GIADA FS MODEL

REPORT ON
IN FLIGHT PASSIVE CHECKOUT N. 1
02-10-2005

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REVISIONS LOG

REV	DOCUMENT CHANGE ORDER	DATE	CHANGES DESCRIPTION	PREPARED
0	-	02-11-2005	First issue	PI Team

1. SCOPE AND APPLICABILITY

The Passive Checkout 1 (PC1) test is one of the routine checkouts performed during Rosetta cruise. It has been executed on 02 October 2005 by switching on Main and Redundant interfaces in sequence and executing the same procedures in the two cases.

This document reports about the results obtained on GIADA experiment on PC1.

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 @ INAF - Osservatorio Astronomico di Capodimonte in Naples.

GIADA IWS software configuration is GES 4.2.1 plus RSOConverter v 1.1.1, 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 Issue 4.7 09/08/2004	Flight Control Procedure
AD4	GIA-GAL-MA-007 Issue 2	GIADA Flight Spare User Manual

2.2 REFERENCE DOCUMENT

	None.	

3. DEFINITIONS AND ABBREVIATIONS

3.1 ABBREVIATIONS

EGSE	Electrical Ground Support Equipment
ESA	European Space Agency
FCP	Flight Control Procedure
FS	Flight Spare
GDS	Grain Detection System
GIADA	Grain Impact Analyser and Dust Accumulator
HK	House Keeping
I/F	InterFace
INAF-OAC	INAF - Osservatorio Astronomico di Capodimonte – Napoli (I)
IS	Impact Sensor
IWS	Instrument Workstation
MBS	Micro Balance Sensor
MTL	Mission TimeLine
OBCP	On-Board Control Procedure
PI	Principal Investigator
PS	GIADA Power Supply
PZT	(IS) Piezo Sensor
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)
SSMM	Solid State Mass Memory on-board of Rosetta Spacecraft
SW	Software
TM	Telemetry
UTC	Universal Time Code

4. DESCRIPTION OF ACTIVITIES

The Passive Checkout was performed on 02 October 2005 according to the timelines reported in Section 10. Commands were previously loaded in the Rosetta S/C and sent to GIADA via MTL. The plan foresaw to use the nominal FCPs, which have been already validated in the previous GIADA Commissioning phases.

The plan of activities foresaw the following steps for the Main interface:

FCP	**Description**
AGDF0001A-B-C	Beginning of activity – GIADA power on Main interface
AGDS035A	Go to Cover Mode
AGDF090A	Open cover
AGDS065A	Go to Safe mode
AGDS110A	Go to Normal mode (science enabled)
AGDS038A	Set GDS L/R receiver thresholds to 1.6/0.8 V
AGDS037A	Set IS Off
AGDS036A	Set IS PZTA/B/C/D/E threshold to 0.05/0.05/0.15/0.05/0.15 V – Gain = H
AGDS037A	Set IS On
AGDS120A	Calibrate GDS – IS – MBS at 5 min intervals
AGDF100A	Self interference test
AGDF055A	MBS # 1-2-3-4-5 heating
AGDF060A	GIADA Switch-off (with Cover close operation in the Power-off OBCP)

followed by similar steps for the Redundant interface:

FCP	**Description**
AGDF0002A-B-C	Beginning of activity – GIADA power on Red interface
AGDS035A	Go to Cover Mode
AGDF090A	Open cover
AGDS065A	Go to Safe mode
AGDS110A	Go to Normal mode (science enabled)
AGDS038A	Set GDS L/R receiver thresholds to 1.6/0.8 V
AGDS037A	Set IS Off
AGDS036A	Set IS PZTA/B/C/D/E threshold to 0.05/0.05/0.15/0.05/0.15 V – Gain = H
AGDS037A	Set IS On
AGDS120A	Calibrate GDS – IS – MBS at 5 min intervals
AGDF100A	Self interference test
AGDF055A	MBS # 1-2-3-4-5 heating
AGDF060A	GIADA Switch-off (with Cover close operation in the Power-off OBCP)

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

5. SUMMARY OF DATA ANALYSIS

The full sets of plots about Housekeeping and Science data are reported in Sections 7 and 8 for Main and Redundant I/F's, respectively.

Here following the main findings are summarised.

5.1 GENERAL CONSIDERATIONS

The test started on "Sun Oct 02 2005 10:43:12.526585", 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 "Sun Oct 02 2005 22:20:02.244242". The test on the Redundant interface started on "Sun Oct 02 2005 22:43:12.533528" (1st packet received) and ended on "Mon Oct 03 2005 10:20:02.376185" (last packet received).

All expected steps were correctly executed.

Due to data download/transmission problems from the Rosetta S/C, presently under investigation by ESA, the "event" packets, type 5, subtype 1 were lost.

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

Except for the mentioned "lost events" and service 17,2, no packets were lost, neither HK nor SCI TM (Main: Figure 7.1-8, Figure 7.1-9, Figure 7.1-10, Figure 7.1-11; Red: Figure 8.1-8, Figure 8.1-9, Figure 8.1-10, Figure 8.1-11) and the **SSMM memory allocated to GIADA (1 Mbytes) is not saturated.**

Due to the loss of events mentioned above, **all "cover reports" were lost**, so that **it was not possible to trace the correct open-close cover operations**. However, despite the poor time resolution, fortunately the cover "closed reed switch" (CLOSED_RS) parameter in the HK data revealed the transition 0-1-0 during the cover close operation with the redundant interface (last closing operation), so testifying the **correct closing operation** (see Figure 8.1-5). Moreover, all other HK parameters (e.g., temperatures) and SCI data of GIADA were in line with a correct open-close sequence both with the Main and the Red. interfaces.

5.2 GIADA STATUS

The **current consumption** and **power supply temperatures** (Main: Figure 7.1-7; Red: Figure 8.1-7) are in line with nominal evolution of operative modes (Main: Figure 7.1-6; Red: Figure 8.1-6). Power values must be compared with soft and hard limits reported in GIADA FS UM (**AD4**) and summarised in Table 5.2-1. These values refer to "nominal operation in Normal Mode". As expected, **out of limits** occur when GIADA is not in Normal Mode or when it is in Normal Mode but some subsystems are OFF (see Section 10).

In general, all functional parameters measured during the PC1 test behave as expected.

Different values of current are measured **on the 5 V line** between Main (1050 mA) and Red (< 1000 mA) I/F (Main: Figure 7.1-6 and Red: Figure 8.1-6). This behaviour **is as expected**.

QUANTITY	NAME	LNAME	SOFT ALARM LIMITS		HARD ALARM LIMITS	
			Lower	Upper	Lower	Upper
+5V Power Consumption	NGDD0086	Current +5V	350 mA	1600 mA	300 mA	1800 mA
+15V Power Consumption	NGDD0087	Current +15V	350 mA	700 mA	300 mA	790 mA
-15V Power Consumption	NGDD0088	Current -15V	200 mA	350 mA	150 mA	400 mA

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

All **Temperatures** behave **as expected** (Main: Figure 7.1-2, Figure 7.1-3, Figure 7.1-4, Red: Figure 8.1-2, Figure 8.1-3, Figure 8.1-4).

The trend of the **IS Temperature is more noisy with the Main** than with the Red I/F (Main: Figure 7.3-4; Red: Figure 8.3-4).

The behaviour of the **GDS Laser 1 Monitor vs. Temperature** presents an offset between Main and Red measurements (Figure 7.2-5, Figure 8.2-5 and Figure 9.1-1). This effect is simply due to a wrong digitalisation of the CAL factors in the conversion tables of the PI EGSE SW, **to be corrected for future computations**.

The behaviour of the **GDS Laser 2 Monitor vs. Temperature** presents some slight difference with previous measurements (Figure 7.2-6, Figure 8.2-6 and Figure 9.1-2). This effect might be due to **some sort of hysteresis**.

The behaviour of the **GDS Laser 4 Monitor vs. Temperature** presents some difference between Main and Red and with previous measurements (Figure 7.2-8, Figure 8.2-8 and Figure 9.1-4). This effect might be due to **some sort of hysteresis**.

The **detection thresholds** applied on GDS are shown in Figure 7.2-2 (Main) and Figure 8.2-2 (Red), while those applied to PZT3 and 5 of IS are shown in Figure 7.3-2 and Figure 7.3-3 (Main) and Figure 8.3-2 and Figure 8.3-3 (Red). 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

About **scientific data** we notice the following points.

The GDS output is **saturated**. This effect was expected due to OP conditions: Sun in FoV. Therefore, it is impossible to evaluate potential effects of internal stray-light and interference generating GDS spurious events. The saturation reflects in **NO GDS scientific event** detection (some event due to stray-light could be expected) and in the (low) **levels of output** during Calibration of GDS Left and Right channels (Main: Figure 7.2-9, Red: Figure 8.2-9)

The "**Dust Monitor**" presents **1 or 2 detections** in Main (Figure 7.3-14) and Red (Figure 8.3-11). It has to be noted that a "Dust Flux" > 0 is possible when just one PZT detects a signal above the threshold.

Some **IS Channel E (PZT 5) Mean CAL values are > 0.1 V**, while value should be around 0 (Main: Figure 7.3-19; Red: Figure 8.3-16).

Some **IS scientific events on Channel E (PZT5)** occur at the beginning of the session **only with the Main** I/F (Figure 7.3-11). Other IS Channels have detected only a few events (see Main: from Figure 7.3-7 to Figure 7.3-10 and Red: from Figure 8.3-6 to Figure 8.3-9). An analysis on these events is reported in Section 5.2.1.

The last **IS CAL** (8 steps rather than 4) are performed at **9.6 V amplitude instead of 10 V** as the others. This is linked to the different setting of the calibration parameters within the "Self Interference Test" procedure. Thus, the IS outputs of the stimuli are lower in the former cases (see Main: from Figure 7.3-21 to Figure 7.3-25 and Red: from Figure 8.3-18 to Figure 8.3-22).

The frequency level of **MBS1** (oriented in the +Xu direction) is **increased by an offset of 80 Hz with respect to PC0** while the frequency – temperature behaviour is unchanged (Figure 9.3-1). All other MBS's present frequency absolute values and frequency-temperature trends unchanged with respect to previous tests. The result on MBS1 suggests some sort of **further stable contamination from PC0 to PC1 for an estimated total mass of $1.6 \cdot 10^{-8}$ g.**

5.2.1 Analysis of IS SCI events on the Main (and Redundant) I/F

Here following is an analysis of the IS SCI events detected on the Main I/F.

IS Events detected by Channel A (Figure 7.3-7)
- 6 events detected
- events detected by Ch-A are the same detected by Ch-B
- all events detected by Ch-A but 1 are also detected by Ch-C
- all events detected by Ch-A are also detected by Ch-D
- no event detected by Ch-A is also detected by Ch-E

IS Events detected by Channel B (Figure 7.3-8)
- 6 events detected
- events detected by Ch-B are the same detected by Ch-A
- all events detected by Ch-B but 1 are also detected by Ch-C
- all events detected by Ch-B are also detected by Ch-D
- no event detected by Ch-B is also detected by Ch-E

IS Events detected by Channel C (Figure 7.3-9)
- 7 events detected – 2 of them are detected only by Ch-C
- the other 5 events detected by Ch-C are also detected by Ch-A
- the other 5 events detected by Ch-C are also detected by Ch-B
- the other 5 events detected by Ch-C are also detected by Ch-D
- no event detected by Ch-C is also detected by Ch-E

IS Events detected by Channel D (Figure 7.3-10)
- 11 events detected
- 5 events detected by Ch-D are detected by Ch-A, B, C – 1 event detected by Ch-D is detected by Ch-A, B
- 5 events are detected by Ch-D only
- no event detected by Ch-D is also detected by Ch-E

IS Events detected by Channel E (Figure 7.3-11)
- Ch-E detects 90 events
- None of them is detected by the other Channels

Conclusions:
- Ch-A and Ch-B detect the same (six) events
- **5 events** are simultaneously detected by **Ch-A, B, C and D**, but not by Ch-E at IS_EVENT_TIMEs 86879778.83, 86905897.3, 86907697.29, 86907762.38, 86908357.3 s
- **1 event** is simultaneously detected by **Ch-A, B, D**, but not by Ch-C, E at IS_EVENT_TIME 86907697.30 s
- **5 events** are detected by **Ch-D only** at IS_EVENT_TIME 86877781.17, 86878895.21, 86881818.43, 86882647.3, 86885007.41 s
- **90 events** are detected by **Ch-E only**
- None of the events detected by Ch-A, B, C, D is also detected by Ch-E
- None of the events detected by Ch-E is also detected by Ch-A, B, C, D

The events detected by Channels A-B-C-D are summarised in Table 5.2-3. 5 of these events do occur in coincidence with other GIADA transitions. The others do not seem correlated to any other GIADA event and cannot be easily identified.

IS	Time	Event
D	86877781.17	
D	86878895.21	
A, B, C, D	86879778.83	
D	86881818.43	
D	86882647.30	
D	86885007.41	
A, B, C, D	86905897.30	Laser OFF
A, B, C, D	86907697.29	Laser Power ON
A, B, C	86907697.30	Laser Power ON
A, B, C, D	86907762.38	Laser ON
A, B, C, D	86908357.30	Laser OFF

Table 5.2-3. IS SCI Events from PZTs A-B-C-D

About the 90 events detected by Ch-E, they may be due to some noise effect on the channel, as they do not correspond to any detection on the other PZTs. In addition, these events do not appear correlated to IS Calibrations (Figure 7.3-13). Some correlation could be present with IS Temperature (Figure 7.3-12): in fact the IS signal decreases with increasing T and after sometime from the beginning of operations the “ghost events” disappear.

For comparison, **on the Red I/F** the number of IS SCI Detected events is very low: 2 on Ch-A, 2 on Ch-B, 2 on Ch-C, 2 on Ch-D and none on Ch-E. All of these events coincide with other GIADA transitions, but the 2 detected by Ch-D ONLY, that fall very close in time and do not correspond to any other GIADA event. It is interesting to note that NO Ch-E SCI event is measured. This could indicate a **less noisy behaviour** of GIADA on the Red I/F. We note also that the **IS Temperature** through all the Red test (Figure 8.3-4) is above the values for which Ch-E generated “ghost events” on the Main I/F.

6. CONCLUSION

According to the above data elaboration and results, the following conclusions can be drawn about the Passive Checkout 1:

- No loss of science TM was observed since no flood of Ghost events was produced by GIADA. All **event reports were lost** due to S/C – ground data transmission problems under investigation by ESA.
- The not synchronised TM report (i.e. Connection report 17,2 which is the first packet produced by GIADA after the switch-on) had a wrong UTC time and this can result in absence of this packet in the time window of the test. **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's) temperatures were in the nominal range, as well as the current consumption during all the phases of the test. The GIADA cover operations could not be followed in detail due to the **loss of the "cover reports"** (as part of the loss of all event reports type 5, subtype 1, under investigation by ESA). However, the monitoring of other GIADA parameters demonstrates that the cover was correctly open and that it was finally closed at the end of the full PC1 test.
- The received Acceptance Failure Report (1,2) '*Inconsistent Packet Data Field (TC Packet Type/Subtype = 20,1) - TC does not produce any change'* (which is received at the start of the MBS heating procedure) is fully understandable because GIADA has already the science TM enabled (refer to the procedure in Section 10) and thus the second 'Enable Sci TM' command is correctly discarded.
- At one of the IS power-on (both in Main and Red), the event '*Hardware error in IS event detection circuitry. No IRQ received*' was received. This is a known problem that may happen @ IS power-on.
- The GDS produced no "ghost events". However, the GDS was permanently saturated, as expected due to the S/C attitude with respect to the Sun.
- The IS Channel E produced few "ghost events". The results of the IS calibration are the same as measured during the other tests.
- **For MBS 1 it was observed a further increase of frequency by 80 Hz on average with respect to PC0**.

7. PC1 DATA ANALYSIS – MAIN INTERFACE

7.1 GIADA STATUS

Figure 7.1-1. HK Status of GIADA and S/S vs. time - Main

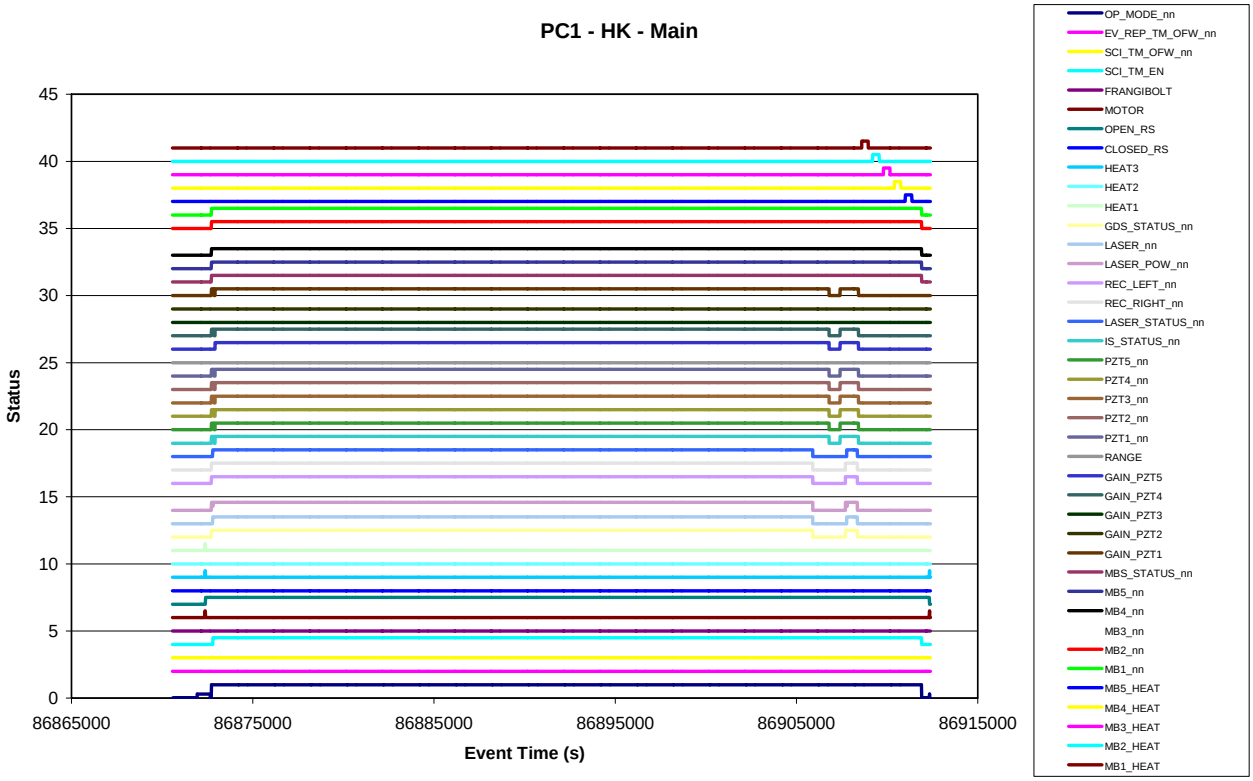


Figure 7.1-2. Evolution of all temperatures vs. time - HK, HK-SCI, SCI - Main

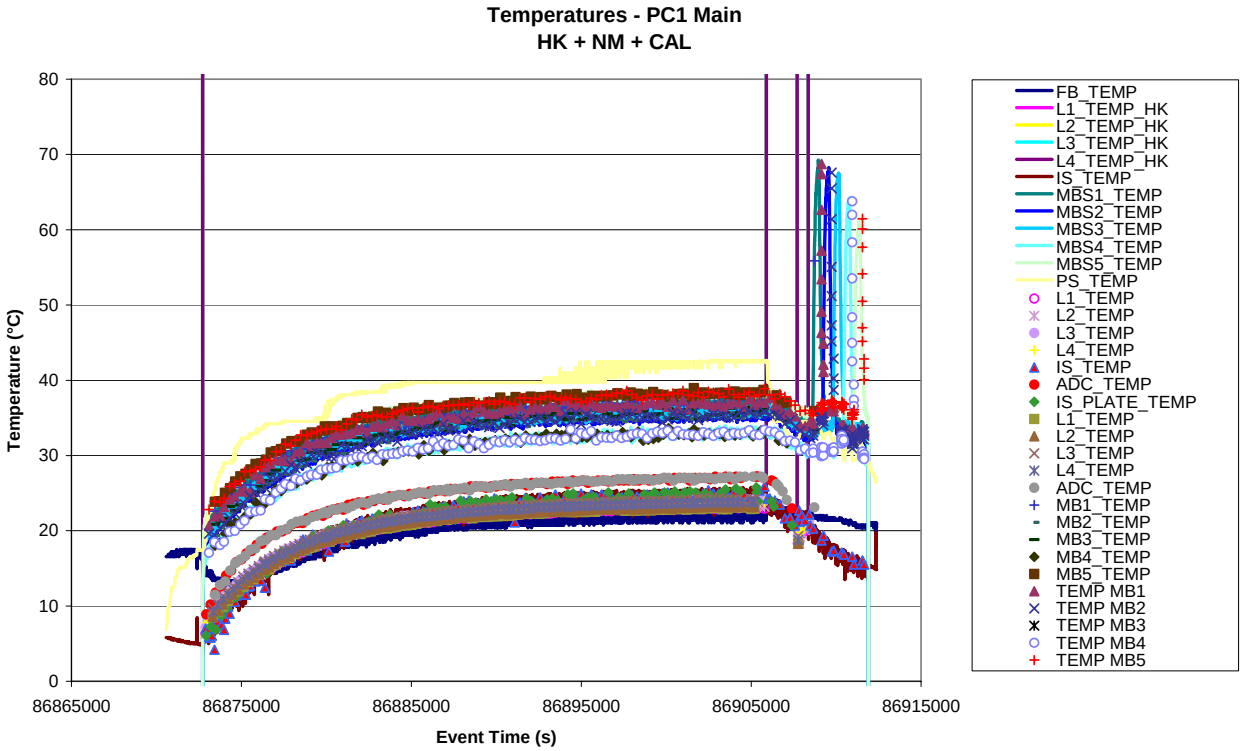


Figure 7.1-3. Evolution of temperatures of system elements vs. time - HK, HK-SCI, SCI - Main

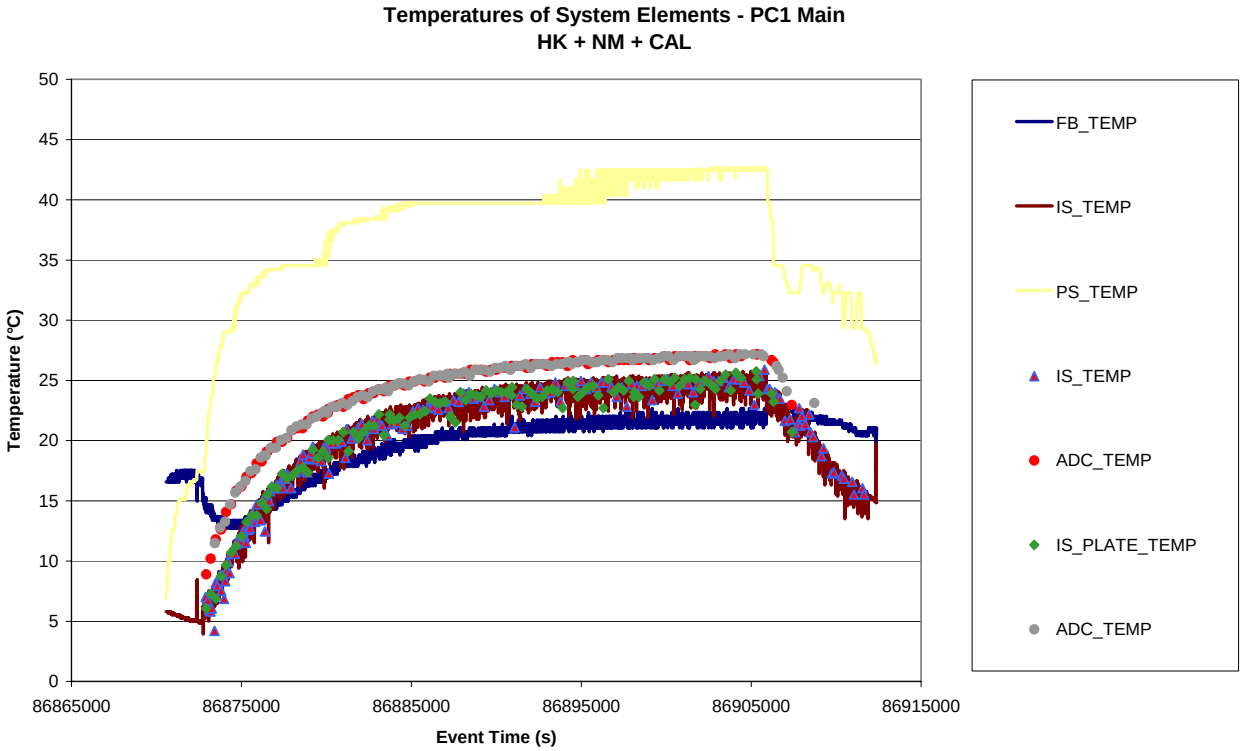


Figure 7.1-4. Evolution of temperatures of sub-systems vs. time - HK, HK-SCI, SCI - Main

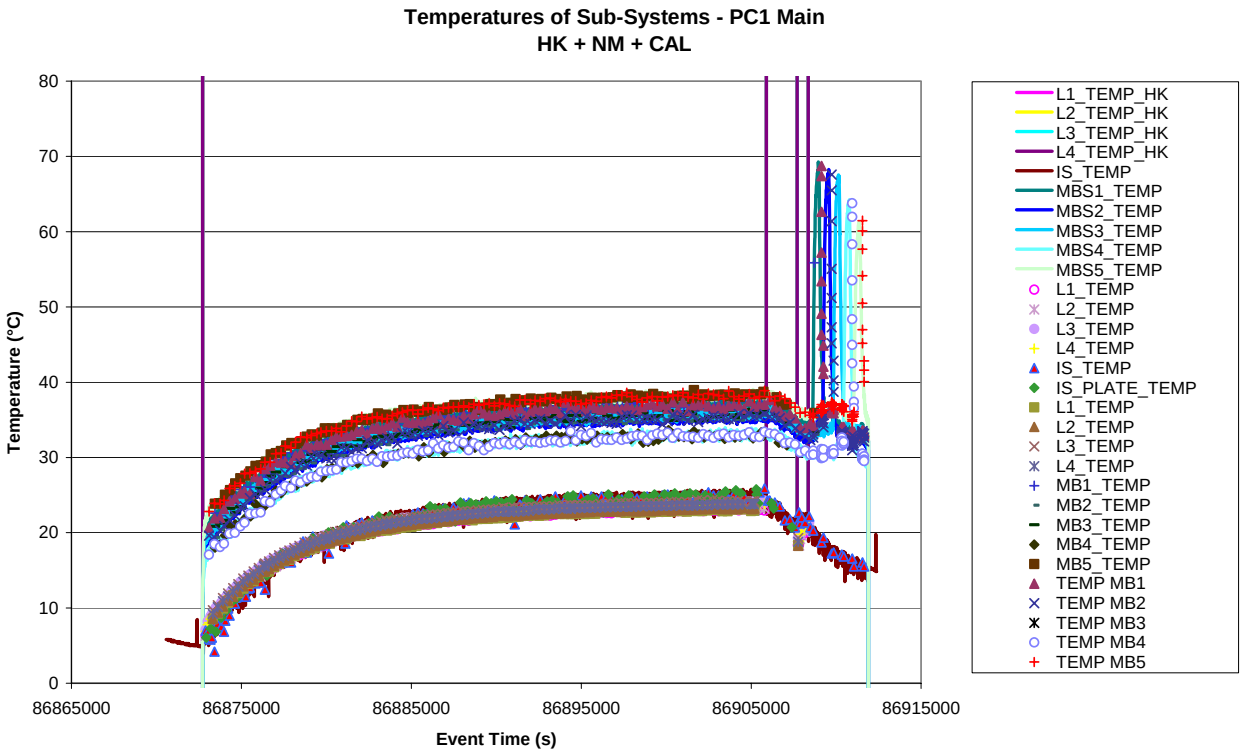


Figure 7.1-5. Operation Status vs. time - Main

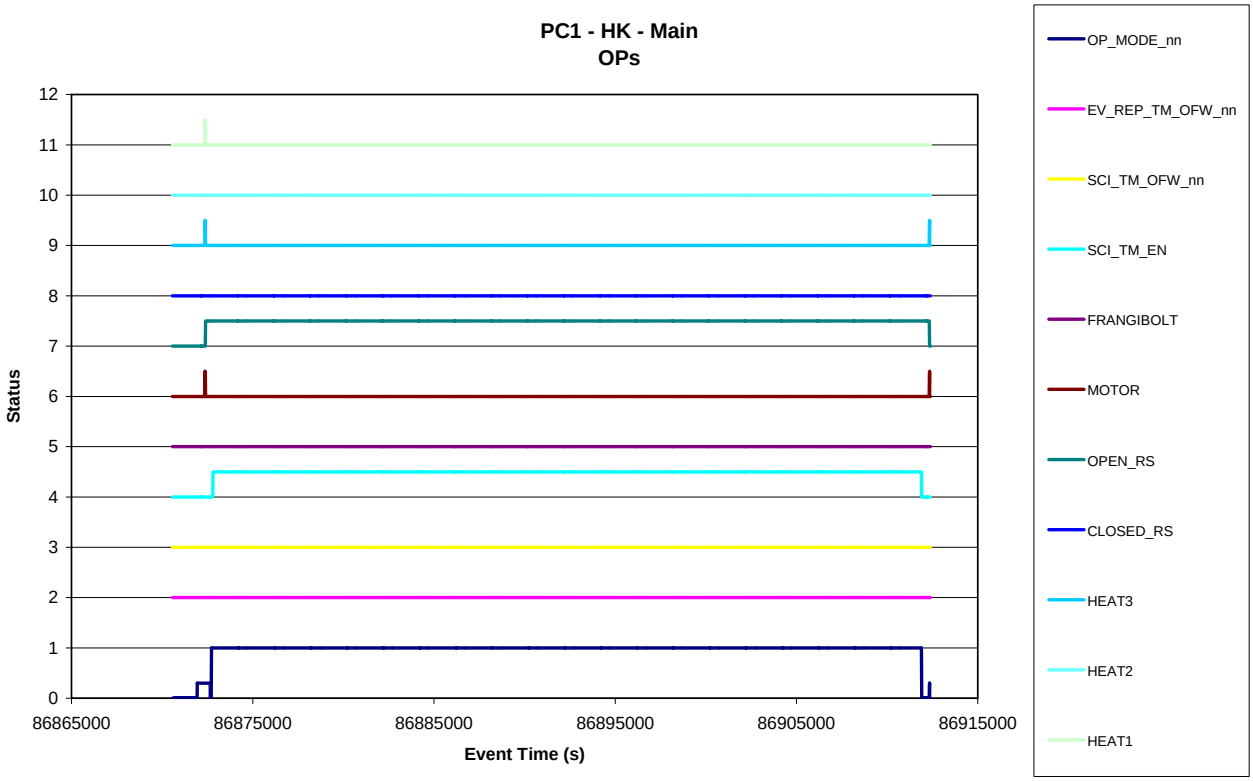


Figure 7.1-6. Power behaviour - Main

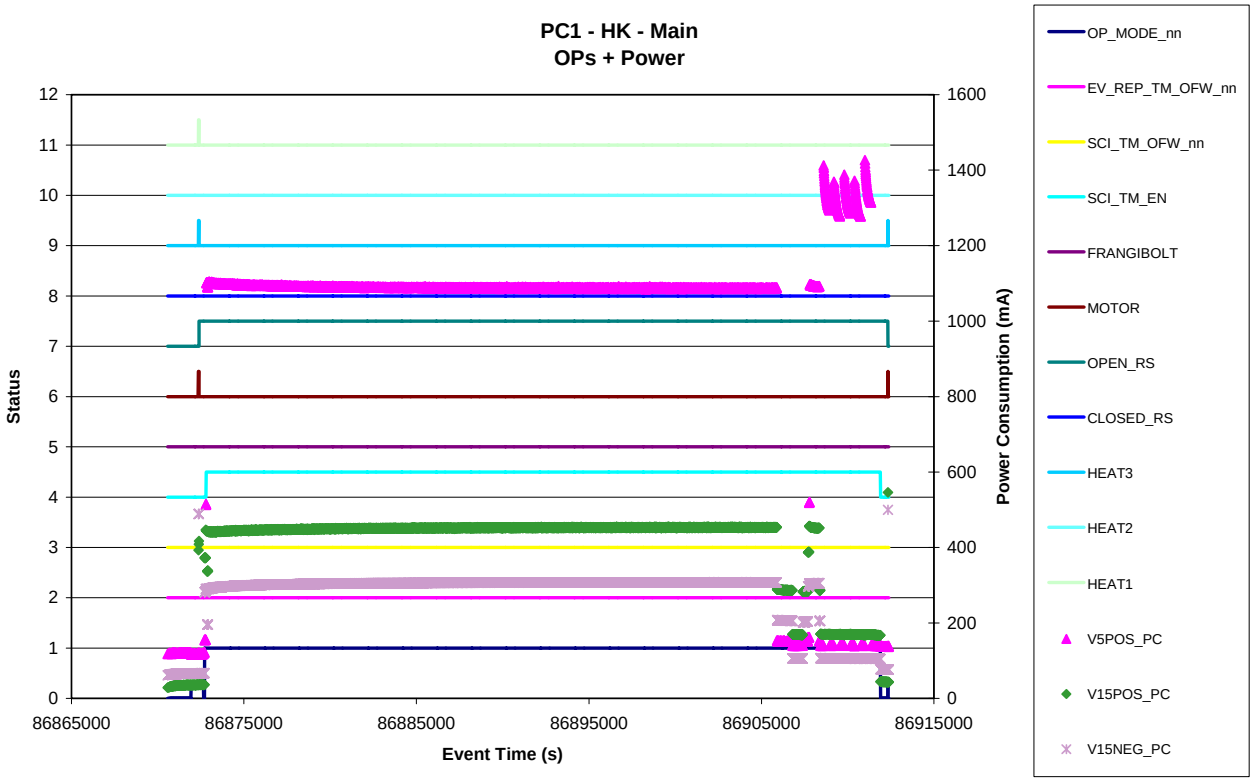


Figure 7.1-7. Power and PS temperature behaviour - Main

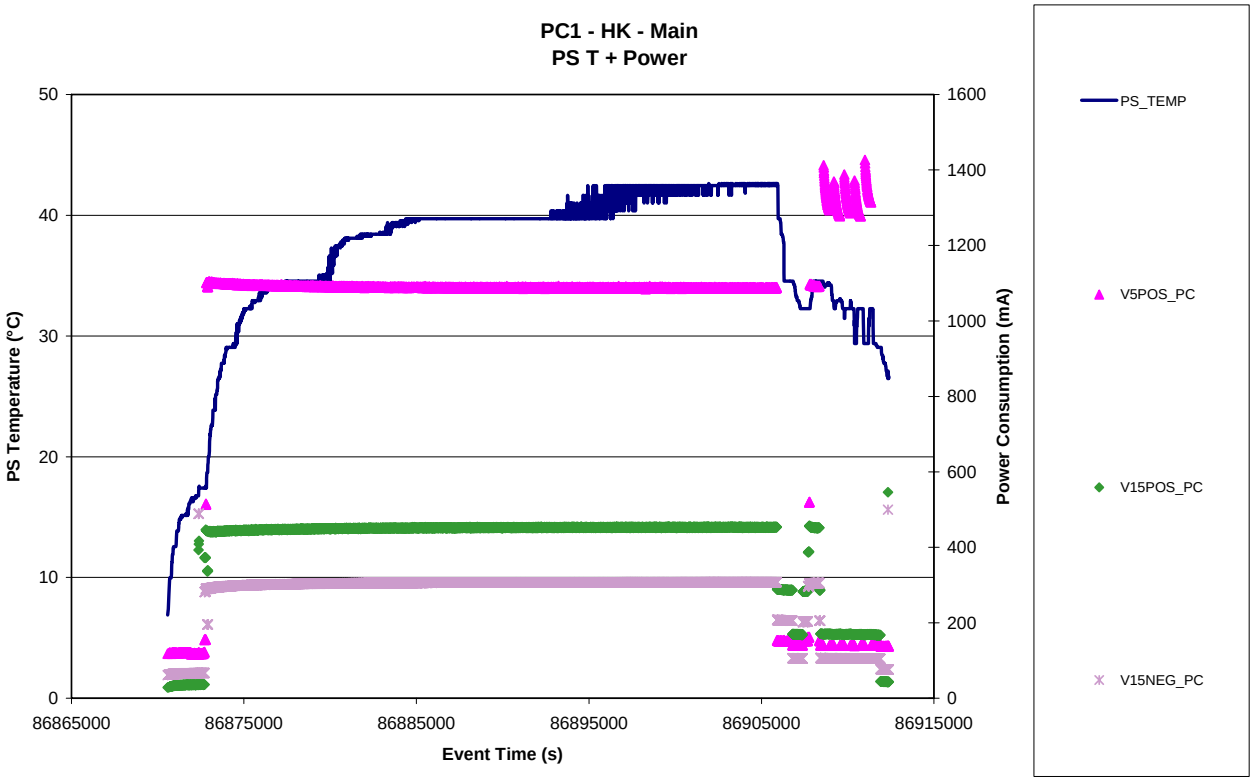


Figure 7.1-8. Source Sequence Count (SSC) of HK Telemetry vs. Time - Main

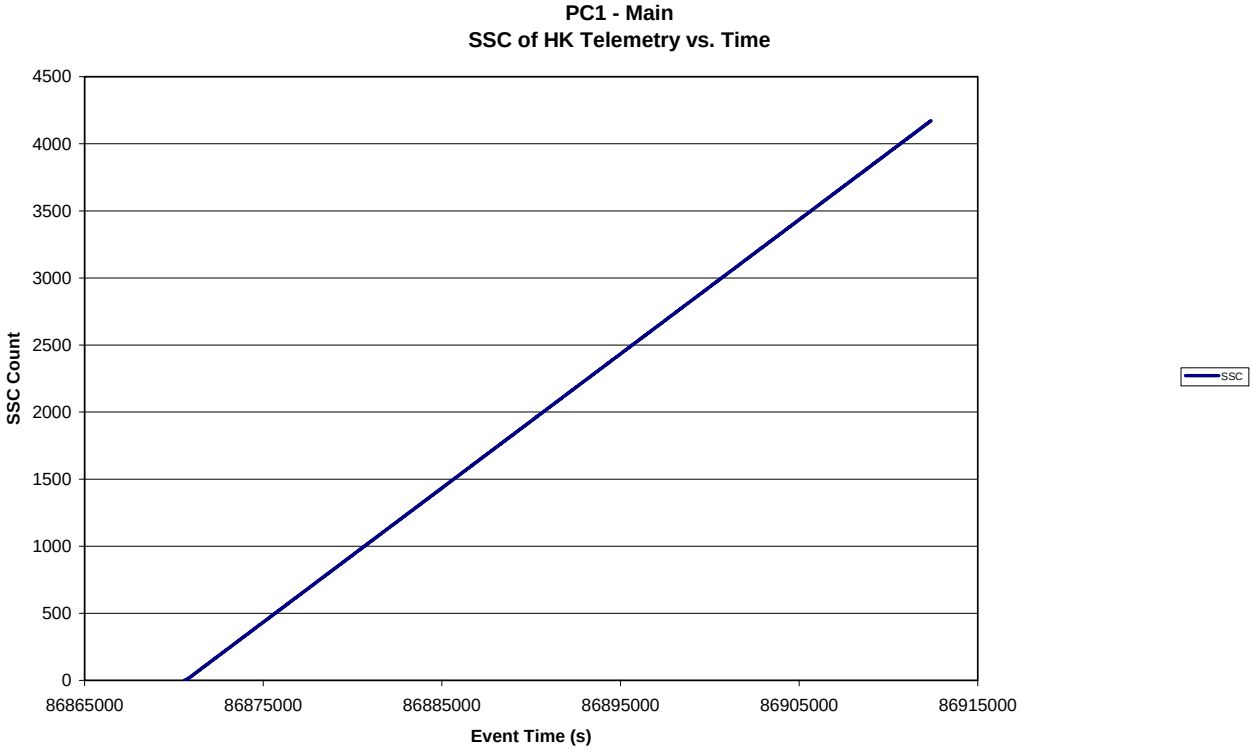


Figure 7.1-9. Source Sequence Count (SSC) of HK Telemetry vs. Number - Main

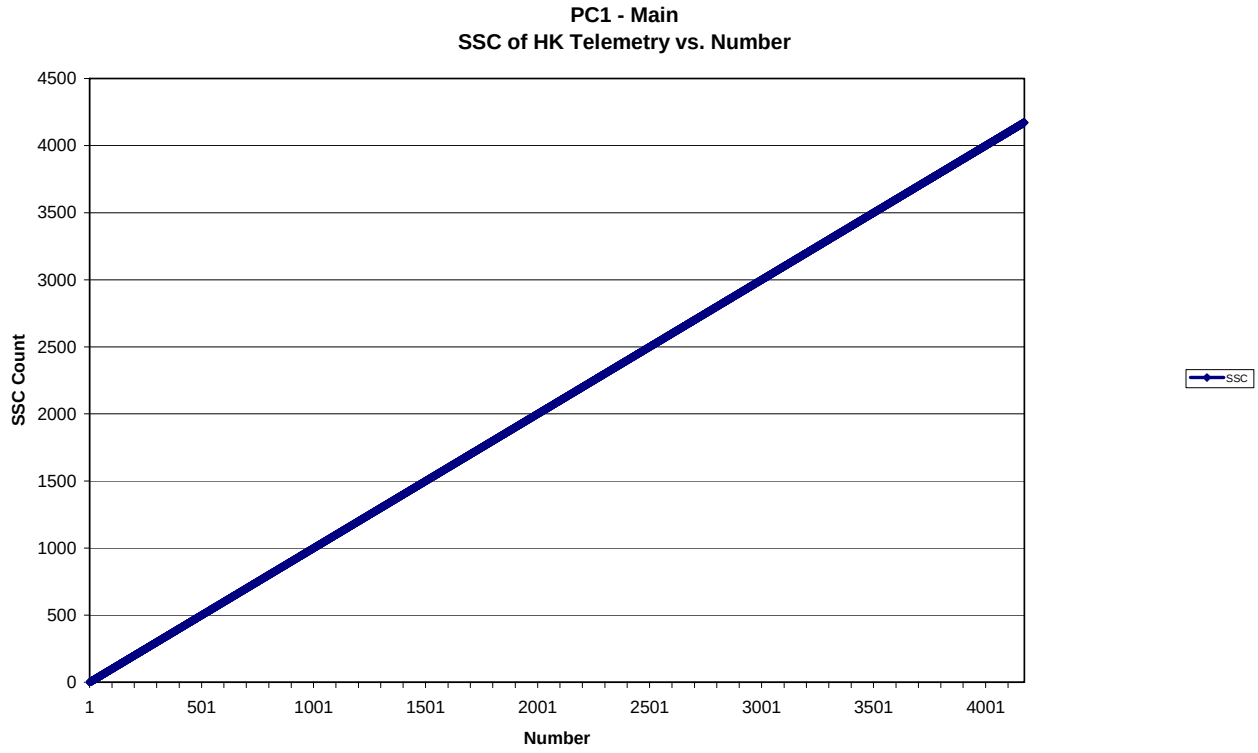


Figure 7.1-10. Source Sequence Count (SSC) of SCI Telemetry vs. Time - Main

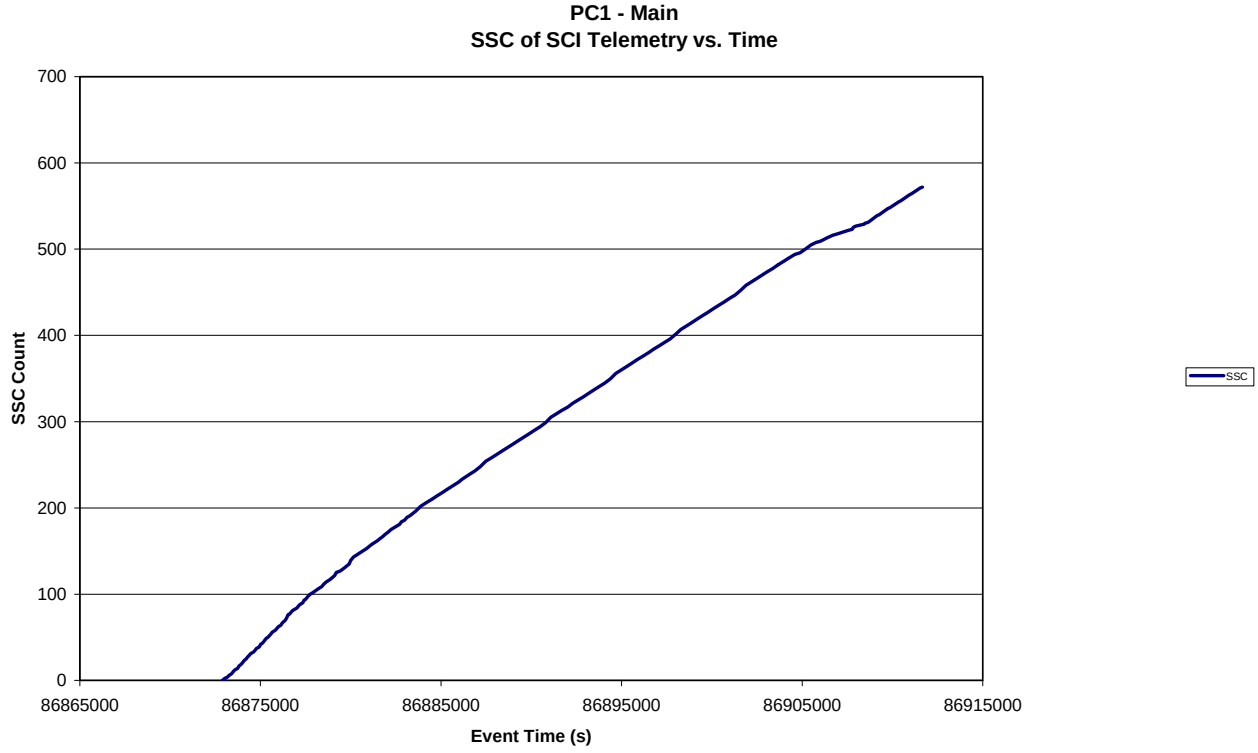
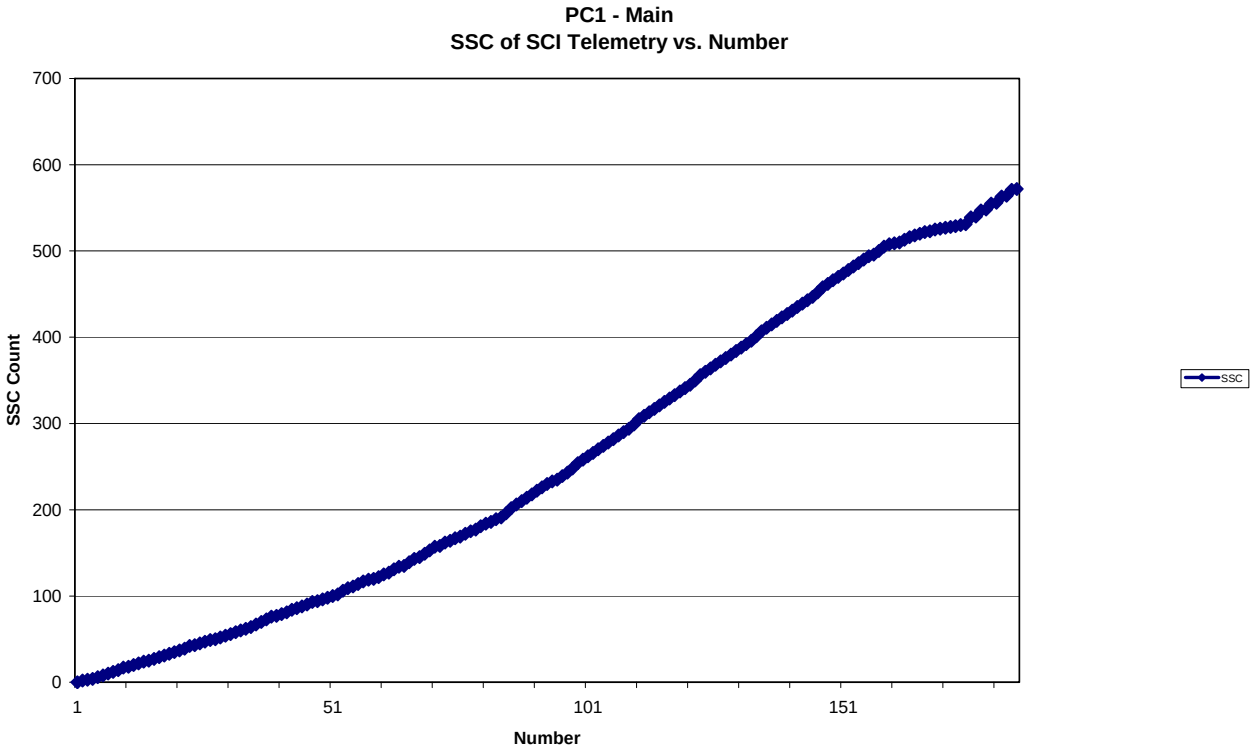


