GIADA FS MODEL

REPORT ON
GIADA STEINS FLY BY (STEINS)
performed on
1-09-2008 and 10-09-2008

PREPARED	APPROVED	AUTHORIZED
GIADA TEAM A.ROTUNDI, V. DELLA CORTE,R.SORDINI,M.ACCOLLA INAF – Osservatorio Astronomico di Capodimonte, Napoli (I) Università Parthenope, Napoli (I)	GIADA PI A.ROTUNDI	GIADA PI A.ROTUNDI

TABLE OF CONTENTS

REVISIONS LOG

REV	DOCUMENT CHANGE ORDER	DATE	CHANGES DESCRIPTION	PREPARED
0	-	10-10-2011	First issue	GIADA Team

1. SCOPE AND APPLICABILITY

The report provides the results from GIADA experiment during the Rosetta Steins Flyby.
Asteroid Steins was the first dedicated scientific target of the Rosetta mission. Unfortunately the three subsystem of GIADA were not able to study Steins, so GIADA during asteroid flyby was in a non-nominal operational configuration, i.e. only the impact sensor operational and the cover closed. Therefore, during Steins fly-by we have only checked the status of GIADA instrument.
Scientific operations targeting the asteroid started on 1 Sept. 2008 and ended on 10 Sept. 2008 and the Closest approach was on 5 Sept. 2008 at 18:38:20 UTC. Actually GIADA was in operation only the 5th Sept. 2008 just for 15 minutes.

This report is applicable to GIADA FS model on board the Rosetta S/C. The data were retrieved from DDS by means of the PI Workstation located at INAF - Osservatorio Astronomico di Capodimonte in Naples.

GIADA IWS software configuration is GES v. 4.2.2 plus RSOC Converter v. 1.1.2. GIADA in flight software configuration is 2.3 plus three additional patches (one more patch is used 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 – last issue	Flight Control Procedure
AD4	GIA-GAL-MA-007 Issue 4	GIADA Flight Spare Experiment User Manual last version

2.2 REFERENCE DOCUMENT

	None.	

3. DEFINITIONS AND ABBREVIATIONS

3.1 ABBREVIATIONS

CAL	Calibration
CF	Context File
CREP	Cover REPort
CT	Configuration Table
DDS	Data Disposition System
EGSE	Electrical Ground Support Equipment
EQM	Electrical Qualification Model
ESA	European Space Agency
FCP	Flight Control Procedure
FS	Flight Spare
GDS	Grain Detection System
GES	GIADA EGSE SW
GIADA	Grain Impact Analyser and Dust Accumulator
HK	House Keeping
I/F	InterFace
INAF-OAC	INAF - Osservatorio Astronomico di Capodimonte – Napoli (I)
IRQ	Interrupt ReQuest
IS	Impact Sensor
IWS	Instrument Work-Station
MBS	Micro Balance System
ME	Main Electronics
MTL	Mission TimeLine
MON	Monitor
OBCP	On-Board Control Procedure
PC	Payload Checkout
PI	Principal Investigator
PS	GIADA Power Supply
PZT	(IS) Piezoelectric Sensor
RED	Redundant
REV	Revision
RMOC	Rosetta Mission Operation Centre
RSOC	Rosetta Science Operation Centre
S/C	(Rosetta) Spacecraft
S/S	(GIADA) Sub-system (e.g. IS or GDS or MBS)
SCI	Scientific
SSC	Source Sequence Count
SSMM	Solid State Mass Memory on-board of Rosetta Spacecraft
SW	Software
TC	TeleCommand
TM	Telemetry
UM	User Manual
UTC	Coordinated Universal Time
VC0	Virtual Channel 0 (Real Time TM packets)
VC1	Virtual Channel 1 (TM packets coming from Mass Memory)

4. DESCRIPTION OF ACTIVITIES

The Steins Fly by was performed on 05 September 2008. The test (named GD01 in ESA documents) is, for GIADA, an opearative non standard mode on the Main I/F.

In the next table there are some information about Steins Fly By

Scenario period	01/09/08 to 10/09/08
Scenario duration	10 days
Sun distance	2.14 AU to 2.41 AU
Propagation delay	~20 min.

The data were off-line elaborated on the PI IWS at INAF-OAC in Naples.

5. SUMMARY OF DATA ANALYSIS

The principal sets of plots about Housekeeping data are reported in Sections 7 for GD01 test on the Main I/Fs.

Here following the main findings are summarised.

5.1 GENERAL CONSIDERATIONS

Test started on "Fri Sep 05 2008 14:01:11.571672", when the first TM packet was received from GIADA switched on the Main interface; the last TM packet on the Main interface was received on "Fri Sep 05 2008 19:14:21.118114".

The first expected packet **(Connection Test Report, service 17,2) was not received** in the time window of any test, because the DDS has marked it with a wrong UTC time, being an unsynchronised time tag (bad time quality) TM report.

As reported in the "Cover Reports" (**CREP**) no OPEN/CLOSE problem occurred during Steins Fly By.

5.2 GIADA STATUS

The **current consumption** and **power supply temperatures** are shown in **Errore. L'origine iferimento non è stata trovata.** for Main on GD01, **Errore. L'origine riferimento non è stata trovata.** for Red on GD01, Figure 8.1-2 for Main GD02 and Figure 10.1-2 for GD_INT; Power values must be compared with soft and hard limits reported in GIADA FS UM (**AD4**) and summarised in Table 5.2-1.

As reported in GIADA FS UM (**AD4**), the Soft and Hard Alarm Limits for Power consumption in Table 5.2-1 for parameters NGDD0086, NGDD0087 and/or NGDD0088 refer to the different GIADA operating modes. The Soft Alarm Limits in Normal and Flux Modes refer to nominal conditions, i.e. with all sub-systems switched ON. This means that when GIADA is in Normal Mode, but not with all sub-systems ON (or in Flux with MBS OFF), the lower Soft Alarm Limits indicated in the Table can be overcome. In order to avoid flood of Out Of Limits (OOL) alarms, it has been decided (July 2006) to refer the Hard Alarm Limits to the extreme instrument status for each mode (e.g., in normal mode, with all subsystems off – lower – or at maximum power consumption - upper). Other configurations not related to real GIADA failure may still give OOL, related to operation in non nominal temperature conditions, although such conditions have never been experienced so far.

