October. Twenty-six participants attended the IFERC PC-21 in person or via videoconference (VC). Among these were six committee members, including the PC chair, David Maisonnier, five project team members, the Project Leader, Noriyoshi Nakajima, one secretary, one PC invited expert, and twelve experts from the EU and JA Implementing Agencies.

IFERC project proceeds as originally planned except for minor delay of reports. The recent status of DEMO Design Activity (DDA) and of REC Activity was reported together with information from IFERC-HPC follow-up working group established at IFERC PC-20 on March 2017. In parallel, the Work programme 2018 was proposed by the PL, and PC members recommended this document to Broader Approach (BA) Steering Committee (SC) in the upcoming 21th BA SC meeting to be held in Leuven on 12th–13th December, 2017 for approval.

One of important issues in this meeting was to set up the 2nd peer review panel for DEMO R&D activity, as a follow up to the 1st peer review which took place in 2012. Related to this proposal, presentations on the content described in the DEMO R&D Final Report were performed in both the 4th DEMO review meeting just before PC-24 and during PC-24 itself. The purpose of the 2nd peer review is 1) to review the activities performed till May 2017, considering the scope of work specified in the PAs and focusing on the activities performed after the first peer review; 2) to review and assess the complementary activities of DEMO R&D to be carried out, mostly as voluntary contributions, until March 2020; and 3) to review and assess the future plans proposed by the Implementing Agencies for the BA phase II from April 2020 to March 2025. The composition of the 2nd peer review panel was agreed, and it was decided that the related documents, including the Terms of Reference should be submitted to the next IFERC PC-22 to be held in February 2018. Hereafter, the recent topics are described.

2. DEMO Design Activity (DDA)

As to DEMO Design Activity (DDA), the 2nd intermediate report, including a new chapter of Balance of Plant, has been issued in February 2017, where the main goals were 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. Also, beneficial points of the collaboration between Europe and Japan in the DDA are stressed. Through those activities summarized in the 1st (issued in Feb. 2015) and the 2nd intermediate reports and the sequential work, the DEMO design and R&D work has continued to be primarily focused on the design integration of baseline DEMO plant concepts, which work as a proxy for more detailed design integration work. The baseline of EU DEMO1 is a pulsed DEMO and that of JA DEMO-2014 is steady state operation device; both range at a major radius (R_p) of 8.5-9.1 m, fusion power (P_{fus}) of 1.4-2 GW, magnetic field on the axis (B_T) of 5.7-5.94 T, and averaged neutral flux to the first wall of ~1 MWm^{-2}. A somewhat higher plasma performance, such as normalized beta (β_N), bootstrap current fraction (f_{bs}) and *HH*-factor (HH_{98y2}), is expected for both DEMOs compared to ITER. Nevertheless, a number of alternative options in configurations, components and design parameters are being studied, albeit still preliminarily to evaluate their DEMO relevance.

3. DEMO R&D Activity

Regarding DEMO R&D, the activity started from the beginning of the IFERC project in the 5 generic areas of the DEMO blanket research, labelled as Tasks 1 to 5: T1 SiC_f/SiC composites; T2 Tritium technology; T3 Materials Engineering; T4 Advanced Neutron Multipliers; and T5 Advanced Tritium Breeders, based on the common interest in both IAs. The analysis of JET tiles and dust was added to the T2 task in 2014, as a EU/JA collaboration using the DEMO R&D facility in Rokkasho. The main

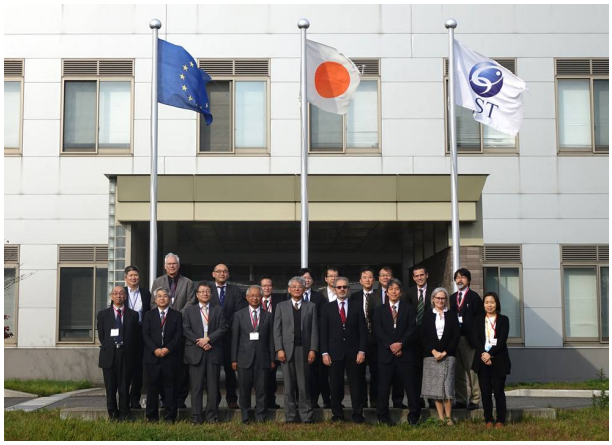
goals of DMEO R&D Activity are (i) characterization and optimisation of structural materials, in particular Reduced Activation Ferritic/ Martensitic steels (RAFM steels in T3) and composites of silicon carbide (SiC_f/SiC composites in T1), (ii) fabrication and characterization of functional materials (Advanced neutron multipliers in T4 and Advanced tritium breeders in T5), and (iii) development of tritium technology and analysis of JET tile and dust in T2. Many of these activities have used the world top-level and unique R&D facility constructed in IFERC site as DEMO R&D building, which is capable of handling Tritium, beta and gamma Radio Isotope species and Beryllium (Be) simultaneously, and was licensed in 2011, together with the DEMO joint research building available from Feb. 2016. The achievements of DEMO R&D activities by May 2017 are summarized in the DEMO R&D final report in November 2017 together with the original research plans.

