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Laboratorio per lo Studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
Via Pentima Bassa, 21 Terni - 05100 TR
phone/fax: +39.0744.49.29.13
Spin Off Accademico dell'Università Degli Studi di Perugia

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TEST REPORT THERMO-VACUUM TEST

doc: ug-crate tvt
data: 26/03/08
rev: A01
pag: 1 di 14
file: ENVRPT27-S1104C-A01-26MAR2K8.doc

CUSTOMER: G&A Engineering - Oricola (AQ) - Italy - phone: +39.0863.90.90.03




TEST REPORT THERMO VACUUM TEST UG-CRATE QM

ENVRPT27-S1104C-A01-26MAR2K8.doc

date: March 26th, 2008

Prot.: 774-08/SERMS srl

signature

test report prepared by:	26/03/08	Ing. Serena Borsini Test responsible	
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TEST REPORT DESCRIPTION

This document is generated by the S.E.R.M.S. Laboratory and reports on the setup, the operation and the results of the test performed on the customer Device Under Test (D.U.T.); several sections compose this report: all of them have been integrated and adapted to the specific tests performed on the D.U.T.

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GENERAL INFORMATION

Job Number:**S1104C**
Universal test number: ..**TVTTEST27**
Test performed on:**UG-crate QM**

contractor:**G&A ENGINEERING**
contractor responsible: ..**ING. RENATO BELLAROSA**
subcontractor:**INFN-ROMA**
test engineer:.....**SERENA BORSINI**
quality assurance:**STEFANO LUCIDI**

APPLICABLE LAWS AND RULES

UGcrate_QM2tests-v12 (13/02/08)

S.E.R.M.S Lab. - INTERNAL TEST PROCEDURE

D.L. 19 settembre 1994, n.626

Attuazione delle direttive 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE e 90/679/CEE riguardanti il miglioramento della sicurezza e della salute dei lavoratori sul luogo di lavoro, e successive modifiche;

MIL-HDBK-831 23 April 1999

Preparation of Test Reports (guidance only);

UNI -10653 – November 1997

Quality product technical documentation (guidance only) ;

UNI CEI EN45001

general criterion for test laboratory operation;

UNI CEI 70001

norm certificate test laboratory terms and definitions;

UNI CEI 70011

guide for test result presentation;

UNI 9513

vibration and shocks : vocabulary

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TEST LEVEL SUMMMARY

The thermal profile of the test is schematically presented in Figure 1.

It derives from the approved reference profile on the AMS procedure:

- UG electronics QM2 Crate Thermal Stress and Thermal-Vacuum Test Procedure, 17 Marzo 2008
- <http://ams.cern.ch/AMS/Electronics/SubD/ga/>

and the related modifications issued by B.Borgia & G.Ambrosi.

The test temperature profiles are sketched in Figure 1 with the following definition of temperature levels:

- T_{AMB} = ambient temperature
- T_{NO-max} = hot storage, non-operating temperature = +85 °C
- T_{NO-min} = cold storage non-operating temperature = -45 °C
- T_{Q-max} = hot operating temperature = +55 °C
- T_{Q-min} = cold operating temperature = -25 °C

The pressure must be below 10^{-4} hPa to set the first hot storage temperature, and below 10^{-5} hPa before the first switch on operation.

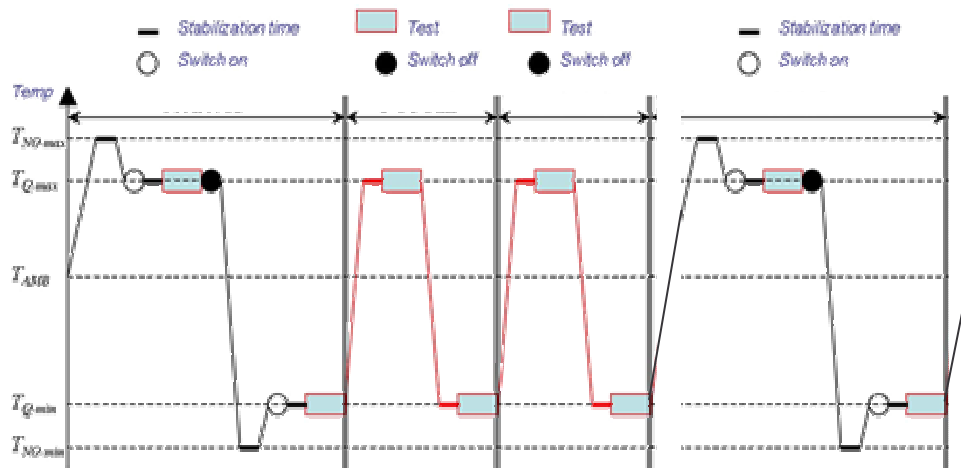


Figure 1 – TVT temperature profile.