Figure 7.1-11. Source Sequence Count (SSC) of SCI Telemetry vs. Number - Main



7.2 GRAIN DETECTION SYSTEM (GDS)

7.2.1 GDS – Status

Figure 7.2-1. GDS Operation Status vs. time - Main

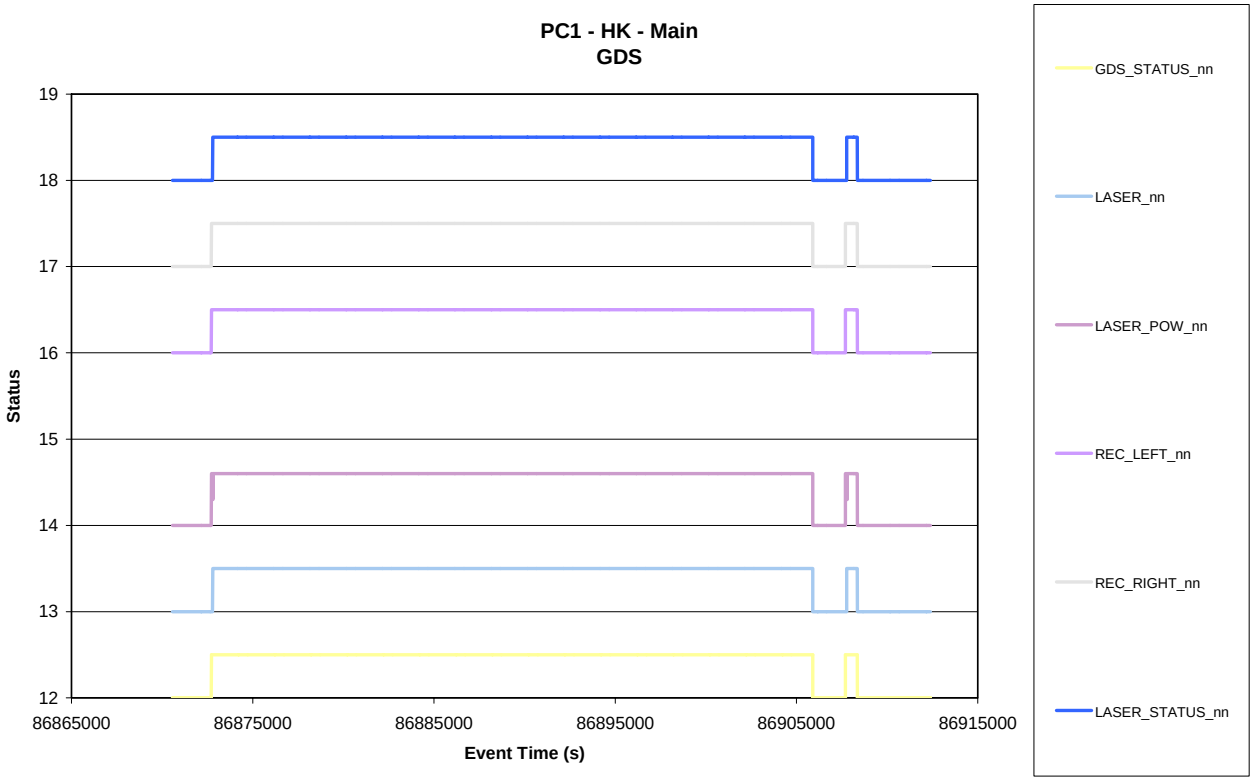


Figure 7.2-2. GDS Thresholds change vs. time - Main

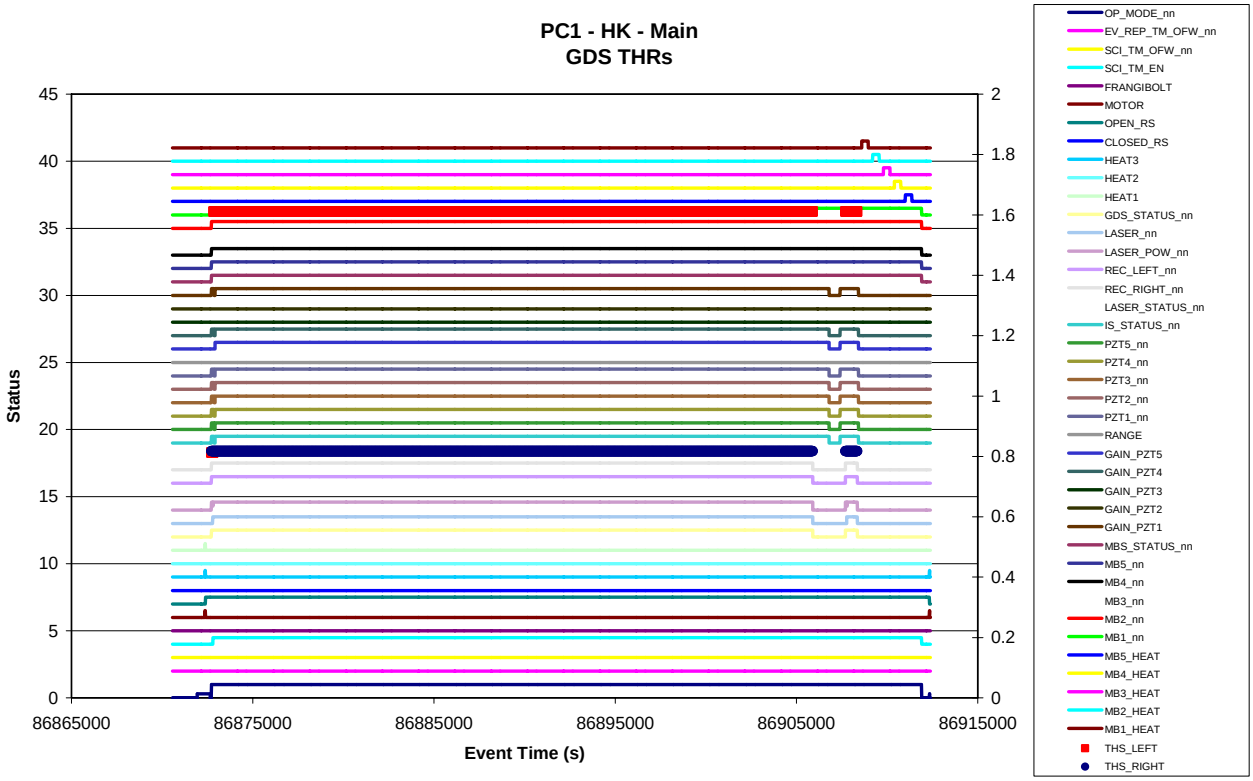


Figure 7.2-3. GDS Laser Temperatures vs. time (HK, HK-SCI, SCI) - Main

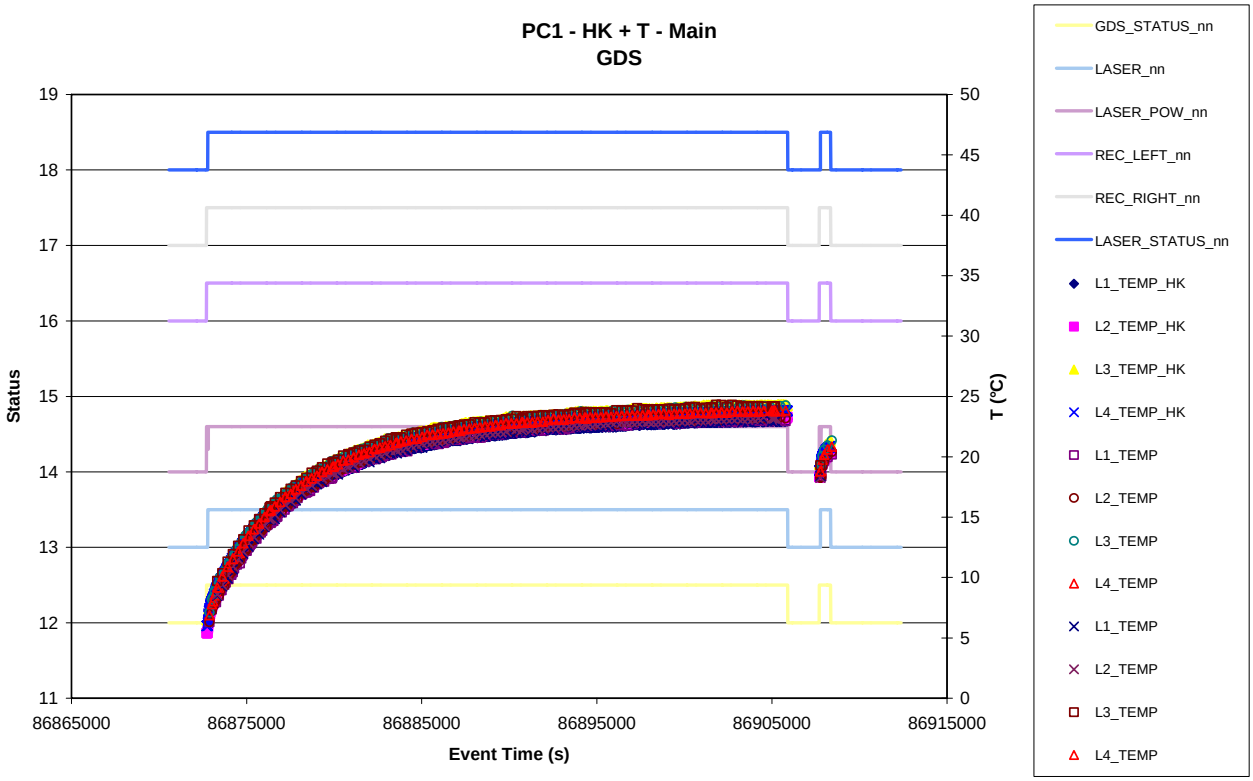


Figure 7.2-4. GDS Laser Monitor vs. time (HK, HK-SCI, SCI) - Main

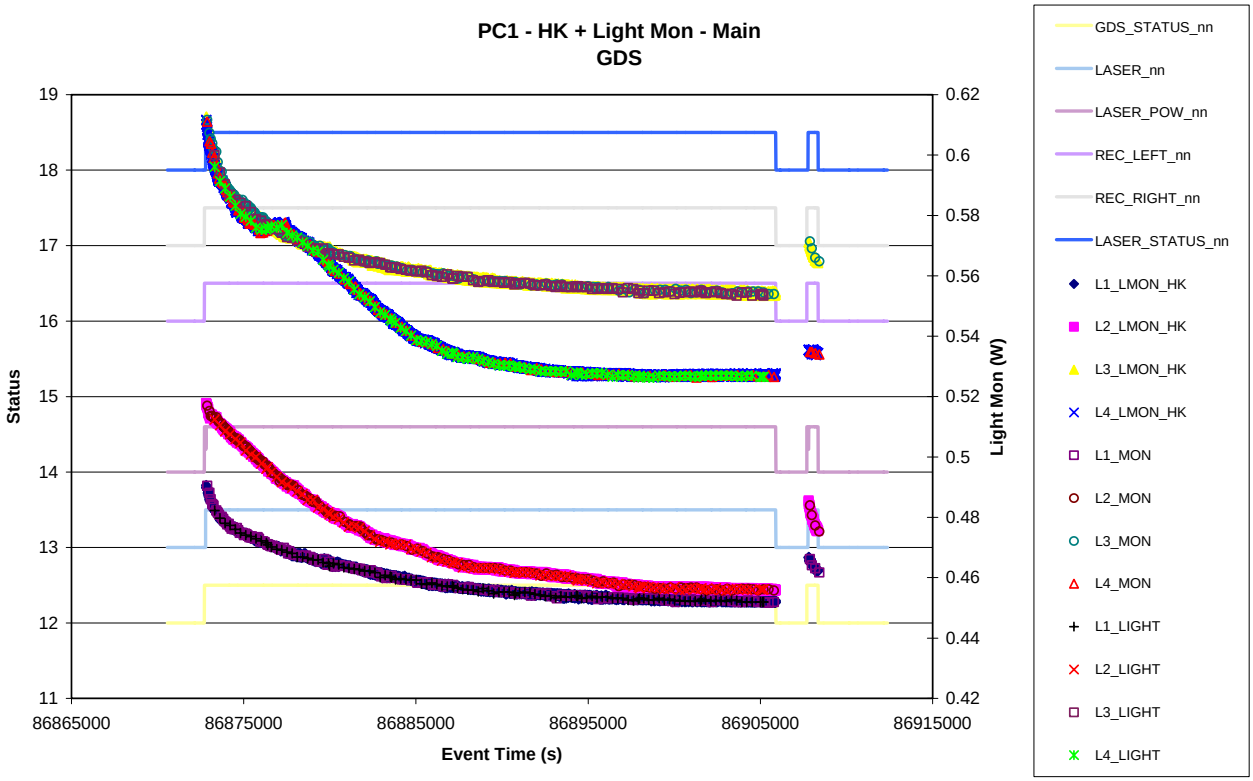


Figure 7.2-5. Laser 1 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Main

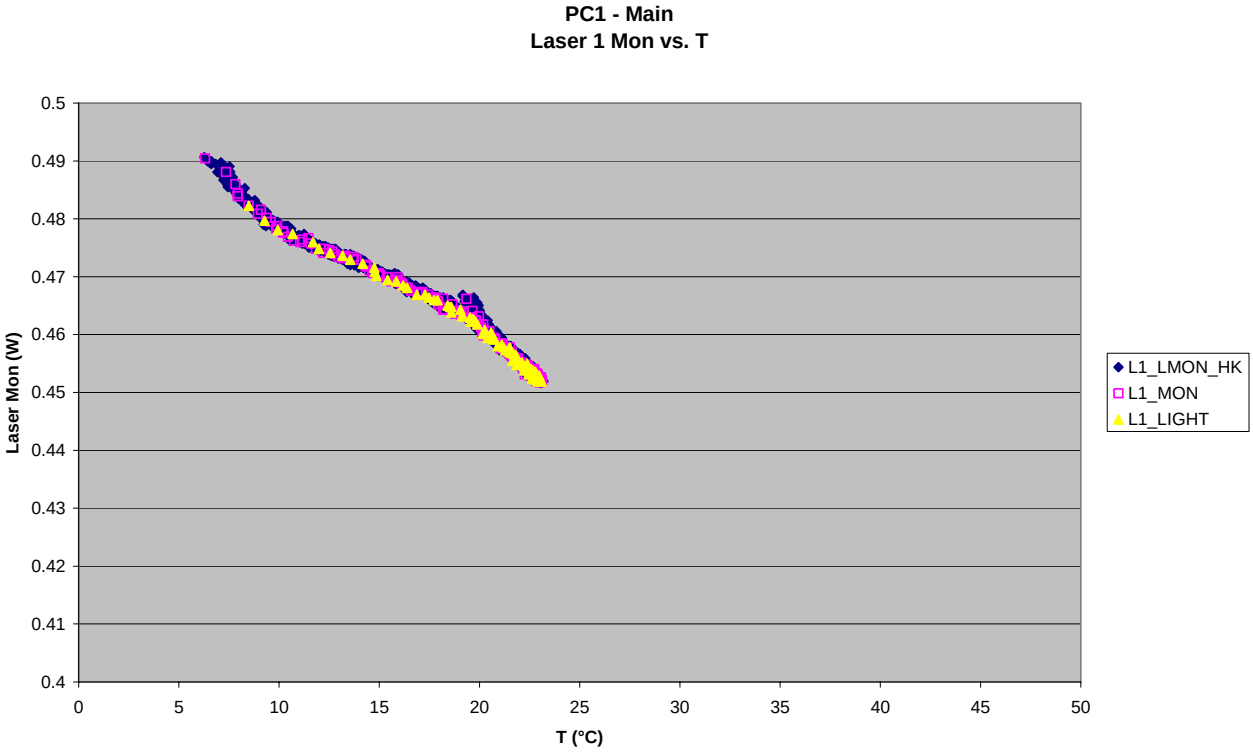


Figure 7.2-6. Laser 2 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Main

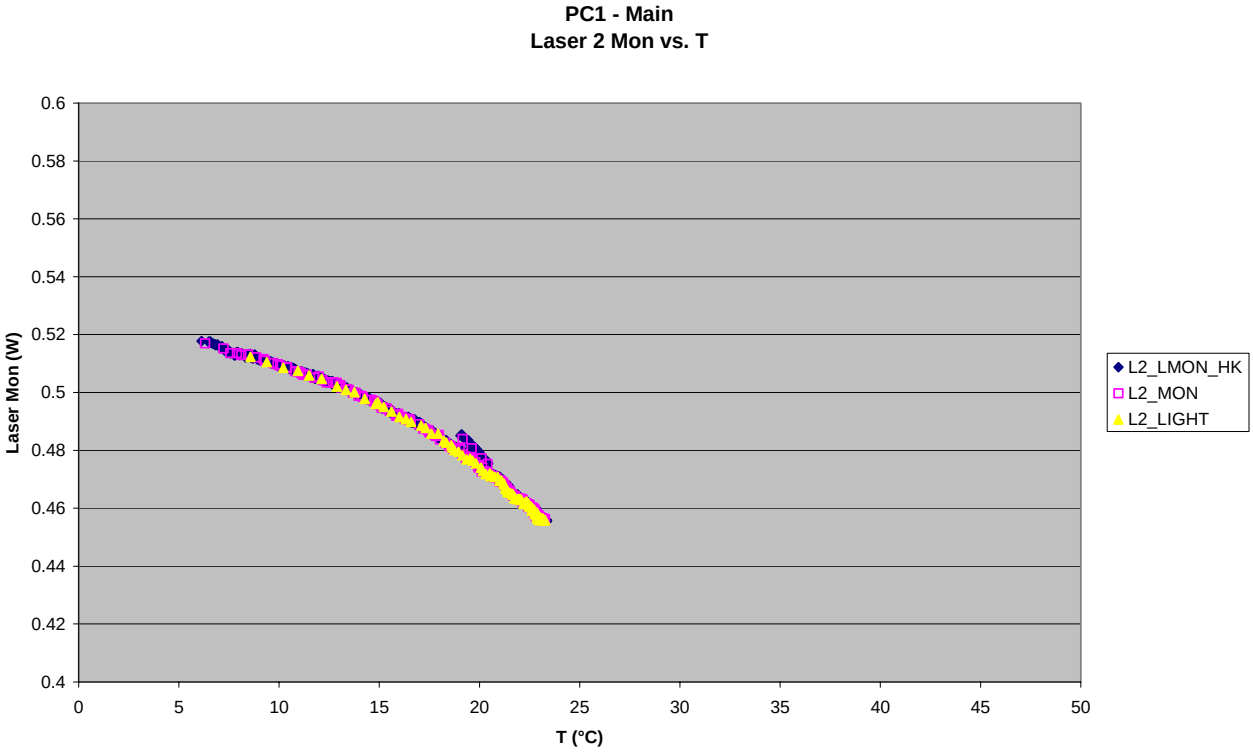


Figure 7.2-7. Laser 3 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Main

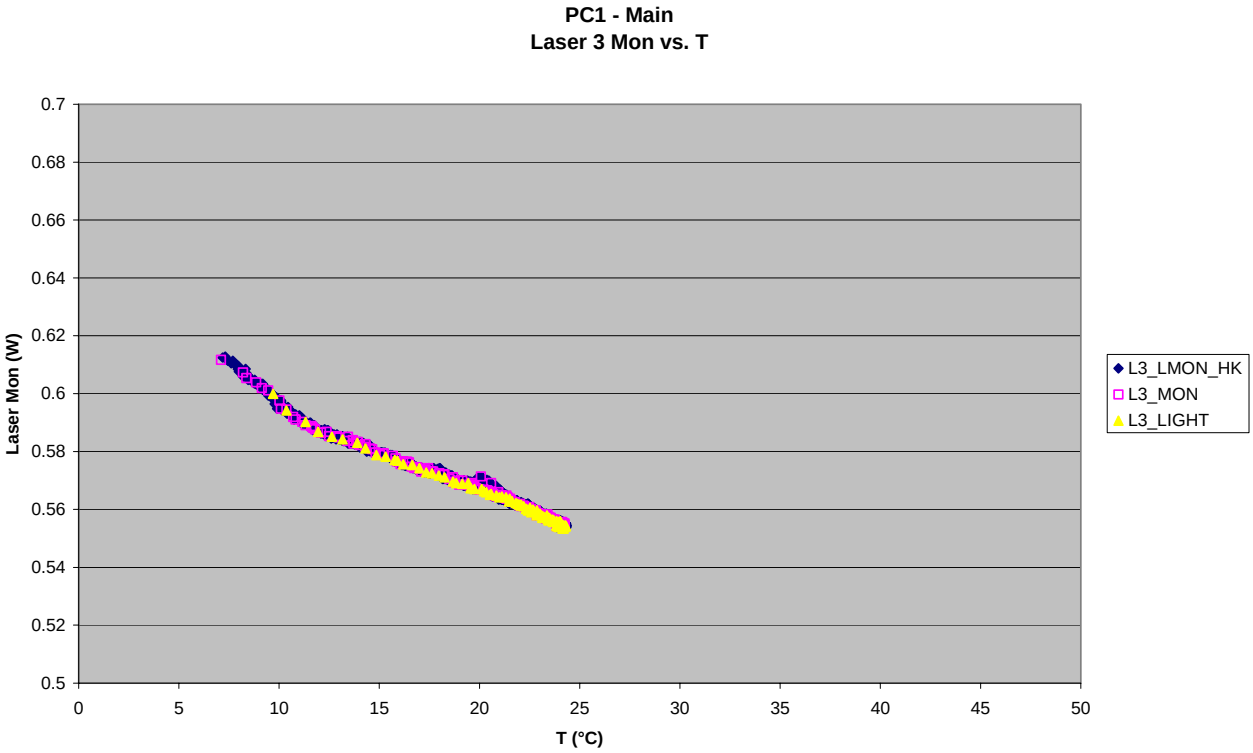
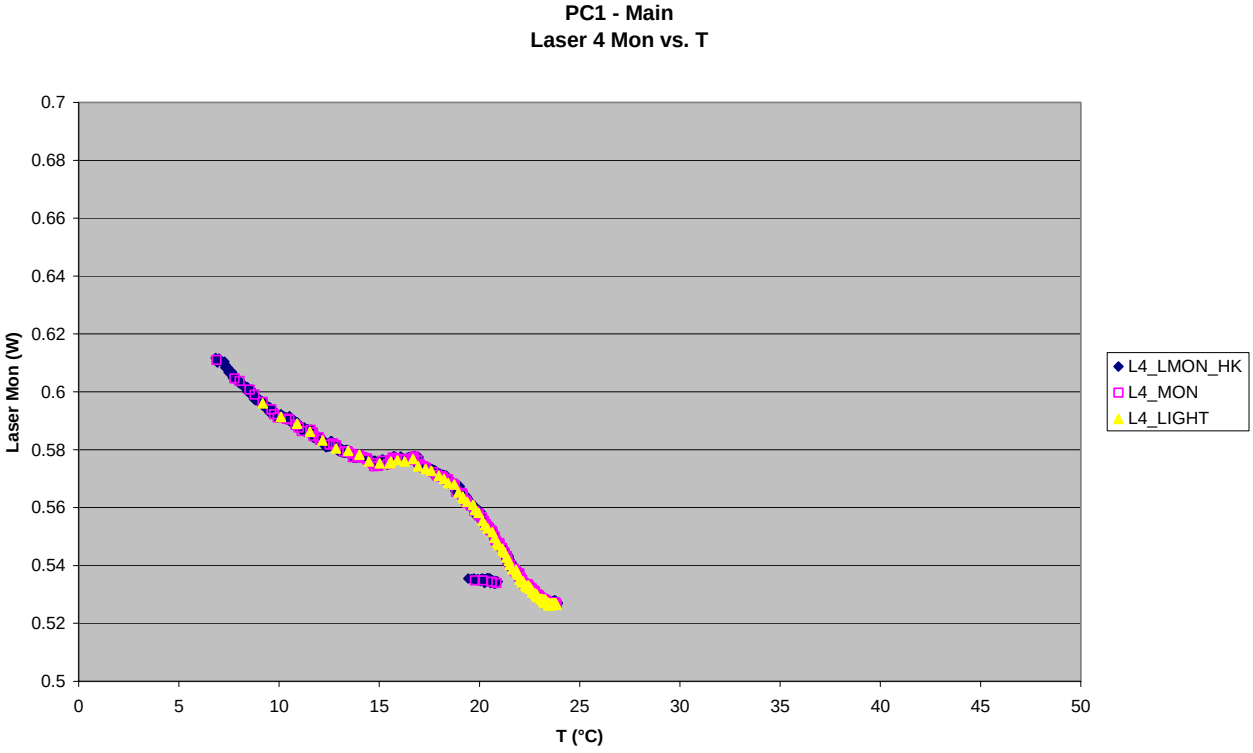


Figure 7.2-8. Laser 4 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Main



7.2.2 GDS – Left & Right

7.2.2.1 Science Events

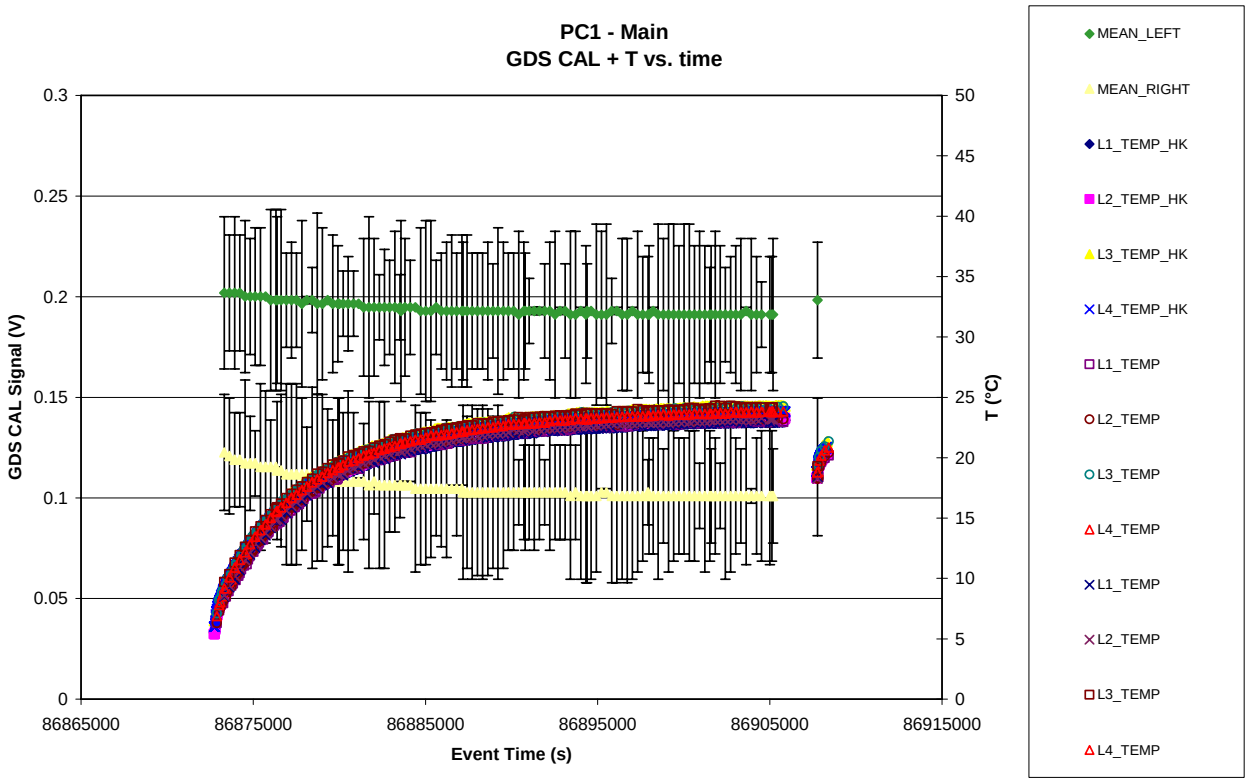
No event detected

7.2.2.2 Event Rates

Not applicable

7.2.2.3 CAL

Figure 7.2-9. Evolution of GDS CAL Left and Right signals (and T) vs. time (Main)



7.3 IMPACT SENSOR (IS)

7.3.1 IS – Status

Figure 7.3-1. IS Operation Status vs. time - Main

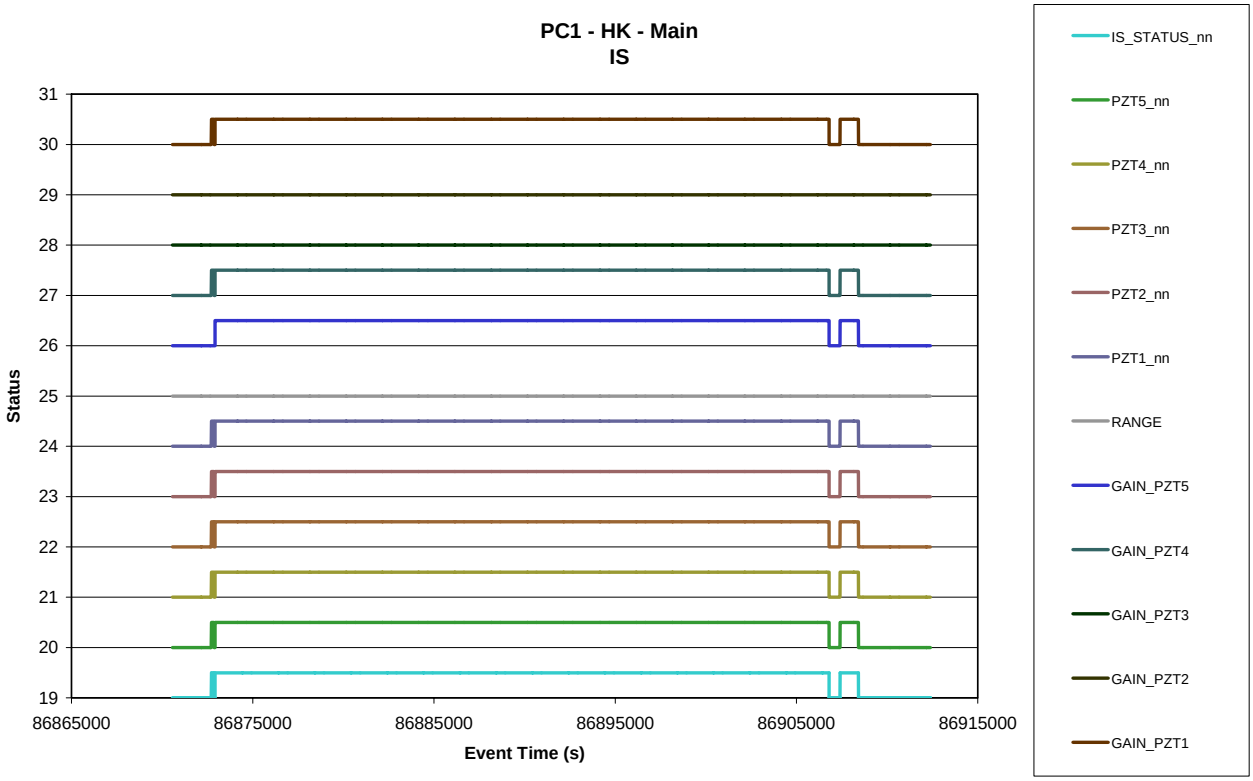


Figure 7.3-2. IS PZT 3 Thresholds change vs. time - Main

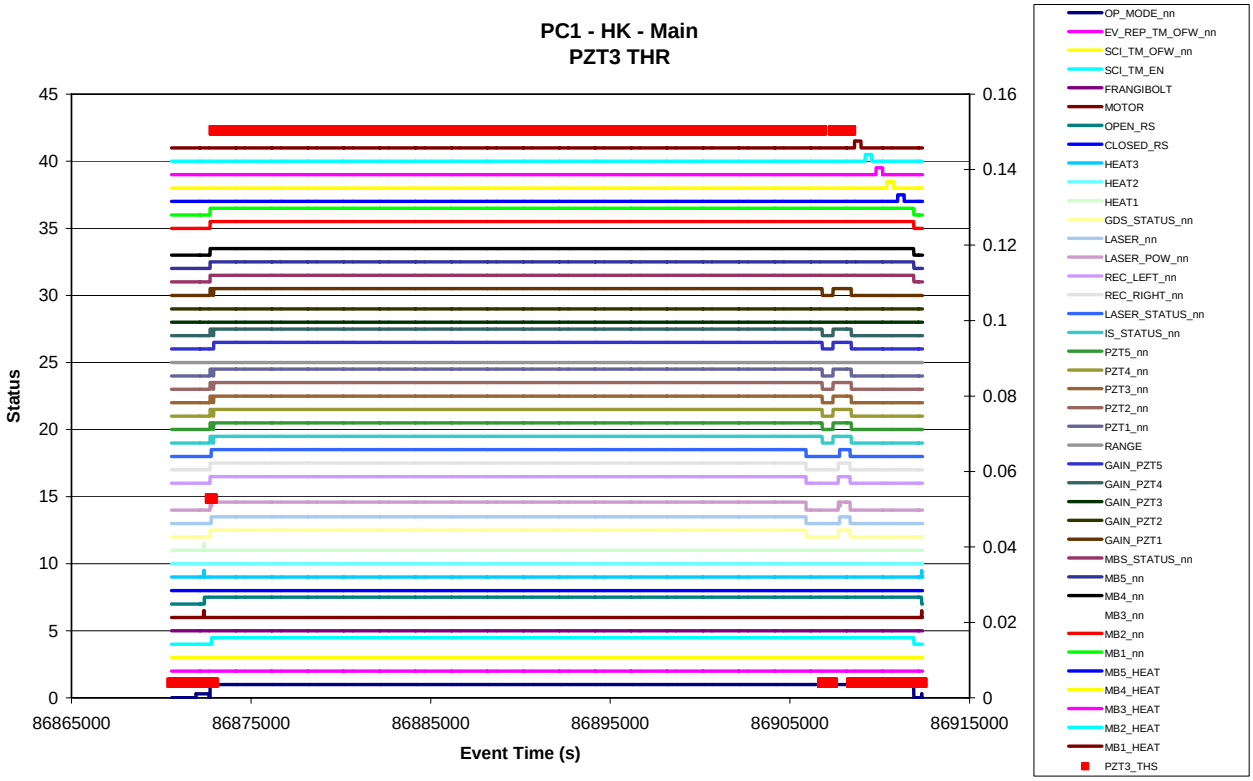


Figure 7.3-3. IS PZT 5 Thresholds change vs. time - Main

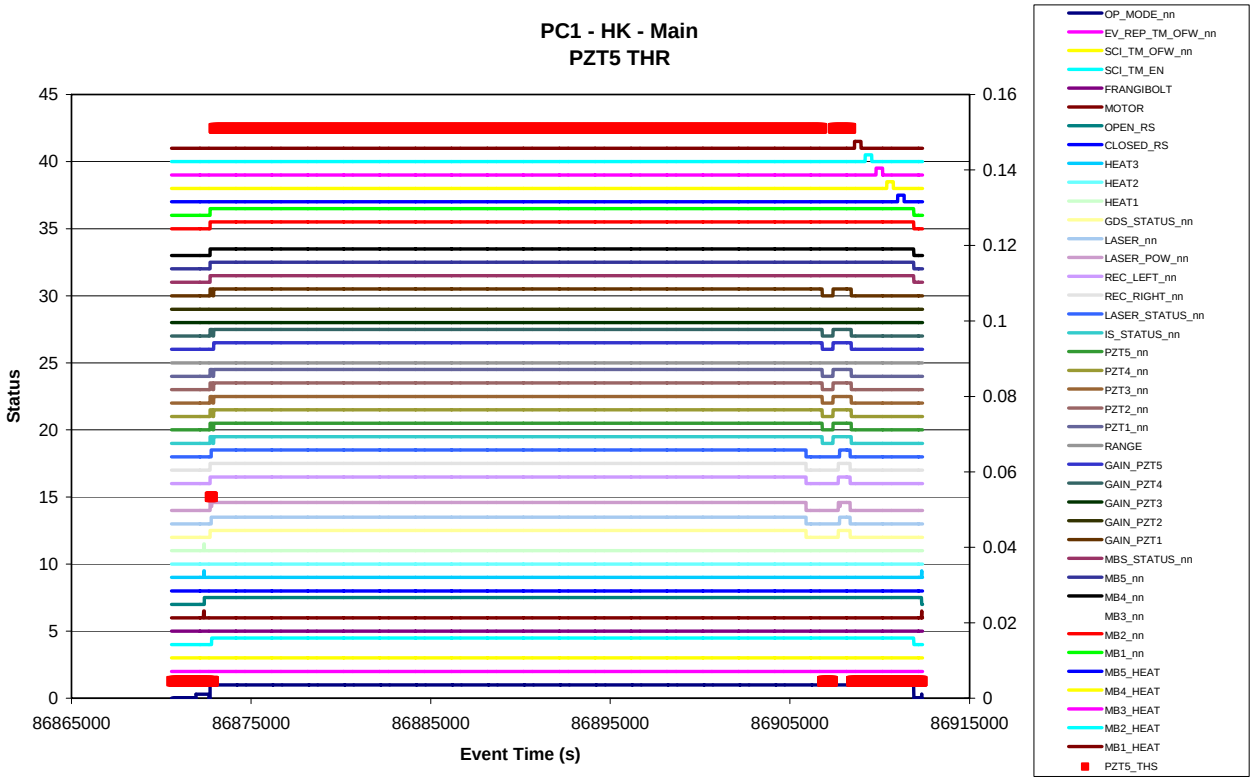
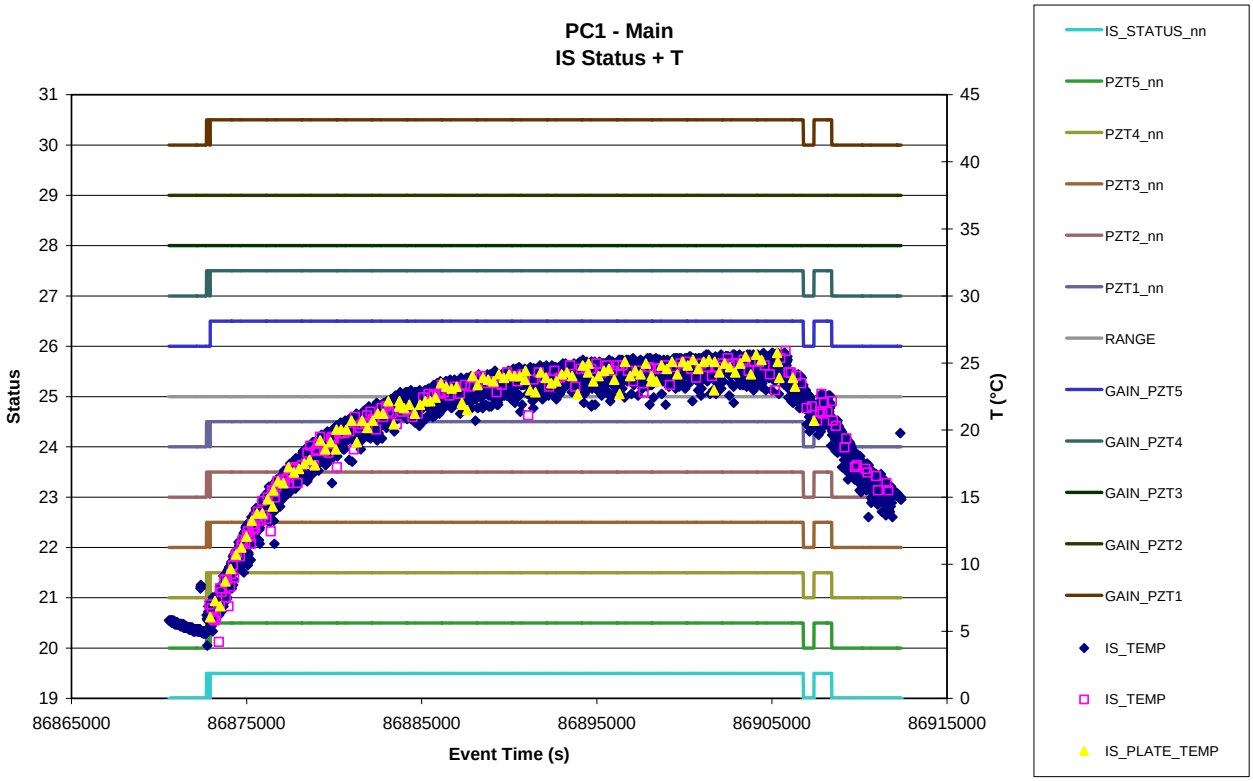


Figure 7.3-4. IS Temperature vs. time (HK, HK-SCI, SCI) - Main



7.3.2 IS – Behaviour

7.3.2.1 Science Events

Figure 7.3-5. All PZT Events (det and non-det) vs. time - Main

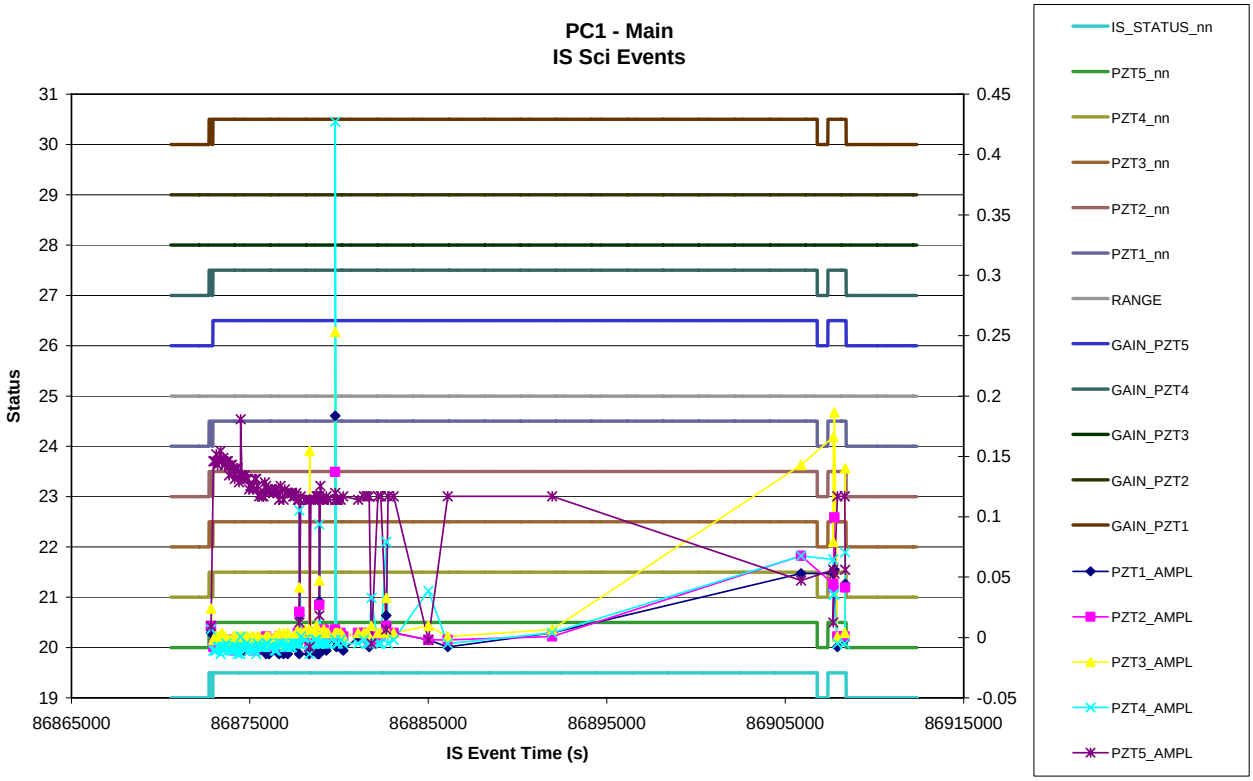


Figure 7.3-6. PZT 1-2-3-4 Detected Events vs. time - Main

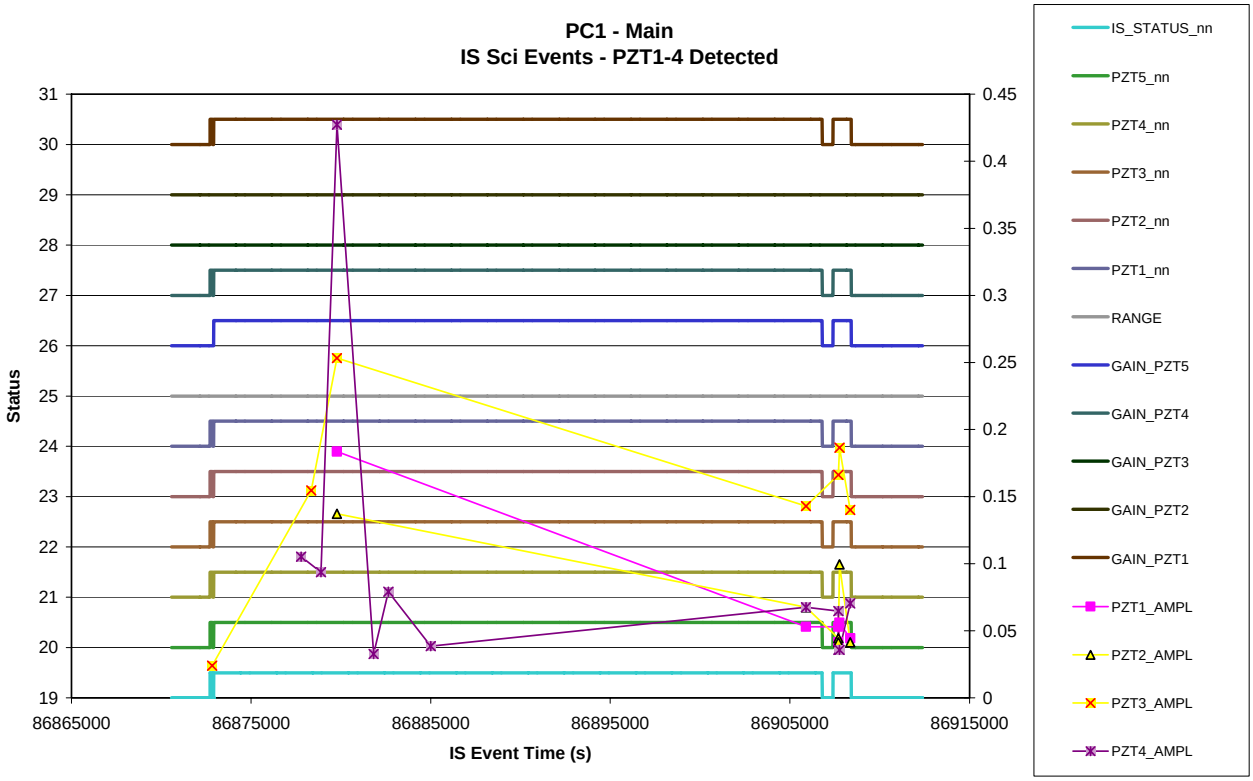


Figure 7.3-7. PZT 1 Detected Events vs. time - Main

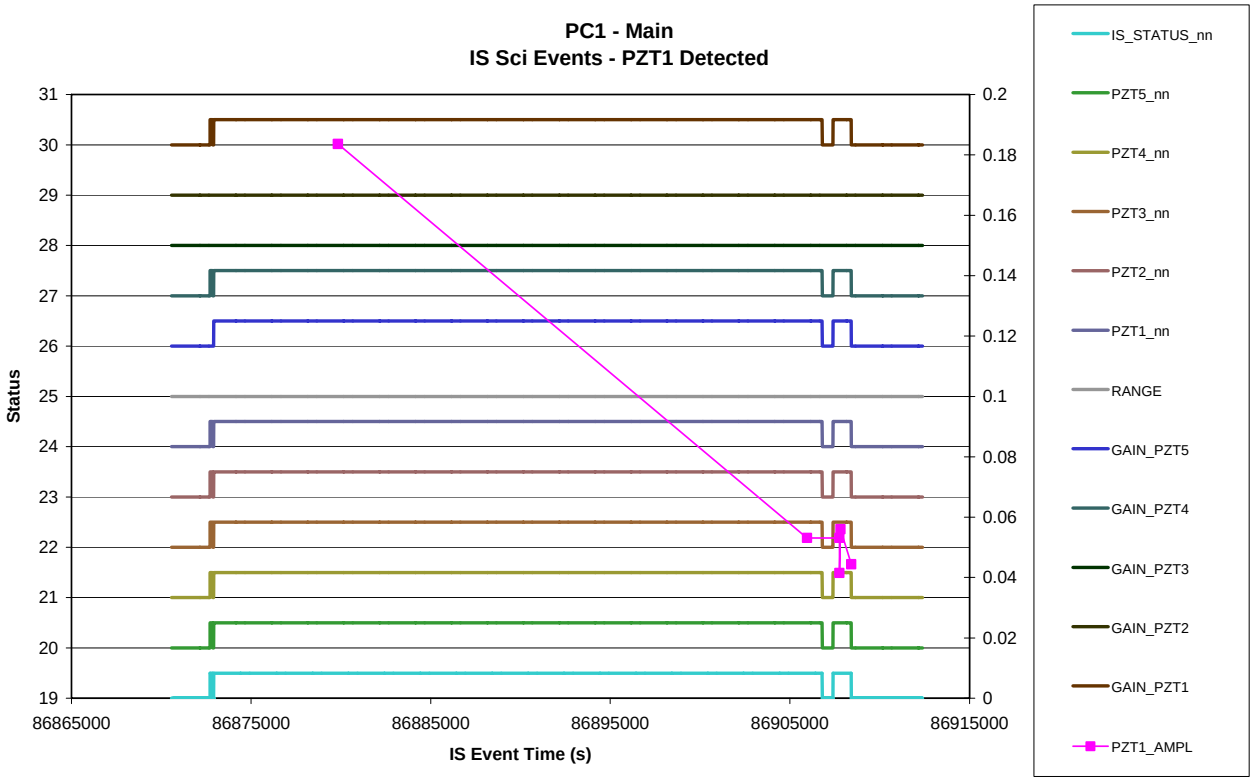


Figure 7.3-8. PZT 2 Detected Events vs. time - Main

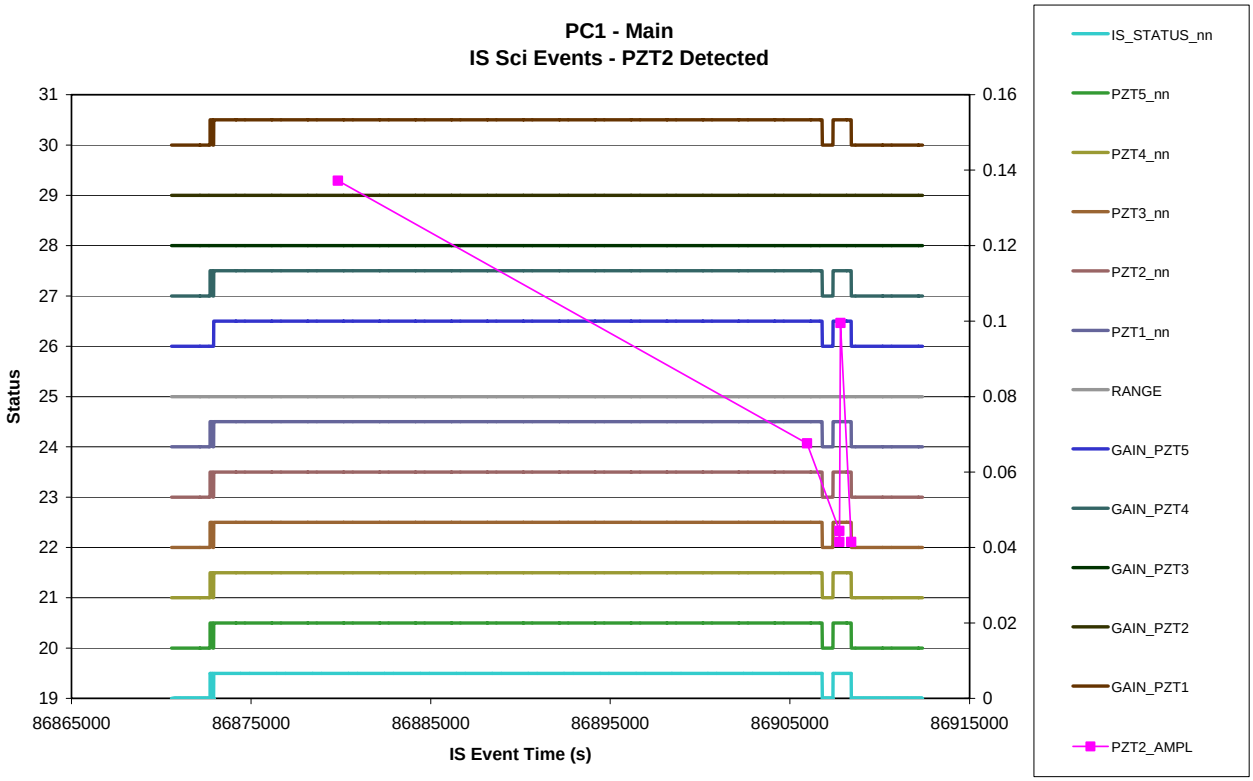


Figure 7.3-9. PZT 3 Detected Events vs. time - Main

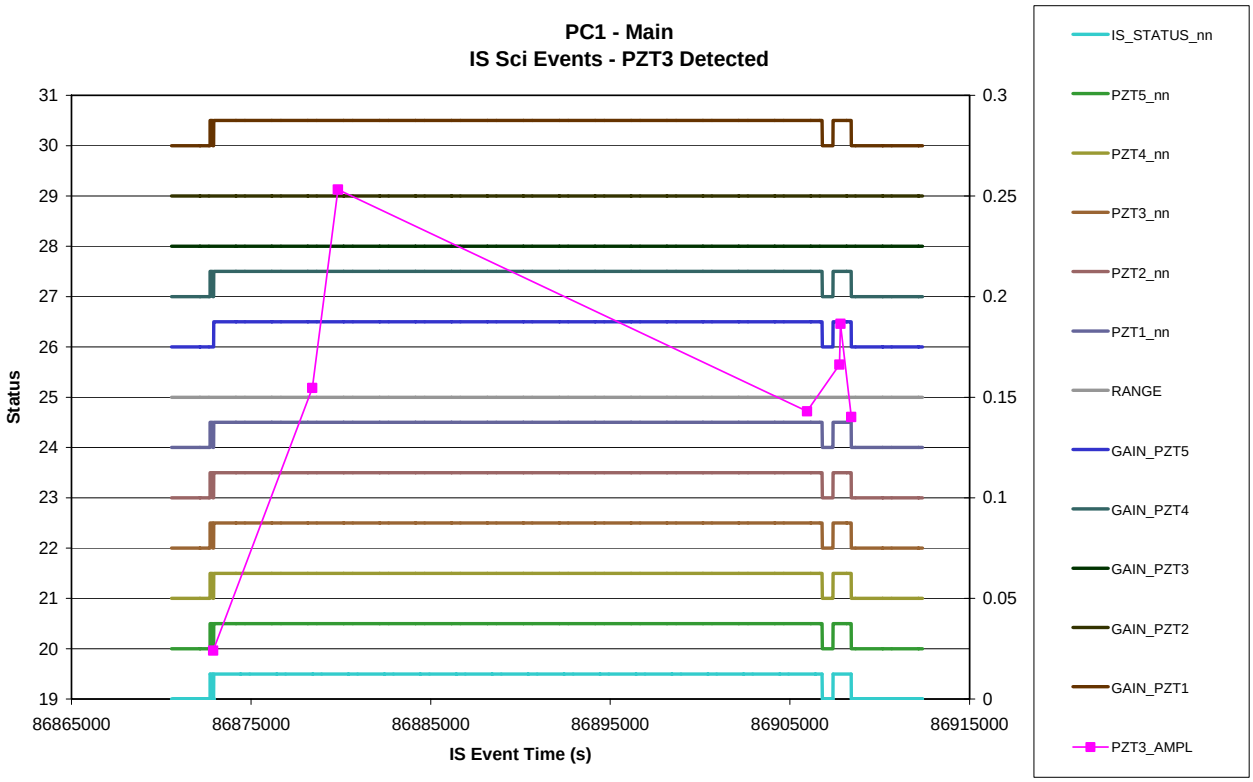


Figure 7.3-10. PZT 4 Detected Events vs. time - Main

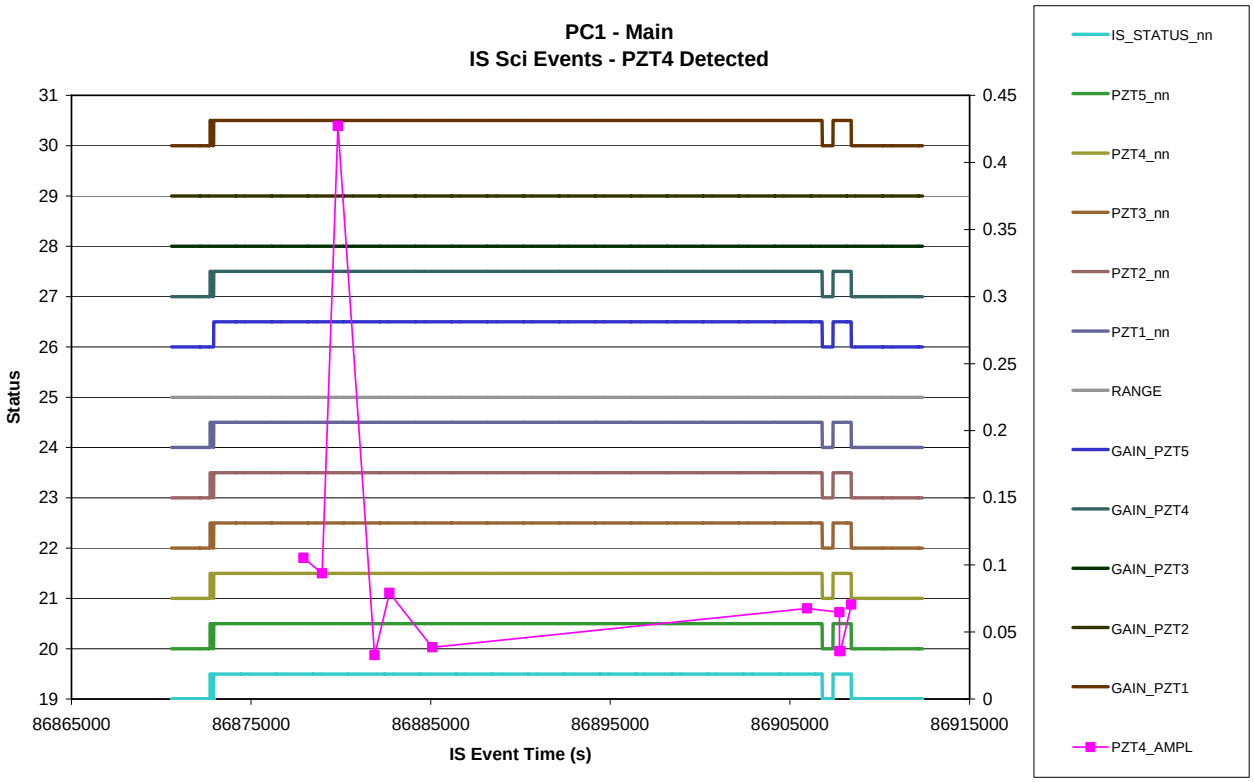


Figure 7.3-11. PZT 5 Detected Events vs. time - Main

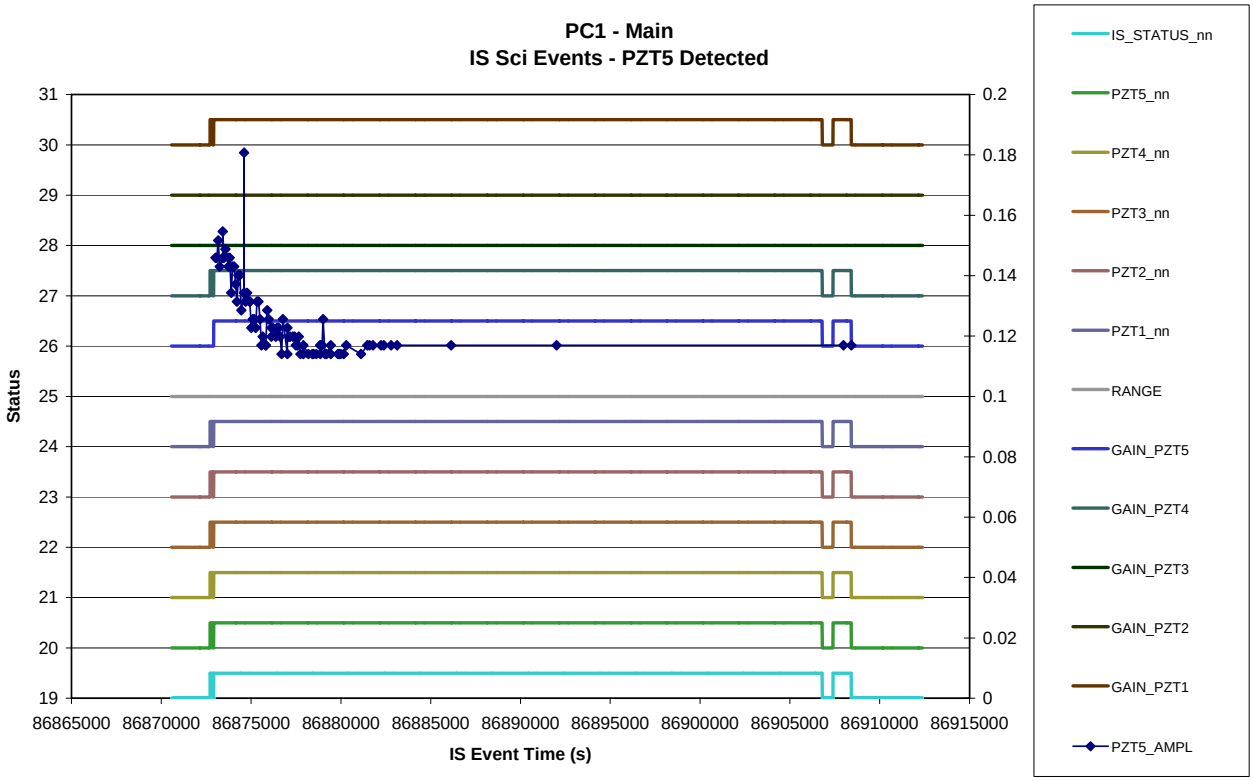


Figure 7.3-12. PZT 5 Detected Events and IS T vs. time - Main

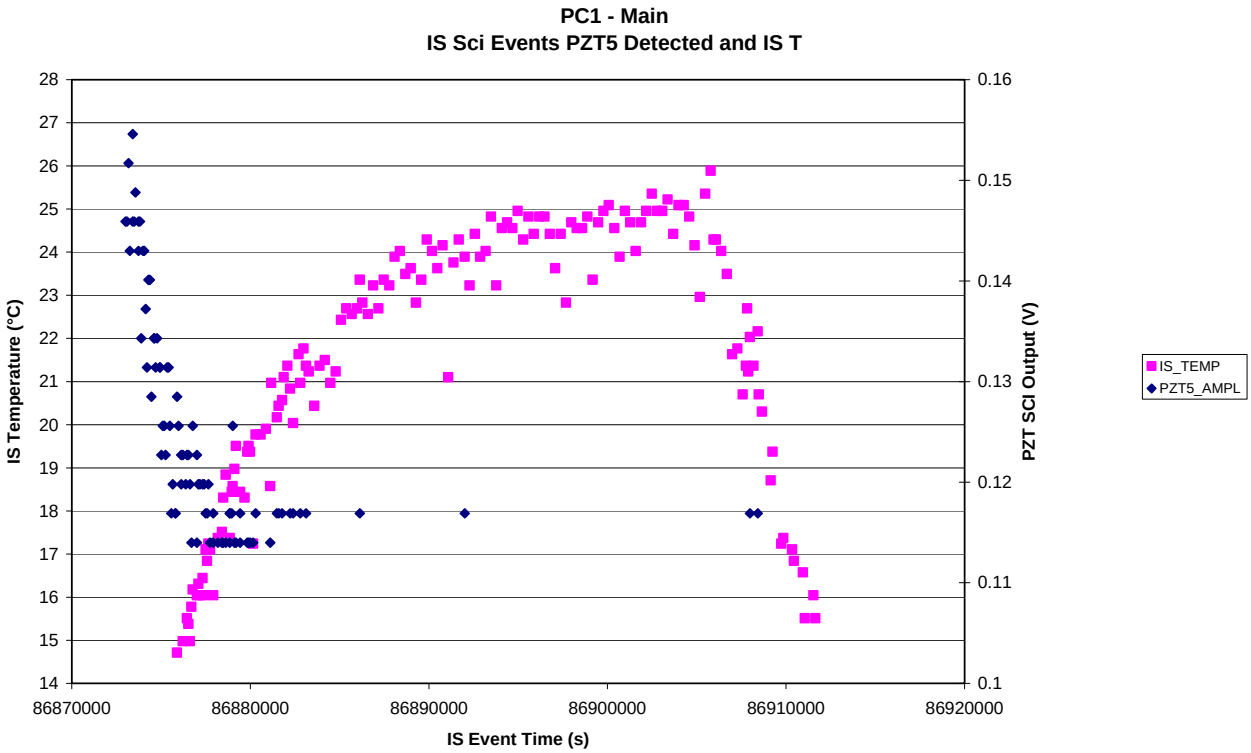


Figure 7.3-13. PZT 5 Detected Events and CAL vs. time - Main

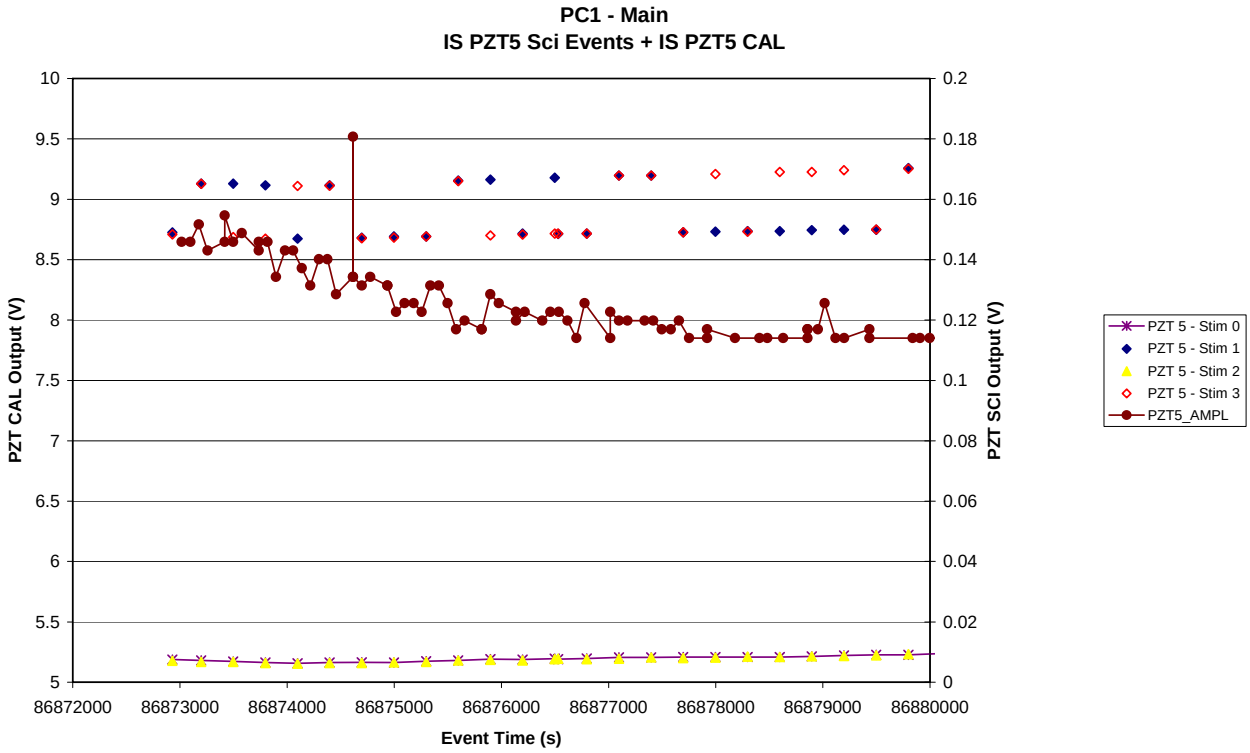
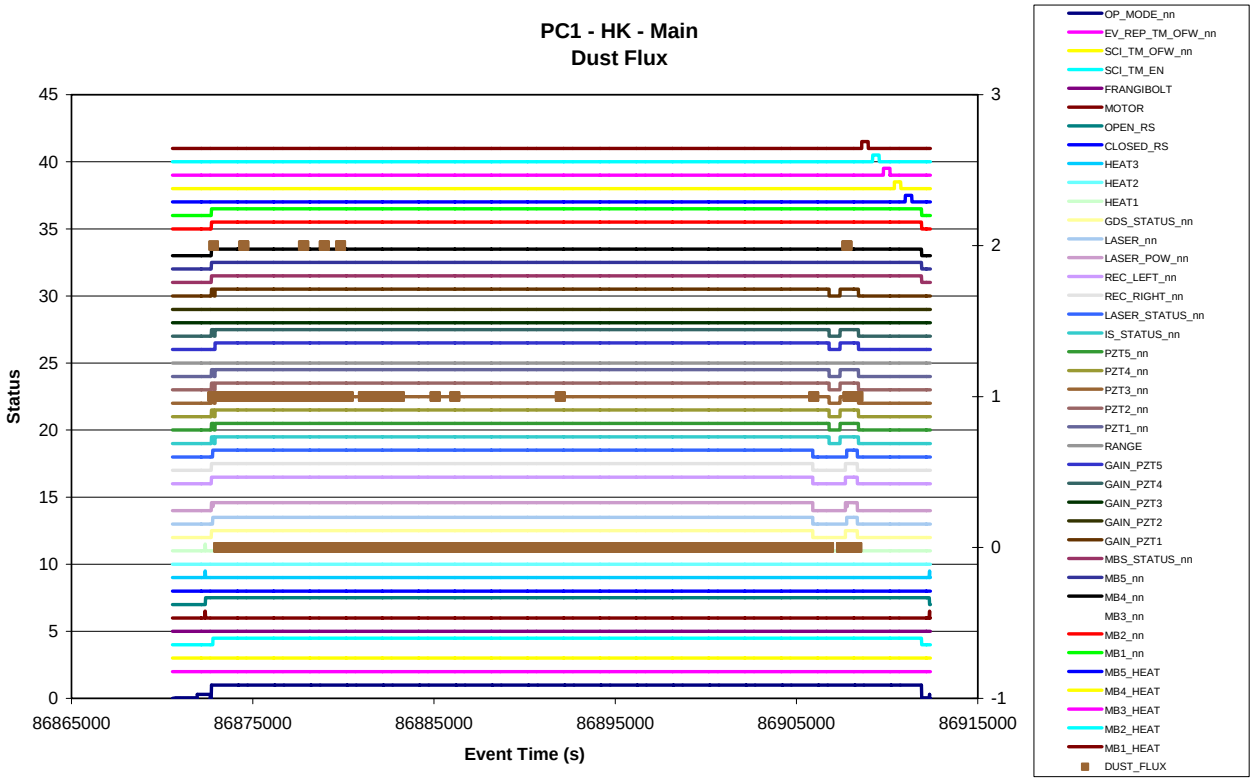


