GIADA FS MODEL

No.	PAGES CLASSIFICATION
	SECRET
	CONFIDENTIAL
	RESTRICTED
61	UNCLASSIFIED
61	TOTAL

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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		29-11-2004	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 IIC part of the in-flight commissioning activities performed on GIADA experiment on 13 October '04 (Interference scenario IIC).

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)
AD8	GIA-GAL-RP-521 Rev 1	GIADA FS MODEL REPORT OF IN-FLIGHT INTERFERENCE SCENARIO IIA & B (12 - 13 Oct ‘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 behaviour during the Interference Scenario IIC. The GIADA PI team located in the INAF – Osservatorio di Capodimonte in Naples with the support of the ESOC team located in the RMOC room at ESOC, have started the activities on 14 Oct. 2004 at about the 09:00. 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 7 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

Table 1 lists all the used FCP's during the GIADA 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
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

Procedure Number	Notes	absolute starting time from Itl	Time from switch on
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 IIC TEST REPORT

5.1 MBS HEATING TEST (14/10/2004 - MAIN)

5.1.1 Activities log

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

UTC	Description
14 Oct 2004 - 07:31	Beginning of activity – GIADA power on
14 Oct 2004 - 07:40	Completion of the Cover open operation
14 Oct 2004 - 08:12	Go to Normal mode (science enabled)
14 Oct 2004 - 08:13:30	GDS Left receiver threshold changed – IS channel E gain/threshold changed
14 Oct 2004 - 09:02	IS & GDS switched off – MBS heating started
14 Oct 2004 - 09:05	MBS # 1 heating
14 Oct 2004 - 09:15	MBS # 2 heating
14 Oct 2004 - 09:25	MBS # 3 heating
14 Oct 2004 - 09:35	MBS # 4 heating
14 Oct 2004 - 09:45	MBS # 5 heating
14 Oct 2004 - 10:10	Go to Safe – Science disabled
14 Oct 2004 - 10:12:30	Go to Normal mode (science enabled)
14 Oct 2004 - 10:15:30	GDS Left receiver threshold changed – IS channel E gain/threshold changed
14 Oct 2004 – 10:59	Go to Safe – Science disabled
14 Oct 2004 – 11:08	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 the 14th of October 2004 @ 07:31 (UTC time), which corresponds to a SCET Time of about 56359858sec.

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 45 minutes after the power-on:

Thu Oct 14 2004 08:15:16.71318
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

As understood after iteration with RMOC people, this is a nominal situation for unsynchronised TM packets that are not received in real time; in this condition the DDS system cannot distinguish for how long the packet was stored in SSMM.

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), probably because they were not 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 08:00 (UTC time).

The next step was to open the cover. The operation was successfully completed @ 06:40 (UTC Time) when the Cover Report was received. Then GIADA was sent to Normal @ 08:12 (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 @ about 08:13:30 (UTC Time) and after about one and half minute the GDS Left receiver threshold was changed from 0.8V to 1.24V (this was decided 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 the 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 08:15:30 and the internal calibration of GDS, IS and MBS sub-systems was periodically performed every 5 minutes to check the instrument behaviour.

The calibrations were run for 45 minutes until the IS and GDS subsystems were switched-off (@ about 9:02 UTC Time) and MBS heating was performed. After the completion of the heating mode of the five MBS, GIADA was placed in Safe mode (@ about 10:10 UTC Time) and then again in Normal mode with science enabled and channel-E Gain/Threshold changed (@ about 10:15:30 UTC Time).

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 to Safe mode @ 10:00 (UTC Time) of 14th October. 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:

Thu Oct 14 2004 10:59:59.489148
TM Packet Received from GIADA:
APID = 90, 1 (ACKNOWLEDGE)
Source Sequence Count: 231

Packet Length: 21
SCET Time: 56372382.296875 sec.
Packet Type, Subtype: 1, 2

0D A1 C0 E7 00 15 03 5C 2C 9E 4C 00 40 01 02 00 1D AC CF 92 00 05 C4 01 00 00 00 00

==========

Thu Oct 14 2004 10:59:59.489148
TC APID = 1452, TC SSC = 3986;
Command can not be executed in the actual operation mode (TC Packet Type/Subtype = 196,1 - Safe)

The cover was automatically closed (with heaters Cover and Motor Heaters Off). The Instrument was switched-off @ about 11:08 of 14 Oct. 2004 (UTC Time) corresponding to a SCET time = 56372867sec.

5.1.2 Housekeeping data analysis

The following figures have been taken from the HK database.

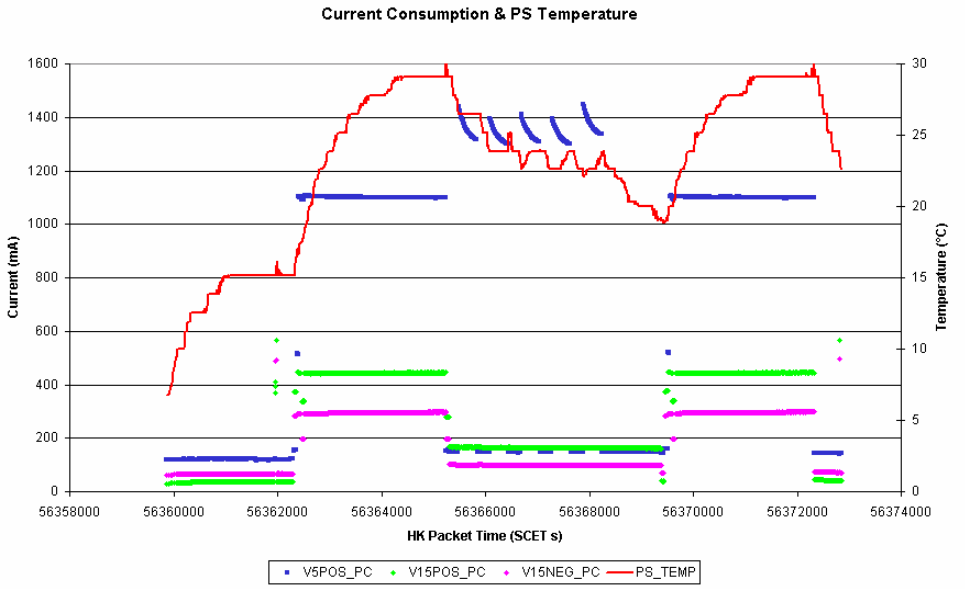

Figure 1 +5V and ±15V Currents and PS Temperature

The current consumption and Power Supply temperatures (Figure 1) are in accordance with operative modes evolution: Safe & Cover mode, Full sensors ON in Normal mode, MBS heating in Normal mode, Full sensors ON in Normal mode and Safe/Cover modes. The sensors status is shown in Figure 2. The current consumption for +5V, +15V and –15V is about 1100mA, 444mA and 300mA respectively (Full Sensors ON in Normal mode when the PS temperature is almost stable at about 29 °C) and is in the range 150/1450mA, 165mA and 99mA respectively (during MBS heating in Normal mode, when the PS temperature is about 23 °C).

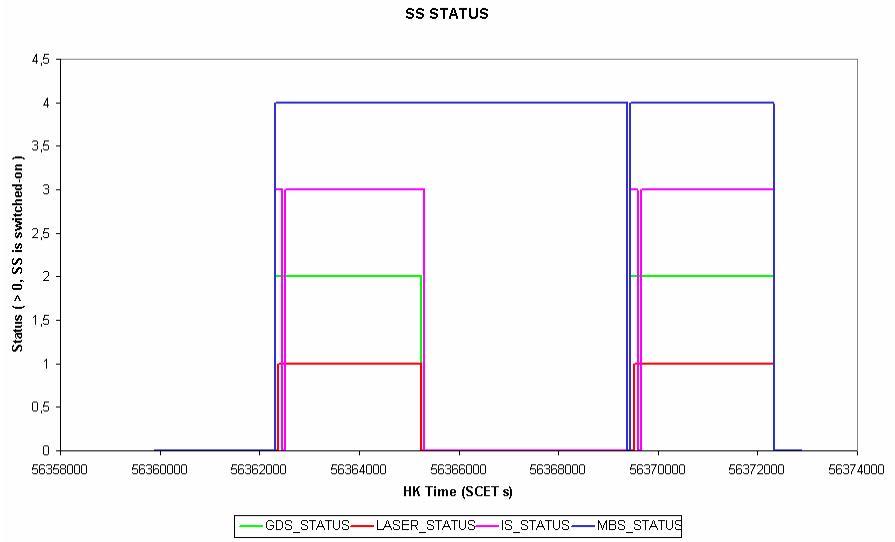

Figure 2 – GIADA Sub-Systems Status (Status = 0 means S/S is Off)

The Instrument cover has been successfully opened and closed at due time (refer to Figure 8, in which the status of the two reed-switches is shown). The complete monitoring of the two switches is done in the Cover Reports, which are shown in Section 5.1.2.1.

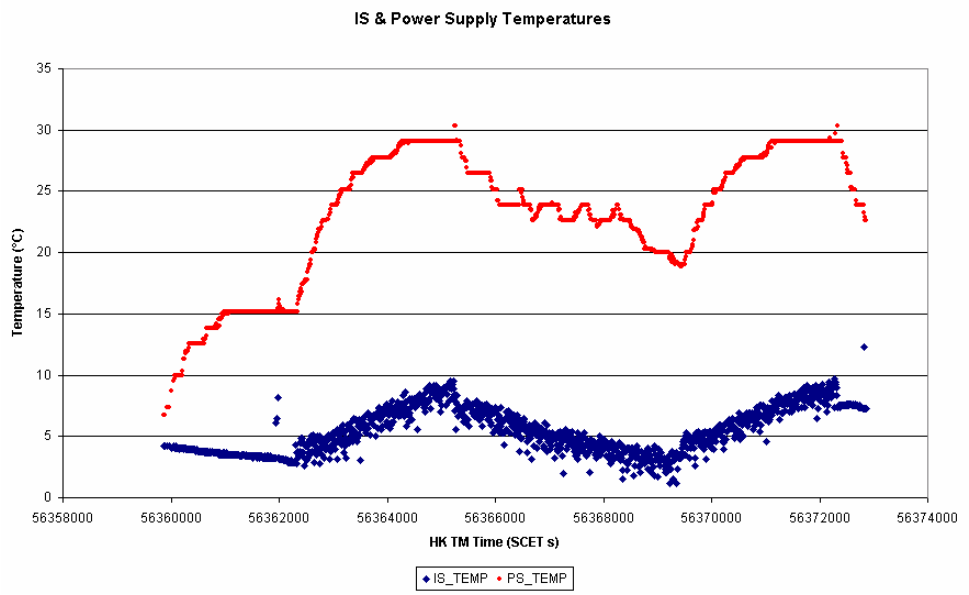

Figure 3 IS & PS Temperatures

In Figure 3, the Power Supply temperature increases from 7°C (@ power-on) up to 29°C when GIADA is in Normal mode and the maximum power is drawn. The IS temperature reaches about 15°C when GIADA is in Normal mode and the cover is open, then decreases to about 2°C when the MBS heating is performed and GDS + IS are switched off. As already detected, **when the lasers are switched on, the IS temperature becomes more noisy** (data are spread within 3°C) with respect to GIADA in safe mode. The same behaviour is observed when the lasers are switched off and MBS heating is running. **In conclusion it seems that the higher noise depends on the operational mode (GIADA Normal mode), independent of current consumption and lasers status.** Investigation to be done on the interaction between software and ADC electronics.

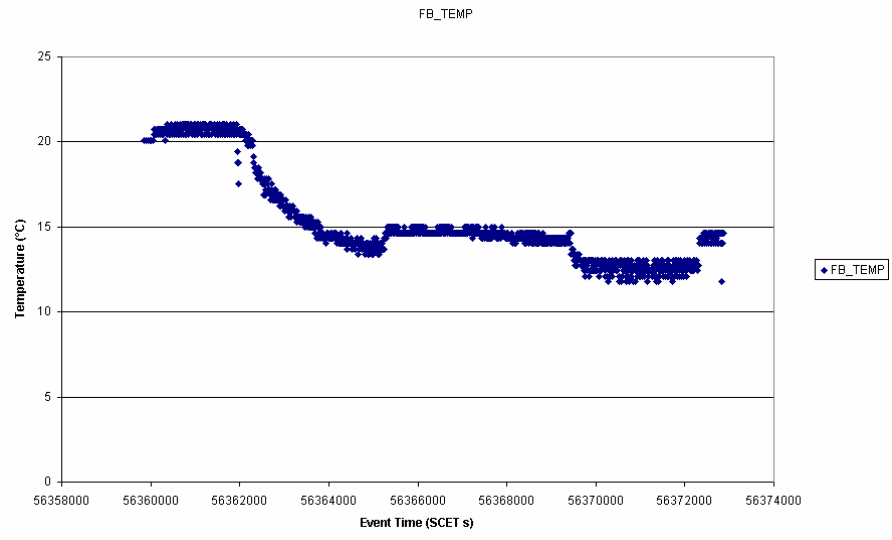

Figure 4 Frangibolt Temperature

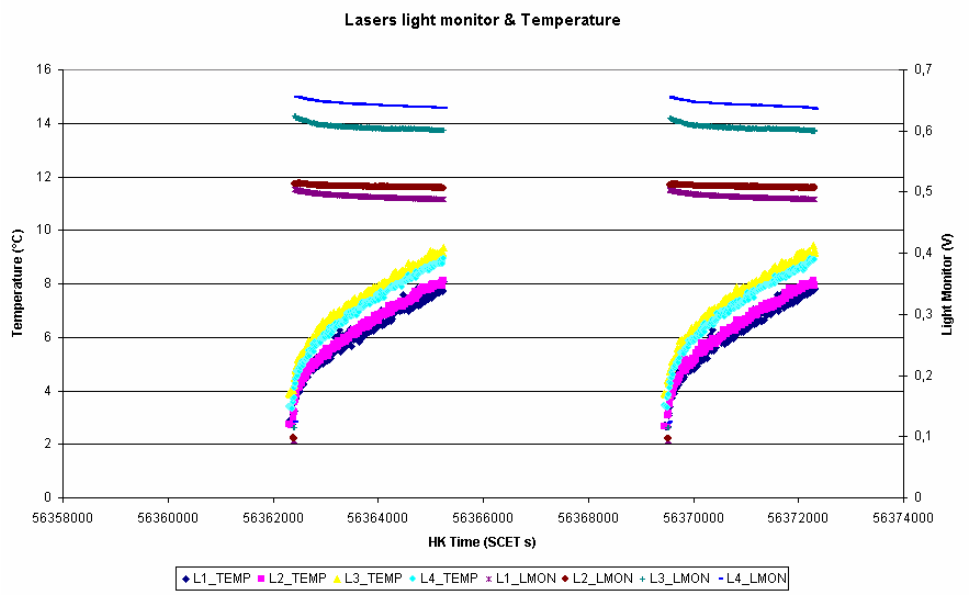

Figure 5 Laser Light monitor and temperatures

Lasers are properly switched-on and their temperatures (Figure 5) increase from 3°C to about 9°C. As expected, the light of each laser decreases when the temperature rises up.

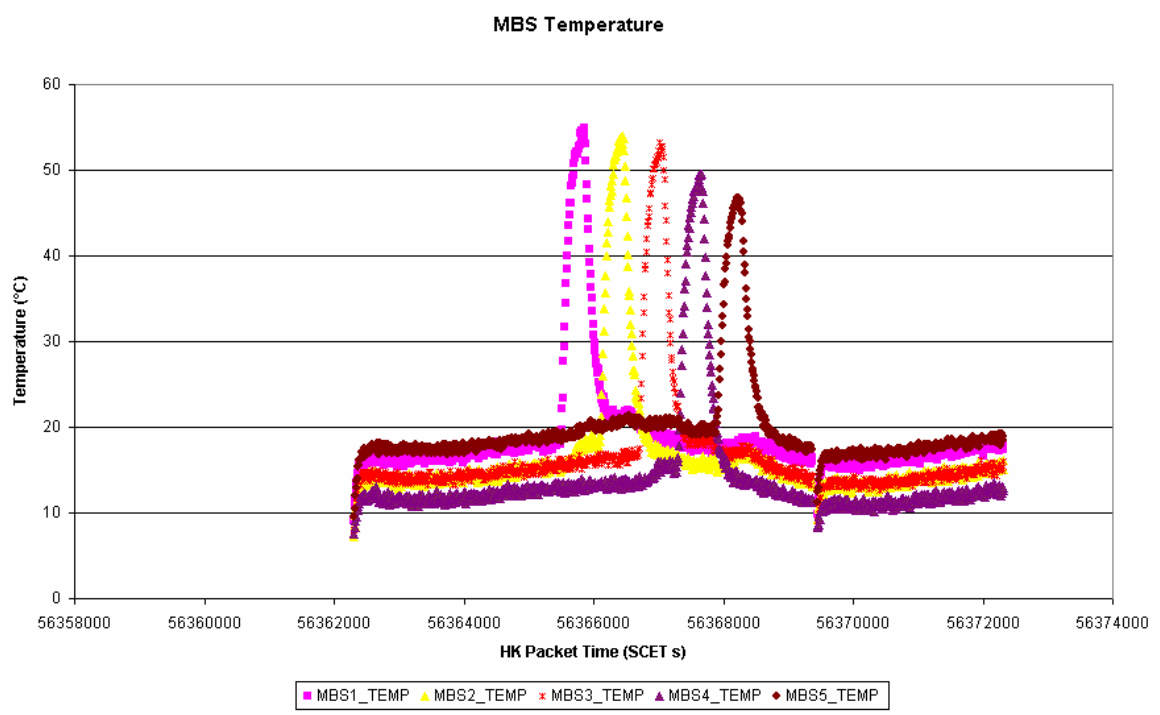

Figure 6 MBS Temperature

The five MBS, after switch-on, show a temperature between 7 and 20 °C (Figure 6). During the MBS heating, the temperatures increase up to a maximum value and then decreases back when the heating is finished. As expected from on-ground tests, the maximum value is different for each MBS. It results about 55°C for MBS1, 54°C for MBS2, 53°C for MBS3, 49.5°C for MBS4 and 46.5°C for MBS5.

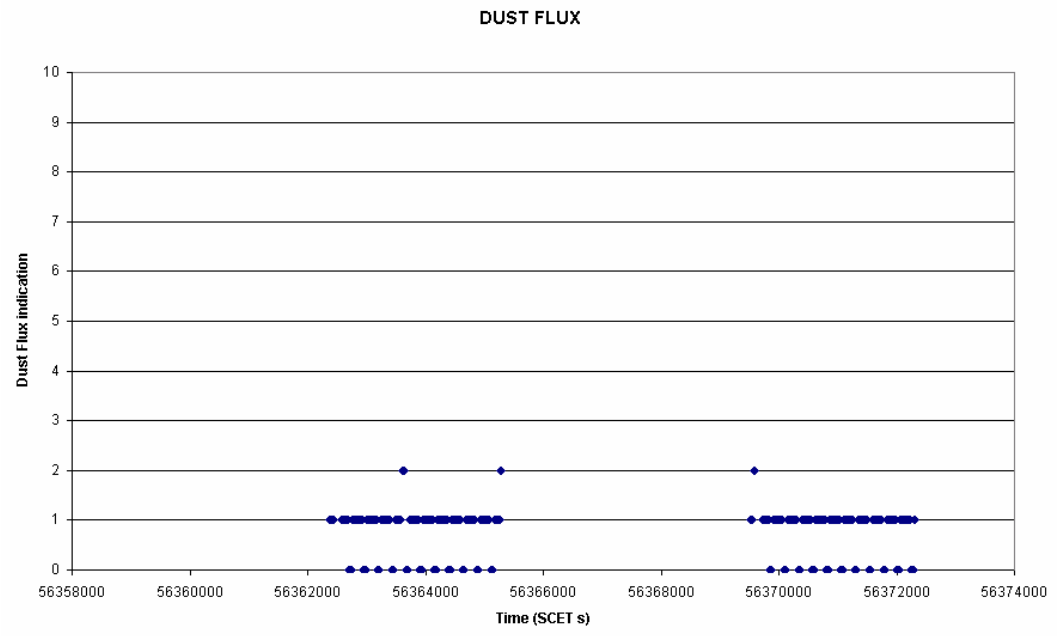

Figure 7 Dust-Flux Monitor (valid only when the IS sub-system is ON)

The Figure 10 and Figure 11 indicate the values in Volt of the IS and GDS detection thresholds and the time when they were changed.

