PRESENT STATUS OF BOOSTER SYNCHROTRON UTILIZATION FACILITY AT KEK

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Booster Synchrotron Utilization Facility (BSF) was established in 1978 to organize three experimental facilities; the pulsed neutron source facility (KENS), the meson physics research facility (BOOM) and the biomedical facility for cancer therapy and diagnosis (PARMS). The 500 MeV pulsed proton beam from the booster of the 12 GeV synchrotron is effectively used for the researches of condensed matter and nuclear physics with the produced neutrons and mesons. The construction of BSF was completed in the spring of 1980, and the first beam from the booster synchrotron was delivered to the facility in June of the year. The operation time of BSF was 1,463 hrs in F.Y. 1980 and 2,883 hrs in F.Y. 1981, respectively. During two years scince the starting-up of the facility, the operation of the facility was so reliable as to be around 90 % in the operation efficiency.

In the shared operation of the booster synchrotron with the main-ring synchrotron, 42 pulses of the proton beam in maximum are available to BSF every 2.5 sec, which is the repetition period of the 12 GeV synchrotron. Each 50 nsec beam pulse contains about 6×10^{11} protons. The beam transmission including the extraction efficiency from the booster was measured by comparing the beam intensity near the production target with that of circulating beam in the booster. The results are 0.93 ± 0.06 in the machine time of the neutron scattering experiment and 0.89 ± 0.10 in that of the meson experiment.

Neutrons produced with a tangsten target are moderated by two kinds of moderators; a polyethylene moderator at ambient temperature and a solid methane cold moderator at 20 K. The 4π equivalent neutron peak flux from KENS is plotted against neutron energy in Fig. 1 and is compared with those of two steady reactors.

We have a project called KENS-I' to increase the neutron flux by one order magnitude without making significant modification of the target assembly and its shield. The increase will be achieved by improving several factors as i) replacing the present W target by U^{238} target, ii) increasing the proton beam current in the booster by making H^- ion beam injection, iii) adopting a groved moderator for the cold neutrons, etc. In the best case, the increase will be achieved in 1985. There is also a future project KENS-II to construct a new proton synchrotron of 800 MeV, which aims to increase the proton beam intensity by two orders of magnitude compared with that of the present booster[1].

The main apparatus in BOOM[2] is a pulsed muon channel, which is characterized by a superconducting solenoid representing the $\pi\mu$ decay section. The superconducting solenoid, which is 6 m long, 12 cm in diameter and with a central field of 5 T, is indirectly cooled by supercritical He. The number of μ^+ produced in the pulsed muon channel was estimated to be 3.5×10^4/pulse or 7×10^5/sec. For the μ^- intensity, those numbers should be divided by a factor of 3. The comparison between the negative muon factories is shown in Fig. 2. The instantaneous intensity is really huge, easily 3 orders of magnitude larger than that of the LAMPF stopped muon channel. This fact promises the unique and fruitful researches of condensed matter with the pulsed μSR.

The F.Y. 1981 was the first year for the regular open of the facility to users in the field of neutron scattering experiments and meson science. In the neutron scattering experiments, twenty-five experimental proposals were approved, which covered a wide range in the research field of condensed matter and biological materials. In the meson experimental facility, a research program on condensed matter with pulsed μSR and nuclear physics with muons and pions has been commenced on the second half of F.Y. 1981.

Construction of the facility building and installation of the experimental facilities for biomedical use of the booster beam have been finished. The first proton beam was introduced into the new beam line of this facility in June of this year.

Reference
1) "Proceedings of the meeting on BSF future prospects" edited by T. Adachi, KEK Int. 82-6; T. Adachi, et al. "Proton Synchrotron for Intense Neutron and Meson Beam" in this symposium.
2) K. Nagamine, et al. "Meson Science Research with Pulsed Muons" in this symposium.

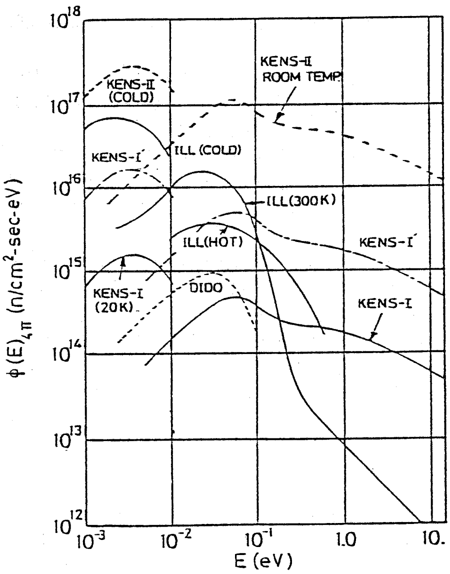

Fig. 1 Neutron spectrum

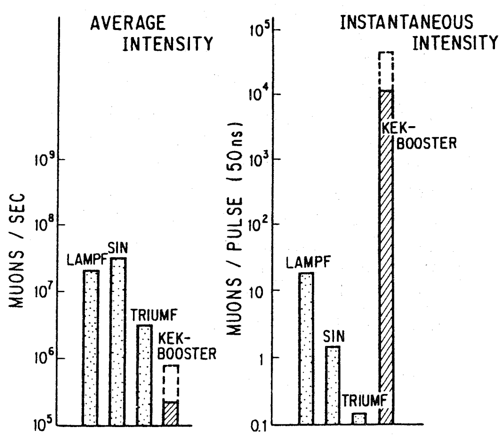

Fig. 2 Comparison of negative muon intensity