Figure 7.3-14. Dust Flux vs. time - Main



7.3.2.2 Event Rates

Not applicable

7.3.2.3 CAL

Figure 7.3-15. PZT 1 Mean and St Dev. CAL vs. time - Main

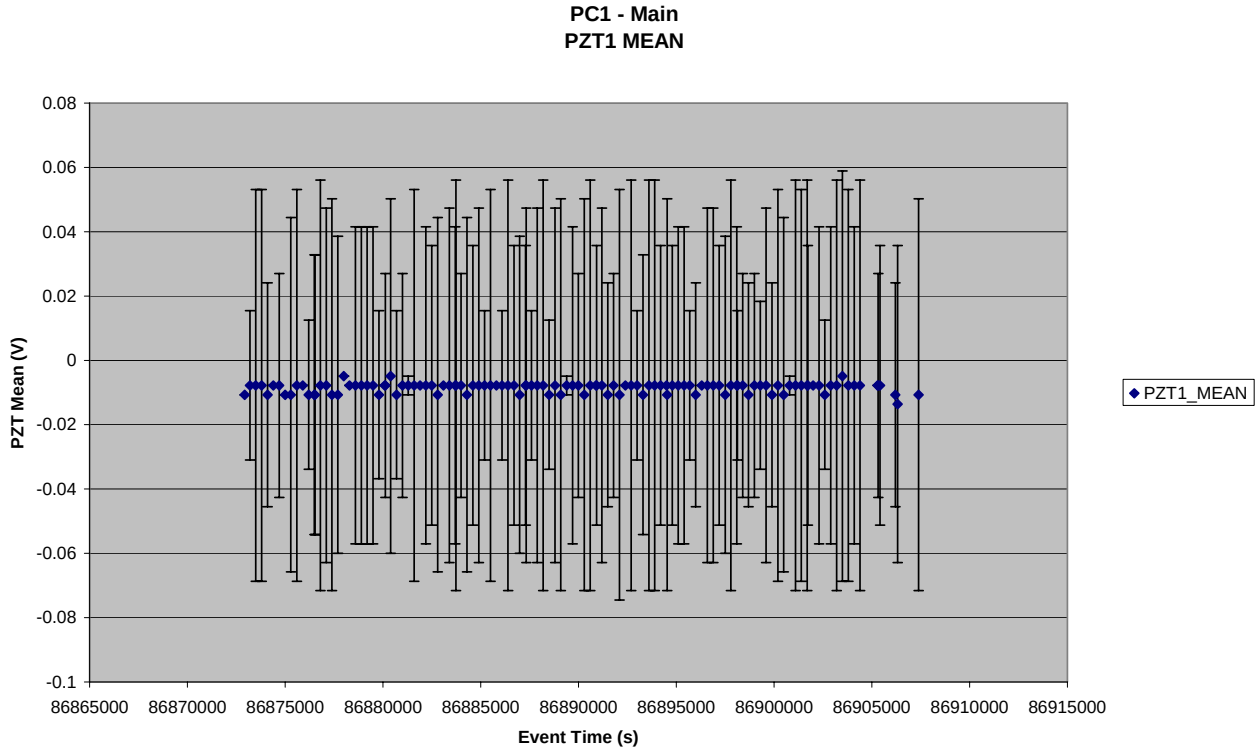


Figure 7.3-16. PZT 2 Mean and St Dev. CAL vs. time - Main

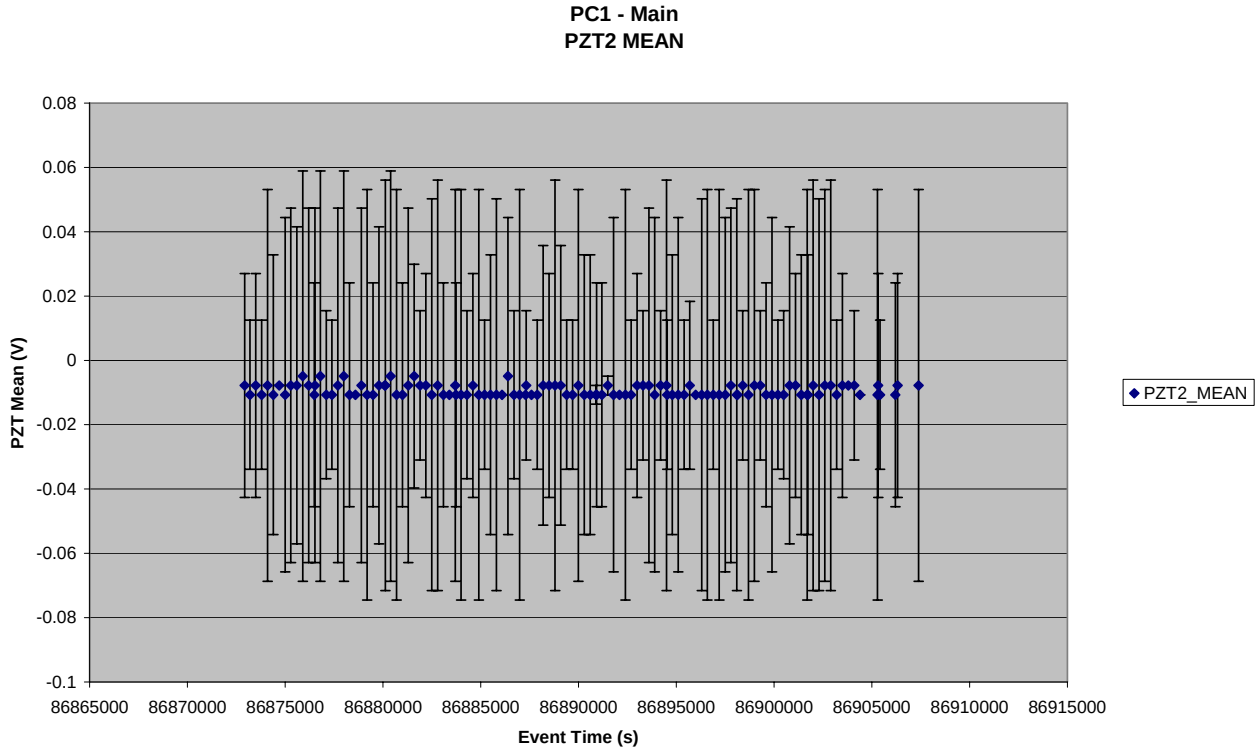


Figure 7.3-17. PZT 3 Mean and St Dev. CAL vs. time - Main

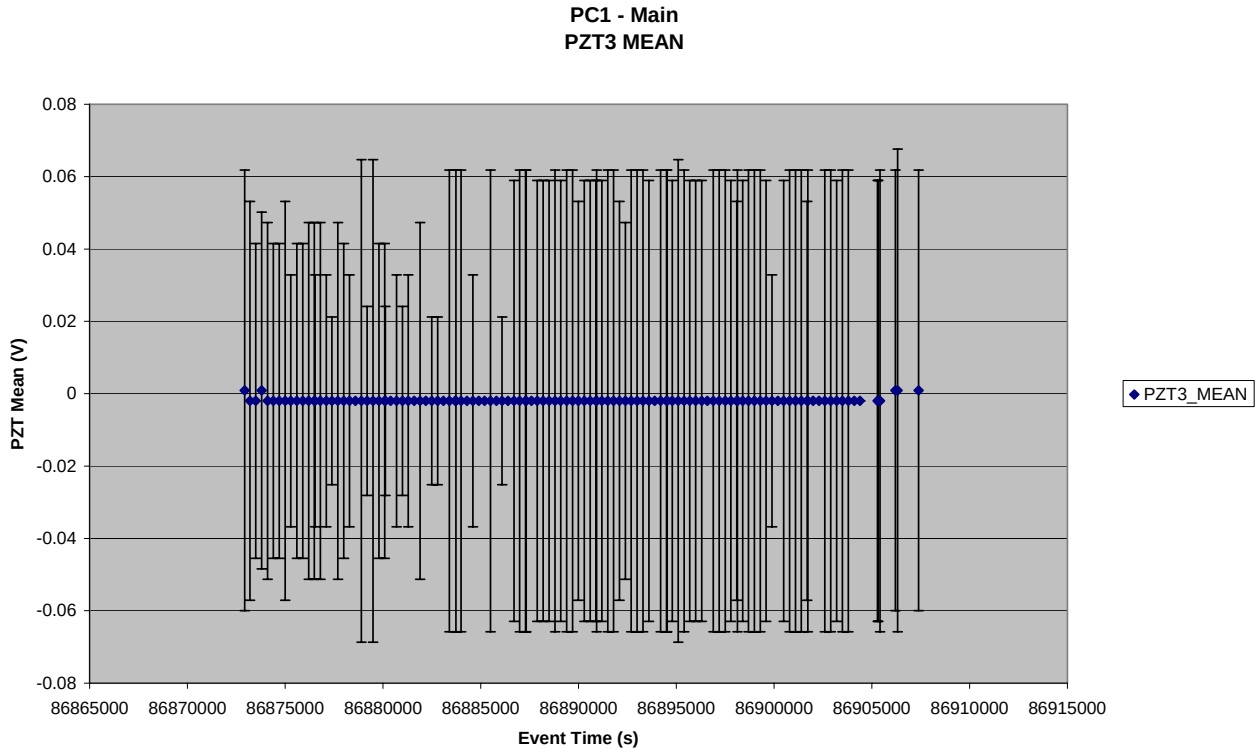


Figure 7.3-18. PZT 4 Mean and St Dev. CAL vs. time - Main

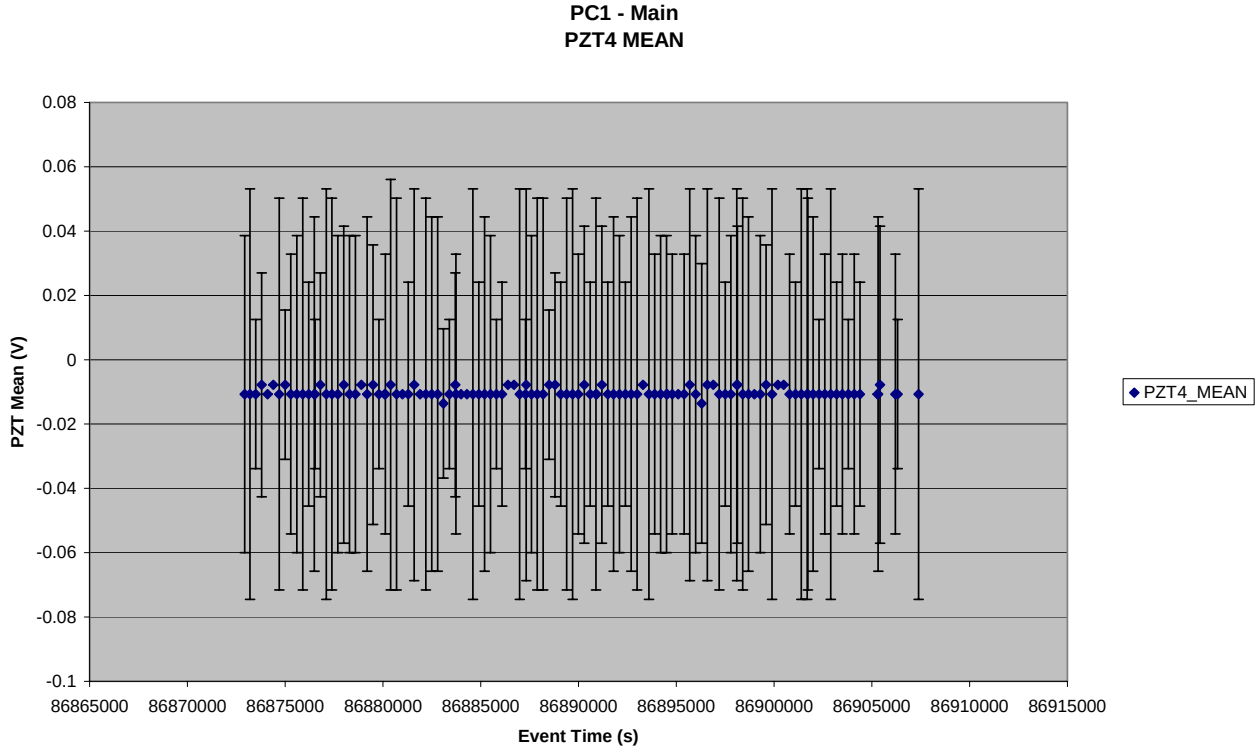


Figure 7.3-19. PZT 5 Mean and St Dev. CAL vs. time - Main

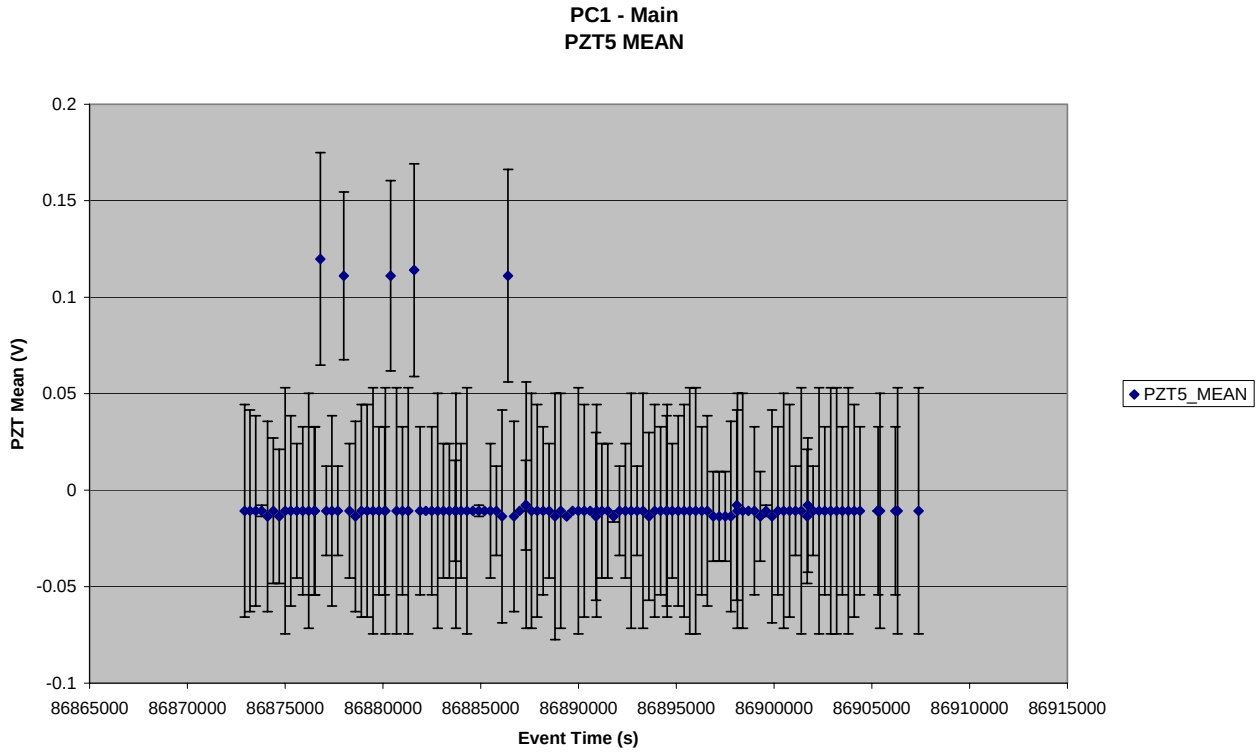


Figure 7.3-20. Reference Voltages for IS calibration vs. time - Main

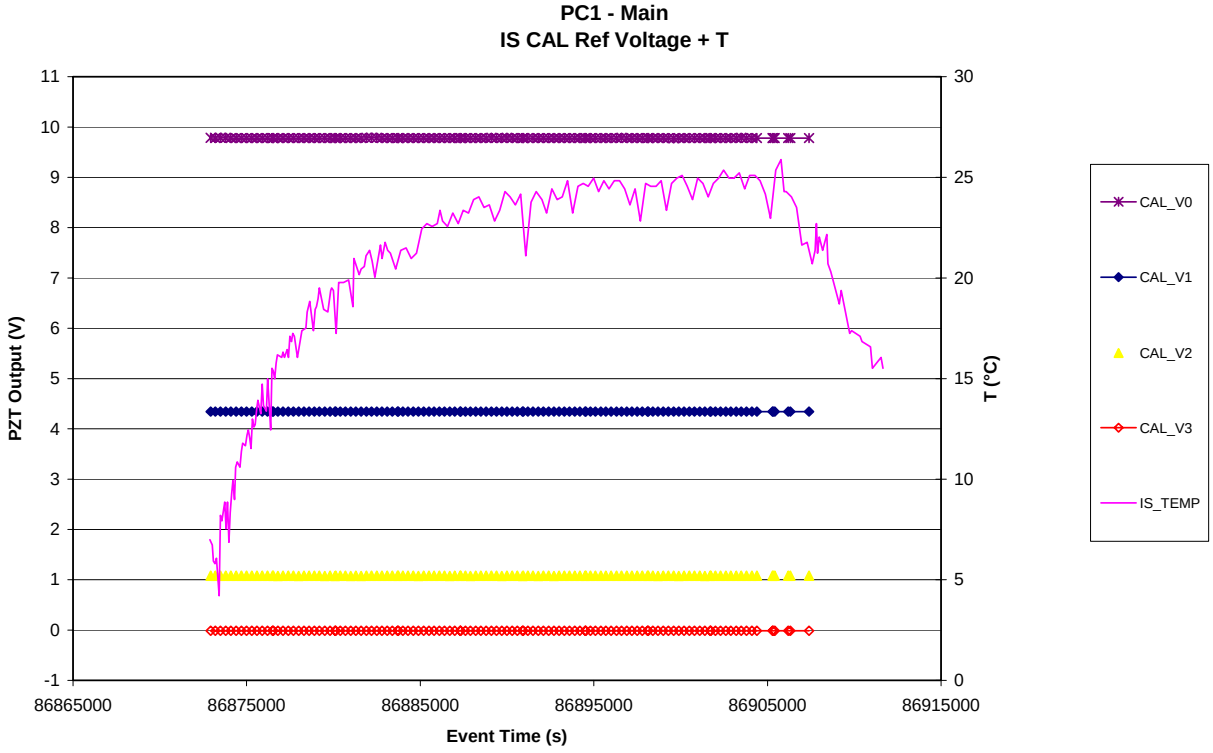


Figure 7.3-21. PZT 1 CAL Signal vs. time - Main

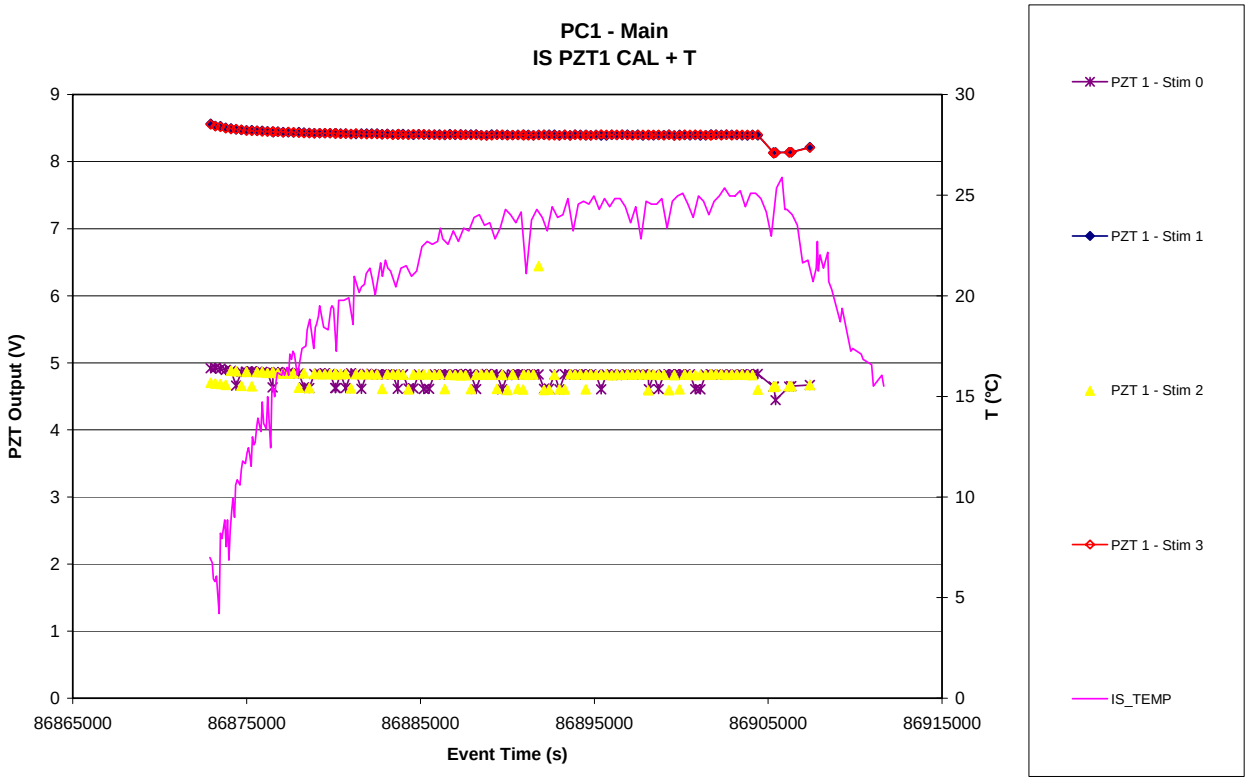


Figure 7.3-22. PZT 2 CAL Signal vs. time - Main

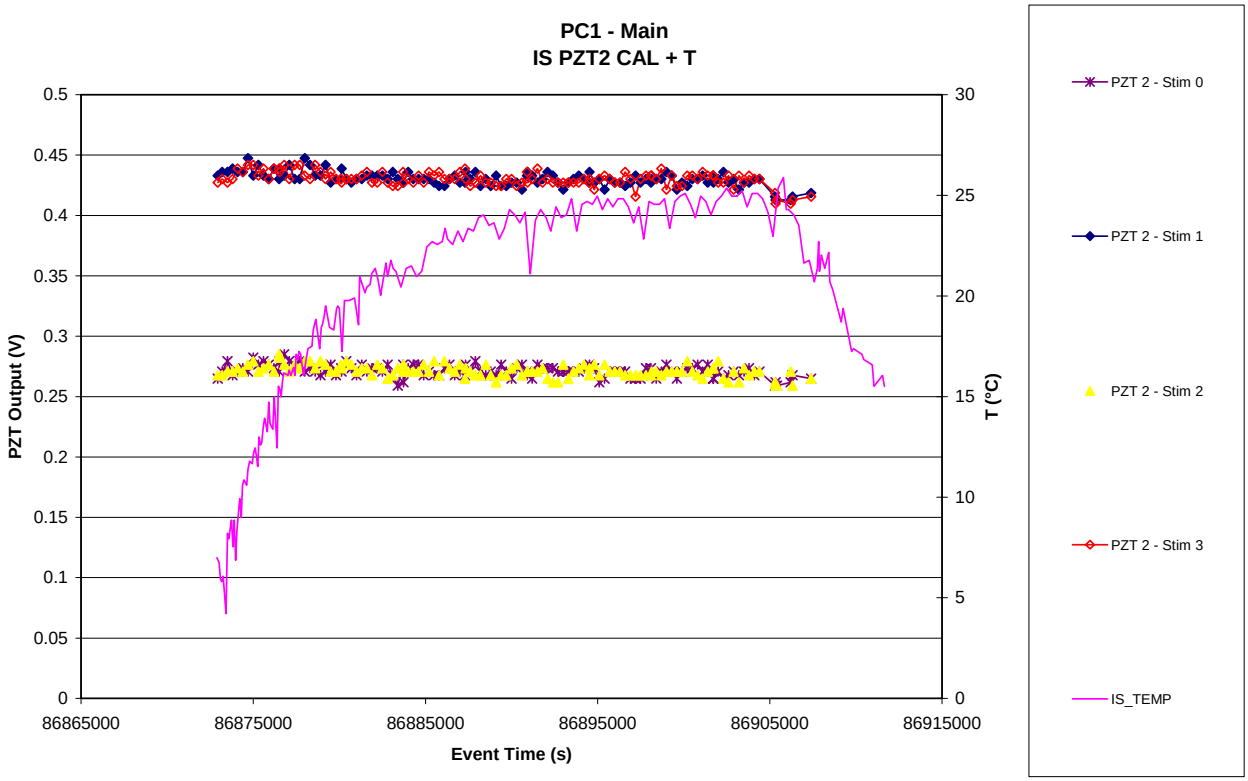


Figure 7.3-23. PZT 3 CAL Signal vs. time - Main

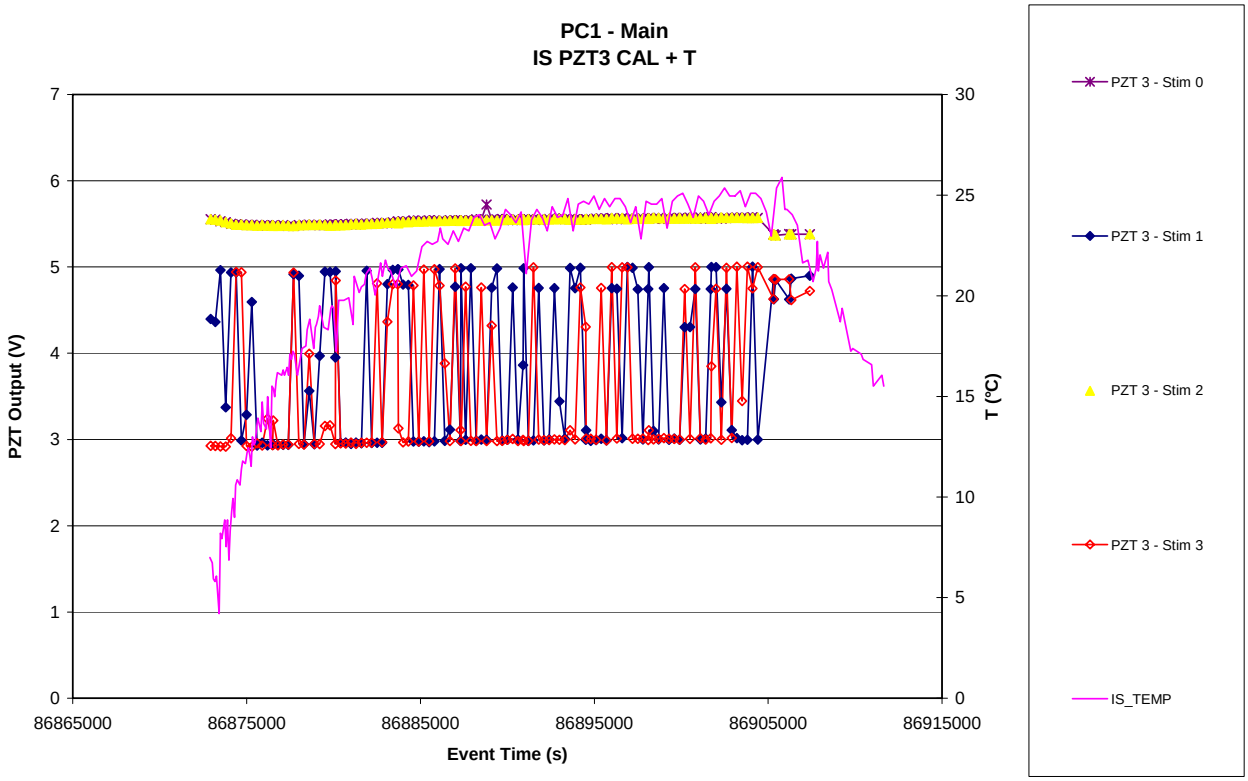


Figure 7.3-24. PZT 4 CAL Signal vs. time - Main

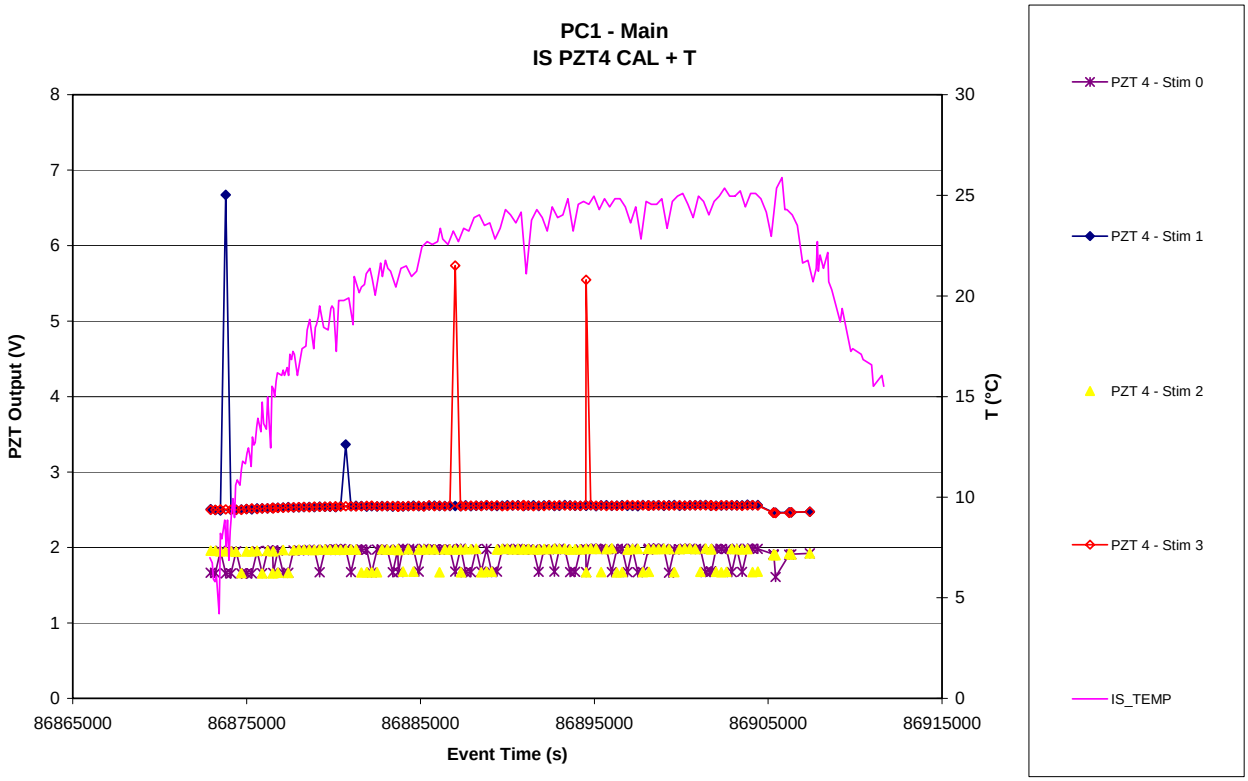


Figure 7.3-25. PZT 5 CAL Signal vs. time - Main

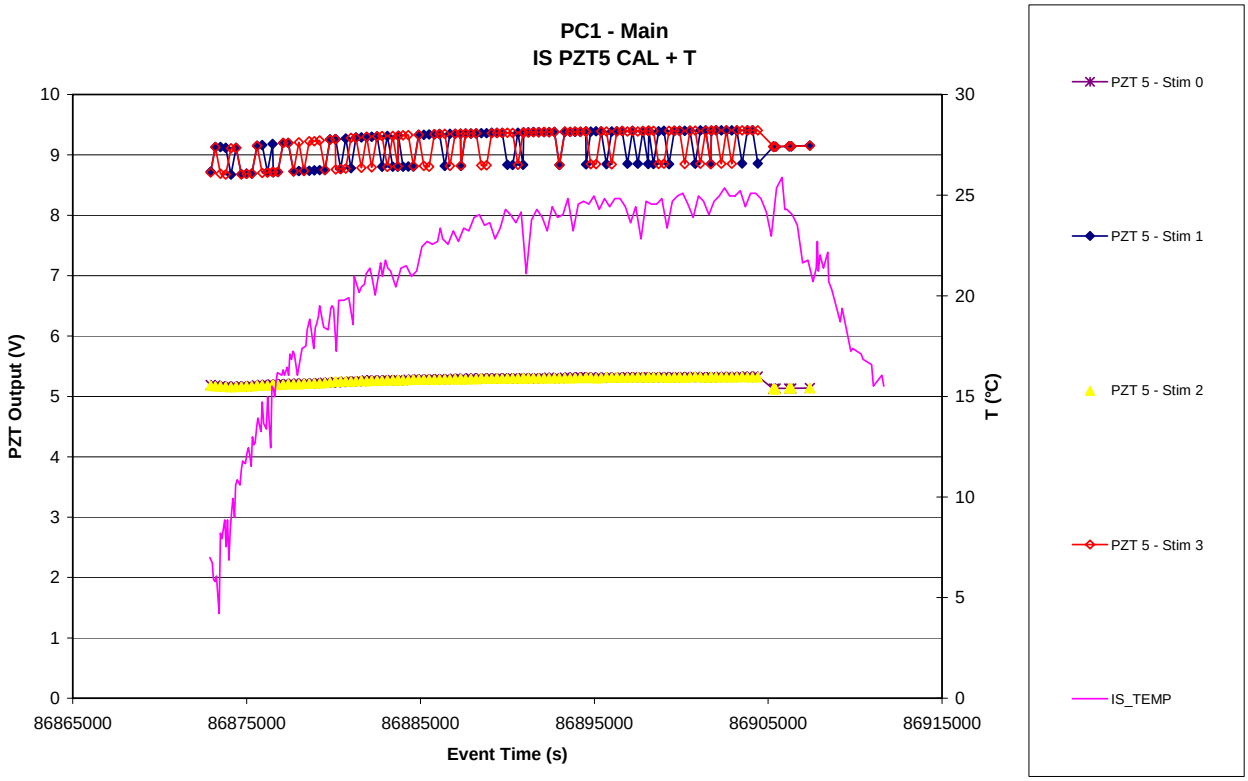


Figure 7.3-26. PZT 1 CAL Time delay vs. time - Main

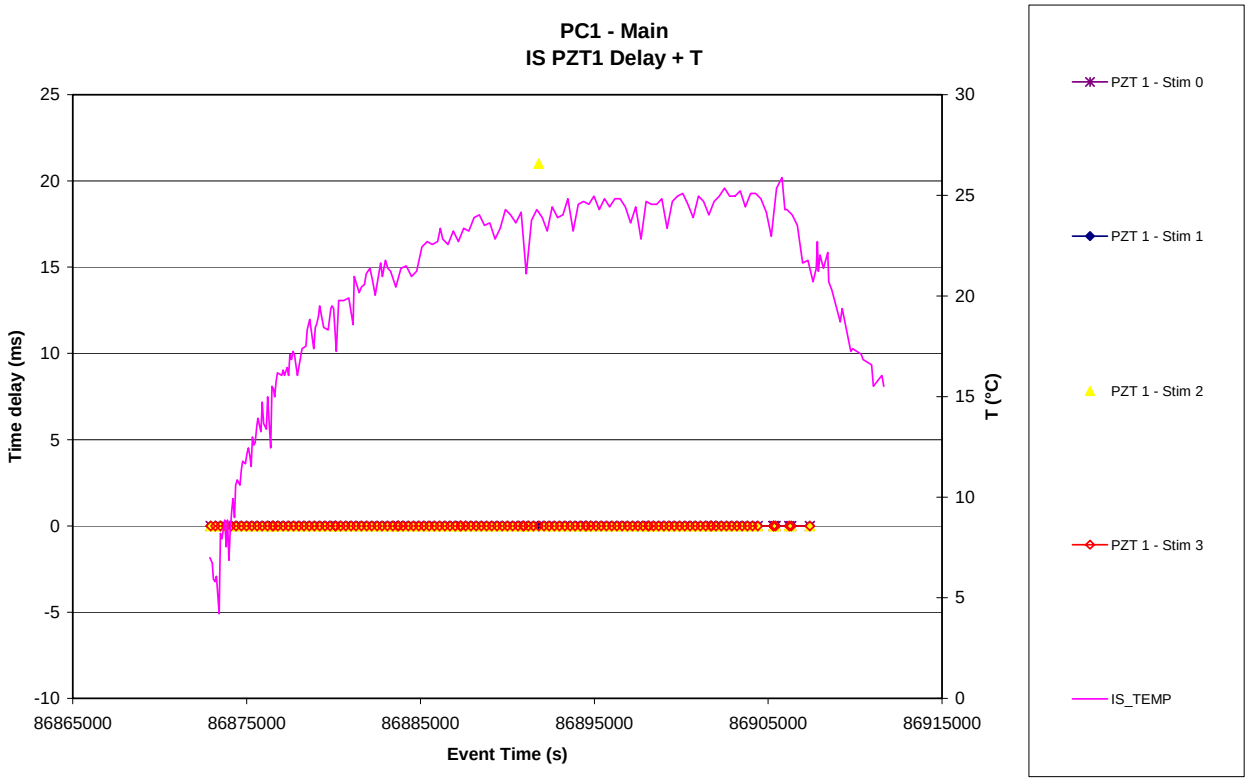


Figure 7.3-27. PZT 2 CAL Time delay vs. time - Main

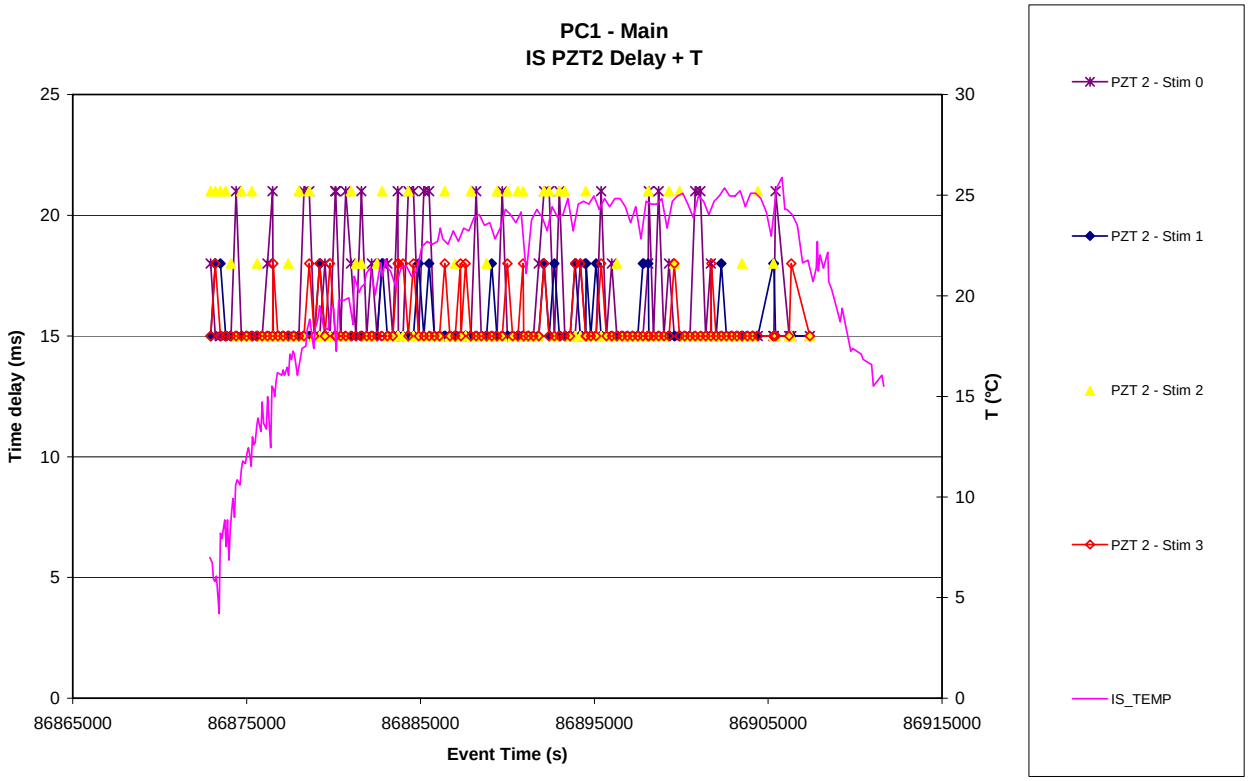


Figure 7.3-28. PZT 3 CAL Time delay vs. time - Main

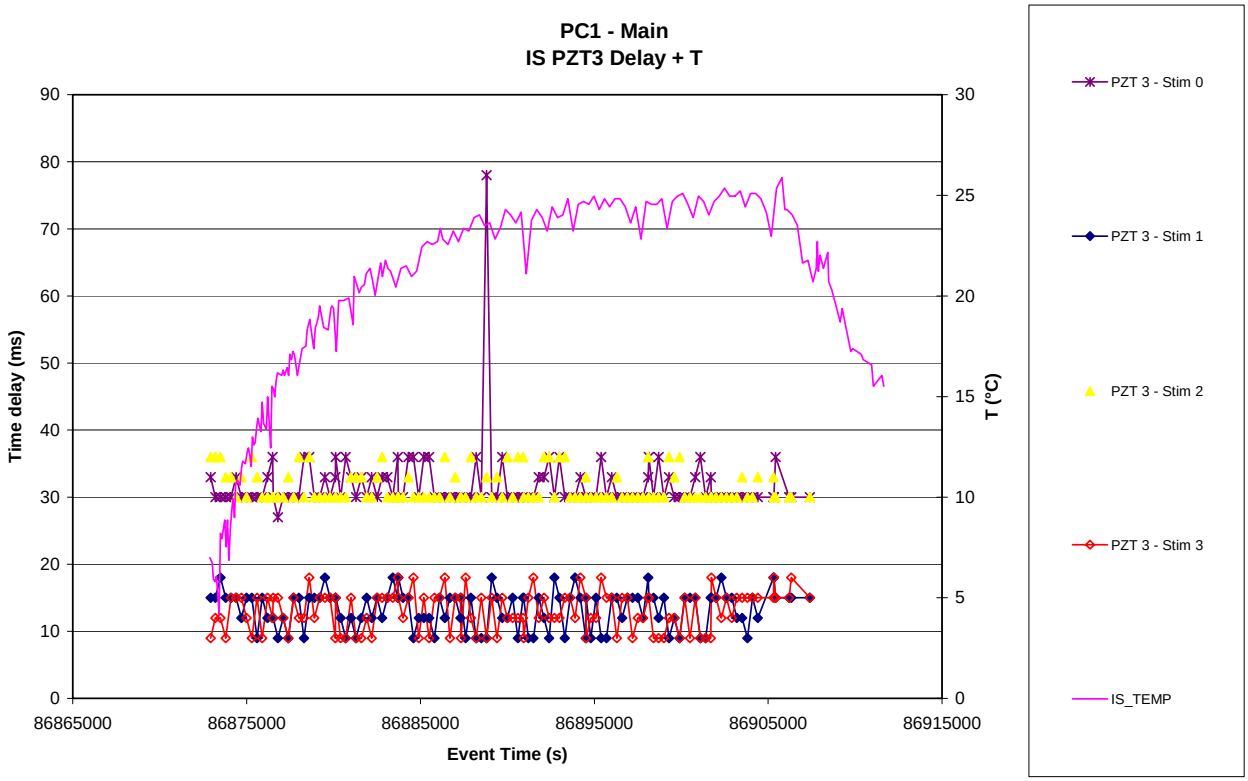


Figure 7.3-29. PZT 4 CAL Time delay vs. time - Main

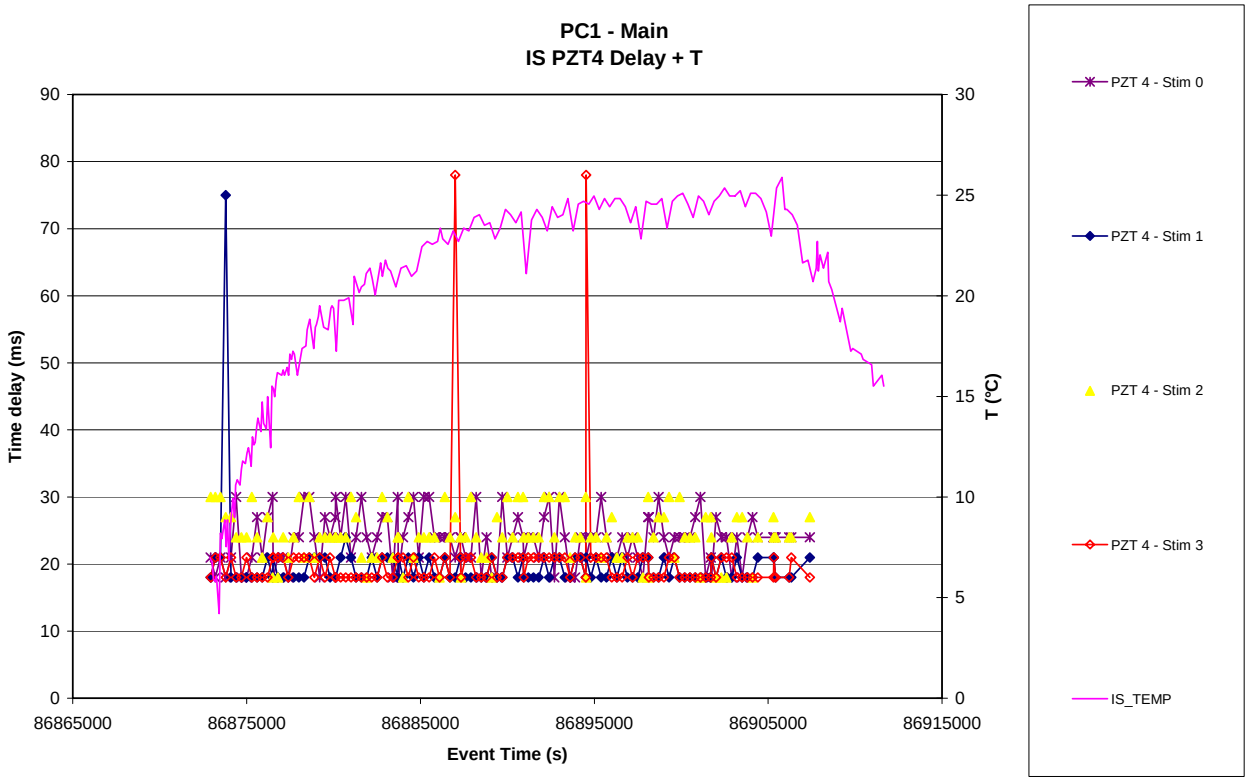


Figure 7.3-30. PZT 5 CAL Time delay vs. time - Main

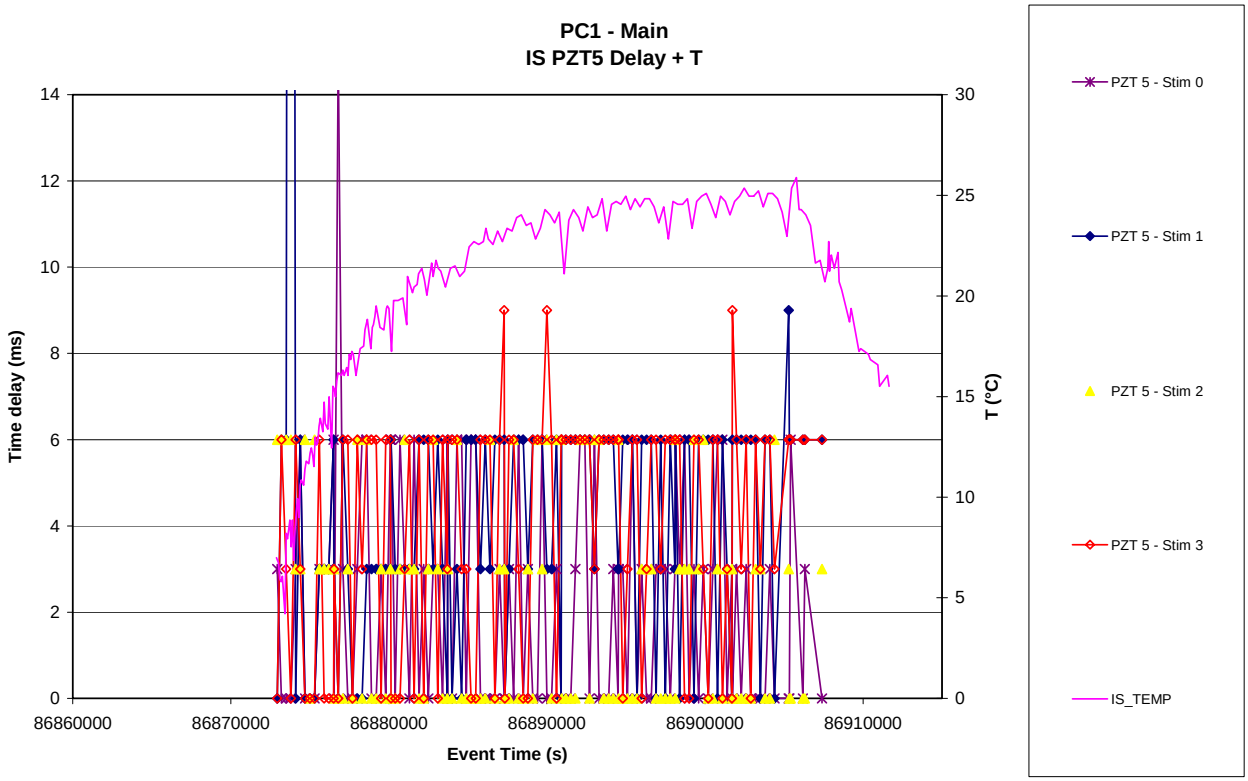


Figure 7.3-31. PZT 1 CAL Signal vs. stimulus – Main

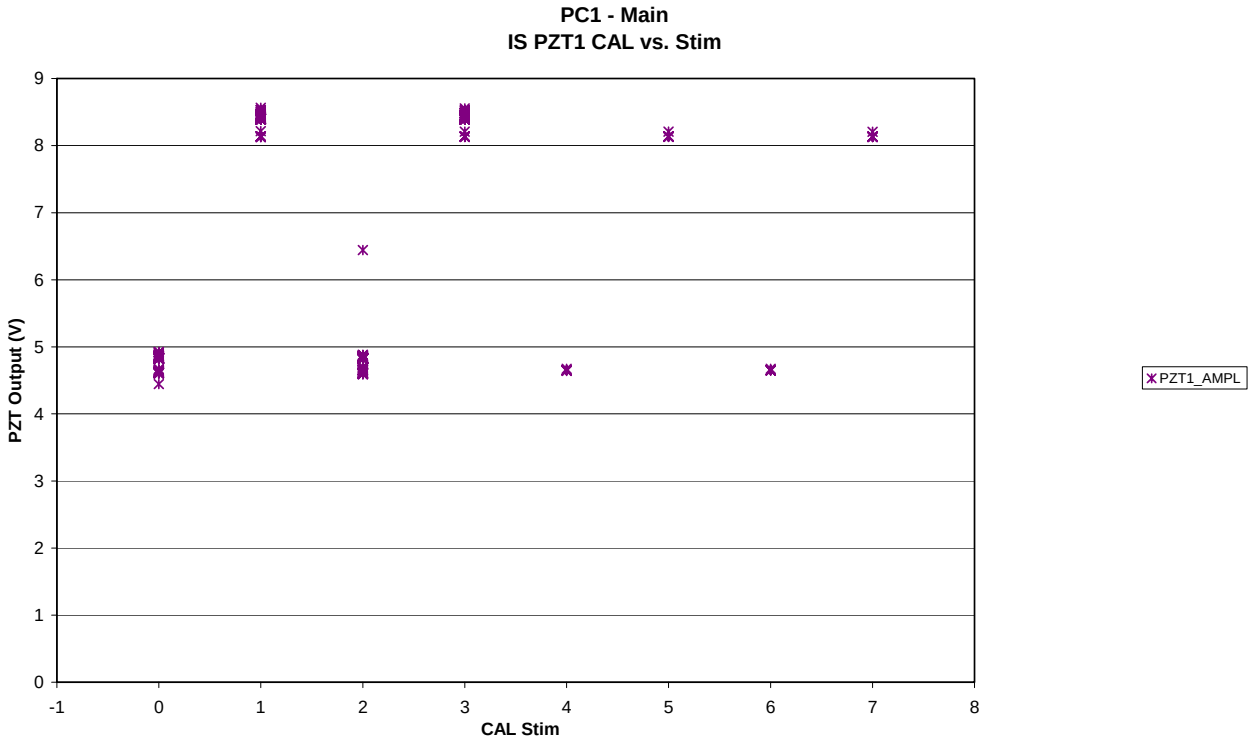


Figure 7.3-32. PZT 2 CAL Signal vs. stimulus – Main

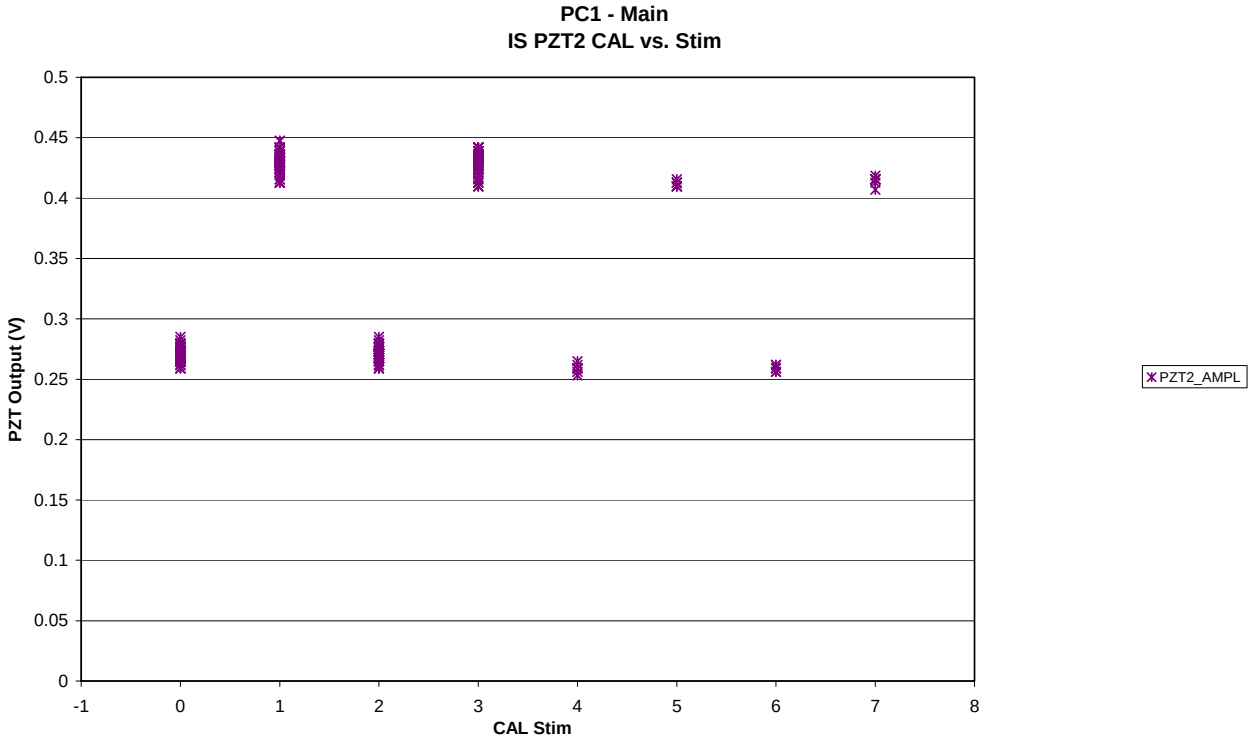


Figure 7.3-33. PZT 3 CAL Signal vs. stimulus – Main

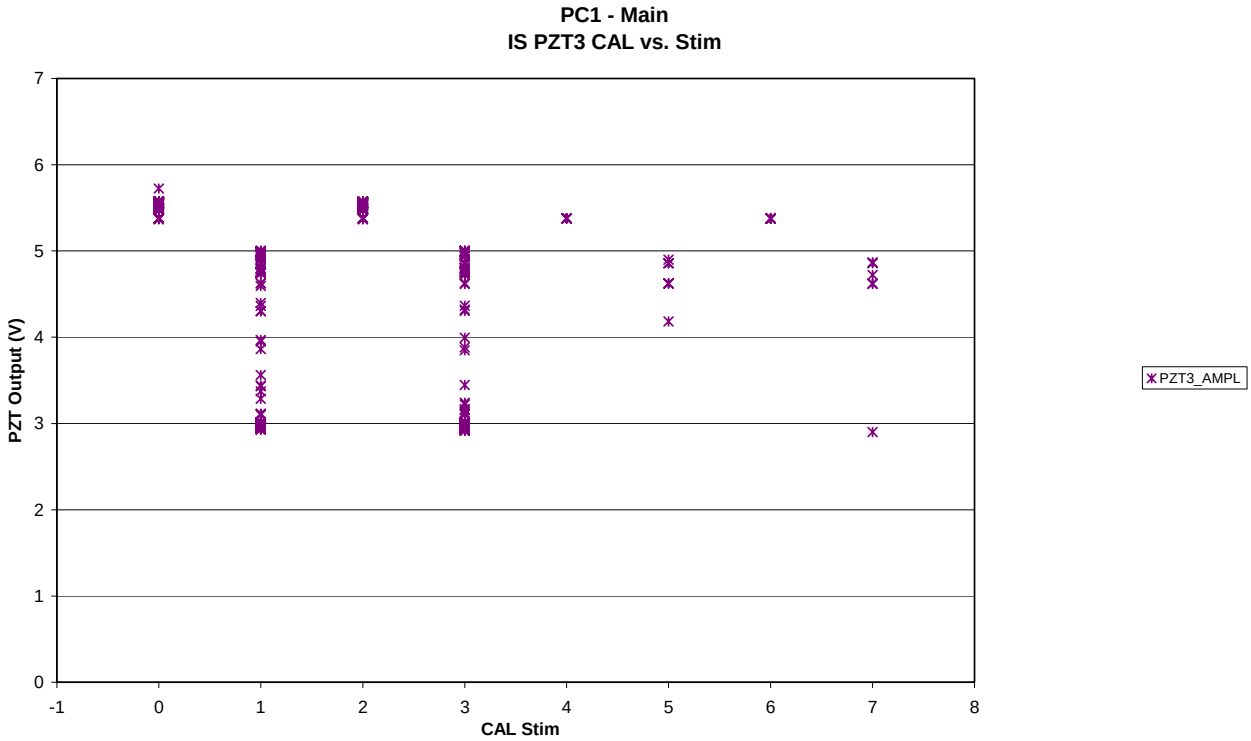


Figure 7.3-34. PZT 4 CAL Signal vs. stimulus – Main

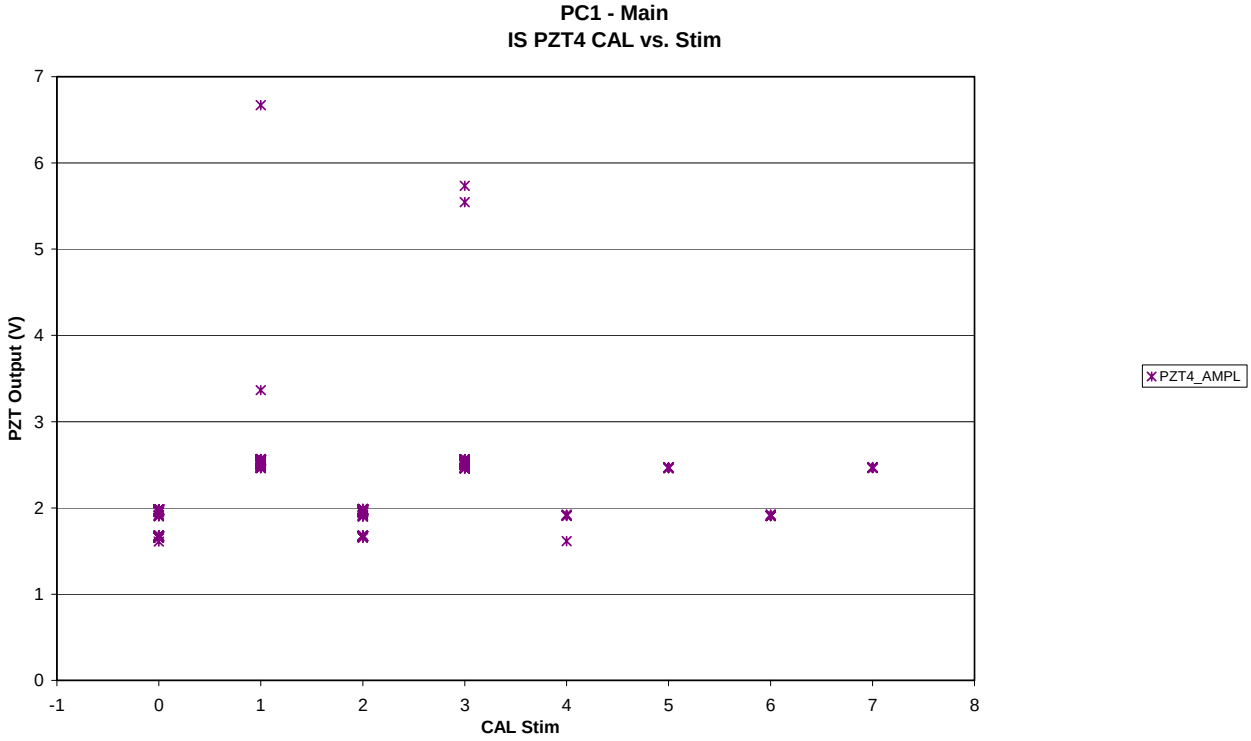


Figure 7.3-35. PZT 5 CAL Signal vs. stimulus – Main

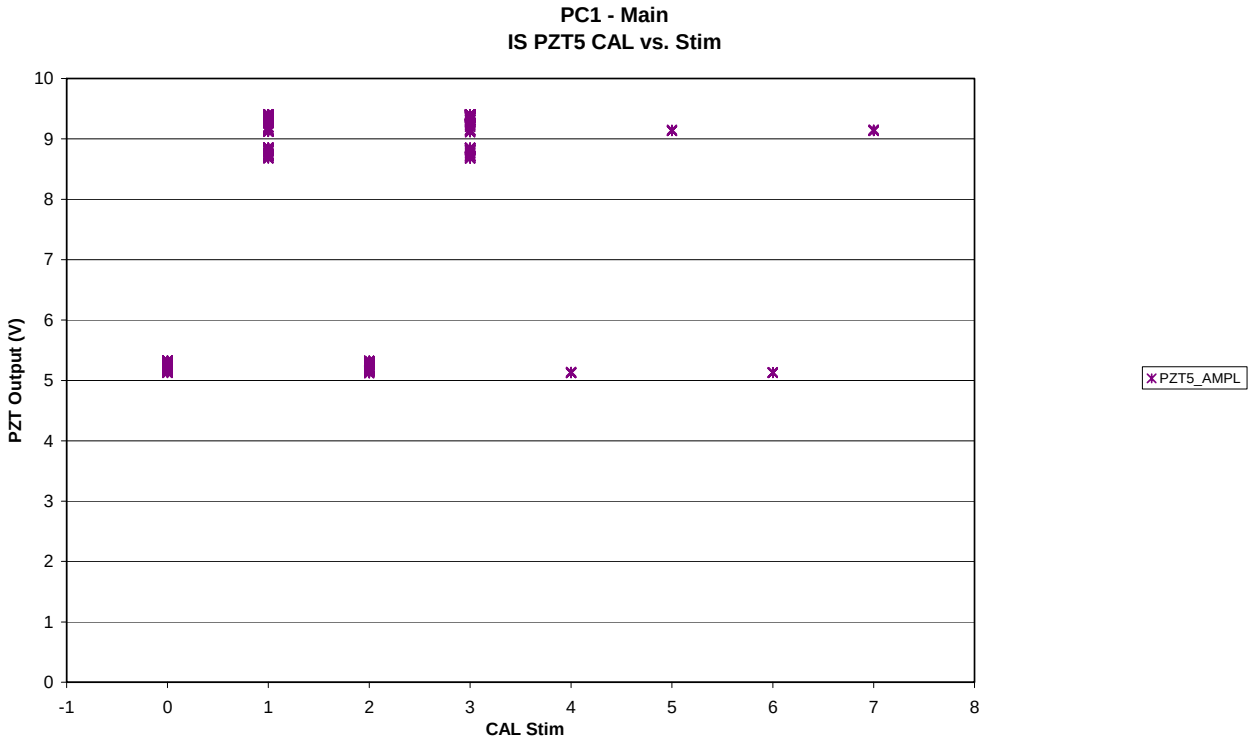


Figure 7.3-36. PZT 1 CAL Time delay vs. stimulus – Main

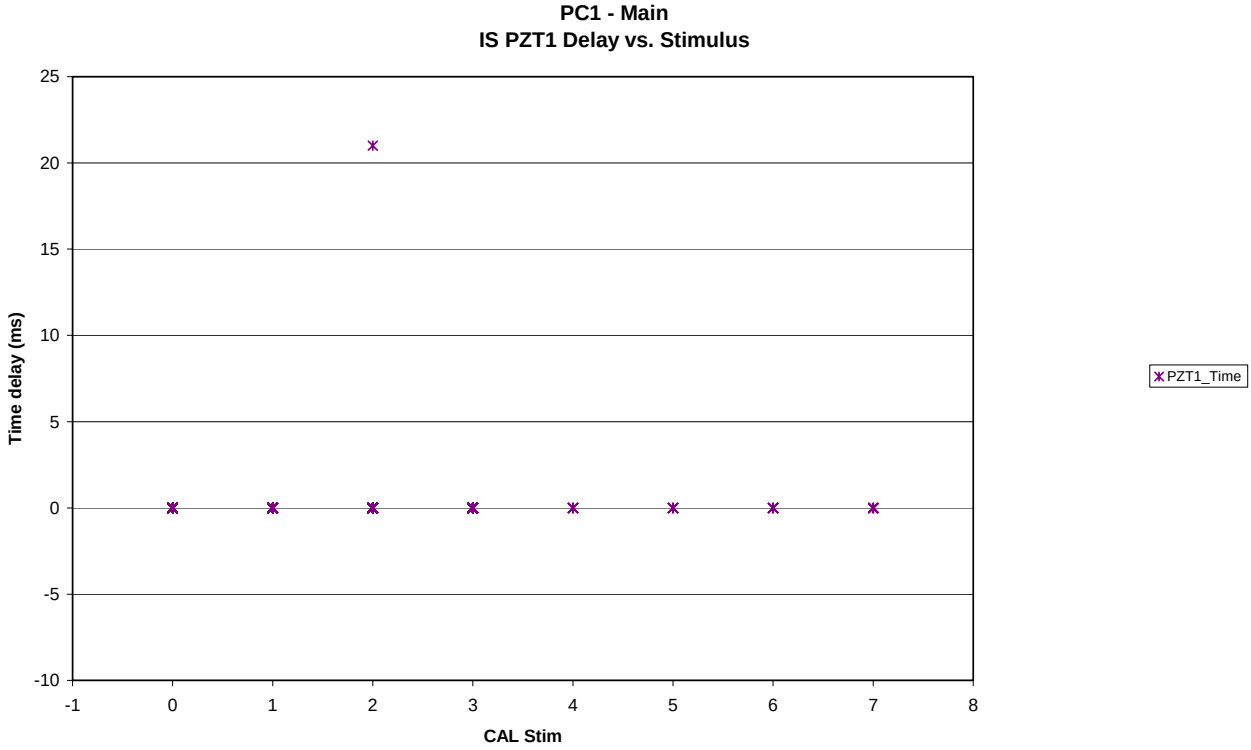


Figure 7.3-37. PZT 2 CAL Time delay vs. stimulus - Main

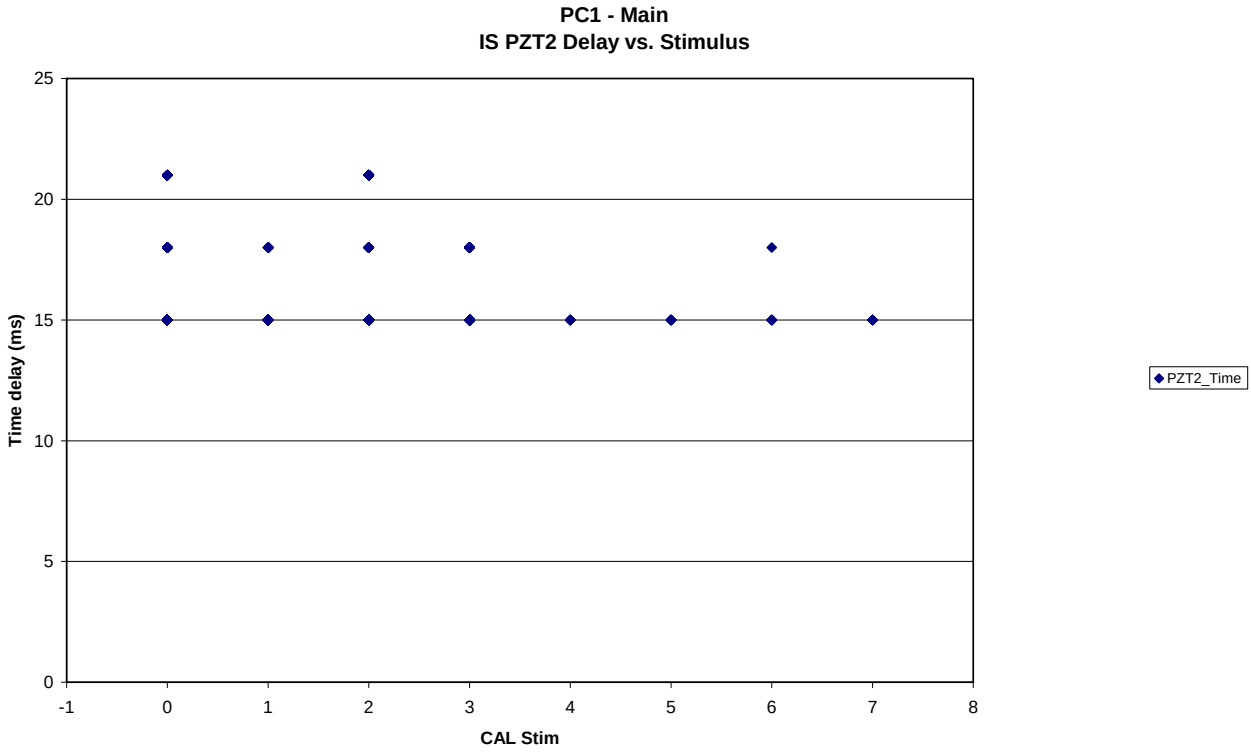


Figure 7.3-38. PZT 3 CAL Time delay vs. stimulus - Main

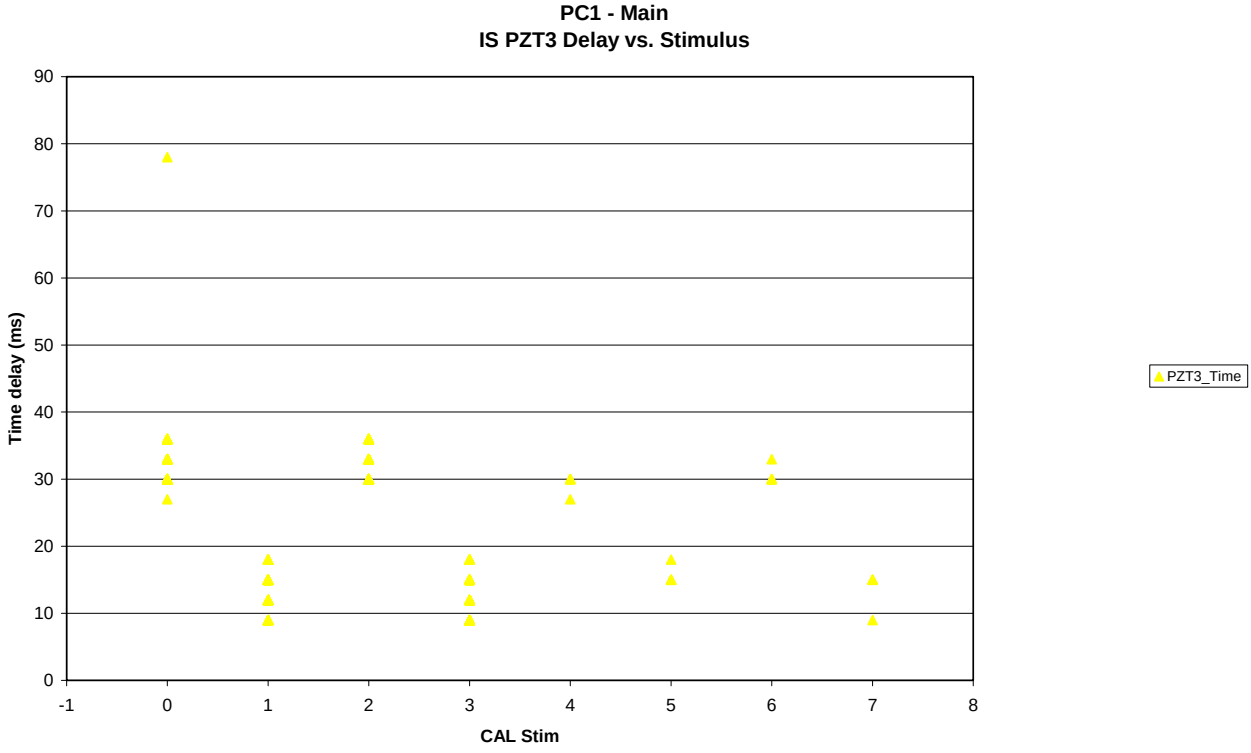


Figure 7.3-39. PZT 4 CAL Time delay vs. stimulus - Main

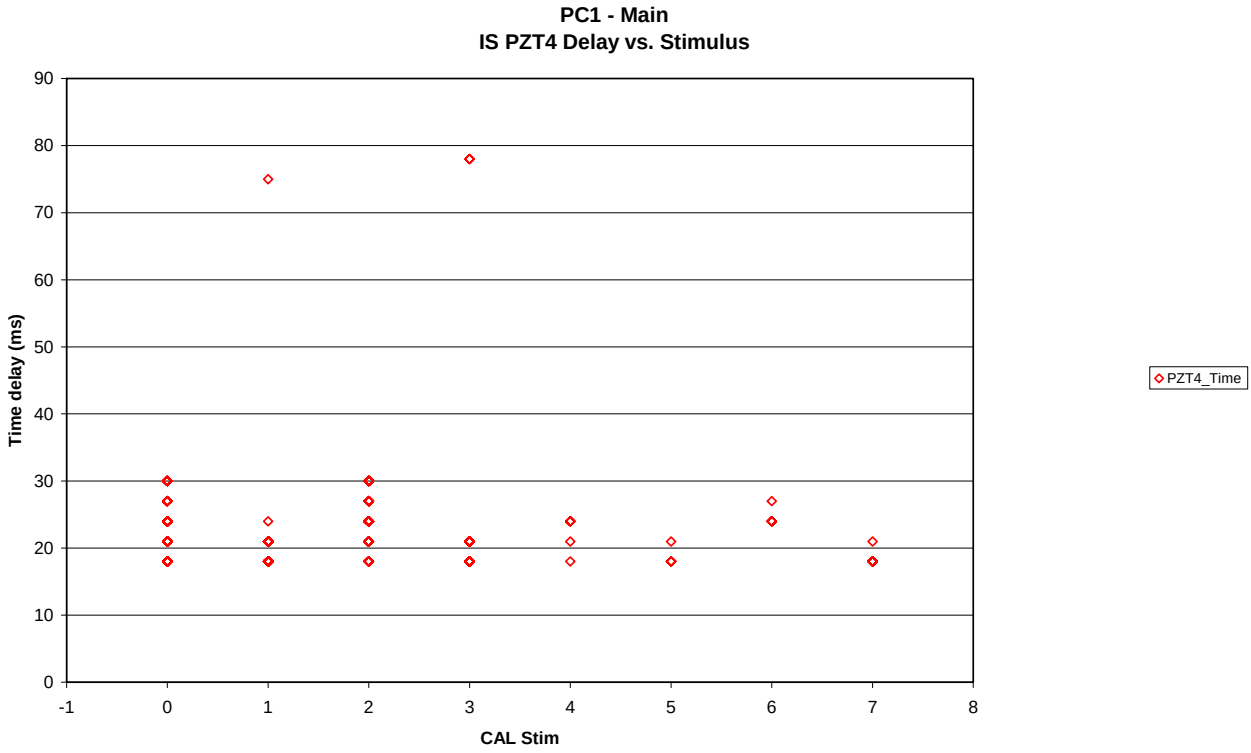
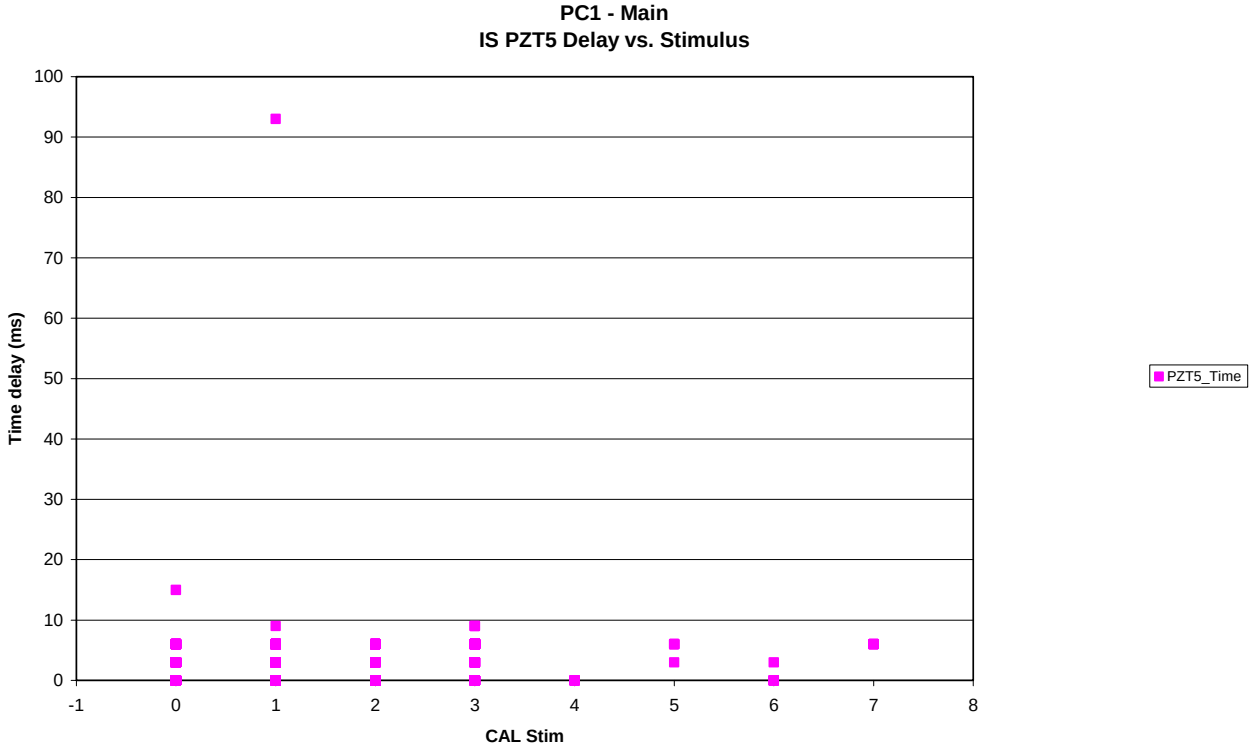


