Accelerator Division -General-

1. Introduction

In FY1998, the Accelerator Division has concentrated on the following tasks:

- to estimate in detail the basic beam quality, such as horizontal emittance, coupling ratio, bunch length, instability *etc*.
- to supply the synchrotron radiation (SR) with the best performance to SR users
- to increase the beam current at the user operation from 20 mA to 100 mA (design value).
- to further improve the SPring-8 accelerator resources and develop its associated instruments.

As a result of these tasks, SPring-8 has almost completely clarified the designed specification.

In addition, SPring-8 was stably operated by a two or three weeks mode for one cycle. The total operation time was 4,190 hours. 2,624 hours (62.6 %) were used by users and 110 hours (2.6 %) were lost due to the failures of machine and beamlines. The remaining 1,456 hours were used for the tuning & study of accelerators (linac, synchrotron, storage ring and beamlines) and for the commissioning of new beamlines.

2. Storage Ring

Since the beam commissioning of the storage ring in March 1997, the machine performance, such as orbit stability, emittance, coupling *etc*., has been investigated in detail. The following improvements and developments of the storage ring are being carried out.

- construction of the remaining A-rf station started and will be completed in next year. After this installation, sufficient rf-voltage can be supplied for the user operation at the full installation of insertion device
- project installing the 30 m long straight section in the storage ring started and will be completed in the summer of 2000.
- construction of the beam diagnostics beamline (BL38B2) started. This beamline was designed to measure the qualities of electron beam (transverse beam size, bunch length, single bunch impurity and so on) and to perform R&D on accelerator components
- R&D on the production of high intensity slow positron beams by using a 10 T supper conducting wiggler started last year, and a new simulation code for slow positron production has been developed.

3. Linac

The energy stability of the linac beam has been intensively studied and improved by reducing the rf power and phase drifts due to the stabilization of the temperature fluctuation of the atmosphere and cooling water. In addition, in January 1999, a chicane was installed downstream at the last accelerator guide to monitor the injection energy of electron beams into the synchrotron.

A high power compact pulse modulator for 80 MW klystron was constructed as a development of the next-generation modulator and tested.

A test stand of a photocathode rf gun was assembled in this summer. High power up to 18 MW was fed into the cavity and an electric field of 127 MV/m was achieved.

Construction of the L3 and L4 beam transport lines began in the spring of 1998. The L3 and L4 beamlines transfer electron beams to an experimental hall and to the New SUBARU storage ring, respectively. The beam commissioning of the L3 beamline started from September 1998, and that of the L4 beamline started from October 1998. The New SUBARU storage ring is a 1.5 GeV synchrotron/storage ring built by the Himeji Institute of Technology for their synchrotron radiation use. The service of 1 GeV electron beam to the New SUBARU ring was carried out as a parasite mode of the linac operation. At present, a current of about 10 mA is being stored with a lifetime of several minutes, and the irradiation of the chamber surface by the photon beam is in progress to further improve the beam lifetime.

4. Synchrotron

The fine tuning of the rf-KO system has been carried out since the last year. A new rf-KO system was installed in the synchrotron to improve the purity of the single-bunch beam in the storage ring. We have achieved an impurity level of less than 2×10^{-8} as a lowest value in the single-bunch beam of the storage ring.

Since December 1996, the booster synchrotron of SPring-8 has been in operations. The control system was built on five DEC workstations running Open VMS and 14 VMEs. This was implemented independently of the storage ring control system. However, due to the future needs and the transparent operation of the accelerators, the synchrotron control system was reintegrated by replacing all CPU boards with HP9000/743rt boards and by installing a new control software based on the same architecture of the storage ring. The new control system has been operating successfully since January 1999.