CONSERT Operations
Post Hibernation Commissioning
Test report

CHANGE RECORDS

ISSUE	DATE	EVOLUTION	AUTHOR
1.0	27/04/14		Y. Rogez
1.1	05/06/14	Complete review for submission	Y. Rogez
1.2	22/12/16	ROSINA/OSIRIS interference test (05/06/2014) added	Y. Rogez

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1 Introduction

This document is the technical report of CONSERT operations from ROSETTA wake-up (20 jan. 2014) to the end of Post-Hibernation Commissioning (April 2014).

The PHC interferences tests analysis is provided in a separate document [RD2] RO-OCN-TN-3832.

It includes:

All Post-Hibernation commissioning (27/03/14 to 23/04/14)

Documents applicables

[AD 1]

Documents de référence

[RD 1] RO-OCN-TN-3850 Stop and start procedure V1-0.doc
[RD 2] RO-OCN-TN-3832 PHC interferences report V1-0.doc

2 Post hibernation commissioning: March/June 2014

2.1 Main actions

A complete set of tests are performed during PHC.

Routine standard tests before cruise phase:

OCN and LCN only tests (UFT), Ping-Pong with RTTC and ATTC commanding, using umbilical or RF link are done.

Complete extended tests:

OCN and LCN only tests (Extended UFT)

Interferences tests:

OCN: Interferences are performed with VIRTIS and ROSINA (cancelled and rescheduled) and OSIRIS.

LCN: with all lander instruments, and a specific with MUPUS.

New stop & start procedure test:

The new stop&start procedure [RD 1] set for SDL/FSS is performed for the first time. The specificity of this procedure is to suspend temporarily the CONSERT sounding during its operation.

Date	Time (UTC)	Duration	Test description
27/03/2014	15:00:00	00:30:00	OCN UFT
29/03/2014	15:00:00	00:40:00	OCN Extended UFT
09/04/2014	10:45:00	00:10:00	LCN switch ON
~~11/04/2014~~	~~16:00:00~~	~~04:00:00~~	~~OCN ROSINA Interferences test (cancelled)~~
13/04/2014	06:45:00	08:15:00	OCN VIRTIS interferences test
14/04/2014	12:10:00	03:30:00	LCN switch ON in LDR Ext AFT
15/04/2014	22:40:00	00:30:00	LCN UFT
16/04/2014	15:30:00	01:00:00	LCN Extended UFT
16/04/2014	16:30:00	00:30:00	Ping-pong Umbilical
16/04/2014	17:00:00	01:00:00	Ping-pong ATTC Umbilical
21/04/2014	18:45:00	00:30:00	Ping-pong RF
22/04/2014	12:15:00	05:35:00	LDR Unit interference tests - CONSERT
22/04/2014	19:50:00	02:05:00	Stop&Start sounding patch test
23/04/2014	06:50:00	00:40:00	MUPUS-CONSERT interferences tests
05/06/2014	12:30:00	17:40:00	ROSINA and OSIRIS interferences tests

Table 1 : CONSERT operations summary for PHC

2.2 Data analysis

2.2.1 Performances

PHC	
Orbiter Functional test	
Noise Level (dB)	-17
GCW	0
Current (mA)	98.9
OCXO	130
Main Spectral Line (MHz)	88 and 88.6
Main Spectral Line (dB)	3
S/P position (°)	-56.8/56.8
Temperature Range	-5.4/-4.4
Lander Functional test	
Noise Level (dB)	-20
GCW	0
OCXO	131
Current (mA)	111.9
Main Spectral Line (MHz)	93.33
Main Spectral Line (dB)	-1.43
S/P position (°)	-55.6/55.6
Temperature Range	-0.7/-0.2
Ping-pong	
S/P position (°)	-55.2/55.2
Ping-pong Orbiter signal	
Peak level (dB)	78.52
GCW	22
Current (mA)	95
OCXO	129
Peak Position	6/7
Temperature Range	-6/3.6
Ping-pong Lander signal	
Peak level (dB)	78.64
GCW	24/26
Current (mA)	114
OCXO	131
Temperature Range	1.3/9.8

Table 2 : Performances overview

Comparing to values observed in cruise phase, we notice:

- A greater noise level of -17 dB (instead of -23 dB). This corresponds to power lines described in detailed UFT and Ext UFT reviews below.
- OCXO values have not changed (details below).
- Currents are roughly the same.
- GCW are the same as those observed in last PC tests.

2.2.2 Solar panel positions

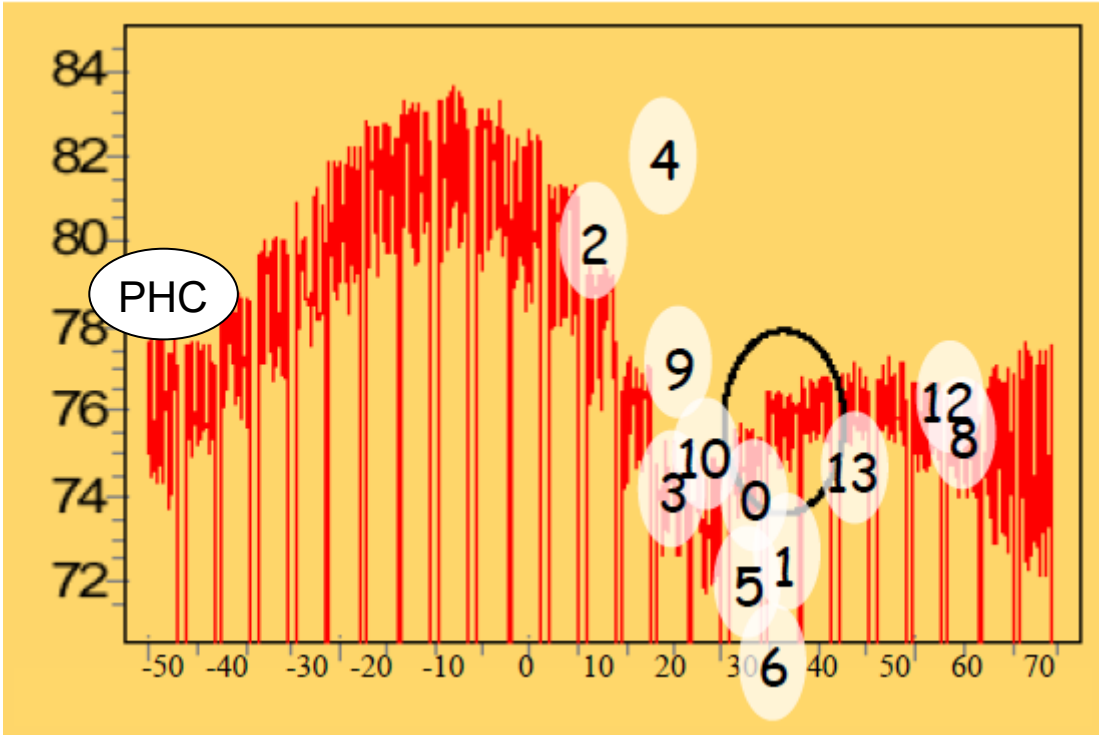


Figure 1 : CONSERT power versus S/P position from -50/+50 to +70/-70 ° by 5° steps and power measured during the different PC tests. Numbers corresponds to each PC ## phase observation.

The figure shows that during PHC the power peak was a little bit greater than expected, regarding to the figure beyond. This shows that the values measured during PHC are consistent with the evaluation done during PC.

2.2.3 Temperature

		Ocxo Start	Ocxo end	Digi Start	Digi End	Ebox Start	Ebox end
OCN UFT		-3.4	3.6	-6	-1	-5.4	-4.4
OCN Extended UFT		-3.4	5.7	-6	-1	-5.1	-3.3
LCN Switch ON		-20.5	-11.4	-20.5	-17.3	-19.7	-18.6
OCN VIRTIS interf.		-1	20.3	-3.4	15.3	-4	8.8
LCN switch ON (in LDR Ext AFT)		-20.5	-14.3	-20.5	-17.3	-22.5	-22.5
LCN UFT		-1	9.8	-1	3.6	-0.7	-0.2
LCN Ext UFT		1.3	9.8	-3.4	3.6	-3.5	-0.2
Ping-pong Umbilical	**OCN**	-6	3.6	-6	-1	-5.7	-4.7
	LCN	1.3	9.8	1.3	5.7	-0.2	0.9
Ping-pong ATTC Umb.	**OCN**	-3.4	5.7	-3.4	1.3	-4.7	-3.3
	LCN	1.3	13.6	3.6	7.8	0.9	2.6
Ping-pong RF	**OCN**	-3.4	3.6	-8.6	-3.4	-6.1	-5.1
	LCN	-11.4	-3.4	-14.3	-11.4	-14.7	-13.6
LCN LDR unit interferences		-8.6	15.3	-11.4	11.7	-11.3	3.2
Ping-ping stop&start	**OCN**	-3.4	7.8	-6	3.6	-6.1	-2.2
	LCN	1.3	11.7	-3.4	7.8	-4.1	0.9
LCN Unit interf. MUPUS		1.3	5.7	-3.4	1.3	-5.8	-3

Table 3 : Temperatures for all tests

2.2.4 Telemetry and data integrity

The data integrity is globally fine.

2 TM packets have been lost during LCN interference tests (22/04/2014). This loss happened, at the CDMS level, after reception of the Consert TM Block by the CDMS.
No data loss observed during LCN/CDMS transfer.