The Dust Flux indication is > 0 (see Figure 7) even after one minute of sensor switch-on, in which - as understood on ground - few IS ghost events can be observed. The reason is that IS channel E detects few 'Ghost events', due to its internal noise level when Gain is High.

No missing packets have been found in the TM (refer to Figure 9**).**

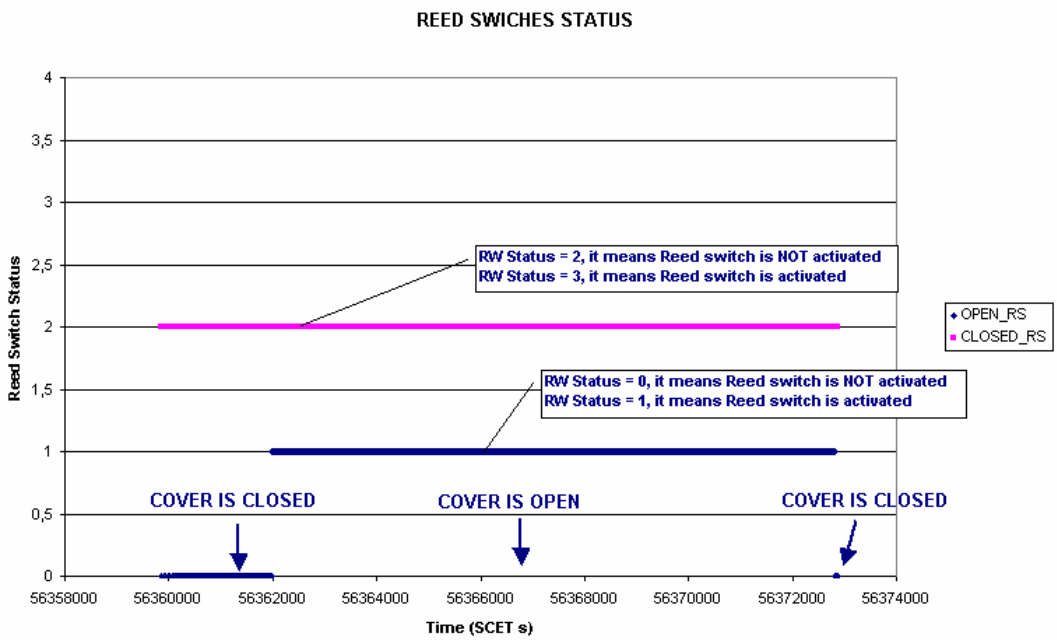

Figure 8 Cover Reed Switch Status (Cover open & close operations)

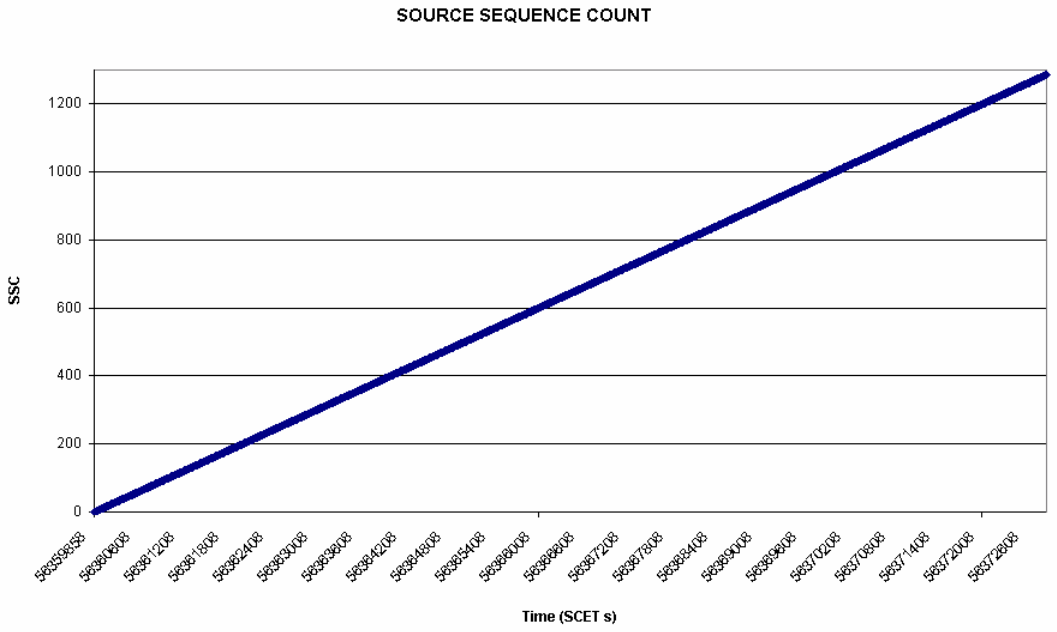

Figure 9 SSC of HK TM

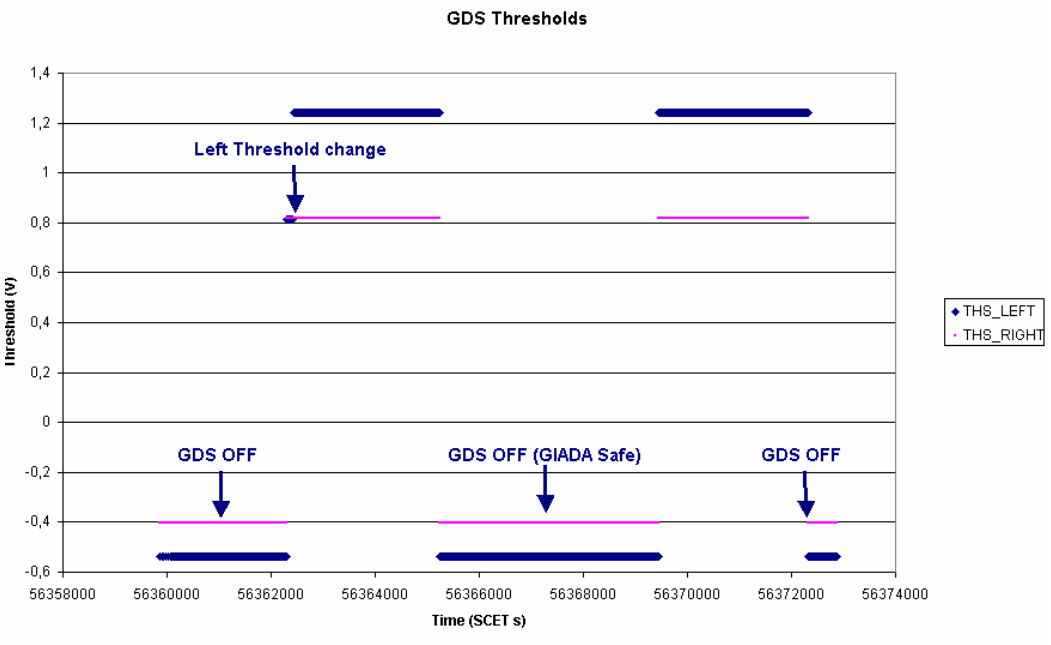

Figure 10 GDS Detection threshold change

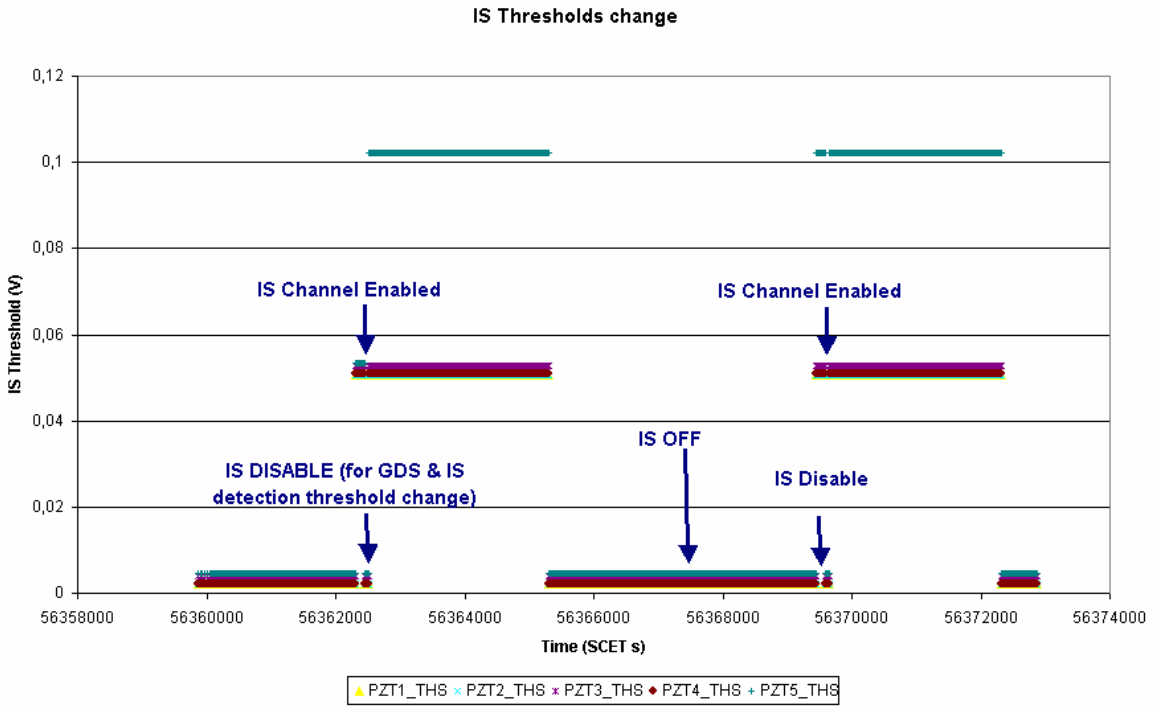

Figure 11 IS Detection threshold change

5.1.2.1 Cover open & close operations

After the cover open operation, the cover results completely open, as shown in Figure 12, 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 56361976s, corresponding to 08:06:40 UTC Time of the 13 Oct 2004).

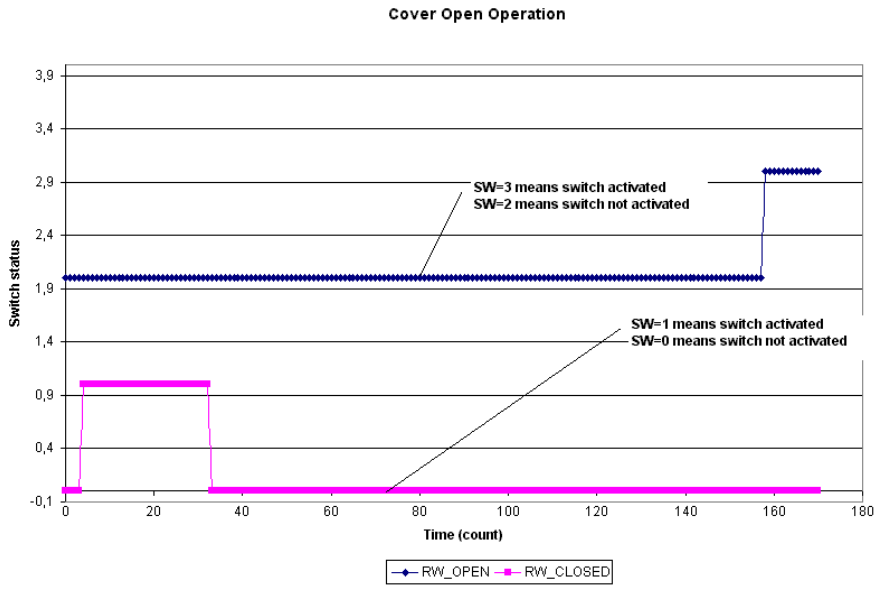

Figure 12 Reed switches Status during the Cover Open operation

At GIADA power-off, the GIADA cover is closed by OBCP (Close Cover). The cover is successfully closed @ SCET time of 56372812s, corresponding to 11:07:14 UTC time of the 13 Oct 2004.

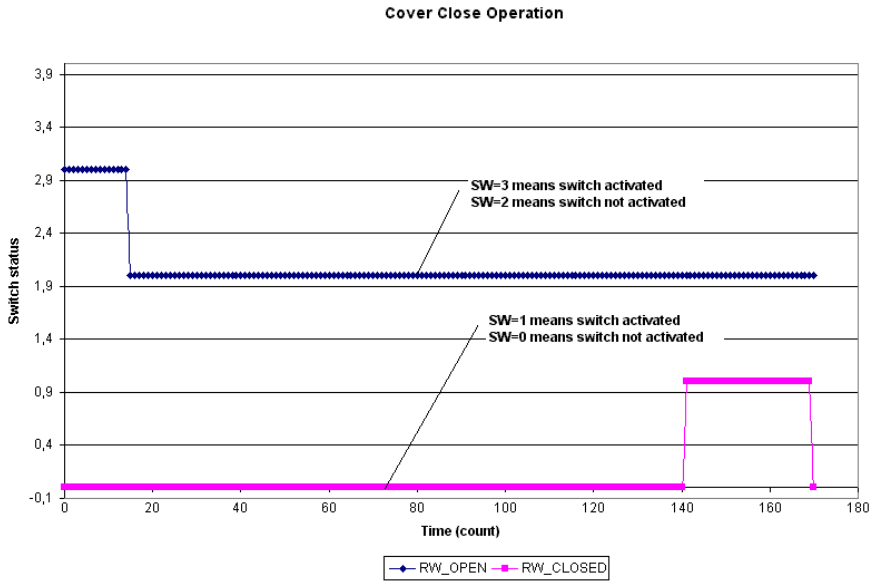

Figure 13 Reed switches Status during Cover Close operation

5.1.3 Engineering evaluation of sensor data

No science TM packets are lost and **SSMM memory allocated to GIADA (1 Mbytes) is not saturated.** Figure 14 shows the Source Sequence Count of TM packets when GIADA is in Normal mode and the science TM is enabled. After the lasers are switched on and the detection Threshold on the GDS Left receiver is changed, only few GDS 'Ghost detections' on both receivers and IS 'Ghost detections' are observed.

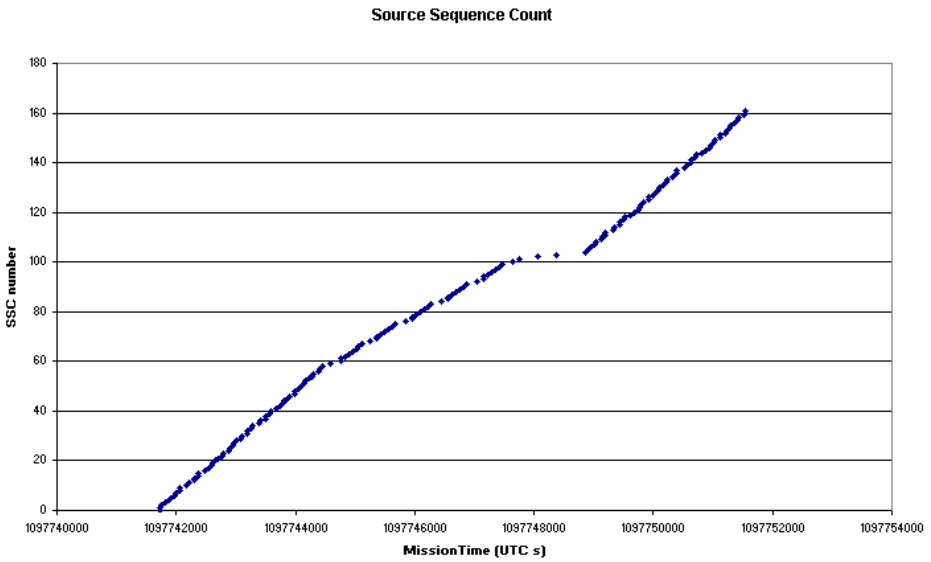

Figure 14 Science TM packet Source Sequence Count wrt Mission Time (SCET s)

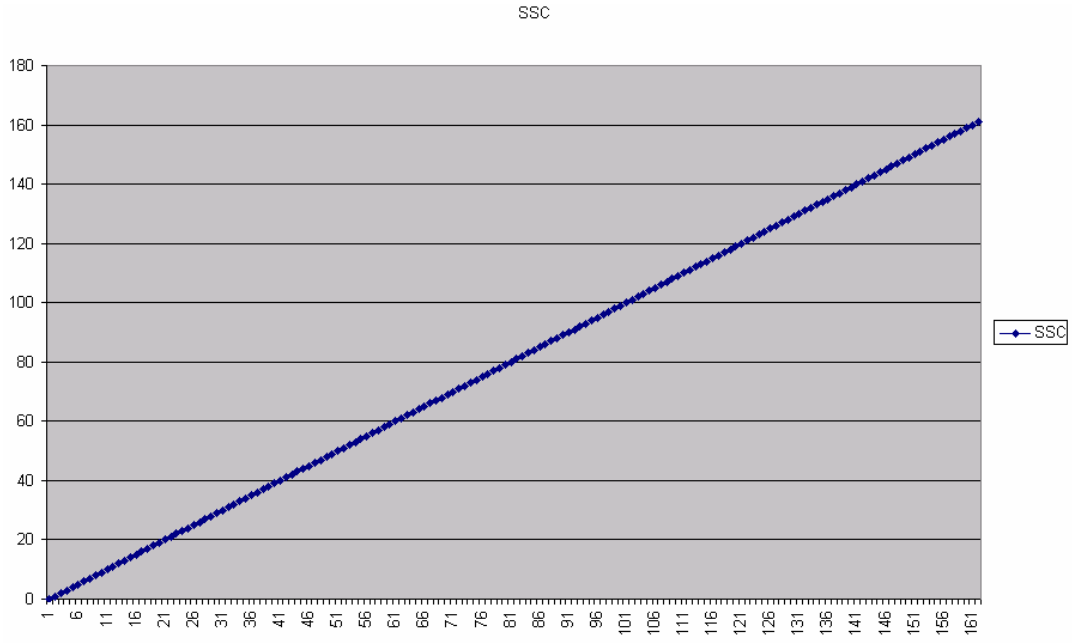

Figure 15 Science TM packet Source Sequence Count

5.1.3.1 IS Sub-system

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

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

Table 2 IS Range/Gain configuration

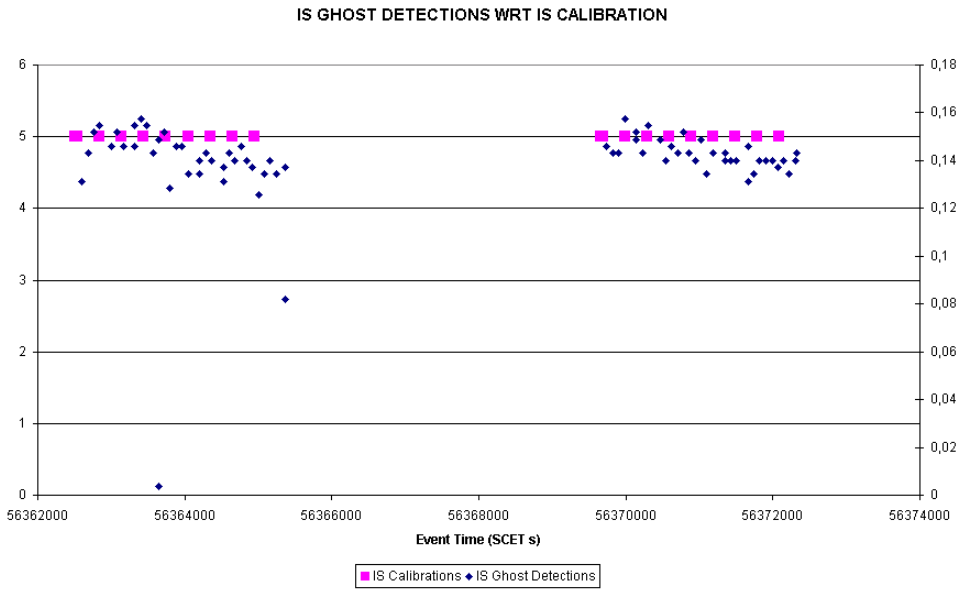

Figure 16 IS Ghost detections wrt IS Calibration

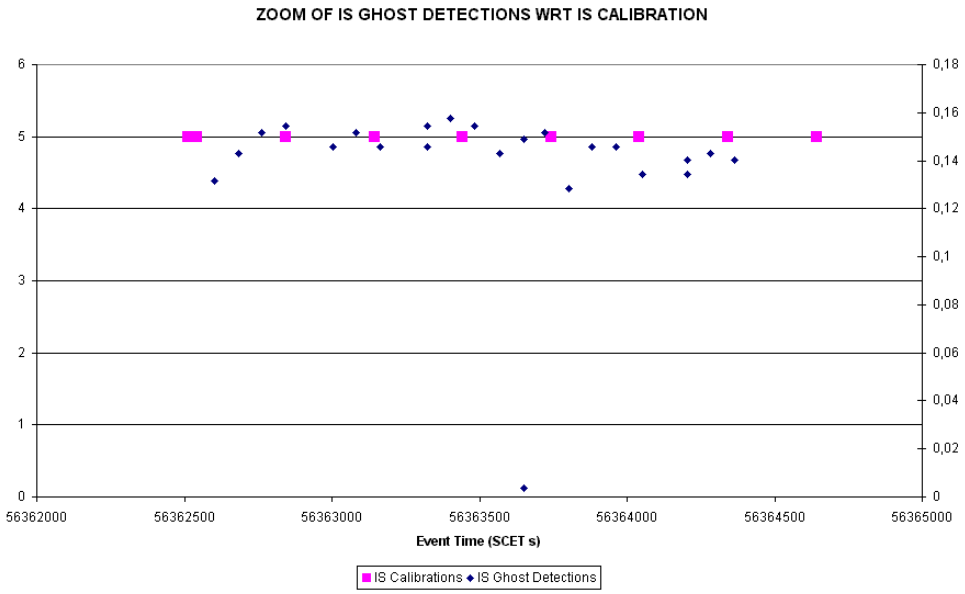

Figure 17 Part of IS Ghost detections wrt IS Calibration

After entering in Normal mode, the IS calibrations run until the end of the test every 5 minutes. Few IS science "Ghost detections" (72 in total, in a period of about 1 and half hour, i.e. about 1 ghost event every about 75 sec) were obtained: one on Channel C, one on Channel A, B, D and 70 on Channel E (see Figure 16 and the zoom in Figure 17).The noise level on Channel E is confirmed higher then on ground. For the future, **to reduce 'Ghost detections' it is required to increase Channel E detection Threshold from 100mV (on-ground campaign) to (minimum) 150mV, when the Gain is set to High.**

Table 3 shows the mean and the standard deviation the channels output before each IS calibration.