In general, all **functional parameters** measured during the PC10 test behave as expected, with the exception of some OOLs reported in the previous section 5.1

QUANTITY	NAME	LNAME	SOFT ALARM LIMITS		HARD ALARM LIMITS	
			Lower	Higher	Lower	Higher
+5V Power Consumption ([1])	NGDD0086	Current +5V	110 mA	150 mA	80 mA	180 mA
+15V Power Consumption ([1])	NGDD0087	Current +15V	30 mA	60 mA	20 mA	70 mA
-15V Power Consumption ([1])	NGDD0088	Current -15V	50 mA	90 mA	40 mA	100 mA
+5V Power Consumption ([2])	NGDD0086	Current +5V	110 mA	150 mA	80 mA	180 mA
+15V Power Consumption ([2])	NGDD0087	Current +15V	30 mA	600 mA	20 mA	700 mA
-15V Power Consumption ([2])	NGDD0088	Current -15V	50 mA	600 mA	40 mA	700 mA
+5V Power Consumption ([3])	NGDD0086	Current +5V	110 mA	1600 mA	80 mA	1800 mA
+15V Power Consumption ([3])	NGDD0087	Current +15V	30 mA	550 mA	20 mA	600 mA
-15V Power Consumption ([3])	NGDD0088	Current -15V	50 mA	350 mA	40 mA	400 mA
+5V Power Consumption ([4])	NGDD0086	Current +5V	110 mA	170 mA	80 mA	1500 mA
+15V Power Consumption ([4])	NGDD0087	Current +15V	30 mA	200 mA	20 mA	220 mA
-15V Power Consumption ([4])	NGDD0088	Current -15V	50 mA	135 mA	40 mA	155 mA

Table 5.2-1. Hard and Soft limits for GIADA FS power consumption

([1]) Safe mode ([2]) Cover mode ([3]) Normal mode ([4]) Flux mode

All **Temperatures** behave as expected (Main on GD01: **Errore. L'origine riferimento non è stata rovata.**3,,

Figure 6.1-4). The peaks visible at the beginning and at the end of Frangibolt and IS temperature profiles are features due to the temporary increasing of power consumption at Power-on of the motor heaters (see Figure 6.1-5 and Figure 6.1-6 for Main on GD01).

The detection **Thresholds** applied to PZT3 and PZT5 of IS are shown in Figure 6.2-2 and Figure 6.2-33.

Moreover, Range and Gain for IS are set as shown in Table 5.2-2.

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

Table 5.2-2. IS Range and Gain configuration

During Steins FlyBy no scientific data were occurred.

During Steins FlyBy only the IS susbsystem were switched on in the following graph are reported the data acquired during the FLYBY.

The MBS and GDS sub-systems were off.

