



FMO
Flight Model Orbiter

Integration and calibration



DOCUMENTATION CHANGE RECORD

Issue	Rev.	Sec.	Page	Date	Changes
1	0	All	All	13/03/2001	Génération du document chap 1 et 4 à 12
1	1	All	All	13/03/01	Modifications apportées .
1	2	All	All	14/03/01	Info de durées et de configuration
1	3	All	All	15/03/01	Complément à toutes les températures
1	4			21/03/01	modif A. Herique + complements banc
2	0	All	All	23/04/01	avec résultats des tests VT
2	1	All	All	27/04/01	avec mesure de courants de v1.7 de JPG
2	2	All	All	07/05/01	mise à jour tableaux et courbes
2	3	All	All	05/11/02	Modif+compléments NS
3	0			06/09/03	Finalisation (AH) Fusion avec partie integration
4	0	All	All	24/11/17	English translation



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1. Introduction

This document describes the tests performed on CONSERT Flight Model Orbiter (FMO) during Rosetta payload integration phase, in 2001. The integration tests included technical functional tests as well as calibration operations.

This document have been originally written in French language and described all the FMO integration tests. In order to document properly the data provided with Rosetta Archive to the Planetary Science Archive, it has been translated to English language.

Only the relevant tests concerning calibration have been included in this translation. It explains the “Intentionnally left blank” sections: to clean the document from useless functional tests descriptions and to ensure keeping track of section numbering between calibration tests and data files (cf. 13. Files correlation table).



2. Intentionnaly left blank section

3. Intentionnaly left blank section



4. Test in Laboratory at ambient temperature

4.1. Characterization of the OCXO and of the Tuning function of the Orbiter

For the different integration tests in front of the bench, it is necessary to set by remote control the Orbiter reference clock with the fixed time of HP test bench (carrier at 90MHz with an accuracy better than one hertz)

The FMO DAC90 setpoint which corresponds to a carrier as close to 90MHz as possible (with a resolution of a few Herz) will be set in real time by the following test, performed in front of the bench.

4.1.1. Intentionnaly left blank section

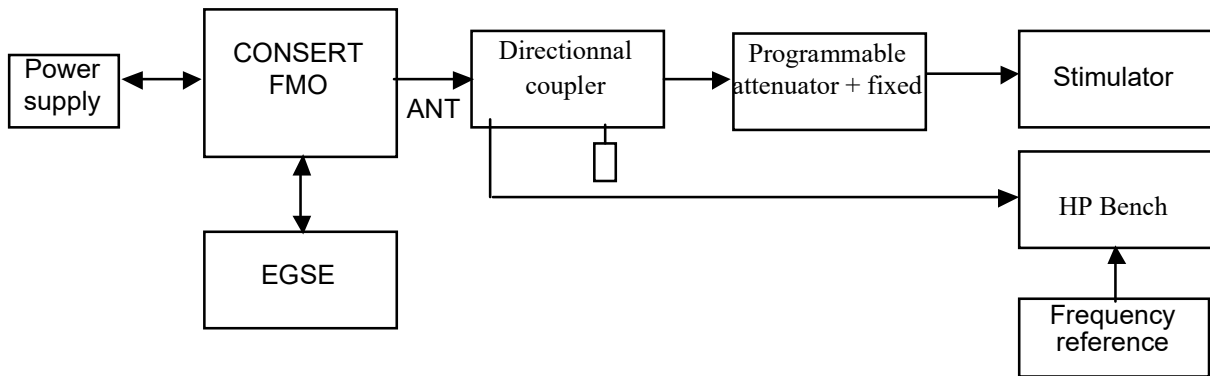


4.1.2. Tuning characterization in front of the stimulator (Lander)

Duration: about 5 hours

Operation: Instrument regular reconfiguration and bench controlling by operator

Assembly configuration: ping-pong and bench coupling



Necessary material

Matériel	Type	Statut	
Adjustable power supply	28V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Manual setting of attenuation
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	EQML1 dit QML		
HP Bench	test emission quality	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Full backup	ok	Acqui_R8_en_TX_derrière_coupleur
Frequency reference	Frequency meter +USO	Ok	HP53132/012

Test description: Instead of controlling the tuning through the bench with a purely sinusoidal signal with an almost absolute frequency and always at a comfortable level, a real tuning is achieved by the Lander instrument (stimulator) near the 4 reference frequencies and for 6 attenuation levels on the path (24 starts)

Test and record of Orbiter and Lander TM are extended beyond the end of tuning (The 10 first soundings are recorded). A R8 binary file is also recorded on the bench with the entire Orbiter emission for each of the 20 tunings (parameters set frequencies and level). The carrier frequency will be measured through calculation up this file. Quality of the rendezvous and of the coherent addition will be checked on both TM Orbiter and Lander (see table next page). The duration is evaluated to 12 minutes per parameters set, which means approximately 5 hours.