2.2.5 OCXO

Ping-Pong test	Umbilical	ATTC	RF	Stop&Start
OCN ocxo	129	129	130	129
LCN ocxo	131	131	131	131

Table 4 : OCXO values after tuning

OCXO values when tuning is done are stable upon the tests, and are the same as observed during the cruise.
This means that there is no shift in frequency of OCN oscillator regarding to the LCN one.

2.3 Specific test

2.3.1 OCN UFT

OCN UFT is successful (27/03/2014 15:00:00)

2.3.1.1 Timing analysis

		Operation relative times		*Expected stack UTC*	*Observed OBT*	*Observed UTC time*	*OCN time*	*Diff*	*Remarks*
1	**OCN ON by OBCP**		00:00:00	**15:00:00**					
2	**OCN ping REP**				14:59:47	15:00:51			
3	**OCN first HK**	(1) +	00:01:05	15:01:05	15:00:04	15:01:08			
4	**OCN MT update**	(1) +	00:02:00	**15:02:00**					
	ACK				15:00:56	15:02:00		**0:00:00**	
5	**End Tuning**	(1) + max	00:07:00				00:00:00		OCXO is 224
	OCN EVT REP				15:05:38	15:06:42		**0:04:42**	Must be within (4) + 4:00 and (4) + 5:00
6	**OCXO Change**	(4) +	00:05:30	**15:07:30**					Must be 130 : OK
	ACK				15:06:25	15:07:29		**0:00:01**	
7	**Sounding**	(5) +	00:01:00	15:07:42					
	OCN EVT REP				15:06:37	15:07:41	00:00:59	**0:00:01**	
8	**End sounding**	(7) +	0:09:49	15:17:30					
	OCN Last snd				15:16:28	15:17:32	00:10:50	**0:00:02**	120 soundings : OK
	OCN EVT REP				15:16:28				
9	**OCN CSA Dump**	(6) +	00:11:00	**15:18:30**					-26 : OK
	ACK				15:17:28	15:18:32	00:11:50	**0:00:02**	
10	**OCN Last HK**				15:18:36	15:19:40			Roughly 40s margin for OFF
11	**OCN OFF on OBCP**	(9) +	00:00:30	**15:19:00**					

Timings are OK.

2.3.1.2 Full experiment signal spectrum

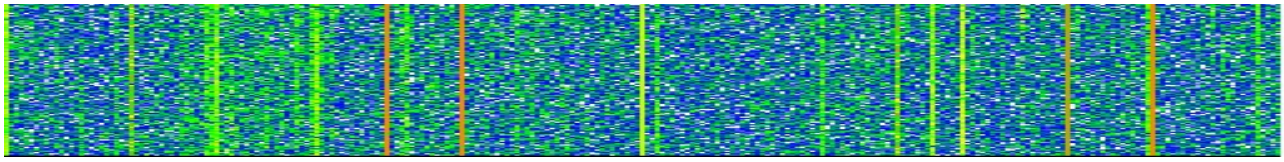
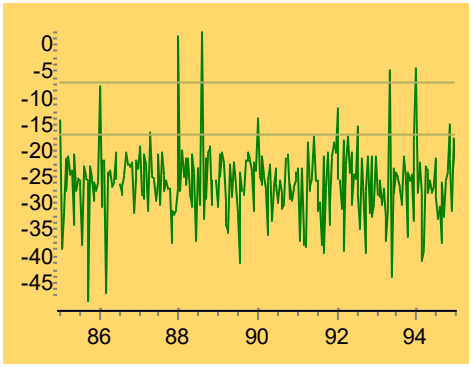


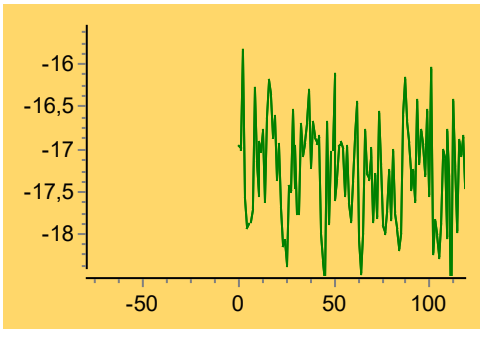
Figure 2 : OCN UFT signal spectrum
soundings are from top to bottom and frequencies from 85 MHz to 95 MHz
cold colors are low power levels and warm colors are high power levels

2.3.1.3 Highlights and comments

- During the UFTO, we observe two powerful lines @ 88MHz (max = +3.46dB, mean = +2.28dB) and @ 88.59MHz (max = +2.94dB, mean = +2.15dB) as shown hereafter



The first line is present 90% of the time, with a ~10 dB amplitude variation on a variable period of ~1 minute. The second one is constant over time. The figure hereafter shows the mean power as a function of the sounding number: this power is ~-17 dB except during short duration every 20 sounding where the power is at its minimum value (~-18.5 dB).



During tuning, the PLL has not locked on the observed powerful lines, so it seems that it does not disrupt CONSERT instrument.

2.3.2 OCN Extended UFT

OCN Extended UFT is OK (29/03/2014 15:00:00).

2.3.2.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	**OCN ON by OBCP**		00:00:00	**15:00:00**					
2	**OCN ping REP**				14:59:47	15:00:51			
3	**OCN first HK**	(1) +	00:01:05	15:01:05	15:00:04	15:01:08			
4	**OCN MT update**	(1) +	00:01:00	**15:01:00**					
	ACK				14:59:56	15:01:00		0:00:00	
5	**OCN Ping REP**	(4) +	00:00:30	**15:01:30**					
	EVT				15:00:26	15:01:30		0:00:00	
6	**OCN Mem Check**	(5) +	00:00:30	**15:02:00**					
	ACK/EVT				15:01:12	15:02:16		0:00:16	The 16s delay is OK regarding to PC#8 test (that was 15s)
7	**OCN Mem Dump**	(6) +	00:00:30	**15:02:30**					
	ACK				15:01:25	15:02:29		0:00:01	
8	**OCN Mem Patch**	(7) +	00:00:30	**15:03:00**					
	ACK				15:01:55	15:02:59		0:00:01	
9	**OCN Mem Dump**	(8) +	00:00:30	**15:03:30**					
	ACK				15:02:25	15:03:29		0:00:01	Dump/patch OK
10	**OCN SWIP Dump**	(9) +	00:00:30	**15:04:00**					
	ACK				15:02:56	15:04:00		0:00:00	
					15:02:57	15:04:01			
					15:03:01	15:04:05			
					15:03:05	15:04:09			
11	**OCN CSA Dump**	(10) +	00:00:32	**15:04:32**					-420 : OK
	ACK				15:03:28	15:04:32		0:00:00	

12	**End Tuning**	(1) + max	00:07:00				00:00:00		OCXO is 224	
	OCN EVT REP				15:05:38	15:06:42		0:05:42	Must be within (4) + 5:00 and (4) + 6:00 : OK	
13	**OCXO Change**	(11) +	00:03:30	**15:07:30**					Must be 130 : OK	
	ACK				15:06:25	15:07:29		0:00:01		
14	**Sounding**	(12) +	00:01:00	15:07:42						
	OCN EVT REP				15:06:37	15:07:41	00:00:59	0:00:01		
15	**OCN CSA Dump**	(13) +	00:02:32	**15:10:02**					-26.21 : OK	
	ACK				15:08:58	15:10:02		0:00:00		
16	**OCN SWIP Dump**	(15) +	00:00:58	**15:11:00**						
	ACK				15:09:57	15:11:01		0:00:01		
					15:09:57	15:11:01				
					15:10:02	15:11:06				
					15:10:05	15:11:09				
17	**OCN time update**	(16) +	00:01:00	**15:12:00**					No ACK is normal	
18	**OCN CSA Dump**	(17) +	00:01:02	**15:13:02**					-420 : OK	
	ACK				15:11:58	15:13:02		0:00:00		
19	**OCN SWIP Dump**	(18) +	00:00:58	**15:14:00**						
	ACK				15:12:56	15:14:00		0:00:00		
					15:12:57	15:14:01				
					15:13:01	15:14:05				
					15:13:05	15:14:09				
20	**End sounding**	(12) +	0:09:49	15:17:30						
	OCN Last snd				15:16:28	15:17:32	00:10:50	0:00:02	120 soundings : OK	
	OCN EVT REP				15:16:28					
21	**OCN Mem Dump**	(19) +	00:04:00	**15:18:00**						
	ACK				15:16:56	15:18:00		0:00:00		
22	**OCN Mem Patch**	(21) +	00:01:00	**15:19:00**						
	ACK				15:17:55	15:18:59		0:00:01		

23	**OCN Mem Dump**	(22) +	00:01:00	**15:20:00**				
	ACK				15:18:56	15:20:00	0:00:00	Patch Dump OK
24	**OCN Last HK**				15:27:16	15:28:20		Roughly 20s margin for OFF
25	**OCN OFF on OBCP**	(23) +	00:08:00	**15:28:00**				

Timings are OK.

2.3.2.2 Dumps analysis

All dumps (patch and SWIP) are OK.
The 16s delay observed to produce de Memory Check is consistent with what was observed in PC#8 (15s).
The Memory Check value is 0xB729 (hex).

