



Centre National d'Études Spatiales



SCA_RAD_10 TRO-34-NT-2800-CNES	Activity : CAL/VAL Scarab Thermal performances	Prepared by : A Rosak/ H Pasquier Verified by : N Karouche
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1. OBJECTIVE

The objective of this study is to check that thermal behaviour is compliant with the requirements, and compatible with radiometric performances.

2. SUCCESS CRITERIA

- Temperature of the heart of the instrument (temperature of the reference blackbody T_BBREF) between 18°C and 22°C
- Stability of the internal temperature of Scarab (T_BBREF) better than 1°C per orbit.
- Difference of temperature between the three calibration blackbodies of the CALM less than 1°C
- Difference of temperature between calibration blackbodies and channels less than 5°C
- Stability of the temperature of the calibration blackbodies better than 0.15°C/min

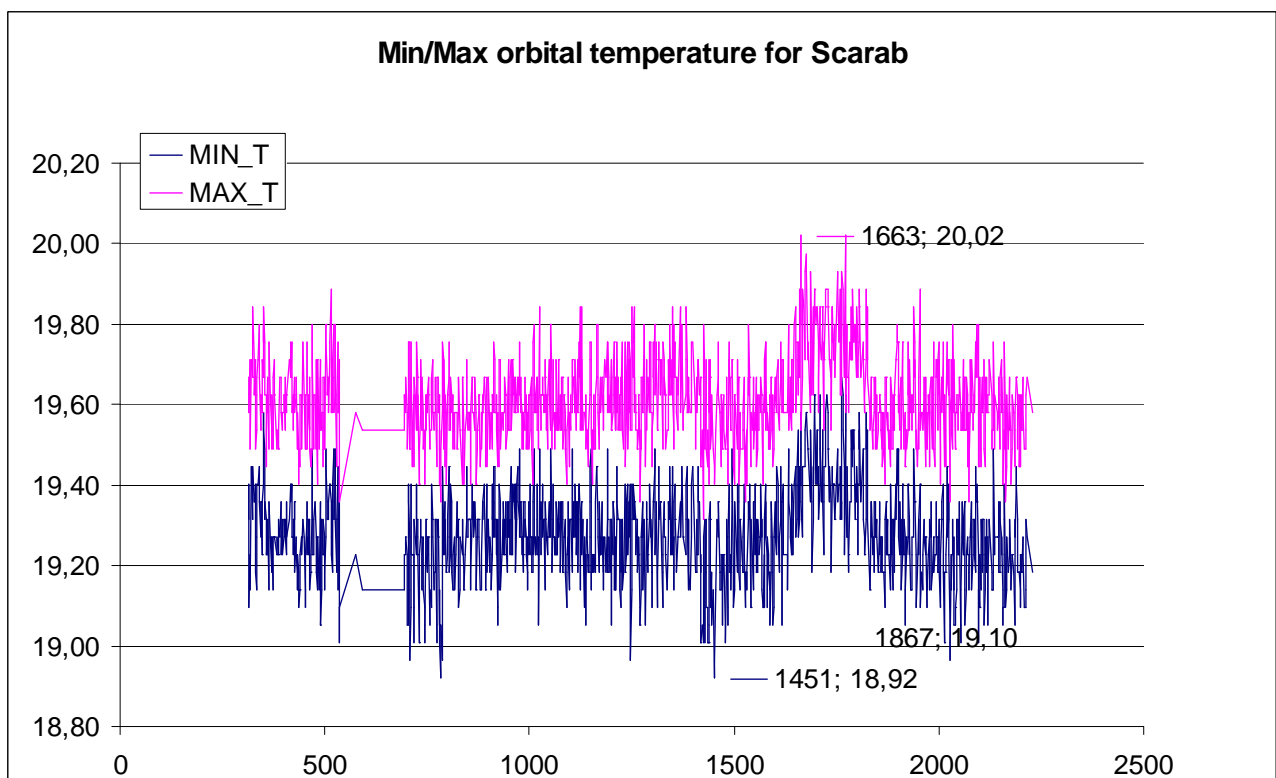
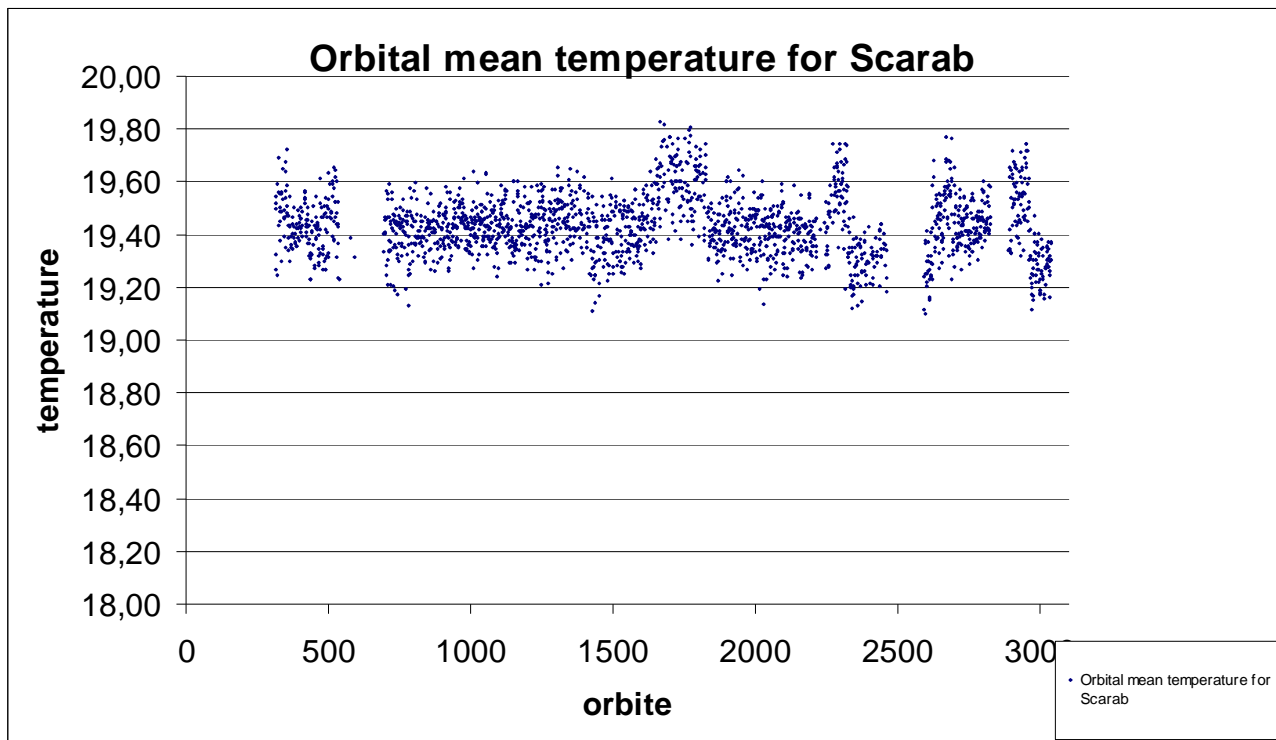
3. PRODUCTS USED

