GIADA FS MODEL

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REVISIONS LOG

REV	DOCUMENT CHANGE ORDER	DATE	CHANGES DESCRIPTION	PREPARED
0	-	15-10-2004	First issue	M. Cosi & PI Team
1	-	12-11-2004	Completely reviewed including PI comments All changes are marked with later bar	M. Cosi & PI Team

1. SCOPE AND APPLICABILITY

1.1 SCOPE

The II part of the in flight commissioning was originally composed by two tests scenario: the Interference (parts 1A and 1B) and the Pointing scenarios. The Interference scenario was started on 20 September and finished on 22 September; it was divided in two parts: Interference Part 1A, from 20 to 21 September, and Interference Part 1B, from 21 to 22 September. Following the Interference scenario, the Pointing scenario was run in two days: on 23 September and on 30 September. After the Rosetta instruments preliminary results analysis, RSOC decided to perform another Interference test in the period 12 - 13 October (Interference IIA, B and C). During Interference II C, GIADA was switched alone and MBS heating was performed.

This document reports about the Interference II part of the in-flight commissioning activities performed on GIADA experiment in the period from 12 and 13 October '04 (Interference scenario II A, B).

1.2 APPLICABILITY

This report is applicable to GIADA FS model on board the Rosetta S/C now flying @ about 74.2 x 10^6 km from the Earth (about 4 minutes of delay between the S/C and Earth in the radio link communication). The Rosetta S/C was launched from Kourou on 2 March 2004. The data were retrieved from DDS by means of the PI Workstation located @ INAF - Osservatorio Astronomico di Capodimonte in Naples.

GIADA IWS software configuration is GES 4.2.1 plus RSOConverter v1.1.1, GIADA in flight software configuration is 2.3 plus four additional patches (one to update the context file).

2. REFERENCES

2.1 APPLICABLE DOCUMENT

AD1	RO-EST-RS-3001/EID A	ROSETTA Experiment Interface Document - Part A
AD2	RO-EST-RS-3009/EIDB	ROSETTA GIADA Experiment Interface Document – Part B
AD3	RO-ESC-PL-5000 Issue 4.7 09/08/2004	Flight Control Procedure
AD4	GIA-GAL-MA-007 Issue 2	GIADA Flight Spare User Manual
AD5	RO-EST-DP-028 dated 04/08/2004	ITL Procedure for Interference scenario
AD6	GIA-GAL-RP-518 Rev 1	GIADA FS MODEL REPORT OF IN-FLIGHT INTERFERENCE SCENARIO PART 1A (20 - 21 SEPT ‘04)
AD7	GIA-GAL-RP-519 Rev 1	GIADA FS MODEL REPORT OF IN-FLIGHT INTERFERENCE SCENARIO PART 1B (21 - 22 SEPT ‘04)

2.2 REFERENCE DOCUMENT

None.

3. DEFINITIONS AND ABBREVIATIONS

3.1 ABBREVIATIONS

ACK	Acknowledge
ADC	Analogue To Digital converter
ADP	Acceptance Data Package
AFT	Abbreviated Functional Tests
AIV	Assembly, Integration and Verification
ALS	Alenia Spazio
BT	Bench Test
CCS	Central Checkout Equipment
DDS	Data Disposition System
EGSE	Electrical Ground Support Equipment
EMC	Electromagnetic Compatibility
ESA	European Space Agency
ESOC	European Spacecraft Operation Centre
FB	GIADA Frangibolt
FCP	Flight Control Procedure
FFT	Full Functional Tests
FS	Flight Spare
GA	Galileo Avionica
GDS	Grain Detection System
GIADA	Grain Impact Analyser and Dust Accumulator
GSE	Ground Support Equipment
H/W	Hardware
HK	House Keeping
I/F	InterFace
IAA	Istituto de Astrofisica de Andalucia – Granada (E)
INAF-OAC	INAF - Osservatorio Astronomico di Capodimonte – Napoli (I)
IS	Impact Sensor
IST	Integrated System Test
IWS	Instrument Workstation
KAL	Keep Alive Line
LCL	Latch Current Limiter
LFT	Limited Functional Tests
MBS	Micro Balance Sensor
MTL	Mission TimeLine
NA	Not Applicable
OBCP	On-Board Control Procedure
PI	Principal Investigator
PM	Progress Meeting
PS	GIADA Power Supply
PZT	(IS) Piezo Sensor
QM	Qualification Model
RMOC	Rosetta Mission Operation Centre

RSOC	Rosetta Science Operation Centre
RW	Reed Switch
S/C	Rosetta Spacecraft
S/S	GIADA Sub-system (e.g. IS or GDS or MBS)
S/W	Software
SIS	Spacecraft Interface Simulator
SPT	Specific Performance test
SSMM	Solid State Mass Memory on-board of Rosetta Spacecraft
STD	Standard
TBC	To Be Confirmed
TBD	To Be Defined
TC	Telecommand
TM	Telemetry
UPA	Università Parthenope – Napoli (I)
UTC	Universal Time Code

4. DESCRIPTION OF ACTIVITIES

The Interference II test was performed in the period 12 - 13 October 2004, according to the Interference scenario plan provided by ESA/ESOC (see ROS-RSSD-PO-004_d3_-_Interference_Part_2_Overview_2004Oct06). Three parts are foreseen: Interference 2A, B and C. In the Interference part 2C GIADA is switched-on to allow micro-balance heating.

This document reports the GIADA behavior during the Interference Scenario II. The GIADA PI team located in the INAF – Osservatorio di Capodimonte in Naples with the support of the ESOC people located in the RMOC room at ESOC, have started the activities on 12 Oct. 2004 at 17:01:15. A GA person supported the PI team from Galileo Avionica firm during all the period in which the S/C was on-pass from the Ground Station network.

Commands were previously loaded in the Rosetta S/C and sent to GIADA via MTL (see Section 8 for the input procedures in ITL format). The plan foresees to use the nominal FCPs, which have been already validated in the previous GIADA Commissioning (refer to Section 4.1 for the FCP list and duration). Ground Commands capability is only given in a limited period when the S/C is on-pass from the Ground Station.

4.1 FCP LIST

The following Table 1 lists all the used FCP's during the GAIDA commissioning. The absolute and relative starting time for each procedure is indicated in the Table.

Procedure Number	Notes	absolute starting time from Itl	Time from switch on
	INTERFERENCE Part 2a	12/13-October-2004	
AGDF001A, B and C	Switch GIADA on main, patch CF with default, patch SW (one patch at a time) and dump	000_17:00:00	0
AGDS035A	Go to COVER	000_17:30:00	0^h30^m
AGDS090A	Cover opening OBCP [arm cover, open cover with heaters 5+6+4 on]	000_17:31:00	0^h31^m
AGDS065A	Go to SAFE	000_17:41:00	0^h41^m
AGDS110A	Go to NORMAL and enable Science TM	000_17:42:00	0^h42^m
AGDS038A	Set GDS L and R Thresholds	000_17:44:00	0^h44^m
AGDS037A	Set IS Off	000_17:44:30	$0h44^m30^s$
AGDS036A	Set IS Status	000_17:45:00	$0h45^m$
AGDS037A	Set IS On	000_17:45:30	$0h45^m30^s$
AGDS120A	Calibrate GDS, IS and MBS - Several times, every 5 minutes until 13-October @ 001_06:00:00	000_17:46:00	$0h46^m$
AGDS065A	Go to SAFE	001_06:00:00	13^h00^m
AGDF060A	Go to SAFE, dump memory CF, switch off OBCP [close cover OBCP with heaters 6+4 on, go to SAFE, Report context, Reset VD .... switch off]	001_06:01:00	13^h01^m
AGDF002A, B and C	Switch GIADA on redundant, patch CF with default, patch SW (one patch at a time) and dump	001_06:16:00	13^h16^m
AGDS035A	Go to COVER	001_06:36:00	130^h36^m
AGDS090A	Cover opening OBCP [arm cover, open cover with heaters 5+6+4 on]	001_06:37:00	13^h37^m
AGDS065A	Go to SAFE	001_06:47:00	13^h47^m
AGDS110A	Go to NORMAL and enable Science TM	001_06:48:00	13^h48^m
AGDS038A	Set GDS L and R Thresholds	001_06:50:00	13^h50^m
AGDS037A	Set IS Off	001_06:50:30	$13h50^m30^s$
AGDS036A	Set IS Status	001_06:51:00	13^h51^m
AGDS037A	Set IS On	001_06:51:30	$13h51^m30^s$
AGDS120A	Calibrate GDS, IS and MBS - Several times, every 5 minutes until 13-October @ 001_08:40:00	001_06:52:00	13^h52^m
AGDS065A	Go to SAFE	001_08:40:00	15^h40^m
AGDF060A	Go to SAFE, dump memory CF, switch off OBCP [close cover OBCP with heaters 6+4 on, go to SAFE, Report context, Reset VD .... switch off]	001_08:41:00	15^h41^m
	INTERFERENCE Part 2b		
AGDF001A, B and C	Switch GIADA on main, patch CF with default, patch SW (one patch at a time) and dump	001_17:00:00	0
AGDS035A	Go to COVER	001_17:30:00	0^h30^m

Procedure Number	Notes	absolute starting time from Itl	Time from switch on
AGDS090A	Cover opening OBCP [arm cover, open cover with heaters 5+6+4 on]	001_17:31:00	0^h31^m
AGDS065A	Go to SAFE	001_17:41:00	0^h41^m
AGDS110A	Go to NORMAL and enable Science TM	001_17:42:00	0^h42^m
AGDS038A	Set GDS L and R Thresholds	001_17:44:00	0^h44^m
AGDS037A	Set IS Off	001_17:44:30	$0^h44^m30^s$
AGDS036A	Set IS Status	001_17:45:00	0^h45^m
AGDS037A	Set IS On	001_17:45:30	$0^h45^m30^s$
AGDS120A	Calibrate GDS, IS and MB - Several times, every 5 minutes until 001_18:30:00	001_17:46:00	0^h46^m
AGDS065A	Go to SAFE	001_18:30:00	1^h30^m
AGDF060A	Go to SAFE, dump memory CF, switch off OBCP [close cover OBCP with heaters 6+4 on, go to SAFE, Report context, Reset VD .... switch off]	001_18:31:00	1^h31^m
	INTERFERENCE Part 2c	14-October-2004	
AGDF001A, B and C	Switch GIADA on main, patch CF with default, patch SW (one patch at a time) and dump	002_07:30:00	0
AGDS035A	Go to COVER	002_08:00:00	0^h30^m
AGDS090A	Cover opening OBCP [arm cover, open cover with heaters 5+6+4 on]	002_08:01:00	0^h31^m
AGDS065A	Go to SAFE	002_08:11:00	0^h41^m
AGDS110A	Go to NORMAL and enable Science TM	002_08:12:00	0^h42^m
AGDS038A	Set GDS L and R Thresholds	002_08:14:00	0^h44^m
AGDS037A	Set IS Off	002_08:14:30	$0^h44^m30^s$
AGDS036A	Set IS Status	002_08:15:00	0^h45^m
AGDS037A	Set IS On	002_08:15:30	$0^h45^m30^s$
AGDS120A	Calibrate GDS, IS and MBS - Several times, every 5 minutes until 002_09:00:00	002_08:16:00	0^h46^m
AGDS055A	Heat all MBSs	002_09:00:00	1^h30^m
AGDS065A	Go to SAFE	002_10:10:00	2^h40^m
AGDS110A	Go to NORMAL and enable Science TM	002_10:11:00	2^h41^m
AGDS038A	Set GDS L and R Thresholds	002_10:13:00	2^h43^m
AGDS037A	Set IS Off	002_10:13:30	$2^h43^m30^s$
AGDS036A	Set IS Status	002_10:14:00	2^h44^m
AGDS037A	Set IS On	002_10:14:30	$2^h44^m30^s$
AGDS120A	Calibrate GDS, IS and MBS - Several times, every 5 minutes until 002_10:59:00	002_10:15:00	2^h45^m
AGDS065A	Go to SAFE	002_10:59:00	3^h29^m
AGDF060A	Go to SAFE, dump memory CF, switch off OBCP [close cover OBCP with heaters 6+4 on, go to SAFE, Report context, Reset VD .... switch off]	002_11:00:00	3^h30^m
END of Interference 2			

Table 1 GIADA Flight Control Procedure (for Interference scenario II)

5. INTERFERENCE SCENARIO IIA TEST REPORT

5.1 INTERFERENCE SCENARIO IIA (12/10/04 TO 13/10/04 - MAIN)

5.1.1 Activities log

The following activities have been performed in sequence by preloaded command timeline sequence.

UTC	Description
12 Oct 2004 - 17:01	Beginning of activity – GIADA power on
13 Oct 2004 - 17:30	Cover open operation
13 Oct 2004 - 17:41	Go to Normal mode (science enabled)
13 Oct 2004 - 17:44:30	GDS Left receiver threshold changed – IS channel E gain/threshold changed
13 Oct 2004 – 06:00	Go to Safe – Science disabled
13 Oct 2004 – 06:01	GIADA Switch-off (with automatic Cover close operation incorporated in the Power-off OBCP)

GIADA was switch-on on the Main I/F and with the Context File stored in SSMM. The Instrument Main I/F was successfully powered-on by means of the GIADA POWER-ON OBCP the 12th of October 2004 @ 17:01 (UTC time), which corresponds to a SCET Time of about 56221258sec.

The first expected packet (Connection Report, service 17,2) was late received because the DDS has marked it with a wrong UTC time being unsynchronised time tag (bad time quality) TM report. In fact, it has been marked with a DDS time 1 hours and 15 minutes after the power-on:

Tue Oct 12 2004 18:18:38.939890
TM Packet Received from GIADA:
APID = 90, 7 (EVENT)
Source Sequence Count: 0
Packet Length: 9
SCET Time: 2147483685.933594 sec.
Packet Type, Subtype: 17, 2

0D A7 C0 00 00 09 80 00 00 25 EF 00 40 11 02 00
==========

The second expected packet (i.e. 'GIADA in Safe mode' Event Report) was received as first TM report in the test. GIADA was correctly time synchronised. After the GIADA in Safe Mode event, the first HK report was correctly received @ default HK rate of 40s.

Afterwards, the first patch (regarding the Context File) was sent, as well as the other required software patches that were, as expected, divided in six memory load commands. All commands were nominally received, **but the memory dumps** (expected number of Memory dump file to be received on-ground is 24) **were not received or most probably they were not correctly retrieved from the DDS system**. As result of the Context File patch, GIADA HK rate was changed to 10s rate. GIADA remained in Safe mode until 17:30 (UTC time).

The next step was to open the cover. The operation was successfully completed @ 17:36 (UTC Time) when the Cover Report was received. Then, GIADA was sent to Normal Mode @ 17:41 (UTC Time). The Lasers were switched-on by the Laser_power_on_OBCP, upon the reception of the 'Start Switch Lasers ON OBCP' event. Science was enabled @ 17:43 (UTC Time) and after about one and half minute the GDS Left receiver threshold was changed from 0.8V to 1.24V (this was decide to avoid flood of 'Ghost events' and possible saturation of the SSMM memory allocated to the experiment). Furthermore, the IS sensor was switched-off and the Gain and Threshold of Channel E changed from Low to High and from 50mV to 100mV, respectively. Finally IS sensor was switched-on again. The nominal Normal mode (all sensors switched-on) was resumed @ 17:46 and the internal calibration of GDS, IS and MBS sub-systems was periodically performed every 5 minutes to check the instrument behaviour.

Except for the mentioned Memory Dump (total 25 packets), no packets were lost, neither HK and Acknowledge reports nor science TM, since having increased the GDS left channel thresholds the SSMM memory (allocated to GIADA) resulted not saturated.

As expected, GIADA was commanded in Safe mode @ 06:00 (UTC Time) of 13th of October. Then the experiment power-off (GIADA power-off OBCP) was started. The 'Go to Safe' command was discarded, as expected, since the experiment was already in Safe mode:

Wed Oct 13 2004 06:00:59.484888
TM Packet Received from GIADA:
APID = 90, 1 (ACKNOWLEDGE)
Source Sequence Count: 968
Packet Length: 21
SCET Time: 56268042.312500 sec.
Packet Type, Subtype: 1, 2

0D A1 C3 C8 00 15 03 5A 95 0A 50 00 40 01 02 00 1D AC CE 7E 00 05 C4 01 00 00 00 00
==========
Wed Oct 13 2004 06:00:59.484888
TC APID = 1452, TC SSC = 3710;
Command cannot be executed in the actual operation mode (TC Packet Type/Subtype = 196,1 - Safe).
==========

The cover was closed (with heaters Cover and Motor Heaters Off) within the GIADA power-off OBCP. The Instrument was switched-off @ about 06:09 of the 13 Oct. 2004 (UTC Time).

5.1.2 Housekeeping data analysis

The following figures have been taken from the HK database.

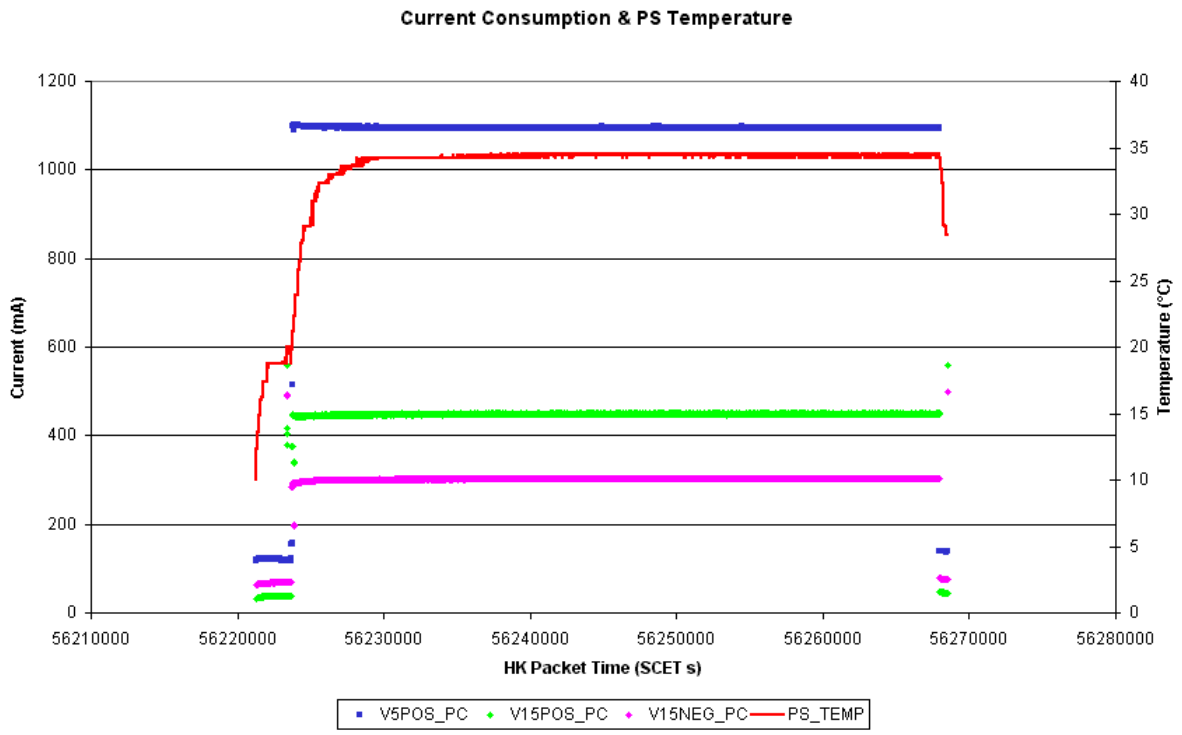

Figure 1 +5V and ±15V Currents

The current consumption and the Power Supply temperature (Figure 1) are in the expected range. The current consumption measured in Normal mode when the PS temperature is stable (about 34.5 °C) for +5V, +15V and –15V is about 1095mA, 450mA and 300mA, respectively.

The Instrument cover was successfully opened and closed at due time. In Figure 7, it is shown the status of two reed-switches, that indicate the close and open position of the cover. As indicated, the status of the 'close position' reed switch is not activated at all, while the status of the other reed switch shows properly when the cover is open. This situation is nominal, since both the following conditions are meet: when the cover reaches its closed position the reed switch is still not active (the switch is active only for few steps before the close position is reached) and the cover closure is performed in a time shorter than the sampling rate of HK telemetry, i.e. 10s (thus the above transitions cannot be seen in the HK TM report). The complete monitoring of the two switches is done in the Cover Reports, which are shown in Section 5.1.2.1.

The Power Supply temperature increases from 10°C (@ power-on) up to 35°C when GIADA is in Normal mode and the maximum power is drawn (see Figure 2). The IS temperature reaches about 15°C when GIADA is in Normal mode and the cover is open. As already detected, when the lasers are switched on, the IS temperature becomes noisy (data are spread within 3°C) with respect to the case of GIADA in safe mode.

The Lasers were properly switched-on and their temperatures (Figure 4) increased from 8°C to 15°C. As expected, the light of each laser decreases when the temperature rises.

The Dust Flux indication is greater than 0 (see Figure 6) even after 1 minute from IS switch-on. As understood on ground ,few IS ghost events can be observed at IS switch-on. The reason of the unexpected events is that the **channel E has detected few 'Ghost events'**, due to its internal noise level when Gain is High (remarks: in the previous Interference Part 1A and Part 1B, we never observed that, since E channel Gain was set to Low).

The five MBS, after switch-on, show a temperature between 10 and 20°C (see Figure 5). The Figure 9 and Figure 10 indicate the values in Volt of the IS and GDS detection thresholds and the time when they were changed.

No packets have been missed in the TM (see Figure 8**).**

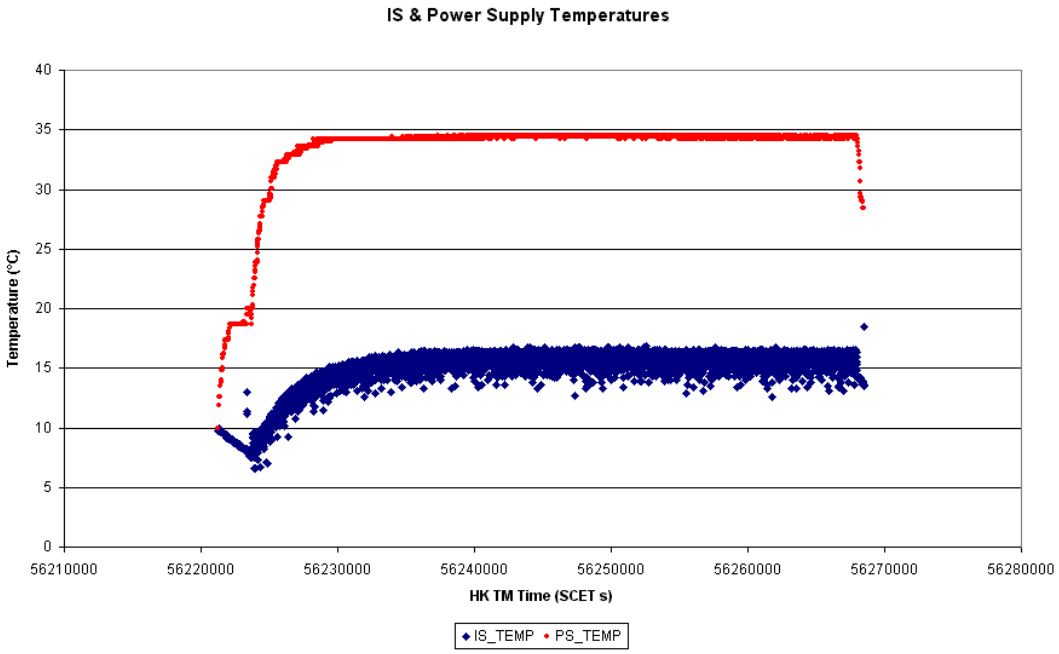

Figure 2 IS & PS Temperatures

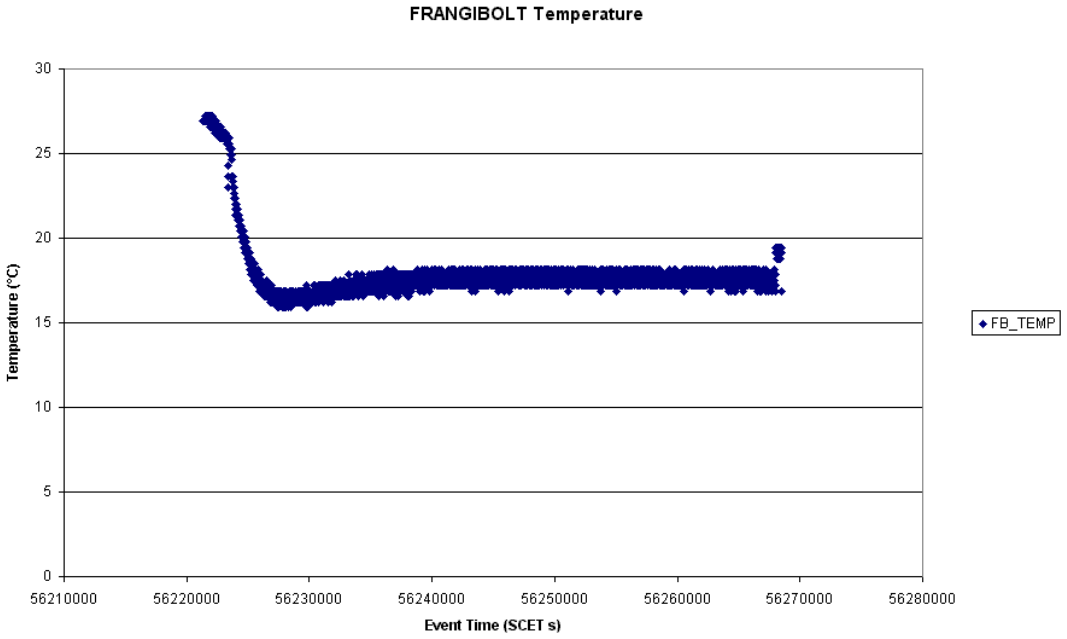

Figure 3 Frangibolt Temperature

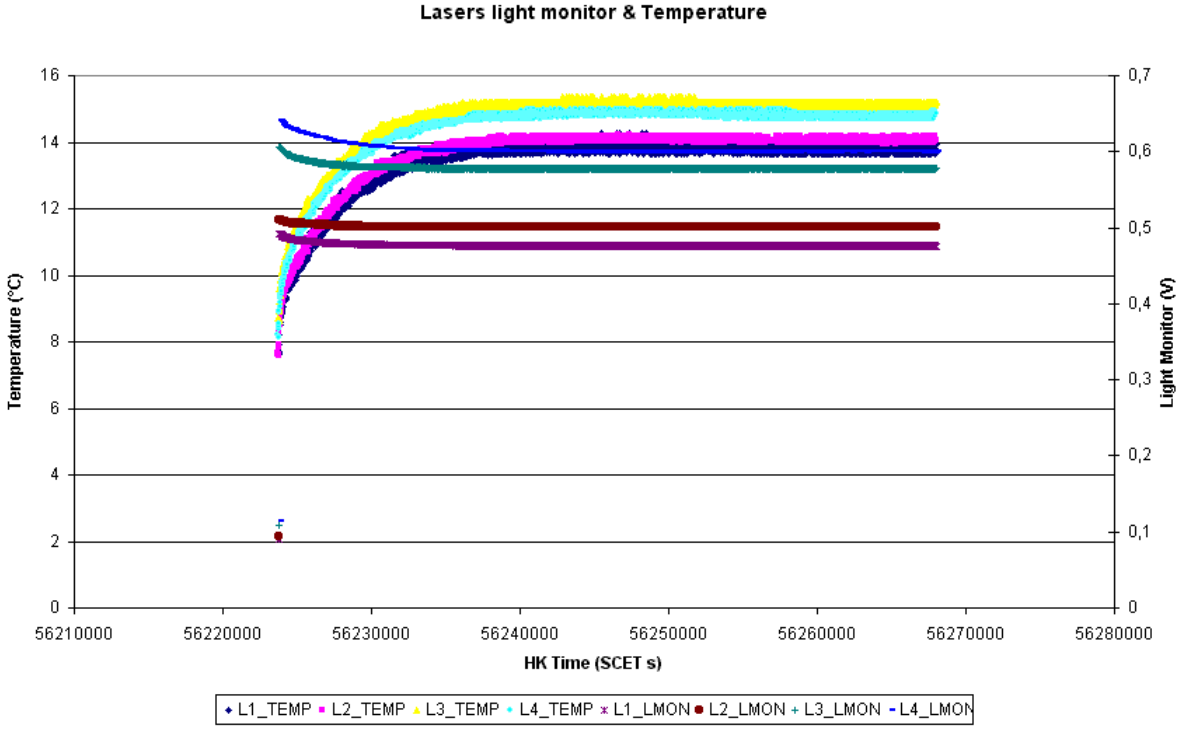

Figure 4 Laser Light monitor and temperatures

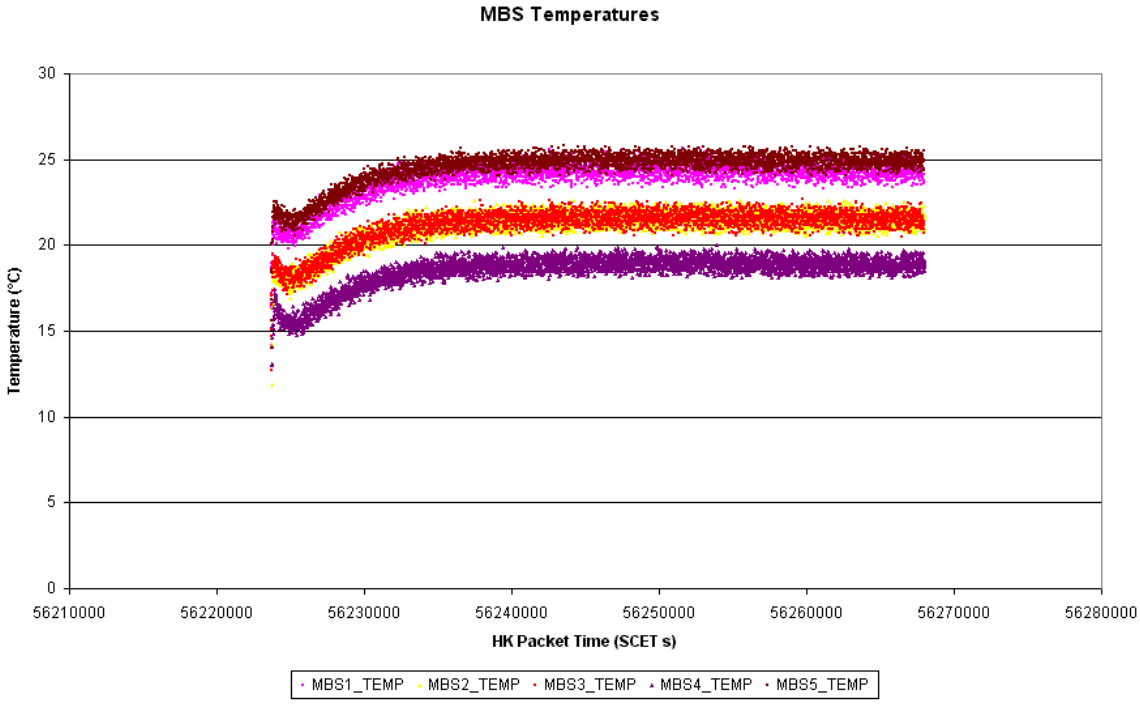

Figure 5 MBS Temperature

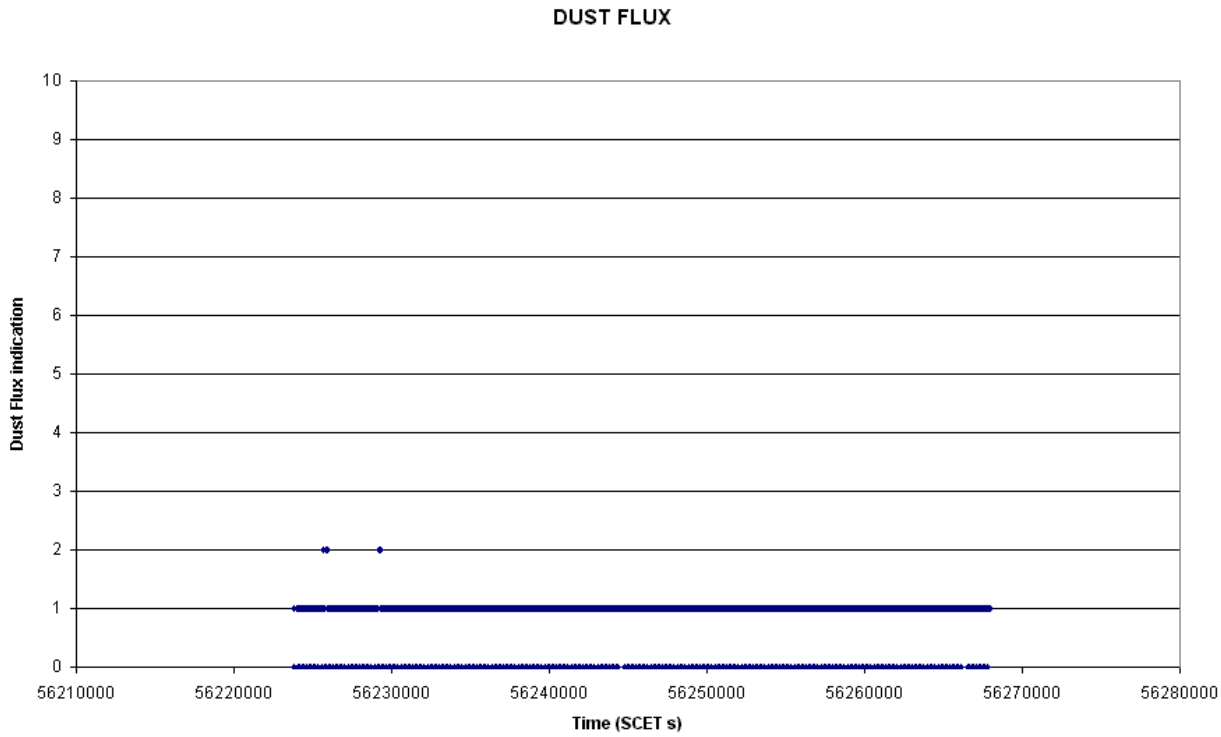

Figure 6 Dust-Flux Monitor (valid only when the IS sub-system is ON)

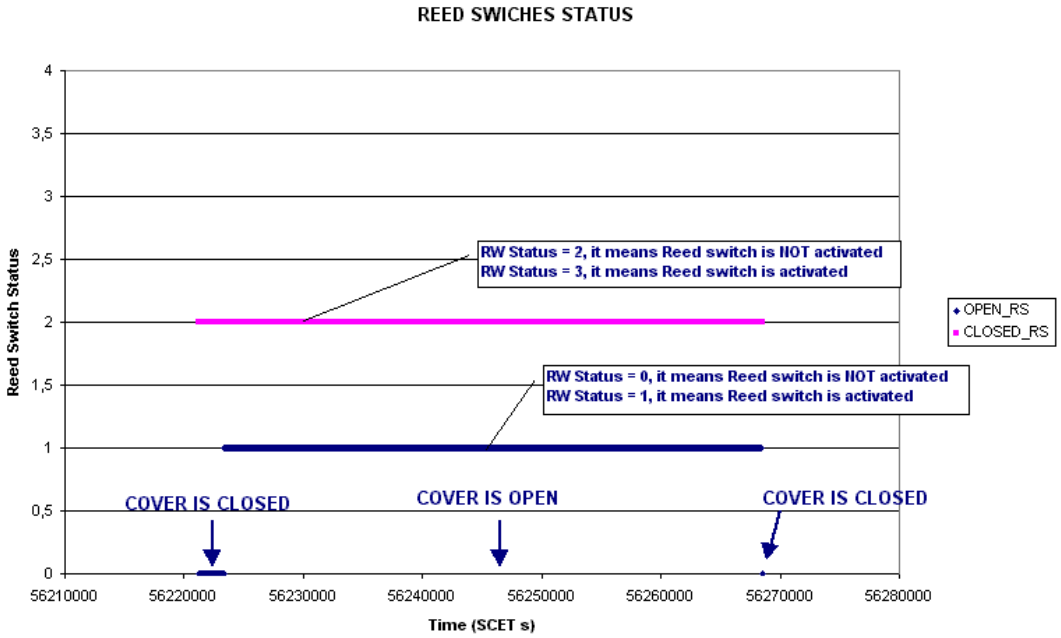

Figure 7 Cover Reed Switch Status (Cover open & close operations)

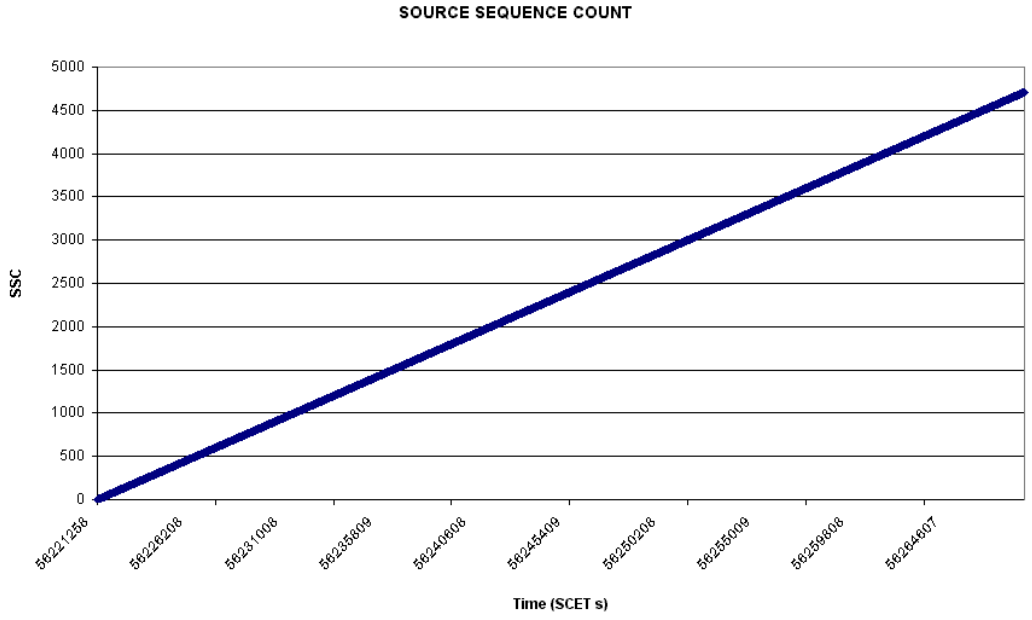

Figure 8 SSC of HK TM

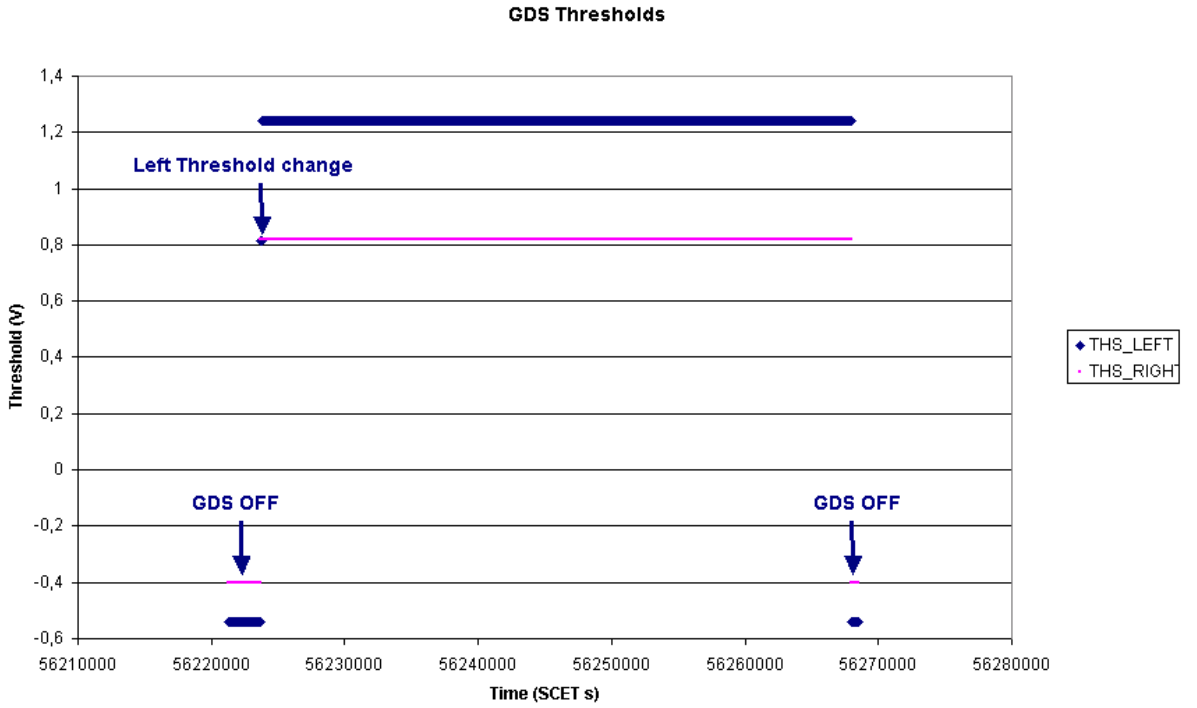

Figure 9 GDS Detection threshold change

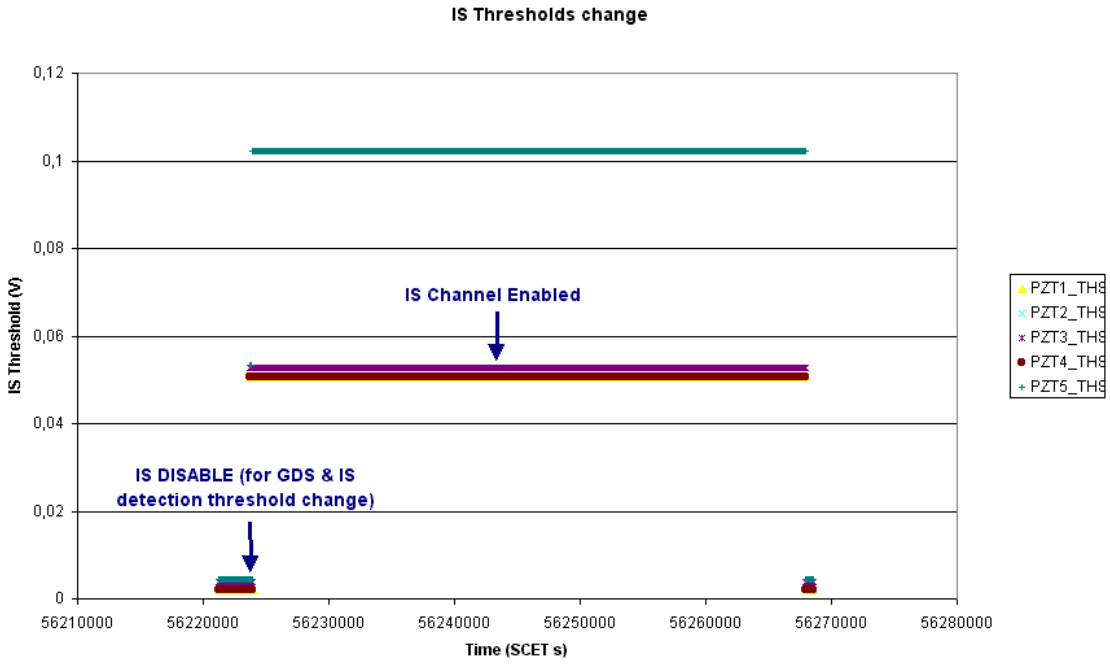

Figure 10 IS Detection threshold change

5.1.2.1 Cover open & close operations

After the cover open operation, the cover resulted completely open, as shown in Figure 11, in which the status of the two reed-switches is reported. The figure is extracted from the cover report, which is received on-ground at the completion of the operation (@SCET time 56223376s, corresponding to 17:36:40 UTC Time of the 12 Oct 2004). The correct behaviour is when the sequence of the following conditions appears:

- The reed switch that indicates the Cover-Close position (named RW_CLOSE) starts not activated, and then it is temporarily activated after the start of opening operation and for a short number of steps (expected value: 29-30 steps).
- The reed switch that indicates the Cover-Open position (named RW_OPEN) is activated after 124-125 steps and remains permanently in this status.

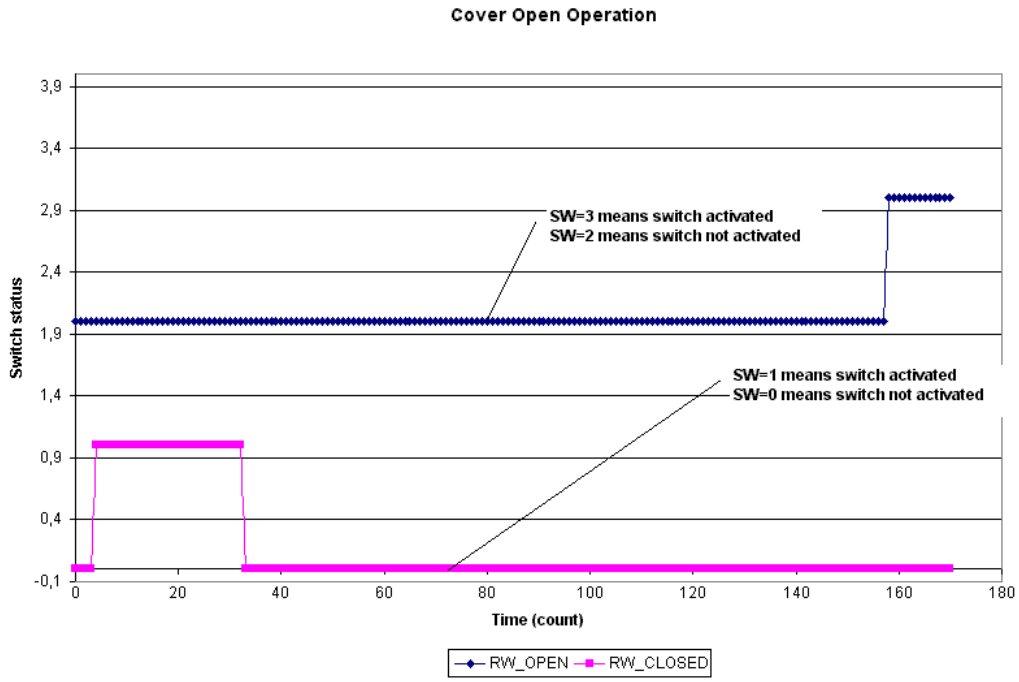

Figure 11 Reed switches status during the Cover Open operation

At GIADA power-off, the GIADA cover was automatically closed by the OBCP (Close Cover). The cover was successfully closed @ SCET time of 56268472s, corresponding to 06:08:15 UTC time of the 13 Oct 2004. Figure 12 reports the correct sequence of the two reed-switches. As expected:

- The reed switch that indicates the Cover-Open position (named RW_OPEN) is activated for a small number of steps (about 15 steps) and then remains not active for all remaining movement.

- The reed switch that indicates the Cover-Close position (named RW_CLOSE) is activated after 126 steps for 29 steps and finally reaches the not-activated status that means the cover is in the closed position.

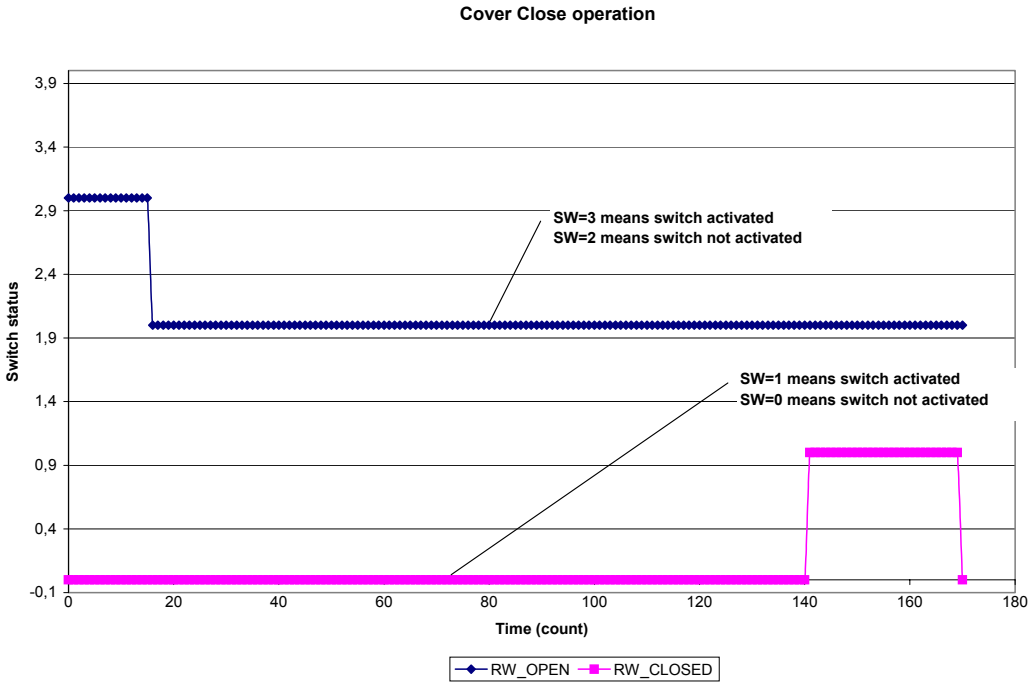

Figure 12 Reed switches Status during Cover Close operation

5.1.3 Engineering evaluation on sensor data

No science TM packets were lost and **the SSMM memory allocated to GIADA (1 Mbytes) was not saturated.** The Figure 13 shows the Source Sequence Count of TM packets when GIADA is in Normal mode and the science TM is enabled. After the lasers were switched on and successfully change of the detection threshold on the GDS Left receiver, few GDS 'Ghost detections' on both receivers were observed since the thresholds resulted above the level of the internal stray-light (background noise) plus the electronic noise.

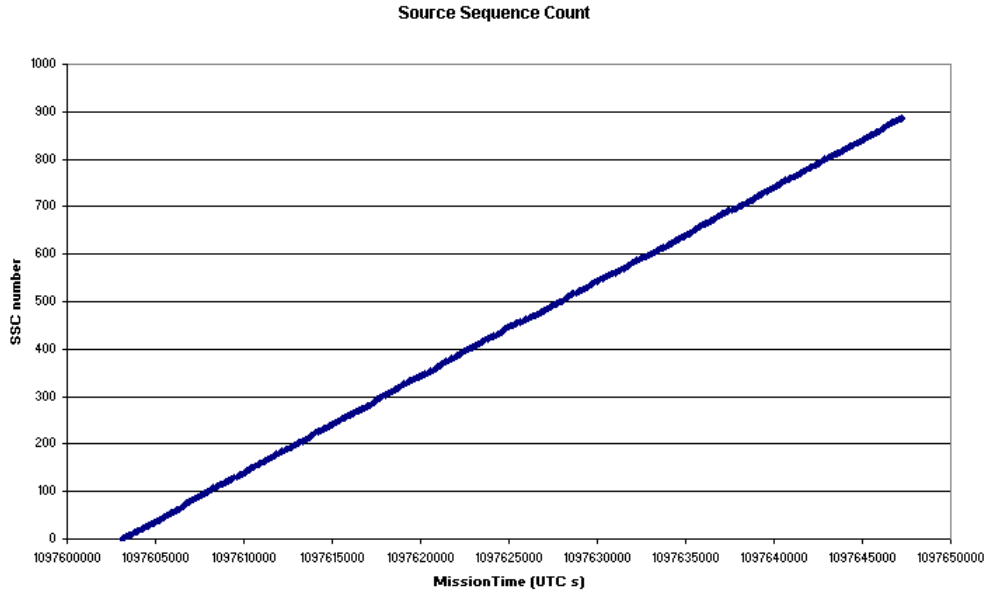

Figure 13 Science TM packet Source Sequence Count

5.1.3.1 IS Sub-system

After the sub-system power on, the detection thresholds of each channel were set to 50 mV (Context file updated via memory load command). One minute after, by the proper commands sequence, the Gain and detection Threshold of Channel E were changed to High (final configuration is shown in Table 2) and to 100mV, respectively.