PZTA		PZTB		PZTC		PZTD		PZTE	
MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
-0,0107	0,0348	-0,0107	0,0551	-0,002	0,0435	-0,0107	0,0232	-0,0107	0,0435
-0,0107	0,0348	-0,0107	0,0551	-0,002	0,0435	-0,0107	0,0232	-0,0107	0,0435
-0,0107	0,0609	-0,0107	0,0493	-0,002	0,0667	-0,0107	0,0638	-0,0136	0,0493
-0,0107	0,0609	-0,0107	0,0493	-0,002	0,0667	-0,0107	0,0638	-0,0136	0,0493
-0,0078	0,0493	-0,0078	0,0232	-0,002	0,0667	-0,0107	0	-0,0136	0,0609
-0,0078	0,0493	-0,0078	0,0232	-0,002	0,0667	-0,0107	0	-0,0136	0,0609
-0,0107	0,0609	-0,0078	0	-0,002	0,0609	-0,0107	0,0551	-0,0107	0,0435
-0,0107	0,0609	-0,0078	0	-0,002	0,0609	-0,0107	0,0551	-0,0107	0,0435
-0,0107	0,0551	-0,0107	0,0551	-0,002	0,0493	-0,0107	0,0551	-0,0107	0,0348
-0,0107	0,0551	-0,0107	0,0551	-0,002	0,0493	-0,0107	0,0551	-0,0107	0,0348
-0,0107	0,0551	-0,0107	0,0609	-0,002	0,0493	-0,0107	0,0638	-0,0136	0,0638
-0,0107	0,0551	-0,0107	0,0609	-0,002	0,0493	-0,0107	0,0638	-0,0136	0,0638
-0,0107	0,0609	-0,0107	0,0493	0,0009	0,0261	-0,0136	0,0551	-0,0107	0
-0,0107	0,0609	-0,0107	0,0493	0,0009	0,0261	-0,0136	0,0551	-0,0107	0
-0,0049	0,0435	-0,0107	0,0638	-0,002	0,0551	-0,0107	0,0232	-0,0107	0,0435
-0,0049	0,0435	-0,0107	0,0638	-0,002	0,0551	-0,0107	0,0232	-0,0107	0,0435
-0,0078	0	-0,0107	0,0638	-0,002	0,0435	-0,0107	0	-0,0136	0,0493
-0,0078	0	-0,0107	0,0638	-0,002	0,0435	-0,0107	0	-0,0136	0,0493
-0,0107	0,0551	-0,0107	0,0638	-0,002	0,0435	-0,0078	0,0232	-0,0107	0
-0,0107	0,0551	-0,0107	0,0638	-0,002	0,0435	-0,0078	0,0232	-0,0107	0
-0,0078	0,0261	-0,0107	0,0493	-0,002	0,0609	-0,0107	0,0435	-0,0136	0,0493
-0,0078	0,0261	-0,0107	0,0493	-0,002	0,0609	-0,0107	0,0435	-0,0136	0,0493
-0,0078	0	-0,0107	0,0609	0,0009	0,0493	-0,0107	0,0493	-0,0136	0,0609
-0,0078	0	-0,0107	0,0609	0,0009	0,0493	-0,0107	0,0493	-0,0136	0,0609
-0,0107	0,0551	-0,0078	0,0232	0,0009	0,0435	-0,0107	0,0638	-0,0107	0,0232
-0,0107	0,0551	-0,0078	0,0232	0,0009	0,0435	-0,0107	0,0638	-0,0107	0,0232
-0,0078	0,0493	-0,0107	0,0348	-0,002	0,0435	-0,0078	0	-0,0107	0,0232
-0,0078	0,0493	-0,0107	0,0348	-0,002	0,0435	-0,0078	0	-0,0107	0,0232
-0,0078	0	-0,0107	0,0638	-0,002	0,0551	-0,0107	0,0609	-0,0107	0,0435
-0,0078	0	-0,0107	0,0638	-0,002	0,0551	-0,0107	0,0609	-0,0107	0,0435
-0,0107	0,0638	-0,0078	0	-0,002	0,0348	-0,0078	0	-0,0107	0
-0,0107	0,0638	-0,0078	0	-0,002	0,0348	-0,0078	0	-0,0107	0
-0,0049	0	-0,0107	0,0551	-0,002	0,0551	-0,0078	0,0435	-0,0136	0,0435
-0,0049	0	-0,0107	0,0551	-0,002	0,0551	-0,0078	0,0435	-0,0136	0,0435

PZTA		PZTB		PZTC		PZTD		PZTE	
MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
-0,0078	0,0232	-0,0078	0,0232	-0,002	0,0609	-0,0107	0,0493	-0,0107	0
-0,0078	0,0232	-0,0078	0,0232	-0,002	0,0609	-0,0107	0,0493	-0,0107	0
-0,0049	0,0029	-0,0107	0,0638	0,0009	0,0261	-0,0107	0,0493	-0,0107	0,0348
-0,0049	0,0029	-0,0107	0,0638	0,0009	0,0261	-0,0107	0,0493	-0,0107	0,0348
-0,0078	0,0493	-0,0078	0,0232	-0,002	0,0435	-0,0107	0,0348	-0,0136	0,0493
-0,0078	0,0493	-0,0078	0,0232	-0,002	0,0435	-0,0107	0,0348	-0,0136	0,0493

Table 3 IS channel outputs before Internal Calibration

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 the detection thresholds, except for channel E which is lower of 70mV.

	PZTA		PZTB		PZTC		PZTD		PZTE	
	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Minimum	-0,0107	0	-0,0107	0	-0,002	0,0261	-0,0136	0	-0,0136	0
Maximum	-0,0049	0,0638	-0,0078	0,0638	0,0009	0,0667	-0,0078	0,0638	-0,0107	0,0638

Figure 18 to Figure 31 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 stable along the period of calibration: its amplitude is spread in a range of 70mV. The measured amplitude slightly depends on the temperature (Figure 19): it decreases when the temperature increases (variation < 70mV for 7°C of temperature change).

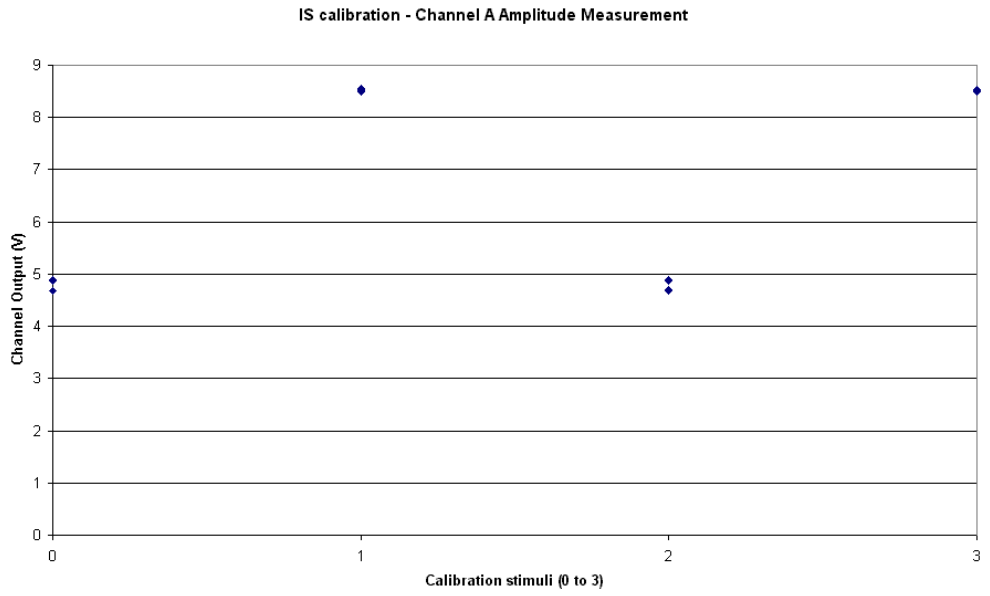

Figure 18 IS Calibration - Channel A Amplitude

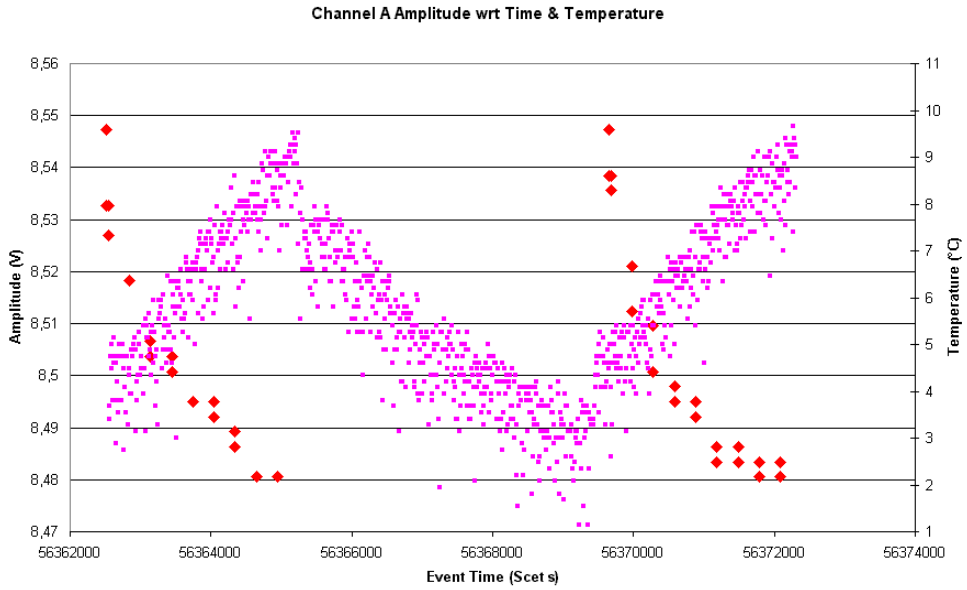

Figure 19 Channel A response wrt IS temperature

- Channel-B output is quite stable along the period of calibration (amplitude variation < 20mV and delay time variation < 3µsec). The amplitude seems slightly increasing when temperature increases of about 7°C (Figure 22) and remains almost stable when the temperature is stable. The variations result < 20 mV.

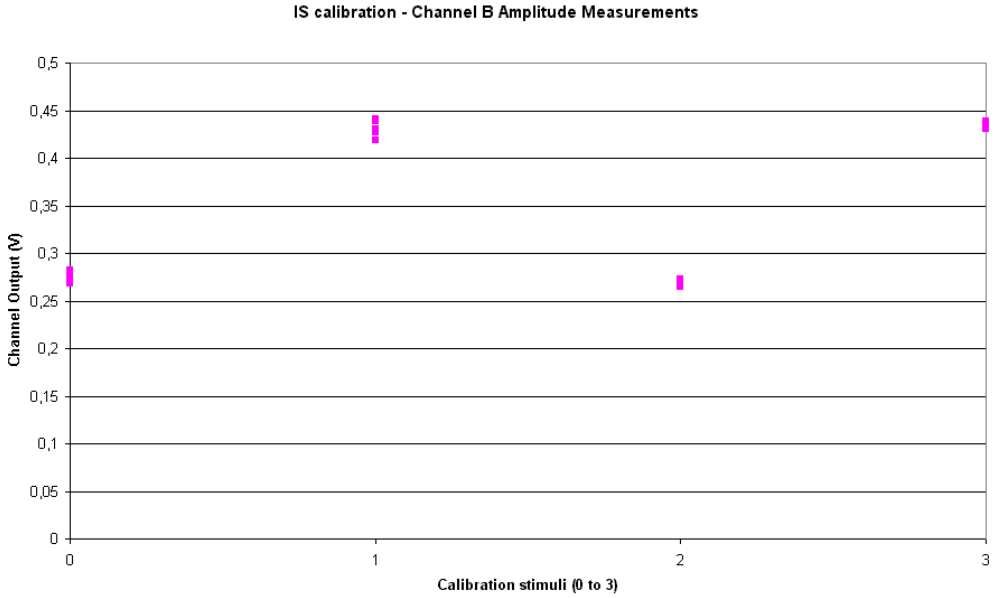

Figure 20 IS Calibration - Channel B Amplitude

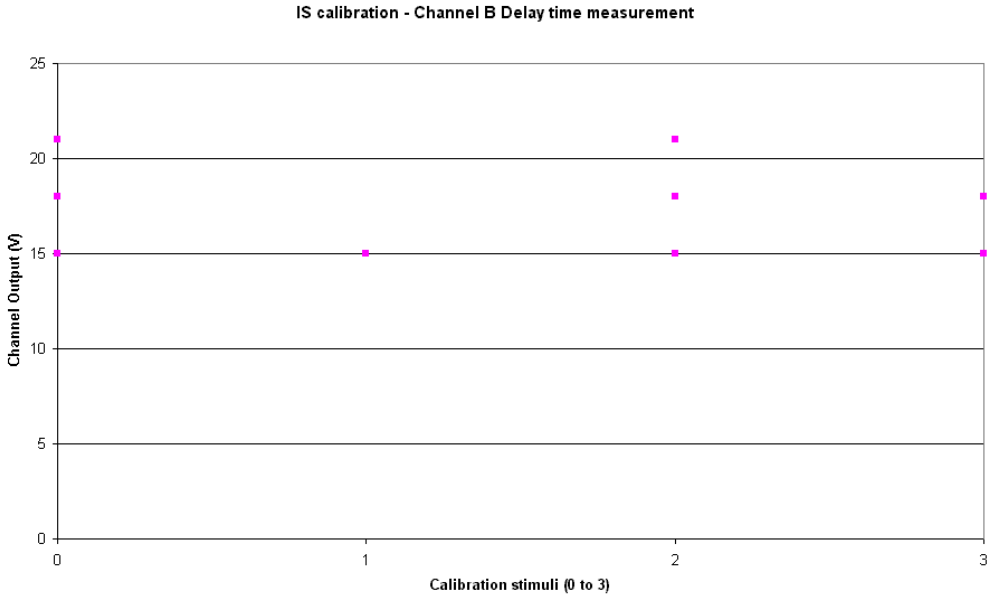

Figure 21 IS Calibration - Channel B Delay Time

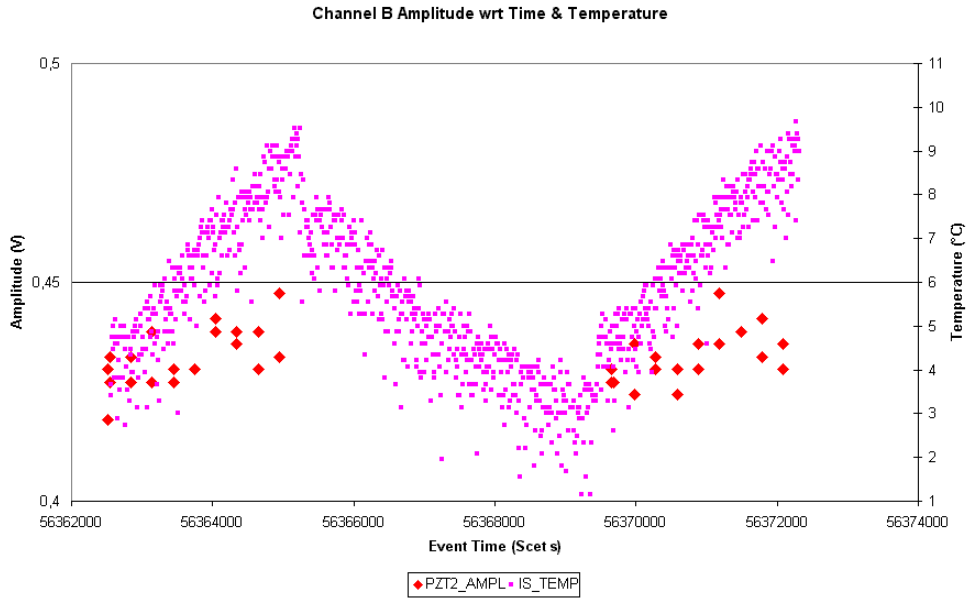

Figure 22 Channel B response wrt IS temperature

- **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 (Figure 25). **It is suggested to increase channel C detection threshold** (e.g., 100/150mV) to keep the detection less susceptible to noise.

