

Current Research Status of Magneto Plasma Sail Propulsion System

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Magnetic sail (MagSail) is a next-generation deep space propulsion system. To propel a spacecraft in the direction leaving the Sun, MagSail produces a large-scale magnetic field cavity to block the hypersonic solar wind plasma flow. Since the thrust of MagSail is proportional to the blocking area, a large-scale interaction between the artificial magnetic field and the solar wind is required to capture the energy of very low density solar wind flow. From our theoretical and experimental research on the thrust production mechanism of MagSail, it is scalable from 1 mN class pure MagSail (150-kg satellite that has 2-m-diameter superconducting coil for the thrust production) to 1 N class magnetoplasma sail (1,000 to 4,000 kg mass spacecraft that inflates the magnetic field produced by a 4-m-diameter superconducting coil with an additional plasma jet from the spacecraft). In order to demonstrate a small but world's first MagSail in space, we are going to start a two-year working group, in which 1) specific mission and spacecraft system will be designed; and 2) key components such as new high-temperature superconducting coil, a cryogenic system, and a navigation system are going to be developed for the first MagSail in space.