2.3.2.3 Full experiment signal spectrum

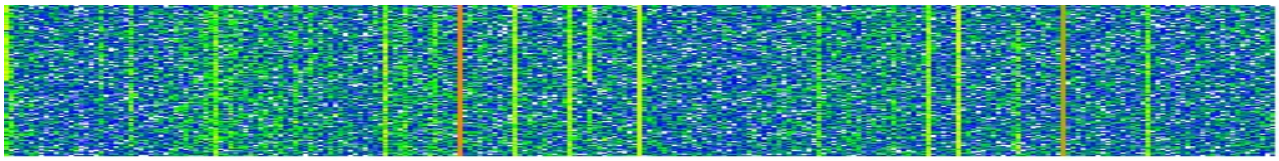
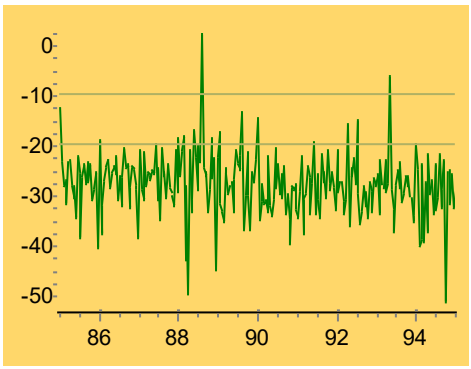


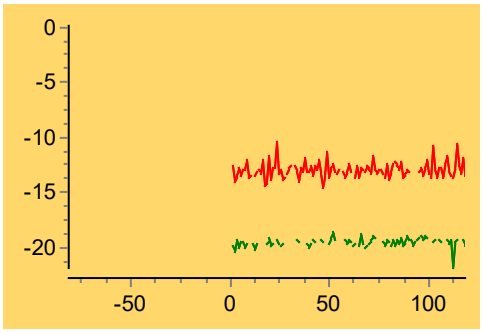
Figure 3 : OCN Extended UFT signal spectrum
soundings are from top to bottom and frequencies from 85 MHz to 95 MHz
cold colors are low power levels and warm colors are high power levels

2.3.2.4 Highlights and comments

- During the Extended UFTO, we observe one powerful line @ 88.59 MHz (max = +2.86 dB, mean = +1.93 dB) as shown hereafter the other observed lines in UFTO has disappeared.



It is constant over time. The figure hereafter shows the mean power as a function of the sounding number: this power is ~-20 dB which is nominal value.



During tuning phase, the PLL has not locked on the observed powerful lines, so it is not a failure case for CONSERT in this configuration (i.e. with this signal-to-pollution ratio).

One observation could be taken into account to explain the 88.59 MHz line: periodically, the mean power decrease, and in has been observed that it could correspond to a HGA TC call (AOCMS-APME ORB select autom ctrl of HGA à 15:15:30).

2.3.3 LCN Switch ON

The switch ON test worked fine. 36 HK received in roughly 9 minutes. Temperatures OK.

2.3.4 OCN VIRTIS interference test

OCN VIRTIS interference test show the influence of the VIRTIS on CONSERT measurements. Interferences test results will be developed in a specific T.N.

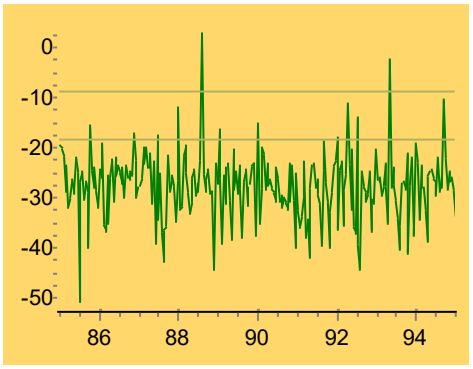
2.3.4.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	06:45:00					
2	OCN ping REP				06:44:47	6:45:52			
3	OCN first HK	(1) +	00:01:05	06:46:05	06:45:04	6:46:09			
4	OCN MT update	(1) +	00:02:00	06:47:00					
	ACK				06:45:55	6:47:00		0:00:00	
5	End Tuning	(1) + max	00:07:00				00:00:00		OCXO is 224
	OCN EVT REP				06:50:38	6:51:43		0:04:43	Must be within (4) + 4:00 and (4) + 5:00 : OK
6	OCXO Change	(4) +	00:05:30	06:52:30					Must be 130 : OK
	ACK				06:51:25	6:52:30		0:00:00	
7	Sounding	(5) +	00:01:00	6:52:43					
	OCN EVT REP				06:51:37	6:52:42	00:00:59	0:00:01	
8	End sounding	(7) +	7:58:25	14:51:07					
	OCN Last snd				14:50:01	14:51:06	07:59:23	0:00:01	120 soundings : OK
	OCN EVT REP				14:50:02				
9	OCN CSA Dump	(4) +	08:10:00	14:55:00					-26 : OK
	ACK				14:53:58	14:55:03	08:03:20	0:00:03	
10	OCN Last HK				14:54:43	14:55:48			Roughly 15s margin for OFF
11	OCN OFF on OBCP	(9) +	00:00:30	14:55:30					

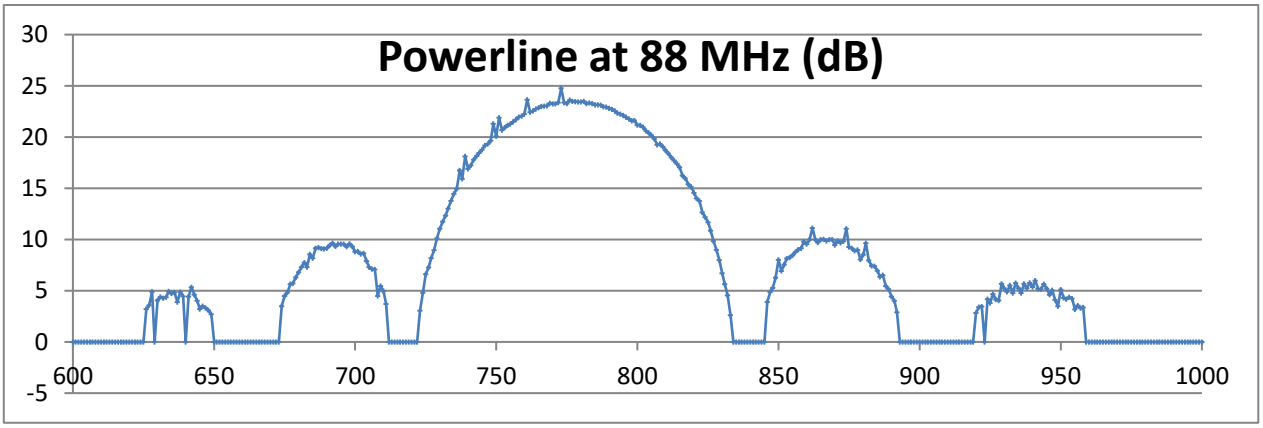
All timings are OK.

2.3.4.2 Highlights and comments

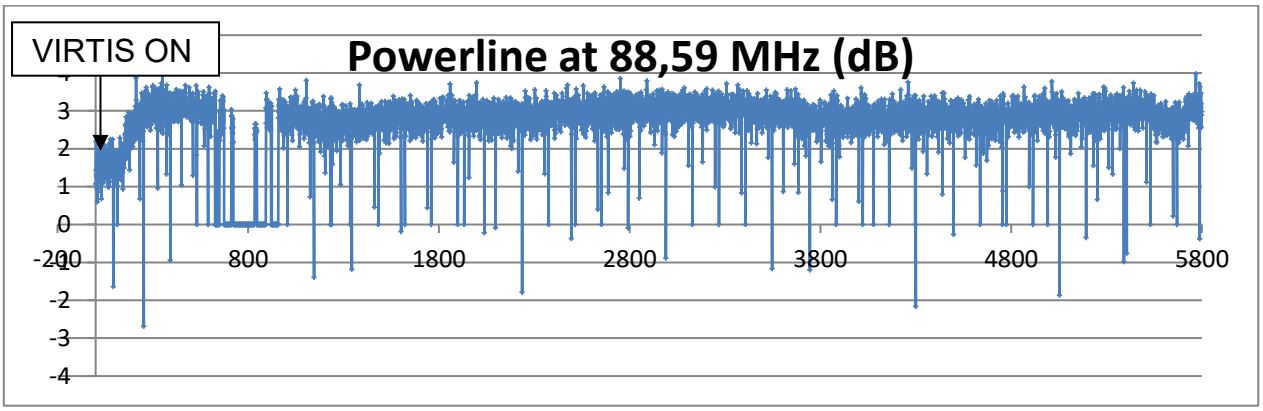
We see the powerline clearly identified as VIRTIS interference @ 88 MHz (max = dB, mean = dB). The powerline @ 88.59 MHz is still present during the entire test slot. We can observe also a variable line @ 85.76 (roughly -12 dB), and 85 MHz. The 88 MHz line periodically vary and seems to be “replaced” by the 85.76 Mhz.



The main interference is observed between 07:45 and 08:15. In the following graph, when value is 0 dB, it means that the powerline at 88.59 MHz is dominating the spectrum (and not the VIRTIS powerline).



We noticed an increase of the mean power, which corresponds to the VIRTIS power ON command. The hole starting at 600-1000 corresponds to the 88 MHz powerline predominance.



Regarding to the 88.59 MHz line, we observe a periodical decay of the mean power. To be checked if it is due to HGA or other S/C operation. This is consistent with the observations of the 2 previous tests (OCN UFT & ExtUFT).

2.3.5 Lander Ext AFT (LCN switch ON)

The switch ON test worked fine. 40 HK received in roughly 10 minutes. Temperatures OK.