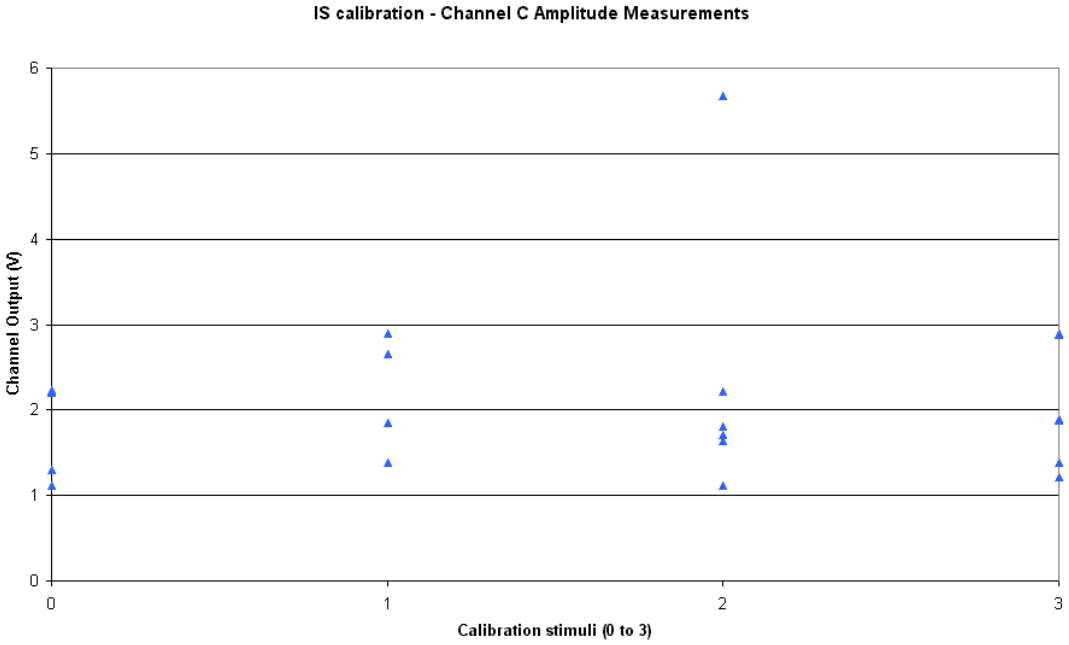

Figure 23 IS Calibration - Channel C Amplitude

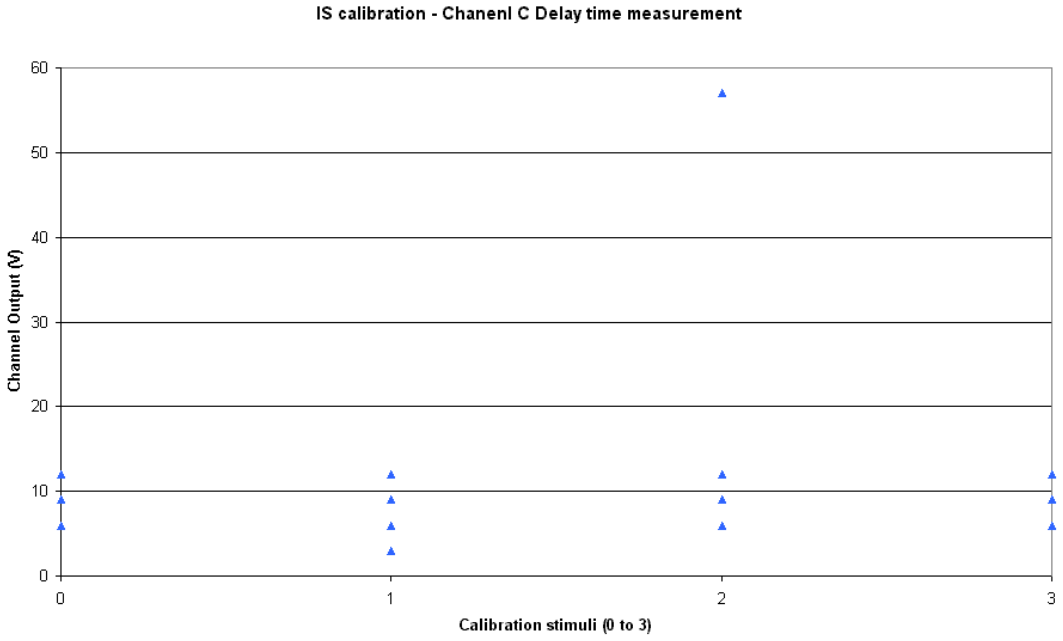

Figure 24 IS Calibration - Channel C Delay Time

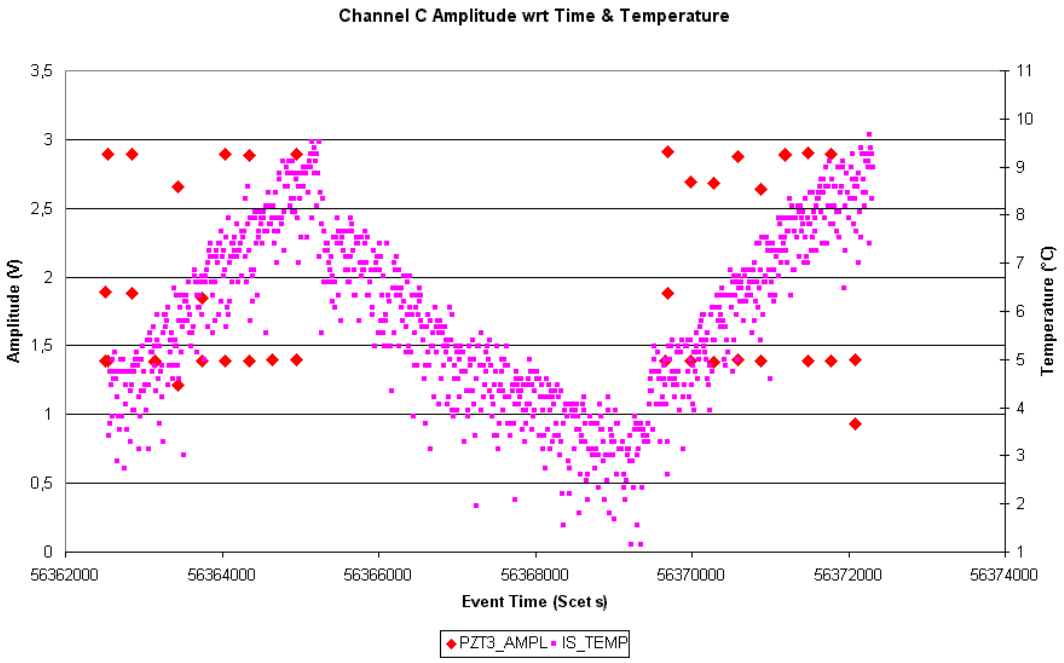

Figure 25 Channel C response wrt IS temperature

- Channel-D amplitude results quite stable along the calibrations, except for one calibration, where the relevant detections result as 'Not detected' (i.e. channel response has passed the threshold by timeout mechanism). The measured amplitudes seem slightly increasing when temperature increases (Figure 28): variation < 30 mV within 7°C of temperature change.

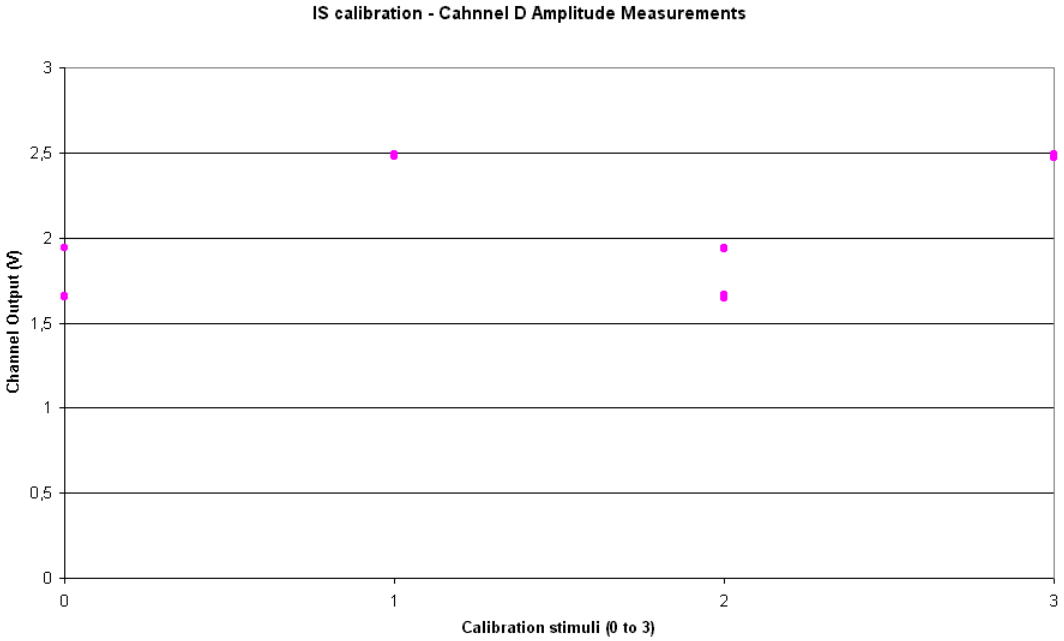

Figure 26 IS Calibration - Channel D Amplitude

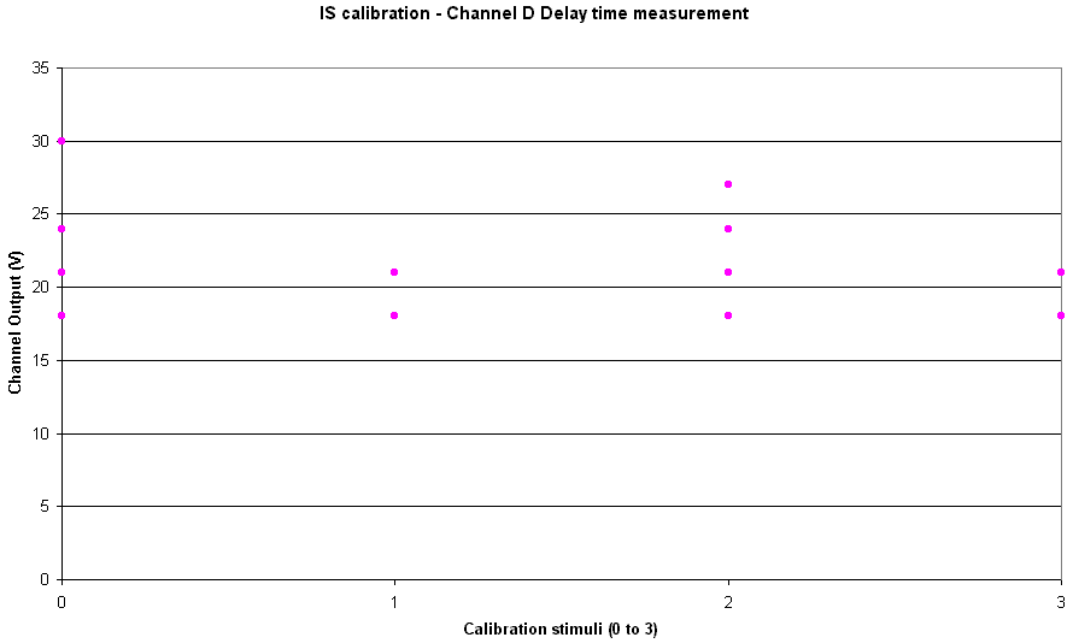

Figure 27 IS Calibration - Channel D Delay Time

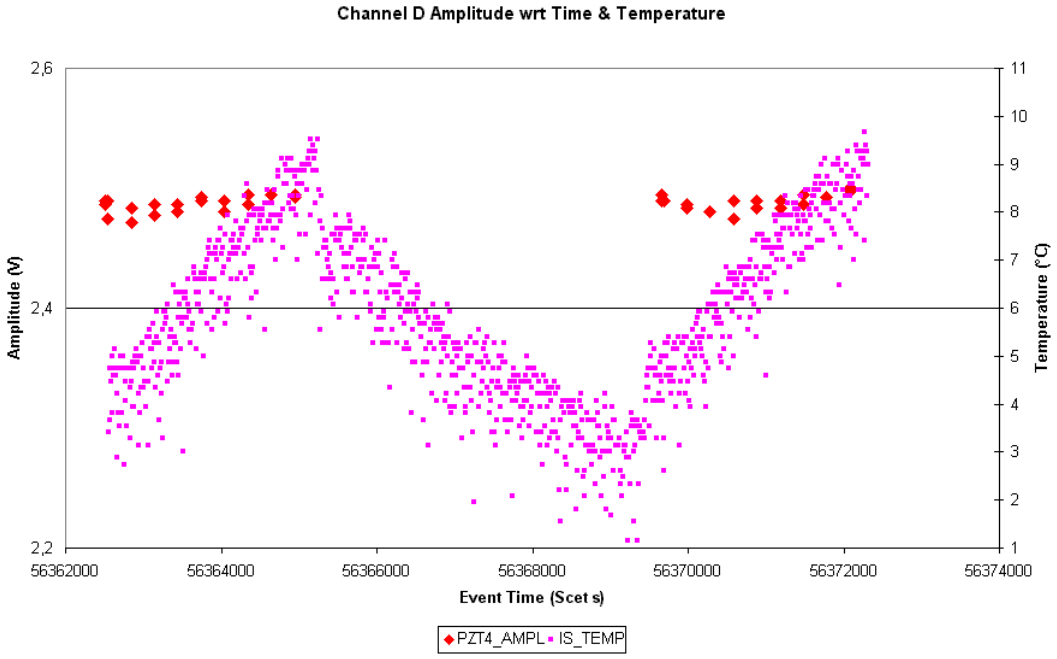

Figure 28 Channel D response wrt IS temperature

- Channel-E response results quite stable along the seven hours of calibration. The measured amplitudes (Figure 31) decreases rapidly and reaches a minimum and then increases and becomes almost stable when the temperature is stable (the amplitude variation is < 60 mV within 7 °C of temperature change).

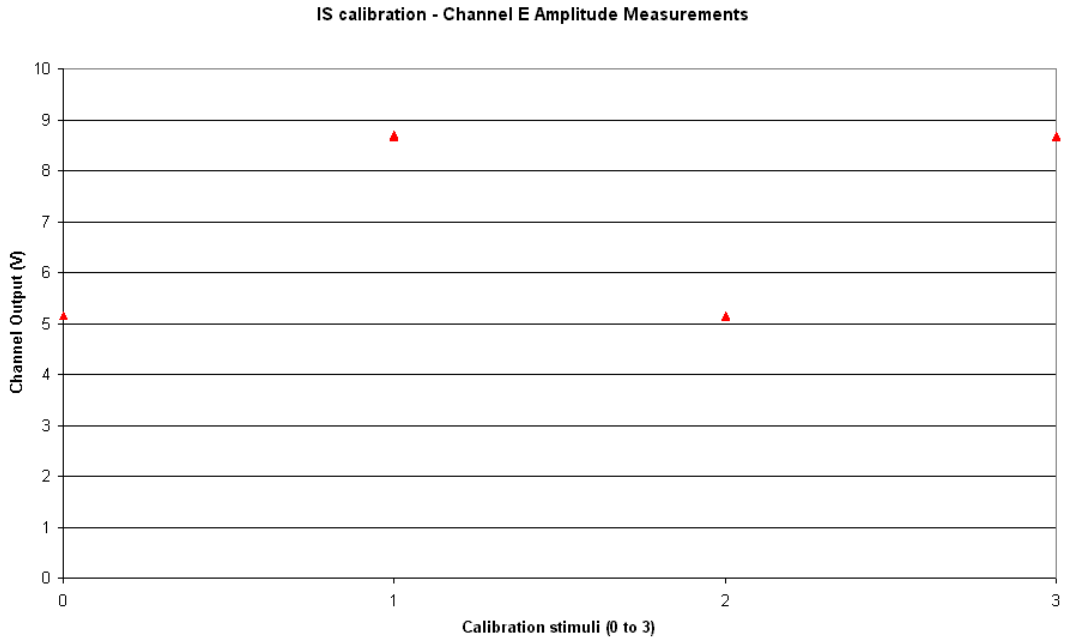

Figure 29 IS Calibration - Channel E Amplitude

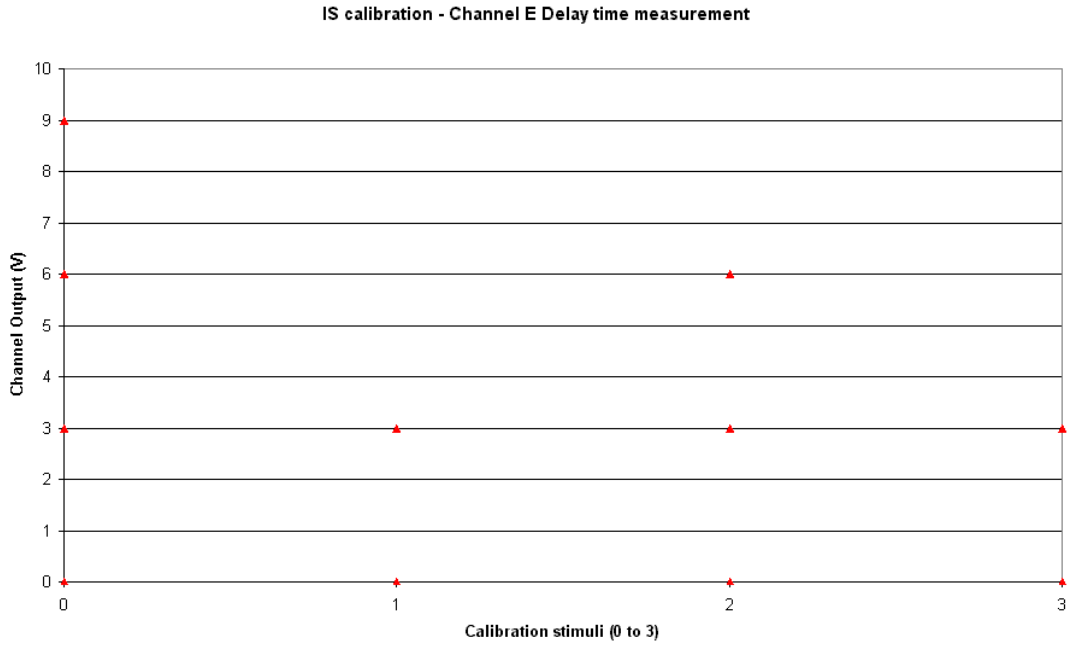

Figure 30 IS Calibration - Channel E Delay Time

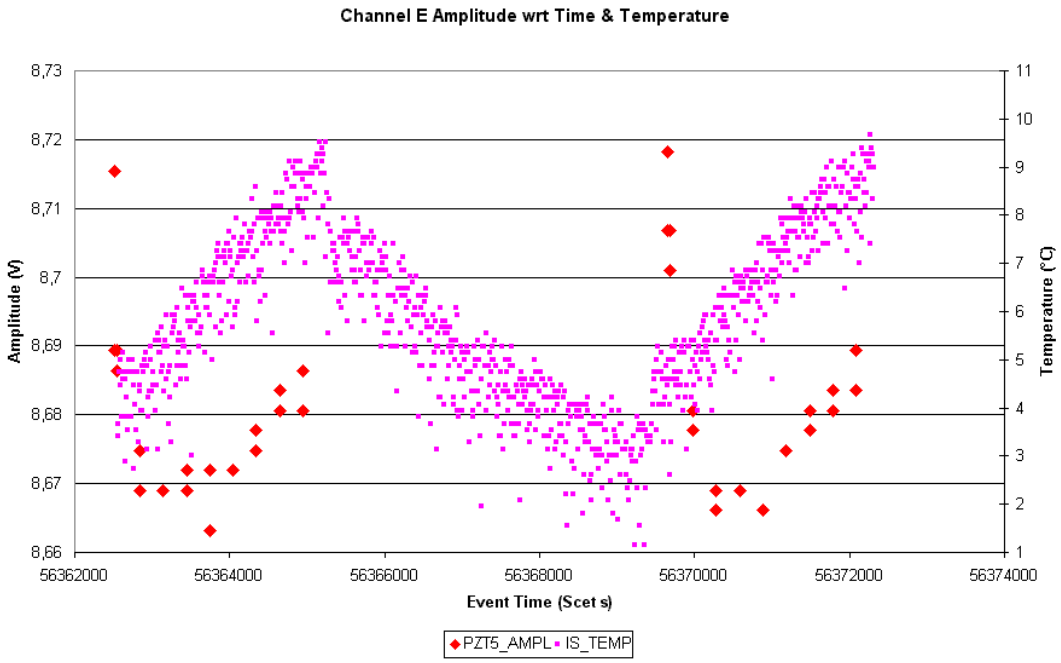

Figure 31 Channel E response wrt IS temperature

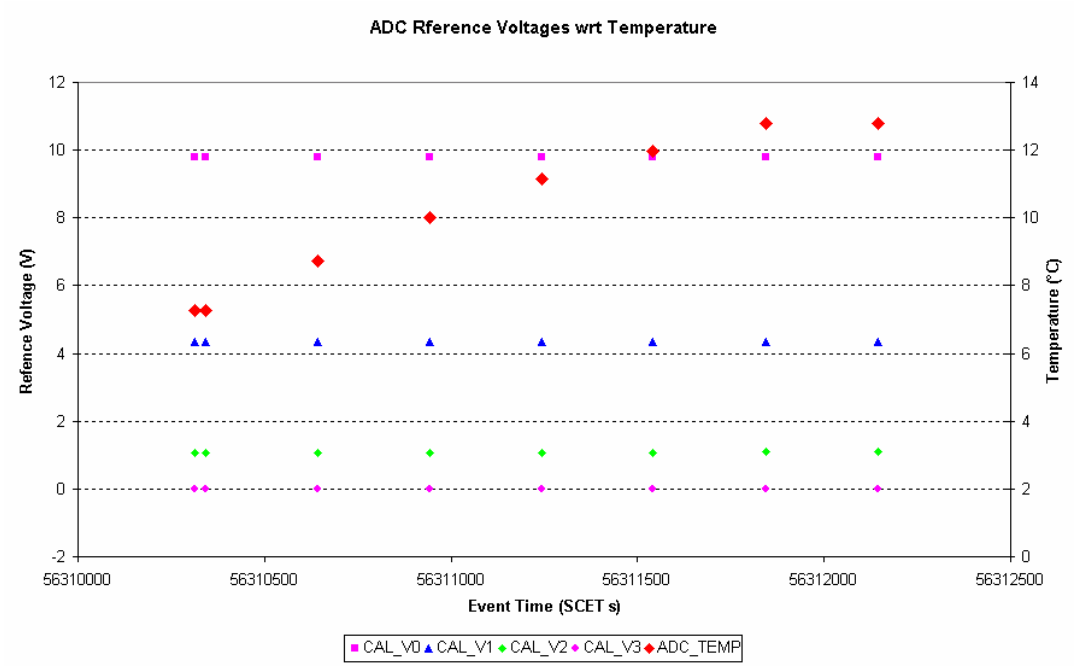

Figure 32 ADC, IS Temperature & ADC Reference Voltages @ IS calibration Time

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 (Context file updated via memory load command at GIADA power-on and, then, command when GIADA is in Normal mode). The nominal operation was to perform periodic GDS calibrations every 5 minutes.