6. STEINS FLYBY DATA ANALYSIS – MAIN INTERFACE (GD01)

6.1 GIADA STATUS

Figure 6.1-1. HK Status of GIADA vs. time – Main

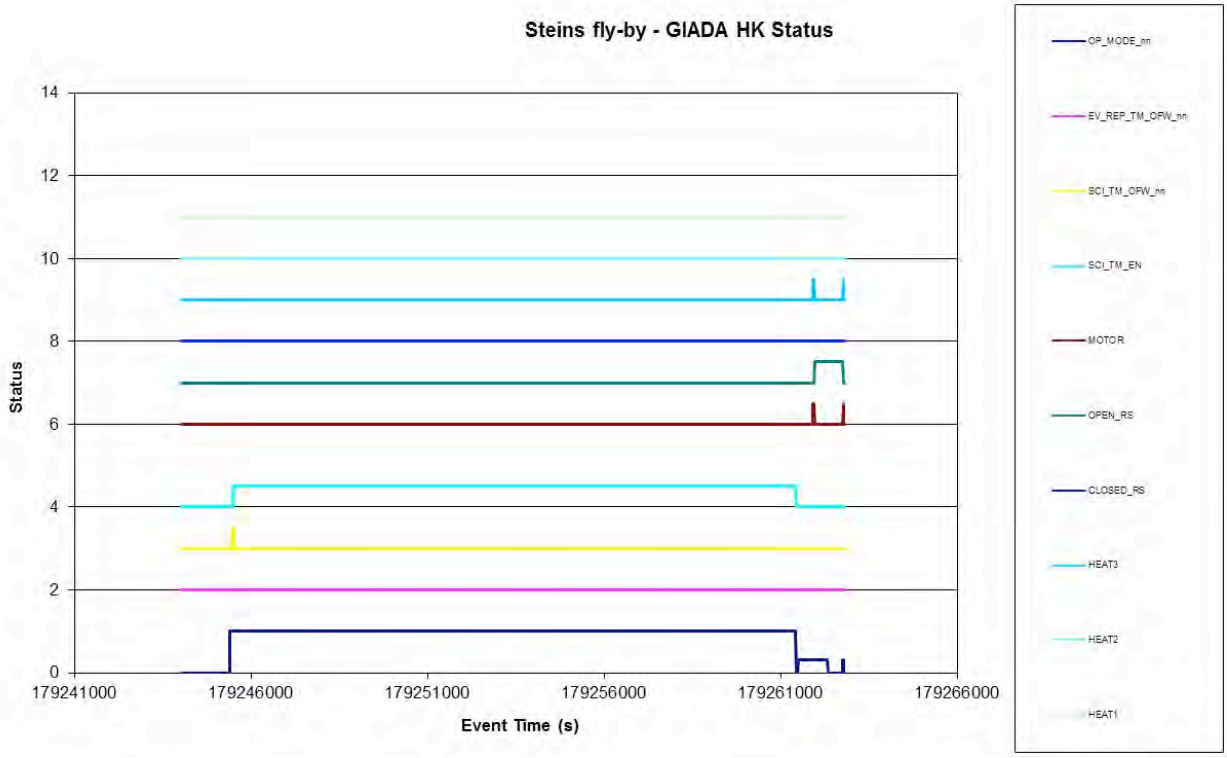


Figure 6.1-2. Power profile and Power Supply temperature vs. time - HK, Main

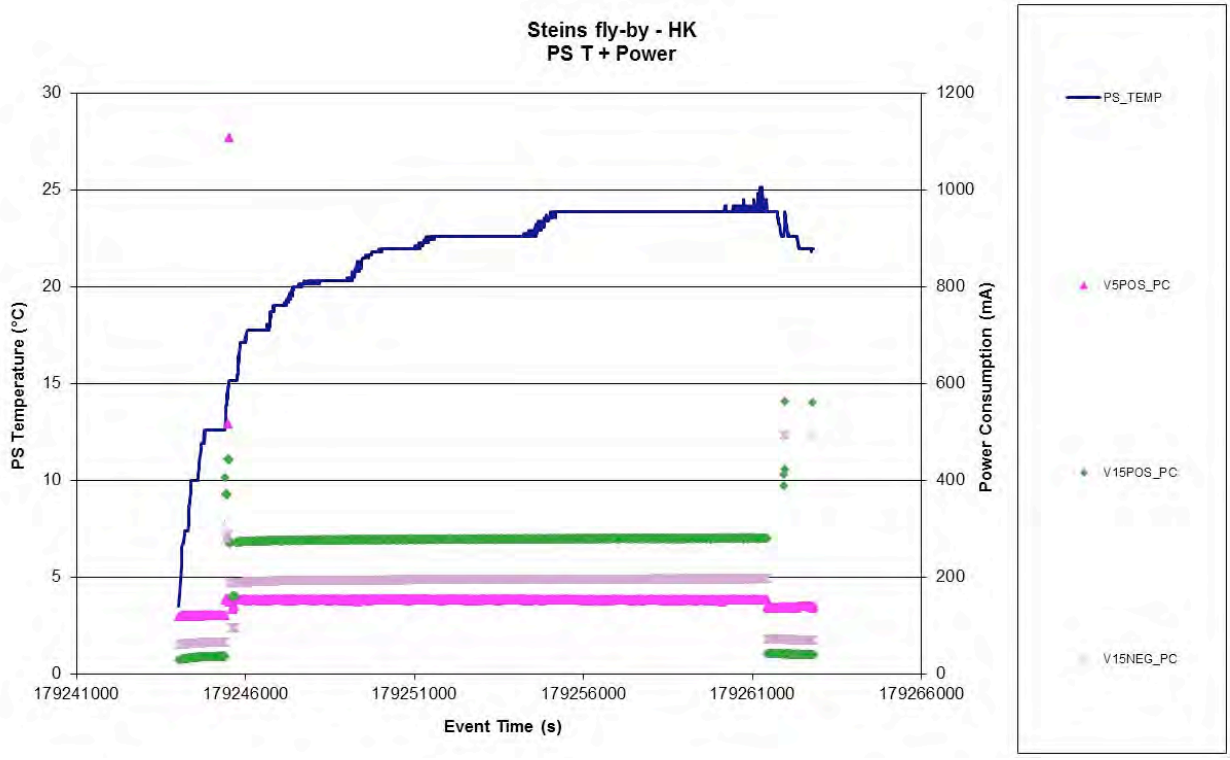


Figure 6.1-3. Evolution of temperatures of system elements vs. time - HK, Main

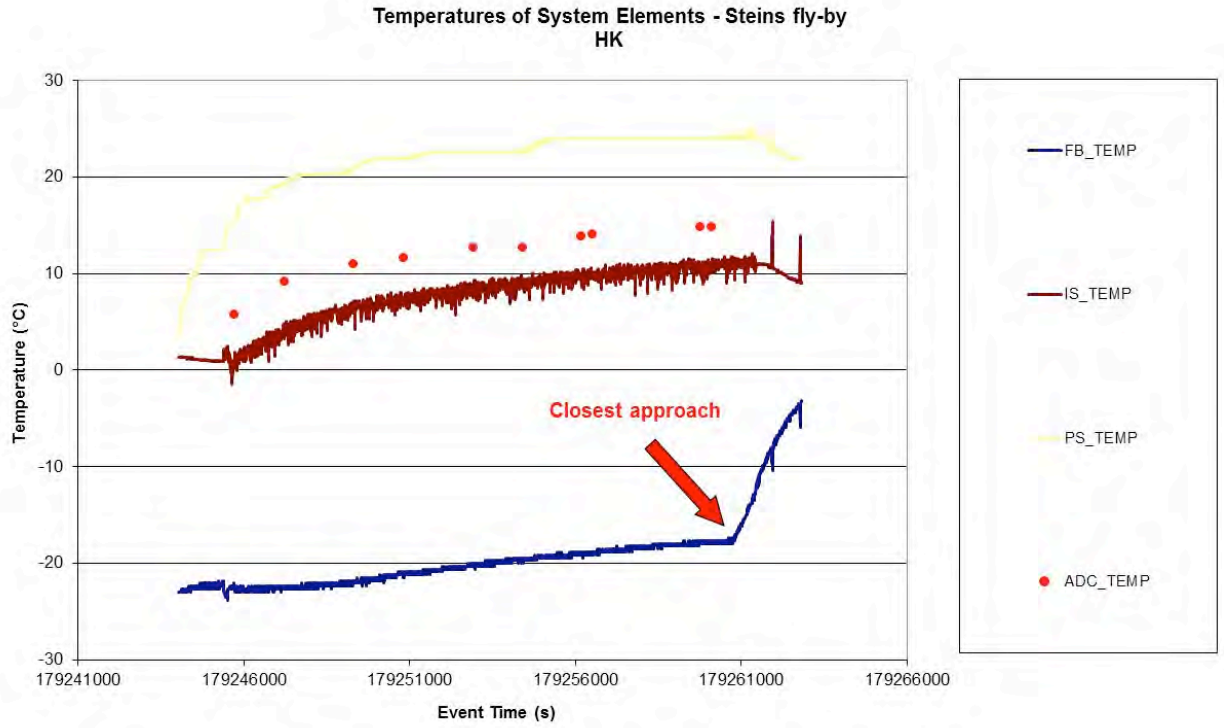


Figure 6.1-4. Evolution of temperatures of sub-systems vs. time with instrument in Normal Mode– Main