Figure 7.3-40. PZT 5 CAL Time delay vs. stimulus - Main



7.4 MICRO BALANCE SYSTEM (MBS)

7.4.1 MBS – Status

Figure 7.4-1. MBS Operation Status vs. time - Main

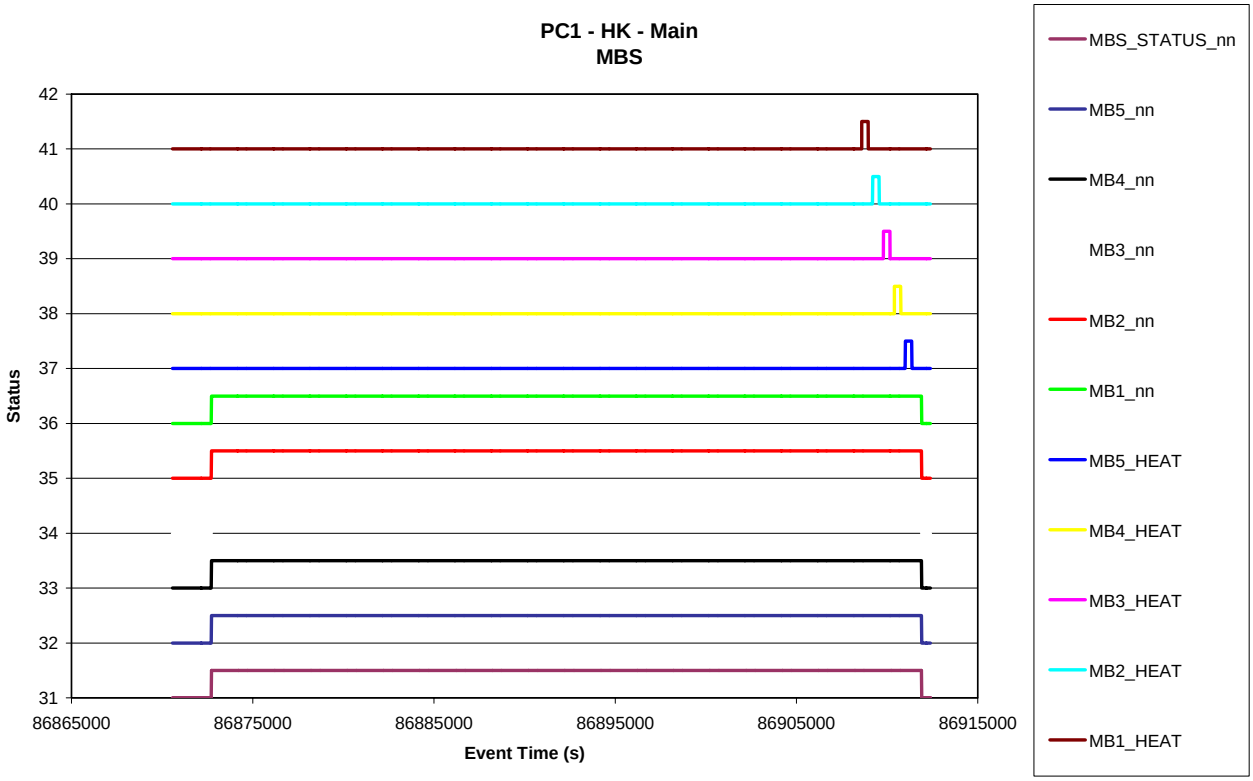


Figure 7.4-2. MBS 1 Temperature vs. time (HK, HK-SCI, SCI) – Main

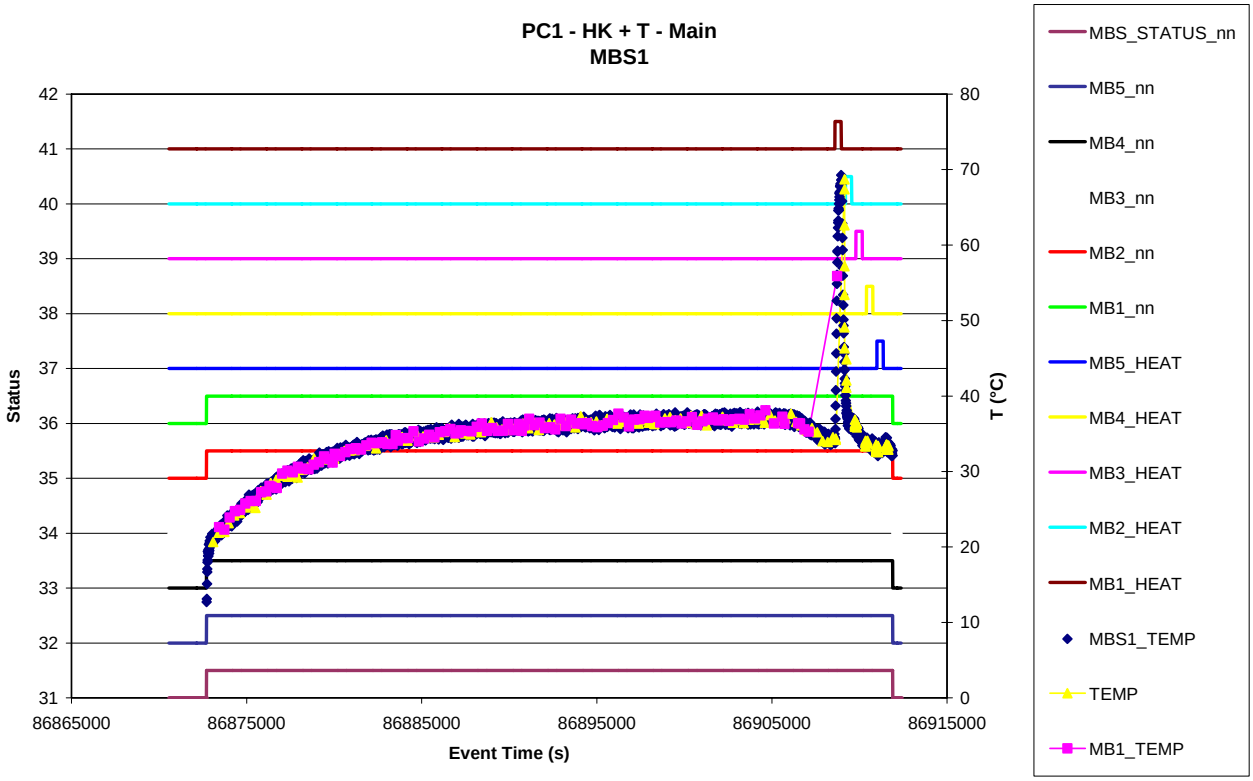


Figure 7.4-3. MBS 2 Temperature vs. time (HK, HK-SCI, SCI) - Main

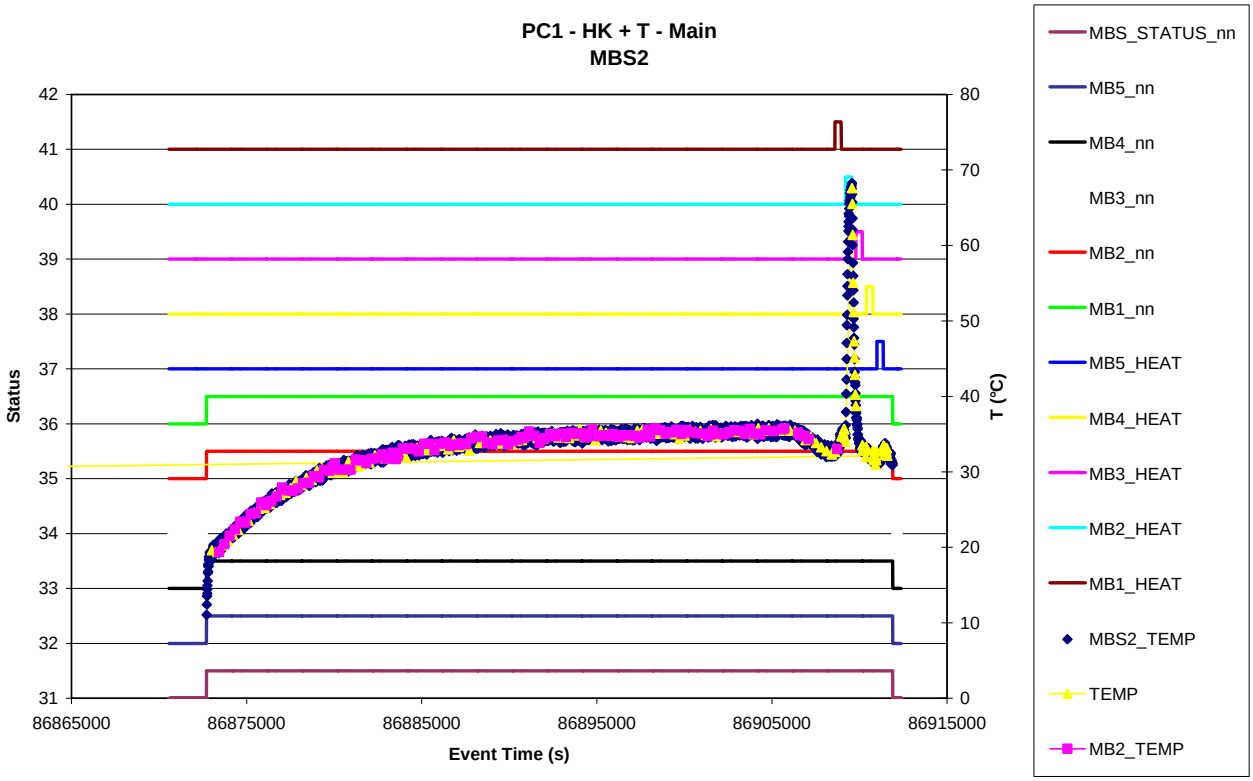


Figure 7.4-4. MBS 3 Temperature vs. time (HK, HK-SCI, SCI) - Main

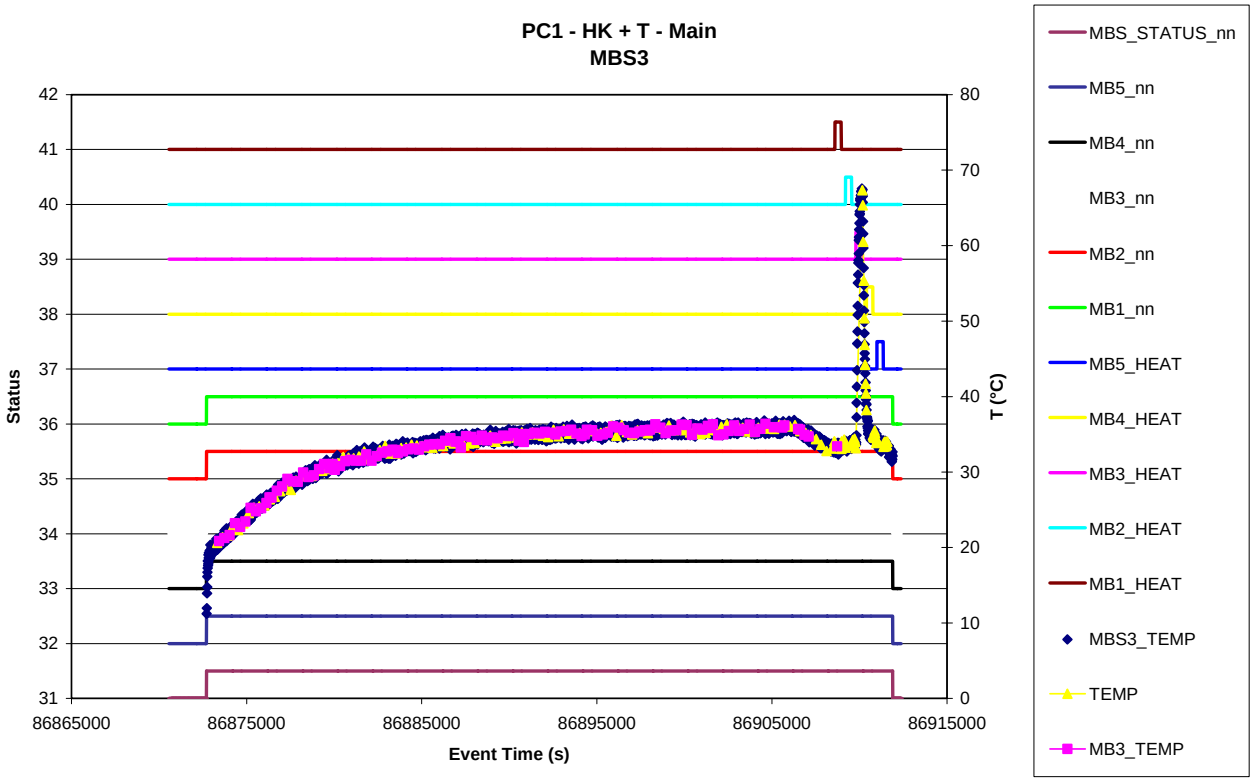


Figure 7.4-5. MBS 4 Temperature vs. time (HK, HK-SCI, SCI) - Main

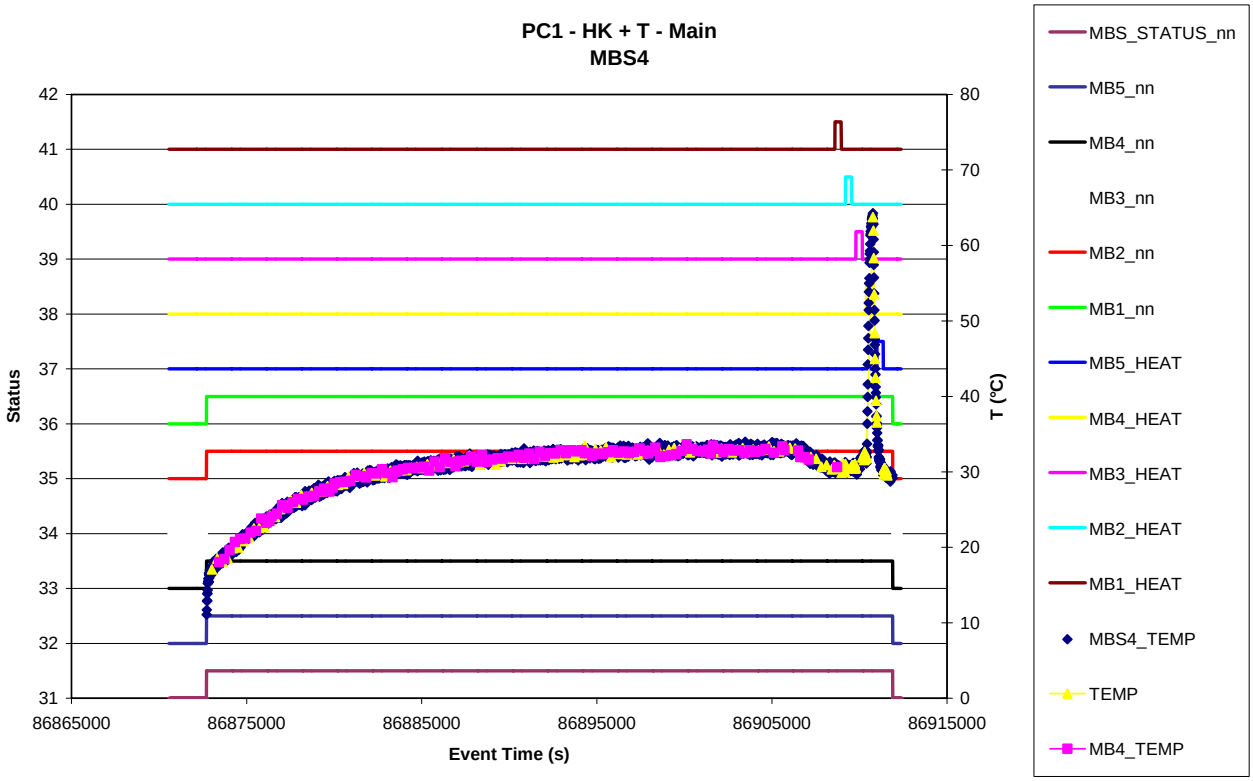
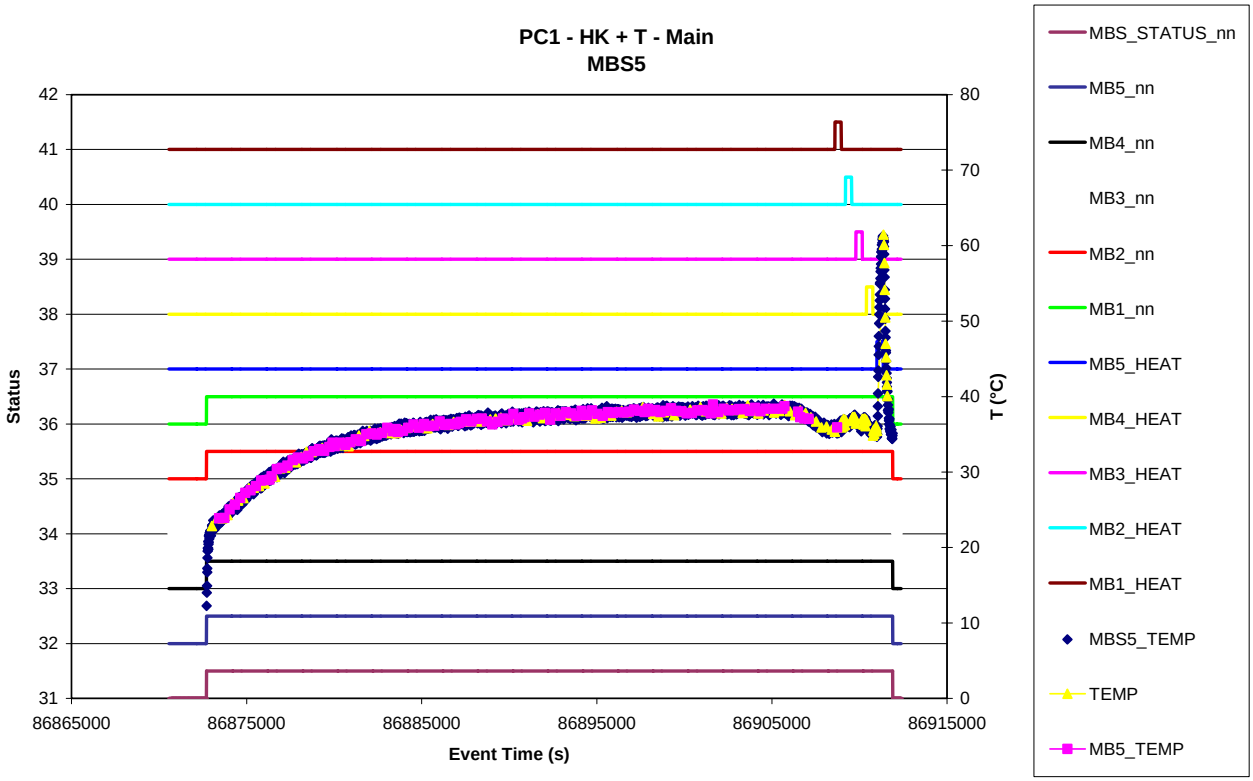


Figure 7.4-6. MBS 5 Temperature vs. time (HK, HK-SCI, SCI) - Main



7.4.2 MBS – Behaviour

7.4.2.1 Science Events (Normal + Heating)

Figure 7.4-7. MBS 1 Frequency and Temperature vs. time - Main

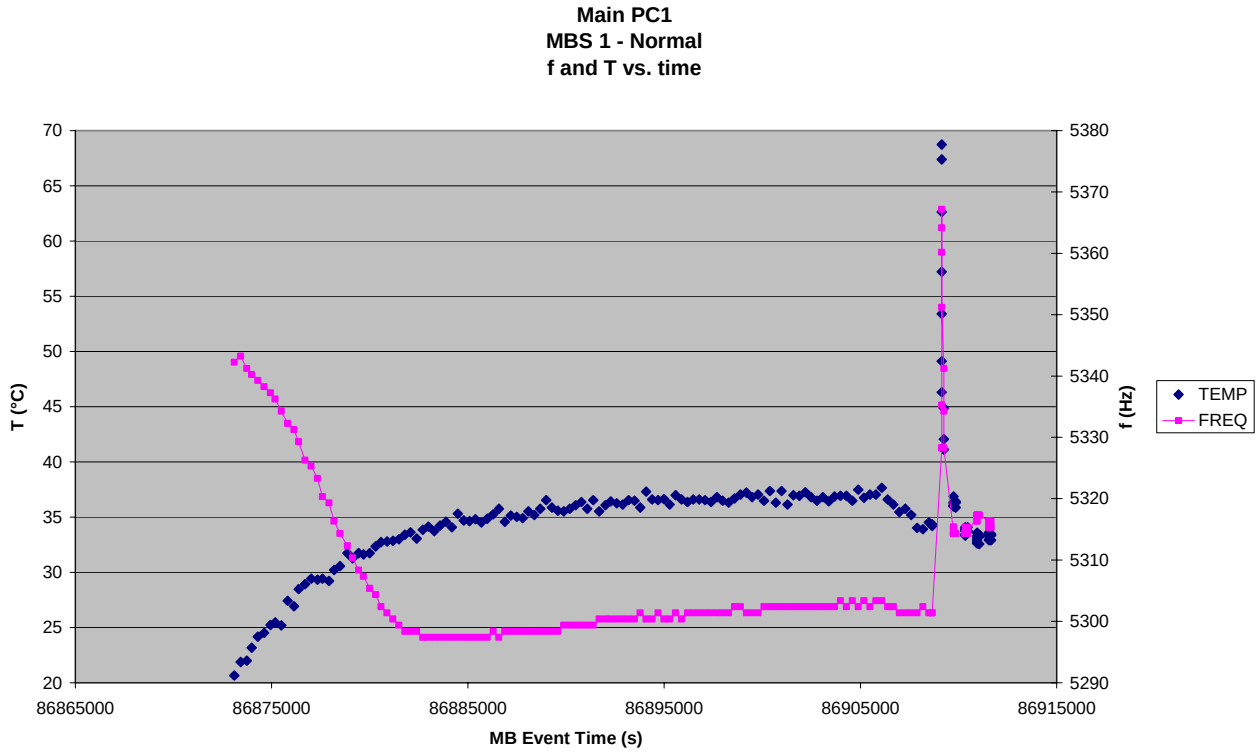


Figure 7.4-8. MBS 2 Frequency and Temperature vs. time - Main

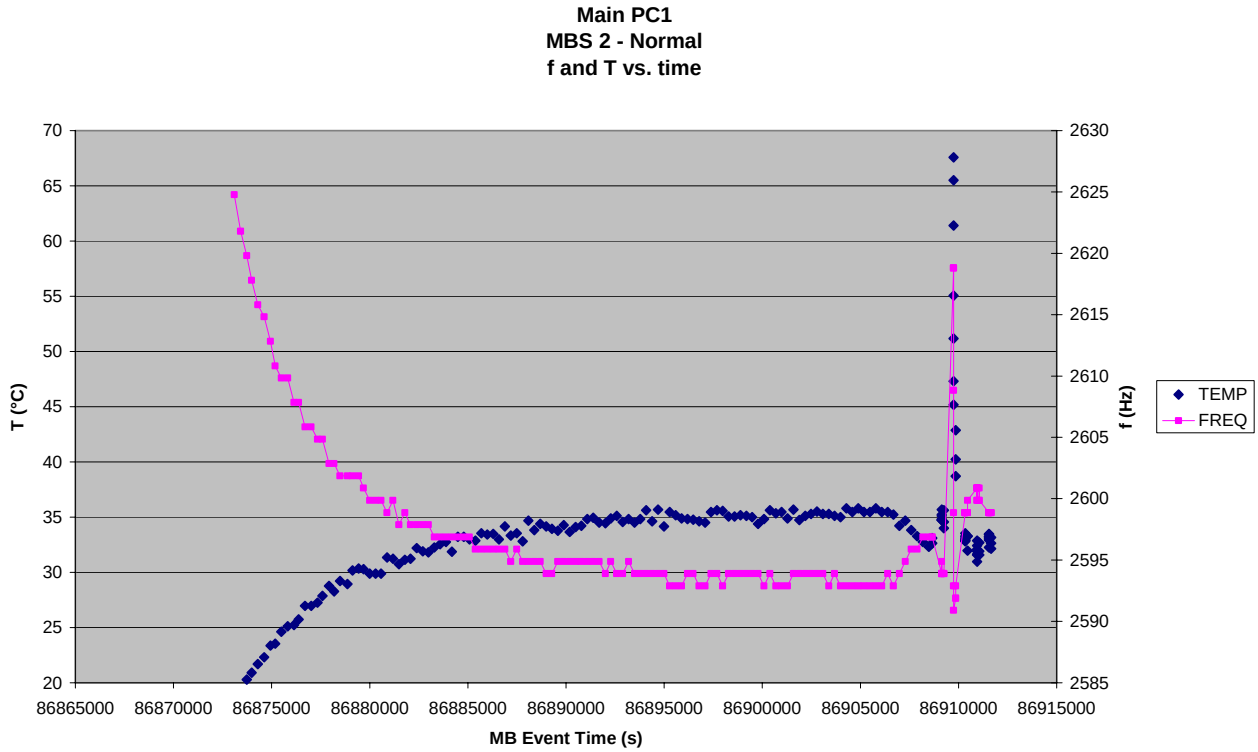


Figure 7.4-9. MBS 3 Frequency and Temperature vs. time - Main

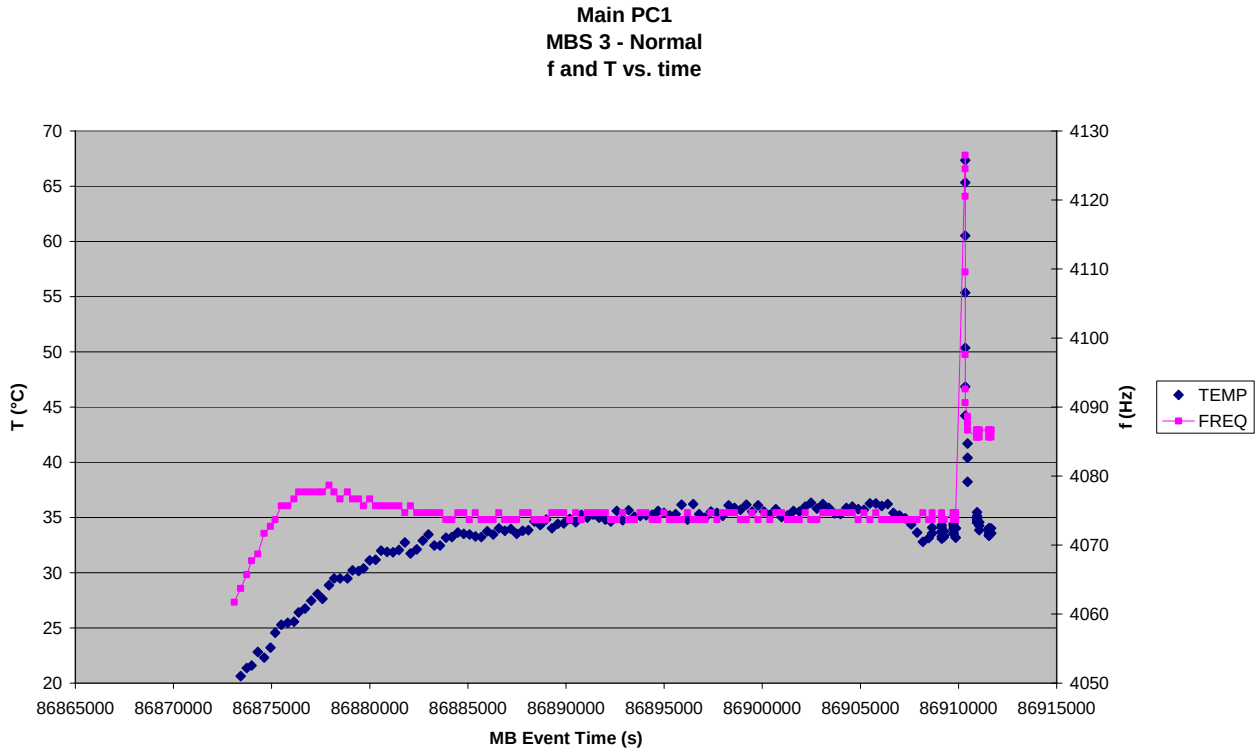


Figure 7.4-10. MBS 4 Frequency and Temperature vs. time - Main

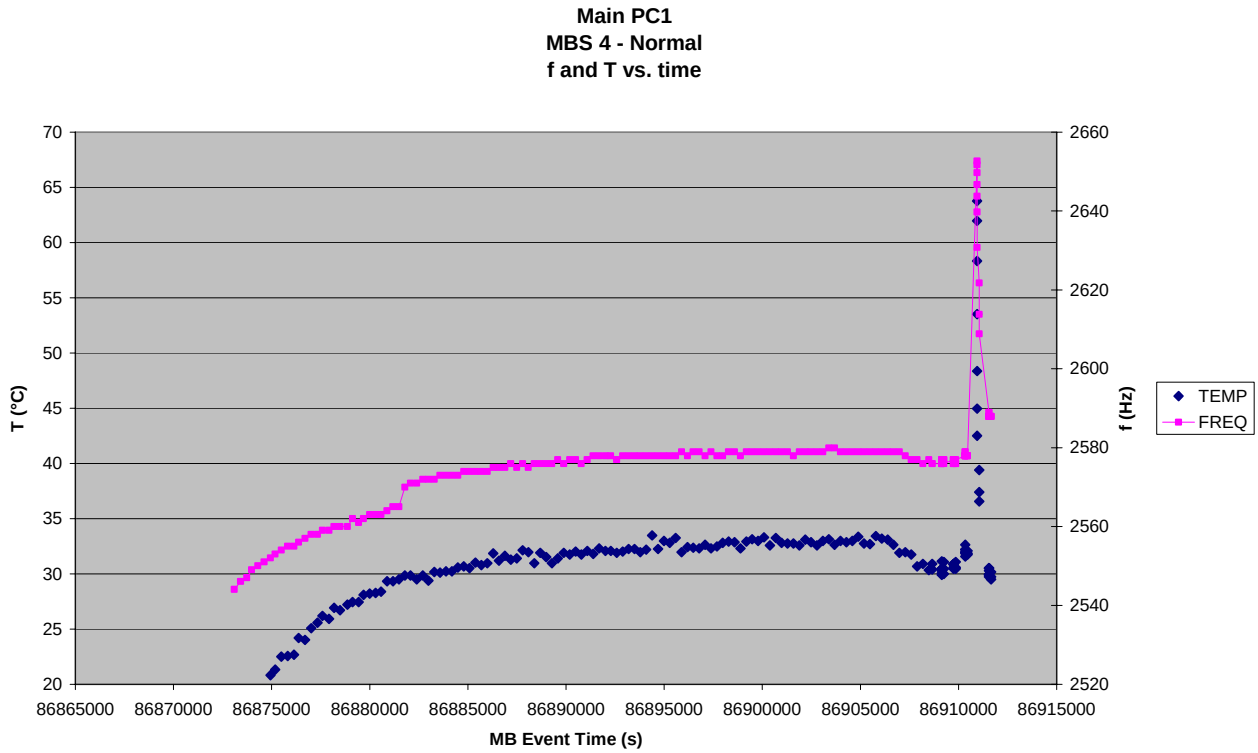


Figure 7.4-11. MBS 5 Frequency and Temperature vs. time - Main

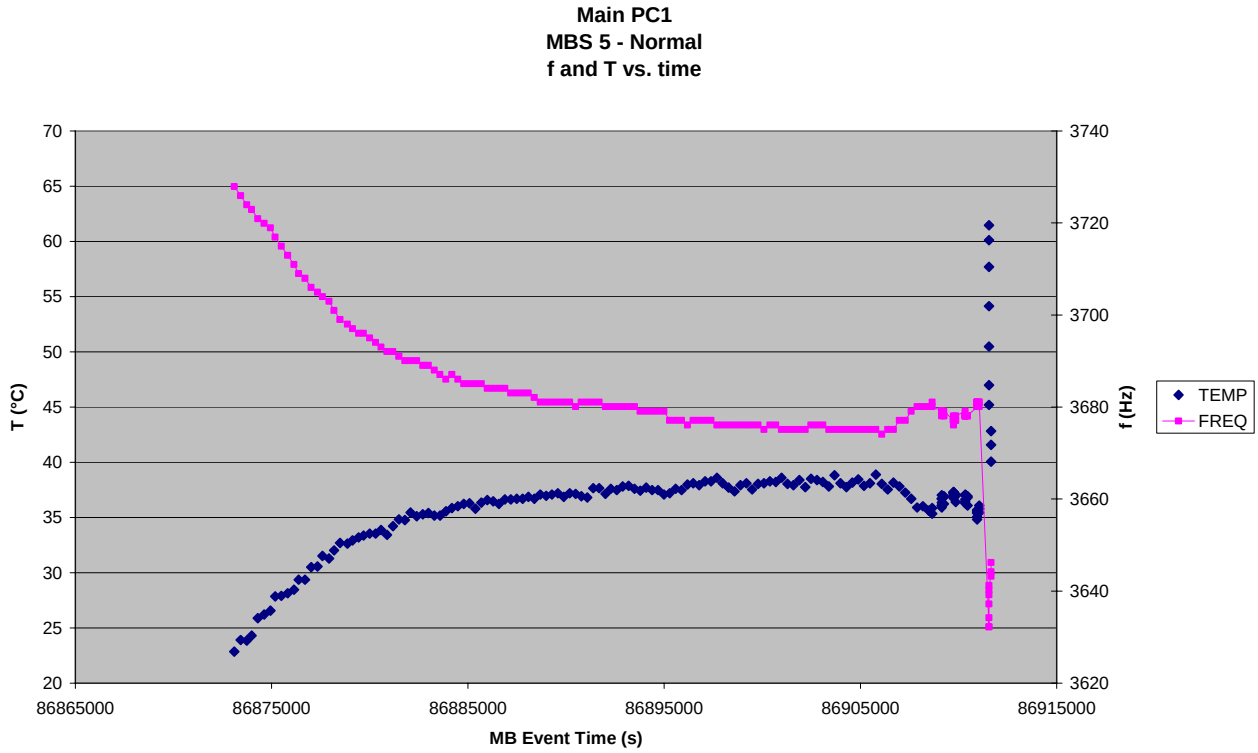


Figure 7.4-12. MBS 1 Frequency vs. Temperature - Main

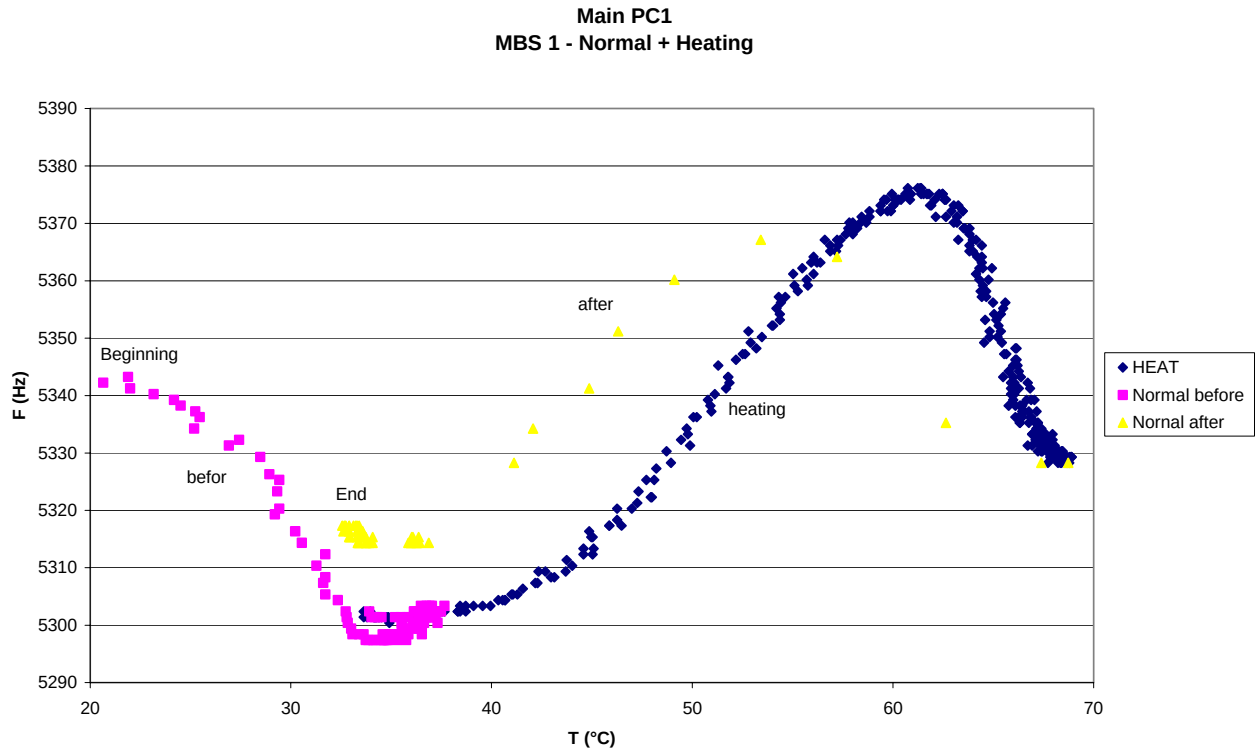


Figure 7.4-13. MBS 2 Frequency vs. Temperature - Main

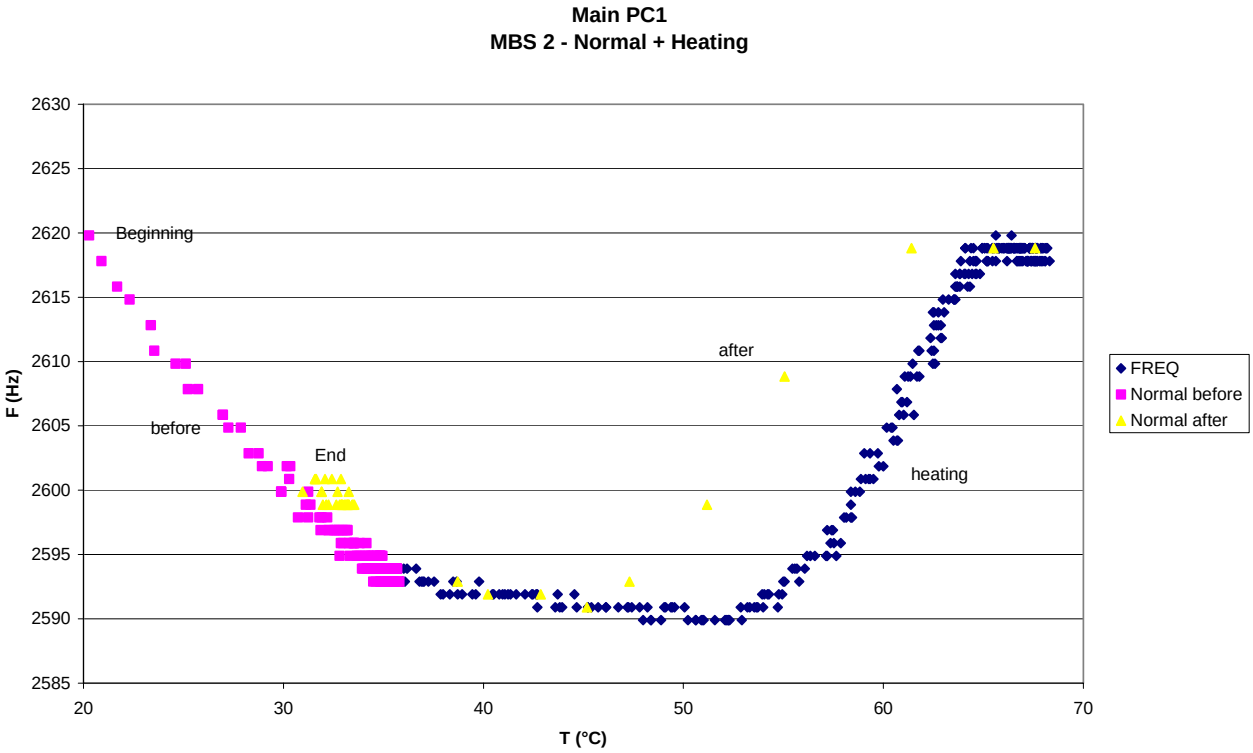


Figure 7.4-14. MBS 3 Frequency vs. Temperature - Main

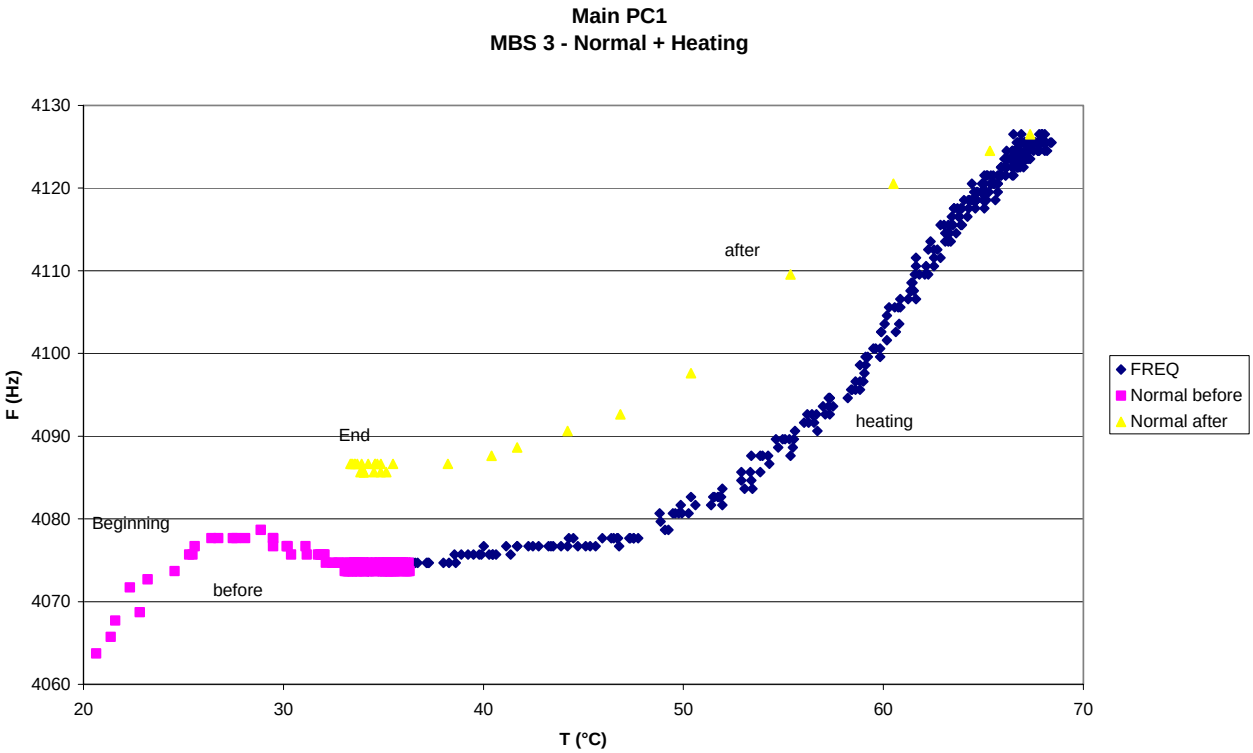


Figure 7.4-15. MBS 4 Frequency vs. Temperature - Main

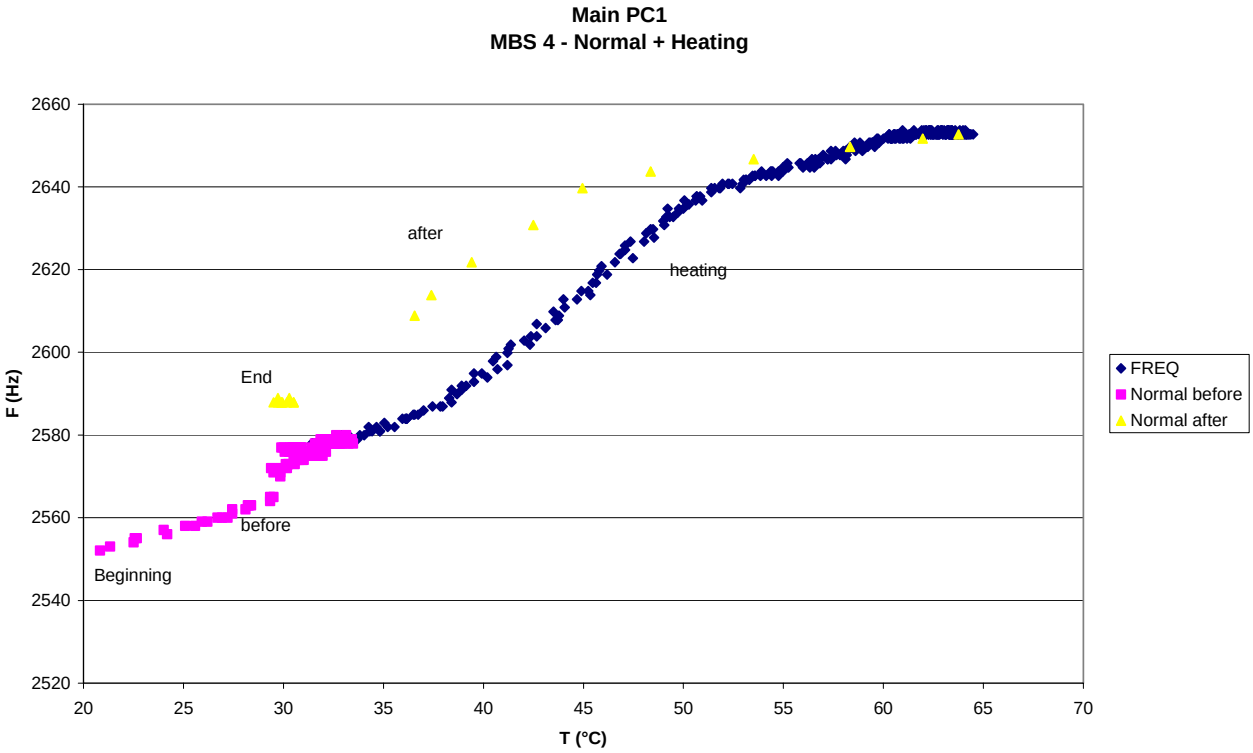
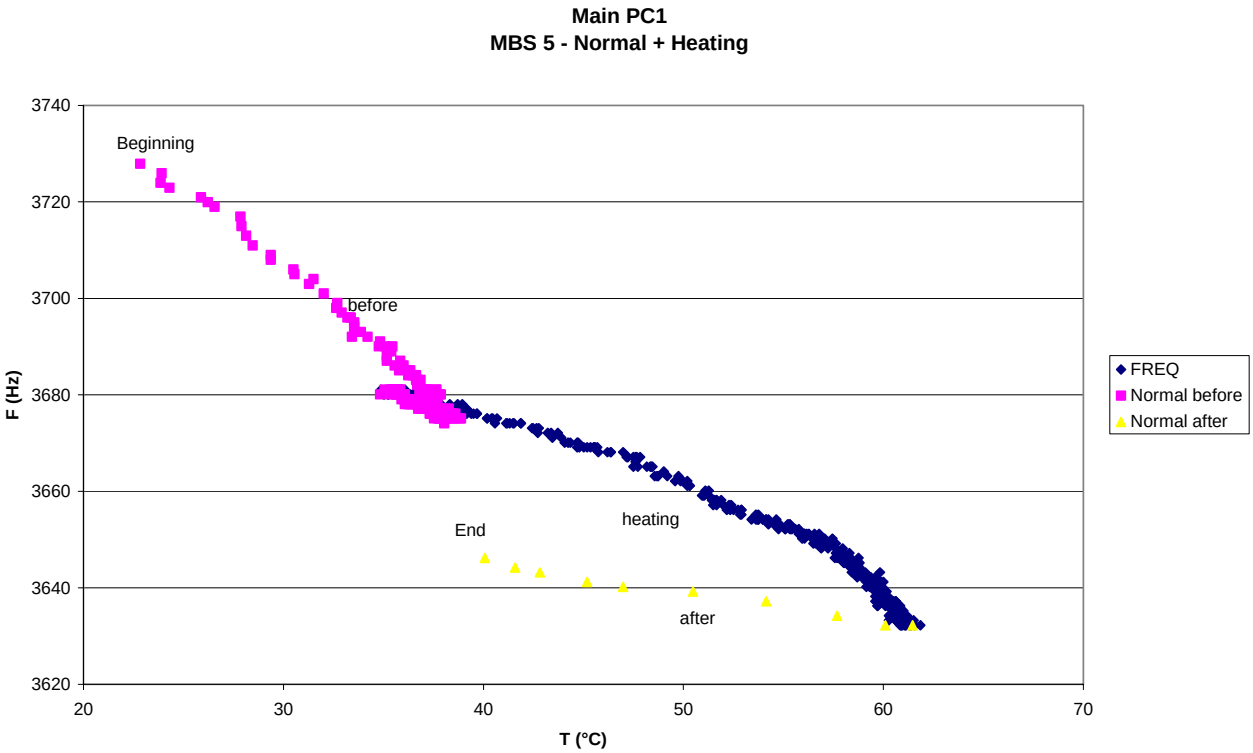


Figure 7.4-16. MBS 5 Frequency vs. Temperature - Main



8. PC1 DATA ANALYSIS – REDUNDANT INTERFACE

8.1 GIADA STATUS

Figure 8.1-1. HK Status of GIADA and S/S vs. time - Redundant

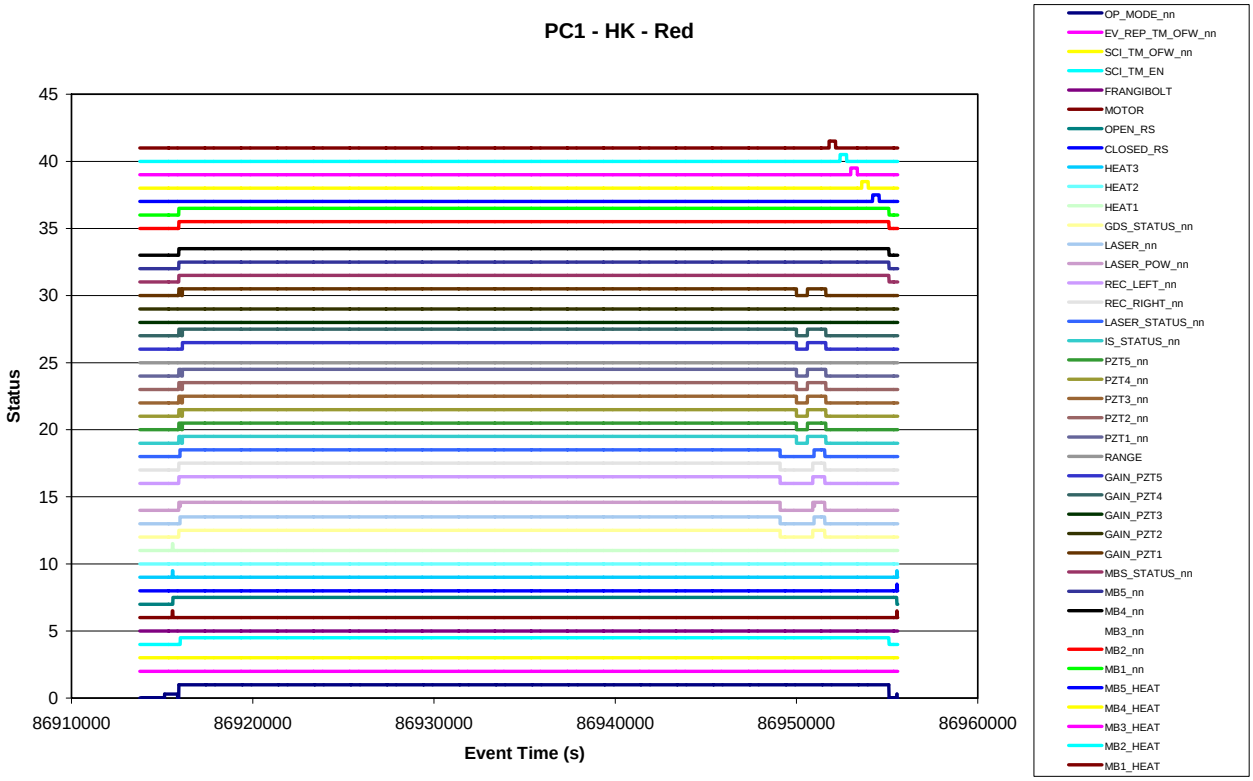


Figure 8.1-2. Evolution of all temperatures vs. time - HK, HK-SCI, SCI - Redundant

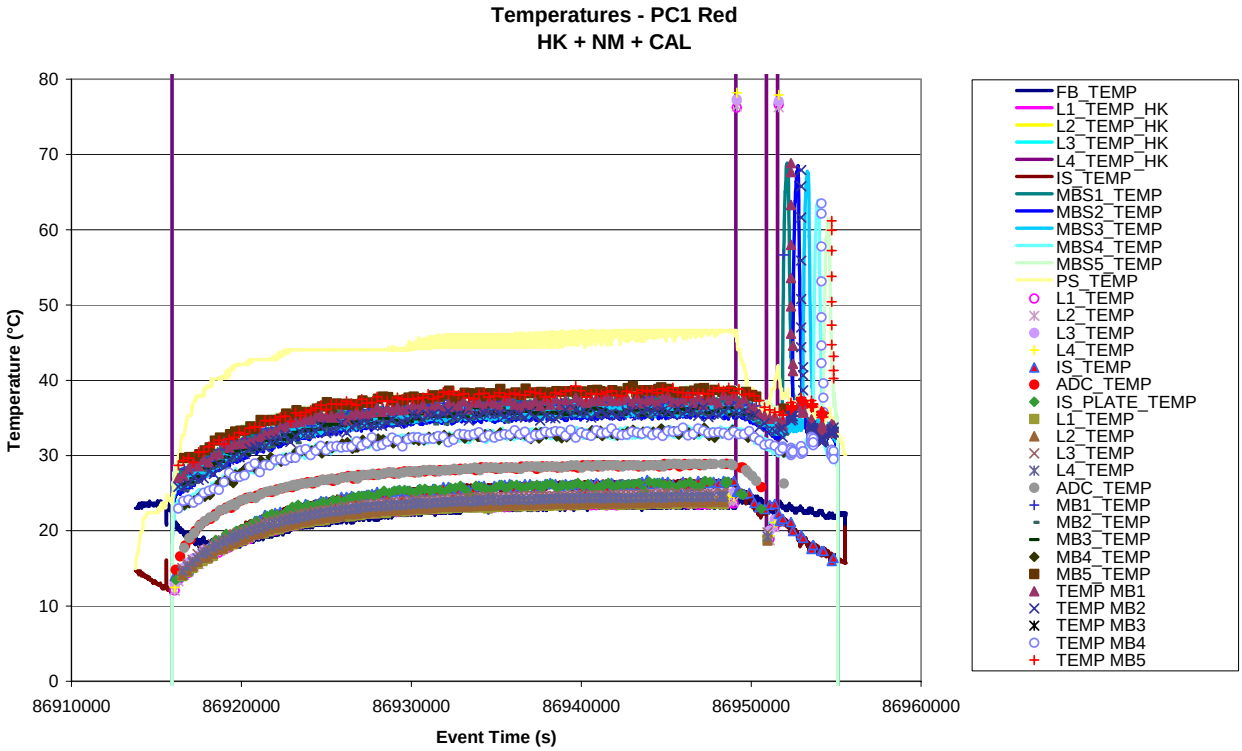


Figure 8.1-3. Evolution of temperatures of system elements vs. time - HK, HK-SCI, SCI - Red

