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BepiColombo SFT#2 at ESTEC 19/10/2015 – 23/10/2015

SERENA Instrument Summary Report

SERENA NPA-IS (Neutral Particle Analyzer - Ion Spectrometer)



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ASI-INAF agreement procedure responsible	ASI	1
	TAS-I	1
	ADS (Airbus)	1
	ESA/ESAC	



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CHANGE LOG

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1. Acronyms and Abbreviations

- **AD**.....Applicable Document
- **AOCS**.....Attitude and Orbital Control System
- **RD**.....Reference Document
- **ENA**.....Energetic Neutral Atoms
- **S/C**.....SpaceCraft
- **P/L**.....PayLoad
- **S/W or SW**.....SoftWare
- **H/W or HW**.....HardWare
- **OOL**.....Out Of Limit
- **FV**.....Functional Verification
- **OL**.....Orbit Load
- **DL**.....Data Load
- **CL**.....Closed Loop
- **MTL**.....Mission TimeLine
- **IST**..... Integrated (Sub-)System Test
- **AFT**.....Abbreviated Functional Test
- **CCS**..... Central Check-Out System (also core EGSE)
- **AIT**..... Assembly Integration and Test
- **AIV**..... Assembly, Integration and Verification
- **LAN**..... Local Area Network
- **NRB**..... Non conformance Review Board
- **NCR**..... Non Conformance Review
- **OBC**..... On-Board Computer
- **OBCP**..... On-Board Control Procedure
- **OBDAH**..... On-Board Data Handling
- **EGSE**..... Electrical Ground Support Equipment
- **EM**..... Engineering Model
- **ETB**..... Engineering Test Bench
- **MIS**..... MPO I/F Simulator
- **TS**..... Technical Specification
- **SEPS**..... Solar Electric Propulsion System
- **SFT**..... System Functional Test
- **SCOE**..... Special Check-Out Equipment
- **W**.....Workmanship

2. Reference Documents

N.	Reference Id	Issue	Title
RD1	BC-ASD-TS-00047	1	MPO SFT#2 SPECIFICATION
	BC-ASD-TS-00001		System Operations Functional Test Module Specification
	BC-ASD-TS-00043		MPO SFT-W and AFT Specification
	BC-ASD-TS-00010		SERENA IST SPECIFICATION



Contents

DISTRIBUTION.....	2
CHANGE LOG.....	3
1.Acronyms and Abbreviations.....	4
2.Reference Documents.....	4
3.Introduction.....	6
4.Background.....	7
5.List of activities	11
6.SERENA H/W & S/W Configuration.....	12
6.1SERENA EGSE PI Details.....	12
7.Activity Summary.....	14
7.1Measurements on Monday (2015-10-19).....	14
7.2Measurements on Tuesday (2015-10-20) Functional Verification (A0).....	16
7.3Measurements on Wednesday (2015-10-21).....	19
7.3.1Wednesday 21 Morning (Functional Verification A0).....	19
7.3.2Wednesday 21 Afternoon (SF#2 Orbit Load A0).....	28
7.4Measurements on Thursday (2015-10-22).....	33
7.4.1Thursday 22 morning (Functional Verification B0).....	34
7.4.2Thursday 22 afternoon (Orbit Load B0).....	38
7.5Measurements on Friday (2015-10-23).....	42
7.6Details on Received TM Packets.....	48
7.6.1System Packets Summary.....	48
7.6.2Science Packets Summary.....	48
8.Observed Susceptibilities and/or Anomalies.....	49
9.Conclusions.....	50



3. Introduction

This is the test report describing the measure collected by the SERENA PI egse, during the System Functional Tests (SFT) #2 in the room ("Rosetta Clean Room") at ESTEC, Noordwijk (NL).

This document provides a summary for the testing activities carried out during the whole period 19/10/2015 - 23/10/2015 and regarding the SERENA suite incoming data, collected by the SERENA PI egse, during the test sessions. Details on the requirements to be verified are given in other section. The conduct of the tests is mainly covered by the staff of ASD and TAS-I and supervised by ESA. P/L instrument teams staff is also required for verification purposes.

The modifications of the test scripts related to SERENA were the followings:

1. Functional Verification:

1.1. Modification in consequence of action C2-3 of BC-ALS-NC-01489:

1.2. In step 1040 sensor operation scheduling is modify in order to
A) enter in science with this order 1.STROFIO,2.ELENA,3.PICAM,4.MIPA
B) exit form science in this order:1.MIPA,2.PICAM,3.ELENA,4.STROFIO

2. Orbit Load:

2.1. Modification in consequence of action C2-3 of BC-ALS-NC-01489:

2.2. In steps 1000,2000,3000,4000,5000 sensors operation scheduling is modify in order to
A) enter in science with this order1.STROFIO,2.ELENA,3.PICAM,4.MIPA
B) exit form science in this order:1.MIPA,2.PICAM,3.ELENA,4.STROFIO



4. Background

The System Functional verification phase succeeds the Integrated Subsystem Tests for subsystems and the Payload, essentially concentrating on system level functions across subsystem boundaries. These tests cover all test cases and scenarios which are beyond the scope of the Integrated Subsystem Tests (IST) because they involve the concurrent operation of several (sub-)systems and payload.

In its final stage, the SFT will be performed with flight representative procedures and will be compiled from lower level functional tests, e.g. by re-using test modules from the various ISTs.

Hardware redundant channels will be used for dedicated configurations to check the complete cross coupling in the S/C. Similar to the IST, system relevant database items will be verified.

The objectives of MPO SFT#2 are

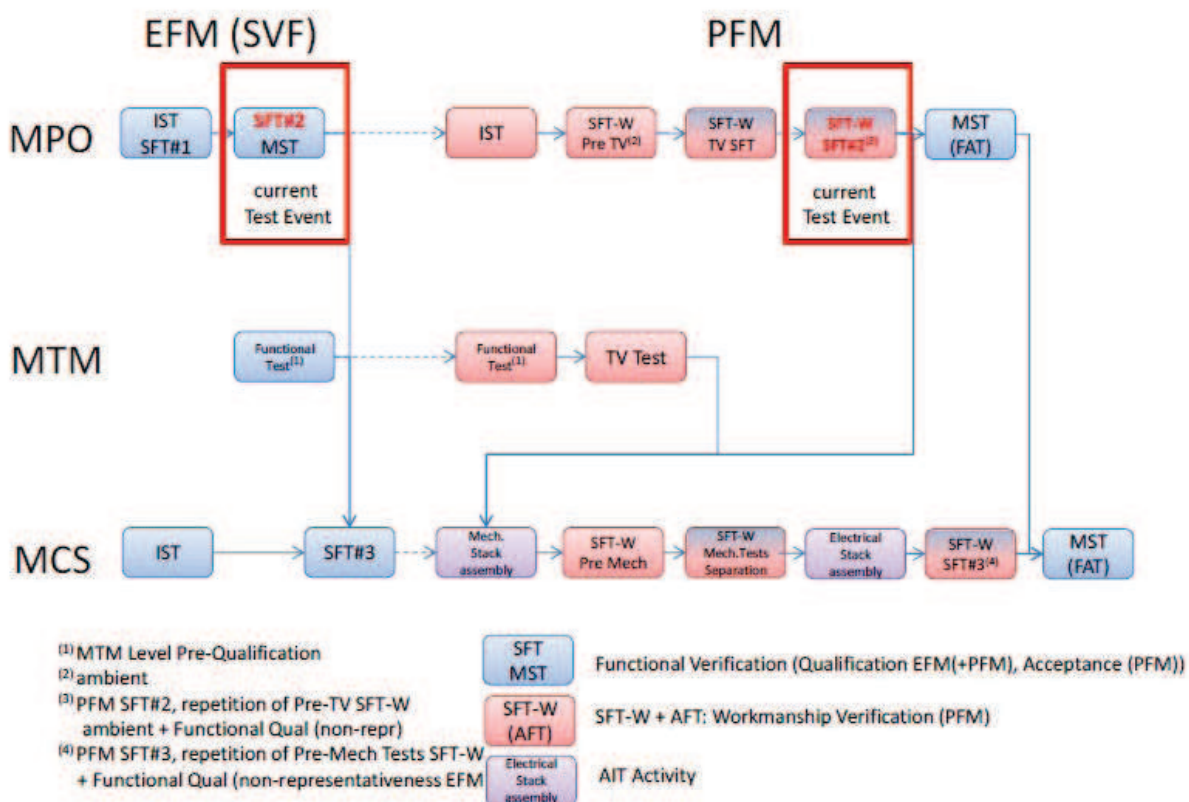
- Functional Verification:
 - Verify MPO system performance of S/C functions by concurrent unit operations with representative data load under environmental conditions. This objective is achieved by a SFT-FV test consisting of parallel Platform and Payload operations in flight representative configuration, including AOCS Hardware in the loop.
 - Verification of individual MPO System Operations Functions on PFM due to nonrepresentativeness of parts of EFM. This objective is achieved by execution on the PFM of a series of individual SysOps Modules defined in [System Operations Functional Test Module Specification]
 - Workmanship Verification: Verify MPO S/C units health & integrity after flight model integration for various units with final CSW and FCESW version. This objective is achieved through the SFTW test consisting of subsystem tests in Open Loop covering all redundancies, mainly by reusing modules from the IST and confirming the results obtained before. These tests are defined in the SFT-W and AFT Specification ([MPO SFT-W and AFT Specification]).

The SFT#2 is executed after thermal environmental campaign on MPO and concludes the qualification of MPO system functions according to [MPO SFT-W and AFT Specification]. The overall qualification and acceptance of MPO system operational concept is finally achieved by the Mission Simulation Tests.



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P/L science downlink

During the science operations phase, two downlink mechanisms will be verified (see [RD-07])

- Flexible downlink: Used typically for high data rate producers, in order to distribute the data load over the X-Band (VC2) and the Ka-Band (VC3).
- Selective downlink: For saving downlink bandwidth, the selective downlink functionality allows to select the data onboard to be downlinked with high resolution from dedicated Packet Stores. For this, the low resolution data contained in separate PS is analysed on ground in order to decide which periods are interesting from the high resolution data.

The main objective of the SFT-W is the workmanship validation, which is achieved through subsystem tests in Open Loop covering all redundancies, mainly by reusing modules from the IST and confirming the results. Since the SFT-W & AFT are performed several times during the S/C AIT, the test is specified separately in [MPO SFT-W and AFT Specification].

In the frame of the SFT#2, the SFT-W is performed with the goal to exclude any workmanship issues for the units replaced after the MPO TB/TV test. Since the configurations R_A0 and R_B0 are covered in the SFT-FV test, the SFT-W is performed only in the configurations R_A1 and R_B1. In general, the AFT is performed prior and after any environmental load on the S/C (environmental tests or transport) in order to ensure the proper functioning of the test setup, i.e. S/C + EGSE+ cabling.

For the SFT#2, this is nominally not required, as the test setup can be verified also with the SFT-W and no major environmental load is injected into the MPO.

SFT#2-W

The SFT-W shall be performed in the redundancy configuration R_A1 and R_B1. This completes the redundancy coverage, as the SFT-FV is performed in R_A0 and R_B0.

SFT#2 Sys Ops Modules

During **P/L parallel Switch On**, SERENA Switch On CALL_MOD SERENA_1_SWON will be operated.

During **P/L Functional Verification via MTL** Run SERENA SFT Functional Performance operations in parallel (all starting together) CALL_MOD SERENA_50_SFT_FUNC_VER will be operated. The typical duration is 1:20 hr per Module running in parallel.

During **P/L SFT Orbit Load Test via MTL** Run SERENA SFT Data Load operations in parallel (all starting together) CALL_MOD SERENA_51_SFT_ORB_LOAD will be operated. The typical duration is 01:00 per module running in parallel

KSE041 SERENA P/L OBCPS OBCP for power on, modes, power off, individual shutdown, maintenance, etc. R_A0

Data to be acquired during the test are the following:

- Test Session Logs
- All the TM and TC generated for the test shall be recorded for post processing availability.
- Standard Session Report consisting of:
 - o Test Sequence Log
 - o Events Log
 - o TC Log
 - o Test Environment Report (Version information)
 - o System Events
 - o Test Bench Configuration (either in the Standard Report or as TCDL)



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The restrictions in operating SERENA P/L instrument during the tests are the following:

- PICAM: No HV operations allowed
- MIPA: No HV operations allowed
- ELENA: No HV operations allowed. No shutter operations allowed.
- Strofio: HV safe operations allowed.

The post evaluation shall be performed according to specified success criteria. As part of the standard post evaluation, the standard session report shall be checked for unexpected events and unexpected negative TM/TC verifications.

- The test shall include online checks of TM parameter and event packets for test success verification.

- Real time telemetry packets and SSMM stored/retrieved ones should be compared for quantity/consistency between them and also wrt the payload mode.

For the SFT, the following verification of acquired data rate/amount wrt. predicted data rate will be performed and shall be documented in the Test Report

- power profile of the executed operations (plot: power over execution time)
- data-rate profile of the executed operations (plot: data-rate over execution time) for science via VC2/VC3 during SFT-FV by analysis of the P/L reports
- total data-volume from the executed operations (= number)

the SFT#2 consists of several tests

- SFT-FV (SFT#2-FV): a contiguous test with the purpose of functional qualification with parallel MPO platform and payload operations
- SysOps Modules: single modules from the ETB SysOPS FV campaign to be repeated on PFM due to non-representativeness of parts of the ETB
- SFT-W: a contiguous test with the purpose of PFM workmanship and health&integrity verification
- AFT (not required nominally for SFT#2): a contiguous test with the purpose to verify the test setup prior / after environmental loads.

During SFT#2-FV, the P/L will be operated by two sets of modules, according to the picture below.

Functional Verification: The objective is to make a functional check of all the experiments in order to ensure all elements of the experiments are working properly. These operations are executed in parallel (duration 1 hour) in order to check-out all experiments at the same time. It will be the basis for the SFT on the FM which will be executed before and after major test events and/or transport in order to check health and workmanship.

Data Load: The objective of the Data Load test is to configure all the experiments to a high data load in order put a load on the system. The test is proving that the system provides adequate resources to the onboard foreseen operations, and represents a qualification of the DMS functionality in support of the P/L. These operations are executed in parallel (duration 1 hour and 20 minutes - half an orbit) in order to have all experiments powered and producing data-load at the same time, assuring a maximum load on the system.

Please note that in general the operations of the Functional Verification are more complex and more TCs are involved. Therefore this test provides a higher load on the MTL.



All timestamps and dates in this report (if not expressly specified) will be given in CEST and hours are expressed in 0-24.



5. List of activities

The time-table of the SFT#2 test was the following

Wednesday, the 19th October 2015 till Friday, 23rd October 2015

1. Monday, 19th October: Workmanship (A1 configuration) + egse setup check
2. Tuesday, 20th October: Functional Verification (A0 configuration)
3. Wednesday, 21st October: morning Functional Verification (A0 configuration) , afternoon Orbit Load (A0 configuration).
4. Thursday, 22nd October: morning SFT#2 Functional Verification (B0 configuration) , afternoon Orbit Load (B0 configuration).
5. Friday, 23rd October: Workmanship (B1 configuration)



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6. SERENA H/W & S/W Configuration

Subsystem	Model level	SW version
SRN PI-EGSE	N/A	1.8.37
SRN Data Base	FM	ASCII_SERENA_MIS_DB_V1.9_17122013r045_FM
SRN SCU App SW	FS	V36
ELENA App. SW	FS	V25
PICAM App. SW	FM	V34
MIPA	FM	Included in SCU SW
STROFIO	PFM	9

6.1 SERENA EGSE PI Details

The PI EGSE is installed on a Sony VAIO PC

PC HW details:

description: Notebook

product: VPCSB2L1E

vendor: Sony Corporation

version: C60930YV

serial: 27547507-5000603

width: 64 bits

capabilities: smbios-2.6 dimi-2.6 vsyscall64 vsyscall32

configuration: boot=normal chassis=notebook uuid=D0DA0C17-8088-E011-82C7-1AF95D4948F0

Motherboard: VAIO

BIOS: INSYDE version R1031H4 (25/94/2011), size 1MiB, 2496KiB

Memory: description: SODIMM, size 4GiB, width 64 bits,

CPU: product: Intel(R) Core(TM) i3-2310M CPU @ 2.1 GHz, size 800MHz, capacity: 2100MHz, width 64 bits, clock 100MHz

CACHE: L1 cache 128 KiB, L2 cache 512 KiB, L3 cache 3MiB

PCI: Sandy Bridge DRAM Controller, size; 32 bits, clock 33MHz

HD DISK: description: ATA Disk, product: Hitachi HTS54505, size 465GiB (500 GB), logical name /dev/sda0

CDROM: DVD-RAM writer, product: DVD-RAM UJ8A2AS, vendor: MATSHITA



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System: x_86_64 GNU/Linux
kernel: 2.6.32-5-amd64 #1 SMP Mon Sep 23 22:14:43 UTC 2013
Distributor ID: Debian
Description: Debian GNU/Linux 6.0.8 (squeeze)
Release: 6.0.8
Codename: squeeze

Gnome Desktop
Version: 2.30.2
Build Date: 11/12/2010

PI-EGSE Network Configuration:

```
ifconfig  
eth0 Link: Ethernet HWaddr F0:BF:97:5D:41:41  
      inet addr: 192.168.201.210 Bcast: 192.168.210.255 Mask: 255.255.255.0  
      RX bytes: 3.1 GiB TX bytes 2.7 GiB (22/10/2015 10:35)
```

SERENA PI-EGSE is having on ifconfig eth0 192.168.201.210
but is accepting ssh connections both on IP 192.168.212.210
and 192.168.201.210



7. Activity Summary

7.1 Measurements on Monday (2015-10-19)

SFT_W (Workmanship) was performed. EGSE Setup was correctly verified, data nominally received including HK and SCI, MIPA Sci spectrogram. The received data packets stopped to arrive in the evening, file closed at 20:15.

During the Dry-Run of SFT#2-W (in which all the payload was switched on) there has been a sudden reset STROFIO and the instrument has been restarted.

In conjunction with the reboot there was a power surge, already registered during other previous reset.

