The MODIS Blackbody

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MODIS Algorithm Team Meeting
9 Feb, 1994

Outline

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Function of the MODIS Blackbody

- Full Aperture Radiometric Calibration for Bands 20-25, 27-36

- Full Aperture DC Restoration for all bands

GSFC Radiometric Calibration Needs

The absolute radiometric calibration Phase C/D requirement for wavelengths greater than 3000 nm is 1%

SBRC Blackbody Requirements

Blackbody spatial and temperature knowledge - 0.1K

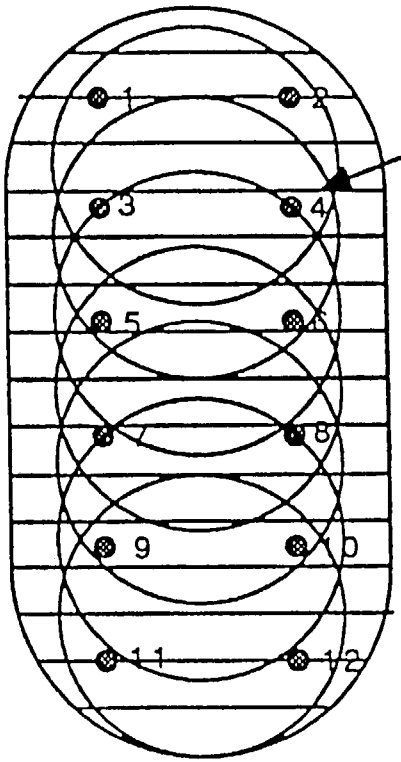
Emissivity - >. 0.992

Cavity V-Groove Included Angle 40.5

Groove Tip and Valley Area Effects < 10%

Calibration Accuracy Prediction 0.7 - 0.2%

Focal Plane Viewing

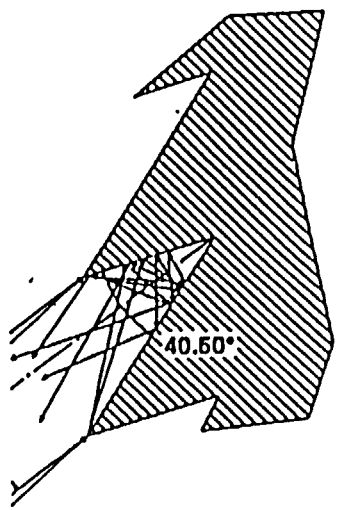


The projected MODIS aperture collects data in 45 FD across the BB for each band

Scan Direction

Blackbody Parameter Summary

Material - anodized aluminum
Height - 15"
Width - 10"
Thickness - 1"
Weight - 8.3 lbs
Heaters - 4
Thermistors - 12 PRT
Blackbody "heat up" (285 - 315) - 130 minutes
Blackbody "cool down" (315 - 285) - 100 minutes
Scan Angle Range "clear view" - (230.750 - 232.050)
Number of Frames of "clear view" Data - 16
Included Groove Angle - 40.5



SBRC Calibration Procedures

- Record all Blackbody Temperature sensors
- Record scan cavity wall temperature sensors
- Calculate effective blackbody temperature for all MODIS signals
- For a given channel and band, the temperature used in the DC restoration algorithm is the average of the effective blackbody temperatures.
- Record all MODIS signals as system is scanned across the blackbody
- Calculate average space signal
- Calculate responsivity and average responsivity
- Calculate scene radiance

SBRC's Radiometric Calibration Algorithm

$$L(B\#,Ch\#)=\frac{DN\_scene(B\#,Ch\#,FD\#)-DN\_sp\_avg(B\#,Ch\#,FD\#)}{R(B\#,Ch\#)}$$

L = Radiance of the scene
DN_scene = MODIS digital signal of the scene
DN_sp_avg = Average MODIS digital signal of the space view
R = Average responsivity of the blackbody