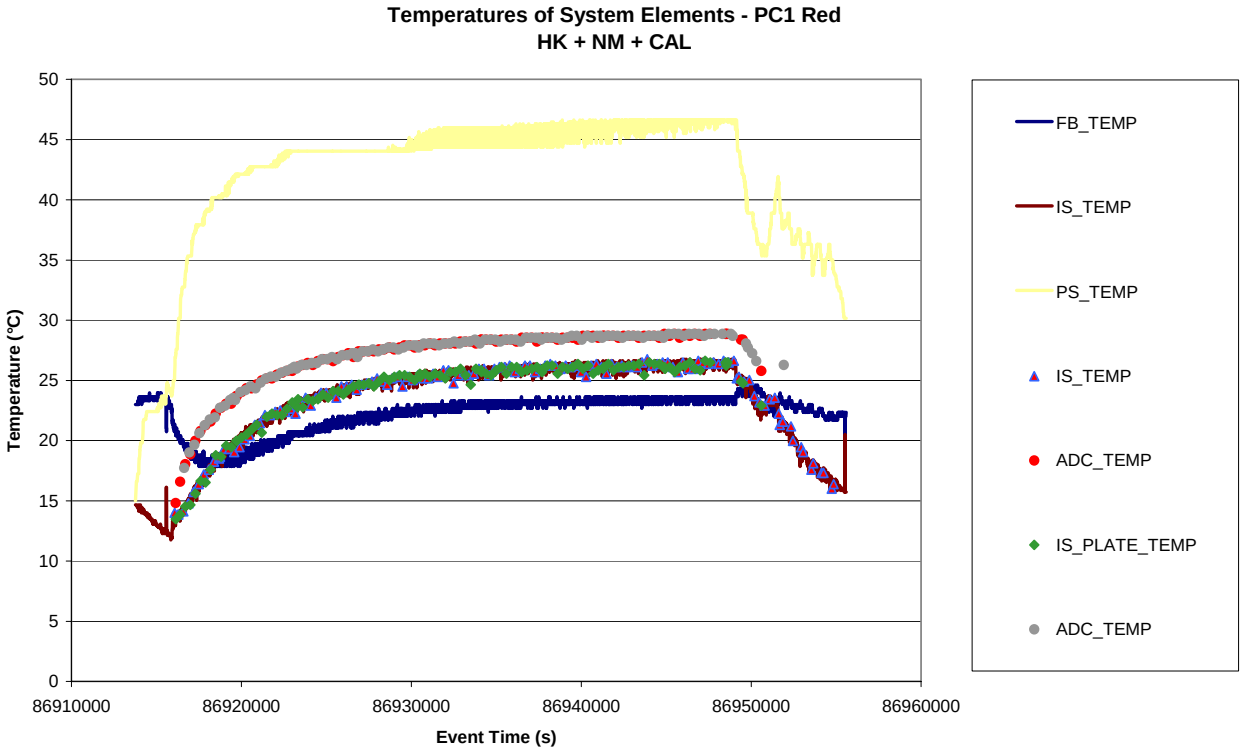


Figure 8.1-4. Evolution of temperatures of sub-systems vs. time - HK, HK-SCI, SCI - Red

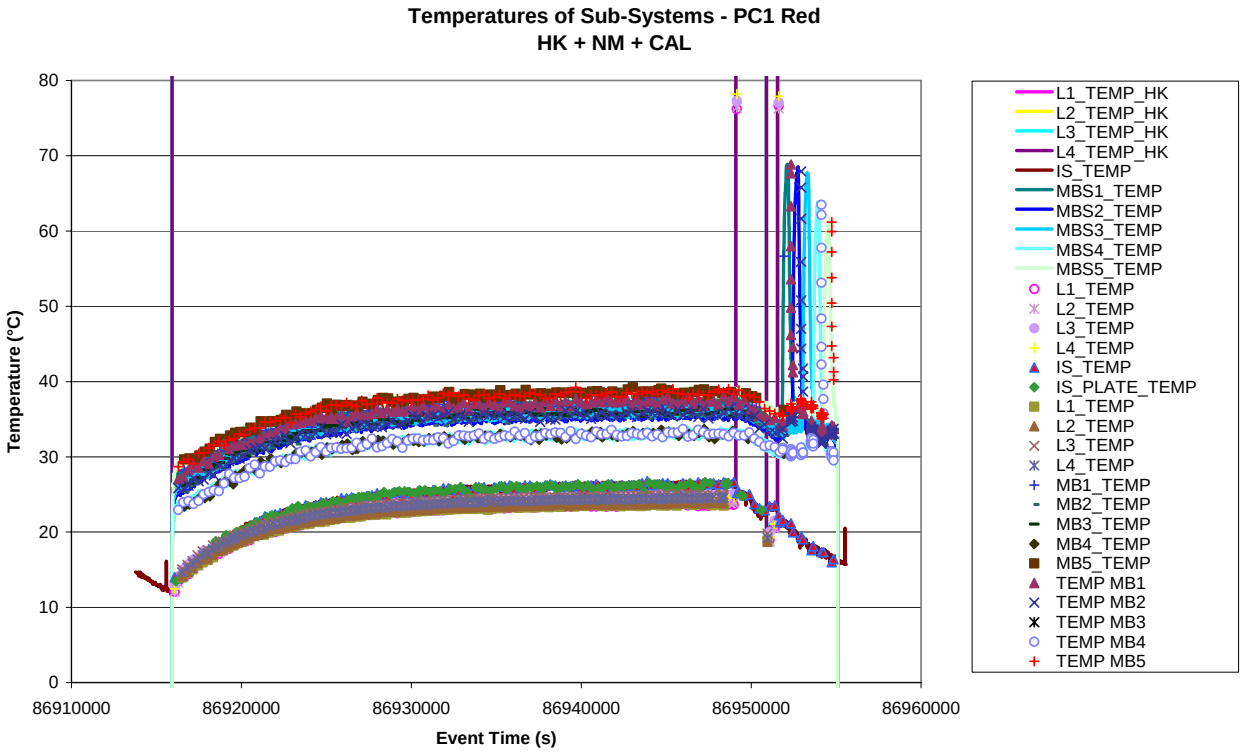


Figure 8.1-5. Operation Status vs. time - Red

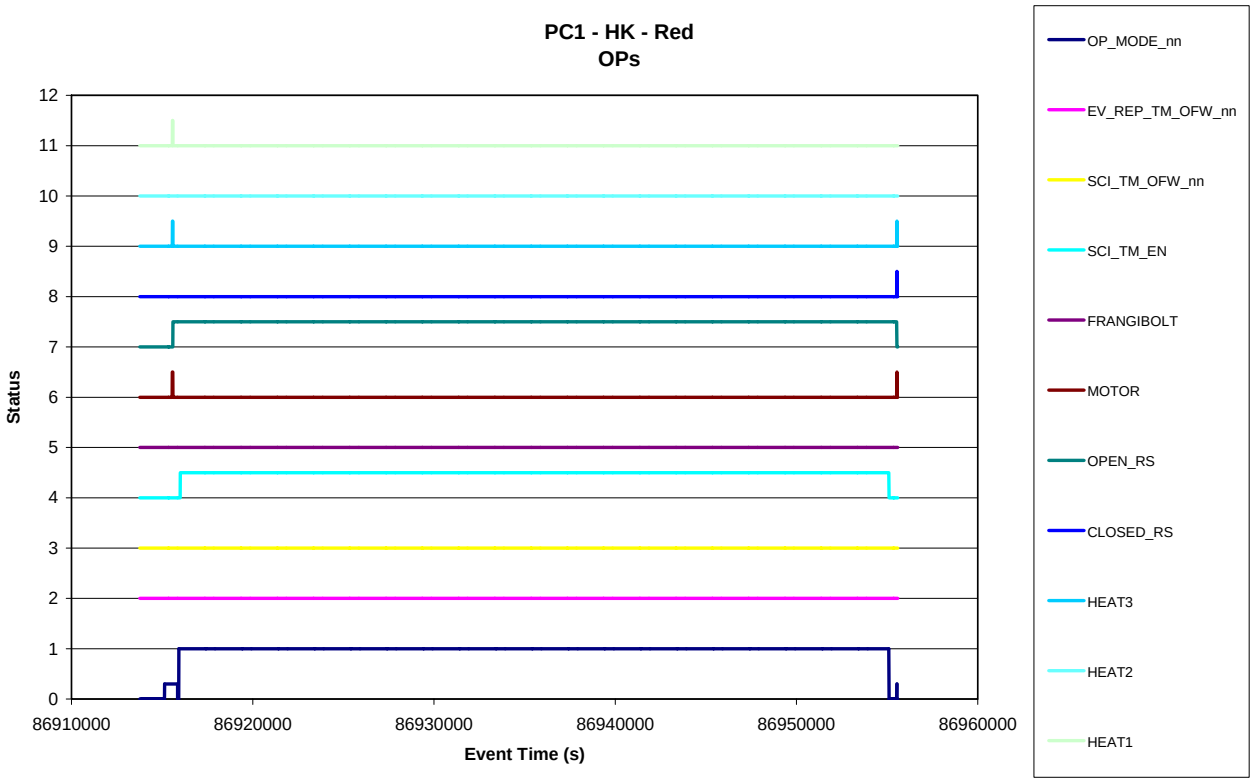


Figure 8.1-6. Power behaviour - Red

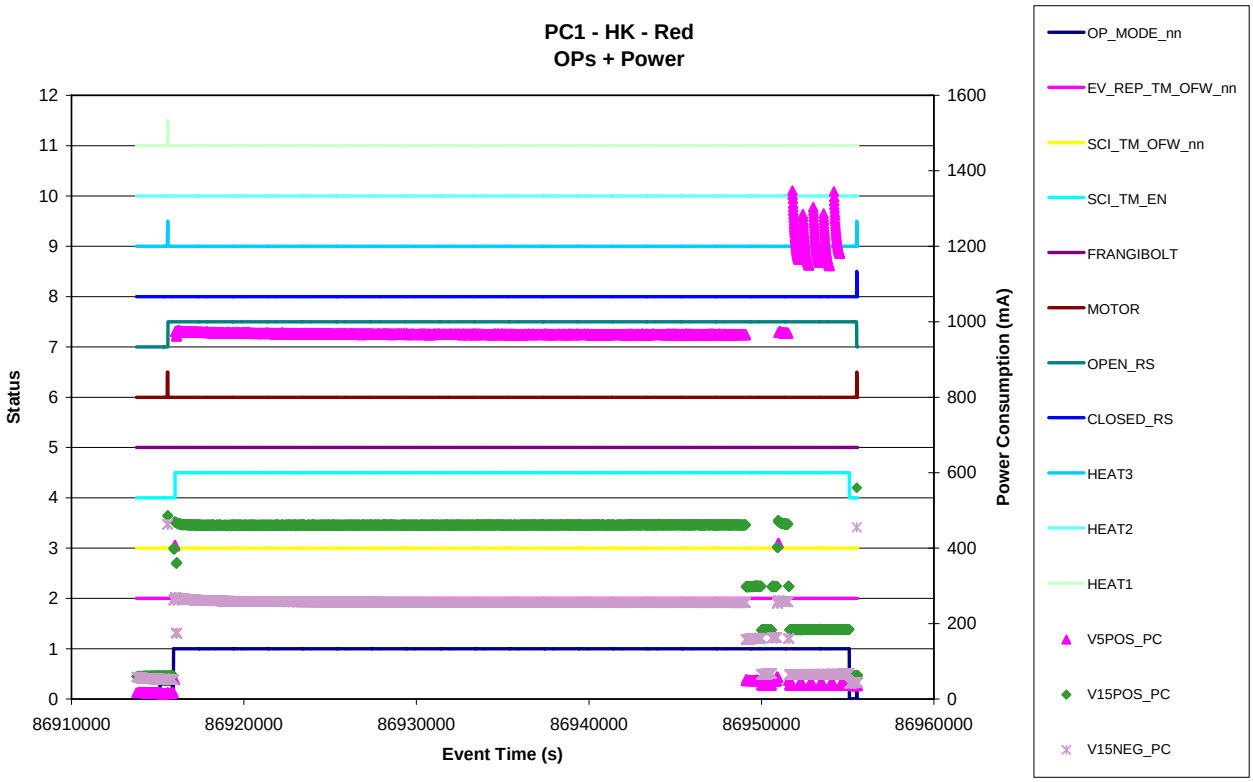


Figure 8.1-7. Power and PS temperature behaviour - Red

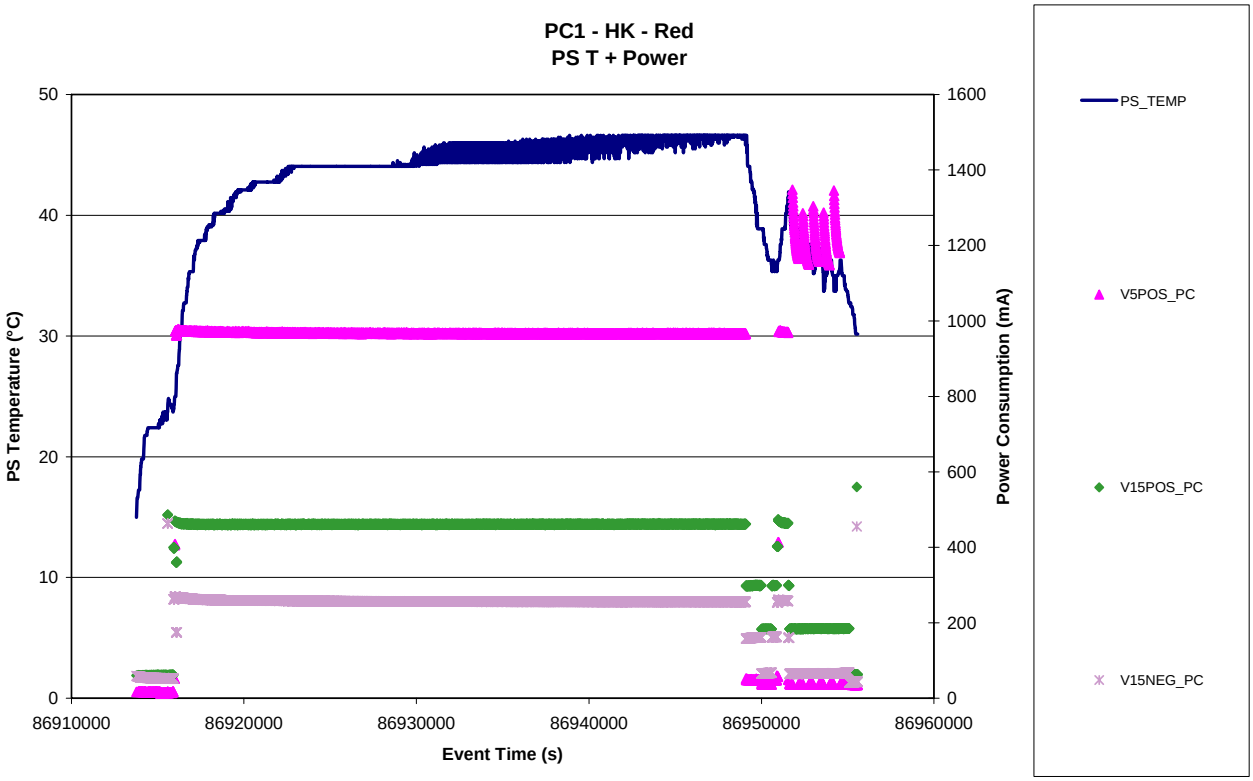


Figure 8.1-8. Source Sequence Count (SSC) of HK Telemetry vs. Time - Red

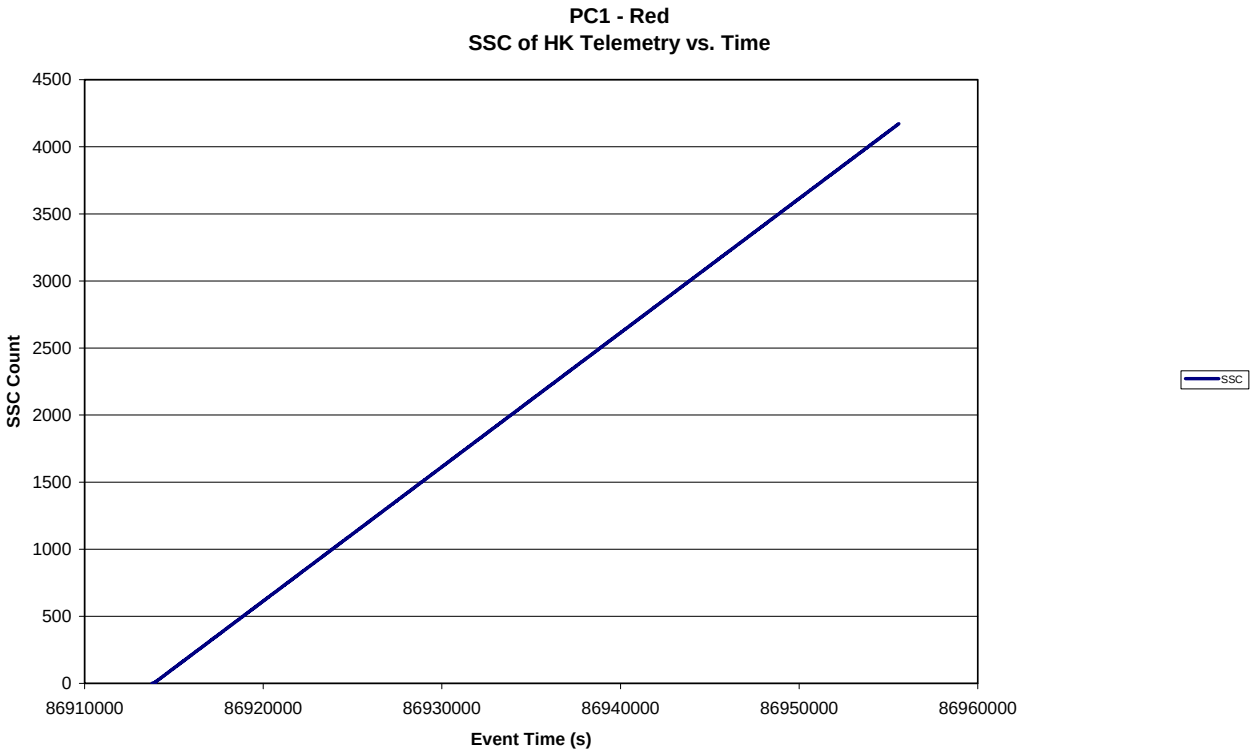


Figure 8.1-9. Source Sequence Count (SSC) of HK Telemetry vs. Number - Red

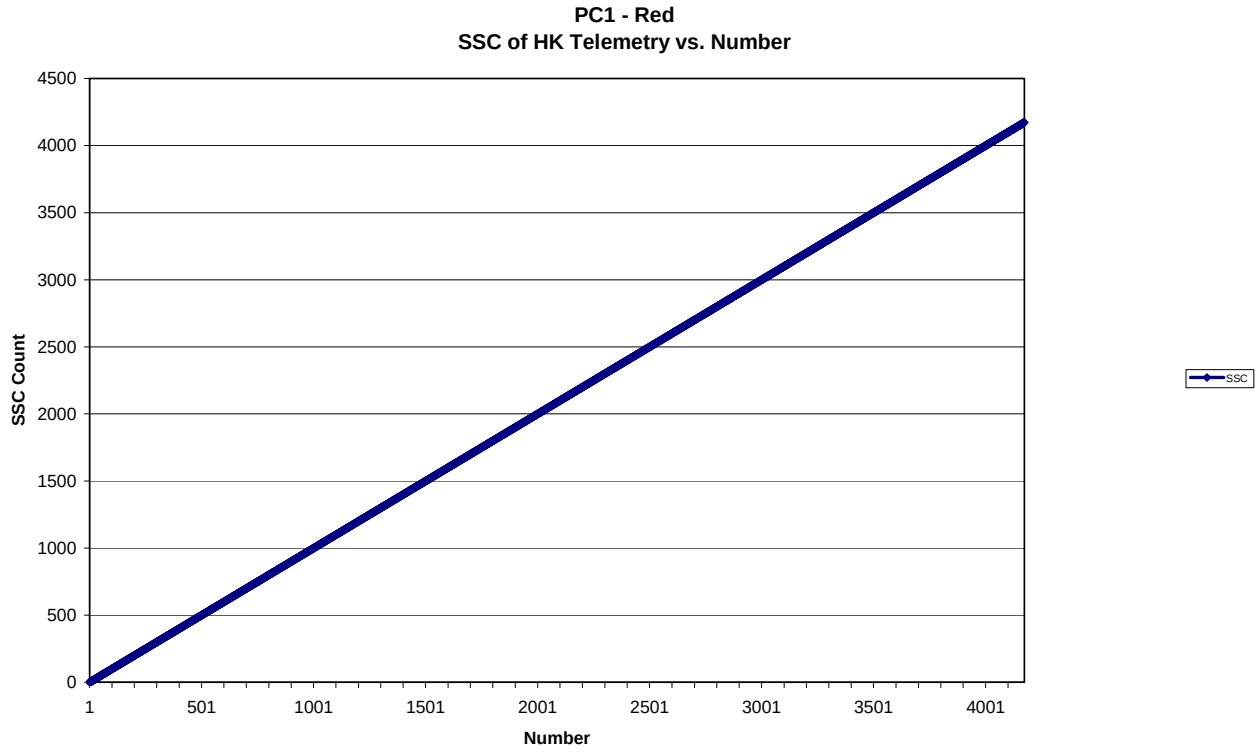


Figure 8.1-10. Source Sequence Count (SSC) of SCI Telemetry vs. Time - Red

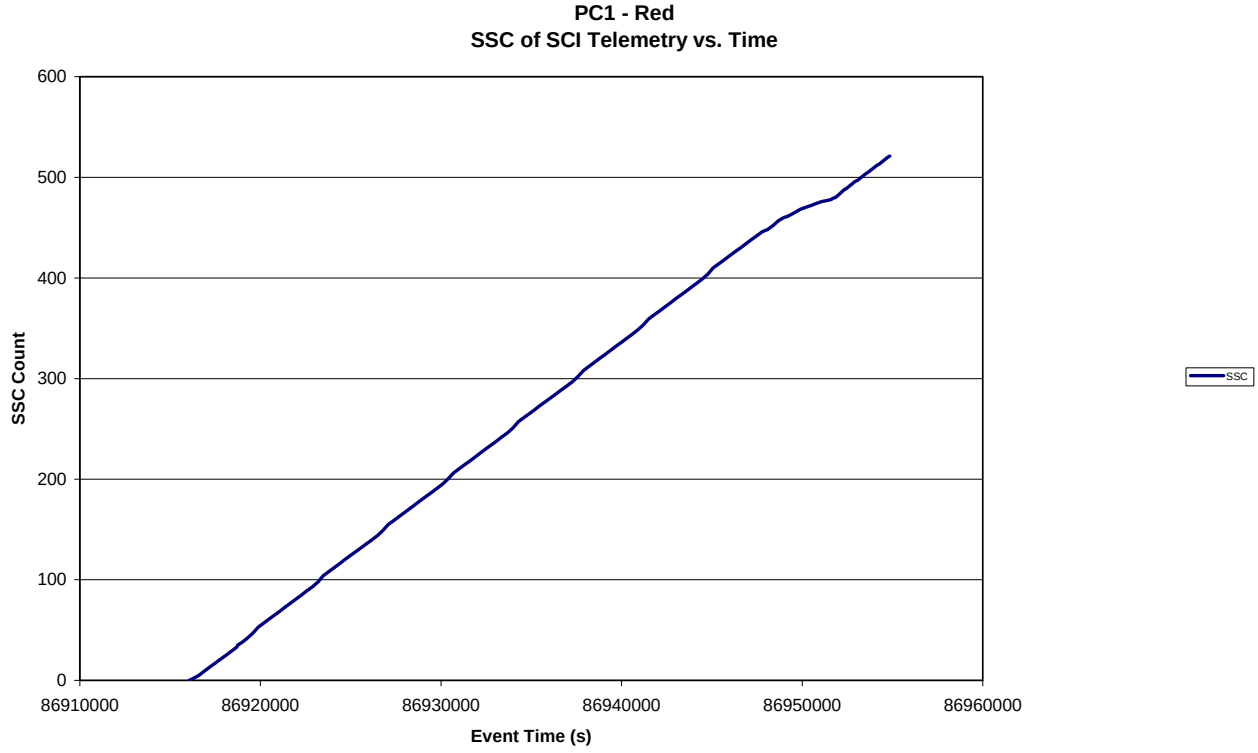
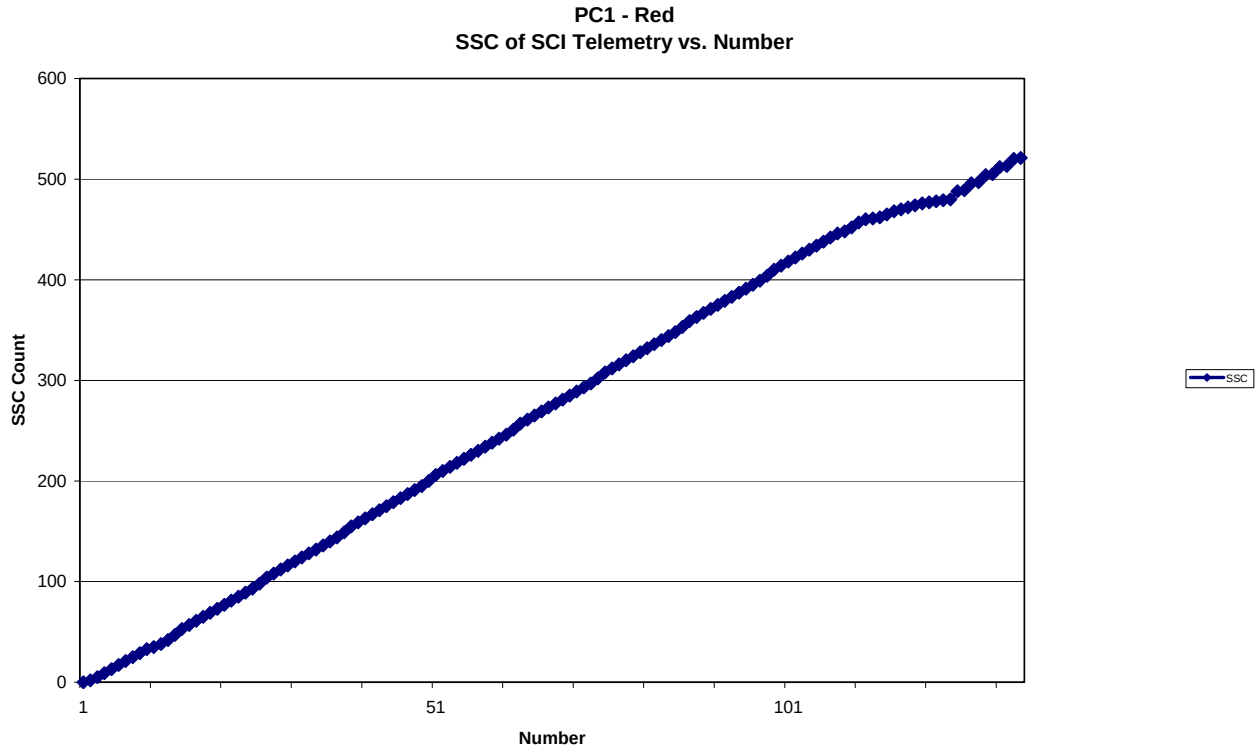


Figure 8.1-11. Source Sequence Count (SSC) of SCI Telemetry vs. Number - Red



8.2 GRAIN DETECTION SYSTEM (GDS)

8.2.1 GDS – Status

Figure 8.2-1. GDS Operation Status vs. time - Red

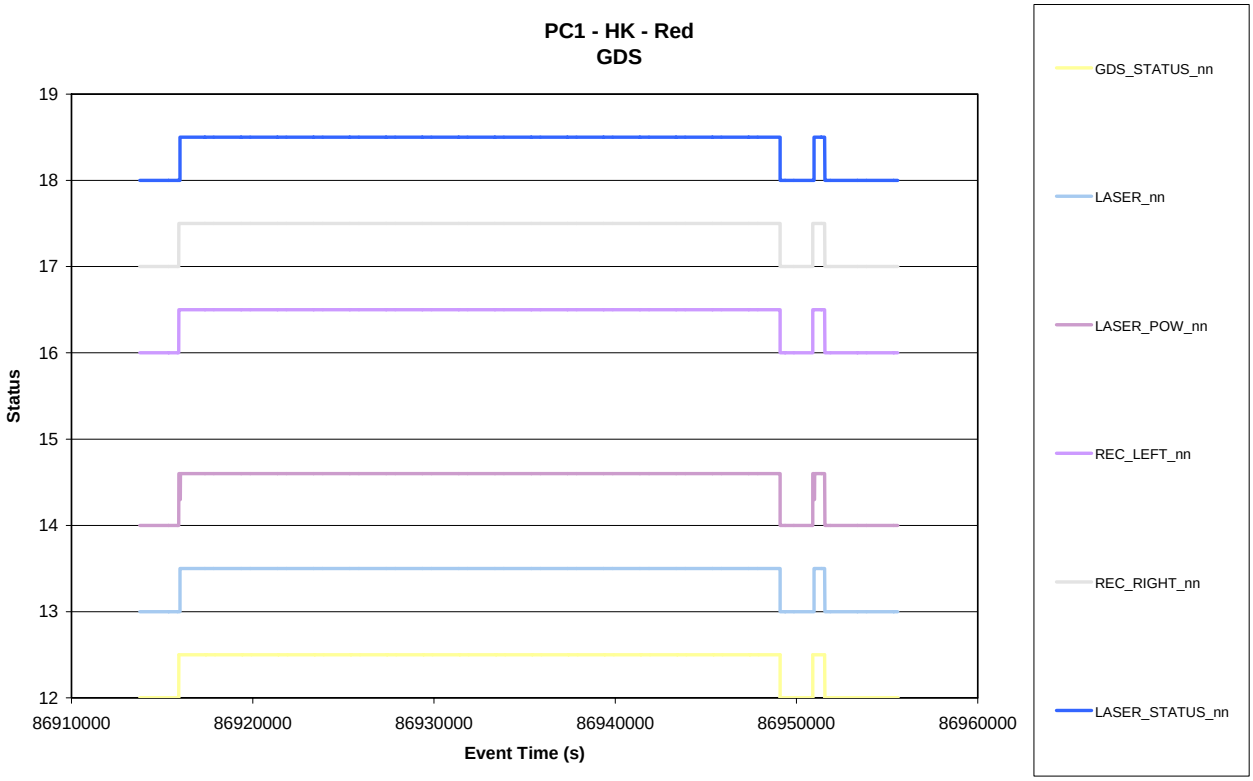


Figure 8.2-2. GDS Thresholds change vs. time - Red

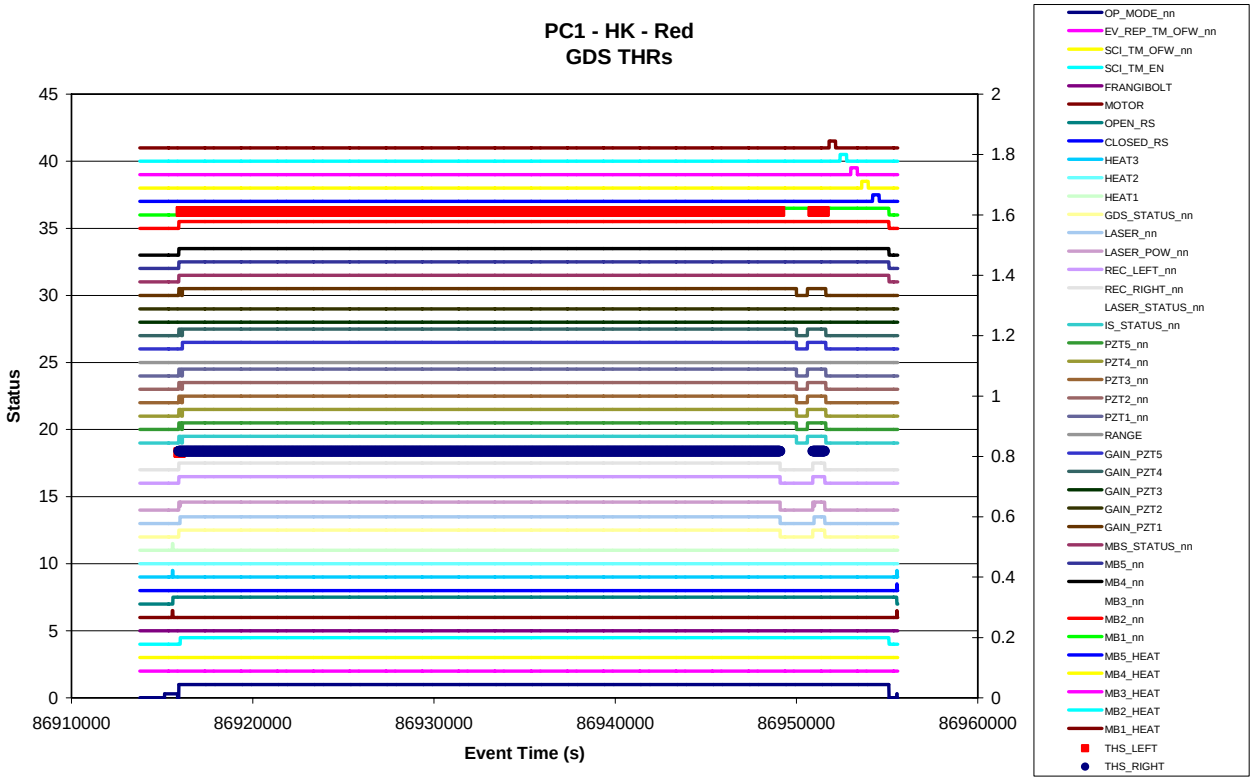


Figure 8.2-3. GDS Laser Temperatures vs. time (HK, HK-SCI, SCI) - Red

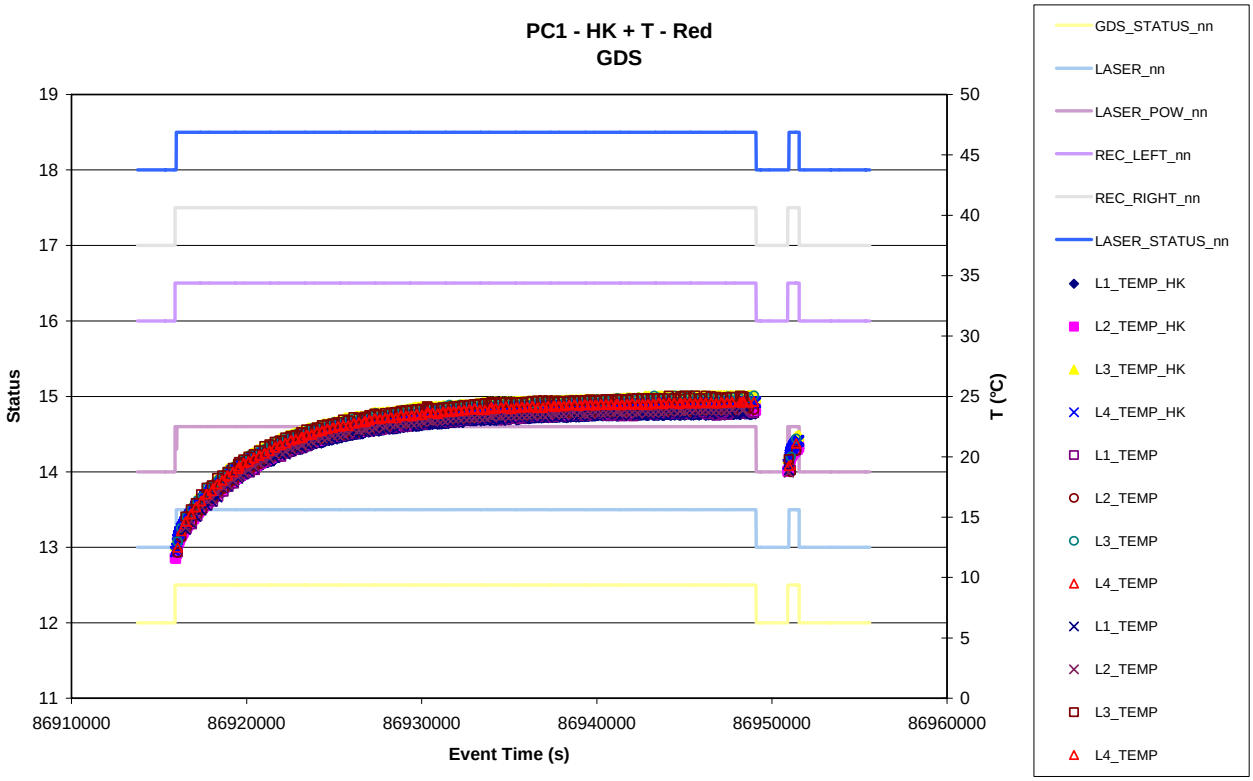


Figure 8.2-4. GDS Laser Monitor vs. time (HK, HK-SCI, SCI) - Red

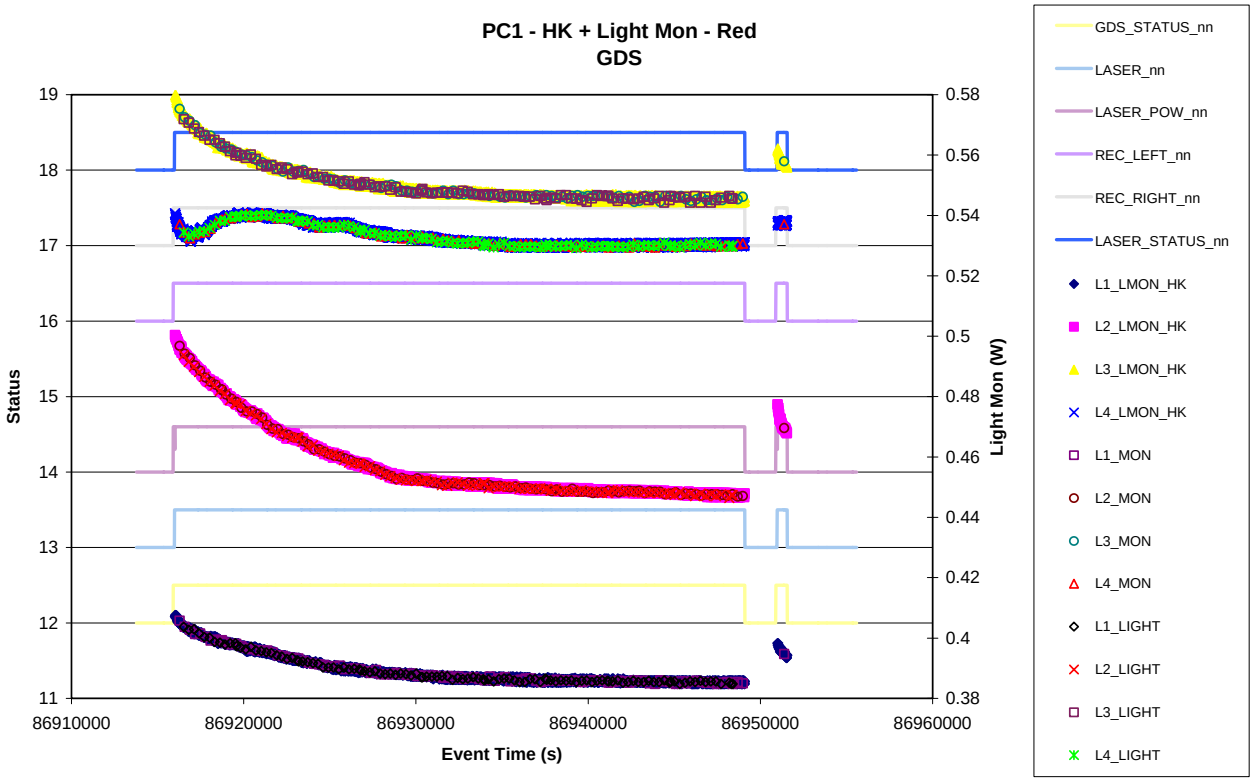


Figure 8.2-5. Laser 1 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Red

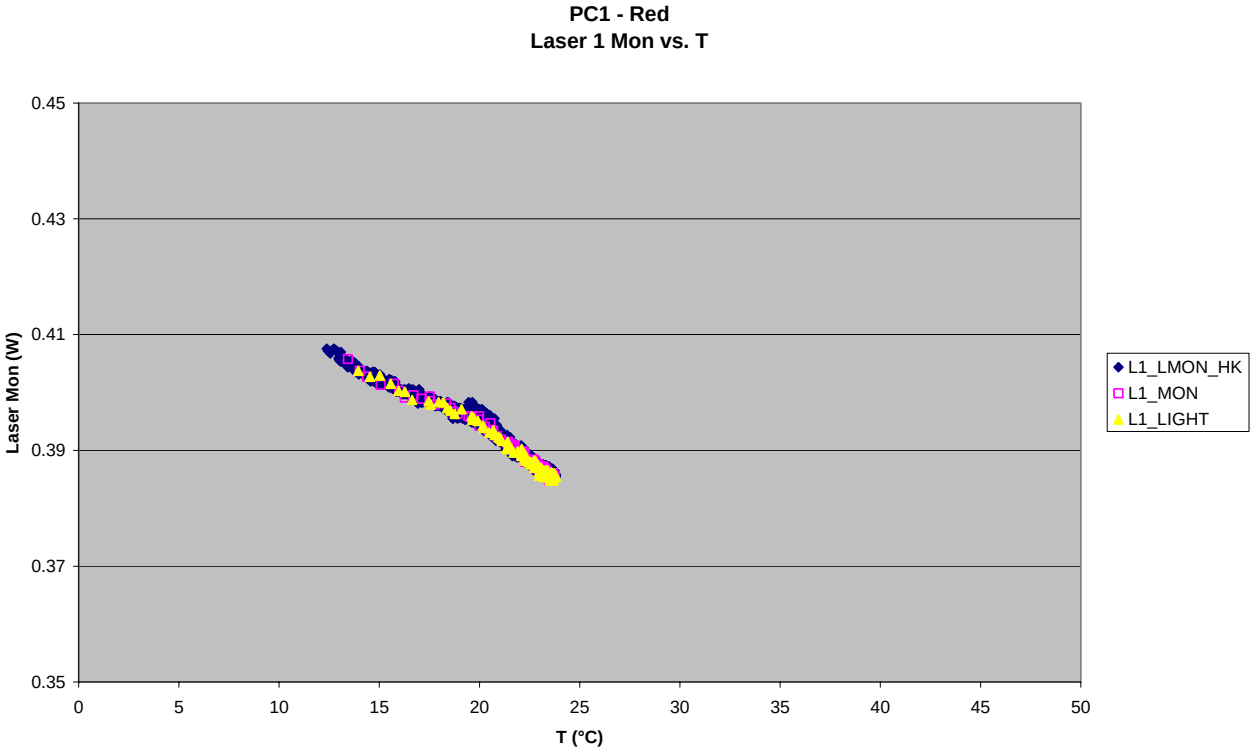


Figure 8.2-6. Laser 2 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Red

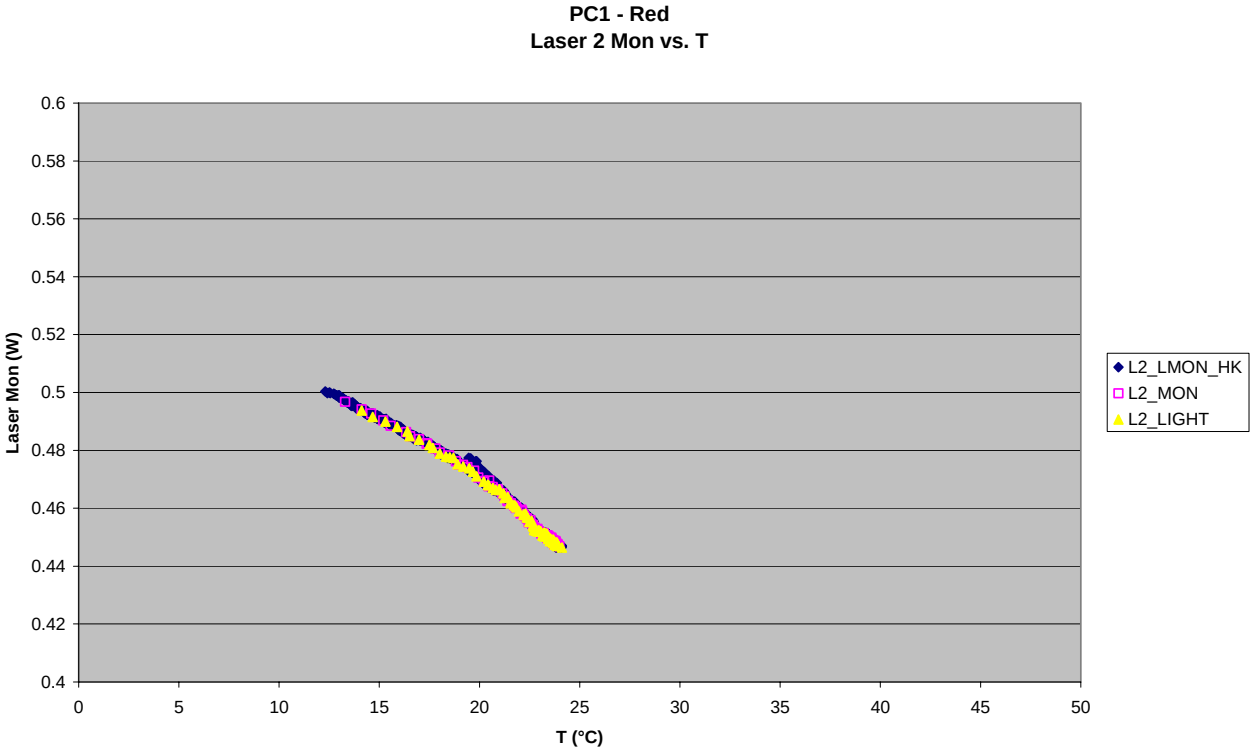


Figure 8.2-7. Laser 3 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Red

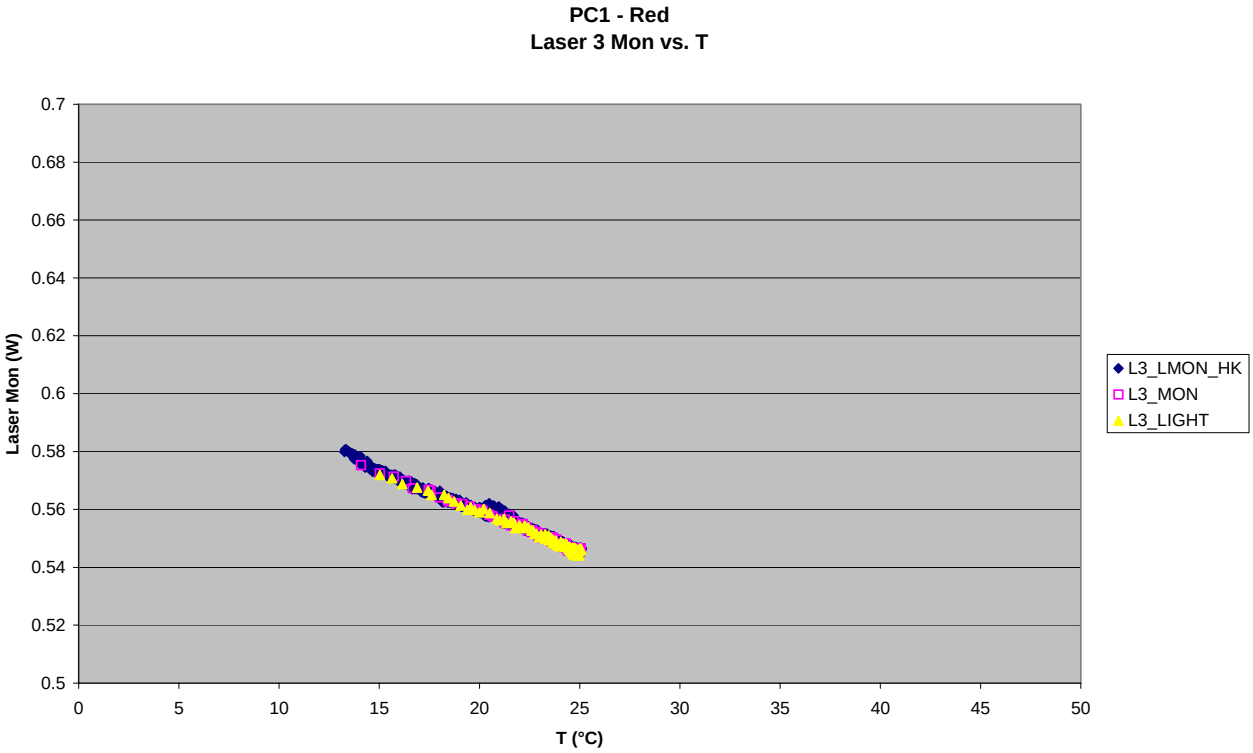
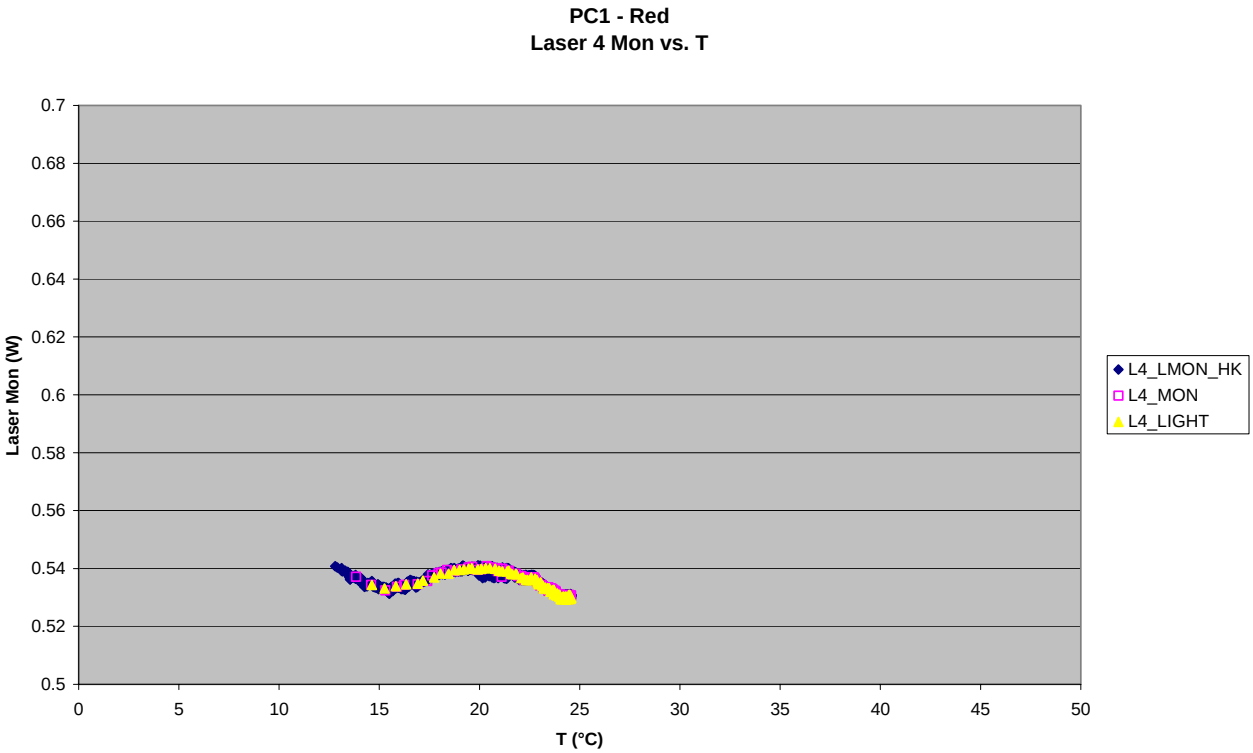


Figure 8.2-8. Laser 4 Light Monitor versus Temperature (HK, HK-SCI, SCI) - Red



8.2.2 GDS – Left & Right

8.2.2.1 Science Events

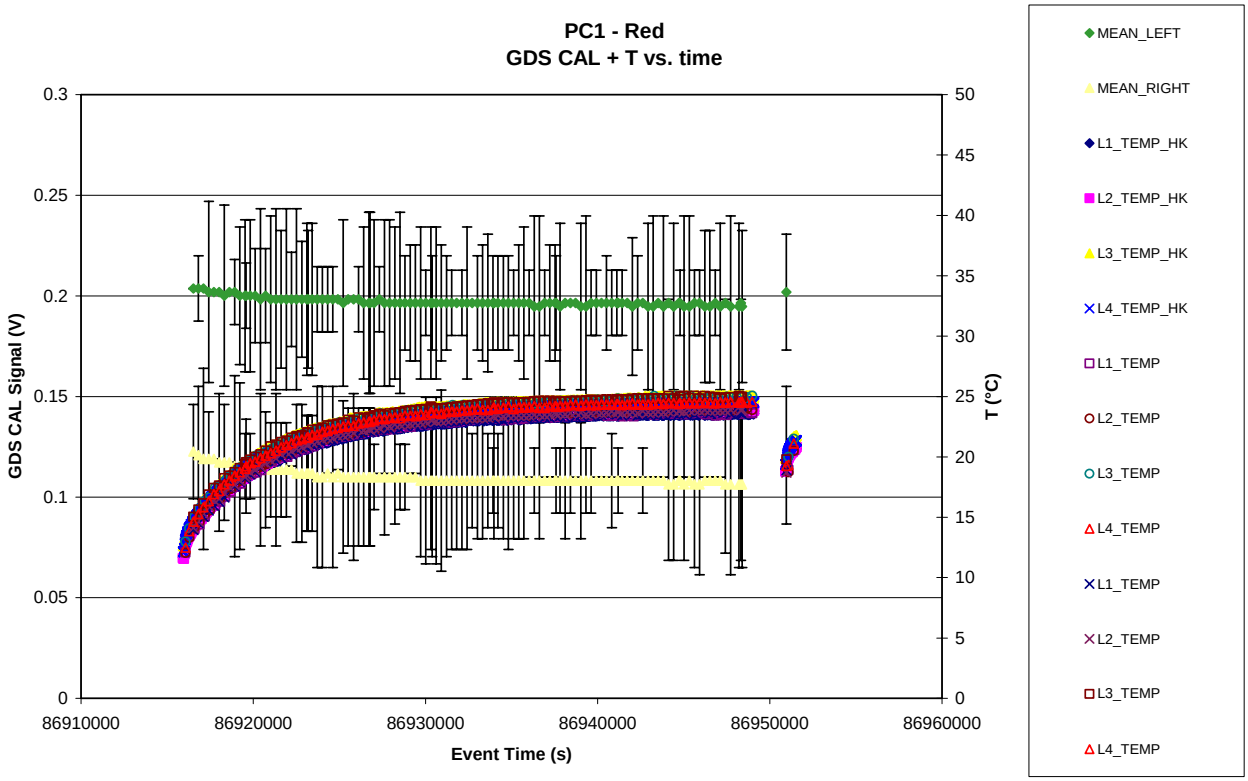
No event detected

8.2.2.2 Event Rates

Not applicable

8.2.2.3 CAL

Figure 8.2-9. Evolution of GDS CAL Left and Right signals (and T) vs. time (Red)



8.3 IMPACT SENSOR (IS)

8.3.1 IS – Status

Figure 8.3-1. IS Operation Status vs. time - Red

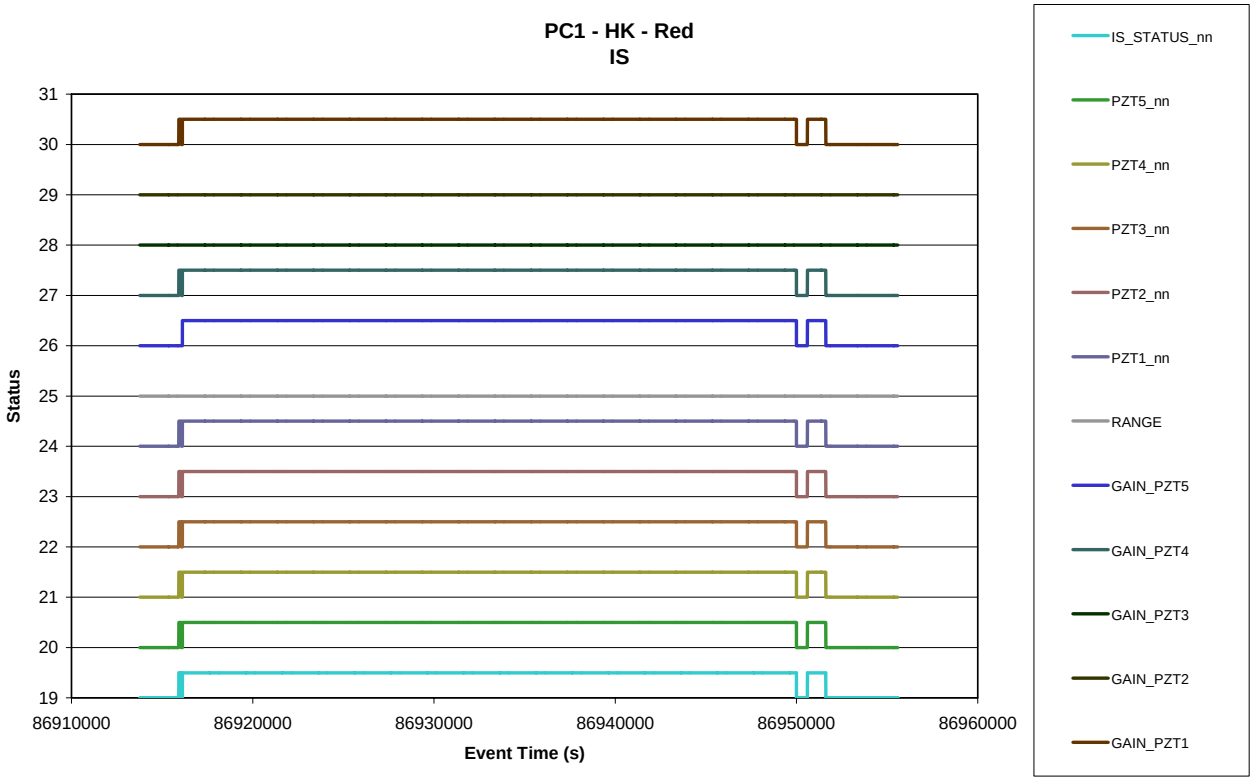


Figure 8.3-2. IS PZT 3 Thresholds change vs. time - Red

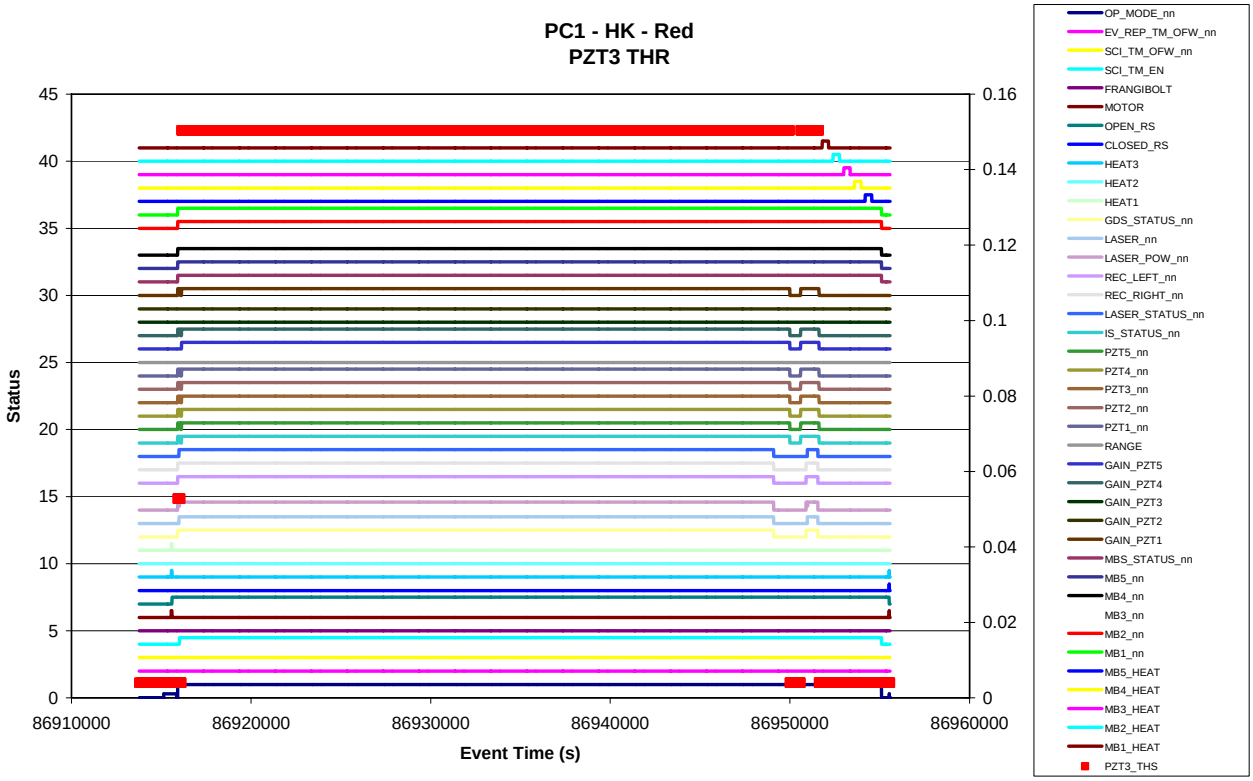


Figure 8.3-3. IS PZT 5 Thresholds change vs. time - Red

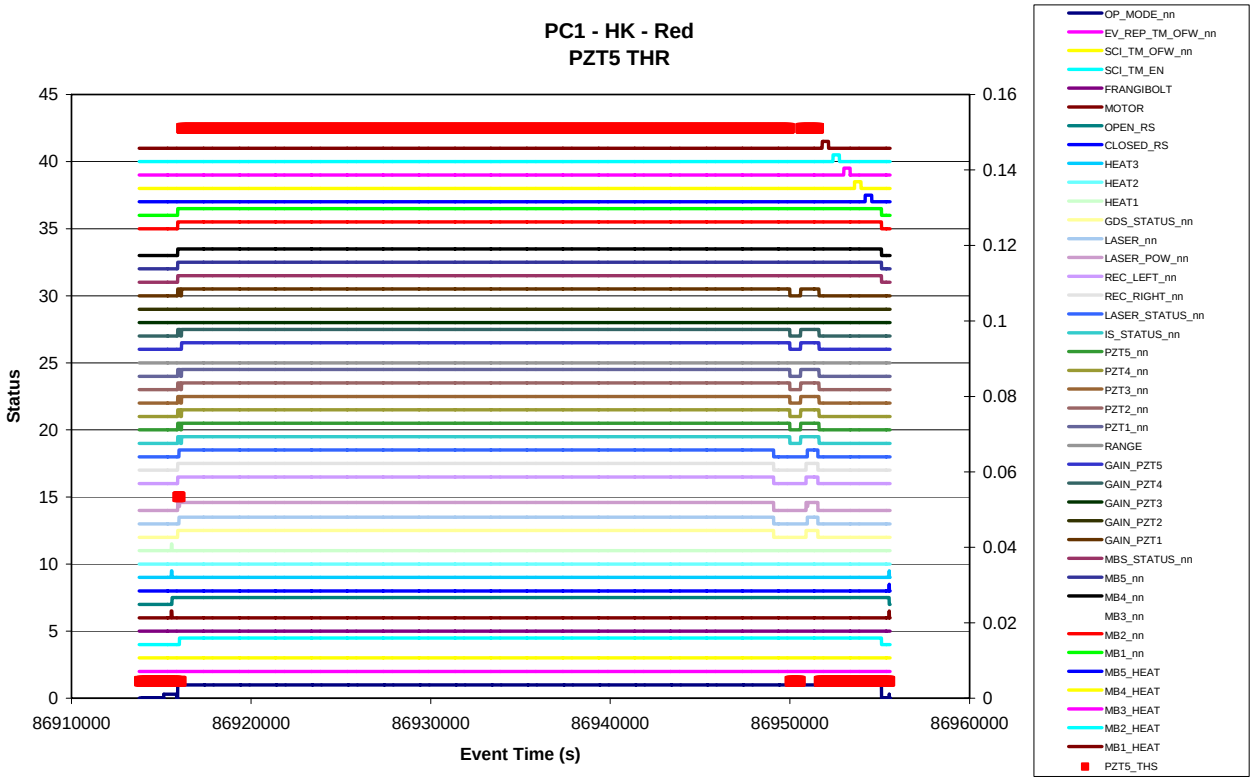
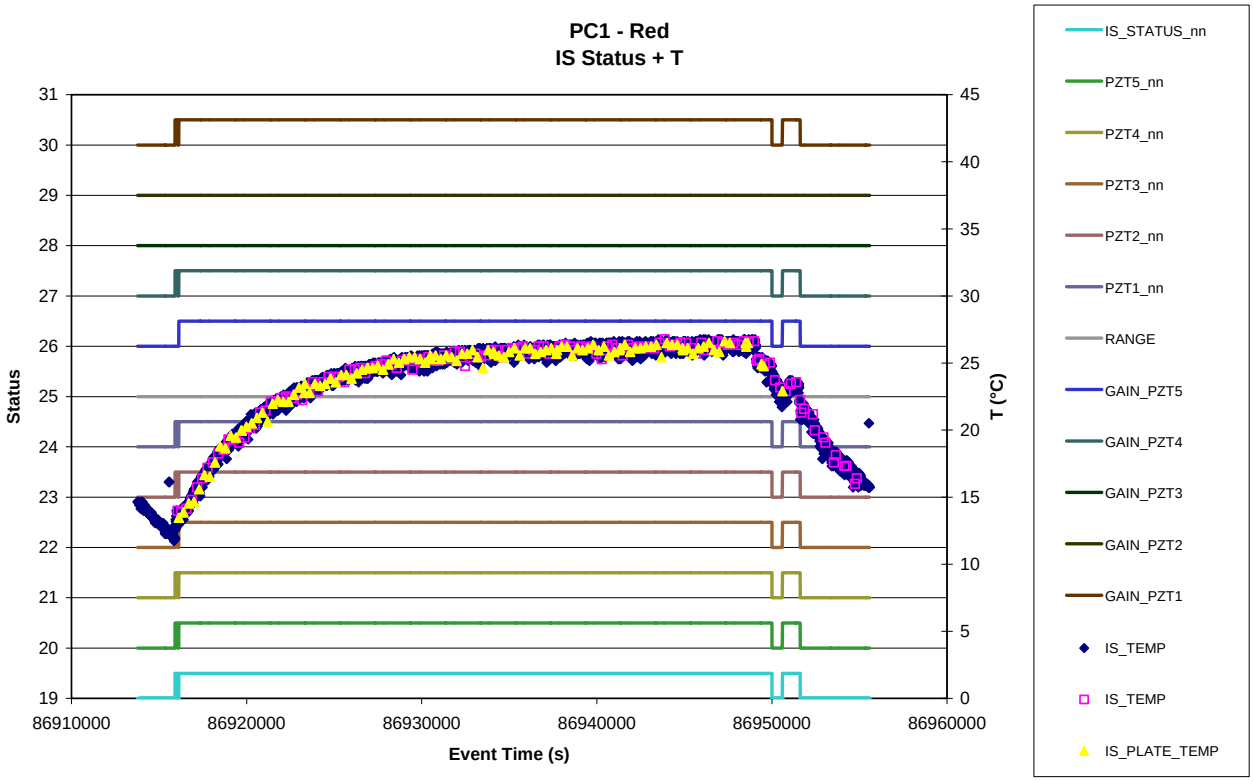


