STATUS OF THE KEK INJECTOR

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Since the 2nd Symposium on Accelerator Science and Technology, the KEK injector has run satisfactorily by improvements and developments of various equipments. Total operation time of the KEK proton synchrotron and the down-time due to the injector are given in Table I.

The new RF windows were made and installed into the linac tank to avoid the breakdown on the ceramic surface.[1] In this window, the brazing was eliminated and the metal gascket of Al Helicoflex was used for the vacuum seal between the ceramic disk and the flange.

The new light link system was made for control of the instruments in the high voltage terminal of 750 kV preinjector. This system has a pair of optical fiber cables and two microprocessors.[2]

The vacuum system was improved in the 20 MeV beam line and 650 ℓ/s turbo-molecular pump was installed in the LEBT for improvements of the beam trans-mission.

Increase of the beam intensity in the KEK injector was tried on June 20th 1979. The maximum intensity of 420 mA at the entrance and of 200 mA at the exit of the linac were gotten with the careful conditioning of the high gradient accelerating column under the pressure of 1.4×10^{-4} Torr and by removing the grid of the buncher.[3] These values are compared with the design values of 200 mA at the entrance and 100 mA at the exit. The slight change of the momentum spread produced by RF beam loading would not be serious to achieve the intense circulating beam in the booster because beam with a rather broad spectrum (± 0.8 %) was favorable for injection into the booster.

Typical characteristics of beam during the operation time from April 1980 are given in Table II. In this run, the narrow spectrum of the momentum was requested by the booster group. Therefore, the RF field of debuncher has been kept in the normal operation level. Since the transfer of beam into the Booster Synchrotron Utilization Facility starts on July, the 20 beam pulses/sec are delivered from the KEK injector to the booster.

The transient field induced by the beam was observed with the spectrum analyser. The higher mode resonances were assigned by measuring the field amplitude along the longitudinal axis. The spectra measured at the high energy end of the tank are shown in Fig.1. As seen in Fig.1, the higher mode reso-nances are excited more strongly by the beam than by RF power, which is supplied with double feed system. The phase shift of the transient field was measured, too. The phase shift due to the beam was less than 3°. The effect of the higher mode on the phase shift was investigated with the spectrum analyser and the contribution of TM_{011} to the phase shifts was observed. The phase shifts calculated with the normal mode analysis[5] agreed with the measured ones.

In the debuncher, the phase shift of RF field due to the beam was measured and was less than 13°. The phase compensation in the debuncher was tried and the estimated effects on the momentum spread was observed.[6]

Acknowledgement

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References

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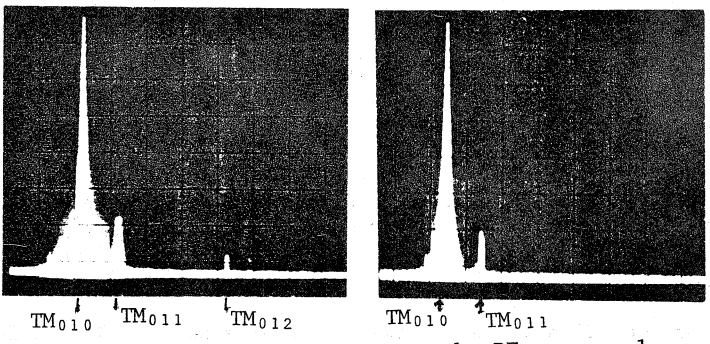
Table I System downtime and Total operation time

	APR.'78 ∫ AUG.'78	SEP.'78 ∫ MAR.'79	APR.'79 ∫ AUG.'79	SEP.'79 ∫ MAR.'80	APR.'80 ∫ AUG.'80
Total operating time	1706.4hr.	2384.1	1760.3	1888.2	
Preinjector	0.28%	0.24%	0.24%	0.52%	
Linac	1.34%	1.02%	0.40%	0.86%	

Table II Characteristics of beam

	after 750 KV acceleration	at entrance of linac	at exit of linac	20 MeV line
Intensity	700 mA	300 mA	150 mA	
Emittance (cm·mrad)		0.27π*		0.8π(Hor.)** 0.6π(Ver.)
Momentum spread				±0.75→±0.35%***

* refered from ref. 4). ** EBIHARA; private cominucation
*** this was measured with the schottky noise under the D.C. operation of the booster magnets.



by the beam and RF power by RF power only

Fig.1 Spectra of RF field in tank