

# **System design and instrument development for future formation-flying magnetospheric satellite mission SCOPE**

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Japan Aerospace Exploration Agency (JAXA) is currently planning a next generation magnetosphere observation mission called SCOPE(cross-Scale COupling in the Plasma universE. The main purpose of this mission is to investigate the dynamic behaviors of plasmas in the Terrestrial magnetosphere that range over various time and spatial scales. The basic idea of the SCOPE mission is to distinguish temporal and spatial variations of physical processes by putting five formation flying spacecraft into the key region of the Terrestrial magnetosphere. The orbit of SCOPE is a highly elliptical orbit with its apogee 30Re from the Earth center. SCOPE consists of one 450kg mother satellite and four 90kg daughter satellites, flying 5 to 5000km apart from each other. The inter-satellite link is used for telemetry/command operation as well as ranging to determine the relative orbit of 5 satellites in a small distance, which cannot be resolved by the ground-based orbit determination. The SCOPE mission is designed such that observational studies from the new perspective, that is, the cross-scale coupling viewpoint, are enabled. The orbit is so designed that the spacecraft will visit most of the key regions in the magnetosphere, that is, the bow shock, the magnetospheric boundary, the inner-magnetosphere, and the near-Earth magnetotail. In order to realize the science objectives, high performance Plasma/Particle sensors, DC/AC Magnetic and Electric field sensors, and Wave Particle Correlator are planned to be onboard the SCOPE satellite. All the SCOPE satellites have two 5m spin-axis antenna. The spin-axis antenna, that all the SCOPE satellites are equipped with, must have high specific rigidity for the attitude stability of the spinning satellite. We are now developing new light-weight inflatable antenna, having sufficient rigidity for the SCOPE satellites' spin rate of 20[rpm]. New instruments for in-situ measurements of space plasmas required by the SCOPE mission are also under development. The goal of our development is to realize 1) plasma/particle sensors that can measure wide energy range between several eV and several MeV without any energy gaps and 2) a high time resolution low energy electron spectrometer that has time resolution below ten milliseconds to understand electron time scale phenomena.