- As a result of this anomaly was opened NRB (NCR BC-ALS-C-01533): conference call scheduled for 16:00 with the team STROFIO, TAS-I, CGS, ADS, AMDL.

The outcome of the telecon was the following:

During SFT-W dry-run, in A1 redundancy configuration, an unexpected reboot has occurred to STROFIO PFM.

It's suspected that a watchdog occurred and Caused a reboot of STROFIO, but within the actual date the investigation can not be completed.

TAS-I to retrieve and send to the SERENA team STROFIO and SCU TM packets for the 60 sec. either side of this event. (due date 23/10/15) [Indeed such data were already downloaded by F. Camozzi]. Another possible cause could be a power interruption; TAS-I to check the availability of a voltage monitoring log and send it to SERENA team. (due date 23/10/15)

TAS-I to send to the SERENA S/C activities (test configuration) in the frame of this issue.

SERENA to investigate the root causes after receiving additional data. (due date 30/10/15)

TAS-I to call an NRB follow-on after SERENA investigation (due date 30/10/15).

On 26/10/2015 Fabio Camozzi from CGS answered that they had reviewed the HKs of SCU and STROFIO during time close to the reboot event and here are the pictures of the packets: no anomalies have been found in both HKs.

- SCU HK show:

- o as last accepted TC the STROFIO ON which is coherent with the procedure applied by TAS-I
- o Configuration of serena sensors is all on as expected
- o no errors or TC refused or failed
- o last TC executed time update working on SCU redundant spacewire link, unit is synchronized with S/C time
- o nominal voltage and current monitors



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F. Camozzi from CGS answered this way in 26 October 2015:

we have reviewed the HKS of SCU and STROFIO near the reboot event (in annex the pictures of packets): no anomalies found in Both HKS.

- SCU HK show:

- as a last TC accepted the STROFIO ON Which is coherent with the procedures applied by TAS-I
- Configuration of sensors or SERENA is all on as expected
no errors or TC refused or failed
- last TC executed time update working on SCU SpaceWire redundant links, unit is synchronized with S / C time
- nominal voltage and current monitors
- HK STROFIO show:ASCII_EM_V2R24_Draft_151013
- no errors or T rejected
- No reboot or two to watchdog declared (from STROFIO_hk + 1 and from STROFIO_hk + 2)
At this point we wait for data on 28V voltage power bus and concurrent (to the STROFIO reboot) activities on S / C to further Top progress in the analysis.

Fabio Camozzi from CGS reported that from the input power log near in time to STROFIO reboot are not monitored anomalous voltage values:

2015.292.09.36.24.500000

NPWD4208	2561	27.9859916357	1	NOMINAL
NPWD4209	2561	27.9859916357	1	NOMINAL

2015.292.09.36.29.476000

NPWD4208	2559	27.9599749071	1	NOMINAL
NPWD4209	2561	27.9859916357	1	NOMINAL

2015.292.09.36.34.390000

NPWD4208	2561	27.9859916357	1	NOMINAL
NPWD4209	2561	27.9859916357	1	NOMINAL

From the other log I can't understand your observation Mark because step 3139 occurred more or less 1 hour later (10:31) than the STROFIO reboot event (9:36)...I see only that during STROFIO reboot the following KAT calibration command was executing:

Sending TC(220,169,23)

NKAD1004 - KAT Operative



7.2 Measurements on Tuesday (2015-10-20) Functional Verification (A0)

The test session started at 9:50.

The Dry-Run of SFT#2-Functional Verification actually started at about 10:15 but data packets were not received. The session restarted at 10:30, after then we could verify the nominal data stream.

- Despite the recent update of the database, SERENA keep popping up OOL warnings related to parameter NSE0P047 (MCP temperatures) on PICAM => OOL T = -225.

With DB update a synthetic parameter was inserted to prevent the occurrence of this fake warning but this trick has not worked as expected. Together with Luigi D'Arcio (ESA) we found that the introduced synthetic parameter pointed to the right TM parameters [see below the content of the e-mail address of Luigi from ESA & Harald from the SERENA/PICAM team] following an intervention by F. Camozzi by CGS of Oct. 1 and it seems all int the right place. Therefore the cause of the occurrence has to be found elsewhere. To clarify this point Luigi D. wrote an email to Harald Jesenszki

Dear Harald,

During the ongoing SFT # 2 here at ESTEC with the ground database definition provided by SERENA we experienced hard ools only for one parameter, That Which is confirming the database changes are mostly effective.

The OOLs Observed are for PICAM parameter NSE0P047 (Which has value of -225) to Which a validity parameter is

Associated being the logical AND between NSEDP050 (CPU mode flag) and NSEDP054 (Vout status flag) Implemented as below

return ((NSEDP050.raw == 1) and (NSEDP054.raw == 1));

The repute the OOL That triggers may indicate the validity parameter is not correct.

Harald, can you please confirm That this is the correct validity parameter to implement?

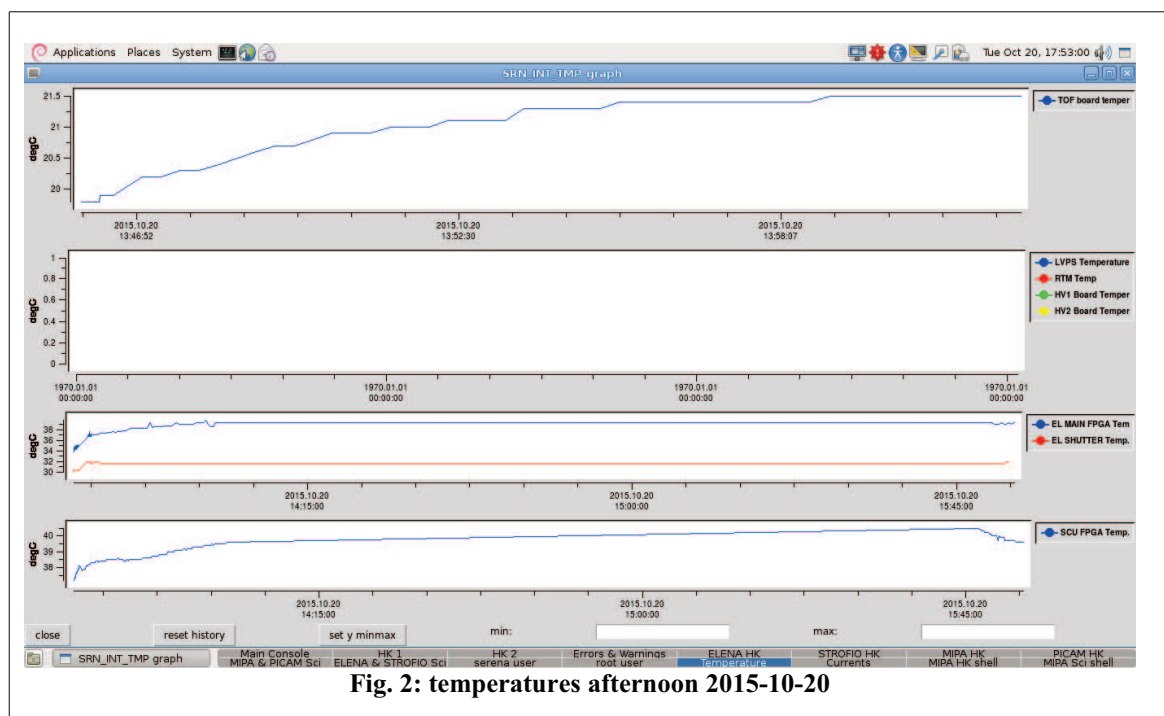
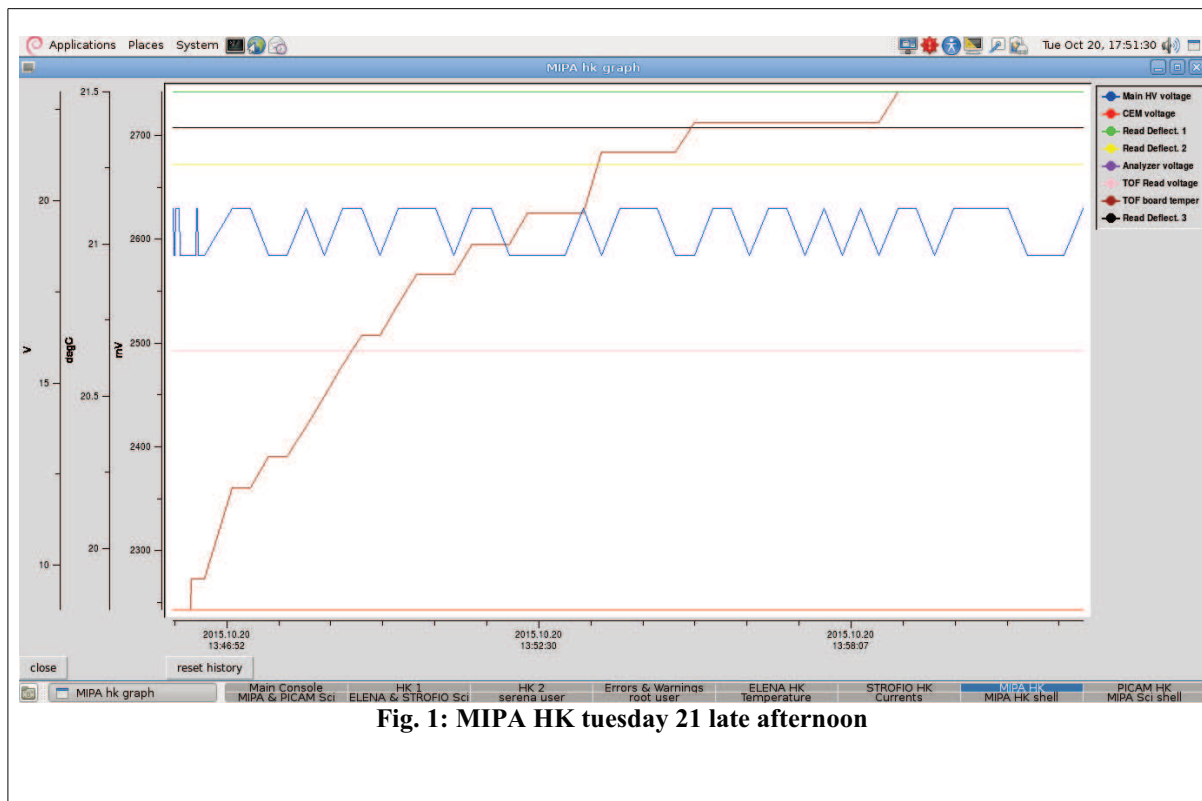
- At 11:15 the timeline MTL starts. Regular data flow, TM nominal temperatures and regular currents, spectrograms of MIPA nominal.
- - At 13:19 EGSE receives and stores data locally.
- At 11:13:30 there was a peak current of STROFIO came to about 0.6 A while normally is about 0.1 A. This is probably due to the start of MTL which provides for the restart of STROFIO and the consequent absorption current.
- Functional Verification Testing suspended at 12:30.
- At 13:44 HK data still received.
- Functional Verification Testing restarted at 14:35. However a problem communicating with the SSMM forced to stop and MTL to send all Payload in standby mode.
- At 15:15 PICAM required a network reset of the connection and of EGSE services because we could not connect from the remote.

At 15:25 SERENA went into Emergency mode was turned off and then on again. The emergency mode is triggered by the satellite due to errors of temporal synchrony with the payload.



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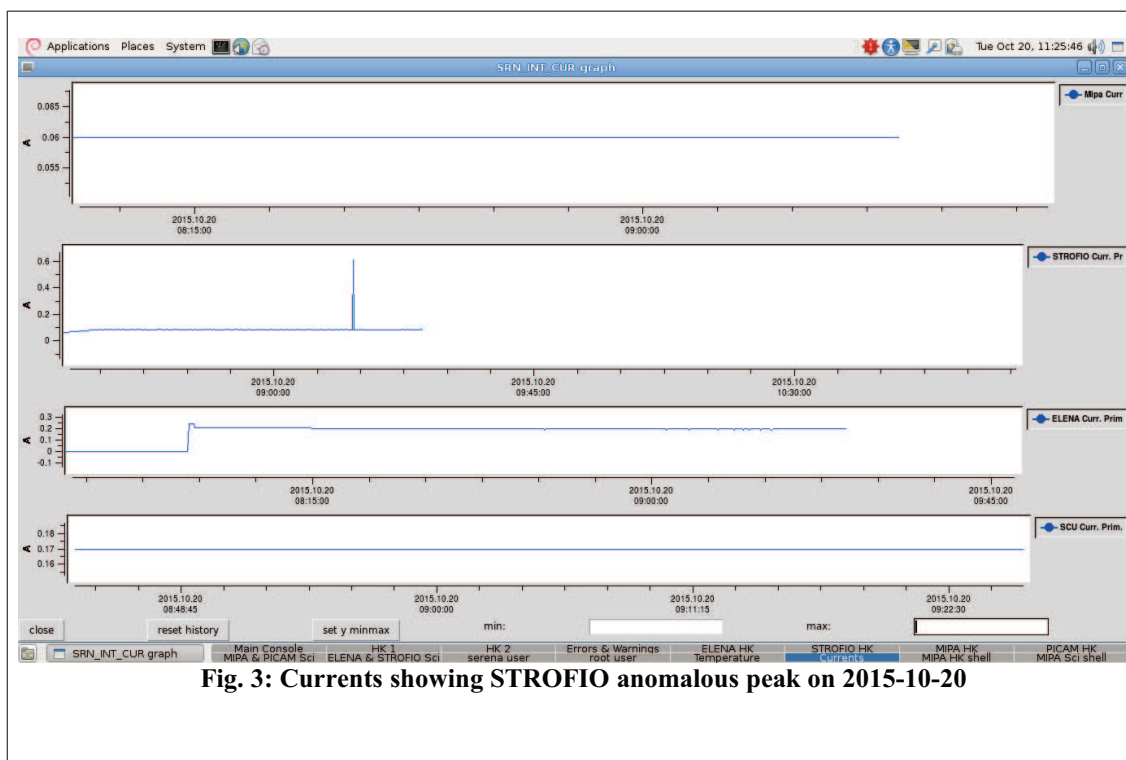


Fig. 3: Currents showing STROFIO anomalous peak on 2015-10-20



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7.3 Measurements on Wednesday (2015-10-21)

7.3.1 Wednesday 21 Morning (Functional Verification A0)

SFT#2-FV test was performed here with MTL mode only, no closed loop: CL is scheduled for the following week (26-30 October), when an S/C simulator will be used to test additional features. At the time that is necessary to verify that the functionality of the ITL are correct so that they can be frozen and used during the test next week.

- It was repeated the second part of the SFT#2 FV-A0 config, failed on 20 October because of problems that have affected the SSMM.
- Session for SFT#2 FV-A0 config starts at 10:03.
- At 10:06:49 received the first data packets.
- At 10:12 I received the MIPA HK.
- At 10:15 they received mainly PICAM HK. MIPA TOF Board temperature increases from $<20^{\circ}\text{C}$ to 21°C .
- At 10:34 the ITL is suspended. Restarted at 10:50 approximately.
- At 11:11 the SCI received packets of PICAM, ELENA, MIPA & STROFIO.
- At 11:23 there is a problem of SERENA: SCU internal buffer becomes full. The problem seems to have been generated by the S / C.
- At 12:03 the Functional Verification test was successfully completed!

