EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Sensors & Technology (3)

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STAND-ALONE ASSEMBLY OF IR CAMERA

Abstract

The demand for IR (Infrared) camera has been increased dramatically from building security, medical diagnosis to military application. Also, if the IR camera is attached to the visible telescope, then more information can be obtained. In this case, the light passing through the visible telescope is divided into two bands (IR and visible) by a dichroic beam splitter. The visible light directly goes to the CCD sensor and the IR light passes through IR optical assembly (IROA) to reach IR sensor array. Usually, IROA is aligned with telescope after finishing assembly of telescope. However, if the telescope and IROA are scheduled to assemble simultaneously in different places, IROA is to assemble without telescope. We developed the method of stand-alone alignment of IROA operating in mid-IR range (3.3 um 5.2 um), which consists of 3 mirrors and 4 lenses. Mirrors and lenses of IROA are assembled on a CFRP (Carbon Fiber Reinforced Plastic) plate with flexures and a lens barrel. The alignment of IROA is carried out by using IR interferometer and some compensating optical components for fine adjustment. Also, we used a reference sphere simulating the wavefront from the telescope. The light from interferometer located focal plane goes through IROA and returns back to IROA and interferometer by the reference sphere. If IROA is perfectly aligned, then the wavefront of light from IROA is perfectly matched to the reference sphere so that the light will trace back to interferometer without any error. The adjustment of optical components was carried out by measuring the wavefront error at several different fields and calculating the amount of positioning error of optical components by computer simulation. In this way, we obtained the final wavefront error of about 215 nm rms which corresponds to lambda/20 rms (lambda=4200 nm), much less than the diffraction limited performance.