Figure 33 and Figure 34 show the GDS Calibration Left and Right mean values 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.

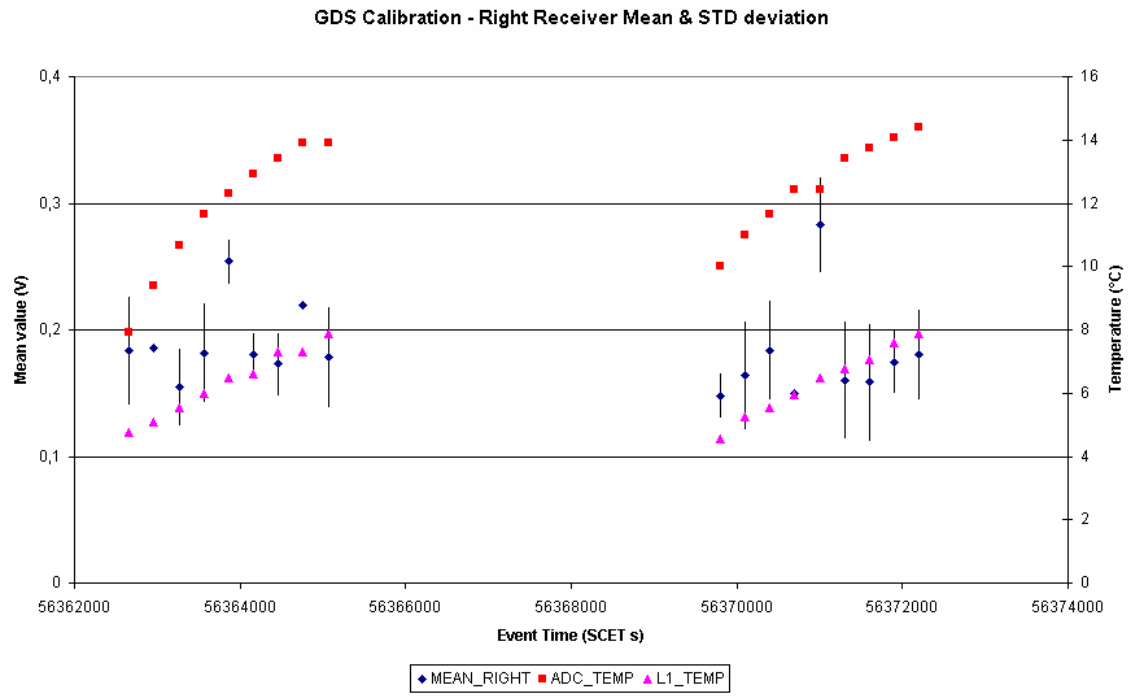

Figure 33 GDS Right Receiver Calibration (mean value and standard deviation)

The output mean value of the Right receiver is always below the detection threshold (only few ghost detections are 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 0.19 V (minimum and maximum are within 0.15V and 0.28V), while its standard deviation is below 50 mV. The mean value remains unchanged when the Lasers & ADC temperatures rise up.

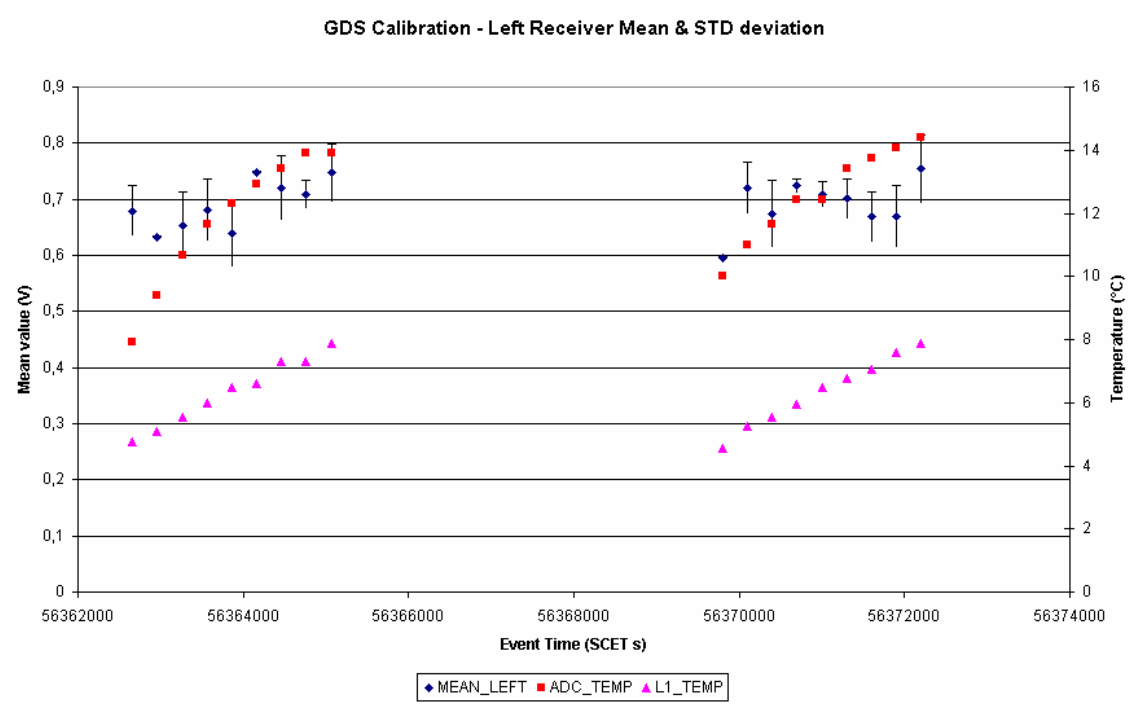

Figure 34 GDS Left Receiver Calibration (mean value and standard deviation)

The output mean and standard deviations of the Left receiver calibrations are quite similar to those described for the right receiver, except a higher mean value and standard deviation. The average is about 0.7 V (minimum and maximum are in within 0.59V and 0.76V), while its standard deviation is always below 60mV.

In conclusion, the Left and Right output average values are lower than those measured during the previous tests (Interference Part 1A, Part 1B, IIA and IIB) when the others payload were switched-on (Note now GIADA is switched-on alone).

Finally, Figure 35 and Figure 36 show the light monitors and the temperatures of the four lasers at the time of the GDS calibration. The figures of the light monitors are as expected (i.e. the laser light decreases when temperature increases).

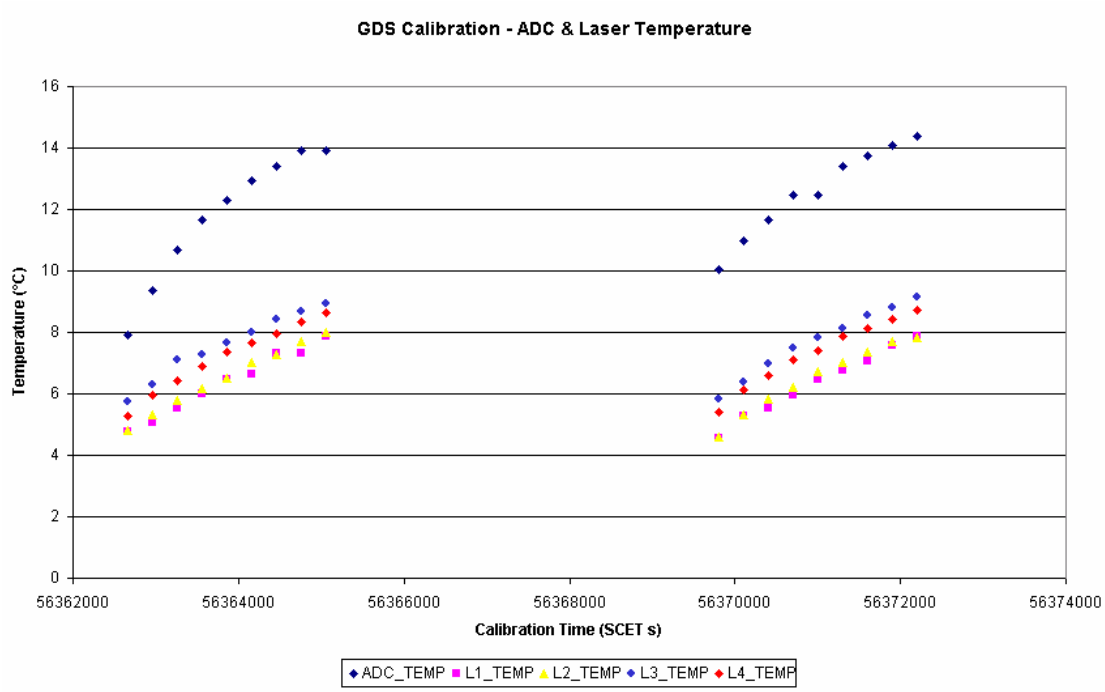

Figure 35 GDS Calibration - ADC & Lasers Temperature

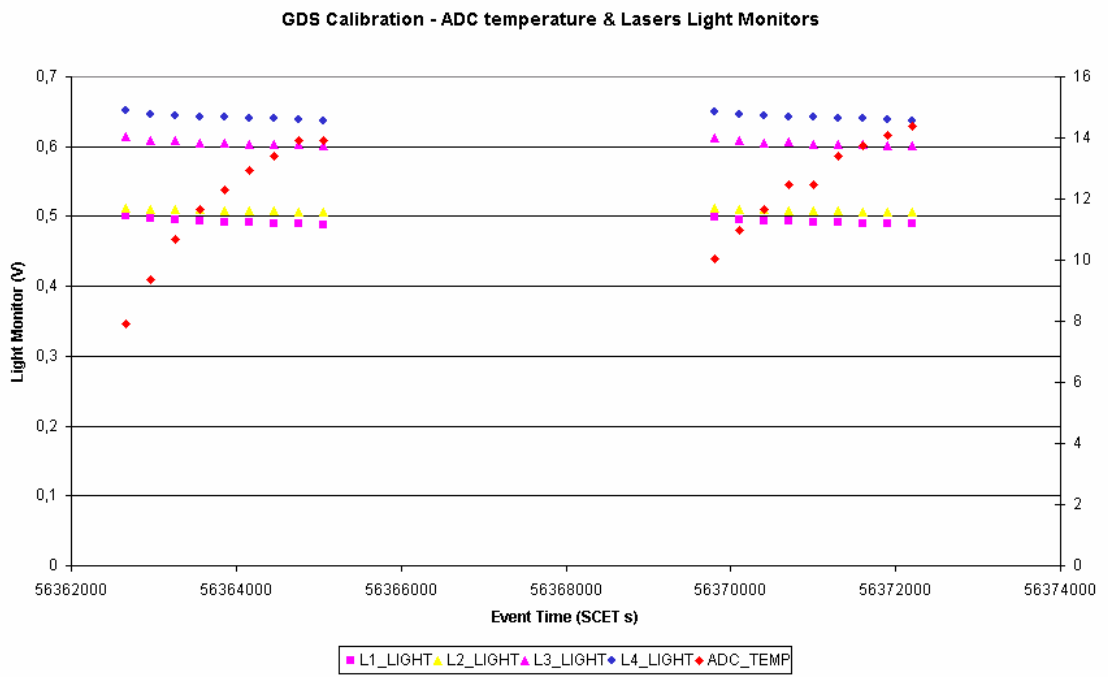

Figure 36 GDS Calibration – Laser Light Monitors

Figure 37 shows the amplitude of the scattered light of the Left and Right Receiver 'Ghost detections'.

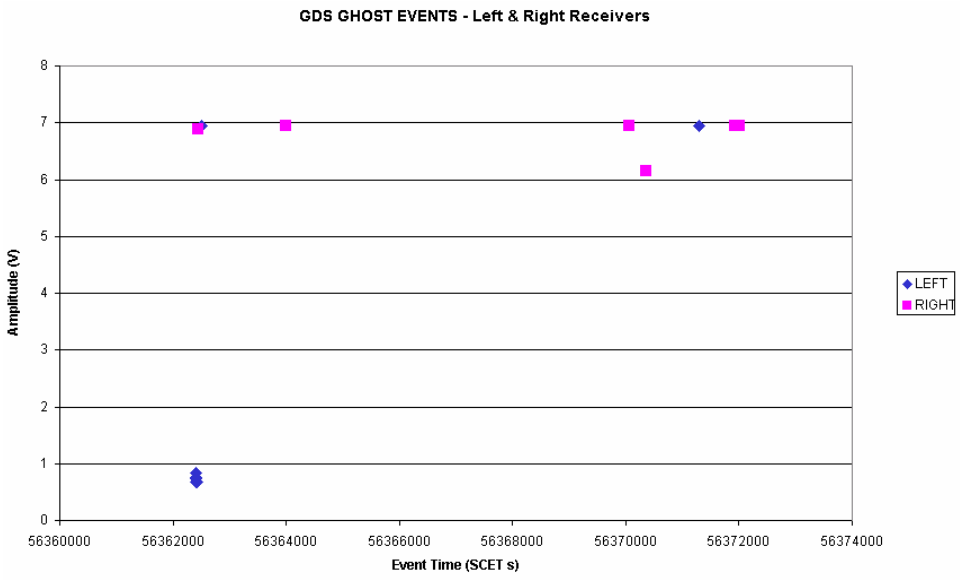

Figure 37 Amplitude of Scattered Light of 'Ghost detections' on Left & Right receivers

The 'Ghost detections' on Right receiver are very few (6 events) and always saturated. Concerning the ghost detections on the Left receivers two 'detection' types can be distinguished:

- The first type in which the detection amplitude is of the order or little below the detection threshold (1.24 V). These 'ghost detections' happen at the GDS Threshold change. No further events (as in the previous test) have happened.
- The second type, in which the detection amplitude on the left receiver is well above the detection threshold or in saturation (6.9375 V). Only one detection has happened and it is confirmed that it seems not correlated to any specific GIADA internal event (such as calibration, temperature or relay on-off switching as shown in Figure 38).

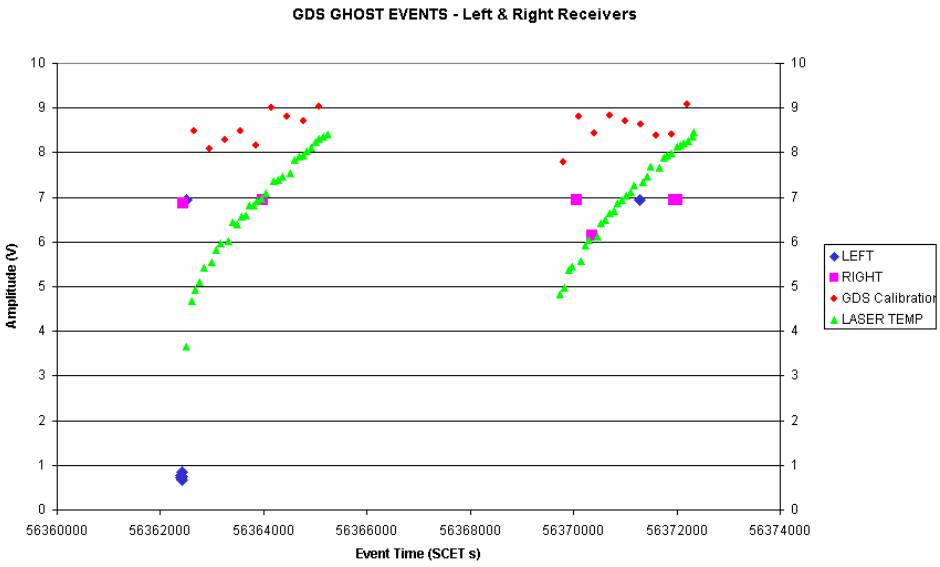

Figure 38 'Ghost detections' on Left & Right receivers wrt Temperature and calibration

Table 4 and Figure 39 show the ADC Reference Voltages along the test for the sequence of the IS, GDS and MBS Calibrations. The voltages are quite stable in the temperature range 11 to 20 °C, except in few measurements, where they jump of about 3 mV (which is two-three digits of ADC).

ADC REFERENCE V0		ADC REFERENCE V1		ADC REFERENCE V2		ADC REFERENCE V3	
Mean	STD	Mean	STD	Mean	STD	Mean	STD
9,7802	0,0011	4,3448	0,0009	1,0805	0,0014	-0,0109	0,00075

Table 4. ADC Reference Voltages along the Interference IIB.