RANGE	GAIN				
	PZTA	PZTB	PZTC	PZTD	PZTE
Low	High	High	High	High	High

Table 2 IS Range/Gain configuration

When in Normal mode, the IS calibration run until the end of the test every 5 minutes. Some IS science 'Ghost' detections (556 in total, in a period of about 12 hours, i.e. about 1 ghost event every minute) were obtained: one on Channel D, 3 on Channel C and 552 on Channel E. As shown in the Figure 14 and in the zoom in Figure 15, few of those detections may be related to IS calibration events, while others seem due to noise on Channel E, which resulted higher then the one found on ground. For the future, **to reduce 'Ghost detections' it is required to increase Channel E detection threshold from 100mV (found during on-ground campaign) to (minimum) 150mV, when the gain is set to High.**

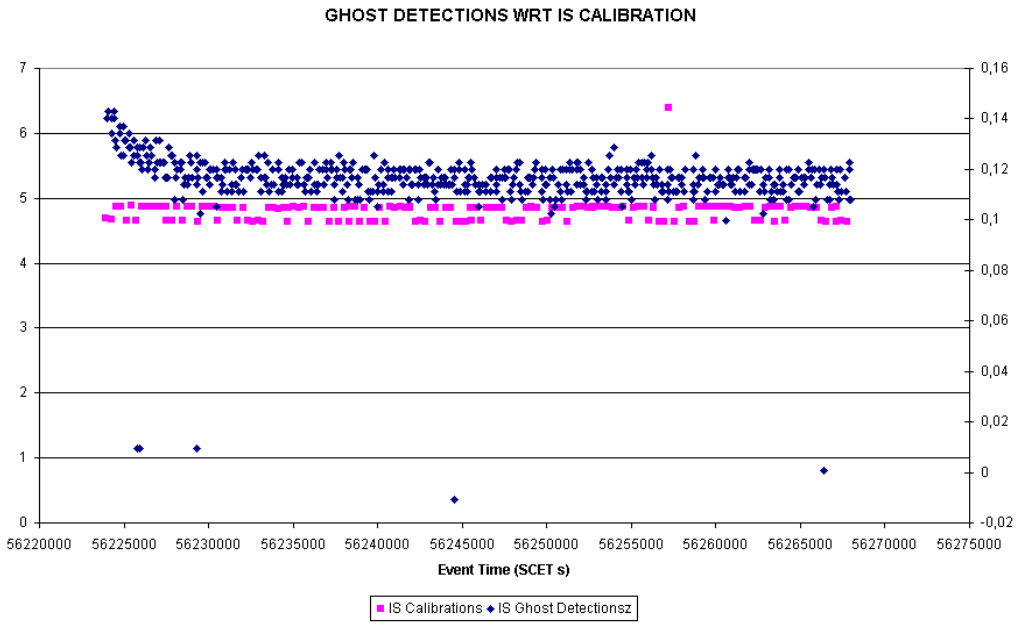

Figure 14 IS Ghost detections wrt IS Calibration

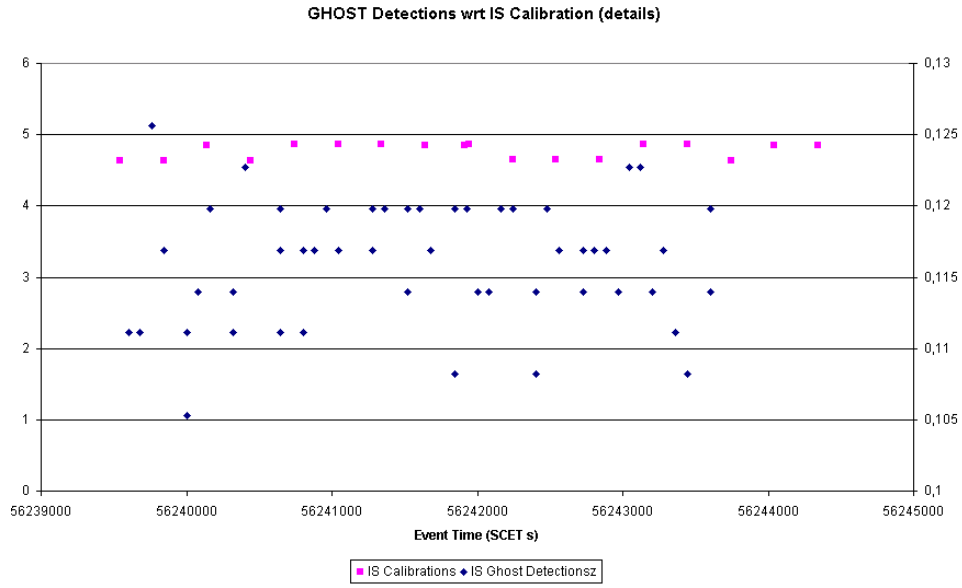

Figure 15 Part of IS Ghost detections wrt IS Calibration

The Table 3 shows the minimum, maximum of mean and the standard deviation of each channels output before the start of the IS calibration.

Type	PZTA		PZTB		PZTC		PZTD		PZTE	
	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Maximum	-0,0049	0,0638	-0,0049	0,0667	-0,002	0,067	-0,008	0,064	-0,008	0,064
Minimum	-0,0136	0	-0,0107	0	-0,002	0,023	-0,014	0	-0,014	0
Average	-0,009	-	-0,009	-	-0,002	-	-0,011	-	-0,012	-

Table 3 IS Calibration – Max, Min & Average of the mean and STD Dev of channel outputs

As we can see, all channel have a low mean value (negative value means channel output close to 0 V) and a noise level (@ 3σ) close to or little above the detection thresholds. The noise levels are compatible with those measured during on-ground test campaign and in the previous Commissioning tests.

Figure 16 to Figure 24 show the results of the IS internal calibrations. According to the section 5.2.2.1 of **AD4**, only the 2nd and 4th stimuli are meaningful.

- Channel-A response is quite consistent (i.e. the same amplitude) along the period of seven hours of calibration, except for four calibrations where the amplitudes have resulted 1V less than the nominal value (about 8.5V). The measured amplitudes slightly depend on the temperature (refer to Figure 25): it decreases when the temperature increases (variation < 100mV for 10°C of temperature change) and remains stable when the temperature becomes stable (variation < 20mV).

- Channel-B response is quite consistent (i.e. the same amplitude) along the seven hours of calibration, except for one calibration, where the amplitude and delay time have resulted about 7 V above the nominal value (about 7.75V) and 20µsec above the nominal value. The amplitude seems slight increasing when temperature increases of about 10°C (refer to Figure 26) and remains almost stable when the temperature is stable. The variations result less then 20 mV.
- **Channel-C response is confirmed not stable** along the different calibrations (refer to the voltage/delay time measurements of 2nd and 4th stimuli) and with respect to the temperature change (refer to Figure 27). **It is suggested to increase channel C detection threshold** (e.g. 100/150mV) and compare the obtained results. Since the Channel C seems noisy, a higher threshold keeps the channel detection less susceptible to noise.
- Channel-D response results quite consistent (i.e. the same amplitude) along the seven hours of calibration, except for three calibrations, where the relevant detections result as 'Not detected' (i.e. channel response has passed the threshold by timeout mechanism). The measured amplitudes seem slight increasing when temperature increases (refer to Figure 28 - variation is less then 30 - 40 mV within 10 °C of temperature change) and remains almost stable when the temperature is stable (variations are less then 20 mV).
- Channel-E response results quite consistent along the seven hours of calibration. The measured amplitudes (refer to Figure 29) decreases rapidly and reaches a minimum and then increases and becomes almost stable when the temperature is stable (the amplitude variation is < 80mV within 10 °C of temperature change).

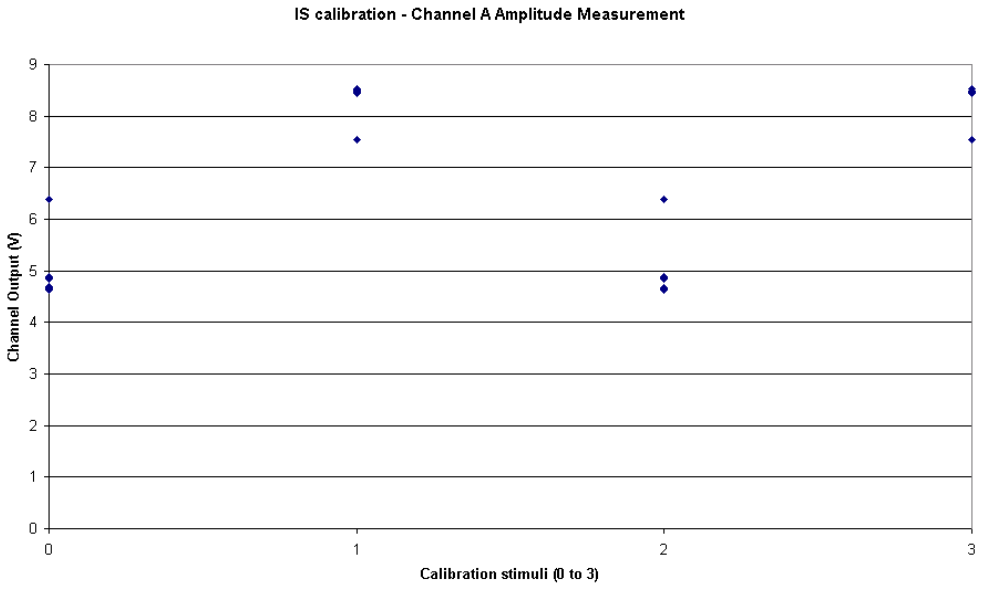

Figure 16 IS Calibration - Channel A Amplitude

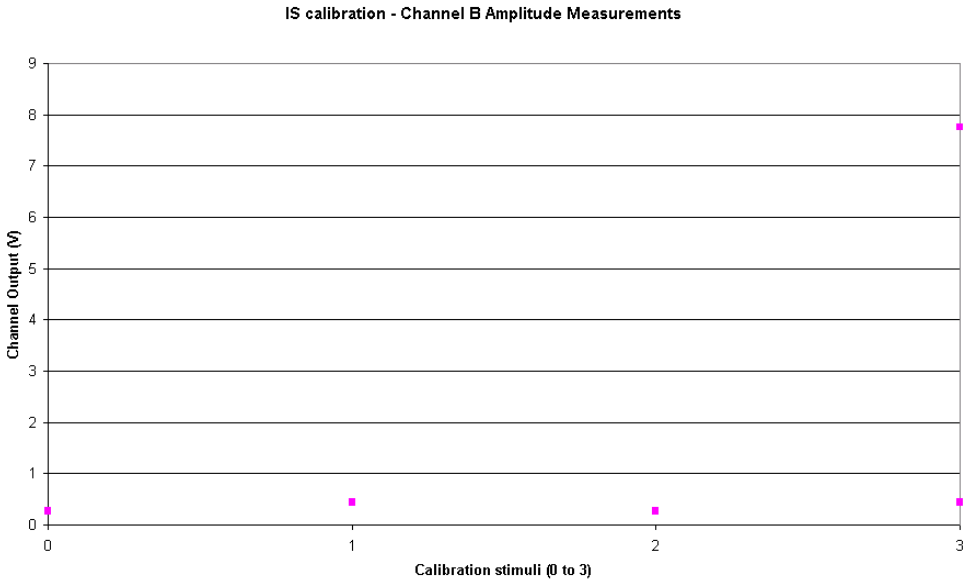

Figure 17 IS Calibration - Channel B Amplitude

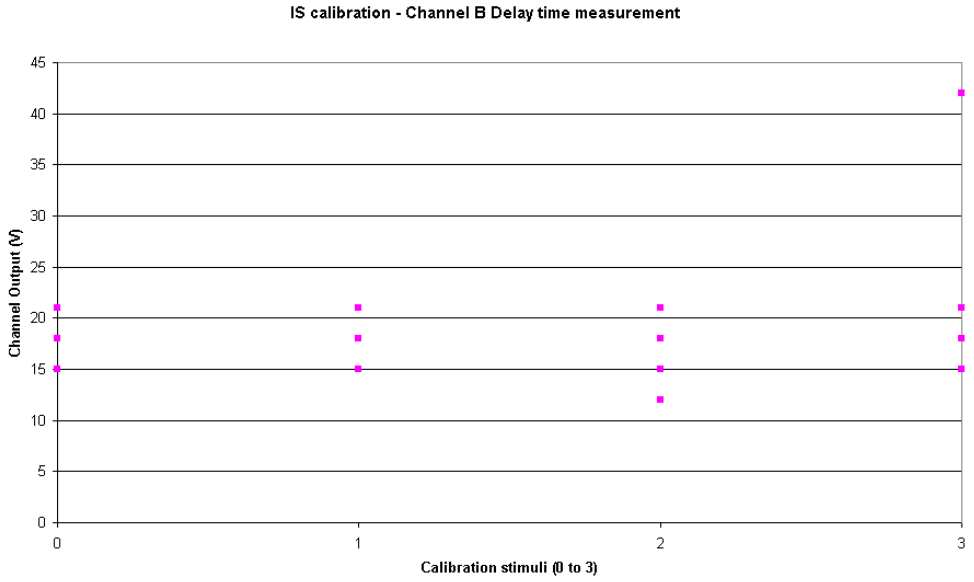

Figure 18 IS Calibration - Channel B Delay Time

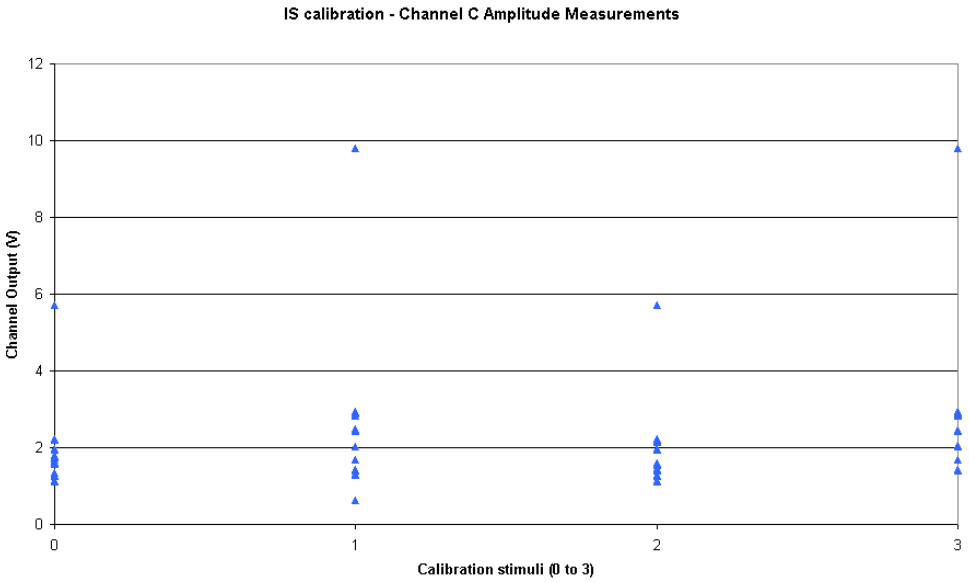

Figure 19 IS Calibration - Channel C Amplitude

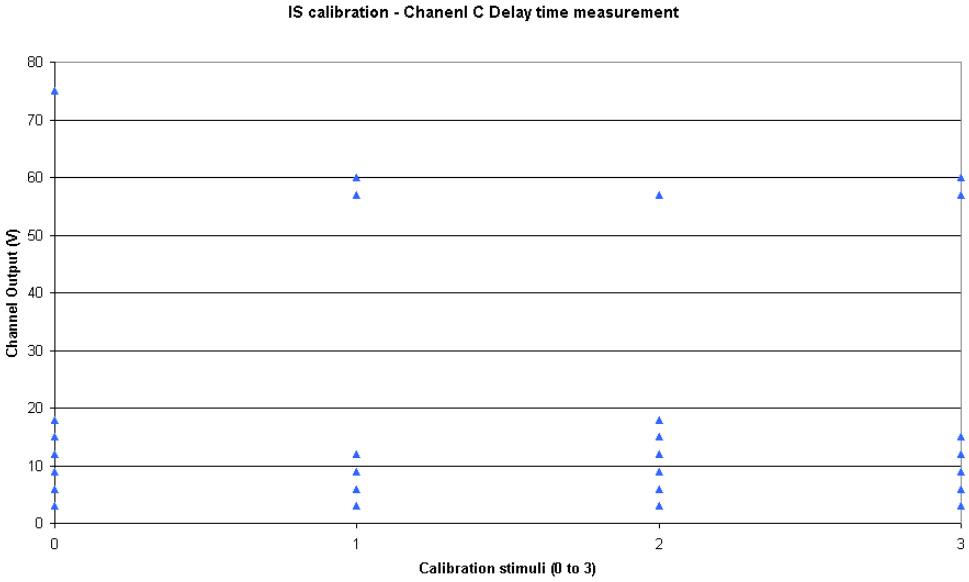

Figure 20 IS Calibration - Channel C Delay Time

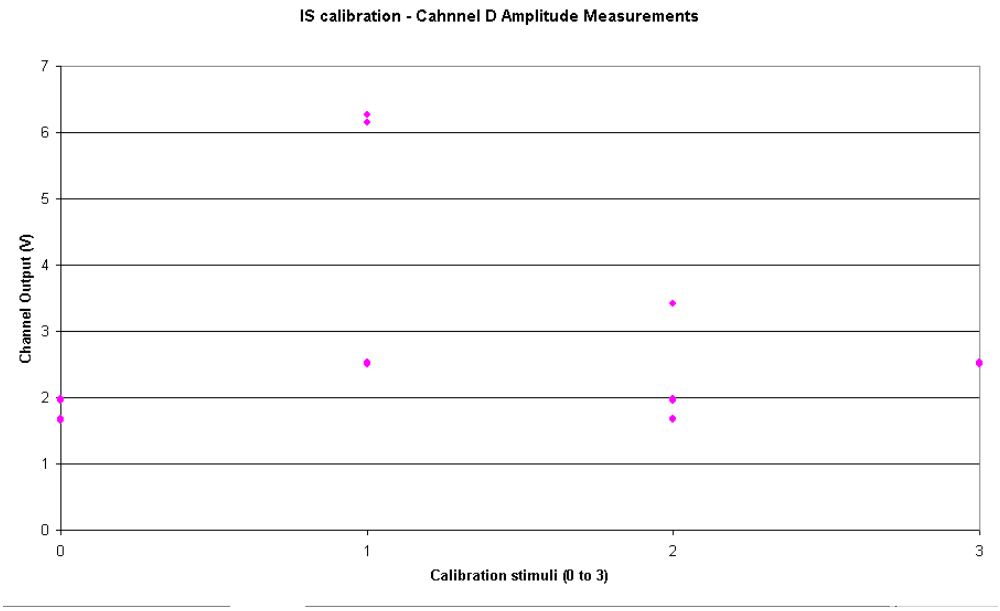

Figure 21 IS Calibration - Channel D Amplitude

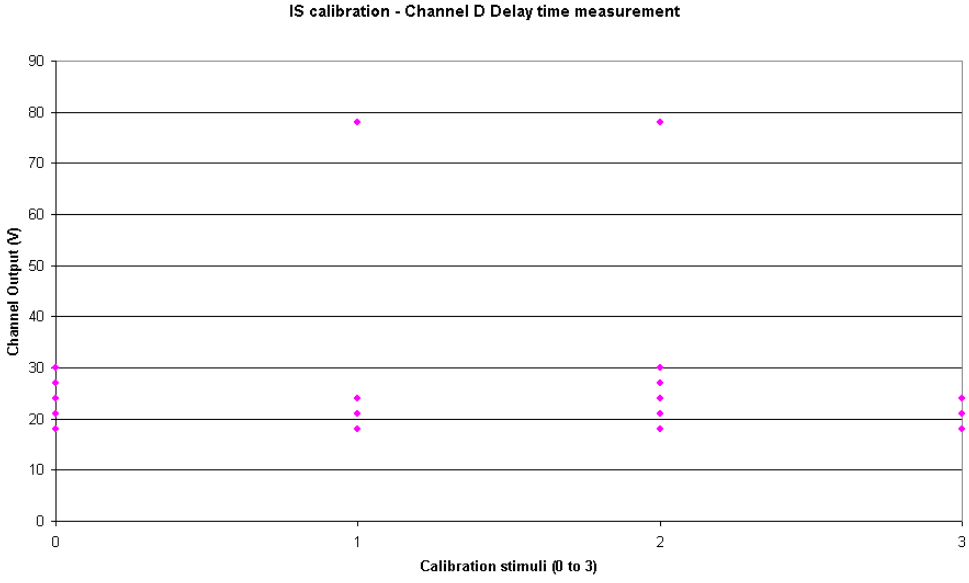

Figure 22 IS Calibration - Channel D Delay Time

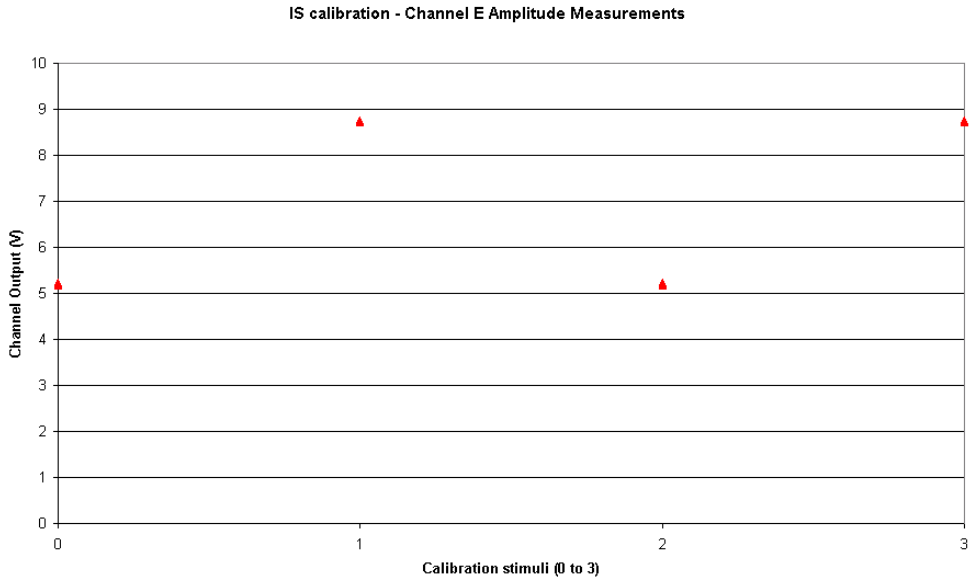

Figure 23 IS Calibration - Channel E Amplitude

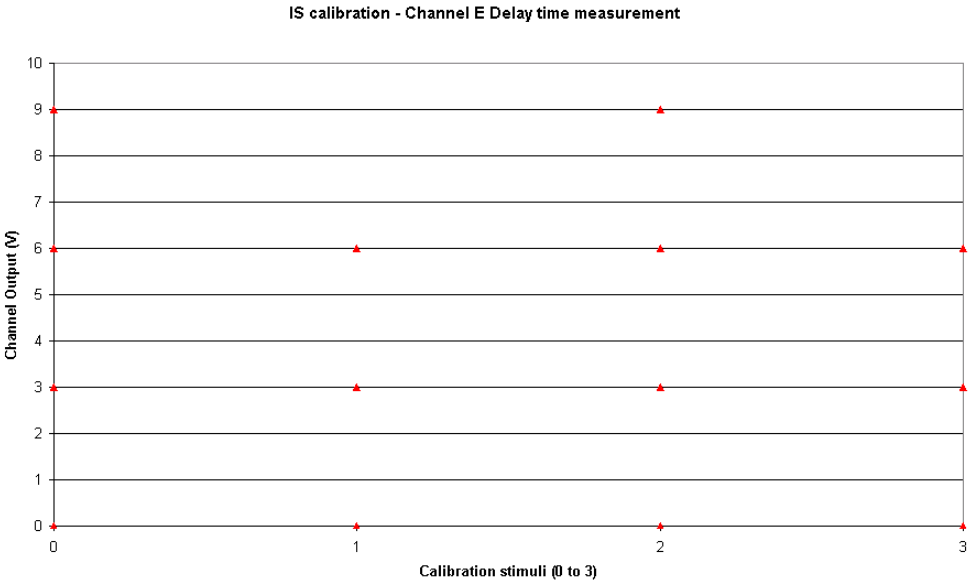

Figure 24 IS Calibration - Channel E Delay Time

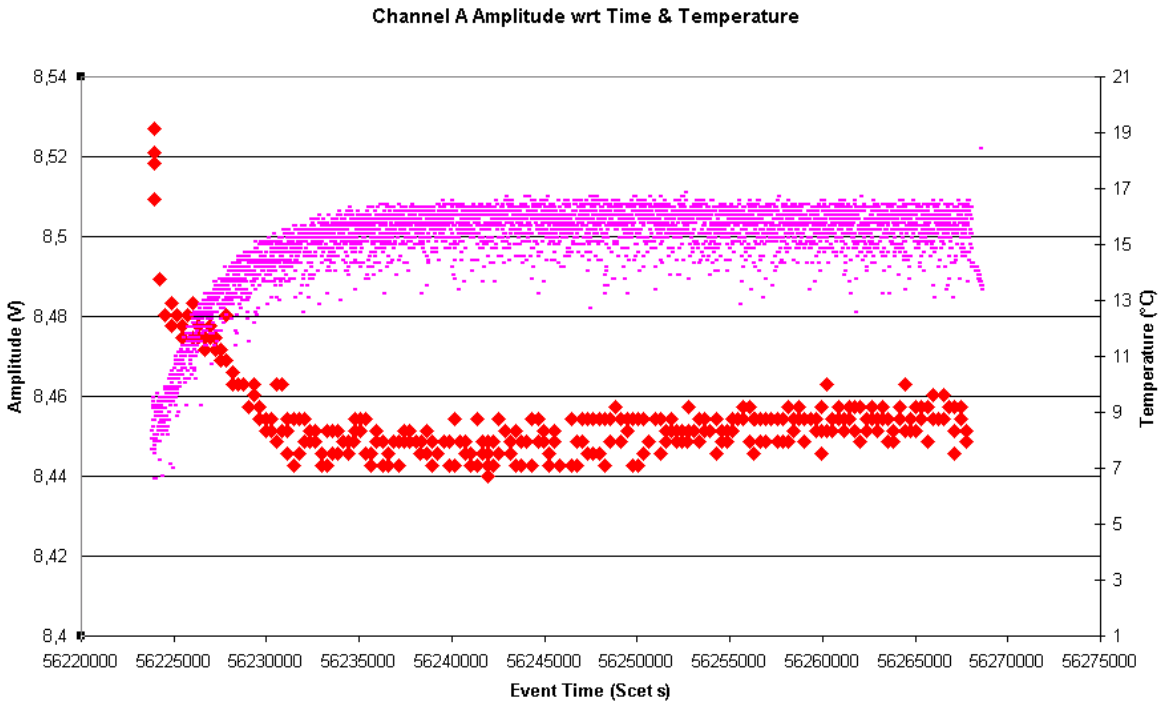

Figure 25 Channel A response wrt IS temperature

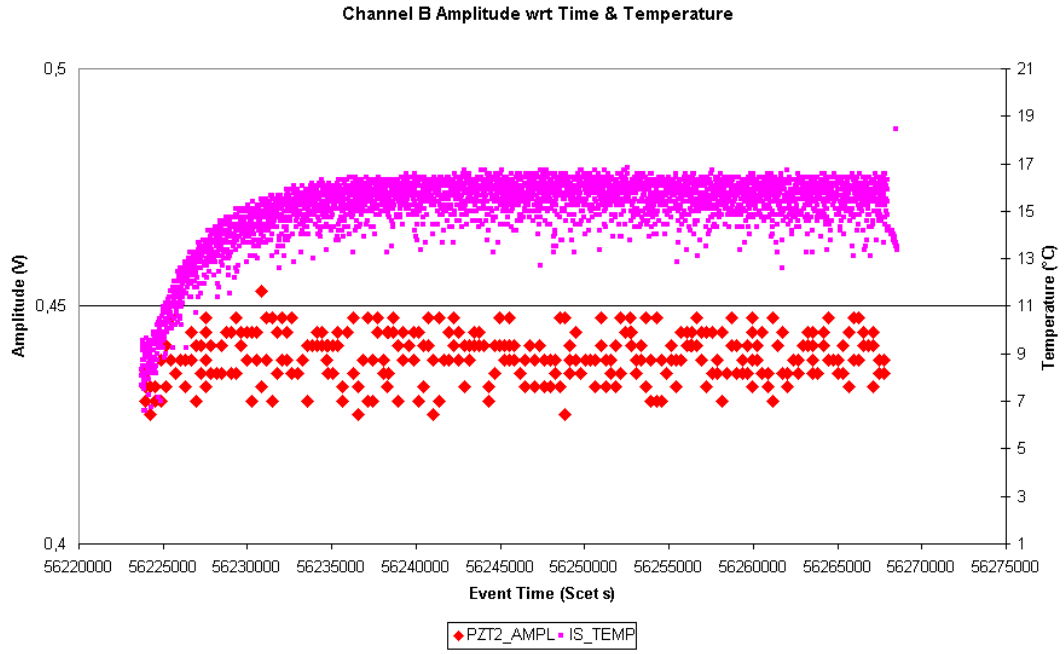

Figure 26 Channel B response wrt IS temperature

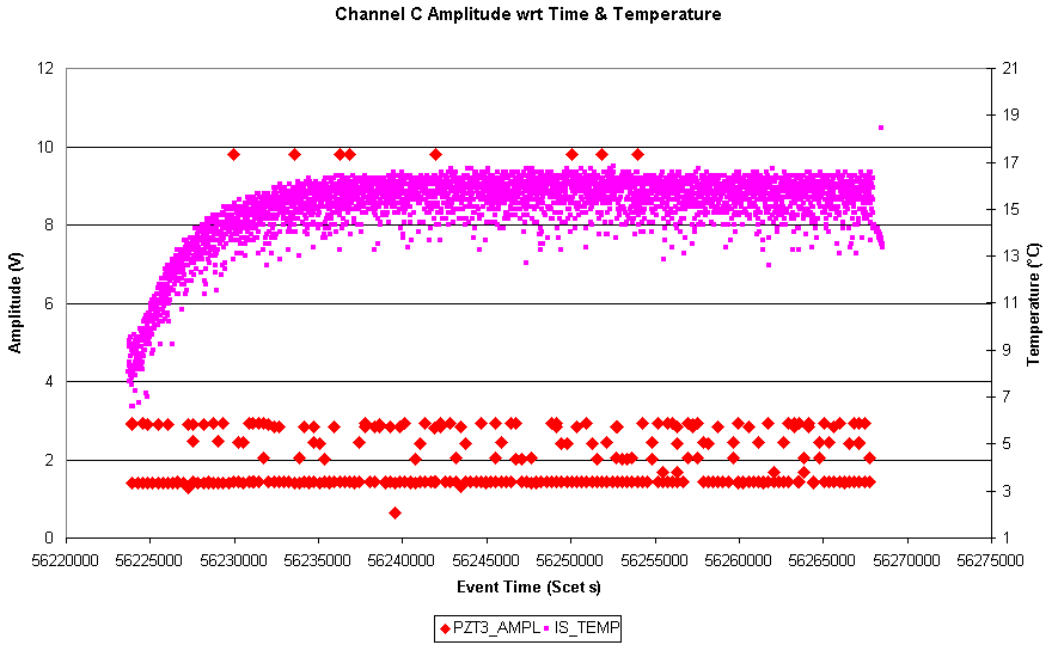

Figure 27 Channel C response wrt IS temperature

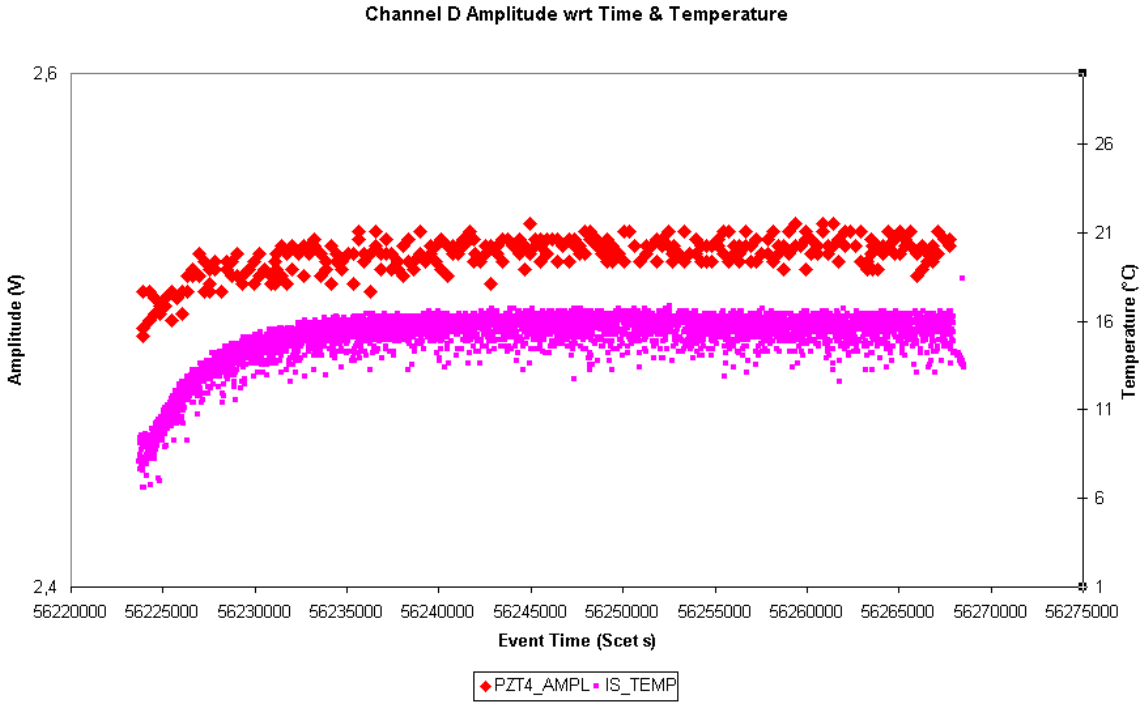

Figure 28 Channel D response wrt IS temperature

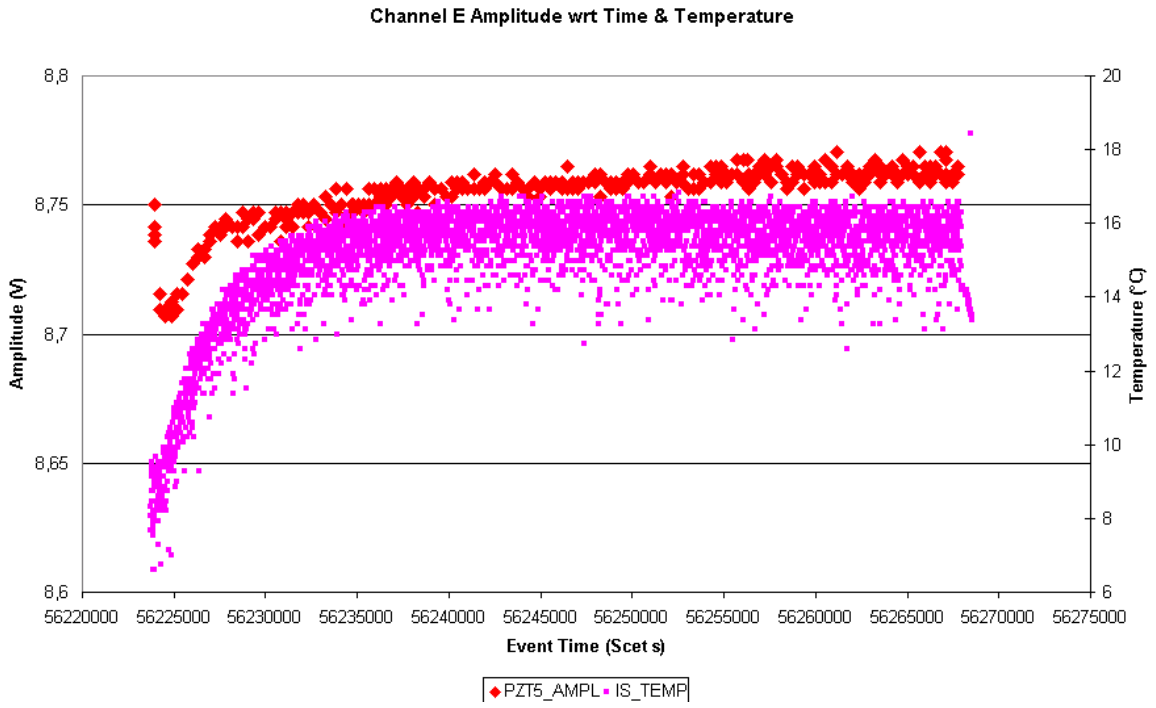

Figure 29 Channel E response wrt IS temperature

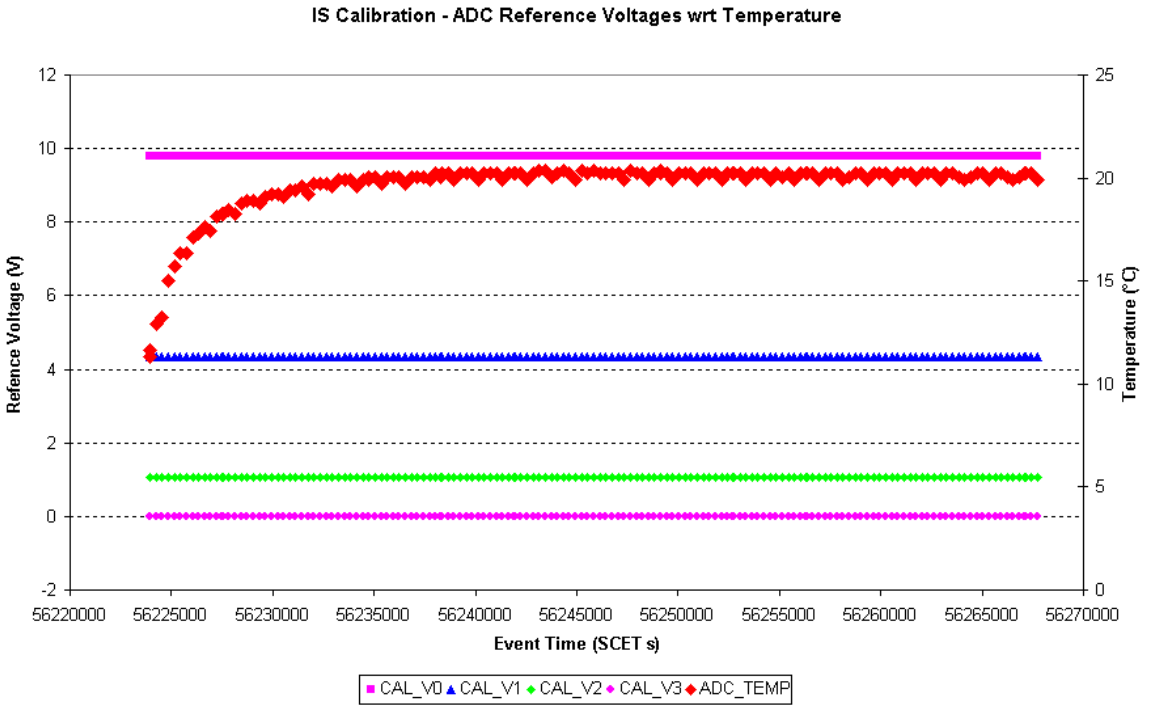

Figure 30 IS Calibration - ADC Temperature & ADC Reference Voltages

5.1.3.2 GDS Sub-system

The detection thresholds of Left and Right channels were set to about 1.24 V and 0.8 V respectively (via Context file updated via memory load command at GIADA power-on and by command after GIADA is entered in Normal mode). The nominal operation was to perform periodic GDS calibrations every 5 minutes.

Figure 31 and Figure 32 show the GDS Calibration Right and Left mean value and standard deviation. The output level of the Left and Right channels reports a direct measure of the internal stray-light in combination with the electronics noise that may be conducted on the power lines from other instruments or induced by temperature increase.

The mean value of the Right receiver is always below the detection threshold (only few ghost detections were observed on the Right channel) and practically the same as during the previous in-flight test since April '04 when GIADA was switched on alone. The average is about 0.25 V (minimum and maximum are in within 0.15V and 0.42V, except for few saturated values and 1.1V), while its standard deviation is below 50 mV. The mean value remains unchanged, but for the initial part of the figure, when the Lasers & ADC temperatures rise.

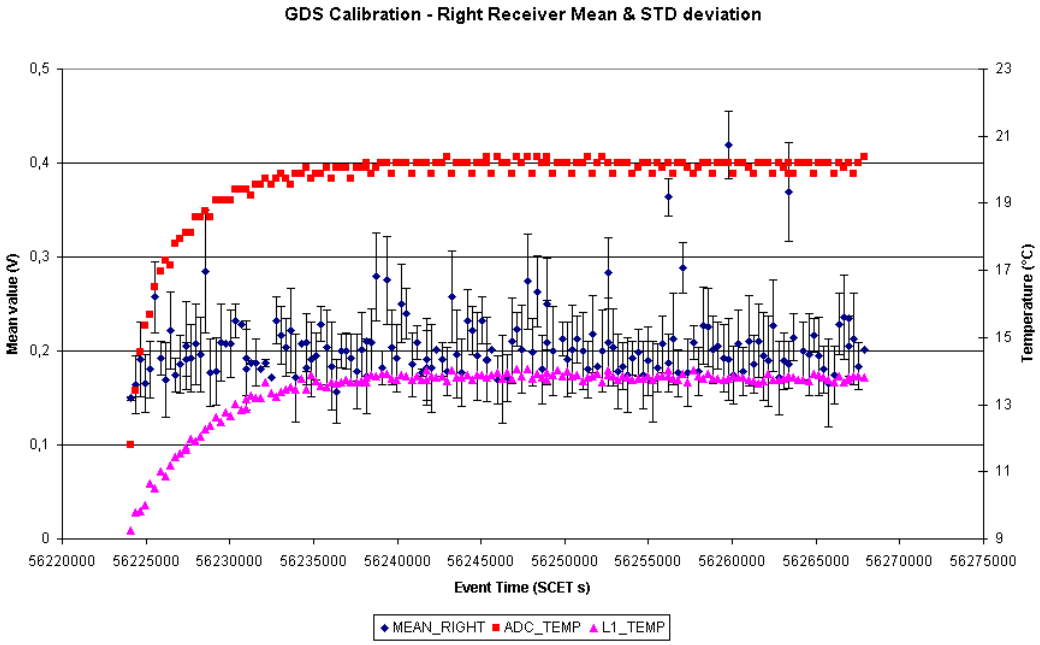

Figure 31 GDS Right Receiver Calibration (mean value and STD deviation)

The mean and standard deviations of the Left receiver calibrations (Figure 32) are quite similar to those described for the right receiver, except a higher mean value and standard deviation.

The average is about 0.84 V (minimum and maximum are in within 0.68V and 0.94V), while its standard deviation is always below 130 mV. The temperature effect on the Left receiver is more evident than on the Right receiver: in the first part of the figure, the mean value rises from its minimum (Laser & ADC temperatures rise) and then it remains almost constant when the temperature becomes constant.

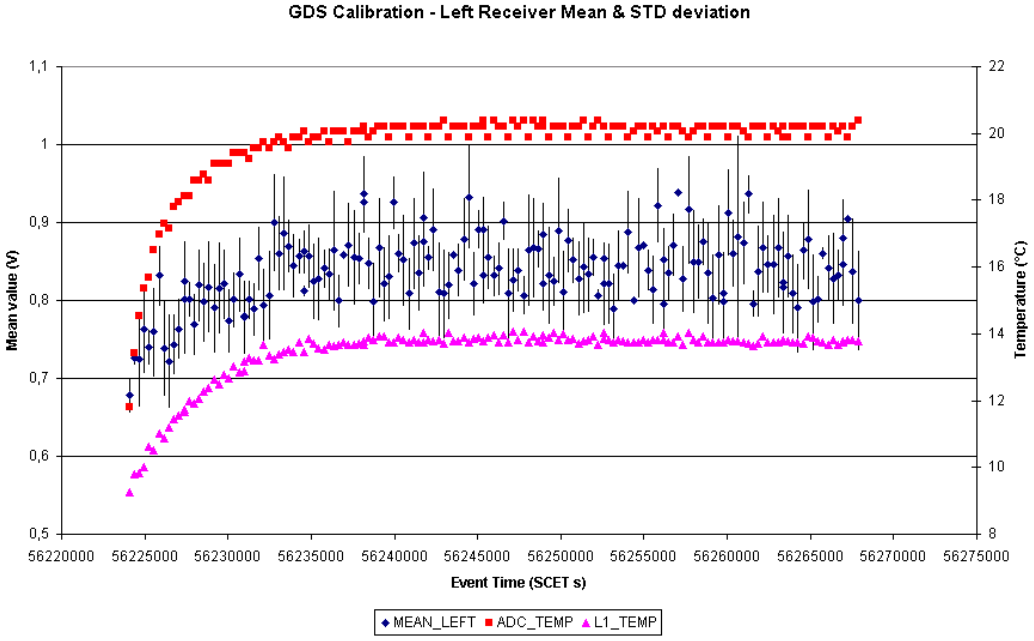

Figure 32 GDS Left Receiver Calibration (mean value and STD deviation)

Figure 33 and Figure 34 show the light monitors and the temperatures of the four lasers at the time of the GDS calibration. Except for the known behaviour (i.e. the laser light decreases when temperature increases), the figures of the light monitors are quite expected.

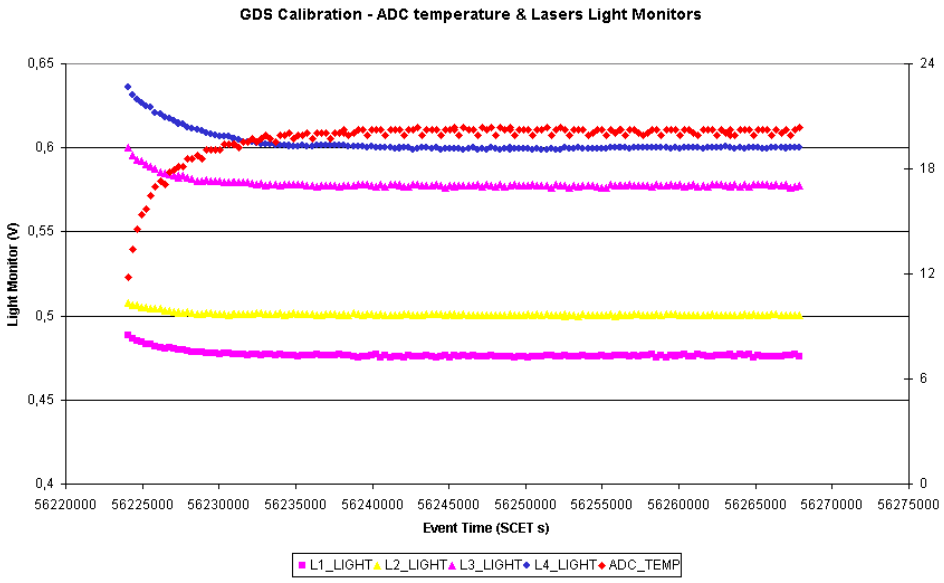

Figure 33 GDS Calibration - ADC & Lasers Light Monitor

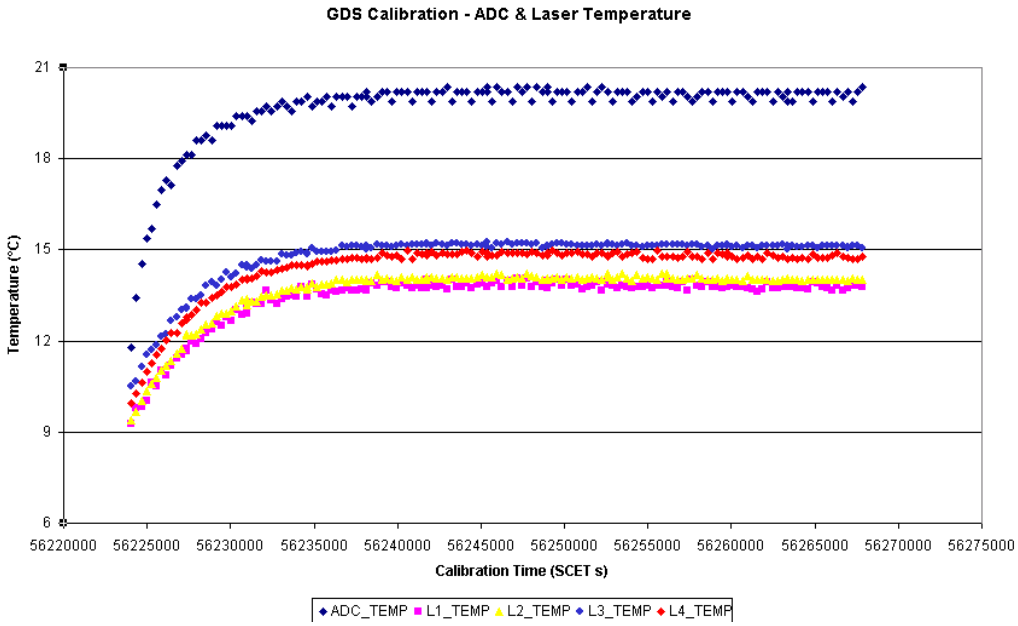

Figure 34 GDS Calibration – Laser Temperature

Figure 35 shows the amplitude of the scattered light of the Right Receiver 'Ghost detections', while Figure 36 reports the Left Receiver 'Ghost detections'.

As we can see the 'Ghost detections' on Right receiver are very few (47 events within about 12 hours of test). The GDS receiver outputs have resulted saturated when the Ghost detections happen.