Mission tables:

Orbiter mission table: MT_FMO_VT (avec DELTATIC = 5s)

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

Mission table MT_QML_VT for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT QML VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Bench program: **Acqui_R8_en_TX_derrière_coupleur.vee** (see section 11.2)

Setting of attenuator: see table next page



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Short results: Tuning is done for each 4 test frequencies at -83dBm, but is assured only on the lower part of the band for -85 dBm or -87 dBm

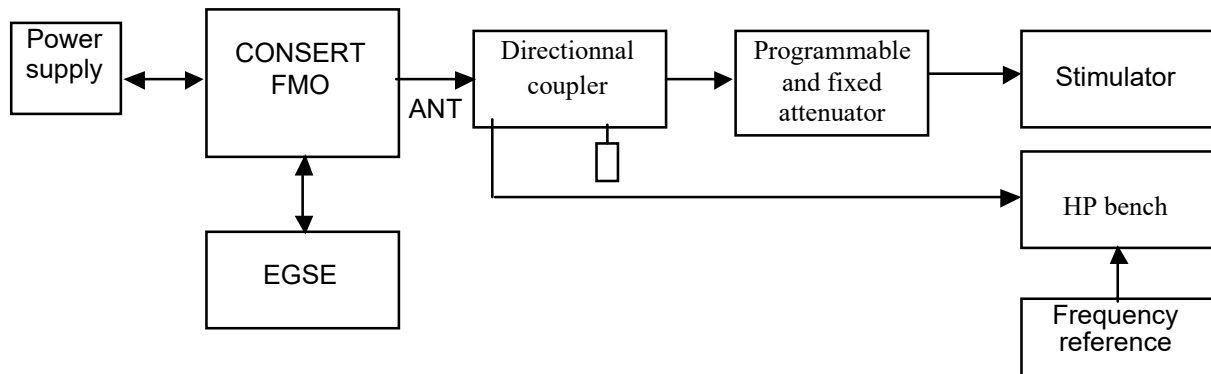
Réf	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tuning	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
-6	89999460	(40)d=(28)h	-45	-47	17	25	1	149	129	OK	AP050953.D04	050401_01	OBloc_IQ_4_1b_01
-6	89999460	(40)d=(28)h	-75	-77	3	25	1	145	129	OK	AP051007.D08	_02	_02
-6	89999460	(40)d=(28)h	-80	-82	0	25	1	149	129	OK	AP051017.D36	_03	_03
-6	89999460	(40)d=(28)h	-81	-83	0	25	1	145	132	OK	AP051601.D31	_26	_26
-6	89999460	(40)d=(28)h	-83	-85	0	25	1	143	129	OK	AP051027.D58	_04	_04
-6	89999460	(40)d=(28)h	-85	-87	0	25	1	142	129	OK	AP051041.D02	_05	_05
-3	89999730	(76)d=(4C)h	-45	-47	17	67	1	149	129	OK	AP051051.D44	_06	_06
-3	89999730	(76)d=(4C)h	-75	-77	2	67	1	149	130	OK	idem	_07	_07
-3	89999730	(76)d=(4C)h	-80	-82	0	67	1	144	130	OK	AP051110.D41	_08	_08
-3	89999730	(76)d=(4C)h	-81	-83	0	67	1	143	129	OK	AP051550.D03	_25	_25
-3	89999730	(76)d=(4C)h	-83	-85	0	218	9	139	129	NON	AP051110.D41	_09	_09
-3	89999730	(76)d=(4C)h	-85	-87	0	220	8	137	129	NON	AP051142.D08	_10	_10
0	90000000	(126)d=(7E)h	-45	-47	17	127	1	149	130	OK	AP051151.D44	_11	_11
0	90000000	(126)d=(7E)h	-75	-77	1	127	1	151	129	OK	AP051201.D43	_12	_12
0	90000000	(126)d=(7E)h	-80	-82	0	127	1	144	129	OK	AP051210.D37	_13	_13
0	90000000	(126)d=(7E)h	-81	-83	0	127	1	142	129	OK	AP051534.D28	_24	_24
0	90000000	(126)d=(7E)h	-83	-85	0	218	10	138	129	NON	AP051220.D45	_14	_14
0	90000000	(126)d=(7E)h	-85	-87	0	220	8	137	133	NON	AP051230.D34	_16	_16
3	90000270	(196)d=(C4)h	-45	-47	17	217	1	149	129	OK	AP051404.D06	_17	_17
3	90000270	(196)d=(C4)h	-75	-77	1	217	1	152	129	OK	AP051420.D51	_18	_18
3	90000270	(196)d=(C4)h	-75	-77	2	217	1	149	129	OK	AP051428.D40	_19	_19
3	90000270	(196)d=(C4)h	-80	-82	0	217	1	146	130	OK	AP051441.D42	_20	_20
3	90000270	(196)d=(C4)h	-81	-83	0	217	1	142	129	OK	AP051524.D26	_23	_23
3	90000270	(196)d=(C4)h	-83	-85	0	220	9	138	129	NON	AP051452.D02	_21	_21
3	90000270	(196)d=(C4)h	-85	-87	0	220	8	135	129	NON	AP051506.D56	_22	_22

See summary of BIN files with calculation of power and frequency section 13



4.1.3. SOREP precise and full characterization

Duration: about 9 hours at **constant temperature**
Operation: many and regular manual interventions on the bench
Assembly configuration: ping-pong and bench coupling



The evolution of the 90MHz carrier frequency is precisely characterized depending on the DAC control of the Orbiter. Measurement will be done at 28 Volts.

For the Orbiter, the carrier measurement is made by analysing signals transmitted by the instrument during coded transmission of the sounding mode in ping-pong (deferred processing in LPG). These signals are recorded on the bench in by-pass through to the coupler during ping-pong.

After a normal starting face to the Lander stimulator (with standard mission tables) at the beginning of the Sounding phase, TC are regularly sent to the Orbiter to modify the DAC setpoint and tune the Orbiter carrier.

TC for Orbiter and sending mode

The telecommand file is selected on the TC window of EGSE Orbiter (file*.cmc).

These files involve a maximum of 128 sequenced commands. The 256 commands are processed in two steps, loading the second one after the end of the first one.

Interval to send telecommands is set to 2 minutes (see below)

Operation on the bench :

For each setpoint, from 0 to 255, a « binary » file of raw acquisition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**

Each file takes up to 8MByte on the bench. Each acquisition lasts about 1 minute 15 seconds (with bus VXI reset). Taking into account the TC acknowledgement delays, 2 minutes per setpoint should be expected, for a total of 512 minutes after the initial phase before ping-pong. In these conditions, the total duration of this measurement is eight hours and forty minutes and requires the constant presence of an operator for the bench.