The stabilization time is defined by the following condition:

the condition $|\Delta T|/\Delta t < 1 \text{ }^\circ\text{C}/\text{hour}$ is reached and maintained for at least 1 hour; that is the temperature remains stable and within 1 °C from the setting for at least 1 hour.

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TEST DIARY

test begun:February 22th 2008
test completed:March 1st, 2008

TEST SET-UP

The UG electronics has been tested in the Thermo Vacuum Chamber fixed to the lower cold plate by an Aluminium alloy fixture with black surface treatment.

During the set up phase the main activities performed have been:

- unpackage and cleaning of the crate (both internally and externally), the Aluminium fixture and the screws needed to place the fixture on cold plate.
- thermal sensors positioning in the TVC
- thermal sensors positioning on the DUT
- positioning of the MLI to cover the DUT

UNPACKAGE AND POSITIONING

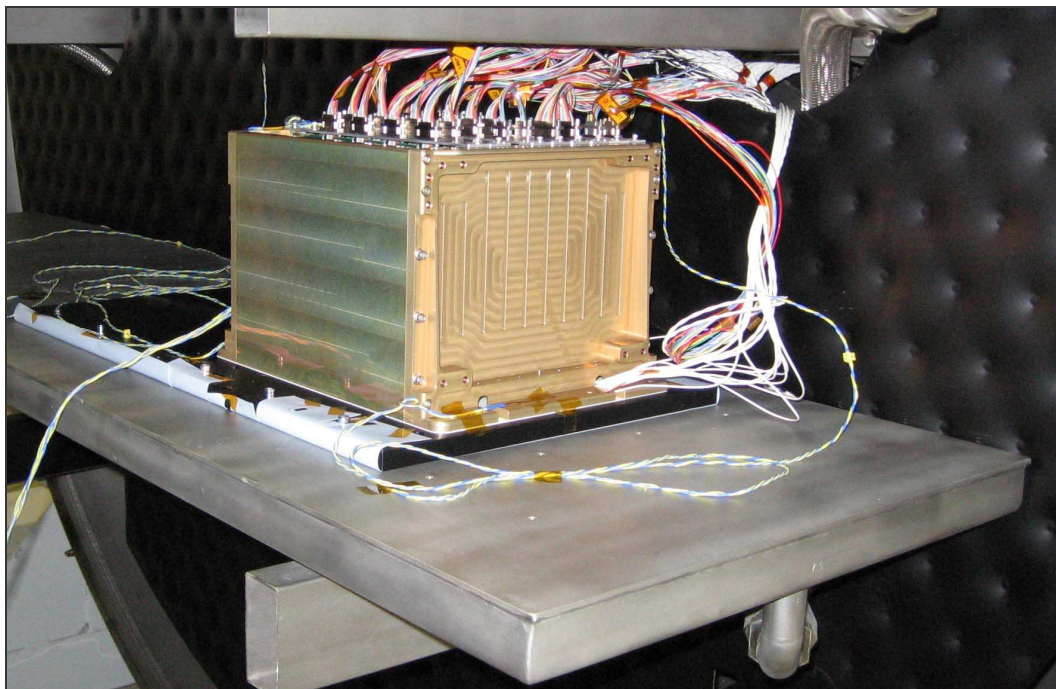


FIGURE 2 –UG CRATE INSIDE THE TVC, FIXED TO THE LOWER COLD PLATE.

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The Aluminium alloy fixture reproduces the same I/F conditions as in the flight configuration; in order to have a good thermal connection between the DUT, the fixture and the cold plate, a layer of thermal conductive material (Cho-Term) was placed both between the crate and the fixture (provided by the customer) and between the fixture and cold plate (Cho-term 1674 from Chomerics from SERMS srl).

**CHO-TERM
LAYER**

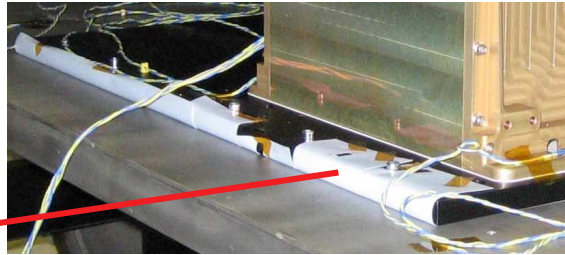


FIGURE 3 - DETAIL OF CHO-TERM LAYER PLACED BETWEEN THE AL FIXTURE AND THE COLD PLATE.