All orbits between 0 and 3200.

4. RESULTS

4.1. TEMPERATURE OF THE HEART OF THE INSTRUMENT

Here is the mean temperature per orbit (T_BBREF).



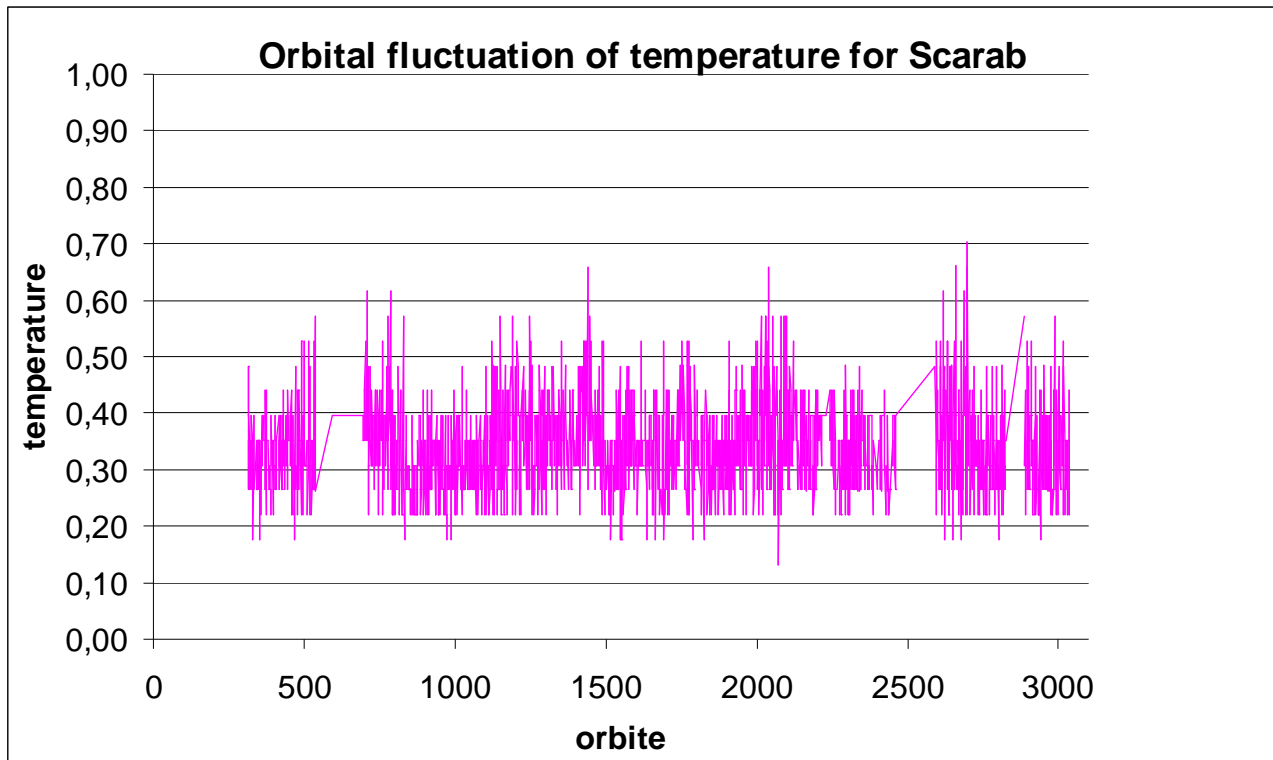
The mean temperature of T_BBREF is 19.4°C

The maximum temperature of T_BBREF is 20.0°C

The minimum temperature of T_BBREF is 18.8°C

The temperatures are fully between 18°C and 22°C.

4.2. STABILITY OF THE TEMPERATURE T_BBREF PER ORBIT.



The mean orbital variation of T_BBREF is 0.4°C peak-peak.

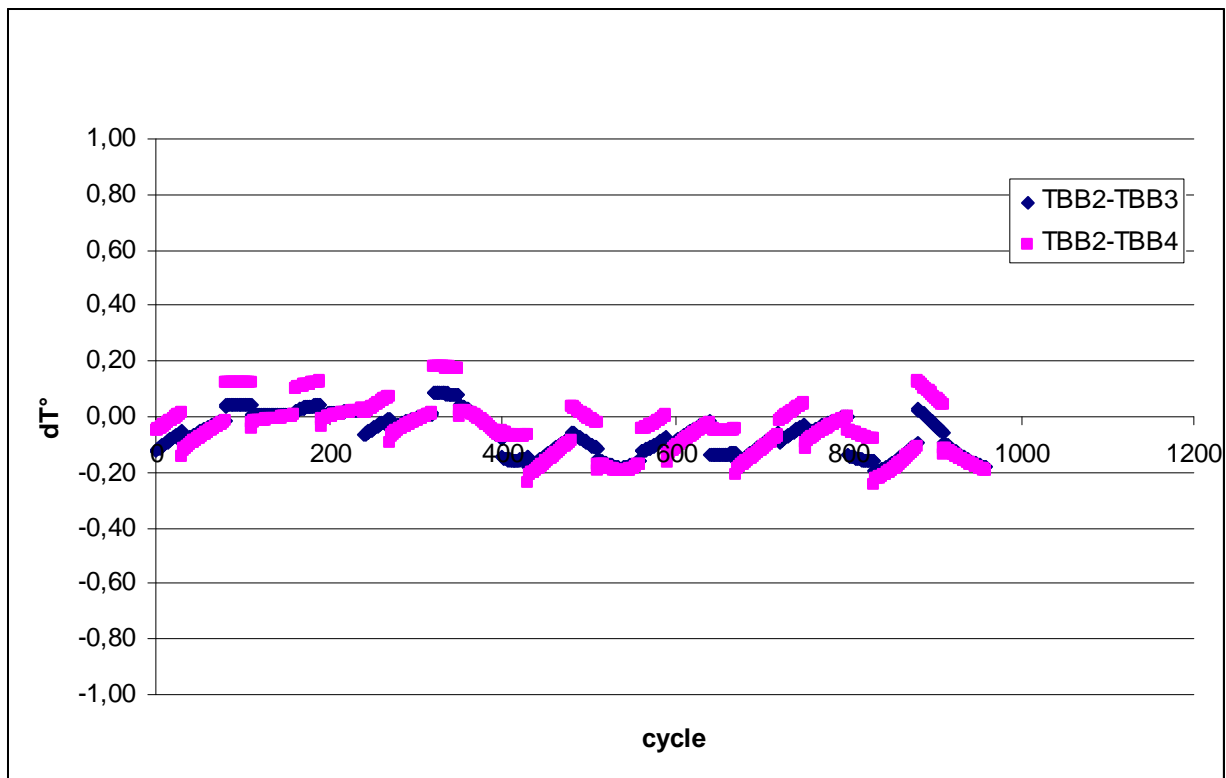
The max orbital variation of T_BBREF is 0.7°C peak-peak.