Figure 8.3-4. IS Temperature vs. time (HK, HK-SCI, SCI) - Red



8.3.2 IS – Behaviour

8.3.2.1 Science Events

Figure 8.3-5. All PZT (det. and non-det.) events vs. time - Red

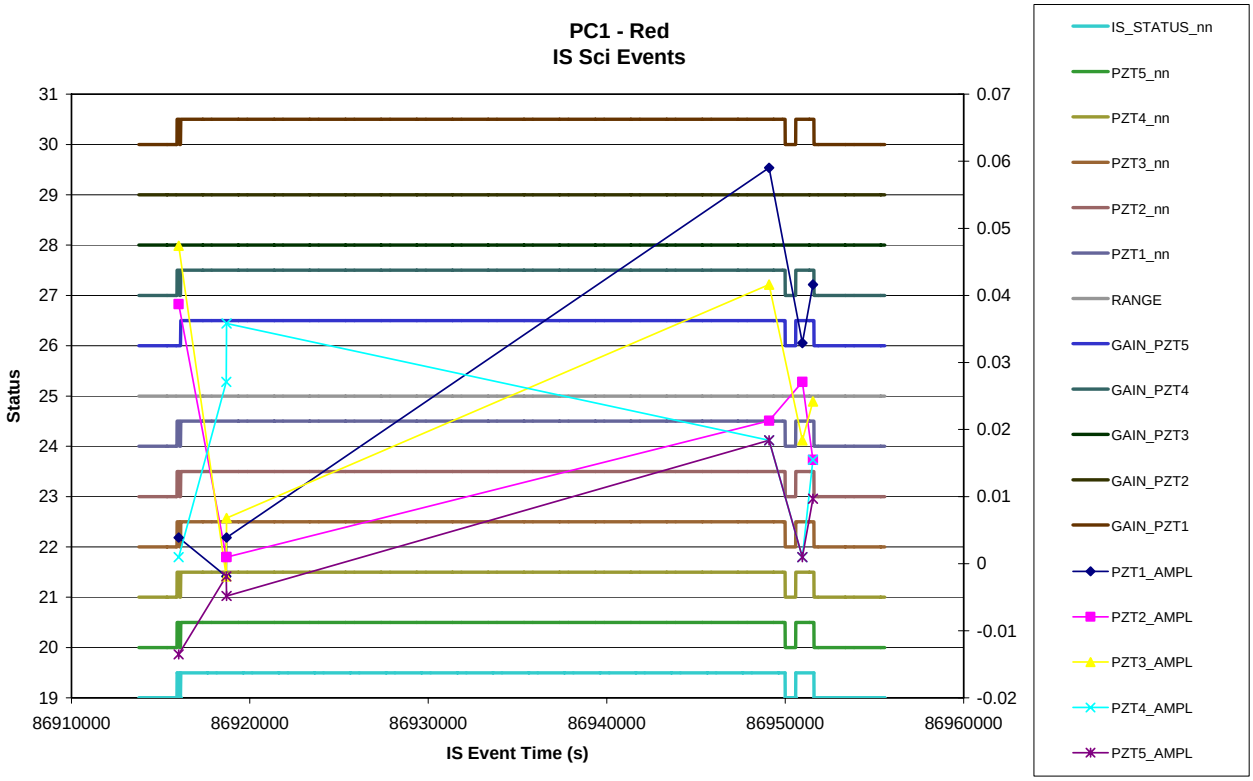


Figure 8.3-6. PZT 1 Detected Events vs. time - Red

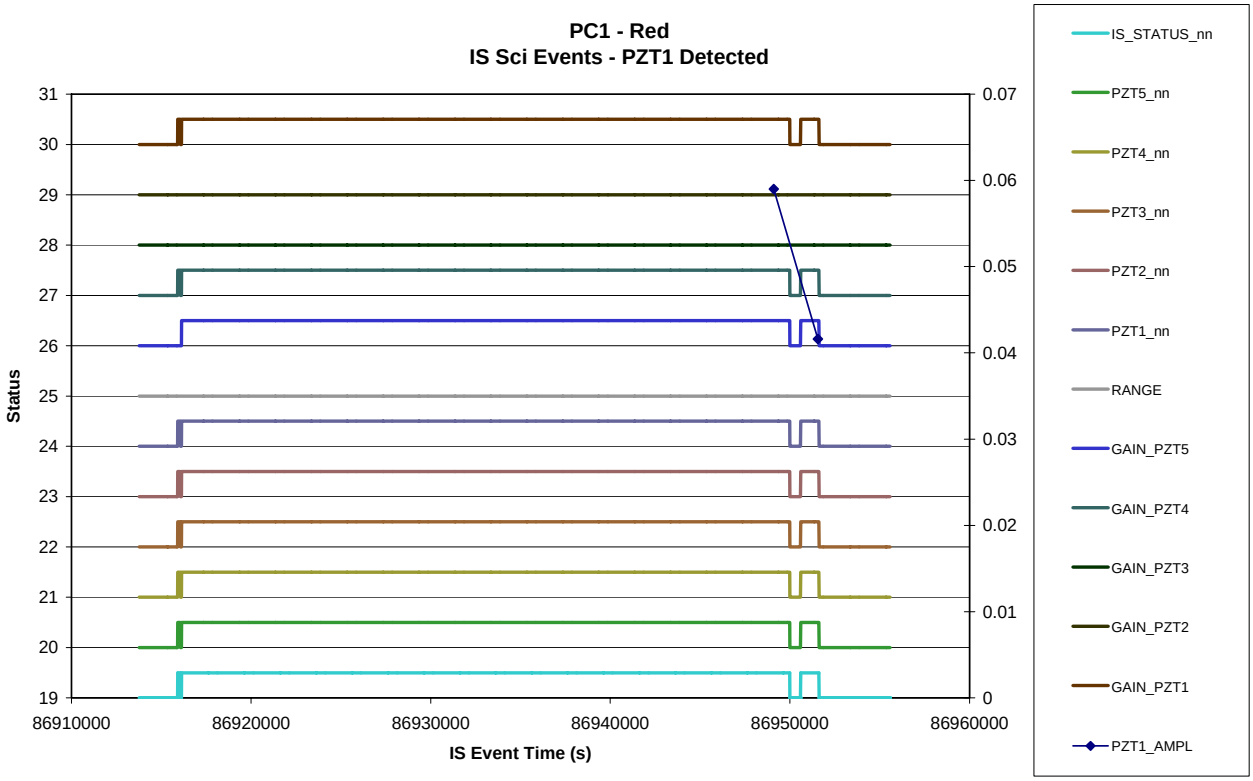


Figure 8.3-7. PZT 2 Detected Events vs. time - Red

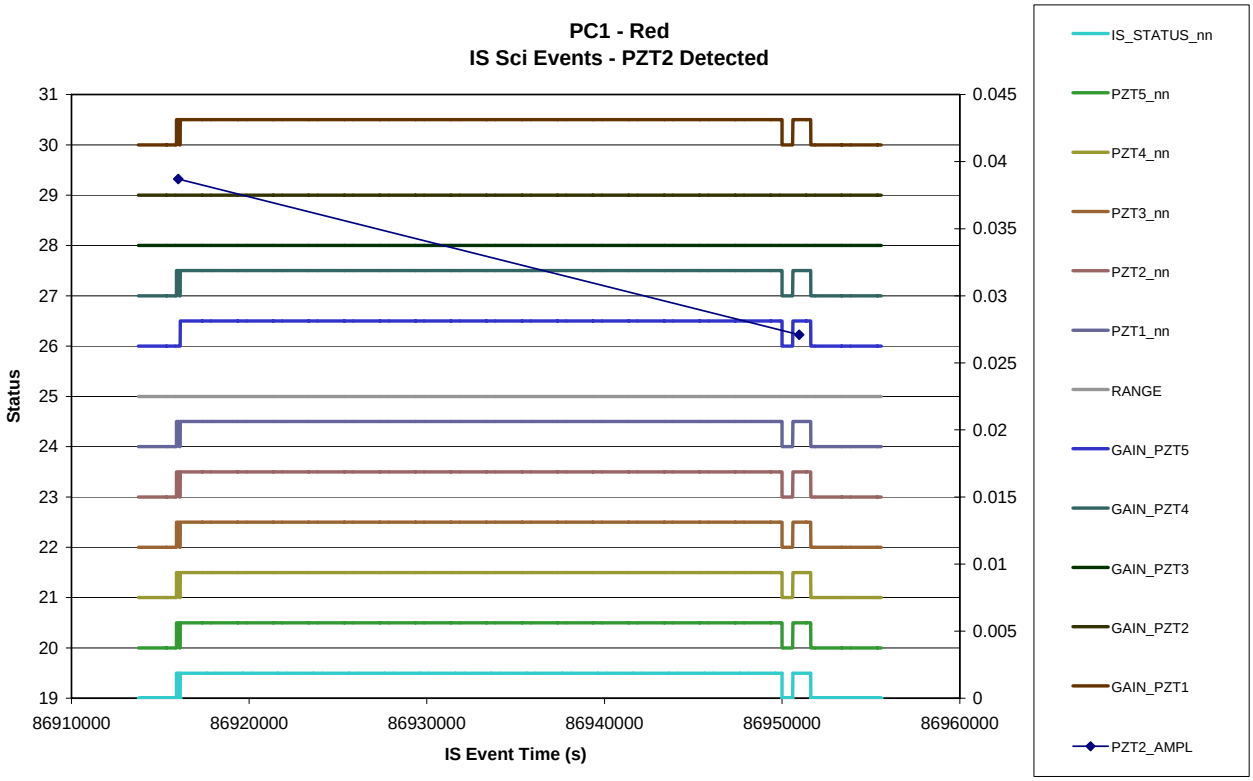


Figure 8.3-8. PZT 3 Detected Events vs. time - Red

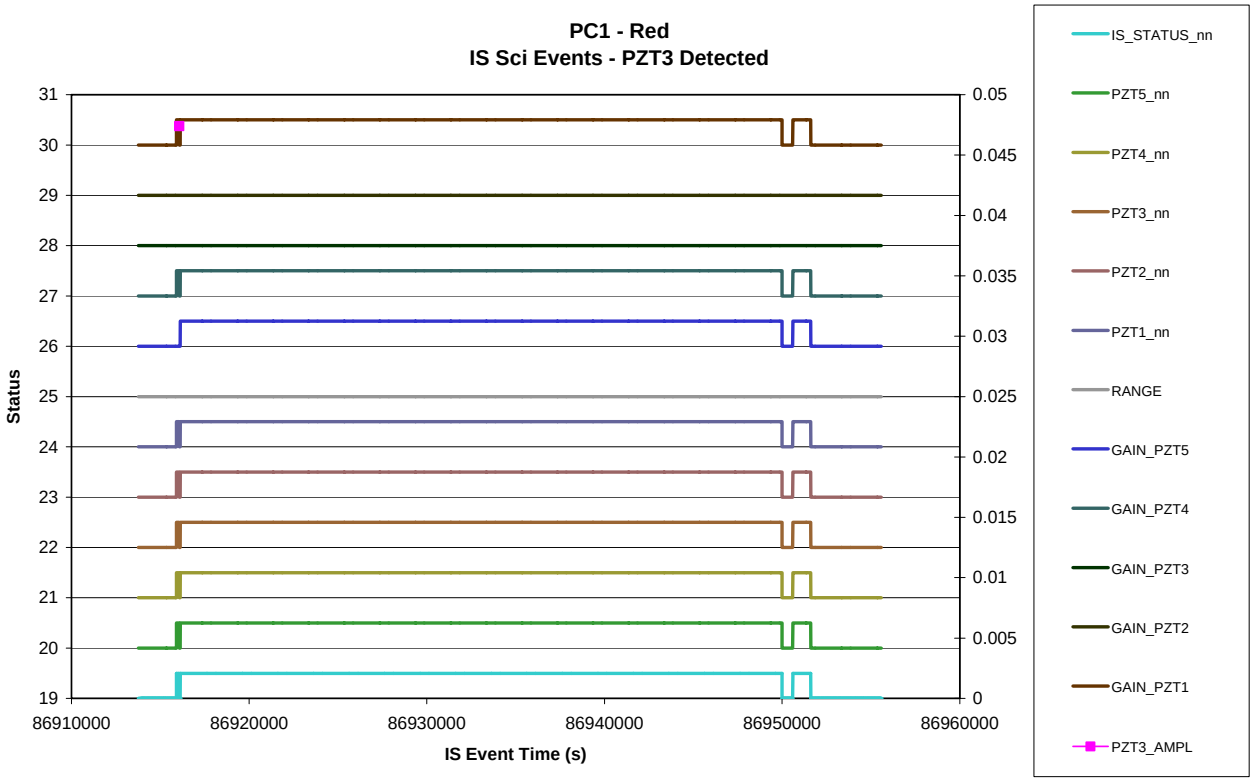


Figure 8.3-9. PZT 4 Detected Events vs. time - Red

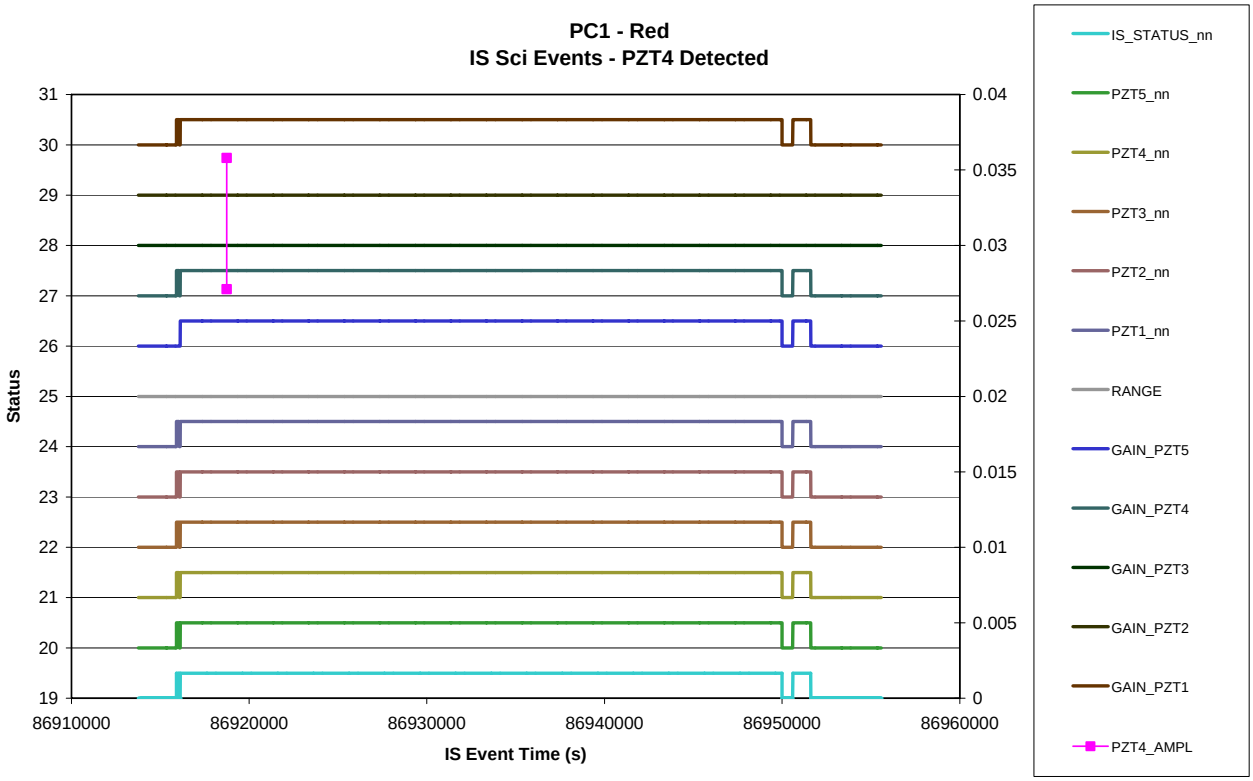


Figure 8.3-10. PZT 5 Detected Events vs. time - Red

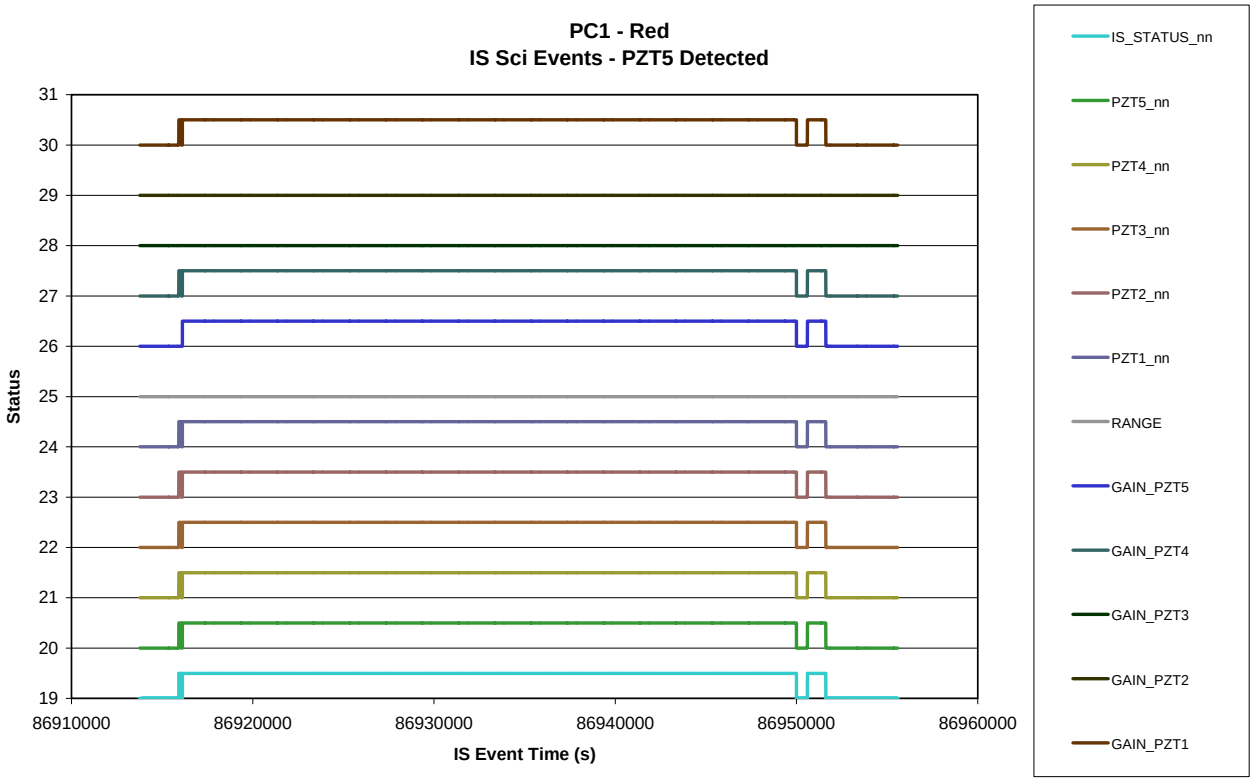
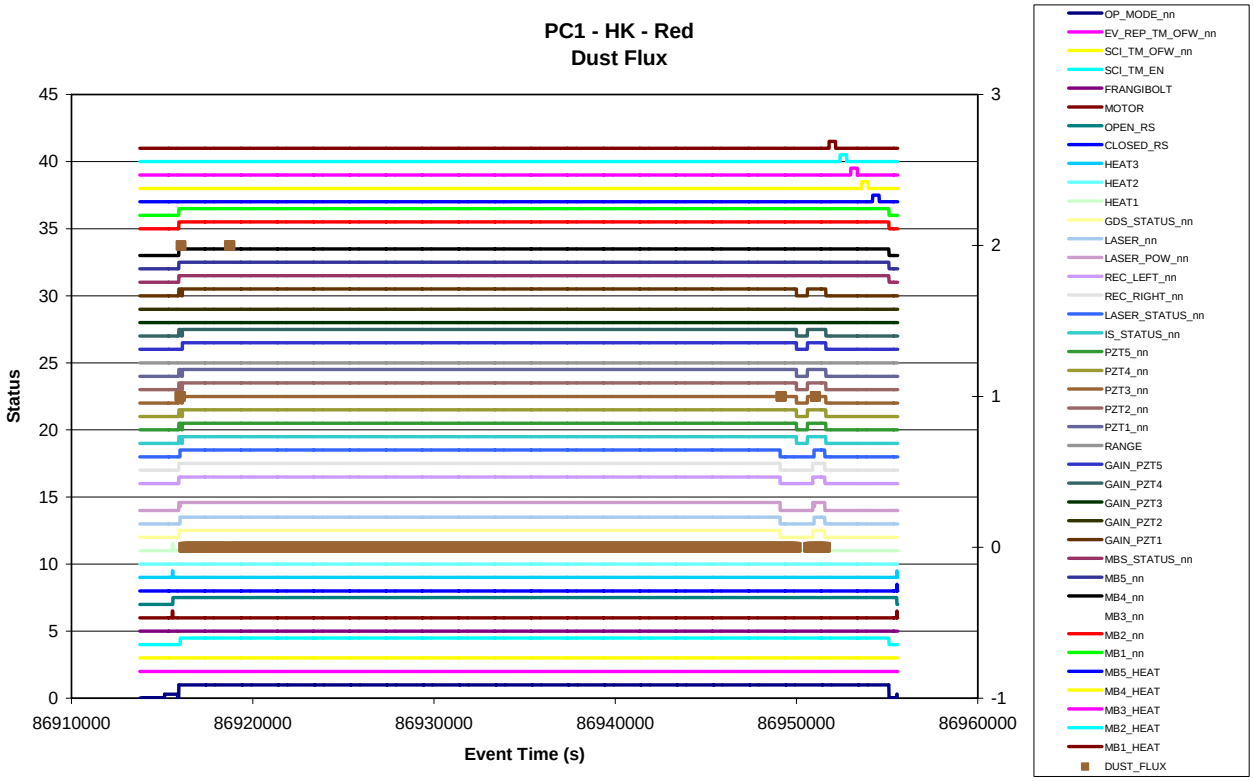