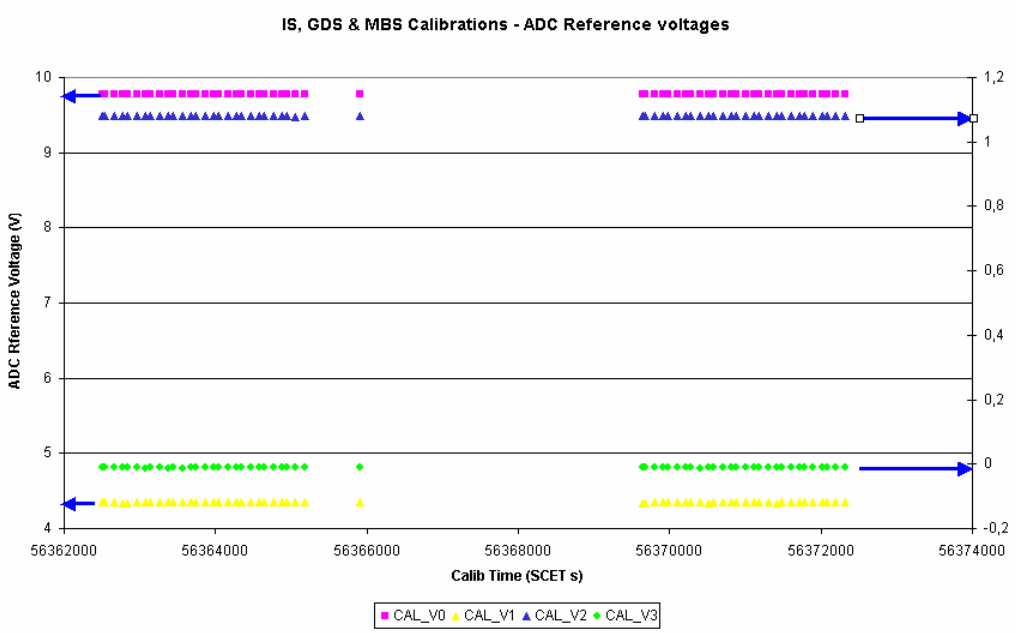

Figure 39 ADC Voltage Reference during Calibration

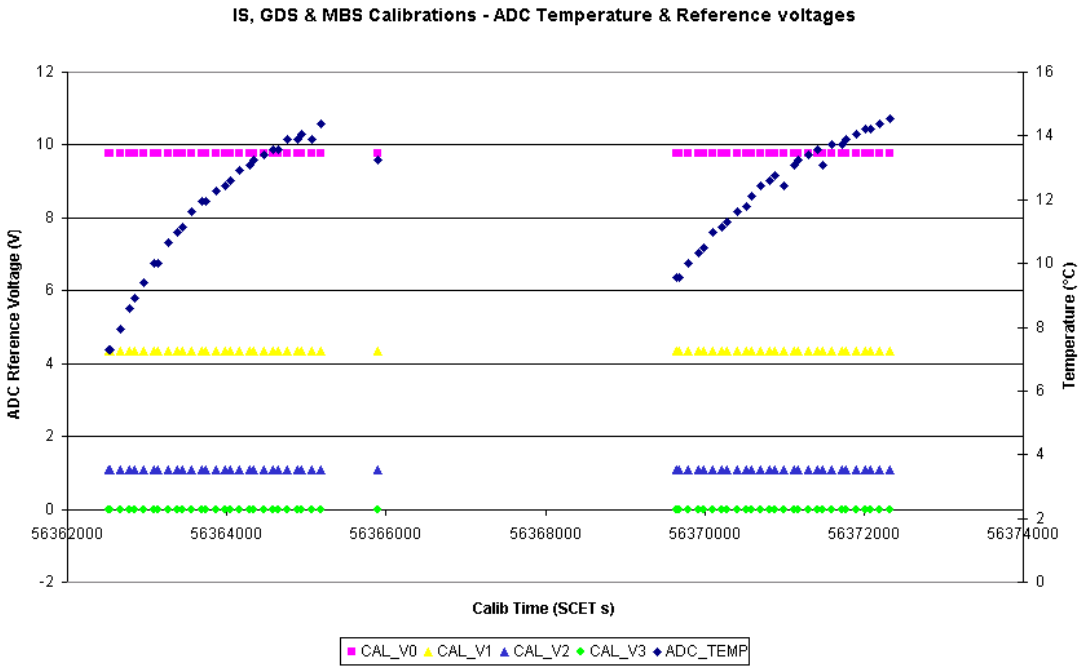

Figure 40 ADC Voltage Reference wrt ADC temperature during Calibration

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. Although it has been performed the dedicated heating of each MBS, the MBS frequency measurements result almost the same wrt. the ones taken during the Interference I (Part 1A and Part 1B) and the first part of the Interference II (A & B).

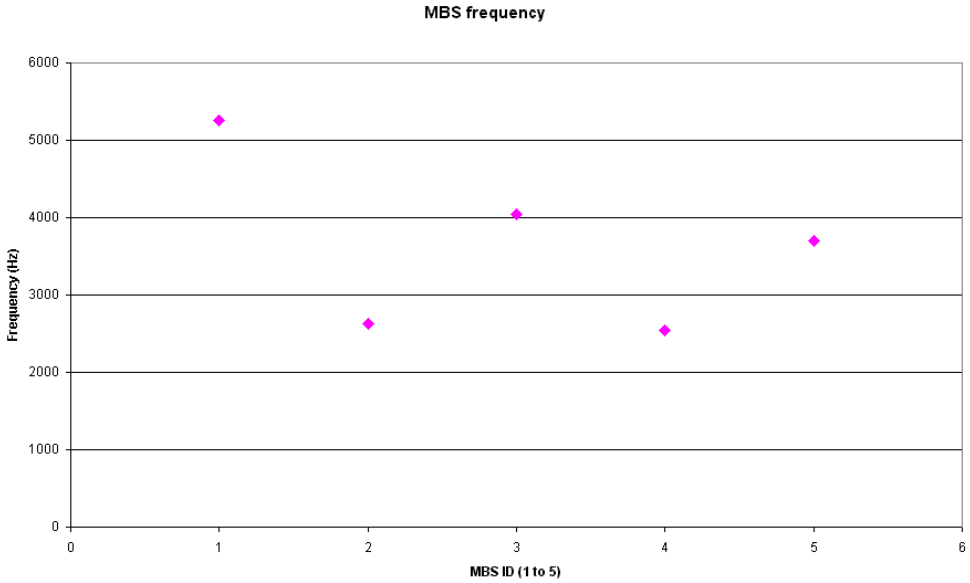

Figure 41 MBS Frequency

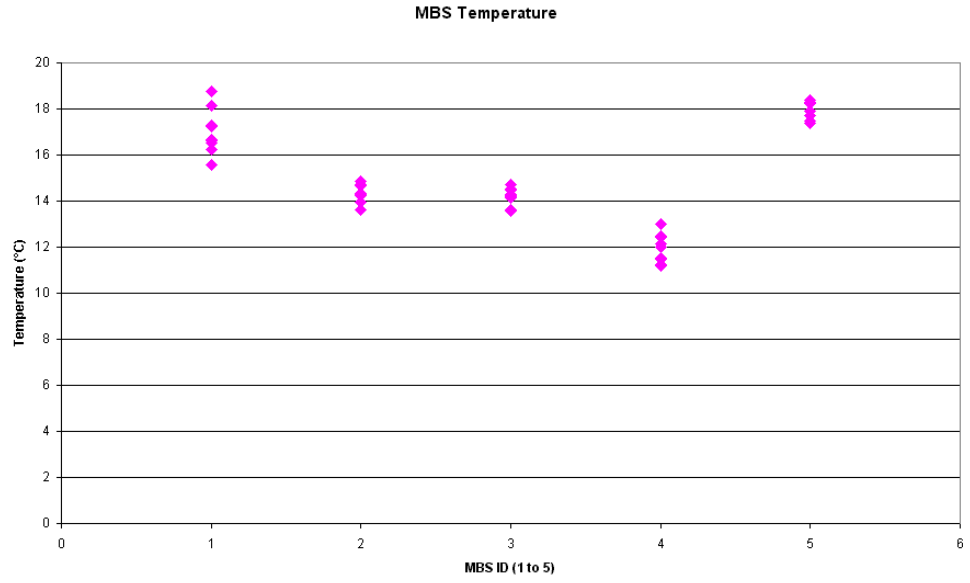

Figure 42 MBS Temperature

In detail, the following variations have been observed:

- The MBS1 (MBS1 points to the +Xu direction) frequency wrt. time and temperature is shown in Figure 43 and Figure 44 respectively. It is about the double of the value measured during April 1st Commissioning. Now, even after the heating the measurements are quite stable with respect to data taken during the Interference Part 1A & B and IIA & IIB tests. The frequency measurements are changed from 2700 Hz (data taken during the GIADA 1st Commissioning @ 25°C) to about 5227 Hz @ 25°C (Interference part 1A), to 5230 Hz @ 24°C (Interference part 1B), to 5249 Hz @ 24°C (Interference IIA) and now to 5273 Hz @ 18°C (Interference IIC).
- The MBS2 (which points to the +Yu direction) frequency wrt. time and temperature is shown in Figure 47 and Figure 48 respectively. Even after heating, it results 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), to 2613 Hz @ 22°C (Interference IIA) and to 2624 Hz @ 16°C (Interference IIC).
- The MBS3 (which points to the -Xu direction) frequency wrt. time and temperature is shown in Figure 51 and Figure 52 respectively. Even after heating, it is increased of about 1700Hz wrt. 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 and IIA & IIB tests. The frequency has changed from 2365Hz (data taken during the GIADA Commissioning @ 23°C), to about 4085 Hz (Interference part 1A), to 4081 Hz @ 20°C (Interference part 1B), to 4065 Hz @ 22°C (Interference IIA) and to 4047 Hz @ 13°C (Interference IIC).
- The MBS4 (which points to the -Yu direction) frequency wrt. time and temperature is shown in Figure 55 and Figure 56 respectively. The measured frequency is about 100 Hz greater than the one measured during the 1st 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), to 2550 Hz @ 19°C (Interference IIA) and to 2546 Hz @ 12°C (Interference IIC).
- The MBS5 (which points to the +Zu direction) frequency is increased of about 1000Hz from the Commissioning and now it results quite stable. The frequency is changed from 2630Hz (data taken during the GIADA Commissioning @ 26°C) to about 3686Hz @ 25°C (Interference part 1A) to 2687Hz @ 24.5°C (Interference part 1B), to 3685 Hz @ 25°C (Interference IIA) and to 3700 Hz @ 17°C (Interference IIC).

It is confirmed that MBSs seem to be contaminated in-flight due to out-gassing of material. The MBSs have been heated to check if the frequency change, observed already during Interference 1A-B, was due to contamination of volatile material. Unfortunately, the contamination is not changed with heating. Actually, this result was expected as during Pointing tests, the MBS were already exposed to high temperature and no frequency change (beside the normal temperature dependence) was observed. However, 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 April '04 Commissioning data.

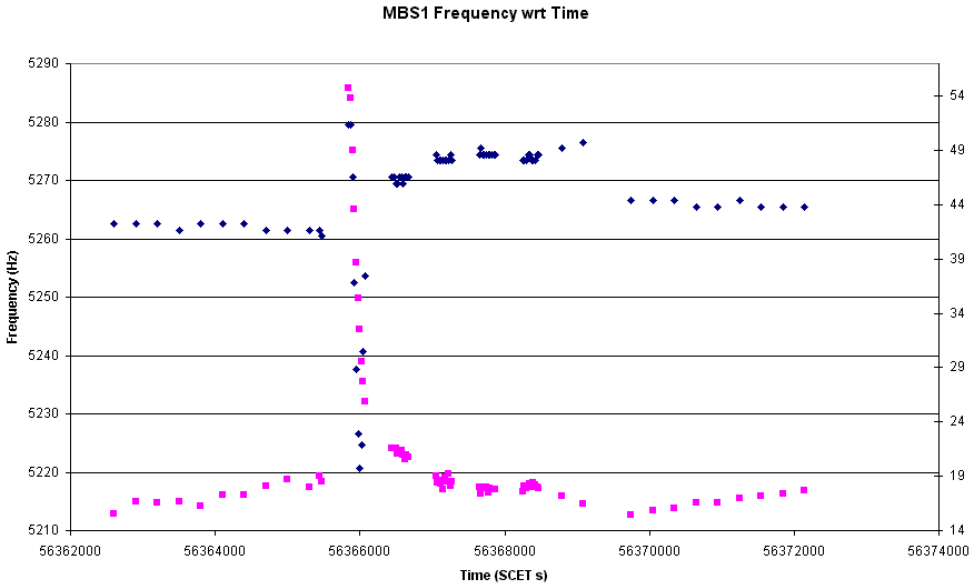

Figure 43 MBS1 Frequency &Temperature wrt Time

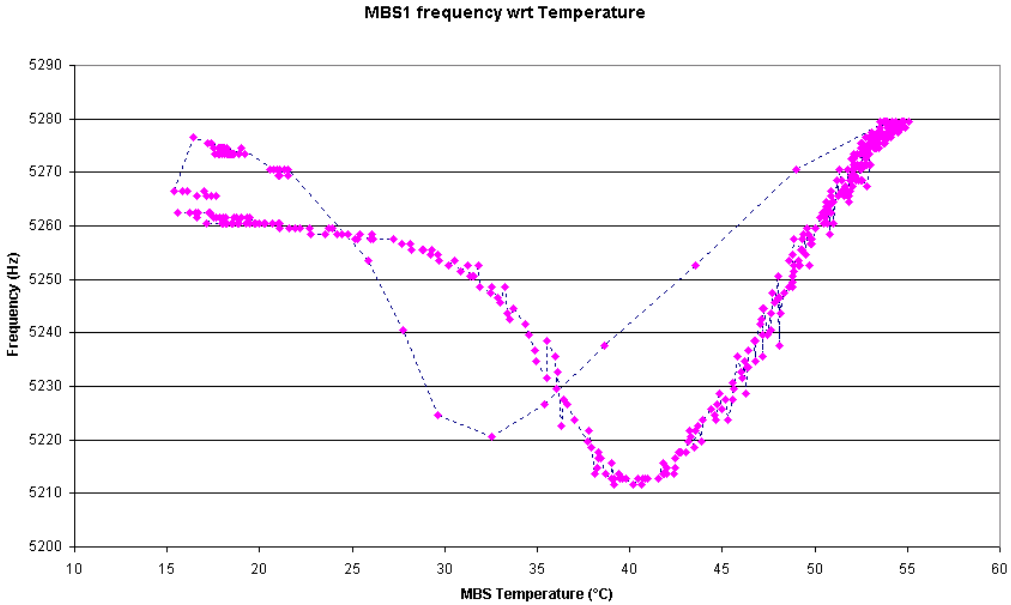

Figure 44 MBS1 Frequency wrt Temperature in Normal acquisition and heating modes

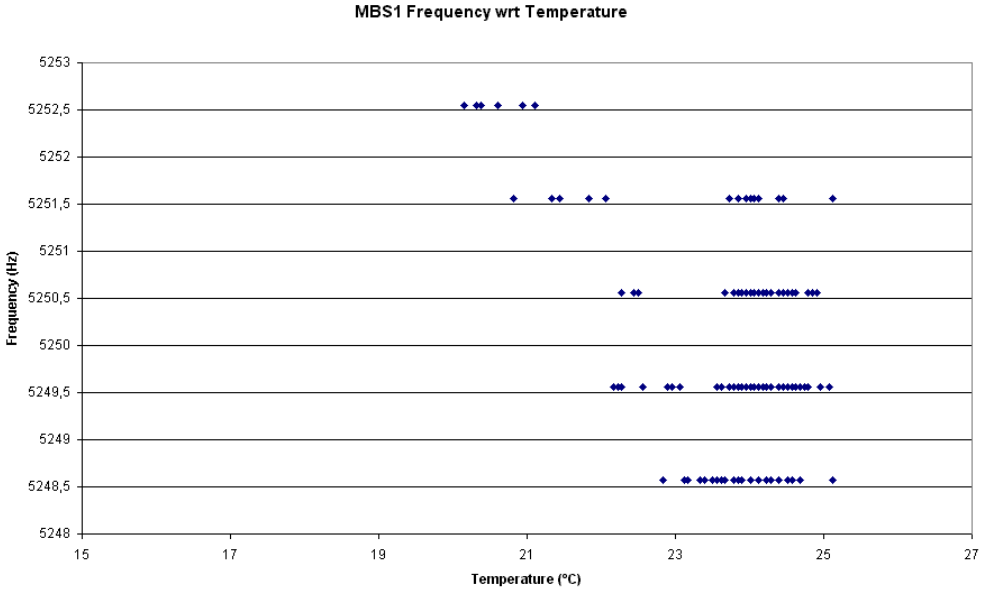

Figure 45 MBS1 Frequency wrt Temperature (Interference IIA)

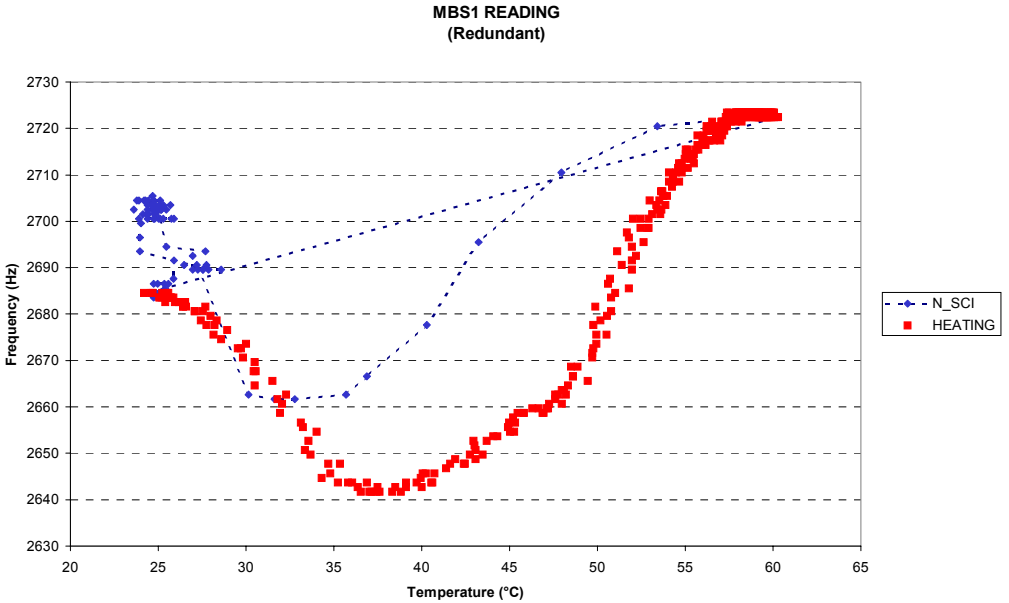

Figure 46 MBS1 Frequency wrt Temperature in Normal acquisition and heating modes – April '04 Commissioning