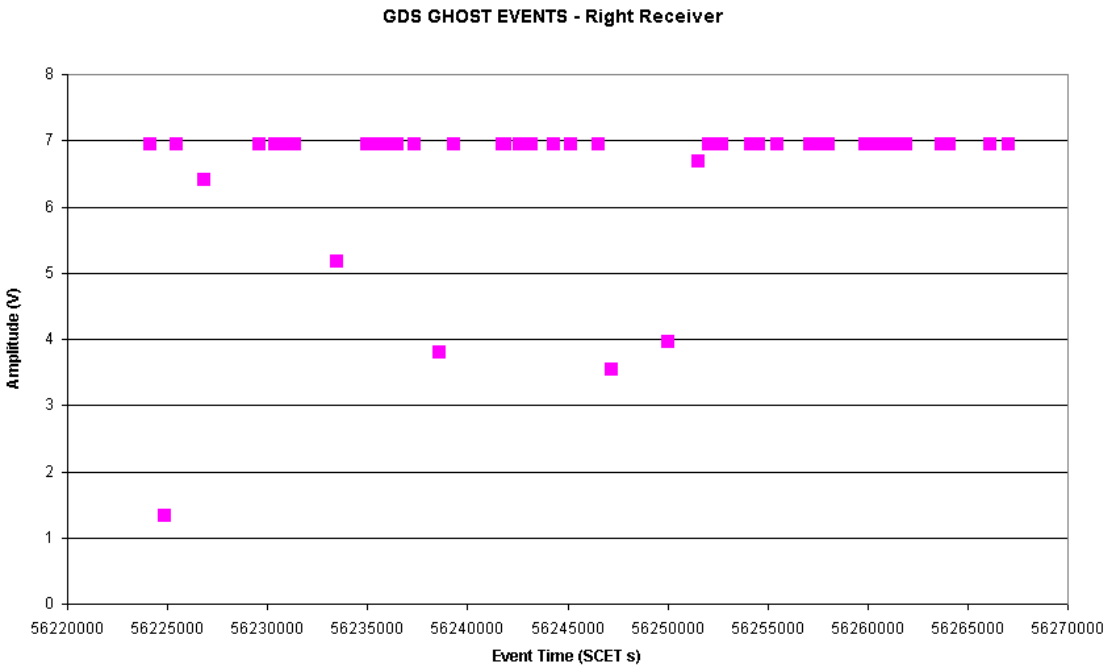

Figure 35 Amplitude of 'ghost detections' on Right receiver

Concerning the ghost detections on the Left receivers two 'detection' types can be distinguished (as in the previous Interference Part 1A &B and Commissioning):

- The first type in which the detections amplitude is of the order or little below the detection threshold (1.24 V). These are 'ghost detections' due to the high level of the internal stray-light in combination with the electronics noise. Except for the first 33 events (that have happened after the lasers on, at the threshold change), the others were very sporadic (97 events in 11 hours, i.e. about 8 events per hour). Note that the measured amplitude is below the detection threshold (e.g. 0.8V while threshold is 1.2V). However**,** having increased the detection threshold with respect to the Interference Part 1A and 1B, **it can be seen that the noise seems not correlated with the other experiments operations while it seems to increase when the GIADA internal temperatures rise**. The noise (and then the number of ghost detections per unit time) remains practically the same when the temperature becomes constant. Moreover, the SSMM memory allocated for GIADA was not saturated because of the increased threshold.

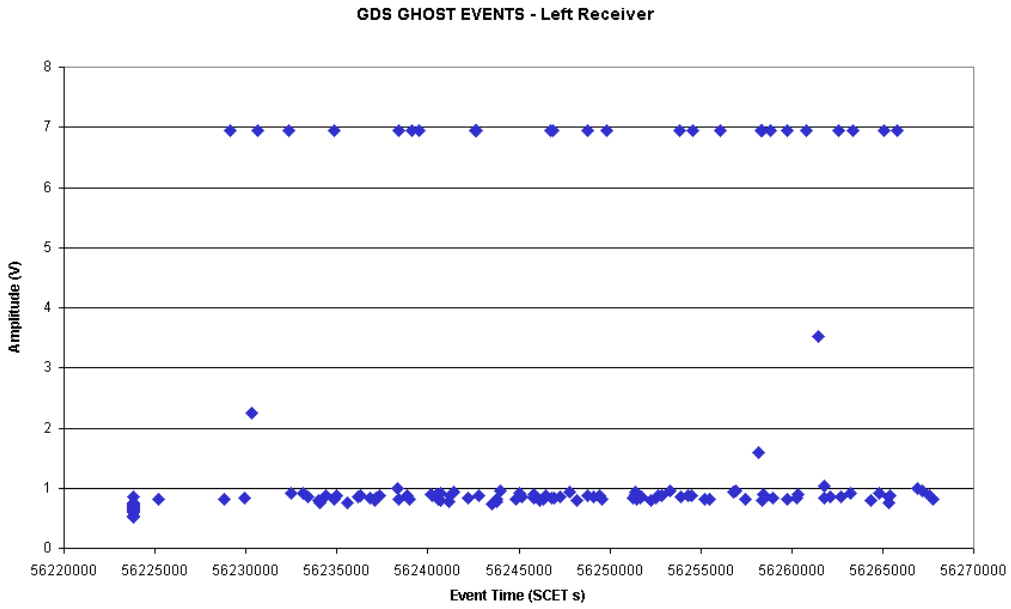

Figure 36 Amplitude of 'ghost detections' on Left receiver

- The second type, in which the detection amplitude on the left receiver is well above the detection threshold or in saturation (6.9375 V). These detections (29 in about 11 hours) have happened as in the Interference Part 1A and B and it is confirmed that they seem not correlated to any specific GIADA internal events (such as calibration, temperature or relay on-off switching as shown in Figure 37).

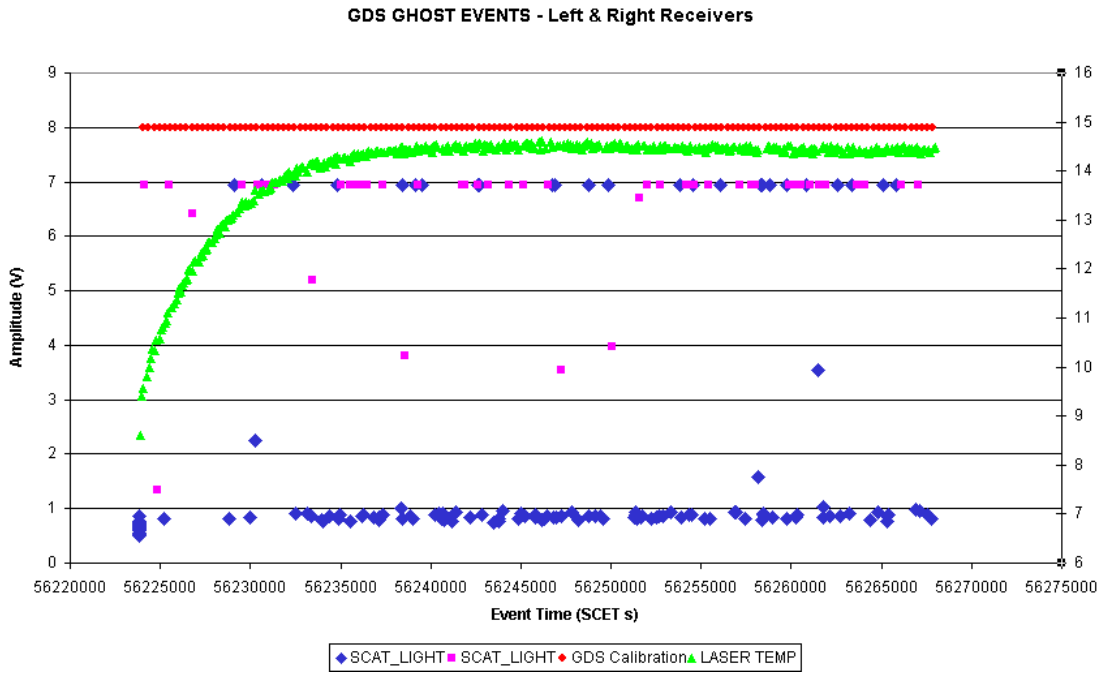

Figure 37 'Ghost detections' on Left receiver wrt Calibration and Temperature

The Table 4, Figure 38 and Figure 39 show the ADC Reference Voltages along the Interference II test for the sequence of the IS, GDS and MBS Calibrations. The voltages are quite stable in the temperature range 10 to 20 °C.

ADC REF. V0		ADC REF. V1		ADC REF. V2		ADC REF. V3	
Mean	STD	Mean	STD	Mean	STD	Mean	STD
9,7797	0,0001	4,3446	0,0011	1,0795	0,0008	-0,0107	0,0004

Table 4. ADC Reference Voltages

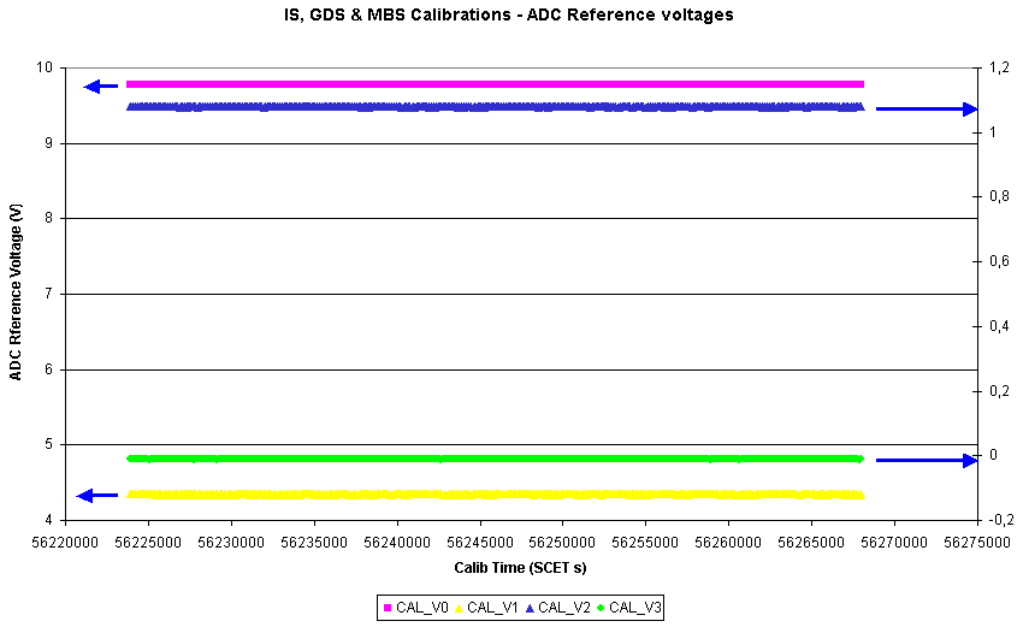

Figure 38 ADC Voltage Reference during Calibration

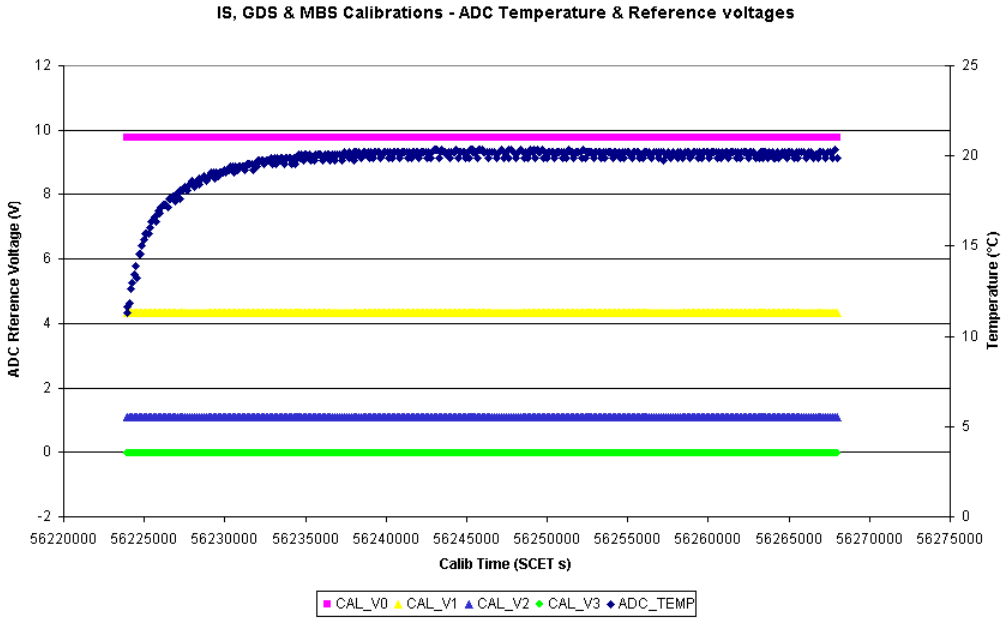

Figure 39 ADC Voltage Reference wrt ADC temperature during Calibration

5.1.3.3 MBS Sub-system normal acquisition

The MBS frequency for three of the MBS (1, 3 & 5) is confirmed to be significantly higher then in the 1st Commissioning. However, no significant deviations have been observed from the measurements taken during the Interference Part 1A and Part 1B.

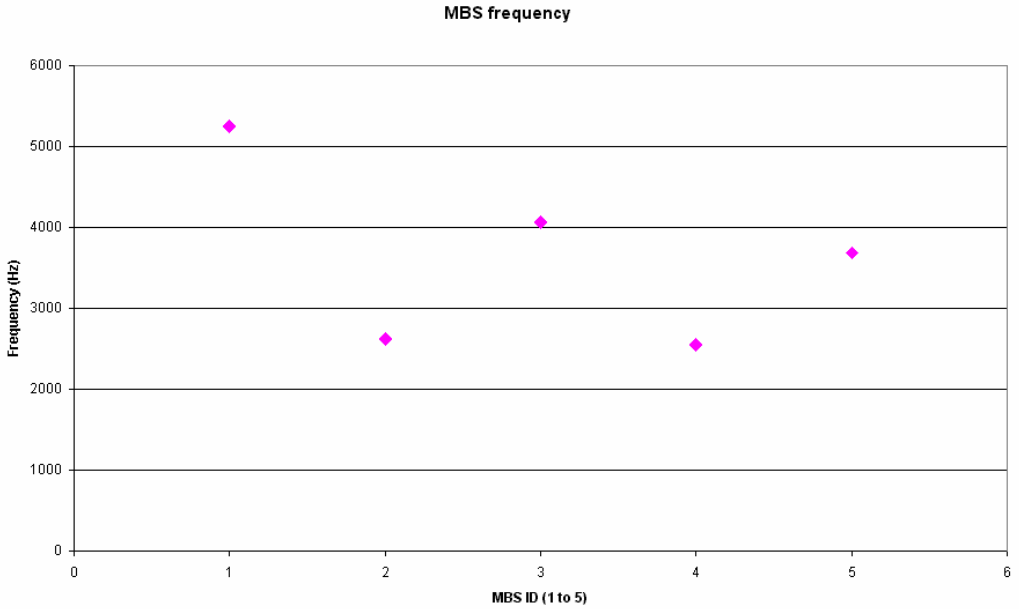

Figure 40 MBS Frequency

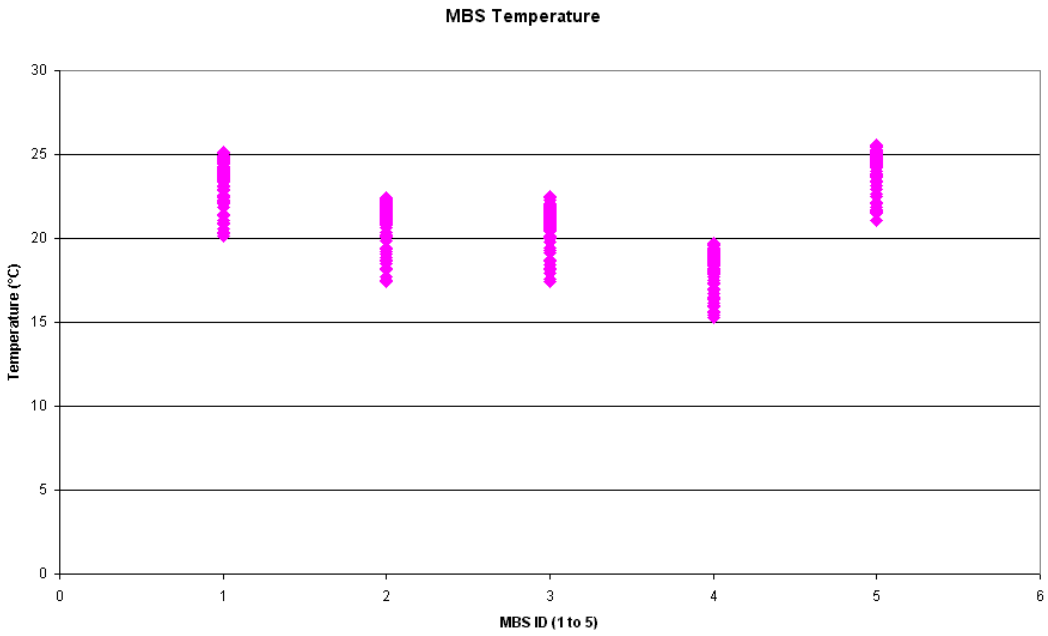

Figure 41 MBS Temperature

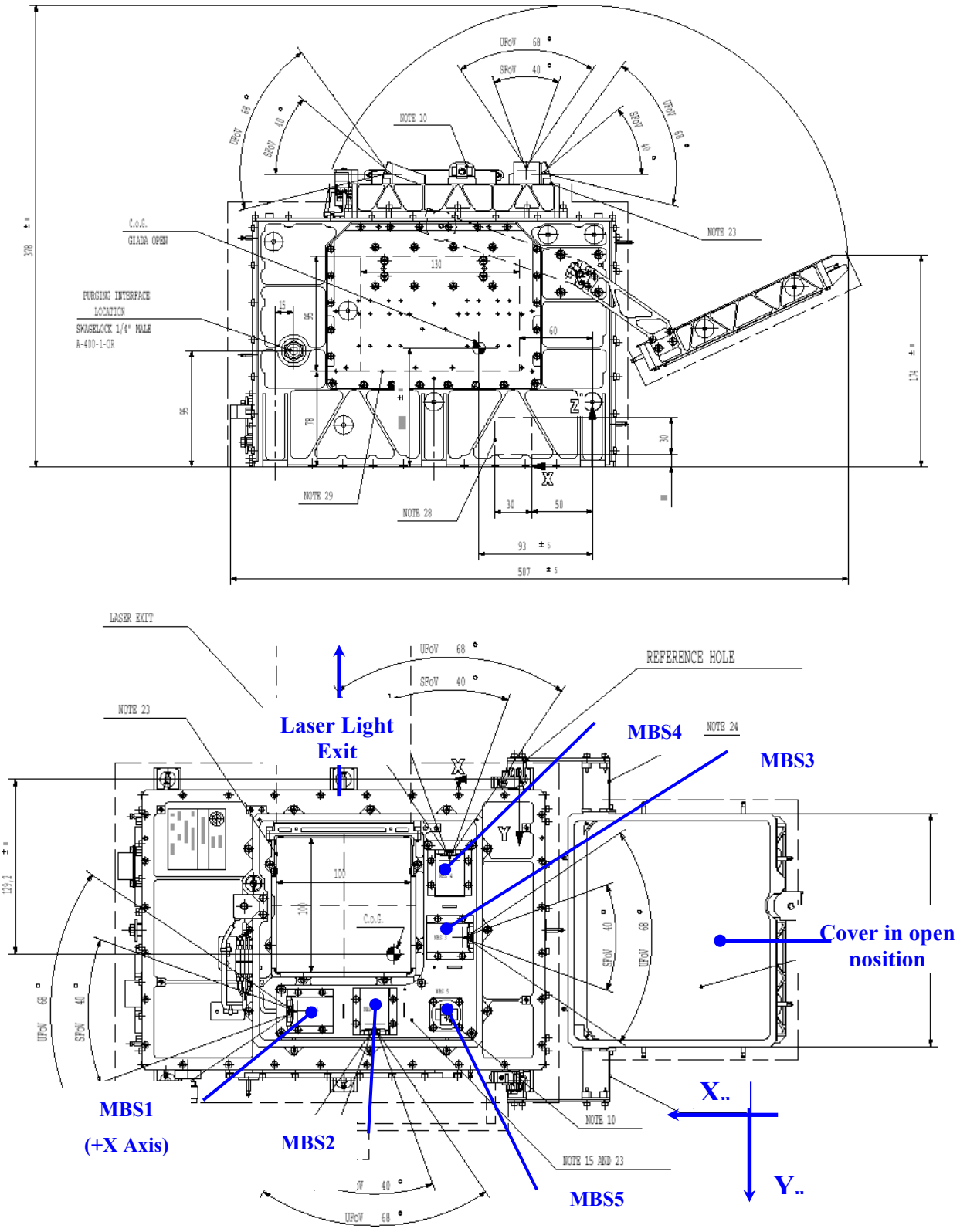

Figure 42 GIADA Cover Open Configuration – MBS location & pointing wrt GIADA unit axes

- The MBS1 frequency (MBS1 points to the +Xu direction, as it is shown in Figure 42) is about doubled of the value measured during April Commissioning. Now the measurements are quite stable with respect to data taken during the Interference Part 1A & B tests. The frequency measurements are changed from 2700 Hz (data taken during the GIADA 1st Commissioning) to about 5227 Hz @ 25°C (Interference part 1A), to 5230 Hz @ 24°C (Interference part 1B) and now to 5249 Hz @ 24°C.
- The MBS2 frequency (which points to the +Yu direction) is close (but not equal) to the one measured in the Commissioning performed in April '04. The frequency has changed from 2550Hz (data taken during the GIADA 1st Commissioning @ 23°C), to about 2624Hz @ 23°C (Interference part 1A), to 2625Hz @ 20°C (Interference part 1B) and now to 2613 Hz @ 22°C.
- The MBS3 frequency (which points to the -Xu direction) is increased of about 1700Hz from the data taken in the Commissioning performed in April '04. Now the frequency measurements are quite stable with respect to data taken during the Interference Part 1A & B tests. The frequency has changed from 2365Hz (data taken during the GIADA Commissioning), to about 4085 Hz (Interference part 1A), to 4081 Hz @ 20°C (Interference part 1B) and now to 4065 Hz @ 22°C.
- The MBS4 frequency (which points to the -Yu direction) is about 100 Hz greater than the one measured during the Commissioning. The frequency results now quite stable from Interference Part 1A up the now. Its frequency is changed from 2455Hz (data taken during the GIADA Commissioning @ 20°C) to about 2548Hz @ 19°C (Interference part 1A), to 2546 Hz @ 18°C (Interference part 1B) and now to 2550 Hz @ 19°C.
- The MBS5 frequency (which points to the +Zu direction) is increased of about 1000Hz from the Commissioning and now it results quite stable. The frequency is changed from 2430Hz (data taken during the GIADA Commissioning) to about 3686Hz @ 25°C (Interference part 1A) to 2687Hz @ 24.5°C (Interference part 1B) and now to 3685 Hz @ 25°C.

It is confirmed that MBS seem to be contaminated in-flight due to out-gassing of material. From the operational point of view, it is confirmed that all MBS's work as expected and the frequency dependence vs. temperature (frequency shift due to temperature change) is consistent with previous the commissioning data.

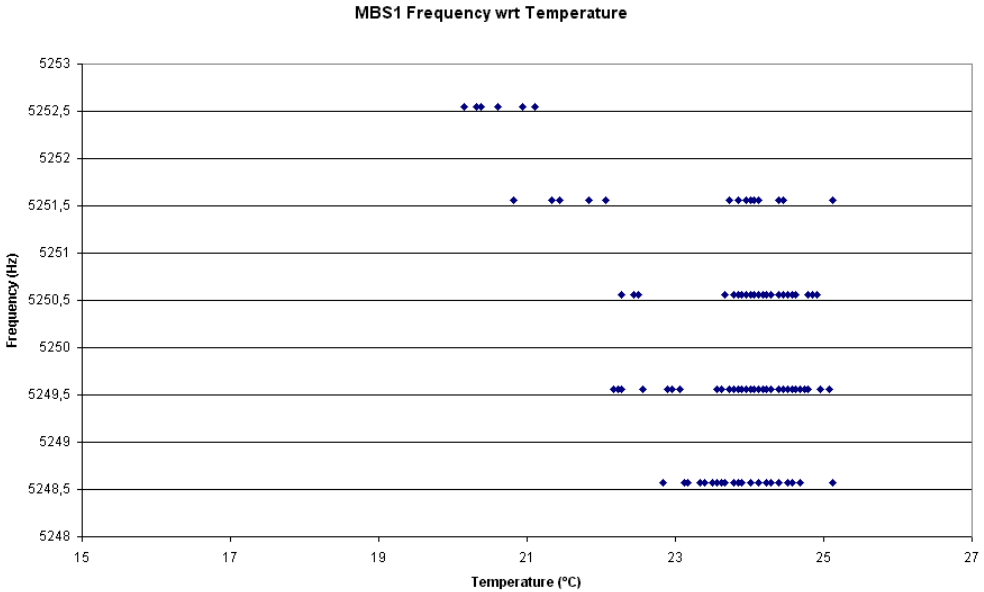

Figure 43 MBS1 Frequency wrt Temperature

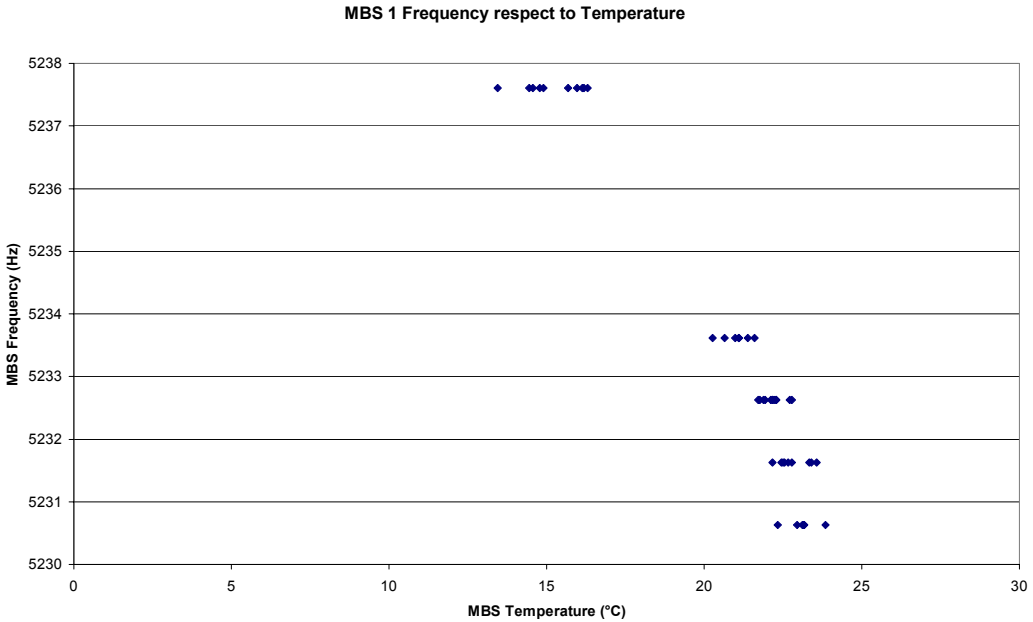

Figure 44 MBS1 Frequency wrt Temperature (Interference part 1B)

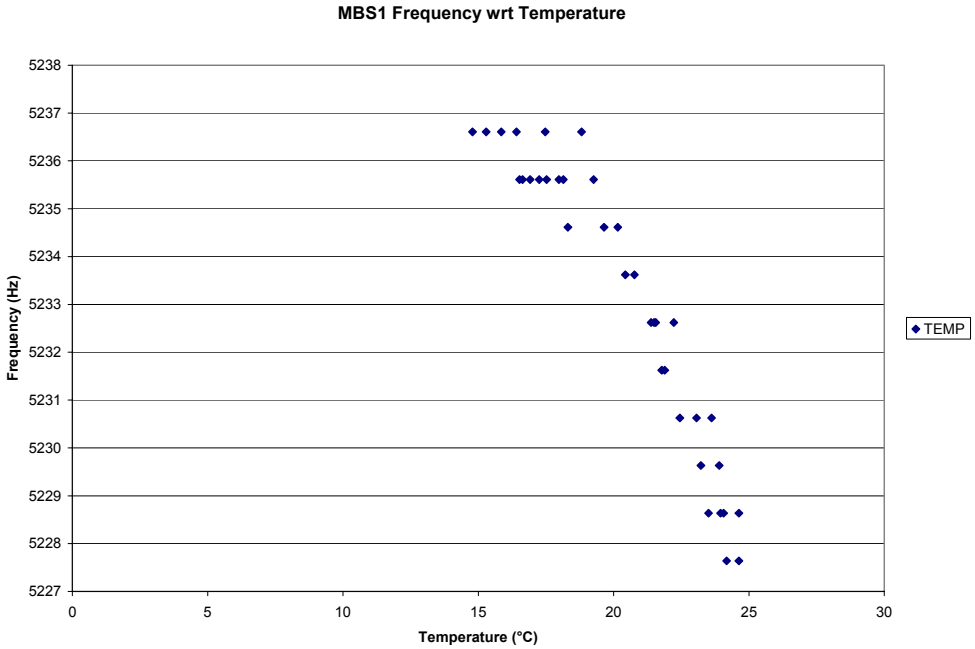

Figure 45 MBS1 Frequency wrt Temperature (Interference part 1A)

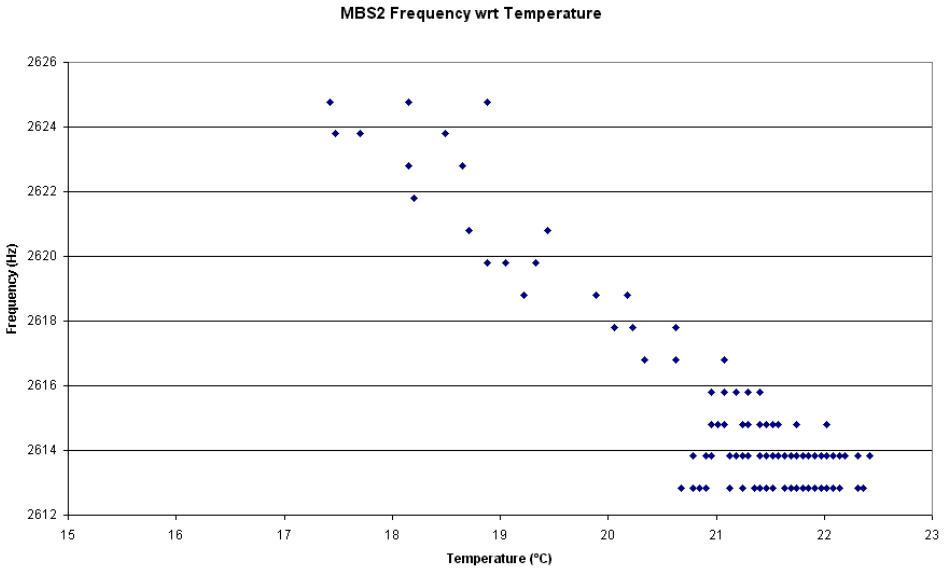

Figure 46 MBS2 Frequency wrt Temperature

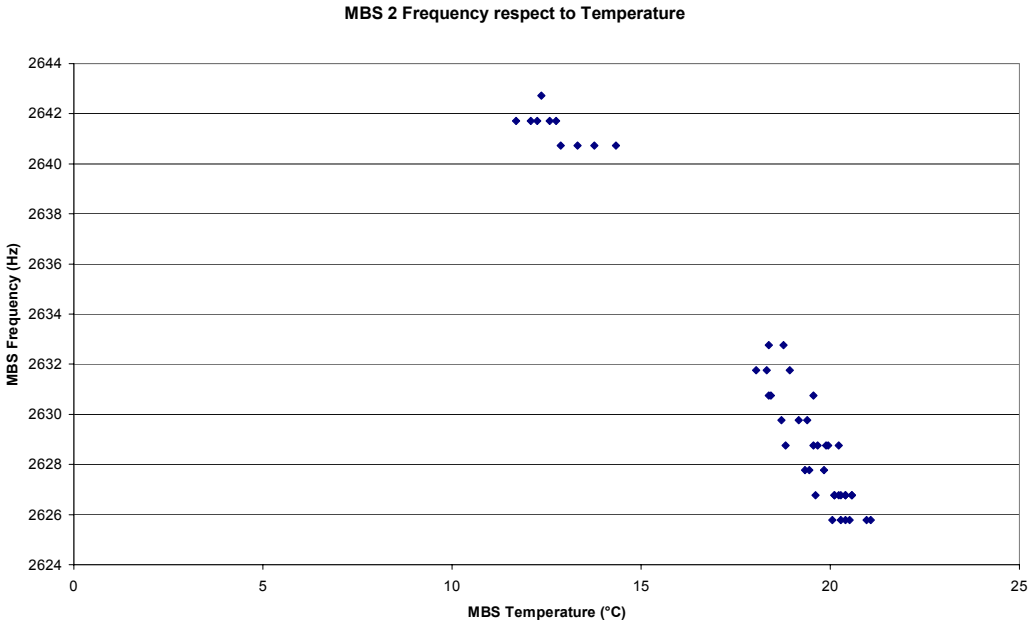

Figure 47 MBS2 Frequency wrt Temperature (Interference part 1B)

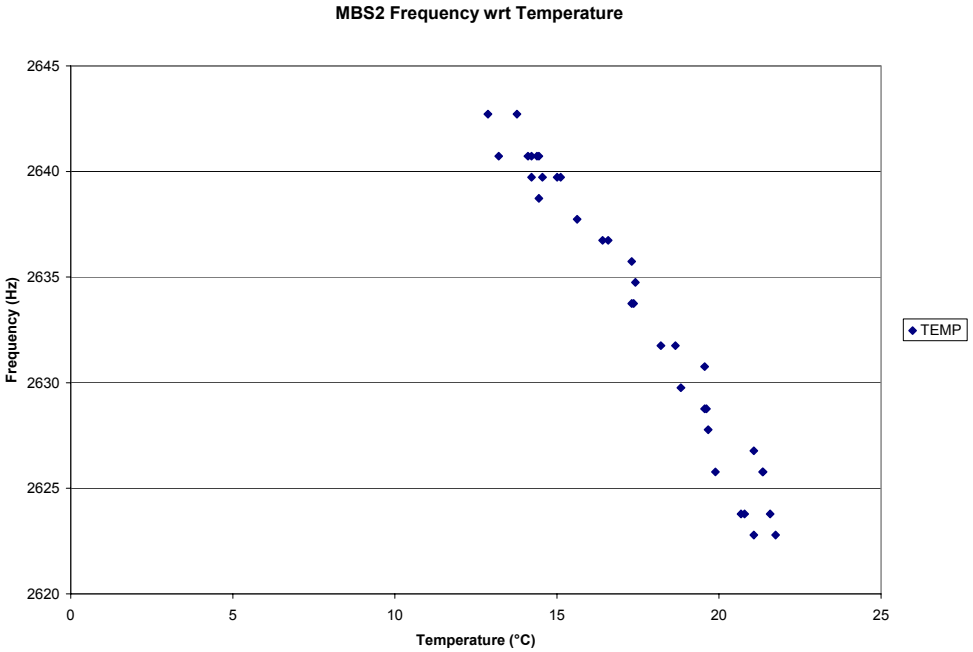

Figure 48 MBS2 Frequency wrt Temperature (Interference part 1A)

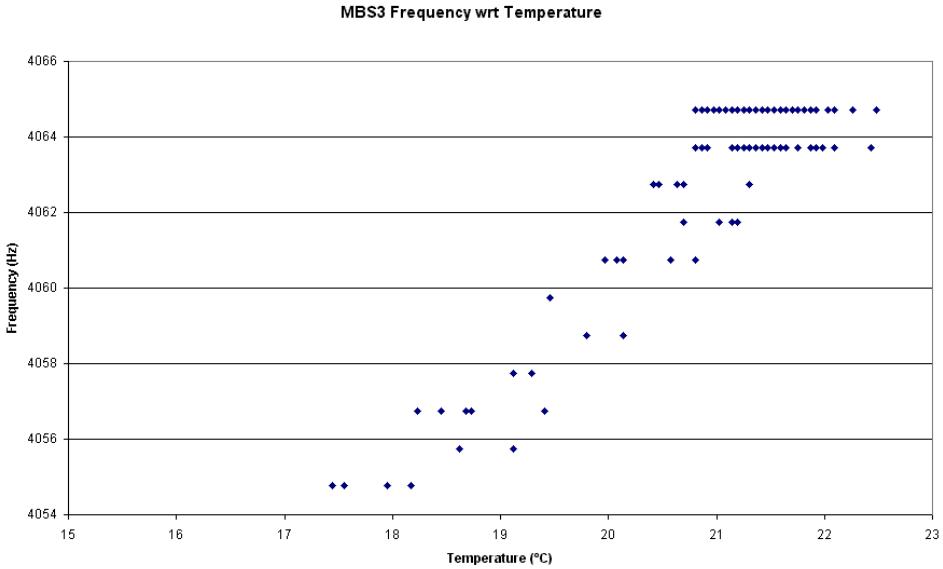

Figure 49 MBS3 Frequency wrt Temperature

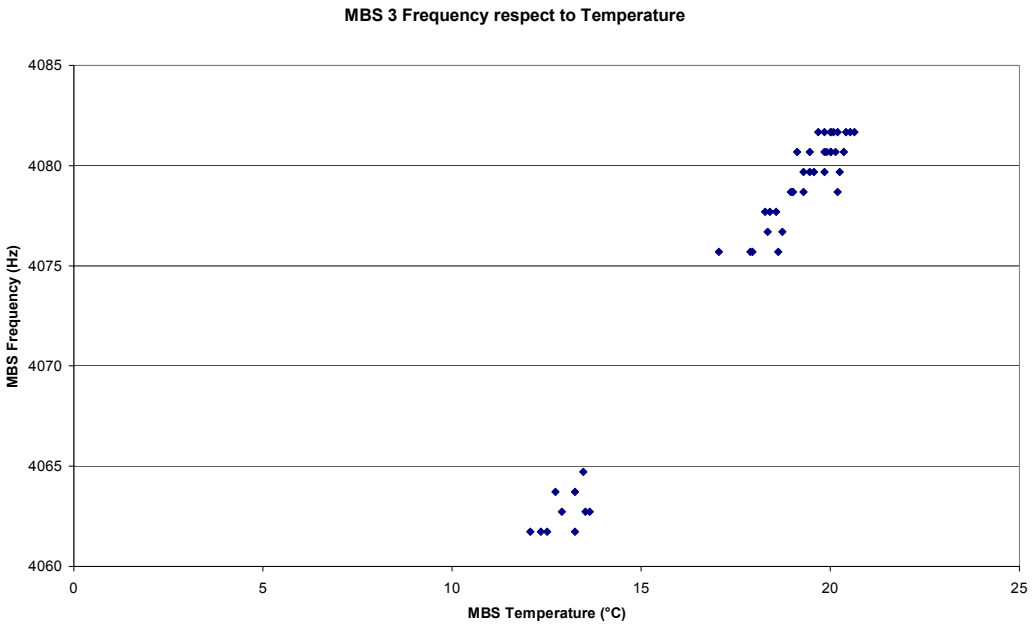

Figure 50 MBS3 Frequency wrt Temperature (Interference part 1B)

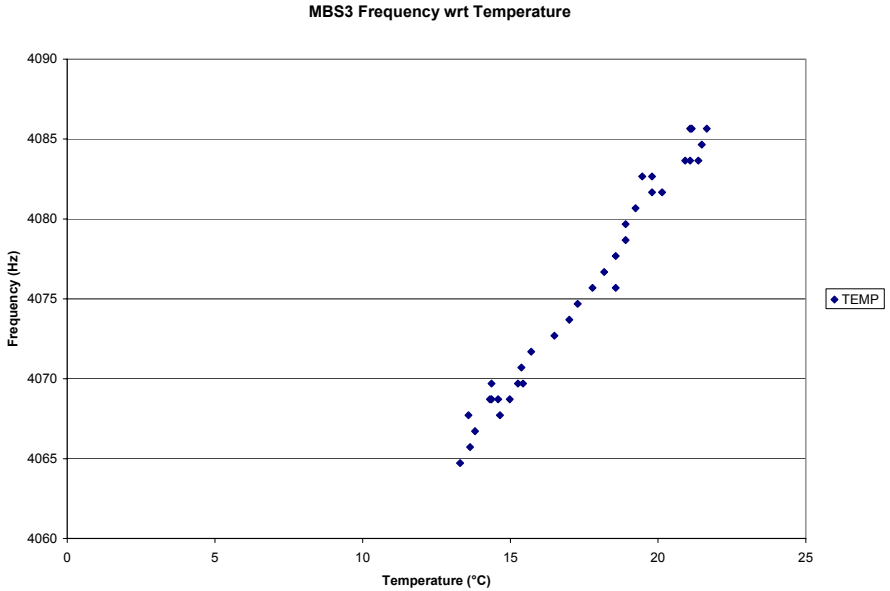

Figure 51 MBS3 Frequency wrt Temperature (Interference part 1A)

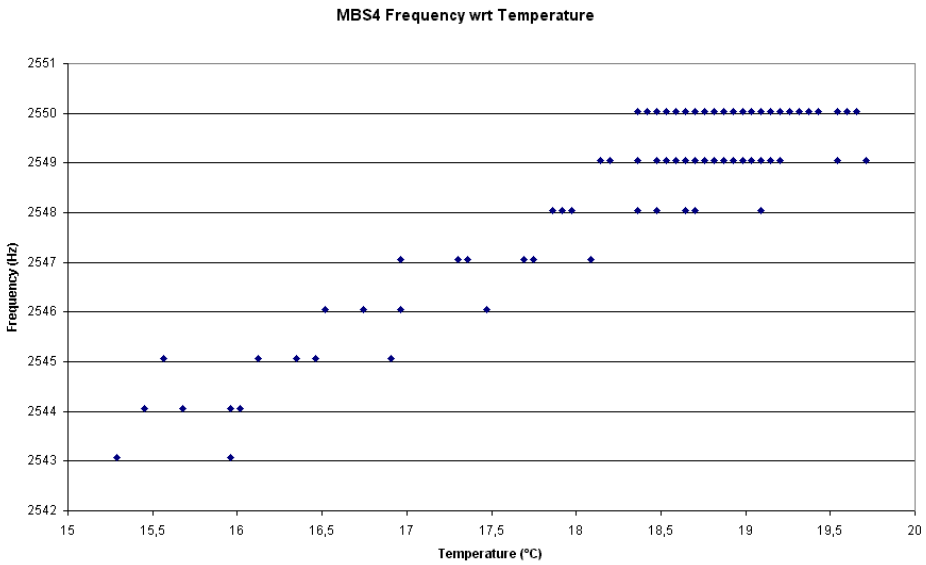

Figure 52 MBS4 Frequency wrt Temperature

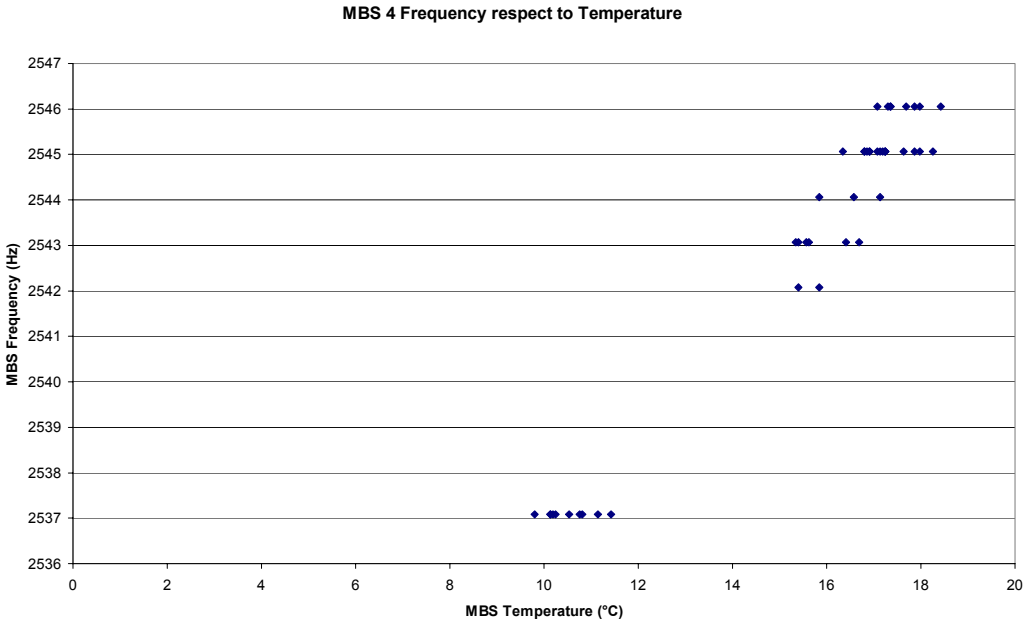

Figure 53 MBS4 Frequency wrt Temperature (Interference Part 1B)

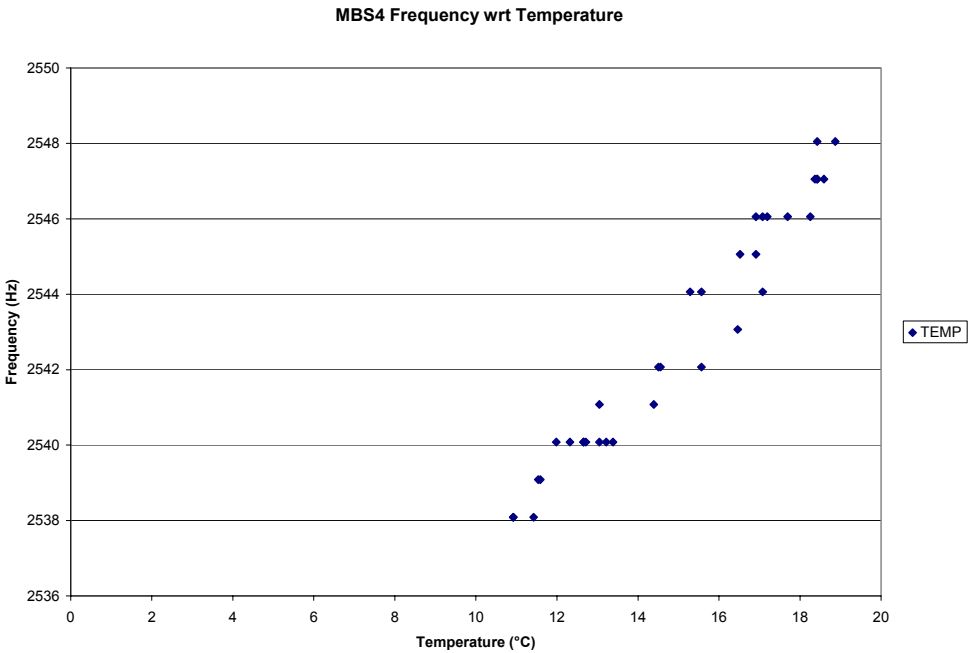

Figure 54 MBS4 Frequency wrt Temperature (Interference Part 1A)

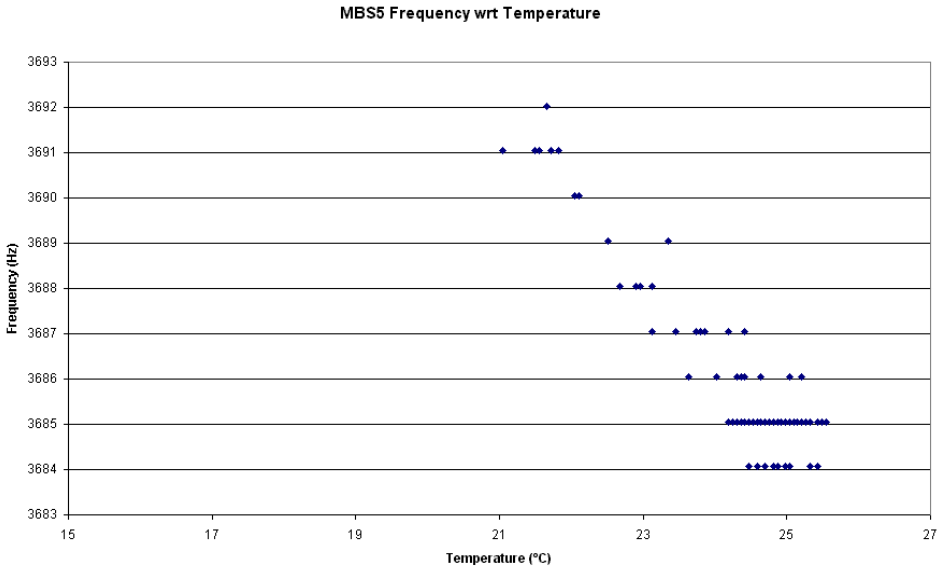

Figure 55 MBS5 Frequency wrt Temperature

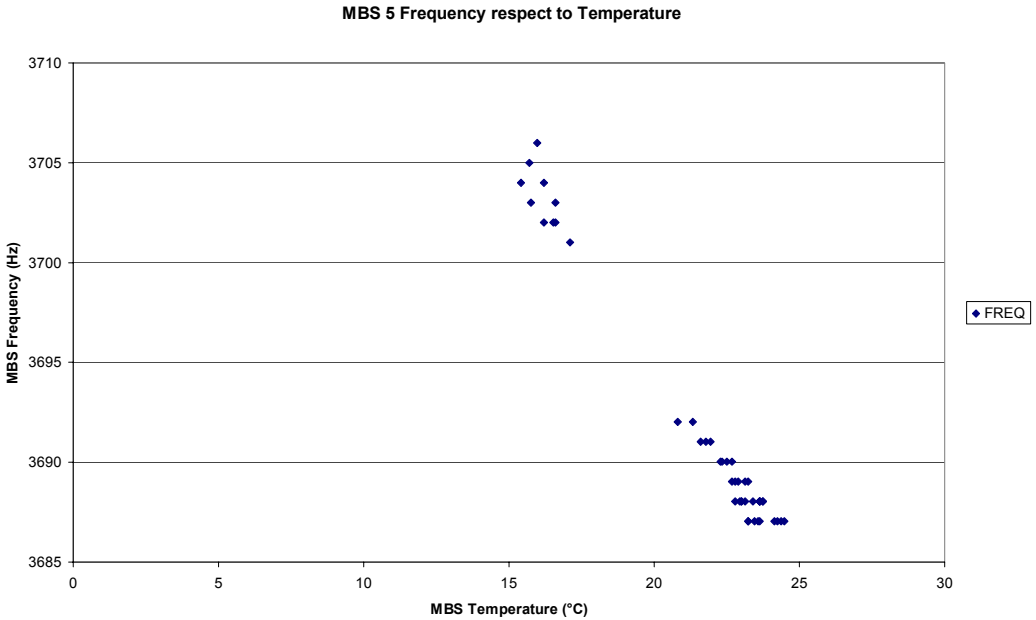

Figure 56 MBS5 Frequency wrt Temperature (Interference Part 1B)

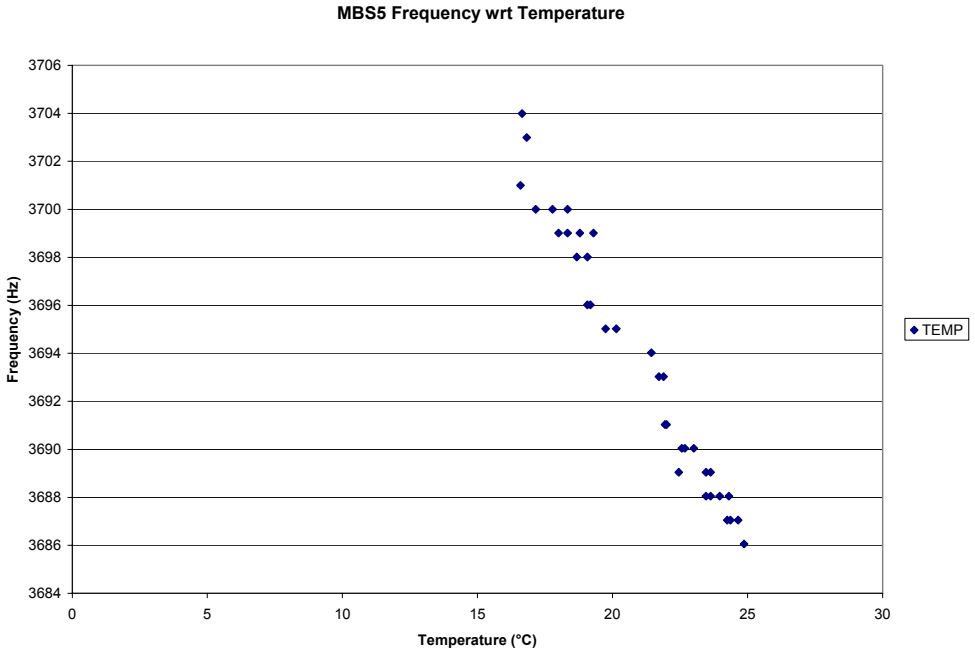

Figure 57 MBS5 Frequency wrt Temperature (Interference Part 1A)

5.1.3.4 Housekeeping signals in science packets

HK data in scientific packets are shown in Figure 58 to Figure 60. They are consistent with HK data.