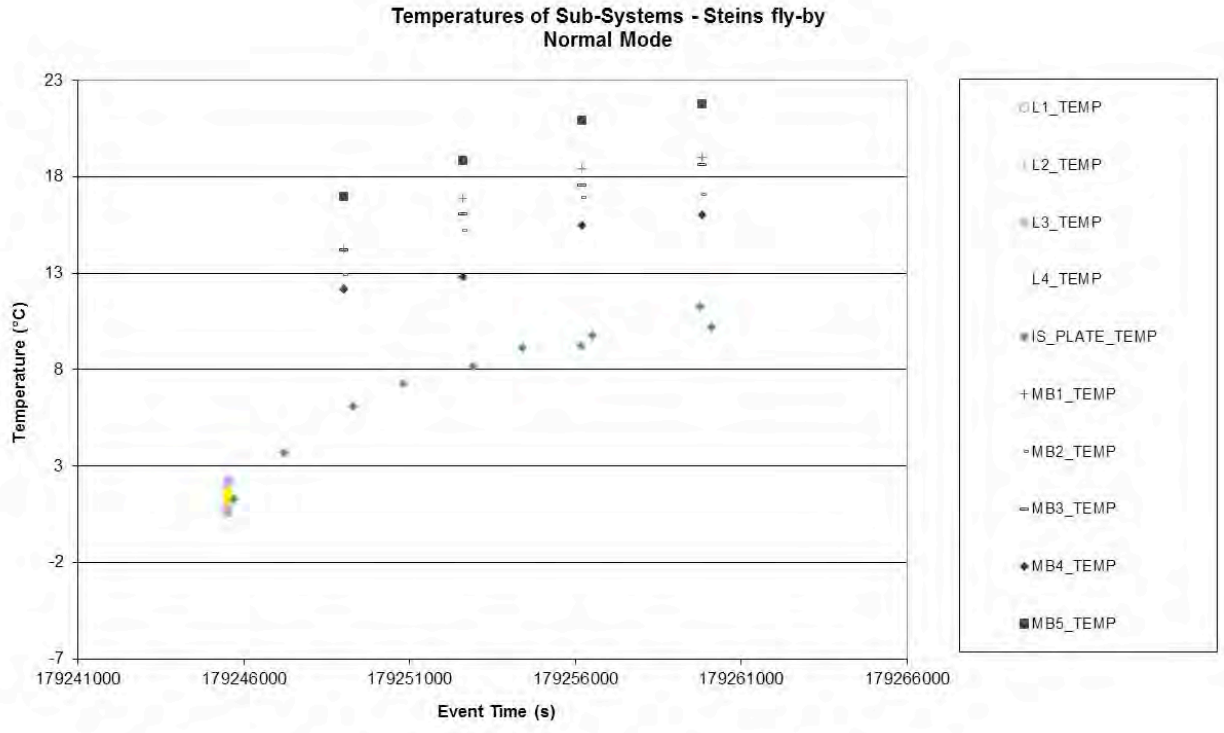


Figure 6.1-5. HK Status versus Temperatures of system elements – Main

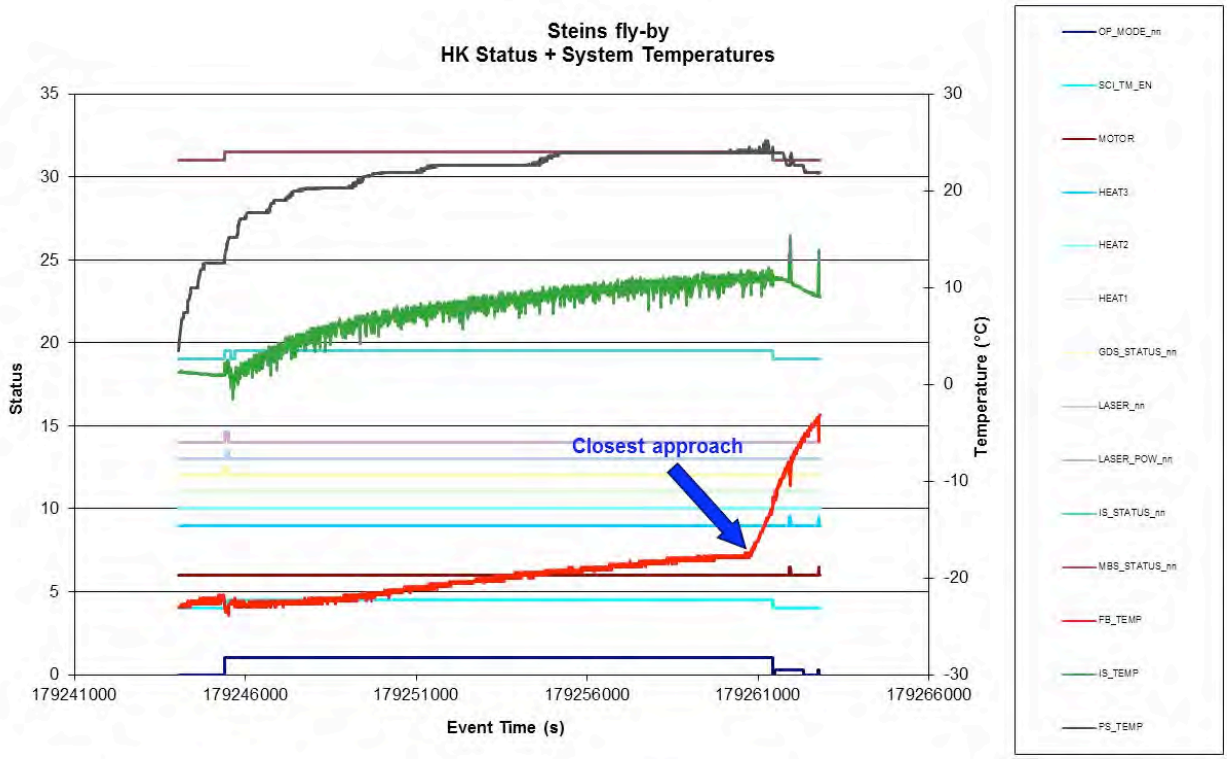
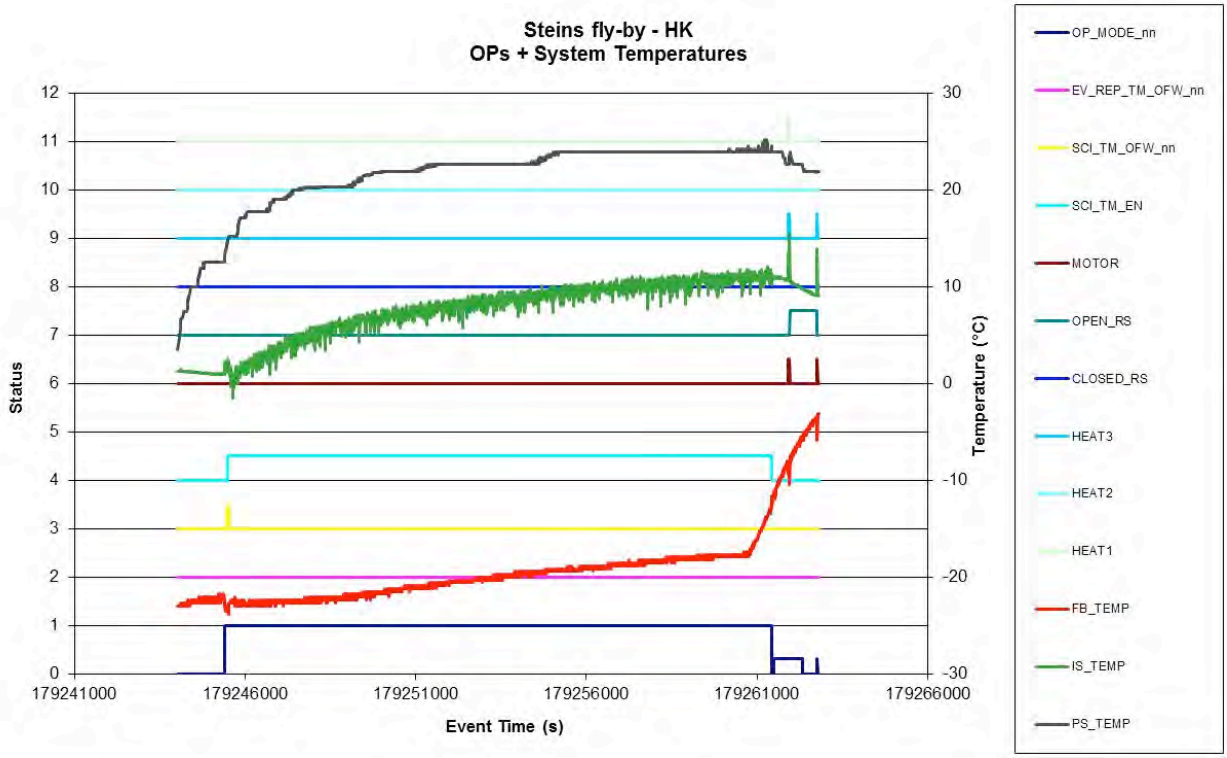


Figure 6.1-6. Operation Status versus Temperatures of system elements – Main
In the diagram are reported operative parameters with relevant variations.