2.3.6 LCN UFT

LCN UFT is successful (15/04/2014 22:40:00)

2.3.6.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	**LCN ON by AMST**		00:00:00	**22:40:00**					
	Execution report				22:38:56	22:40:01			
3	**LCN first HK**	(1) +	00:01:05	22:41:05	22:39:14	22:40:19			
4	**LCN MT update**	(1) +	00:02:00	**22:42:00**					
	ACK CDMS				22:40:58	22:42:03		0:00:03	
	ACK LCN				22:40:59	22:42:04		0:00:04	
5	**End Tuning**	(1) + max	00:07:00				00:00:00		OCXO is 131
	LCN EVT REP				22:45:59	22:47:04		0:05:01	Must be within (4) + 4:00 and (4) + 5:00 : OK
6	**Sounding**	(5) +	00:01:00	22:48:04					
	LCN EVT REP				22:46:59	22:48:04	00:01:00	0:00:00	
7	**End sounding**	(7) +	0:08:10	22:56:14					
	LCN Last snd				22:55:08	22:56:13	00:09:09	0:00:01	100 soundings : OK
	LCN EVT REP				22:55:28				
8	**LCN Last HK**				22:56:37	22:57:42			Roughly 1 min margin for OFF
9	**LCN OFF**	(8) +	00:00:30	**22:56:44**					

Timings are OK

2.3.6.2 Full experiment signal spectrum

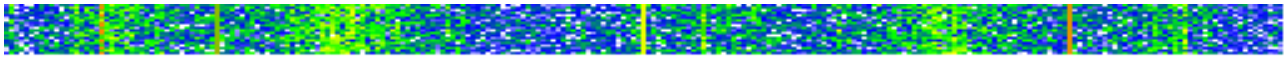
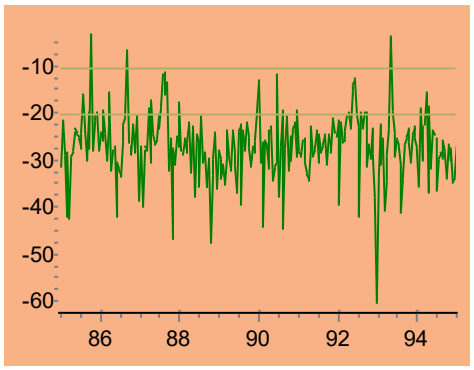


Figure 4 : LCN UFT signal spectrum
soundings are from top to bottom and frequencies from 85 MHz to 95 MHz
cold colors are low power levels and warm colors are high power levels

2.3.6.3 Highlights and comments

- During the UFTL, we observe two powerful lines @ 85.76 MHz (max = -0.95 dB, mean = -1.99 dB) and @ 93.33 MHz (max = -3.47 dB, mean = -4 dB) as shown hereafter



2.3.7 LCN Extended UFT

LCN Extended UFT is OK (16/04/2014 15:30:00).

2.3.7.1 Timing analysis

			Operation relative times	Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	**LCN ON**		00:00:00	**15:30:00**					
2	**LCN first HK**				15:29:14	15:30:19			
3	**LCN MT update**	(1)+	00:02:00	**15:32:00**					
	ACK				15:30:56	15:32:01		0:00:01	
4	**End Tuning**		00:07:00				00:00:00		OCXO is 131
	LCN EVT REP				15:35:59	15:37:04		0:05:03	Must be within (4) + 5:00 and (4) + 6:00 : OK
5	**Sounding**	(4)+	00:01:00	15:38:04					
	LCN EVT REP				15:36:59	15:38:04	00:01:00	0:00:00	
6	**LCN FIOW ratio v2**	(3)+	00:08:00	**15:40:00**					
	ACK				15:38:54	15:39:59		0:00:01	FIOW get the same behavior as in PC12 (reference)
7	**LCN Load full signal**								
	ACK	(6)+	00:01:00	**15:41:00**	15:39:56	15:41:01		0:00:01	FIOW count read 0x0000
	ACK		00:00:30	**15:41:30**	15:40:24	15:41:29		0:00:01	
	ACK		00:00:30	**15:42:00**	15:40:56	15:42:01		0:00:01	
	ACK		00:00:30	**15:42:30**	15:41:24	15:42:29		0:00:01	FIOW count read 0x0000
8	**LCN SWIP**								
	ACK	(7)+	00:02:00	**15:44:30**	15:43:24	15:44:29		0:00:01	
	ACK		00:01:00	**15:45:30**	15:44:24	15:45:29		0:00:01	
	ACK		00:01:00	**15:46:30**	15:45:24	15:46:29		0:00:01	All dumps OK
9	**LCN FIOW ratio v2**	(8)+	00:05:00	**15:51:30**					
	ACK				15:50:24	15:51:29		0:00:01	The FIOW actually reset to 4 (dec)
10	**Sounding stop**	(5)+	0:13:57	15:52:00	15:50:56	15:52:01		0:00:00	
11	**LCN dump**	(9)+	00:15:00	**16:06:30**					
	ACK				16:05:24	16:06:29		0:00:01	
12	**LCN Mode byte**	(11)+	00:01:00	**16:07:30**					

	ACK			16:06:24	16:07:29	0:00:01
13	LCN Last HK			16:08:27	16:09:32	Roughly 2s margin for OFF
14	LCN OFF	(12)+	00:02:00	16:09:30		

All timings are OK.

2.3.7.2 Full experiment signal spectrum

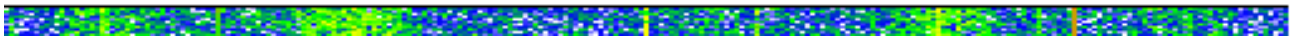
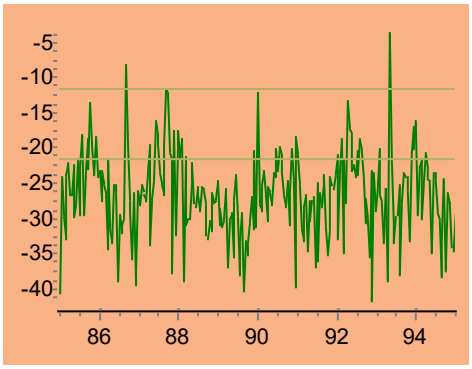


Figure 5 : LCN Extended UFT signal spectrum
soundings are from top to bottom and frequencies from 85 MHz to 95 MHz
cold colors are low power levels and warm colors are high power levels

2.3.7.3 Highlights and comments

During LCN Extended UFT, we observe a main powerline @ 93.33 MHz. This behaviour is nominal.



Comparing to OCN UFT and Ext UFT tests, we observe some not powerful but large bandwidth pollution on spectrum.

2.3.8 Ping-pong Umbilical

Ping-pong test with umbilical link and relative time tags commanding with OCN and LCN is OK (16/04/2014 16:30:00).

2.3.8.1 Timing analysis

	Operation relative times	Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1 OCN ON by OBCP	00:00:00	16:30:00					
2 LCN ON by AMST	(1)+ 00:00:05	16:30:05					
3 LCN first HK			16:29:19	16:30:24			
4 OCN ping REP			16:29:47	16:30:52			
5 OCN first HK			16:30:04	16:31:09			
6 OCN MT update	(2)+ 00:01:55	16:32:00					
ACK			16:30:56	16:32:01		0:00:01	
7 LCN MT update	(6)+ 00:00:10	16:32:10					
ACK CDMS			16:31:05	16:32:10		0:00:00	
ACK LCN			16:31:05	16:32:10		0:00:00	
8 End Tuning	00:07:00				00:00:00		OCXO is 129
OCN EVT REP			16:36:04	16:37:09		0:06:17	Must be within (1) + 6:00 and (1) + 7:00 : OK
LCN EVT REP			16:36:04	16:37:09		0:06:17	Must be within (1) + 6:00 and (1) + 7:00 : OK
9 Sounding	(8)+ 00:01:00	16:38:09					
OCN EVT REP			16:37:03	16:38:08	00:00:59	0:00:01	
LCN first snd			16:37:05	16:38:10	00:01:01	0:00:01	
10 End sounding							
LCN Last snd	(9)+ 0:08:10	16:46:20	16:45:13	16:46:18	00:09:09	0:00:02	100 soundings : OK
OCN Last snd	(9)+ 0:09:49	16:47:57	16:46:53	16:47:58	00:10:49	0:00:01	120 soundings : OK
OCN EVT REP			16:46:53	16:47:58		0:00:01	
11 LCN dump	(7)+ 00:15:50	16:48:00					
cdms ACK			16:46:56	16:48:01			
12 OCN CSA Dump	(11)+ 00:00:10	16:48:10					-0.5095 : OK

	ACK			16:47:08	16:48:13	00:11:04	0:00:03
13	**LCN Last HK**			16:47:58	16:49:03		Roughly 30s margin for OFF
14	**OCN Last HK**			16:48:27	16:49:32		Roughly 40s margin for OFF
15	**LCN OFF**	(12)+	00:00:30	**16:48:40**			
16	**OCN OFF on OBCP**	(15)+	00:00:10	**16:48:50**			

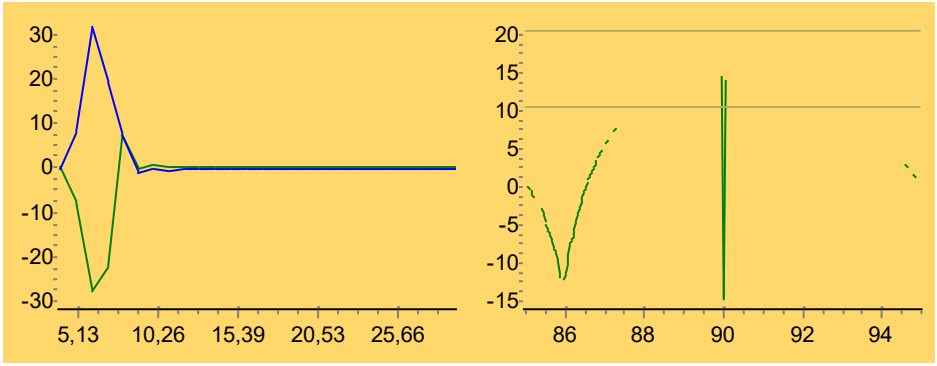
All timings are OK.

