Contribution ID: **2140** Contribution code: **WEPS060** Type: **Poster Presentation**

Design of High Gradient, Fast Response, Broadband RF System for HIAF

Wednesday 4 June 2025 16:00 (2 hours)

The high broadband field-gradient RF system based on direct oil-cooling magnetic alloy cavity for High Intensity Heavy-ion Accelerator Facility (HIAF) Bost Ring (BRing) has been successfully reached and developed in Oct. 2022. The RF system consists of a three gaps cavity which loaded by 24 domestic nanocrystalline soft magnetic alloy (MA) ring cores, a RF power amplifier with an output power of 500 kW and digital LLRF. The acceleration voltage reached 66kV (gradient > 30kV/m) with a frequency swing from 290kHz to 2.1MHz, amplitude stability $|\triangle A/A| \leq 1\%$ and phase stability $|\triangle \varphi| \leq 1°$.
In 2011, we collaborated with Chinese companies to begin the R&D of ultra-thin amorphous metal ribbon and magnetic ring core manufacturing process, in the meanwhile also established a MA core test platform. After ten years'effort, 780(OD)×350(ID)×35 (TH) mm MA core with broadband characteristics in the frequency range of 0.1MHz to 20MHz has been successfully developed using domestic 14μm ribbon in 2021. The key performance μQf and Q at 0.3MHz are 6.5GHz and 0.9, respectively.
In addtion, in order to further improve the acceleration gradient, we are still working hard to enhance the performance of MA core.

Footnotes

Paper preparation format

Word

Region represented

Asia

Funding Agency

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Session Classification: Wednesday Poster Session