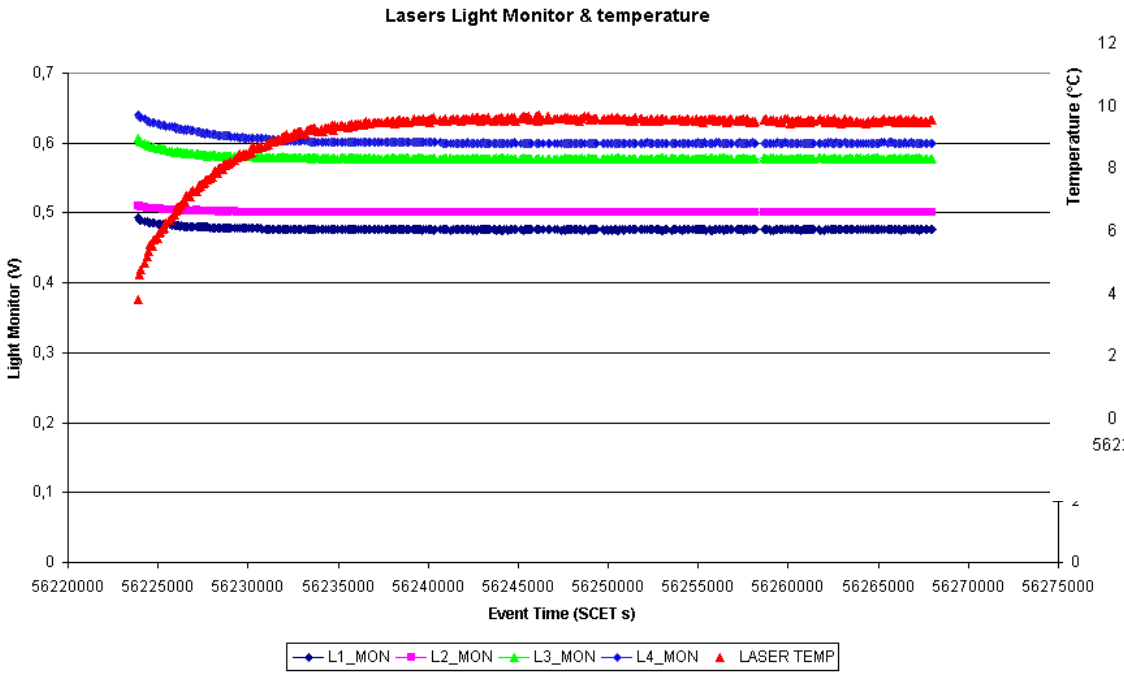

Figure 58 Laser lights monitor (Normal science packet)

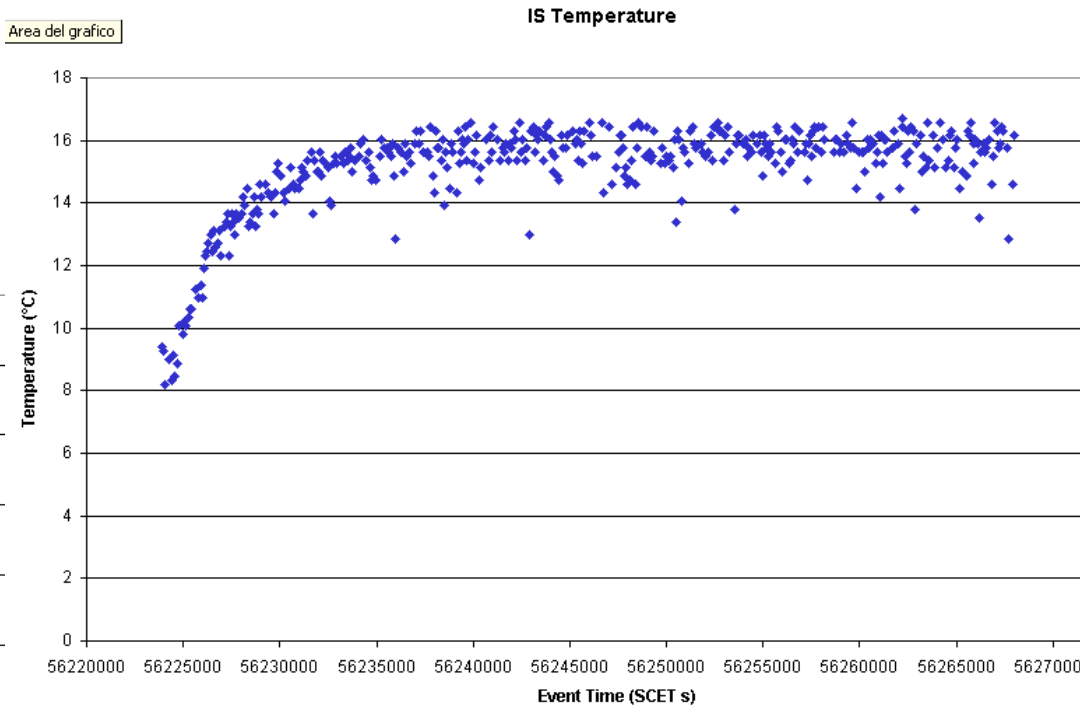

Figure 59 IS temperature (Normal science packet)

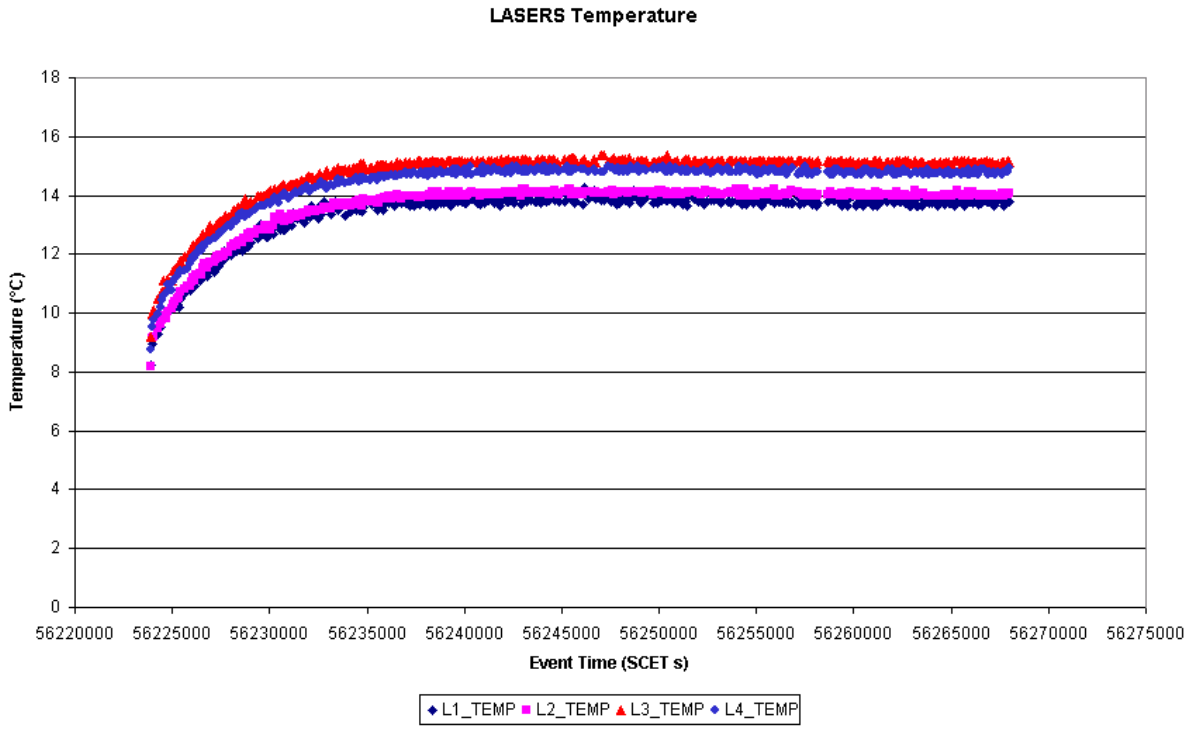

Figure 60 Lasers temperatures (Normal science packet)

5.2 INTERFERENCE SCENARIO IIA (13/10/04 - REDUNDANT)

5.2.1 Activities log

The following activities were performed in sequence by preloaded command timeline sequence.

UTC	Description
13 Oct 2004 - 06:17	Beginning of activity – GIADA power on
13 Oct 2004 – 06:40	Cover open operation
13 Oct 2004 - 06:47	Go to Normal mode (science enabled)
13 Oct 2004 – 06:50	GDS Left receiver threshold changed – IS channel E gain/threshold changed
13 Oct 2004 – 08:40	Go to Safe - Nominal science disabled
13 Oct 2004 –	GIADA Switch-off (with automatic Cover close operation incorporated in the Power-off OBCP)

The GIADA switch-on procedure was applied selecting the Redundant I/F and with the Context File stored in SSMM. The Instrument Redundant I/F was successfully powered-on by means of the GIADA POWER-ON OBCP on 13th October 2004 @ 06:17 (UTC time), which corresponds to a SCET Time of about 56269018s.

The first expected packet was 'lost' (Connection Report, service 17,2), because the DDS marked it with a wrong UTC time since this telemetry report had an unsynchronised time-tag (bad time quality). In fact, it was received with a DDS time of about 2 hours after the power-on:

Wed Oct 13 2004 08:15:41.764518
TM Packet Received from GIADA:
APID = 90, 7 (EVENT)
Source Sequence Count: 0
Packet Length: 9
SCET Time: 2147483685.933594 sec
Packet Type, Subtype: 17, 2

0D A7 C0 00 00 09 80 00 00 25 EF 00 40 11 02 00
==========

The second packet was an Event Report ('GIADA Safe' mode). GIADA was started synchronised. Afterwards, the first HK report was received (default HK rate is 40s).

After completion of the power-on, as expected, the first patch (regarding the Context File) was sent, as well as the other required software patches that were, as expected, divided in six memory load commands. All were nominally received, **but the memory dump reports** (expected number of Memory dump report to be received on-ground is 24) **were not received or most probably they were not correctly retrieved from the DDS system**. As result of the Context File patch, GIADA HK rate was changed to 10s rate. GIADA remained in Safe mode until 17:30 (UTC time).

The next step was to open the cover. The operation was successfully completed @ 06:42 (UTC Time) when the Cover Report was received.

Then GIADA was sent to Normal @ 06:47 (UTC Time) and science telemetry enabled. The Lasers were switched-on by the Laser_power_on OBCP, upon the reception of the 'Start Switch Lasers ON OBCP' event. Science was enabled @ 06:49 (UTC Time) and after about one and half minute the GDS Left receiver threshold was changed from 0.8V to 1.24V (this was decide to avoid flood of 'Ghost events' and possible saturation of the SSMM memory allocated to the experiment). Then, the IS sensor was switched-off and the Gain and Threshold of Channel E were changed from Low to High and from 50mV to 100mV, respectively. Finally IS sensor was switched-on again. The nominal Normal mode (all sensors switched-on) was resumed @ about 06:52 (UTC Time) and the internal calibration of GDS, IS and MBS sub-systems was periodically performed every 5 minutes to check the instrument behaviour.

Except for the mentioned Memory Dump (total 25 packets), no more packets were lost, neither HK and Acknowledge reports nor science TM, since by increasing the GDS left channel thresholds the SSMM memory (allocated to GIADA) resulted not saturated.

As expected, GIADA was commanded in Safe mode @ 08:40 (UTC Time) of 13th October. Then the experiment power-off (GIADA power-off OBCP) was started. The 'Go to Safe' command was discarded, as expected, since the experiment was already in Safe mode:

Wed Oct 13 2004 08:40:59.455467

TM Packet Received from GIADA:

APID = 90, 1 (ACKNOWLEDGE)

Source Sequence Count: 194

Packet Length: 21

SCET Time: 56277642.281250 sec.

Packet Type, Subtype: 1, 2

0D A1 C0 C2 00 15 03 5A BA 8A 48 00 40 01 02 00 1D AC CE DF 00 05 C4 01 00 00 00 00

==========

Wed Oct 13 2004 08:40:59.455467

TC APID = 1452, TC SSC = 3807;

Command can not be executed in the actual operation mode (TC Packet Type/Subtype = 196,1 - Safe).

==========

The cover was closed (with heaters Cover and Motor Heaters Off) and the instrument switched-off @ about 08:49:04 of 13 Oct. 2004 (UTC Time).

5.2.2 Housekeeping data analysis

The following figures have been taken from the HK database.

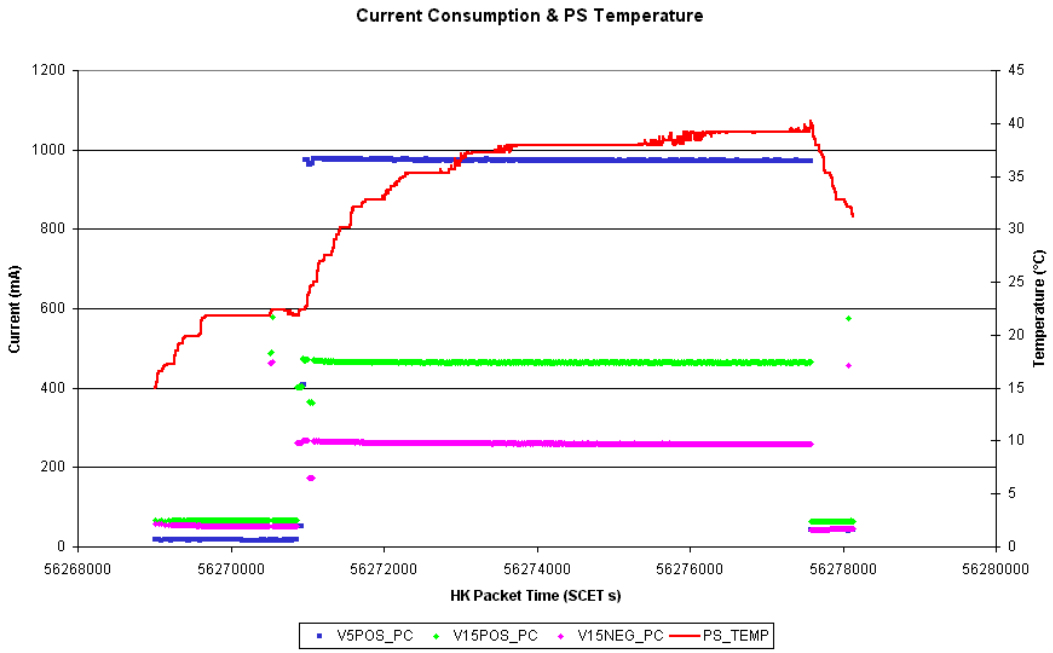

Figure 61 +5V and ±15V Currents

The current consumption and the Power Supply temperatures (Figure 61) are in the expected range. The current consumption measured in Normal mode when the PS temperature is constant (about 38 °C) for +5V, +15V and –15V is about 972mA, 464mA and 261mA, respectively. They result slightly different those measured on the Main interface (refer to Section 5.1).

The cover was successfully opened and closed at due time. In Figure 67, it is shown the status of the two reed-switches, that indicate the close and open position of the cover. As indicated, the status of the 'close position' reed switch is not activated at all, while the status of the other reed switch shows properly when the cover is open.

In Figure 62, the Power Supply temperature increases from 15°C (@ power-on) up to about 40 °C at the end of the GIADA Normal mode. The IS temperature reaches about 14-15 °C when GIADA is in Normal mode and the cover open. As already noticed, when the lasers are switched on, the IS temperature becomes noisy (data are spread within 1 °C) with respect to GIADA in safe mode. **The temperature sensors acquisition results less noisy than when the Main interface is used**.

The Lasers were properly switched-on and their temperatures (Figure 64) increased from 9°C to 15°C. As expected, the light of each laser decreases when the temperature rises.

The Dust Flux is only seldom greater than 0 (see Figure 66) due to few IS ghost events. Only two sporadic Ghost events were detected (refer to 5.2.3.1) because of channel E behaviour. The IS sensor (and also the channel E) is clearly less noisy than when the Main Interface is used (refer to section 5.1.3.1).

The five MBS, after switch-on, show a temperature between 10 and 25°C (see Figure 65). Figure 69 and Figure 70 report the values in Volt of the IS and GDS detection thresholds and the time when they were changed.

No missing packets have been found in the TM (refer to Figure 68**).**

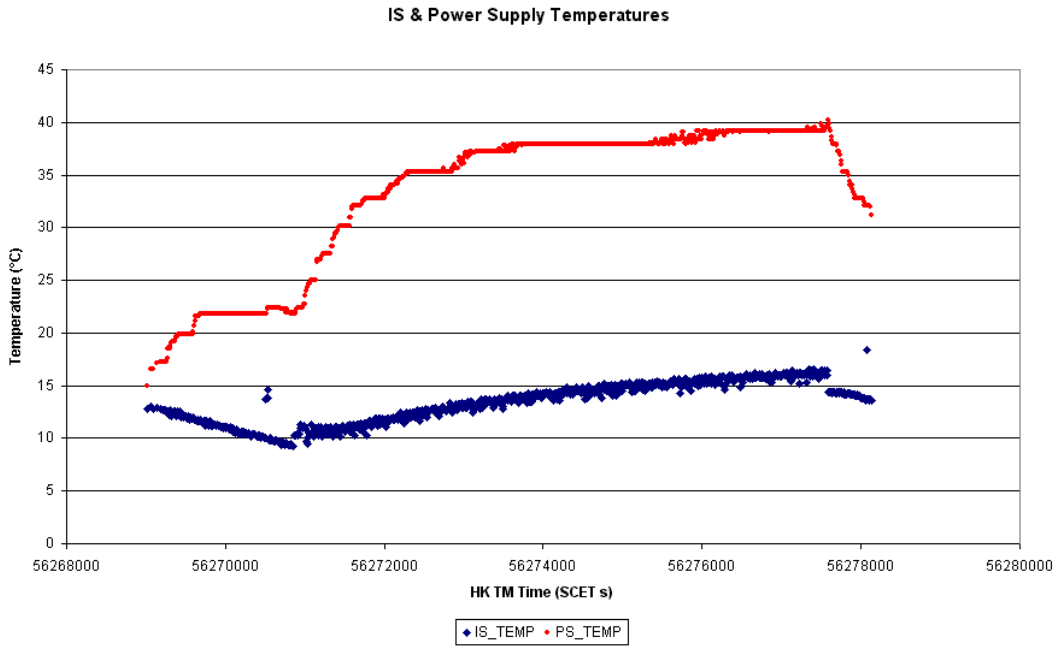

Figure 62 IS & PS Temperatures

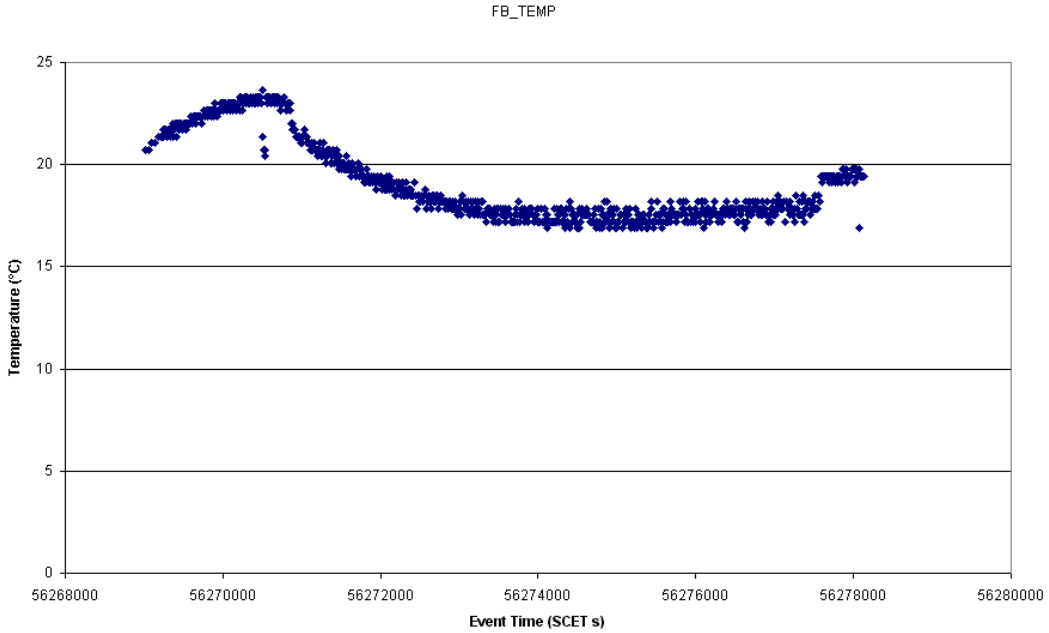

Figure 63 Frangibolt Temperature

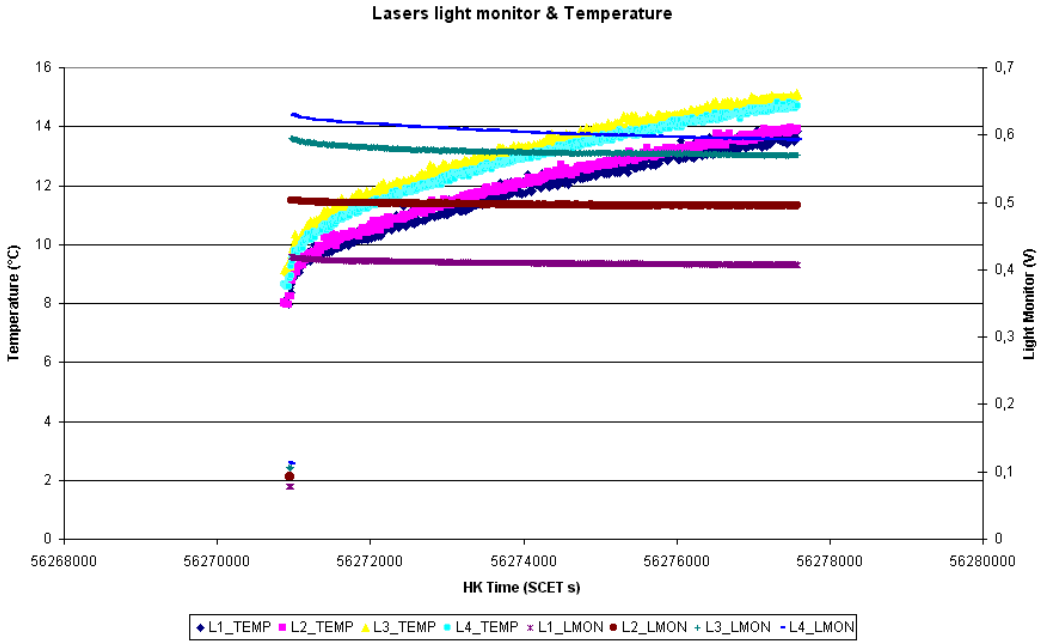

Figure 64 Laser Light monitor and temperatures

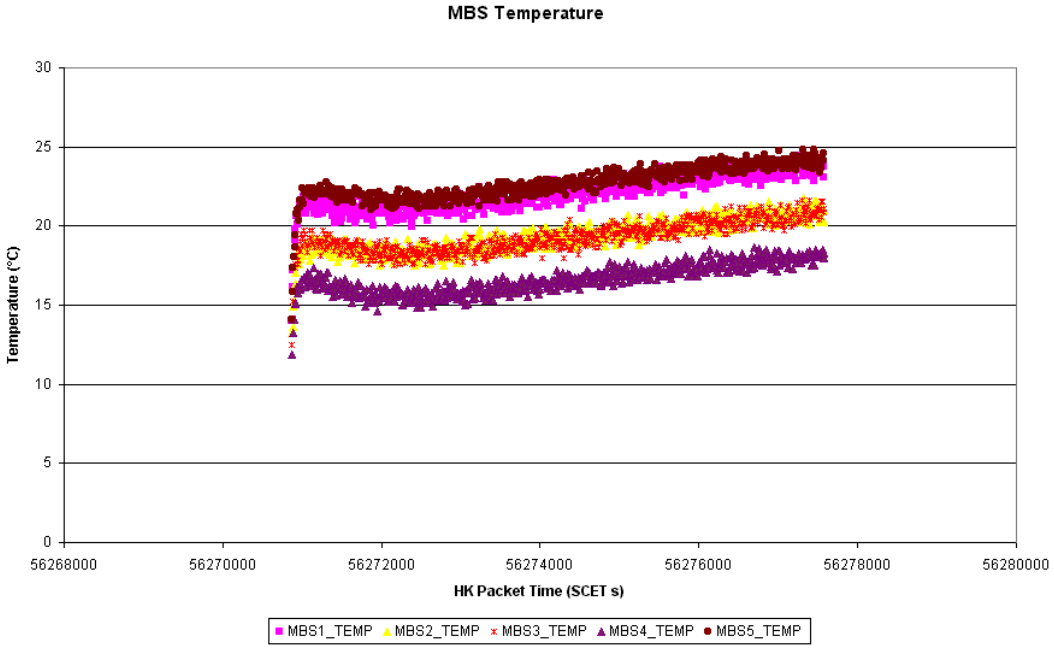

Figure 65 MBS Temperature

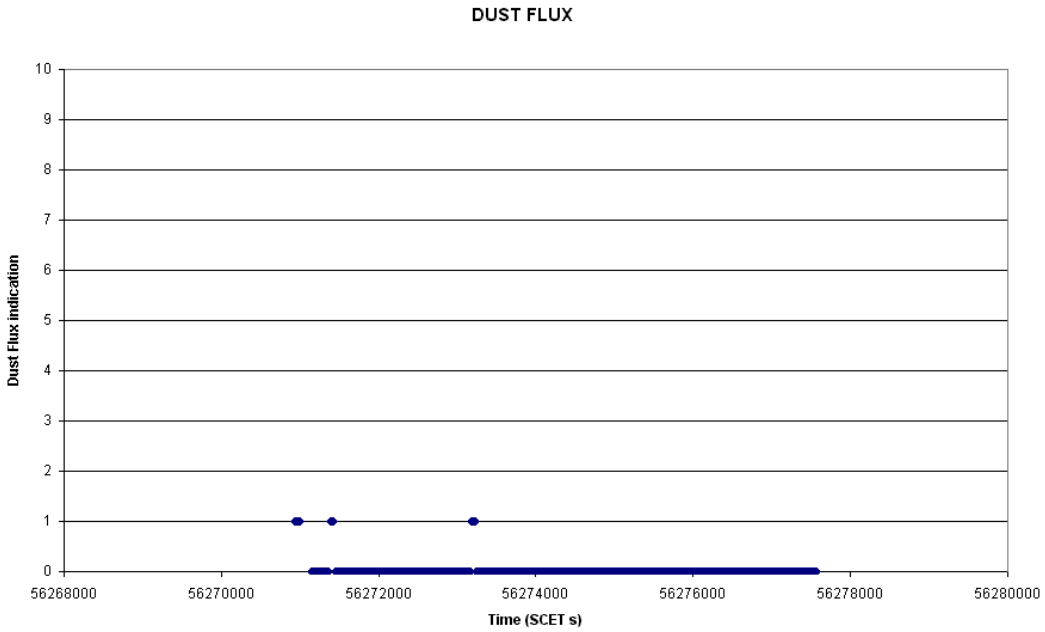

Figure 66 Dust-Flux Monitor (valid only when the IS sub-system is ON)

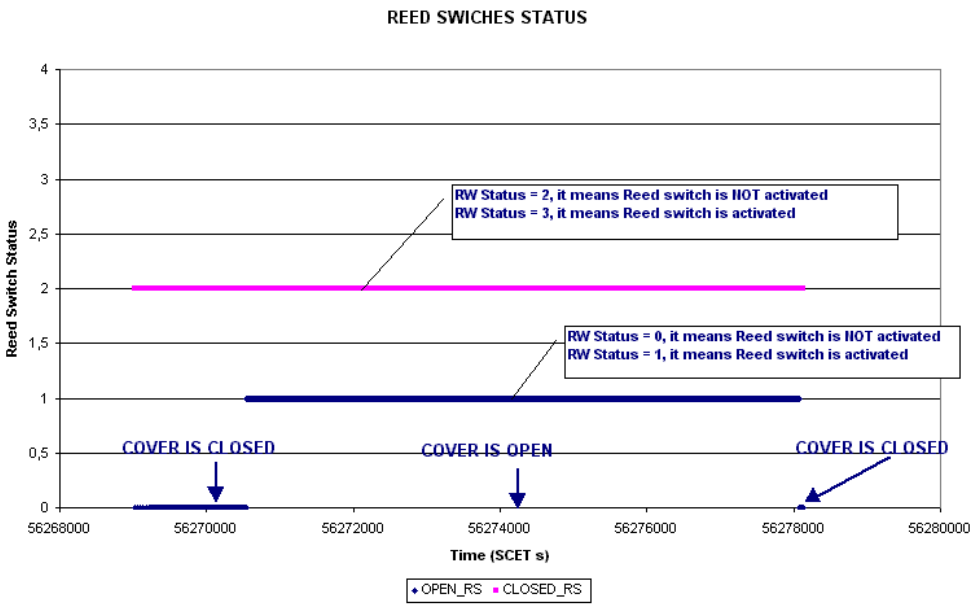

Figure 67 Cover Reed Switch Status (Cover open & close operations)

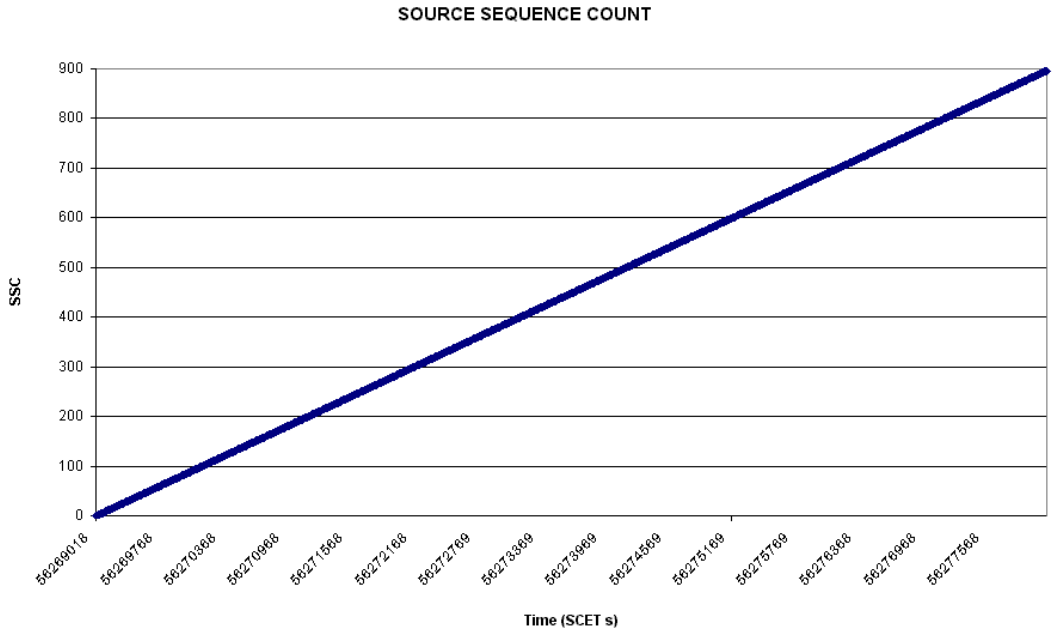

Figure 68 SSC of HK TM

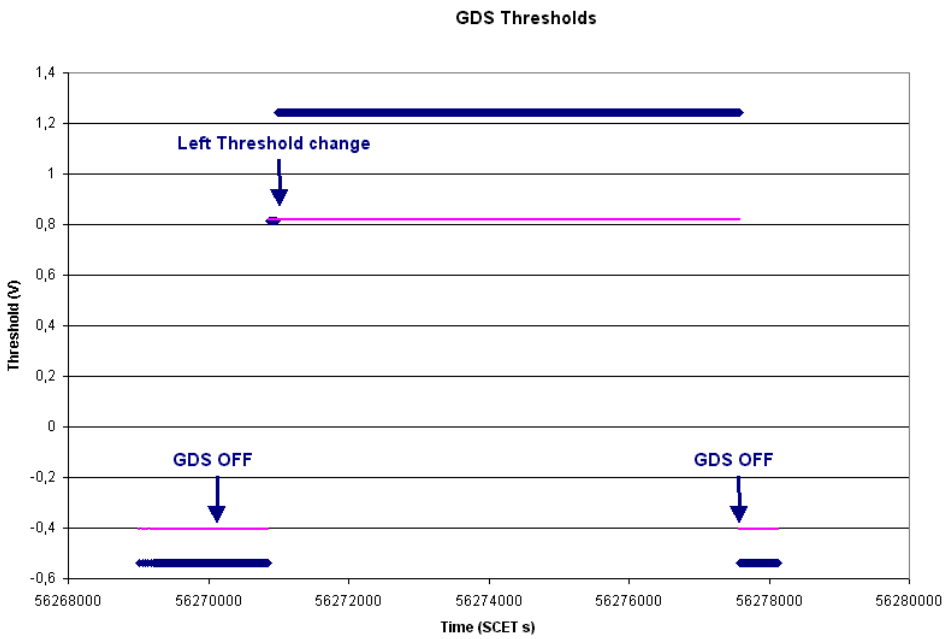

Figure 69 GDS Detection threshold change

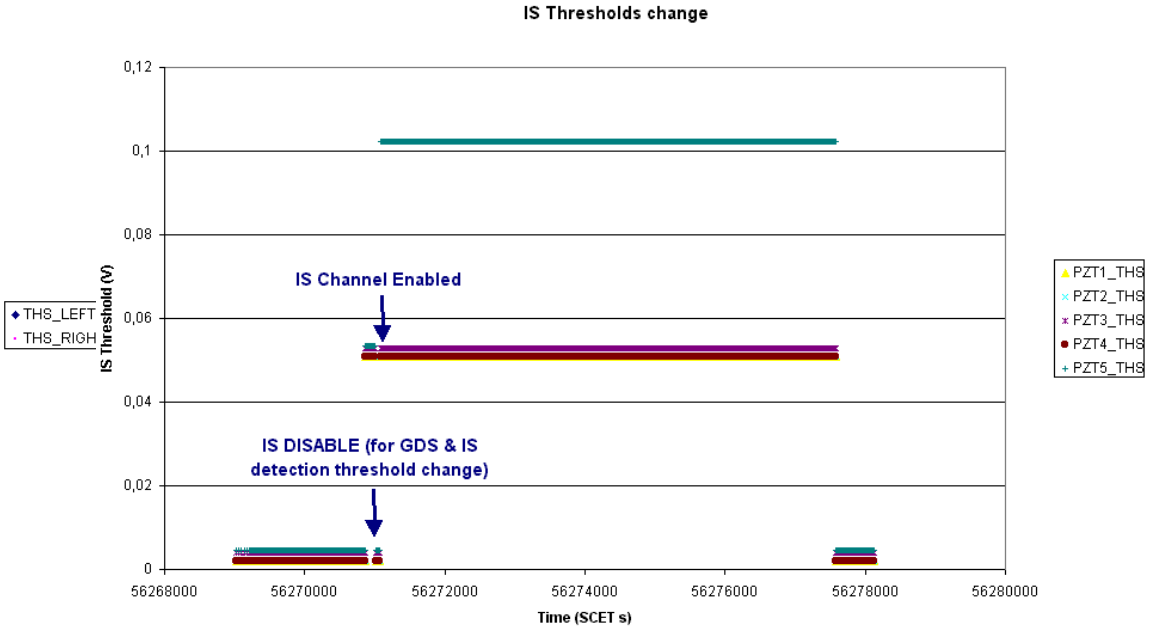

Figure 70 IS Detection threshold change

5.2.2.1 Cover open & close operations

- After the cover open operation, the cover resulted completely open, as shown in Figure 71, in which the status of the two reed-switches is reported. The figure is extracted from the cover report, which is received on-ground at the completion of the operation (@SCET time 56270536s, corresponding to 6:42:40 UTC Time of 13 Oct 2004). The correct behaviour is as reported in Section 5.1.2.1.

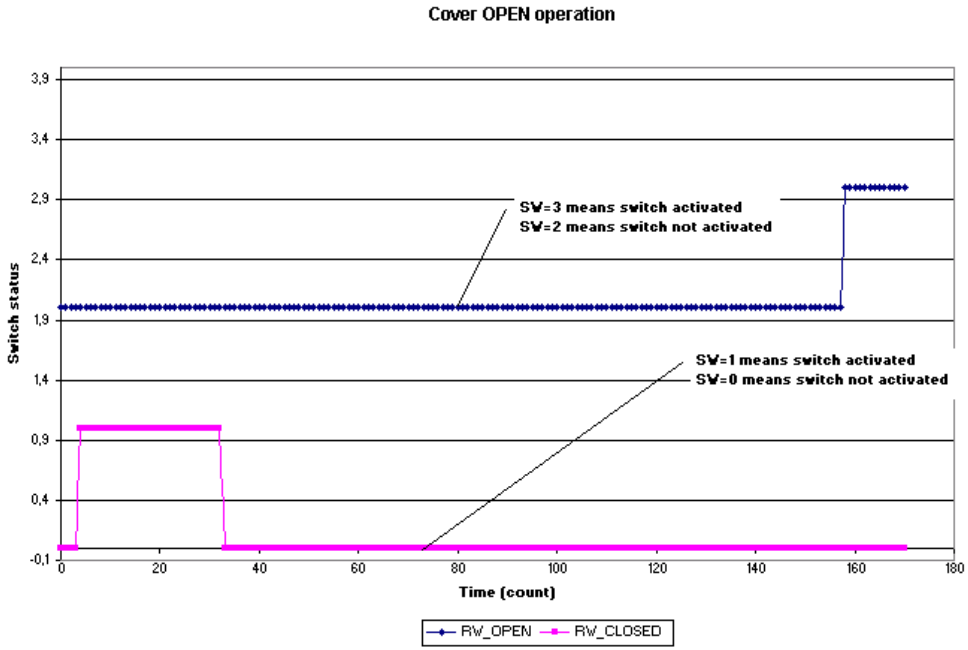

Figure 71 Reed switches Status during the Cover Open operation

- At GIADA power-off, the GIADA cover was closed by the OBCP (Close Cover). The cover was successfully closed by command @ SCET time of 56278072s, corresponding to 08:48:15 UTC time of 13 Oct 2004. Figure 72 reports the correct sequence of the two reed-switches.

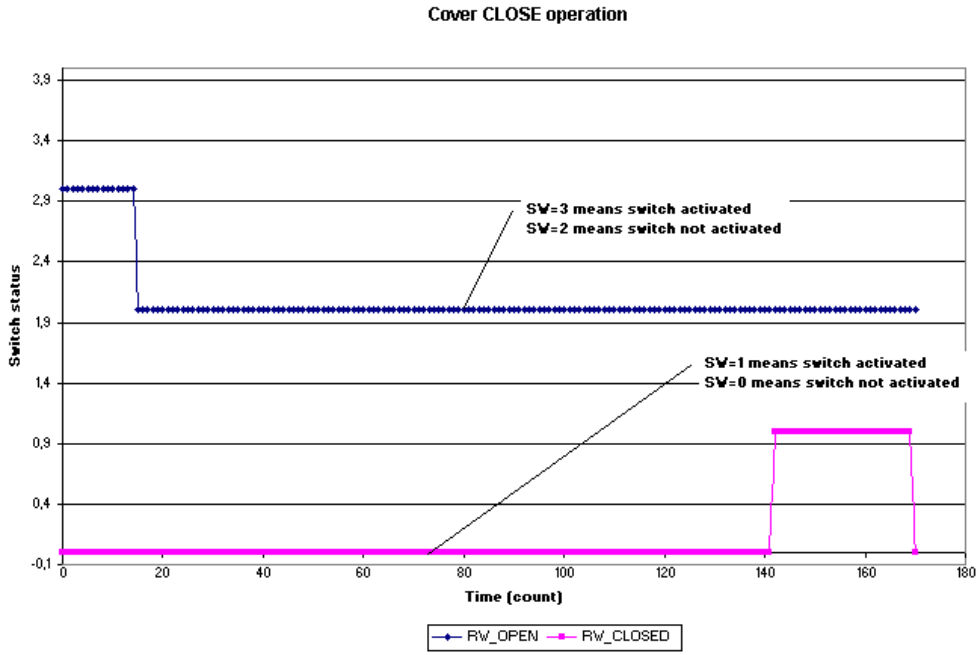

Figure 72 Reed switches Status during Cover Close operation

5.2.3 Engineering evaluation on sensor data

No science TM packets were lost and **no saturation was observed on the SSMM memory allocated to GIADA (1 Mbytes).** Figure 73 shows the Source Sequence Count of TM packets when GIADA is in Normal mode and the science TM is enabled. After the lasers were switched on and the detection threshold on the GDS Left receiver was successfully changed, only few GDS 'Ghost detections' on both receivers were observed, since the thresholds resulted above the level of the internal stray-light (background noise) plus the electronic noise.

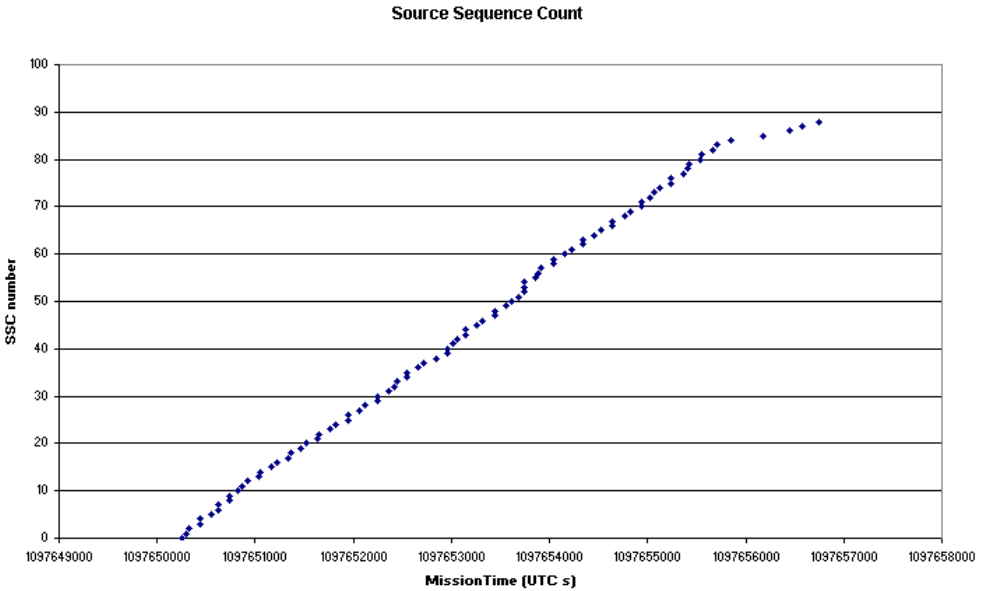

Figure 73 Science TM packet Source Sequence Count

5.2.3.1 IS Sub-system

After the sub-system power on, the detection Threshold of each channel was set to 50 mV (Context file updated via memory load command). One minute after, by the proper commands sequence, the Gain and detection Threshold of Channel E were changed to High (final configuration is shown in Table 2) and to 100mV respectively.

After entering in Normal mode, the IS calibration run until the end of the test every 5 minutes. Only two 'Ghost' detections were obtained: one on Channel D (detected amplitude = 0.071V) and one on Channel A (detected amplitude = 0.054V). No detections on Channel E were observed as seen when GIADA Main interface was switched-on. **It seems that the IS sensor noise is less than the one found when the Main Interface was switched-on.**

Table 5 shows the minimum, maximum of mean and the standard deviation for each channel output before the start of the IS calibration.

Type	PZTA		PZTB		PZTC		PZTD		PZTE	
	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Maximum	-0,0106	0	-0,0106	0	-0,0019	0,0435	-0,0106	0	-0,0135	0
Minimum	-0,0048	0,0638	-0,0077	0,0638	-0,0019	0,0667	-0,0077	0,0638	-0,0077	0,0609
Average	-0,008	-	-0,0083	-	-0,0019	-	-0,00985	-	-0,0109	-

Table 5 IS Calibration – Max, Min & Average of the mean and STD Dev of channel outputs

As we can see, all channels have a low mean value (negative value means channel output close to 0 V) and a noise level (@ 3σ) close or little above to the detection Thresholds. The noise levels are below those measured with the Main Interface.

Figure 74 to Figure 82 show the results of the IS internal calibrations. According to Section 5.2.2.1 of **AD4**, only the 2nd and 4th stimuli are meaningful.

- Channel-A response is quite consistent (amplitude varies within 60mV) along the one-hour and half period of calibration. The measured amplitude slightly depends on the temperature (refer to Figure 83): it decreases when the temperature increases (variation < 60mV in 10°C of temperature change). Its trend with respect to the temperature is quite similar to that observed when the Main interface was switched-on.
- Channel-B response is quite consistent (amplitude varies within 30mV) along the one hour and half period of calibration, except for one calibration where the amplitude and delay are about 0.07V below the nominal and 6μsec below the nominal. The trend of the measured amplitude with respect to the temperature (refer to Figure 84) is similar to that observed when the Main interface was switched-on.

- Channel-C response is confirmed not stable along the different calibrations (refer to the voltage/delay time measurements of 2nd and 4th stimuli) and with respect to the temperature change (refer to Figure 85). However the spread of the measured amplitudes and delay is lower than that observed with GIADA main Interface.
- Channel-D response results quite consistent (i.e. the same amplitude) along the one hour and half period of calibration, except for two calibrations where the measured amplitudes result above the nominal value. The measured amplitude (refer to Figure 86) slightly increases when temperature rises (variation is less then 30mV within 7 °C of temperature change).
- Channel-E response results quite consistent along the one hour and half period of calibration. The measured amplitudes (refer to Figure 87) decreases and reaches a minimum and then increases with temperature (the amplitude variation is < 50mV within the 7 °C of temperature change).

