

IAF SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SPACE PHYSICS MISSIONS (A7)
Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics (2)

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AN OVERVIEW OF THE ASO-S MISSION AND THE DESIGN OF SPACECRAFT

Abstract

ASO-S mission is a Chinese Solar Observation project managed in Strategic Priority Research Program of Space Science by Chinese Academic of Science (CAS). The meanly scientific objective is to study the intricate relationships among solar magnetic field, solar flares, and coronal mass ejections (CMEs). The ASO-S spacecraft will perform the first simultaneous observations of the three solar activities utilizing its three scientific instruments: Full-disc vector MagnetoGraph (FMG), $\text{Ly}\alpha$ Solar Telescope (LST), and Hard X-ray Imager (HXI). The spacecraft is characterized by its requirements on lines-of-sight of scientific instruments: high pointing accuracy, $10''$ for Solar Corona Imager (SCI) and Solar Disk Imager (SDI) of LST, and high pointing stabilization, $0.25''/60\text{s}$ for FMG. In order to address this issue, multi-loop strategy is utilized in the design of the spacecraft. Another technical challenge is that in order to realize the simultaneous observation, the misalignment among lines-of-sight of the three scientific instruments should be less than 30 arcsec. The alignment of multi-instrument is guaranteed through an optical bench for reducing the thermal-elastic error on board. Moreover, the pointing and coalignment performance is also disturbed by micro-vibrations, mainly generated by rotational reaction wheels. So, the micro-vibration impact is analyzed and validated by experiments. ASO-S is scheduled to be launched in to a 720 km Sun-synchronous orbit in 2022. The mission is now closed to the end of phase-C. this paper will give an overview introduction of the ASO-S mission and the design of the ASO-S spacecraft.