THERMAL SENSORS POSITIONING ON THE DUT

A total amount of:

- 2 Chamber Thermal Sensors (PT100 sensors S651) have been installed on the DUT by S.E.R.M.S. personnel under the direction of INFN of Rome personnel in order to control the temperature of the device (TRP sensors);
- 3 Chamber Thermal sensors (PT100 sensors S651) have been installed inside the DUT to monitor the temperature of FBGA on the UGFV, UGBS and UGBC1 boards

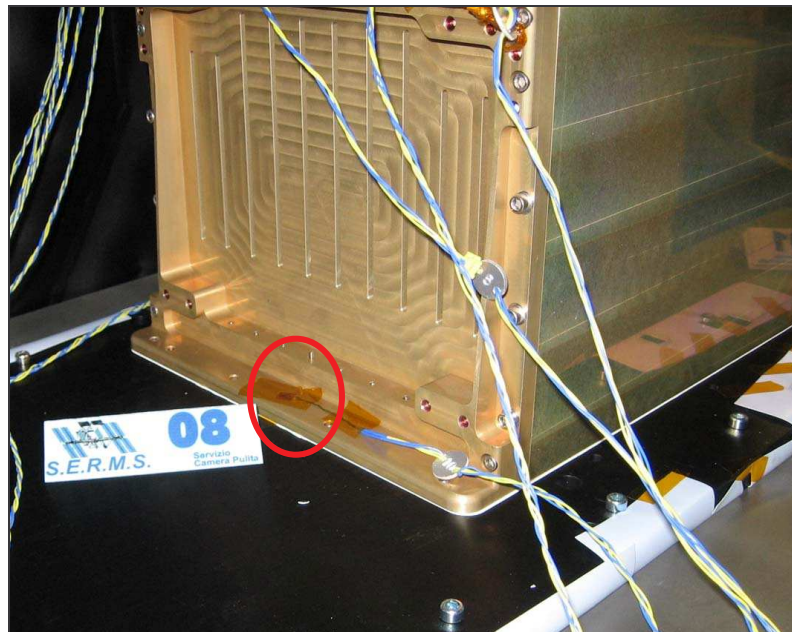


FIGURE 4 – TEMPERATURE REFERENCE POINT (TRP-CH8) POSITIONING ON THE DUT.

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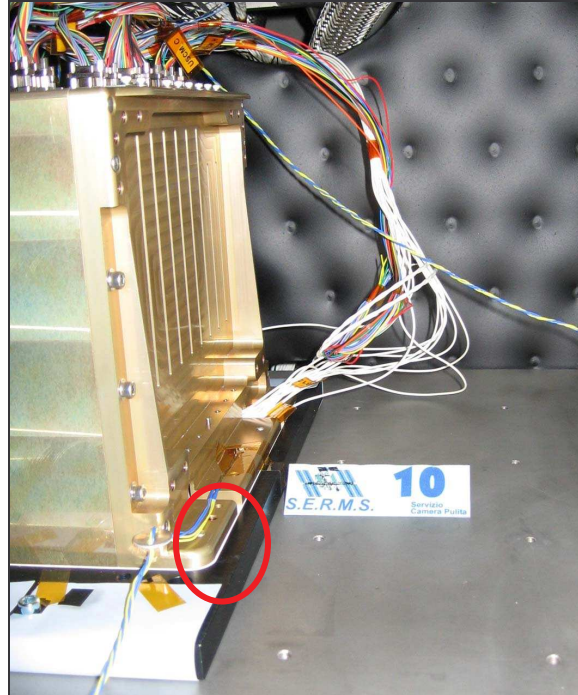


FIGURE 5 - TEMPERATURE REFERENCE POINT (TRP-CH10) POSITIONING ON THE DUT.