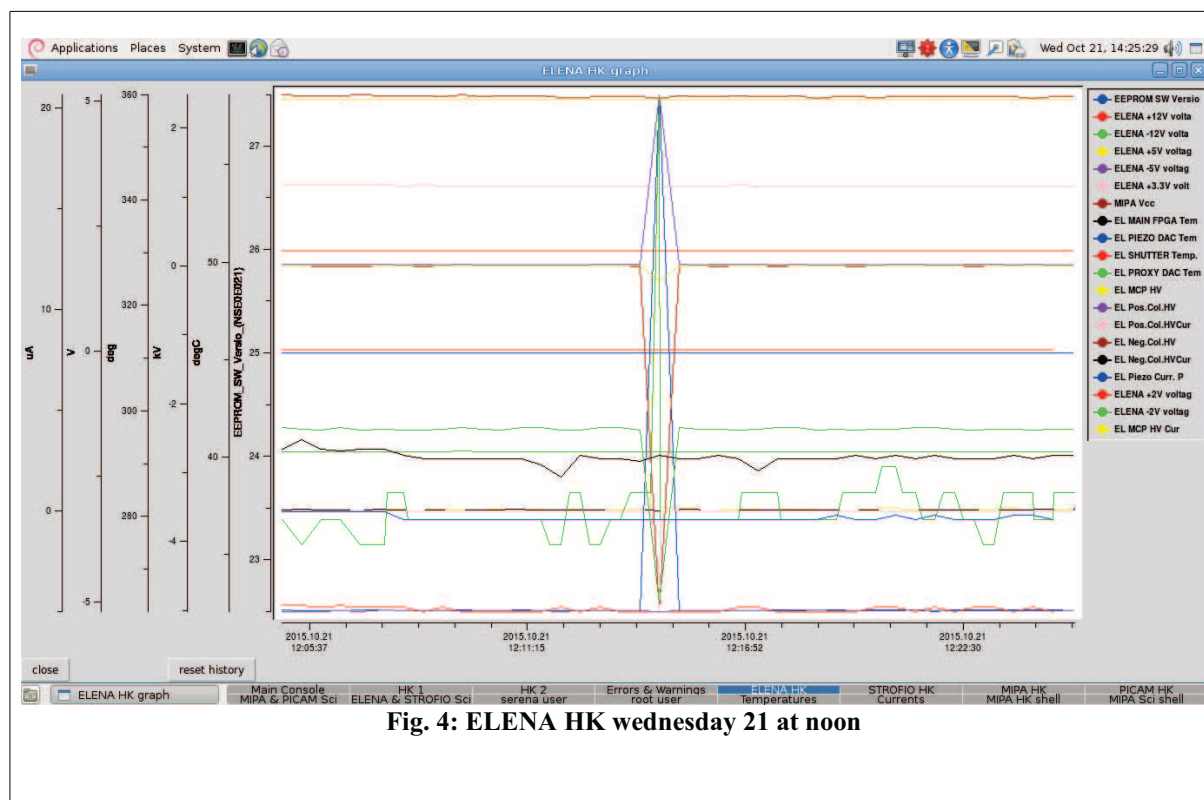


Fig. 4: ELENA HK wednesday 21 at noon



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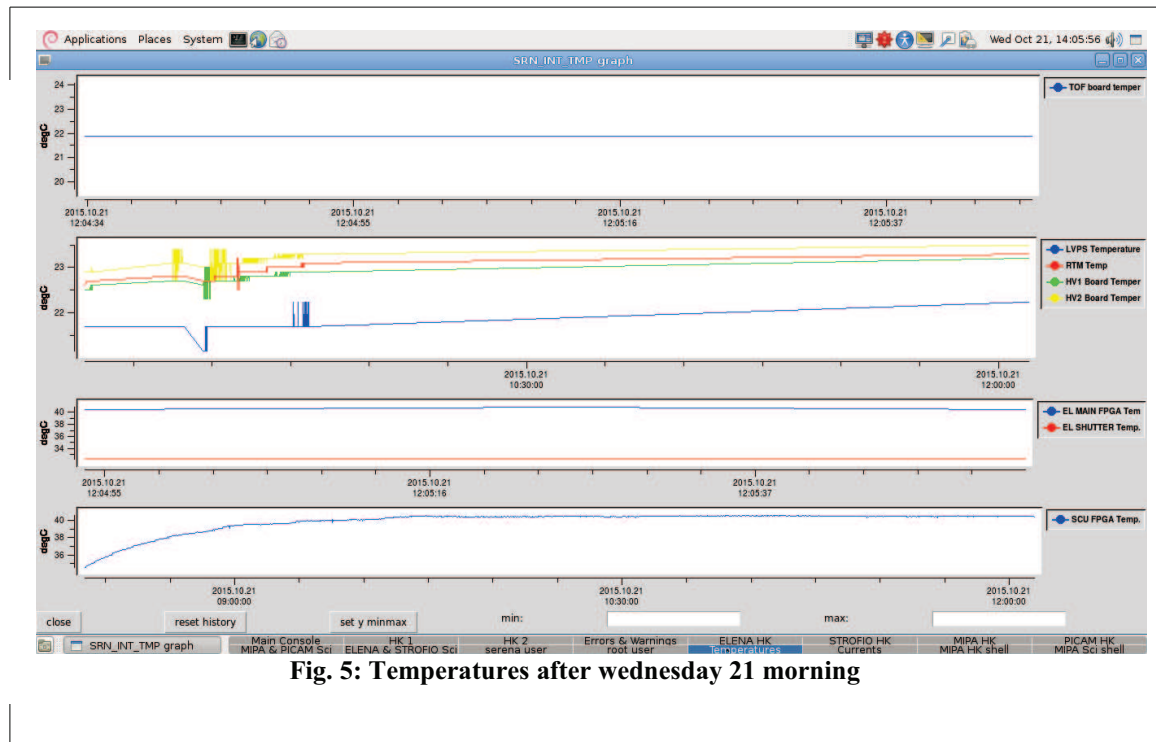


Fig. 5: Temperatures after wednesday 21 morning

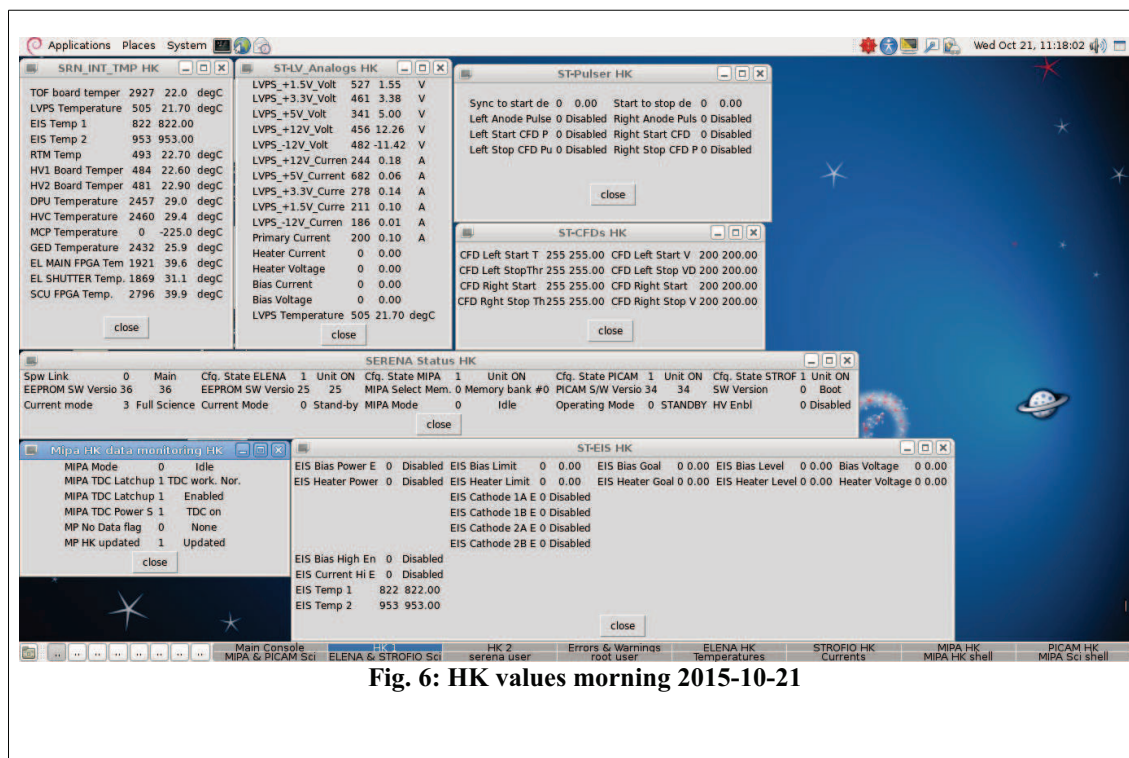


Fig. 6: HK values morning 2015-10-21



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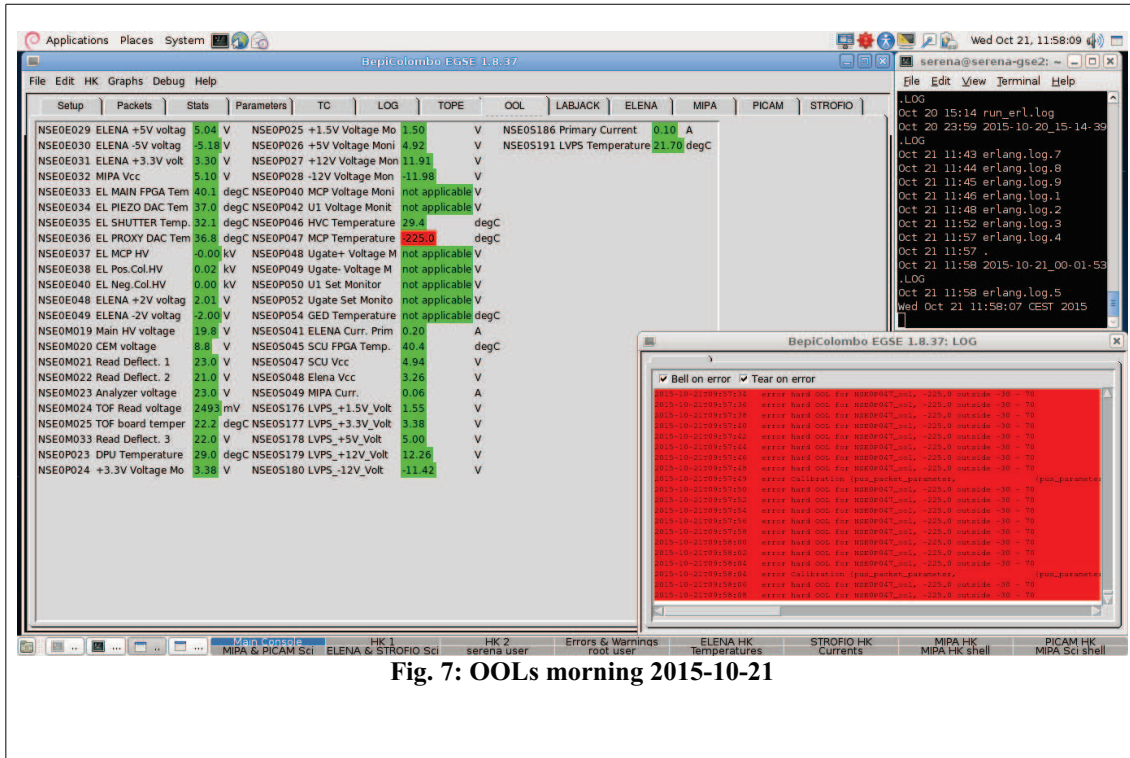


Fig. 7: OOLs morning 2015-10-21

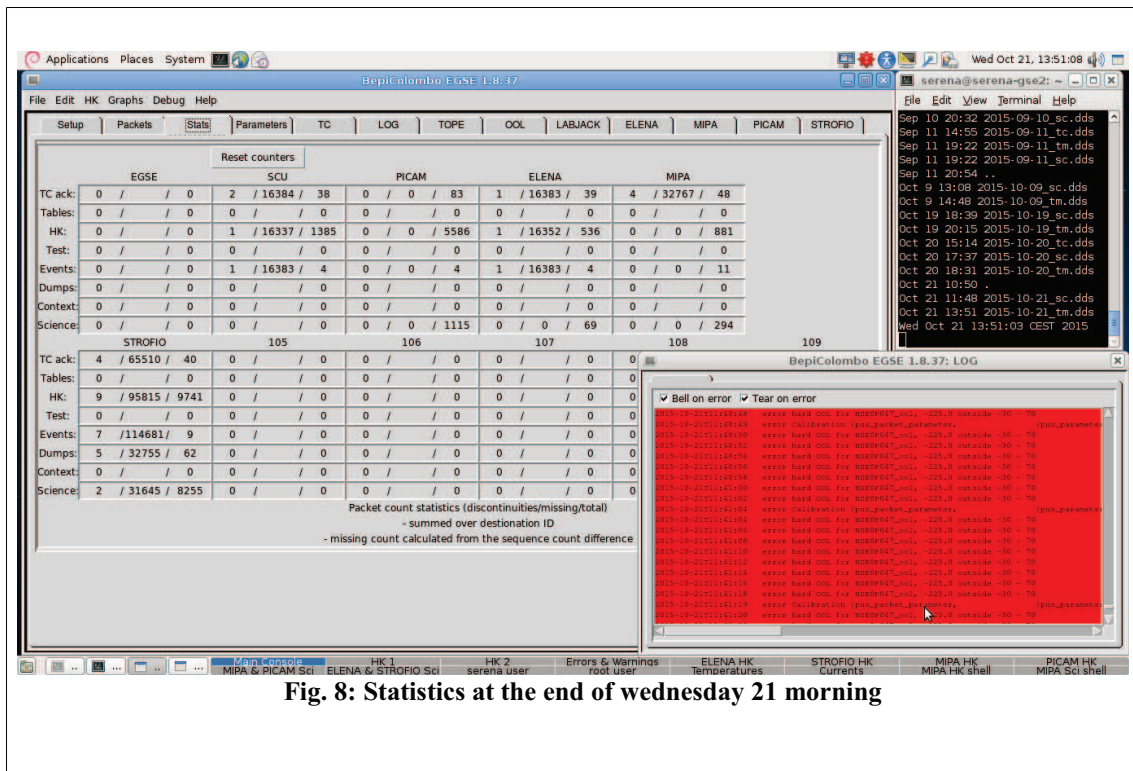
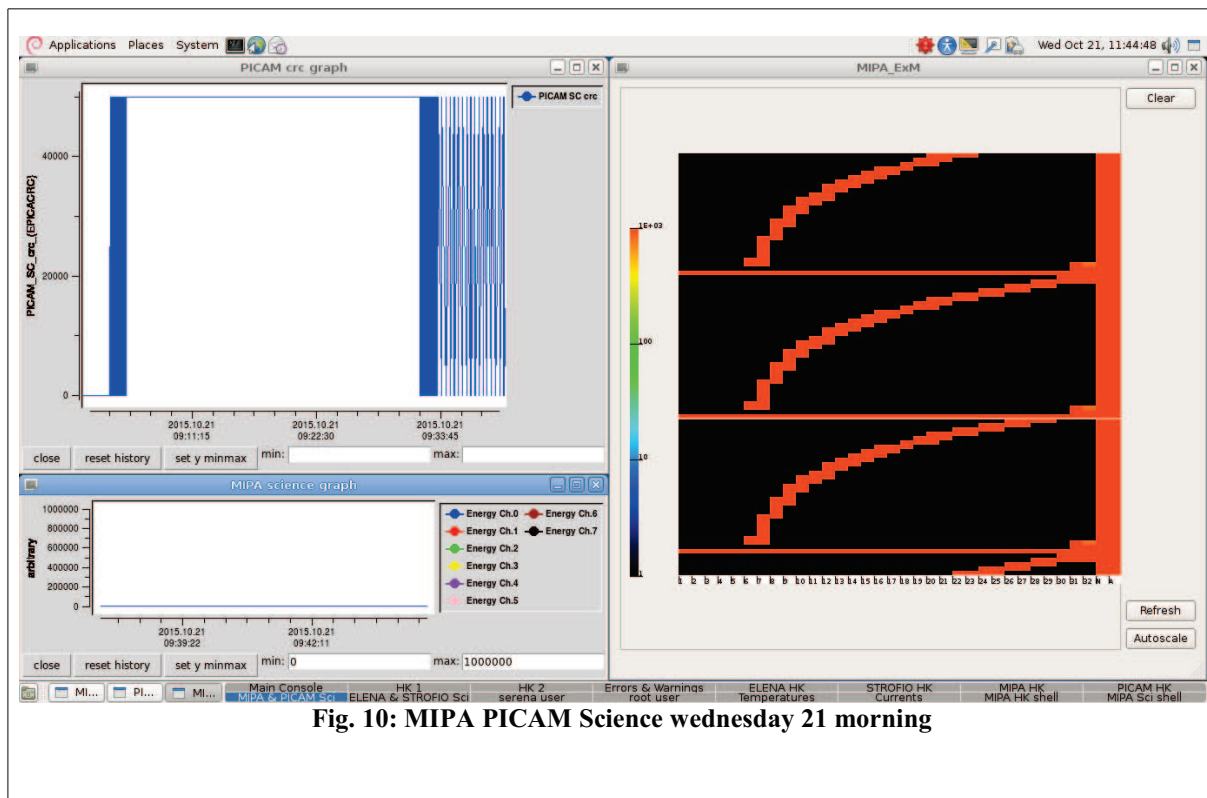
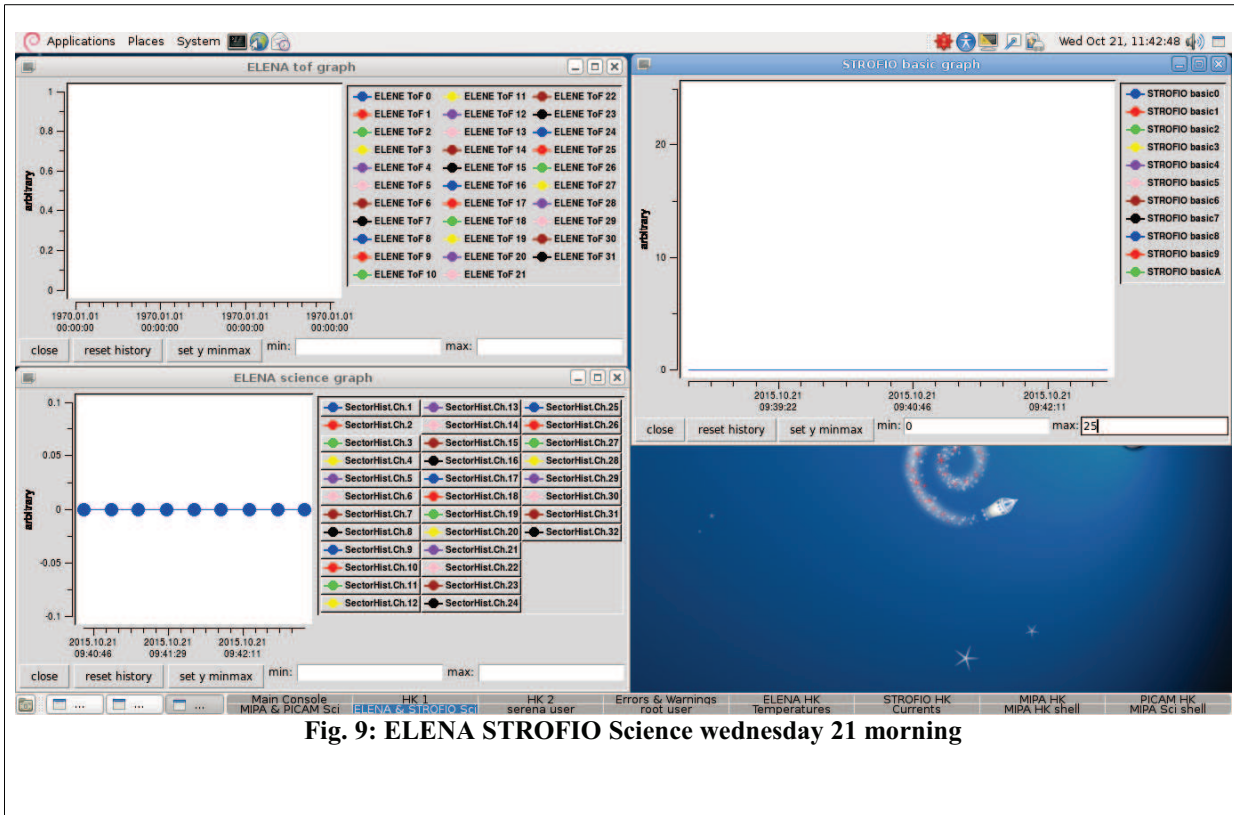


Fig. 8: Statistics at the end of wednesday 21 morning



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7.3.2 Wednesday 21 Afternoon (SFT#2 Orbit Load A0)

