

Plan and strategy for ITER Blanket Testing in Japan

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This paper presents a plan and strategy for ITER blanket module testing in Japan. The Fusion Council of Japan has established the long-term research and development program of the blanket in 1999. In the program, the solid breeder blanket was selected as the primary candidate blanket of the fusion power demonstration plant in Japan. In the program, Japan Atomic Energy Research Institute (JAERI) has been nominated as a leading institute of the development of solid breeder blankets, in collaboration with universities, for the near term power demonstration plant, while, universities including National Institute for Fusion Science (NIFS) are assigned mainly to develop advanced blankets for longer term power plant development.

In the long term research and development program, ITER blanket module testing is identified as the most important milestone, by which integrity of candidate blanket concepts and structures are evaluated. For establishing material irradiation data for fusion power plants, International Fusion Material Irradiation Facility (IFMIF) is expected to provide the mechanical data of Reduced Activation Ferritic/martensitic Steel, silicon carbide composite, vanadium alloy, ODS ferritic steel and other functional materials, for material selection and licensing data base. In Japan, universities, NIFS and JAERI cover a variety of types of blanket development. In the Test Blanket Working Group, Japan showed interest to all working sub-groups.

As the primary blanket options, solid breeder test blankets with ferritic steel structure cooled by helium and water are being developed by JAERI with cooperation of university experts. Japan has intention to fabricate test modules for solid breeder blankets in a possible collaboration with other international partners as appropriate. In all necessary fields of blanket development, element technology development phase has been almost completed and is now stepping further to the engineering test phase, in which scalable mockups of solid breeder test blanket modules will be fabricated and tested to clarify the total structure integrity for final specification decision of test blanket modules.

As the advanced blanket options, solid breeder blanket module with SiC composite structure cooled by high temperature helium gas, liquid LiPb breeder cooled by helium, molten salt self cooled blanket module and liquid Li self cooled blanket module are under development by universities and NIFS with cooperation of JAERI. Key issues have been addressed and critical technologies are being developed.

The development of blankets in Japan has shown sound progress on both of solid and liquid breeder blankets under coordinated domestic development programs, for both of primary and advanced options.