2.3.8.2 CSA

CSA is -0.51s: LCN is turned ON before OCN.
Abs(CSA) < 5 s: OK

2.3.8.3 Highlights and comments

Ping-pong signal is OK.



Signal
Spectrum

2.3.9 Ping-pong ATTC Umbilical

Ping-pong test with umbilical link and absolute time tags commanding with OCN and LCN is OK (16/04/2014 17:00:00).

2.3.9.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	17:30:00					
2	LCN ON by AMST	(1)+	00:00:05	17:30:05					
3	LCN first HK				17:29:18	17:30:23			
4	OCN ping REP				17:29:47	17:30:52			
5	OCN first HK				17:30:04	17:31:09			
6	OCN MT update	(2)+	00:01:55	17:32:00					
	ACK				17:30:56	17:32:01		0:00:01	
7	LCN MT update	(6)+	00:00:10	17:32:10					
	ACK CDMS				17:31:08	17:32:13		0:00:03	
	ACK LCN				17:31:05	17:32:10		0:00:00	
8	End Tuning		00:07:00				00:00:00		OCXO is 129 / 131
	OCN EVT REP				17:36:04	17:37:09		0:06:17	Must be within (1) + 6:00 and (1) + 7:00 : OK
	LCN EVT REP				17:36:03	17:37:08		0:06:16	Must be within (1) + 6:00 and (1) + 7:00 : OK
9	Sounding	(8)+	00:01:00	17:38:06					
	OCN EVT REP				17:37:03	17:38:08	00:00:59	0:00:02	
	LCN first snd				17:37:03	17:38:08	00:01:02	0:00:02	
10	End sounding								
	LCN Last snd	(9)+	0:08:10	17:46:18	17:45:13	17:46:18	00:09:12	0:00:00	100 soundings : OK
	OCN Last snd	(9)+	0:09:49	17:47:57	17:46:54	17:47:59	00:10:50	0:00:02	120 soundings : OK
	OCN EVT REP				17:46:54	17:47:59		0:00:02	
11	LCN dump	(7)+	00:15:50	17:48:00					
	cdms ACK				17:46:56	17:48:01			
12	OCN CSA Dump	(11)+	00:00:10	17:48:10					-0.2899 : OK

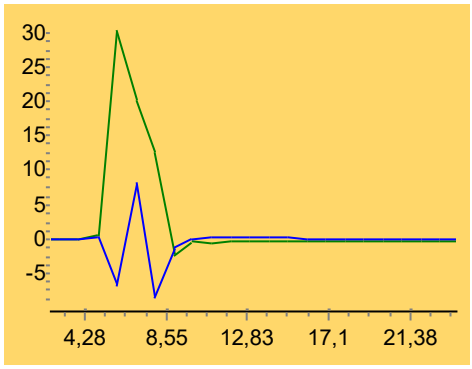
	ACK				17:47:08	17:48:13	00:11:04	0:00:03
13	**LCN Last HK**				17:47:57	17:49:02		Roughly 25s margin for OFF
14	**OCN Last HK**				17:46:54	17:47:59		Roughly 1min margin for OFF
15	**LCN OFF**	(12)+	00:00:30	**17:48:40**				
16	**OCN OFF on OBCP**	(15)+	00:00:10	**17:48:50**				

2.3.9.2 CSA

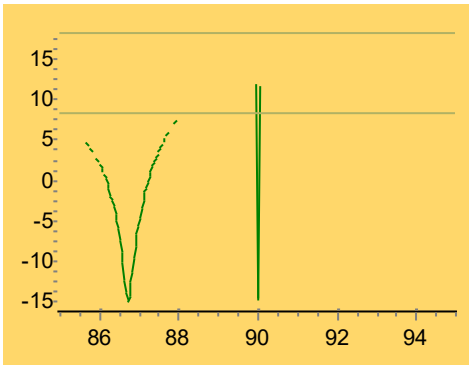
For the first run, CSA is -0.026s: LCN is turned ON before OCN.
For the second run, CSA is -0.29s: LCN is turned ON before OCN.
Abs(CSA) < 5 s: OK

2.3.9.3 Highlights and comments

Ping-pong signal is OK.

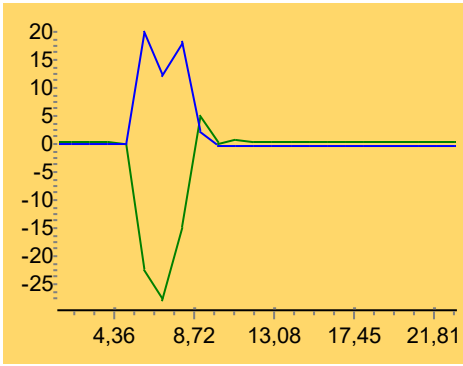


Signal

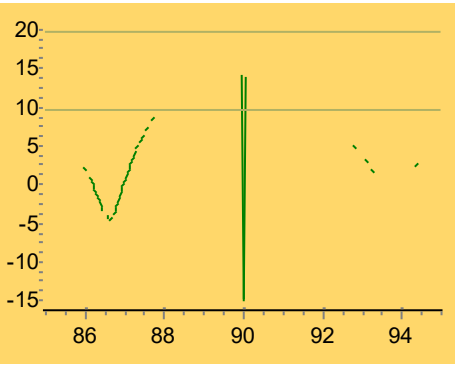


Spectrum

The same is observed in the second run of the test:



Signal



Spectrum

2.3.10 Ping-pong RF

Ping-pong test with RF link OCN and LCN is OK (21/04/2014 18:45:00).

2.3.10.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	18:45:00					
2	LCN ON by AMST	(1)+	00:00:05	18:45:05					
3	LCN first HK				18:44:18	18:45:23			
4	OCN ping REP				18:44:46	18:45:51			
5	OCN first HK				18:45:03	18:46:08			
6	OCN MT update	(2)+	00:01:55	18:47:00					
	ACK				18:45:55	18:47:00		0:00:00	
7	LCN MT update	(6)+	00:00:10	18:47:10					
	ACK CDMS				18:46:06	18:47:11		0:00:01	
	ACK LCN				18:46:07	18:47:12		0:00:02	
8	End Tuning		00:07:00				00:00:00		OCXO is 130 / 131
	OCN EVT REP				18:51:03	18:52:08		0:06:17	Must be within (1) + 6:00 and (1) + 7:00 : OK
	LCN EVT REP				18:51:03	18:52:08		0:06:17	
9	Sounding	(8)+	00:01:00	18:53:08					
	OCN EVT REP				18:52:02	18:53:07	00:00:59	0:00:01	
	LCN first snd				18:52:04	18:53:09	00:01:01	0:00:01	
10	End sounding								
	LCN Last snd	(9)+	0:08:10	19:01:19	19:00:13	19:01:18	00:09:10	0:00:01	100 soundings : OK
	OCN Last snd	(9)+	0:09:49	19:02:56	19:01:53	19:02:58	00:10:50	0:00:02	120 soundings : OK
	OCN EVT REP				19:01:53	19:02:58		0:00:02	
11	LCN dump	(7)+	00:15:50	19:03:00					
	cdms ACK				19:02:02	19:03:07			
12	OCN CSA Dump	(11)+	00:00:10	19:03:10					-0.308 : OK
	ACK				19:02:07	19:03:12	00:11:04	0:00:02	
13	LCN Last HK				19:02:55	19:04:00			Roughly 20s margin for OFF

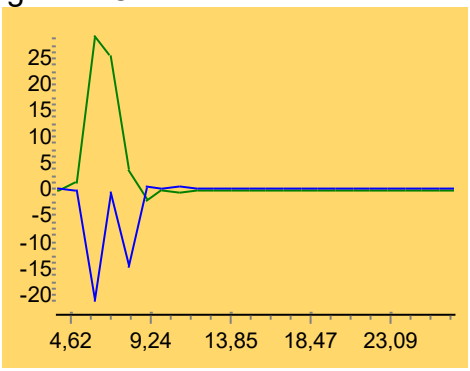
14	**OCN Last HK**			19:01:53	19:02:58	Roughly 1min margin for OFF
15	**LCN OFF**	(12)+	00:00:30	**19:03:40**		
16	**OCN OFF on OBCP**	(15)+	00:00:10	**19:03:50**		

2.3.10.2 CSA

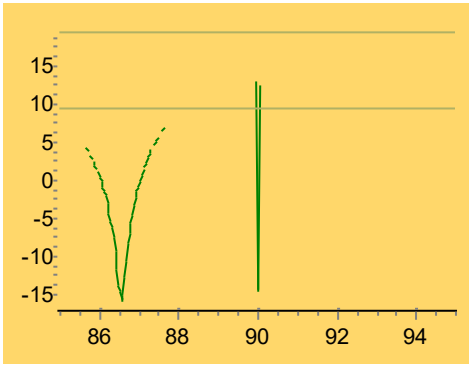
CSA is -0.31s: LCN is turned ON before OCN.
Abs(CSA) < 5 s: OK

2.3.10.3 Highlights and comments

Ping-pong signal is OK.



Signal



Spectrum

2.3.11 LCN unit interferences tests LDR

Interferences are analysed in a separate report [RD2] RO-OCN-TN-3832 (22/04/2014 12:15:00).