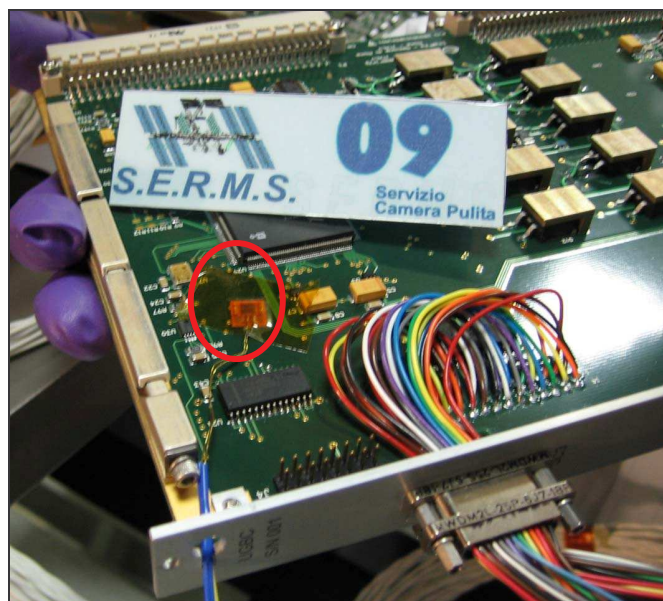


FIGURE 6 - TEMPERATURE SENSOR (CH9) PLACED NEAR THE FBGA ON UGBC1 BOARD.

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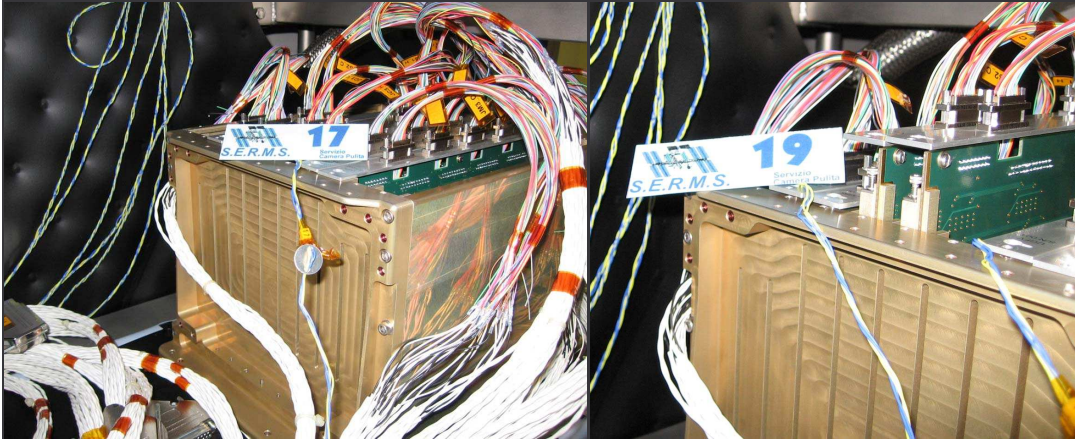


FIGURE 7 – TEMPERATURE SENSORS: CH17 WAS PLACED NEAR FBGA ON UGFV BOARD; CH19 WAS PLACED NEAR FBGA ON UGBS BOARD.

All the temperature sensors used were the chamber sensors and they were installed using Kapton tape.

After positioning, all sensors (TRP and internal sensors) have been tested to verify possible failures after installation.

POSITIONING OF MLI

The DUT was covered with MLI blanket in order to reproduce the flight conditions.

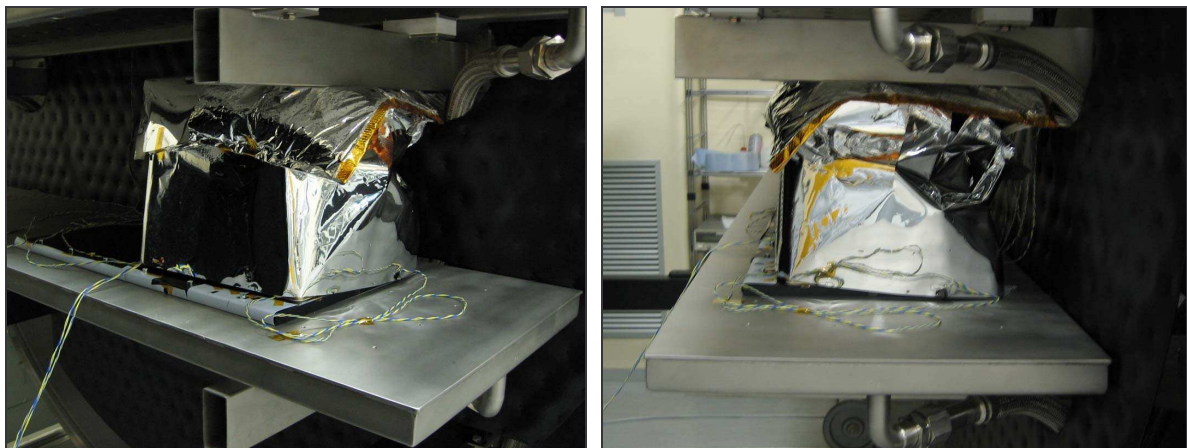


FIGURE 8 – UG CRATE INSIDE THE TVC COVERED WITH MLI BLANKET.

