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Introduction to the experimental capabilities of the SPERF-DREX device in China

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The Space Plasma Environment Research Facility (SPERF) is an important part of the Space Environment Simulation Research Infrastructure (SESRI) which located in Harbin, China [1]. It is the first experimental device to simulate the whole three-dimension magnetosphere configuration including the solar wind, the Magnetopause, the dipole field, and the magnetotail, with the symmetry breaking considered. It can make deeper understand of space plasma, and promote the development of space technology and the utilization of space resources.
The Dipole Research EXperiment (DREX) platform, as the core and basic part of SPERF (the other two part are the Asymmetric Reconnection EXperiment and the Tail Research EXperiment sub-system) will produce and experimental platform to study key scientific issues in the dipole field and the radiation band region in the inner magnetosphere, such as the excitation, propagation and dissipation of plasma waves, such as the excitation, propagation and dissipation of plasma waves, and the acceleration and transport of the energetical particles. And together with the AREX and TREX, study of the interaction of the asymmetric magnetic reconnection, the injection of energetical particles and the dipolar front can be realized.
The experimental condition is provided by the vaccum-machinery, the coil system, the plasma source system, the diagnostic system and the auxiliary system. Contract to the magnetosphere plasma, parameters scaling of DREX is determine systematically based on physical similarity, considering the MHD dynamics.
The magnetic configuration of the DREX system is generated by the dipole field coil (simulating the dipole configuration as that near the Earth) and the perturbing field coil (simulating the current loop in a sub-storm). Pulsative exciting current can provide a 50ms magnetosphere like field over 50% maximum. Two ECR plasma sources with 2.45GHz and 6.4GHz microwave frequency are responsible for the background plasma. A cold cathode source is used to increase plasma parameter and more importantly provide a non-Maxwell distribution plasma. A plasma gun is used to perturbing the magnetic field and the plasma. The diagnostic system include a three-dimension movable probe system, a multi-channel soft X-ray imaging, a Polarization interferometer and optical diagnostic system, which measure local perturbation, chord average density and magnetic perturbation, chord average temperature and tomograph image, visible spectrum and fast video, respectively.
The SPERF has got the first plasma in May this year and is expected to contribute to the space science study as soon as possible.

Reference：
[1] Qingmei X, Zhibin W, Xiaogang W, et al. *Conceptual design of dipole research experiment (DREX)*[J]. Plasma Science and Technology, 2017, 19(3): 035301.

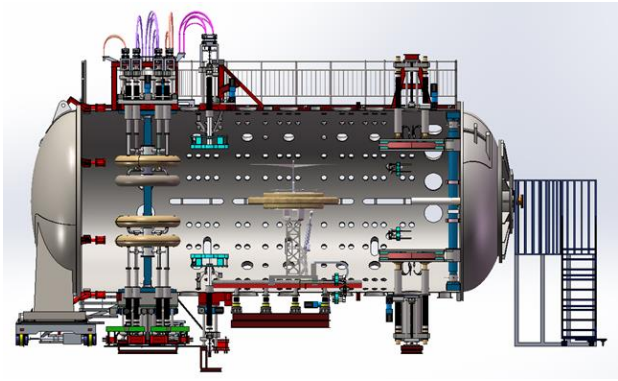

Figure 1, a structural diagram of the SPERF.

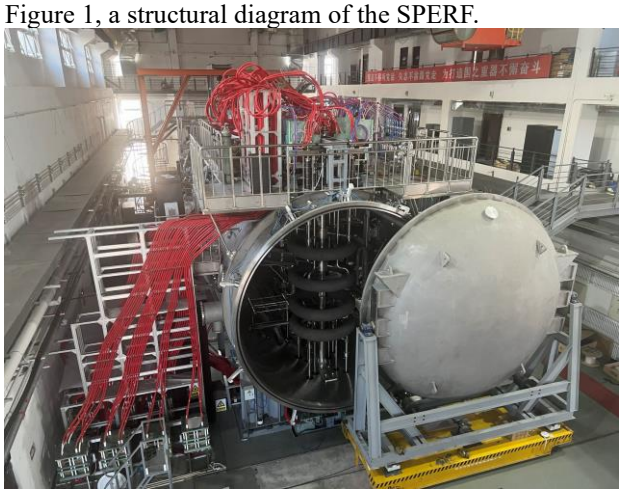

Figure 2, a photo of the SPERF.