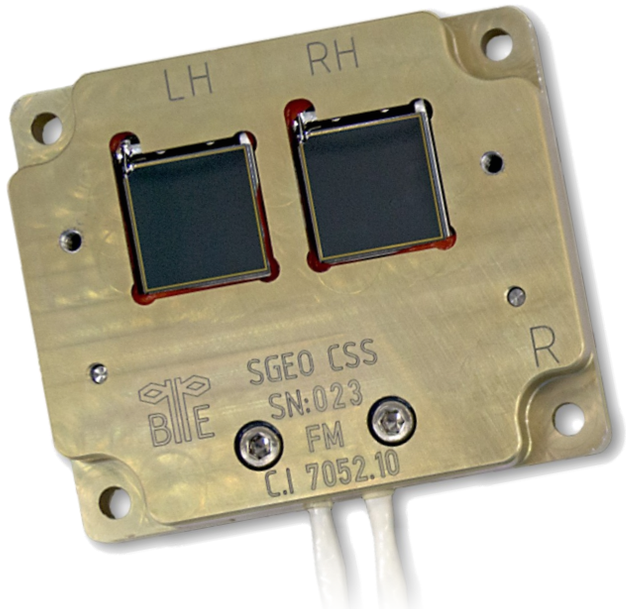
COSINE SUN SENSOR REDUNDANT



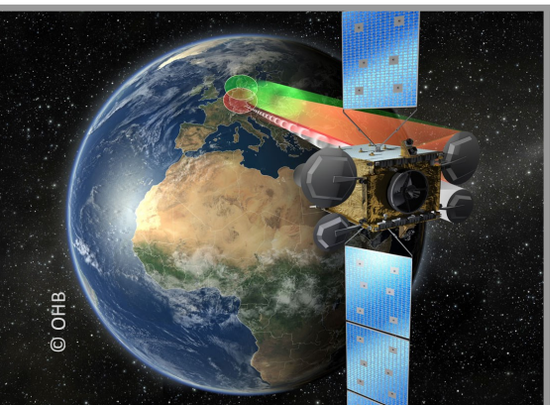
The Cosine Sun Sensor Redundant (CoSS-R) delivers coarse information about the position of the sun relative to the spacecraft with integrated redundancy. This information is used for coarse maneuvering of the spacecraft and to inform the spacecraft about the position of the sun.

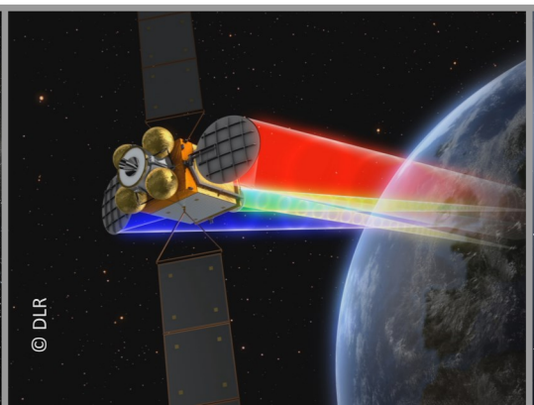
With a suite of CoSS-R, of which at least three sensors with different viewing directions have the sun in their field of view, the Attitude & Orbit Control Subsystem (AOCS) can retrieve the position of the sun in the coordinate reference system of the spacecraft.

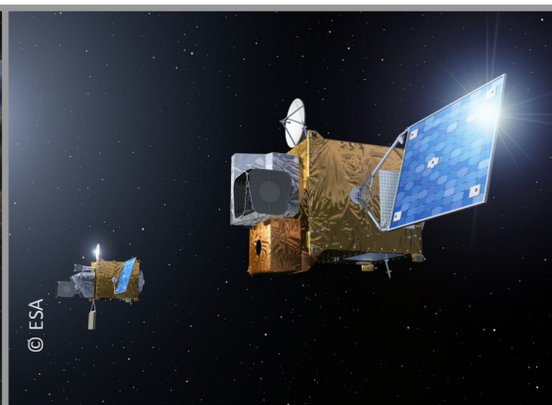
The design of the CoSS-R exploits the excellent heritage of the dual chip detectors while optimizing the footprint and mass. The core element is the detector which is based on proven technology applied in the Coarse Sun Sensor (CSS) formerly known as Sun Acquisition Sensors (SAS) with an excellent heritage since 1975.

Key Advantages

- Small footprint and low mass
- Large FOV (180° full cone) for measurement of solar aspect offset angle
- Internally redundant
- Qualified for long GEO, MEO and LEO missions
- Virtually zero EMC susceptibility and emissions







Cosine Sun Sensor Redundant

Characteristic	Performance / Interfaces Budget
Mass	15±2 grams (exclusive cable)
Dimension	45 x 37 x 6 mm3 (inclusive cable fixation provisions)
FOV	Minimum operational FOV: 180 degrees of arc full cone angle (±90°)
Outputs	Analog, in voltage mode (with built-in resistor) up to about 90mV with sun induced analog current up to about 35 mA per detector Albedo will also produce disturbing output with a magnitude depending on orbit characteristics. In LEO worst case albedo signal can be as high as about 60%@ 500 km of the direct sun input. At 5000 km worst case albedo can be 10% of direct sun input, at GEO albedo is less than 0.7% of direct sun input.
Power Consumption	nil: CoSS-R is passive
Accuracy	Individual output has approximate cosine response with angle of incidence. OBC can retrieve solar aspect angles from CoSS-R suit ; accuracy typically in the order of ±3 degrees of arc (if on-board corrections are made for sun sensor temperature). Note: this accuracy figure can be derived from units, which are solely lit by direct sunlight, i.e. no albedo). S/C coarse attitude must be resolved from those CoSS-R units in the sensor suit which are not exposed to albedo.
Noise equivalent angle	Negligible
Redundancy and reliability	Internally redundant. Failure rate of one channel (in redundant unit): 6FIT @ 30°C
Alignment	Orthogonality better than 0.5 degrees of arc. No dedicated alignment cube incorporated in design.
Qualification temperature	-55°C to +115°C (With qualified excursions of –145 °C to +120 °C)
Qualification Sine Vibration	20 g
Qualification Random Vibration	34 grms
Qualification Shock	2600 g
Radiation hardness	Detectors are radiation hardened (EPI technology) with 300 microns thick cover glass. They sustain and remain operating with known (small) degradation of performance when applied in long duration missions.

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ABOUT

Bradford is a high-tech European developer and manufacturer of satellite control sub-systems and components.

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