2.3.11.1 Overview

2.3.11.1.1 Timings

Timings observed for all the tests are OK.

2.3.11.1.2 Signal spectrum overview

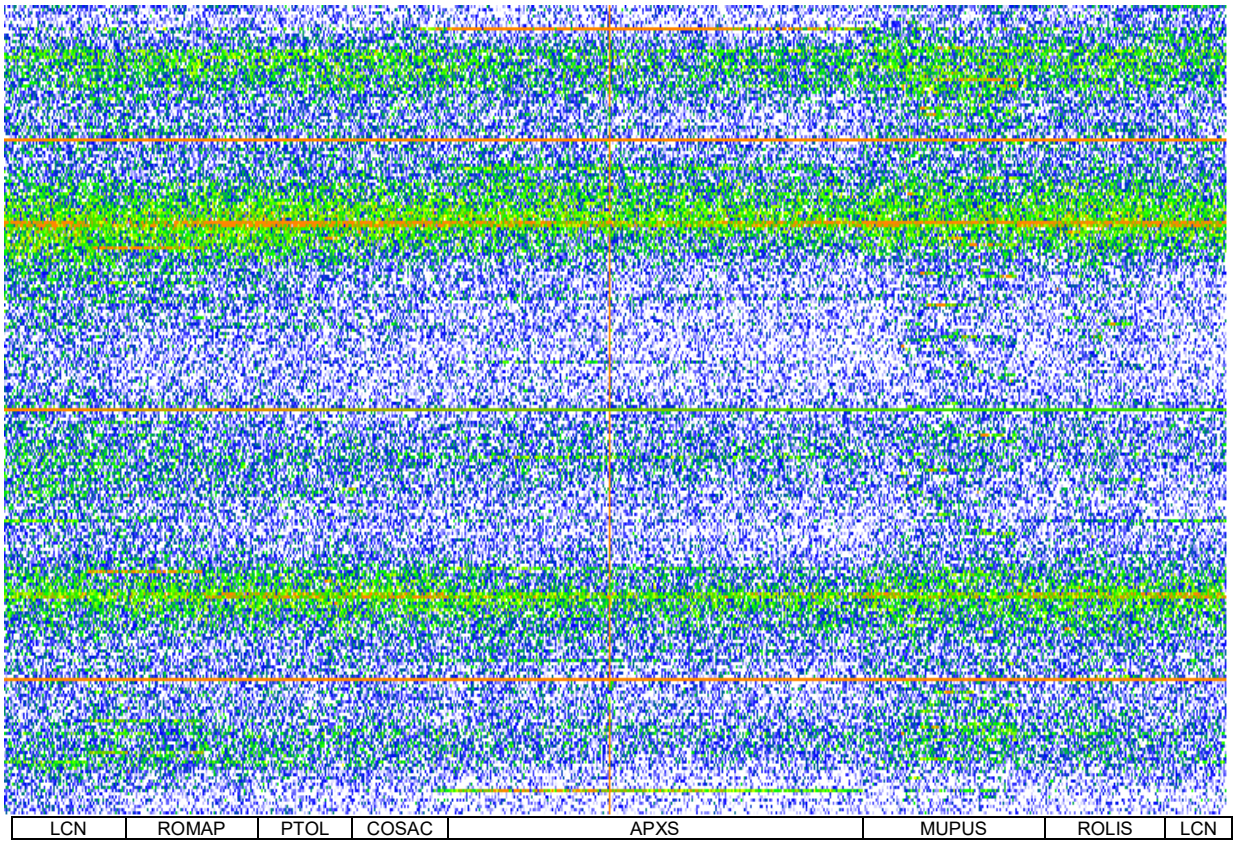


Figure 6 : LCN Unit interference test with LDR signal spectrum
soundings are from the left to the right and frequencies from 85 MHz (bottom) to 95 MHz (top)
cold colors are low power levels and warm colors are high power levels

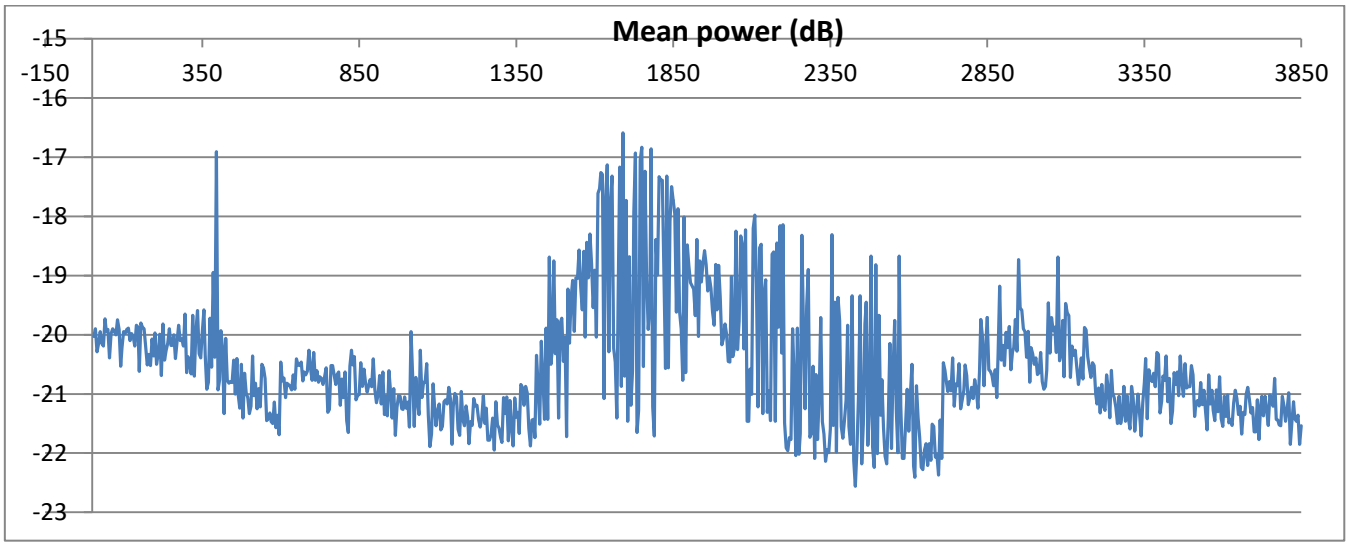


Figure 7 : LCN Unit interference test with LDR mean power

2.3.11.2 LCN stand alone

From 12:15:00 to 12:45:00.

The global mean power is around -20.5dB. Line @ 90 MHz, roughly -12 dB. Some large lobes appear in spectrum @ 87.7 MHz. We can observe more powerful lines at -3.3 and +3.3 MHz with value of -5 dB. Two other lines are present @ 88 and 92 MHz.

2.3.11.3 ROMAP

From 15:45:00 to 13:25:00.

At on-board time 12:54, we see a big peak @ 85.53 MHz, which should correspond to the start of ROMAP. We observe the -2/+2 MHz and the noise level decrease.

2.3.11.4 PTOL

From 13:25:00 to 13:45:00

One line @ 87.7 MHz (-5 dB).

2.3.11.5 COSAC

From 13:45:00 to 14:06:00

Still the 87.7 MHz.

2.3.11.6 APXS

From 14:06:00 to 16:16:00

A powerful line is present @ 85.3 MHz. We can see at the same time the 93 MHz line decreasing.

During this run, we have to TM blocks that have been corrupted. This leads to the huge peak at 14:59:50. Packets from TM 1804 number 2161 and 2166 are missing.

A step down in perturbation is visible at 16:20.

2.3.11.7 MUPUS

From 16:16:00 to 16:56:00
The power increase is seen from -21 dB to -19.5 dB with a peak above -19 dB

2.3.11.8 ROLIS

From 16:56:00 to 17:36:00

2.3.11.9 LCN stand alone

From 17:36:00 to 17:50:00
The power level is below -21 dB

2.3.12 Ping-pong stop&start patch

This test is the first on-board run of the stop&start procedure. It has been developed specifically for SDL/FSS phases, to allow CONSERT sounding to be suspended during the touch-down window, keeping the instrument ON and therefore tuned.

The test consists in a ping-pong successively stopped and restarted three times:

- "Patch V1":
  - stop simultaneously OCN and LCN: t0 + 3:00 (CONSERT internal time).
  - restart at t0 + 10:00
- "Patch V2":
  - stop LCN before OCN: t0 + 13:00 and t0 + 15:00
  - restart at t0 + 30:00
- "Patch V3":
  - stop OCN before LCN: t0 + 39:55 and t0 + 40:00
  - restart at t0 + 100:00

The idea is to check the stop & restart timings, and the total amount of soundings actually done by the instrument.

The test was successful (22/04/2014 19:50:00).

