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A NEW LIGHT-WEIGHT HIGH PERFORMANCE OFF-AXIS TMA TELESCOPE

Abstract

To demonstrate the feasibility of wide-field high resolution off-axis Three Mirror Anastigmat telescopes, a new complete Optical Demonstration Model has been successfully developed in BISME. This 1.75-m focal length, f/9 relative aperture, 6.21.0field of view visible telescope, which uses the TDICCD detectors of 7m pixel size, can provide 2.0-m ground sampling distance and 51-km swath from an altitude of 500 km.

With some significant efforts, the main goals of the ODM have been reached: a compact light-weight design while realizing high performance and high stability. Over its whole 6.21.0field of view, the off-axis TMA telescope achieved diffraction limited image quality at visible wavelengths, and higher than 0.41@71.4lp/mm (detector Nyquist frequency) modulation transfer function. The optical system employed the quasi telecentric in image space and the relative distortion was less than 0.01

To guarantee a good image quality, Multi-point spherical hinge supporting structure was used to support off-axis mirrors which has the capability of decoupling of Degrees of Freedom. Thermal stresses from the unmatched thermal distribution were filtered while the structure retains a sufficient high stiffness to withstand launch vibrations. CFRP, a very light material, and high volume fraction Sic/Al were used in the telescope structure. With the technologies of topology optimization and finite element analysis, the total weight of the whole structure system is 30

The telescope has successfully passed the environmental test for space use including vibration test and vacuum thermal test. The main specifications match the system demand. The optical system and key technologies have been applied in the Multispectral Camera of the Resources Satellite Three, which was successfully launched on January 9, 2012.