6.2 IMPACT SENSOR (IS)

6.2.1 IS – Status

Figure 6.2-1. IS Operation Status vs. time – Main

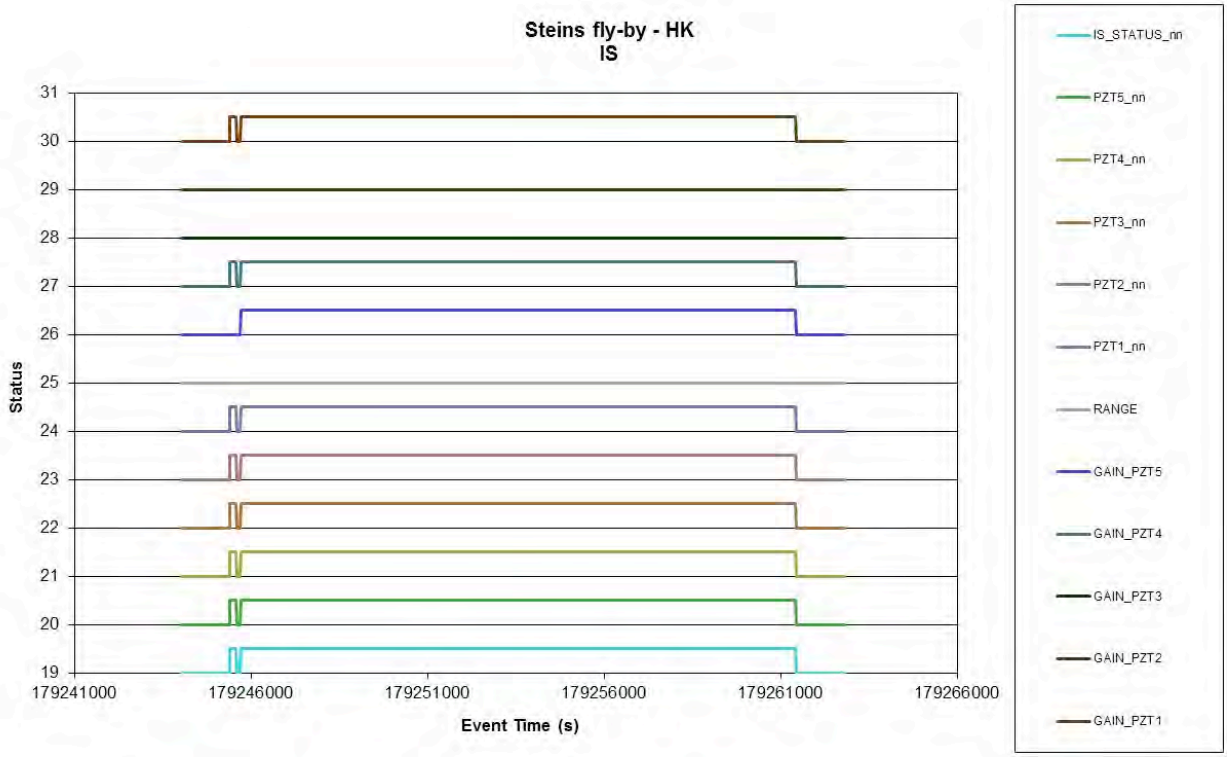


Figure 6.2-2. IS PZT 3 Thresholds change vs. time – Main

