

OPERATIONAL RESULTS OF KEK
KICKER MAGNET SYSTEM

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In KEK Proton Synchrotron 3 kicker magnets are fired in synchronization with the 500 MeV beam bunch to extract it from the booster ring at a maximum rate of 20 Hz, and 4 kicker magnets for the injection into the main ring are triggered at every 2 seconds by 9 sequential pulses of 20 Hz. Each magnet has its own HV pulse supplying system which generates 40 KV 200 nS pulses with a rise time of 35 nS for a 25 ohm system. The block diagram is shown in Figure 1. The basic principles of this system is similar to those of CERN PS (1). The details were already described in a previous report(2). The system has been operated since summer of 1975. The total heating time of the main thyatron CX1171 is about 6000 hours, and we have experienced some troubles peculiar to a HV pulse supplying system.

The HV is generated by a resonant charging method. A 40-cm \times 33cm \times 57cm dry transformer with a winding ratio of 100:20000 charges a 3.5nF PFN up to 80KV in 2.5mS when the primary winding is excited by a 25mF condenser bank held at 260V. There have been neither HV breakdowns nor thermal troubles for 20Hz continuous operations with respect to the windings molded by an epoxy resin and also to the peak holding diode. The HV supply and PFN are connected with a 10m long standard 50ohm coaxial cable 10D2V which has 10mm ϕ polyethylene (PE) layer. This cable, though flexible enough, has been one of weak elements, as 15 times of the HV breakdown have already occurred for the 7 systems. We are now trying a 10D2V with a semiconductor layer. The PFN is a 36m long standard 50ohm cable 20D2V with a 20mm ϕ PE insulation layer. The both ends of the cable are connected into a thyatron housing. Thus it forms a 18m long 25ohm PFN. The PFN has showed no HV breakdown, but a 20D2V with a semiconductor layer is also now under testing. The main thyatron CX1171 is housed in a oil filled case. Every tube is operated

with a reservoir voltage 10% higher than that specified by English Electric Valve Co. Ltd.. After 5000hours of operation, 3 of 7 tubes began to show some delaying and jitter of the switching time which is normally about 230 nS. One tube was replaced, and the other two are now used with a reservoir voltage raised still by 10%. The housing, vacuum chamber in which the magnets are enclosed, and terminating resistor are connected by a pair of the 20D2V cables. The termination of these cables is done by a specially designed connector(2). There are used 56 such connectors. They have shown 38 times of the HV breakdown . Most of them were due to Teflon which was at first employed for the insulating material. After changing it for PE no troubles have been encountered. The other troubles are found in a trigger circuit for CX1171. A 10 V 1 microsecond input pulse is amplified by EFP60 and then a 1.6KV 2 microsecond output pulse is generated by 3C45. Usually the delay in the former stage is 60 nS and 120 nS in the latter. During operation we have encountered rather frequently the elongation and jitter of these delays and we have had to change EFP60 22 times and 3C45 13 times.

By improving the components and periodical checking of the system, the down time of KEK PS due to the failure of the kicker system have been greatly reduced. At present it is about 1% of the total operating time.

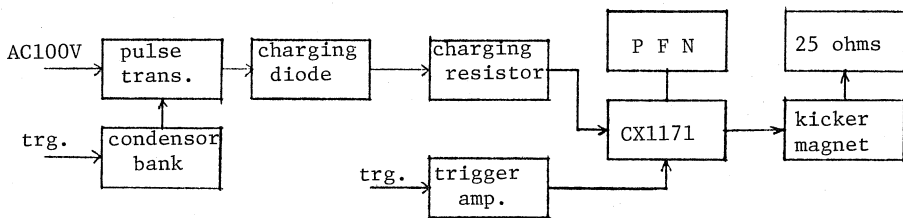


Figure 1

References:

- (1) D.Fiander: CERN/MPS/SR 71-5 (1971)
- (2) K.Takata, S.Tazawa, Y.Kimura: KEK-76-21 (1977)