4. ITER Remote Experimentation Centre (REC)

Concerning REC, a plan of verification tests including the contents of the tests, the schedule, the necessary conditions and mutual relations was agreed in REC-PRM-7 in January 2016. The preparation work on hardware and software started in parallel, and was successfully completed on schedule in 2017, including the verification of the various functions. The remote experiment consists of three essential parts; remote facility, host facility with the functions of remote participation, and Remote Data Access (RDA) or Remote Computer Access (RCA) technology via network between remote and host facilities. As the remote facility, the REC room was arranged with a large main video wall, servers and additional working space/compartments by JA and EU at Rokkasho IFERC site, for preparing future ITER remote experiments. A network with 10 Gbps bandwidth, firewall and servers were prepared in the REC room by JA. The functions of REC room as the remote facility were verified by EU and JA experts. In order to make the future experiments of ITER and JT-60SA effectively and efficiently implemented, software packages required for the remote experimentation with the Satellite Tokamak (JT-60SA) facilities were developed. Those packages include 1) Remote Experimental System (RES) providing remote users with environment similar to that of users at the host facility, Remote Data Analysis Software (EDAS) providing a basic comfortable environment for participants to conduct data analysis, and extended tokamak simulator (eTos: a basic tool to prepare discharge scenario) for inter-discharge analysis developed by JA, and 2) tokamak simulation codes (METIS: fast transport code, CREATE: user friendly magnetic equilibrium code) for inter-discharge analysis, developed and customized for JT-60SA and ITER by EU. The functions of the developed software packages have been verified by EU and JA experts just after the REC-TCM-9 held in the end of May 2017. As for the RDA and RCA technology, software for RDA has been developed, and tests for RDA and RCA have been performed for various host facilities. EU developed MDSplus with i) the customization and the provision of MDSplus to the REC project, and ii) the characterization of RDA performance between Europe and Japan using different communication protocols. The following RDA and RCA tests have been performed: RDA tests between Naka and JET, fast data transfer tests between ITER and Rokkasho by using software mmcftp developed by NII and L2VPN, RDA and RCA tests between Rokkasho and RFX (Padova), RDA and RCA tests with the remote participation tools of JET from Rokkasho, and RDA tests with tape library between Naka and Rokkasho by using JT-60U data. The contents of RDA RCA tests were also confirmed by EU and JA experts. Moreover, demonstration of remote participation with JT-60SA has been done in April 2017. All those activities in REC by 2017 are summarized in a provisional final report of REC, which will be updated into the final report of REC in 2020, including demonstrations with EU tokamaks planned in 2018 - 2019.

5. Computational Simulation Centre (CSC) and IFERC HPC follow-up working group

As to CSC, the dismantling of Helios system was completed in February 2017 and a part of IT equipment, including the accelerators and tape library, was officially transferred from F4E to QST. The transferred part will be in operation by QST until March 2018. The CSC activities were summarized in the full final report with two annexes; Annex I for technical experiences learnt from the CSC and Annex II for scientific results obtained by using Helios issued in October 2017. In addition to the activity directly related to the CSC, an “IFERC HPC follow-up working group” was set-up in 2017, as recommended by the IFERC Project Committee (PC-18), according to guidelines presented to the IFERC Project Committee (PC-20). The topics to be addressed by this working group include the sharing experience and best practices in the design and operation of HPC centres for fusion users and in the usage of such centres by fusion users and the preparation propositions for future joint activities in HPC for the BA extended period.



(IFERC Project Leader: Noriyoshi Nakajima)