It is necessary to take into account the parameters of bench, coupler, external cables and tank cables that links the instrument to the BNC connector of tank crossing for the auxiliary measurement of the



coded transmit power (length 5m, estimated delay 25ns, measured loss of 1,9 dB (TBC) see table section 12). **37.4dB (TBC) have thus to be added to all the measured powers on bench 1437 input board to get the power output of the Orbiter.**

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C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
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C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)



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DAC setpoint	Telecommand		Measurements on file / bench			
	TC type	TC Param	File name/bench	Carrier frequency measured by calculation	Calculated power/bench	Output power dBm
0			FMO_000.bin			
1			FMO_001.bin			
2			FMO_002.bin			
3			FMO_003.bin			
4			FMO_004.bin			
5			FMO_005.bin			
6			FMO_006.bin			
7			FMO_007.bin			
8			FMO_008.bin			
9			FMO_009.bin			
10			FMO_010.bin			
11			FMO_011.bin			
12			FMO_012.bin			
13			FMO_013.bin			
14			FMO_014.bin			
15			FMO_015.bin			
16			FMO_016.bin			
17			FMO_017.bin			
18			FMO_018.bin			
19			FMO_019.bin			
20			FMO_020.bin			
21			FMO_021.bin			
22			FMO_022.bin			
23			FMO_023.bin			
24			FMO_024.bin			
25			FMO_025.bin			
26			FMO_026.bin			
27			FMO_027.bin			
28			FMO_028.bin			
29			FMO_029.bin			
30			FMO_030.bin			
31			FMO_031.bin			
32			FMO_032.bin			
33			FMO_033.bin			
34			FMO_034.bin			
35			FMO_035.bin			
36			FMO_036.bin			
37			FMO_037.bin			
38			FMO_038.bin			
39			FMO_039.bin			
40			FMO_040.bin			
41			FMO_041.bin			
42			FMO_042.bin			
43			FMO_043.bin			
44			FMO_044.bin			
45			FMO_045.bin			
46			FMO_046.bin			
47			FMO_047.bin			
48			FMO_048.bin			



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49			FMO_049.bin			
50			FMO_050.bin			
51			FMO_051.bin			
52			FMO_052.bin			
53			FMO_053.bin			
54			FMO_054.bin			
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62			FMO_062.bin			
63			FMO_063.bin			
64			FMO_064.bin			
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72			FMO_072.bin			
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74			FMO_074.bin			
75			FMO_075.bin			
76			FMO_076.bin			
77			FMO_077.bin			
78			FMO_078.bin			
79			FMO_079.bin			
80			FMO_080.bin			
81			FMO_081.bin			
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102			FMO_102.bin			



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103			FMO_103.bin			
104			FMO_104.bin			
105			FMO_105.bin			
106			FMO_106.bin			
107			FMO_107.bin			
108			FMO_108.bin			
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154			FMO_154.bin			
155			FMO_155.bin			
156			FMO_156.bin			



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157			FMO_157.bin			
158			FMO_158.bin			
159			FMO_159.bin			
160			FMO_160.bin			
161			FMO_161.bin			
162			FMO_162.bin			
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211			FMO_211.bin			
212			FMO_212.bin			
213			FMO_213.bin			
214			FMO_214.bin			
215			FMO_215.bin			
216			FMO_216.bin			
217			FMO_217.bin			
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219			FMO_219.bin			
220			FMO_220.bin			
221			FMO_221.bin			
222			FMO_222.bin			
223			FMO_223.bin			
224			FMO_224.bin			
225			FMO_225.bin			
226			FMO_226.bin			
227			FMO_227.bin			
228			FMO_228.bin			
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230			FMO_230.bin			
231			FMO_231.bin			
232			FMO_232.bin			
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237			FMO_237.bin			
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246			FMO_246.bin			
247			FMO_247.bin			
248			FMO_248.bin			
249			FMO_249.bin			
250			FMO_250.bin			
251			FMO_251.bin			
252			FMO_252.bin			
253			FMO_253.bin			
254			FMO_254.bin			
255			FMO_255.bin			



4.2. Intentionnaly left blank section

4.3. Intentionnaly left blank section

4.4. Wideband receiver test

The aim of these tests is to check the proper functioning of the receiver in measurement mode with linkage and coherent addition. The receiver receives on its antenna the signal coming from the bench ESGD generator through a 10 dB attenuator.

This test corresponds to the calibration tests 4.7, 4.9, 4.10 and 1.6

4.4.1. Intentionnaly left blank section

4.4.2. Intentionnaly left blank section

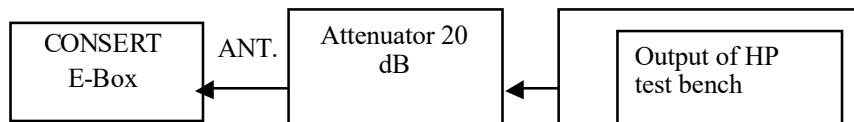


4.4.3. Test of AGC on coded signal

Duration: 3 hours

Operation: automatic, after OCXO reset, as of sounding phase

Assembly configuration: in receiving face to the bench



The aim of this AUTOMATIC test is to check the correct functioning of AGC varying the RF input level and verifying the attenuation set point for each RF level.

This test will be performed at ambient temperature. There is another test for small signals (section 4.4.4)

The bench transmits the signal through an attenuator of 20dB. Total attenuation is **21.7 dB** inserting the modulation and cables losses in the laboratory configuration (see table12.4).

