

**Positive Ion Multi-Turn Injection with Bi-Waveform Orbit Bump Magnet,** I. SAKAI, A. TAKAGI, Y. MORI, S. MACHIDA, M. YOSHII, T. TOYAMA, M. SHIRAKATA, Y. SHOJI, H. SATO, K. KITAGAWA, KEK, K. FURUYA, Nichicon Corporation - Positively charged helium ions are injected into the KEK booster synchrotron by means of a septum magnet and two fast orbit bump magnets which are placed at the upstream and downstream positions respectively. At each position, the phase of betatron oscillation lead and lags by  $\pi/2$  from the injection point. Beams are injected gradually from the centre of the phase space to the outside by the shift of closed orbit, which is controlled by these two orbit bump magnets. The slope of the optimum bump field is decided by emittance of injected beams, acceptance of the ring, and fraction of betatron oscillation around the ring. To fill the ring acceptance effectively, nonlinear slope of the bump magnetic field is required. An approximated waveform is realized by a newly developed bi-waveform power supply for the orbit bump magnet, and helium beams are successfully accelerated in the KEK PS.