The requirement is less than 1°C.

4.3. TEMPERATURE DIFFERENCE BETWEEN THE THREE CALIBRATION BLACKBODIES OF THE CALM

Here is the difference between Tbb2, Tbb3 and Tbb4, for each of the first 12 calibration sequences.

One sequence of calibration represents 80 cycles of measurements.

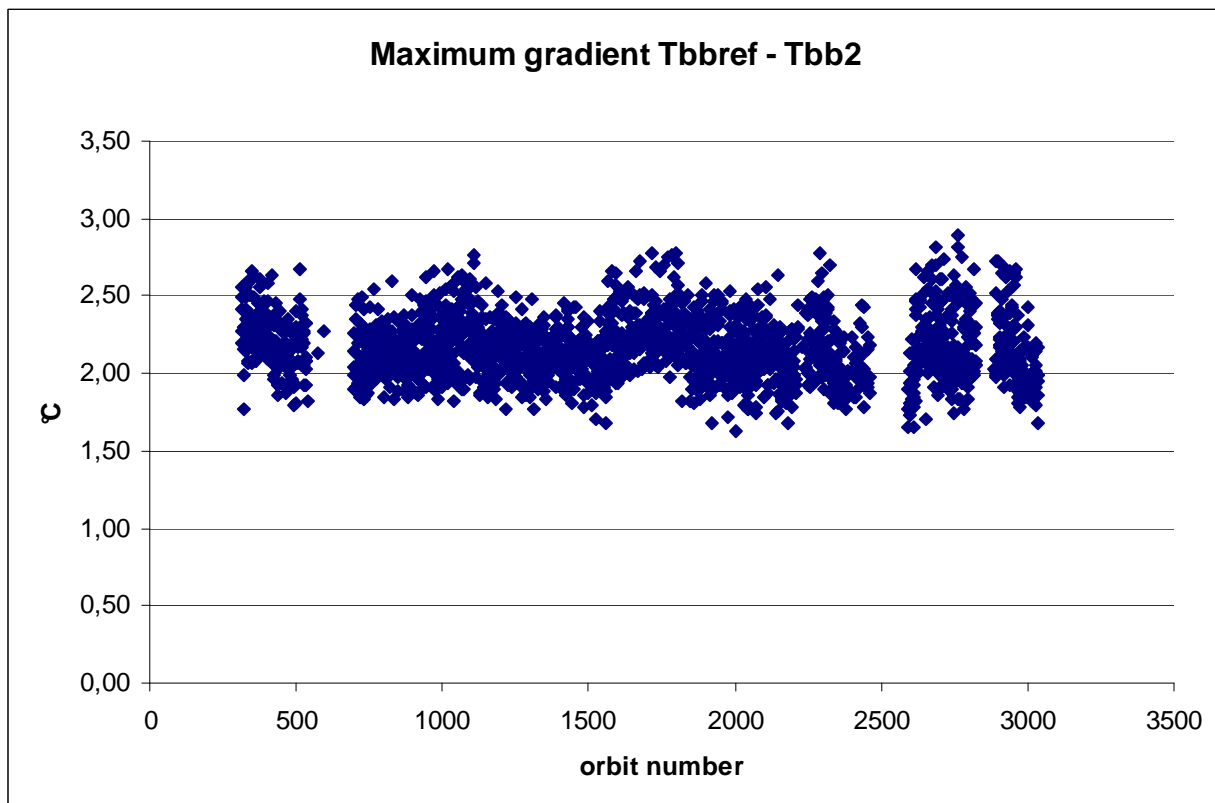


The maximum temperature difference between the three calibration blackbodies of the CALM is less than 0.25°C.

The requirement is less than 1°C.

4.4. TEMPERATURE DIFFERENCE BETWEEN CALIBRATION BLACKBODIES AND CHANNELS

This is computed for channel 2. Here is the maximum gradient between Tbbref and Tbb2, per orbit.

