OPERATION STATISTICS AND RELIABILITY OF THE KEK-PS

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Abstract

The construction of KEK proton synchrotron started in April 1971, and the first designed beam was obtained in March 1976. For 1976 and 1980, the number of runs were 88 times, the run of one week cycle was 48 times and its two weeks cycle was 40 times. The average failure hours was 6.3 %. In recent runs, above 70 % of the total operating time is used for Physics experiment. The efficiency, the percentage of actual beam houres for the scheduled opration time was more than 80 %.

It is four and half years since the operations group was formed, and during that time the records connected with the reliability has been collecting. We report about these in detail.

Fig.1 shows the operational status which became the aim of this study. The results of operational reliability of the KEK-PS are shown in Fig.2. There was a steady increase in the reliability from 1979. Fig.3 shows the failure frequency for duty period in three shifts. Fig.4 shows the relation of graded repair times to failure hour and its frequency. The failure frequency for repair time of less than 5 min takes the greater number of 60 %. But the ratio of failure hour for the repair time of less than 5 min was only 8 %. On the other hand, the proportion of failure hour to the repair time of 41 to 160 min was about 46 %. As for as we know, the almost repair time was spent in searching of the failure location, the connection to system specialist and the suppliment of parts. Fig.5 shows the fault distribution by system and the system reliability. The system code in Table 1 was classified the constitution of KEK-PS in to 14

FIG.1 OPERATIONS FACTS OF KEK-PS

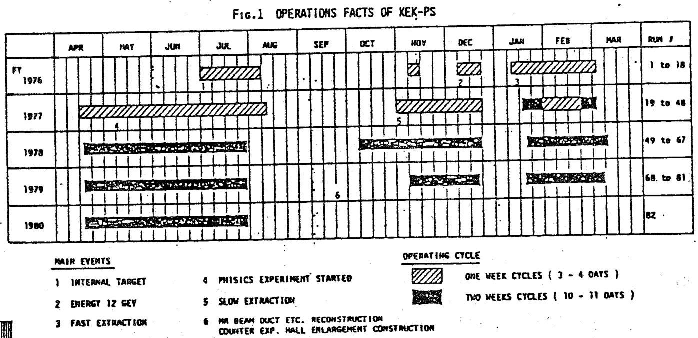


Fig.2 OPERATION STATISTICS OF KEK-PS

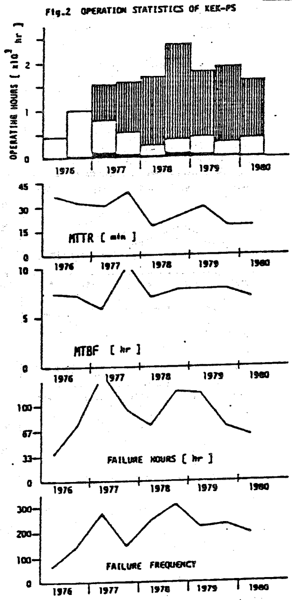
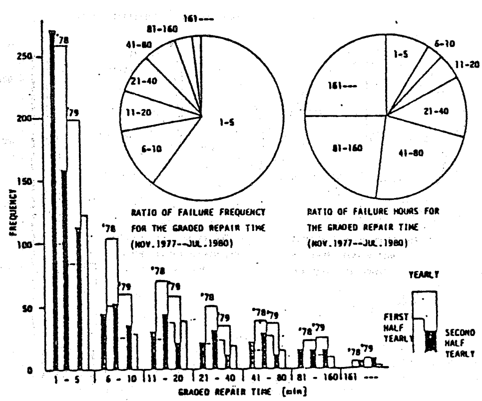


Fig.4 STATISTICS OF REPAIR TIMES

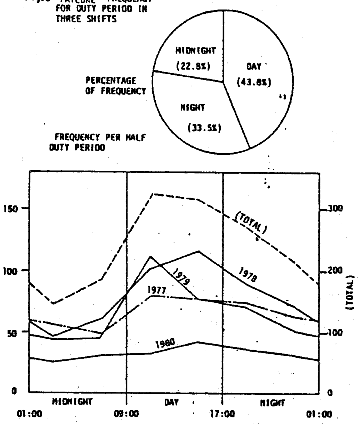


groups and they are used in Fig.5.

