Consert In-flight Operation
Test report

CHANGE RECORDS

ISSUE	DATE	EVOLUTION	AUTHOR
1.0	21/9/6	PC#3	A. Herique
1.1	1/11/6	Typing error in PC#3 tables	AH
4.1	29/11/6	PC4 preliminary results (OCN UFT and Philae AFT)	AH
		Correction tables PC#2	
5.1	6/7/7	PC#5	AH&AR
5.2	27/8/7	Operation summary in Annex. Clarification of PC3 conclusion (FOP versus OBCP)	AH
6.1	17/9/7	PC#4	
7.1	23/01/08	PC#7	AH&AR
8.2	1/9/8	PC#8	AH
8.3	20/10/08	SCROP and CPPR updated in annex	AH
10.1	23/10/9	PC#10	AH, SZ
12.0	30/07/10	PC#12	SZ, AH
13.0	25/02/11	PC#13	AH,SZ
14.0	13/12/17	Removed closed actions (section 16.6.x) for PSA archiving	YR

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1 Introduction

This document is the test report of Consert operation from the end of the commissioning to the beginning of the comet scientific operation.

The version number corresponds into the operation phase number.

This document is closed with the hibernation, beginning of '11.

Documents applicables

[AD 1]

Documents de référence

[RD 1]

2 PC#13 - 12/10

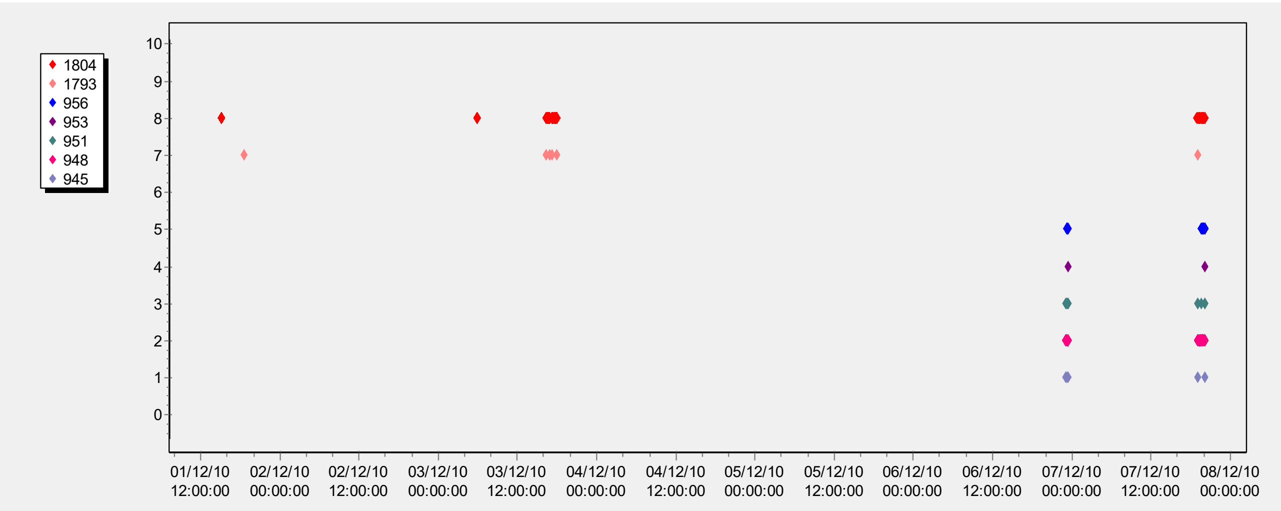
2.1 Main actions

This test is a passive PC from the orbiter point of view (UFT-O and PPT only) while it is an active test from Philae point of view with the finalization of the new cdms sw validation, a dedicated interference test Consert versus Sesame and the validation of the SDL sequence.

The PC13 report will be split in two TN: The analysis of the sdl will be done in a dedicated TN to prepare comet operations. Only the main results are summarized here.

-

335	**01/déc**	**14:15:00**	*03:30*	17:45:00	**Philae Extended AFT "PC12 version" (CDMS SW 6.98)**	*without ADS*
337	**03/déc**	**05:00:00**	*03:30*	08:30:00	**Philae Extended AFT "PC12 version" (CDMS SW 8.14)**	*without ADS*
337	**03/déc**	**16:30:00**	*02:15*	18:45:00	**SESAME - CONSERT Interference Test and UFT L.**	with CONSERT Lander only
	06/déc	**13:30:00**			**UFT O**	
341	**07/déc**	**14:35:00**	*08:00*	22:35:00	**PC13 FM SDL test - with Sbatt and MM**	**with CN Orbiter (ON: 19:04 - OFF: 20:15)**



Ext AFT lander (2x), UFTL and interference test, UFTO, SDL test

2.2 Data analysis

2.2.1 Performances

PC#13 Dates	
Orbiter Functional test	
Noise Level (dB)	-18
GCW	0
Current (mA)	95
OCXO	130
Main Spectral Line (MHz)	88
Main Spectral Line (dB)	3
S/P position (°)	43/-43
Temperature Range	-1/10
Lander Functional test	
Noise Level (dB)	-10
GCW	0
OCXO	131
Current (mA)	115
Main Spectral Line (MHz)	92.27
Main Spectral Line (dB)	12
S/P position (°)	43/-43
Temperature Range	-15/-1
Ping-pong test (SDL)	
S/P position (°)	44/-44
Ping-pong Orbiter signal	
Peak level (dB)	74
GCW	21/22
Current (mA)	95
OCXO	130
Peak Position	8/9
Temperature Range	-6/8
Ping-pong Lander signal	
Peak level (dB)	76.5
GCW	23
Current (mA)	120
OCXO	131
Temperature Range	-17/2

2.2.2 Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
UFT O	3	10	-1	4	-1	
UFT L	-15	-1	-15	-8	-14	-11
PPT (O) - SDL	-4	8	-6	4	-4	-2
PPT (L) - SDL	-17	2	-17	-4	-17	-7

2.2.3 Telemetry and data integrity

The data integrity is fine, with only one data corruption at LCN/CDMS interface level observed during interference test: 3/12 @17:37 APID 1804 # 586.

There is no data corruption during SDL test from which the data rate is lower with FIOV = 25.

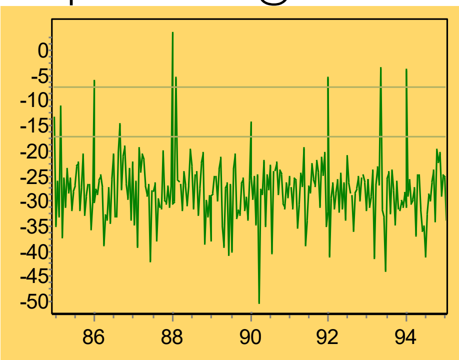
2.3 Specific test

2.3.1 ExtAFT

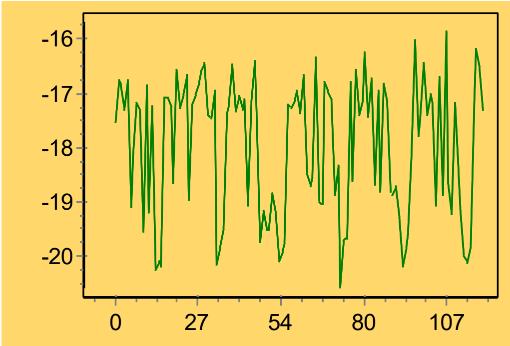
The two ExtAFT are successful (1/12/10 and 3/12/10)

2.3.2 UFT O

- During the UFTO, we observe a powerful line @ 88MHz: +4 dB as shown hereafter

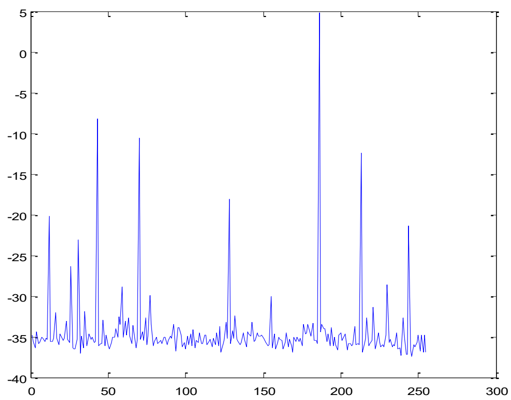


This line is present 90% of the time with periodicity of about 1 minute. The figure hereafter shows the mean power as a function of the sounding number: this power is -17/-18dB excepted during short duration every 20 sounding where the power is around its normal value (~20dB).



2.3.3 *Interference test and UFT*

During PC 13 the usual AFT and the interference test with Sesame were run. The first observation was that the perturbation (noise) level during the AFT was much higher, about 10 dB than usual. This perturbation level is due to the very strong line at 92.27 MHz (at about 175 in the figure hereafter). This line is observed also when one has the normal level but the line is about 20dB weaker. The same line exists at this low level during the AFT of Orbiter. This line does not exit on the CONSERT spectra taken during laboratory tests. Therefore the source of this line is probably on the orbiter because the line exists when Orbiter operates alone.
What is the origin of the line?
During AFT no instruments were run on the Orbiter (except SREM) and not on the Lander. From the previous observations we know that SREM does not pollute CONSERT.
The question is what subsystem has run during this test (during AFT and SESAME because the line is seen also during interference)



Average spectra during AFT 20101203. One can see the strong line at 175 position.

The test with SESAME confirmed what we have seen before. SESAME pollutes strongly CONSERT.

2.3.4 SDL

The SDL test has been analyzed in a separated TN : RO-OCN-TN-3834 Consert SDL.
The main conclusions are reported hereafter:

The SDL test is globally successful for Consert with a good timing and good data integrity.

Nevertheless the detailed analyze of the timing demonstrates that t**he LCN calendar drift by regard to an absolute timing is larger than the allocated synchronization margins (+/- 10s per platform).**

This drift is partially compensated by the orbiter one. Although a successful tuning, the situation presents some risks by regards to the success of the synchronization and **synchronization error budget has to be investigated in detail.**

2.4 Conclusions

The instrument is nominal for the beginning of the hibernation:
- The RF pollution during the two UFT tests has to be analyzed

The SDL test is successful but the synchronization error budget has to be investigated in detail to consolidate the SDL and comet operations

The CPPCR and the SCROP have been modified in annex:
- All the actions have been completed before hibernation for the space segment activities
- A part of the actions are taken as "To Be a part of the post-hibernation commissioning"
- A part are to be completed/ achieved with ground test of paper study.

3 PC#12 - 05/10

3.1 Main actions

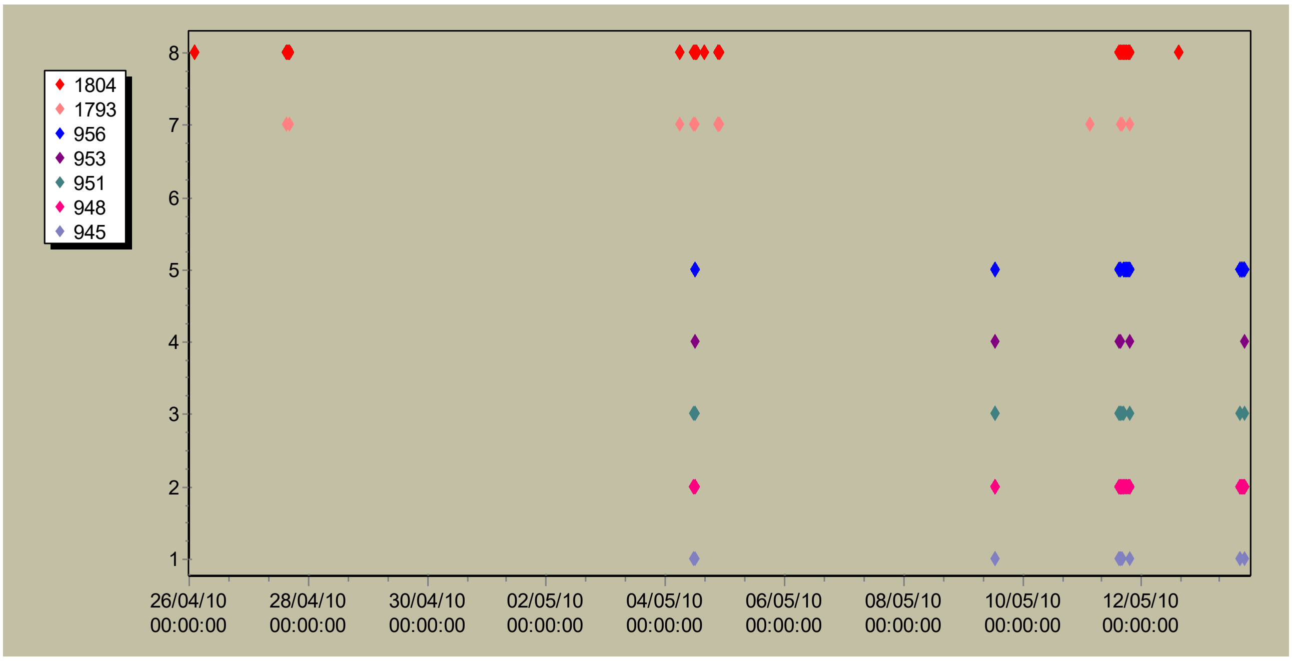
A fair amount of tests have been performed for CONSERT during PC12: ping pong tests using umbilical, RF link and Absolute Time Tag commands, OCN and LCN Interferences test, long ping pong, LCN contingency recovery procedure. Theses operations are essential for the Consert comet operation preparation

During PC12, the new CDMS SW has to be validated by regards to the OCN/LCN synchronization especially.

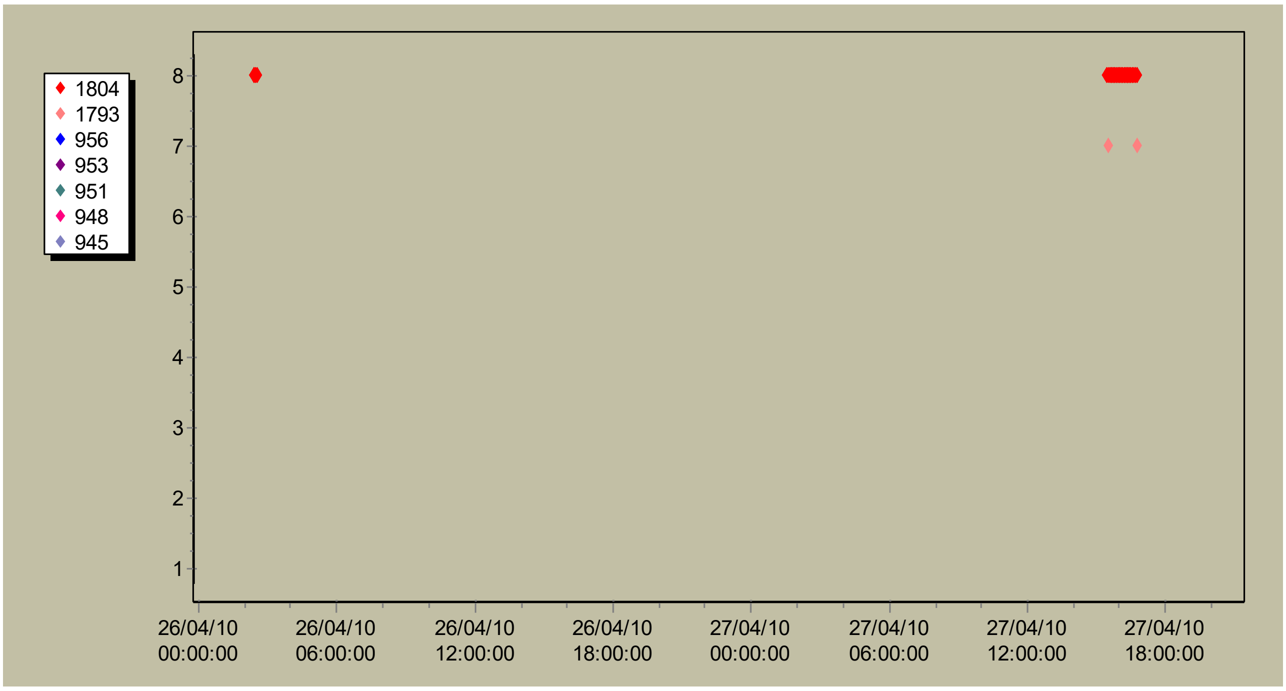
3.1.1 Operation global planning

Step	Date	Start Time	Duration	End Time	Lander Activity	
D1-1	26 apr	01:30:00	*03:30*	05:00:00	**Philae Extended AFT "PC10 version" (CDMS SW 6.98)**	**PAFT1**
D2-19	27 apr	15:30:00	*01:30*	17:00:00	**CONSERT Lander interference test with SESAME**	**LIT**
D1-4	4 may	05:50:00	*00:20*	06:10:00	**CONSERT Lander Short Unit switch ON test**	**LON**
D1-13	4 may	11:50:00	*00:30*	12:20:00	**CONSERT Ping Pong test using RF link**	**PPT-RF**
D1-14	4 may	12:20:00	*00:30*	12:50:00	**CONSERT Lander Unit Functional test (with RF)**	**UFTL**
D1-21	4 may	15:00:00	*03:00*	18:00:00	**Philae ExAFT "PC12 version" with CDMS SW 8.07**	**PAFT2**
D1-23	4 may	21:10:00	*00:45*	21:55:00	**CONSERT Lander Extended Unit Functional test (CRP-311)**	**CRPL**
Step	**Date**	**Start Time**	**Duration**	**End Time**	**Orbiter Activity**	
	9 may	13:00:00	*00:20*	13:20:00	**CONSERT Orbiter Unit Functional test**	**UFTO**
Step	**Date**	**Start Time**	**Duration**	**End Time**	**Lander Activity**	
D1-4	11 may	03:10:00	*00:30*	03:40:00	**ATTCs upload**	**PUD**
'D1-'21	11 may	15:00:00	*00:30*	15:30:00	**CN Ping Pong Test with ATTCs**	**PPT-TT**
'D1-'22	11 may	15:30:00	*01:00*	16:30:00	**CN Ping Pong test over Umbilical (+ SESAME)**	**PPT-UL**
'D1-'23	11 may	16:30:00	*04:00*	20:30:00	**CN Long Ping Pong Test (3h) with MM1&2 RAM**	**PPT-LT**
'D2-'13	12 may	14:00:00	*03:00*	17:00:00	**Philae ExAFT "PC12 version" with CDMS SW 6.98**	**PAFT3**
Step	**Date**	**Start Time**	**Duration**	**End Time**	**Orbiter Activity**	
	13 may	15:55:00	*01:55*	17:50:00	**CONSERT Orbiter interference test with ROSINA**	**OIT**