Figure 8.3-11. Dust Flux vs. time - Red



8.3.2.2 Event Rates

Not applicable

8.3.2.3 CAL

Figure 8.3-12. PZT 1 Mean and St Dev. CAL vs. time - Red

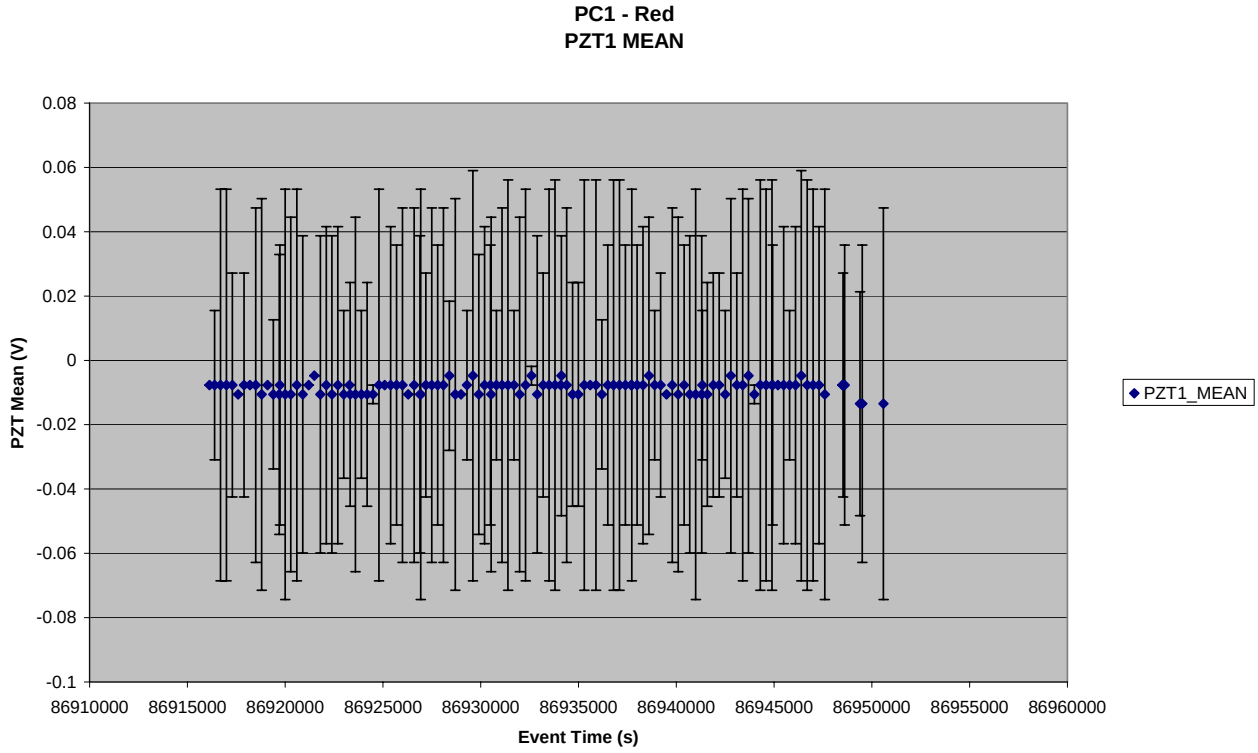


Figure 8.3-13. PZT 2 Mean and St Dev. CAL vs. time - Red

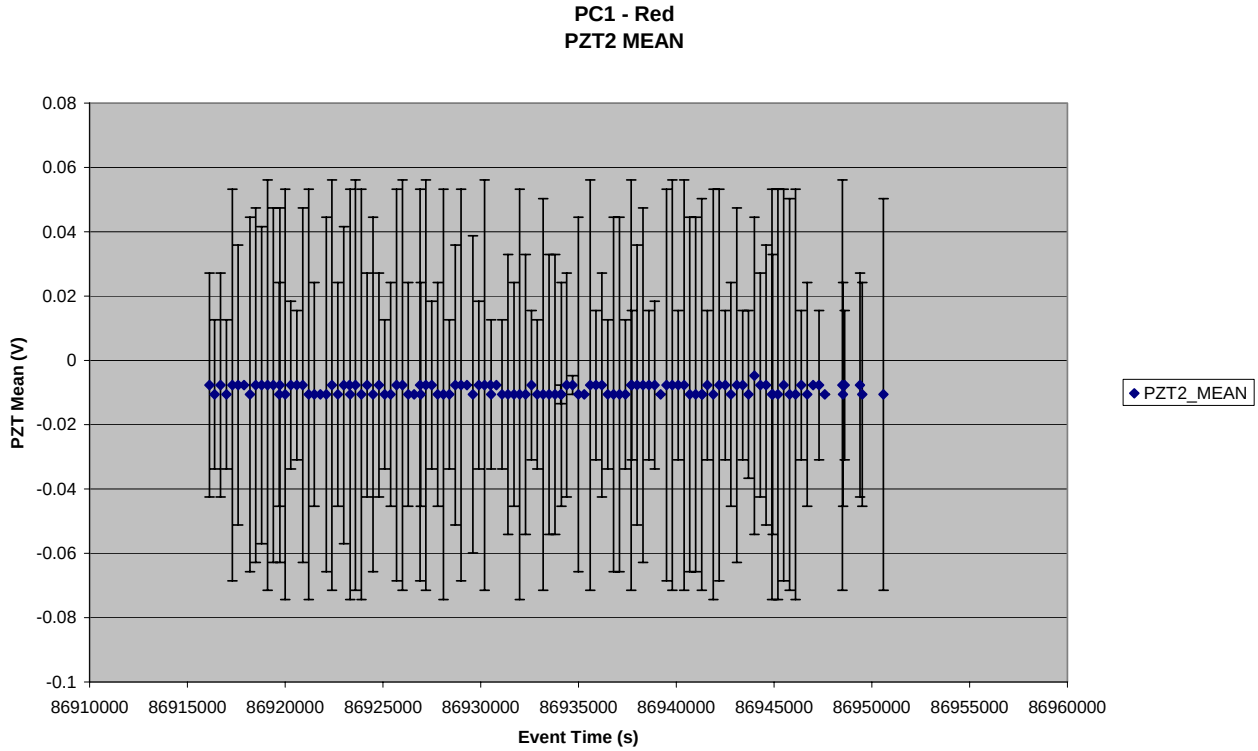


Figure 8.3-14. PZT 3 Mean and St Dev. CAL vs. time - Red

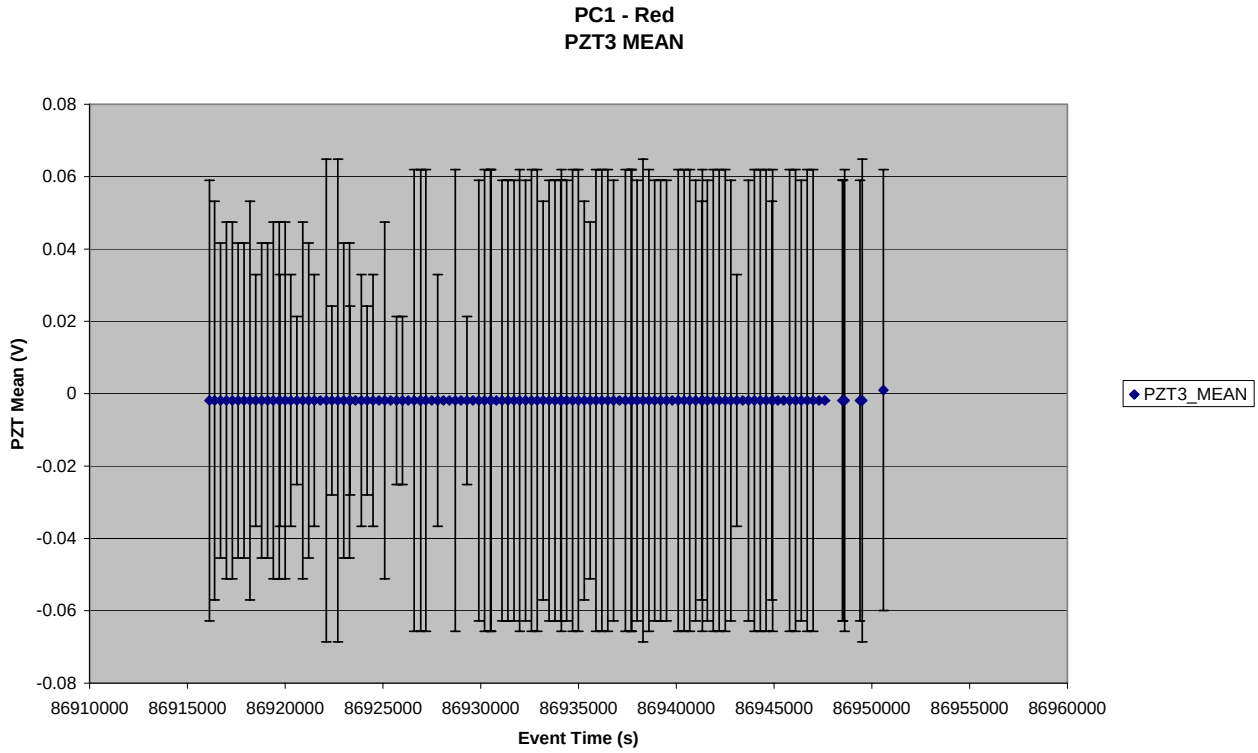


Figure 8.3-15. PZT 4 Mean and St Dev. CAL vs. time - Red

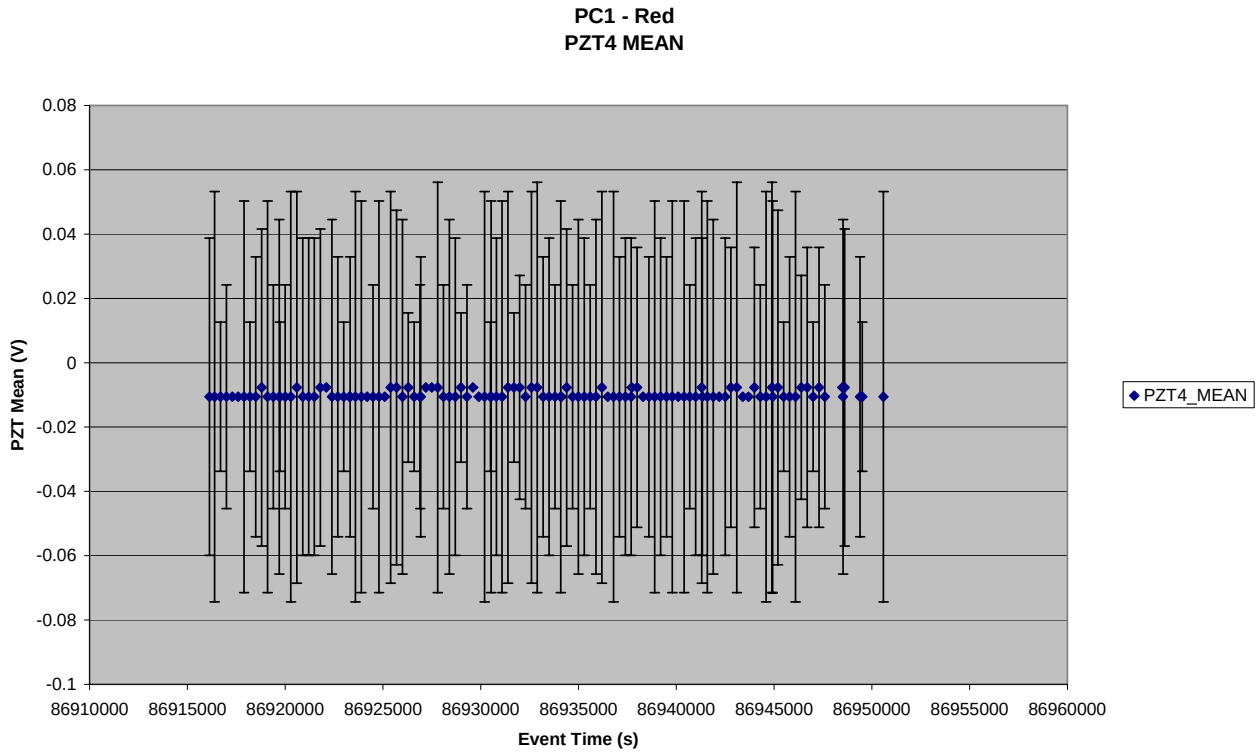


Figure 8.3-16. PZT 5 Mean and St Dev. CAL vs. time - Red

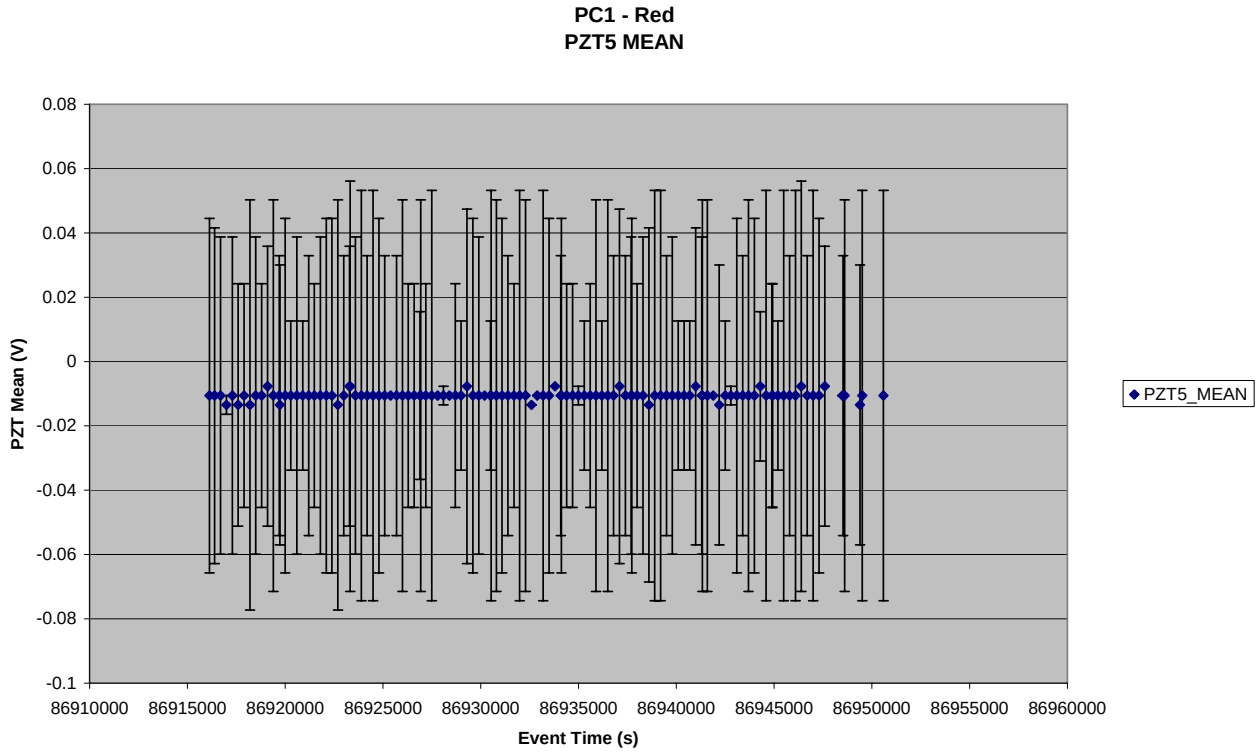


Figure 8.3-17. Reference Voltages for IS calibration vs. time - Red

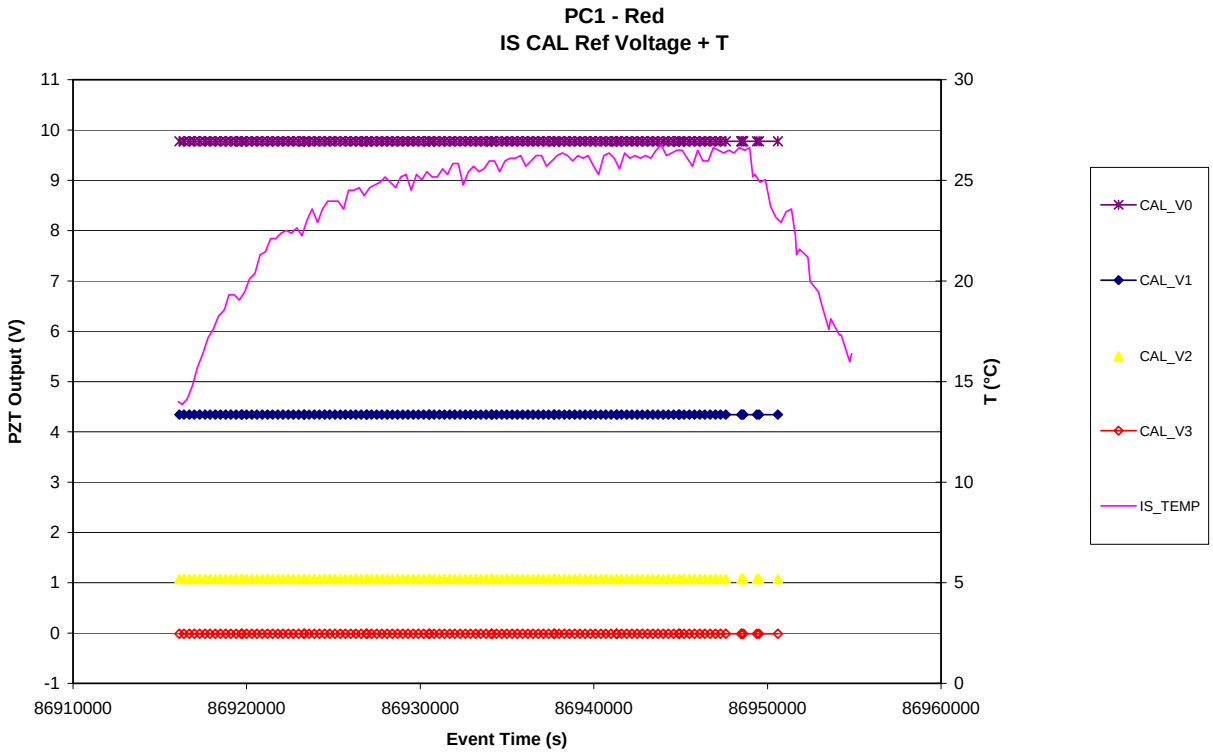


Figure 8.3-18. PZT 1 CAL Signal vs. time - Red

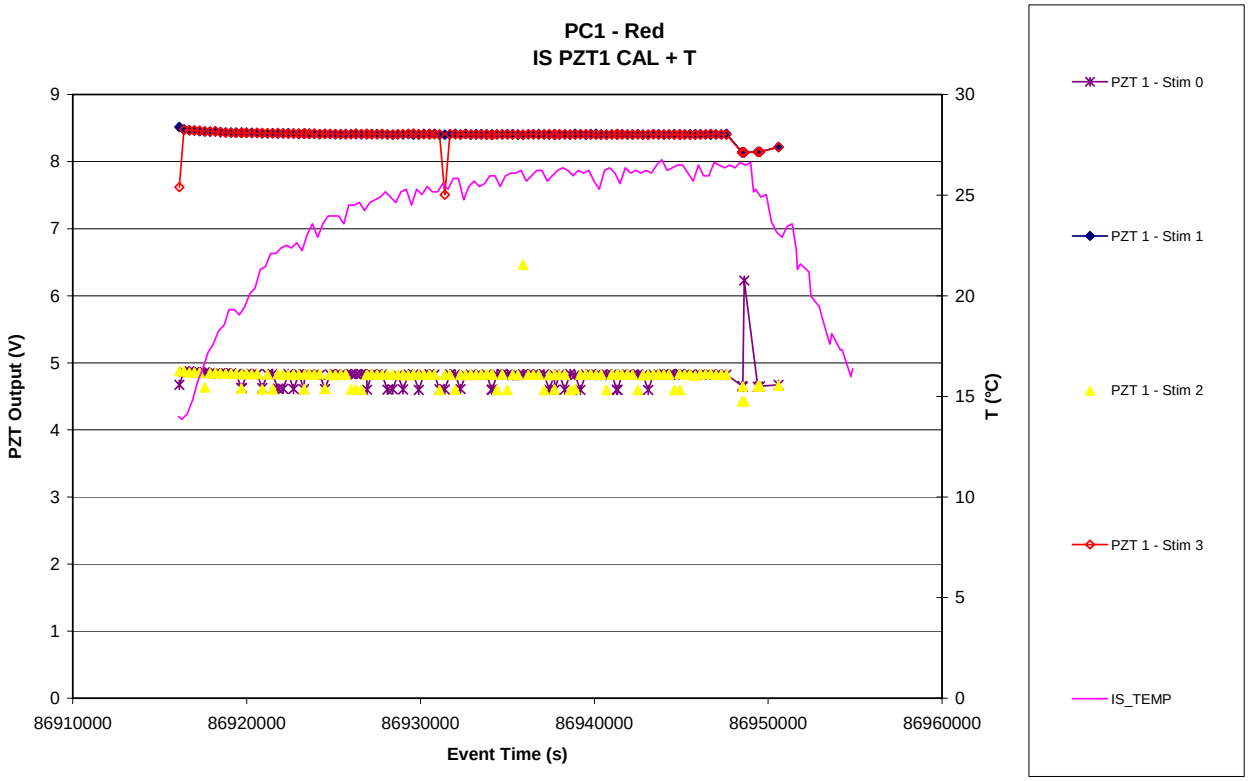


Figure 8.3-19. PZT 2 CAL Signal vs. time - Red

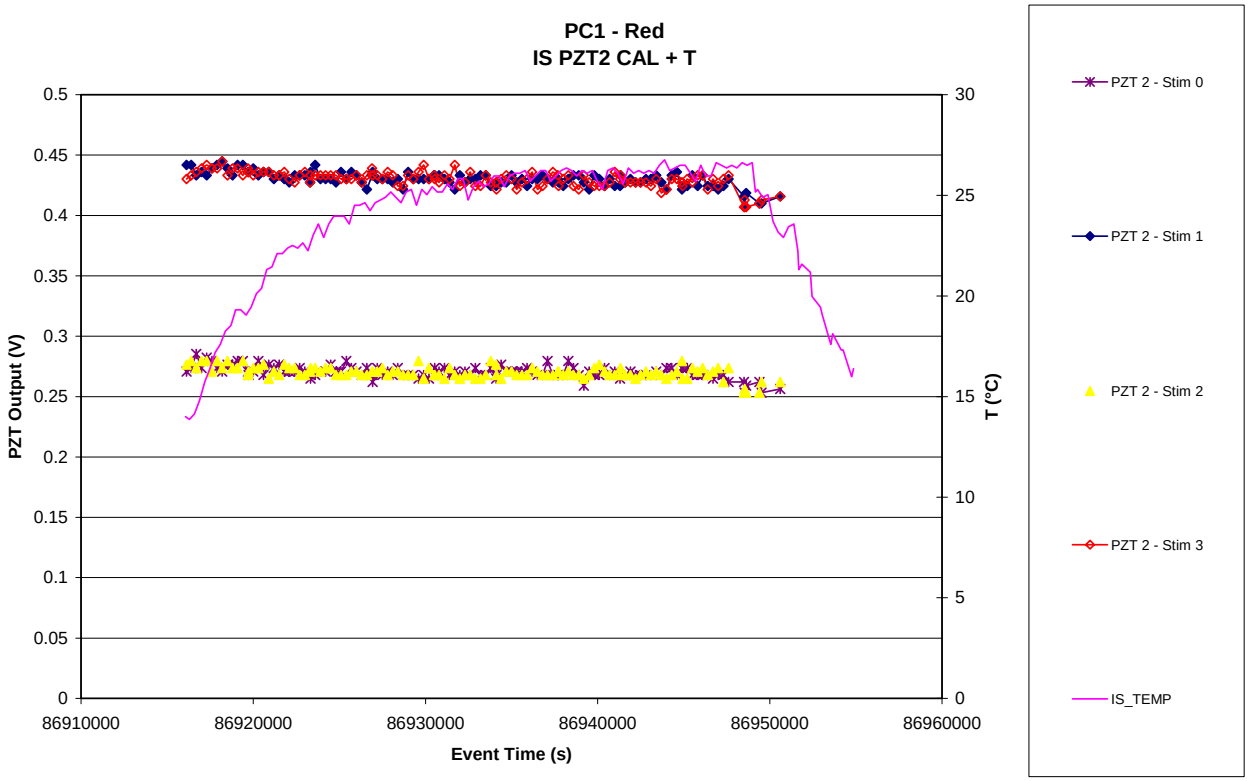


Figure 8.3-20. PZT 3 CAL Signal vs. time - Red

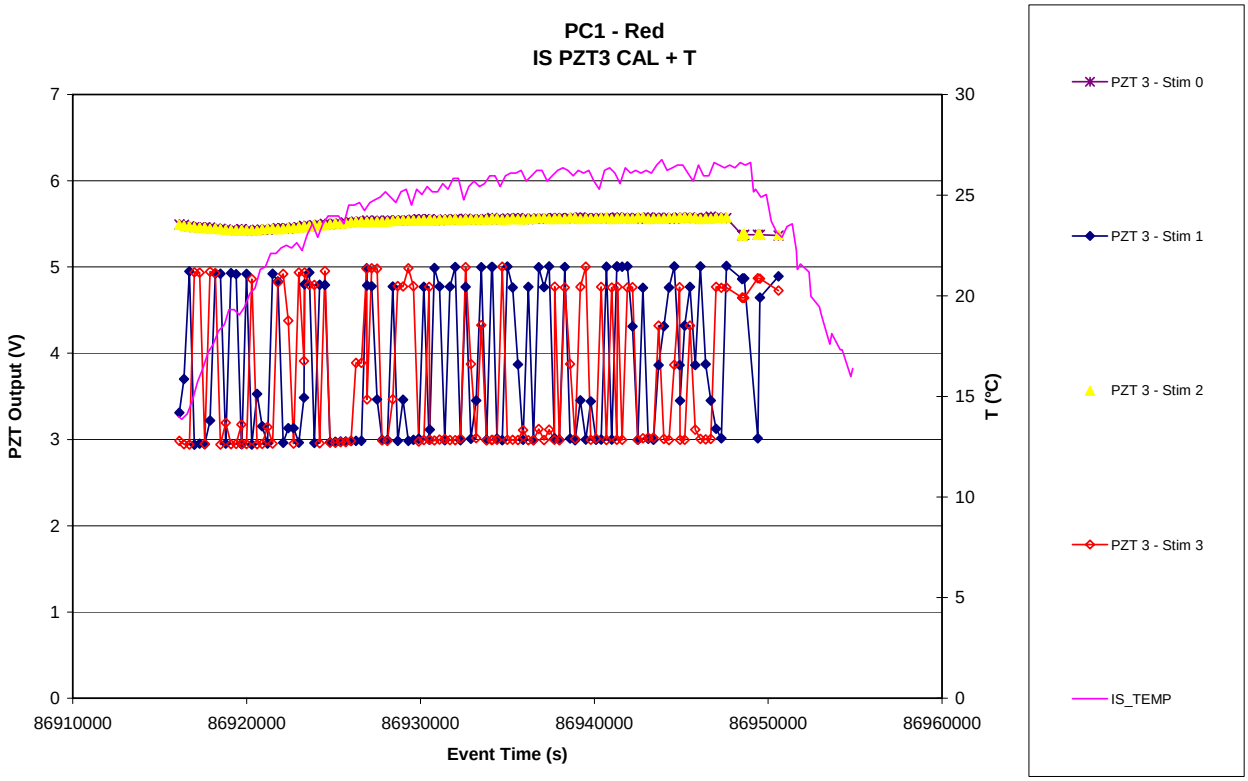


Figure 8.3-21. PZT 4 CAL Signal vs. time - Red

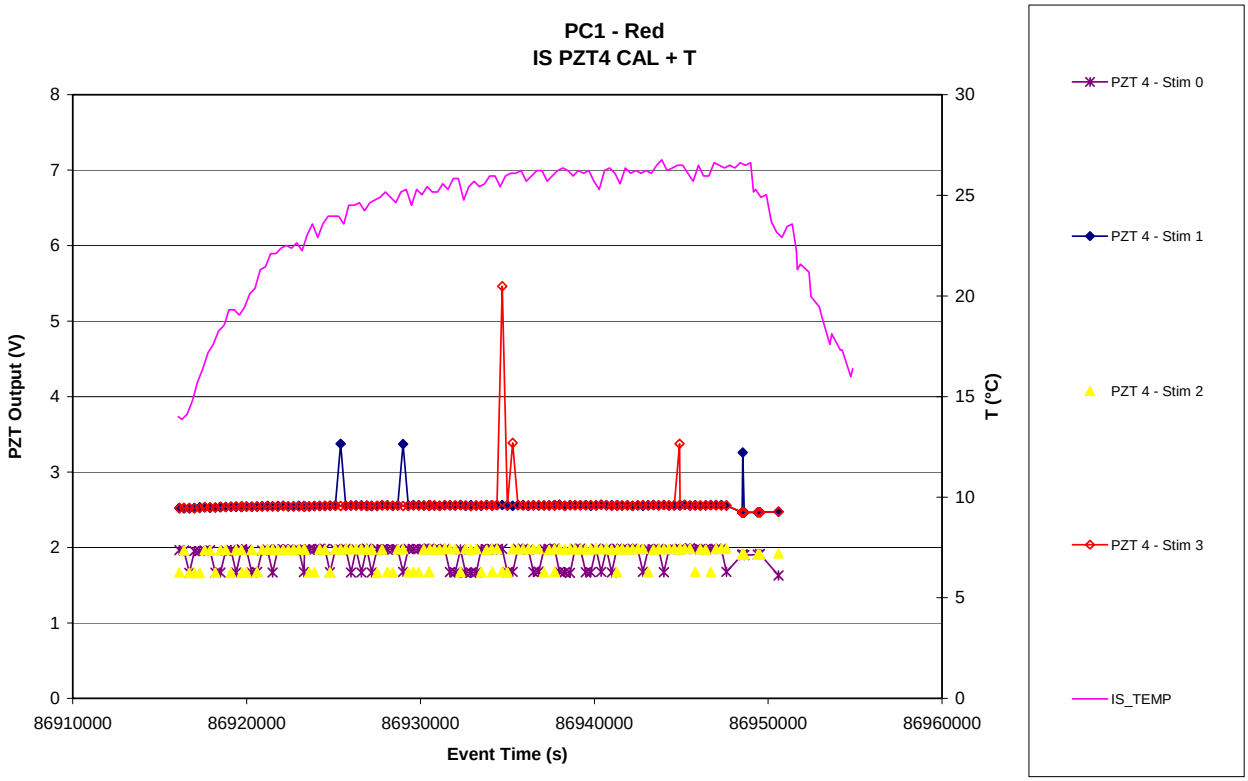


Figure 8.3-22. PZT 5 CAL Signal vs. time - Red

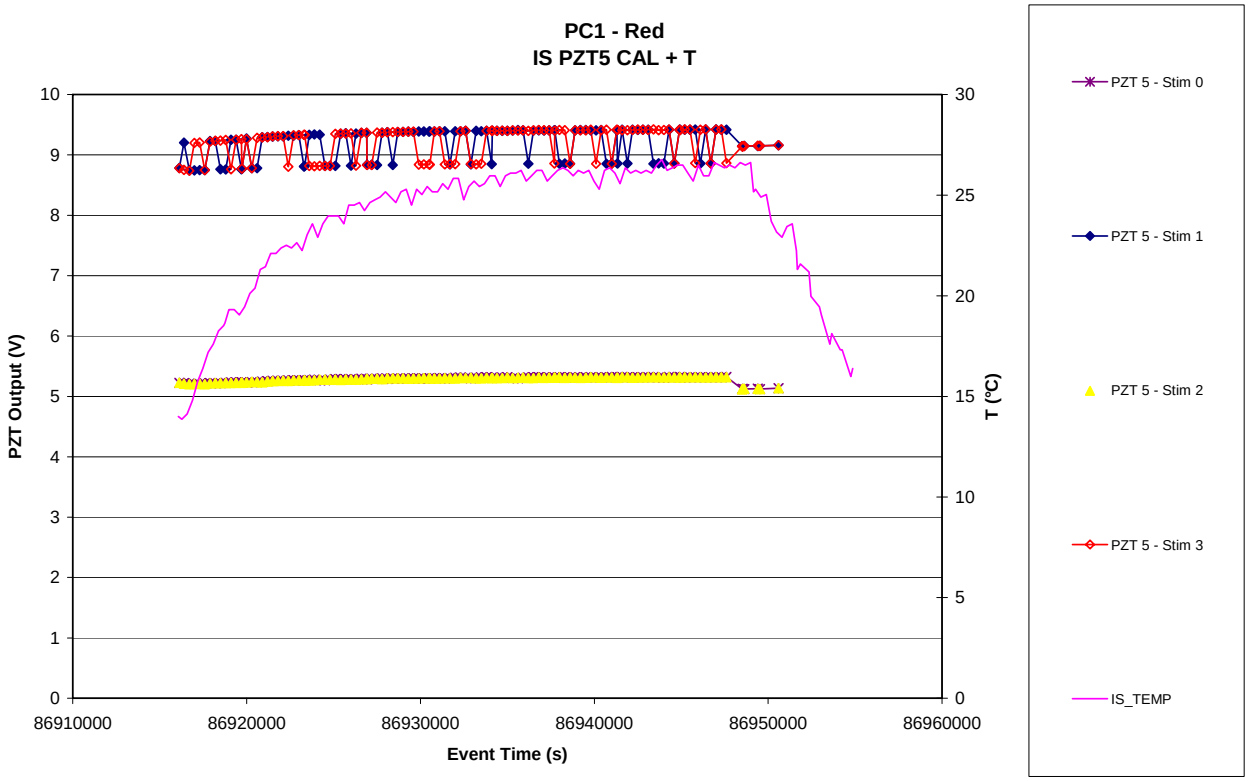


Figure 8.3-23. PZT 1 CAL Time delay vs. time - Red

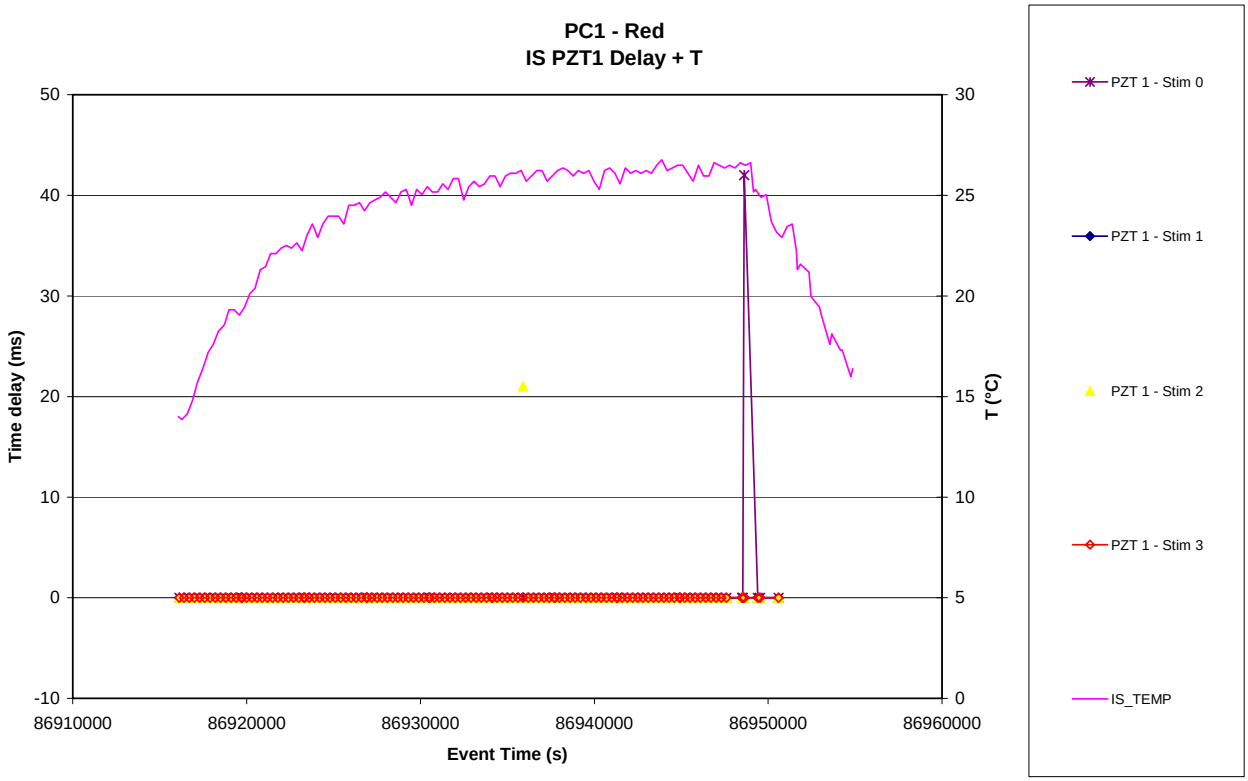


Figure 8.3-24. PZT 2 CAL Time delay vs. time - Red

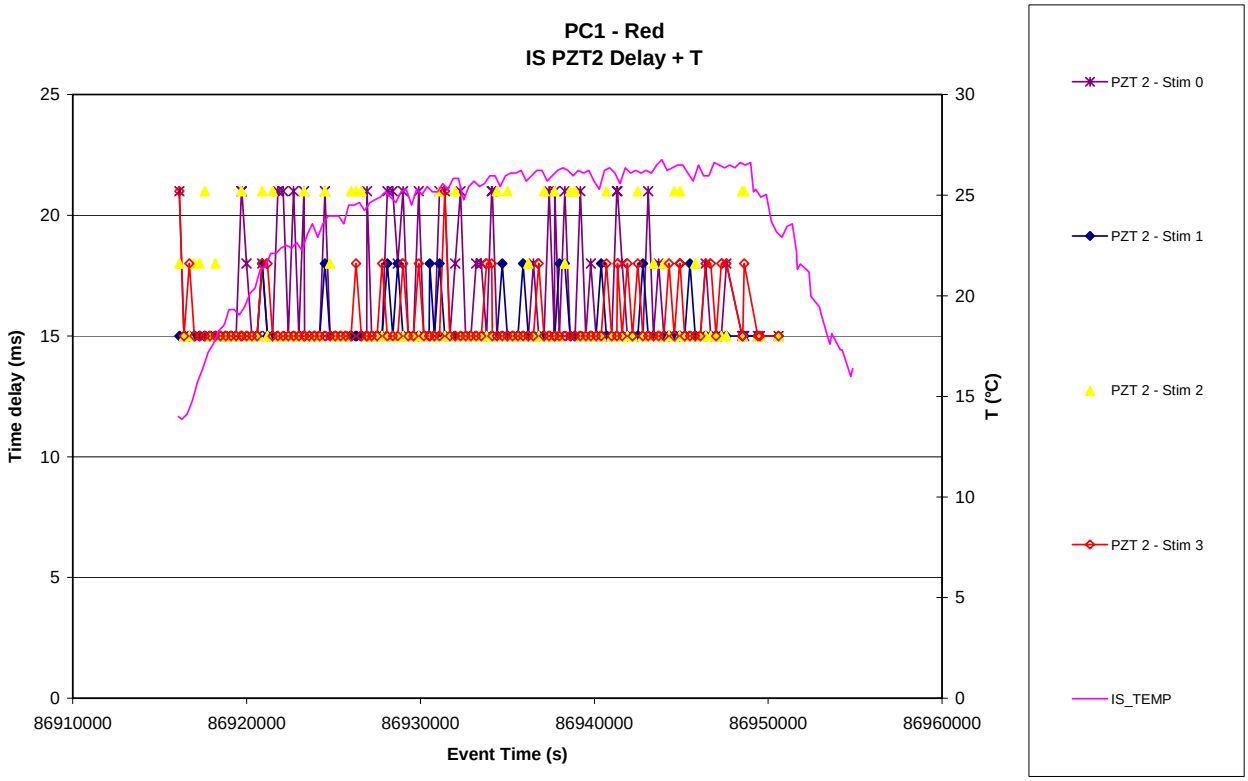


Figure 8.3-25. PZT 3 CAL Time delay vs. time - Red

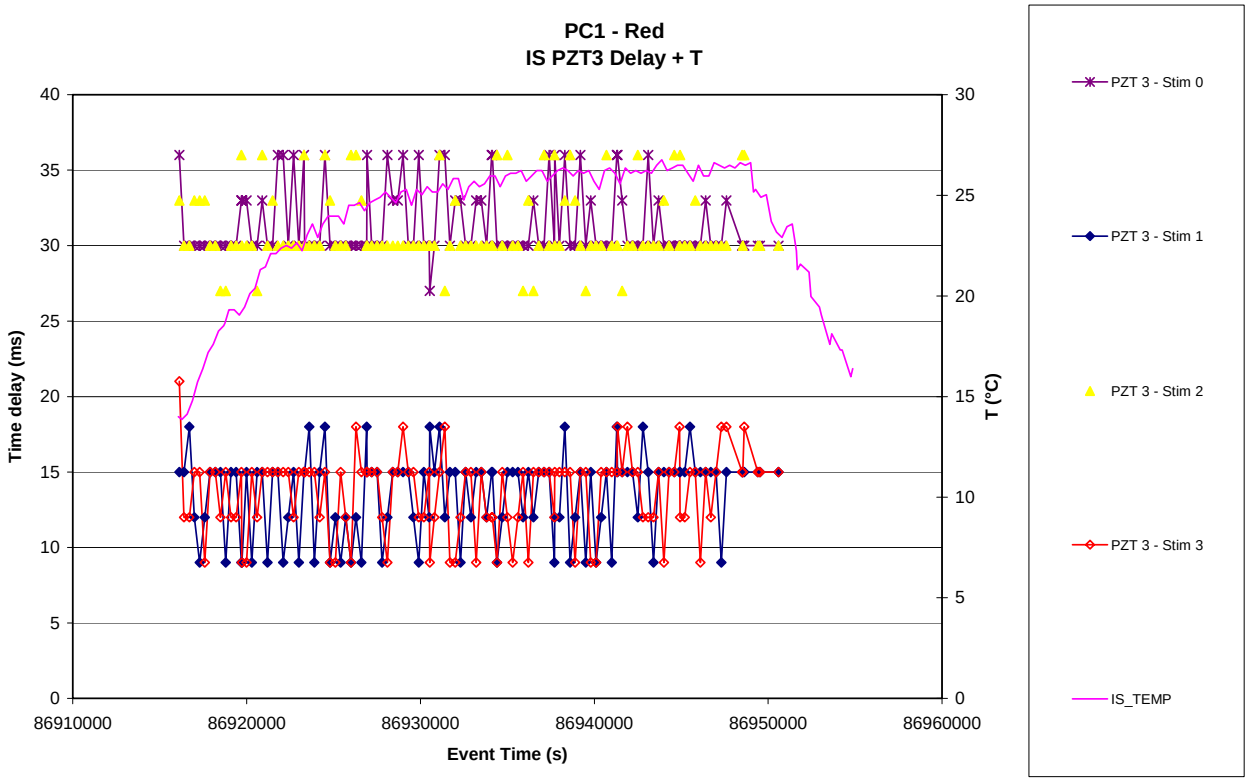


Figure 8.3-26. PZT 4 CAL Time delay vs. time - Red

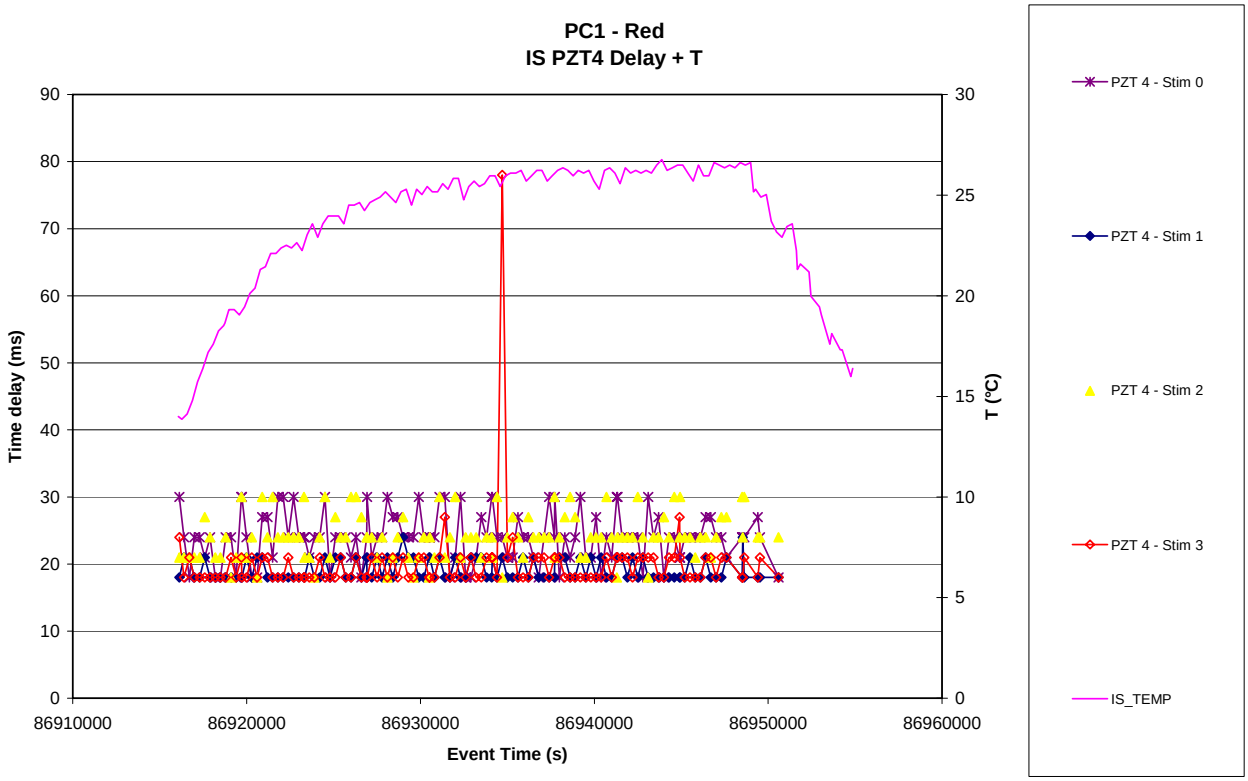


Figure 8.3-27. PZT 5 CAL Time delay vs. time - Red

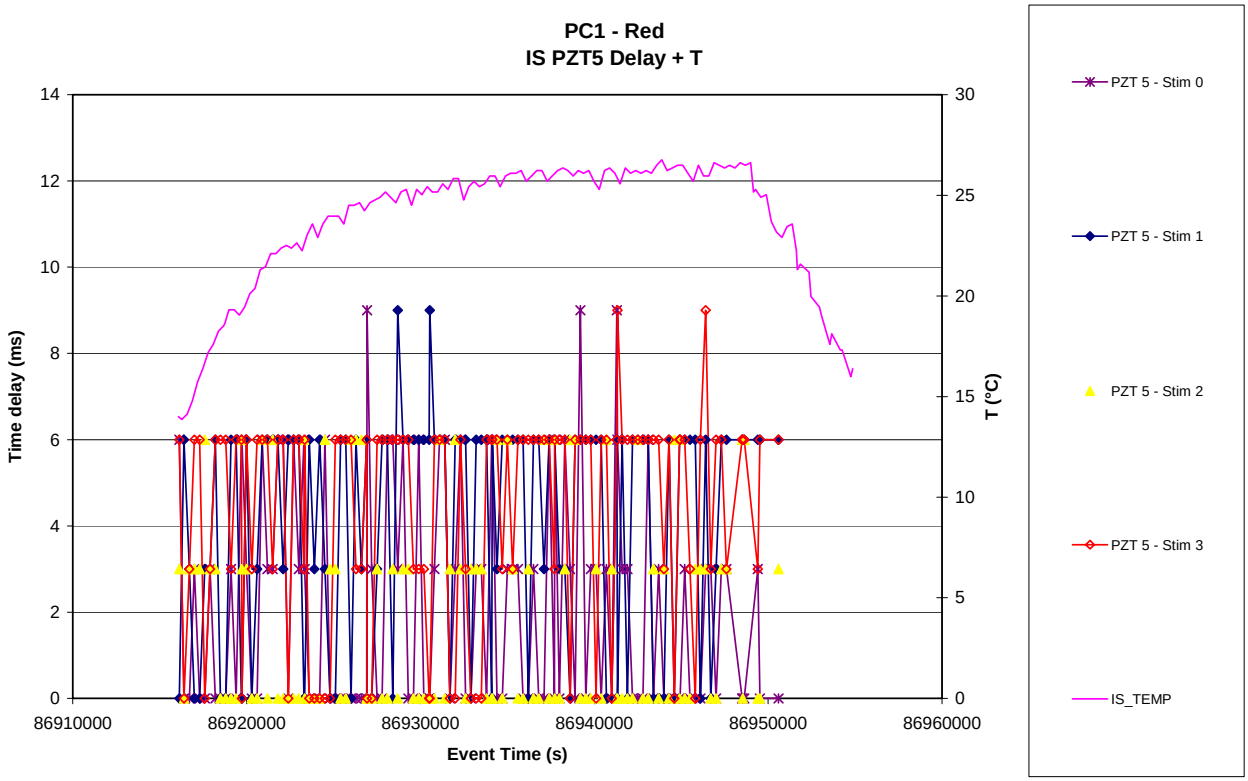


Figure 8.3-28. PZT 1 CAL Signal vs. stimulus – Red

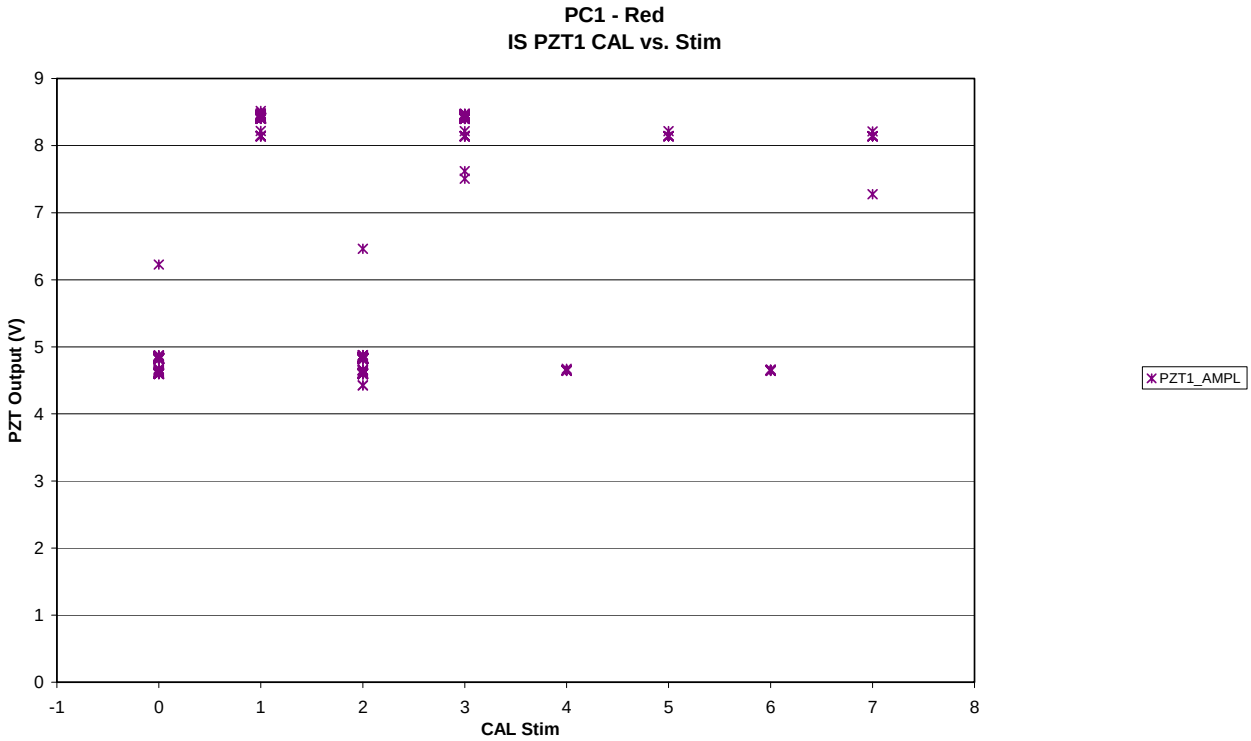


Figure 8.3-29. PZT 2 CAL Signal vs. stimulus – Red

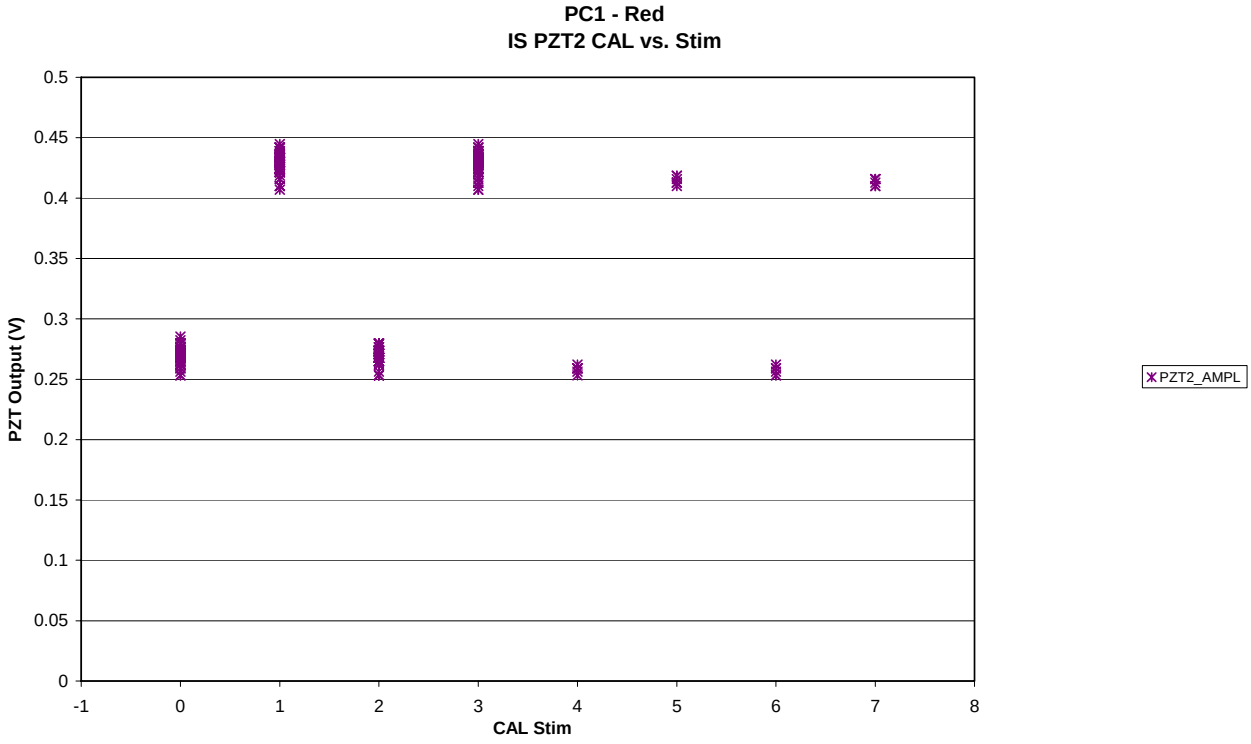


Figure 8.3-30. PZT 3 CAL Signal vs. stimulus – Red

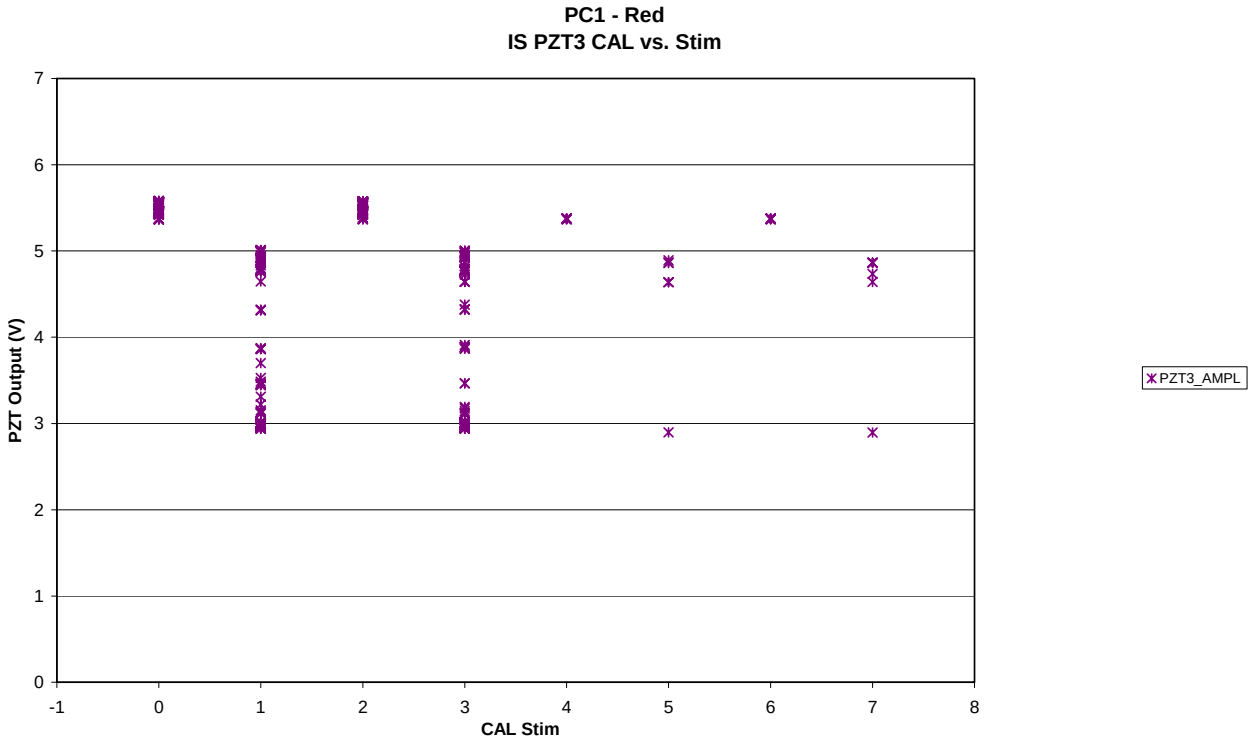


Figure 8.3-31. PZT 4 CAL Signal vs. stimulus – Red

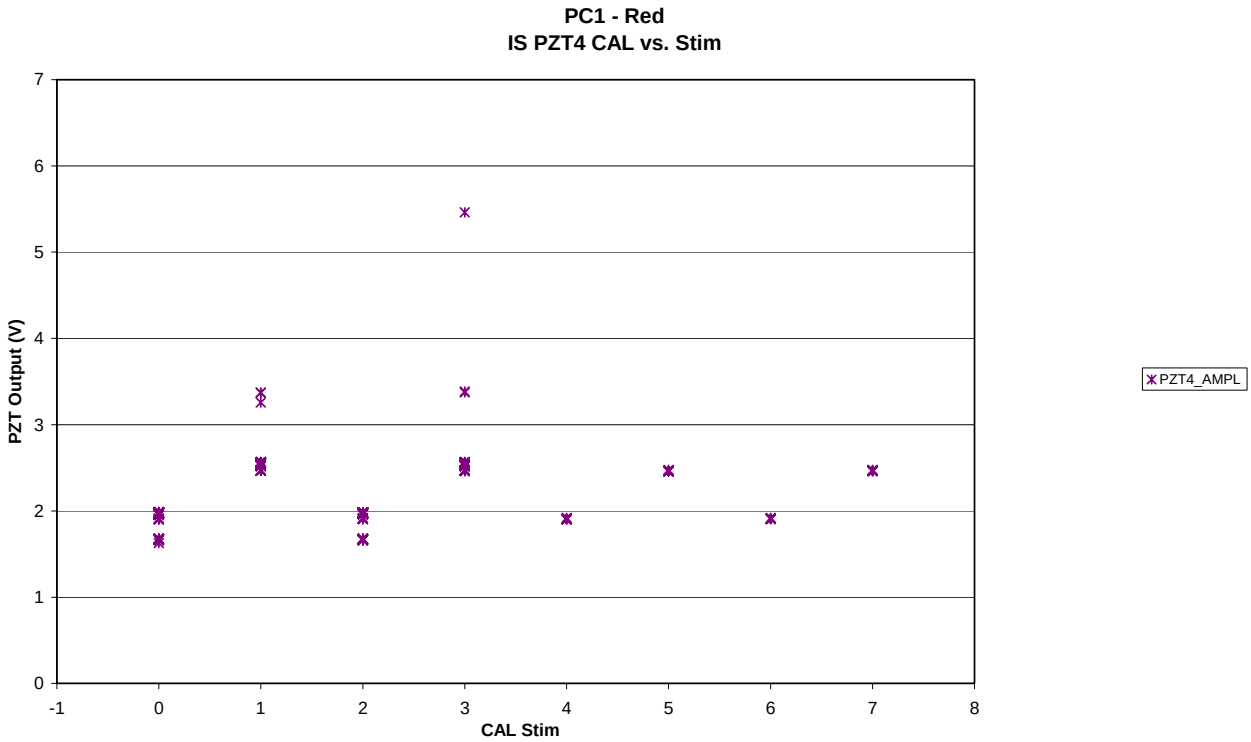


Figure 8.3-32. PZT 5 CAL Signal vs. stimulus – Red

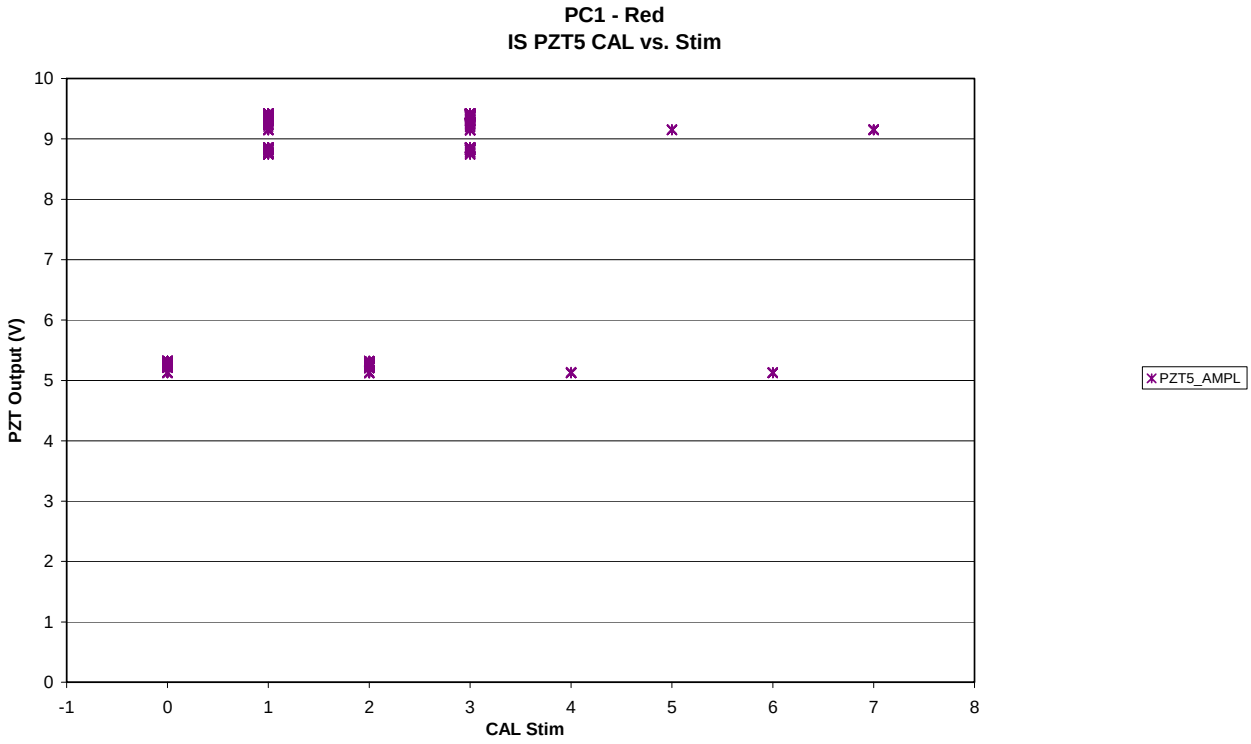


Figure 8.3-33. PZT 1 CAL Time delay vs. stimulus – Red

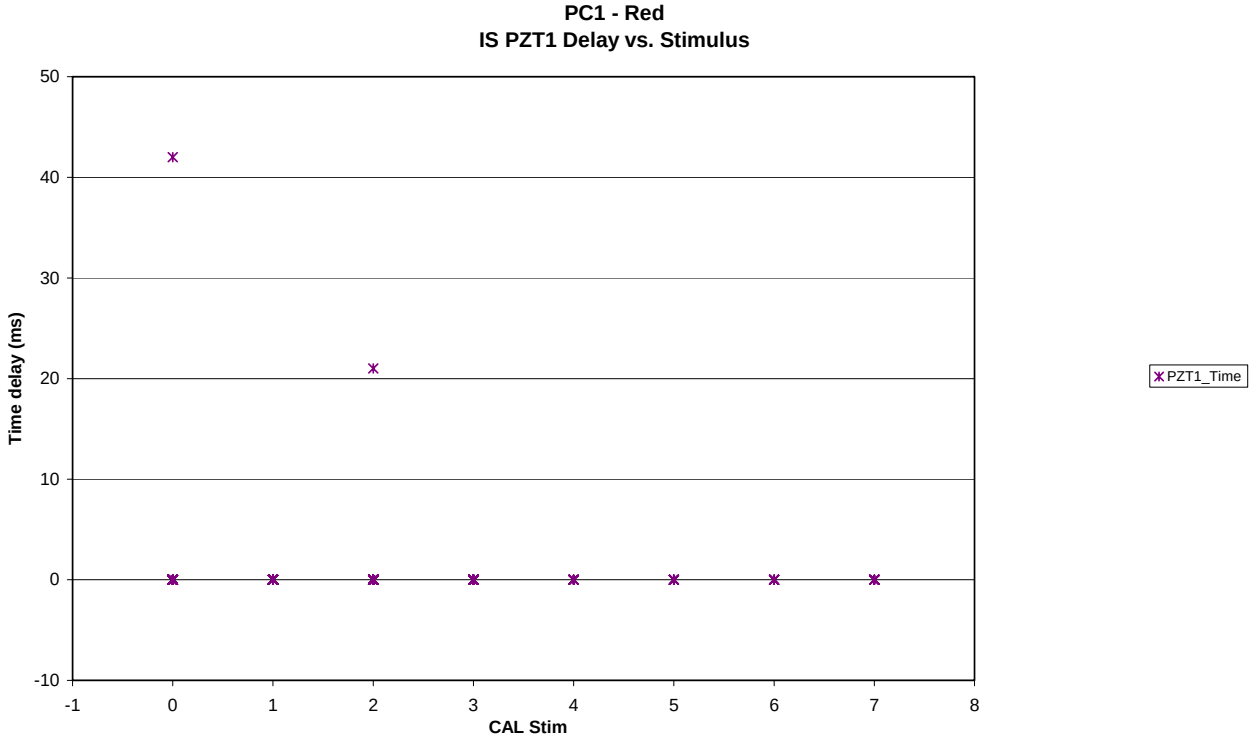


Figure 8.3-34. PZT 2 CAL Time delay vs. stimulus - Red

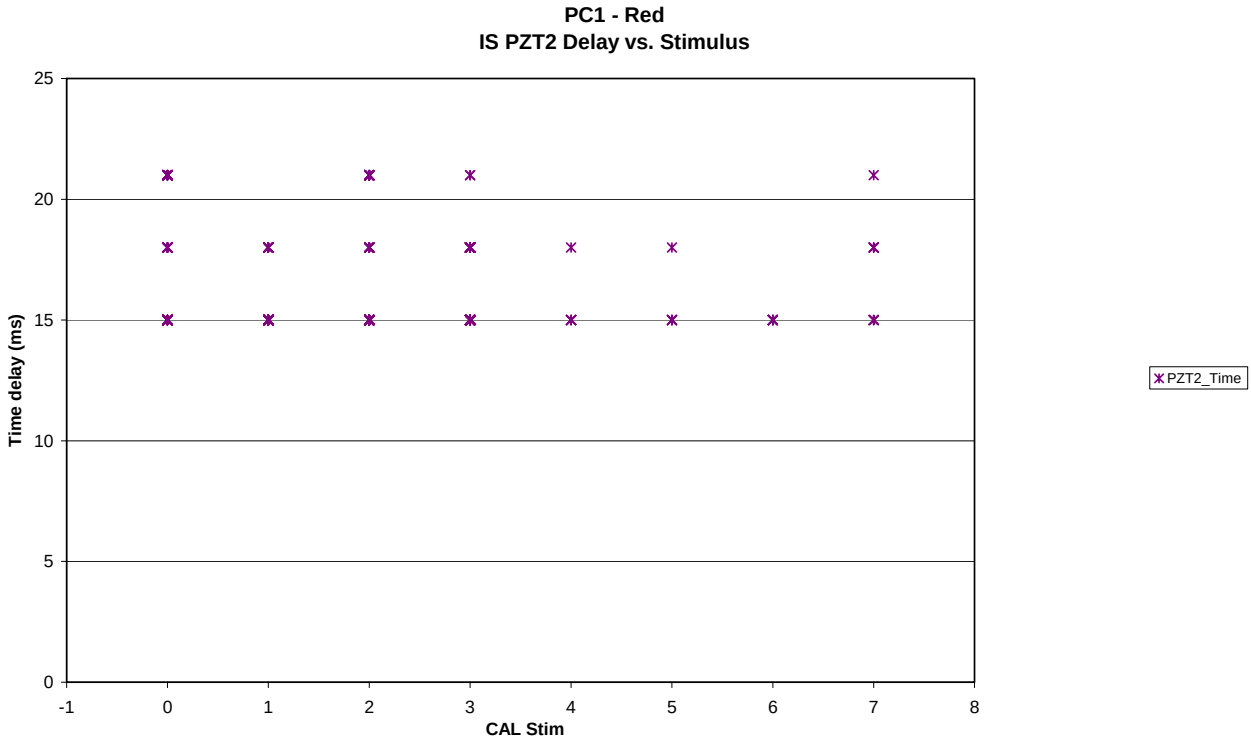


Figure 8.3-35. PZT 3 CAL Time delay vs. stimulus - Red

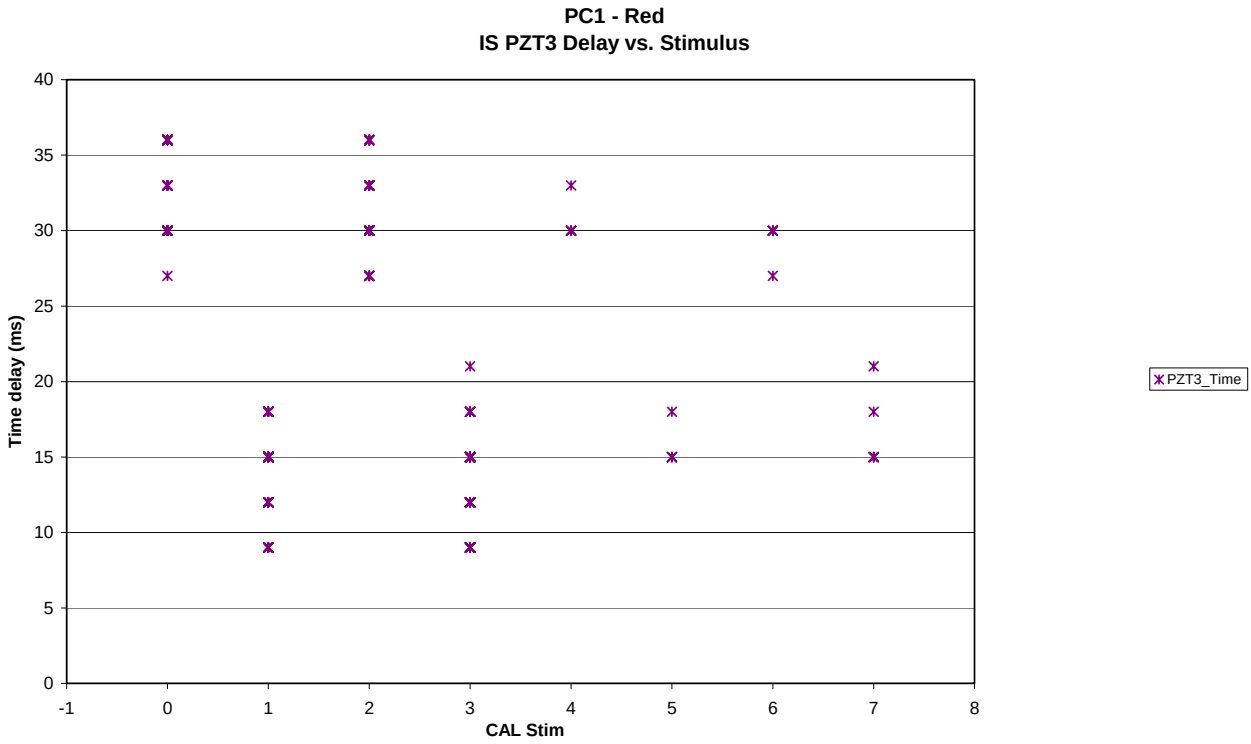


Figure 8.3-36. PZT 4 CAL Time delay vs. stimulus - Red

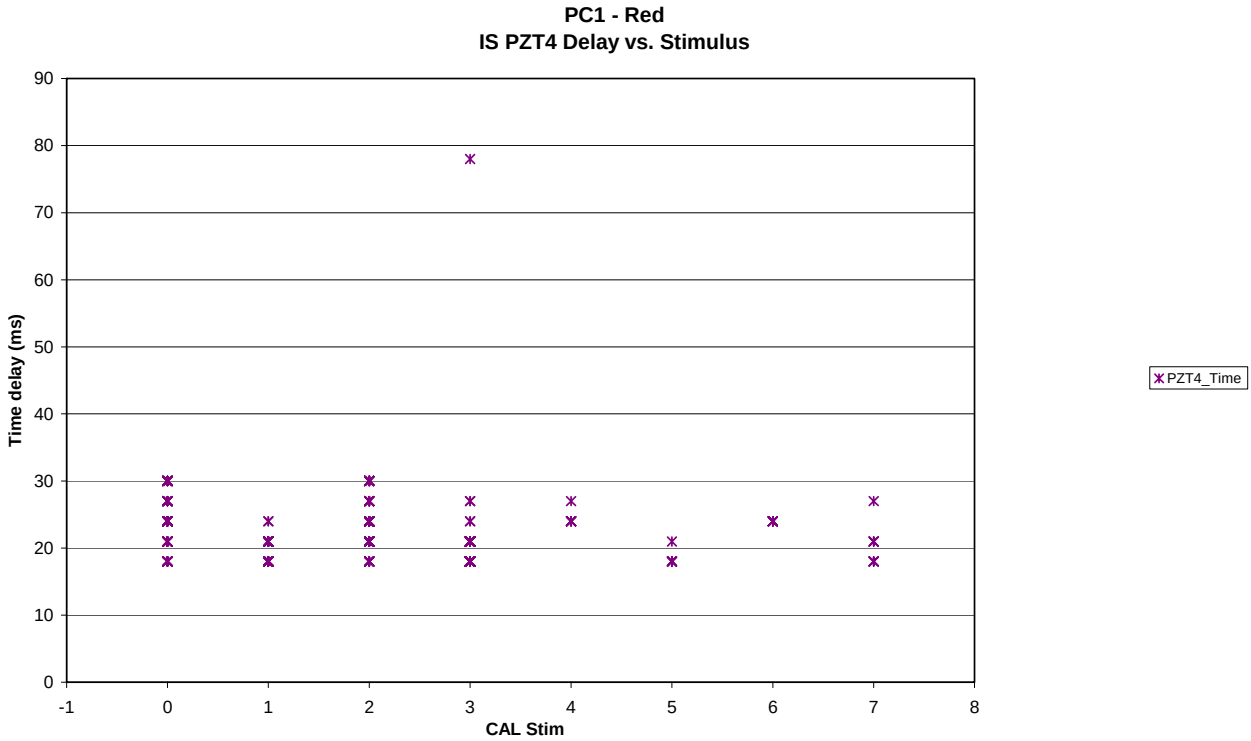
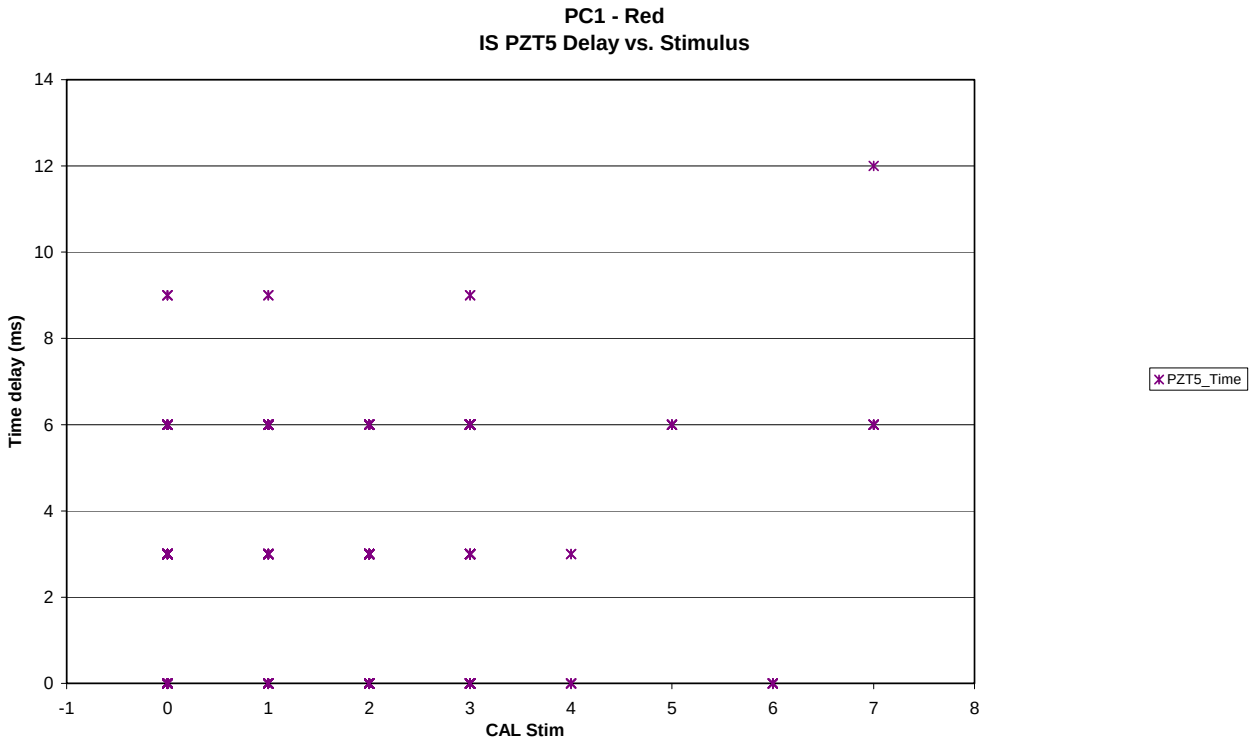


Figure 8.3-37. PZT 5 CAL Time delay vs. stimulus - Red



8.4 MICRO BALANCE SYSTEM (MBS)

8.4.1 MBS – Status

Figure 8.4-1. MBS Operation Status vs. time - Red

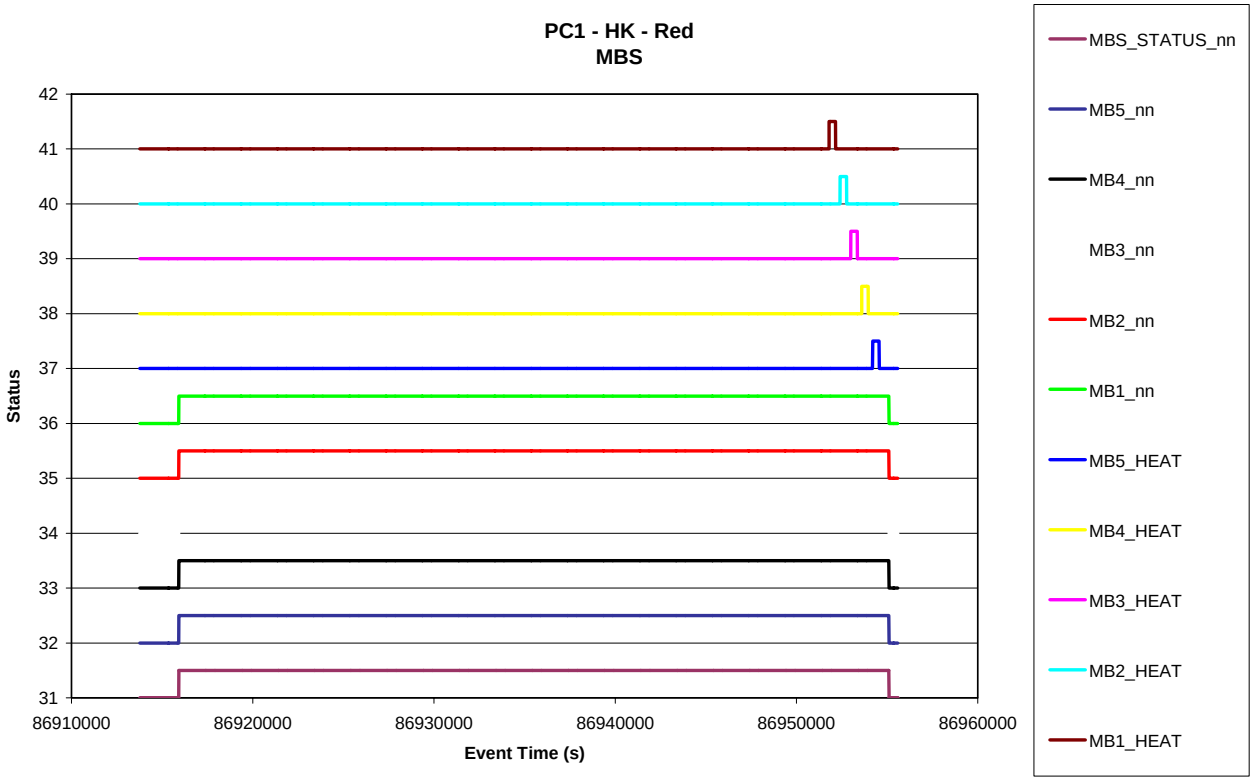


Figure 8.4-2. MBS 1 Temperature vs. time (HK, HK-SCI, SCI) – Red

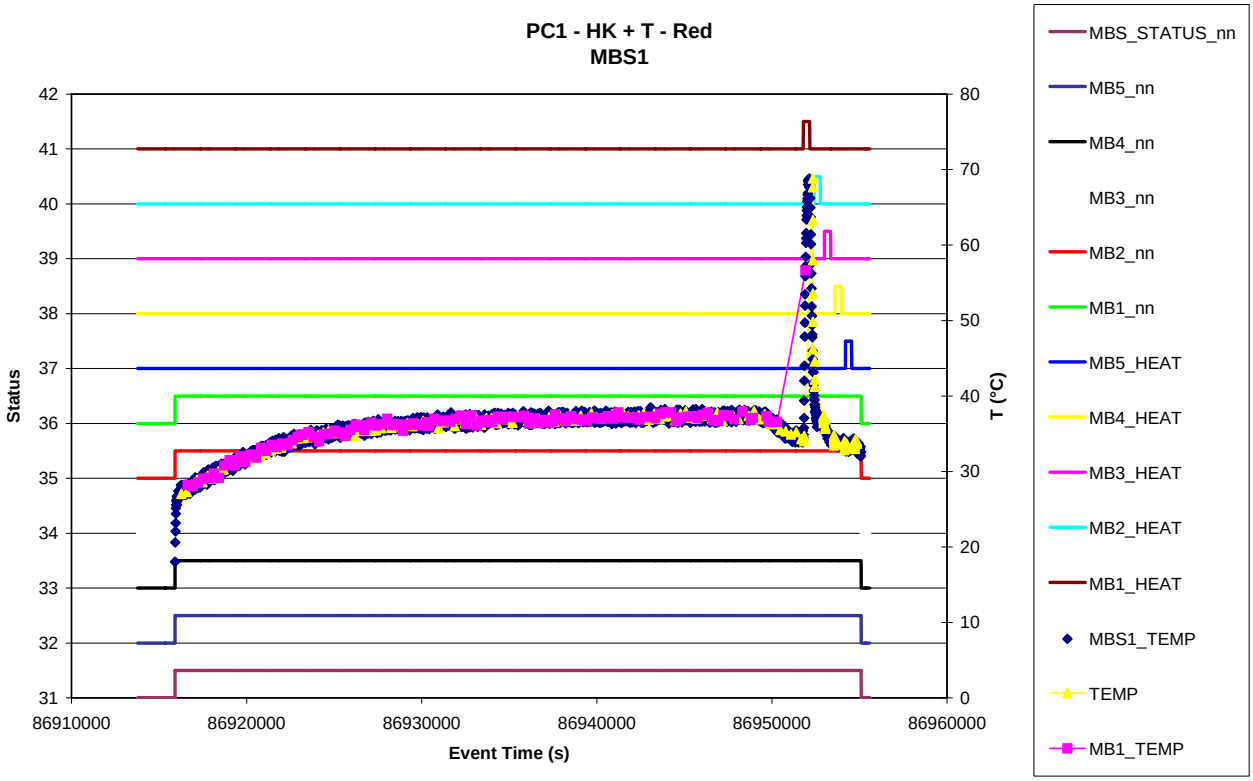


Figure 8.4-3. MBS 2 Temperature vs. time (HK, HK-SCI, SCI) - Red

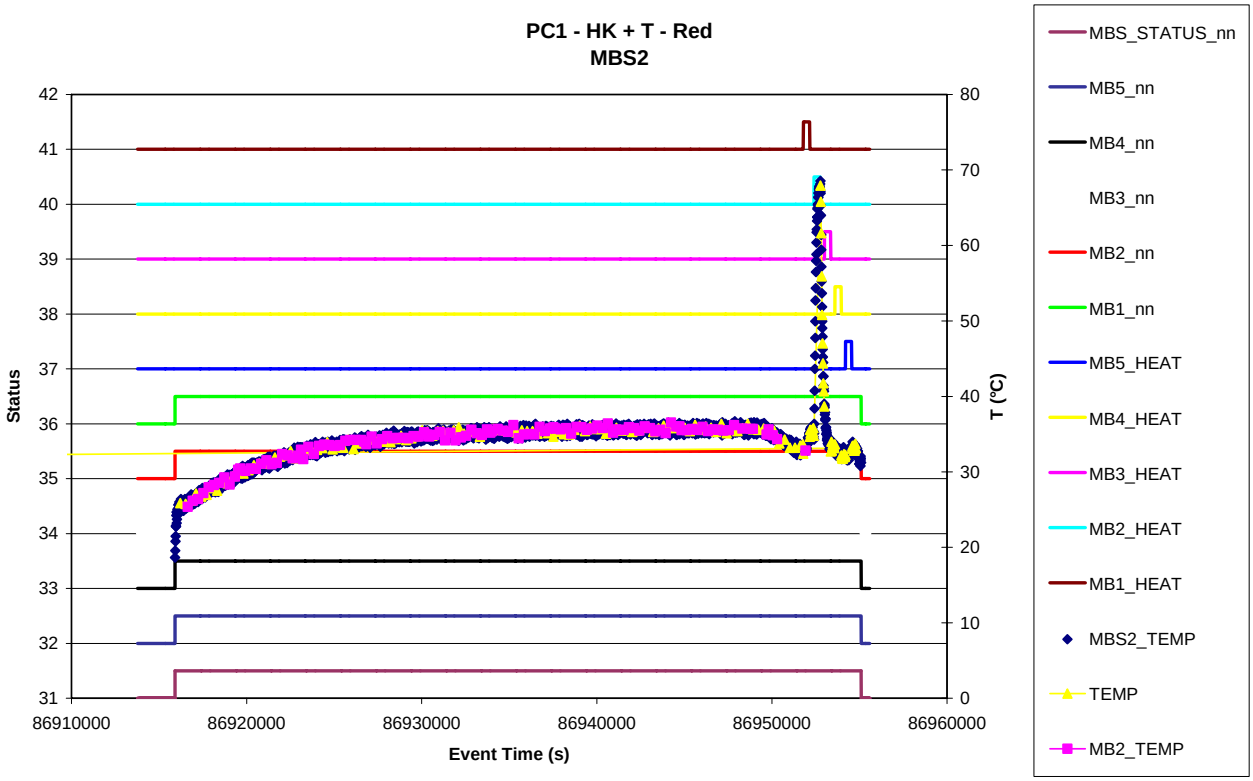


Figure 8.4-4. MBS 3 Temperature vs. time (HK, HK-SCI, SCI) - Red

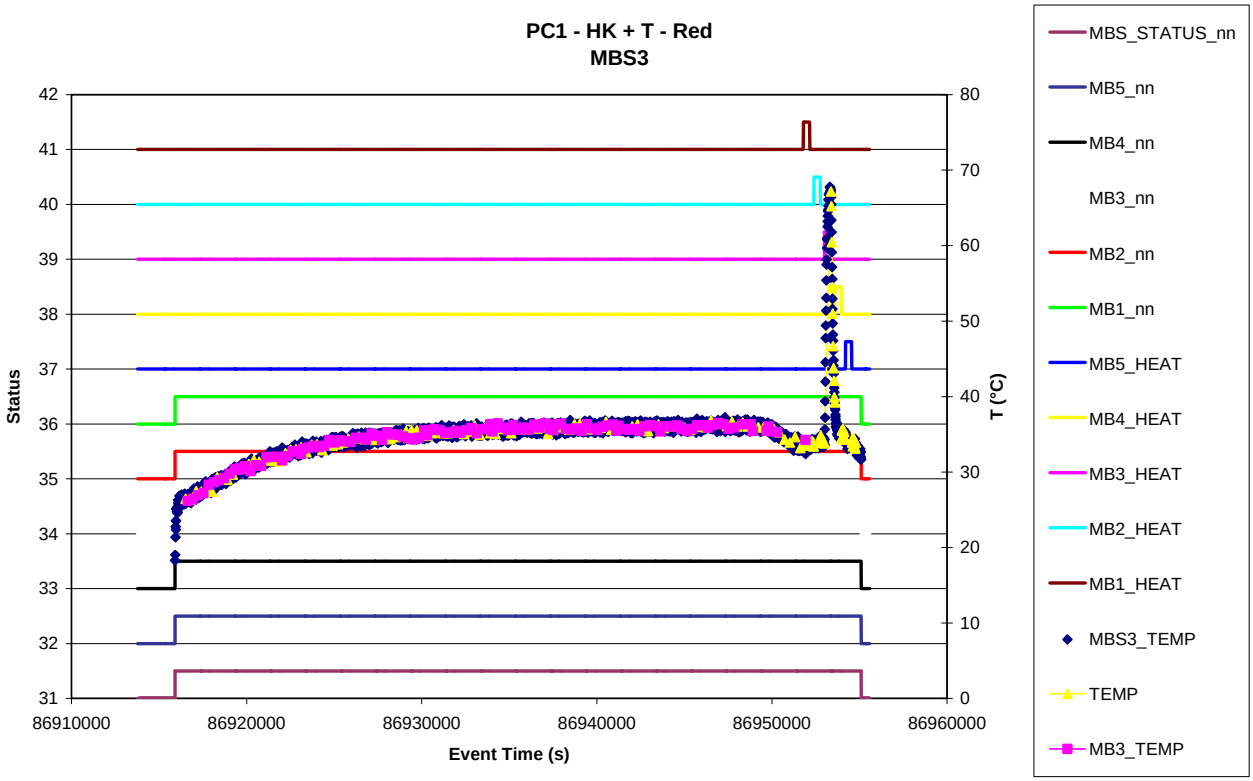


Figure 8.4-5. MBS 4 Temperature vs. time (HK, HK-SCI, SCI) - Red

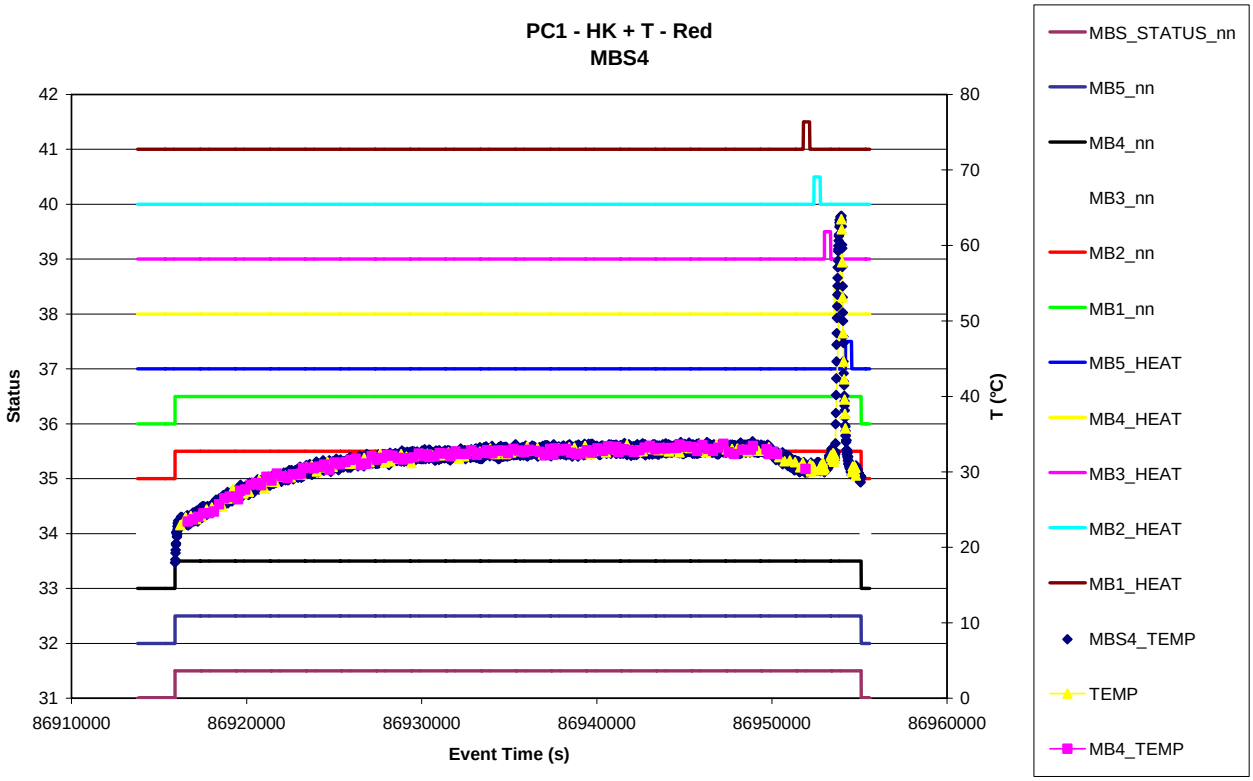
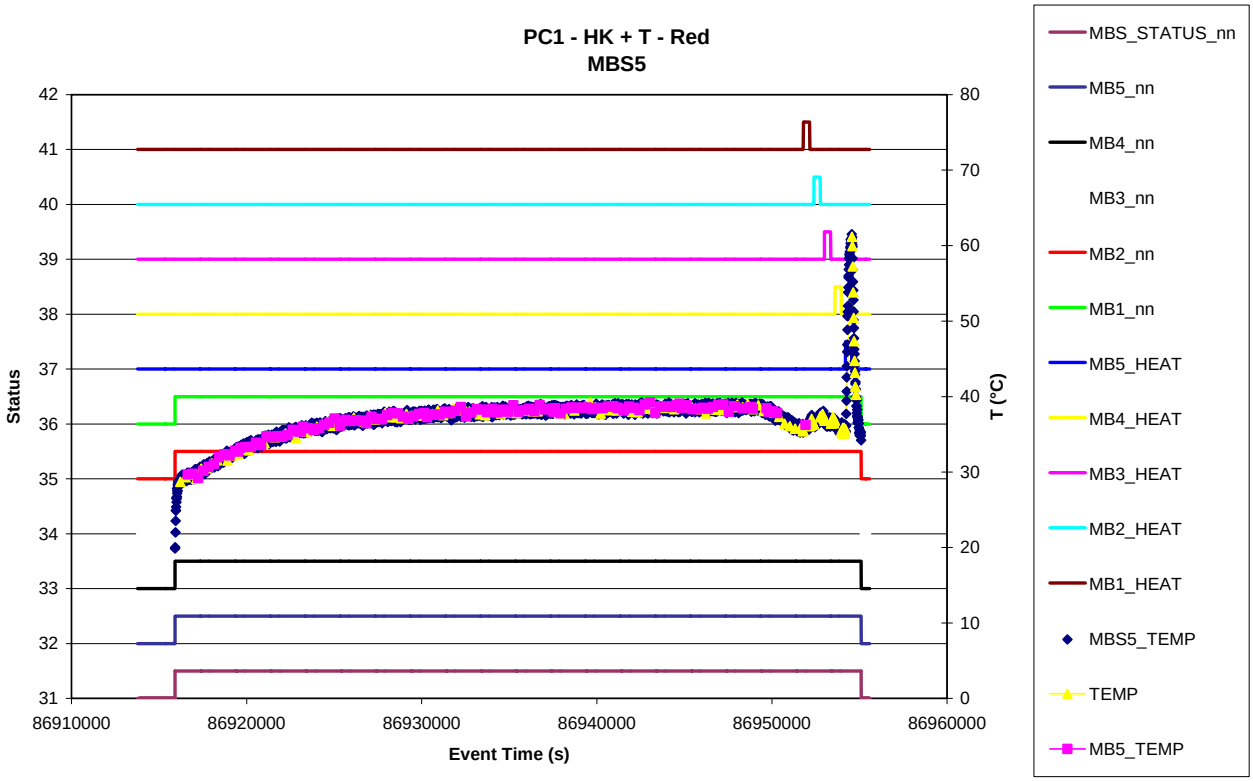