SFT test # 2-OL is performed here with MTL mode only, without closed loop: CL is scheduled for next week (26-30 October), when you will use an S / C simulator to test additional features. At the time that is necessary to verify the functionality of the ITL are correct so that they can be frozen and used during the test next week

- Session for SFT# 2-OL A0 config started at 14:05.
- At 14:11 it received the package SERE MIPA Hello low mode. Following all SCI packets of 4 sensors are received.
- MTL test Orbit Load completed successfully at 15:30! HK packets will still be received. However, some packages are available on SCI SSMM (maximum 1 MB), have not been sent to EGSE.
- At 15:35 all the payload are in Standby Mode.
- Hours 16:15 to 16:25 => after a necessary confirmation of SSMM by TAS-I and dump all the data (including HK payload, not just those of the S / C), were sent back to the Payload all HK packets. This means that unfortunately EGSE receive duplicate all HK packets, including those already received during the testing of PV morning.
- Data SCI was received at 16:27.
- At 16:32 Data packets are going to be dumped again from the system to the EGSE (mass memory replay) But this operation is going to be stopped, HK data will be no more re-routed

Checked successfully that the time-stamp is received after the orbit-load are correlated with the time of the test (before in the day)

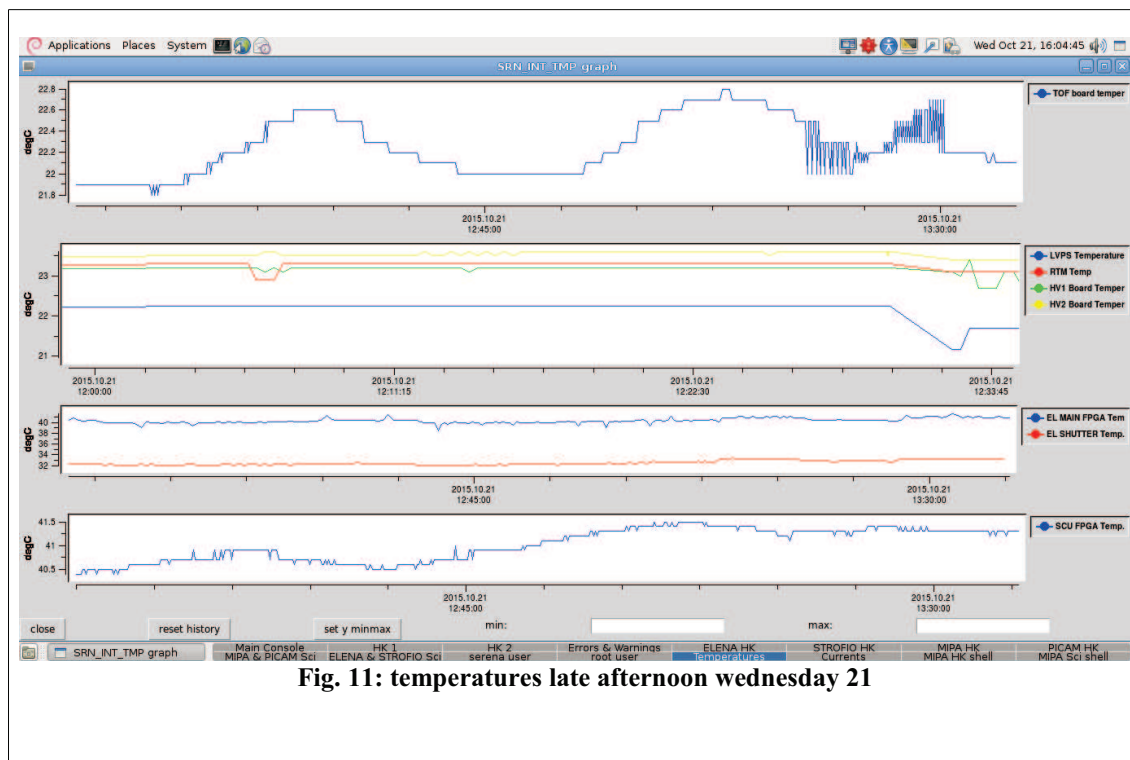
- At 16:53 TAS-I decided to stop sending packets HK so as not to duplicate on EGSE entire database of the day.
last received data 16:25 (HK), 16:27 (SCI)

RECEIVED PACKETS (16:53)

SUBSYSTEM	HK PKTS	SCI PKTS
SCU	2027	-
PICAM	9104	3585
ELENA	784	313
MIPA	1303	882
STROFIO	11313	20787



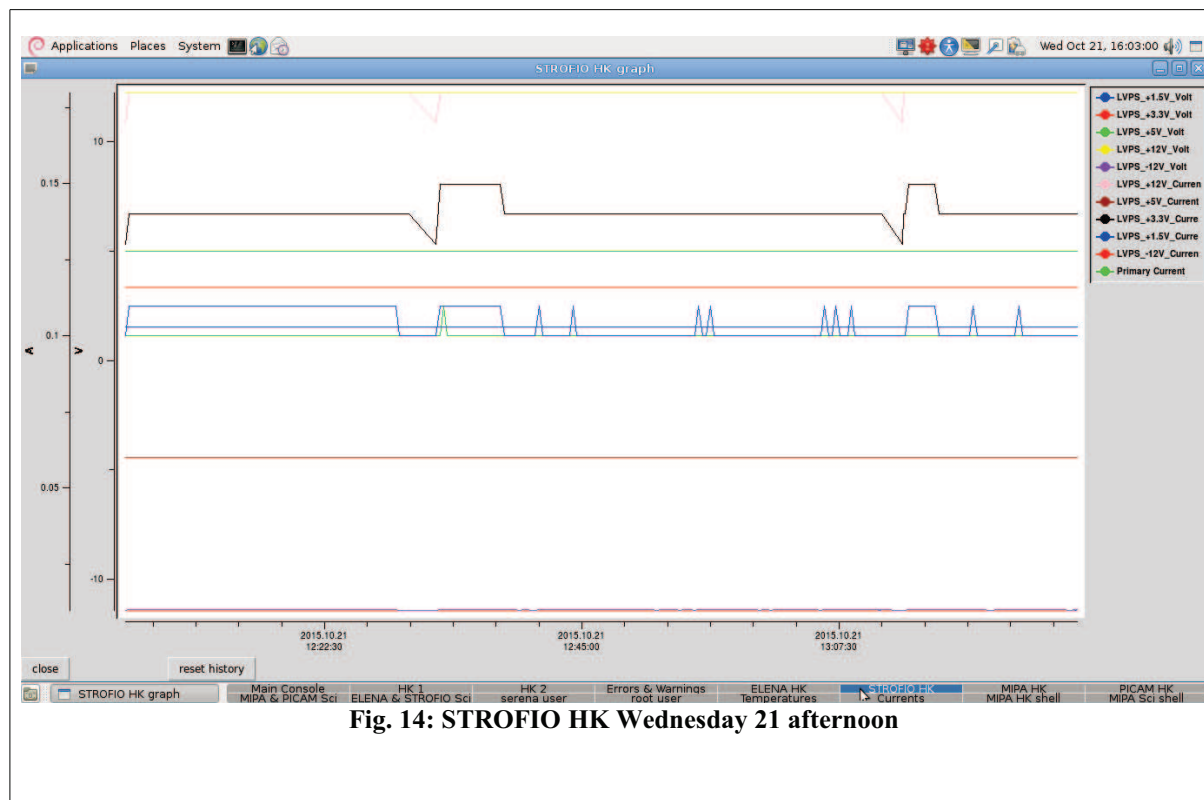
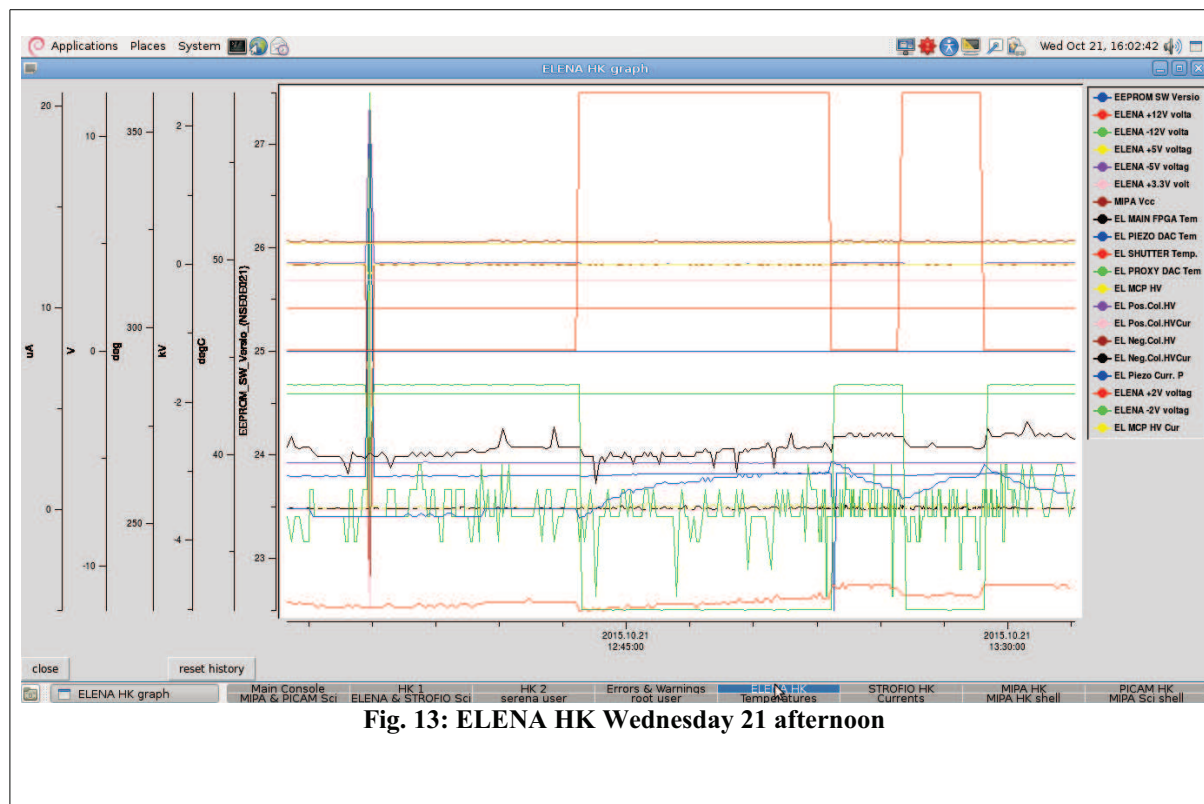
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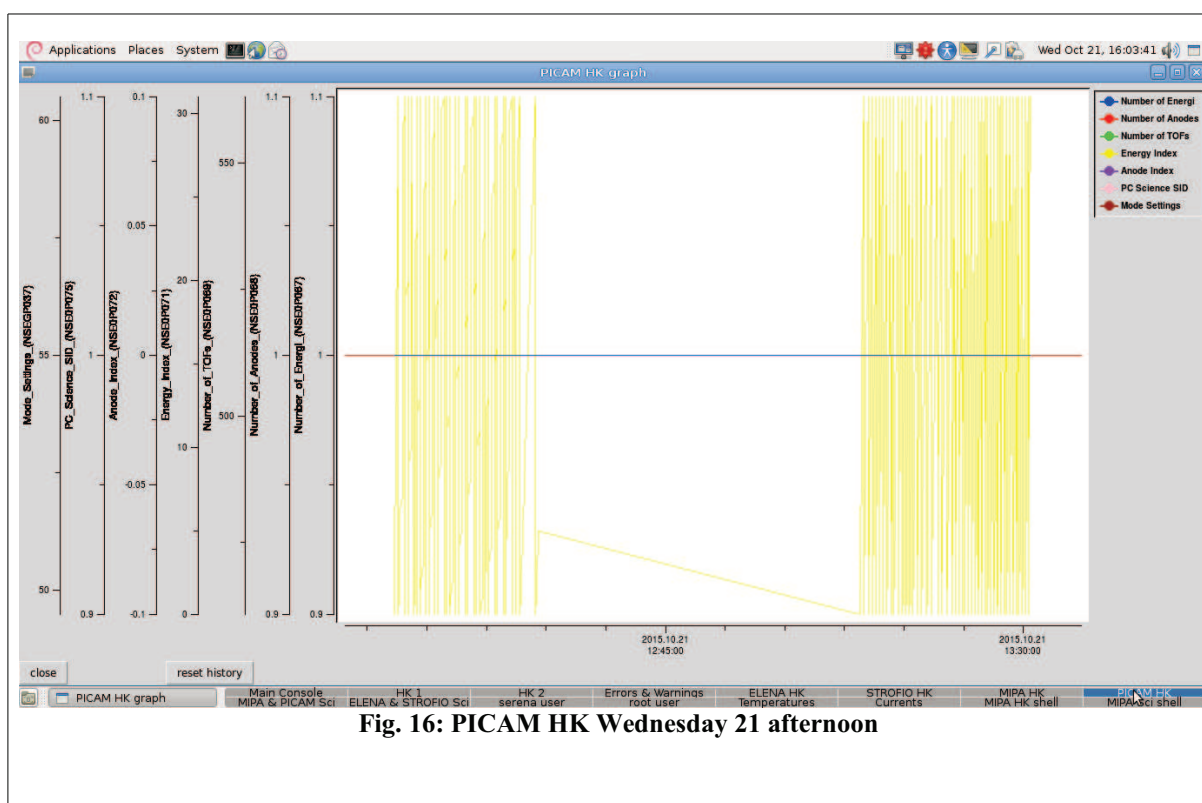
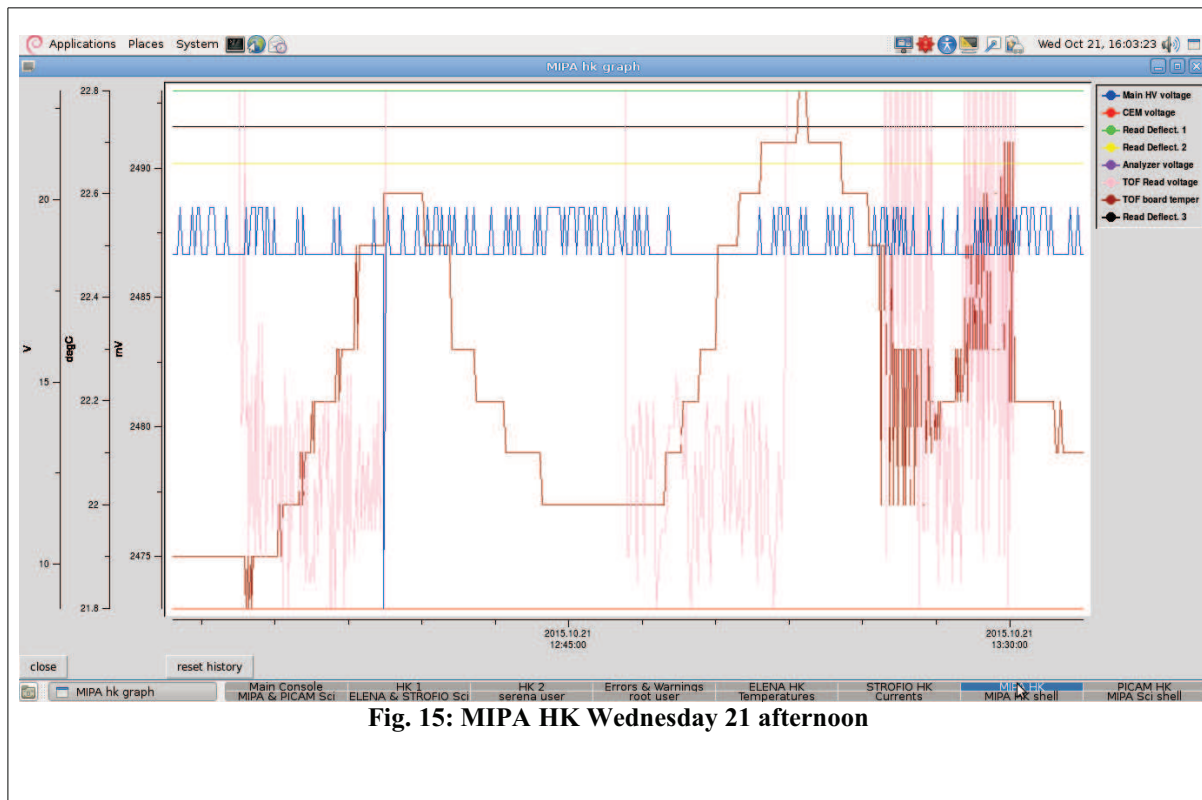
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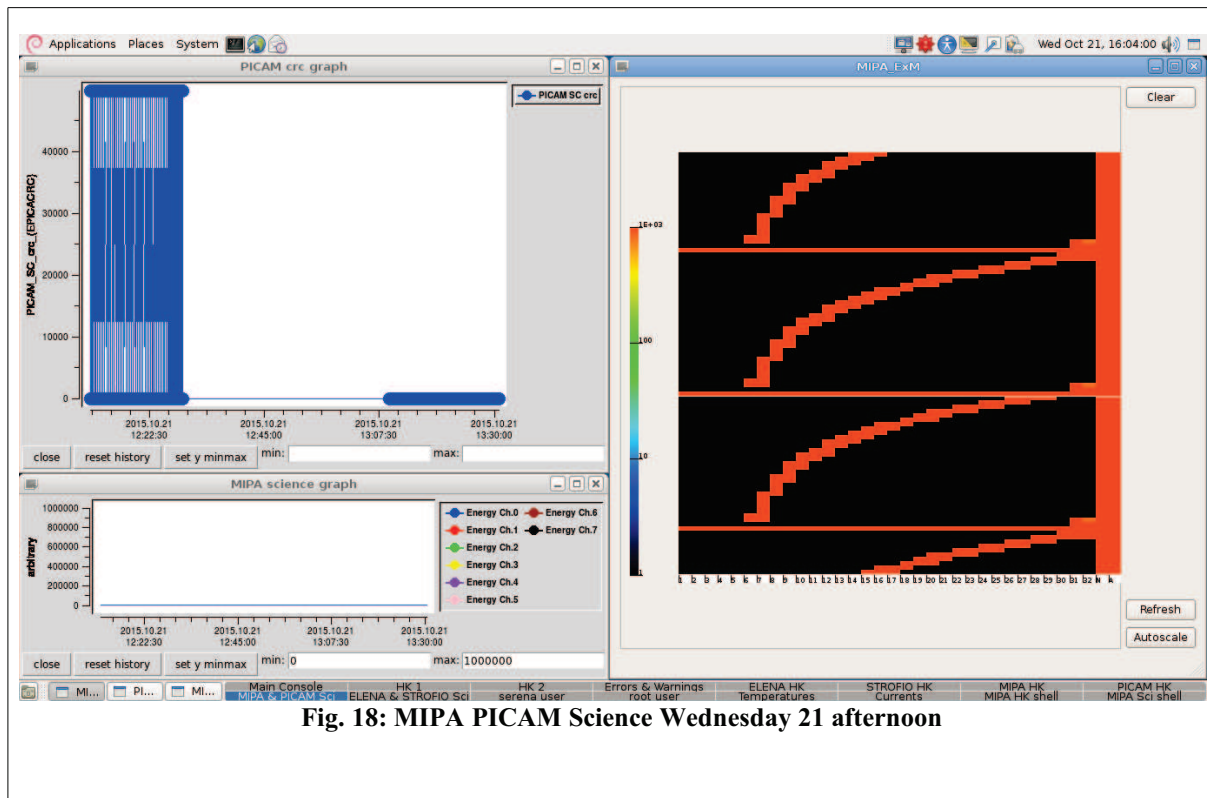
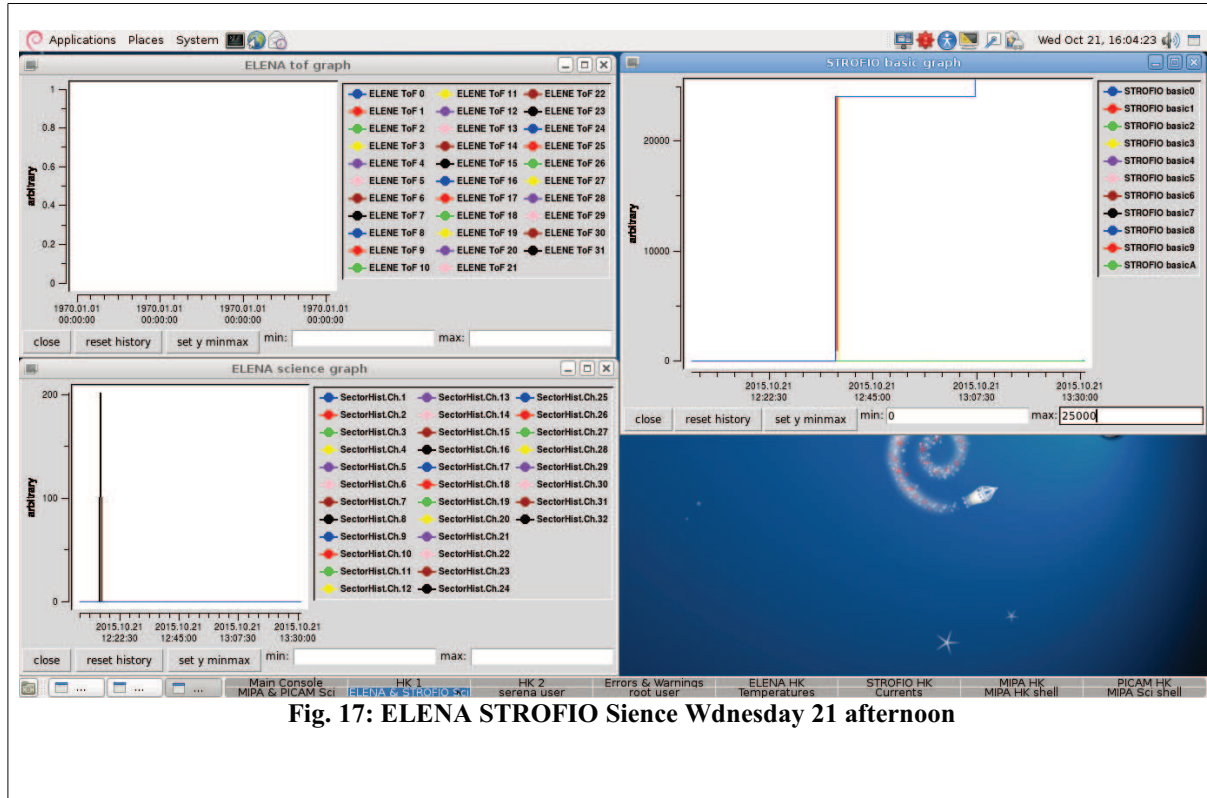
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7.4 Measurements on Thursday (2015-10-22)