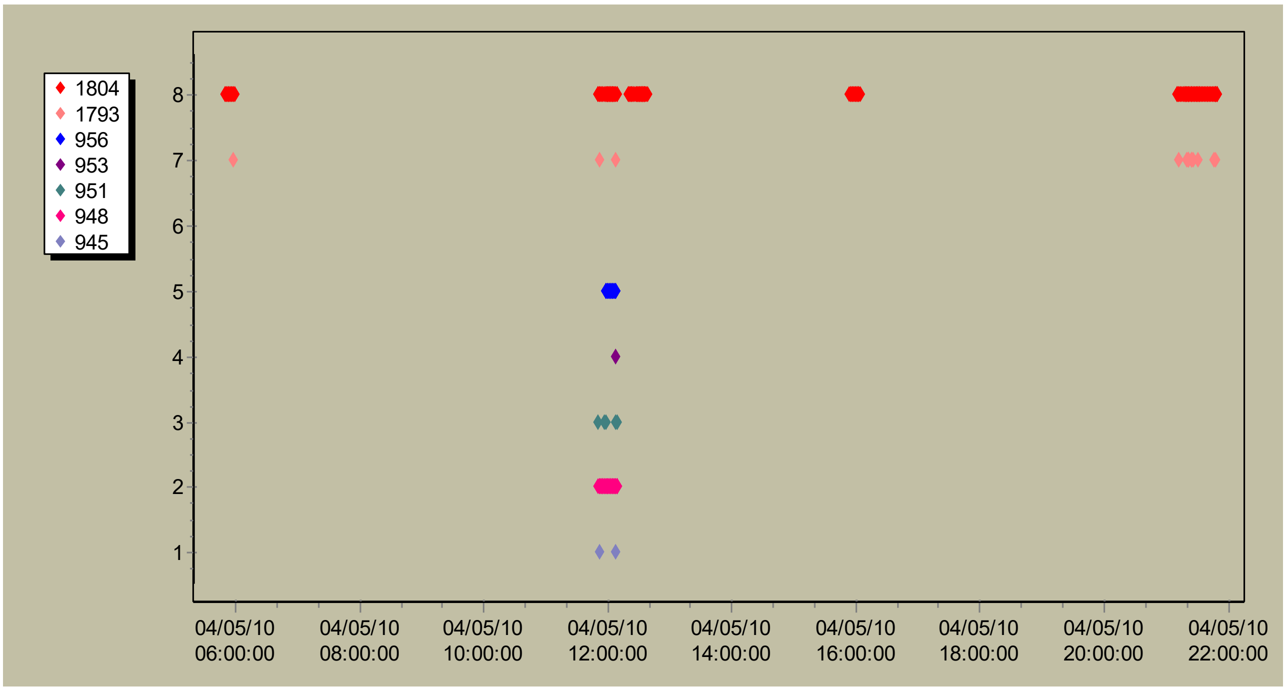
3.1.2 TM data flow



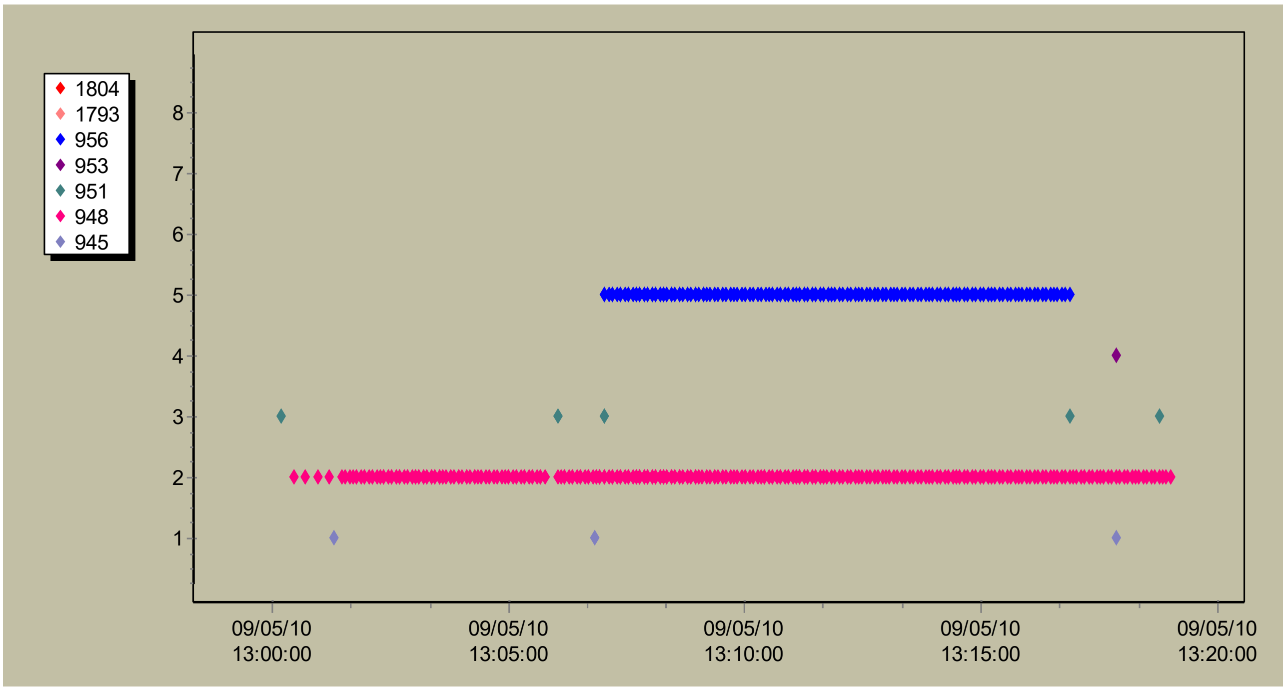
PC12



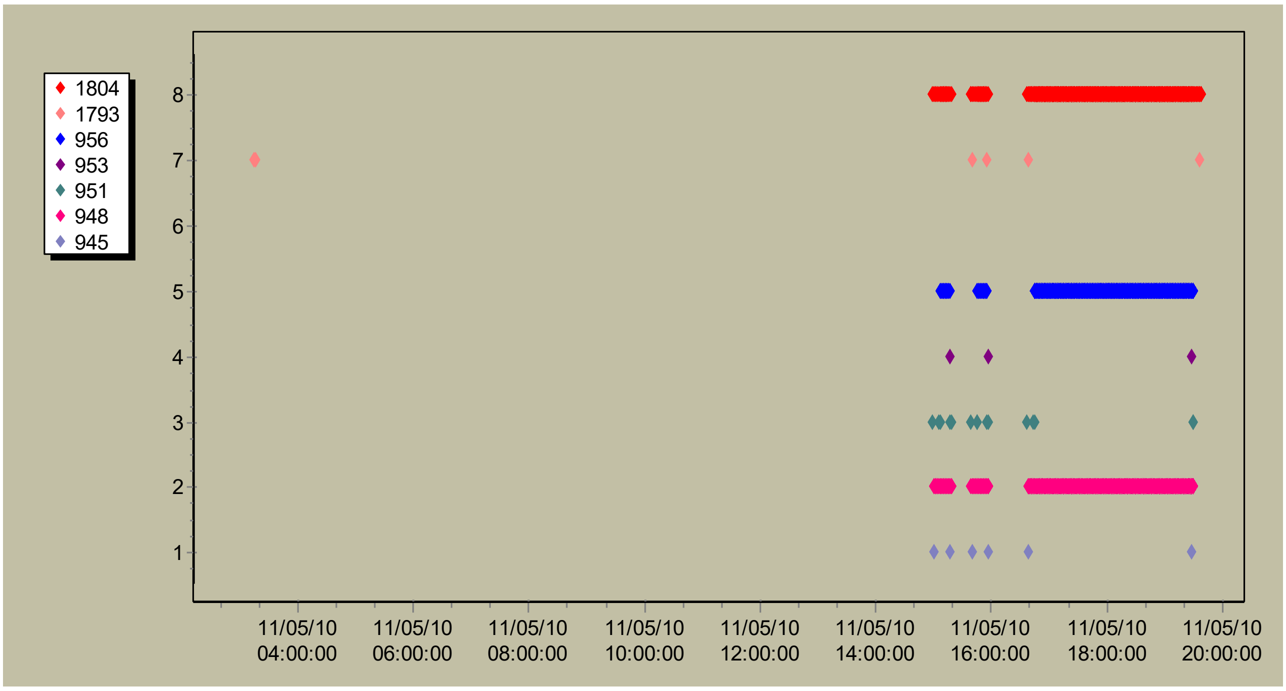
PAFT1, LIT



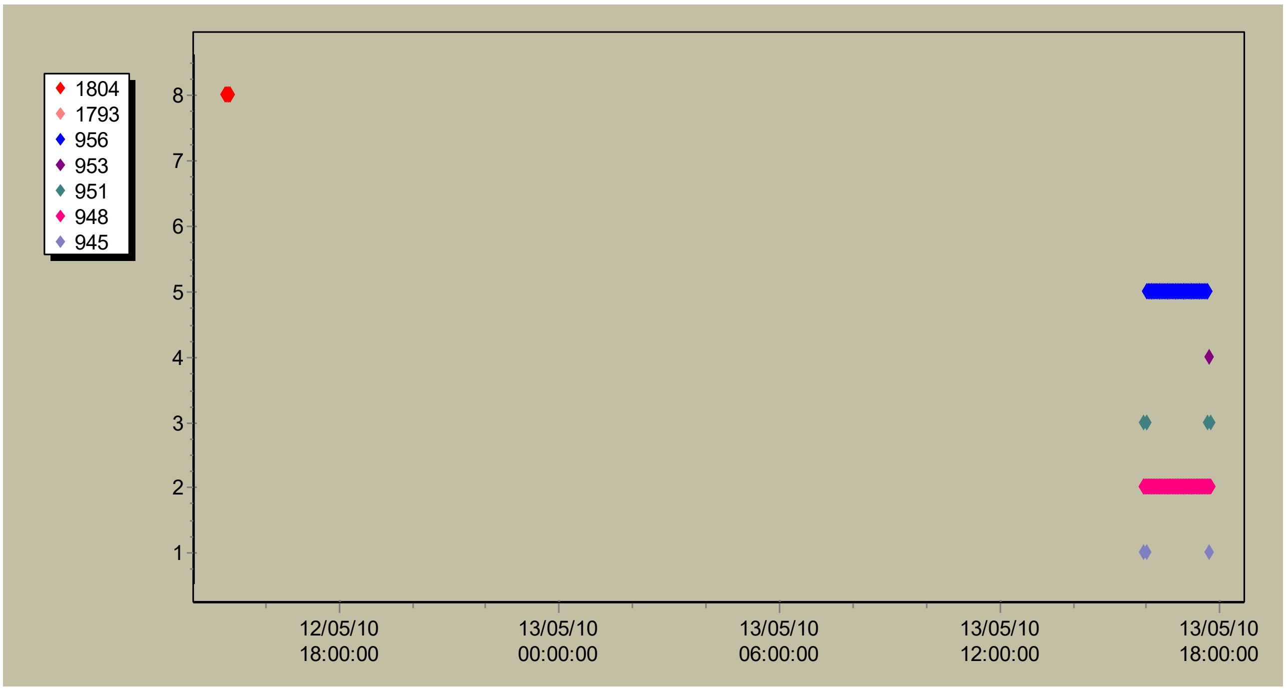
LON, PPT-RF, UFTL, PAFT2, CRPL



UFTO



PUD, PPT-TT, PPT-UL, PPT-LT



PAFT3, OIT

3.2 Data analysis

3.2.1 Performances

PC#12 Dates	
Orbiter Functional test	09/05 13:00
Noise Level (dB)	-23
GCW	0
Current (mA)	100 (370)
OCXO	130
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	+60/-60
Temperature Range	-1.2/+0.2
Lander Functional test	04/05 12:20
Noise Level (dB)	-22
GCW	0
OCXO	131
Current (mA)	120
Main Spectral Line (MHz)	86.7
Main Spectral Line (dB)	-9
S/P position (°)	+60/-60°
Temperature Range	-24.5/-21.5
Ping-pong test	11/05 15:30
S/P position (°)	+60/-60°
Ping-pong Orbiter signal	
Peak level (dB)	76
GCW	22
Current (mA)	100 (350)
OCXO	130
Peak Position	6
Temperature Range	1.8/2.6
Ping-pong Lander signal	
Peak level (dB)	78
GCW	23
Current (mA)	120
OCXO	131
Temperature Range	-20.8/-19.2

Temperature

	Ocxo Start	Ocxo end	Digi Start	Digi End	Ebox Start	Ebox end
PAFT1	-30	-20.5	-30	-23.5	-33	-30
LIT	-5	7	-10	2	-10	-2
LON	-30	-21	-30	-24	-30.3	-29.7
PPT-RF (O)	3.6	11.7	1.3	5.7	1.4	2.6
PPT-RF (L)	-30	-17	-30	-20	-26.5	-24
UFTL	-20.5	-12	-24	-18	-24.5	-22
PAFT2	-20.5	-14	-20.5	-18	-23	-23
CRP L	-20.5	-8	-20.5	-14	-22.5	-18.5
UFT O	-1	7.8	-1	3.6	-0.8	0.3
PUD					-30.3	-29.7
PPT-TT (O)	1.3	9.8	-1	5.7	0.6	2.2
PPT-TT (L)	-21	-13	-24	-18	-23	-21
PPT-UL (O)	3.6	11.7	1.3	5.7	2.2	2.2
PPT-UL (L)	-20	-8	-20	-14	-20.8	-19.6
PPT-LT (O)	3.6	18.7	1.3	15.3	2.2	3.5
PPT-LT (L)	-14	8	-18	2	-19	-10
PAFT3	-20	-8	-20	-14	-18	-16.8
OIT	1.3	15.3	-1	11.7	0.7	4.5

3.2.2 Telemetry and data integrity

During PC12, the data integrity is good for both Orbiter and Lander sides.

At lander level, there are a few data losses between LCN and CDMS (internal LCN numbering is discontinue and APID 1804 numbering is continue) during the 3h test ping pong test and the Sesame interference test.

3.2.3 S/P positions

3.2.4 Conclusions

All is nominal
No impact from the new CDMS SW

3.3 Specific tests and actions

3.3.1 Ping pong test with RF link (PPT-RF)

CSA = -0,3063808 s
The ping pong test with RF link is successful. No TM losses have been observed.

3.3.2 Ping pong test with absolute time-tagged commands (PPT-TT)

CSA = -2,8491776 s

The ping pong test with ATTC is successful. No TM losses have been observed.

3.3.3 Ping pong test with umbilical (PPT-UL)

CSA = -1,4024704 s
The ping pong test with the umbilical is successful. No TM losses have been observed.

3.3.4 Long ping pong test (3h) (PPT-LT)

A few TM losses (a few percents) have been observed: some type 3 long data blocks are shorter than expected with blocks of 32 words missing. This test has been performed with CDMS software v8.07, with the sending of RERC messages deactivated. However, we observe similar block losses than when RERC messages are activated.

Deactivating RERC messages did not solve the TM loss problems because it resulted in unexpected side effects. These side effects need to be analysed in detail.

The CSA value is equal to -420,0005632 s because all TM generated after the time synchronisation performed at 131.19.23.00 were shifted by 8 min. A NCR has been opened (**ROS_SC-203**) and we plan to do some tests on the EQM during hibernation to understand this point.

3.3.5 Lander contingency recovery procedure (CRPL)

No TM losses have been observed during this test of ALNS311.
This test replays an unsuccesfull PC8 test and validates the CRP

3.3.6 Lander interference test (LIT)

27 April SESAME interference test

Some type 3 long data blocks are shorter than expected with blocks of 32 words missing.

Some of those missing blocks correspond to dates where SESAME telecommand were sent. It could be that CDMS was busy receiving the SESAME telecommand and sent CONSERT a "RERC" message. Following the RERC message reception, CONSERT clears its internal TM buffer, and as a consequence data are lost. This test has been performed with CDMS software v6.98, therefore it was not possible to deactivate the sending of the RERC messages.
This was already observed in the past, both at the GRM and at the FM.

One can see very strong perturbation during the Sesame operations (more than 15 dB).

3.3.7 Orbiter interference test (OIT)

13 may Rosina/RTOF interference test, from 16h01 to 17h41

At the beginning the noise level is normal then at about 20 minutes from the start the noise started to increase up to -22dB and then stayed at this level until about 63 minutes from

the beginning. The sharp increase up to -21 dB until 72 minutes. This increase is due to wideband noise , Rosina RTOF was in emissive mode from 17 and 17h15.
The level between -23 to – 22 dB is the normal level however the level at – 21 dB could be acceptable.

3.4 Conclusions

The PC12 test is successful for the instrument as well as for the operations. Some points remain open:

- The TM losses between LCN and CDMS when RERC messages are deactivated need to be analyzed.
- The 8-min time shift of TM observed during the long ping pong test has to be investigated and tested on the EQM during hibernation.

The classical ping pong tests (RF, ATTC, umbilical, long) were mostly successfully tested with the new CDMS SW version.

4 PC#11 - CANCELED

5 PC#10 - 09/09

5.1 Main actions

PC10 comports a large set of Consert test: RF link, Absolute Time Tag commands, OCN and LCN Interferences test, long ping pong. Theses operations are essential for the Consert comet operation preparation.

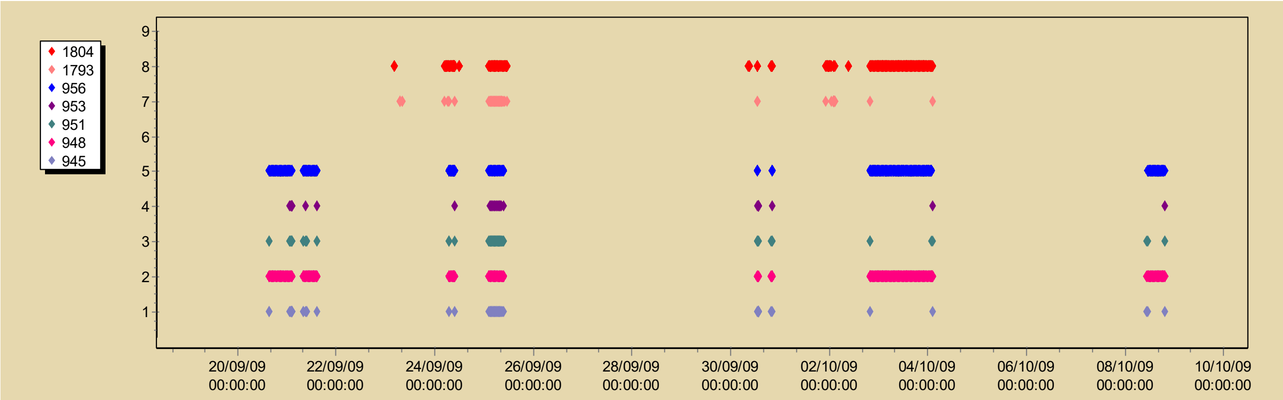
The validation of the turn on accuracy margins and the investigation of the command propagation delay is a way to secure Consert operations around the comet.

The FOP modifications have to be validated during PC10 especially the dump sequences (CRP) and the new LCN TC's.

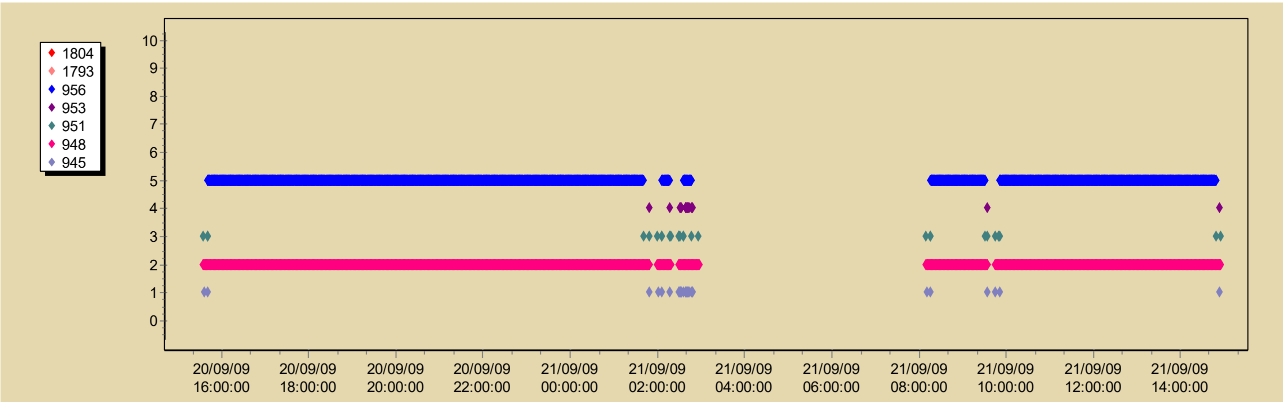
5.1.1 Operation global planning

Step	Date	Start Time	Duration	End Time	Lander Activity	
	20 sept	**15:35:00**	*10:20:00*	01:55:00	**OCN Interference test with MD, RPC & HGA movement**	**OIT1**
	21 sept	**02:00:00**	*00:30:00*	02:30:00	**CONSERT Orbiter unit functional Test (UFT)**	**UFTO**
	21 sept	**02:30:00**	*02:00:00*	04:30:00	**CONSERT Orbiter FOP Validation/ Ext, UFT**	**FOP1**
	21 sept	**08:10:00**	*01:30:00*	09:40:00	**CONSERT Orbiter Interference test with RN-COPS**	**OIT2**
	21 sept	**09:45:00**	*05:15:00*	15:00:00	**OCN Interference with MD,WOL, pass AOS (&RN SW upl)**	**OIT3**
D1-10	23 sept	**03:31:00**	*03:29:00*	07:00:00	**Philae Extended AFT "PC8 version"**	**PAFT1**
D2-5	24 sept	**05:10:00**	*01:40:00*	06:50:00	CONSERT Lander ON in parallel to APXS Interference	LIT1
D2-6	24 sept	**07:00:00**	*04:00:00*	11:00:00	**CONSERT Long PingPong (3 hrs) with MM**	**PPT-LT1**
D2-8	24 sept	**12:00:00**	*00:30:00*	12:30:00	**CONSERT Lander Unit Functional Test**	UFTL
D3-1	25 sept	**02:40:00**	*00:30:00*	03:10:00	**CONSERT PingPong Test - umbilical**	**PPT-UL**
D3-2	25 sept	**03:10:00**	*05:40:00*	08:50:00	**CONSERT Validation of the turn-on accuracy**	**PPT-UL1**
D3-3	25 sept	**08:50:00**	*00:30:00*	09:20:00	**CONSERT FOP validation**	**FOP2**
D3-4	25 sept	**09:20:00**	*00:50:00*	10:10:00	**CONSERT OBCP 2 sec delay investigation**	**PPT-UL2**
D3-5	25 sept	**10:10:00**	*01:30:00*	11:40:00	CONSERT Lander ON in parallel to SD2 Interference	LIT2
D2-2	30 sept	**08:58:00**	*00:19:00*	09:17:00	**CONSERT Lander ROMAP Interference Test - MM & Sbatt**	LIT3
D2-4	30 sept	**12:40:00**	*01:15:00*	13:55:00	**CONSERT Ping Pong test using RF link**	**PPT-RF**
	30 sept	**14:00 :00**	*00 :00 :10*	14:10:00	**OCN Memory DUMP**	**FOP4**
D2-16	30 sept	**20:10:00**	*00:25:00*	20:35:00	**CONSERT PingPong Test with ATTCs**	**PPT-TT**
D3-20	01 oct	**22:30:00**	*02:40:00*	01:10:00	**CONSERT Lander Interference Test**	LIT4
D4-2	02 oct	**02:20:00**	*01:00:00*	03:20:00	**CONSERT LN memory dump**	**FOP3**
D4-6	02 oct	**08:51:00**	*03:59:00*	12:50:00	**Extended AFT "PC10 version" (revised SESAME LFT)**	**PAFT2**
D4-10	02 oct	**20:00:00**	*31:20:00*		**CONSERT Long PingPong (30 hrs) with MM**	PPT-LT2
D6-1	04-oct		*31:20:00*	03:20:00	**CONSERT Long PingPong (30 hrs) with MM**	PPT-LT2
	08-oct	**11:00:00**	*08:35:00*	19:35:00	**CONSERT Orbiter Interference Tests with RSI TxRx**	**OIT4**