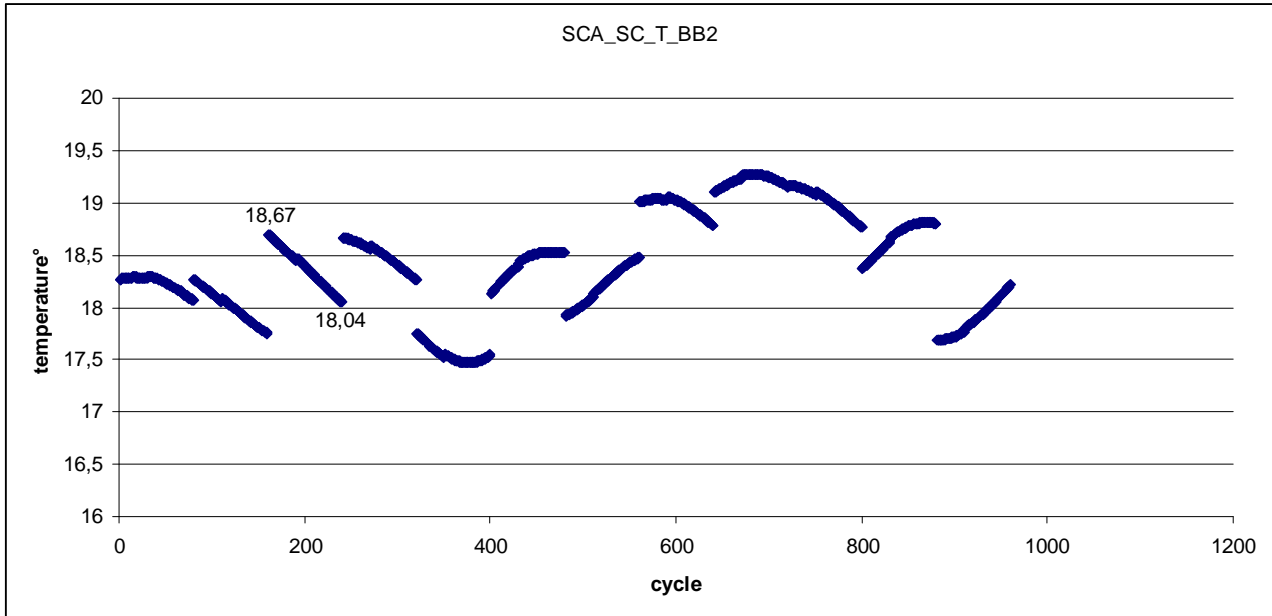


The difference between T_BBREF and TBB2 is lower than 3°C.

The mean value is around 1.2°C.

The requirement is less than 5°C.

4.5. TEMPERATURE STABILITY OF THE CALIBRATION BLACKBODIES



The maximum fluctuation of temperature during one calibration sequence is around 0.6°C, for 80 cycles of 6seconds.

The worst stability is around $0.6^{\circ}\text{C} / (80 * 6 / 60) = 0.075^{\circ}$ per minute.

The requirement is 0.15°/minute

5. CONCLUSION

The instrument is fully compliant with thermal requirements, with very good margins.