7.4.1 Thursday 22 morning (Functional Verification B0)

SFT# 2 test-FV is performed here with MTL mode only, no closed loop => CL is scheduled for next week (26-30 October), when you will use an S / C simulator to test additional features. At the time that is necessary to verify the functionality of the ITL are correct so that they can be frozen and used during the test next week.

- Session for SFT # 2 FV-B0 config started at 11:19 and egse started to receive packets precisely at 11:19:07 first packet YEE55007 TM(5,1) APID 0647 (PID 100 CAT 7) 55040 "SERE SCU Reduced SW Hello world"

RECEIVED PACKETS (11:50)

SUBSYSTEM	HK PKTS	SCI PKTS
SCU	190	-
PICAM	229	0
ELENA	127	0
MIPA	87	0
STROFIO	92	0

- science packets received at 12:40 => all nominal for the 4 SERENA units.
- SERENA was out in Standby Mode at 13:10 => test was declared successful!

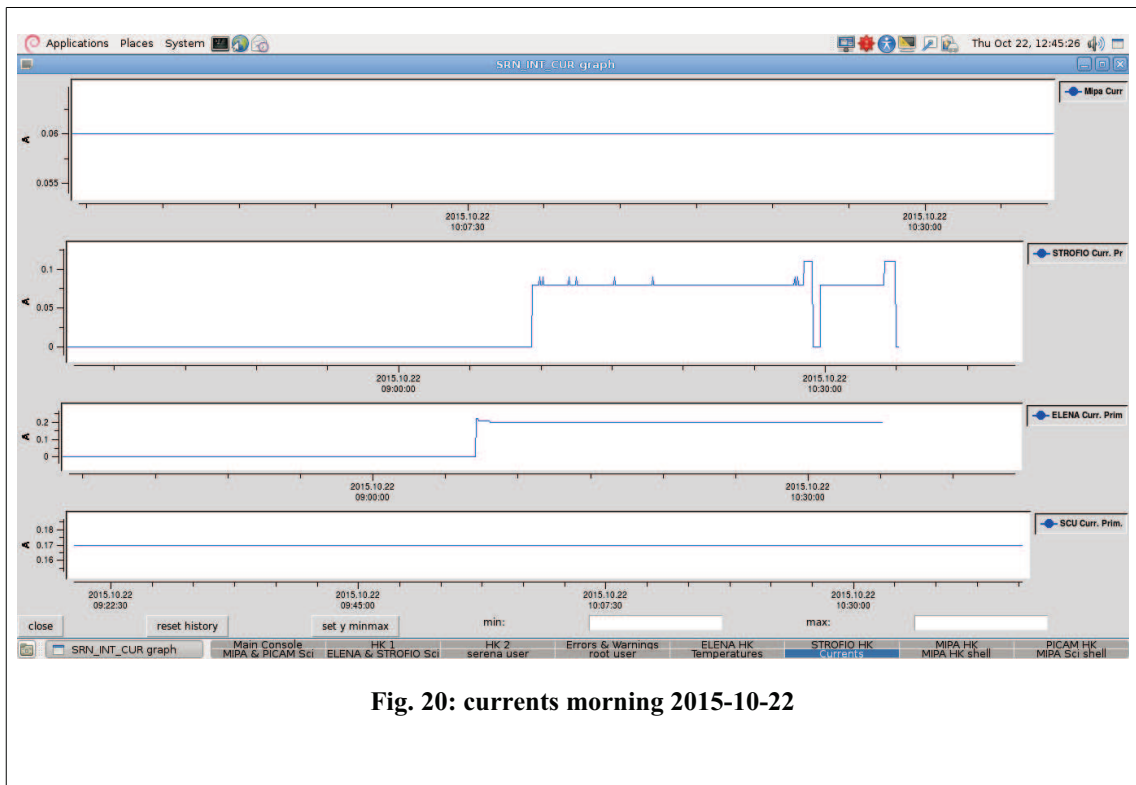
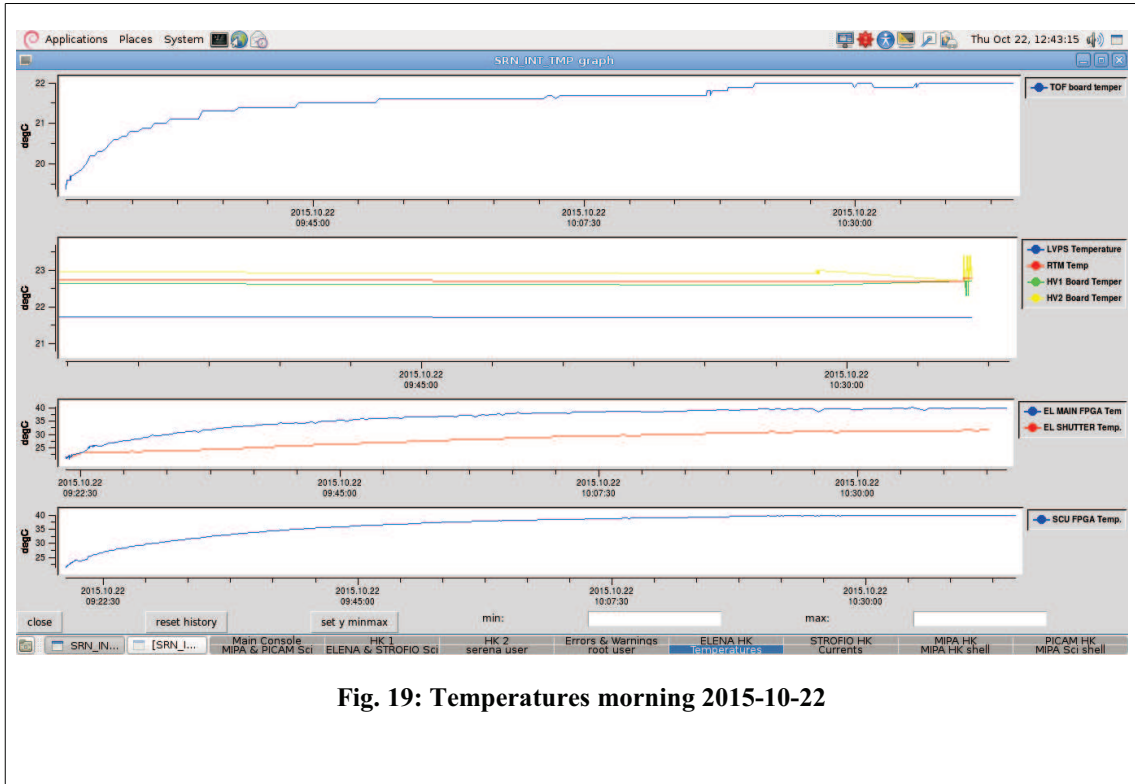
RECEIVED PACKETS (13:00)

SUBSYSTEM	HK PKTS	SCI PKTS
SCU	629	-
PICAM	1190	487
ELENA	298	43
MIPA	347	154
STROFIO	1823	4246

At ~13:10 the Functional Verification (conf B0) is over, but at 13:15 HK data was still arriving on the egse. At 14:27 the egse was still receiving data packets (HK)



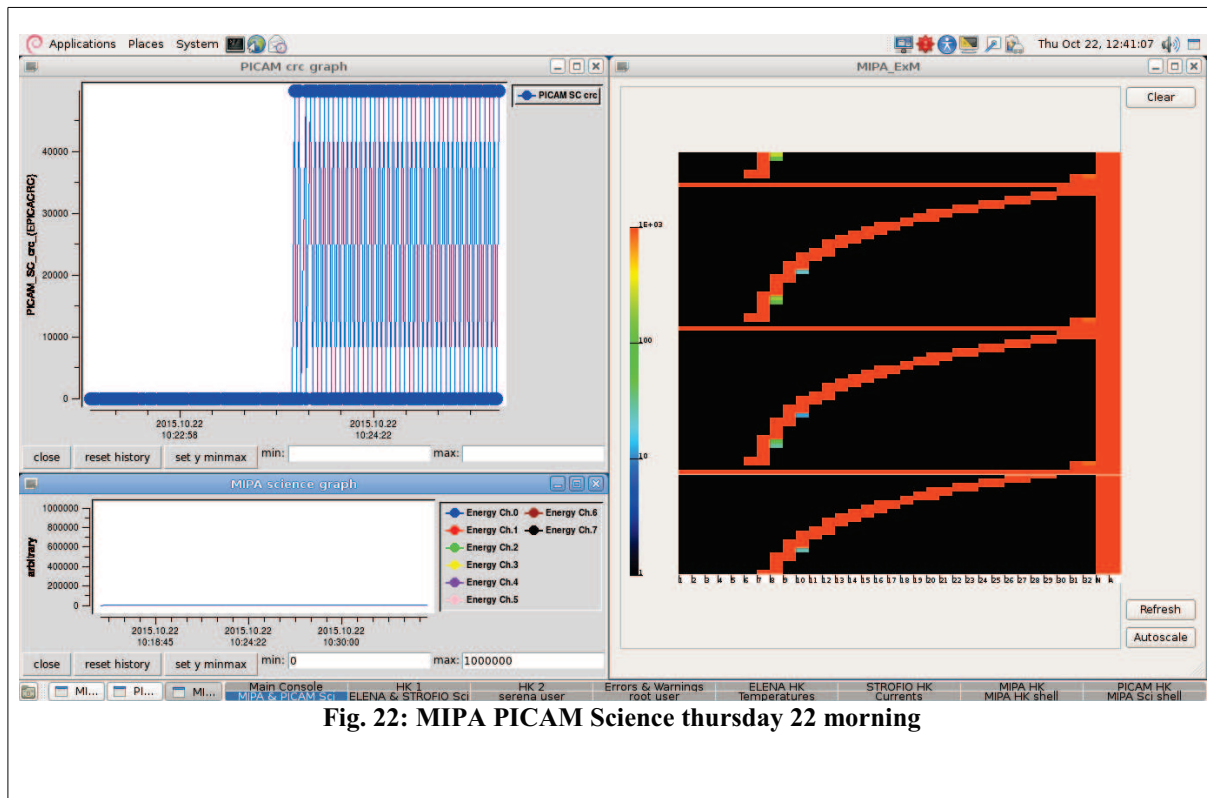
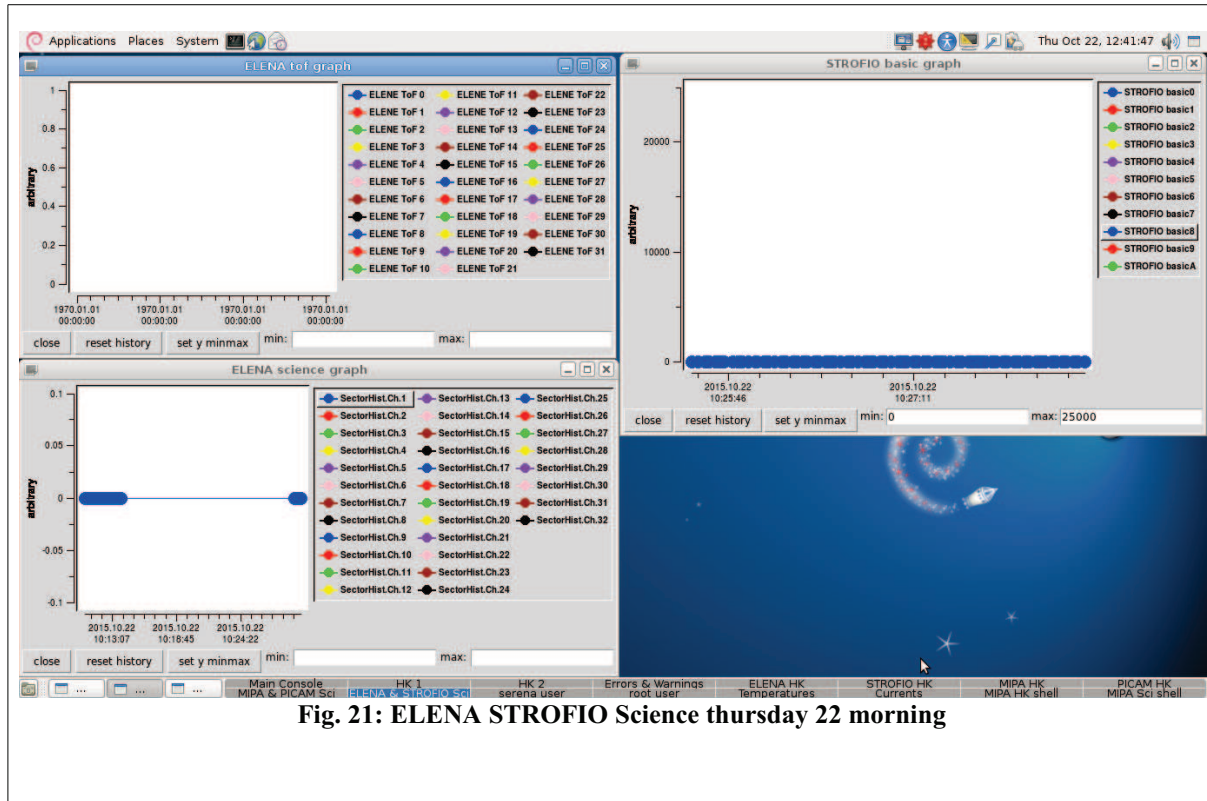
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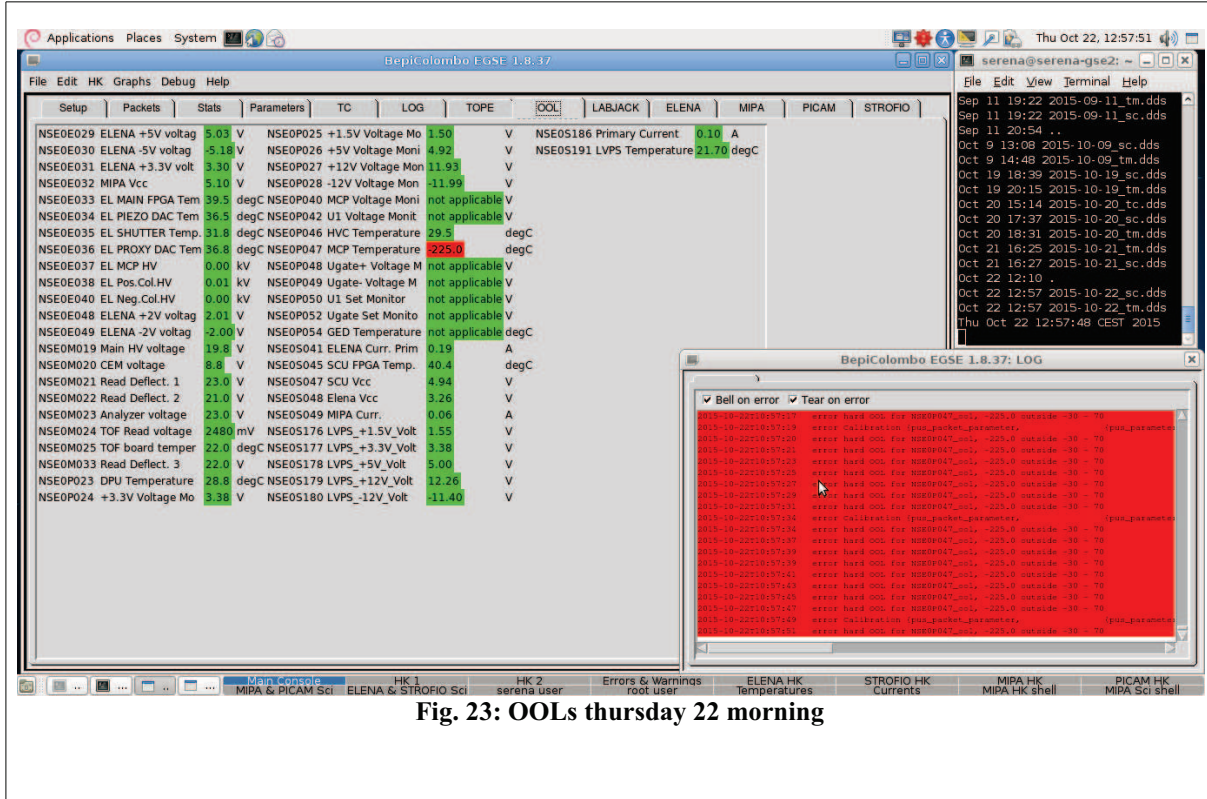
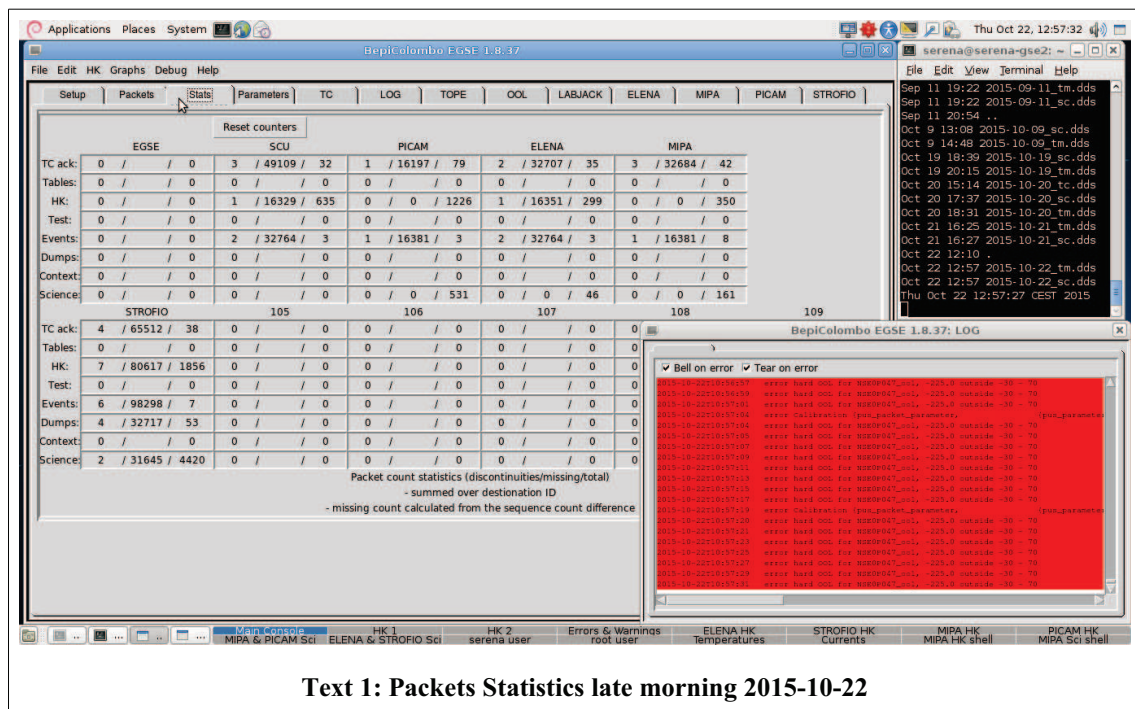