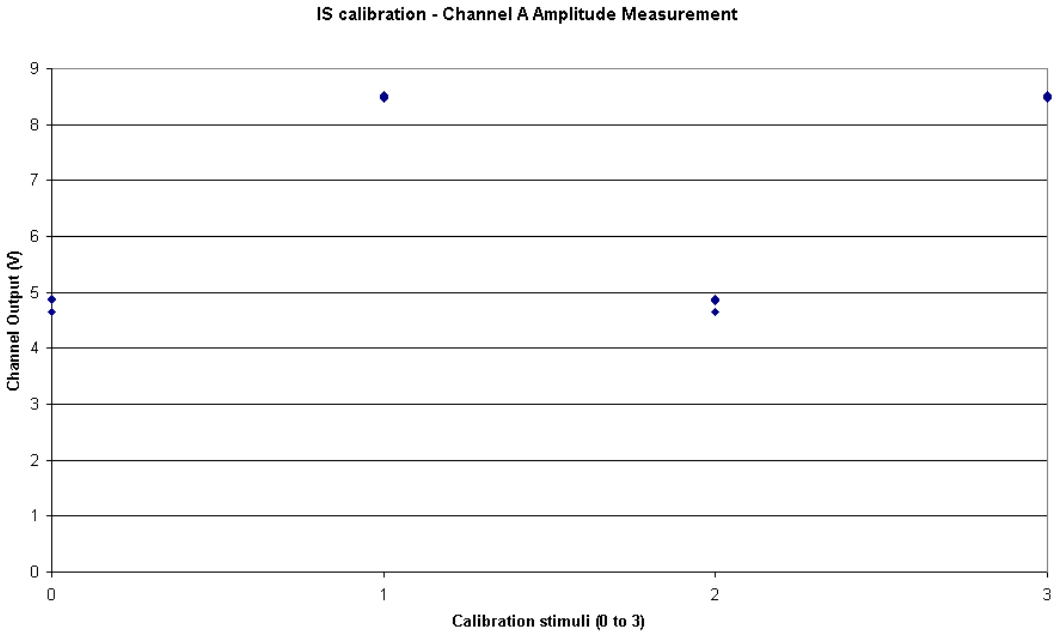

Figure 74 IS Calibration - Channel A Amplitude

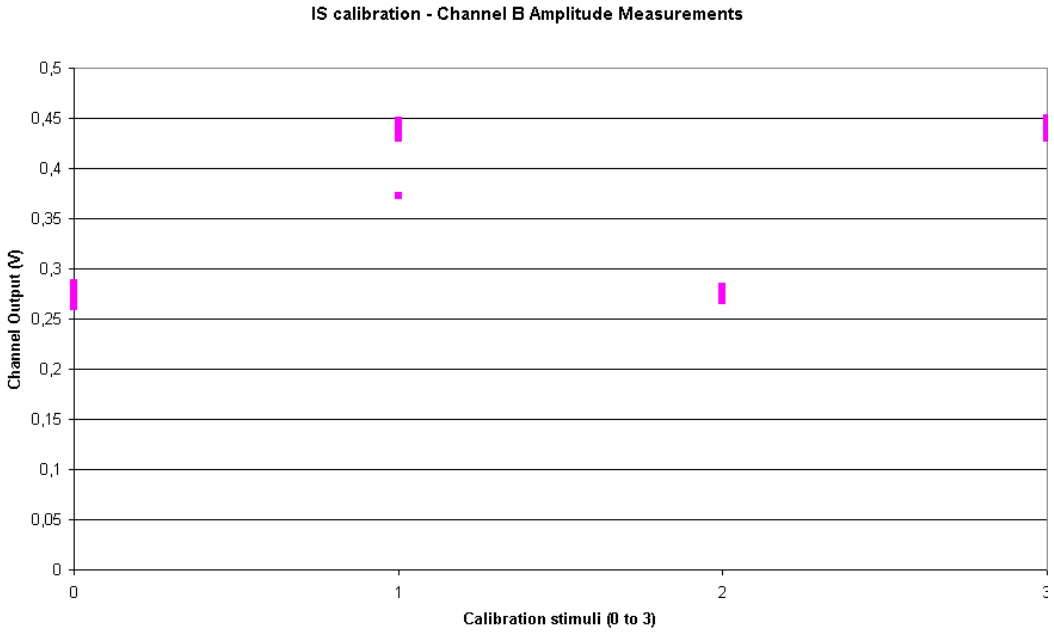

Figure 75 IS Calibration - Channel B Amplitude

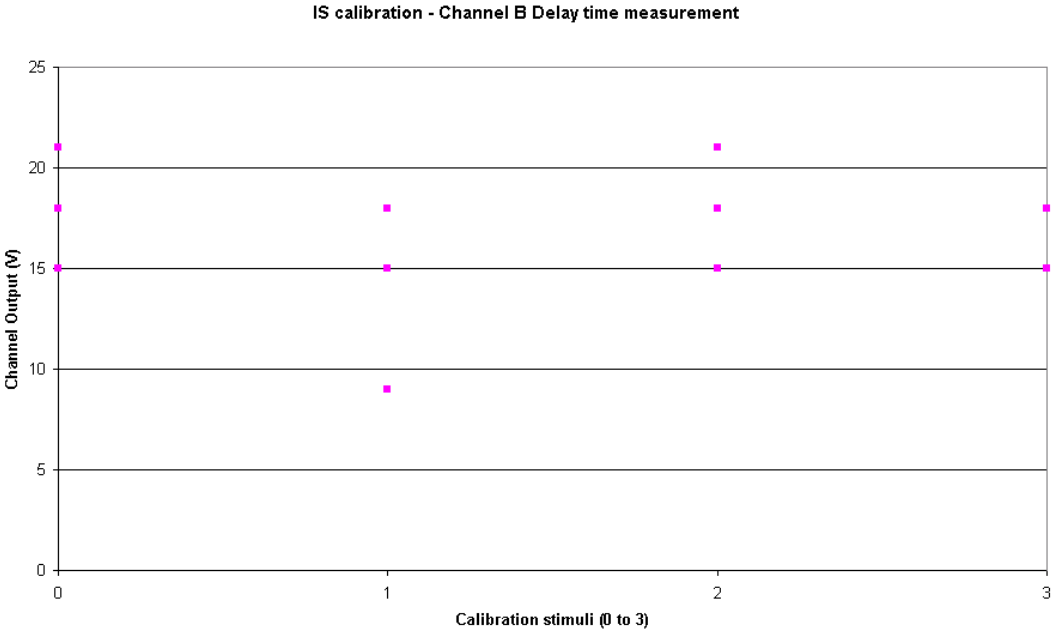

Figure 76 IS Calibration - Channel B Delay Time

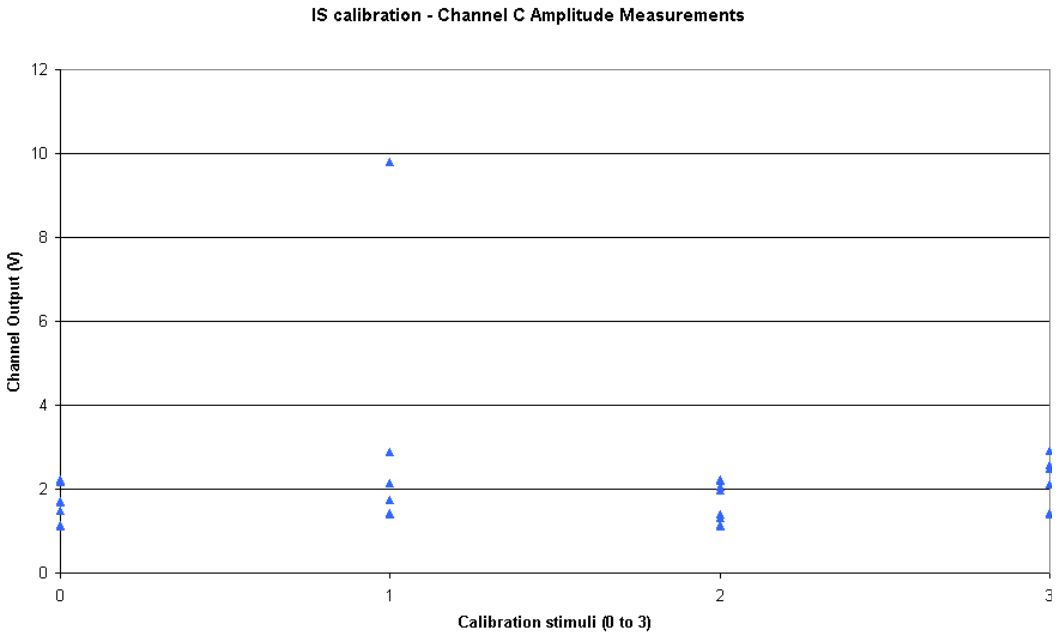

Figure 77 IS Calibration - Channel C Amplitude

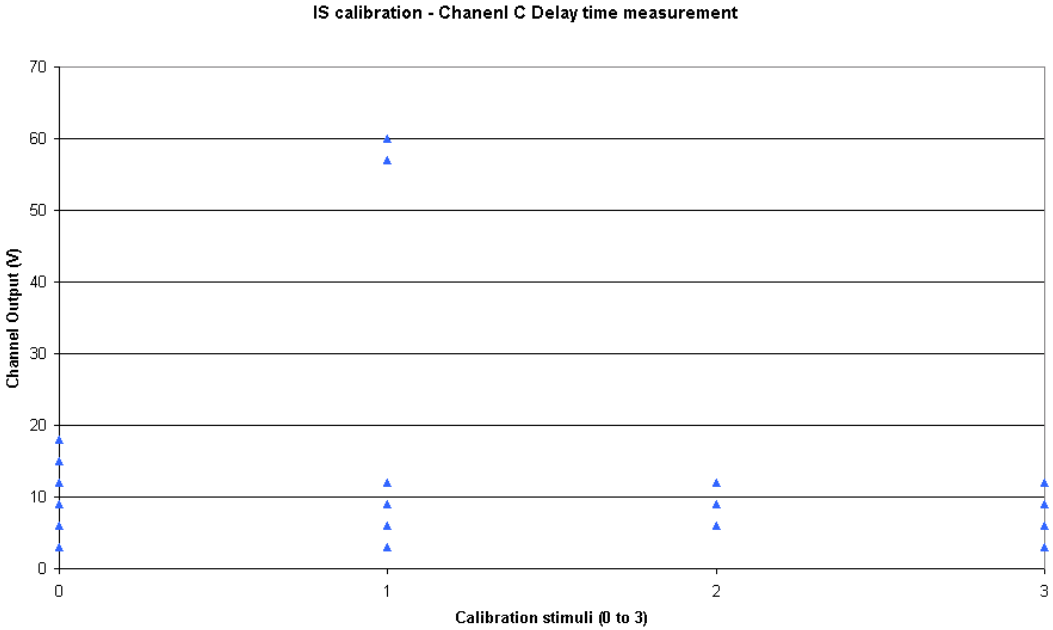

Figure 78 IS Calibration - Channel C Delay Time

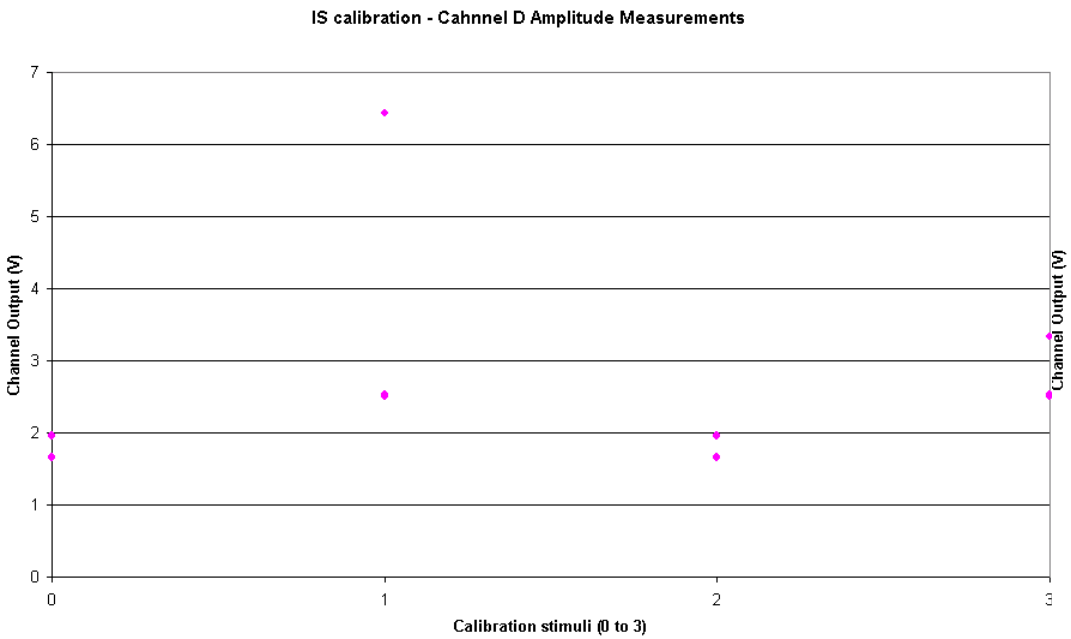

Figure 79 IS Calibration - Channel D Amplitude

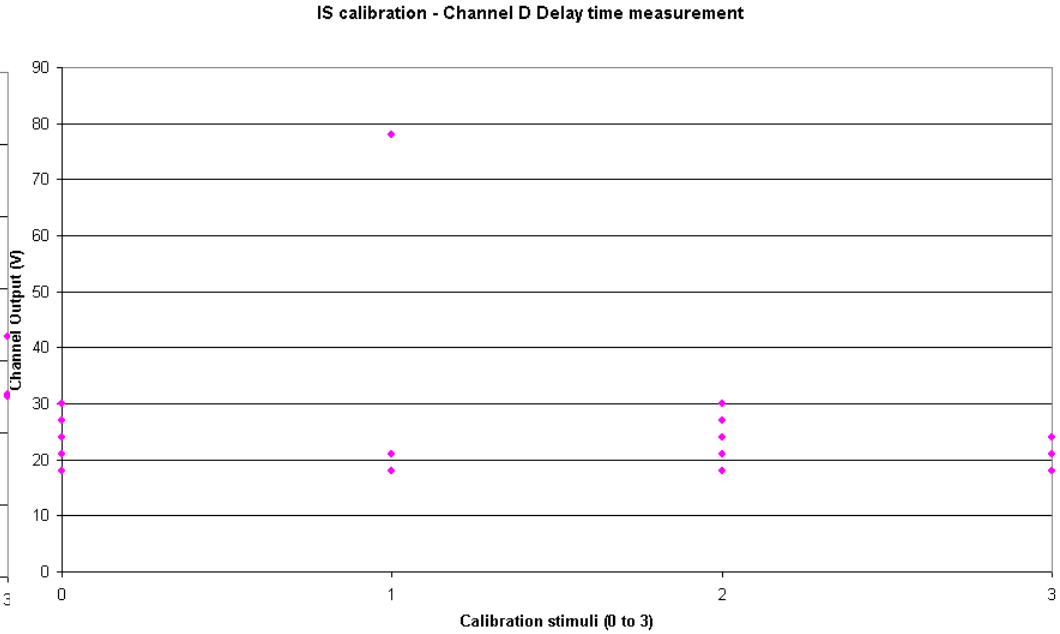

Figure 80 IS Calibration - Channel D Delay Time

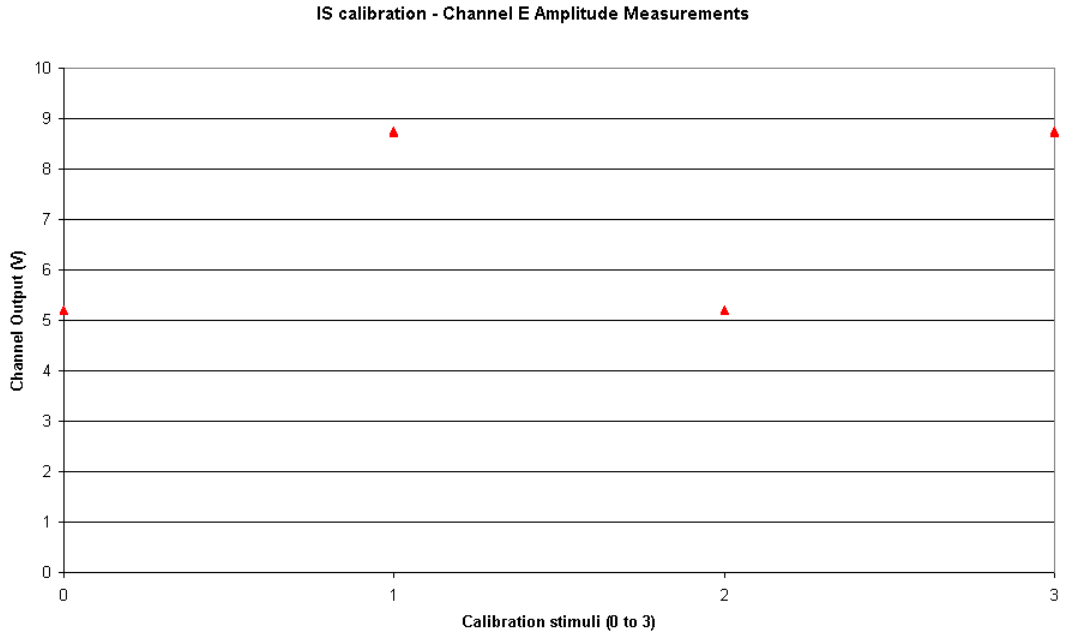

Figure 81 IS Calibration - Channel E Amplitude

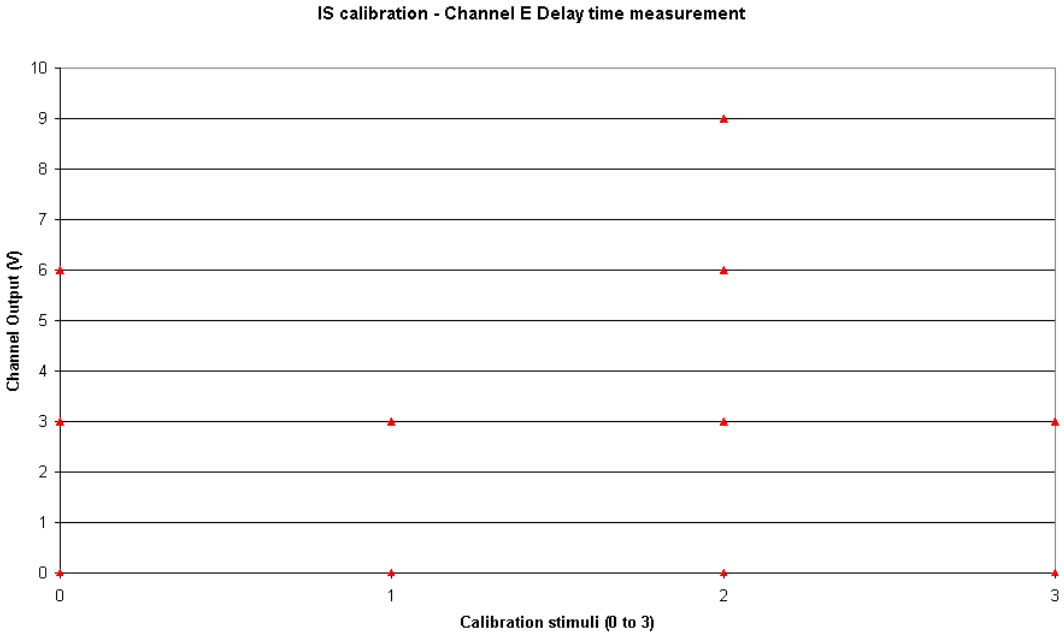

Figure 82 IS Calibration - Channel E Delay Time

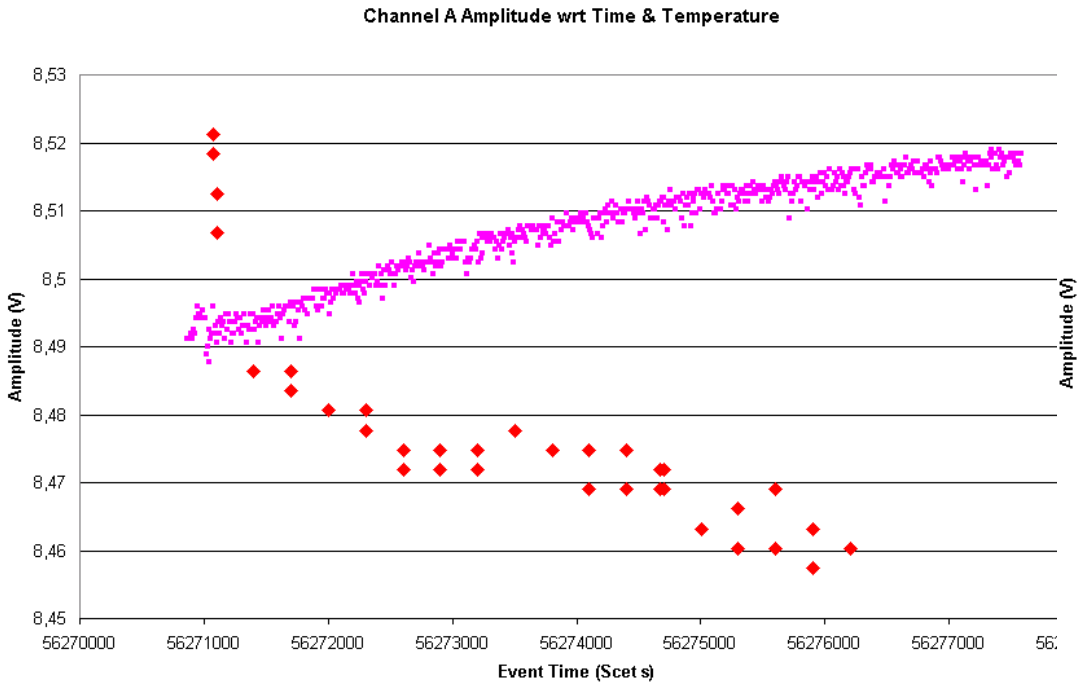

Figure 83 Channel A response wrt IS temperature

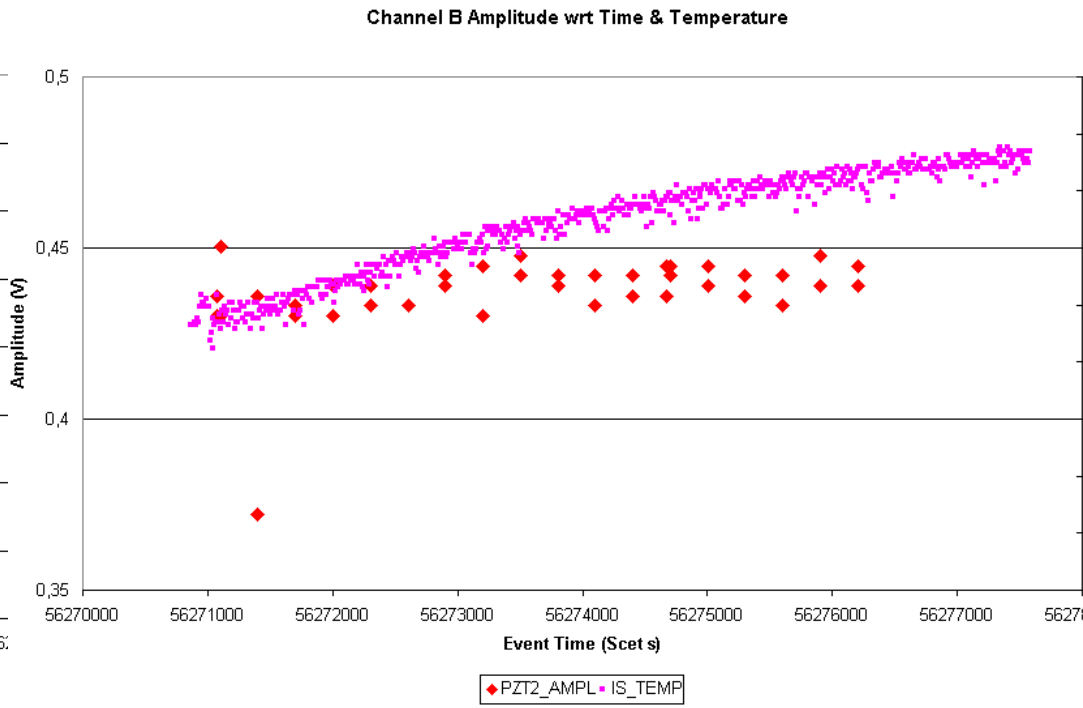

Figure 84 Channel B response wrt IS temperature

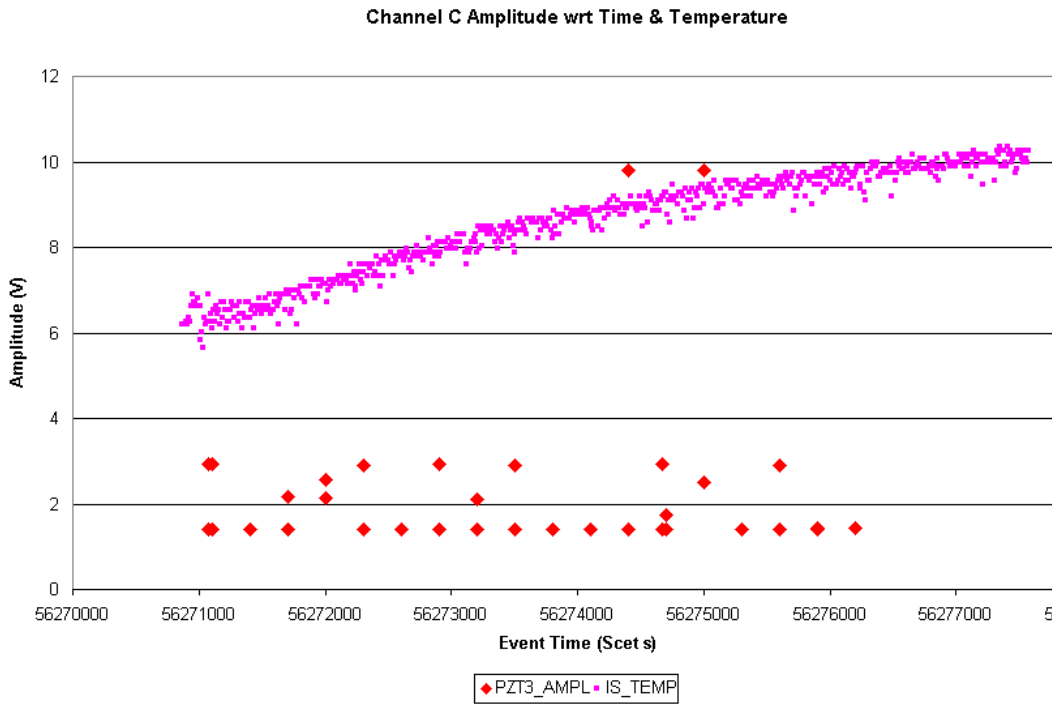

Figure 85 Channel C response wrt IS temperature

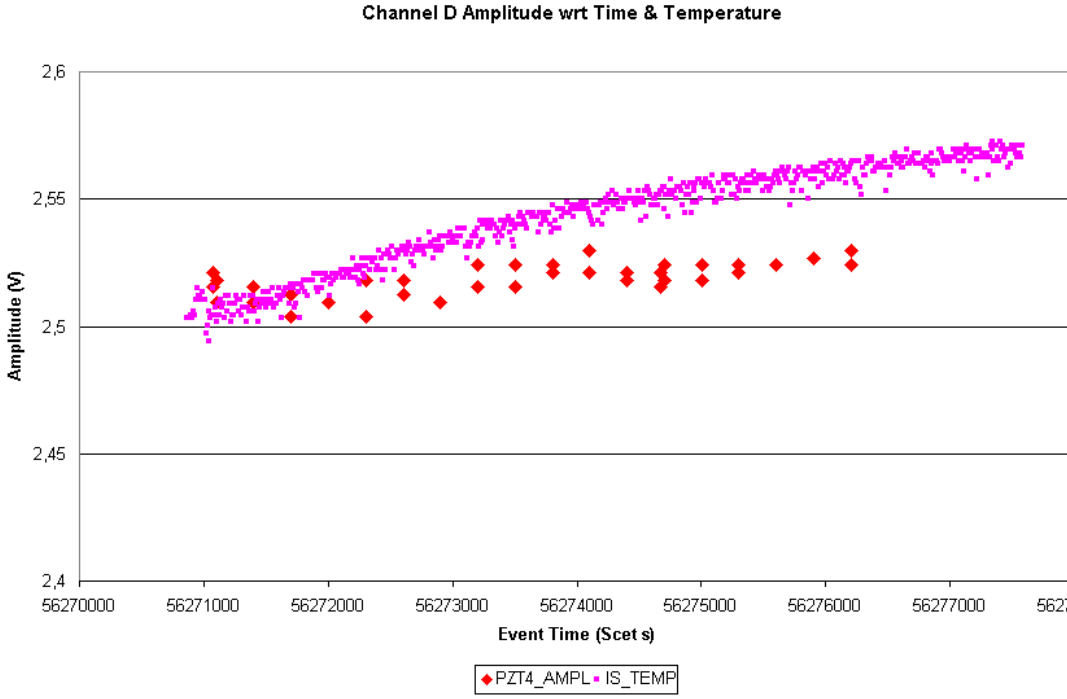

Figure 86 Channel D response wrt IS temperature

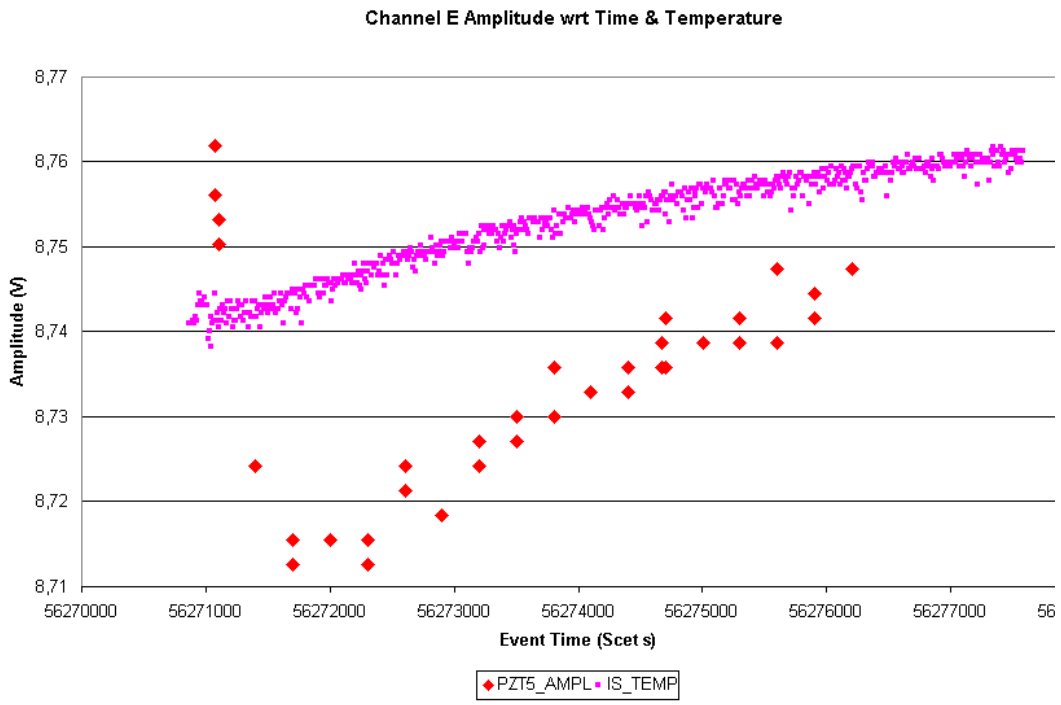

Figure 87 Channel E response wrt IS temperature

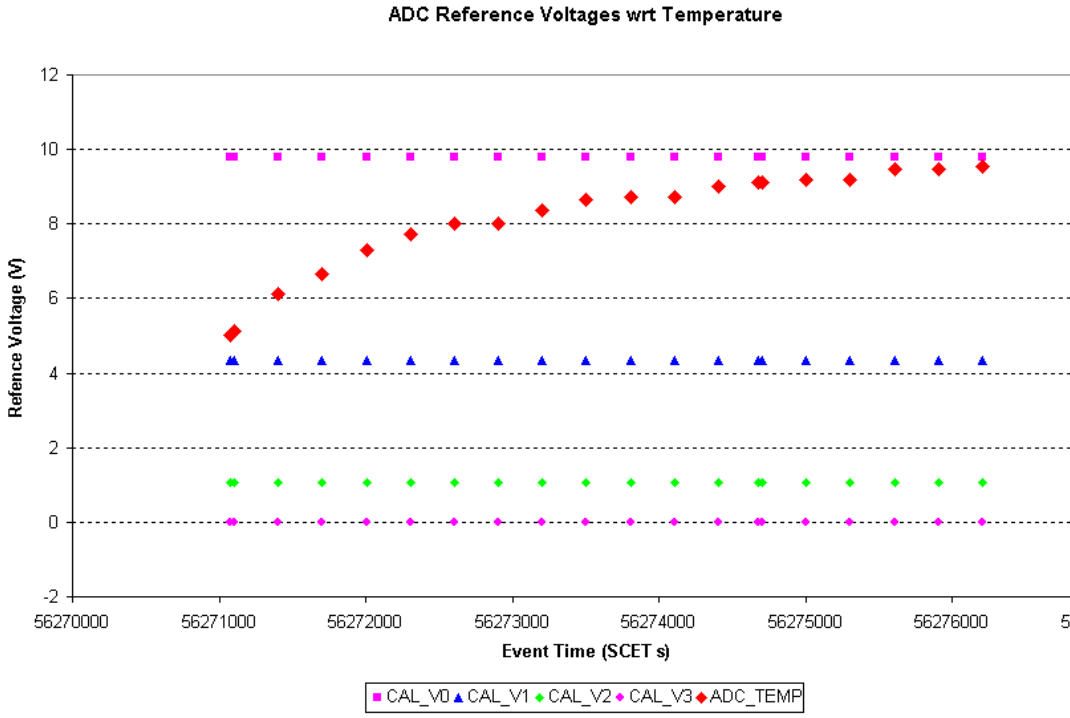

Figure 88 IS Calibration - ADC Temperature & ADC Reference Voltages

5.2.3.2 GDS Sub-system

The detection thresholds of Left and Right channels were set to about 1.24 V and 0.8 V respectively. The nominal operation was to perform periodic GSD calibrations every 5 minutes.

Figure 89 and Figure 90 show the GDS Calibration Right and Left mean value and standard deviation. As we can see, the mean value of the Right receiver is always below the detection threshold (only few ghost detections were observed on the Right channel) and practically the same as during the previous in-flight tests since April '04 when GIADA was switched on alone. The average is about 0.2 V (minimum and maximum are within 0.15V and 0.292V), while its standard deviation is below 45 mV. It is confirmed that noise level on GDS right receiver is less than that measured with Main Interface.

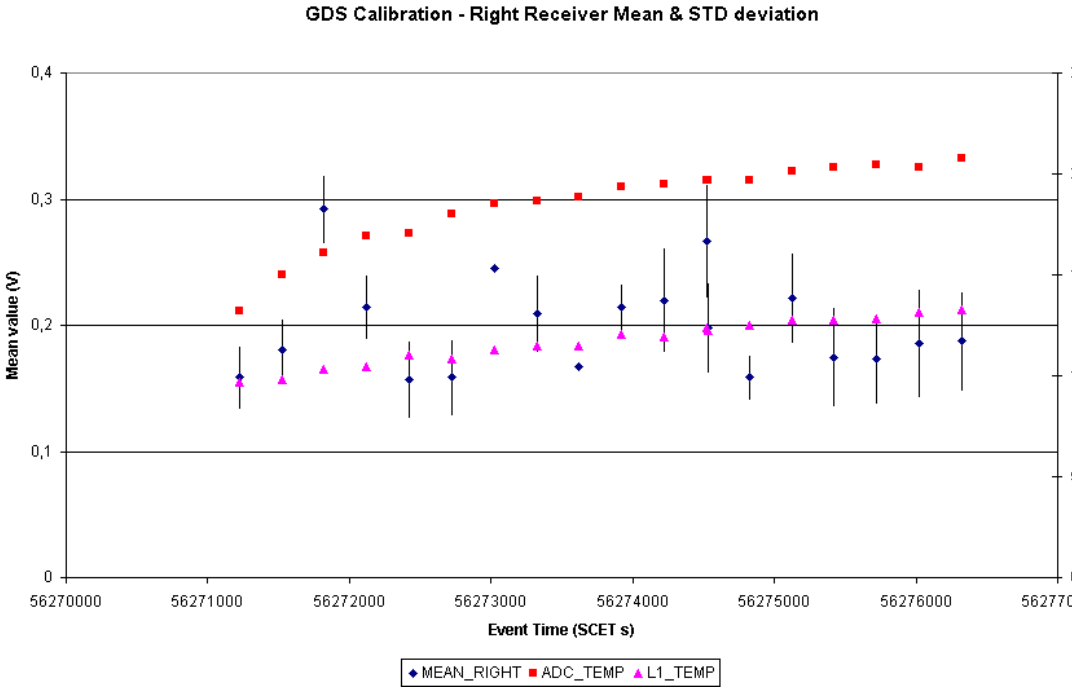

Figure 89 GDS Right Receiver Calibration (mean value and STD deviation)

The mean and standard deviations of Left receiver calibrations (Figure 90) are quite similar to those described for the right receiver, but for a higher mean value and standard deviation.

The average is about 0.78 V (minimum and maximum are 0.7V and 0.9V respectively), while its standard deviation is always below 70 mV.

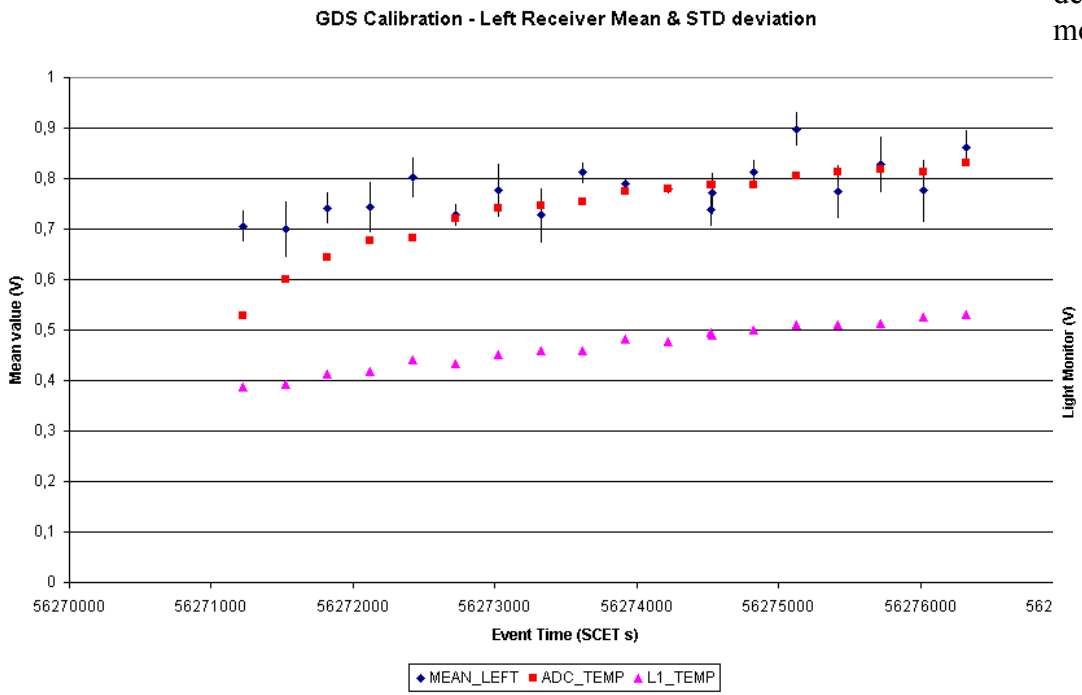

Figure 90 GDS Left Receiver Calibration (mean value and STD deviation)

Figure 91 and Figure 92 show the light monitors and the temperatures of the four lasers at the time of the GDS calibration. Except for the known behaviour (i.e. the laser light decreases when temperature increases), the figures of the light monitors are as expected.

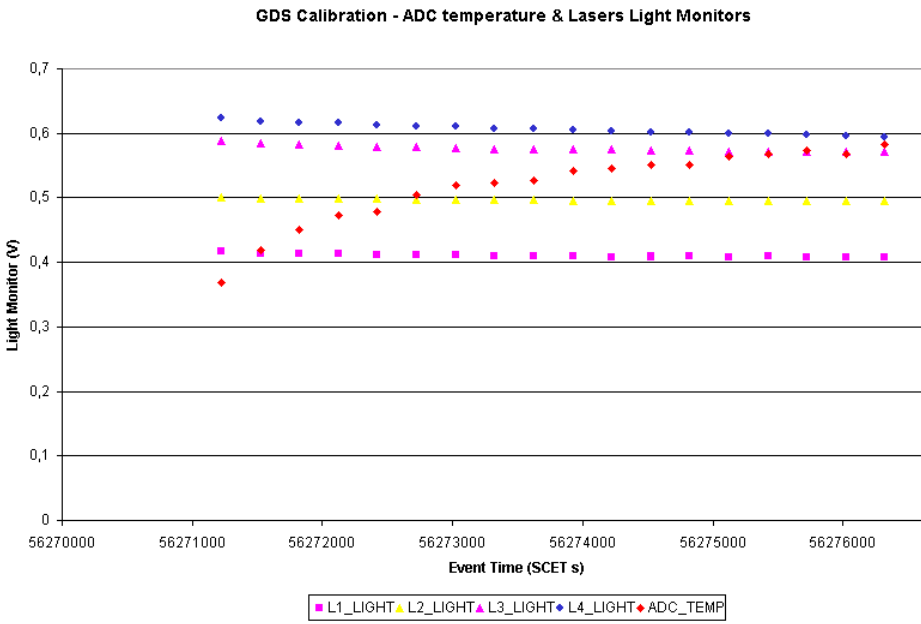

Figure 91 GDS Calibration - ADC & Lasers Light Monitor

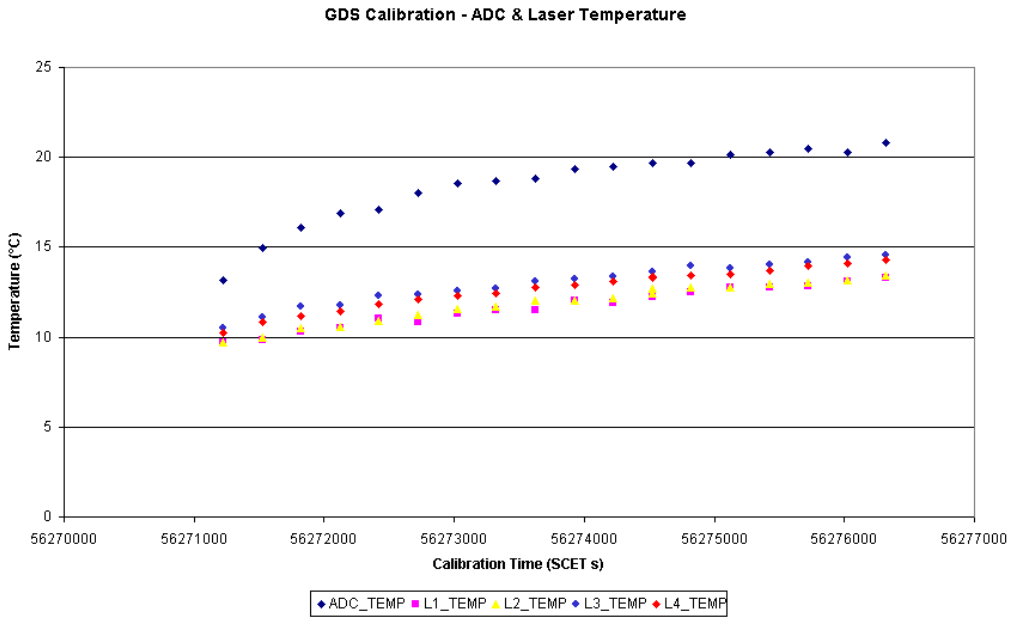

Figure 92 GDS Calibration – Laser Temperature

Figure 93 shows the amplitude of the scattered light of the Left Receiver 'Ghost detections', while Figure 94 reports the Right Receiver 'Ghost detections'.

As we can see the 'Ghost detections' on Right receiver are very few (7 events within about 1 and half hour of test). The GDS receiver outputs result practically saturated when the Ghost detection happens. Its rate is surely lower then the one observed on the Main Interface.

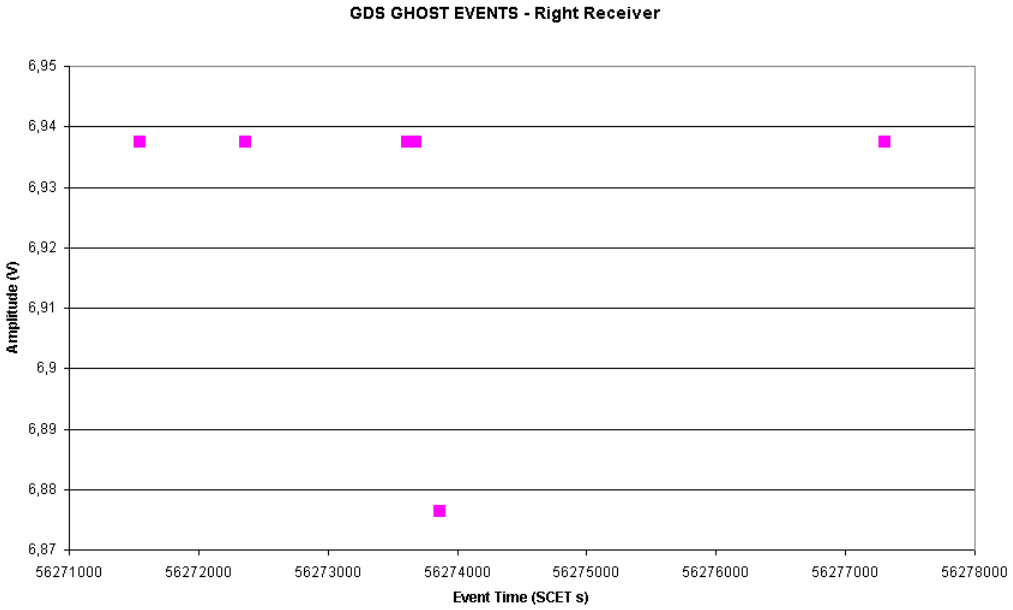

Figure 93 Amplitude of 'ghost detections' on Right receiver

Concerning the ghost detections on left receivers (as in the previous tests) two 'detection' types can be distinguished:

- The first type in which the detections amplitude is of the order or little below of detection threshold (1.24 V). These are 'ghost detections' due to the high level of the internal stray-light in combination with the electronics noise. Except for the first 39 events (that have happened after the lasers on, at the threshold change), the others were very sporadic (3 events in 1 and half hour, i.e. < 7 events per hour). Note that the measured amplitude is below the detection threshold (e.g. about 0.8V while threshold is 1.2V). It is confirmed that: a) the noise level is lower than the one observed with the Main Interface and b) it seems that the noise is not correlated with the other experiments operations while it increases when the GIADA internal temperatures rise. Of course, the SSMM memory allocated for GIADA was not saturated because of the increased threshold.

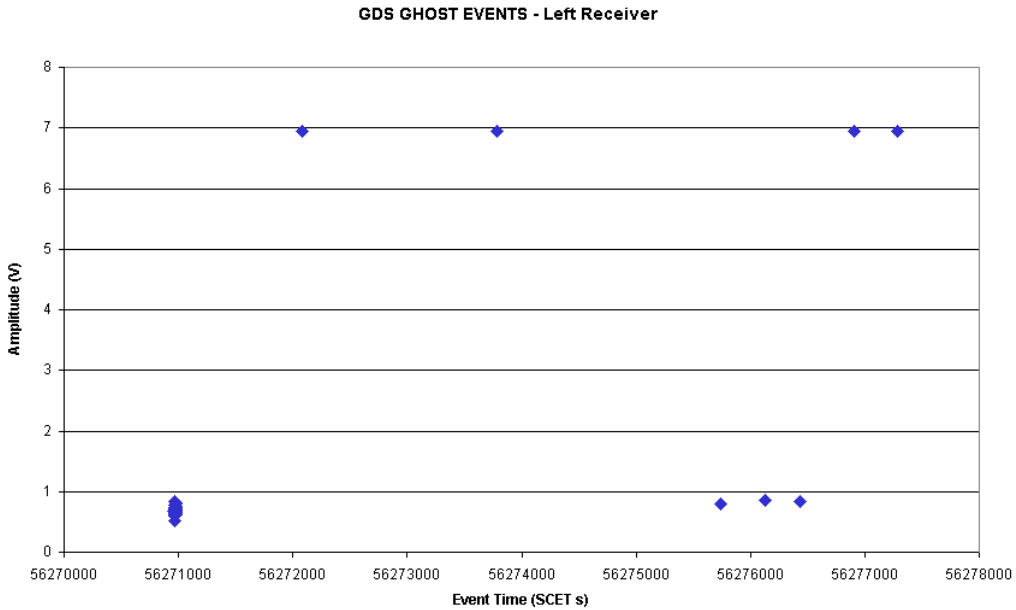

Figure 94 Amplitude of 'ghost detections' on Left receiver

- The second type of detections (4 in about 1 and half hour), in which the amplitude on the left receiver is well above the detection threshold or in saturation (6.9375 V). It is confirmed that they seem not correlated to any specific GIADA internal event (such as calibration, temperature or relay on-off switching as shown in the Figure 95).

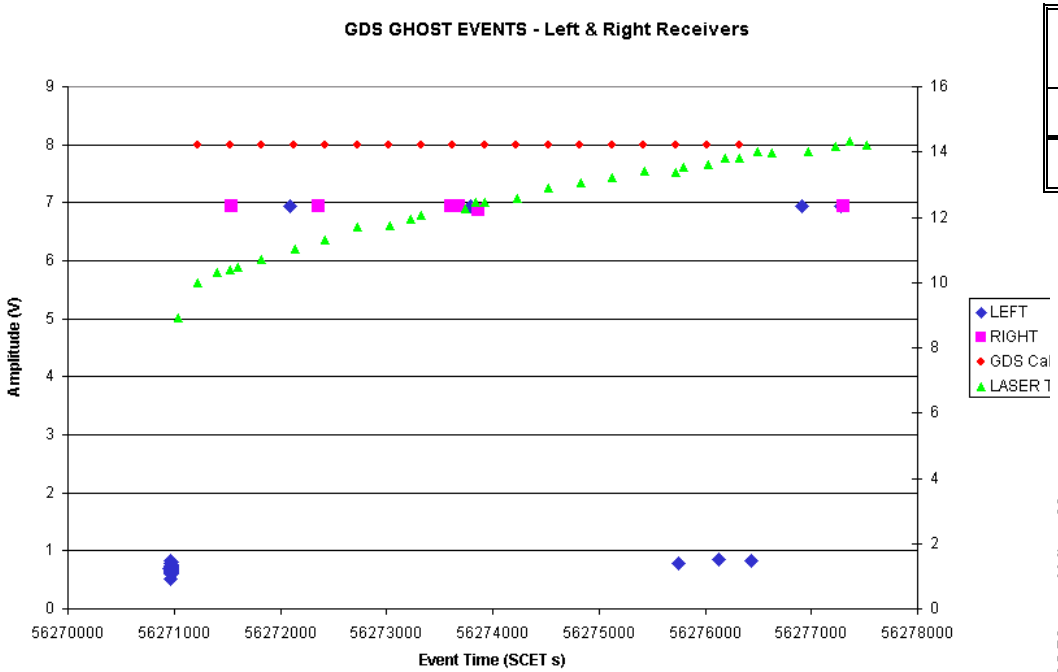

Figure 95 'Ghost detections' on Left receiver wrt Calibration and Temperature

Table 4, Figure 96 and Figure 97 show the ADC Reference Voltages along the Interference II test for the sequence of the IS, GDS and MBS calibrations. The voltages are quite stable in the temperature range 12 to 20 °C.

ADC REF. V0		ADC REF. V1		ADC REF. V2		ADC REF. V3	
Mean	STD	Mean	STD	Mean	STD	Mean	STD
9.77435	0,001	4,3452	0	1,0769	0	-0,0106	0

Table 6. ADC Reference Voltages

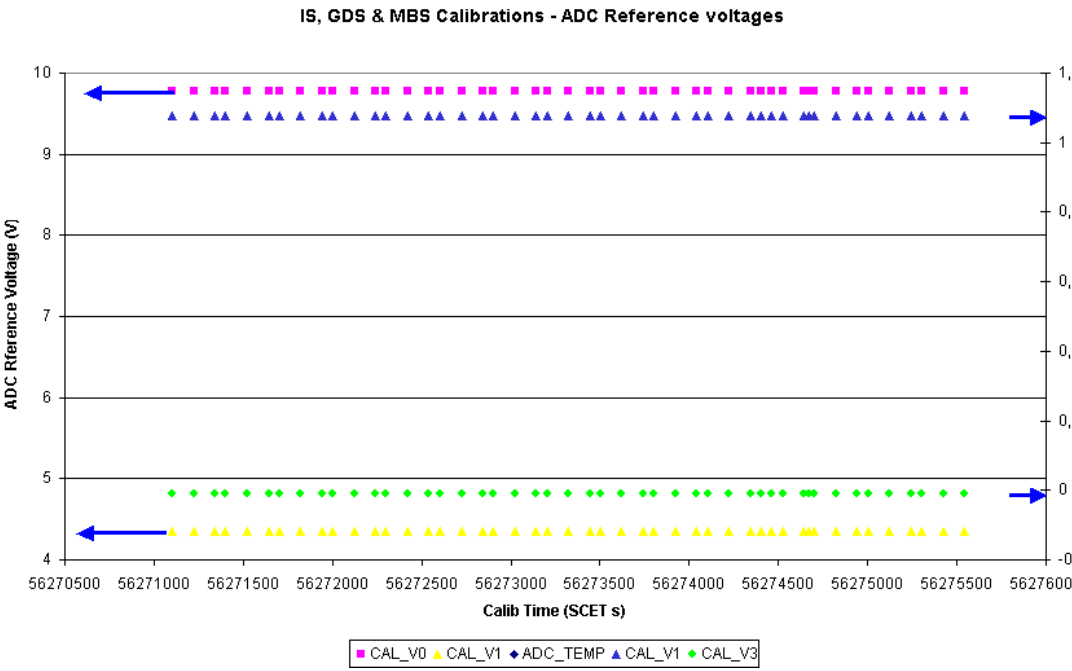

Figure 96 ADC Voltage Reference during Calibration

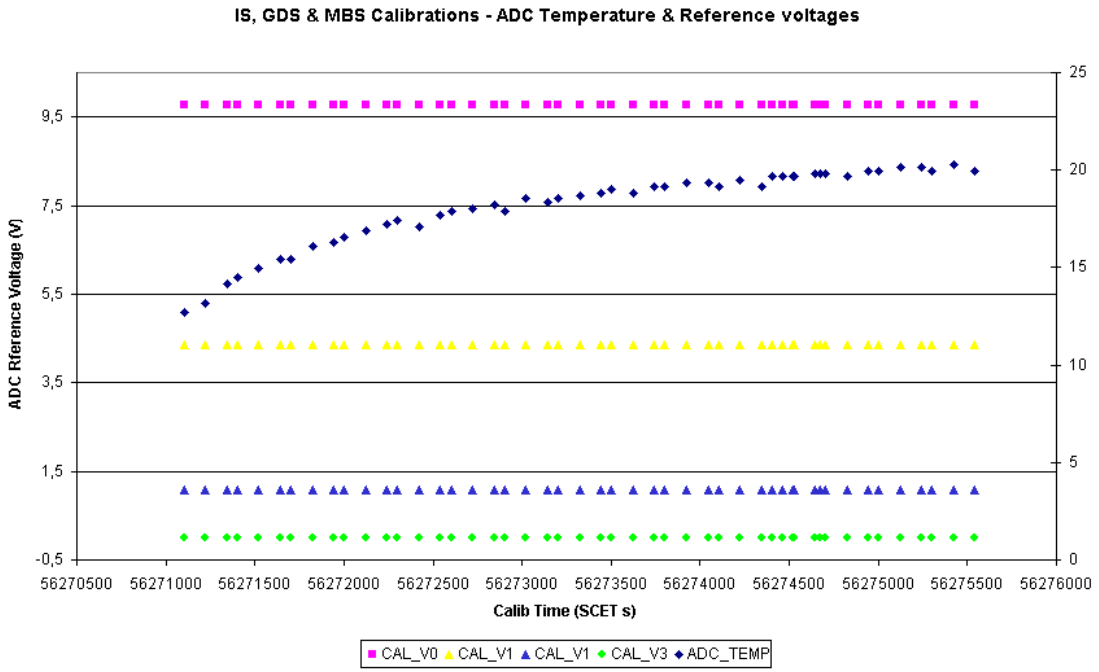

Figure 97 ADC Voltage Reference wrt ADC temperature during Calibration

5.2.3.3 MBS Sub-system normal acquisition

The MBS frequency for three of the MBS (1, 3 & 5) is confirmed to be significantly higher then in the 1st Commissioning. However, no significant deviations have been observed from the measurements taken during the Interference Part 1A and Part 1B.

