3 PF-AR

3-1 Summary

The operation statistics for FY2006 are summarized in Table 1. The total operation time of the PF-AR in FY2006 was 5016 hours, of which 4223 hours were assigned to users' experiments. The total operation time has been comparable to that of the PF in recent years. However, failure rate is about 1.2%, still twice that of the PF ring. The injection frequency of twice a day and the initial beam current of 60 mA were unchanged throughout the year. The PF-AR was not operated for medical applications in FY2006.

The first in-vacuum undulator with a period of 36 mm was installed in the first half of the west straight section in FY2005 for the NW-14 beamline. In FY2006, second in-vacuum undulator with a period of 20 mm was installed in the second half of west straight section.

The power supply for the bending magnets has been decrepit and maintenance has been difficult. We have been preparing a new power supply system since FY2005, and the new system will be introduced for users' operation from FY2007. Replacement of the other decrepit components such as the quadrupole magnet power supplies and the RF system is a matter of great urgency.

Table 1 Operation statistics of PF-AR in FY2006.

Operation Time	5016.0 h	
SR Experiment	4223.5 h	84.2%
Beam Development	653.5 h	13.0%
Failure	61.5 h	1.2%
Miscellaneous	77.5 h	1.7%

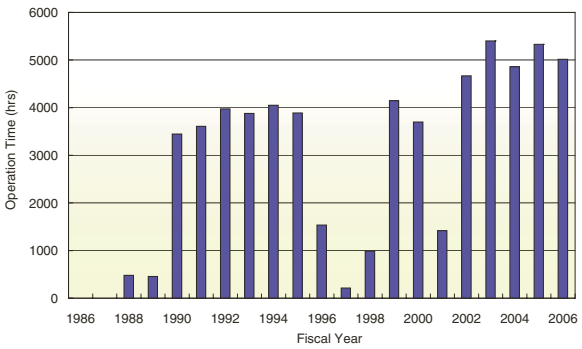

Figure1
Operation time history of the PF-AR.

3-2 Replacement of the Power Supply for the Bending Magnets

In March 2007, the power supply for the bending magnets was replaced. The new power supply consists of six parts; two converter parts with IEGT (injection enhanced gate transistor) switches, a direct current reactor part (a filter part with IGBT (insulated gate bipolar transistor) switches), an over voltage protection part and a control circuit part. The special characteristic of the new power supply is that it has a power factor of 1. A block diagram of the circuit is shown in Fig. 2, and the specifications are listed in Table 2. Some problems were found in the beginning, but the new power supply has been under operation since May 2007. Figure 3 shows a typical one-day history of the current stability. A current stability of less than $\pm 2\times10^{-5}$ at the currently-used power 1392 A was achieved. The beatatron tunes vary due to variation in the product of the natural chromaticities and the field fluctuations of the bending magnets. A one-day history of betatron tunes are shown in Fig. 4. Variations in the betatron tunes due to the power fluctuation were not observed.

Table 2 Principal specifications of the new power supply for the bending magnets.

Maximum output current	I	1500 A
Maximum output voltage	V	1200 V
Maximum power	P	1.8 MW
Input voltage	Vac	6.6 kV
Current ripple		$< \pm 1\times10^{-5}$
Current stability		$< \pm 1\times10^{-5}$ /12 hours
Power factor		1

