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Design and commissioning of BRing vacuum system

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The Booster Ring (BRing), which requires an average vacuum to be better than the 10-10Pa, is the key part of the High Intensity Heavy Ion Accelerator Facility. The total length of BRing is 569.0985 meters, the characteristics of long circumference, large cross-section and a large amount of gas load, pose great challenges for on-site installation and achieving the vacuum index. Therefore, optimization has been carried out from several aspects. Firstly, in order to reduce eddy current, 0.3mm thick low permeability stainless steel is required. Different from the commonly used ceramic vacuum chamber or 0.3mm thin-walled chamber with ribs, the structure of placing high-strength, low gas load inner lining skeleton at intervals inside the 0.3mm thin-walled chamber is proposed for the first time. Using 3D printing technology to process the inner lining skeleton and coating it with getter film to reduce the pressure gradient. Secondly, the kicker chambers are equipped with ferrite, which brings high gas load. So a process for reducing the outgassing rate of ferrite has been explored, which can make the outgassing rate of ferrite ≤ 1.125×10-9Pa.L.S-1.cm-2. After testing, the vacuum of the kicker chamber is better than 7×10-10Pa. Thirdly, the pressure distribution of BRing was calculated by Molflow software, and the pumping scheme has been optimized. The BRing vacuum system has been installed, and the entire ring has undergone on-site baking, with an average vacuum better than 7×10-10Pa.

Footnotes

Paper preparation format

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