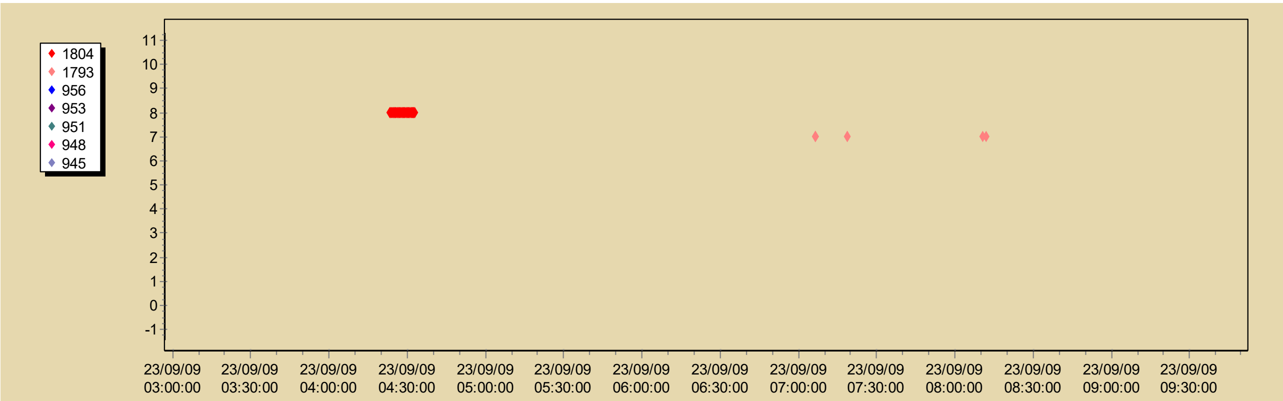
5.1.2 TM data flow



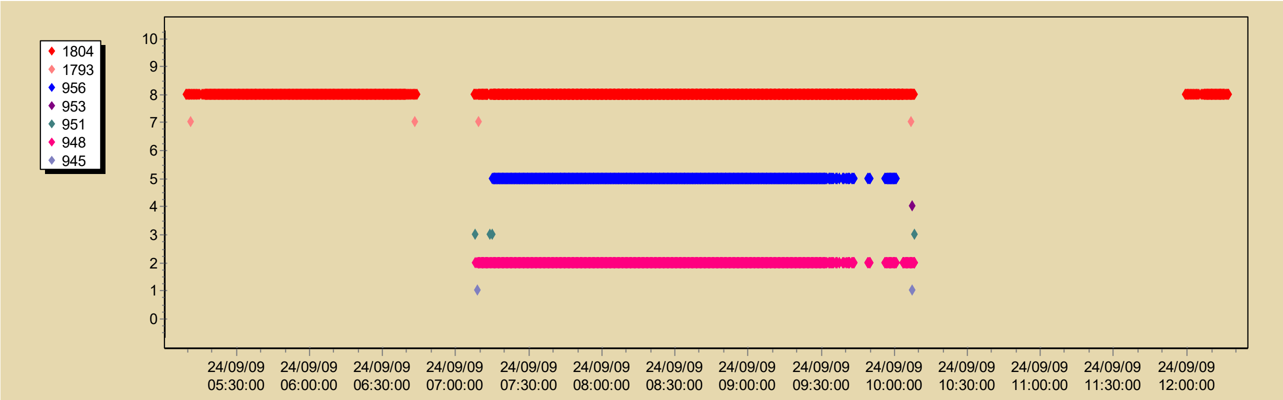
PC10



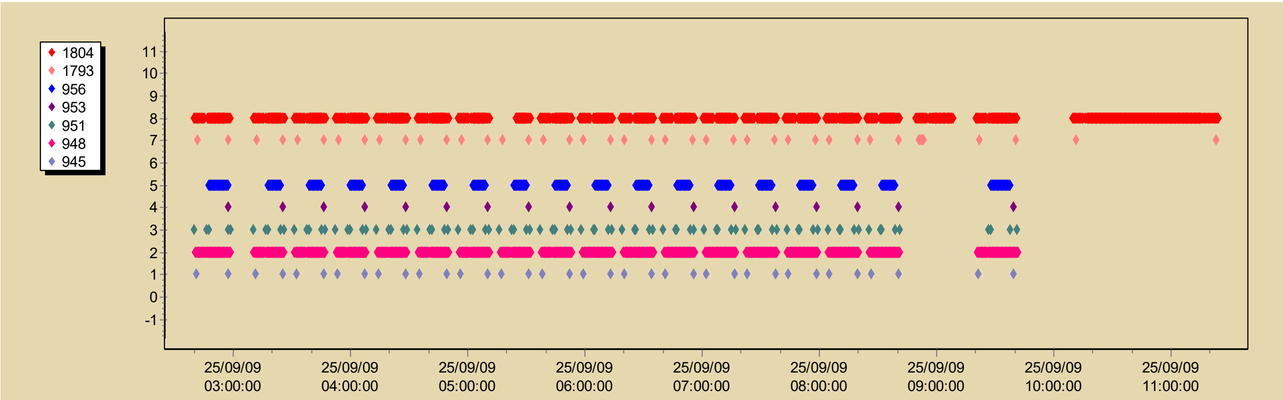
OIT1, UFTO, FOP1, OIT2, OIT3



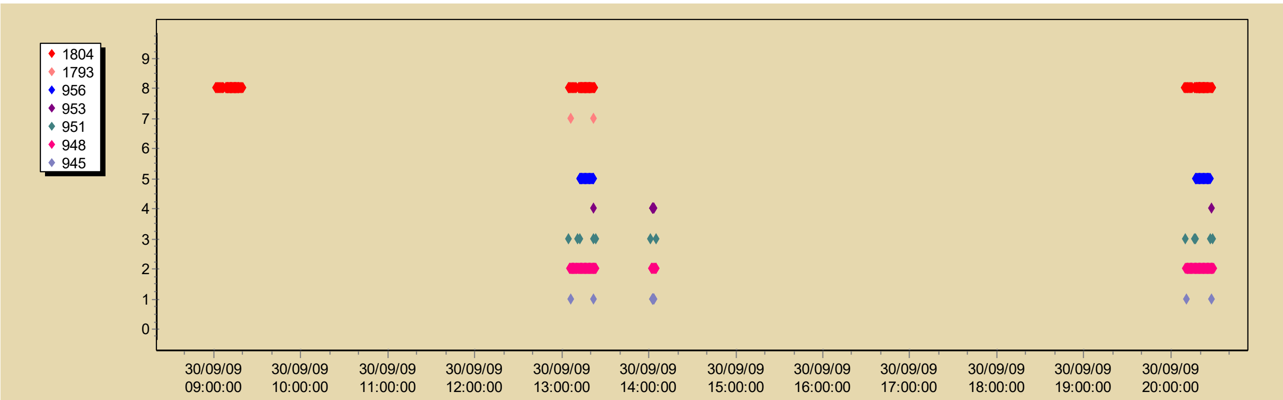
PAFT1 and ACK corresponding in the AMS update and ATTC



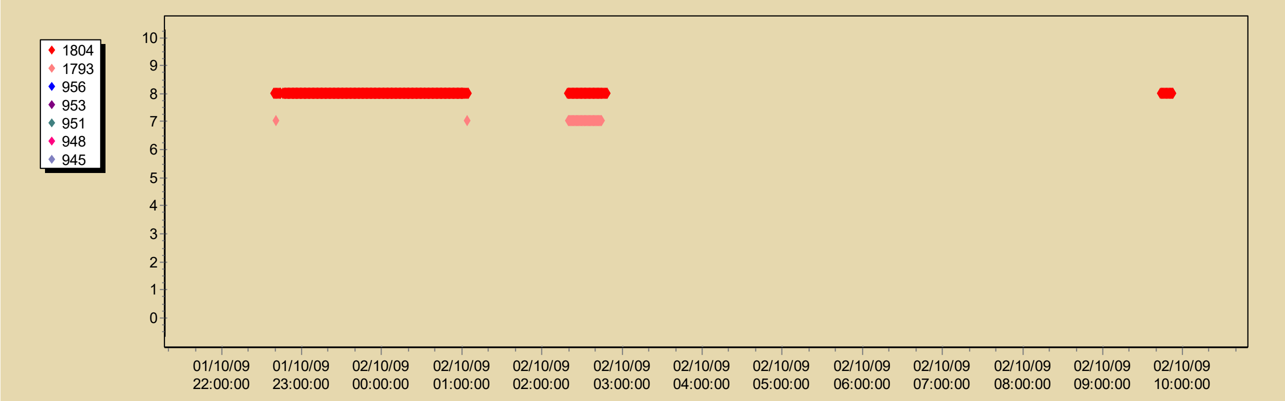
LIT1, PPT-LT1 (with OCN TM losses), UFTL



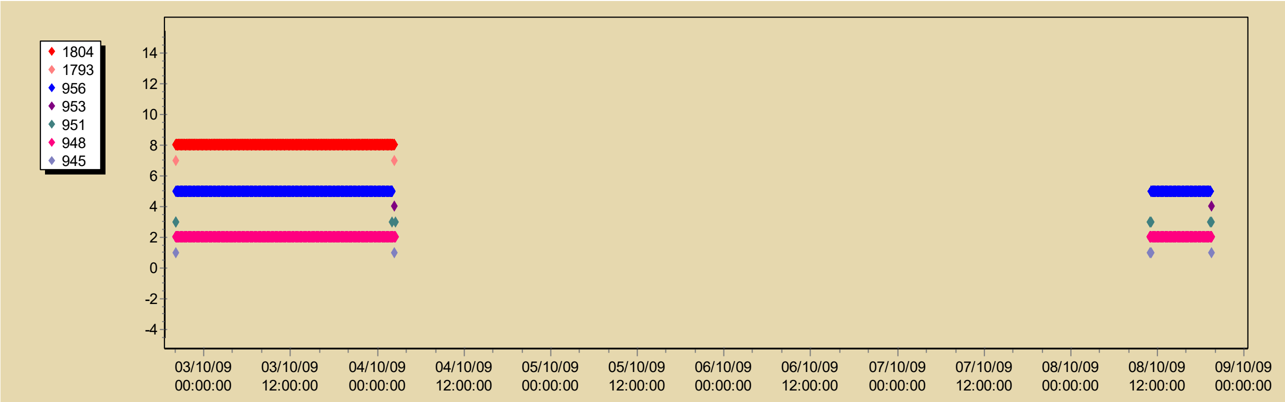
PPT-UL, PPT-UL1, FOP2, PPT-UL2, LIT2



LIT3, PPT-RF, FOP4, PPT-TT



LIT4, FOP3, PAFT2



PPT-LT2, OIT4

5.2 Data analysis

5.2.1 Performances

PC#10 Dates	29/09/09
Orbiter Functional test	
Noise Level (dB)	-23
GCW	0
Current (mA)	90
OCXO	130
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	25/-25
Temperature Range	9/18
Lander Functional test	24/9 12:00
Noise Level (dB)	-18
GCW	0
OCXO	131
Current (mA)	320
Main Spectral Line (MHz)	92.7/87.3
Main Spectral Line (dB)	0
S/P position (°)	25/-25
Temperature Range	-6/2
Ping-pong test	
S/P position (°)	24/-24
Ping-pong Orbiter signal	
Peak level (dB)	74.5
GCW	21
Current (mA)	100 (350)
OCXO	129
Peak Position	8/9
Temperature Range	4/15
Ping-pong Lander signal	
Peak level (dB)	77
GCW	23
Current (mA)	110 (350)
OCXO	131
Temperature Range	-11/-1

5.2.2 Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
UFT O	15	18	11	14	9	9
UFT L	-6	4	-6	-2	-6	-6
PPT (O)	5	15	4	10	5	7
PPT (L)	-11	-1	-11	-6	-11	-8

5.2.3 Telemetry and data integrity

During PC10, the data integrity is good for both Orbiter and Lander sides.

At the orbiter level numerous corruptions appear during the 3hours long ping pong test due to a too fast repetition cycle (see hereafter § long pingpong test for detailed analysis).

At lander level, there are a few data losses between LCN and CDMS (internal LCN numbering is discontinue and APID 1804 numbering is continue) especially during this 3h test (see idem).
On the Lander, it appears also a few TM lack between CDMS and the ground (discontinuous APID1804 numbering) the 25th of September from @ 5:11:11, from TM#818 to 852. To be investigated

A complete and detailed TM check is in progress in order to detect other minor data losses or corruptions.

5.3 Specific tests and actions

5.3.1 Validation of the turn On Accuracy Requirement (PPT-UL1)

At the beginning of a Consert sounding sequence, both electronics are synchronized in frequency and in time (same OCXO frequency and same time origin). To achieve successfully this tuning, both electronics have to be turned on at the same time with an accuracy of +/-10s relatively to an absolute time reference. These margins correspond to +/-20s OCN relatively to LCN. Before PC10, these turn-on accuracy margins have never been explored and validated on board with an accurate scheduler.

From a practical point of view, this test is based on sequences ACNS400 and ALNS410:
- The ACNS410 uses the OBCP “OCN turn-on”, which adds an additional delay of 5s. That means OCN OBCP 33 seconds before LCN AMST is equivalent to OCN starts 28 s before LCN.
- during PC8; we have noted a systematic additional delay of 2 seconds on the orbiter command channel coming possibly from the OBCP execution (test hereafter)

The result is measured from the CSA. This parameter gives the delay between the OCN turn on and the LCN turn on. It is NOT an absolute measurement; it is a relative measurement between both electronics: it is the difference between the Orbiter propagation delay and the Lander one.

	Delay in second	(positive when OCN before LCN)	
	Command (mission timeline)	Measured From CSA	difference
OCN Before	28	26.4	-1.6
	26	23.92	-2.08
	24	21.92	-2.08
	22	21	-1
	20	18	-2
	18	17.2	-0.8
	16	13.8	-2.2
	14	13.5	-0.5
			-0.98
LCN before	-14	-14.98	-0.94
	-16	-16.94	-0.7
	-18	-18.7	-1.15
	-20	-21.15	-1
	-22	-23	-1
	-24	-25	0
	-26	-26.1	tuning failed
	-28	-26.1	tuning failed

For the synchronization point of view, this test is successful: the synchronization margins are larger than the expected 20 s:
- 26 seconds when LCN starts before OCN
- Larger than 26 seconds when OCN starts before LCN.

It is a positive point to secure Consert operations around the nucleus.
This test has to be completed during PC12, in order determine the limit value when OCN stats before LCN.

Nevertheless the results of this test and especially the CSA show a unexpected random variation analyzed hereafter.

5.3.2 2 second delay on Turn-On OBCP and propagation

During the PC8 test a systematic delay of 2 seconds has been observed on the orbiter: the propagation delay of the commands is 2 seconds larger on the orbiter than on the Lander. 2 seconds is low enough to be compatible with the Consert margins but it is important to identify the source of this delay in order to evaluate its stability. The ESOC analysis has identified the OBCP manager as the sources of this delay. The goal of this test is to compare the propagation delay with and without the OBCP.
The result is conclusive with a CSA = +1s with direct command and CSA = -2s with OBCP's turn-on. The OBCP induces a delay of a few seconds;

5.3.3 CSA and propagation delays

The following table summarizes the CSA value for all the ping pong test during PC10 (excepted the PPT-UL1 – turn on accuracy given in the previous table)

Date	Hour	CSA (s)	Test	
24/09/2009	10:07:33	-2.1	PPT-LT1	CONSERT Long PingPong (3 hrs) with MM
25/09/2009	02:57:33	-2.0	PPT-UL	CONSERT PingPong Test - umbilical
25/09/2009	09:39:23	1.0	PPT-UL2	CONSERT OBCP 2 sec delay investigation
30/09/2009	13:22:33	-1.9	PPT-RF	CONSERT Ping Pong test using RF link
30/09/2009	20:28:23	-4.4	PPT-TT	CONSERT PingPong Test with ATTCs
04/10/2009	02:29:33	-1.9	PPT-LT2	CONSERT Long PingPong (30 hrs) with MM

During PC8, we have observed over 4 tests a very stable value of the CSA and so of the propagation delay of the TC in both the Rosetta and the Philae platforms (Values from -2.05 to -2.12 s).

During this test, we observe variability, apparently random.
- During the turn-on accuracy test, the residual variation is -0.7 to -2.08s in the same operational conditions (ie the same command mode with umbilical and orbiter scheduling only).
- In the absolute time tagged mode, the comparison between PC8 (-2.1s) delay and PC10 (-4.4s) delay shows a variation of -2.3 second. The PC10 result seems understandable with a slowed command link in ATTC mode (CDMS only) than with umbilical (orbiter scheduler + ess umbilical + cdms) and so LCN arrive "more before" OCN in ATTC than in UL test. What about the variation from PC8 to 10?
- The difference between OBCP and direct command is conclusive if we don't consider random variation…

Guarantee the stability of the propagation delay to guarantee the success of the synchro is one of our major objectives throughout all the cruise tests. We observe instability during this test and we want to characterize it in order to help to identify the source. It's the meaning of our request.
This delay is not critical for the Consert synchronization success but we have to be sure, it is a stable and limited delay.
Both CN instruments can be involved in this non conformance as it is clearly a unexpected behaviour: The propagating delays inside the lander or orbiter channel seems not stable.

The PC10 test is successful for the investigation of the turn-on and of the OBCP delay margins but the detected problem is larger than the frame of this test. The NCR RO-OCN-NCR-032 is open on this topic

5.3.4 FOP validation and Dump

Test ok.
TM dump to be included in the consert documentation.

5.3.5 Long Ping pong test: 30 hours

The 30h ping pong test is totally successful

For OCN, no problems, including TM integrity
For LCN, there is a few number of TM losses between LCN and CDMS (due to the Consert SW problem resolved by the future CDMS SW).

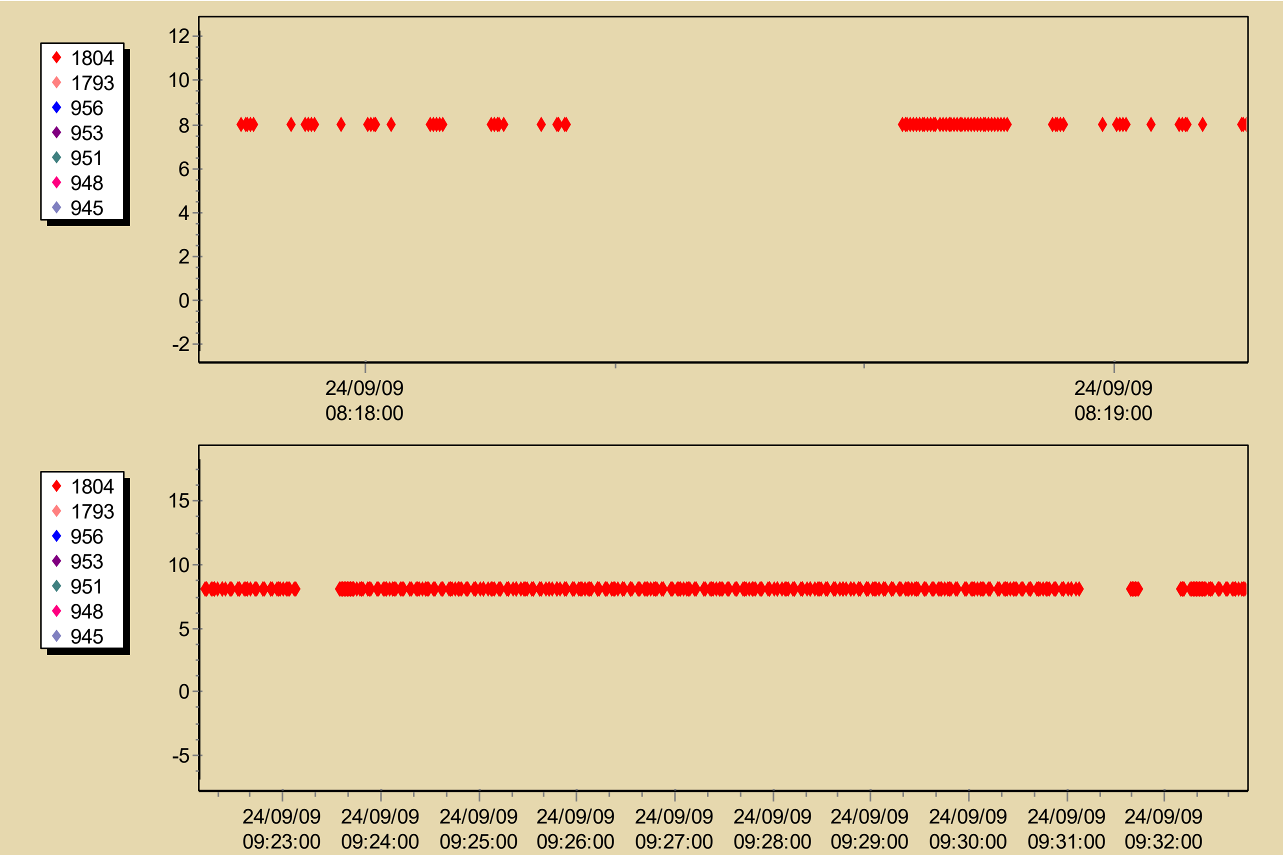
5.3.6 Long Ping pong test: 3 hours

Orbiter
During the 3hours Consert ping pong test, there are a lot of TM corruptions and losses on the Orbiter data. These losses correspond in TM rejection at DMS level (TM anomalous event emitted by DMS). It is the first time we meet this unexpected problem. It is also the first run of Consert with one sounding every second which is a limit for our instrument (ie 2 TM per second = 1 SCI + 1 HK.)

It could be due to a FIFO saturation at large data rate if the DMS interrogation rate is too low.
Further investigations show that the corruptions happened only from 9h30 to the end of the sequence (10h03) (ie only 20 % of the sequence. Can we indentify a work overload of the DMS on this slot?. It could be an explanation for the OCN FIFO saturation.

Lander
On the Lander, only 6 TM are corrupted or missing. This test is very succesfull for LCN...
A detailed analysis shows that the losses are correlated with the TM date given by the CDMS. During 20s the CDMS doesn't ask LCN for TM. The Consert FIFO is full and LCN blocks are lost. When the CDMS asks for TM, the FIFO is flushed and several TM's have been produced by CDMS in a short time.
In this case, these data losses are due to a FIFO overflow: a too large consert data flow with respect to the maximum delay between two Tm requests by CDMS.

For both LCN and OCN parts, the maximum data rate has to be analyzed in detail in order to secure our telemetry.



5.3.7 Orbiter Interference Test

September 20 from 15h35 to September 21 01H55
Interference Test with HGA movement, RP MIP & RP ICA. Duration 10hrs 25mins.

During these tests the observed perturbation are of the order of 1 dB.
At the beginning perturbation was observed during slew to GSEP and then when Midas was in passive check-out. (3h). After the MIP started for 3 hours the perturbations were also observed. All these perturbations were intermittent.
During the ICA tests the perturbations were not observed.
.

September 21 from 8h10 to 9h40
Interference Test with RN-COPS. Duration 1hr 35min.

At 8h30 RN-COPS is only, in Full Measurement mode.
The noise level was 1 dB higher (-22) than the minimum (-23). After 38 minutes of operation the noise level increased 1 dB more (-21) during about 20 minutes. What happened? Then the noise decreased to (-23dB) and this happened when RN was stopped.

September 21 from 9h45 to 15h.
Interference Test with MD, WOL & Pass AOS. Duration 5hrs 15mins

At the beginning MD operated during 15 minutes the increased noise level is of about 1.5 dB (-21.5).
Then at 10h30 WOL started during 2 hours and after the monitoring pass started for 8 hours. The noise level stayed increased (at -21 dB) until about 14h and than dropped to about -22.5.
What was stopped or changed at 14h?

October 8 from 11H to 19h35
Interference Test with TxRx Modes (RSI Passive Checkout). Duration 8hr 35mins.

The RSI checkout started at 11h25 and finished at 14h10. The noise level was at about -23 dB, no perturbation observed. At about 15h the perturbation (transient line) of about 1.5 dB during about 1h is observed.
What is the reason?

The level of perturbation of 1 to 2 dB is acceptable for Consert, however as the perturbations add then if each instrument add 1 dB finally the perturbation will be too large!

5.3.8 Lander Interference test

September 25 SD2 interference tests

The noise level before and after SD2 started is at about (-22dB) which is a normal noise level. During SD2 operations the noise level increased of about 5 dB.

Consert will be not able to operate with SD2.

October 1 Civa/Rolis and Mupus interference tests.
The tests started with Civa/Rolis heating (at 22h30) for very short period about 1 min then Civa/Rolis was stopped. Consert started data acquisition at about 22h48h and since the beginning the perturbation level was large increased by about 4 db (-18) to the normal level.

12 minutes later during Mupus operations the noise level increased up to -16 dB. At about 24h at the end of Mupus operations (TBC) the noise level decreased to -18 dB and stayed about constant for 80 minutes. After that it decreased to -22dB and this decrease started when Civa/Rolis stopped to operate.
The Civa started to operate at 0h10 and finished 26 minutes later. It seems that the high noise level do not coincide completely with Civa operations.
What instrument operated during this period?

5.4 Conclusions

The PC10 test is successful in term of instrument and also in term of operations. some points remain open and to be tested during PC12:

- The maximum sounding rate and the maximum data flow has to be analyzed for both LCN and OCN parts in order to secure the TM integrity.

- The propagation delay of the command has to be analyzed and test on board for both Rosetta and Philae platform in order to secure Consert synchronization. Especially the random variability of this parameter

The classical ping pong tests are fine (RF, ATTC, long) and will be reproduce during PC12 with the new CDMS SW version.

