

## Three-dimensional reconnection studies for SPERF-AREX experiments

Mao Aohua<sup>1</sup>, Wang xiaogang<sup>1</sup>, He xianglei<sup>1</sup>, SPERF-HIT Team<sup>1</sup>

<sup>1</sup> Harbin Institute of Technology, China

e-mail (speaker): ahuamao@hit.edu.cn

The Space Plasma Environment Research Facility (SPERF) has constructed at the Harbin Institute of Technology in China. One of its experimental components, the Asymmetric Reconnection EXperiment (AREX), aims to study the asymmetric reconnection dynamics relevant to the magnetic reconnection process at the magnetopause. In AREX, the reconnection process is driven by a set of flux cores through coil-current-ramp-up to interact with a dipole magnetic field generated by the dipole coil. A wide range of plasma parameters can be achieved through inductive plasma generation with flux cores and electron cyclotron resonance (ECR) plasma source and cold cathode discharge plasma source around the dipole coil. Different reconnection regimes and geometries can be produced by adjusting plasma parameters and coil configurations as well as coil current waveforms. The numerical simulations of the 3D reconnection process in AREX in a 3D magnetohydrodynamics (MHD) model are carried out for planned experiments. The simulation results reveals that the magnetic topology and the plasma distribution in AREX is analogous to the magnetopause reconnection. The typical 3D reconnection topology in AREX, including the X-line structure, the B-A-B null pair structure, and the A-B null pair structure, are discussed in detail.

### References

- [1] Peng E et al., *Rev. Sci. Instrum.*, 92, 044709 (2021).
- [2] Aohua Mao et al., *Rev. Sci. Instrum.*, 91, 084702 (2020).
- [3] Aohua Mao et al., *Plasma Science and Technology*, 19, 034002 (2017).
- [4] Qingmei Xiao et al., *Plasma Science and Technology*, 19, 055302 (2017).

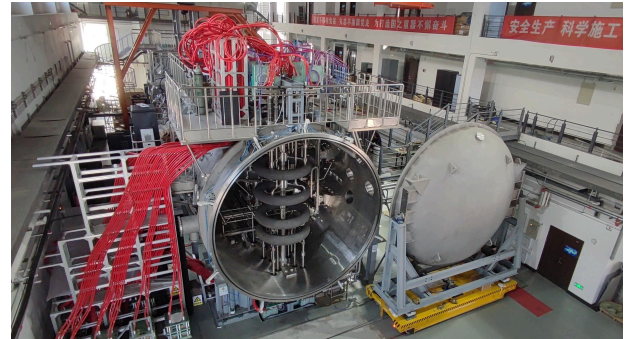


Figure 1. The status of the SPERF device