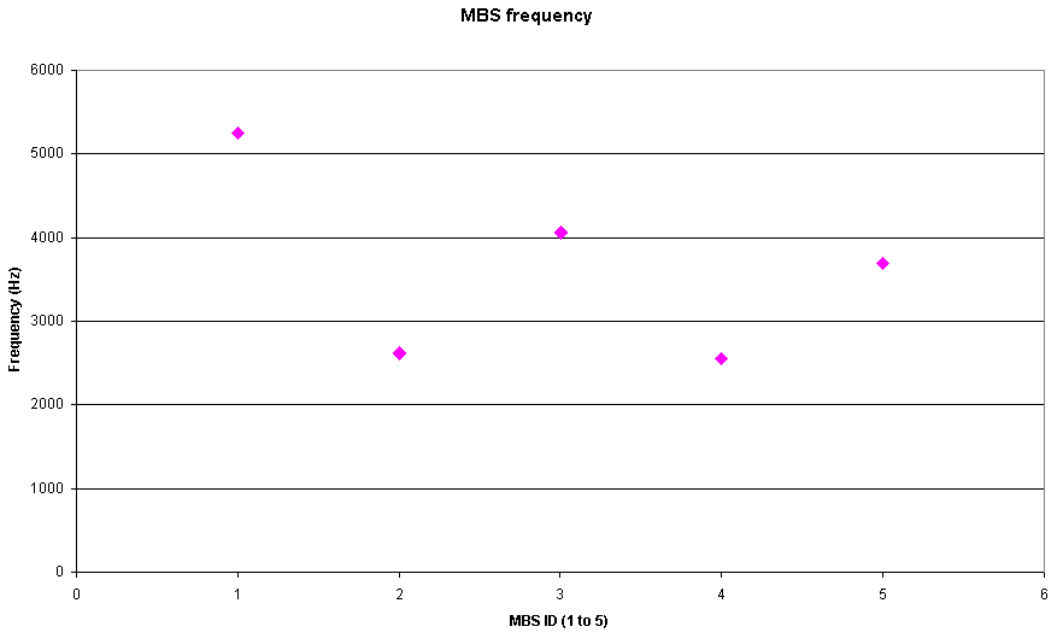

Figure 98 MBS Frequency

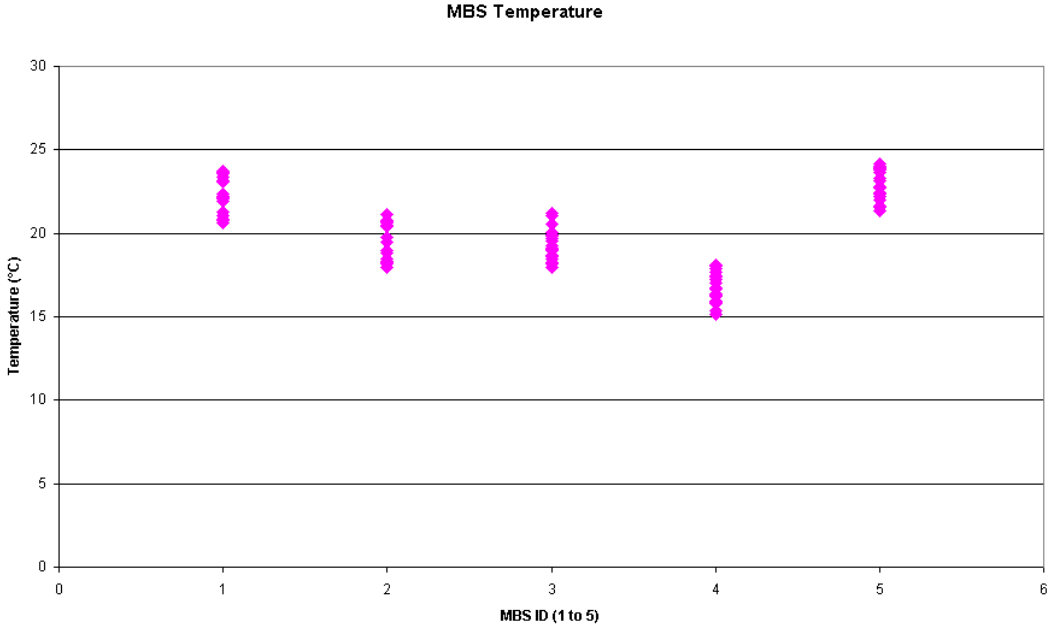

Figure 99 MBS Temperature

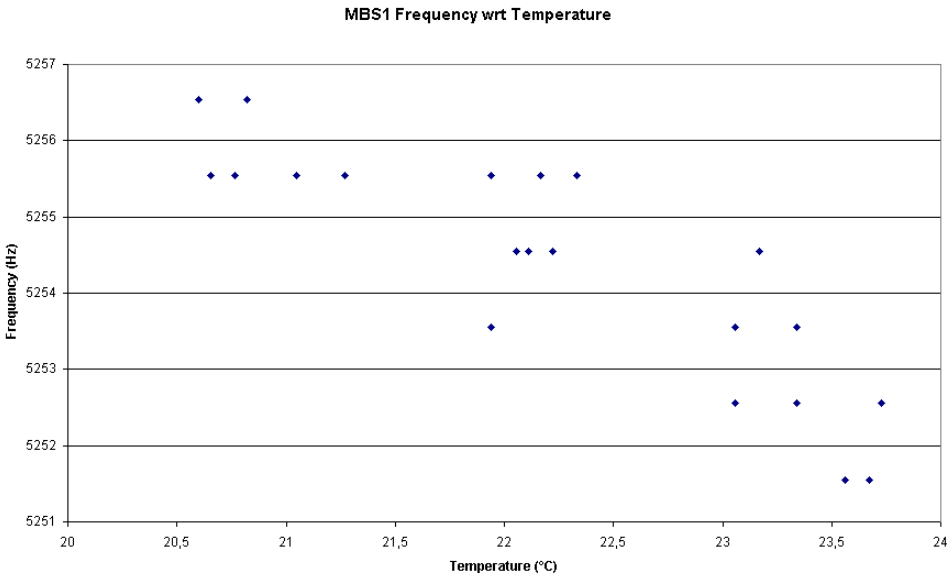

Figure 100 MBS1 Frequency wrt Temperature

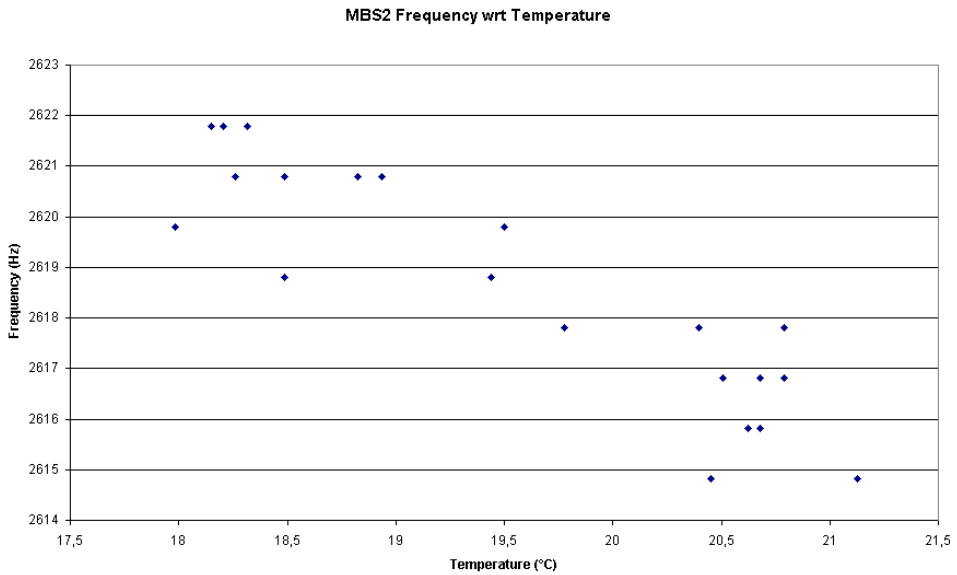

Figure 101 MBS2 Frequency wrt Temperature

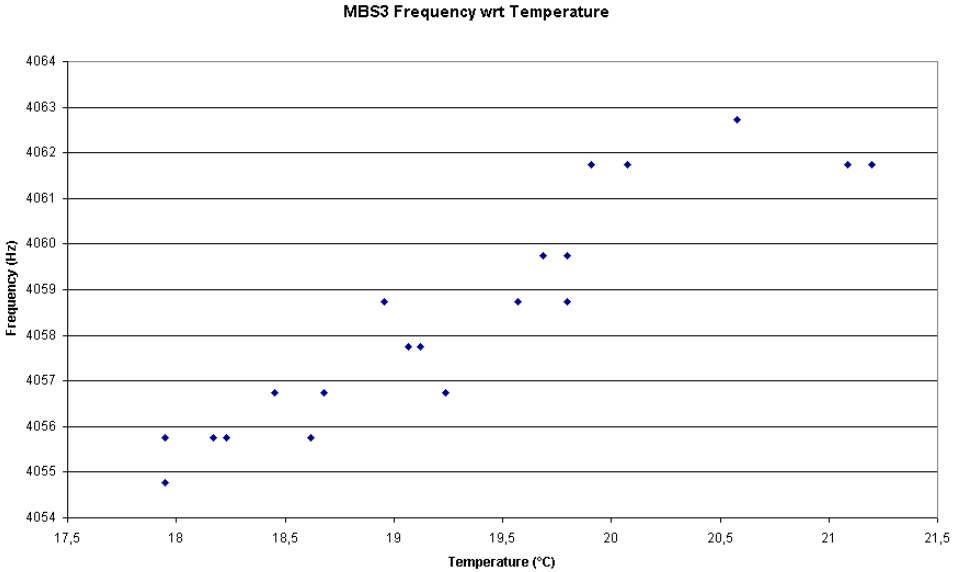

Figure 102 MBS3 Frequency wrt Temperature

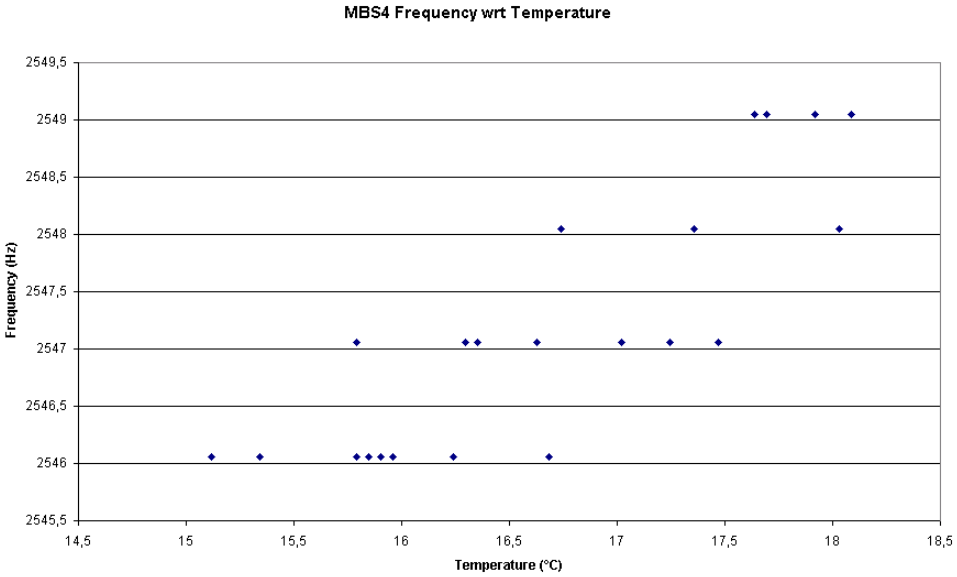

Figure 103 MBS4 Frequency wrt Temperature

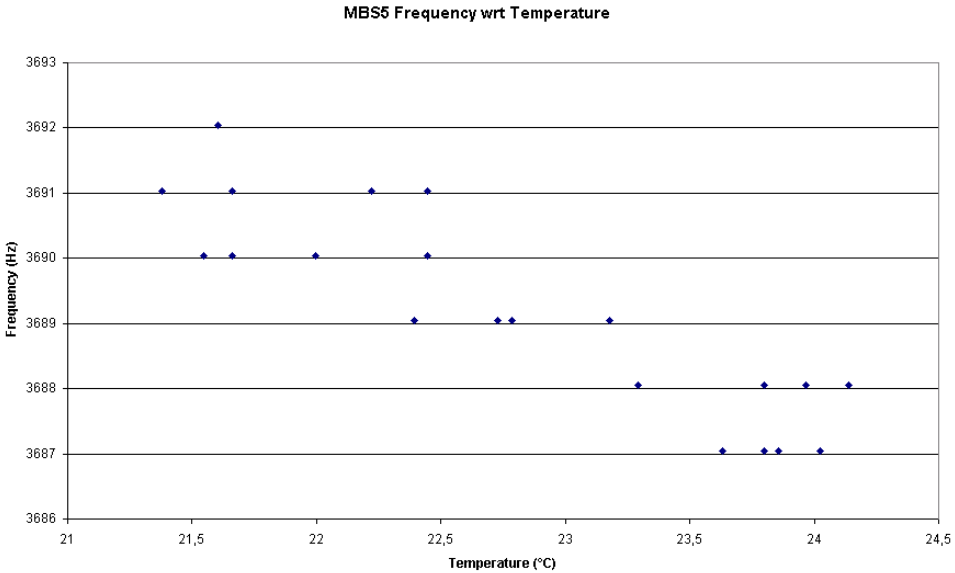

Figure 104 MBS5 Frequency wrt Temperature

5.2.3.4 Housekeeping signals in science packets

HK data in scientific packets are consistent with HK data.

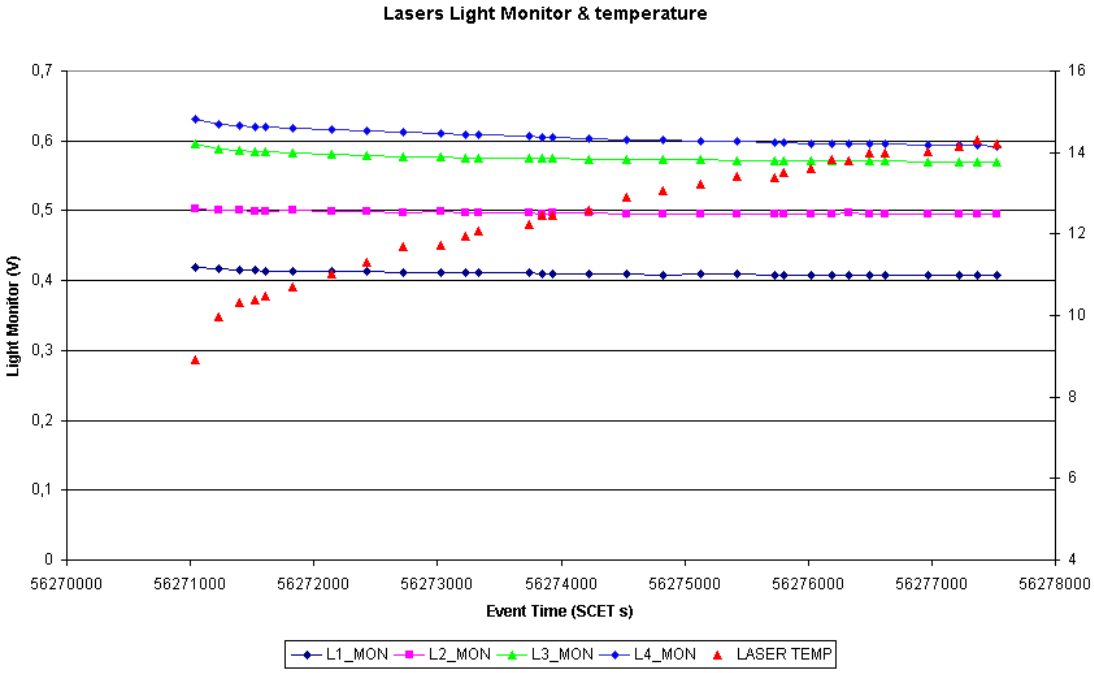

Figure 105 Laser lights monitor (Normal science packet)

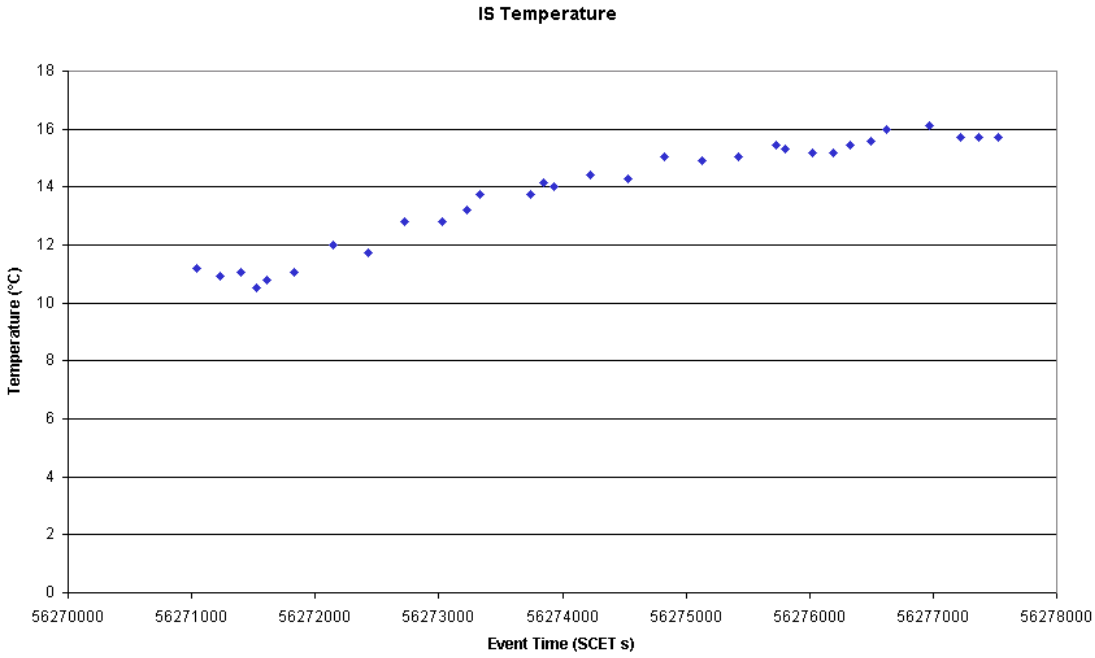

Figure 106 IS temperature (Normal science packet)

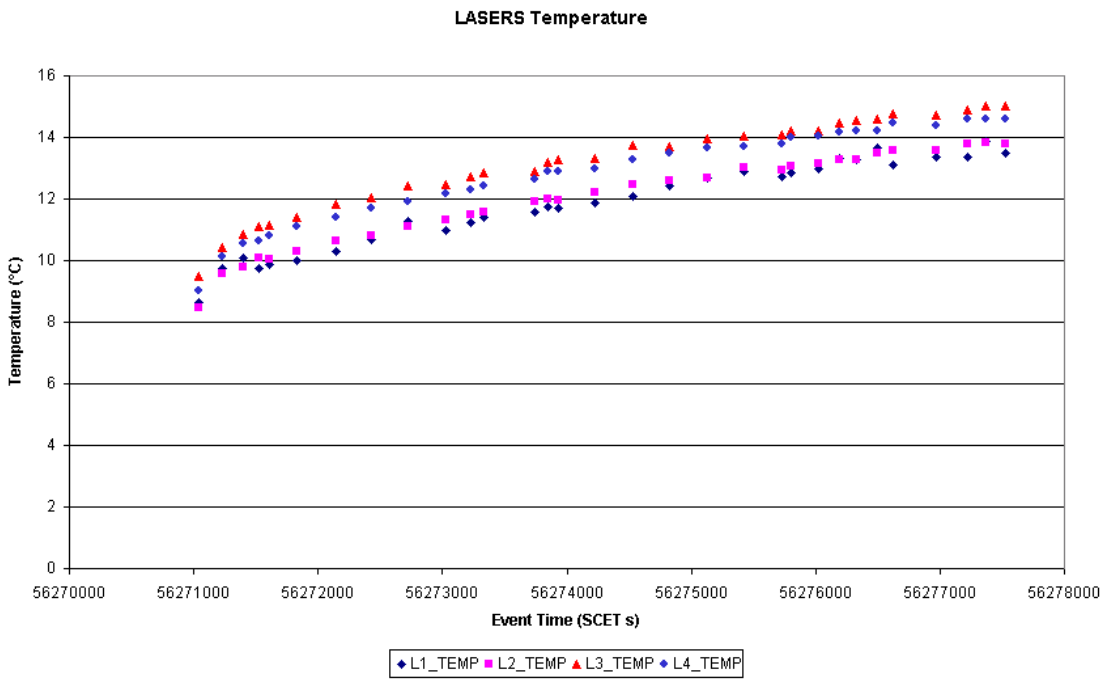

Figure 107 Lasers temperatures (Normal science packet)

6. INTERFERENCE SCENARIO IIB TEST REPORT

6.1 INTERFERENCE SCENARIO IIB (13/10/04 - MAIN)

6.1.1 Activities log

The following activities were performed in sequence by preloaded command timeline sequence.

UTC	Description
13 Oct 2004 - 17:01	Beginning of activity – GIADA power on
13 Oct 2004 - 17:30	Cover open operation
13 Oct 2004 - 17:43	Go to Normal mode (science enabled)
13 Oct 2004 - 17:44:30	GDS Left receiver threshold change – IS channel E gain/threshold change
13 Oct 2004 – 18:30	GIADA Switch-off (with automatic Cover close operation incorporated in the Power-off OBCP)

The GIADA switch-on procedure was applied selecting the Main I/F and with the Context File stored in SSMM. The Instrument Main I/F was successfully powered-on by means of the GIADA POWER-ON OBCP on 13th October 2004 @ 17:01 (UTC time), which corresponds to a SCET Time of about 56307658sec.

The first expected packet (Connection Report, service 17,2) was late received because the DDS was marked it with a wrong UTC time being unsynchronised time tag (bad time quality) TM report. In fact, it was marked with a DDS time 1 hours and 15 minutes after the power-on:

Wed Oct 13 2004 18:15:59.731607
TM Packet Received from GIADA:
APID = 90, 7 (EVENT)
Source Sequence Count: 0
Packet Length: 9
SCET Time: 2147483685.933594 sec.
Packet Type, Subtype: 17, 2

0D A7 C0 00 00 09 80 00 00 25 EF 00 40 11 02 00
==========

The second expected packet (i.e. 'GIADA in Safe mode' Event Report) was received as first TM report in the test. GIADA was correctly time synchronised. After the GIADA in Safe Mode event, the first HK report was correctly received @ default HK rate of 40s.

Afterwards, the first patch (regarding the Context File) was sent, as well as the other required software patches that were, as expected, divided in six memory load commands. All commands have been nominally received, but the memory dumps (expected number of Memory dump file to be received on-ground is 24) were not received or most probably they were not correctly retrieved from the DDS system. As result of the Context File patch, GIADA HK rate was changed to 10s rate. GIADA remained in Safe mode until 17:30 (UTC time).

The next step was to open the cover. The operation was successfully completed @ 17:36 (UTC Time) when the Cover Report was received. Then GIADA was sent to Normal @ 17:46 (UTC Time) and science telemetry enabled. The Lasers were switched-on by the Laser_power_on OBCP, upon the reception of the 'Start Switch Lasers ON OBCP' event. Science was enabled @ 17:43 (UTC Time) and after about one and half minute the GDS Left receiver Threshold was changed from 0.8V to 1.24V. Then, the IS sensor was switched-off and the Gain and Threshold of Channel E were changed from Low to High and from 50mV to 100mV respectively. Finally IS sensor was switched-on again. The nominal Normal mode (all sensors switched-on) was resumed @ 17:46 and the internal calibration of GDS, IS and MBS sub-systems was periodically performed every 5 minutes to check the instrument behaviour.

Except for the mentioned Memory Dump (total 25 packets), no more packets were lost, neither HK and Acknowledge reports nor science TM, since having increased the GDS left channel thresholds the SSMM memory (allocated to GIADA) resulted not saturated.

As expected, GIADA was commanded in Safe mode @ 18:30 (UTC Time) on 13th October and the science TM was disabled. Then the experiment power-off (GIADA power-off OBCP) was started. The 'Go to Safe' command was discarded since the experiment was already in Safe mode:

Wed Oct 13 2004 18:31:00.466120
TM Packet Received from GIADA:
APID = 90, 1 (ACKNOWLEDGE)
Source Sequence Count: 128
Packet Length: 21
SCET Time: 56313043.285156 sec.
Packet Type, Subtype: 1, 2

0D A1 C0 80 00 15 03 5B 44 D3 49 00 40 01 02 00 1D AC CF 1F 00 05 C4 01 00 00 00 00
==========
Wed Oct 13 2004 18:31:00.466120
TC APID = 1452, TC SSC = 3871;
Command can not be executed in the actual operation mode (TC Packet Type/Subtype = 196,1 - Safe).
==========

The cover was closed (with heaters Cover and Motor Heaters Off) and the instrument was switched-off @ about 18:39:05 (UTC Time) on 13 Oct. 2004.

6.1.2 Housekeeping data analysis

The following figures have been taken from the HK database.

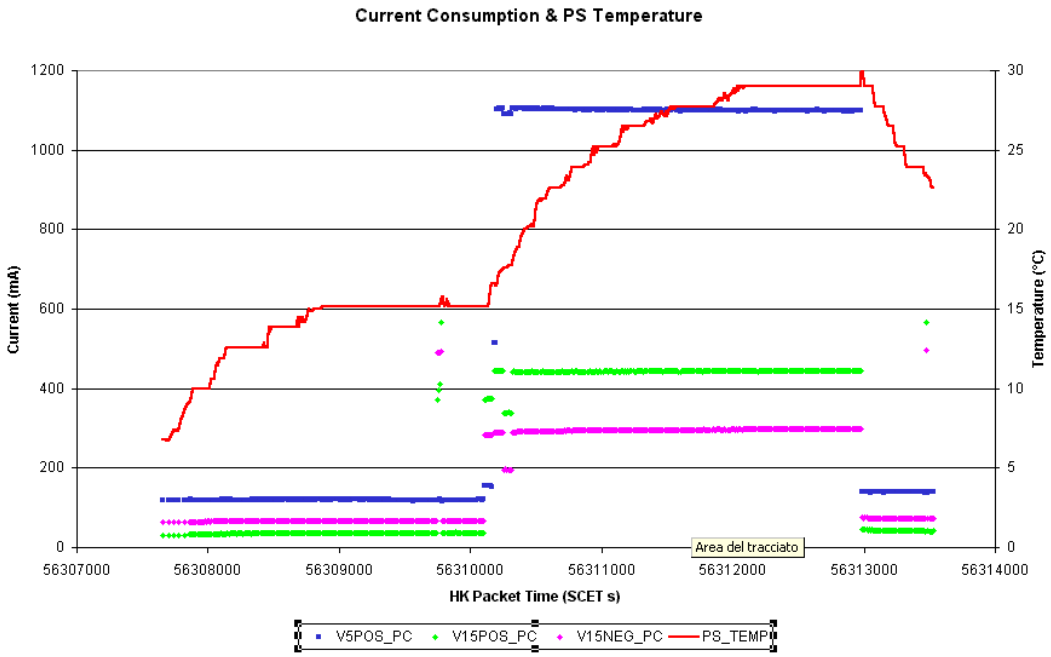

Figure 108 +5V and ±15V Currents

The current consumption and the Power Supply temperatures (Figure 108) are in the expected range. The current consumption measured in Normal mode for +5V +15V and –15V is about 1100mA, 445mA and 295mA respectively.

The Instrument cover was successfully opened and closed at due time. In Figure 114, it is shown the status of the two reed-switches that indicate the close and open position of the cover. As indicated, the status of the 'close position' reed switch is not activated at all, while the status of the other reed switch shows properly when the cover is open. This situation is nominal, since both the following conditions are meet: when the cover reaches its close position the reed switch is still not active (the switch is active only for few steps before the close position is reached) and the cover closure is performed in a time shorter than the sampling rate of HK telemetry, i.e. 10s (thus the above transitions cannot be seen in the HK TM report). The complete monitoring of the two switches is done in the Cover Reports, which are shown in the section 6.1.2.1.

In Figure 109, the Power Supply temperature increases from 15°C (@ power-on) up to 35°C when GIADA was in Normal mode and the maximum power was drawn. The IS temperature reached about 10°C when GIADA was in Normal mode and the cover was open. When the lasers are switched on, the IS temperature becomes noisy (data are spread within 3°C) with respect to GIADA in safe mode.

The Lasers were properly switched-on and their temperatures (Figure 111) increased from 4°C to 10°C. As expected, the light of each lasers decreases when the temperature rises.

The Dust Flux indication is greater than 0 (see Figure 113) even after one minute from sensor switch-on (in which - as understood on ground - few IS ghost events can be observed.) The reason, which will be better analysed in section 6.1.3.1, is that - as understood on ground - Channel E has detected few 'Ghost events', due to its internal noise level when Gain is High (remarks: in the previous Interference Part 1A and Part 1, we never observed that since Channel E Gain was set to Low).

The five MBS, after switch-on, show a temperature between 10 and 20°C (see Figure 112 MBS Temperature).

No missing packets have been found in the TM (refer to Figure 115**).**

Figure 116 and Figure 117 indicate the values in Volt of the IS and GDS detection thresholds and the time when they were changed.

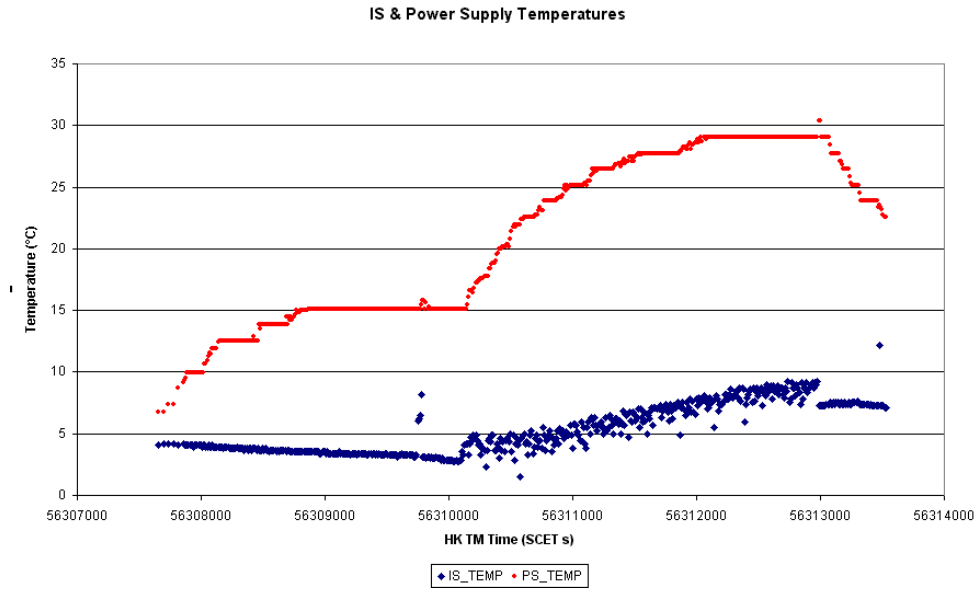

Figure 109 IS & PS Temperatures

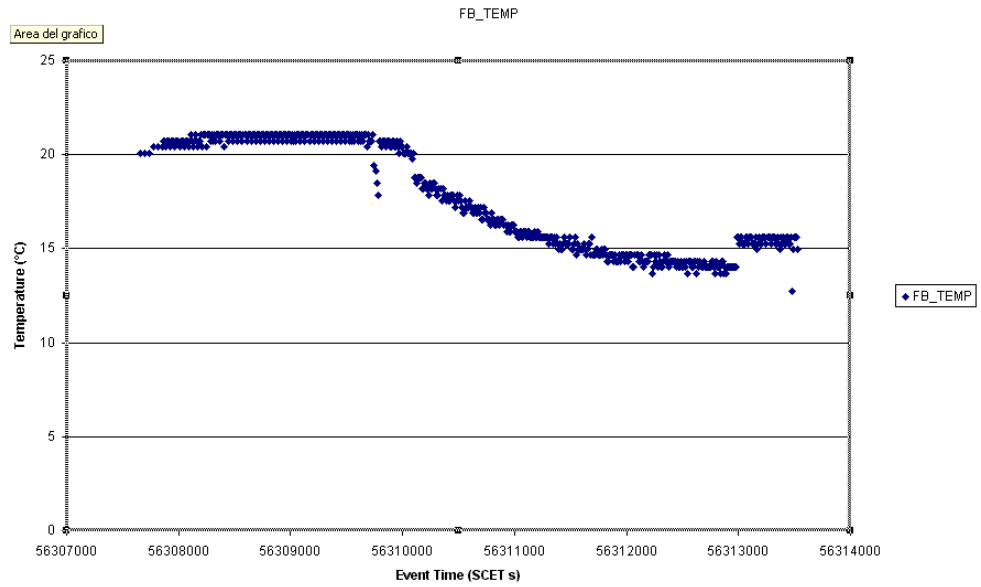

Figure 110 Frangibolt Temperature

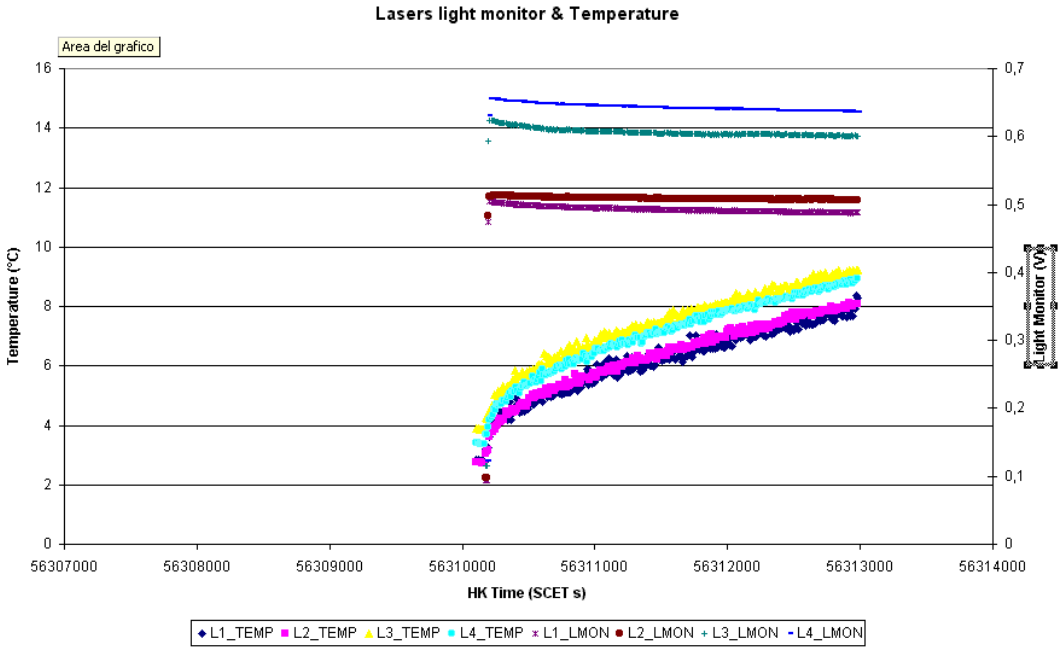

Figure 111 Laser light monitors & temperatures

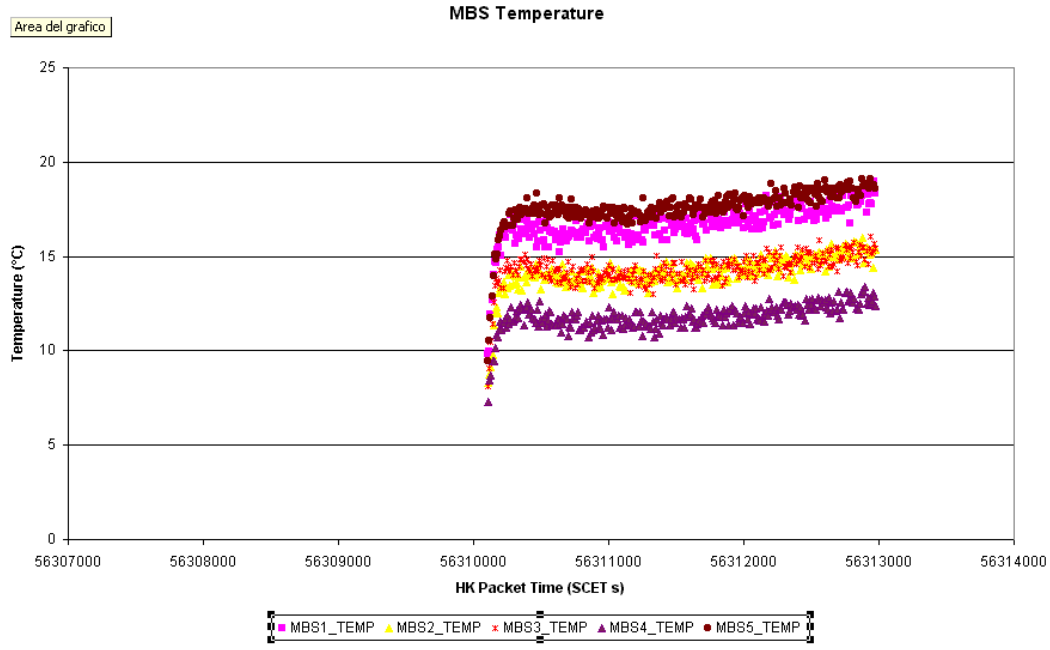

Figure 112 MBS Temperature

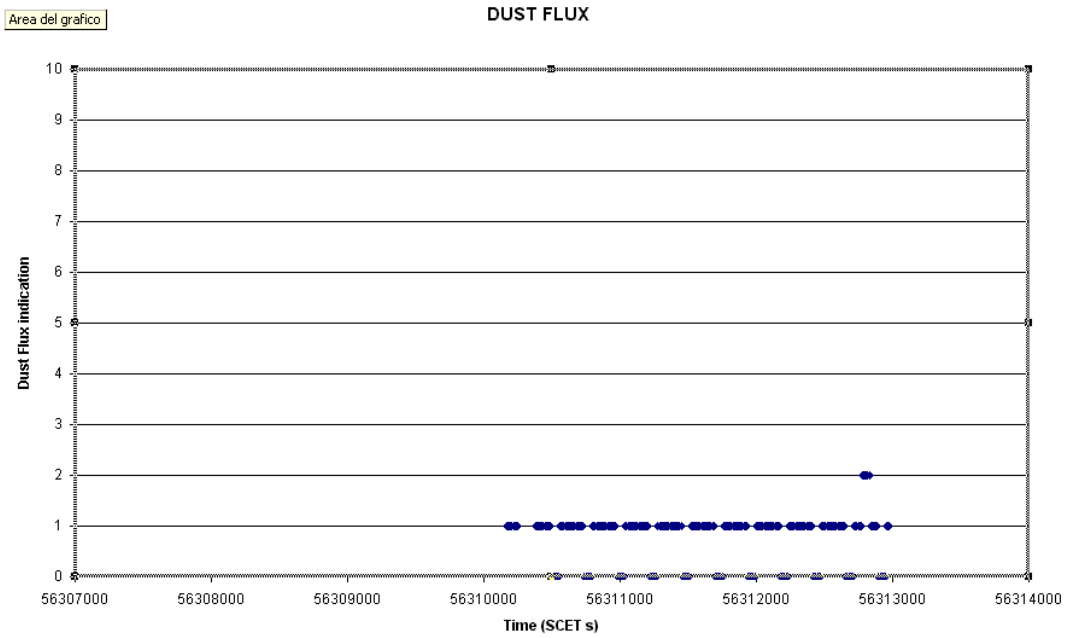

Figure 113 Dust-Flux Monitor (valid only when the IS sub-system is ON)

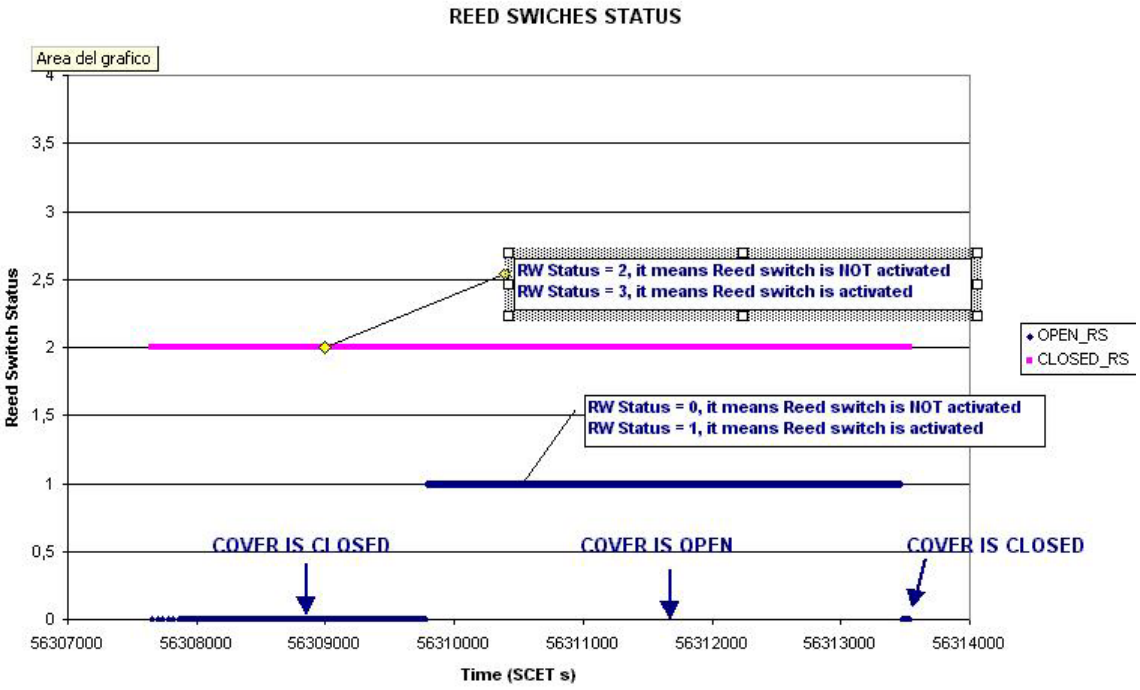

Figure 114 Cover Reed Switch Status (Cover open & close operations)

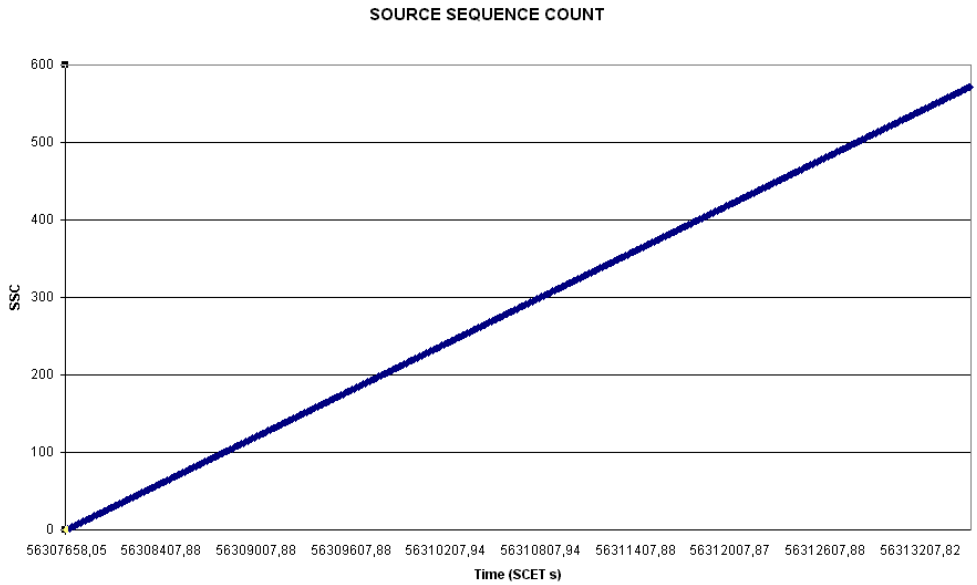

Figure 115 SSC of HK TM

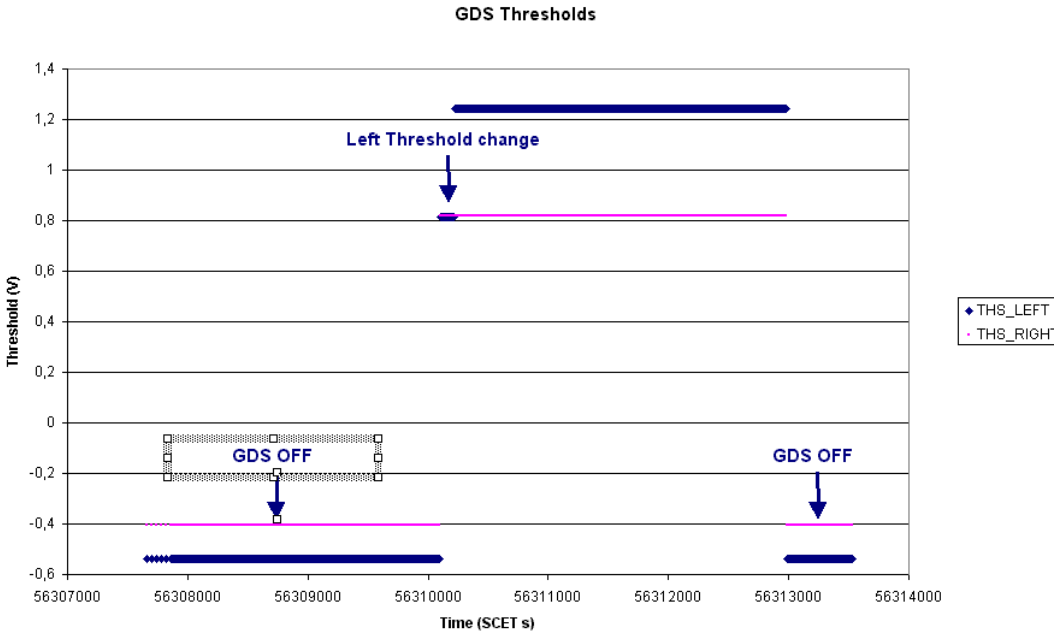

Figure 116 GDS Left receiver Threshold change

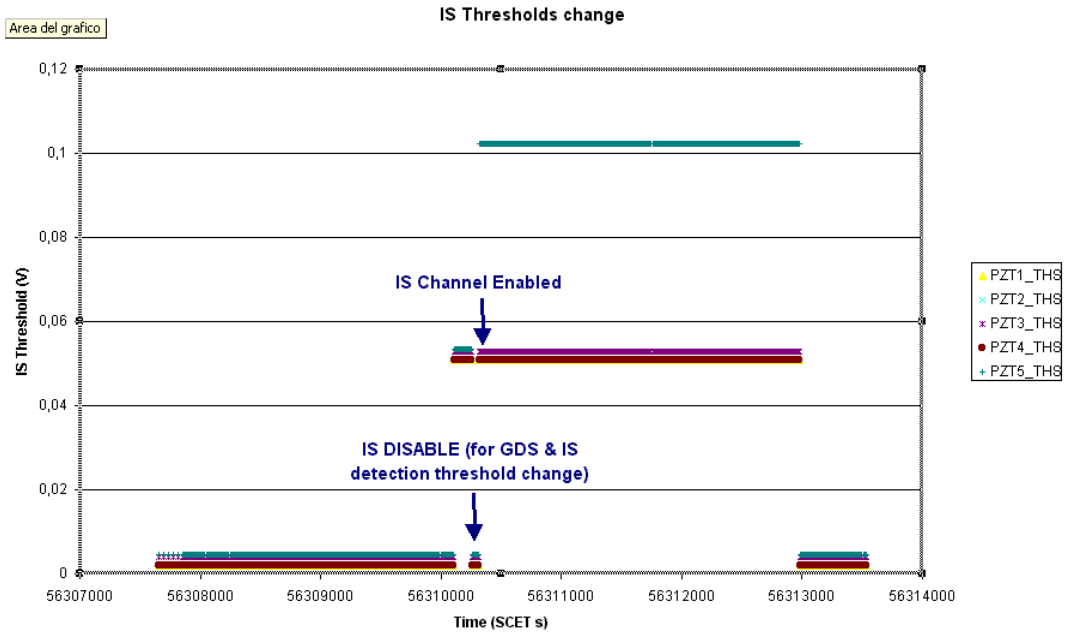

Figure 117 IS channel E gain and detection threshold change

6.1.2.1 Cover open and close operations

- After the cover open operation, the cover resulted completely open, as shown in Figure 118, in which the status of the two reed-switches is reported. The figure is extracted from the cover report, which is received on-ground at the completion of the operation.

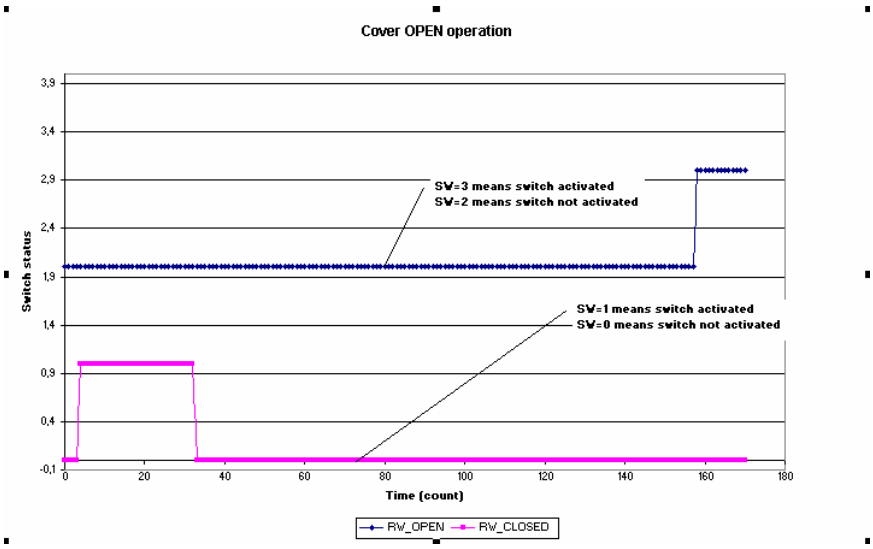

Figure 118 Reed switches Status during the Cover Open operation

- After the completion of the test, the cover was successfully closed by means of the GIADA power-off OBCP procedure @ SCET time of 56313472s. Figure 119 reports the correct sequence of the two reed-switches.