Fig. 23: OOLs thursday 22 morning



Text 1: Packets Statistics late morning 2015-10-22



7.4.2 Thursday 22 afternoon (Orbit Load B0)

SFT#2 test OL was performed here with MTL mode only, no closed loop => CL is scheduled for next week (26-30 October), when you will use an S / C simulator to test additional features. At the time that is necessary to verify the functionality of the ITL are correct so that they can be frozen and used during the test next week.

- Session for SFT#2-OL B0 config started at 15:22.
- At 15:25 came the first SCI packet of Elena and STROFIO. Regular data flow, TM nominal temperatures and regular currents, spectrograms of MIPA nominal.
- At 16:40 They said to us that for SERENA and MERTIS here was a delay in the data dump that therefore we'll receive data about 40 minutes after being generated.
- At 16:45 there was a suspension of the data stream SCI and at 16:57 of the data stream HK. This is due to a voluntary interruption of the downlink by the S/C to make the copy data of all the payload. Data SCI residues still amounted to download at maximum 1 MB.
- At 16:50 we were initiated procedures Standby Payload.
- At 18:08 we have restored the procedures for sending data SCI SSMM residues from the payload. Unfortunately, because of a specific configuration of the system, we have not been sent only the data SCI missing but also all the packets of HK relative to both tests of the day (FV and OL). This means that all HK today will be duplicated. But in the end, as for the previous day, the HK duplicate packets were limited in number.

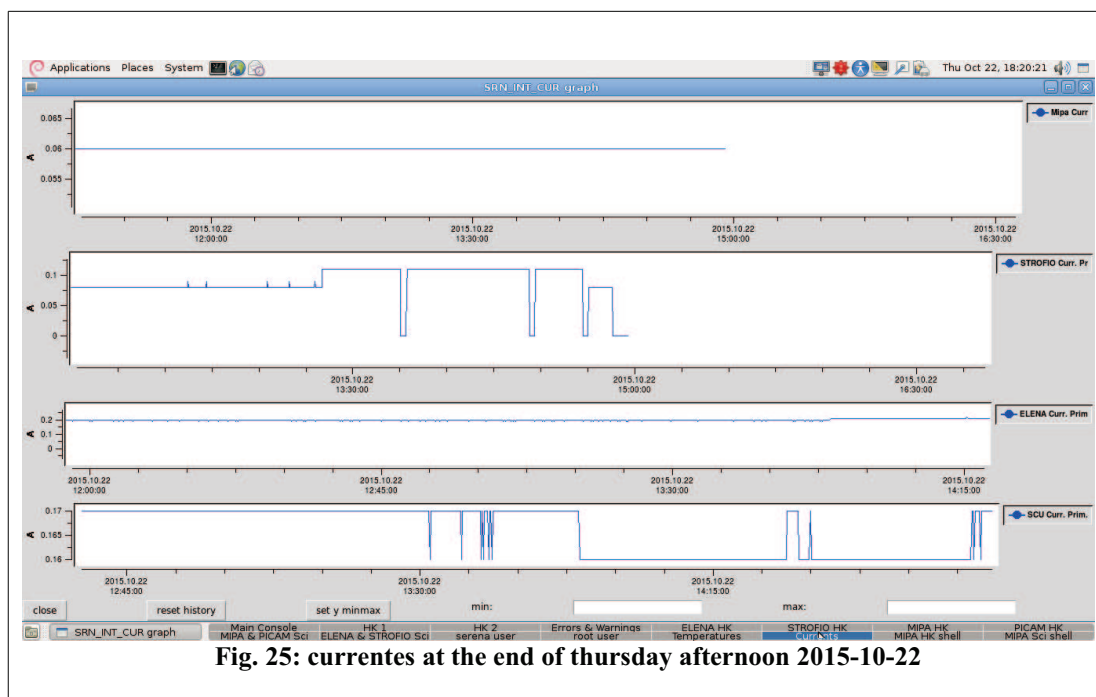
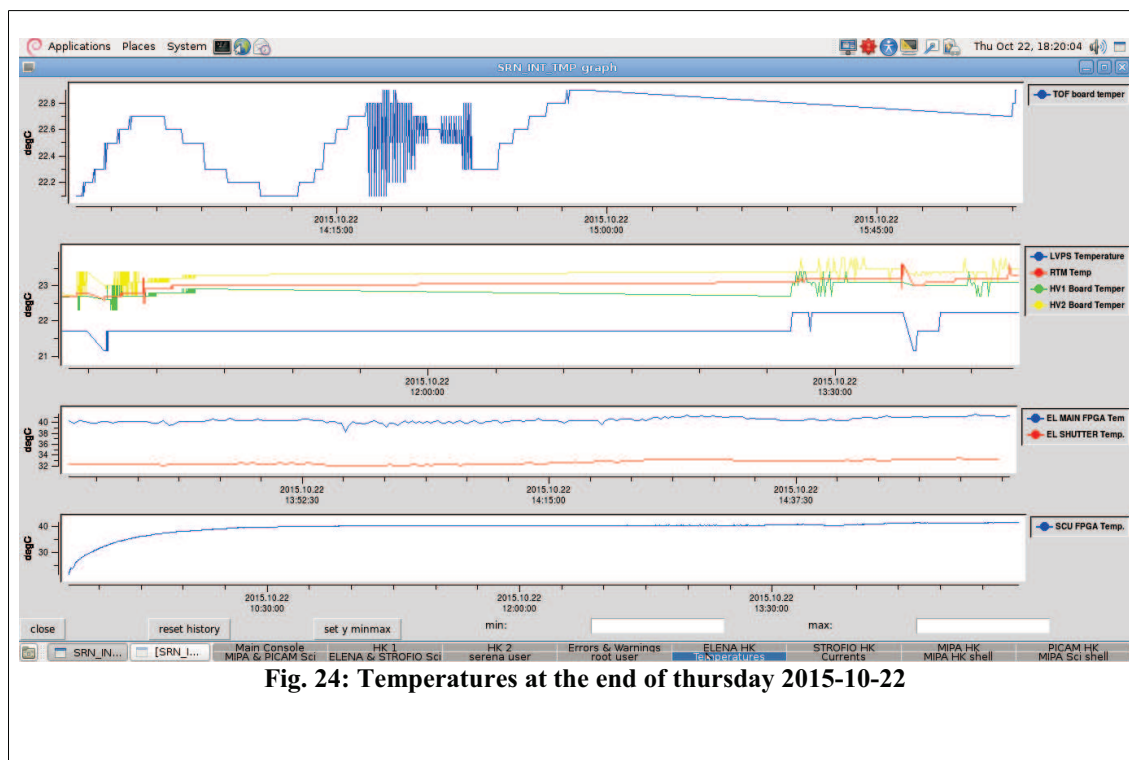
RECEIVED PACKETS (18:10)

SUBSYSTEM	HK PKTS	SCI PKTS
SCU	567	-
PICAM	3016	2835
ELENA	222	263
MIPA	373	742
STROFIO	783	11554



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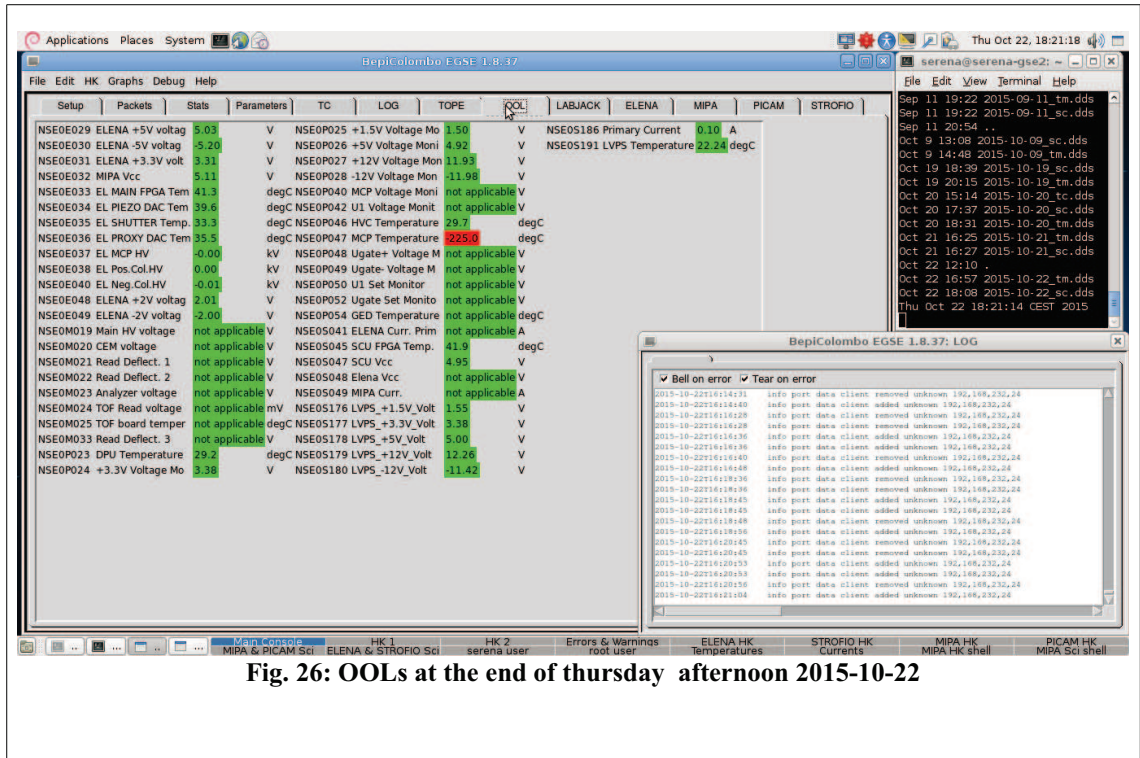


Fig. 26: OOL at the end of thursday afternoon 2015-10-22

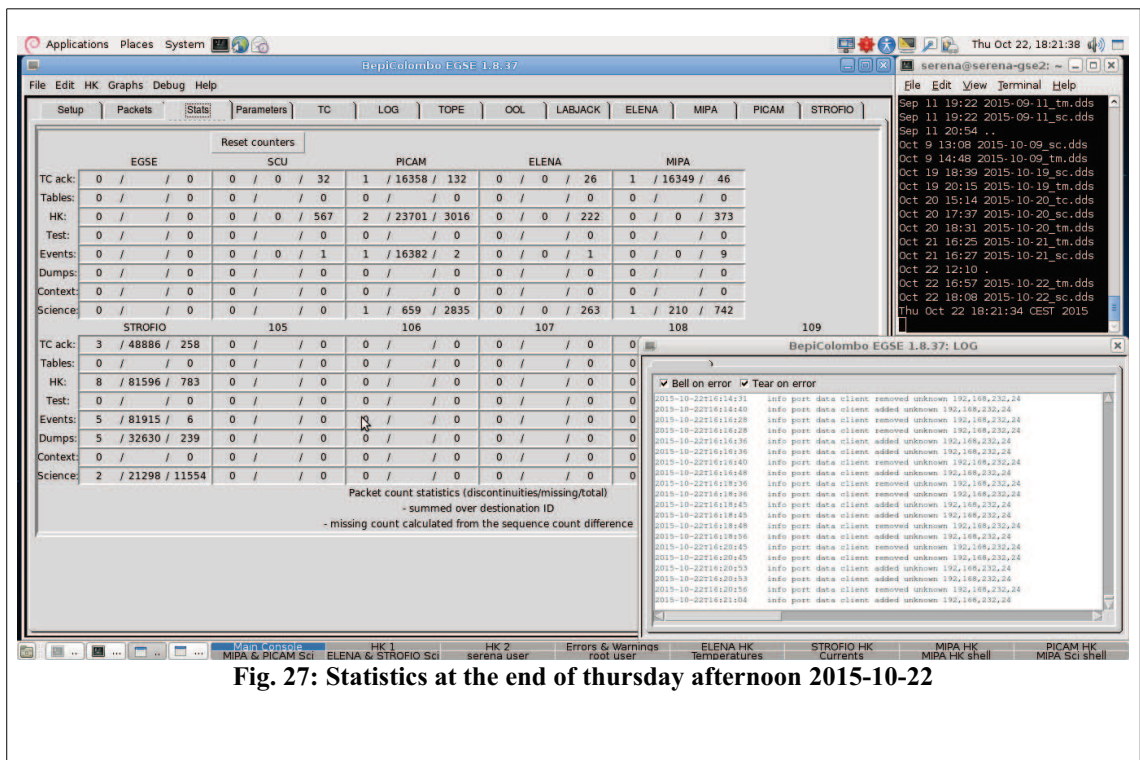


Fig. 27: Statistics at the end of thursday afternoon 2015-10-22



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7.5 Measurements on Friday (2015-10-23)

During the test in the morning are not produced SCI packets, only HK.