From the generator, the RF input level varies from -70dBm to $+10\text{dBm}$ in increments of 1 dB. Orbiter is started with a standard table mission :

<u>Table Mission Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After the failure of the sounding phase, Orbiter OCXO is reset with a TC with a DAC90 (=0x7E) setpoint. The instrument is thus tuned to the bench.

During the test, the HP bench emits permanently, emitted power changes of 1 dB each 120 seconds. There is about 24 soundings per level increment.



Bench Programming:

Use the program **Test_en_Rx_Rampe_niveau.vee** (see sheet, section 11)

Before starting, choose the following ramp bench parameters:

Min level: -70dBm,
Max level: +10dBm,
Increment: 1dB
Duration of each increment: 120s

The 81 steps last 162 minutes or 2 hours and about 42 minutes.

Orbiter TM file name: AP040941.D17

After a first attempt that failed (file TM: AP040910.D51), test is restarted around 9h41 am with a code tuning at -70dBm (too weak) then a sending of TC tuning DAC 90 towards sounding 14. The ramp is first started with a low level at SND 14 to 70, then generator is interrupted, noise on FMO is recorded, then the ramp is really started towards sounding 92, with a generator level at -70dBm (which means -91.7dBm on FMO input).

Recording is over at 12h58 pm with a useful ramp signal towards sounding SND2040, then only noise towards SND 2312.

Example of parameters set during ramp :

Generator level:	-41dBm
FMO input level:	-62.7 dBm
TM value of GCW	11
Approximate gain of analogic section RX	$91 - (2 \times 11) = 69\text{dB}$
Global level of IQ analogic output	+6.3 dBm

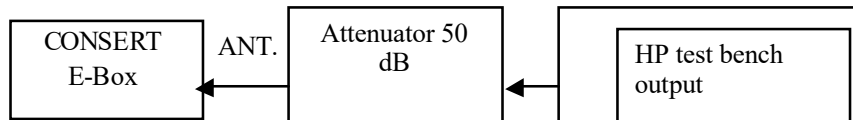


4.4.4. Receiver answer in small-signal

Duration: 2 hours

Operation: automatic, after OCXO tuning, as of sounding phase

Assembly configuration: in receiving face to the bench with a 50 dB attenuator



Aim of this AUTOMATIC test is to try and characterize the functioning of the receiving chain for coherent small signals of lower level than the receiver own noise. The test must be done at constant temperature. It corresponds to section 4.7b of the Specifications.

The bench transmits the signal through a 50dB attenuator : R&S attenuator is set on 30dB and there is two fixed 10 dB attenuators (in fact 20.45dB). The total attenuation is in fact **51.8 dB** including the cable loss.

RF power at generator level varies from - 80dBm to - 30 dBm in 1 dB step.

Orbiter is started with a standard mission table.

Orbiter Mission Table (10 "16bits Words") : FMO VT

<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After the failure of Orbiter tuning phase, Orbiter OXCO is tuned again with a TC with a DAC90 (=0x7E) setpoint. The instrument is thus tuned to the Bench.

During the test, HP bench emits permanently, the emitted power changes from 1 dB each 120 seconds. There are around 24 soundings for each level step.



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Bench Programming:

Use program **Test_en_Rx_Rampe_niveau.vee** (see sheet, section 11)

Before launching, choose the following bench ramp parameters:

Min level: -80dBm,

Max level: -30dBm,

Step: 1dB

Each step duration: 120s

The 51 steps last 102 minutes or 1 hour and about 42 minutes.

Beginning of the test at 3h25 pm on April 3rd 2001, tuning failure with INTQ=10, then tuning DAC90.

TM Orbiter file name: AP031525.D02

At the ramp beginning and with a 51.8 dB attenuation, FMO input level would be -131.8 dBm. At this level, there are higher losses, and there is a big and long reverberation on the trace.

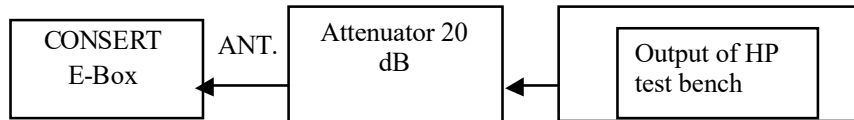


4.4.5. Relative spectrum receiving measurement

Duration: less than 4 hours

Operation: automatic after OCXO tuning and sounding beginning

Assembly configuration: in receiving face to the bench



This test is done on flight and spare models. The instrument receives generator's signal through the 20 dB attenuator. Normally, during measurement and sweep frequency, gain is fixed at a constant value. As this function does not work on FMO, we use automatic gain. The generator level at -20 dBm, so **-41.5 dBm** at receiver input, allows to have a good SNR for measurement. (GCV variable value around 21)

For FMO, we choose to do the measurement only in the useful range (from -4MHz to +4MHz) corresponding to the lines - 100 to + 100.

Using 120 seconds per line (2mn), sweep duration of this test is 400 minutes, about 6 hours 40 all in all.

Launching on April 3rd at 6h45 pm

with a standard mission table: 323,60,5,50000

Tuning without carrier followed by a correction tuning by TC OCXO_DAC90_FMO,

some soundings with noise record,

then bench start, and begin of spectrum measurement at 6h53 pm.

GCW is around 21 as expected.

