

# Ion-optical design and performance analysis of High energy FRagment Separator (HFRS) at HIAF

*Monday, 12 February 2024 18:30 (5 minutes)*

The High energy FRagment Separator (HFRS), a new generation in-flight radioactive separator in the intensity Heavy Ion Accelerator Facility (HIAF), is under construction in China. It is characterized by large ion-optical acceptance, high resolution power, high magnetic rigidity, and excellent particle identification. In combination with the HIAF accelerator facility, which will provide high-intensity beams, a wide range of neutron-rich and proton-rich exotic nuclei far from the stability using not only projectile fragmentation but also in-flight fission can be produced and studied. In addition, some experiments which need high beam energy like hypernuclei and  $\Delta$ -resonances studies in exotic nuclei can be also carried out in the HFRS. In this paper, the development of ion-optical calculation and the high-order correction of aberrations are demonstrated using the detailed measured and simulated magnetic field distribution first. Then, the performance of the separator are studied using fission products and heavy fragmentation products. This work will guide future experimental designs at the HFRS.

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**Session Classification:** Poster collection