6 PC#9 - 02/09

6.1 Data analysis

PC#9 Dates	01/02/09
Orbiter Functional test	
Noise Level (dB)	- 23
GCW	0
Current (mA)	110
OCXO	130
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	+20/-20°
Temperature Range	6/12
Lander Functional test	
Noise Level (dB)	-21/-22
GCW	0
OCXO	131
Current (mA)	110
Main Spectral Line (MHz)	89
Main Spectral Line (dB)	-3
S/P position (°)	+20/-20
Temperature Range	-20/-7
Ping-pong test	19:10
S/P position (°)	+20/-20°
Ping-pong Orbiter signal	
Peak level (dB)	77/78
GCW	21
Current (mA)	95 (205)
OCXO	130
Peak Position	8/9
Temperature Range	4/14
Ping-pong Lander signal	
Peak level (dB)	79/81
GCW	24/25
Current (mA)	114
OCXO	131
Temperature Range	-20/-4

6.2 Temperature

	Ocxo Start	Ocxo end	Digi Start	Digi End	Ebox Start	Ebox end
UFT O	8	11.7	6	9.8	6	7
UFT L	-14	-14	-20.5	-20	-9	-7
PPT (O)	4	14	4	10	4	5
PPT (L)	-14	-11	-20.5	-17	-6	-4

6.3 Conclusion

PC 9 is ok, Consert works well.
We don’t have detected problems during this test.

The signal shape and the noise level seem coherent.
However the Consert power is about 3 dB above the value waited in comparison with the position of the solar panel.

7 PC#8 - 07/08

7.1 Main actions

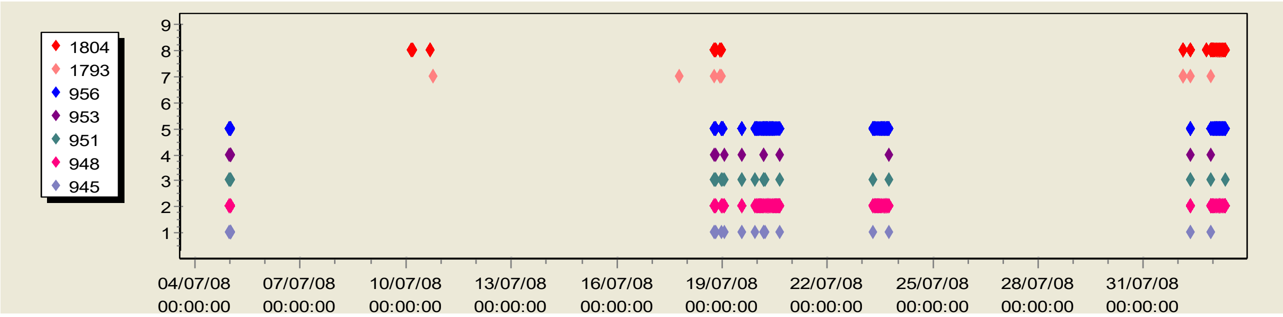
PC8 comports a large set of Consert test: RF link, Absolute Time Tag commands, OCN Interferences test, long ping pong. Theses operations are essential for the Consert comet operation preparation.

The FOP has been totally rewritten during PC8 preparation. The validation of the new FOP (comet-ready) has to be done during PC8. Some minor timing problem has been detected with nested sequences in May and seems without impact on the CN operations.

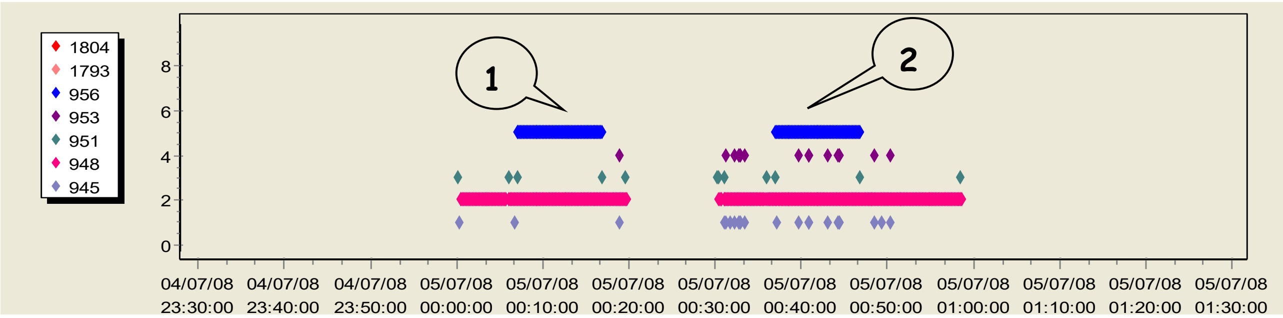
The CSA (Consert Synchronization Accuracy) has been implemented and have to be validated during PC8

7.1.1 Operation global planning

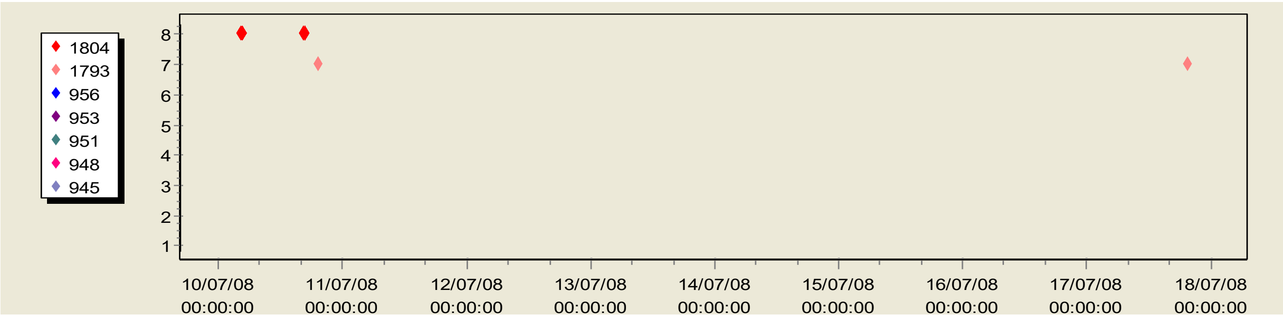
Step	Date	DOY	Start Time	Duration	End Time	Orbiter Activity	status
	5 July	187	00:00	00:30		OCN UFT	UFTO
	5 July	187	00:30	00:30		Test CRP (Ext AFT O)	CRPO
Step	**Date**		**Start Time**	**Duration**	**End Time**	**Lander Activity**	
D1-11	10 July	192	03:45:00	03:30:00	07:15:00	Philae Extended AFT "PC7 version" with CDMS SW 6.0	PAFT1
D1-25	10 July	192	15:45:00	03:30:00	19:15:00	Philae Extended AFT "PC7 version" with CDMS SW 6.98	PAFT2
	10 July	192	19:25:11	00:10:00		Philae AMST update	PUD1
	17 July	199	19:30:00	00:10:00		Time Tagged sequence upload in CDMS	PUD2
D6-21	18 July	200	18:40:00	00:30:00	19:10:00	CONSERT Lander Verification	UFTL
D6-22	18 July	200	19:10:00	00:30:00	19:40:00	CONSERT PingPong Test on Umbilical link	PPT-UL
D6-23	18 July	200	19:40:00	00:30:00	20:10:00	CONSERT PingPong Test with ATTCs	PPT-TT
D6-27	18 July	200	23:10:00	00:50:00	00:00:00	CONSERT Lander Extended UFT	CRPL1
D7-01	19 July	201	00:00:00	02:00:00	02:00:00	CONSERT Orbiter Lander Interference Test with Lander	OIT1
Step	**Date**		**Start Time**	**Duration**	**End Time**	**Orbiter Activity**	
	19 July	201	13:40:		14:10	Interferences IC15	OIT2
	19 July	201	23:25		15:50	Interferences IC29 – 39 (3 sequences)	OIT3
	23 July	205	07:30		18:30	Virtis puis Tx/Rx	OIT4
Step	**Date**		**Start Time**	**Duration**	**End Time**	**Lander Activity**	
~~D9-20~~	~~29 July~~		~~22:00:00~~	~~11:00:00~~	~~09:00:00~~	~~CONSERT Long Test MM RAM~~	~~canceled~~
	01 August	214	03:00:00	00:50:00	04:00:00	CONSERT Lander Extended UFT	CRPL2
D12-02	01 August	214	07:00:00	01:30:00	09:00:00	CONSERT PingPong Test on RF link	PPT-RF
D12-20	01 August	214	18:46:00	03:30:00	22:16:00	ExtAFT "PC8 version" (new ROLIS LFT)	PAFT3
	01 August	214	22:00:00	11:00:00	09:00:00	CONSERT Long Test MM RAM	PPT-LT



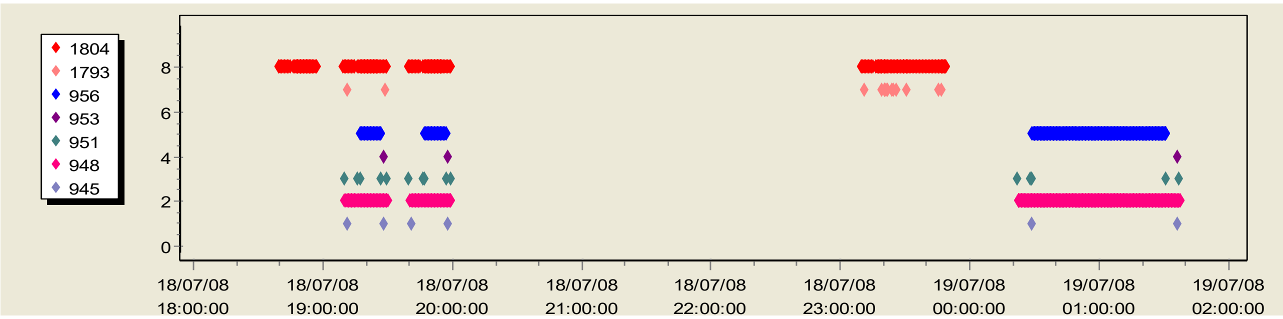
Received TM's as function of time: All PC8 data and operations



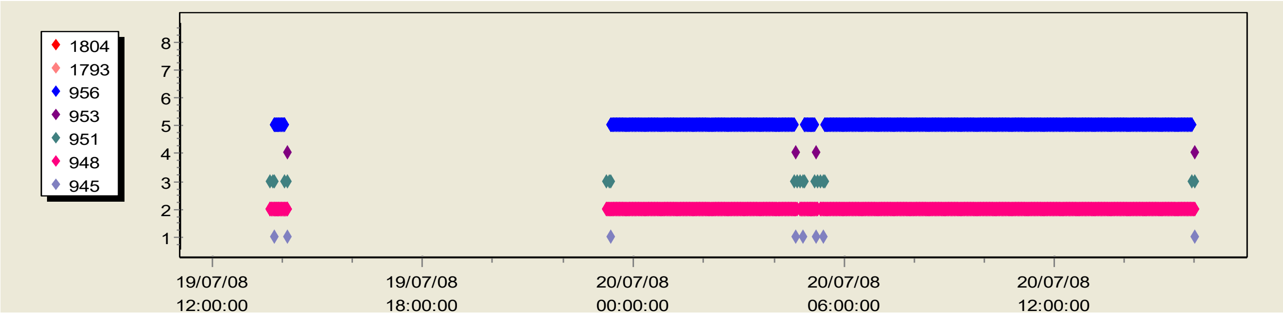
UFTO, CRPO



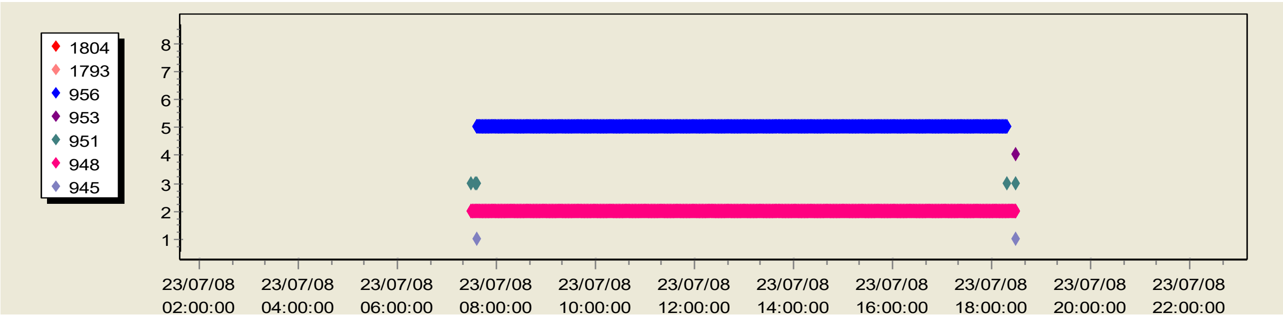
PAFT1, PAFT2, PUD1, PUD2



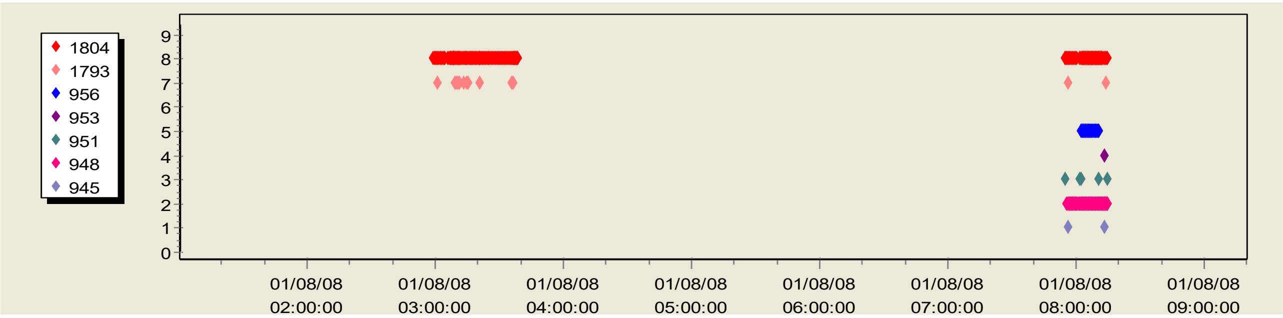
UFTL, PPT-UL, PPT-TT, CRPL1, OIT1



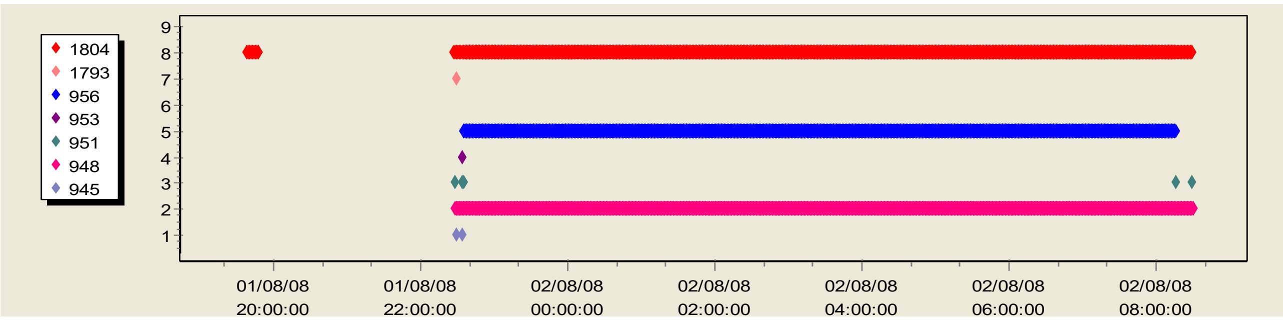
OIT2, OIT3



OIT4



CRPL2, PPT-RF



PAFT3, PPT-LT

7.2 Data analysis

7.2.1 Performances

PC#8 Dates	25/09/08
Orbiter Functional test	5/07 00:07
Noise Level (dB)	- 23
GCW	0
Current (mA)	100
OCXO	130
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	+60/-60°
Temperature Range	+6/+9
Lander Functional test	18/7 18:40
Noise Level (dB)	-18.5
GCW	0
OCXO	131
Current (mA)	110
Main Spectral Line (MHz)	87.7
Main Spectral Line (dB)	-3
S/P position (°)	+60/-60
Temperature Range	-9/+1
Ping-pong test	19:10
S/P position (°)	+60/-60°
Ping-pong Orbiter signal	
Peak level (dB)	75
GCW	21
Current (mA)	95 (205)
OCXO	129
Peak Position	5/6
Temperature Range	4/14
Ping-pong Lander signal	
Peak level (dB)	78
GCW	22
Current (mA)	114
OCXO	131
Temperature Range	-6/3

Temperature

	Ocxo Start	Ocxo end	Digi Start	Digi End	Ebox Start	Ebox end
UFT O	8	11.7	6	9.8	6	7
CRP O	11.7	17	9.8	13.6	7	8
AFT Philae SW6.0	-30	-20			-28	
AFT Philae SW 6.98	-20	-20			-24	
UFT L	-9	1	-9	-3	-9	-7
PPT (O)	4	14	4	10	4	5
PPT (L)	-6	3	-6	1	-6	-4
PP ATTC (O)	8	13	6	10	5	6
PP ATTC (L)	-1	6	-4	1	-4	-3
CRP L	1.3	5.7	-6	-1	-7	-4
Orb Inter with Philae						

7.2.2 *Telemetry and data integrity*

	TM							OCN	LCN							CSA
	945	948	951	953	956	1804	1793	Sound.	TM	T1	T2	T3	T4	Sound.	Status	(s)
UFTO	3	233	5(2)	1	120										ok	-26.05
CRPO	23(1)	341	7(1)	19(1)	120										ok	-26,21
PAFT1						40	0		40	39	1	0	0		**ok**	
PAFT2						40	0		40	39	1	0	0		**ok**	
PUD1						0	4									
PUD2						0	2									
UFTL						135	0		195	173	2	20	0	100	ok	
PPT-UL	2	224	5(1)	1	120	142	2	120	223	201	2	20	0	100	ok	-2.06
PPT-TT	2	217	5(1)	1	120	140	0	120	214	192	2	20	0	100	ok	-2.09
CRPL1						190	12		457(5)	435(3)	11(1)	10(1)	1	170	Pb	
OIT1	2(1)	2717	5(1)	1	2250			2250							ok	-26.21
OIT2	2(1)	595	5(1)	1	361			361							ok	-26.21
OIT3.1	2(1)	3931	5(1)	1	3795			3795							ok	-26.21
OIT3.2	2(1)	595	5(1)	1	361			361							ok	-26.21
OIT3.3	2(1)	7749	5(1)	1	7605			7605							ok	-26.21
OIT4	3	7998	6	1	7780										ok	-26.21
CRPL2						194			460(2)	436(2)	12	11	1	170	ok	
PPT-RF	2	222	6	1	100	157	2	100	221	195	2	24	0	120	ok	-2.12
PAFT3						40	0		40	39	1	0	0	0	**ok**	
PPT-LT	2	12412	5(1)	1	12000	12739	1(1)	12000	12399(4)	10001	2	2396(4)	0			-2.06

The number of missing TM is written between parentheses in the table after the number of received TM. For every operation out of visibility, the first event (apid 951) which is emitted before time update is missing due to a wrong time (sometimes the same for the first ACK 945).
For Lander TM Type 3, the number written between parentheses corresponds to corrupted TM with block losses between LCN and CDMS.

The detailed analysis of the TM losses for CRPL 1&2 is done in § 7.3.2.4 and for PPT-LT in § 7.3.5.1.

7.2.3 S/P positions

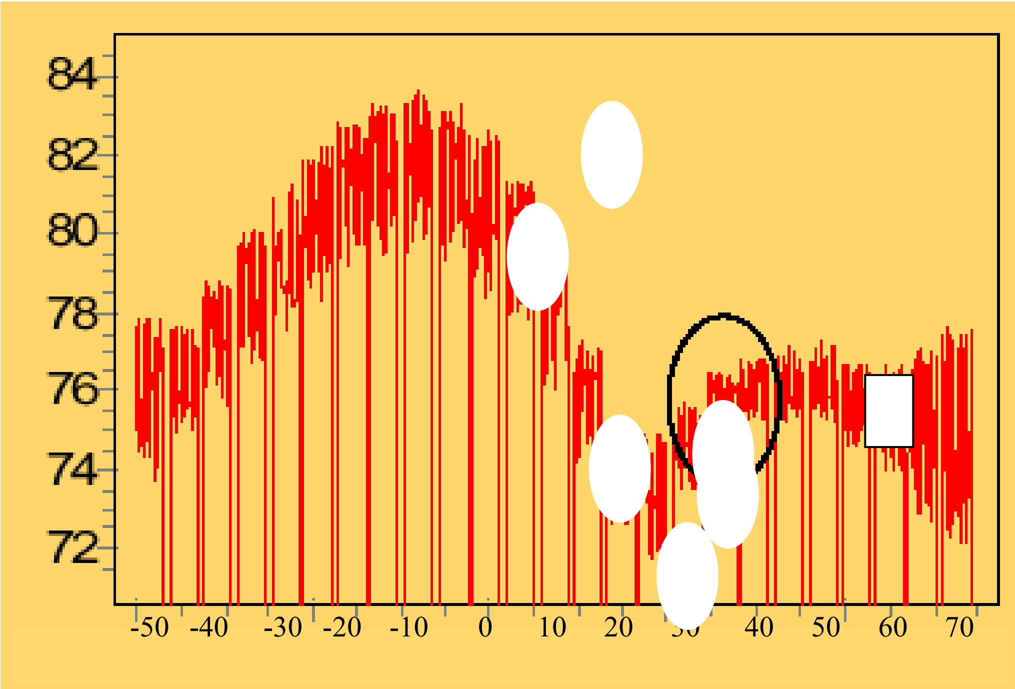


Figure 1: Consert power versus S/P position from -50/50 to +70/70° by 5° steps and power measured during the different PC tests.

7.2.4 Conclusions

The data analysis of the test data shows nominal performances and operations for OCN and LCN.

There is no unexpected TM-losses on the orbiter side: some minor modifications in the Fop has to be done in order to avoid some ACK losses before time update.

On the Lander, there is a few losses during long ping pong test using mass memory. These limited losses are acceptable for Consert.

The losses during CRPL have to be investigated in delay.

7.3 Specific tests and actions

7.3.1 CSA and Time synchronization

7.3.1.1 Introduction to the CSA

The CSA (Consert synchronization accuracy) is a new Consert internal parameter which measure the delay occurred between the turn on of both Consert lander and orbiter parameters. Consert requires a turn on accuracy of +/- 10 seconds. After turn on, both Consert orbiter electronics is tuned and resynchronized on the lander one by an RF carrier. The CSA parameter gives the delay between the end of this resynchronization sequence and the theoretical duration. So, it's the difference between the propagation delay in both lander and orbiter channels:
- A positive CSA corresponds in a larger delay in the Lander channel than in the orbiter one (LCN start late and OCN wait LCN to be synchronized)
- A negative CSA corresponds in a larger delay in the Orbiter Chanel (OCN starts late and is synchronized before the expected date).

7.3.1.2 CSA

Here after are all the values of the CSA measured during PC8.