Bench programming:

Use program **Rx_trois_raies_10.vee** with following parameters:

Begin line: -100,
Final line: +100,
Step: 1 line
Duration on each line: 120 seconds
Generator range: -20dBm

TM on 2 files, name of TM Orbiter files: AP031845.D13 and AP040742.D25



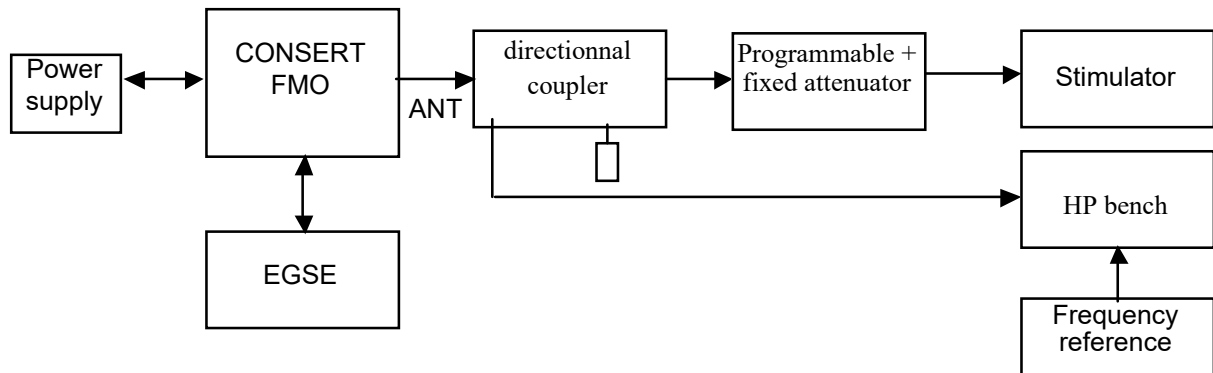
4.5. Intentionnaly left blank section

4.6 "Nominal" ping-pong (interval signal level) at ambient temperature

Duration: one night or at least 10 hours

Operation: automatic

Assembly configuration: ping pong, total attenuation of 90dB, and bench coupling (option)



A DELTATIC is used, sounding interval of 10 seconds. **The right coding on each part of hexadecimal value 17D8 has to be checked.** A high and realistic attenuation of the way is used, it will be set on 90 dB (adding cable loss, it means a total of 92.2dB see 12.4.)

Mission table orbiter: MT_FMO_10

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO 10</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
17D8	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission table MT_QML_10 for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_10</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
17D8	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Tune the attenuator Rohde et Schwarz on 70dB for a global attenuation of 90dB (+3 dB).

Orbiter parameters report on "Tuning" mode

GCWT	NBLon (GCW)	NBLoFF (at STOP)	OCXO setting	INTQ
5	147	129	126	1

Parameters report on « Sounding » mode

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
8	DE	7	8

TM Orbiter files: AP041948.D31 (failure, attenuator out of power!)
AP041958.D18 (ok, noise alone at the end of the file)
TM stimulator files: 040401_9.xls (failure, attenuator out of power!)
040401_10.xls (ok)

CONTROL: At the beginning of soundings, at the end of the test, and if possible during the test, R8 acquisitions will be done on the bench (**with several attempts if necessary, because shot interval is long**) with the program **Acqui_R8_en_TX_derrière_coupleur.vee** (see section 11.2).

Budget link in laboratory since FMO -> enter of ADC1437: **-35.3 dB see table 12.4**

R8 file/ bench beginning of soundings: OBLOC_IQ_4_6_1.bin et xxx_2.bin
Other R8 files/ bench during test: xxxxx_3, _4, _5. Channel Q is missing on file _4.

See summary analysis of BIN files (power and frequency) at section 13.

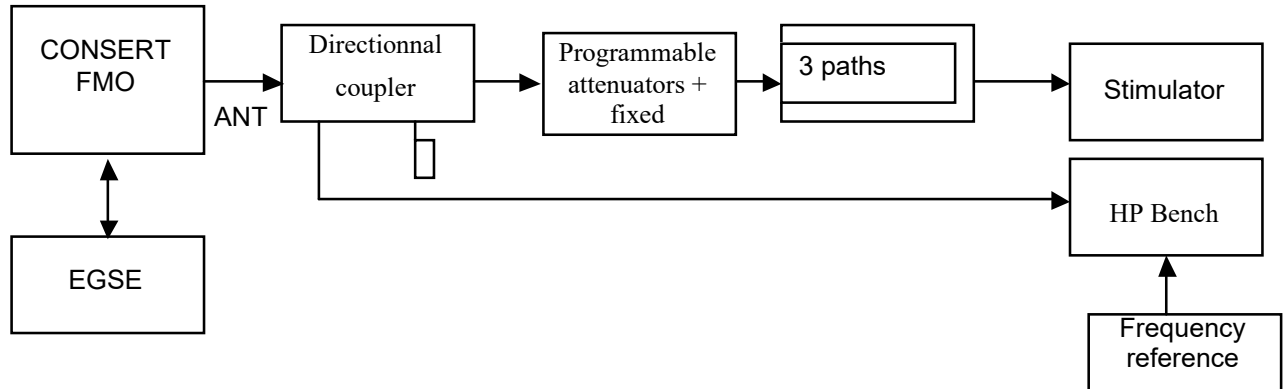


4.7. Ping-pong with multipath propagation

Duration: around half an hour including the installation of 3 paths box.

Operation: automatic

Assembly configuration: ping-pong multipath, and total attenuation around 95dB/path



In the common assembly, the big Zargal 3 path box is inserted, attenuation for each path of which is close to 22dB, more or less 1 dB and two protective attenuators of 10 dB.

