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Space absolute radiometry payload and on-orbit traceable radiometric calibration system

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In order to improve the measurement accuracy and stability for space optical remote sensors, the on–orbit traceable radiometric calibration system of solar reflection spectrum is investigated for developing the space absolute radiometry payload. The space cryogenic absolute radiometer (SCAR) operated at 20K is developed to realize the on–orbit traceable high accuracy radiation measurement, and to establish the radiation calibration standard source with the 0.03% uncertainty. The earth–moon imaging spectrometer with high signal–to–noise ratio and ultra–large dynamic range is researched. The wide spectrum coverage and full spectrum high transmittance are achieved through optical design optimization. The high–order aspheric off–axis three–mirror telescope system is designed to optimize the optical layout. The earth–moon imaging spectrometer has the measurement functions for earth and moon. The onboard radiation standard transfer chain of the self–calibration system is established through the components of monochrome source, halogen tungsten lamp, solar and transfer radiometer. The earth–moon imaging spectrometer can be calibrated in orbit, such as the radiance and the response linearity. The absolute observation of the spectral radiance of the earth reflection spectrum and the lunar spectral irradiance can be realized. The observation modes of the satellite scanning, the calibration site, and lunar radiation are designed. The optical remote sensing instruments can be cross–calibrated by the earth–moon imaging spectrometer, pass through observing the calibration site on the earth or the lunar surface simultaneously. Then the radiation scale on the satellite is unified. The research results will provide the key technology basis for the future establishment of the high–precision calibration benchmarks for onboard radiation, significantly improve the comparability and long–term stability of remote sensing data, and have important significance for the study of the climate change, disaster prediction, and monitoring.

SHORT BIO:

Dr. Ye is an associate professor of optical engineering at Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP). He is also the deputy director of space optics department I of CIOMP. His research interests are solar absolute irradiance radiometer, space cryogenic radiometer and on–orbit radiometric calibration. He is the project leader of the Absolute observation technique of solar, earth and lunar spectral radiation based on space cryogenic radiometer (2018YFB0504603) supported by National Key R&D Program of China under grant 2018YFB0504600.

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