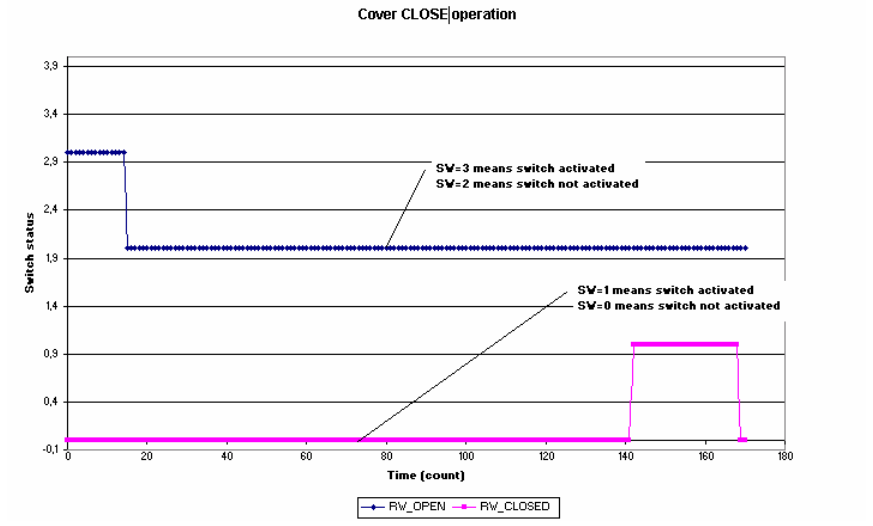

Figure 119 Reed switches Status during Cover Close operation

6.1.3 Engineering evaluation on sensor data

No science TM packets were lost. Figure 120 shows the Source Sequence Count of TM packets when GIADA is in Normal mode and the science TM is enabled. After the lasers were switched on and the detection threshold on the GDS Left receiver successfully changed, only few GDS 'Ghost detections' on both receivers were observed since the thresholds resulted above the level of the internal stray-light (background noise) plus the electronic noise.

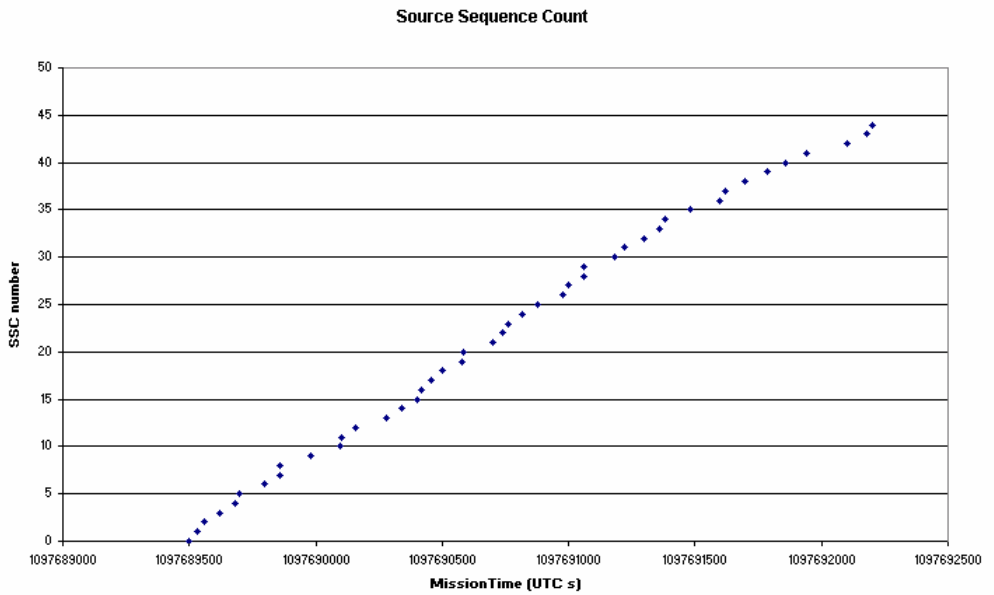

Figure 120 Science TM packet Source Sequence Count

6.1.3.1 IS Sub-system

After the sub-system power on, the detection thresholds of each channel were set to 50 mV (Context file updated via memory load command). As described in section 5.1.3.1, Channel E Gain was changed from Low to High and its detection threshold from 50mV (default) to 100mV.

After entering in Normal mode, the IS was calibrated until the end of the test every 5 minutes. Few IS science 'Ghost' detections (35 in total) were obtained: one on Channel C and 34 on Channel E. As in the Figure 121, few of those detections seem to happen when the IS calibrations were performed, while others seem due to the noise level on Channel E. To reduce its 'Ghost detections' **it is requested** (most probably) **to increase its detection threshold** from 100mV (on ground) to 150mV (minimum) when the gain is set to High. Table 7 shows the sequence of the mean and standard deviation for the IS calibrations with four stimuli @ 10V level.

CAL #	TIME	PZTA		PZTB		PZTC		PZTD		PZTE	
		MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
1	56310313	-0,0078	0,0638	-0,0107	0,0609	-0,002	0,0667	-0,0107	0,0609	-0,0136	0,0435
2	56310343	-0,0049	0,0435	-0,0078	0,0232	-0,002	0,0551	-0,0107	0,0493	-0,0107	0
3	56310643	-0,0107	0,0638	-0,0107	0,0609	0,0009	0	-0,0107	0,0348	-0,0078	0,0029
4	56310942	-0,0107	0,0638	-0,0107	0,0551	-0,002	0,0609	-0,0107	0,0232	-0,0107	0,0638
5	56311242	-0,0078	0	-0,0107	0,0435	0,0009	0,0435	-0,0107	0,0609	-0,0136	0,0638
6	56311542	-0,0078	0,0493	-0,0078	0,0435	-0,002	0,0493	-0,0107	0,0348	-0,0107	0
7	56311843	-0,0107	0,0348	-0,0107	0,0348	-0,002	0,0435	-0,0107	0,0493	-0,0136	0,0435
8	56312143	-0,0078	0,0029	-0,0107	0,0638	-0,002	0,0435	-0,0078	0,0348	-0,0107	0,0348

Table 7 IS channel outputs prior Internal Calibration

As we can see, the channel outputs have a low mean value (negative value means channel output close to 0 V) and a noise level (@ 3σ) close or little above to the detection thresholds. The noise levels are compatible with those measured during on-ground test campaign and in the previous Commissioning tests.

Figure 122 to Figure 130 show the results of the IS internal calibrations. According to the section 5.2.2.1 of **AD4**, only the 2^{nd} and 4^{th} stimuli are meaningful; Channel C response is confirmed not stable along the different internal calibrations performed during the test (refer to the voltage/delay time measurements of 2^{nd} and 4^{th} stimuli). It is suggested to increase channel C detection threshold (e.g. 100/150mV) and compare the obtained results. The idea is that, since the Channel C seems noisy, a higher threshold keeps the channel detection less susceptible to the noise. The other channels (A, B, D and E) show a reproducible calibration data set.

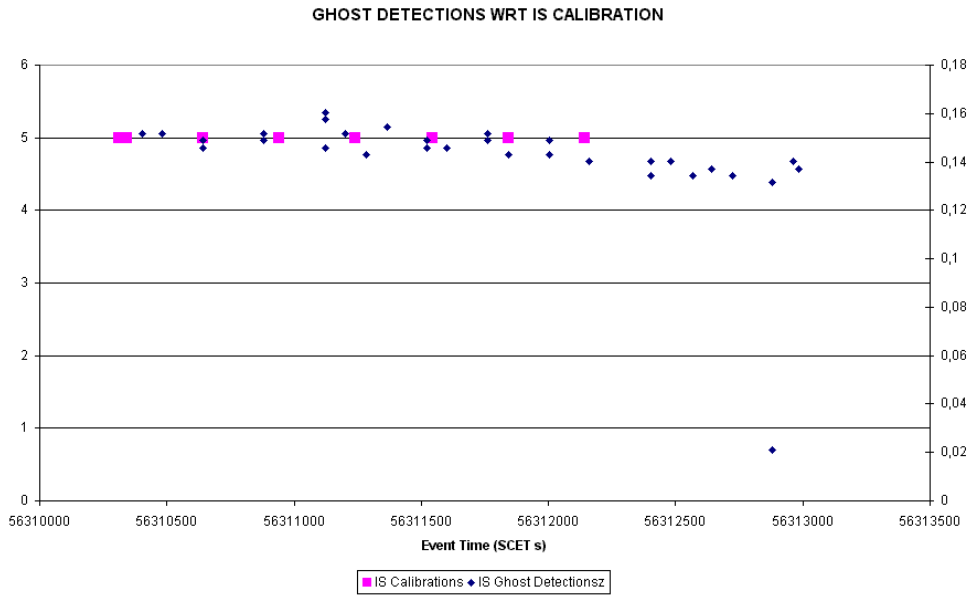

Figure 121 IS Ghost detections wrt IS Calibration

It is confirmed that the channel response along the calibration slightly depends on sensor temperature (refer to the channel detection amplitudes relevant to the 2nd and 4th stimuli, which are shown from Figure 131 to Figure 135).

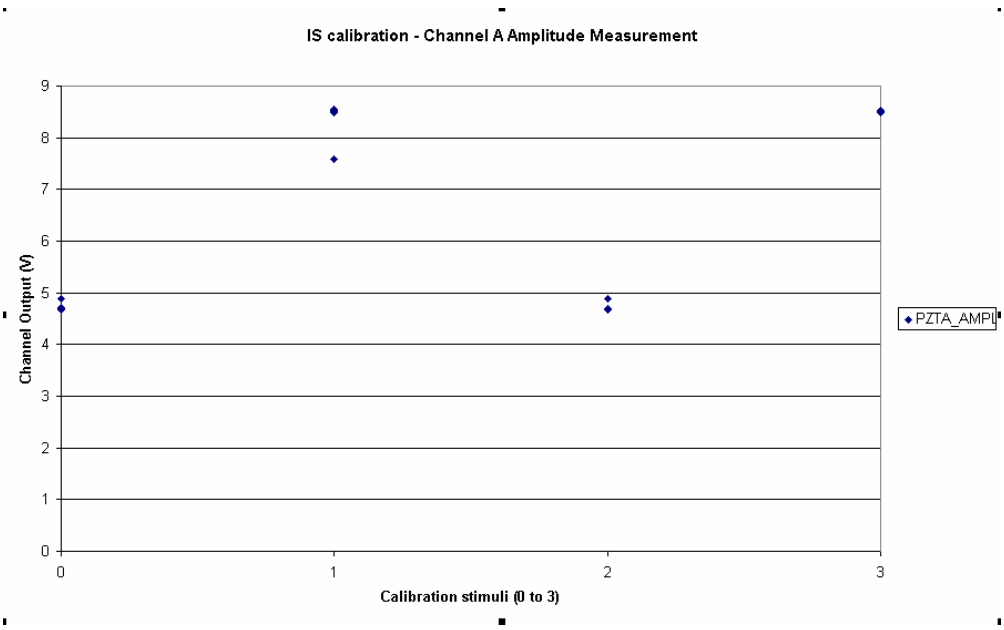

Figure 122 IS Calibration - Channel A Amplitude

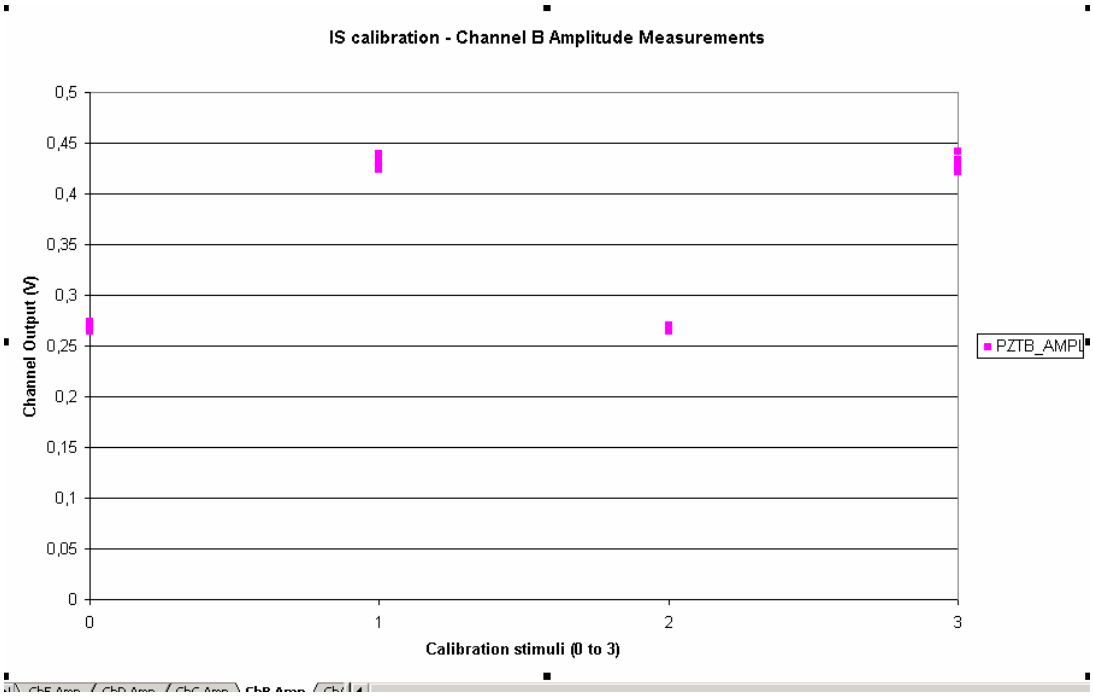

Figure 123 IS Calibration - Channel B Amplitude

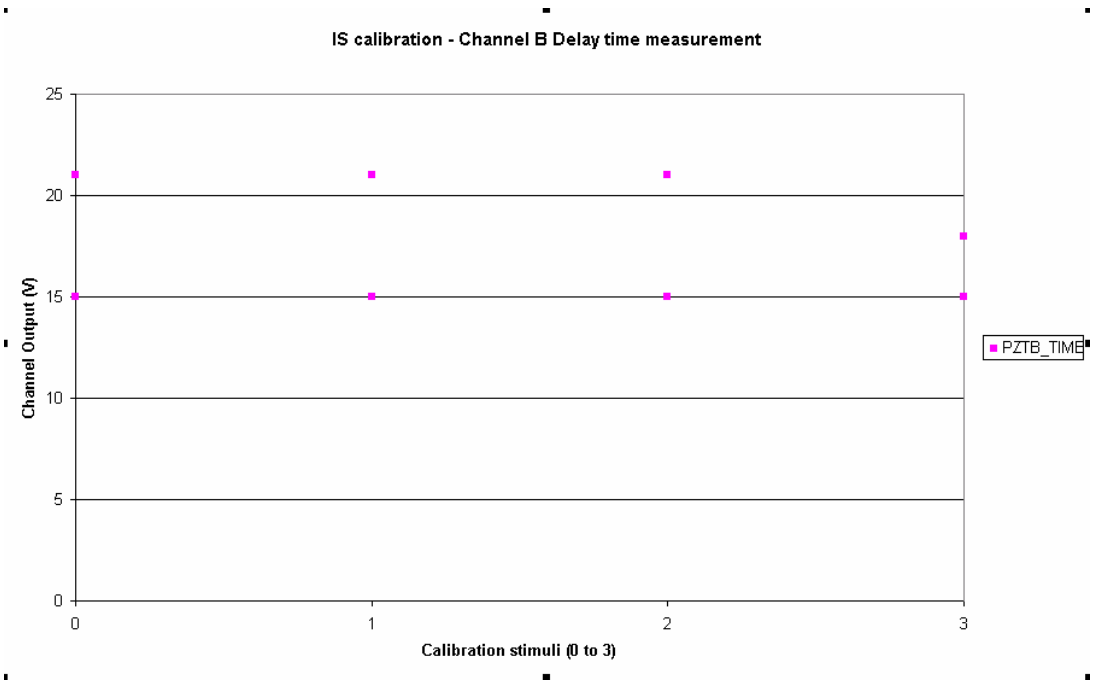

Figure 124 IS Calibration - Channel B Delay Time

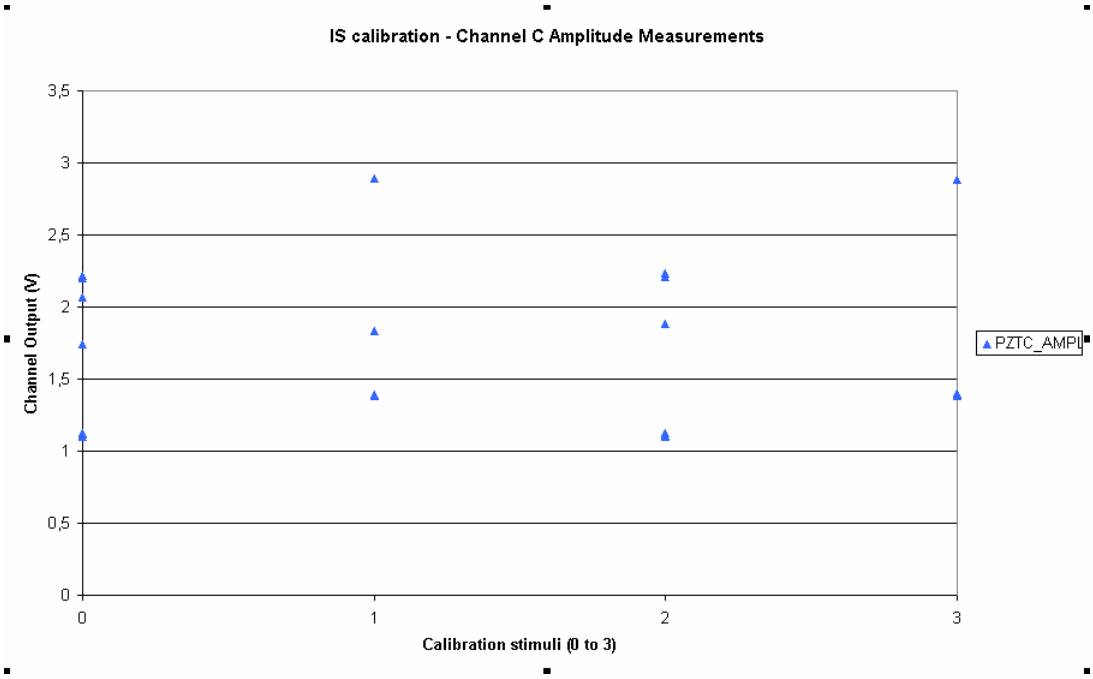

Figure 125 IS Calibration - Channel C Amplitude

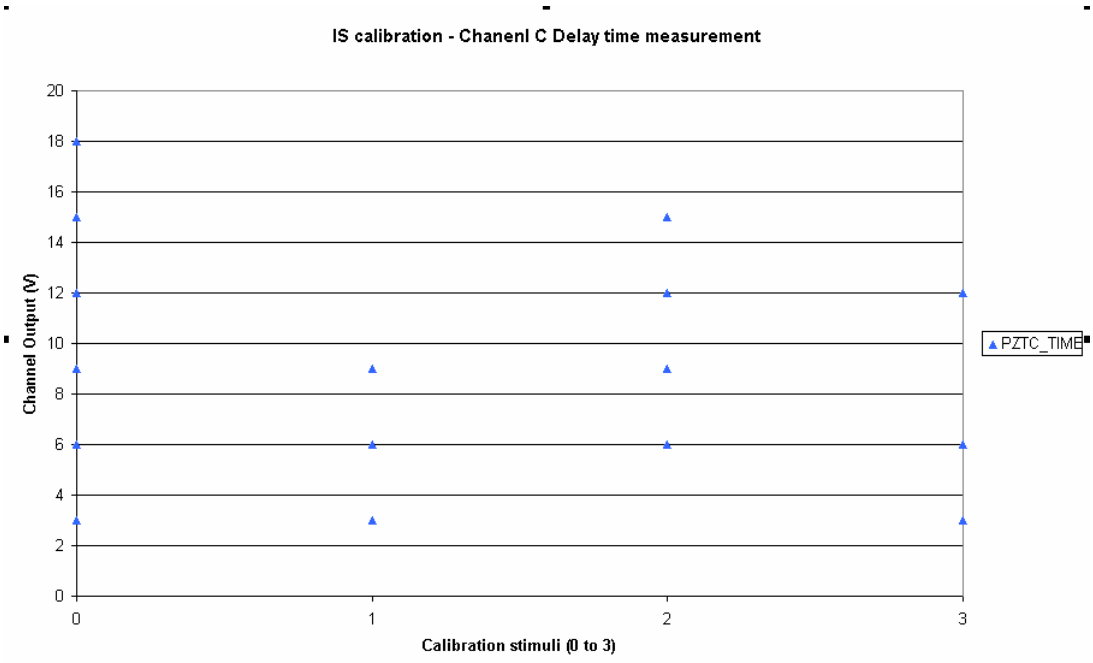

Figure 126 IS Calibration - Channel C Delay Time

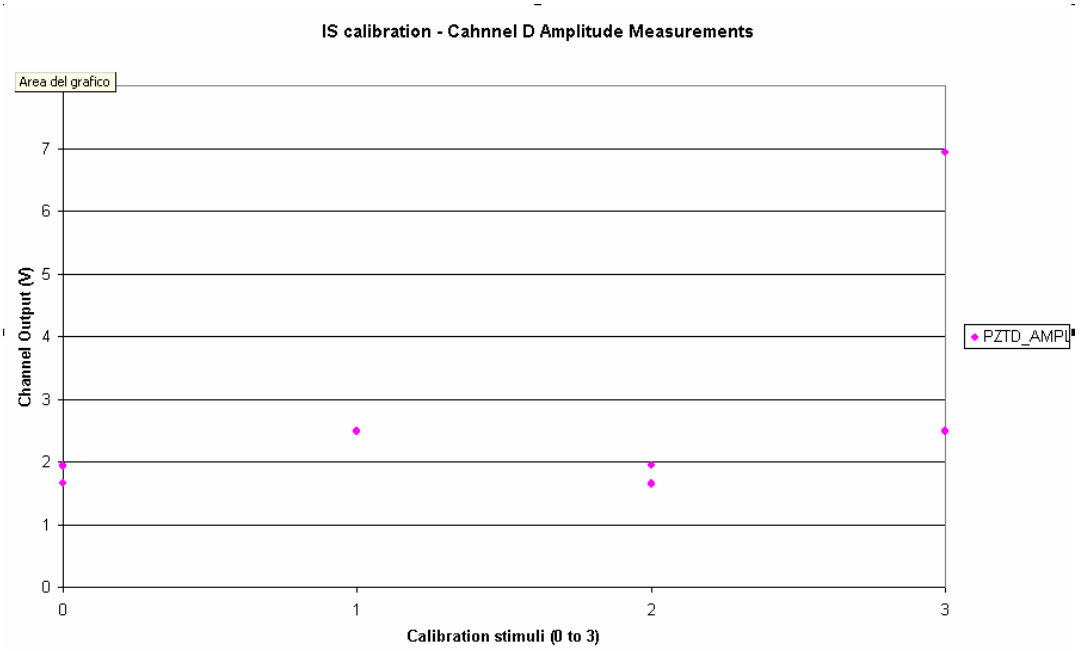

Figure 127 IS Calibration - Channel D Amplitude

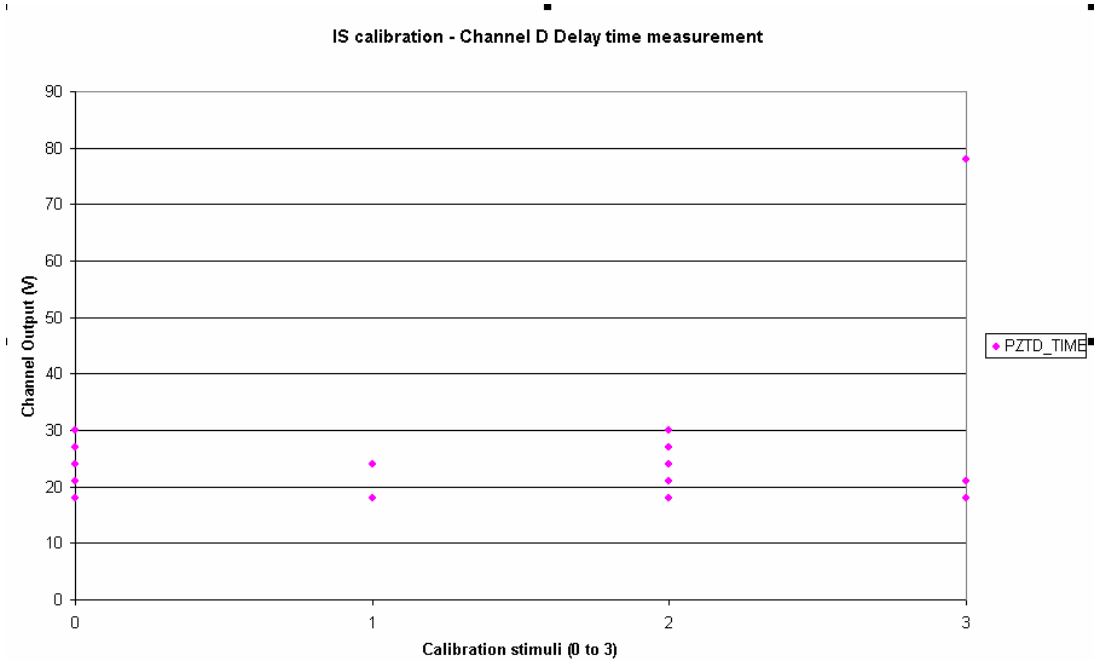

Figure 128 IS Calibration - Channel D Delay Time

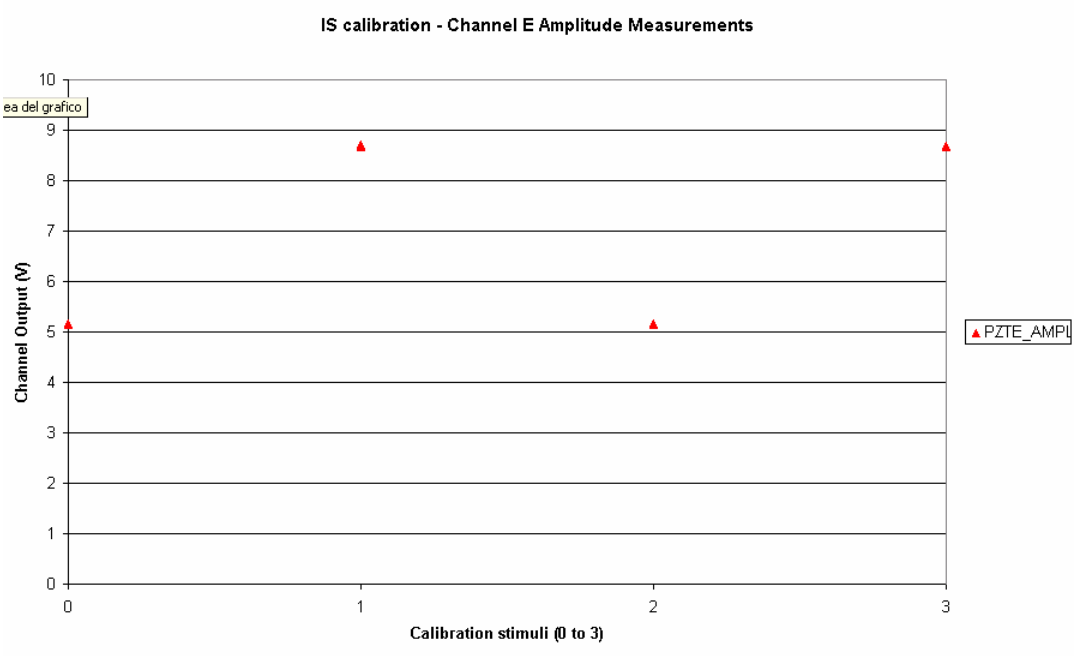

Figure 129 IS Calibration - Channel E Amplitude

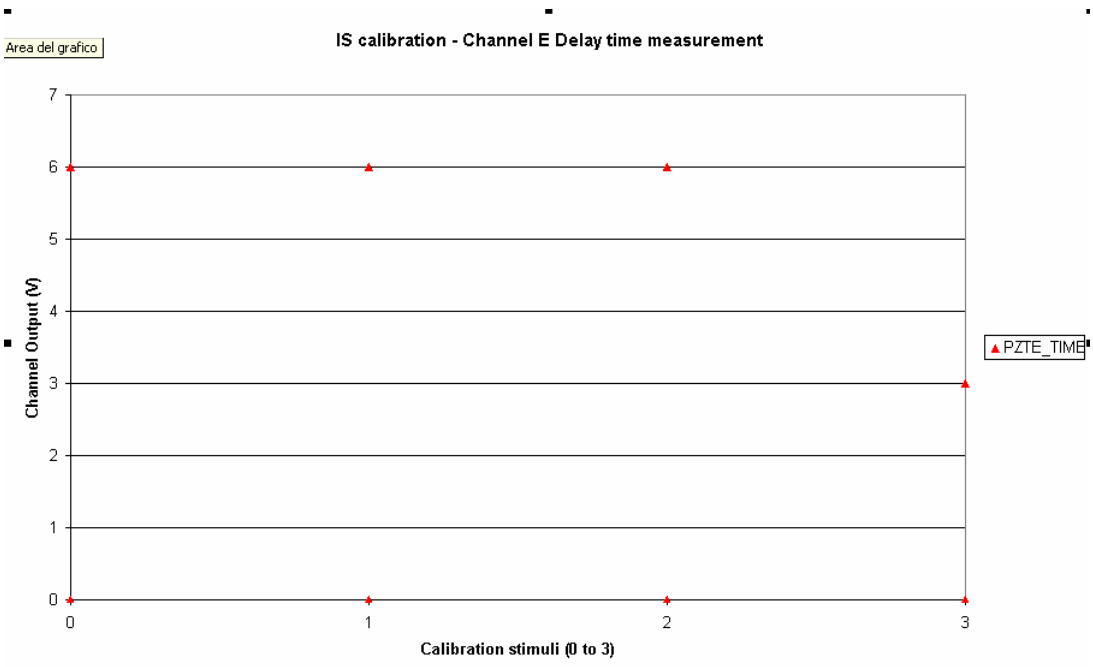

Figure 130 IS Calibration - Channel E Delay Time

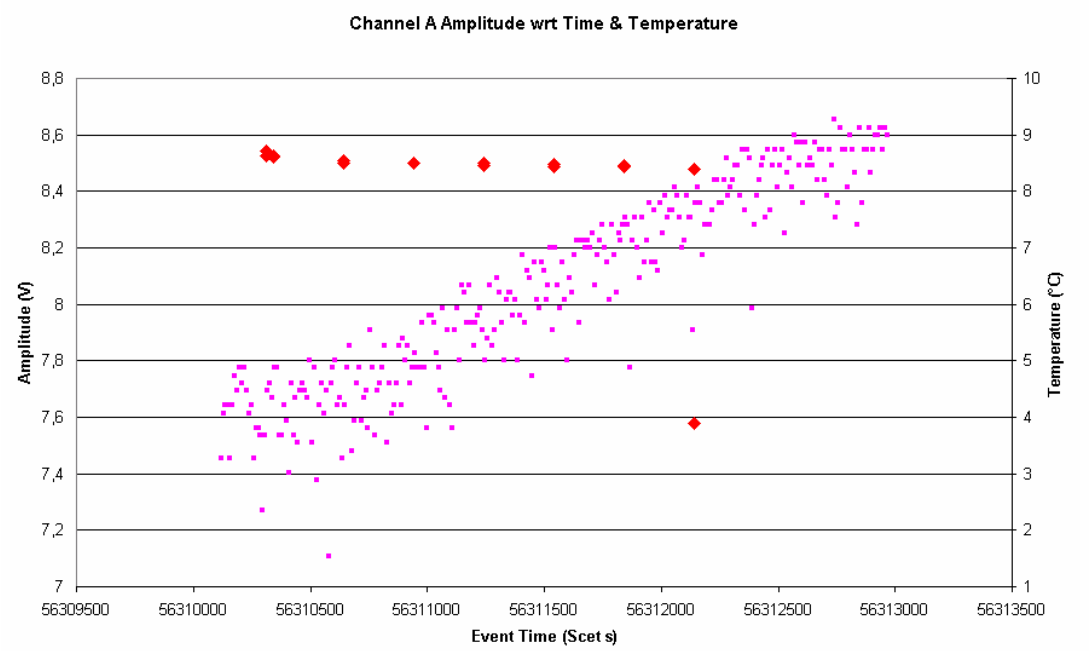

Figure 131 Channel A response wrt IS temperature

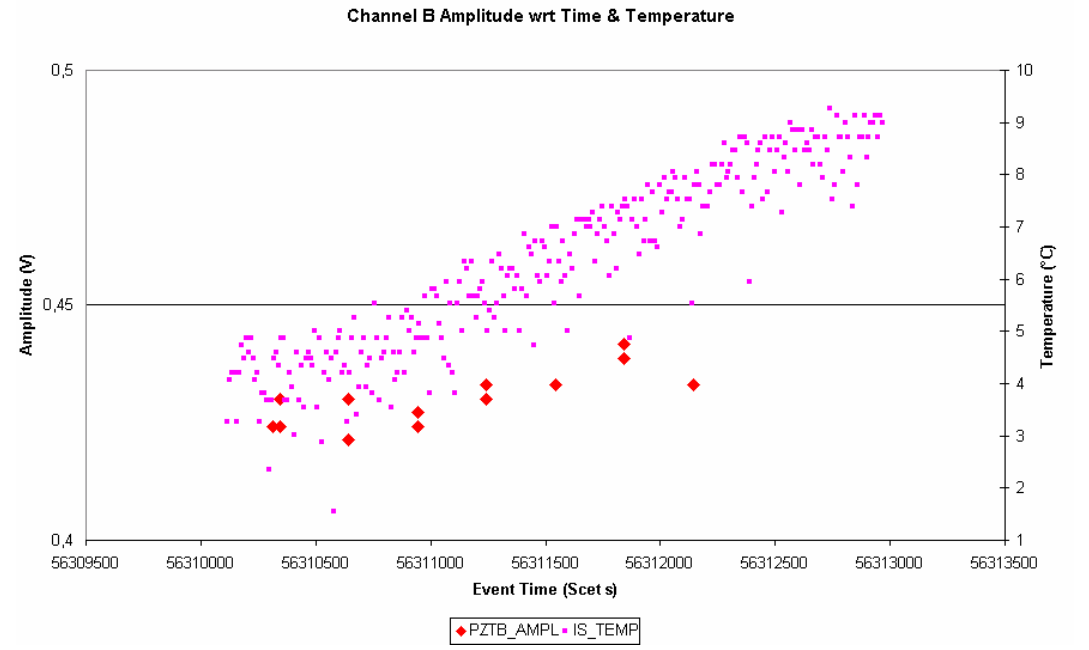

Figure 132 Channel B response wrt IS temperature

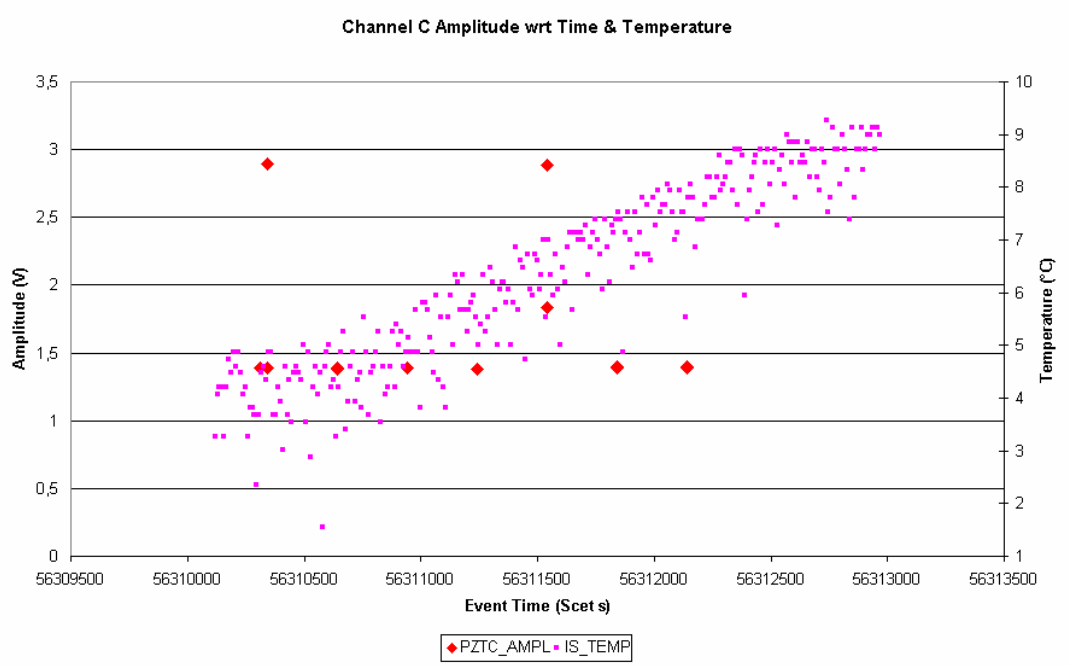

Figure 133 Channel C response wrt IS temperature

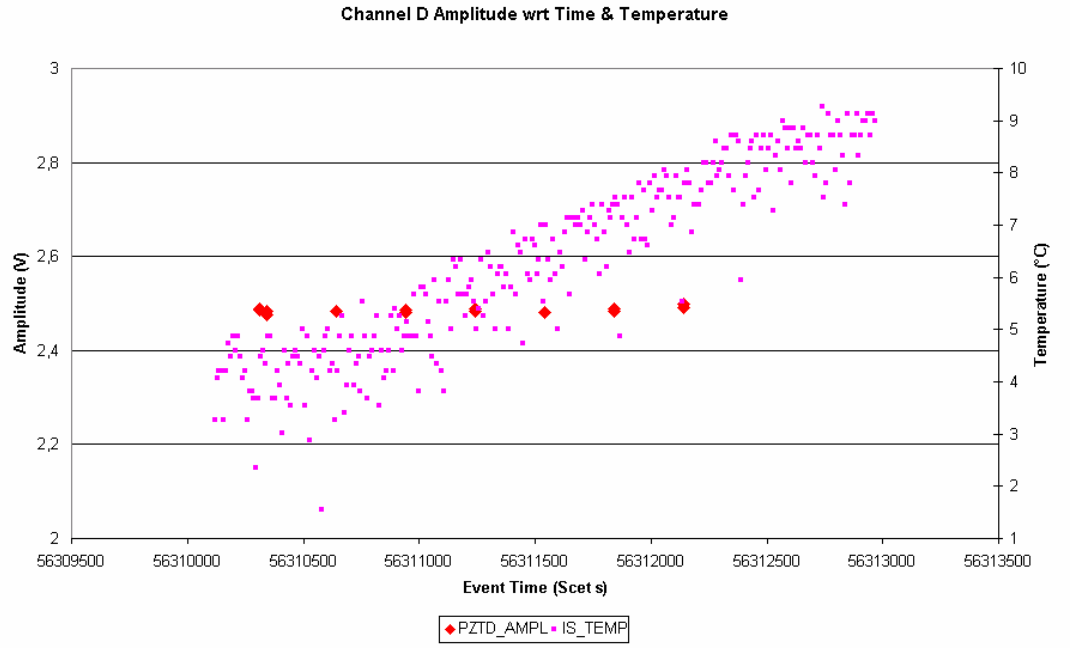

Figure 134 Channel D response wrt IS temperature

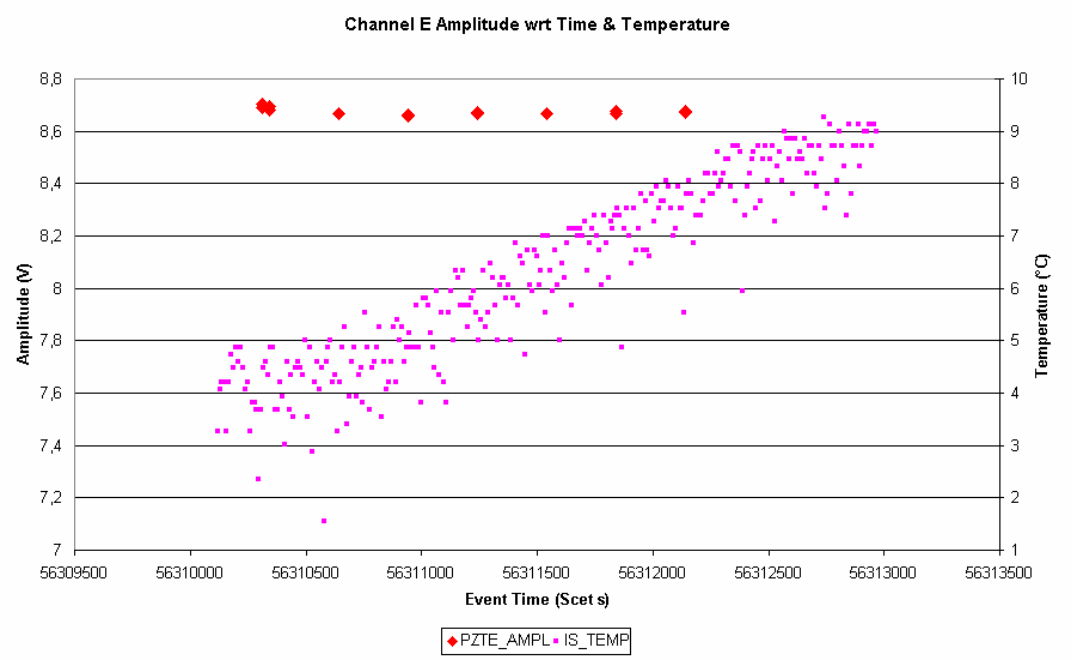

Figure 135 Channel E response wrt IS temperature

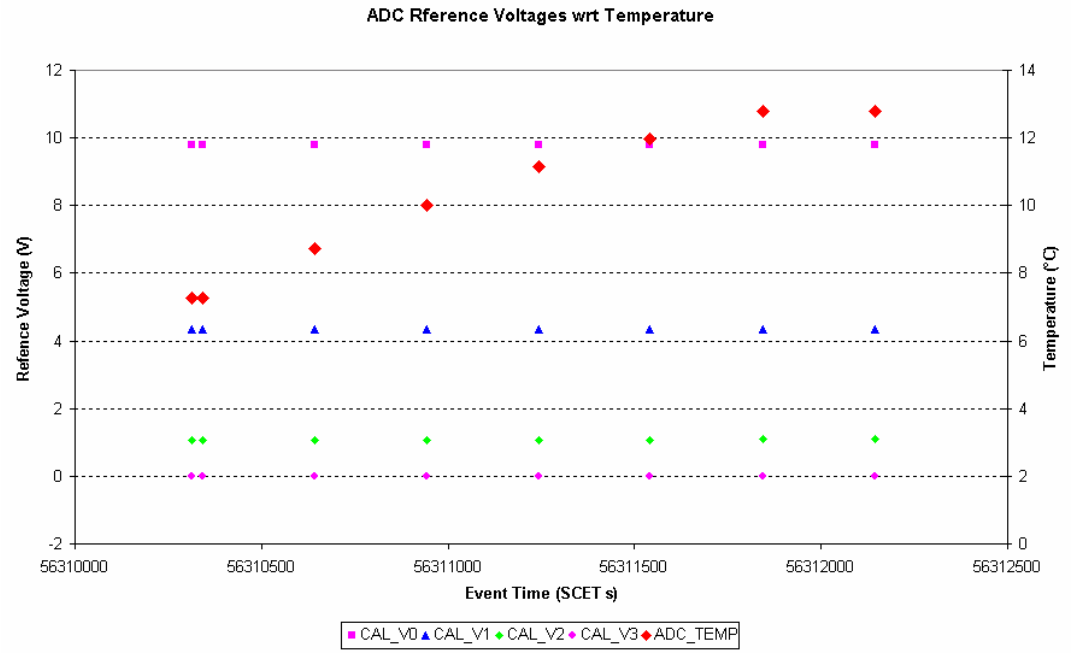

Figure 136 ADC, IS Temperature & ADC Reference Voltages @ IS calibration Time

6.1.3.2 GDS Sub-system

The detection thresholds of Left and Right channels were set to about 1.2 V and 0.8 V respectively (Context file updated via memory load command at GIADA power-on and by command after GIADA is entered in Normal mode). The nominal operation was to perform periodic GDS calibrations every 5 minutes. Figure 137 and Figure 138 show the GDS Calibration Left & Right mean value and standard deviation along test.

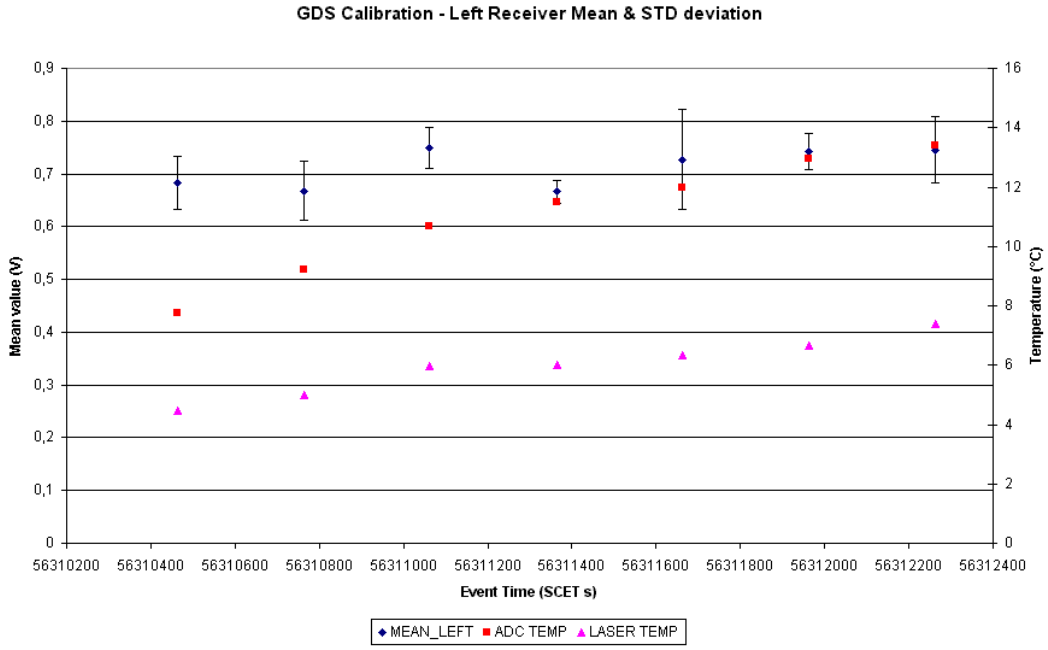

Figure 137 GDS Left Receiver Calibration (mean value and STD deviation)

As we can see, the mean value of the Right receiver is always below the 0.8V detection threshold (only few ghost detections were observed on the Right channel) and practically the same as during the previous in-flight tests from April '04 when GIADA was switched on alone. Its average is below 0.25 V, while its standard deviation is below 50 mV always.

On the Left receiver it is still observed a mean value increased with respect to the commissioning: at the end of the test it results 0.75 V and $3\sigma < 100$ mV. The behaviour seems to depend on the GIADA internal temperature (Laser temperatures) rising, as we can see from Figure 137.

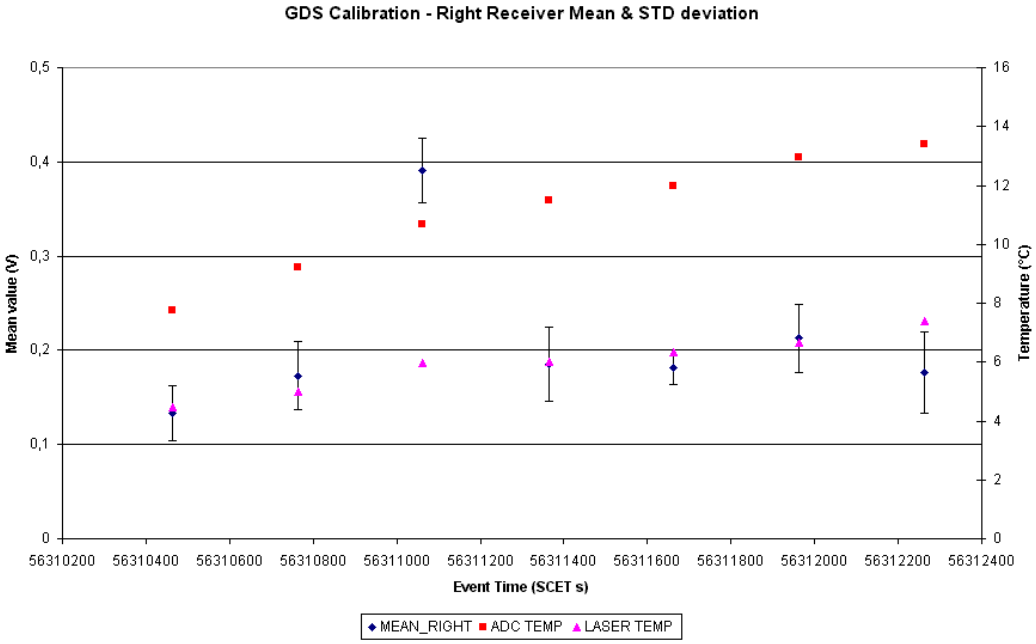

Figure 138 GDS Right Receiver Calibration (mean value and STD deviation)

Finally, Figure 139 and Figure 140 show the laser light monitor and the laser temperature at the time of the GDS calibration.