After a tuning of 30dB of the R&S attenuator, we have a global attenuation around 94.2dB per path (30 dB R&S, 20 dB fixed/R&S, 3dB cable, 22dB/path, 20dB fixed/box, table 12.4)

Orbiter Mission Table: MT_FMO_VT (with DELTATIC = 5s)

<u>Orbiter Mission Table (10 "16bits Words") : MT_FMO_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT_FREQ (=128) & MODE_BYTE (= 0)
001F	MIN_ATT (= 0) & MAX_ATT (= 31)
9585	NBL_Level (= 149) & NBL_zero (= 133))



Lander Mission Table MT_QML_VT for STIMULATOR EQML1:

<u>Lander Mission Table (10 "16bits Words") : MT_QML_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Tune Rohde et Schwarz attenuator on 30dB to get the global attenuation of 94.2dB

Report of Orbiter parameters of « Tuning » FAILURE because of interference

GCWT	NBLon (GCW)	NBLOff (at STOP)	OCXO setting	INTQ
1	144	129	218	7

Frequency tuning through TC: OCXO_DAC_90

Report of parameters in Sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
voir TM	voir TM	voir TM	3 pics

Test stopped after 150 soundings/LDR and 240 on Orbiter, about 15 minutes after starting.

TM Orbiter file: AP051621.D23

TM stimulator file: 050401_27.xls

New start and new file with R&S attenuation variation at -30, -44, -54, -64, then -34 and -24dB. We notice a strong loss reverberation for R&S attenuation at -64 dB corresponding to a total attenuation of the path around -129dB !!!

TM Orbiter file: AP051649.D56

TM stimulator file: 050401_28.xls

Stop after more than 400 soundings.

Visibly no file on the bench



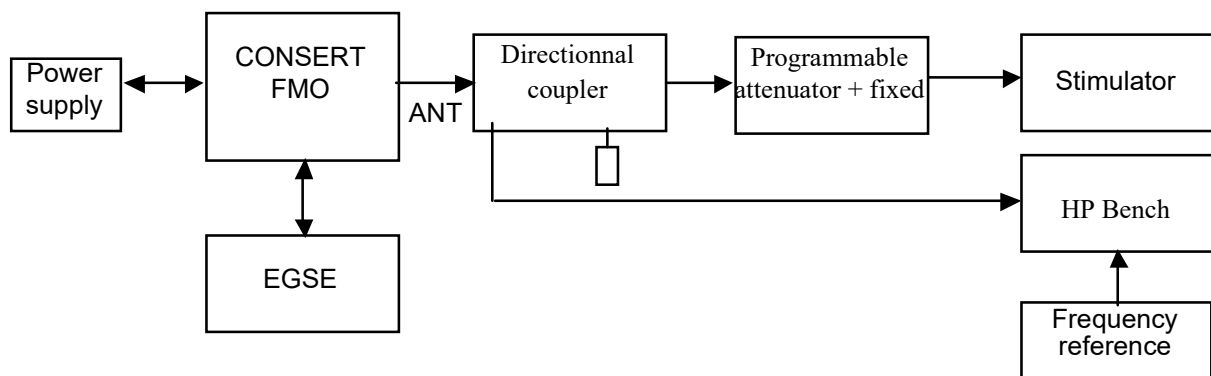
5. TV tests at -20°C, on Thursday, April 12th, 2001

5.1. Intentionnaly left blank section

5.2. Intentionnaly left blank section

5.3. SOREP quick characterization

Duration: 60 minutes
Operation: many and regular manual interventions on the bench
Assembly configuration: ping-pong and bench coupling



The purpose of the test is to characterize at each temperature the frequency variability of the 90 MHz carrier depending on the DAC control. Measurements are only made at 28 volts.

As for fine characterization test 4.1.3, measurement of the carrier is made by analysing signals transmitted by the instrument during coded transmission of the Sounding mode in ping-pong (deferred processing in LPG). These signals are recorded on the bench wired to the coupler during ping-pong.

After a normal starting face to the Lander stimulator with standard table mission during the Sounding phase, TC are sent to the Orbiter to change the DAC setpoint and so the frequency of the Orbiter carrier around 90 MHz. A setpoint from 0 to 255 is sent to DAC/OXCO through TC in increments of 11, which means a total of 25 setpoints. In order to achieve it, file to select on the TC window of EGSE Orbiter is OCXO_VT.cmc . Interval to send telecommands is set to 2 minutes.

For each setpoint, a « binary » file of raw acquisition without coherent addition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**. Each file takes up to 8 MByte on the bench. Each acquisition lasts about 1 minute 15 seconds (with bus XVI reset). Adding 2



minutes per setpoint (for a total of 50 minutes) and the initial phase before ping-pong, the total duration of this measurement is one hour and requires the constant presence of an operator for the bench.

It is necessary to take into account the bench, coupler and cable (external cable and vessel cable that connect the instrument to the BNC connector of crossing vessel) parameters for the auxiliary measurement of the coded transmit power (see table 12.4). **37.40dB** have thus to be added to the measured powers on bench 1437 input card to get the power output of the Orbiter. During the initial test of April 12th around 5pm, R&S attenuator is set to -77dB (instead of 50). The attenuation FMO to STIM is therefore 101.27dB (see table 12.4)

As some measurements failed, we went on on April 19th 2001 (see following table)