2.3.12.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	19:50:00					
2	LCN ON by AMST	(1)+	00:00:05	19:50:05					
3	LCN first HK				19:49:19	19:50:24			
4	OCN ping REP				19:49:46	19:50:51			
5	OCN first HK				19:49:46	19:50:51			
6	OCN MT update	(2)+	00:01:55	19:52:00					
	ACK				19:50:54	19:51:59		0:00:01	
7	LCN MT update	(6)+	00:00:10	19:52:10					
	ACK CDMS				19:51:06	19:52:11		0:00:01	
	ACK LCN				19:51:07	19:52:12		0:00:02	
8	End Tuning		00:07:00				00:00:00		OCXO is 129 / 131
	OCN EVT REP				19:56:04	19:57:09		0:06:18	Must be within (1) + 6:00 and (1) + 7:00 : OK
	LCN EVT REP				19:56:04	19:57:09		0:06:18	

9	**Sounding**	(8)+	00:01:00	**19:58:09**					
	OCN EVT REP				19:57:03	19:58:08	00:00:59	0:00:01	
	LCN first snd				19:57:05	19:58:10	00:01:01	0:00:01	
	Patch V1								
	OCN ACK	(8)+	00:03:00	20:00:09	19:58:58	20:00:03	00:02:54	0:00:06	last sounding is #24, stop at exact specified stop time => 24 soundings done, expected = 24
	LCN HK	(8)+	00:03:00	20:00:09	19:59:02	20:00:07	00:02:58	0:00:02	last sounding is #25 (long signal) => fisrt desync LCN/OCN SN-N => 25 soundings done, expected = 24
	Restart V1								
	OCN HK	(8)+	00:10:00	20:07:09	20:06:04	20:07:09	00:10:00	0:00:00	Relative CONSERT time restart is perfect
	LCN HK	(8)+	00:10:00	20:07:09	20:06:03	20:07:08	00:09:59	0:00:01	
	Patch V2								
	OCN ACK	(8)+	00:15:00	20:12:09	20:11:01	20:12:06	00:14:57	0:00:03	last sounding is #85, stop at exact specified stop time => 61 soundings done, expected = 61
	LCN HK	(8)+	00:13:00	20:10:09	20:09:01	20:10:06	00:12:57	0:00:03	last sounding is #62 (short signal) => 37 soundings done, expected = 37
	Restart V2								
	OCN HK	(8)+	00:30:00	20:27:09	20:26:04	20:27:09	00:30:00	0:00:00	Relative CONSERT time restart is perfect
	LCN HK	(8)+	00:30:00	20:27:09	20:26:04	20:27:09	00:30:00	0:00:00	
	Patch V3								
	OCN ACK	(8)+	00:39:55	20:37:04	20:35:54	20:36:59	00:39:50	0:00:05	last sounding is #205 => 120 soundings done, expected = 120
	LCN HK	(8)+	00:40:00	20:37:09	20:26:04	20:27:09	00:30:00	0:10:00	last sounding is #184 (short signal) => second desync => 122 soundings done, expected = 121
	Restart V3								
	OCN HK	(8)+	01:40:00	21:37:09	21:36:04	21:37:09	01:40:00	0:00:00	Relative CONSERT time restart is perfect
	LCN HK	(8)+	01:40:00	21:37:09	21:36:03	21:37:08	01:39:59	0:00:01	
10	**End sounding**								
	OCN Last snd	(8)+	01:50:00	21:47:09	21:46:03	21:47:08	01:49:59	0:00:01	last sounding is #327 => 122 soundings done, expected = 122
	LCN Last snd	(8)+	01:50:00	21:47:09	21:45:47	21:46:52	01:49:43	0:00:17	last sounding is #303 => two desyncs leads in 2 SN lost => 119 soundings done, expected = 121
	OCN EVT REP				21:46:03	21:47:08		0:00:01	
11	**LCN dump**	(7)+	00:15:50	**20:08:00**					
	cdms ACK				21:48:35	21:49:40			

12	**OCN CSA Dump ACK**	(11)+	01:40:35	**21:48:35**	21:47:32	21:48:37	01:51:28	0:00:02	-0.446 : OK
13	**LCN Last HK**				21:48:00	21:49:05			
14	**OCN Last HK**				21:46:03	21:47:08			
15	**LCN OFF**	(12)+	00:00:30	**21:49:05**					
16	**OCN OFF on OBCP**	(15)+	00:00:10	**21:49:15**					

2.3.12.2 CSA

CSA is -0.45 s: LCN is turned ON before OCN.
Abs(CSA) < 5 s: OK

2.3.12.3 Highlights and comments

On LCN, two times, one sounding was acquired more than expected. This is due to different the command propagation delay for both platforms. This is not a real problem for CONSERT: it just needs to re-synchronize LCN versus OCN data based on time rather than on the sounding number.
A tricky selection of the patch command date and a few minutes margin could limit this effect.

All patched date for restart worked successfully. The LCN/OCN automats synchronization has been preserved and allows correct operations.

Stop and Start test is successful.

2.3.13 LCN Unit interference test MUPUS

Interferences are analysed in a separate report [RD2] RO-OCN-TN-3832 (23/04/2014 06:50:00).

2.3.13.1 Full experiment signal spectrum

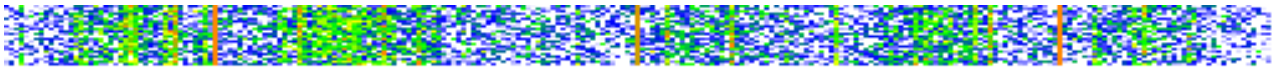


Figure 8 : LCN Unit interference test with MUPUS signal spectrum
soundings are from top to bottom and frequencies from 85 MHz to 95 MHz
cold colors are low power levels and warm colors are high power levels

2.3.13.2 Timing analysis

Initially, the test was planned to begin at 07:25:00. As the AMST commanding sequence was leaded by the “Operations completed” event, and the previous tests completed earlier, the CONSERT tests started earlier.

2.3.13.3 Highlights and comments

Three main lines are present @ 86.67 Hz, 88.27 MHz and 93.3 MHz. The power does not go upper than -3 dB.

2.3.14 OCN ROSINA and OSIRIS interference test

OCN ROSINA and VIRTIS interference test show the influence of the ROSINA and OSIRIS instruments on CONSERT measurements. Interferences test results will be developed in a specific T.N.

The test schedule is as follows:

05-June-2014_12:30:00 = Consert ON
05-June-2014_13:00:00 = Osiris OFF
05-June-2014_13:30:00 = Rosina ON
05-June-2014_15:30:00 = Rosina reaches steady state
05-June-2014_16:30:00 = Rosina start OFF
05-June-2014_16:40:00 = Rosina OFF
05-June-2014_17:10:00 = Osiris ON OBCP
05-June-2014_17:25:00 = Osiris Thermal Control ON
05-June-2014_17:40:00 = Consert OFF

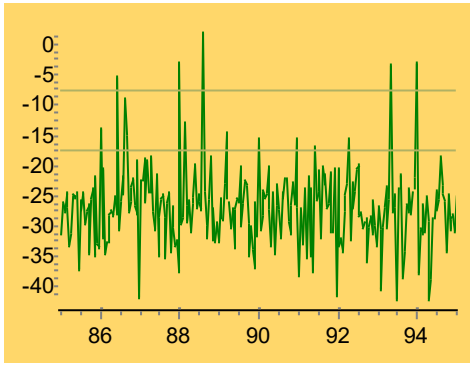
2.3.14.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	12:30:00					
2	OCN ping REP				12:29:44	12:30:49			
3	OCN first HK	(1) +	00:01:05	12:31:05	12:30:02	12:31:07			
4	OCN MT update	(1) +	00:02:00	12:32:00					
	ACK				12:30:53	12:31:58		0:00:02	
5	End Tuning	(1) + max	00:07:00				00:00:00		OCXO is 182
	OCN EVT REP				12:35:36	12:36:41		0:04:43	Must be within (4) + 4:00 and (4) + 5:00 : OK
6	OCXO Change	(4) +	00:05:30	12:37:30					OK
	ACK				12:36:24	12:37:29		0:00:01	
7	Sounding	(5) +	00:01:00	12:37:41					
	OCN EVT REP				12:36:35	12:37:40	00:00:59	0:00:01	
8	End sounding	(7) +	4:56:55	17:34:35					
	OCN Last snd				17:33:30	17:34:35	04:57:54	0:00:00	3600 soundings : OK
	OCN EVT REP				17:33:30				
9	OCN CSA Dump	(4) +	05:10:00	17:40:00					-26 : OK
	ACK				17:38:56	17:40:01	05:03:20	0:00:01	
10	OCN Last HK				17:39:41	17:40:46			Roughly 15s margin for OFF
11	OCN OFF on OBCP	(9) +	00:00:30	17:40:30					

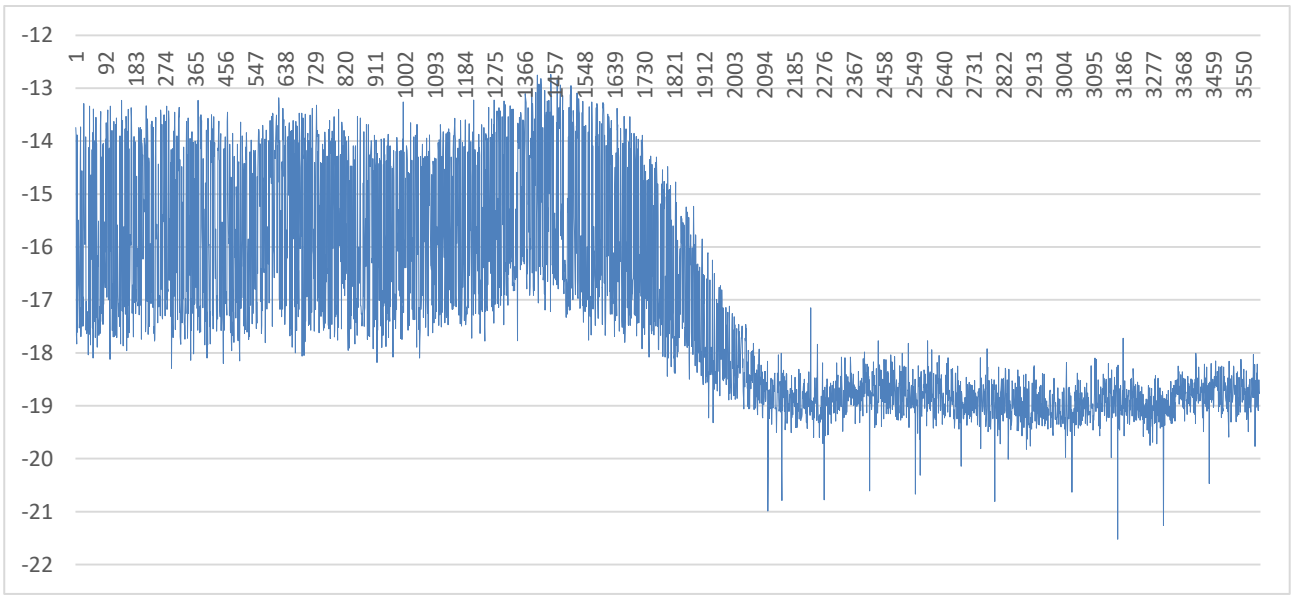
All timings are OK.