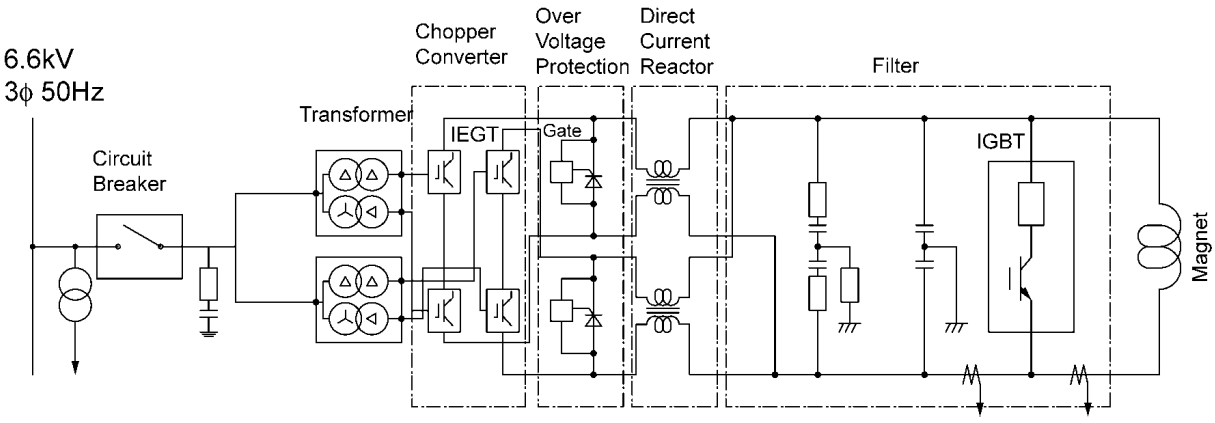

Figure 2
Schematic block diagram of circuit of the new power supply.

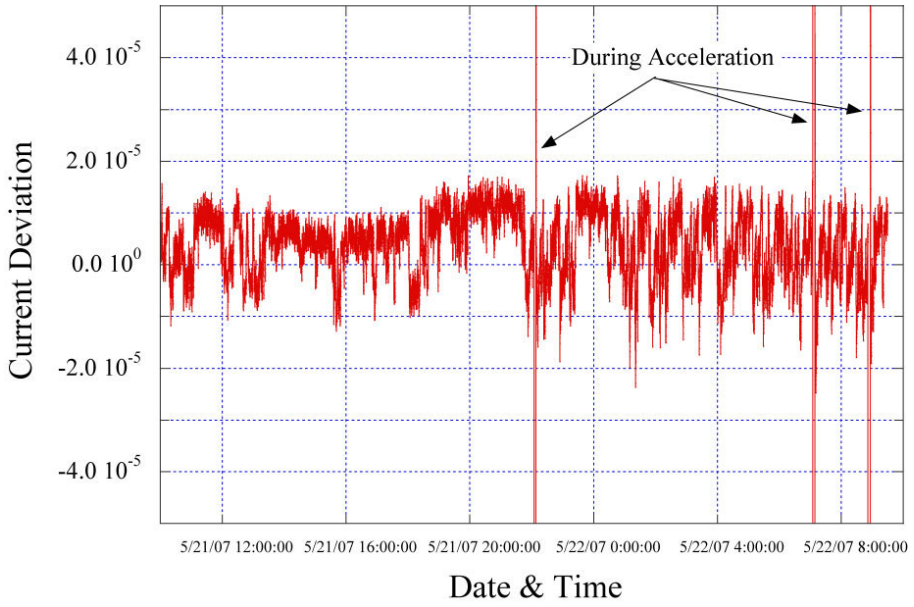

Figure 3
Current stability of the new power supply over one day.

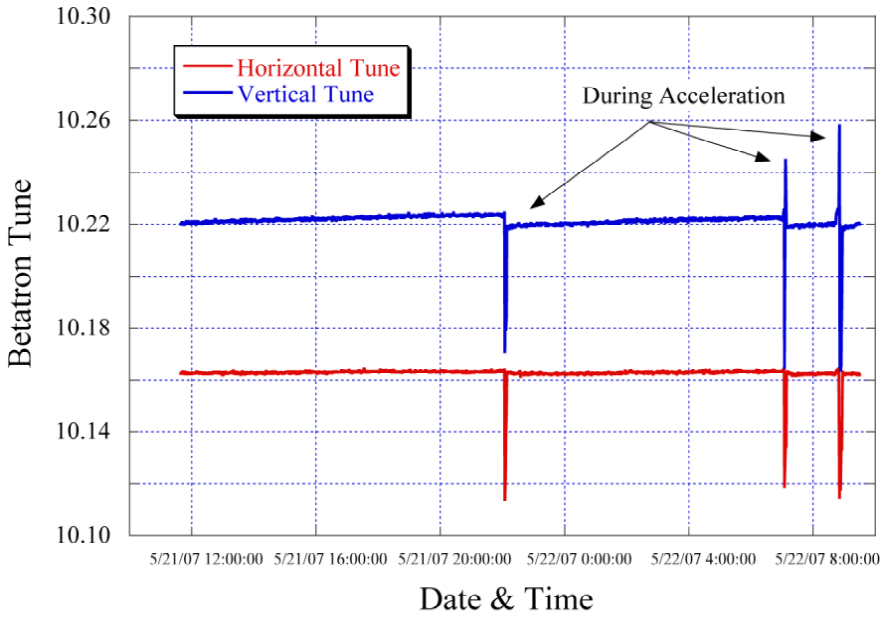

Figure 4
Betatron tune variations over one day.