Recent Progress of Design & Development in IFMIF Activities

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The International Fusion Materials Irradiation Facility (IFMIF) is an accelerator-based neutron source facility utilizing the deuteron-lithium stripping reaction with an energy spectrum peaked at around 14MeV, to be the best choice for a materials irradiation facility in fusion application with a similarity of the lattice damage production and the nuclear transmutation characteristics. IFMIF is a joint effort currently of the EU, Japan, the Russian Federation and the USA within the framework of Fusion Materials Implementing Agreement of the IEA. A reference conceptual design including a detailed cost estimate and a cost reduction design was developed in the first stage of the activity (1995-99). The primary risk factors of some key component technology to achieve a cw deuteron beam with 40MeV/125mA and to accept a 10MW beam power by a flowing lithium target were reduced by the success of more than 80 tasks performed during 2000-02 as the Key Element Technology Phase (KEP).

The IFMIF conceptual design is based on the use of existing, proven technology to the maximum extent feasible. Thus there are no requirements for basic research to validate any of the principle of technology. However the development activities have been planned to improve or adapt the technologies selected for IFMIF and it was recognized that some development activities and some detailed preliminary design were still required to provide the basis for making a decision on IFMIF construction. In the present schedule a next phase, the Engineering Validation and Engineering Design Activity (EVEDA), is planned to focus on the detailed engineering design and the associated prototypical component tests, under a new organizational structure to allow for enhanced joint team design work and smooth transition to subsequent construction.

In these two years, the IFMIF activity stays in the transition phase from previous phase to the next EVEDA phase, and a working draft for new Implementing Agreement for EVEDA was prepared and a Comprehensive Design Report was published for domestic technical reviews in each party to make a decision to participate the EVEDA. As the preparatory work for starting EVEDA, an extended design study of accelerator beam dynamics, lithium loop experiments, test assembly thermo-mechanical design, etc. have been carried out using an existing resource and a test stand developed in KEP. A new result of end-to-end beam dynamics simulation study shows that a perturbation on output beam energy exaggerates the non-uniformity of beam distribution at the target surface. A lithium flow speed record of 15m/s was achieved at the Osaka Univ. experimental loop and a cavitation signal was observed successfully, however, with no indication of break of flow stability at the nozzle area. Many other technical improvements and design issues clarified through the experimental results are also presented in the talk.
(450 words, limit 500)