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Vacuum simulation of the Korea 4th Generation Storage Ring

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The Korea Fourth-Generation Storage Ring (Korea-4GSR) has an ultra-low beam emittance of 62 pm·rad which demands spatially restricted vacuum system. The conventional vacuum system using lumped pumps is not suitable to guarantee the required vacuum level in this conductance limited system. To overcome the limited space for vacuum components, we employed a distributed pumping system with pill-type getters. The electron beam channel is octagon-shaped with an inner diameter of 24 mm (H) x 18 mm (V) and multiple slots for getters are located beside the beam channel. Getters are inserted into the slots along the beam direction, serving as primary pumps, while ion pumps are intermittently positioned for inert gas pumping. In the preliminary phases of commissioning, it is necessary to predict the performance degradation of the getters attributable to high dynamic pressure, enabling the proactive determination of reactivation timing. In the operational stages after beam cleaning, it is imperative to attain an average dynamic pressure of 10-9 mbar to ensure sufficient life time of the electron beam at 400 mA. We conducted a vacuum simulation using Synrad and Molflow+ to optimize the vacuum system.

Summary

The Korea-4GSR is using molflow+ and synrad to optimize the vacuum system for storage ring. We calculated the saturation time of the NEG pump during the commissioning initial stages to predict the reactivation timing. Additionally, after an operating time exceeding 1000 Ah, we calculated the reaching of an average dynamic pressure of 10E-9 mbar.

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