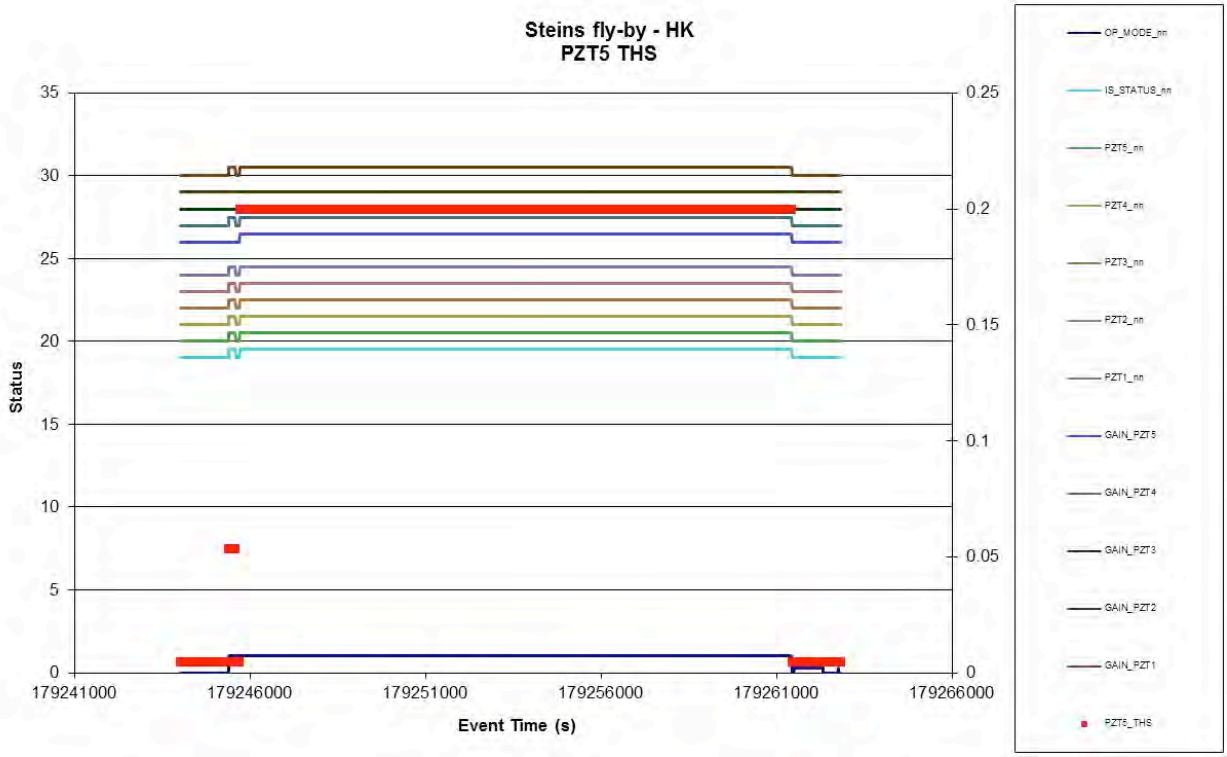


Figure 6.2-3. IS PZT 5 Thresholds change vs. time – Main

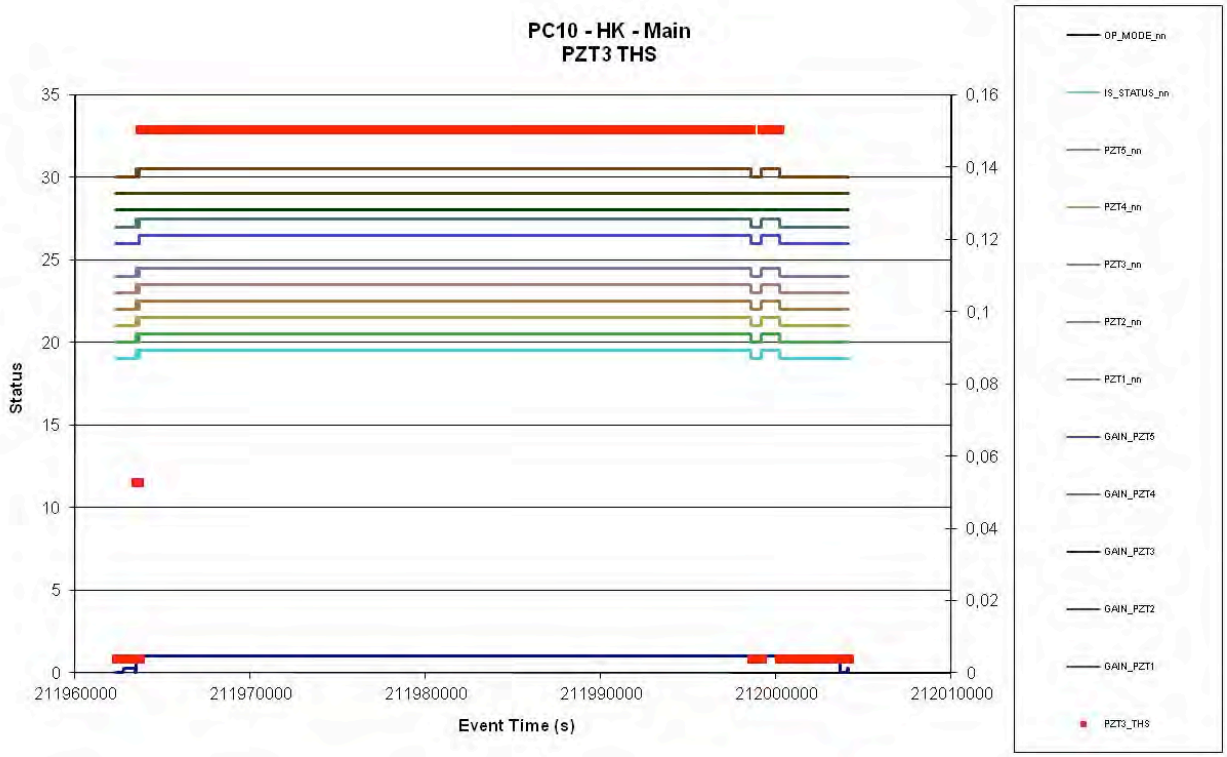
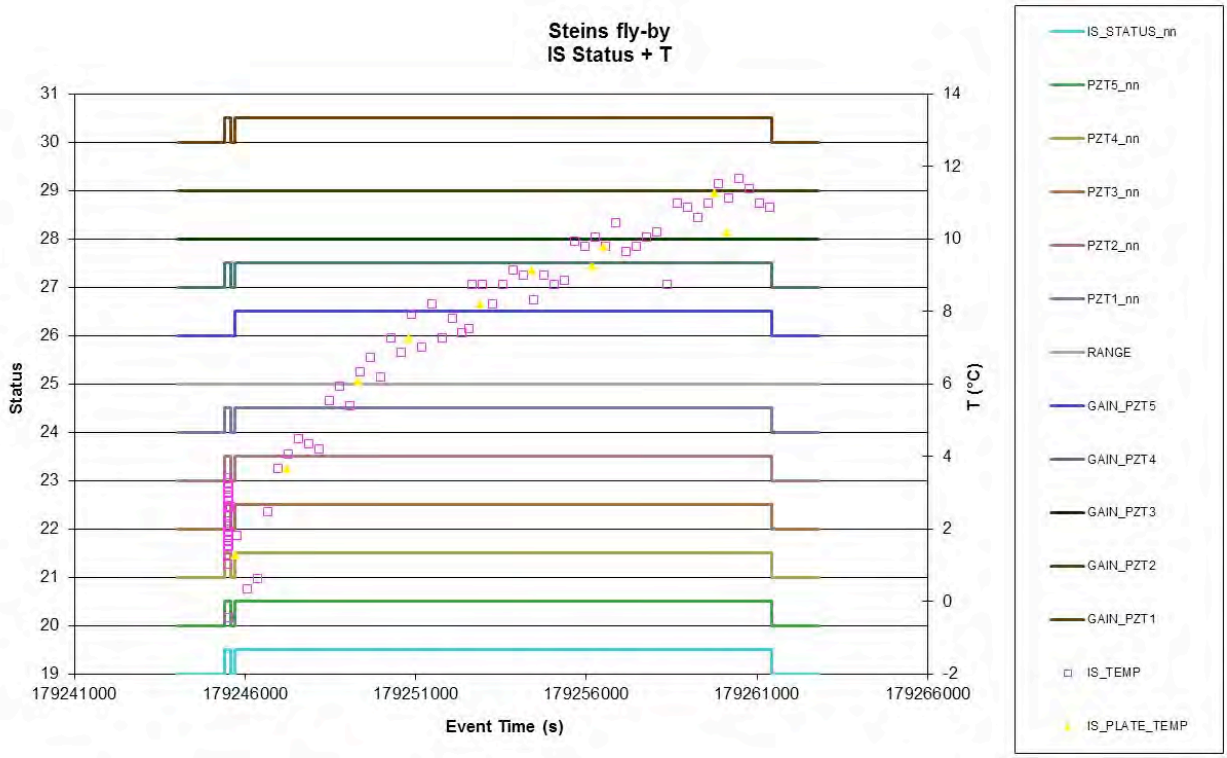