Jour	Heure	TT ofset	CSA (s)	
05/07/2008	00:18:56	0003AADE	-26.2111232	UFTO
05/07/2008	00:32:53	00000000	-420.000563	CRPO
05/07/2008	00:33:32	00000000	-420.000563	CRPO
05/07/2008	00:39:45	0003AADE	-26.2111232	CRPO
05/07/2008	00:40:56	0003AADE	-26.2111232	CRPO
05/07/2008	00:43:13	00000000	-420.000563	CRPO
05/07/2008	00:44:25	00000000	-420.000563	CRPO
18/07/2008	19:28:36	0003E474	-2.0578304	PPT UL
18/07/2008	19:58:26	0003E460	-2.0905984	PPT TT
19/07/2008	01:36:26	0003AADD	-26.2127616	OIT
19/07/2008	14:08:56	0003AADD	-26.2127616	OIT
20/07/2008	04:38:56	0003AADD	-26.2127616	OIT
20/07/2008	05:13:56	0003AADD	-26.2127616	OIT
20/07/2008	15:58:56	0003AADE	-26.2111232	OIT
23/07/2008	18:29:26	0003AADE	-26.2111232	OIT
01/08/2008	08:13:26	0003E44A	-2.1266432	PPT-RF
01/08/2008	22:34:56	0003E475	-2.056192	PPT-LT

This set of values can be analyzed as follow:

- When OCN operate alone (UFTO, CRPO, OIT), the CSA equals -26.21s as observed on the Qualification Model in our lab. This value means 34 seconds between the theoretical LCN start-tuning date and the end of the OCN tuning algorithm in case of no carrier detection.

In this 34 s, OCN wait 21 s (Mission Table parameter) and then starts to tune: the orbiter frequency drifts from the lower frequency to the upper one without carrier detection and

then the tuning stops. This second phase times 13 s (compatible with the 15 s as written in the OCN ADP).
This value is calculated in the OCN referential only and is independent of the OCN turn-on date. It just varies of 1 Tic (1 level in raw value) from run to run.

- When the CSA is dumped before tuning or after time-update, the raw value is 0, corresponding to -420s. (360 s warm-up before LCN tuning + 60 s LCN Tuning)

- When OCN and LCN are operating together, the value is about -2.1 seconds as observed during PPT UL, TT, RF and LT.
These -2 seconds correspond in OCN stating 2 seconds AFTER LCN and could corresponds in a propagation delay inside the orbiter power unit.

7.3.1.3 <u>PPT-UL (umbilical link)</u>

The time correlation is 36 second during operation.
The CSA is -2.06 s

	APID	#	Times				
			CN	OBT	Zoulou	Stack	Equiv. T0
OCN							
TC OBCP ON						*19:10:05*	*19:10:10*
TM Ping	951	2		19:10:19	19:10:55	19:10:50	n.a.
First OCN HK	948	1	00:01:00	19:10:37	19:11:13		19:10:13
MT ACK	945	1		19:11:24	19:12:00	19:12:00	19:10:10
LCN							
TC Swith ON						*19:10:10*	*19:10:10*
State vector change	1719	1953		19:09:34	19:10:10	19:10:10	19:10:10
First LCN HK	1804	136	00:00:14	19:09:49	19:10:25		19:10:10
ESS MT ACK	1793	3		19:11:32	19:12:08		
MT ACK	1804	143	00:01:59	19:11:34	19:12:10	19:12:10	19:10:11

The mission Time line:

```
ZDMX0041  Define Nom/Red branch for CONSERT       ACNS320A 08.199.08.47.52  08.200.19.10.00.000
ZSKA8021  START CONSERT ON OBCP                   ACNS960A 08.199.08.47.52  08.200.19.10.05.000
ZLC90003  Swith ON CONSERT                        ACNS320A 08.199.08.47.55  08.200.19.10.10.000
ZCN19201  Mission Table Update                    ACNS320A 08.199.08.47.55  08.200.19.12.00.000
ZLN00112  CONSERT TC                              ACNS320A 08.199.08.47.58  08.200.19.12.10.000
ZDM10164  Remove APID from Packets Store Def      ACNS242A 08.199.08.47.58  08.200.19.29.10.000
ZDM10163  Add APID to Packets Store Definition    ACNS242A 08.199.08.47.58  08.200.19.29.11.000
ZCN00605  Dump Memory                             ACNS242A 08.199.08.47.58  08.200.19.29.12.000
ZDM10164  Remove APID from Packets Store Def      ACNS242A 08.199.08.47.58  08.200.19.29.22.000
ZDM10163  Add APID to Packets Store Definition    ACNS242A 08.199.08.48.02  08.200.19.29.23.000
ZLN00112  CONSERT TC                              ALNS143A 08.199.08.48.02  08.200.19.29.33.000
ZSKA8022  START CONSERT OFF OBCP                  ACNS980A 08.199.08.48.02  08.200.19.30.33.000
ZLC90000  Lander to Normal Mode                   ACNS320A 08.199.08.48.05  08.200.19.30.43.000
```

For OCN, with this classical pingpong, we observe a delay of 3 seconds in the turn on. This delay is measured with an accuracy of 1 second and is coherent with the CSA = -2.06s.
From the Mission Table Update ACK, we observe no delay in the timeline execution. The mission table update is sent at 19:12:00 as planed.

The delay observed could come from the OBCP execution due to the fact that the "connection test request" nested at the end of the Consert ON OBCP arrives with a 6 second delay (The sum of all the delay written in the OBCP is 45s).

So observed delay is apparently due to the OBCP execution or may be to the propagation delay in the DPU of the orbiter.

During the PC8 preparation and the new fop validation on the Rosetta eqm, we have noted a similar delay of 8 seconds in the turn on.

For LCN, we observe no delay, by regards to the 1s accuracy of the time estimation from TM/TC. The scheduling is right and LCN is turn on at 19:10:10 as expected.
The MT ACK from ESS is 2 seconds before the expected date form the time line. This unexpected time has to be explain and can come from a poor time quality on board of the ESS. We don't observe the same shift between the execution time and acknowledgment time of the LCN memory dump TC @ 19:29:33.
The MT table ACK from LCN seems indicating a delay of 1 second in the turn on but we are at the limit of the time estimation accuracy.

7.3.1.4 PPT-TT (absolute time tag commands)

The time correlation is 36 second during operation.
The CSA is -2.09 s

	APID	#	Times				
			CN	OBT	Zoulou	Stack	Equiv. T0
OCN							
TC OBCP ON						*19:40:05*	*19:40:10*
TM Ping	951	2		19:40:20	19:40:56	19:40:50	n.a.
First OCN HK	948	1	00:01:00	19:40:37	19:41:13		19:40:13
MT ACK	945	1		19:41:24	19:42:00	19:42:00	19:40:10
LCN							
TC Swith ON						*19:40:10*	*19:40:10*
State vector change	1719	1967		19:39:34	19:40:10	19:40:10	19:40:10
First LCN HK	1804	278	00:00:14	19:39:49	19:40:25		19:40:10
MT ACK	1804	285	00:01:48	19:41:23	19:41:59	19:41:59	19:40:11

The mission Time line:

```
ZSKA8021  START CONSERT ON OBCP                ACNS960A 08.199.08.48.05  08.200.19.40.05.000
ZCN19201  Mission Table Update                 ACNS260A 08.199.08.48.08  08.200.19.42.00.000
ZDM10164  Remove APID from Packets Store Def   ACNS242A 08.199.08.48.08  08.200.19.59.00.000
ZDM10163  Add APID to Packets Store Definition ACNS242A 08.199.08.48.08  08.200.19.59.01.000
ZCN00605  Dump Memory                          ACNS242A 08.199.08.48.08  08.200.19.59.02.000
ZDM10164  Remove APID from Packets Store Def   ACNS242A 08.199.08.48.10  08.200.19.59.12.000
ZDM10163  Add APID to Packets Store Definition ACNS242A 08.199.08.48.10  08.200.19.59.13.000
```

The OCN timing is similar to the one observed in the previous test with the -2 seconds delay.

The LCN operations are fine with a turn on at the due date and the Mission table update at 19:41:23. This date corresponds in the date planned in the TC. So, the Mission Table update is correctly executed at the due date

The absolute Time tagged test is perfectly compliant. The large CSA could indicate a lower propagation delay for the Philae channel: Philae scheduling is faster than Rosetta scheduling + umbilical transmission + CDMS execution.

7.3.1.5 PPT-RF (RF link test)

The time correlation is 36 second during operation.
The CSA is -2.12 s

	APID	#	Times				
			CN	OBT	Zoulou	Stack	Equiv. T0
OCN							
TC OBCP ON						*07:55:05*	*07:55:10*
TM Ping	951	2		07:55:20	07:55:56	07:55:50	
First OCN HK	948	1	00:01:00	07:55:37	07:56:13		07:55:13
MT ACK	945	1		07:56:24	07:57:00	07:57:00	07:55:10
LCN							
TC Swith ON						*07:55:10*	*07:55:10*
State vector change	1719	2436		07:54:34	07:55:10	07:55:10	07:55:10
First LCN HK	1804	195	00:00:14	07:54:48	07:55:24		07:55:09
MT ACK	1804	202	00:01:59	07:56:33	07:57:09	07:57:10	07:55:10

The mission Time line:

```
ZESF0014  TCLDRPickUp                             AESF004B 08.203.09.21.28  08.214.07.44.00.000
ZLC80007  Fast CDMS/PSS HK                        AESF004B 08.203.09.21.31  08.214.07.46.00.000
ZDMX0041  Define Nom/Red branch for CONSERT       ACNS420A 08.203.09.21.31  08.214.07.55.00.000
ZSKA8021  START CONSERT ON OBCP                   ACNS960A 08.203.09.21.31  08.214.07.55.05.000
ZLC19265  Executing an AMST                       ACNS420A 08.203.09.21.34  08.214.07.55.10.000
ZCN19201  Mission Table Update                    ACNS420A 08.203.09.21.34  08.214.07.57.00.000
ZLN00112  CONSERT TC                              ACNS420A 08.203.09.21.37  08.214.07.57.10.000
ZDM10164  Remove APID from Packets Store Def      ACNS242A 08.203.09.21.37  08.214.08.14.00.000
ZDM10163  Add APID to Packets Store Definition    ACNS242A 08.203.09.21.37  08.214.08.14.01.000
ZCN00605  Dump Memory                             ACNS242A 08.203.09.21.37  08.214.08.14.02.000
ZDM10164  Remove APID from Packets Store Def      ACNS242A 08.203.09.21.37  08.214.08.14.12.000
ZDM10163  Add APID to Packets Store Definition    ACNS242A 08.203.09.21.40  08.214.08.14.13.000
ZLN00112  CONSERT TC                              ALNS143A 08.203.09.21.40  08.214.08.14.23.000
ZSKA8022  START CONSERT OFF OBCP                  ACNS980A 08.203.09.21.40  08.214.08.15.23.000
ZLC90000  Lander to Normal Mode                   ACNS420B 08.203.09.21.43  08.214.08.15.33.000
ZDM10122  SSMM-Stop Retrieval from a File         ADMF160F 08.214.08.00.00  08.214.08.15.49.222
ZDM10121  SSMM-Read Pckt Store Cont for Pckt RangeADMF160E 08.214.08.00.01  08.214.08.15.50.302
```

The OCN operations present the -2 second delay.

The LCN operations are fine with good synchronization. The small increase of the CSA is unexpected if significant.

7.3.1.6 Other OCN operations

In the following table comparing the observed time and the expected time of the first OCN HK for all the operations, on can observe a systematic delay of 2~3 second.
On Board Time of the first OCN HK's for all the operations

		OBT	Zoulou	Expected
UFTO	05/07/08	00:00:32	00:01:08	00:00:05
CRPO	05/07/08	00:30:32	00:31:08	00:31:05
PPT-UL	18/07/08	19:10:37	19:11:13	19:11:10
PPT-TT	18/07/08	19:40:37	19:41:13	19:41:10
OIT1	19/07/08	00:22:32	00:23:08	00:23:05
OIT2	19/07/08	13:40:32	13:41:08	13:41:05
OIT3	19/07/08	23:15:32	23:16:08	23:16:05
OIT3	20/07/08	04:45:32	04:46:08	04:46:05
OIT3	20/07/08	05:20:32	05:21:08	05:21:05
OIT4	23/07/08	07:30:32	07:31:08	07:31:05
PPT-RF	01/08/08	07:55:37	07:56:13	07:56:10
PPT-LT	01/08/08	22:28:37	22:29:13	22:29:10

The following table shows the response to the connectivity test included in the OBCP.

One can see an additional delay of 5-6 second for execution of the "connectivity test" by the OBCP (by comparison to the internal delay included in the OBCP). That allows us to attribute the observed delay of the turn-on to the OBCP manager.

		OBT	Zoulou	Expected
UFTO	05/07/08	00:00:15	00:00:51	00:00:45
CRPO	05/07/08	00:30:15	00:30:51	00:30:45
PPT-UL	18/07/08	19:10:19	19:10:55	19:10:50
PPT-TT	18/07/08	19:40:20	19:40:56	19:40:50
OIT1	19/07/08	00:22:15	00:22:51	00:22:45
OIT2	19/07/08	13:40:15	13:40:51	13:40:45
OIT3	19/07/08	23:15:14	23:15:50	23:15:45
OIT3	20/07/08	04:45:15	04:45:51	04:45:45
OIT3	20/07/08	05:20:15	05:20:51	05:20:45
OIT4	23/07/08	07:30:15	07:30:51	07:30:45
PPT-RF	01/08/08	07:55:20	07:55:56	07:55:50
PPT-LT	01/08/08	22:28:20	22:28:56	22:28:50

7.3.1.7 Conclusions

The Lander synchronization is fine during all the operation including Time Tagged commands and RF link.

The Orbiter operation shows a delay of 2~3 seconds. This delay seems stable and may be attributed to the OBCP management. Further investigations or tests have to secure this point. Test with ACNS950 has to be done to clarify (Consert on with direct TC) this point.

The CSA is an efficient parameter to estimate the synchronization accuracy and has to be used in routine.
The timing deduced from the ESS ACK has to be clarified.

7.3.2 New FOP

7.3.2.1 ACNS300 (UFTO)

The ping included in the ACNS300 @ 00:00:30 is redundant with the one included in the OBCP. This "connecteivity test" is done before the time update and so generates a response with a wrong timing. This TC has to be removed from ACNS300 and some timing has to be modified.

7.3.2.2 ACNS301 (CRPO)

A preliminary analysis shows this test is successful for ACNS301 and the nested sequences. Some timing modifications have to be done taking into account the nested sequences in order to clarify the scheduling and simplify the data analysis.
The analysis has to be completed in order to extract a procedure useful for instrument validation.

7.3.2.3 ALNS310 (UFTL)

Ok (no modifications for PC8)

7.3.2.4 ALNS311 (CRPL)

The first test of the ALNS311 (18 July) presented some TM corruption between LCN and the CDMS. These lacks are directly related to the Consert type 2 TM and some hypotheses about reasons have been proposed. The replay of this test (CRPL2 – 1/8/9) has partially answered to the open questions.

In CRPL1, 1 TM type 3 is corrupted (12 block missing) & 1 TM type 2 is missing (APID 1084 #463) and three times 1 TM type 1 is missing (APID 1804 # 478, 525 & 579)

In CPRL2, we observe 2 TM losses. For each it is a TM type 1 happened just before a TM type 2 (but not located in the 3° position as previously observed during CRPL1). CDMS causes and LCN causes can be envisaged. Losses are directly correlated to the TC reception or ACK. We have to analyze this in more detail, in particular to see if the TM losses observed during commissioning were also related to TC and ACK.

To conclude this paragraph, This NCR is not critical for CNOT. Consert can be operated without inconveniences. **Nevertheless, it is important for us to understand and to secure this problem.**
The CRP has to be modified in order to exclude this kind of losses. From a philosophical point of view, we can't imagine a CRP with its own foreseen errors…

7.3.2.5 ALNS320 (PPT-UL)

Ok
No Ack for the memory check by OBCP.

7.3.2.6 ALNS400 (OIT1 to 4)

Ok
Minor timing modification TDB for Mission Table update

7.3.2.7 ALNS410

To be tested

7.3.2.8 ALNS420 (PPT-RF, PPT-LT)

Ok

7.3.2.9 Conclusion

The following individual sequences have been successfully tested during PC8 as nested or individual sequences:
ALNS100, ALNS131, ALNS132, ALNS133, ALNS141, ALNS143
ACNS201, ACNS210, ACNS220, ACNS230, ACNS240, ACNS241, ACNS242, ACNS250
ALNS900, ACNS960 ACNS980

The following sequences haven't been tested during PC8:
ACNS200 (direct TC)
ACNS260 (Mission Table update)
ACNS950 (On by TC)
ACNS970 (Off by TC)

ALNS410 has to be tested

All the tested sequences are fine. Minor modifications have to be done in order to take into account timing of the nested sequences.
Some TC's have to be delay (minimum 1 minute after OCN on) in order to avoid ACK without valid dating.

User Manuel has to be updated in order to include a description of the typical data set for the new FOP, especially for the CRP's.

7.3.3 Lander AFT with new CDMS SW

7.3.3.1 AFT SW 6.0 (10 July 08)

LCN is on @ 10/07/09 04:34:28 for 10 minutes
40 TM blocks received without losses
The Dump before turn of is ok
The LCN external temperature is around -28°

The LCN internal temperature increases from -30° to -20 during operations.

7.3.3.2 AFT SW 6.98 (10 July 08)

LCN is on @ 10/07/09 16:39:30 for 10 minutes
40 TM blocks received without losses
The Dump before turn of is ok
The LCN external temperature is around -24°
The LCN internal temperature around -20°

7.3.3.3 AFT SW 6.98 (1 August 08)

LCN is on @ 01/08/09 19:38:30 for 10 minutes
40 TM blocks received without losses
The Dump before turn of is ok
The LCN external temperature is around -5°
The LCN internal temperature around 0°

7.3.3.4 Other telemetry

A corrupted TM from TCU (APID 1780) has given a corrupted temperature for LCN Ebox 10/07/09 @ 9:00. It is the last TM 1780 before the shift to the nominal 1588.

For LN ACK (apid 1793) are emitted by ESS @ 19:24 corresponding in the update of the AMST.

```
ZLN00112  CONSERT TC                          ALNS100A 08.184.09.52.25  08.192.19.25.11.000
  PLND0006CONS TC DescriptorWrdCnt            Raw      Hex              5
  PLND0009CONS TC UsrCmdWrdCnt                Raw      Hex              A
  PLNG0002CONSERT TC Parameter 2              Raw      Hex              35000001
  PLNG0003CONSERT TC Parameter 3              Raw      Hex              F00
  PLNG0004CONSERT TC Parameter 4              Raw      Hex              670301
  PLNG0005CONSERT TC Parameter 5              Raw      Hex              35A4F
  PLNG0006CONSERT TC Parameter 6              Raw      Hex              8F0D
  PLNG0007CONSERT TC Parameter 7              Raw      Hex              BCD0064
  PLNG0008CONSERT TC Parameter 8              Raw      Hex              83050000
  PLNG0009CONSERT TC Parameter 9              Raw      Hex              1F000000
ZLN00112  CONSERT TC                          ALNS100A 08.184.09.52.28  08.192.19.25.12.000
  PLND0006CONS TC DescriptorWrdCnt            Raw      Hex              5
  PLND0009CONS TC UsrCmdWrdCnt                Raw      Hex              2
  PLNG0002CONSERT TC Parameter 2              Raw      Hex              3500000B
  PLNG0003CONSERT TC Parameter 3              Raw      Hex              83E0
  PLNG0004CONSERT TC Parameter 4              Raw      Hex              670440
  PLNG0005CONSERT TC Parameter 5              Raw      Hex              C1A0000
ZLN00112  CONSERT TC                          ALNS100A 08.184.09.52.28  08.192.19.25.13.000
  PLND0006CONS TC DescriptorWrdCnt            Raw      Hex              5
  PLND0009CONS TC UsrCmdWrdCnt                Raw      Hex              2
  PLNG0002CONSERT TC Parameter 2              Raw      Hex              1500000B
  PLNG0003CONSERT TC Parameter 3              Raw      Hex              4600
  PLNG0004CONSERT TC Parameter 4              Raw      Hex              2A0000
ZLN00112  CONSERT TC                          ALNS100A 08.184.09.52.31  08.192.19.25.14.000
  PLND0006CONS TC DescriptorWrdCnt            Raw      Hex              5
  PLND0009CONS TC UsrCmdWrdCnt                Raw      Hex              2
  PLNG0002CONSERT TC Parameter 2              Raw      Hex              1500000B
  PLNG0003CONSERT TC Parameter 3              Raw      Hex              F00
  PLNG0004CONSERT TC Parameter 4              Raw      Hex              1F80440
  PLNG0005CONSERT TC Parameter 5              Raw      Hex              C1A0000
```

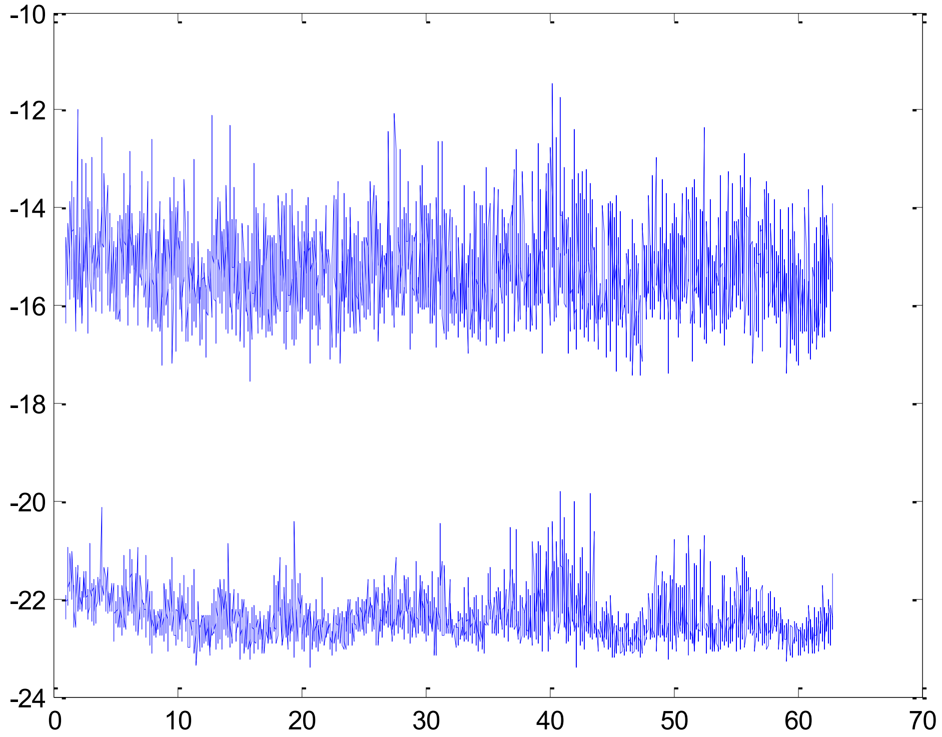
7.3.3.5 Conclusion

Consert AFT is OK

7.3.4 Interferences

The result of the interference test will be done in a separate report.