- Session for SFT#2-Workmanship B1 config started at 8:51.
- First data received at 08:52:42 (SCU Packets).
- At 9:11 packets are received HK for all four sensors.
- At 10:12 EGSE has crashed. Probably this is due to a disconnection between SERENA and the S/C.
- At 10:14 EGSE was restored, every tab and graph counts/values were reset.
- At 10:17 still not receiving HK packets => request to TAS-I to disconnect and reconnect the EGSE.
- At 10:18:30 EGSE back again receiving HK data from CCS.
- At 10:29 was recorded last HK packet received, contacting the S/C team for a new connection reset.
- At 10:41:41 EGSE back receiving HK data from CCS.
- 12:37 to the test is suspended for the lunch break.
- Test restarted at 14:30. HK packets received regularly.
- At 14:32 we also received the first SCI packets of the day.
- At 14:37 data SCI data are received from MIPA but the spectrogram shows quite incomprehensible saturated spectra (screenshots taken at 14:53). Also from 14:37 to 14:59 is observed an abnormal reduction of TOF Voltage passing from a stable and nominal value of 26 V to a fluctuating value in the range 9-15 V. At the same time there was an increase in the temperature of the TOF Board from a value of slightly less than 22 °C up to a value of nearly 23 °C after that (from ~15 and then on) the measurements returned to the average values. At the same time a change in the PICAM HK Mode setting HK is recorded.
- At 14:59 the MIPA Temperatures and Voltage values started returning nominal and the MIPA Spectrogram also.
- Between 15:02 and 15:05 got hard ools for NSE0P048 (Ugate + Voltage Monitor), NSE0P049 (Ugate- Voltage Monitor) and NSE0P052 (Ugate September Monitor).
- At 15:18 we received the last SCI packet. From now on there will only come HKs.
- At 15:26 STROFIO HK data started to fill the display
- At about 16:00 the AOCS test started (which is part of the SFT#2 Workmanship).
- At 16:20 the Performance Verification test is completed definitively and payload are put in standby mode. The P/L Provided HK packets for another hour.
- At 17:18 they are sent to the TC Switch off all payload.
- At 17:19 HOT Temperature parameters was ~75°C
- Last package HK received dall'EGSE SERENA and at 17:21 test finished!

RECEIVED PACKETS (18:01)

SUBSYSTEM	HK PKTS	SCI PKTS
SCU	2462	-
PICAM	2575	10
ELENA	1208	6
MIPA	1226	3316
STROFIO	1258	3649



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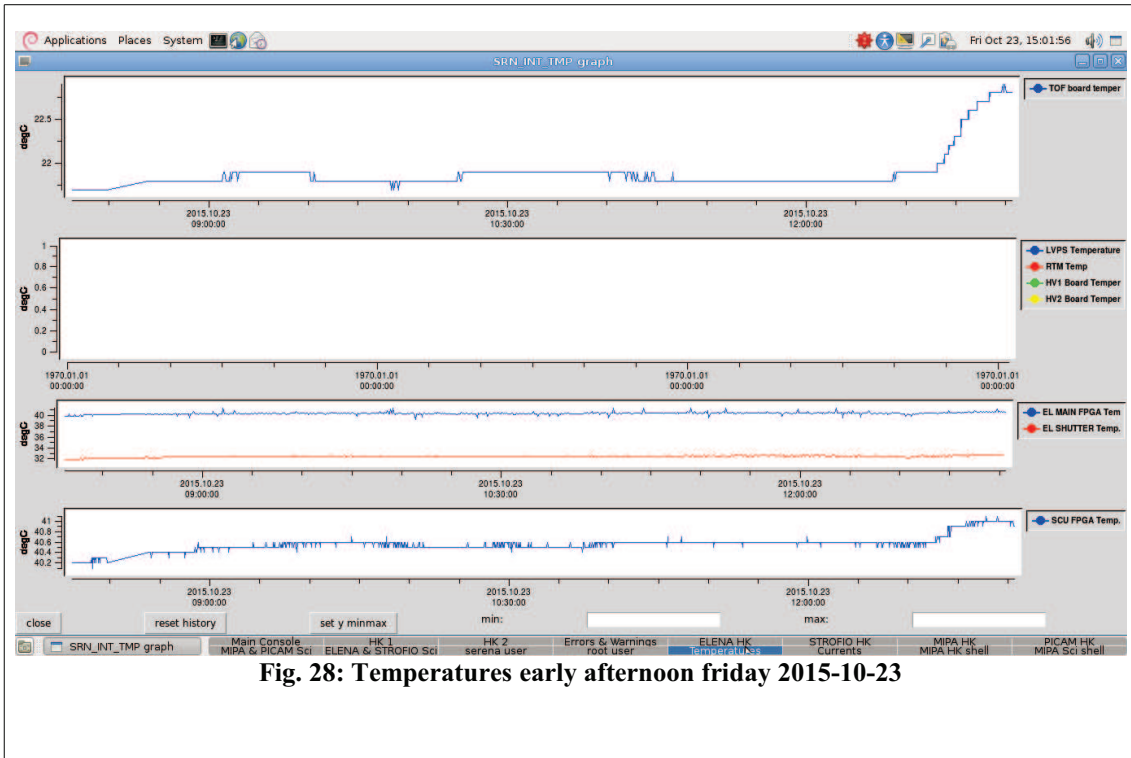


Fig. 28: Temperatures early afternoon friday 2015-10-23

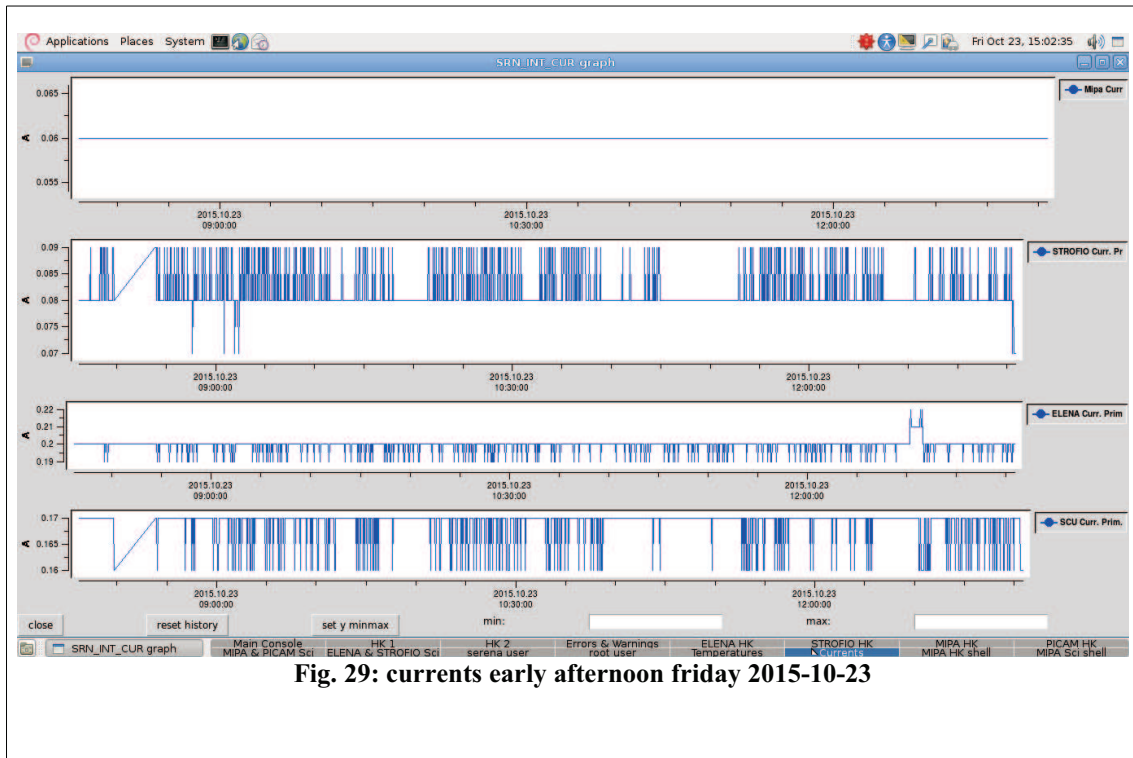


Fig. 29: currents early afternoon friday 2015-10-23



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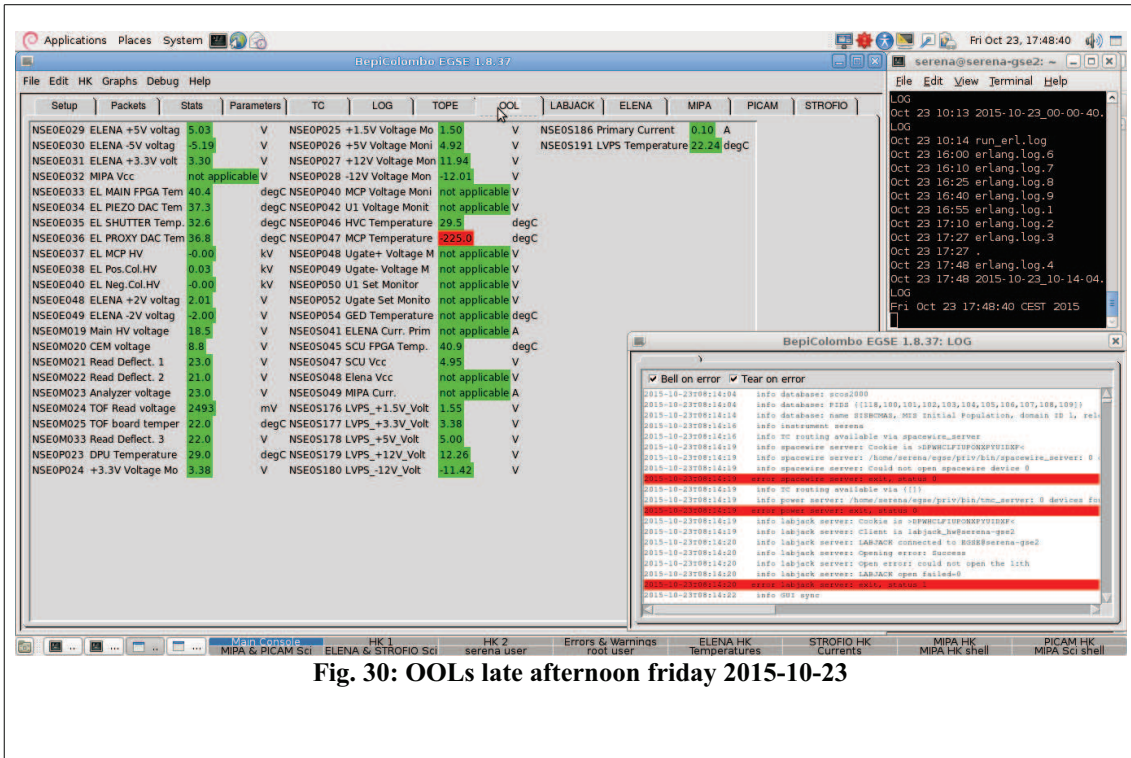


Fig. 30: OOLs late afternoon friday 2015-10-23

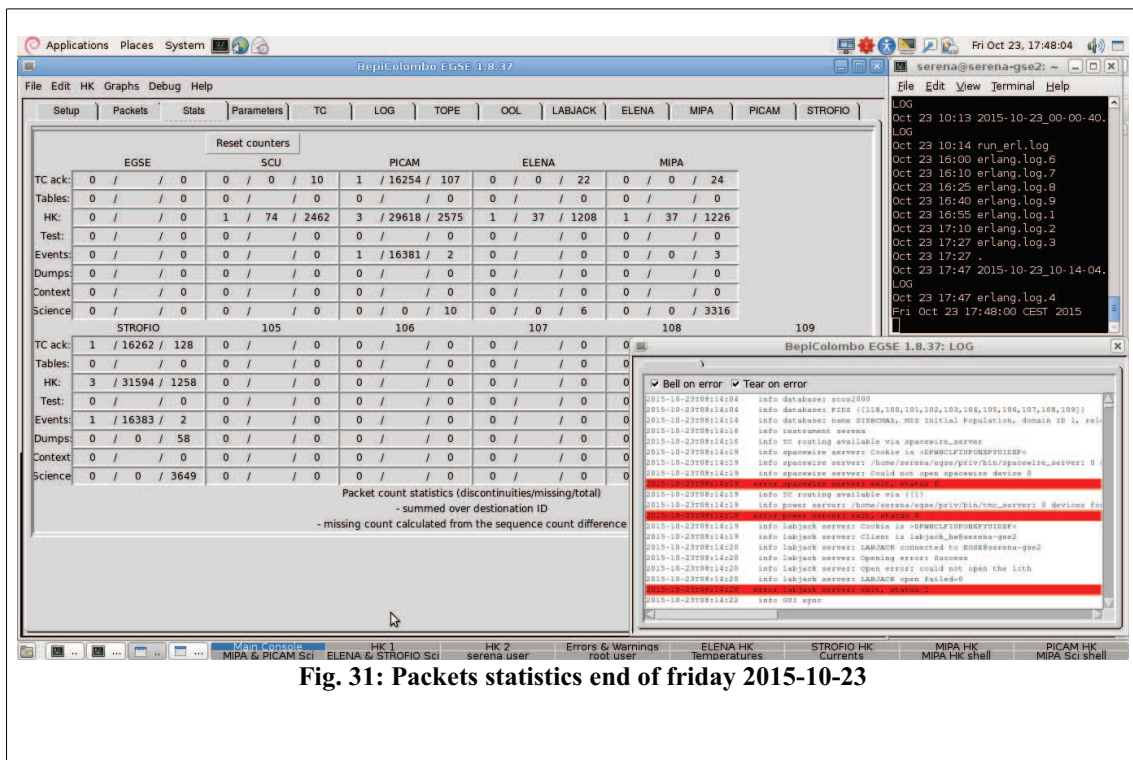
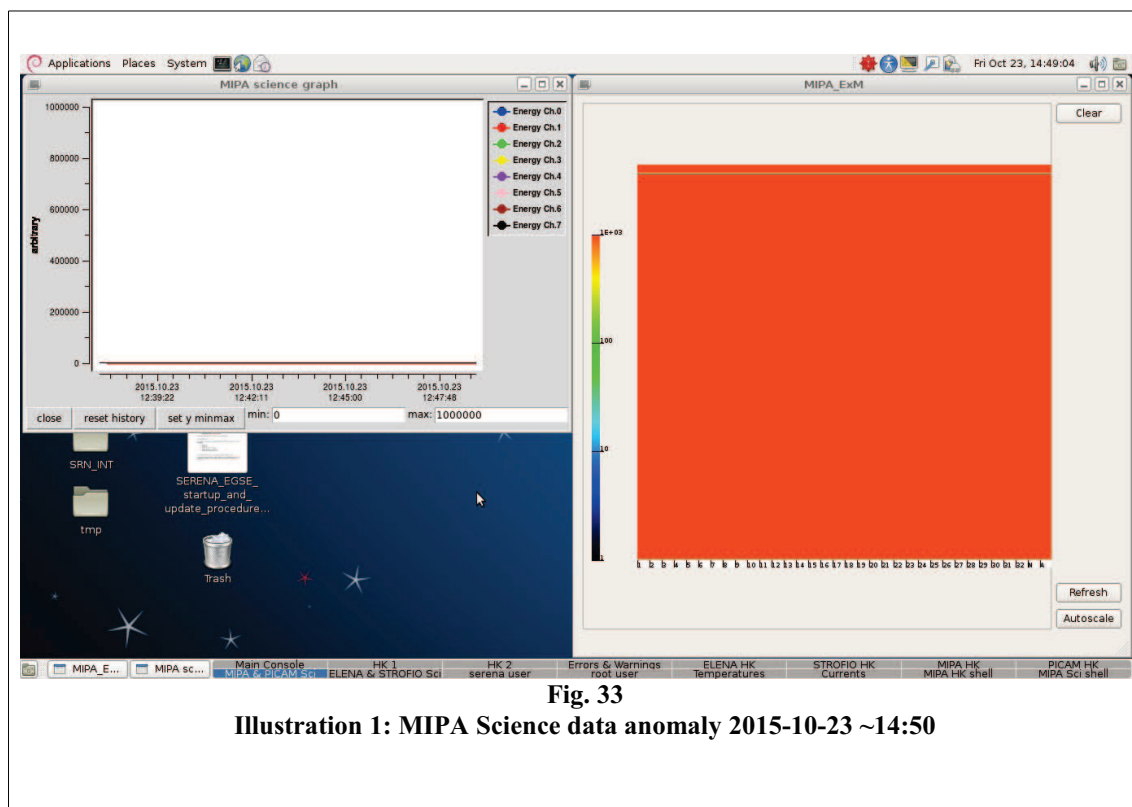
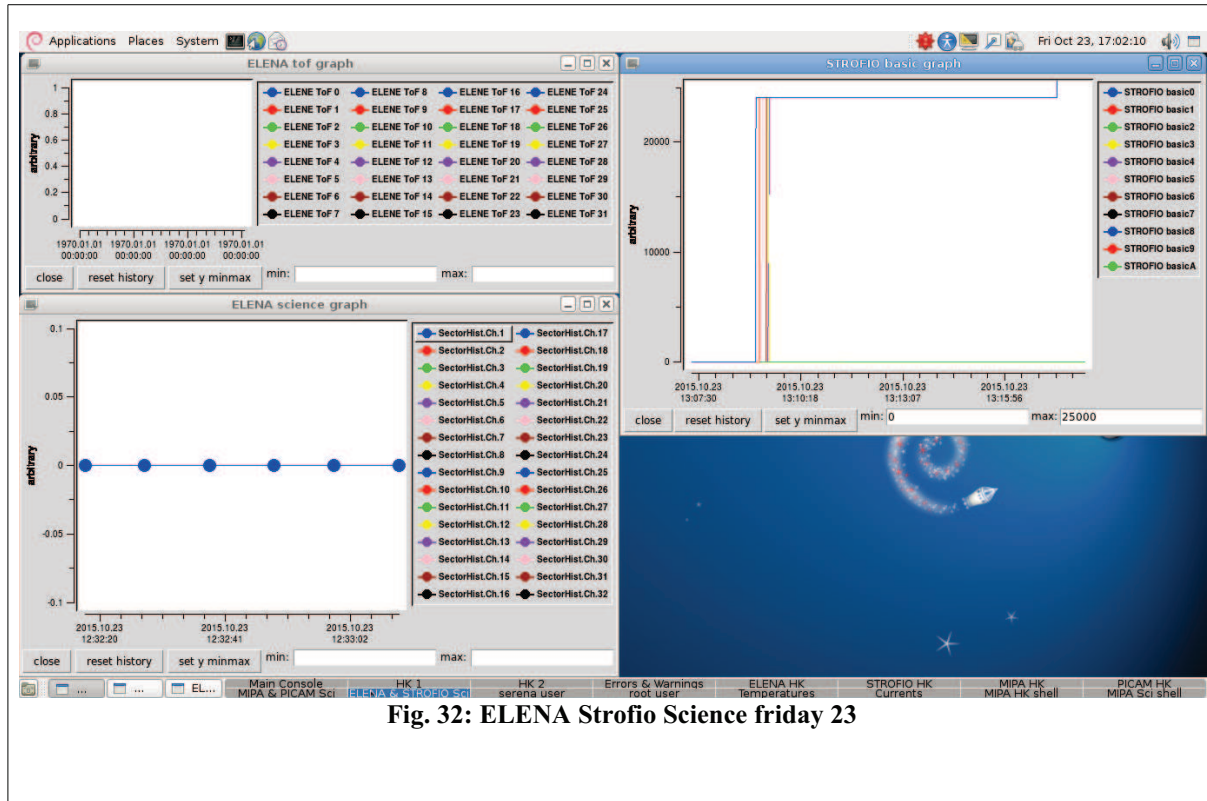


