

Synchrotron

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Introduction

All components of the booster synchrotron for SPring-8 were put in place at the end of March 1996, and were operated by the computer control system of the synchrotron to be prepared for the beam operation starting in April. We were able to begin beam commissioning of the synchrotron on the 10th of December.

Alignment of Magnets

In the synchrotron, there are 64 dipole-, 80 quadrupole- and 60 sextupole-magnets. Accurate alignment of these lattice magnets determines the performance of the synchrotron. We carried out the alignment operations using the triangulation network method with the SMART system, which resulted in the alignment error, as estimated by the analyzing the measurement data, to be less than ± 0.2 mm in the tolerance.^{Ref.1)}

RF Cavity

The conditioning of the RF cavities was started at June 1996 and continued up to the beam commissioning of the synchrotron. This operation was performed by the computer-control system of the synchrotron with the input RF-power of the cavities increased or decreased depending on the vacuum pressure of the cavities. When the

reflected power from the cavities increased rapidly, the input power was switched off. The control system monitored the vacuum pressure and the reflected power, and was able to start the RF conditioning automatically.

The input power of the cavities was kept at a constant value during the operating period of the synchrotron, ie, beam injection, energy ramping and beam extraction. This was to avoid the effect of heat cycle of the cavities. Accelerating voltage, which was controlled as the beam energy, was effectively compounded by the powers of the two klystrons.^(Ref.2) To get the appropriate voltage, we operated the phase difference between the klystrons as a phase pattern, which was determined at the beam commissioning.

Beam Commissioning^{Ref.3 & 4}

On the 9th of December in 1996, the first beam of the Linac was displayed on the fluorescent-screen monitor which was placed in front of the 1st septum magnet of the injection system. We were able to start the beam commissioning of the synchrotron on the next day, the 10th of December. On the same day, the first 5 turns of the electron beam were observed by the fast-CT in the synchrotron. We succeeded in getting the energy ramping of the electron beam in the synchrotron from 1 GeV of the injection energy to 8 GeV of the extraction energy on the 16th of December.

References

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- 2) H.Yonehara et al., internal report JAERI-memo 03-352. (in Japanese).
- 3) H.Yonehara, private communication (in Japanese).
- 4) H. Suzuki et al., submitted to the contributed paper of PAC97.