jasonSWIR CALIBRATION OF SPECTRALON REFLECTANCE FACTOR

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ABSTRACT

Satellite instruments operating in the reflective solar wavelength region require accurate and precise determination of the Bidirectional Reflectance Factor (BRF) of laboratory-based diffusers used in their pre-flight and on-orbit radiometric calibrations. BRF measurements are required throughout the reflected-solar spectrum from the ultraviolet through the shortwave infrared. Spectralon diffusers are commonly used as a reflectance standard for bidirectional and hemispherical geometries. The Diffuser Calibration Laboratory (DCaL) at NASA's Goddard Space Flight Center is a secondary calibration facility with reflectance measurements traceable to those made by the Spectral Tri-function Automated Reference Reflectometer (STARR) facility at the National Institute of Standards and Technology (NIST). For more than two decades, the DCaL has provided numerous NASA projects with BRF data in the ultraviolet (UV), visible (VIS) and the Near InfraRed (NIR) spectral regions. Presented in this paper are measurements of BRF from 1475nm to 1625nm obtained using an indium gallium arsenide detector and a tunable coherent light source. The sample was a 2 inch diameter, 99% white Spectralon target. The BRF results are discussed and compared to empirically generated data from a model based on NIST certified values of 6° directional/hemispherical spectral reflectance factors from 900nm to 2500nm. Employing a new NIST capability for measuring bidirectional reflectance using a cooled, extended InGaAs detector, BRF calibration measurements of the same sample were also made using NIST's STARR from 1475nm to 1625nm at an incident angle of 0° and at viewing angles of 40°, 45°, and 50°. The total combined uncertainty for BRF in this ShortWave Infrared (SWIR) range is less than 1%. This measurement capability will evolve into a BRF calibration service in SWIR region in support of NASA remote sensing missions.

Keywords: BRF, BRDF, Calibration, Spectralon, Reflectance, Remote Sensing.