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TEST RESULTS

The UG-crate qualification model has been tested at S.E.R.M.S. in the Thermal Vacuum Chamber (TVC) during the period February 22th – March 1st 2008.

The test has been performed according to the test profile shown in the previous section of this report. INFN-Roma experts have attended the test and operated the electronics during the switch-on/switch-off and functional test phases.

No malfunctioning has been observed in the S.E.R.M.S equipment: the environmental parameters in the TVC matched the customer requests and were continuously recorded.

The UG electronics temperatures have been continuously monitored:

- N° 2 chamber sensors (part # S651) placed on two opposite side walls of the DUT near the feet; these sensors were the temperature reference points during the test and drove the cold plate and shroud temperature (Chamber Ch8 and Ch10);
- N° 3 chamber sensors (Ch9, Ch17 and Ch19) placed internally (part # S651).

The complete set of recorded data can be provided on request. In this report will be summarized only the most significant test data.

All the commitments of S.E.R.M.S. with the customer have been fulfilled and the test can be declared successfully completed for what concerns the items under S.E.R.M.S. responsibility.

REMARKS

All the functional test on the equipment are reported on the following customer document:

R1.

none

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TEST GRAPHS

All the control and environmental parameters in the TVC have been continuously monitored and recorded during the test. The UG-crate temperatures have been continuously monitored in all the locations and their values recorded during the whole test period.

In this section, the graphs summarizing the temporal evolution of all measured quantities during the whole test period are reported.

Hereby the S.E.R.M.S. guarantees that:

- the handling of the test data has been done only by qualified members of the S.E.R.M.S. staff.
- all graphs presented in this report are a truthful representation of the recorded data and have been solely produced by the S.E.R.M.S. engineer in charge of the test.

The complete set of recorded data and more detailed graphs relative to specific measurements can be provided on request.

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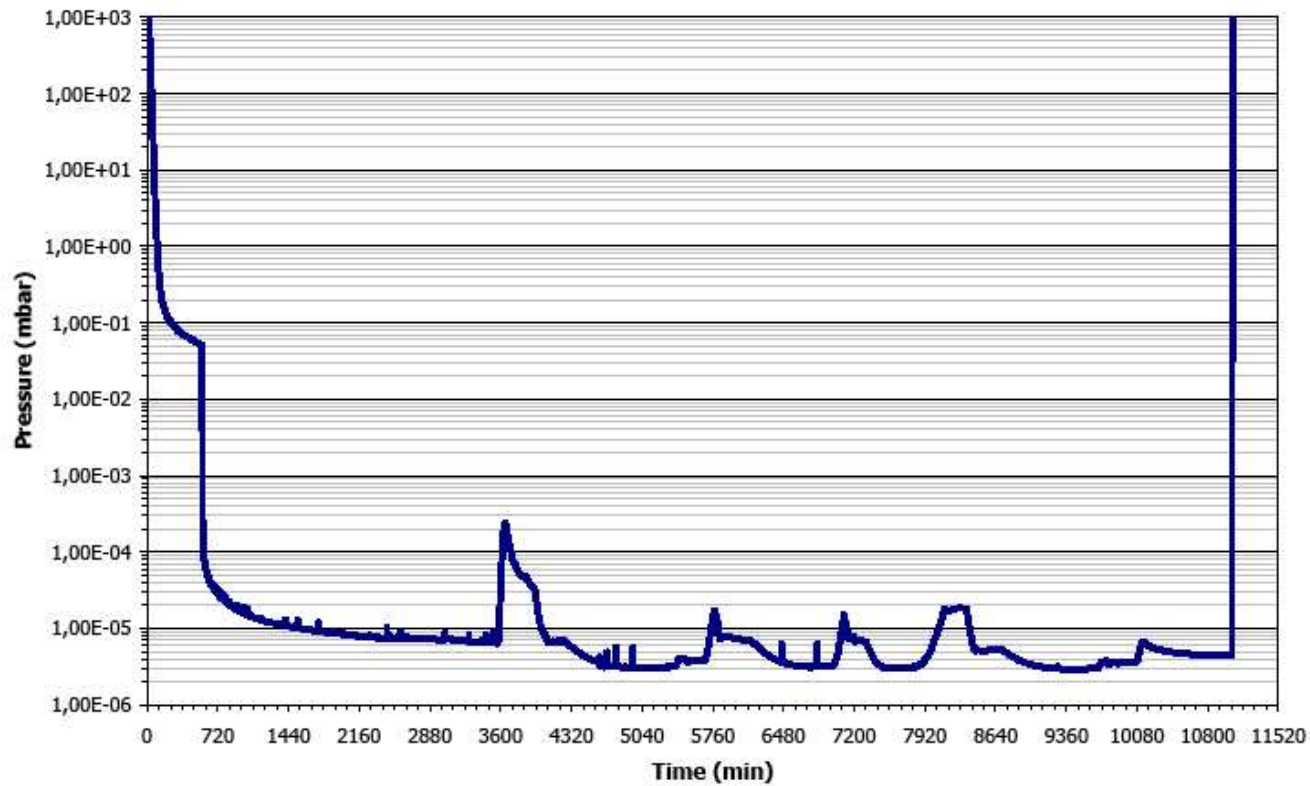
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PRESSURE PROFILE



