GSICS-Reference

Global Satellite   
Inter-Calibration System

Instrument pre-launch calibration & characterization data requirements

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RECORD OF DOCUMENT CHANGES

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DoI (if relevant)

# Instrument pre-launch calibration & characterization data requirements

Satellite remote sensing instrument pre-launch calibration and characterization data are critical for the production of calibrated and geolocated Level 1 data and their processing by NWP and climate applications. Satellite instrument prelaunch testing must strive to reproduce, as closely as possible, instrument operation in the predicted on-orbit environment. This is also known as “testing as you fly.”

The latest generations of satellite instruments employ increasingly complex focal planes, often with two dimensional detector arrays and innovative read-out schemes producing large amounts of data. While acknowledging this increasing complexity, as well as the contractual constraints vis-a-vis industrial parties involved, making the calibration and characterization data produced by this testing available to the user community should allow the instrument behavior to be fully understood by the time of launch and facilitate proper and efficient use by the remote sensing community, meeting as early as possible the on-orbit performance requirements.

The following data should be provided before launch and updated during commissioning:

1. To be made available to users 2-3 years before launch to aid user preparation:

* Channel naming, numbering convention and channel science application(s)
* Spectral Response Function (SRF) (relative Radiometric Spectral Responsivity (RSR))
  + Channel central frequencies/wavelengths and bandwidths (full width half max power)
* Pixel sampling distance/time intervals
* System level instrument noise (i.e. NEdL, NEdT), including calibration noise, as a function of instrument parameters (temperatures and voltages) – and reference scenes at which they are valid
* Radiometric calibration and characterization:
  + Polarisation sensitivity and response versus scan angle
  + Dynamic range, linearity, quantisation
* Expected mission and instrument lifetimes

1. To be provided 6 months before launch:

* Spectral Response Function (SRF) (relative Radiometric Spectral Responsivity (RSR))
  + Responsivity versus wavelength as a function of channel (i.e. average) and detector
* Along-scan and in-track Field of View (FOV)-pixel size or full PSF/MTF/antenna pattern
* Field of Regard/swath coverage, repeat cycle /orbit configuration
* Radiometric calibration and characterization:
  + Full calibration error budget
  + Response versus scan angle
* Instrument pointing, geometric accuracy and band to band calibration/registration (i.e. geometric performance)
* Key parameters of on-board calibrators (i.e. blackbody emissivity and temperature uniformity, solar diffuser spectral Bidirectional Reflectance or Transmittance Distribution Function (BRDF or BTDF) and uniformity).
* Target and realized measurement uncertainties for the above data

1. General recommendations:

* All the above should indicate the level of maturity of the determination of instrument testing parameter. This is accomplished by identifying if the data were determined using analysis/modelling, demonstration, inspection, or testing at the part, subassembly, subsystem, system or observatory (i.e. spacecraft plus instruments) level.
* Prelaunch test data should be provided for all potential instrument on-orbit operational configurations.
* All information should be retained indefinitely.