Figure 6.2-4. IS Temperature vs. time (HK, HK-SCI, SCI) – Main



6.2.1.1 CAL

Figure 6.2-5. PZTs Mean and St Dev. CAL vs. time – Main

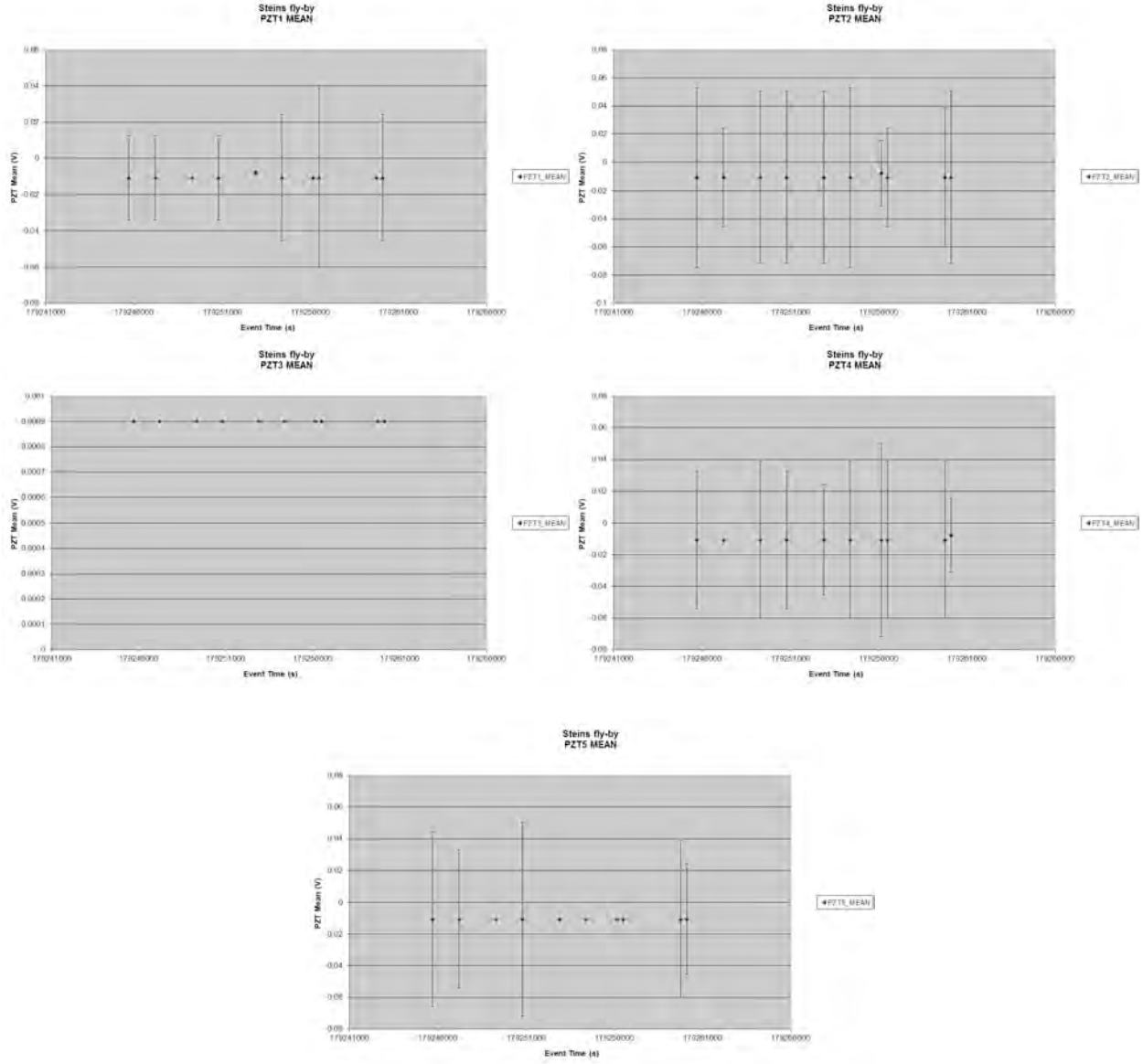


Figure 6.2-6. Reference Voltages for IS calibration vs. time – Main Voltages values for the calibrator don't show level variation