For the OCN versus ESS test, the data shows a limited increase of the noise of about 2dB. This increase is similar for both modes: link requested and link established.



19/07/2008 inteference with TxRxESS de LZ 00h29 a 1h42 observed nois level. The lower plot is the average noise and upper one is the instantaneous noise.

7.3.5 Long ping pong test

7.3.5.1 TM integrity

The PPT-LT was done using the mass memory of the Lander. During this test we observe 4 TM type 3 corruptions where some block are lost before the writing of the TM by the CDMS. In other words, there is a discontinuity in the LCN block and no discontinuity in the APID 1804 numbering.

This losses don't correspond in "zero padding" as observed during PC6. There are no discontinuities in the APID1804 TM.

The corruptions are:
- APID 1804 # 1231 – LCN TM #883 : 8 blocks missing
- APID 1804 # 1314 – LCN TM #963 : 4 blocks missing
- APID 1804 # 7249 – LCN TM #6617 : 11 blocks missing
- APID 1804 # 7331 – LCN TM #6697 : 8 blocks missing

In all cases, the missing blocks are apparently located at the end of the TM type 3 and the block before are not corrupted.

One can remark that the first and the second corruption are separated by 80 LCN block = 3 minutes and 53 seconds. It is the same for the third and the fourth corruptions.

As it is explain in the data TM integrity analysis, these few corruptions are acceptable for Consert.

7.3.5.2 Clock synchronisation

Form this test, we extract the time stamped by the CDMS on the LCN TM in order to compare CDMS clock to LCN clock. This calculation is done for the soundings which are in fourth positions in the APID 1804 TM. Only these soundings are processed at OCN level.

During this operation, OCN SCET time is updated every hour: 23:28, 00:28, etc…
The CDMS time is not updated between 22:36 up to 8:00.

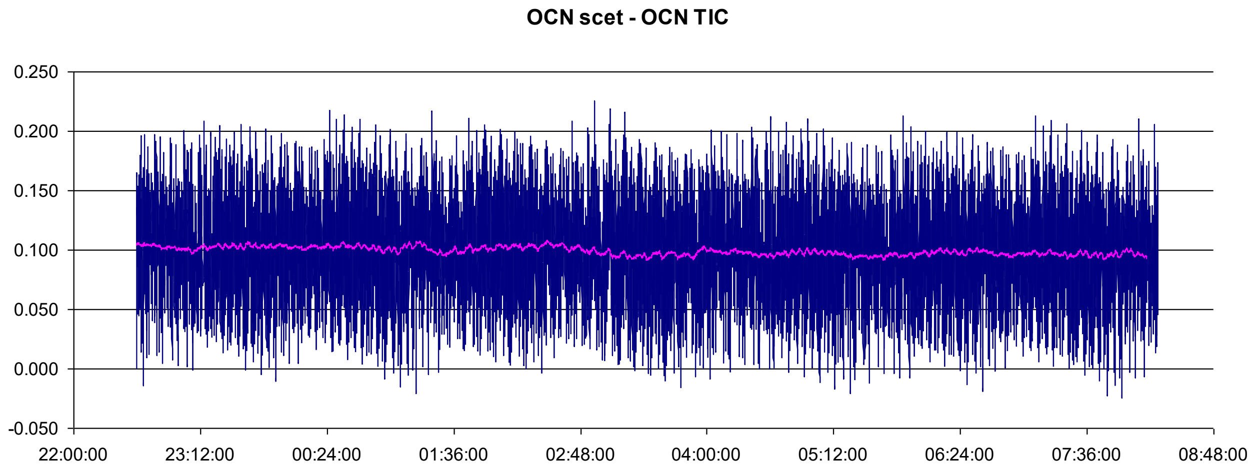
7.3.5.2.1 OCN

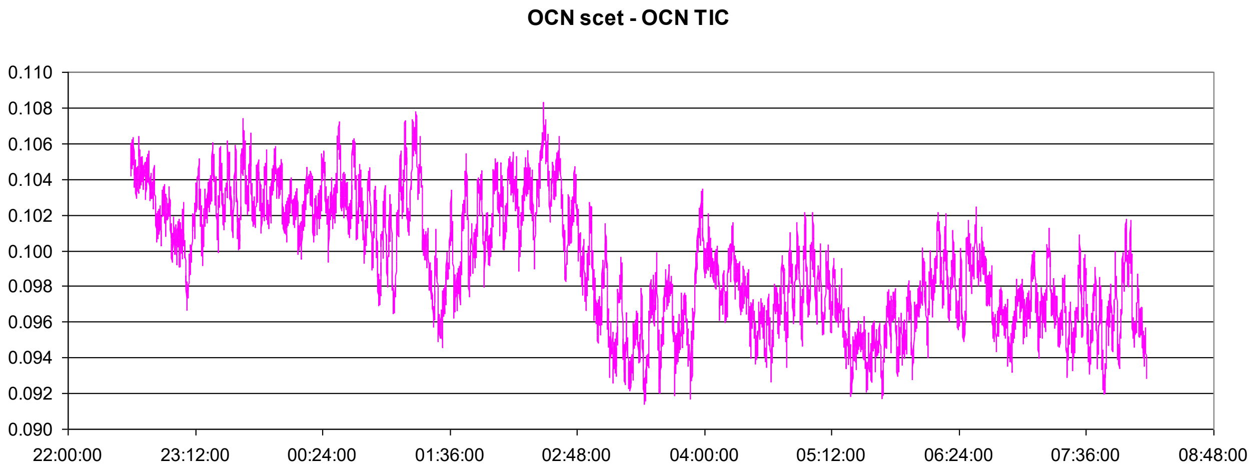
The following figure shows the difference between OCN SCET and OCN time in TIC: in blue the raw measurement and in pink the average over 10 minutes. The second figure shows the averaged difference full scale.

Between two time-updates, this both SCET and TIC time are from the clock: the OCN USO. The difference has to be constant over one hour: the observed oscillation comes from the OCN S/W management of the SCET: the SCET is calculated from TIS time and a delay calculated during the time-update sequence and the SCET is store in the microcontroller memory to be used when a TM is written. The OCN on board SW refreshed this memory and recalculates this value every 200 ms typically (σ=50 ms for an expected value of 57 ms).
So the error on the OCN SCET is random between 0 to 200 ms and this fluctuation disappeared on averaged delays.

From the whole experiment, the delay changes from time-update to time update. One can observe no variations on the averaged values. The standard variation of the value is lower than the expected one in case of no-clock drift (σ=3 ms for 6 ms expected).

In conclusion, there is no drift observed between the Rosetta USO and OCN USO with an accuracy of 10 ms over 10 hours. Considering the Rosetta USO as a perfect reference at this scale, the OCN USO is 10 MHz with an accuracy of ~3 10^{-7}. This accuracy corresponds to the typical accuracy of the command and to the typical thermal variation. There is no aging detected on the OCN USO. This conclusion is significantly better than the aging expected the manufacturer specifications.





7.3.5.2.2 LCN

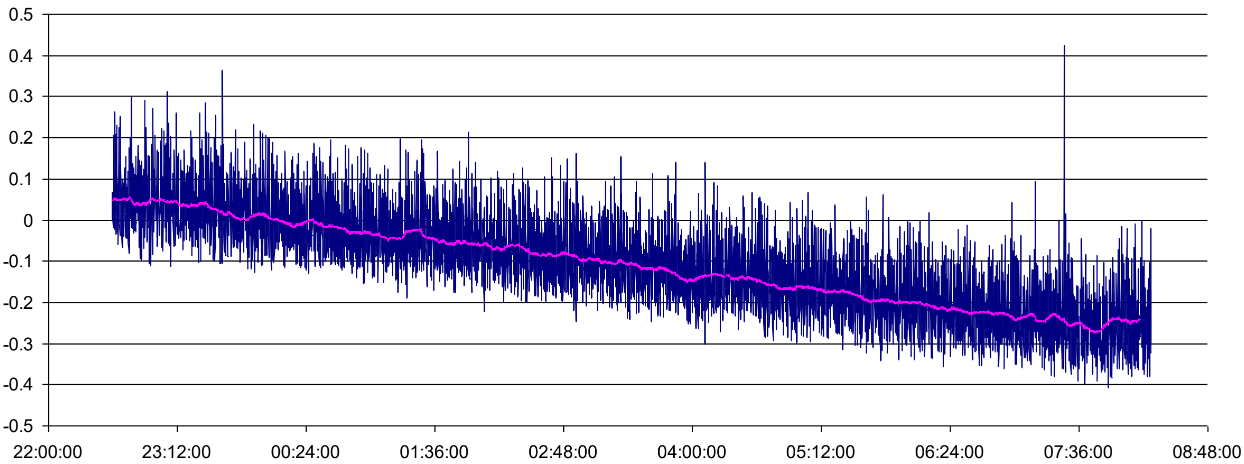
The following figure shows the difference between the CDMS SCET and the LCN TIC (blue raw data, pink averaged data over 10 minutes). For the Lander, the SCET is managed by the CDMS and there is no absolute timing on board of our experiment.

During the 10 hours, the ping pong test is successful, that means the OCN/LCN synchronisation with an accuracy of a few 10ms. **From the previous paragraph we can conclude, there is no aging on the LCN USO and the LCN USO can be considered as a 10 MHz reference with accuracy better than 10^{-6}.**

During 10 hours, we observe a random and fast delay-variation up to 200-300ms. This variation can be explained by the asynchronous protocol to transfer data from LCN to CDMS. The peak at 7:27:33 could be due to a specific CDMS overload.

In the same time, we note a global drift from 0.3 seconds over 10 hours. This drift can perhaps correspond to a frequency shift of the Philae main clock of about ~10^{-5}.

At 8:00, Philae restart transmission with Rosetta s/c and so the Philae time is updated. At this moment, we expected a reset to zero of the delay: it is not the case and we observe a 200ms remaining shift. This point can be due to the accuracy of the Philae resynchronization.



7.3.5.3 Conclusion

This test is compliant in an operational point of view: Consert synchronization, memory management, etc…
This test has to be replay for other Mission Table parameters (delta Tic, and duration) in order to validate the whole operational domain of Consert.

Some TM losses are observed between LCN / CDMS. This point has to be investigated
The estimation of the USO aging gives perfect result (better than OCXO specifications)

7.4 Conclusions

PC8 is successful for Consert:
- Our instrument is operational and the performances are nominal.
- There are limited TM losses between LCN and CDMS.
- The new FOP is operational, some minor correction are required in the timing.
- CSA is an operational parameter of the greatest interest in order to secure / validate Consert operations.
- Interference test has provided data of interest closing some doors and opening a lot of other doors…
- The estimation of the OCXO aging is good

8 PC#7 - 01/08 – OCN only

8.1 Main actions

During UFTO the Ocxo is commanded at the frequency 130 after tuning in order to measure the noise in than band used for ping pong operations

test	Day	Day	Start	End	Status
UFT orbiter	7	07/01/08	7H31	7H51	Ok

8.2 Data analysis

Performances

PC#7 Dates	07/01/08
Orbiter Functional test	07H31
Noise Level (dB)	-23
GCW	0
Current (mA)	90
OCXO	130
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2
S/P position (°)	+35/-35
Temperature Range	11/13

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
Orbiter Functional test	xx	xx	xx	xx	11	13

8.3 Conclusion

Due to the fact of no Lander operation (ESS thermal problems) only the Orbiter Functional test has been run.
Consert orbiter works correctly.

9 PC#6 - 09/07

9.1 Main actions

- Modification of the Consert Orbiter Event List: fusion of the Consert_on and Consert_Start event
- Modification of the Consert off procedure (FCP) in order to remove the delay at the beginning of the procedure.

test	Day	Day	Start	End	Status
Interference test	256	13/9/7	5h30	18h31	Ok
UFT orbiter	264	21/9/7	23h	23h30	Ok
Absolute Time Tag Command	268	25/9/7	5h30	6h	Not Ok
Classical Ping Pong	268	25/9/7	6h00	6h30	Ok
UFT Lander	268	25/9/7	6h30	7h00	Ok
Long Term drift	268	25/9/7	7h	15h30	Ok
Lander ext AFT	267	24/9/7	8h50		
Lander ext AFT 2	272	29/9/7	21h40		

9.2 Data analysis

9.2.1 Performances

PC#6 Dates	25/09/07
Orbiter Functional test 1	05H37
Noise Level (dB)	-23
GCW	0
Current (mA)	94
OCXO	222
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2
S/P position (°)	+30/-30
Temperature Range	6/13
Lander Functional test	
Noise Level (dB)	-22
GCW	0
OCXO	128
Current (mA)	120
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	+30/-30
Temperature Range	-20
Ping-pong test S/P position (°)	+30/-30
Ping-pong Orbiter signal	
Peak leval (dB)	70.5
GCW	19/22
Current (mA)	95(200)
OCXO	129
Peak Position	7/9
Temperature Range	7/13
Ping-pong Lander signal	
Peak leval (dB)	74
GCW	20/23
Current (mA)	120(300)
OCXO	131
Temperature Range	-20/0

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
absolute time tag O	12	13	7	10	7	9.5
Classic ping pong O	13	13	10	10	8	10
Classic ping pong L	-14	-11	-20	-17	-23	-22
UFT lander	-11	-8	-17	-14	9.5	12.5
Long term drift O	15	22	12	19	10	13
Long term drift L	-8	10	-14	4	-22	-2

Link Budget

The link budget is different than the one observed during the solar panel test of the commissioning for the same position of the solar panels (+30/-30°).
The signal shape and the peak position are significantly different for these two tests. We note a maximum of the peak passing from 7 to 9 without intermediate value 8.

This difference in shape and in power is due to the propagation between Lander Consert and Orbiter Consert and not to the electronics.
The High Gain Antenna (HGA) doesn't appear as an explanation, because its position is the same than during commissioning. A possible explanation could be the mode of use of the solar panels. To be investigate.

9.2.2 Telemetry and data integrity

9.2.2.1 <u>Lander</u>

Some Lander data corruptions are detected during the long term ping pong (10000 sounidngs). 3 Tm's are completed by zeros (APID 1804, TM # 4969, 5446 and 5652). This kind of corruption has been previously observed on the Philae GRM.
This "packets corrupted with zeros" problem has been identified, and will be fixed in the new CDMS SW 7.0 under development at KFKI. (Email Cinzia Fantinati 7/8/7)

9.2.2.2 <u>Orbiter</u>

There are no detected problems in the Orbiter telemetry.

9.2.3 Synchronization

Classical ping pong

	TM time	Deduced Turn On Time
1° Orbiter Consert HK 1° Lander TM CDMS Report	6:00:41 5:59:54 5:59:44	5:59:41 5:59:39

The synchronization accuracy is 2 second as observed during the previous tests.

9.2.4 Ground segment & Operations

Orbiter Operation:

A major failure in the computer network of our lab have happen at the beginning of July. This failure was 3 days long during which the FTP server of our lab was down. It has happen just before the deadline for OIOR submission while this server has to be used to receive the submission ACK. The server was rebuilt just in time to allow us the submission.

Nevertheless, this problem demonstrates the low robustness of the mission preparation process due to the fact that the ACK are delivered on a unique FTP server referenced by a numerical IP address.
The redundant server located in another lab has to be usable in case of failure and an address management based on logical address will give more versatility.

9.3 Specific tests and actions

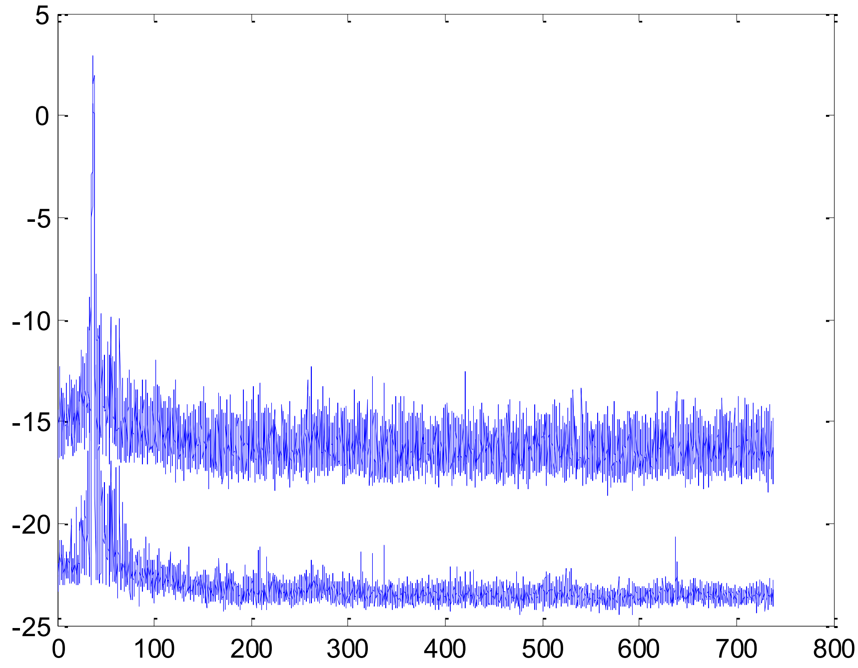
9.3.1 Interferences

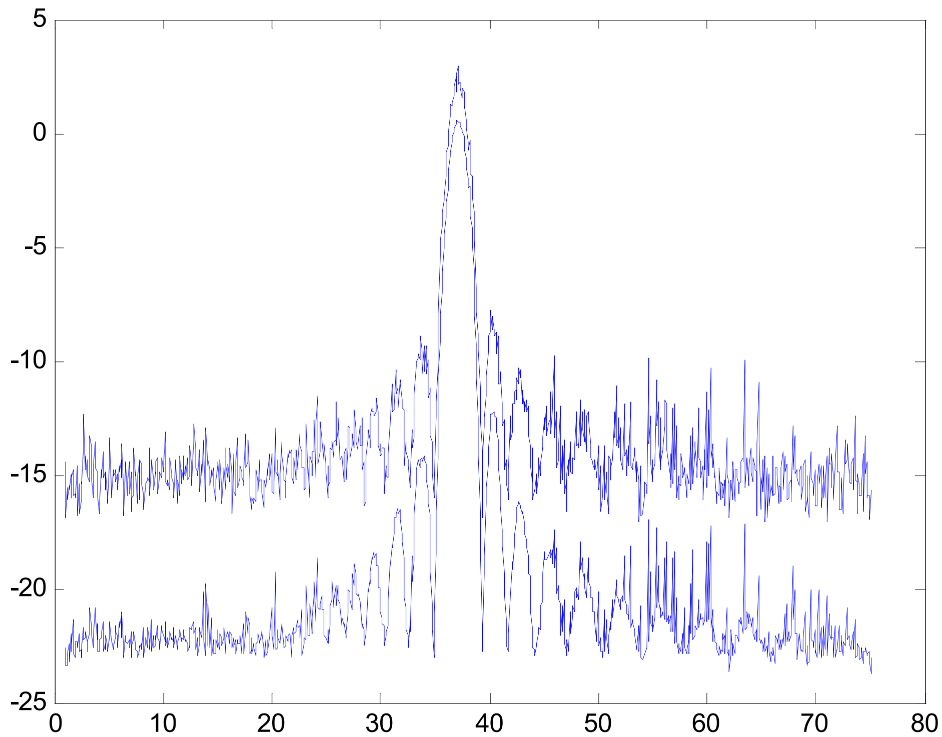
CONSERT interference test CN04 on the Orbiter was run on September 13, starting from 5:30 until 18:00.
During the same time other instruments were on.
SREM and COSIMA were ON during the whole experiment.
ALICE ON from 5:30:00 to 07:00:00
OSIRIS ON from 5:30:00 to 07:00:00
VIRTIS ON from 5:30:00 to 09:00:00 (Cooler on at 06:00:00) (initialisation) than from 9:00:00 to 14:23:00

During this period :

> calibration of VR-M started at 08:20:00
> calibration of VR-H started at 08:45:00
> data acquisition by VR-H from 08:58:30 to 14:23:00
> data acquisition by VR-M from 08:59:05 to 09:16:00

slew of satellite from 07:00:00 to 09:00:00.





The figure shows to the average and the instantaneous power in dB at the output of our receiver as function of time in minutes. The strong signal corresponds to the power

the line at 88 MHz drifting about 766 Hz across our receiving system. The line starts at 06:00:00 and lasts for about 43 minutes. After this period the line is out of our receiving system and is not detected by Consert. After this period the perturbation level is at previous interference tests level (-23 dB average and -16 instantaneous). This means normal perturbation.
The question is what instrument is the source of this line. The best candidate seems to be VIRTIS. The Cooler of VIRTIS is ON at 06:00:00 exactly when the line arrive at the input of our receiver.

Questions;
What is the frequency of clocks used by VIRTIS? Could be 88MHz the harmonic of its clock?
The same questions are addressed to other instruments being ON.

9.3.2 Absolute Time Tagged Command

The Absolute Time Tagged Commands have been lost/rejected by the CDMS. From the Consert TM, the TC's have been acknowledged by ESS (APID 1793). This problem is under investigation by LCC and the test is going to be play again during PC#8.

In the Consert ground segment point of view: the absolute time tagged command corresponds to a specific use of the Lander TC container. Consequently the position of the Consert own part of the TC is modified by regards to the classical command mode. This change of format appears confusing during the TC check by Consert team.
Consert team has to developed solutions to give operation reliable.

9.3.3 Long term ping pong and time drift.

The long term ping pong is successful in term of operation, Consert long term synchronization and data handling (excepted a few Lander Tm corruptions as previously noted)

The data are under analysis and will be developed in a specific test report in collaboration with LCC. The first analysis demonstrates the efficiency of the method to monitor the clock drift between Lander Consert / CDMS / Philae master clock / orbiter Consert / rosetta Master Clock (HFC)

For Consert, the test results will be of the higher interest by regards to the time accuracy in absolute time tagged command mode. It is also a way for an absolute calibration of Consert clocks aging

9.4 Conclusion

Consert has worked correctly during this operation slot:
- We observe variations of the signal shape similar to one observed during PC#4, but with a negative impact on the link budget. The system analysis demonstrates this variation is external to the Consert experiment. But, at the moment, we are not able to identify the variation source and to reproduce this effect by simulation
- The limited TM corruptions are under correction by KFKI.

Operation demonstrates a low robustness of the ground segment at the local FTP server level. This problem has to be analyzed and solution should be proposed by ESOC.

The interference test shows a high noise at 88 MHz at the beginning of the test slot. This pollution is at a level unacceptable by Consert and its source has to be identified. More complete interference test has to be done during PC#8 and especially with the HGA RF system.

The long term clock drift test is under analysis.

The absolute time tagged test failed. Raisons are under analyzed by LCC/KFKI.

