PERTURBATORS OF INJECTOR SYNCHROTRON FOR UVSOR

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A pre-accelerator of the 600 MeV injector synchrotron for UVSOR is a 15 MeV linac. Electrons from the linac are injected by a usual multi-turn method with an inflector and three perturbators. In this paper, details of the perturbators are presented.

Plane view of the injection point and its neighbourhood is shown in Figure 1. Electrons from the linac are injected by an inflector located at a straight section S1. The exit of the inflector is 40 mm outside from the central orbit. The three perturbators P1, P2 and P3 located at straight sections S6, S1 and S2 displace equilibrium orbit 40 mm outside from the central orbit at the exit of the inflector at the injection moment. Deflection angles of P1, P2 and P3 are 14.8, 16.0 and 13.4 mrad respectively. The perturbed orbit is restored during 1 μ s. It corresponds the time in which electrons in the synchrotron turn the orbit 10 times.

Three perturbators have the same structure as shown in Figure 2. They consist of ferrite cores and two-turns coils. They are set in vacuum. The aperture of the ferrite core is 110 mm wide and 30 mm high, and the length is 100 mm. An inductance measured by an LCR meter was 2.5 $\mu H.$ Pulsers were designed so that the perturbators deflect a maximum angle of 20 mrad with a fall time of 1 μ s. The deflection of 20 mrad requires a magnetic field of 116 gauss. Figure 3 shows a diagram of a circuit for the pulsers. As shown in Figure 3, charge stored in a condenser C is discharged through silicon controlled rectifiers. Current waveform is half sine wave. A part of sine wave between 135° and 180° can be utilized as the field linealy fallen down. In Figure 4 is shown a field waveform at the center of the perturbator when HV was set at 800 V. This was obtained by integration of output signal from a search coil inserted in the gap of the perturbator. As shown in Figure 4, required maximum field of 116 gauss with a fall time of 1µs is obtained as a part of a sine wave. The current at 116 gauss was 140 A.



Fig. 1 Plane view of the injection point and its neighbourhood. P1~P3: perturbators.



Fig. 2 Perspective view of the perturbator.



Fig. 3 Diagram of the circuit for the pulser of the perturbator.





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