

Vacuum performance of PLS storage ring

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The vacuum system for the Pohang Light Source(PLS) storage ring is designed to maintain a beam on operating pressure in the nano-Torr range in order to achieve a beam lifetime of 5 hours or more. The PLS vacuum chambers were made using either machined A5083 or extruded A6063 aluminium alloy. The vacuum system is mainly pumped by combination pumps which consist of lumped non-evaporable getter(NEG) pumps and sputter ion pumps(SIPs). They offer about 30,600 l/s for the storage ring. Most of the synchrotron radiations are dealt with by photon stops where high photon induced gas loads are present.

The storage ring vacuum system has been successfully commissioned by July 1995. At the early stage of the vacuum system commissioning, the system was pumped by SIPs only whose pumping speed is approximately 5,300 l/s and the ultimate static vacuum was about 8×10^{-9} Torr without *in-situ* bakeout. The specific pressure rise was 2×10^{-7} Torr/mA at the very first of system operation.

After 8 AH of running, the system has been vacuum baked at $\sim 90^\circ\text{C}$ followed by lumped NEG activation, resulting in the total pumping speed increment to about 30,000 l/s for the storage ring. The average static vacuum is low 10^{-10} Torr and a dynamic vacuum of about 3×10^{-9} Torr has been achieved with the electron beam current of 100 mA. After chamber bakeout and NEG activation, the beam lifetime has increased from several minutes to about 10 hours at 100 mA.

The specific pressure rise due to photon induced desorption(PID) has been measured as a function of the integrated stored beam current($D[\text{amphrs}]$). The pressure rise varies from 6×10^{-9} Torr/mA at 1 AH to 1×10^{-9} Torr/mA at 7 AH with SIPs only, and to 3×10^{-11} Torr/mA at 100 AH with NEG activated due to pumping speed increment. The reduction of PID with the accumulated beam dose has followed closed to the expected value, $D^{-0.7}$.