10 PC#5 - 05/07

10.1 Main actions

10.2 Data analysis

10.2.1 Performances

PC# Dates	22/05/07
Orbiter Functional test	
Noise Level (dB)	-22/-23.5
GCW	0
Current (mA)	95/100
OCXO	223
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2 dB
S/P position (°)	37/-37
Temperature Range	6/15°
Lander Functional test	
Noise Level (dB)	-19/-21
GCW	0
OCXO	131
Current (mA)	120
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2.5/-3
S/P position (°)	37/-37
Temperature Range	-29/-17
Ping-pong test	
S/P position (°)	37/-37
Ping-pong Orbiter signal	
Peak leval (dB)	71/73
GCW	19/21
Current (mA)	95 (205/360)
OCXO	131
Peak Position	6
Temperature Range	5/13
Ping-pong Lander signal	
Peak leval (dB)	74/76
GCW	21/23
Current (mA)	118
OCXO	131
Temperature Range	-27/-14

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
O Unit Functional Test	10	15	6	10	6	6
Lander System test	-23	-20	-23	-23	-31	-30
L UFT	-20	-17	-23	-23	-29	-27
O Ping pong	10	13	6	10	5	6
L Ping-pong	-20	-14	-23	-20	-27	-26

Noise decreases during Lander UFT from -19 to -21 dB

10.2.2 TM / TC

The Checksum memory implemented before Consert Orbiter turn off OBCP returns, as expected, the following TM (APID 951):

```
0B B7 C0 06 00 13 08 40 8F C4 96 00 40 06 0A 00 3C 01 00 01 0C 21 15 42 27 DC
                        time                           address     length result

0B B7 C0 06 00 13 08 41 0E 22 76 00 40 06 0A 00 3C 01 00 01 0C 21 15 42 27 DC
                        time                           address     length result
```

Lander Turn off

During the different tests (3) the memory dump implemented before Consert Lander turn off returns as expected the following TM (type 2 – 2nd block)

```
120F 1B75 2C07 9060 52E0 FF12 1273 9060 52EF F012 1DB0 1210 0790 5015 E0FC A3E0
FDA3 E0FE A3E0 FF90 500B E0F8 A3E0 F9A3 E0FA A3E0 FB74 0312 00C4 70D7 9050 09E0
```

10.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	18:42:43	18:41:43
1° Lander TM	18:41:57	18:41:42
CDMS Report	18:41:47	

During PC4 and PC5, Consert start respectively 2 seconds and 1 second before on the Lander than on the orbiter, while the propagation delay is expected higher on the orbiter than on the Lander.

It's difficult to conclude from this test and this delay remains inside the operational margins (10s). This point has to be check during the future tests

10.3 Conclusion

PC 5 is ok.
No problems detected during this test.

The signal shape, the power and the noise level seems coherent with the one observed during the commissioning. We don't observed the effect noted during PC4 .

11 PC#4 - 12/06

11.1 Main actions

- finalization of the Orbiter Consert Off modification (FOP)
- New Lander Consert Off Procedure with memory Dump

This test is an active payload checkout with a cdms SW upgrade. Consert operations are spread on two weeks as follow:

- 25/11 Consert Orbiter UFT
- 28/11 Lander platform AFT and cdms TC acknowledgement
- 1/12 Consert Lander UFT
- 2/12 Consert ping pong
- 8/12 Lander platform AFT

11.2 Data analysis

11.2.1 Performances

PC#4 Dates	12/06
Orbiter Functional test	
Noise Level (dB)	-23 /-21dB
GCW	0
Current (mA)	95 (180)
OCXO	224
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2dB
S/P position (°)	+16/-16°
Temperature Range	6/17°
Lander Functional test	
Noise Level (dB)	-20.5
GCW	0
OCXO	131
Current (mA)	110
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-5dB
S/P position (°)	+16/-16°
Temperature Range	6/17°
Ping-pong test	
S/P position (°)	+16/-16°
Ping-pong Orbiter signal	
Peak leval (dB)	82
GCW	24/26
Current (mA)	95 (210)
OCXO	129
Peak Position	7/8
Temperature Range	6/14°
Ping-pong Lander signal	
Peak leval (dB)	84.5
GCW	26/27
Current (mA)	110 (312)
OCXO	131
Temperature Range	4/14°

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	End
O Unit Functional Test	8°	17°	6°	12	6°	8°
Lander System test	-40°	-20°	-40°	-30°	-34°	-34°
L UFT(*)	6°	17°	6°	11	6°	8°
O Ping pong	6	14	6	10	5	6
L Ping-pong	4	14	4	10	4	5.5
2nd Lander Sys. test	-6	2	-6	-4	-6	-5

(*) it's the same than for orbiter UFT, and not a typing error…

11.2.2 TM / TC

Orbiter Turn off

The Checksum memory implemented before Consert Orbiter turn off OBCP returns, as expected, the following TM (APID 951):

```
0B B7 C0 06 00 13 07 5E F5 99 86 00 40 06 0A 00 3C 01 00 01 0C 21 15 42 27 DC
                  time                                  address   length result
```

This TM is 14 second before the last Consert HK as expected.
The Check memory is ok for Orbiter Unit Functional Test and ping pong test.
The FCP and OBCP modifications are validated.

Lander Turn off

The memory dump implemented before Consert Lander turn off returns as expected the following TM (type 2 – 2nd block)

```
120F 1B75 2C07 9060 52E0 FF12 1273 9060 52EF F012 1DB0 1210 0790 5015 E0FC A3E0
FDA3 E0FE A3E0 FF90 500B E0F8 A3E0 F9A3 E0FA A3E0 FB74 0312 00C4 70D7 9050 09E0
```

This TM is 20 – 40 seconds before the last TM (Lander UFT 20s; ping pong 25s; second platform AFT 38 s).
There is no memory dump at the end of the first platform AFT (28/12). This first AFT has maybe been done at Lander wakeup before AMST upgrade. This has to be confirm / explained

Philae AFT

The Lander platform extended AFT turns Consert on during 10 minutes. The Consert HK is right. (28/11/6 16h51).

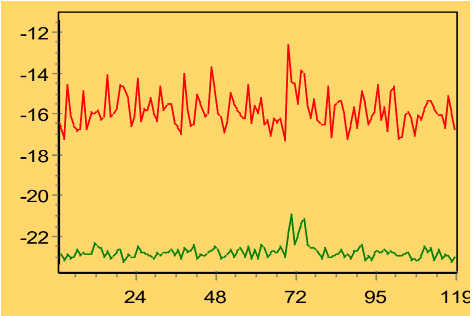
12 TC are send by orbiter to Lander platform for Consert Lander (28/11/6 19h). This TC's are well acknowledged by the platform while Consert Lander is turn-off at this moment.

11.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	6:45:46	6:44:46
1° Lander TM	6:44:59	6:44:44
CDMS Report	6:44:48	

11.2.4 Noise Level

An increase of the noise level of 2 dB appears at the soundings 70-79 during the Orbiter Unit functional Test, (25/11/06 20:45). This noise level increase corresponds to spectral lines at 86.6 MHz and could be related to the RPC warm-up.



Mean and Peak Consert Power (dB) versus sounding number

11.2.5 Link Budget

The link budget is significantly better than the one observed during the solar panel test of the commissioning for the same position of the solar panels (+16/-16°).

	PC4	Solar Panel tes
Orbiter		
Peak power	82 dB	75 dB
GCW	24-25	21
Peak position	7/8	8/9
Temperature (E box)	5°	7°
Temperature (digit)	8°	11°
Lander		
Peak power	84.5 dB	79 dB
GCW	26-27	22-23
Temperature (E box)	4°	-18°
Temperature (digit)	8°	-14°

This increase of 7dB on the Lander and of 5.5 dB on the orbiter could partially be due to the temperature increase on the Lander side. The Lander is 22° hotter inducing a higher Rx gain (1 dB expected) and a higher Tx power (TBC). The temperature can only explain around 1dB on the Lander signal and maybe 3 dB on the orbiter power. 4db are remaining…

The signal shape and the peak position are significantly different for these two tests:

- In the solar panel test, +16° corresponds in a minimum in the link budget (Figure 3): the main propagation path from Lander antenna to orbiter antenna is canceled for this specific position of the solar panels. A secondary path dominates the signal which is large with a maximum at the position 8 or 9 (Figure 2).
- The PC#4 signal is not so large and its maximum is at the position 7/8. this signal is similar to the signals observed for position of the S/P close to -30°.

This difference in shape and in power is due to the propagation. The High Gain Antenna (HGA) could be proposed as explanation. To be investigated…

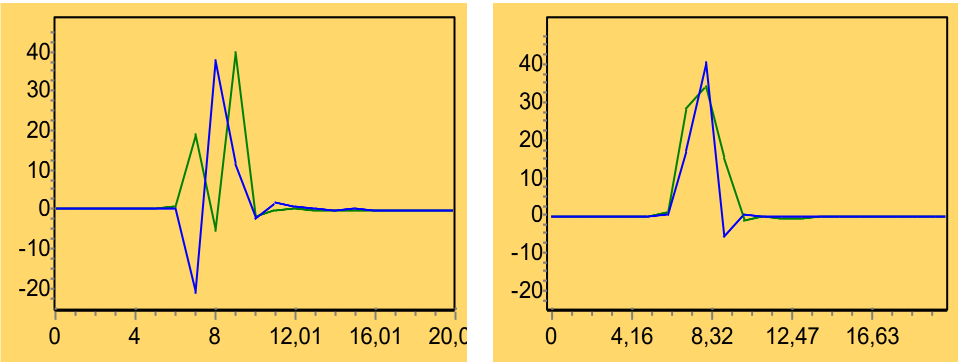


Figure 2: Consert Obiter signal for +16° S/P position. Left: S/P test; right: PC#4

11.3 Conclusion

Test ok.

New Turn Off procedure validated for both Lander and orbiter: no memory dump in the first Lander AFT to be explained.

Orbiter Unit Functional Test ok – Extra noise level sources to be identified
Consert ping pong ok: 4dB extra power to be investigated

12 PC#3 - 08/06

12.1 Main actions

- Data Base modification for acceptance of the Check Memory TM
- Validation of a memory check in the Orbiter Consert Turn Off OBCP procedure

12.2 Data analysis

12.2.1 Performances

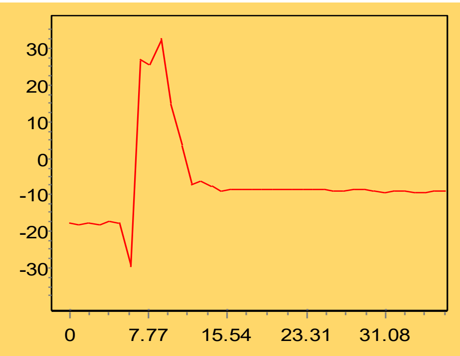
PC#	3
Dates	29/8/6
Orbiter Functional test	
Noise Level (dB)	-23.5
GCW	0
Current (mA)	95
OCXO	222
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-3
S/P position (°)	20
Temperature Range	14/22
Lander Functional test	
Noise Level (dB)	-20.8
GCW	0
OCXO	131
Current (mA)	171
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	0
S/P position (°)	20
Temperature Range	-27/-17
Ping-pong test	
S/P position (°)	20
Ping-pong Orbiter signal	
Peak leval (dB)	74.2
GCW	19/21
Current (mA)	96 (208)
OCXO	130
Peak Position	9 (8-9)
Temperature Range	8/17
Ping-pong Lander signal	
Peak leval (dB)	77
GCW	20/24
Current (mA)	118
OCXO	131
Temperature Range	-23/-14

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
O Unit Functional Test	17	22	15	19	13.5	14
Lander System test	-23	-17	-23	-20	-27	-27
L UFT	-20	-14	-23	-17	-25	-24
O Ping pong	10	17	8	11	8	9
L Ping-pong	-20	-14	-20	-17	-23	No Data

The performances are nominal by regards to the temperature and the S/P position:

- RF peak power equal to 74 dB and lower than the one for the previous tests, corresponds to the position of the S/P, as shown in Figure 3.
- The signal present a double peak as shown in the following figure and as observed during Solar Panel test.
- The temperatures and the currents are nominal.



Consert Orbiter signal in dB.

12.2.2 TM / TC

Functional Test

During functional test, Consert Orbiter generates 7 TM on packet category 7 (Apid 951) presented in the following list:

```
APID    #      Size    Detail
951     2      9       0B B7 C0 02 00 09 06 E2 0A E9 56 00 40 11 02 00
951     3      17      0B B7 C0 03 00 11 06 E2 0C 48 66 00 40 05 01 00 A0 2A DE 05 00 81 81 00
951     4      17      0B B7 C0 04 00 11 06 E2 0C 83 76 00 40 05 01 00 A0 2B DE 05 00 81 81 00
951     5      17      0B B7 C0 05 00 11 06 E2 0E D2 26 00 40 05 01 00 A0 2C DE 05 00 81 81 00
951     6      19      0B B7 C0 06 00 13 06 E2 18 99 06 00 40 06 0A 00 3C 01 00 00 00 00 3F FF 43 FB
951     7      19      0B B7 C0 07 00 13 06 E2 18 CC 96 00 40 06 0A 00 3C 01 00 01 0C 21 15 42 27 DC
```

The first event is lost (EVT#1) due to a mistiming. This event is generated at Consert On and before Time-Update. The reconstructed time in the SFDU header is generally wrong enough and this TM is not delivered by the database (out of the request time slot).

The second is the ping test response (service type 11hex)
The events 3 to 5 are internal Consert progress report (Service type 5)

The TM #6 and 7 are check memory:
- The first check memory (add 00 00 00 00, length 3F FF, result 43 FB) corresponds to the FOP as implanted and un-tested for PC#2
- The second check memory (add 00 01 0C 21, length 15 42, result 27 DC) corresponds to the OBCP implemented for the PC#3 and test for the first time. The return value is right. This TM is sent between 14 to 19 seconds before Consert Turn Off, which is compliant with the expected timing.
This TM has been accepted by the Data Base.

For PC#4, the first Check will be removed from the Fop and only the one OBCP will be done.

Ping-pong
For the ping pong test, the APID 951 Tm is similar as the functional test excepted for the check memory. No check memory has been implemented on the ping pong FOP and just the OBCP check is done (00 01 0C 21 15 42 27 DC).

12.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	23:15:47	23:14:47
1° Lander TM	23:15:02	23:14:47
CDMS Report	23:14:53	???

The Consert TM time shows that the synchronization is very accurate for the ping-pong phase. The CDMS report seems delays 6 seconds after the execution, as observed during the previous PC.

12.3 Conclusion

Consert is nominal.

The change of the Consert Turn Off is in progress for the orbiter: TC in OBCP is validated and TC in FOP has to be removed.
The Data Base modification is closed.

13 PC#2 - 03/06

13.1 Main actions

- Implementation of a memory check in the Orbiter Consert Turn-Off FOP procedure

13.2 Data analysis

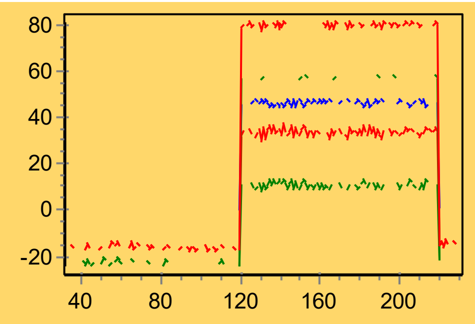
13.2.1 Performances

PC#	2
Dates	07/03/06
Orbiter Functional test	
Noise Level (dB)	-23
GCW	0
Current (mA)	96
OCXO	224
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2
S/P position (°)	8
Temperature Range	7/11
Lander Functional test	
Noise Level (dB)	-19.5
GCW	0
OCXO	131
Current (mA)	250
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	2
S/P position (°)	8
Temperature Range	-31/-17
Ping-pong test	
S/P position (°)	8
Ping-pong Orbiter signal	
Peak leval (dB)	80
GCW	22/24
Current (mA)	95 (360)
OCXO	130
Peak Position	8 (7-8)
Temperature Range	-1/6
Ping-pong Lander signal	
Peak leval (dB)	82
GCW	23/25
Current (mA)	119
OCXO	131
Temperature Range	-23/-17

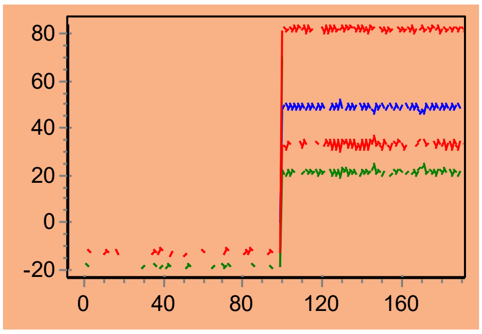
Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	End	Start	End	Start	end
O Unit Functional Test	6	14	4	8	4	5
Lander System test	-23	-20	-30	-30	-32	-32
L UFT	-30	-17	-30	-23	-31	-29
O Ping pong	4	6	-1	1	-1	-1
L Ping-pong	-20	-17	-23	-20	Xx	xx

The experiment works correctly. The UFT tests of Lander and Orbiter have a correct number of dumps, and the noise level is identical to previous one. The OCXO values are correct and did not change from previous PC tests.



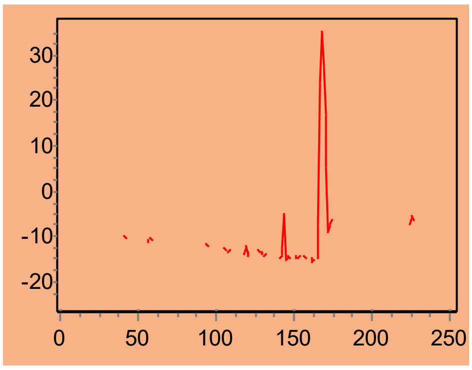
orbiter



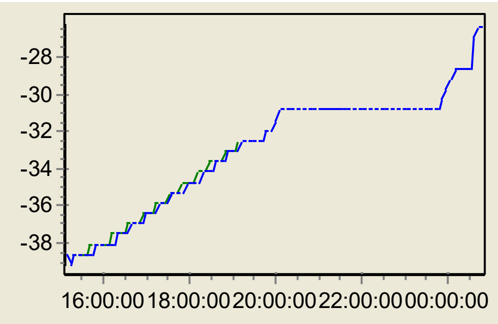
lander

The signal level is higher than measured during PC0 and PC1 tests. The measured signal increase is due to the solar panels position. This can be seen on our calibrations curves (the figure below). The solar panel position corresponds to 7.7°, that is close to the abscise 631 (81dB) in the figure.

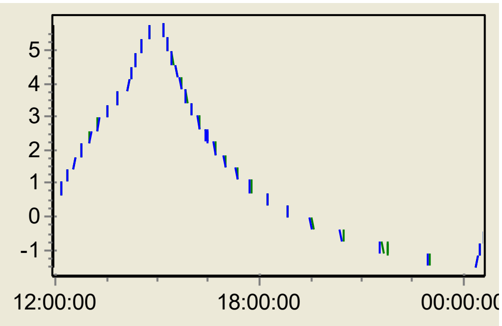
The orbiter and lander signal correlation functions have a correct and normal form.



Lander signal



lander electronic box temperature



orbiter electronic box temperature

Temperatures are in normal interval.

13.2.2 TM / TC

The new command (check memory) added to Consert was executed correctly, however the Apid returned does not exist in our data base. This means that we should modify Consert data base. This incited us to check more deeply some of commands. We will propose some changes in data base and a small modification of the TC.
In addition to include this modification in all Consert operations we should include this TC in Consert Off procedure.

13.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	0:15:50	0:14:50
1° Lander TM	0:15:05	0:14:50
CDMS Report	0:14:56	

13.3 Conclusion

Consert nominal
Database to be modified
Check Memory to be included in the OBCP

14 PC#1 - 10/05

14.1 Main actions

14.2 Data analysis

14.2.1 Performances

PC#	1
Dates	04/10/05
Orbiter Functional test	
Noise Level (dB)	-23
GCW	0
Current (mA)	95 (365)
OCXO	223
Main Spectral Line (MHz)	93.33
Main Spectral Line (dB)	-2
S/P position (°)	36
Temperature Range	10/18
Lander Functional test	
Noise Level (dB)	-20
GCW	0
OCXO	131
Current (mA)	122
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	2
S/P position (°)	36.2
Temperature Range	-40/-23
Ping-pong test	
S/P position (°)	36.2
Ping-pong Orbiter signal	
Peak leval (dB)	72
GCW	19/23
Current (mA)	94 (360)
OCXO	131
Peak Position	6 (5-7)
Temperature Range	5/15
Ping-pong Lander signal	
Peak leval (dB)	74
GCW	20/24
Current (mA)	119
OCXO	131
Temperature Range	-34/-20

Temperature

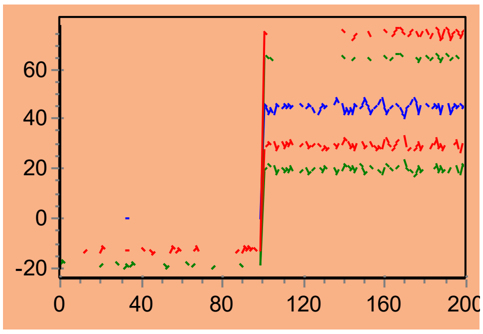
	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	End
O Unit Functional Test	12	18	12	15	10	10
Lander System test *	-40	-30	-40	-30	-38.5	38.1
L UFT	-30	-23	-40	-30	-37	-36
O Ping pong	8	15	6	10	5	6
L Ping-pong	-30	-20	-30	-30	-34	-32

In the Orbiter Functional Test, the noise increase of 1dB during the test.

The lander temperature is close to the Consert limit. In this range the accuracy of the internal Consert temperature measurement is really poor.

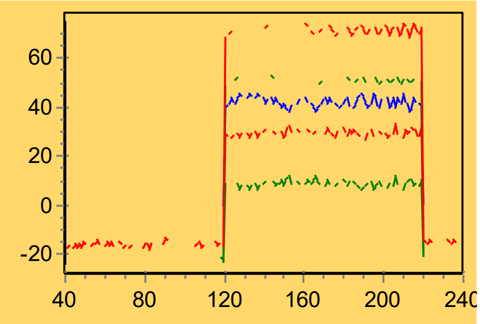
Signal power

During these passives tests we have run three Instrument verification tests: Consert Orbiter Verification, Consert Lander Verification and Consert Orbiter/Lander Time Synchronisation (test usually called Ping-Pong). These tests were successful and instrument worked well. For the first Consert orbiter verification test the EVT's are missing, however it is due to the lost of data by S/C (see the calculations of data volume below)
In figures below we compare the results from PC0 and PC1. These figures correspond to the Ping-Pong and verification tests and show the signal (noise) power in decibels dB. Comparing the low level, for instance on the red (green) curves, with the high level one can estimates the signal to noise ratio SNR. One can see that there is no difference between the PC0 and PC1 tests. During both PC0 and PC1 test, the solar panel positions are quasi-identical (respectively 34.7° and 36.2°). This small difference doesn't impact the Consert Lander / Consert Obiter link budget and is not detectable on the data as shown during the Solar Panel (oct 04) calibration tests. See the figure 2 from data taking during the calibration tests.
The signal level is correct one corresponding to the level during the calibration measurements.
The OCXO values after tuning are sensibly the same during this tests and this means the there is no observable drift of the clocks.