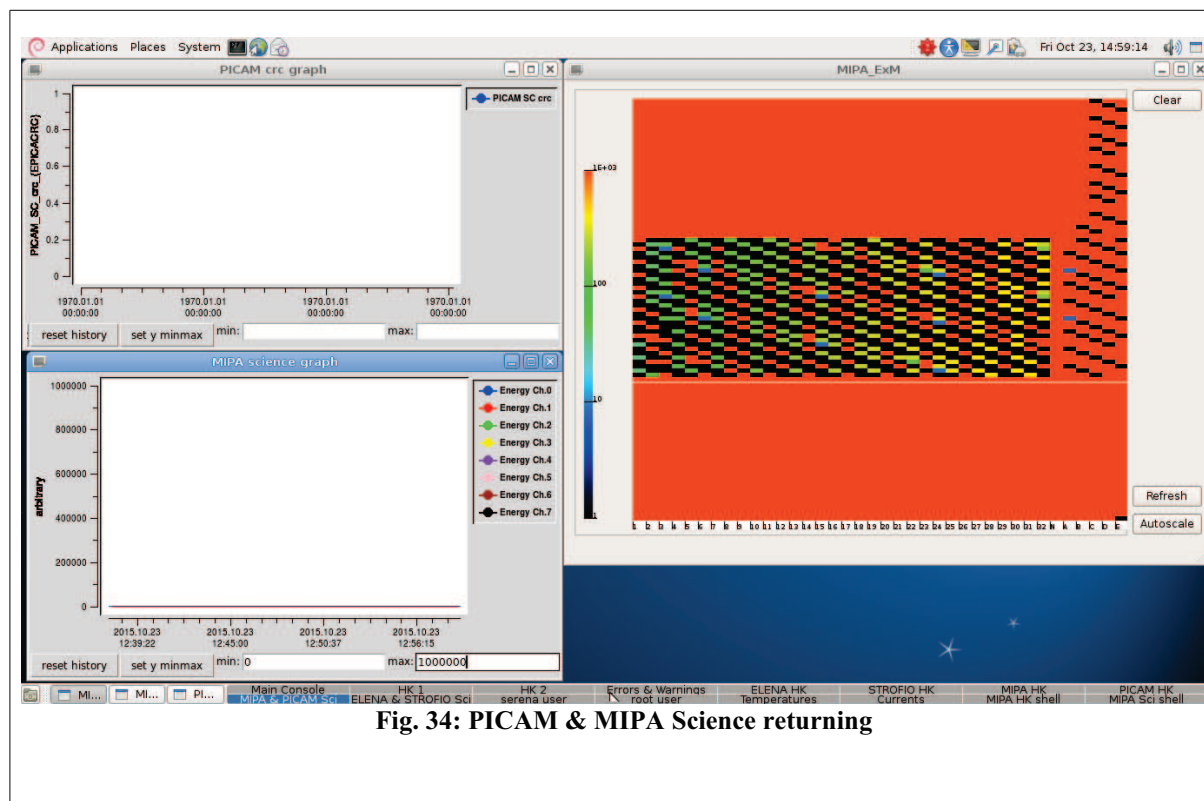
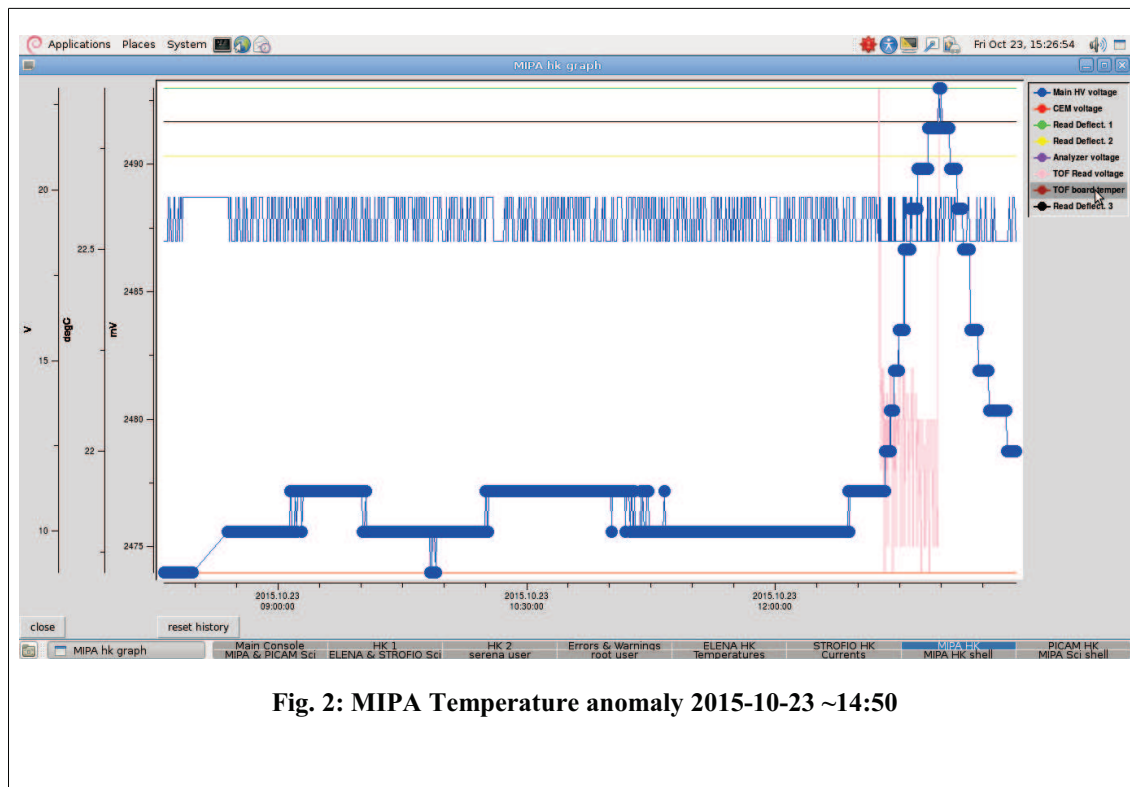
Fig. 31: Packets statistics end of Friday 2015-10-23





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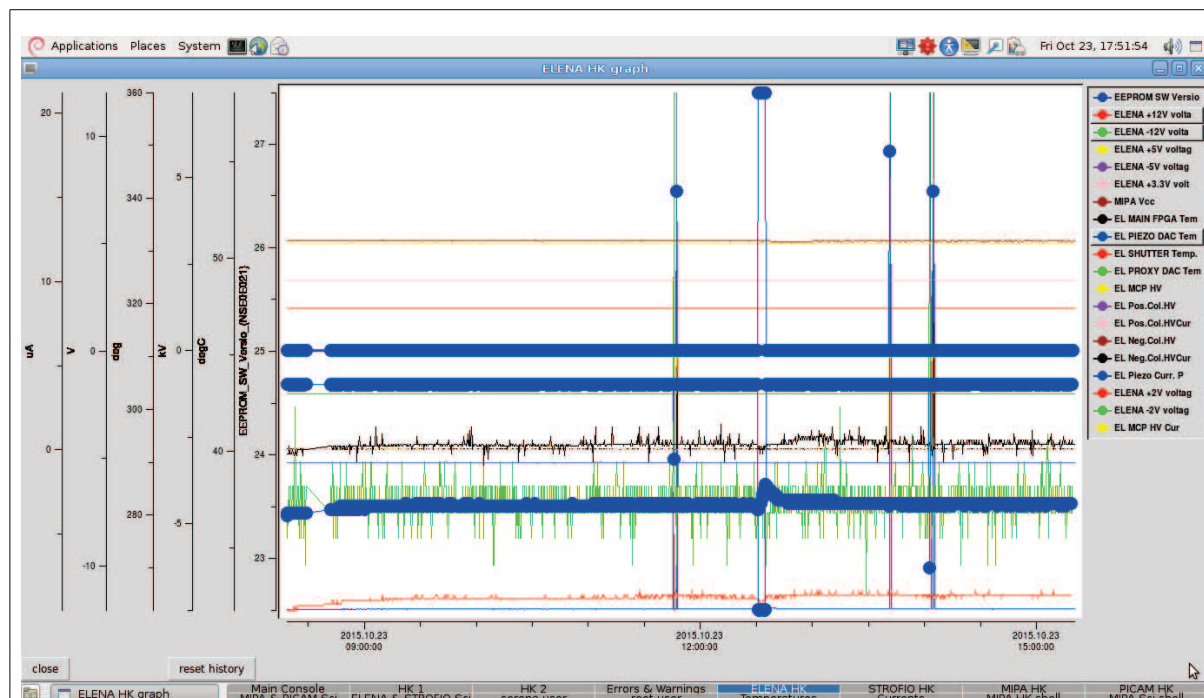


Fig. 35: ELENA HK friday 23 afternoon

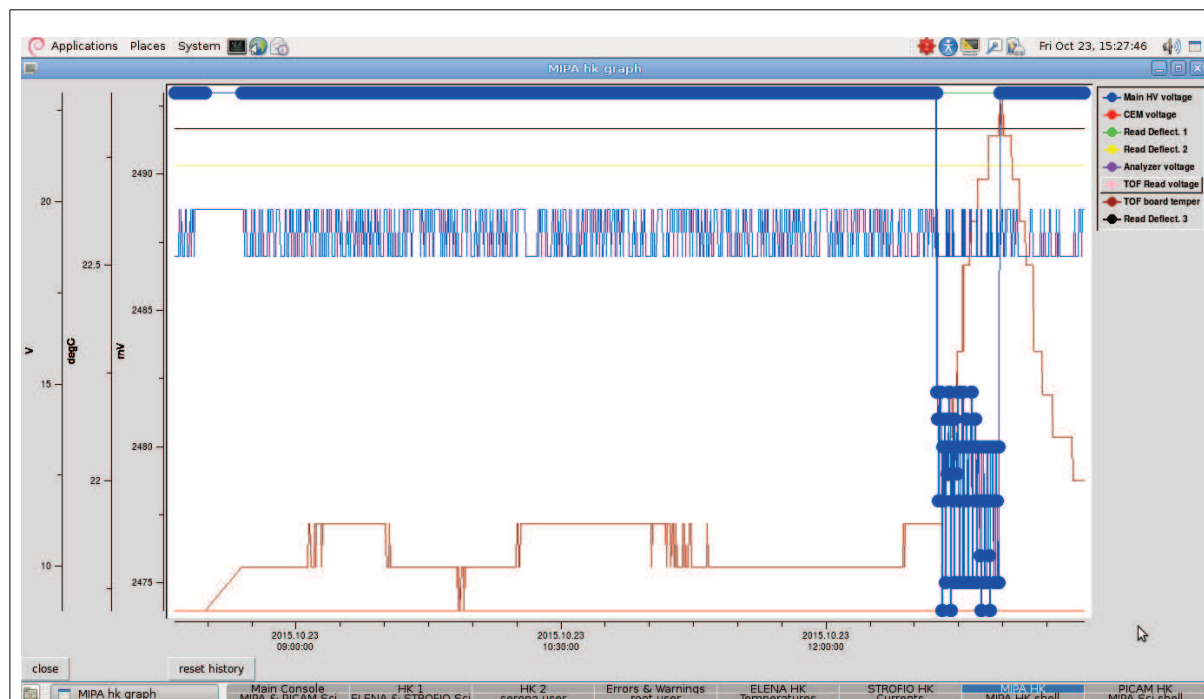


Fig. 36: MIPA HK TOF Read Voltage friday 23 afternoon



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7.6 Details on the Received TM Packets

Here some of the received packets (but not all) are listed.

7.6.1 System Packets Summary

- EPOCH time and time synchronization was correct.
- Received TM(1,1) "SERE PC Command Accepted" as expected.
- Received TM(1,7) "SERE SCU TC Exec. Ack." as expected.
- Received TM(1,7) "SERE MIPA TC Exec. Ack." as expected.
- Received TM(1,7) "SERE PICAM TC Exec. Ack." as expected.
- Received TM(1,7) "SERE ELENA TC Exec. Ack." as expected.
- Received TM(1,7) "SERE STROFIO TC Exec. Ack." as expected.
- Received HK TM(3,25), all the data was as expected.

7.6.2 Science Packets Summary

All received SERENA TM(21,3) science packets for the four sensors, STROFIO, MIPA, PICAM and ELENA look nominal and without unexpected jumps in the SSC values.



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8. Observed Susceptibilities and/or Anomalies

Here the warnings detected during the 5 days of testing (a few sporadic, and other more frequent in groups):

1. error hard OOL for NSE0P047 (MCP temperatures) on PICAM: OOL T = -225 => thousands of OOL during all five days, probably the synthetic parameter does not do its duty see the discussion between Luigi D. and Harald S.
2. error hard OOL for NSE0P048 (Ugate + Voltage Monitor), NSE0P049 (Ugate- Voltage Monitor), NSE0P052 (Ugate Set Monitor) => several groups of errors, especially during the test session on 23 October.
3. error hard OOL for NSE0E034 (EL PIEZO DAC Temp.), NSE0E035 (EL SHUTTER Temp.), NSE0E036 (EL PROXY DAC Temp.), NSE0E038 (EL Pos.Col.HV), NSE0E040 (EL Neg.Col.HV) => sporadic events, recorded almost all during transition phases between one test and another, that is when the payload were in StandBy mode.
4. error YSE56775 (STROFIO Pvt Cmd Echo) NSE0s002 parameter parsing error => numerous, ongoing and groups for all 5 days here Mariella V. says it should be due to an error in the EGSE database.
5. error packet sequence check, PID 104, PCAT 9, Src / Dest ID 0 sequence error (STROFIO): error in the sequence counter sometimes sporadic, sometimes grouped in series => we asked Mariella V. but she wasn't able to give a answer. Moreover, such errors in the sequence occur also on the other three SERENA sensors (PID 101, 102, 103).
6. error YSE55910 TM 100 (1,2) 0 SERE SCU illegal APID: occurred at 11:40:51, 11:41:56 and 11:42:46 on October 20 and recurred more numerous in the days after => error due (NCR-03062) to a wraparound (excessive load of TCs in a small time interval). It was generated a TM(1,2) and the TC is not executed. This has happened for the MIPA TC "check HK" and "LOW to STANDBY".
7. error TM YSE56596 103 (1,8) 0 SERE MIPA command can't be executed at this time => generated because it was not performed the Previous "to LOW STANDBY" => [F. Camozzi>] probably is a timing issue of the MIPA TC, in fact we must leave enough time to MIPA to exit the Test Mode to the Low Mode or the command and 'refused. Apply timing TC.
8. error Calibration (pus_Packet_parameter, NSE0M002, MIPA Last Critic, undefined, with value 7 fails) => a dozen errors between 11:57 and 11:59 of 21 October (ie at the end of the Functional Verification) => [F. Camozzi>] The parameter has associated calibration curve CSET0002TM which provides values range from 0 to 4, 7 and not 'contemplated ---> probable error of the DB to add value 7 defined in SW manual as "Command can not be executed at this time "



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In addition we want to stress the following items :

1. October 19 (Monday afternoon): abnormal reboot STROFIO => no error or TC refused or failed, HK SCU and STROFIO all nominal. It seems that the reboot was not caused by the watchdog suggested by TAS-I: pending further analysis of data on the S / C during the reboot.
2. OCTOBER 20 (Tuesday morning): peak current of STROFIO arrived up to about 0.6 A while normally is about 0.1 A. This is probably due to the start of the MTL which provides for the restart of STROFIO and the resulting current consumption
3. October 23 (Friday afternoon): MIPA spectrograms show a not very understandable saturation on the spectra (screenshots taken at ~ 14:53). Also from 14:37 to 14:59 is observed an abnormal reduction of the TOF Voltage passing from a stable value and nominal 26 V to a fluctuating value in the range 9-15 V. At the same time an increase in temperature of the TOF is recorded from a value of slightly less than 22 ° C up to a value of nearly 23 ° C.



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9. Conclusions

The goal to verify the SERENA nominal behaviour during SFT#2 Functional Verification and Orbit Load scripts in all different configurations was achieved during these tests. Both at SERENA package level and for all the subsystems the SERENA performance as a whole was nominal, with the exceptions of the events described before in this report.

Test Start Date: 2015-10-19 09:37:06, Test End Date: 2015-10-23 19:35:00