TM FMO file: AP121706.D40

TM STIM file: 120401_17.xls

Initial measurements on bench – April 12th 2001

DAC setpoint	TC Hex Param	File name/bench	Δ carrier frequency measured by calculation	Power/bench 1437 Veff	Output power dBm
0	0	OBLOC_5_3_01.bin	-610.06	0.0614	26.17
11	0B	OBLOC_5_3_02.bin	-583.64	0.0614	26.17
22	16	OBLOC_5_3_03.bin (Raté)	-2275.77	0.0009	-10.50
33	21	OBLOC_5_3_04.bin	-494.79	0.0619	26.24
44	2C	OBLOC_5_3_05.bin	-413.99	0.0617	26.22
55	37	OBLOC_5_3_06.bin	-337.01	0.0621	26.27
66	42	OBLOC_5_3_07.bin	-269.99	0.0623	26.30
77	4D	OBLOC_5_3_08.bin	-210.25	0.0619	26.24
88	58	OBLOC_5_3_09.bin	-156.25	0.0618	26.23
99	63	OBLOC_5_3_10.bin	-106.46	0.0607	26.07
110	6E	OBLOC_5_3_11.bin	-60.13	0.0645	26.60
121	79	OBLOC_5_3_12.bin	-16.85	0.0649	26.66
132	84	OBLOC_5_3_13.bin	24.51	0.0626	26.34
143	8F	OBLOC_5_3_14.bin	63.19	0.0646	26.61
154	9A	OBLOC_5_3_15.bin	99.57	0.0625	26.33
165	A5	OBLOC_5_3_16.bin (Raté)	134.04	0.0278	19.29
176	B0	OBLOC_5_3_17.bin	167.36	0.063	26.40
187	BB	OBLOC_5_3_18.bin	198.38	0.0631	26.41
198	C6	OBLOC_5_3_19.bin	227.86	0.0625	26.33
209	D1	OBLOC_5_3_20.bin	255.44	0.0633	26.44
220	DC	OBLOC_5_3_21.bin	281.1	0.0626	26.34
231	E7	OBLOC_5_3_22.bin	305.22	0.0631	26.41
242	F2	OBLOC_5_3_23.bin	327.82	0.0631	26.41
253	FD	OBLOC_5_3_24.bin	349.26	0.0631	26.41
255	FF	OBLOC_5_3_25.bin	352.71	0.0632	26.42

See BIN files summary (power and frequency) section 13



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Complementary Measurements on April 19th 2001

During the complementary test of April 19th, temperature -20°C around 11h20 am, R&S attenuator is set to -50dB as foreseen. The attenuation from FMO to STIM is **74.3dB** (see table 12.4)

TM FMO file: AP191120.D53

TM STIM file: 010419_04.xls

DAC setpoint	TC Hex Param	File name/bench	carrier frequency measured by calculation	Power/bench 1437	Output power dBm
auto		FMO_VT_5_3_00.bin	3.06	0.0648	26.64
0	0	FMO_VT_5_3_01.bin	-609.3	0.0615	26.19
11	0B	FMO_VT_5_3_02.bin	-583.26	0.0616	26.20
22	16	FMO_VT_5_3_03.bin	-548.79	0.0616	26.20
33	21	FMO_VT_5_3_04.bin	-494.03	0.0616	26.20
154	9A	FMO_VT_5_3_05.bin	100.34	0.0617	26.22
165	A5	FMO_VT_5_3_06.bin	135.19	0.0627	26.36
176	B0	FMO_VT_5_3_07.bin	168.12	0.063	26.40
255	FF	FMO_VT_5_3_08.bin	353.48	0.0632	26.42

End of the test round 12h



Frequency and power curves depending on the setpoint.