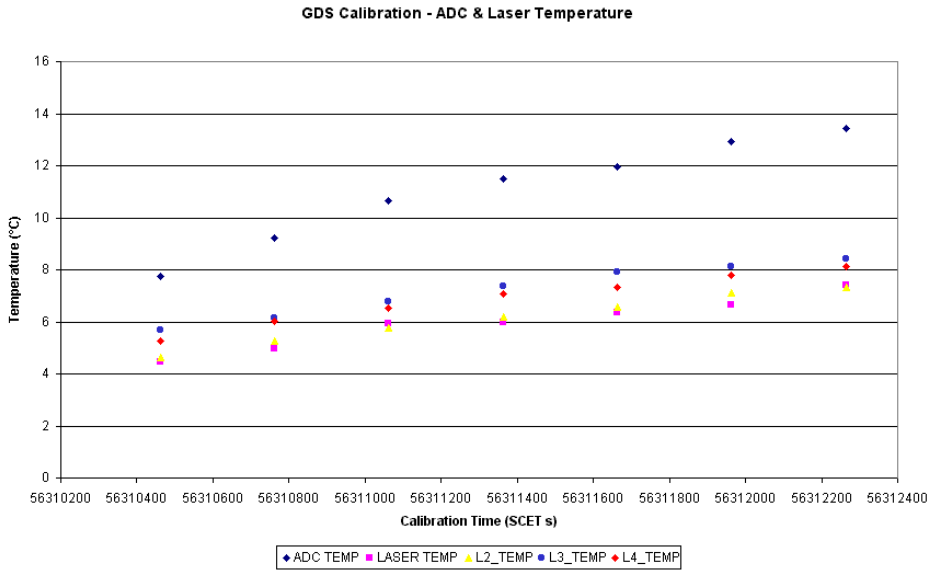

Figure 139 GDS Calibration - ADC & Lasers Temperature

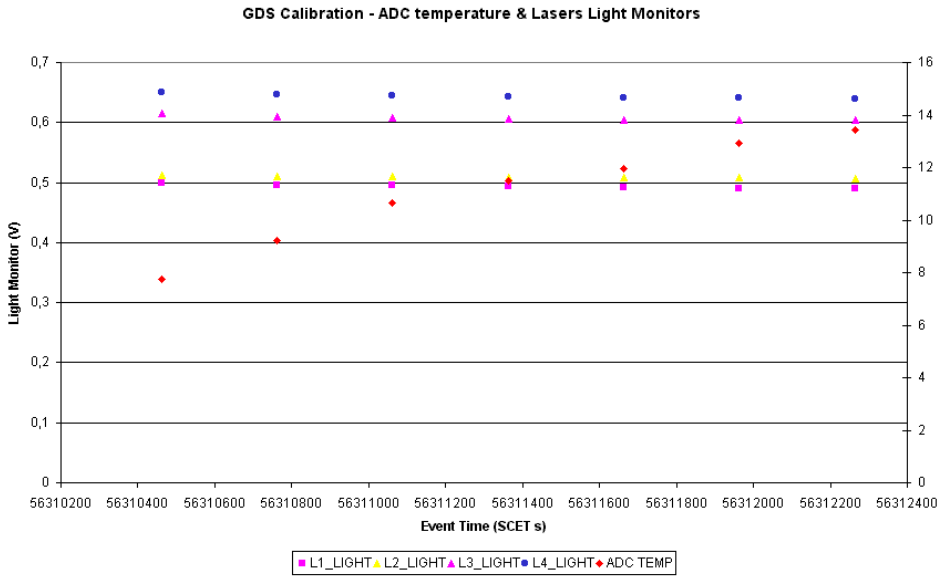

Figure 140 GDS Calibration – Laser Light Monitors

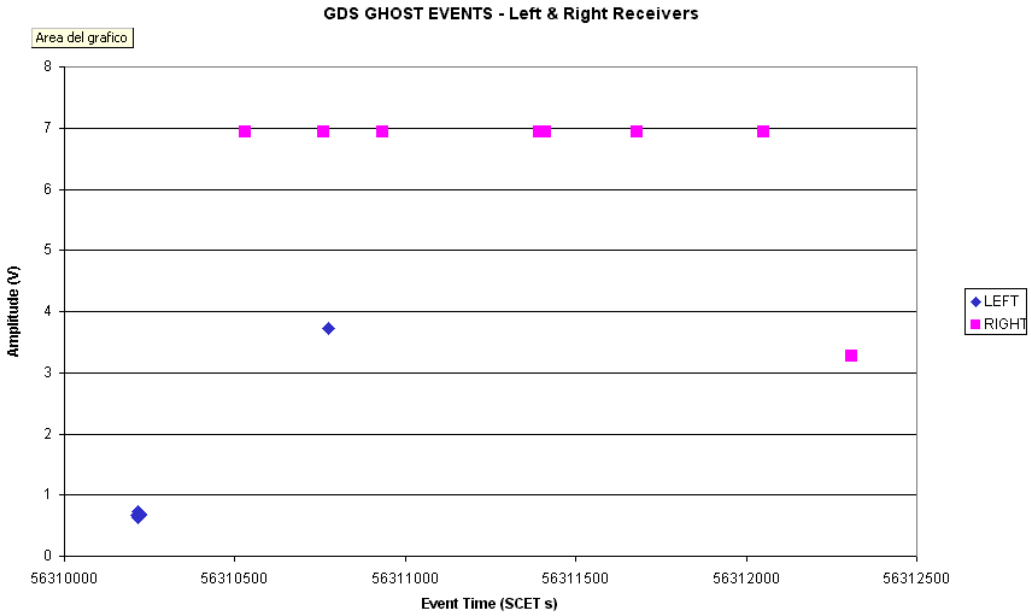

Figure 141 Amplitude of 'ghost detections' on Left & Right receiver

Figure 141 shows the amplitude of the scattered light of the Left & Right Receiver 'Ghost detections'. Concerning the detections on left receivers it can be distinguished two phases: the first when the threshold was 0.8V (as in the previous Interference Part 1A and Part 1B) in which due to the internal stray-light & noise it has been detected some ghost, the second after the threshold has been changed (from 0.8V to 1.2V) in which only one ghost was found in correspondence of one GDS calibration (refer to Figure 142. Regarding the ghost detections on right receiver, it seems they happen in correspondence of the GDS calibration. However they were sporadic and seem to have the same amplitude of the ones detected in previous tests.

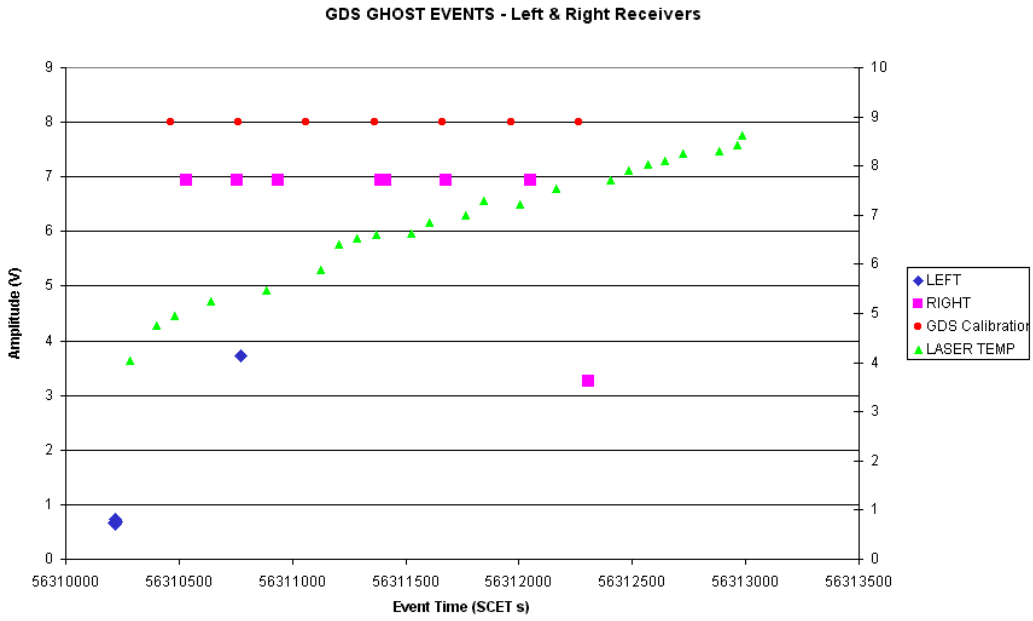

Figure 142 'Ghost detections' on Left & Right receivers wrt Calibration and Temperature

Table 8, Figure 143 and Figure 144 show the ADC Reference Voltages along the Interference Part 1B test for the sequence of the IS, GDS and MBS Calibrations. The voltages are quite stable in the temperature range 4 to 10 °C.

ADC REFERENCE V0		ADC REFERENCE V1		ADC REFERENCE V2		ADC REFERENCE V3	
Mean	STD	Mean	STD	Mean	STD	Mean	STD
9,7804	0,0012	4,345	0,0006	1,081	0,0014	-0,0108	0,0006

Table 8. ADC Reference Voltages

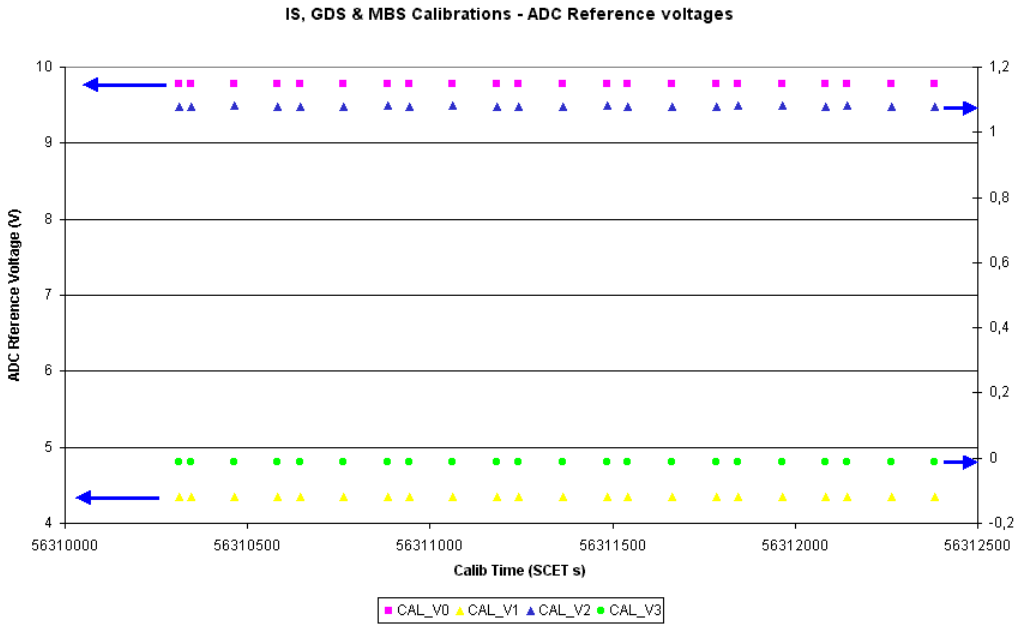

Figure 143 ADC Voltage Reference during Calibration

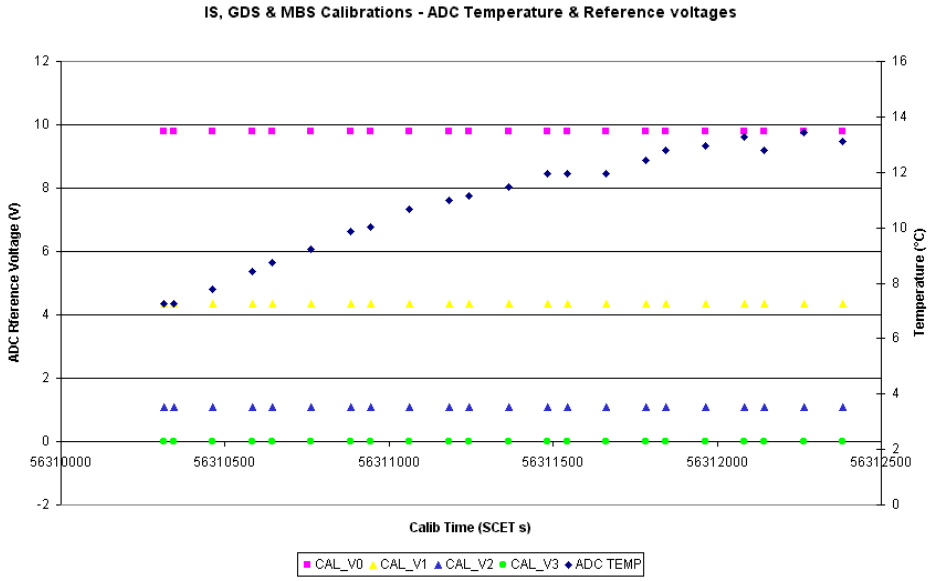

Figure 144 ADC Voltage Reference wrt ADC temperature during Calibration

6.1.3.3 MBS Sub-system normal acquisition

The MBS frequency for three of the MBS (1, 3 & 5) is confirmed to be significantly higher then in the 1st Commissioning; the five MBS frequency measurements are almost the same (MBS 1, 3, 4 & 5) of the ones taken during the Interference Part 1A and Part 1B.

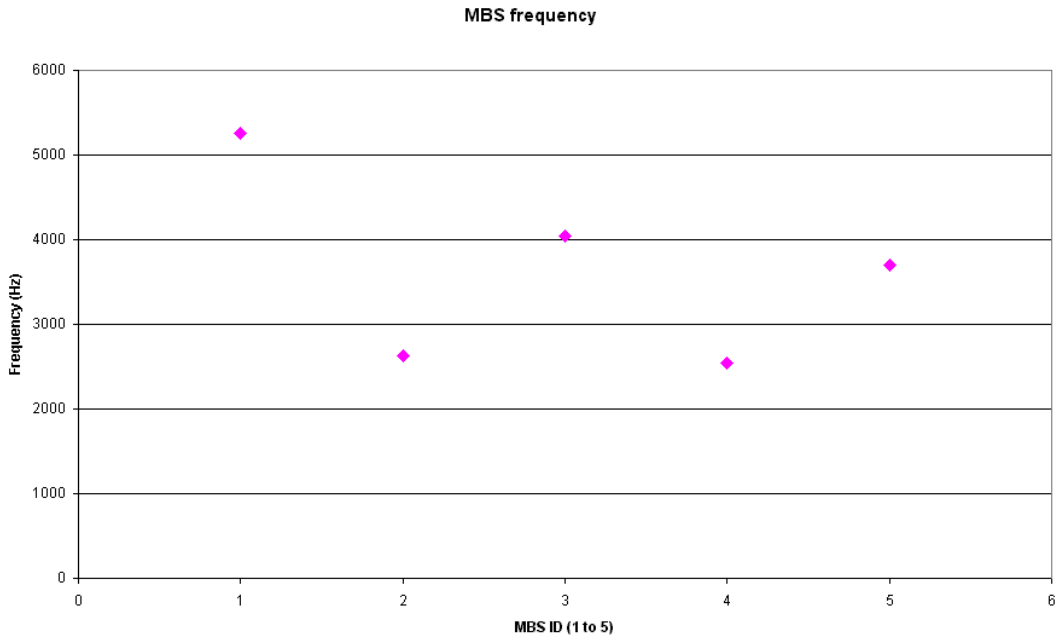

Figure 145 MBS Frequency

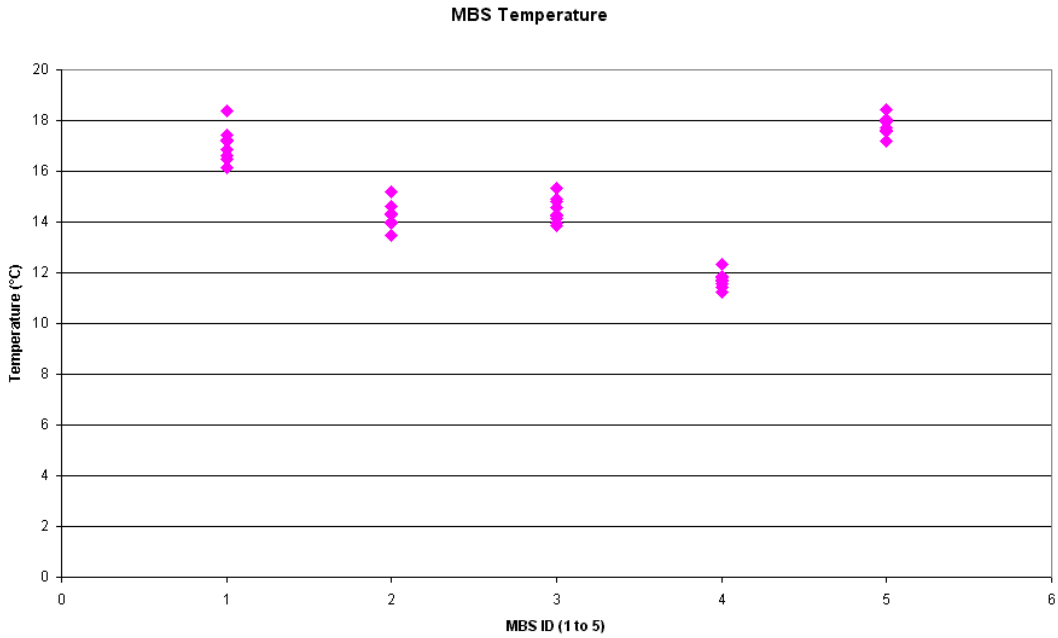

Figure 146 MBS Temperature

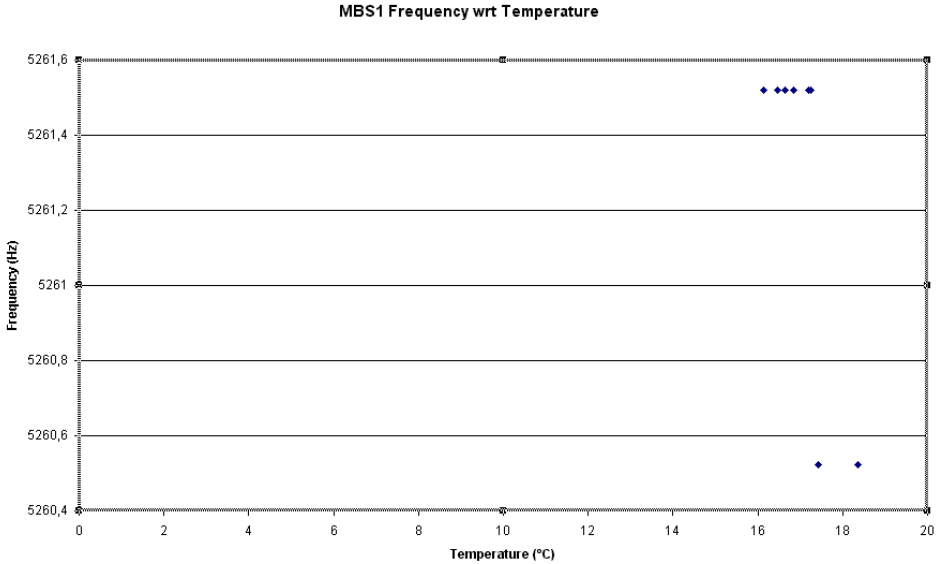

Figure 147 MBS1 Frequency wrt Temperature

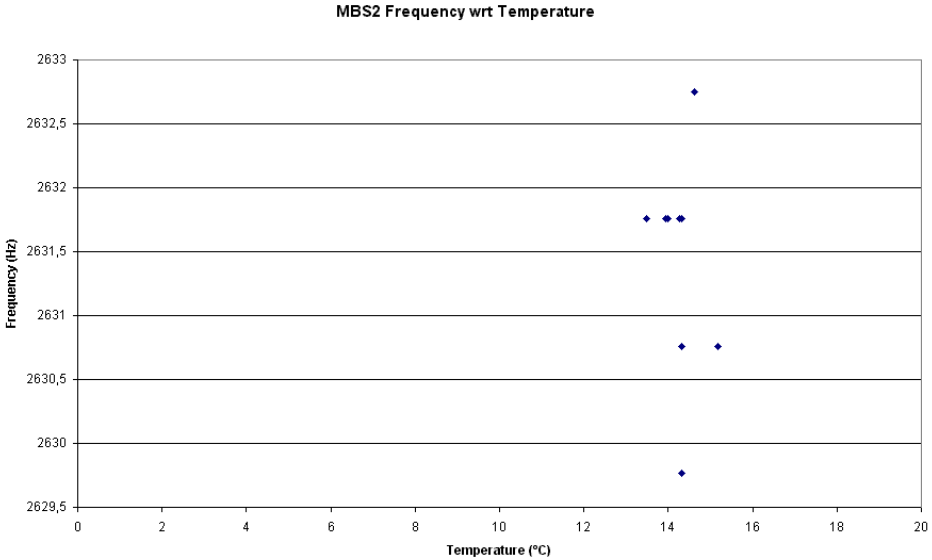

Figure 148 MBS2 Frequency wrt Temperature

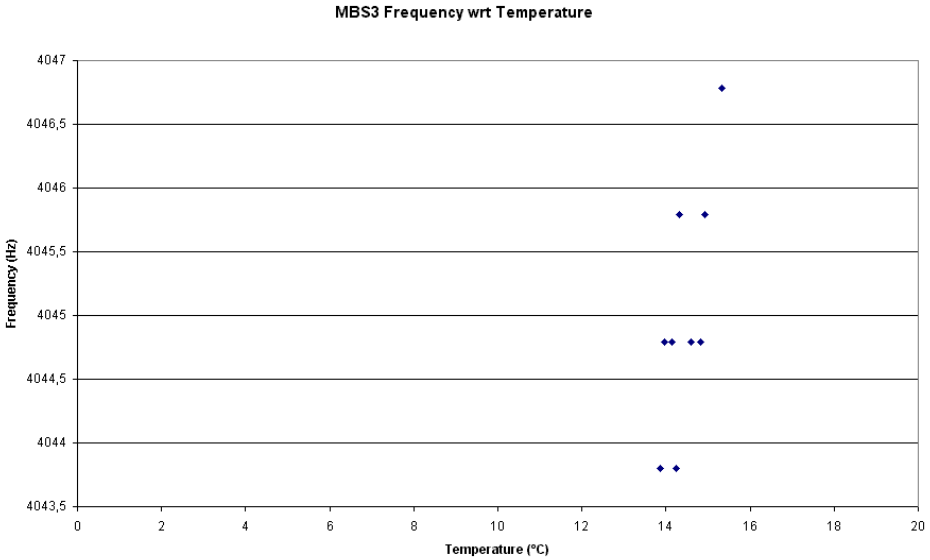

Figure 149 MBS3 Frequency wrt Temperature

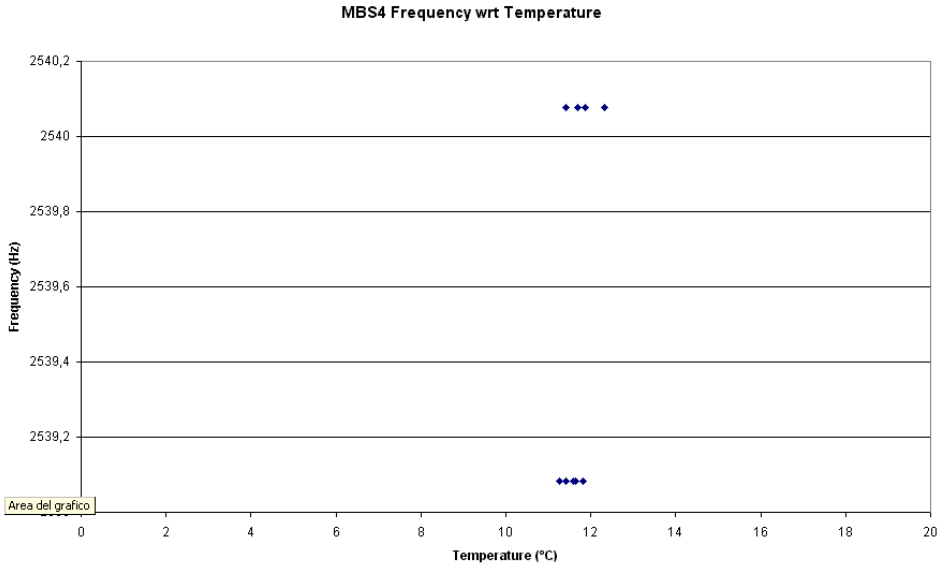

Figure 150 MBS4 Frequency wrt Temperature

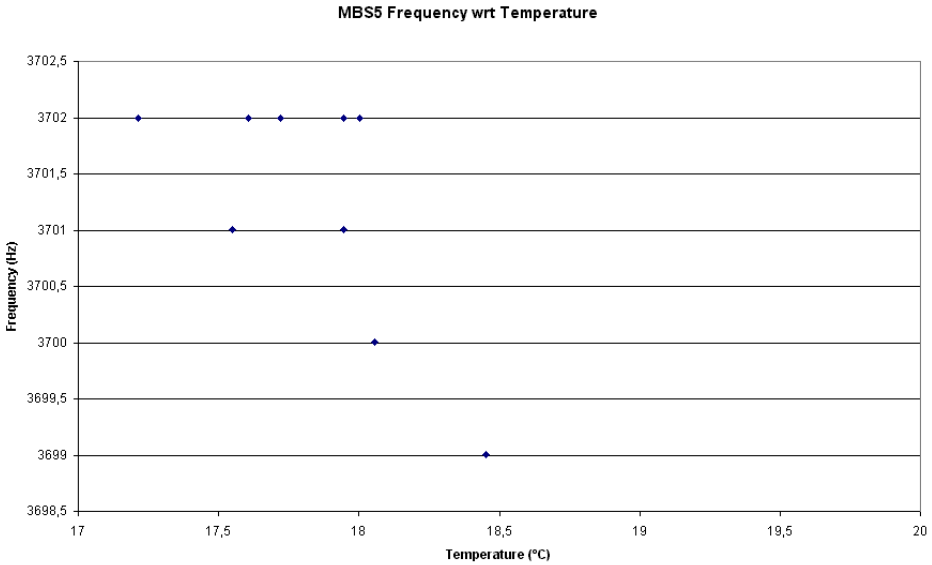

Figure 151 MBS5 Frequency wrt Temperature

6.1.3.4 Housekeeping signals in science packets

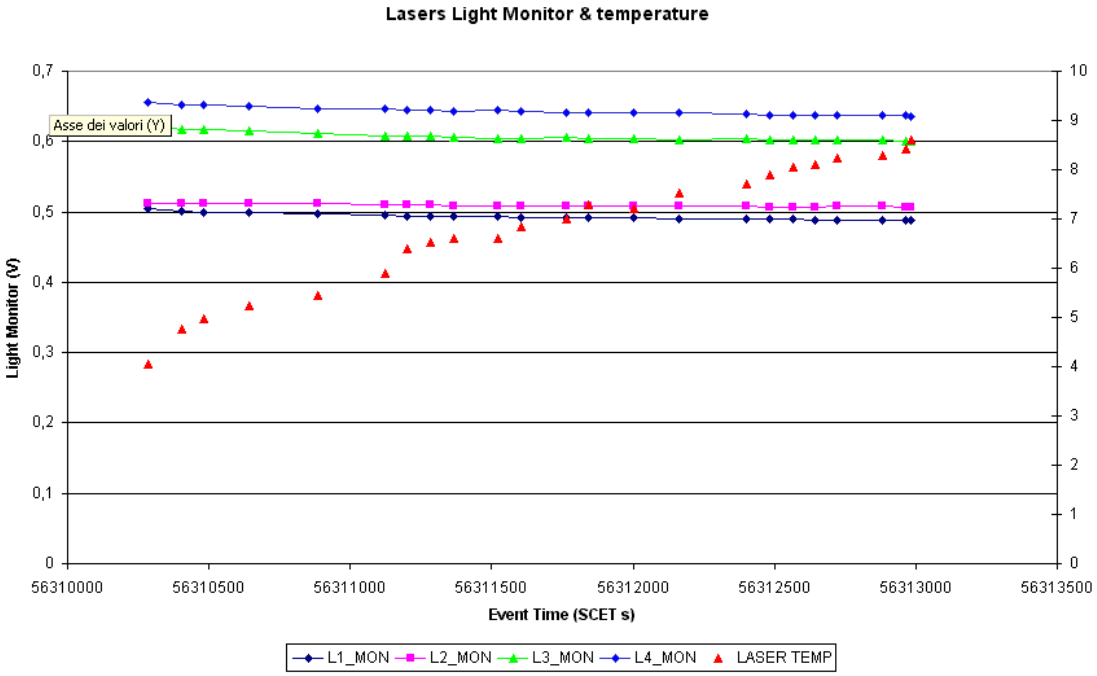

Figure 152 Laser lights monitor (Normal science packet)

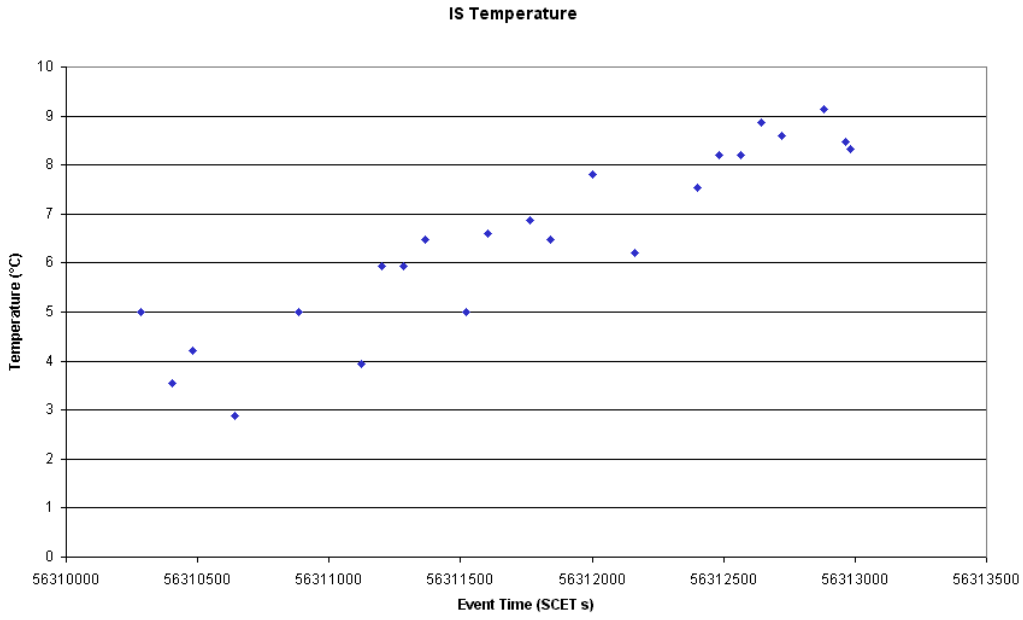

Figure 153 IS temperature (Normal science packet)

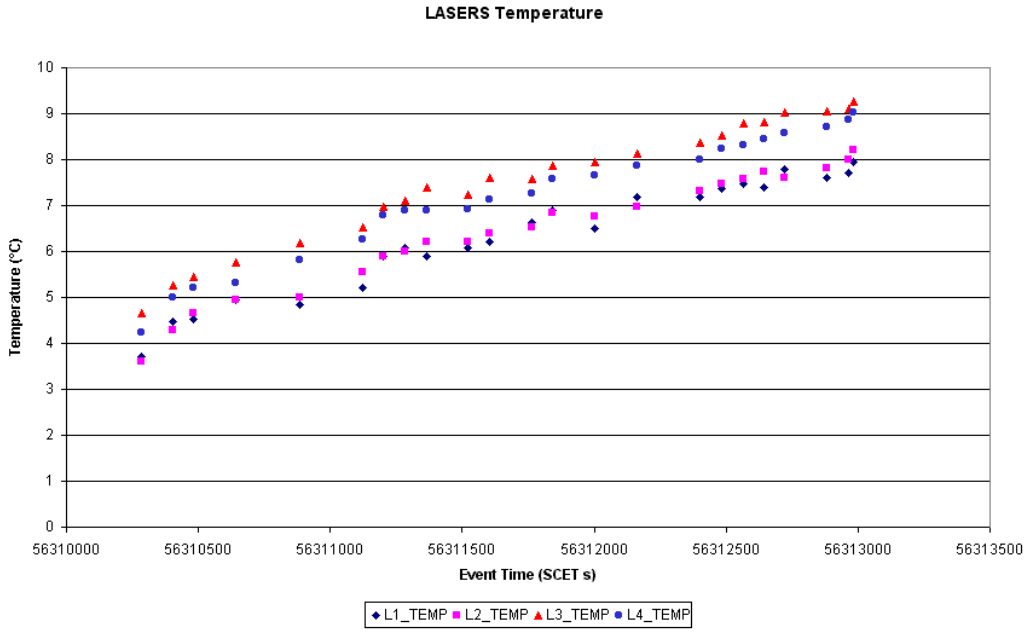

Figure 154 Lasers temperatures (Normal science packet)

7. CONCLUSION

According to the above data elaboration and results, the following conclusions can be drawn about the Interference test IIA & B:

- No loss of science TM was observed since no flood of Ghost events was produced by GIADA, having increased the detection thresholds of the GDS left receiver. **It is under investigation why few Ghost events have a measured amplitude below the level of the detection threshold**. The memory dump reports were lost along the three GIADA switch-on. **This problem shall be investigated on ESOC side.**
- The not synchronised TM report (i.e. Connection report 17,2 which is the first packet produced by GIADA after the switch-on) has a wrong UTC time; it results delayed of some hours with respect to the UTC time @ GIADA switch-on. **Even if it is not a major problem, it is requested a deep investigation on the side of ESOC.**
- The received event '*Command can not be executed in the actual operation mode'* (which is received at the start of the GIADA switch-on OBCP) is fully understandable because GIADA is already in safe mode (refer to the ITL procedure in the next section) and thus second 'Go to Safe' command is correctly discarded.
- **The GIADA Redundant interface seems less noisy with respect to the Main interface.** This behaviour has been observed comparing the IS and GDS Ghost measurements: for the Redundant interface there is a lower number of Ghost events with lower amplitude. Similar conclusions can be seen in the GDS and IS calibration data.
- **The value of frequency for three of the MBS's (1, 3 & 5) is confirmed to be significantly higher then in the 1st Commissioning (April '04)**. The measurements seem stable with respect to the ones taken during the Interference Part 1A and B. **The reasons of this change must be investigated, together with other experiments/payloads that have observed similar situation.** From the operational point of view, each MBS works as expected and the frequency dependence vs. temperature is consistent with the 1st commissioning data.

More in general, the following points should be considered as part of the next in-flight data analysis and recommendations for next tests:

- The GIADA internal stray-light (with or without electronics noise) is definitely higher than the detection threshold of the Left receiver. **It is confirmed that the detection threshold on Left receiver should be left at 1.24V**.
- Since the response of Channel C is noisier then others channels, it is suggested to increase (for both Main and Redundant) its detection threshold from 50mV to 120mV.

- In the case of the Main Interface, to stabilise the response of channel E when gain is High, it is required to increases its detection threshold from 100mV to 150mV in order to avoid Ghost events.

8. ATTACHEMENT A – GIADA ITL TIMELINE

```
#=============================================================================================#
# Filename:    GD_INTERFER_PART2____OPS01A.itl
# Type:        Input Timeline file
#
# Description:  This is a description of the interference scenario Part 2, in which the experiments
#              check for external influence from other experiments or subsystems.
#
#              This version of the timeline has all its operations scheduled relative to
#              experiments events, which allows easy re-scheduling while at the same time
#              clearer iteration with PI teams (as all PI inputs can remain in ONE file,
#              rather then mixed in with other experiments)
#
# Author:      GIADA team
#
# Verified by:  RSOC
#
#
# Date:        4 October 2004
#
# (c) ESA/Estec
#
#---------------------------------------------------------------------------------------------#
#
# CVS version information:
# $Log: GD_INTERFER_PART2____OPS01A.itl,v $
# Revision 1.5  2004/10/06 08:48:47  rhoofs
# Updated timing again in order to avoid sequence overlap
#
# Revision 1.4  2004/10/05 15:26:35  rhoofs
# Updated timing in order to avoid sequence overlap
#
# Revision 1.3  2004/10/04 16:29:47  rhoofs
# Updated file from GIADA with errors corrected
#
# Revision 1.1  2004/10/04 14:06:15  rhoofs
# Initial Interference Part 2 files
#
#
#=============================================================================================#

# NOTE: procedures for the Interference Part2
# To allow safe IS setting, a new TC shall be included in the tml (ZGD19401).
# This TC is not included in a dedicated sequence so far; so it should be included ?by hand? in the timeline.
```

INTERFERENCE IIa
Executed on 12 – 13 October 2004

```
# INTERFERENCE  Part 2a

Version: 00001

# The Interference Scenario will be performed on 12, 13 and 14 October 2004
```

```
Start_time:    000_00:00:00
End_time:      003_00:00:00

Init_Mode:     GIADA    Off

# NOTE: timing is absolute, starting from 17:00:00; as a reference, about  10 hours are considering for the
# first phase (GIADA on with Main Interface) and about 2:45 hours for the second phase (Red. interface)

#-------------------------------------------------------------------------------#
Description: "Switch on GIADA"
#-------------------------------------------------------------------------------#

GD_PWRON (COUNT = 1)   00:00:00       GIADA         OFF          AGDF001A ( \
                                        VGD0001A = "Yes" [ENG])    # GIADA on Main IF

GD_PWRON (COUNT = 1)   00:02:00       GIADA         Safe         AGDF001B

GD_PWRON (COUNT = 1)   00:06:00       GIADA         Safe         AGDF001C

#-------------------------------------------------------------------------------#
Description: "Switch GIADA to susceptible mode"
#-------------------------------------------------------------------------------#

GD_SUSC (COUNT = 1)    00:00:00       GIADA         Safe         AGDS035A       # Goto Cover

Description: "Cover operations with possible vibrations"

GD_SUSC (COUNT = 1)    00:01:00       GIADA         Cover        AGDF090A       # Open Cover

GD_SUSC (COUNT = 1)    00:11:00       GIADA         Cover        AGDS065A       # Goto Safe

Description: " normal science operation with lasers on "

GD_SUSC (COUNT = 1)    00:12:00       GIADA         Safe         AGDS110A       # Goto Normal and enable Sci TM

GD_SUSC (COUNT = 1)    00:14:00       GIADA         Normal       AGDS038A( \
                                        VGDS038A = 29 \
                                        VGDS038B = 20 )      # Set GDS L and R Thr. ? dec values

GD_SUSC (COUNT = 1)    00:14:30       GIADA         Normal       AGDS037A(\
                                        VGDS037A = Off [ENG])       # Set IS On/Off

GD_SUSC (COUNT = 1)    00:15:00       GIADA         Normal       AGDS036A ( \
                                        VGDS0031 = 0x5 \
                                        VGDS0032 = 0x5 \
                                        VGDS0033 = 0x5 \
                                        VGDS0034 = 0x5 \
                                        VGDS0035 = 0xa \
                                        VGDS0018 = Enabled [ENG] \
                                        VGDS0019 = Enabled [ENG] \
                                        VGDS0020 = Enabled [ENG] \
                                        VGDS0021 = Enabled [ENG] \
                                        VGDS0022 = Enabled [ENG] \
                                        VGDS0023 = Low [ENG] \
                                        VGDS0025 = High [ENG] \
                                        VGDS0026 = High [ENG] \
                                        VGDS0027 = High [ENG] \
                                        VGDS0028 = High [ENG] \
                                        VGDS0029 = High [ENG])       # Set IS status and thresholds
```

```
GD_SUSC (COUNT = 1)     00:15:30        GIADA           Normal          AGDS037A(\
                                                VGDS037A = On [ENG])        # Set IS On/Off

Description: "Execute the Calibrate IS, GDS, MBS TC Seq every 5 minutes"
Description: "during all the time of this test phase, i.e. up to Goto Safe TC Seq"
# 12 hours 15 minutes of susceptible operations should be scheduled = 735 min/5 = 147 calibrations

GD_SUSC (COUNT = 1)     00:16:00        GIADA           Normal          AGDS120A ( \
                                                VGDS0010 = 0xF8 \
                                                VGDS0011 = 0x04 \  # Calibrate IS, GDS, MBS
                                                REPEAT = 147 \
                                                SEPARATION = 00:05:00 )

# Description: "Goto Safe at the end of sensitivity phase, 5 min after last calibration sequence "

#-------------------------------------------------------------------------------#
Description: "Switch off GIADA"
#-------------------------------------------------------------------------------#

GD_PWROFF (COUNT = 1)   00:00:00        GIADA           Normal          AGDS065A        # Goto Safe

GD_PWROFF (COUNT = 1)   00:01:00        GIADA           SAFE            AGDF060A        # Safe Mode and OFF via OBCP
```

INTERFERENCE IIa

Executed on 13 October 2004

```
#-------------------------------------------------------------------------------#
Description: "Switch on GIADA using Redundant Interface"
#-------------------------------------------------------------------------------#

Description: "Switch GIADA to the Redundant Interface"
Description: "all other experiments should stay in stable configuration "

GD_PWRON (COUNT = 2)    00:00:00        GIADA           OFF             AGDF002A ( \
                                                VGD0001A = "Yes" [ENG])     # GIADA on Redundant IF

GD_PWRON (COUNT = 2)    00:02:00        GIADA           Safe            AGDF002B

GD_PWRON (COUNT = 2)    00:06:00        GIADA           Safe            AGDF002C

#-------------------------------------------------------------------------------#
Description: "Switch GIADA to susceptible mode"
#-------------------------------------------------------------------------------#

GD_SUSC (COUNT = 2)     00:00:00        GIADA           Safe            AGDS035A        # Goto Cover

Description: "Cover operations with possible vibrations"

GD_SUSC (COUNT = 2)     00:01:00        GIADA           Cover           AGDF090A        # Open Cover

GD_SUSC (COUNT = 2)     00:11:00        GIADA           Cover           AGDS065A        # Goto Safe
# RSOC Comment: Normally only 00:01:00 is used in this sequence of TC sequences

GD_SUSC (COUNT = 2)     00:12:00        GIADA           Safe            AGDS110A        # Goto Normal and enable Sci TM

GD_SUSC (COUNT = 2)     00:14:00        GIADA           Normal          AGDS038A( \
                                                VGDS038A = 29 \
                                                VGDS038B = 20 )       # Set GDS L and R Thr. ? dec values
```

```
GD_SUSC (COUNT = 2)     00:14:30        GIADA           Normal          AGDS037A(\
                                        VGDS037A = Off [ENG])       # Set IS On/Off

GD_SUSC (COUNT = 2)     00:15:00        GIADA           Normal          AGDS036A ( \
                                        VGDS0031 = 0x5 \
                                        VGDS0032 = 0x5 \
                                        VGDS0033 = 0x5 \
                                        VGDS0034 = 0x5 \
                                        VGDS0035 = 0xa \
                                        VGDS0018 = Enabled [ENG] \
                                        VGDS0019 = Enabled [ENG] \
                                        VGDS0020 = Enabled [ENG] \
                                        VGDS0021 = Enabled [ENG] \
                                        VGDS0022 = Enabled [ENG] \
                                        VGDS0023 = Low [ENG] \
                                        VGDS0025 = High [ENG] \
                                        VGDS0026 = High [ENG] \
                                        VGDS0027 = High [ENG] \
                                        VGDS0028 = High [ENG] \
                                        VGDS0029 = High [ENG])      # Set IS status and thresholds

GD_SUSC (COUNT = 2)     00:15:30        GIADA           Normal          AGDS037A( \
                                        VGDS037A = On [ENG])        # Set IS On/Off

Description: "Execute the Calibrate IS, GDS, MBS TC Seq every 5 minutes"
Description: "during all the time of this test phase, i.e. up to Goto Safe TC Seq"
# 1 hour and 30 minutes of susceptible operations should be scheduled = 100 min/5 = 18

GD_SUSC (COUNT = 2)     00:16:00        GIADA           Normal          AGDS120A ( \
                                        VGDS0010 = 0xF8 \
                                        VGDS0011 = 0x04 \  # Calibrate IS, GDS, MBS
                                        REPEAT = 18 \
                                        SEPARATION = 00:05:00 )

#-------------------------------------------------------------------------------#
Description: "Switch off GIADA"
#-------------------------------------------------------------------------------#

# Description: " Goto Safe at the end of sensitivity phase, 5 min after last calibration sequence "

GD_PWROFF (COUNT = 2)   00:00:00        GIADA           Normal          AGDS065A        # Goto Safe

Description: " last sequence can be executed 1 minute after the Goto Safe "

GD_PWROFF (COUNT = 2)   00:01:00        GIADA           SAFE            AGDF060A        # Safe Mode and OFF via OBCP
```

INTERFERENCE IIb

Executed on 13 October 2004

```
#-------------------------------------------------------------------------------#
# INTERFERENCE  Part 2b
#-------------------------------------------------------------------------------#

#-------------------------------------------------------------------------------#
Description: "Switch on GIADA"
#-------------------------------------------------------------------------------#


GD_PWRON (COUNT = 3)    00:00:00        GIADA           OFF             AGDF001A ( \
```

```
                                        VGD0001A = "Yes" [ENG])    # GIADA on Main IF

GD_PWRON (COUNT = 3)    00:02:00        GIADA           Safe            AGDF001B

GD_PWRON (COUNT = 3)    00:06:00        GIADA           Safe            AGDF001C

#-------------------------------------------------------------------------------#
Description: "Switch GIADA to emissive mode"
#-------------------------------------------------------------------------------#

GD_EMISS (COUNT = 1)    00:00:00        GIADA           Safe            AGDS035A        # Goto Cover

Description: "Cover operations with possible vibrations"

GD_EMISS (COUNT = 1)    00:01:00        GIADA           Cover           AGDF090A        # Open Cover

GD_EMISS (COUNT = 1)    00:11:00        GIADA           Cover           AGDS065A        # Goto Safe

GD_EMISS (COUNT = 1)    00:12:00        GIADA           Safe            AGDS110A        # Goto Normal and enable Sci TM

GD_EMISS (COUNT = 1)    00:14:00        GIADA           Normal          AGDS038A( \
                                        VGDS038A = 29 \
                                        VGDS038B = 20 )      # Set GDS L and R Thr. ? dec values

GD_EMISS (COUNT = 1)    00:14:30        GIADA           Normal          AGDS037A(\
                                        VGDS037A = Off [ENG])        # Set IS On/Off

GD_EMISS (COUNT = 1)    00:15:00        GIADA           Normal          AGDS036A ( \
                                        VGDS0031 = 0x5 \
                                        VGDS0032 = 0x5 \
                                        VGDS0033 = 0x5 \
                                        VGDS0034 = 0x5 \
                                        VGDS0035 = 0xa \
                                        VGDS0018 = Enabled [ENG] \
                                        VGDS0019 = Enabled [ENG] \
                                        VGDS0020 = Enabled [ENG] \
                                        VGDS0021 = Enabled [ENG] \
                                        VGDS0022 = Enabled [ENG] \
                                        VGDS0023 = Low [ENG] \
                                        VGDS0025 = High [ENG] \
                                        VGDS0026 = High [ENG] \
                                        VGDS0027 = High [ENG] \
                                        VGDS0028 = High [ENG] \
                                        VGDS0029 = High [ENG])       # Set IS status and thresholds

GD_EMISS (COUNT = 1)    00:15:30        GIADA           Normal          AGDS037A(\
                                        VGDS037A = On [ENG])         # Set IS On/Off

Description: "Execute the Calibrate IS, GDS, MBS TC Seq every 5 minutes"
Description: "during all the time of this test phase, i.e. up to Goto Safe TC Seq"
# 35 minutes of susceptible operations should be scheduled = 35 min/5 = 7 calibrations

GD_EMISS (COUNT = 1)    00:16:00        GIADA           Normal          AGDS120A ( \
                                        VGDS0010 = 0xF8 \
                                        VGDS0011 = 0x04 \  # Calibrate IS, GDS, MBS
                                        REPEAT = 7 \
                                        SEPARATION = 00:05:00 )

#-------------------------------------------------------------------------------#
Description: "Switch off GIADA"
#-------------------------------------------------------------------------------#
```

```
# Description: " Goto Safe at the end of sensitivity phase, 5 min after last calibration sequence "
GD_PWROFF (COUNT = 3)   00:00:00      GIADA        Normal       AGDS065A      # Goto Safe
GD_PWROFF (COUNT = 3)   00:01:00      GIADA        SAFE         AGDF060A      # Safe Mode and OFF via OBCP
```

INTERFERENCE IIc

Executed on 14 October 2004

```
#-------------------------------------------------------------------------------#
# INTERFERENCE  Part 2c
#-------------------------------------------------------------------------------#

#-------------------------------------------------------------------------------#
Description: "Switch on GIADA"
#-------------------------------------------------------------------------------#

GD_PWRON (COUNT = 4)    00:00:00      GIADA        OFF          AGDF001A ( \
                                        VGD0001A = "Yes" [ENG])    # GIADA on Main IF

GD_PWRON (COUNT = 4)    00:02:00      GIADA        Safe         AGDF001B

GD_PWRON (COUNT = 4)    00:06:00      GIADA        Safe         AGDF001C

#-------------------------------------------------------------------------------#
Description: "Perform GIADA specific operations"
#-------------------------------------------------------------------------------#

GD_SUSC (COUNT = 3)     00:00:00      GIADA        Safe         AGDS035A      # Goto Cover

Description: "Cover operations with possible vibrations"

GD_SUSC (COUNT = 3)     00:01:00      GIADA        Cover        AGDF090A      # Open Cover

GD_SUSC (COUNT = 3)     00:11:00      GIADA        Cover        AGDS065A      # Goto Safe

GD_SUSC (COUNT = 3)     00:12:00      GIADA        Safe         AGDS110A      # Goto Normal and enable Sci TM

GD_SUSC (COUNT = 3)     00:14:00      GIADA        Normal       AGDS038A( \
                                        VGDS038A = 29 \
                                        VGDS038B = 20 )      # Set GDS L and R Thr. ? dec values

GD_SUSC (COUNT = 3)     00:14:30      GIADA        Normal       AGDS037A(\
                                        VGDS037A = Off [ENG])       # Set IS On/Off

GD_SUSC (COUNT = 3)     00:15:00      GIADA        Normal       AGDS036A ( \
                                        VGDS0031 = 0x5 \
                                        VGDS0032 = 0x5 \
                                        VGDS0033 = 0x5 \
                                        VGDS0034 = 0x5 \
                                        VGDS0035 = 0xa \
                                        VGDS0018 = Enabled [ENG] \
                                        VGDS0019 = Enabled [ENG] \
                                        VGDS0020 = Enabled [ENG] \
                                        VGDS0021 = Enabled [ENG] \
                                        VGDS0022 = Enabled [ENG] \
                                        VGDS0023 = Low [ENG] \
                                        VGDS0025 = High [ENG] \
                                        VGDS0026 = High [ENG] \
```

```
                                    VGDS0027 = High [ENG] \
                                    VGDS0028 = High [ENG] \
                                    VGDS0029 = High [ENG])      # Set IS status and thresholds

GD_SUSC (COUNT = 3)   00:15:30    GIADA       Normal      AGDS037A(\
                                    VGDS037A = On [ENG])      # Set IS On/Off

Description: "Execute the Calibrate IS, GDS, MBS TC Seq every 5 minutes"
Description: "during all the time of this test phase, i.e. up to Goto Safe TC Seq"
# 45 minutes of susceptible operations should be scheduled = 45 min/5 = 9 calibrations

GD_SUSC (COUNT = 3)   00:16:00    GIADA       Normal      AGDS120A ( \
                                    VGDS0010 = 0xF8 \
                                    VGDS0011 = 0x04 \  # Calibrate IS, GDS, MBS
                                    REPEAT = 9 \
                                    SEPARATION = 00:05:00 )

GD_SUSC (COUNT = 3)   01:00:00    GIADA       Normal      AGDF055A      # Heat all MBSs

GD_SUSC (COUNT = 3)   02:10:00    GIADA       Normal      AGDS065A      # Goto Safe

GD_SUSC (COUNT = 3)   02:11:00    GIADA       Safe        AGDS110A      # Goto Normal and enable Sci TM

GD_SUSC (COUNT = 3)   02:13:00    GIADA       Normal      AGDS038A( \
                                    VGDS038A = 29 \
                                    VGDS038B = 20 )     # Set GDS L and R Thr. ? dec values

GD_SUSC (COUNT = 3)   02:13:30    GIADA       Normal      AGDS037A(\
                                    VGDS037A = Off [ENG])     # Set IS On/Off

GD_SUSC (COUNT = 3)   02:14:00    GIADA       Normal      AGDS036A ( \
                                    VGDS0031 = 0x5 \
                                    VGDS0032 = 0x5 \
                                    VGDS0033 = 0x5 \
                                    VGDS0034 = 0x5 \
                                    VGDS0035 = 0xa \
                                    VGDS0018 = Enabled [ENG] \
                                    VGDS0019 = Enabled [ENG] \
                                    VGDS0020 = Enabled [ENG] \
                                    VGDS0021 = Enabled [ENG] \
                                    VGDS0022 = Enabled [ENG] \
                                    VGDS0023 = Low [ENG] \
                                    VGDS0025 = High [ENG] \
                                    VGDS0026 = High [ENG] \
                                    VGDS0027 = High [ENG] \
                                    VGDS0028 = High [ENG] \
                                    VGDS0029 = High [ENG])      # Set IS status and thresholds

GD_SUSC (COUNT = 3)   02:14:30    GIADA       Normal      AGDS037A(\
                                    VGDS037A = On [ENG])      # Set IS On/Off

Description: "Execute the Calibrate IS, GDS, MBS TC Seq every 5 minutes"
Description: "during all the time of this test phase, i.e. up to Goto Safe TC Seq"
# 45 minutes of susceptible operations should be scheduled = 45 min/5 = 9 calibrations

GD_SUSC (COUNT = 3)   02:15:00    GIADA       Normal      AGDS120A ( \
                                    VGDS0010 = 0xF8 \
                                    VGDS0011 = 0x04 \  # Calibrate IS, GDS, MBS
                                    REPEAT = 9 \
                                    SEPARATION = 00:05:00 )
```

```
#-------------------------------------------------------------------------------#
Description: "Switch off GIADA"
#-------------------------------------------------------------------------------#

# Description: " Goto Safe at the end of sensitivity phase, 5 min after last calibration sequence "
GD_PWROFF (COUNT = 4)   00:00:00      GIADA        Normal       AGDS065A      # Goto Safe
GD_PWROFF (COUNT = 4)   00:01:00      GIADA        SAFE         AGDF060A      # Safe Mode and OFF via OBCP
```