TABLE 1 CONSTITUTION OF KEK-PS

SYSTEM CODE	CONTENTS OF SYSTEM
1. PI	ION SOURCE, HV GEN., ACC.COLUMN, LEBT/MONI., VAC(TMP*2,GV*2)
2. LINAC	TANK, 516 PA(2), 4616 PA(2), PRE/DEBUNCHER, VAC(IP*12), DRIFT TUBE, WATER COOLING CONTROL
3. 20 BT	HEBT; VAC(IP*5,GV*6), ANALYZER/MONI.
4. B MAG	MAG(8+1), P.S., FIELD MEAS./FEED BACK, CORRECTION
5. B RF	8F/4CX PA(1+1), FERRITE BIAS(1+1), CAVITY(1+1), LOW LEVEL/BEAM CONTROL
6. 500 BT	BSTR INJ.MAG(SEPT*2,BUMP*2), BSTR EXT.MAG(KICKER*4,BUMP*2, SEPT*2), MR INJ.MAG(KICKER*5,SEPT*2)
7. BSF DUMP	DUMP LINE MAG, VAC(IP*2), PROFILE MONI.
8. M MAG	BEND(49), Q(58), FIELD MEAS., CORRECTION
9. M PS	6.6KV BUS LINE(ACF,REACTOR,TR), SCR CONTROL(TQC,DCCT,DCF), HIDIC-350, OP.CON.
10. M RF	8F/4CX PA(4), FERRITE BIAS(4), CAVITY(4), LOW LEVEL/BEAM CONTROL, HP-2100(1+1)
11. EXTRACTION	SX/IT MAG(SEPT*5,BUMP*6,ESS,EQ*3,RQ*3,O), FX MAG(SEPT*5,BUMP*4,FB*2,EQ,O)
12. CONTROLS	KEK STD.CONTROL(CCR,LOCAL*6), DISPLAY BOARD, BEAM SW, MELCOM-70
13. MONITOR	MR(INTENSITY,PROFILE,POSITION,LOSS), BSTR(INTENSITY,PROFILE,POSITION)
14. B M VACUUM	MR VAC(IP*56,GV*6,PRESS.GAUGE*28), BSTR VAC(IP*6,PRESS.GAUGE*6)
15. HUMAN ERROR	

Fig.3 FAILURE FREQUENCY FOR DUTY PERIOD IN THREE SHIFTS



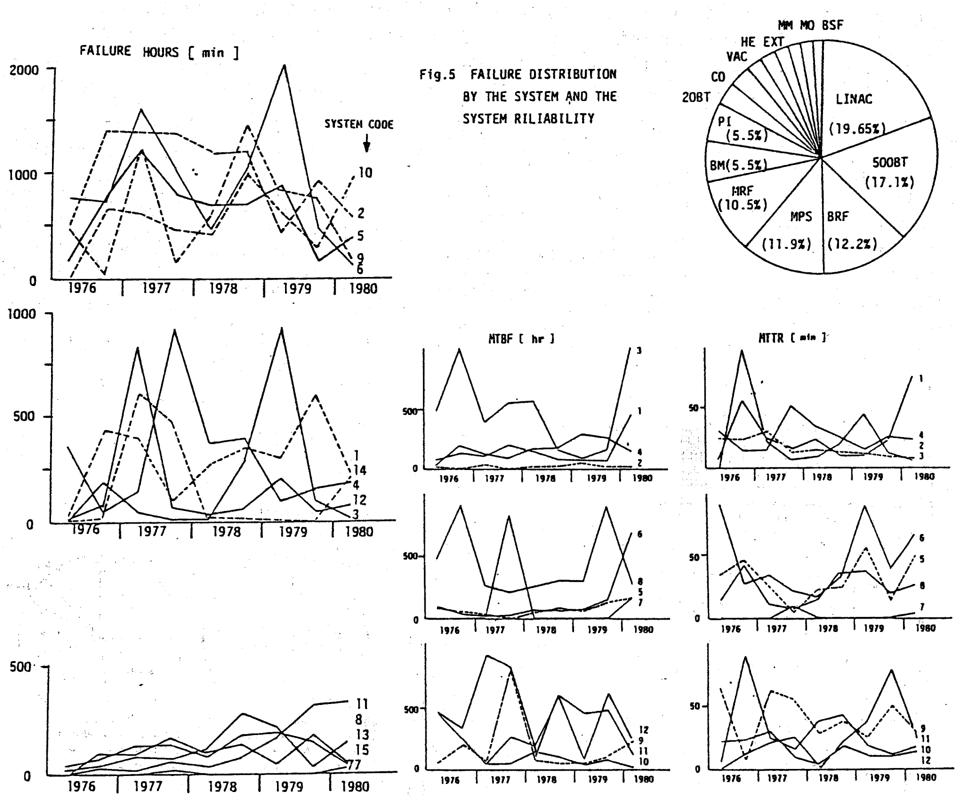


Fig.5 FAILURE DISTRIBUTION BY THE SYSTEM AND THE SYSTEM RILIABILITY