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Development of metal vacuum chamber with low eddy currents under high frequency magnetic fields

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HIAF-BRing, the booster synchronous ring of the High Intensity Heavy-Ion Accelerator Facility, is rapid cycling synchrotron. It requires a vacuum pressure of 5 ×10 -10Pa and a vacuum pipeline that generates small eddy currents under high-frequency magnetic fields of 12 T/s. A new type of vacuum chamber has been successfully developed to reduce effectively the eddy current effect. It also significantly reduces the gap of the dipoles and quadrupoles, compared to the thin-walled stainless steel vacuum chamber with reinforced ribs. The chamber consists of stainless steel pipe with a thickness of 0.3mm and ceramic lining rings. Ceramic rings are gradually and intermittently arranged along the pipeline as a support frame for metal thin-walled chamber. High strength ceramics and stainless steel of the chamber can be baked safely at 300 ℃. Through experimental testing, vacuum pressure of the chamber reaches 4.2 × 10-10pa. The ceramic rings are Au-coated to effectively reduce the beam impedance and the desorption rate of ceramic materials.

Footnotes

Paper preparation format

Region represented

Asia

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