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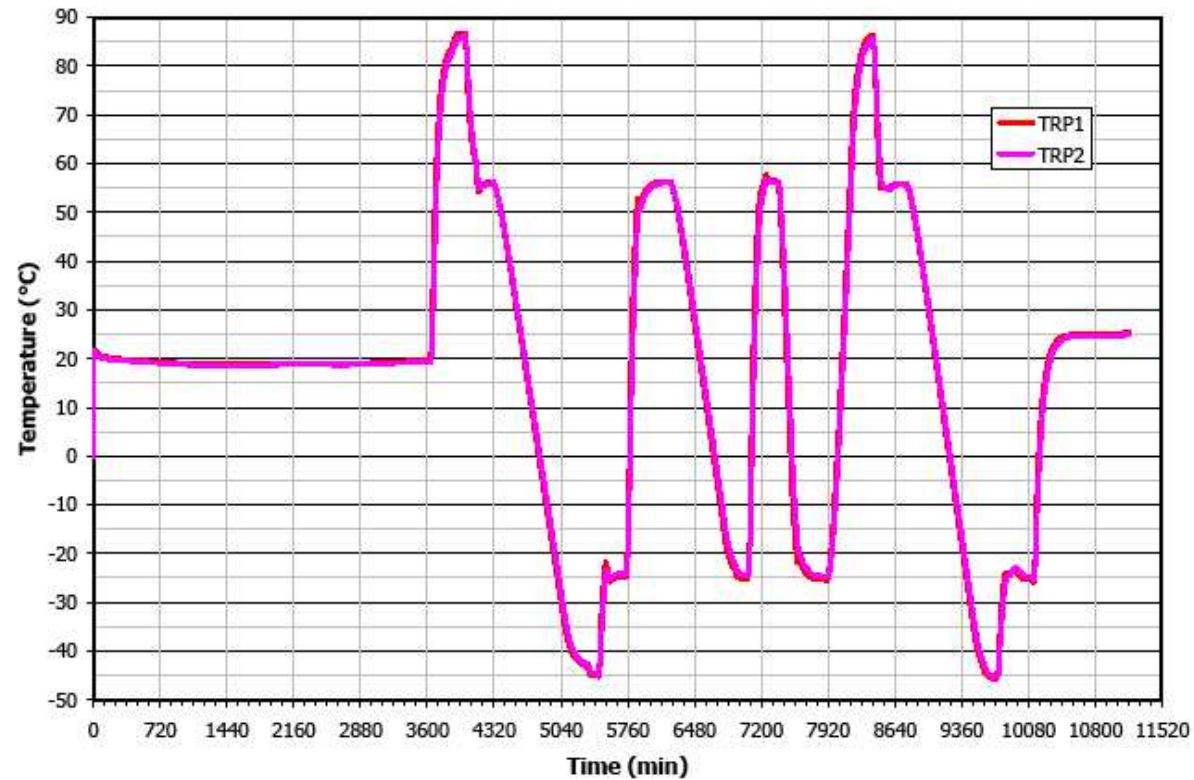
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TEMPERATURE REFERENCE POINTS (TRP) PROFILE



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INTERNAL SENSORS TEMPERATURE PROFILE

