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Vacuum system design for the booster of Iranian Light Source Facility

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The Iranian Light Source Facility (ILSF) booster serves as a 3 GeV injector for the ILSF storage ring. The booster ring has a circumference of 504 meters, divided into five equal sections. Each section comprises ten dipole magnets, each 1300 mm in length, designed to deflect the electron beam by 7.2° per magnet. The distance between two successive bending magnets is 8780mm. The vacuum chambers are fabricated from 1 mm thick stainless steel 316L tubes. This material and thickness were carefully selected to minimize eddy current effects at the 2 Hz repetition rate caused by the rapidly changing magnetic fields. For all magnets except the dipoles, the vacuum chambers have an outer diameter of 35 mm, with a minimum clearance of 1.5 mm maintained between the chambers and the magnet poles. In the dipole regions, the vacuum chamber diameter is reduced to 20 mm, with a clearance of 2 mm to accommodate the tighter magnetic gap. A Monte Carlo simulation is performed using Molflow and Synrad to calculate the pressure profile along the booster. According to the result, 250 Starcell ion pumps with 20 l/s pumping speed will be required to provide the desired pressure at ultra-high vacuum regime.

Footnotes

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