



HIGH ACCURACY DUAL SCAN TEMPERATURE RADIOMETER FOR SEA AND LAND SURFACE MONITORING FROM SPACE

SLSTR is a high accuracy infrared radiometer which will be embarked in the Earth low-orbit ESA Sentinel 3 mission as a part of the GMES (Global Monitoring for Environment & Security) operational program.

SLSTR is an improved version of previous AATSR and ATSR2 instruments, flying respectively on board of ENVISAT and ERS2, regarding higher swaths for Sea (SST) and Land (LST) Surface Temperature climatological and meteorological applications, a higher spatial resolution and two more solar channels for a better clouds/aerosols screening, and two additional channels for global scale fire monitoring (11 overall spectral channels). The program is in the phase B2/C/D and the first launch is scheduled for 2012.

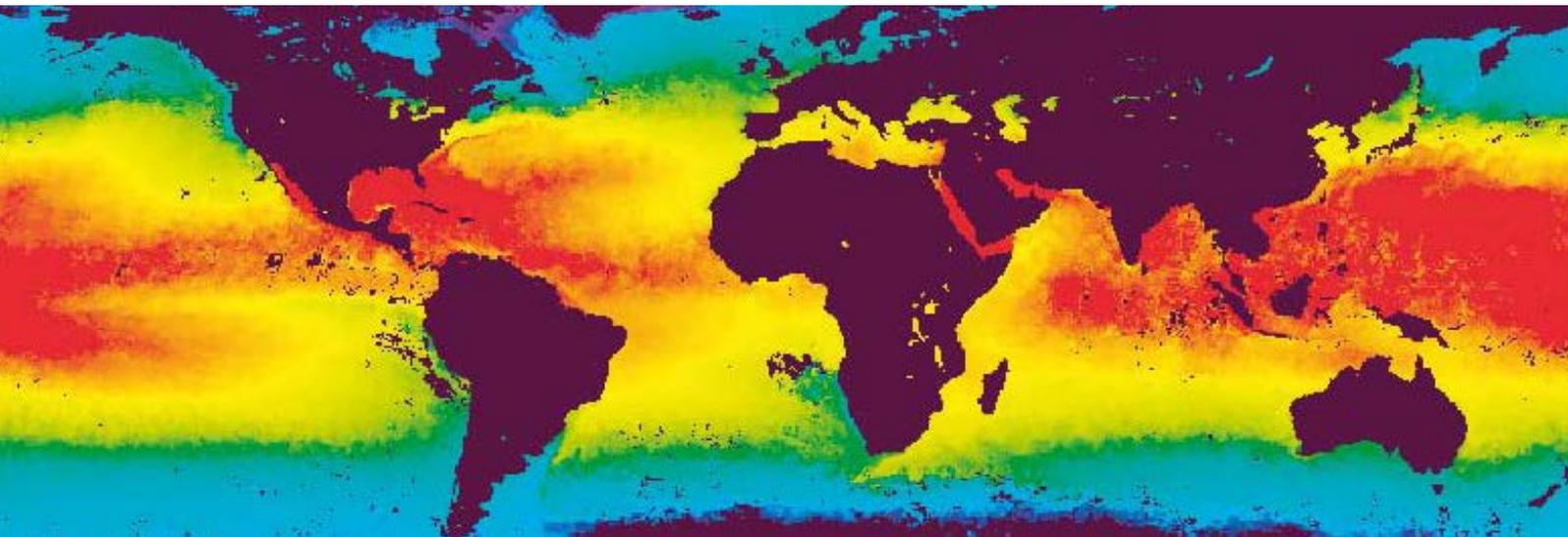
The SLSTR Optical Scanning Unit comprises two scanners & telescopes which permit a quasisimultaneous observations of the same target with two atmospheric paths for correction of aerosols effects.

For each telescope, the IR and VIS energy is reflected off a Scan Mirror and focused by means of a paraboloid into a common Focal Plane Assembly (FPA). A flip mirror is used to alternatively switch from one view to the other.

FPA is a cylinder box composed of a base-plate, with an input field stop common for both views, dichroics for spectral channels separation and lens optics to focalize the beam onto each detector unit.

The IR/SWIR detectors and optics are cooled at 80K by means of a high space heritage & life time cryo-cooler, while the VIS ones operate at 260K.

The instrument cooling is assured by six separate passive radiators. A good radiometric calibration is achieved by observing with both telescopes every scan two accurate and stable blackbodies and every orbit a visible calibration unit with a sun diffuser.



KEY CAPABILITIES

- Sea Surface Temperature (SST): climatology (el-nino and el-nina), meteorology (weather forecasting), sea currents, ocean/atmosphere interface (evaporation), sea ice monitoring
- Land Surface Temperature (LST): climatology and meteorology, land thermal inertia, de-forestation and evaporation, fire intensity and area monitoring
- Land and vegetation cover
- Atmospheric aerosols and cloud screening
- Typhoon and Iceberg breaking monitoring.

PERFORMANCE

A common swath (745Km) for the nadir and inclined views allows an Earth global coverage of 3 days (1 day with 2 satellites) for climatology (SST accuracy < 0.3K), while a new large swath (1400Km) in the nadir view allows a coverage less than 1 day for meteorology (SST acc. < 0.6K), as for the Ocean and Land Colour Imager (OLCI).

The SST/LST measurements are retrieved by means of the three infrared channels (3.7, 10, 12µm) which allow the correction of the water vapour atmospheric content as well as the aerosols effects when the two path views mode is considered.

The two synchronized conical scanners optimise the radiometric accuracy, allowing constant optical area beam and incidence angle (23.5 deg) for all scan points (scene and blackbodies), low polarization effects and frequent views of blackbodies (every scan) with the same observation geometry.

TECHNICAL CHARACTERISTICS

Swaths	745Km (double view) 1400Km (single nadir view)
Ground Spatial Resolution (800 Km altitude)	VIS-SWIR: 0.5Km MIR-TIR-Fire 1Km
Spectral Range and Resolution	11 channels from 555nm to 12µm with different bandwidths
Radiometric Quantisation	14 bit
Radiometric Resolution	SNR=21-25 on VIS channels at 0.5% albedo SNR=25-37 on SWIR channels at 0.5% albedo NeDT=56mK on MIR channel at 270K, NeDT=21-29mK on TIR channels at 270K NeDT=80-30mK on Fire channels at 350-500K
Absolute Radiometric Accuracy	5% on VIS-SWIR channels 0.1K on MIR-TIR channels 3K on Fire channels
Pointing Stability and Channels Co-registrations	50m
Image Quality	MTF>0.3 at Nyquist frequency
Telescope Aperture Diameter	110mm
Cooling System	Active at 80K for FPA, Passive radiators for other subsystems
Optical Head Size (Max envelope)	Height X = 1315mm (satellite direction - X) Width Y = 1075mm (cold space - Y) Depth Z = 1497mm (Nadir view +Z)
Nominal mass	140Kg
Nominal Power Consumption	155W
Operative Life Time	7.5 years