ICANS XIV
14th Meeting of the International Collaboration on
Advanced Neutron Sources
June 14-19, 1998
Starved Rock Lodge, Utica, IL

Current Status of JHF N-arena Development

M. Furusaka and H. Ikeda
Neutron Science Laboratory (KENS),
High Energy Accelerator Research Organization (KEK),
Tsukuba-shi 305, Japan

The Japan Hadron Facility Project (JHF) aims to advance the multi-disciplinary research fields, such as materials science, life science, and nuclear and particle physics, by using high intensity beams supplied by a proton accelerator complex. It consists of a 200-MeV linac, a 3-GeV-200 μA-25 Hz booster synchrotron and a 50-GeV-10 μA proton synchrotron. The pulsed spallation neutron source (SNS) facility N-arena is one of the four facilities in the JHF project. It will utilize proton beam from the 3-GeV booster synchrotron (0.6 MW for the first stage, 1.2 MW for the second stage).

For the first stage of the N-arena, a heavy-water cooled solid-metal target made of cladded-tungsten plates will be employed for the upstream part. For the down stream part, we are considering to put a liquid mercury "beam dump" to acquire experiences of handling the mercury system.

To design the solid-target system, we are performing a series of thermal-hydraulic experiments. From critical heat flux experiments we performed so far, we have confidence in making a solid-target system which could be used for the upgraded 1.2 MW source with reasonable performance. Mockup experiment of a water distributor for the target is also carrying out by a flow visualization technique using laser beam. We have only got preliminary results so far, but simple-shaped distributors seems to have enough performance. Continuing efforts to make an optimized distributor is underway.

Production of ^{7}Be and T by spallation process in the cooling water circuit could become a very severe problem. We are now performing test experiments to determine the production rate of both nuclei, deposition-rate and deposition-mechanism of ^{7}Be using the room-temperature water-moderator circuit at the KENS facility.

We are also developing a liquid-metal target system for the second stage of the project. We have done a mockup experiment using water in place of liquid-metal to optimize the flow of the system. Modified U-shaped target model shows consistent flow without any vertexes.

We have been carrying out extensive neutronic calculations as well as experiments using the Hokkaido university electron linac. From the results, we decided to have two liquid-hydrogen moderators with a premoderator, one coupled and one decoupled. Liquid-methane moderator is indispensable for high-resolution experiments, but it is well known from its radiation damage problems. Since no good substitution is found so far, we are trying to improve the life-time of the moderator. We are trying to evaluate the effect of putting a heavy-water premoderator for the reduction of damage. There are several other possibilities to reduce the damage, but if that fails, decoupled liquid-hydrogen moderator would be the only solution. For the reflector, lead seems to have better performance for decoupled moderators and beryllium for coupled one.