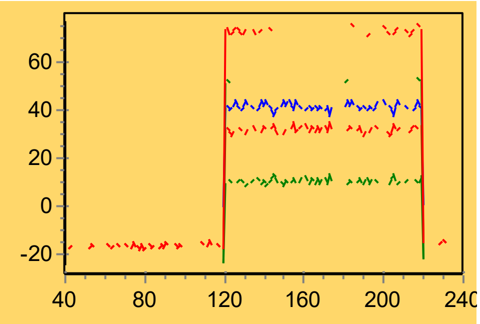
lander octobre 2005 test passifs OCXO 131

figure 1a



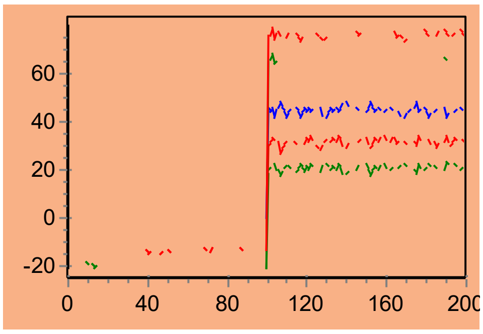
orbiter octobre 2005 tests passifs OCXO 131

figure 1b



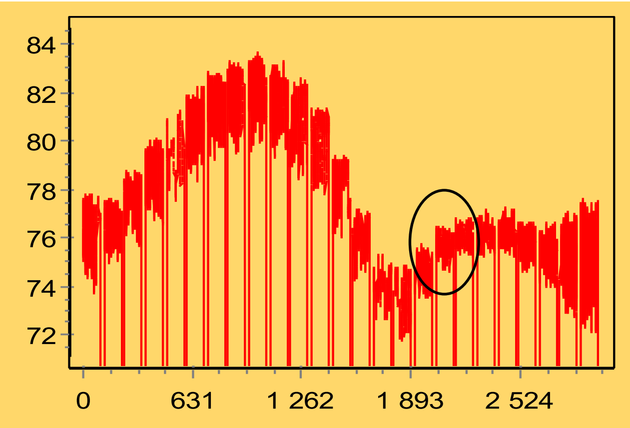
orbiter mars 2005 tests passif OCXO 130 GCW 20-21

figure 1c



lander mars 2005 tests passif OCXO 131

Figure 1d



Rx power variation in dB as a function of the SADE position (from S/P tests)
The solar panel position increases from -50/50 to +70/70° by 5° steps.
The circle denotes the position +35/-35° that was in the PC0 and PC1 tests and corresponds well to the power seen in figures 1 (75/76 dB).

Figure 2

14.2.2 TM / TC

<u>Consert TM check</u>

The Consert turn off doesn't requires preliminary TC in order to park Consert in given configuration: the e-box is turned off by the spacecraft power unit. This simple procedure is allowed by the structure of the experiment and simplifies some Consert procedures.
In the other hand, it's more difficult to check the Consert TM: we don't have a clear signal just before turn off and we are not able to check the integrity of the housekeeping.
For this reason, we propose to add a Memory Dump TC 5 second before turn off in the procedure. This could be included by a modification of the switch-off OBCP (ACNF012A) and up linked after verification during Active Checkout.

Analysis of the volume of PC1 tests.

<u>Data analysis :</u> **<u>The EVT's of the first Orbiter test are missing.</u>**

1h42 to 2h40 OCN Unit test
ACK: 1 TM
SCI: 120
HK: 691
EVT: missing

Test completed
All the EVT missing

3h22 to 3h32 LCN On
The Lander Consert TM consist in SCI only
39 TM 112,12 corresponding in HK only.
No mission table after 9 minutes

No operation, Lander basic test

7h22 to 7h39 LCN on
Lander operation ok
173 TM received corresponding in 100 sounding and expected HK and ACK.

Test completed, TM ok

7h52 to 8h09 OCN and LCN ON
ACK 1
HK 190
EVT 5

The "CONSERT_ON" EVT appears later due to a reconstituted time
The 2nd EVT is a test response (ping)

SCI 120
Lander SCI 136

Test completed, TM ok

Data volume

Orbiter UFT : 0.13 Mbytes

	ACK	HK	EVT	EVT ping	SCI	total
Size (Byte)	17	28	24	18	1048	
number	1	150	4	0	120	
Total Size	17	4200	96	0	125760	130073

Lander UFT : 0.042 Mbytes
All the TM a SCI TM in the orbiter point of view…

Lander	HK	ACK	Sound	FIOR	Fin	block
Number	70	1	120	5	40	615

615 Consert TM blocks = 154 Lander TM = 42435 bytes

Ping Pong
Idem for each part.

14.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	7:52:51	7:51:51
1° Lander TM	7:52:05	7:51:50
CDMS Report	7:51:57	

14.2.4 Currents Monitoring

The comparison between the predicted power consumption and real one, showed in the RO-EST-RP-3342_1 report, shows that the predictions are correct. The differences seen came from the sampling rate of the power measurements. In the figure in this report one can see that the pick is not correctly sampled during the first test and can be see in the second one.

During the commissioning and the ground tests, the current was monitored at the spacecraft level with a sampling rate of ~16 seconds. This monitoring was appeared as a good way to check Consert and the Consert mission table has been modified in order to allow this control (4.95s sounding rate versus 5s)
On the figure, one can observe Consert current peaks corresponding to Consert sounding phases: Tx phase @ 350 mA, Rx and processing phases @ 200 mA. Just a few peaks are measured do to some stroboscopic effects between the sounding rate and the currant sampling rate.

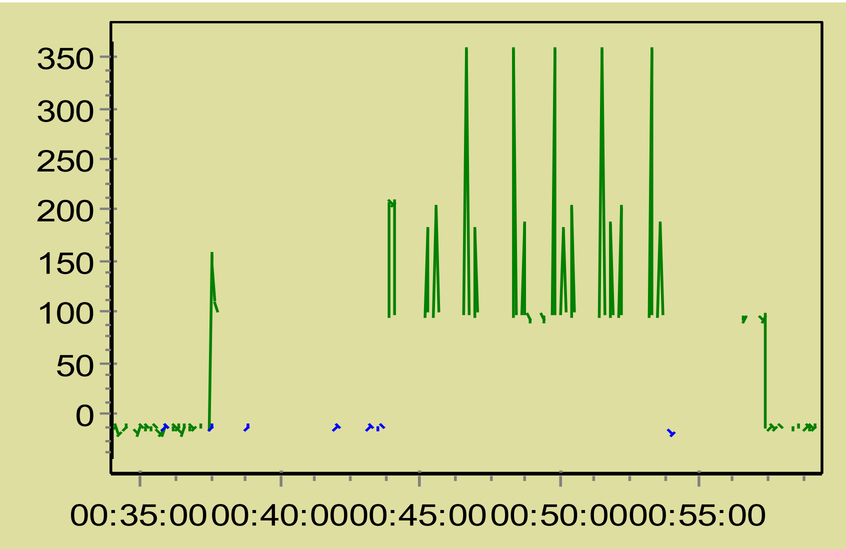


figure 3

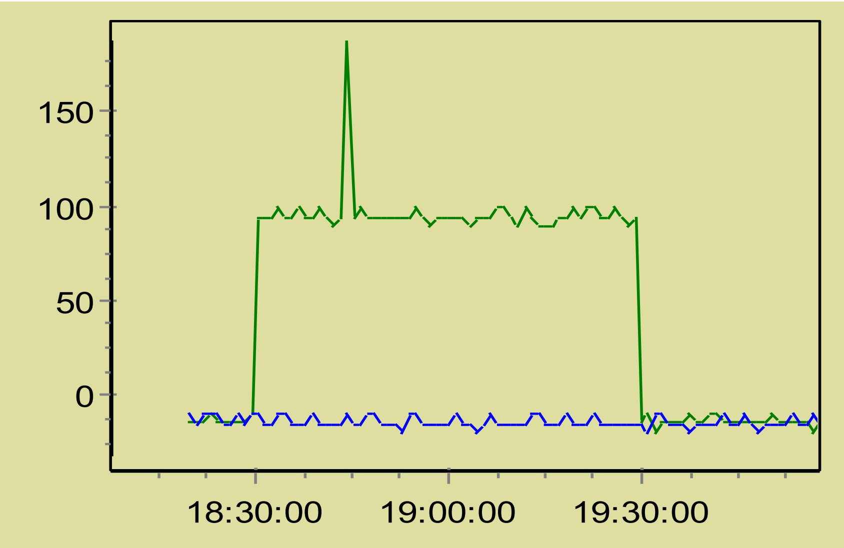


figure 4

During PC#0 and PC#1, the current sampling rate was ~64s. The consequence of this rate is a reduced number of sampled current peaks (sometime no peaks) as shown.

The measurements of the primary current of Consert give the information about the technological functioning of the instrument. The sampling every 5 seconds of the current, could allow to have a complete cycle after 100 samples if Consert works with 4.95 seconds cycle. When everything works well we don't need these measurements. However to have these measurements every time will prevent the special request if something goes wrong.
Could we have 5 seconds sampling rate . If yes this requires the modification of Consert ON by OBCP: ACNF011A or at least Consert Orbiter UFT (modification of ACNF001A) to include the current monitoring in the Consert procedure.

14.3 Conclusion

- To add a Memory Dump TC 5 second before turn off in the procedure. This could be included by a modification of the switch-off OBCP (ACNF012A) and up linked after verification during Active Checkout.
- Modification of the current monitoring sampling rate if possible (Proposition cancelled after discussion with ESOC)

15 PC#0 - 03/05

15.1 Main actions

Validation of the orbiter Time Update

15.2 Data analysis

15.2.1 Performances

PC#	0
Dates	29/03/05
Orbiter Functional test	
Noise Level (dB)	-23.5
GCW	0
Current (mA)	95 (190)
OCXO	221
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	-2
S/P position (°)	34.4
Temperature Range	11 / 20
Lander Functional test	
Noise Level (dB)	-19
GCW	0
OCXO	131
Current (mA)	337
Main Spectral Line (MHz)	93.3
Main Spectral Line (dB)	1.5
S/P position (°)	34.6
Temperature Range	-30/-20
Ping-pong test	
S/P position (°)	34.6
Ping-pong Orbiter signal	
Peak leval (dB)	73.5
GCW	19/22
Current (mA)	95 (200)
OCXO	130
Peak position	6 (6-9)
Temperature Range	7/15
Ping-pong Lander signal	
Peak leval (dB)	76
GCW	21/24
Current (mA)	115
OCXO	131
Temperature Range	-30/-17

Temperature

	Ocxo	Ocxo	Digi	Digi	Ebox	Ebox
	Start	end	Start	End	Start	end
O Functional Test	13	20	12	15	11	12
Lander System test	-30	-20	-30	-30	-33	-33
L Functional Test	-30	-20	-30	-30	-31	-31
O Ping pong	10	15	8	11	7.5	8.4
L Ping-pong	-24	-17	-24	-23	-30	-26 (~)

15.2.2 TM / TC

PC#0 starts with some Consert turn on / turn off to validate Time Update procedure (22/03/05). Test ok.

15.2.3 Synchronization

	TM time	Deduced Turn On Time
1° Orbiter Consert HK	0:0:54	23:59:54
1° Lander TM	0:0:8	23:59:53
CDMS Report	23:59:59	

15.3 Conclusion

- time-update validated

16 Annexes

16.1 S/P positions

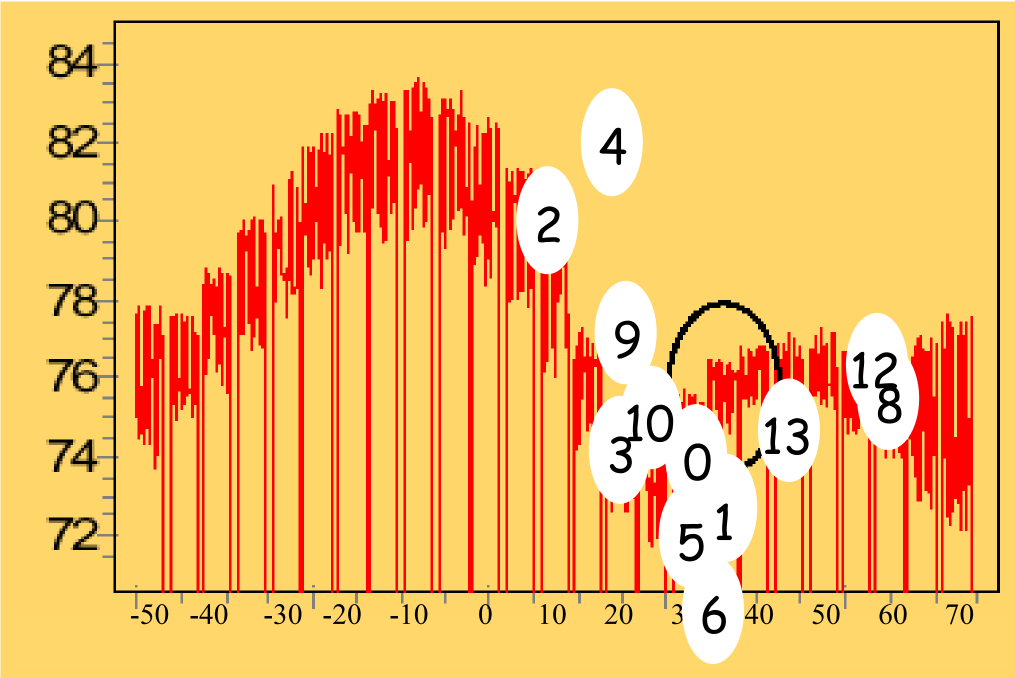


Figure 3: Consert power versus S/P position from -50/50 to +70/70° by 5° steps and power measured during the different PC tests.

16.2 Performances synthesis

PC# / Dates	0 29/03/05	1 04/10/05	2 07/03/06	3 29/08/06	4 1/12/06	5 22/05/07	6 25/09/07	7 07/01/08	8 25/09/08	9 01/02/09	10 29/09/09	12 26/4/10	13 3/12/10
Orbiter Functional test													
Noise Level (dB)	-23.5	-23	-23	-23.5	-23 /-21	-22/-23.5	-23	-23	- 23	- 23	-23	-23	-18
GCW	0	0	0	0	0	0	0	0	0	0	0	0	0
Current (mA)	95 (190)	95 (365)	96	95	95 (180)	95/100	94	90	100	110	90	100 (370)	95
OCXO	221	223	224	222	224	223	222	130	130	130	130	130	130
Main Spectral Line (MHz)	93.3	93.33	93.3	93.3	93.3	93.3	93.3	93.3	93.3	93.3	93.3	93.3	88
Main Spectral Line (dB)	-2	-2	-2	-3	-2	-2	-2	-2	-3	-3	-3	-3	3
S/P position (°)	34.4	36	8	20	+16	37/-37	+30/-30	35/35	+60/-60°	+20/-20°	25/-25	60/-60	43/-43
Temperature Range	11 / 20	10/18	7/11	14/22	6/17°	6/15°	6/13	11/13	+6/+9	6/12	9/18	-1.2/+0.2	-1/10
Lander Functional test													
Noise Level (dB)	-19	-20	-19.5	-20.8	-20.5	-19/-21	-22		-18.5	-21/-22	-18	-22	-10
GCW	0	0	0	0	0	0	0		0	0	0	0	0
OCXO	131	131	131	131	131	131	128		131	131	131	131	131
Current (mA) Undersampled !!!	337	122	250	117	110	120	120		110	110	320	120	115
Main Spectral Line (MHz)	93.3	93.3	93.3	93.3	93.3	93.3	93.3		87.7	89	92.7/87.3	86.7	92.27
Main Spectral Line (dB)	1.5	2	2	0	-5dB	-2.5/-3	-3		-3	-3	0	-9	12
S/P position (°)	34.6	36.2	8	20	+16	37/-37	+30/-30		+60/-60	+20/-20	25/-25	60/-60	43/-43
Temperature Range	-30/-20	-40/-23	-31/-17	-27/-17	6/17°	-29/-17	-20		-9/+1	-20/-7	-6/2	-24/-21	-15/-1
Ping-pong test													
S/P position (°)	34.6	36.2	8	20	+16	37/-37	+30/-30		+60/-60°	+20/-20°	24/-24	60/-60	44/-44
Ping-pong Orbiter signal													
Peak leval (dB)	73.5	72	80	74.2	82	71/73	70.5		75	77/78	74.5	76	74
GCW	19/22	19/23	22/24	19/21	24/26	19/21	19/22		21	21	21	22	21/22
Current (mA)	95 (200)	94 (360)	95 (360)	96 (208)	95 (210)	95	95(200)		95 (205)	95 (205)	100 (350)	100 (350)	95
OCXO	130	131	130	130	129	131	129		129	130	129	130	130
Peak Position	6 (6-9)	6 (5-7)	8 (7-8)	9 (8-9)	7/8	6	7/9		5/6	8/9	8/9	6	8/9
Temperature Range	7/15	5/15	-1/6	8/17	6/14°	5/13	7/13		4/14	4/14	4/15	1.8/2.6	-6/8
Ping-pong Lander signal													
Peak leval (dB)	76	74	82	77	84.5	74/76	74		78	79/81	77	78	76.5
GCW	21/24	20/24	23/25	20/24	26/27	21/23	20/23		22	24/25	23	23	23
Current (mA)	115	119	119	118	110(312)	118	120(300)		114	114	110 (350)	120	120
OCXO	131	131	131	131	131	131	131		131	131	131	131	131
Temperature Range	-30/-17	-34/-20	-23/-17	-23/-14	4/14°	-27/-14	-20/0		-6/3	-20/-4	-11/-1	-21/-19	-17/2

Table 1: Performances

16.3 Definition of the CSA parameter (from User Manuel)

The CSA is a data from Consert Telemetry to estimate the turn on accuracy of a ping pong sequence.

The CSA (consert synchronization accuracy) is an internal parameter of the Consert SW used to manage the SCET time on board on consert (convertion of the interal consert time to SCET time). On the Orbiter, at the end of the tunning, the CSA stores the date of the end of the tunning in consert tic time, juste before the reset of the consert internal clock. In other for, the CSA (raw value) is the number of TIC between the OCN turn on and the end of the tunning.

In ping pong mode, the end of the tunning at the OCN level is induced by the end of the tunning signal transmission by LCN. When both OCN and LCN turn-on's are perferctly synchronized, this delay is a constant equal to 0x3E95C (raw value).

The drift by regards to this value indicates the delay between OCN and LCN trun-on. This value is dumped by CN-SEQ-242 redirected and downloaded as a science TM.

CSA = engenering value = (raw value - 0x3E95C) * (2^14/10^7) secondes

The sign of the CSA (engenerign value) indicates the turn-on order:
CSA < 0 : LCN is on the first and OCN after
CSA > 0 : OCN the first.

CSA is not relevant for Consert Orbiter operating alone (CSA = ~ -26s).
CSA is not relevant before tuning (CSA = ~ -420 s)
CSA is not relevant when a Time update is happened after tuning (CSA= ~ -420s).

The CSA has been defined taking into account the standart value of TAB_TUNETIC in the mission table.

16.4 Operation summary and future operations

slot	Action	test list	Conclusion after test	Present status	Rosetta ref.	Philae Ref
PC0 03/05	Orbiter Time Update Validated	UFTO & Ping Pong	Validated	Close		
PC1 10/05						
PC2 03/06	Memory Check in turn Off FOP (Orbiter)	UFTO & Ping Pong	Orbiter memory check TM rejected by database	Close		
PC3 08/06	Memory Checked TC in OBCP Memory Checked TM declaration in RMIB	UFTO & Ping Pong UFTO & Ping Pong	Ok Ok	Close Close		
PC4 12/06	Memory Checked TC removed from FOP Memory Dump Validated in Turn Off Lander FOP Routine Test	UFTO & Ping Pong UFTL & Ping Pong Ping Pong	Ok Ok 4 dB Extra Power in ping pong	Close Close Open	OICN001 RCN002	
PC5 05/07						
PC6 09/07	Time tag sequence Validation on board Long term sequence validation	Time Tagged Ping Pong Long Term test	Failure	Open Open	RCN003 RCN005	***R_LZ008 CNS_6***

	Interference test Orbiter	Interference test	To be improved	Open	RCN001	
ESB2	No operation					
PC7	No Lander operation					
PC8	Definition of the ground command philosophy Time tag sequence Validation on board New FOP Some TM/TC formats Clarification in RMIB Ping Pong with RF link Long term sequence validation Interference Test Orbiter including HGA Tx/Rx	Time Tagged Ping Pong Long Term test	Time Tagged command to be used with time line and FOP	Ok Partially done done Ok Partially done Done	RCN003 RCN004 RCN005 RCN001	***R_LZ008 CNS_6*** ***R_LZ010 CNS_8***
Stein	No operations					
ESB3	Validation of the ground command philosophy	TTagged & Classical Ping pong				
PC10 09/07	Delta Interference test Obiter Time tag sequence Validation on board Ping Pong with RF link Long term sequence validation	Time Tagged Ping Pong	Time Tagged command to be used with time line and FOP	Done TB repeated TB repeated TB done	RCN001 RCN003 RCN004 RCN005	***R_LZ008 CNS_6*** ***R_LZ010 CNS_8*** CNS_11

	Delta FOP validation (Lander et ppt)			ok	RCN008	***CNS_15***
	Delta FOP validation (OCN only)			ok	RCN009	
	Validation of the turn on accuracy requirement				RCN010	***CNS_16***
	OBCP propagation delay				RCN011	
	Interference Test Lander					***R_LZ007 CNS_2***
	Study of the CDMS propagation delay.					CNS_14
PC12	Delta Interference test Obiter		closed	done	RCN001	
	Time tag sequence Validation on board	Time Tagged	successful	TB repeated	RCN003	***R_LZ008 CNS_6***
	Ping Pong with RF link		successful	TB repeated	RCN004	***R_LZ010 CNS_8***
	Long term sequence validation		successful	TB done	CN005	CNS_11
	Ping Pong Umbilical		successful	TB repeated	CN006	
	UFT O		successful	TB repeated	CN007	
	UFT L		successful	TB repeated		
	Interference Test Lander		successful	done		***R_LZ007 CNS_2***
PC13	SDL validation		successful		CN012	

	Interference Test Lander (delta required by sesame)		closed	done		***R_LZ007 CNS_2***
	UFT O		successful		CN007	
	UFTL		successful			
Delayed						
x	Validation of the turn on accuracy requirement				CN010	***CNS_16***
x	Command propagation delay				CN011	
x	Study of the CDMS propagation delay.					CNS_14

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