# STATUS OF THE INS ELECTRON SYNCHROTRON

Kazuo Huke

Institute for Nuclear Physics, University of Tokyo

The construction of the INS electron synchrotron began in 1956 and the first beam with the energy of 0.75 GeV was obtained in the end of 1961. Since then, experimental studies on high energy physics started in Japan. In 1965, the energy of the synchrotron was raised up to 1.3 GeV by superposing the DC bias current on the AC power supply of the magnet. The schematic plan view of the synchrotron is shown in Fig. 1.

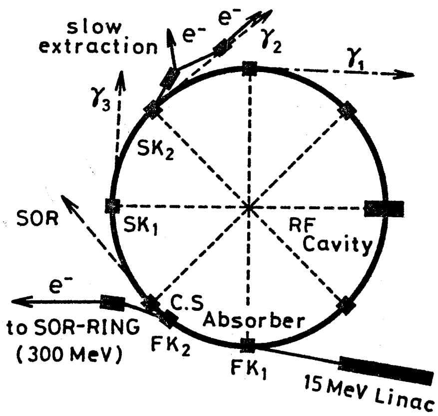


Fig. 1 Schematic plane view of INS synchrotron. FK : fast kicker magnet. SK : slow kicker. C.S : current strip.

The main parameters and the properties of the synchrotron are as follows;

Energy: 0.3 GeV ∿ 1.26 GeV. Maximum is limited by crossing the vertical betatron oscillation across the integral resonance $\nu_z = 2$.
Repetition rate: 21.5 CPS
Injector linac: 15 MeV. Acceleration structure, $3/2\cdot\pi$ - mode. Out put, 100 mA (energy spread: within ± 1 %.)
Magnet: $\rho$ = 400 cm. Number of sector magnet, 8. Structure of the sector magnet, 1/2D·F·1/2D. $|n| = 14$ $\nu_r = \nu_z = 2.25$.
RF system: 138.0 MHz. 30 KW in peak. Harmonic number, 16. Nose cone single cavity.
Vacuum system: Corrugated metal dounuts made by stainless steel of 0.13 mm in thickness. 160 ℓ/sec ion pump × 12. $7 \times 10^{-7}$ torr in average.

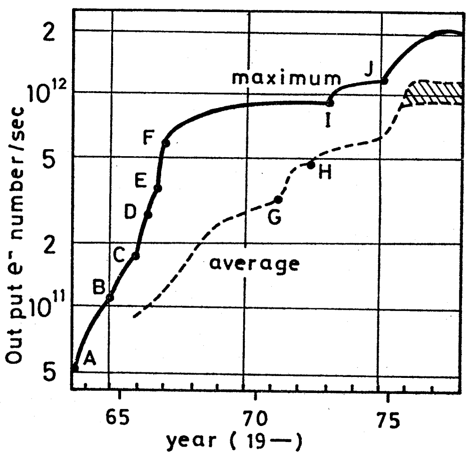


Fig. 2 Intensity of the synchrotron

Beam channels for experiments are following;

γ-ray: There are three γ-ray channels for high energy physics, one of which is available for using polarized γ-ray produced by the

Üherall effect.

Slow extraction: Full beams are extracted with an efficiency of 60 % by the method using the one-third resonance of betatron oscillations. Several percent of accelerated electrons, after hitting a target to produce γ-rays, are extracted by the use of an absorber and is used for tagged photon experiments, so that the simultaneous use of the machine are possible with main experiment using γ-rays.

Fast extraction: This channel is used to supply electrons to the 0.3 GeV electron storage ring with an interval of one pulse per second. The efficiency of the extraction is 50 %.

Synchrotron radiation: One channel is available for users who want to use photons which have wave lengths ranging from 1000 Å to 20 Å.

The beam current circulating in the synchrotron had been increasing step by step as the improvements of the machine as shown in Fig. 2. The maximum value is now 120 mA. The average beam intensity available to experiment also increased according to the progress of the machine handling and is now limited by a high radiation level at the boundary of the site. We are now adding the extra concrete shields on the ceiling of the syncrotron.

Concerning the spill time of γ-rays, the frequency modulation of the RF power is done to widen the beam spill smoothly. It is easy to obtain the spill time of 4 msec in the energy above 800 MeV, but under 800 MeV operations, the good region of the spill time becomes narrow.

The utilization of the synchrotron is summarized in Fig. 3. Figure 4 illustrates the total budget for the construction, improvement and maintenance of the synchrotron excluding the cost of electric power. Rapid decreasing of the scheduled machine time at 1972 is due to the repairement of the machine. This continues up to now and the performance of the machine is recovering.

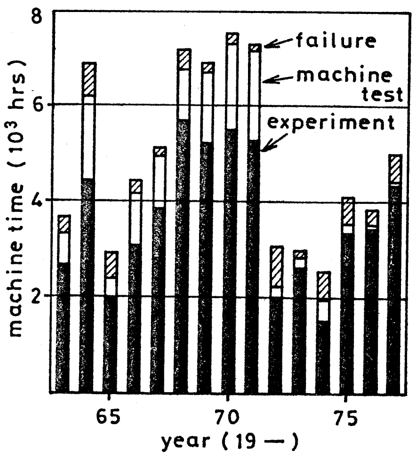


Fig. 3 Scheduled machine time

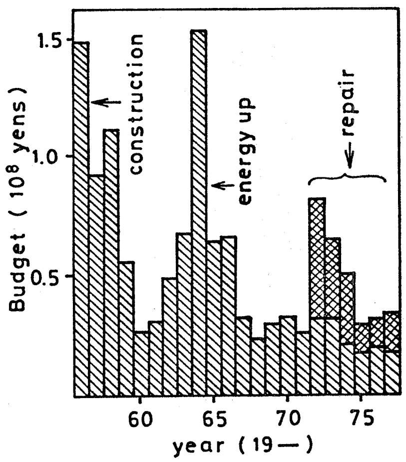


Fig. 4 Budget for the synchrotron (Inflation factor corrected 1975)