

Chapter 3 Storage Ring Operation

The SPring-8 accelerator systems have continued to develop and mature into a stable synchrotron radiation facility. In particular, the top-up operation, started in 2004, becomes a level of routine service to users that delivers constant synchrotron radiation beams to experimental stations. Currently, electrons are injected into the storage ring every five minutes to stabilize the beam current less than 0.1 % deviation. This has settled a long-standing problem that originates in incompatible requests from different users' groups; one requests a several-bunch operation with a short lifetime of storage beams and the other does a longer lifetime.

The downtime rate for failure and trouble is 2.9 % in average since 1997, it means that the beam availability is as high as 97 %. Synchrotron radiation beams have been delivered to beamlines for approximately 5,000 hours annually in recent years.

JASRI altered the operation schedule in 2004B, due to the typhoons' attacks in September 2004 and urgent repair of the damaged roof of the storage-ring building. Despite the total of the storage-ring operation time was reduced to approximately 4,900 hours (approximately 5,500 hours for 2004A and 2004B in original plan), JASRI managed to keep the whole user time as planned beforehand by implementing a plan of long-time storage-ring operation.

In 2005, the storage ring restarted its operation in April after the three-months-long repairs on the damaged roof. Besides this, the operation was favorable through the year.

Table 3-1 SPring-8 storage ring operations (1997B-2005B)

Research Term	Period	Storage Ring Operation Time (hours)	User Time (hours)	Downtime for failure (Rate) (hours (%))	Machine Study, Beamline Study & Beamline Tuning (hours)
1997B	Oct. 1997-Mar. 1998	1,932.0	1,286.0	32.0 (2.4)	614.0
1998A	Apr. 1998-Oct. 1998	2,674.0	1,700.5	73.5 (4.1)	900.0
1999A	Nov. 1998-Jun. 1999	3,555.3	2,584.5	71.6 (2.7)	899.2
1999B	Sep. 1999-Dec. 1999	2,117.2	1,371.1	21.2 (1.5)	724.9
2000A	Jan. 2000-Jun. 2000	2,756.5	2,051.0	55.0 (2.6)	650.5
2000B	Oct. 2000-Jan. 2001	2,645.2	1,522.4	35.7 (2.3)	1,087.1
2001A	Feb. 2001-Jun. 2001	2,696.4	2,313.0	68.2 (2.9) ⁽ⁱ⁾	315.2
2001B	Sep. 2001-Feb. 2002	2,788.7	1,867.1	26.1 (1.4)	895.5
2002A	Feb. 2002-Jul. 2002	2,795.2	2,093.4	161.3 (7.2) ⁽ⁱⁱ⁾	540.5
2002B	Sep. 2002-Feb. 2003	2,665.9	1,867.5	27.4 (1.4)	771.0
2003A	Feb. 2003-Jul. 2003	2,748.9	2,245.9	32.7 (1.4)	470.3
2003B	Sep. 2003-Feb. 2004	2,823.0	1,843.8	171.2 (8.5) ⁽ⁱⁱⁱ⁾	808.0
2004A	Feb. 2004-Jul. 2004	2,575.5	2,095.1	16.8 (0.8)	463.6
2004B	Sep. 2004-Dec. 2004	2,394.3	1,970.9	62.9 (3.1) ^(iv)	360.5
^(v) 2005A	Apr. 2005-Aug. 2005	2,443.6	1,880.3	35.6 (1.9)	527.7
2005B	Sep. 2005-Dec. 2005	2,337.8	1,817.9	24.2 (1.3)	495.7
Total		41,949.5	30,510.4	915.4 (2.9)	10,523.7

User Time: Actual beam time for users
(Storage Ring Operation Time)

$$= (\text{User Time}) + (\text{Downtime}) + (\text{Machine Study, Beamline Study \& Beamline Tuning})$$

(Downtime Ratio) = $(\text{Downtime}) / (\text{User Time}) + (\text{Downtime})$

(Scheduled User Time) = $(\text{User Time}) + (\text{Downtime})$

(i): Storage ring trouble (RF C-station, vacuum trouble), 2001/6/24 (36:12)

(ii): Storage ring trouble (ID22, vacuum trouble), 2002/6/20 (134:29)

(iii): Linac trouble (electron gun trouble), 2003/9/18 (31:59)

Storage ring trouble (damage of injection vacuum chamber), 2003/10/5 (119:37)

(iv): Typhoon alert, 2004/10/20 (28:36)

(v): The first two cycles in 2005 is dedicated to machine tuning and beam-delivering to beamlines starts at the third cycle.

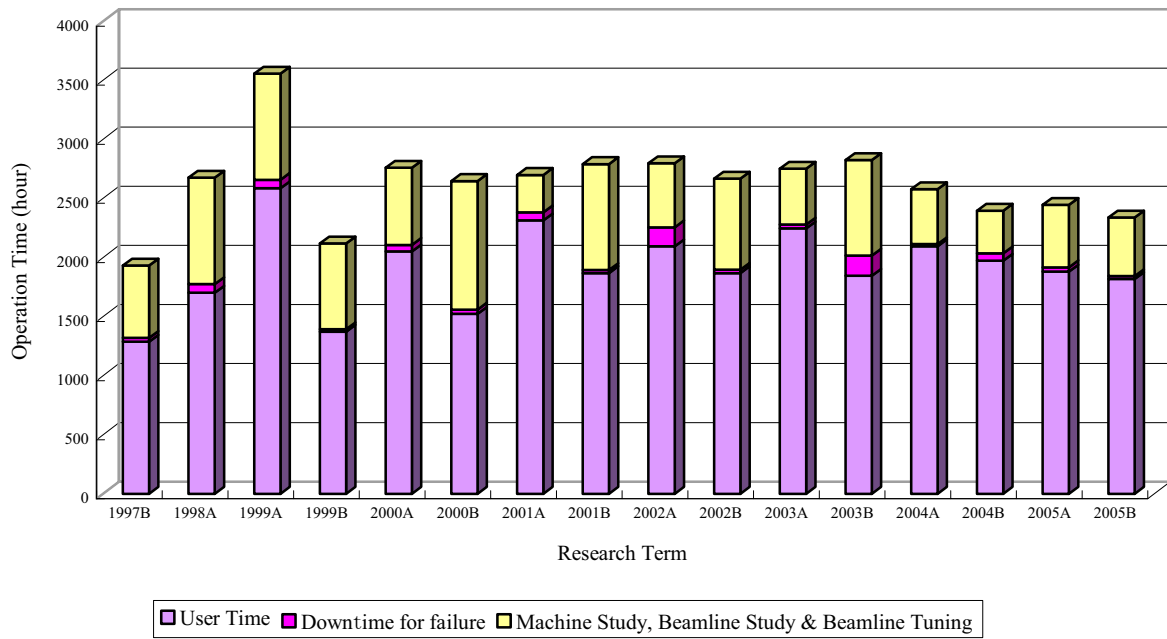


Figure 3-1 SPring-8 storage ring operations (1997B-2005B)