Figure 8.4-6. MBS 5 Temperature vs. time (HK, HK-SCI, SCI) - Red



8.4.2 MBS – Behaviour

8.4.2.1 Science Events (Normal + Heating)

Figure 8.4-7. MBS 1 Frequency and Temperature vs. time - Red

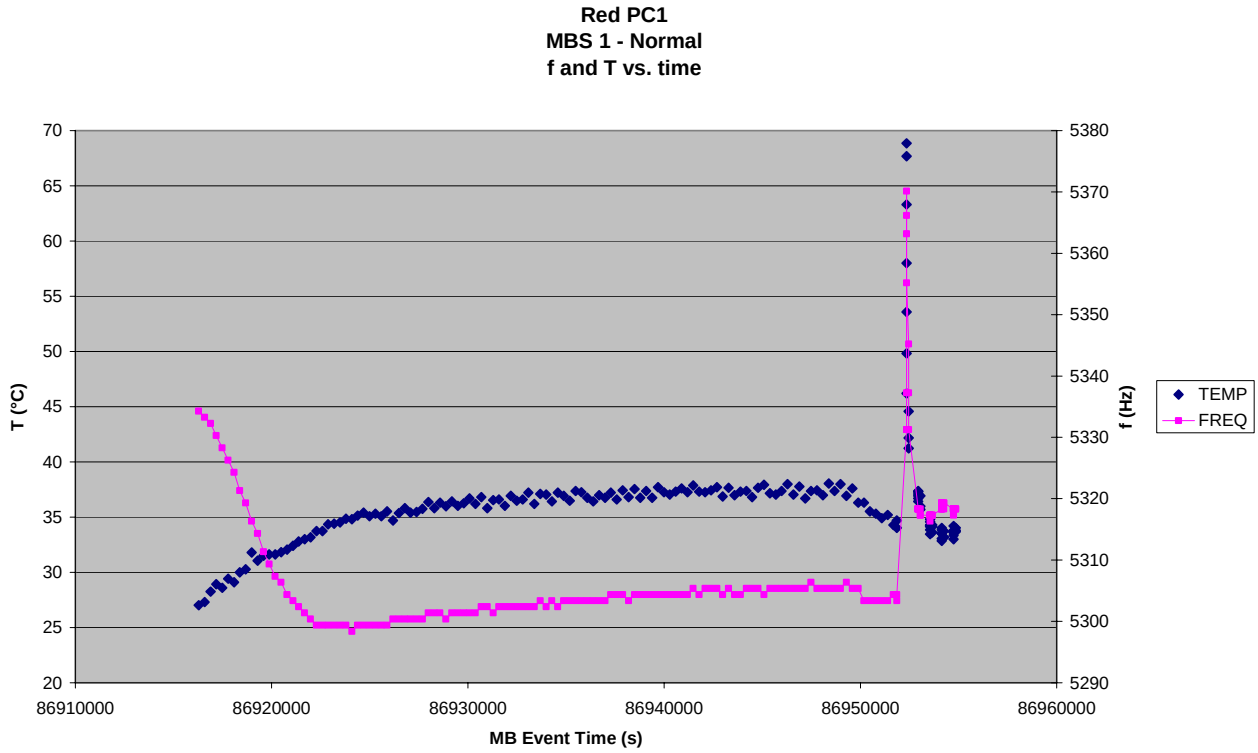


Figure 8.4-8. MBS 2 Frequency and Temperature vs. time - Red

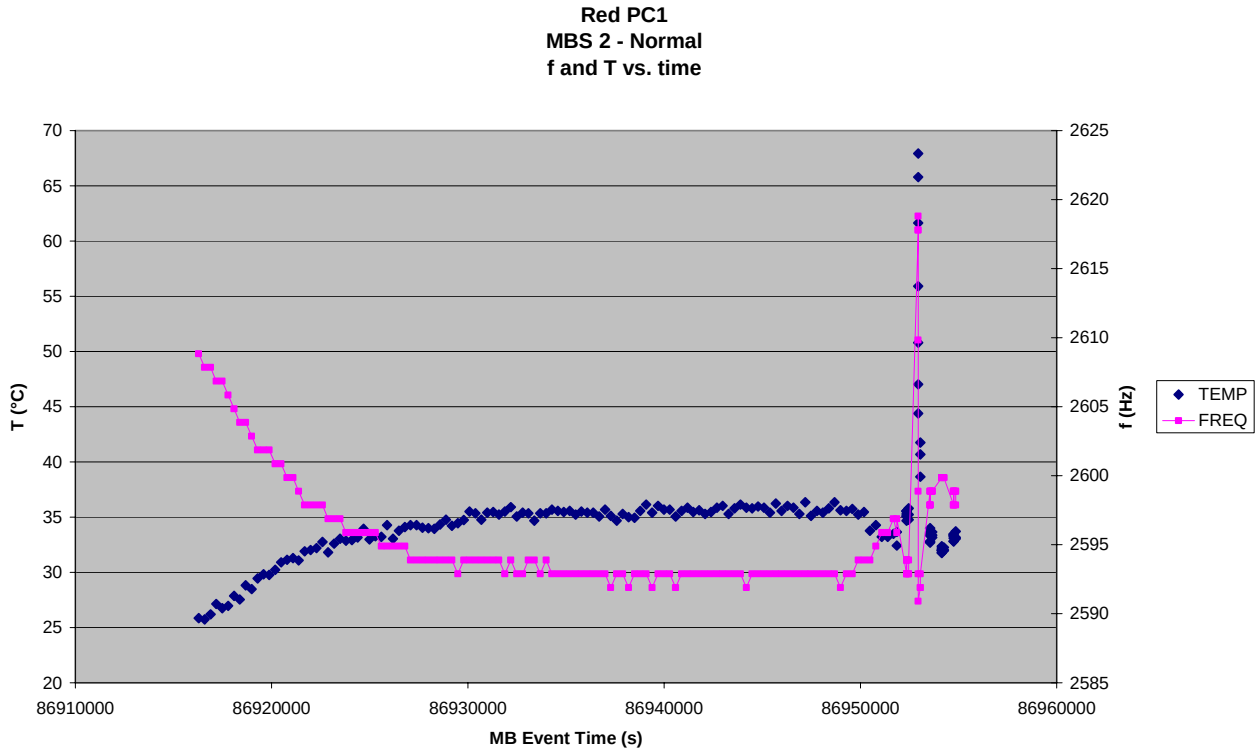


Figure 8.4-9. MBS 3 Frequency and Temperature vs. time - Red

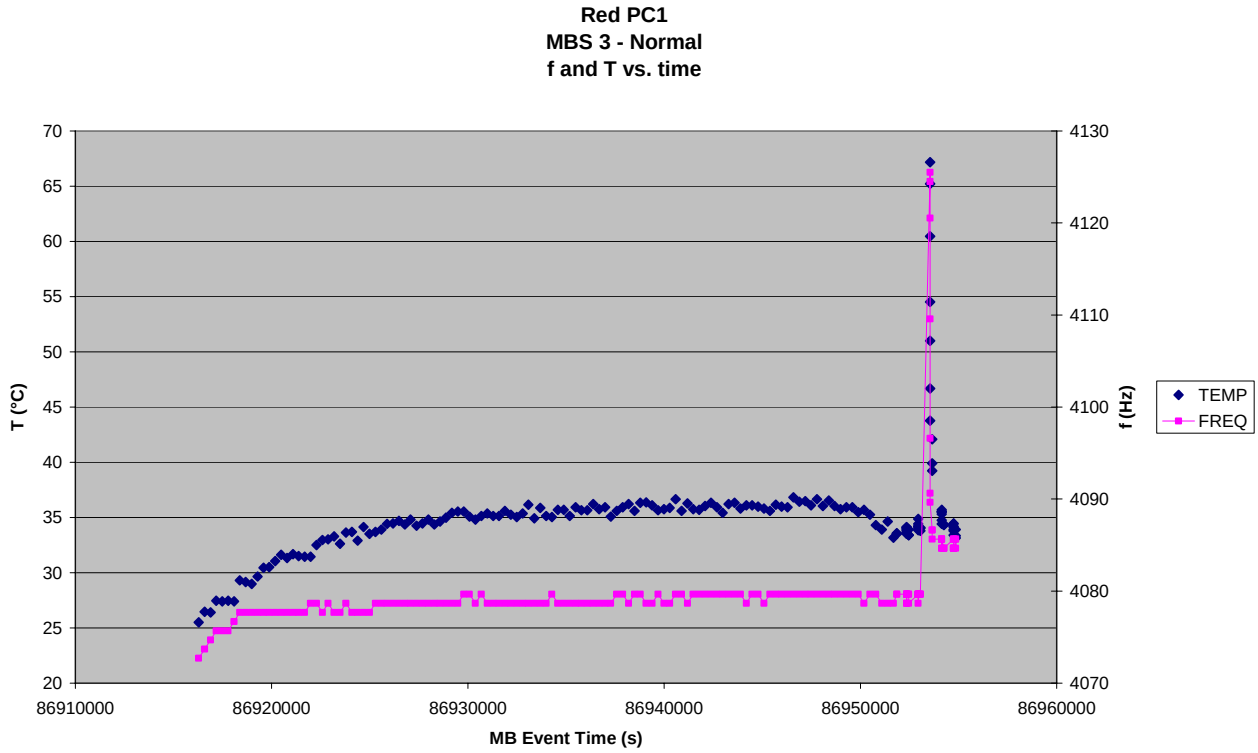


Figure 8.4-10. MBS 4 Frequency and Temperature vs. time - Red

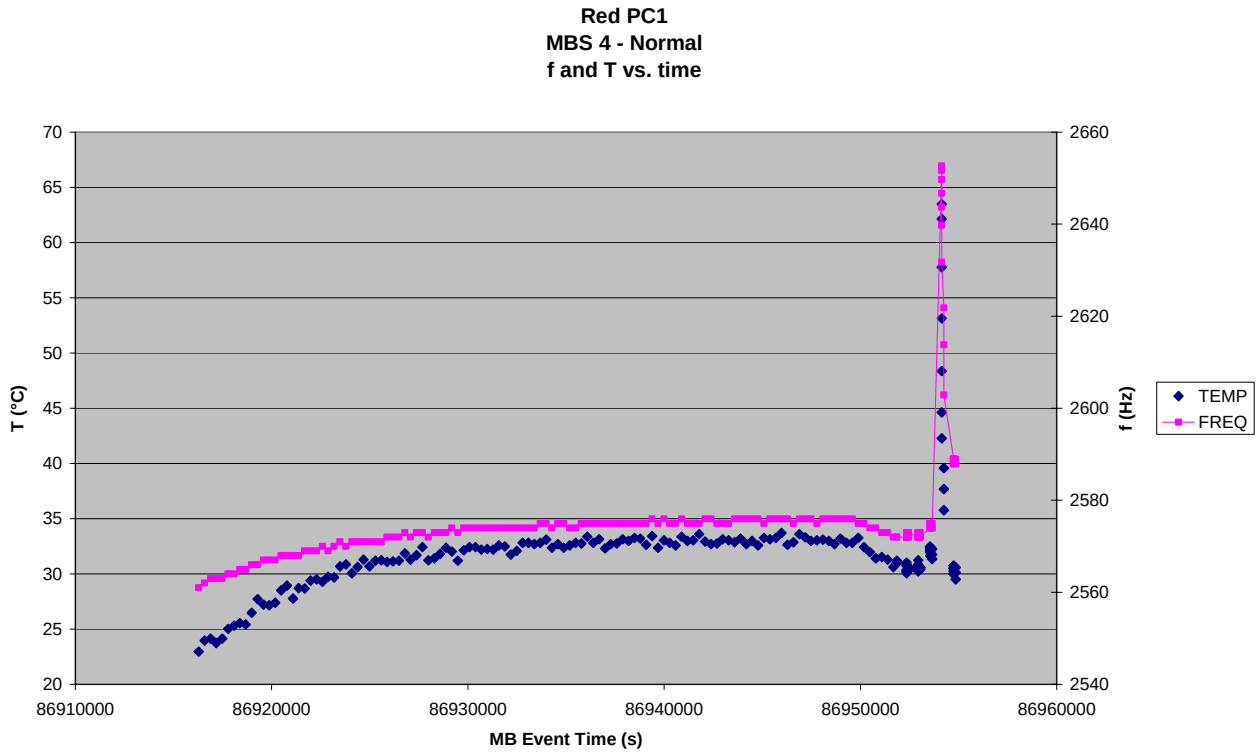


Figure 8.4-11. MBS 5 Frequency and Temperature vs. time - Red

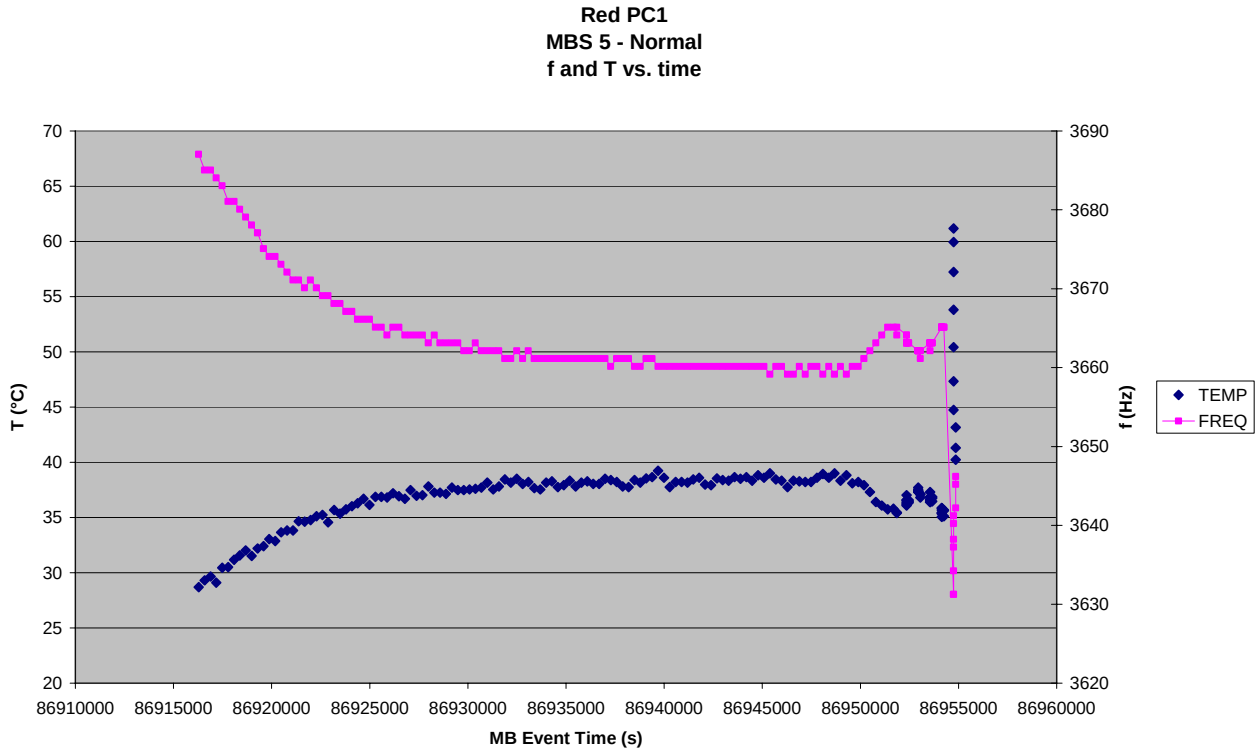


Figure 8.4-12. MBS 1 Frequency vs. Temperature - Red

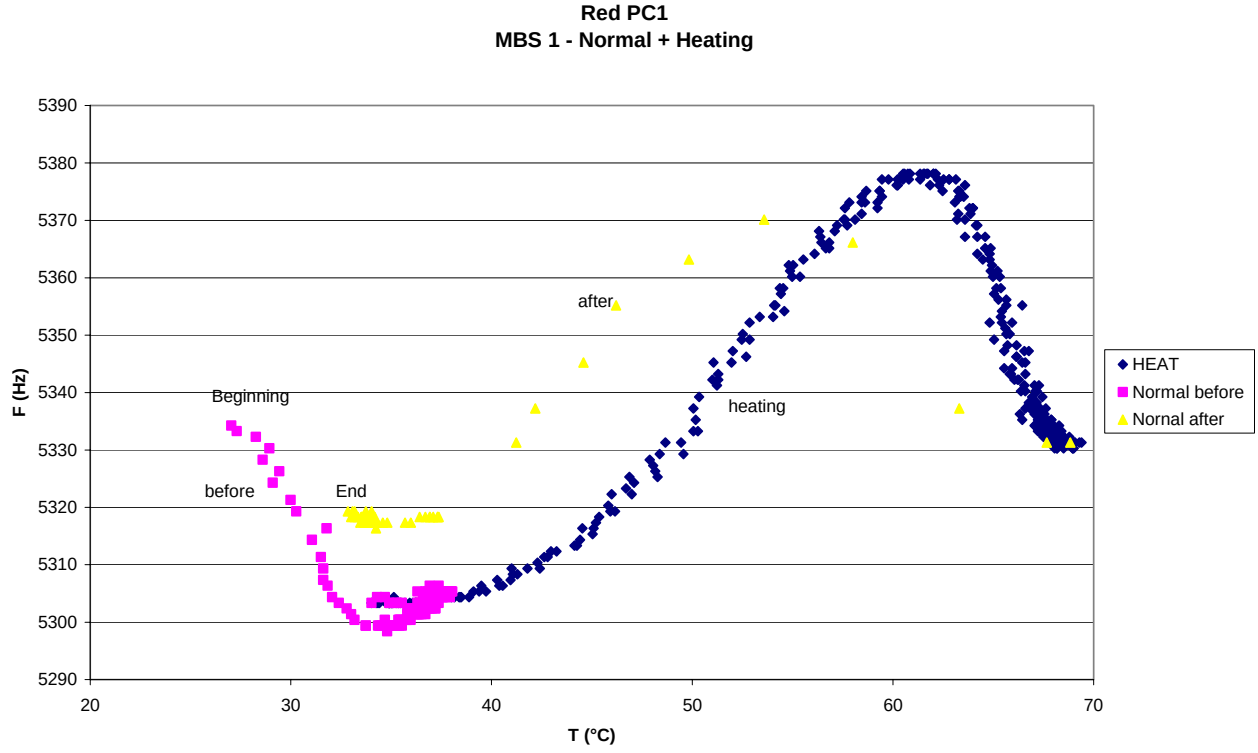


Figure 8.4-13. MBS 2 Frequency vs. Temperature - Red

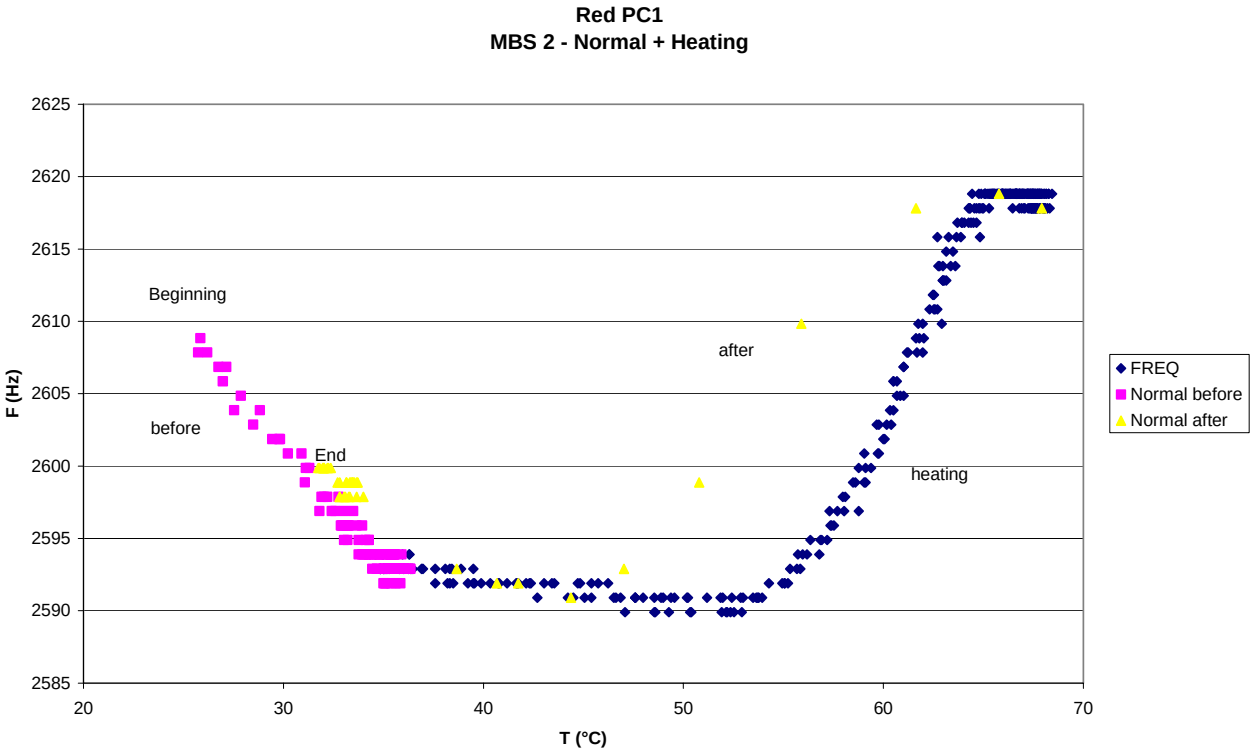


Figure 8.4-14. MBS 3 Frequency vs. Temperature - Red

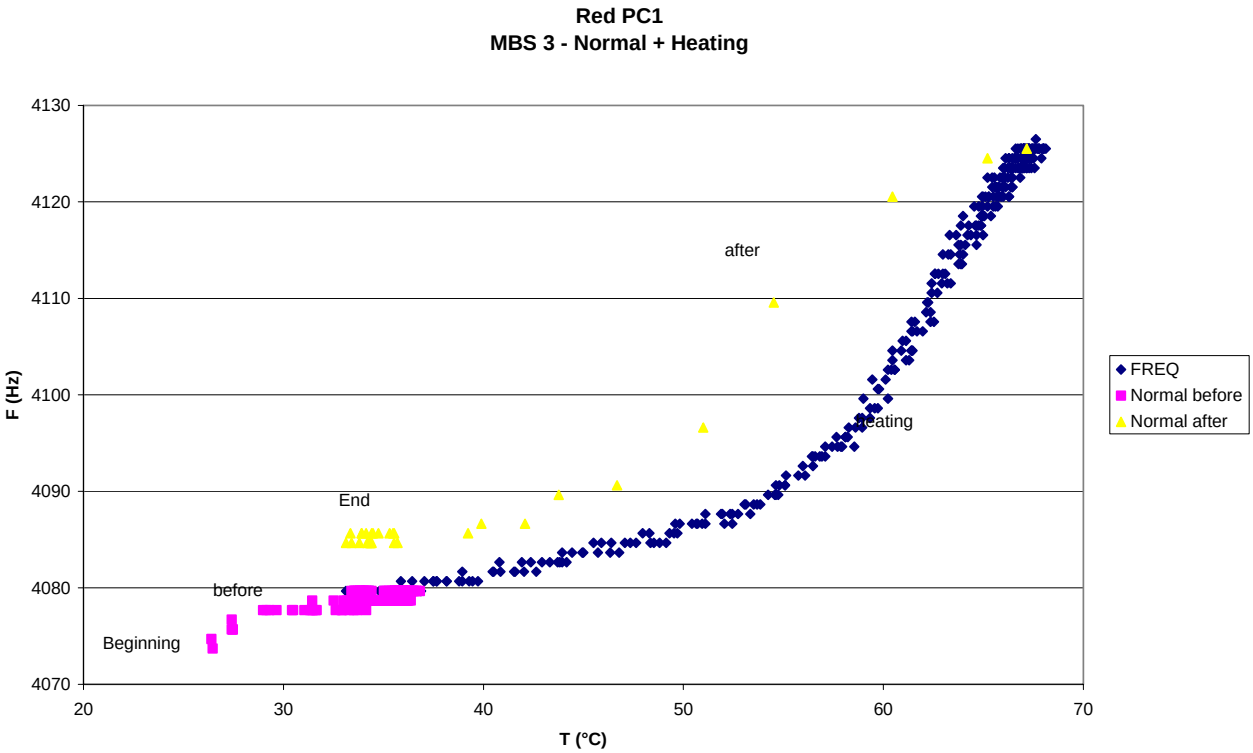


Figure 8.4-15. MBS 4 Frequency vs. Temperature - Red

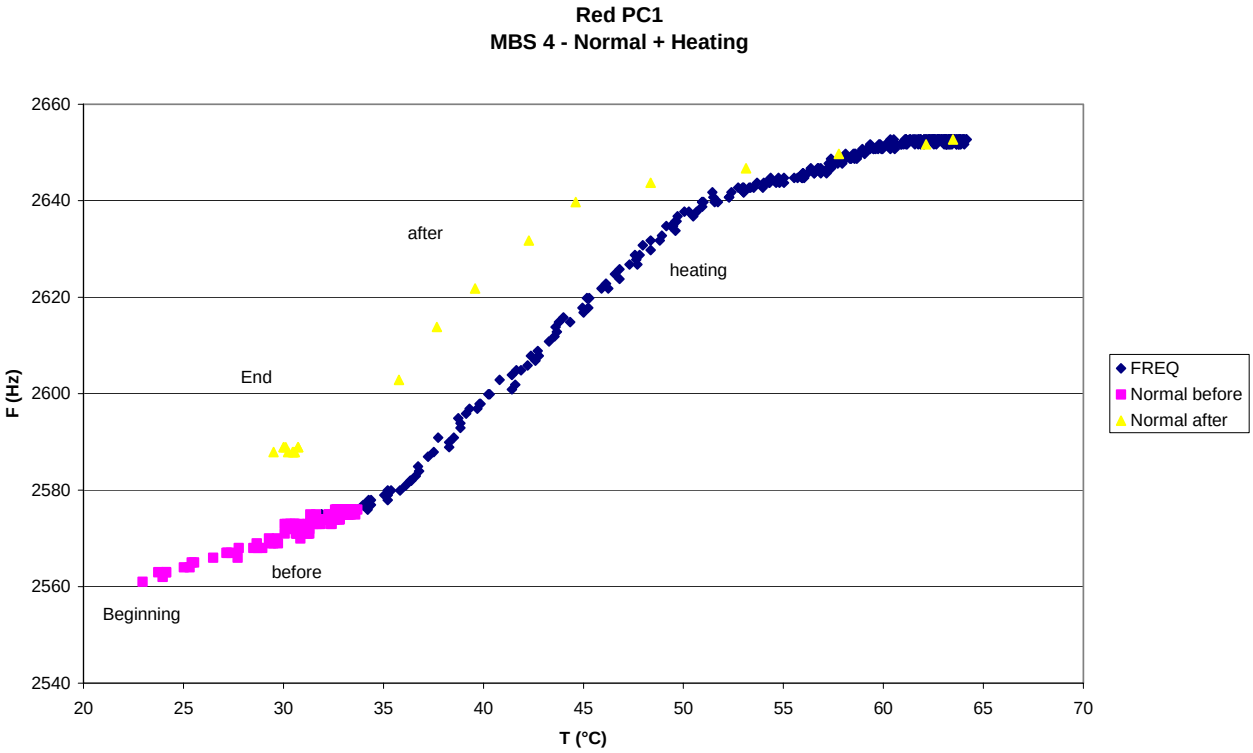
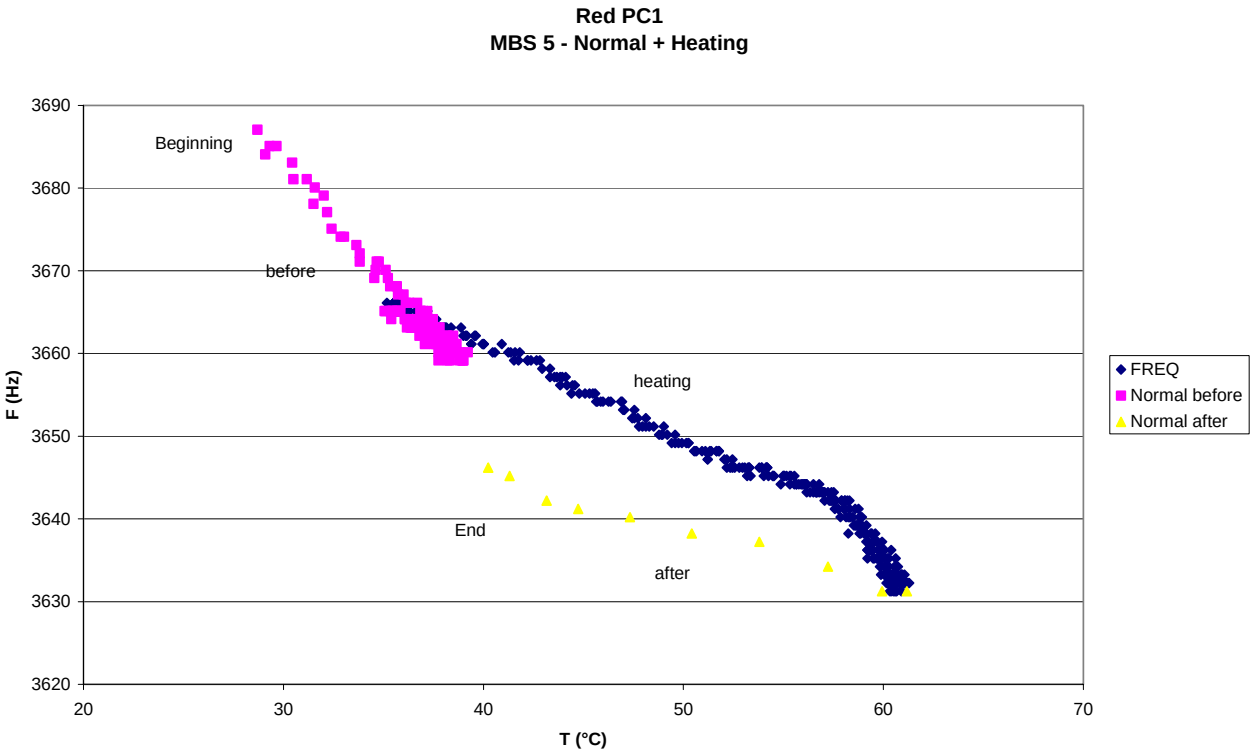


Figure 8.4-16. MBS 5 Frequency vs. Temperature - Red



9. COMPARISIONS WITH PREVIOUS TESTS

9.1 GRAIN DETECTION SYSTEM (GDS)

9.1.1 Laser Light Mon vs. Temperature

Figure 9.1-1. GDS Laser 1 Light Mon vs. Temperature (PC0 in yellow – PC1 in blue)

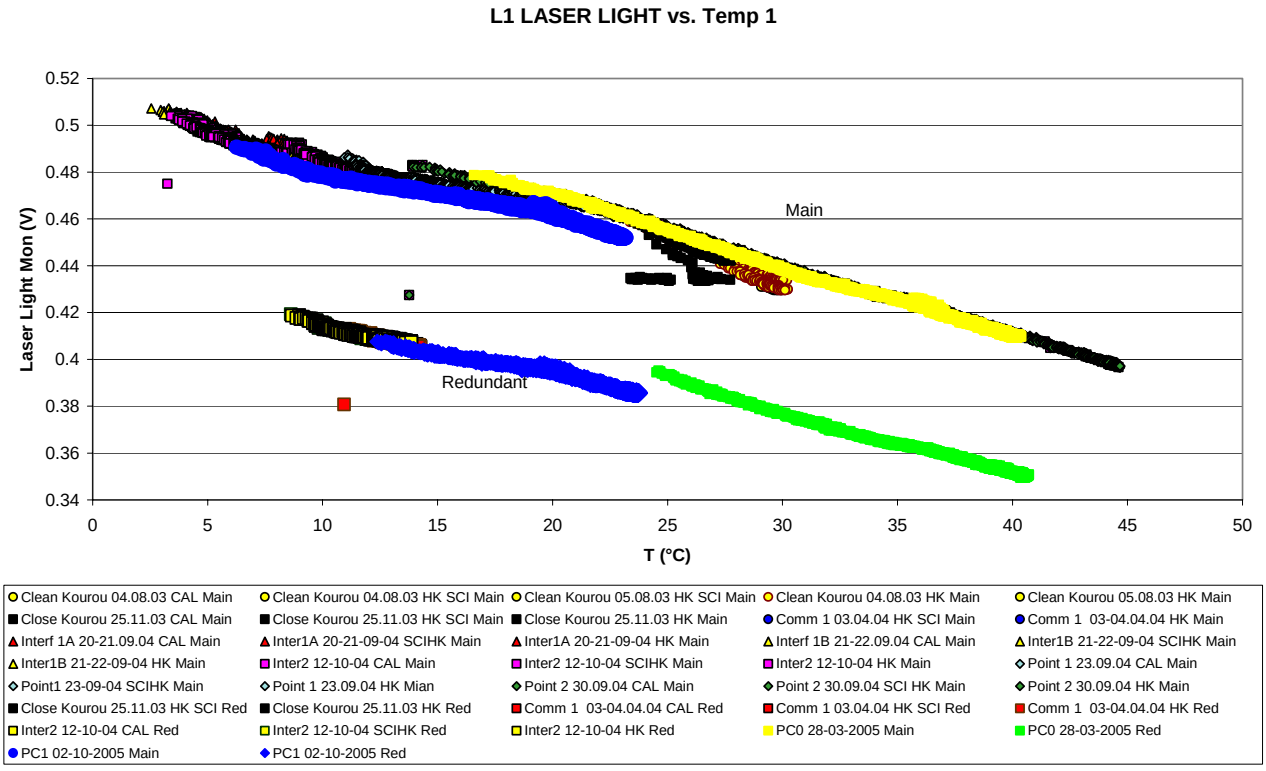


Figure 9.1-2. GDS Laser 2 Light Mon vs. Temperature (PC0 in yellow – PC1 in blue)

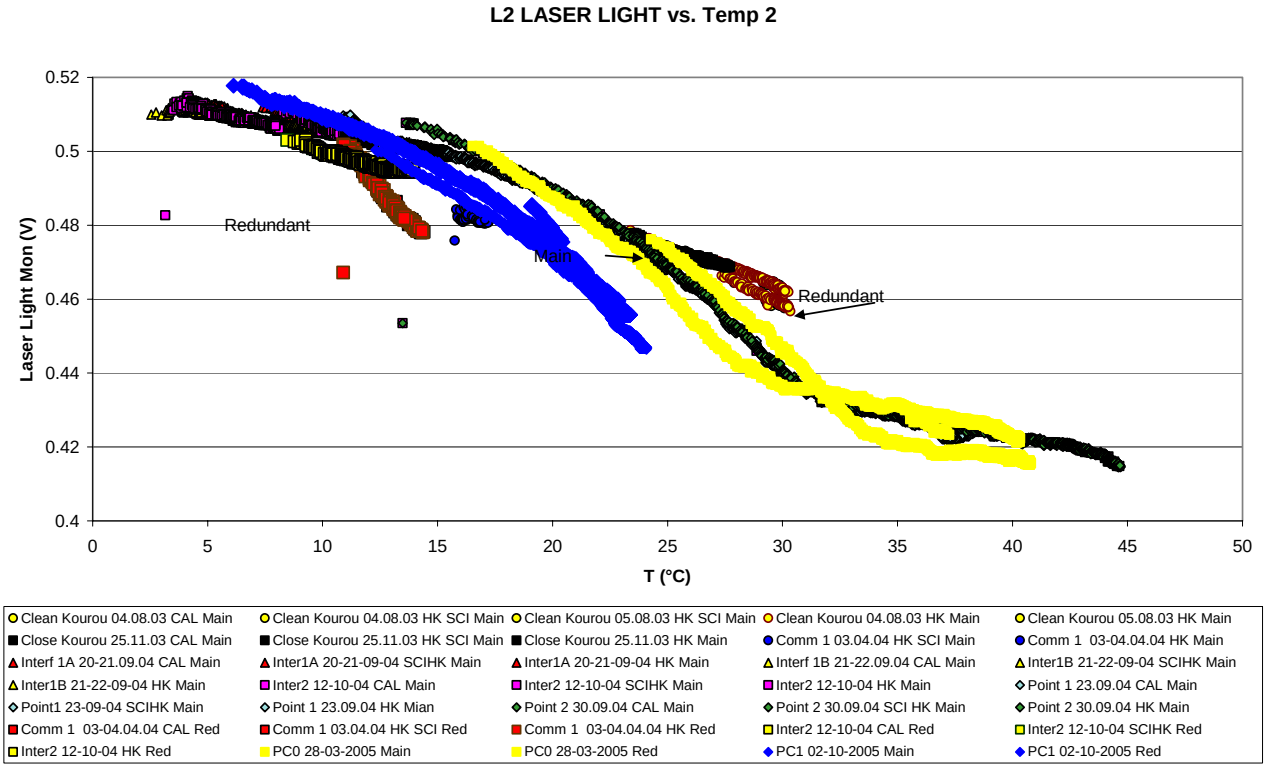


Figure 9.1-3. GDS Laser 3 Light Mon vs. Temperature (PC0 in yellow – PC1 in blue)

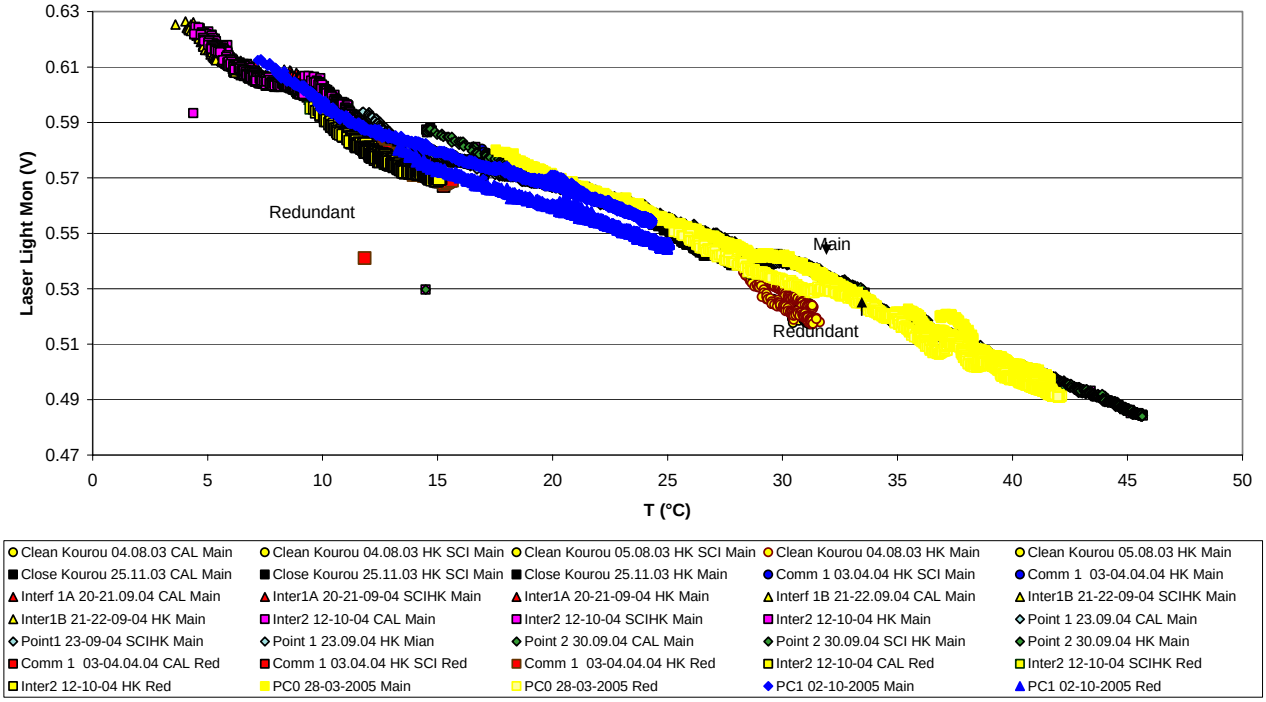
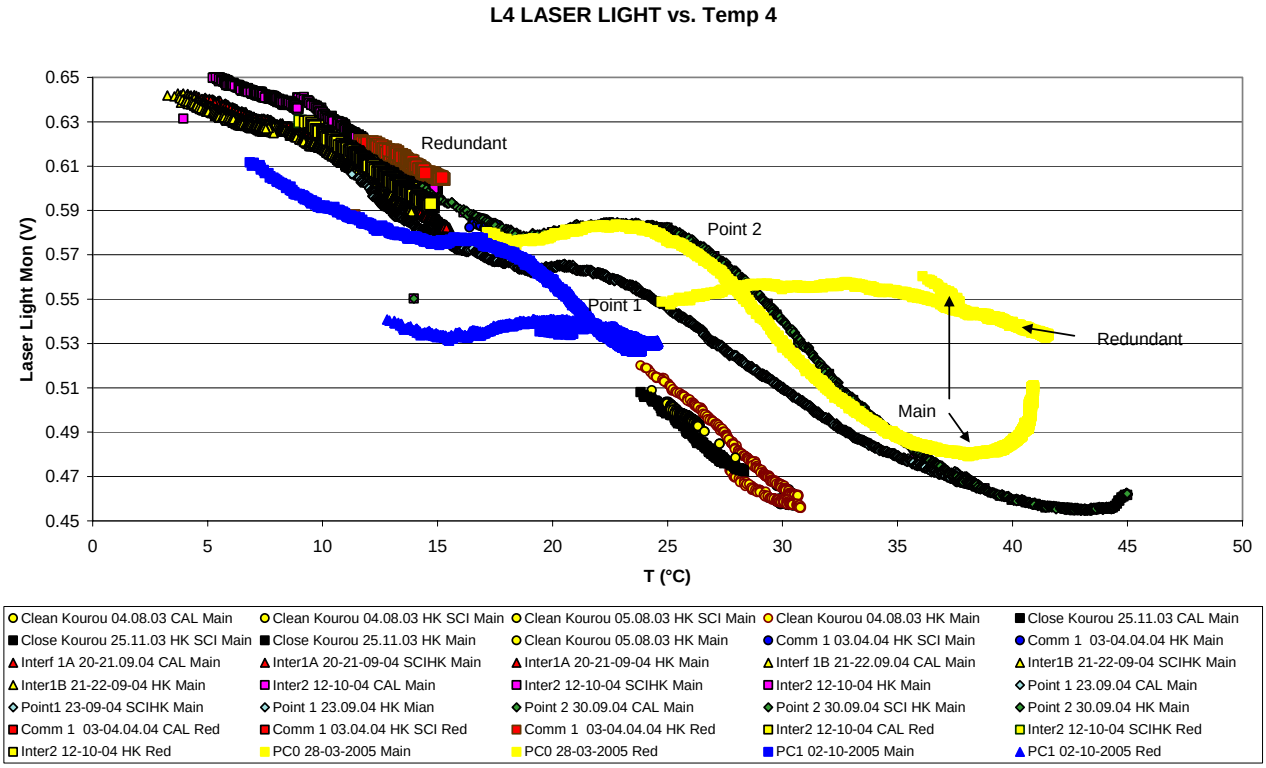


Figure 9.1-4. GDS Laser 4 Light Mon vs. Temperature (PC0 in yellow – PC1 in blue)



9.2 IMPACT SENSOR (IS)

9.2.1 CAL Amplitude vs. Temperature

No significant data on this subject during PC1.

9.3 MICRO BALANCE SYSTEM (MBS)

9.3.1 Frequency vs. Temperature

Figure 9.3-1. MBS 1 Frequency vs. Temperature - After

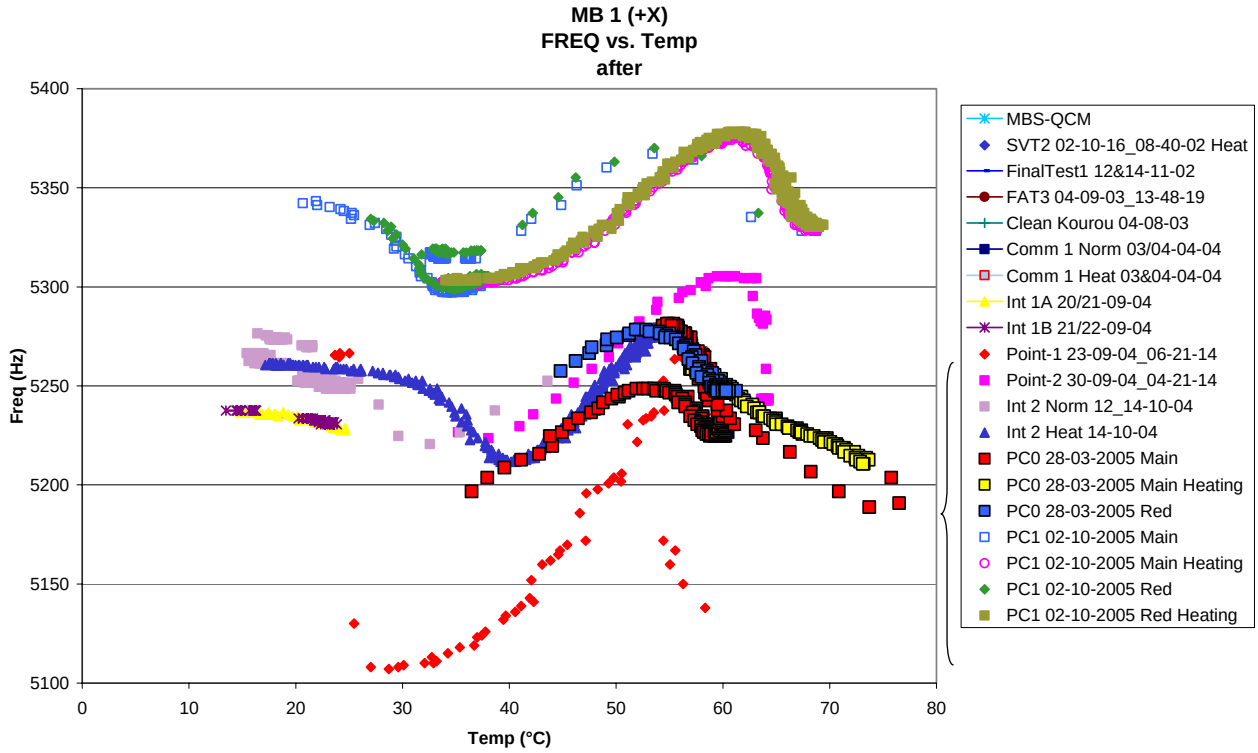


Figure 9.3-2. MBS 2 Frequency vs. Temperature

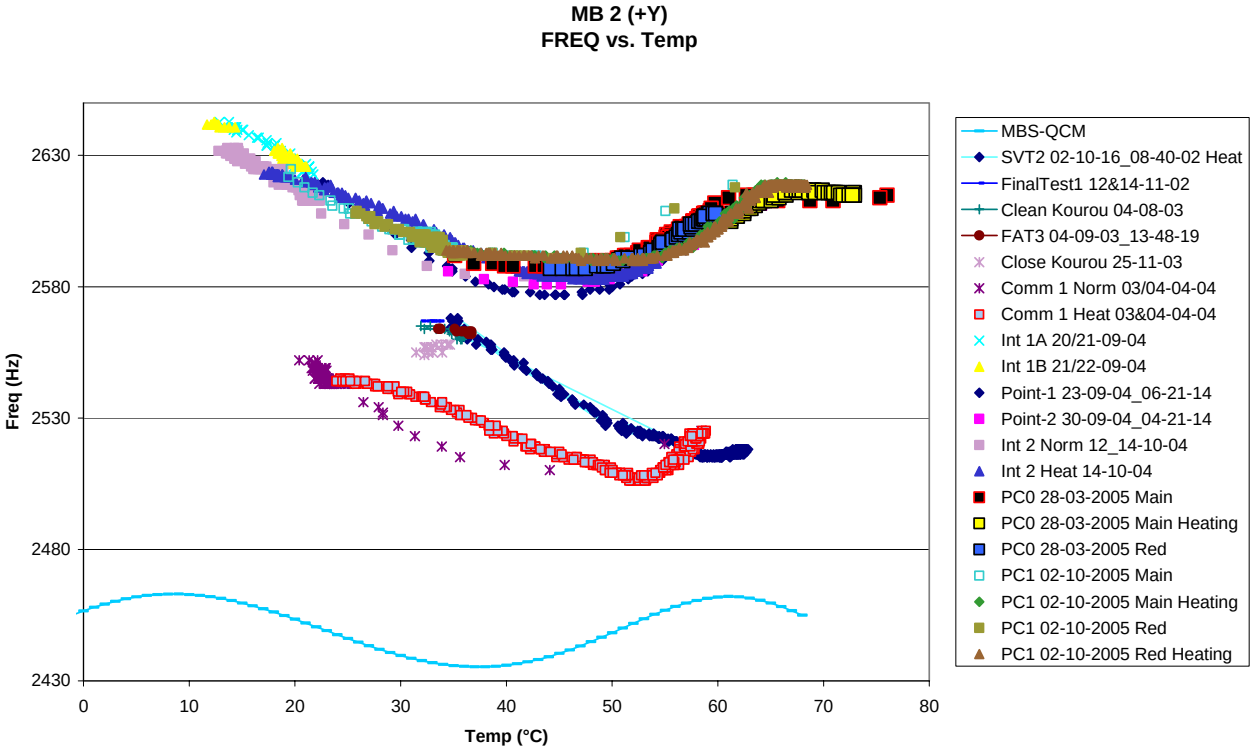


Figure 9.3-3. MBS 3 Frequency vs. Temperature

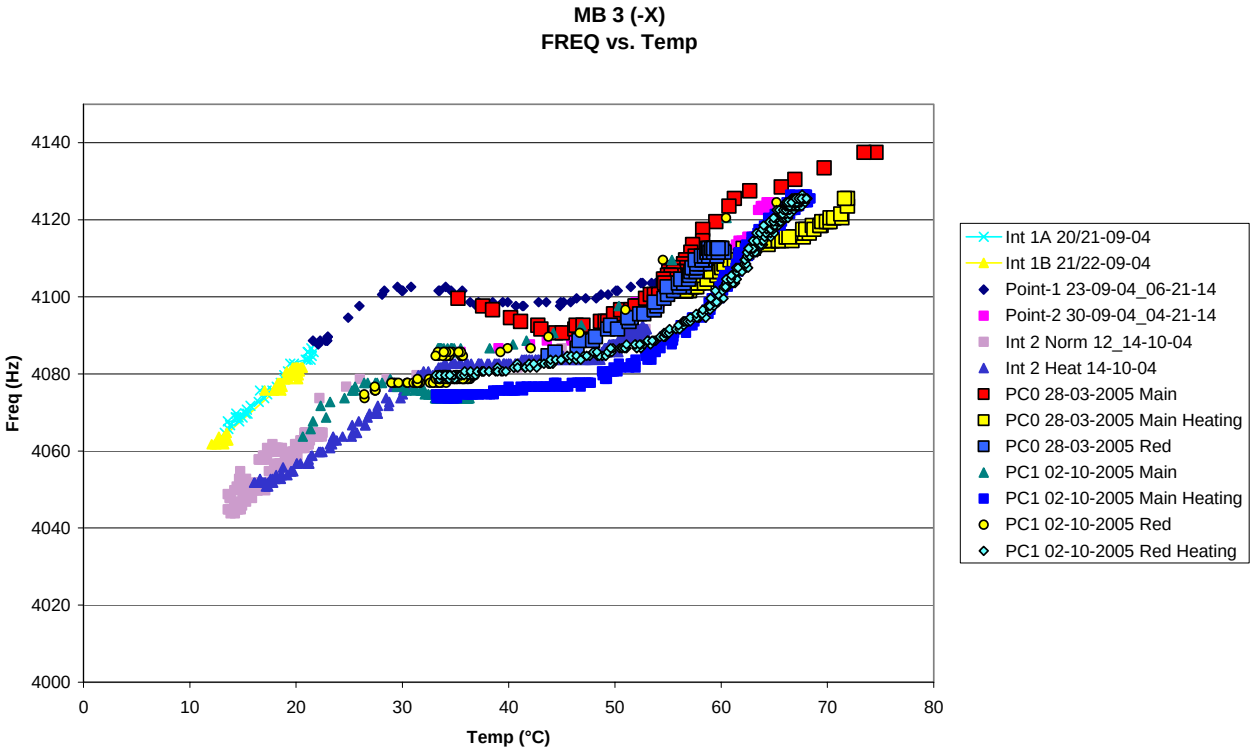


Figure 9.3-4. MBS 4 Frequency vs. Temperature

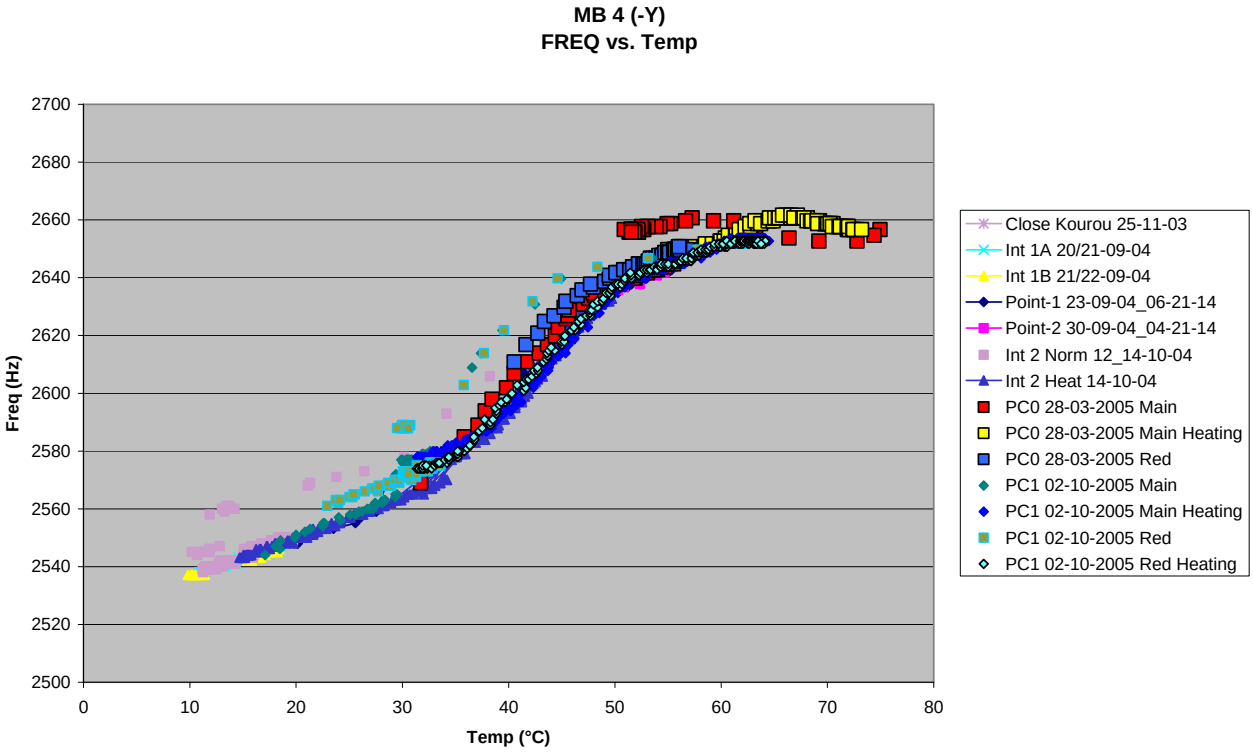
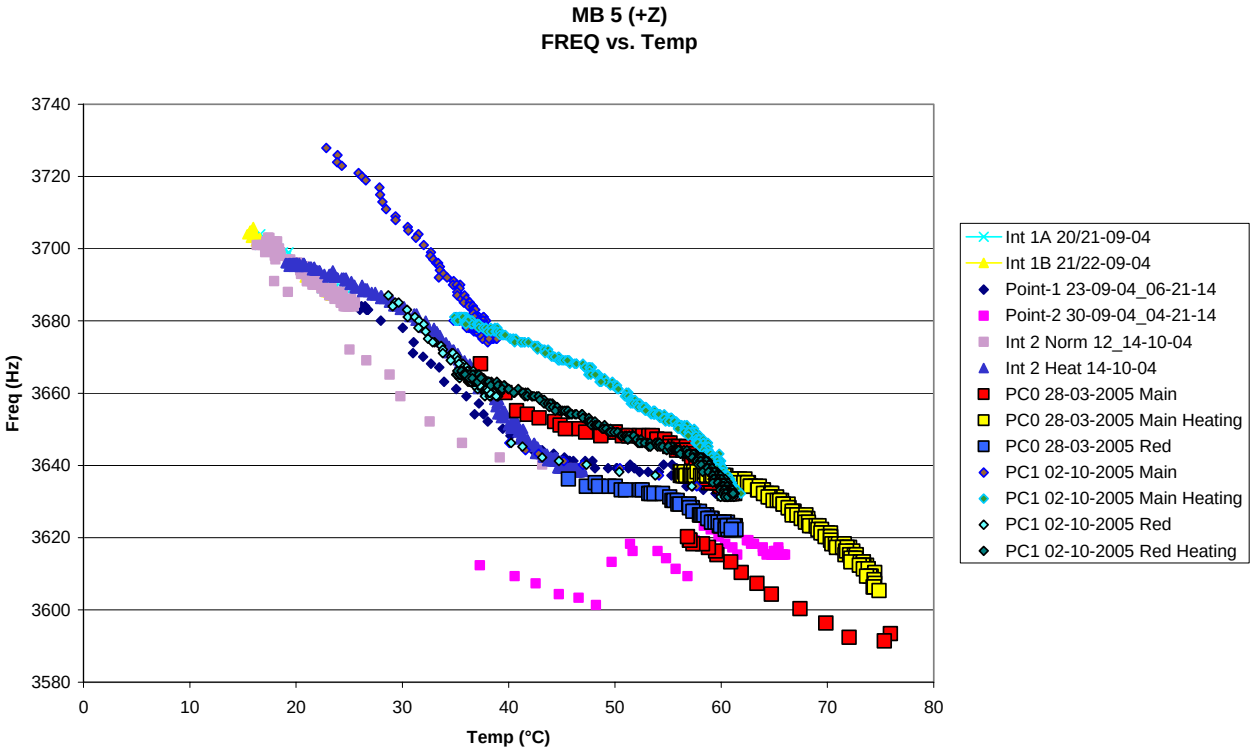


Figure 9.3-5. MBS 5 Frequency vs. Temperature



10. TIMELINES FOR GIADA PC1

10.1 TIMELINE FOR MAIN INTERFACE

```
# $Log: OIOR_PIHRSO_D_0000_GD_PCn_m.ROS,v $
# Version  1.1  2005/05/17 giada MAIN for PCn
# Passive Checkout OIOR for GD RSOC Assumption MSP I1
#
#============================================================================#
# Filename:       OIOR_PIHRSO_D_0000_GD_PCn_m00001.ROS
# Type:     Input Timeline file
#
# Description:    Passive Check-Out GD
#
#
# Author:   V.Dhiri
#
#           RSOC
#
# Date:           17 May 2005
#
#
# Proposed by GIADA team
# 17 May 2005
#
# (c) ESA/Estec
#
#----------------------------------------------------------------------------#
#============================================================================#

Version: 00001

Ref_date: 30-Sep-2005
Start_time: 000_00:00:00
End_time: 005_00:00:00

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

```
PC_START (COUNT=001004)    +00:00:00     GIADA   OFF AGDF001A ( \
                                         VGD0001A = "YES" [ENG]) # GIADA on Main IF

PC_START (COUNT=001004)    +00:01:00     GIADA SAFE  AGDF001B # GIADA On

PC_START (COUNT=001004)    +00:06:00     GIADA SAFE  AGDF001C # GIADA On

PC_START (COUNT=001004)    +00:24:00     GIADA SAFE  AGDS035A # Go to Cover Mode

PC_START (COUNT=001004)    +00:26:00     GIADA COVER AGDF090A # Open cover

PC_START (COUNT=001004)    +00:36:00     GIADA COVER AGDS065A # Go to Safe mode

PC_START (COUNT=001004)    +00:37:00     GIADA SAFE  AGDS110A # Go to Normal mode

Description: "GIADA operative in normal mode"

PC_START (COUNT=001004)    +00:39:00     GIADA NORMAL      AGDS038A( \
                                               VGDS038A = 35 \
                                               VGDS038B = 20 )   # Set GDS L and R thresholds

PC_START (COUNT=001004)    +00:39:30     GIADA NORMAL      AGDS037A(\
                                               VGDS037A = Off [ENG])   # Set IS On/Off

PC_START (COUNT=001004)    +00:40:00     GIADA NORMAL      AGDS036A ( \
                                         VGDS0031 = 0x5 \
                                         VGDS0032 = 0x5 \
                                         VGDS0033 = 0xf \
                                         VGDS0034 = 0x5 \
                                         VGDS0035 = 0xf \
                                         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

PC_START (COUNT=001004)    +00:40:30     GIADA NORMAL      AGDS037A(\
                                           VGDS037A = On [ENG])    # Set IS On/Off

PC_START (COUNT=001004)    +00:45:00     GIADA NORMAL      AGDS120A ( \
                                    VGDS0010 = 0xF8 \
                                    VGDS0011 = 0x04 \ # Calibrate IS, GDS, MBS
                                    REPEAT = 105 \
                                    SEPARATION = 00:05:00 )

Description: "change GIADA setting and check effects"

PC_START (COUNT=001004)    +09:30:00     GIADA NORMAL      AGDF100A # Self-interference test

PC_START (COUNT=001004)    +10:30:00     GIADA NORMAL      AGDF055A # MBS heating

#============================================================================#
# Description: "2. | Shut down"
#============================================================================#

PC_START (COUNT=001004)    +11:30:00     GIADA NORMAL      AGDF060A # go to safe mode & off

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

10.2 TIMELINE FOR REDUNDANT INTERFACE

```
# $Log: OIOR_PIHRSO_D_0000_GD_PCn_r.ROS,v $
# Version  1.1  2005/05/17 giada REDUNDANT for PCn
# Passive Checkout OIOR for GD RSOC Assumption MSP I1
#
#============================================================================#
# Filename:       OIOR_PIHRSO_D_0000_GD_PCn_r00001.ROS
# Type:     Input Timeline file
#
# Description:    Passive Check-Out GD
#
#
# Author:   V.Dhiri
#
#           RSOC
#
# Date:           17 May 2005
#
#
# Proposed by GIADA team
# 17 May 2005
#
# (c) ESA/Estec
#
#----------------------------------------------------------------------------#
#============================================================================#

Version: 00001

Ref_date: 30-Sep-2005
Start_time: 000_00:00:00
End_time: 005_00:00:00

#============================================================================#
# Description: "1. | Switch on and test – redundant I/F"
#============================================================================#

PC_START (COUNT=001004)    +12:00:00      GIADA   OFF AGDF002A ( \
                                          VGD0001A = "YES" [ENG]) # GIADA on Main IF
```

```
PC_START (COUNT=001004)    +12:01:00     GIADA SAFE  AGDF002B # GIADA On

PC_START (COUNT=001004)    +12:06:00     GIADA SAFE  AGDF002C # GIADA On

PC_START (COUNT=001004)    +12:24:00     GIADA SAFE  AGDS035A # Go to Cover Mode

PC_START (COUNT=001004)    +12:26:00     GIADA COVER AGDF090A # Open cover

PC_START (COUNT=001004)    +12:36:00     GIADA COVER AGDS065A # Go to Safe mode

PC_START (COUNT=001004)    +12:37:00     GIADA SAFE  AGDS110A # Go to Normal mode

Description: "GIADA operative in normal mode"

PC_START (COUNT=001004)    +12:39:00     GIADA NORMAL      AGDS038A( \
                                               VGDS038A = 35 \
                                               VGDS038B = 20 )   # Set GDS L and R thresholds

PC_START (COUNT=001004)    +12:39:30     GIADA NORMAL      AGDS037A(\
                                               VGDS037A = Off [ENG])   # Set IS On/Off

PC_START (COUNT=001004)    +12:40:00     GIADA NORMAL      AGDS036A ( \
                                         VGDS0031 = 0x5 \
                                         VGDS0032 = 0x5 \
                                         VGDS0033 = 0xf \
                                         VGDS0034 = 0x5 \
                                         VGDS0035 = 0xf \
                                         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
```

```
PC_START (COUNT=001004)    +12:40:30     GIADA NORMAL      AGDS037A(\
                                               VGDS037A = On [ENG])    # Set IS On/Off

PC_START (COUNT=001004)    +12:45:00     GIADA NORMAL      AGDS120A ( \
                                         VGDS0010 = 0xF8 \
                                         VGDS0011 = 0x04 \ # Calibrate IS, GDS, MBS
                                         REPEAT = 105 \
                                         SEPARATION = 00:05:00 )

Description: "change GIADA setting and check effects"

PC_START (COUNT=001004)    +21:30:00     GIADA NORMAL      AGDF100A # Self-interference test

PC_START (COUNT=001004)    +22:30:00     GIADA NORMAL      AGDF055A # MBS heating

#============================================================================================#
# Description: "2. | Shut down"
#============================================================================================#

PC_START (COUNT=001004)    +23:30:00     GIADA NORMAL      AGDF060A # go to safe mode & off

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