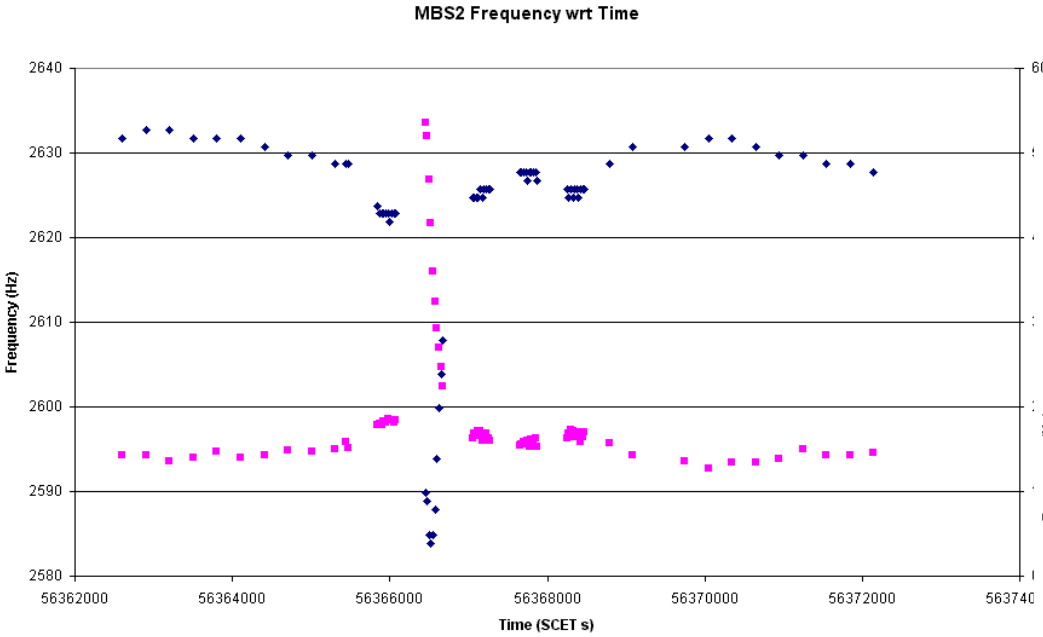

Figure 47 MBS2 Frequency &Temperature wrt Time

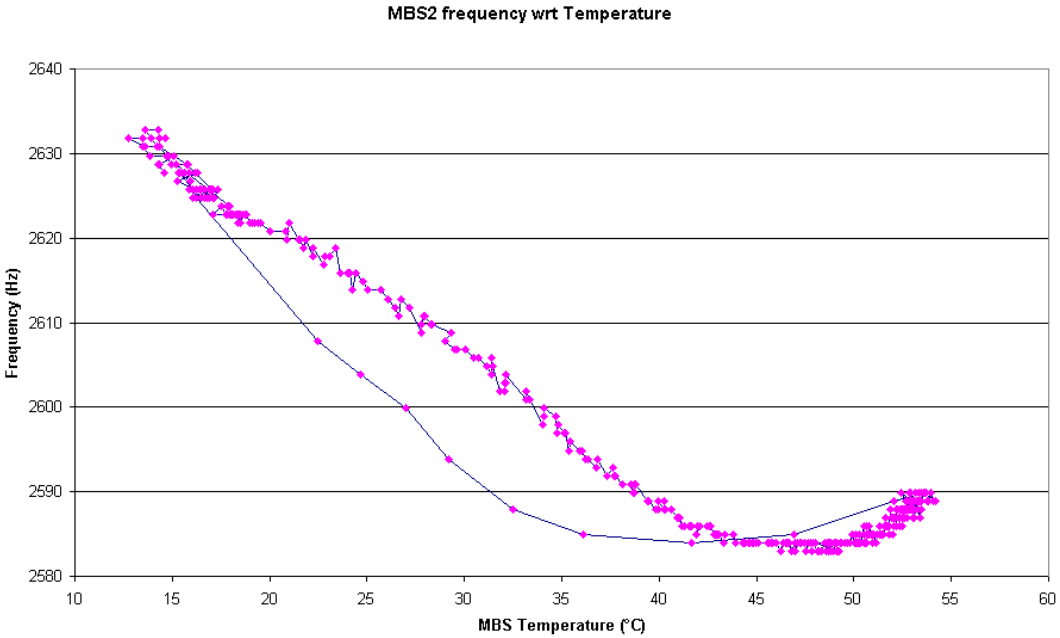

Figure 48 MBS2 Frequency wrt Temperature in Normal acquisition and heating modes

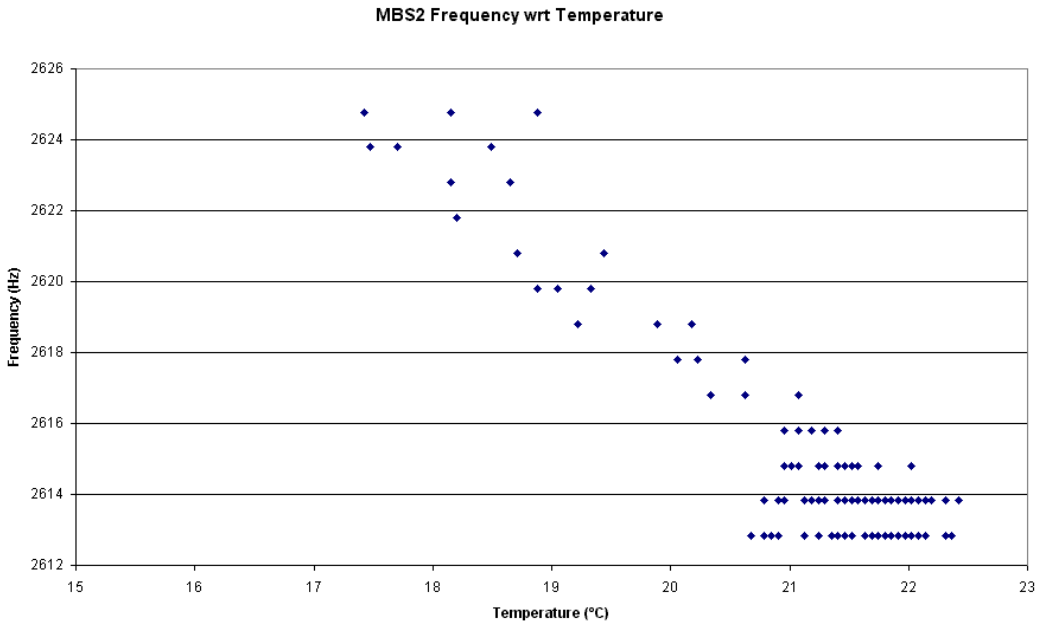

Figure 49 MBS2 Frequency wrt Temperature (Interference IIA)

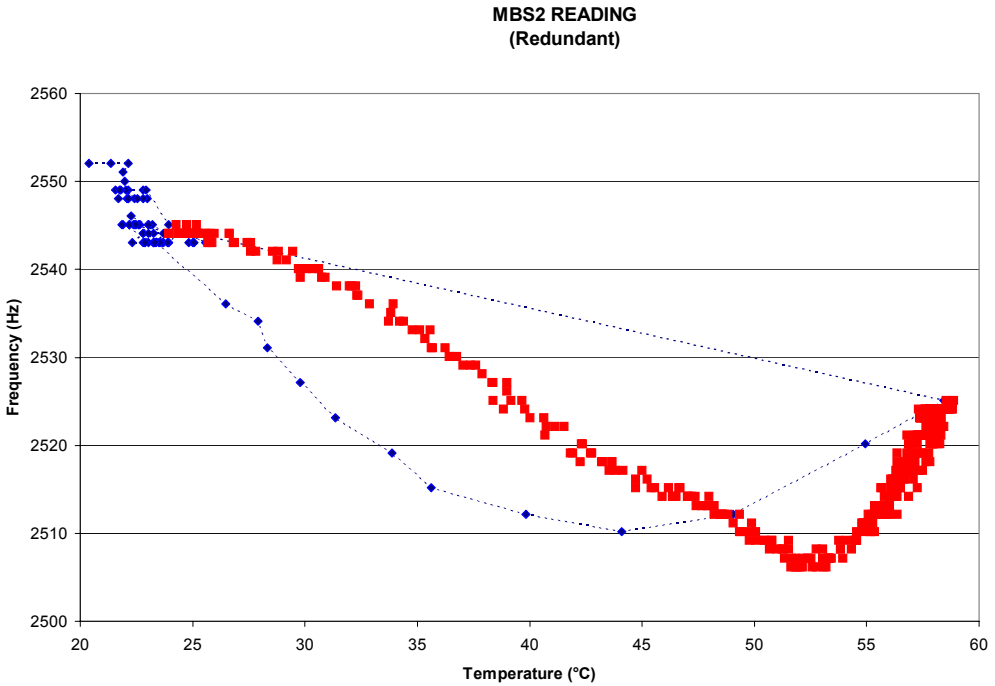

Figure 50 MBS1 Frequency wrt Temperature in Normal acquisition and heating modes – April '04 Commissioning

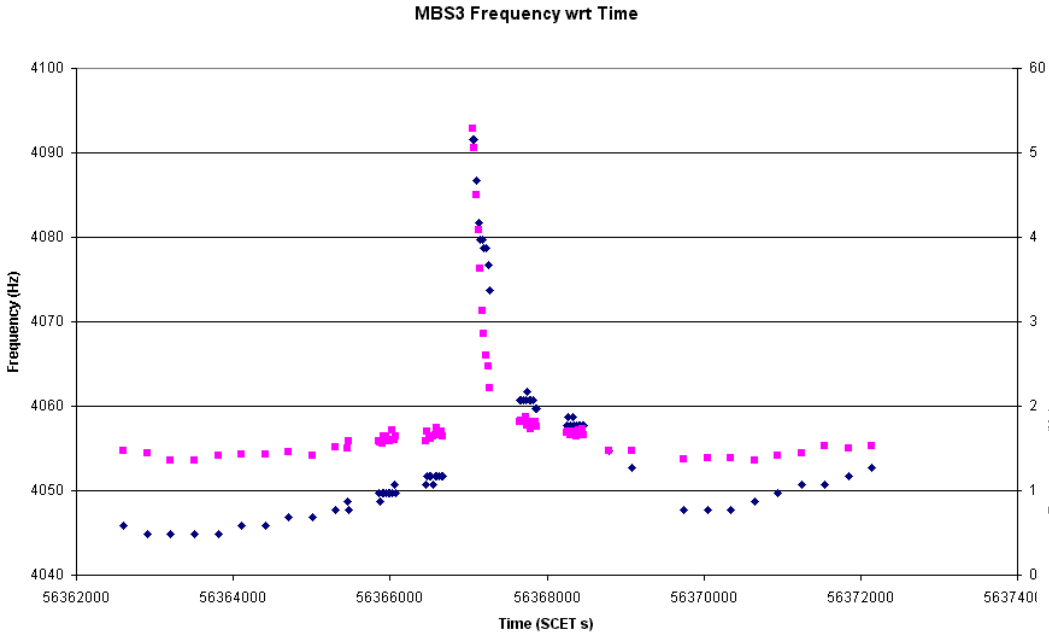

Figure 51 MBS3 Frequency &Temperature wrt Time

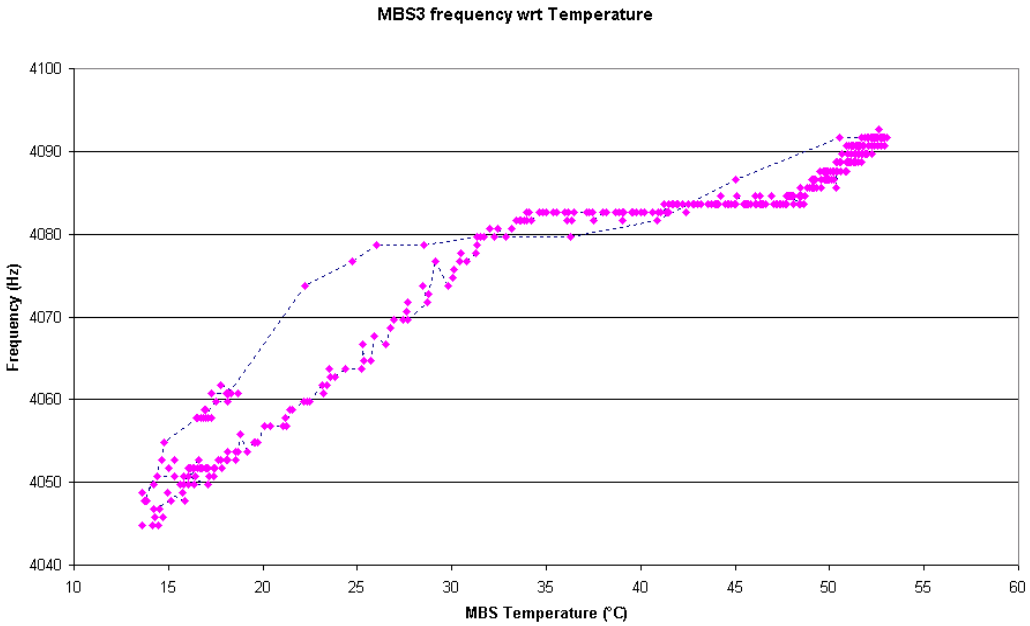

Figure 52 MBS3 Frequency wrt Temperature in Normal acquisition and heating modes

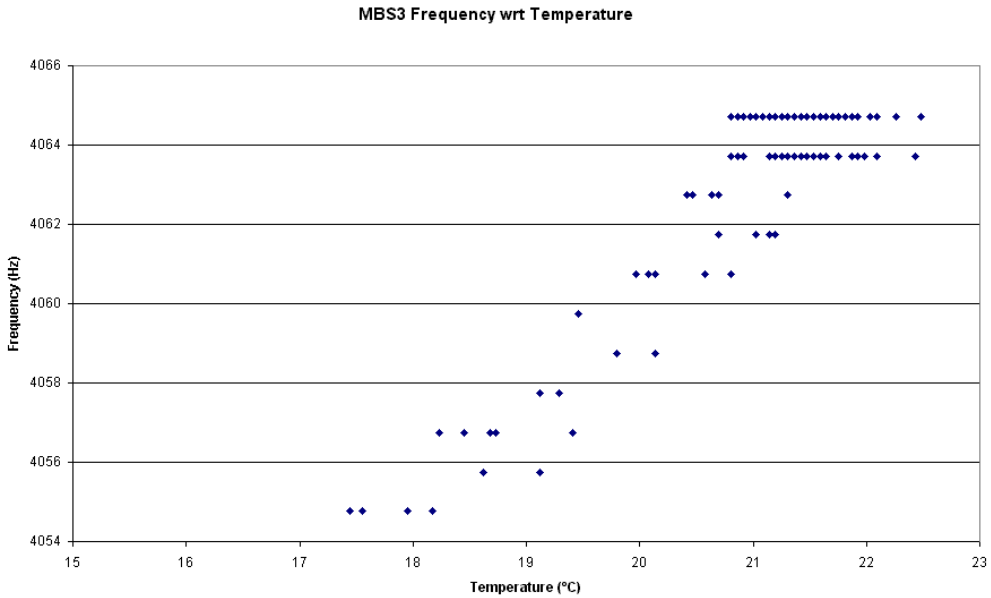

Figure 53 MBS3 Frequency wrt Temperature (Interference IIA)

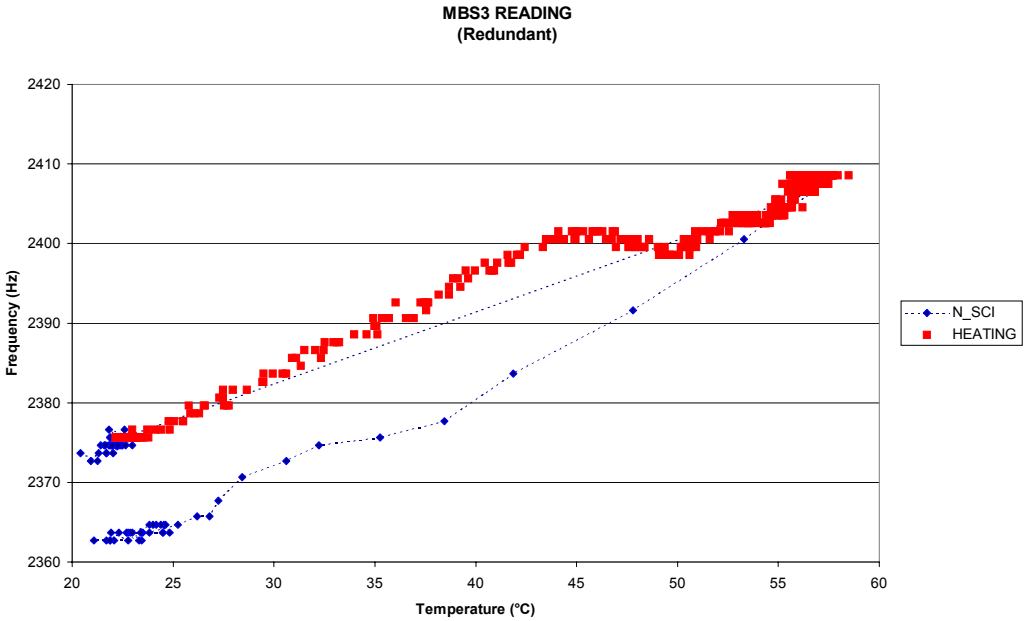

Figure 54 MBS3 Frequency wrt Temperature in Normal acquisition and heating modes – April '04 Commissioning

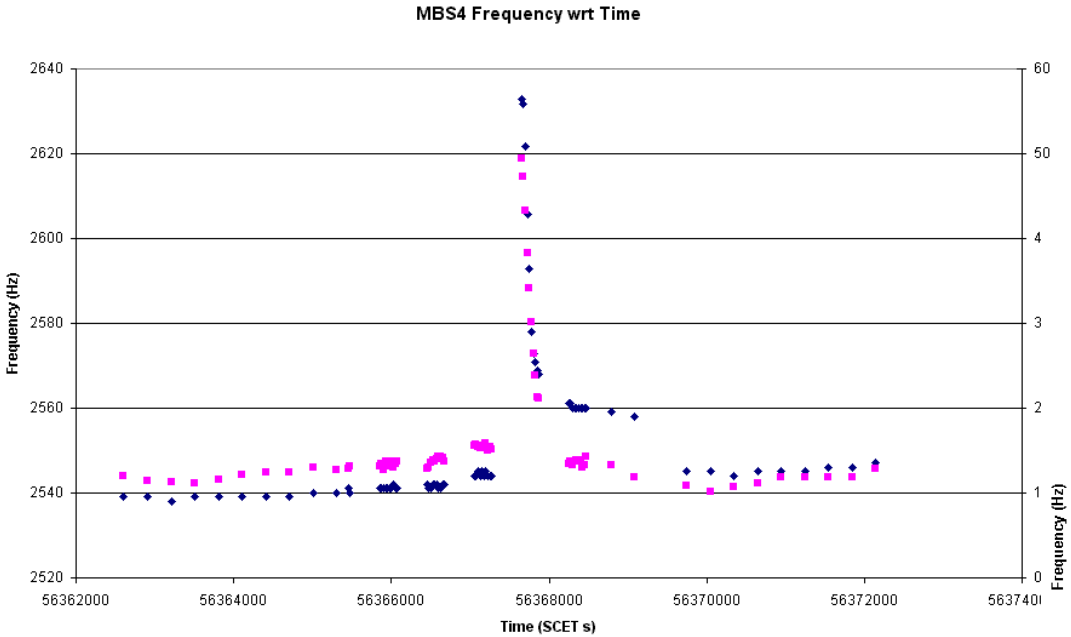

Figure 55 MBS4 Frequency &Temperature wrt Time

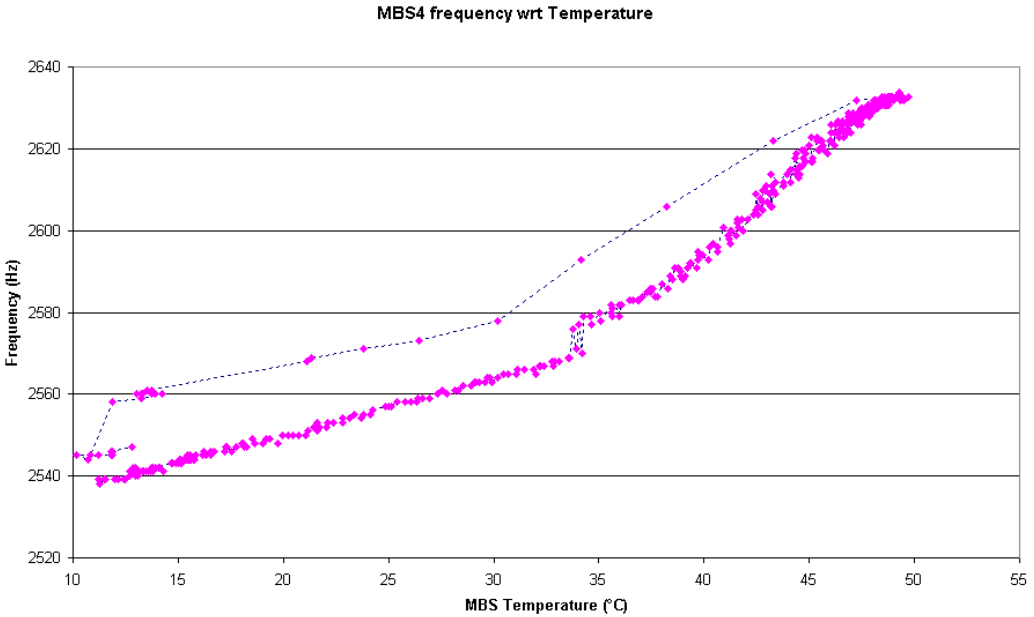

Figure 56 MBS4 Frequency wrt Temperature in Normal acquisition and heating modes

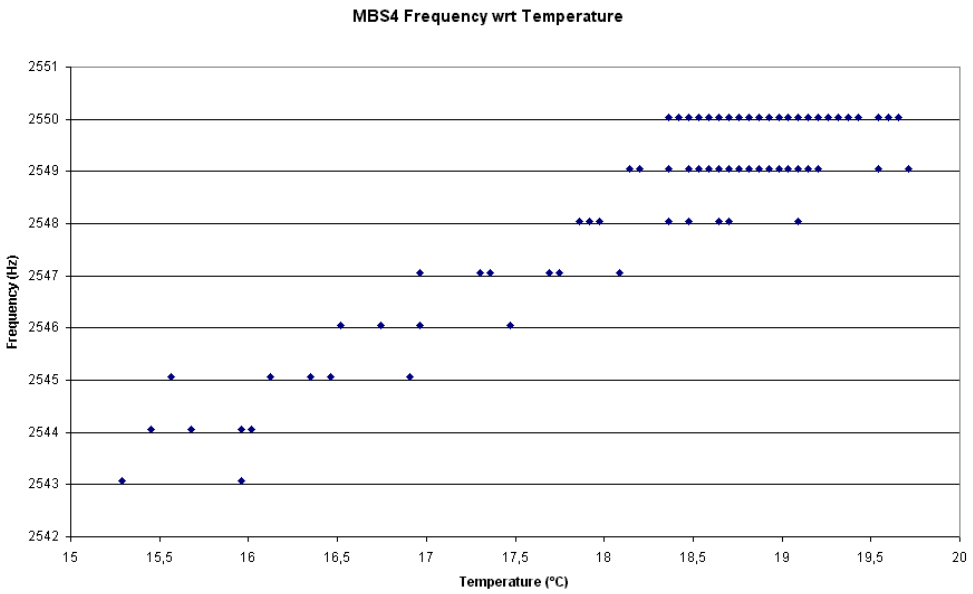

Figure 57 MBS4 Frequency wrt Temperature (Interference IIA)