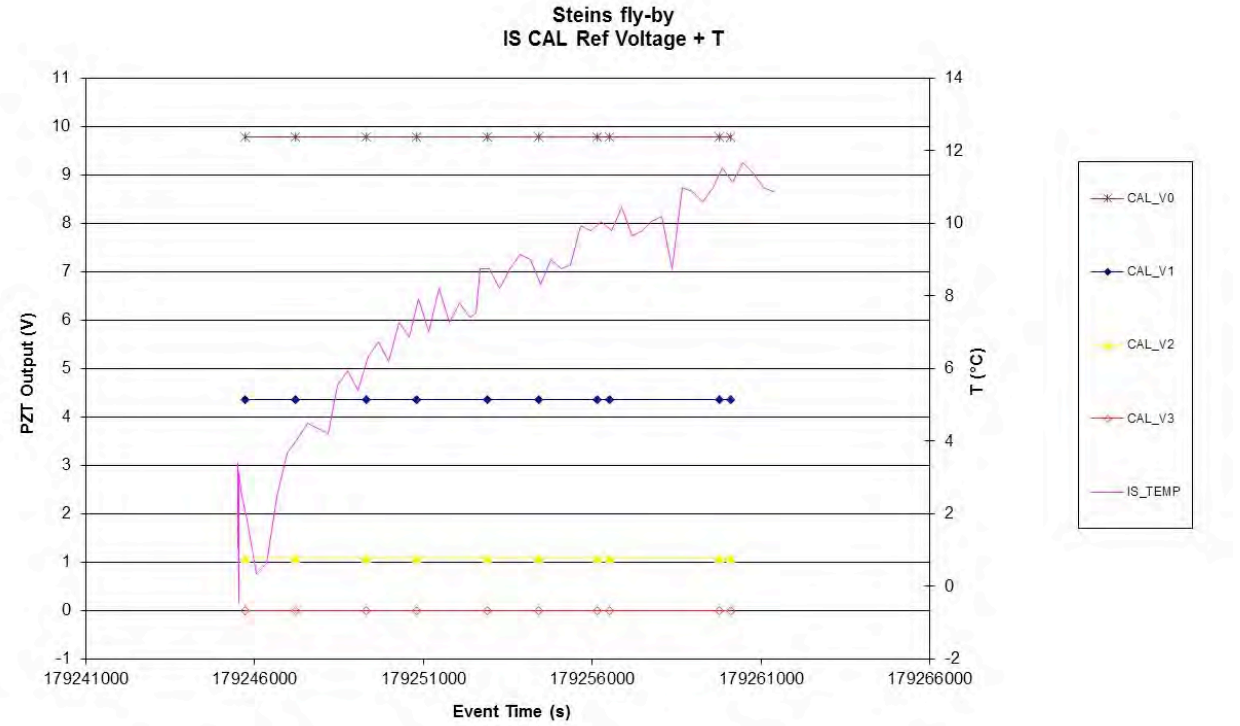
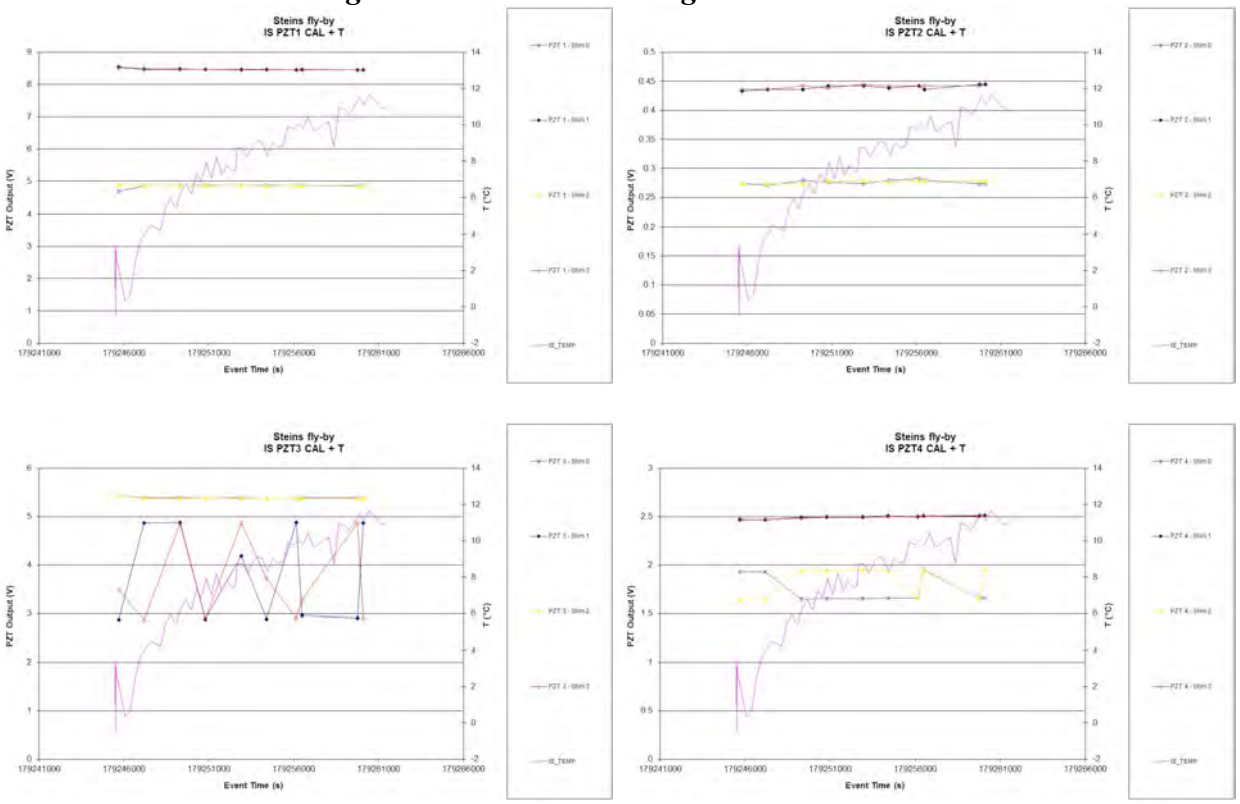
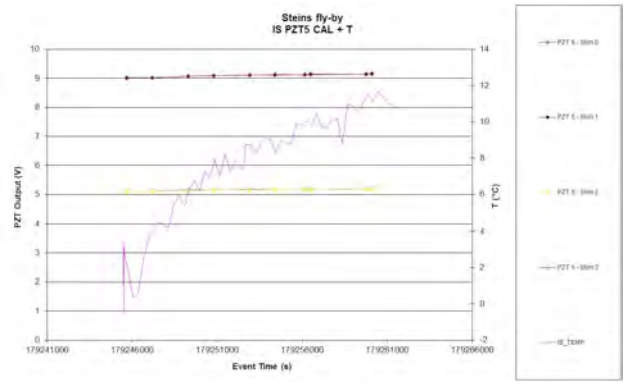


Figure 6.2-7. PZTs CAL Signal vs. time – Main





7. TIMELINES FOR GIADA STEINS FLY-BY

7.1 TIMELINE FOR MAIN INTERFACE (GD01)

```
# $Log: OIOR_PIHRSO_D_0012_GD_01___.ROS,v $
#
# Version  1.0  2008/04/09 GIADA MAIN for Steins Fly-by
#
# Version  1.1  2008/05/26 GIADA MAIN for Steins Fly-by
# Timing conflict with the sequence AGDS311A fixed.
#
# Revision 1.2  2008/05/27 08:46:50  mkueppers
# Email delivery 27 May 2008
#
# Revision 1.3  2008/06/06 11:21:46  mkueppers
# Update by MK of last submission.
#
# Revision 1.4  2008/06/09 10:10:32  mkueppers
# Another RSOC update of the end time.
#
#============================================================================#
# Filename:       OIOR_PIHRSO_D_0012_GD_01____00037.ROS
# Type:     Input Timeline file
#
# Description:    GIADA activities during Steins Fly-by
#
#
# Author:   PP, AA
#
#           GIADA
#
# Date:           11 Jul 2008
#
#
# Proposed by GIADA team
#
# (c) ESA/Estec
#
#----------------------------------------------------------------------------#
#============================================================================#

# EPS required, but RSOC will use CVS version
Version: 00001

# End time below modified by MK to make eps check work. Was 000_00:02:35 before
```

```
Ref_date: 05-Sep-2008
Start_time: 000_00:00:00
End_time: 000_03:00:00

#============================================================================#
# Description: "1. | Switch on and test - main I/F"
#============================================================================#

+000_00:00:00     GIADA   OFF AGDS001A ( \
                                  VGD0001B = "nom. branch" [ENG] \ # GIADA on
Main IF
                                  VGD0001A = "YES" [ENG]) # Context exists

+000_00:03:00     GIADA SAFE  AGDS002A # Patch CT v.flight 1

+000_00:08:00     GIADA SAFE  AGDS003A # Patch SW v.2.3

+000_00:24:00     GIADA SAFE  AGDS110A # Go to Normal mode

+000_00:26:00     GIADA NORMAL      AGDS311A( \
                                        VGDS037A = Off [ENG])   # Set GDS off

Description: "GIADA operative in normal mode, GDS off, cover closed"

+000_00:27:00     GIADA NORMAL      AGDS037A(\
                                        VGDS037A = Off [ENG])   # Set IS Off

+000_00:28:00     GIADA NORMAL      AGDS036A ( \
                                  VGDS0031 = 0x05 \
                                  VGDS0032 = 0x05 \
                                  VGDS0033 = 0x0f \
                                  VGDS0034 = 0x05 \
                                  VGDS0035 = 0x14 \
                                  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

+000_00:29:00     GIADA NORMAL      AGDS037A(\
                                        VGDS037A = On [ENG])    # Set IS On

+000_00:54:00     GIADA NORMAL      AGDS426A ( \
                                  VGDS0010 = 0xF8 \
                                  VGDS0011 = 0x04 \ # Calibrate IS
                                  REPEAT = 3 \
                                  SEPARATION = 01:00:00 )

#=====================================END====================================#
```