Conceptual Design of the Injection Section Chambers

Teruhiko Bizen, Seiichi Sato, Kowashi Watanabe, Hiroshi Saeki, Keiko Kumagai, Haruo Ohkuma, and Suck Hee Be

Spring-8, Kamigori, Ako-gun, Hyougo 678-12, Japan

We are designing the injection section chambers of the SPring-8 storage ring. The layout of the injection section chambers is shown in Fig.1, and the orbit structure around the injection point is shown in Fig.2. This section consists of three types of chambers.

The electron or positron beam pulses from the synchrotron are injected into the storage ring through the beryllium window which is fabricated in the injection section chamber 1 [1].

The injection section chamber 1 is made of a magnetic stainless steel, to reduce the stray leakage magnetic fields from the septum 8 magnet. This material has good magnetic characteristics, such as, high magnetic saturation field, high permeability and low coercive force. However, this material should be annealed to recover the magnetic properties which is deteriorated by the strain due to machining, and by the weld heat [2].

The magnetic shield effect depends on the thickness of the magnetic stainless steel, but the orbits structure requires the thin chamber wall to avoid the interception. In view of these facts, we decided the chamber wall thickness to be 0.7 mm, and to minimize the clearance between the chamber and the septum 8 magnet, the chamber is combined tightly to attach on the magnet core by the cramps. Because of the geometry of the beam orbits, it is impossible to arrange the exchangeable vacuum flange with beryllium window at the injection point. Therefore we are considering to design the long life window which is welded directly to the chamber. To avoid producing the corrosion of the beryllium by the interaction between the synchrotron radiation (SR) and the air, the chamber is installed in the vacuum tank, and the 1 mm thickness beryllium plate is applied for the window. The water cooling is also applied to reduce the heat shock when the beams are injected.

The SR from the bending magnet is almost intercepted by the absorber placed just downstream of the injection section chamber 2, so as not to intercept the chamber 1. This absorber is able to intercept about the 700W photon beam. To place this absorber makes the downstream absorbers (AB1 and AB2 in the 1st. cell) unnecessary.

The injection section chamber 2 is made of extruded aluminum alloy chamber. The non-evaporable getter assembl which is exchangeable for maintenance, is installed in this chamber. The sputter ion pump is also used at the absorber location to evacuate the SR-induced out gasses.

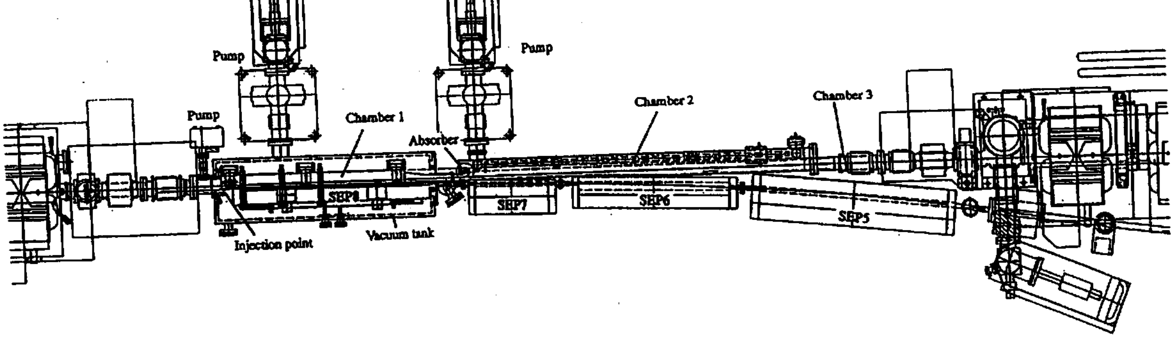

Fig.1 The layout of the injection section chambers.

The injection section chamber 3 is the bellows assembled chamber for accommodate the thermal expansion due to bakeout. On the basis of these concepts, detailed design of the chambers are in progress.

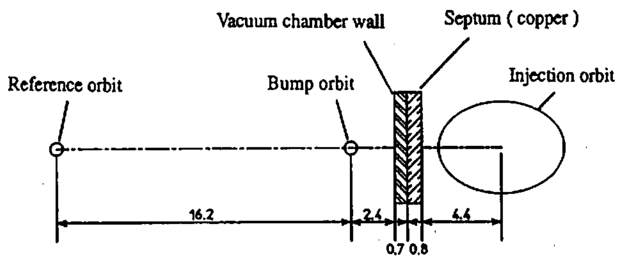

Fig.2 Schematic diagram of the orbits structure around the injection point. The vacuum chamber wall thickness affects the magnetic shield effects, but it is regurated to avoid the interception of the orbits.

References

[1] JAERI-RIKEN SPring-8 Project Team,"SPring-8 PROJECT PART 1 FACILITY DESIGN 1991 [REVISED]," August (1991).

[2] K.Kumagai and S.Matsui, IEEE TRANSACTIONS ON MAGNETICS, vol.30. NO.40. P.2134, JULY (1994).