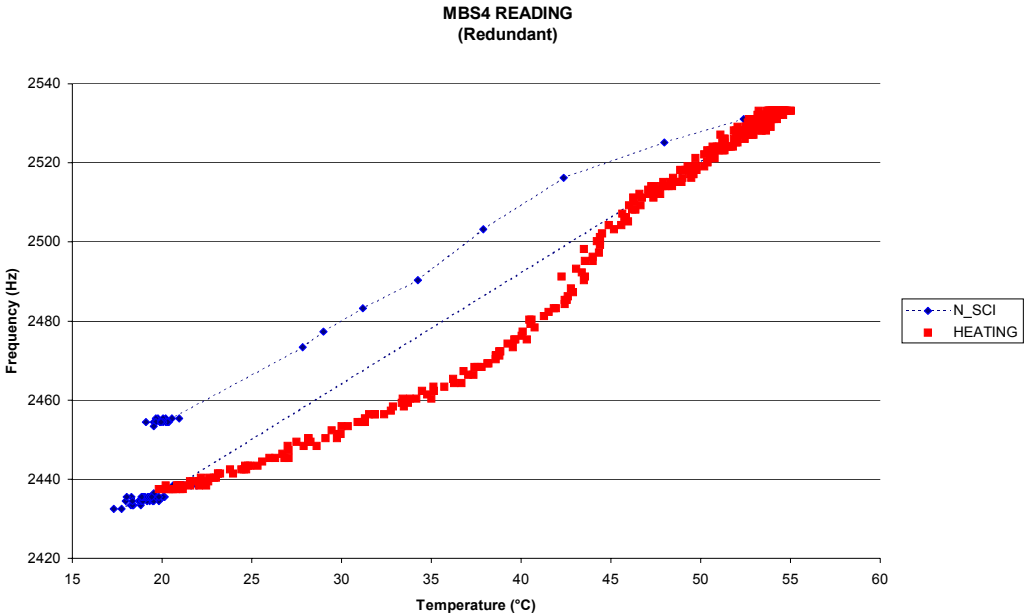

Figure 58 MBS4 Frequency wrt Temperature in Normal acquisition and heating modes – April '04 Commissioning

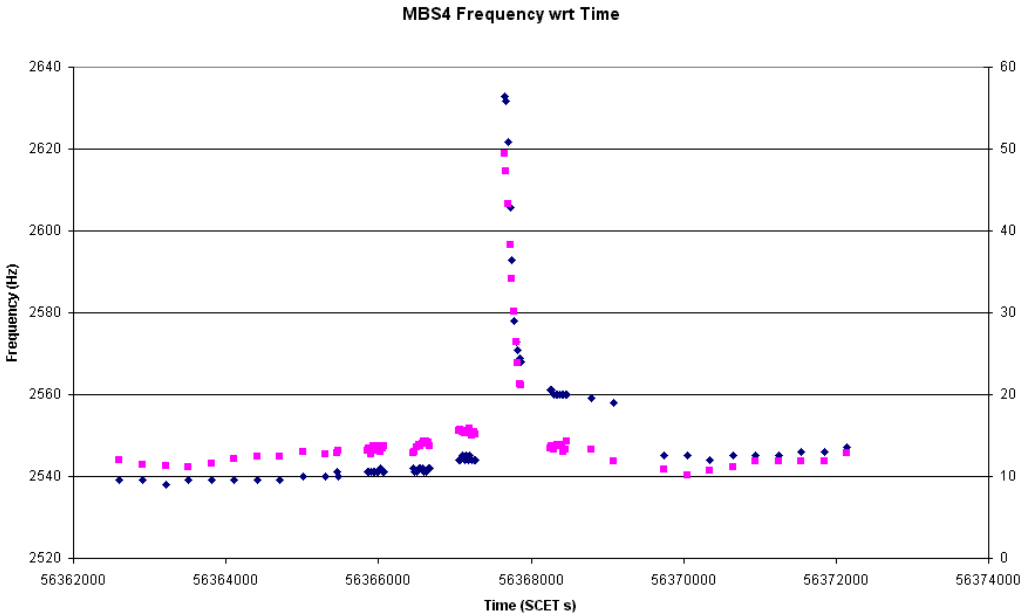

Figure 59 MBS5 Frequency &Temperature wrt Time

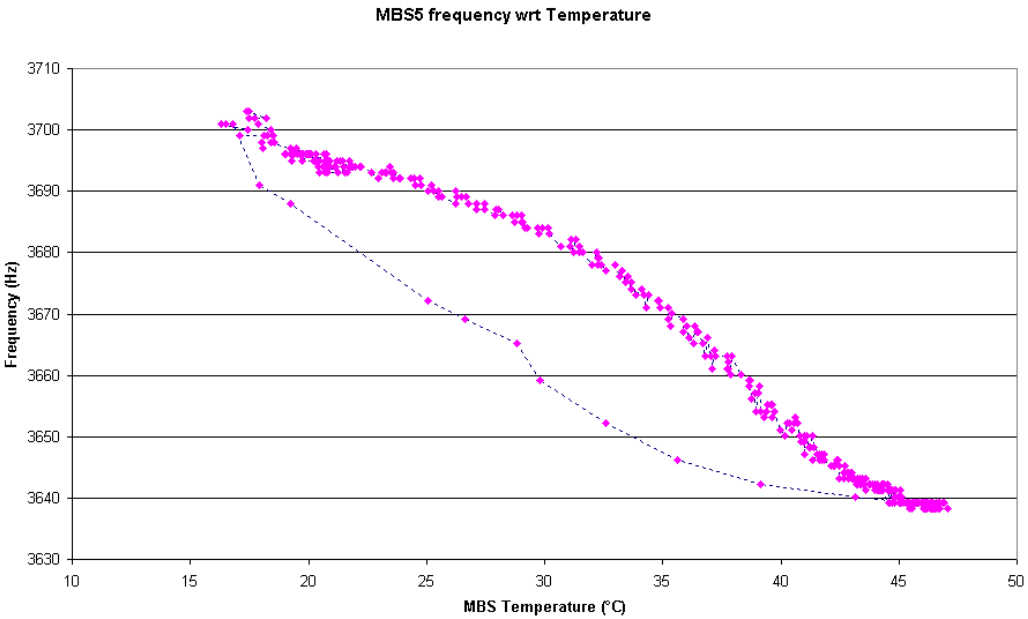

Figure 60 MBS5 Frequency wrt Temperature in Normal acquisition and heating modes

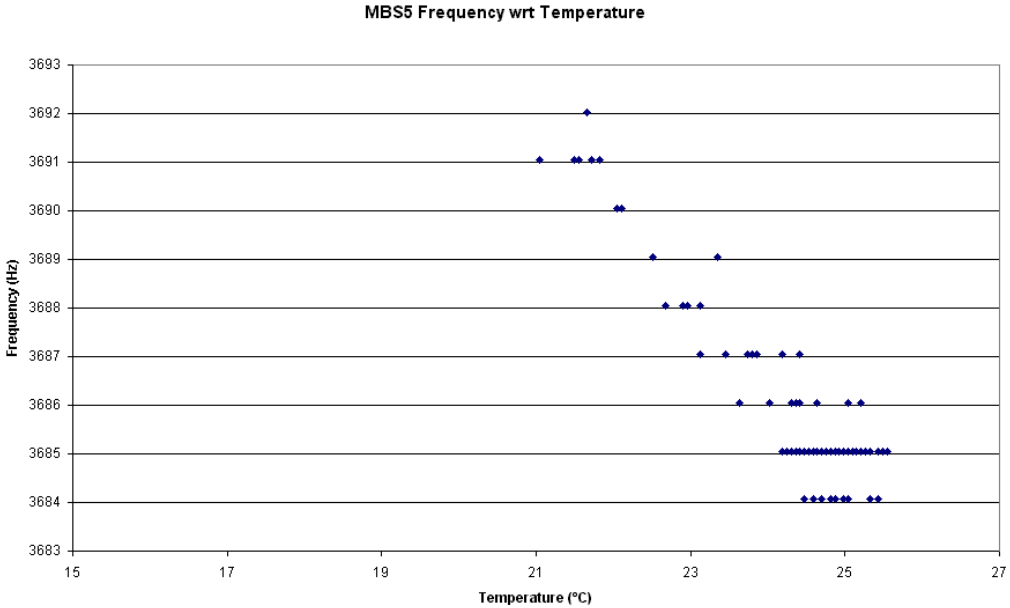

Figure 61 MBS5 Frequency wrt Temperature (Interference IIA)

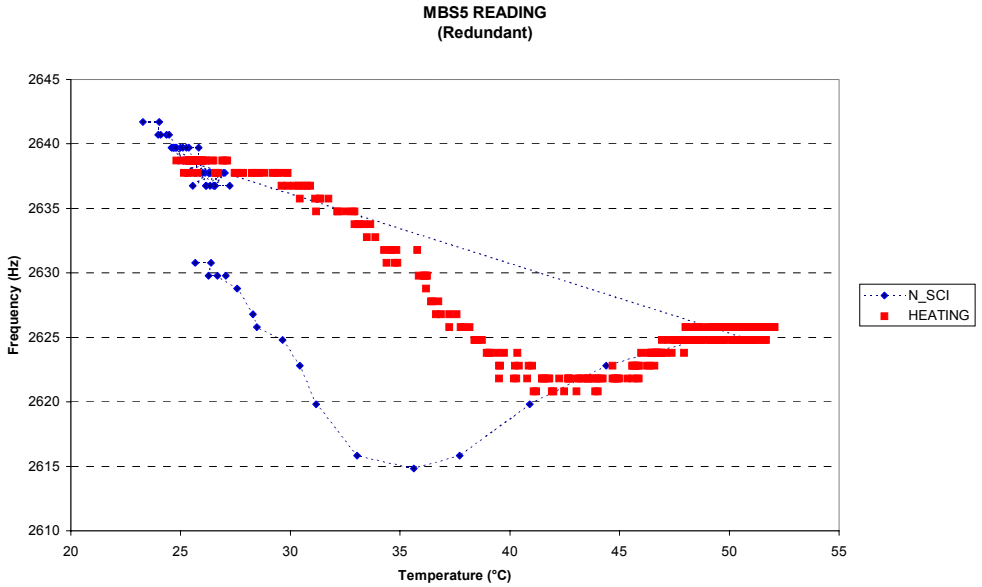

Figure 62 MBS5 Frequency wrt Temperature in Normal acquisition and heating modes – April '04 Commissioning

5.1.3.4 Housekeeping signals in science packets

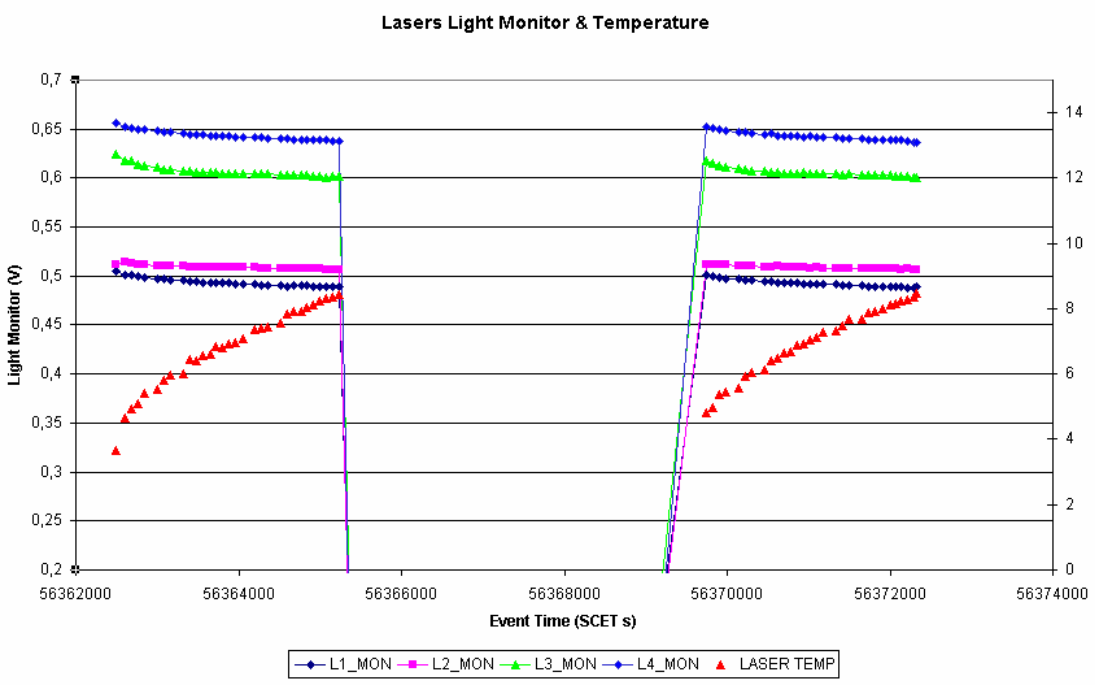

Figure 63 Laser lights monitor (Normal science packet)

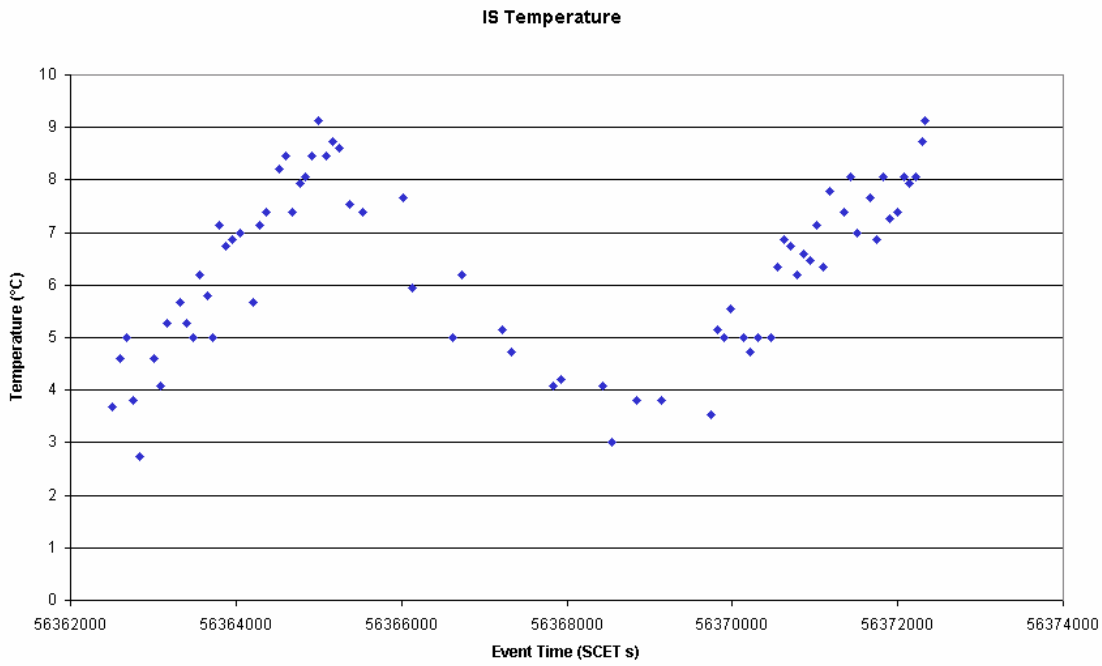

Figure 64 IS temperature (Normal science packet)

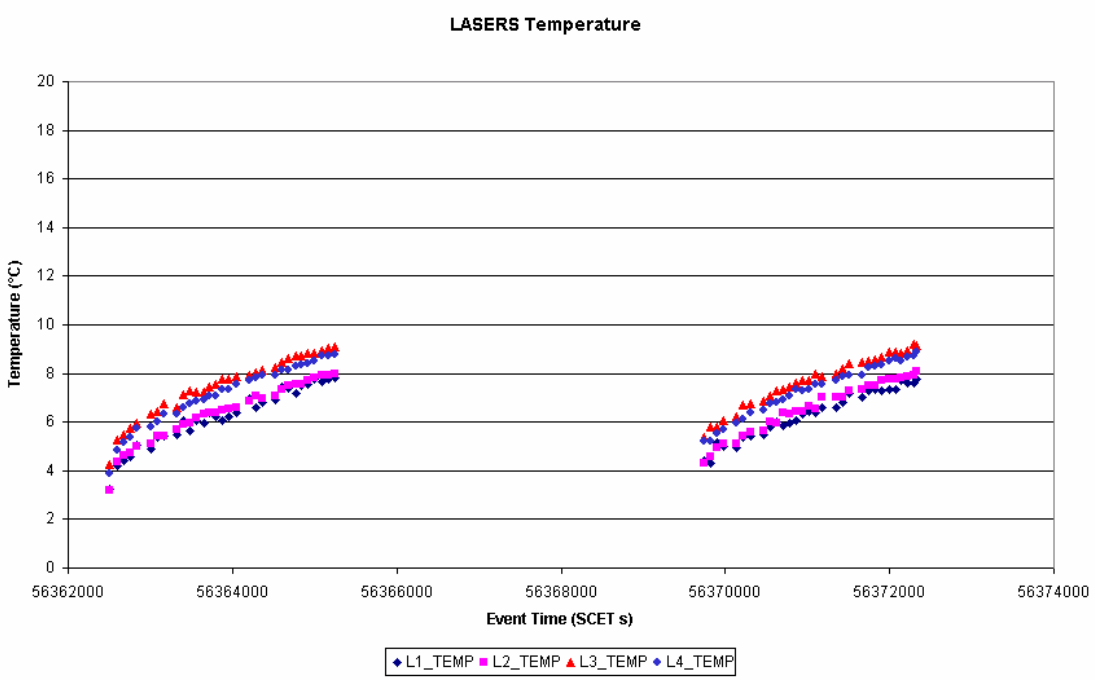

Figure 65 Lasers temperatures (Normal science packet)

6. 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. The memory dump reports were not retrieved along the three GIADA switch-on.
- 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 45 minutes with respect to the UTC time @ GIADA switch-on. **This issue has been understood**: if the packet is received on VC0, the delay of the time stamping is about some seconds, because the RMOC is able to calculate quite accurately when the packet was generated on-board. When the packet is received on VC1, the Mission Control Centre is not able to calculate the generation time since the packet could have been generated many days before.
- The internal (Impact Sensor, Laser and Power Supply) and external (Frangibolt and MBS) temperatures were in the nominal range, as well as the current consumption during all the phases of the test. The GIADA cover was correctly open and closed (cover close operations were successfully repeated twice).
- 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 Impact sensor (IS) and GDS receivers have produced few 'ghost events'. The GDS left and right receiver still produce 'ghost events', even if with a rate lower then in the previous tests, where GIADA was switched-on together with the other payloads. The IS ghost events are mainly due to the Channel E behaviour, for which it could be interesting to increase its detection threshold when the Gain is set to High. The results of the IS calibration are the same as experienced during the other tests. Again, it is suggested to increase the detection Threshold of Channel C to decrease its susceptibility to the noise. The results of GDS calibration seem indicating a lower noise level wrt. previous tests (now GIADA has been switched-on alone).
- **It is confirmed that MBSs are contaminated in-flight** due to out-gassing of material. The MBS have been heated to check if the frequency change, observed already during Interference 1A-B, was due to contamination of volatile material. **Unfortunately, the contamination is not changed with heating**.

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

- Since the response of IS Channel C is noisier then others channels, it is suggested to increase (for both Main and Redundant) its detection threshold from 50mV to 120mV.
- To stabilise the response of IS Channel E when Gain is High, it is required to increases its detection threshold from 100mV to 150mV in order to avoid Ghost events.

7. 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
Pass: 14-October-2004 07:00 - 14:00 (By DSN)

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#-------------------------------------------------------------------------------#
# 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