2.3.14.2 Highlights and comments

We see a dominating powerline @ 88 MHz during the first half of the test. The powerline @ 88.59 MHz is still present during the entire test slot (remaining in the second half of the test). We can observe also lower variable lines @ 93.17 Mhz and @ 94 MHz.



OSIRIS shows no interferences and ROSINA effect is relatively low (to be confirmed, please refer to the interference report).



2.4 PHC Conclusions

The Post Hibernation Commissioning tests for CONSERT were successful and show a nominal state of the instrument, for both orbiter and lander part.

All instrument parameters and performances are nominal:

- All execution timings were verified with regard to the mission tables
- The OCXO of OCN and LCN has not relatively shifted. This shows a good aging of these oscillators.
- Tuning was successful during all Ping-Pong tests.

Nevertheless, we noticed a higher noise level than observed during cruise phase tests. The difference is about +6 dB for OCN. It is possible that OSIRIS can cause these perturbations. Additional tests are scheduled during MTP 4 (05/06/2014 12:30) to evaluate this hypothesis.
All interference tests results and analysis will be detailed in a separate technical document RO-OCN-TN-3832 [RD2].

In an operation point of view, all the synchronization are successful with CSA lower than 1 second: these values are better than those observed during cruise (2 second typic).

No TM corruption observed on both OCN and LCN excepted two packets where lost at CDMS level on LCN.

The new CONSERT stop&start procedure was successful and can be applied to SDL/FSS.

CONSERT is ready for operations.

3 MTP 8 – Close Observation: 16 Oct. 2014

3.1 Main actions

During this activity, CONSERT is operated in mono-static radar mode, which means Philae is still attached to Rosetta. A signal is transmitted from OCN to LCN through a direct path (very short and constant) and also reflected by the comet nucleus surface. The transponder system send back the same signal in the same paths from LCN to OCN.

Date	Time (UTC)	Duration	Test description
16/10/2014	11:00:00	14:00:00	Ping-pong monostatic observation

Table 5 : CONSERT operations summary for MTP8

3.2 Data analysis

3.2.1 Performances

MTP8	
Ping-pong	
S/P position (°)	-1.8/1.8
Ping-pong Orbiter signal	
Peak level (dB)	29 to 39
GCW	24/26
Current (mA)	95
OCXO	131
Peak Position	All
Temperature Range	11/13.5
Ping-pong Lander signal	
Peak level (dB)	22 to 39
GCW	26/27
Current (mA)	116
OCXO	131
Temperature Range	-27/-12.5

Table 6 : Performances overview

Comparing to values observed in cruise phase, we notice:

- OCXO values have not changed (details below).
- Currents are roughly the same.
- GCW are the same as those observed in PC and PHC tests.

3.2.2 Solar panel positions

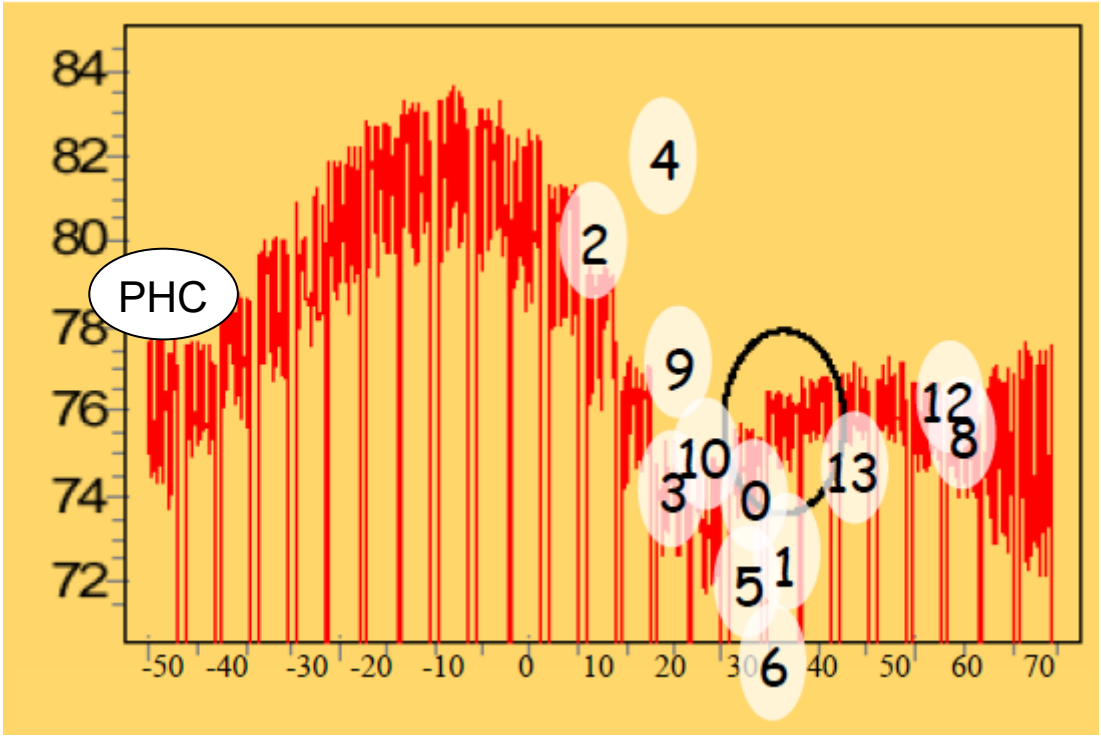


Figure 9 : CONSERT power versus S/P position from -50/+50 to +70/-70 ° by 5° steps and power measured during the different PC tests. Numbers corresponds to each PC ## phase observation.

During this activity, the solar panel are in a very different configuration as encountered in PC and PHC tests.

3.2.3 Temperature

	Ocxo Start	**Ocxo end**	**Digi Start**	**Digi End**	**Ebox Start**	**Ebox end**
MTP8 OCN	17	23.3	13.6	20.3	11	13.5
MTP8 LCN	-20.5	-1	-23.7	-6	-27	-12.5

Table 7 : Temperatures during MTP8 activity

The temperatures on LCN e-box and components are a bit low by comparison to usual ones in the beginning of the operation.

3.2.4 Telemetry and data integrity

The data integrity is fine.

3.3 Operation details

3.3.1 Timing analysis

		Operation relative times		Expected stack UTC	Observed OBT	Observed UTC time	OCN time	Diff	Remarks
1	OCN ON by OBCP		00:00:00	11:00:00					
2	LCN ON by AMST	(1)+	00:00:05	11:00:05					
3	LCN first HK	(2)+	00:00:15	11:00:20	10:59:13	11:00:23		0:00:03	
4	OCN ping REP				10:59:41	11:00:51			
5	OCN first HK	(1)+	00:01:05	11:01:05	10:59:58	11:01:08		0:00:03	OCN and LCN within 10s
6	OCN MT update	(1)+	00:02:00	11:02:00					
	ACK				11:00:49	11:01:59		0:00:01	
7	LCN MT update	(2)+	00:02:05	11:02:10					
	ACK CDMS				11:01:00	11:02:10		0:00:00	
	ACK LCN				11:01:00	11:02:10		0:00:00	
8	End Tuning	(2)+	00:07:00						OCXO is 131 / 131
	OCN EVT REP			11:07:05	11:05:57	11:07:07		0:00:02	2s delay taken at switch ON
	LCN EVT REP			11:07:05	11:05:58	11:07:08		0:00:03	3s delay taken at switch ON
9	Sounding	(8)+	00:01:00	11:08:08					
	OCN EVT REP				11:06:56	11:08:06	00:00:59	0:00:01	OK regarding to the end of tuning
	LCN first snd				11:10:27	11:11:37	00:04:29	0:03:29	
12	End sounding								
	OCN Last snd	(9)+	02:47:58	13:56:06	13:54:56	13:56:06	13:56:06	0:00:00	
	LCN Last snd			no expected date	13:45:41	13:46:51			no data corruption detected
	OCN EVT REP				13:54:56	13:56:06			
13	LCN dump								
	cdms ACK								LCN dump not expected as LCN OFF was event driven
14	OCN CSA Dump								No CSA dumped
	ACK								
15	OCN Last HK				13:59:01	14:00:11			
16	OCN OFF on OBCP	(14)+	00:00:30	14:00:10					

All timings are OK.

3.3.2 Highlights and comments

In a first approach, the signal synchronization and SNR are good for the direct path. Surface response seems to stay under the noise level (further analysis to be done later).

– END OF DOCUMENT –