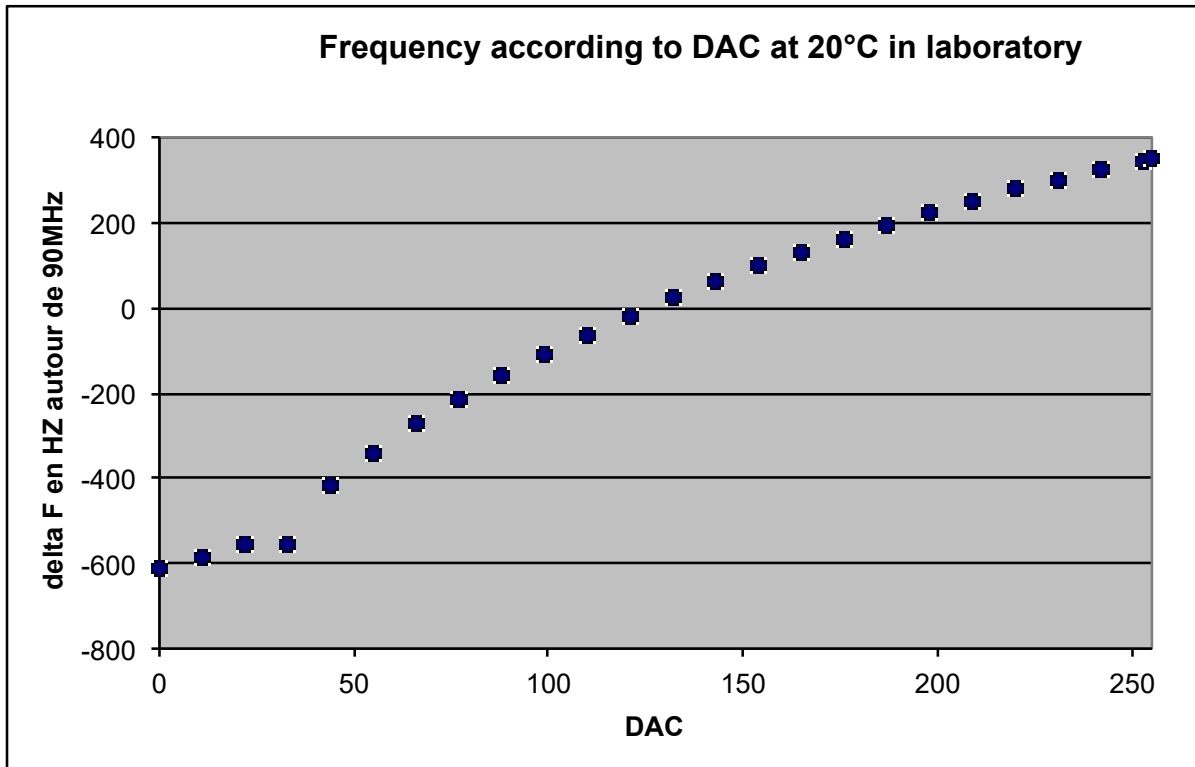


Figure 53a : Carrier frequency variation depending on DAC setpoint

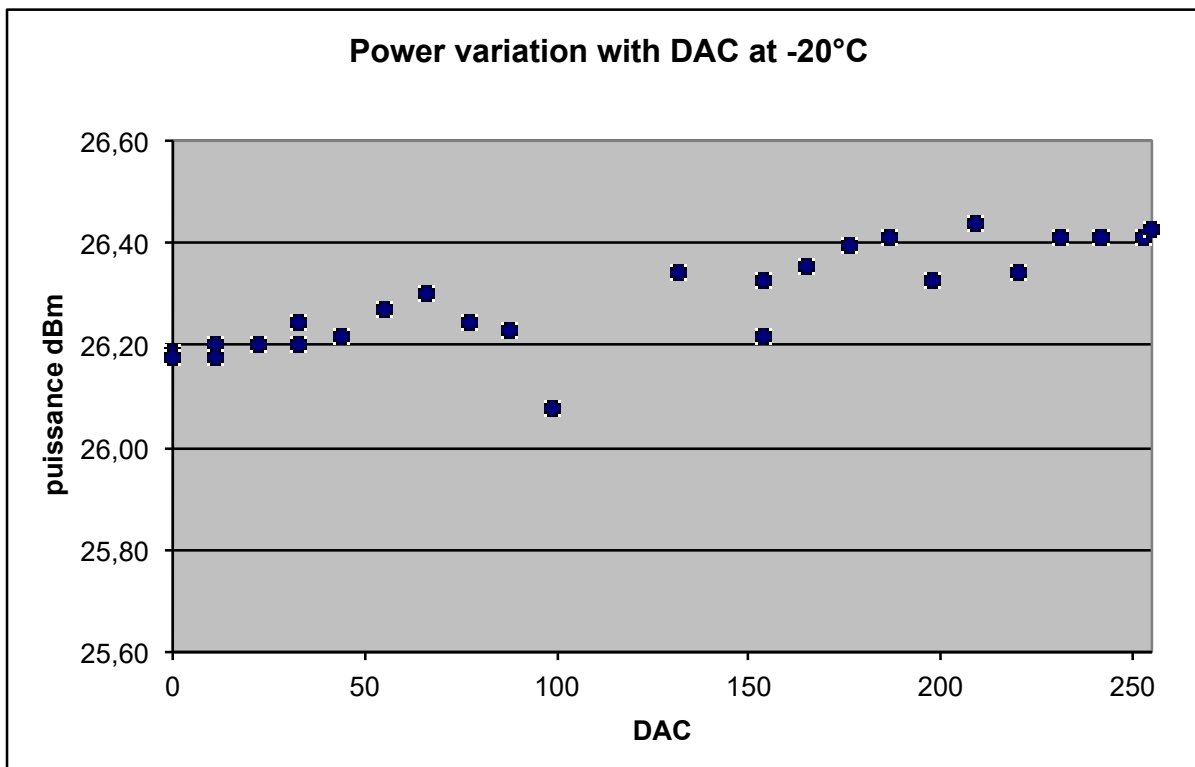


Figure 5.3b : Output power variation depending on DAC setpoint

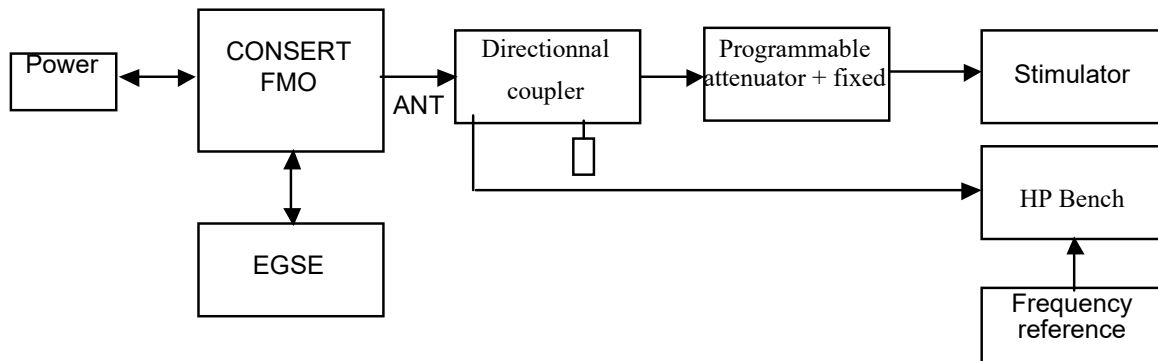


5.4. Tuning mode test

Duration: about 3 hours

Operation: regular reconfiguration of the instrument and bench controlled by operator

Assembly configuration: ping-pong and bench coupling



A real tuning is done with Lander instrument (stimulator), near the 4 reference frequencies and for 3 attenuation levels on the path (12 starts)

The recording of Orbiter and lander TM is extended after the end of Tuning, and the 10 first soundings are recorded. A full R8 binary file of Orbiter emission for the 12 tunings is also recorded on the bench (parameters sets, frequency and level)

The carrier frequency will be measured by calculation in this file, and the quality of rendezvous and coherent addition will be checked both on Orbiter and Lander TM. The test lasts around 15 minutes for each parameters set, for a total around 3 hours.

Link budgets (see 12.4)

Attenuation FMO to STIM-QML (dB) :	24.3 dB + Tuning R&S
Attenuation FMO to E1437in / bench (dB) :	37.4 dB
QML output power on the Delta line :	20 dBm



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Réf.	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tuning	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
-6	89999460	(40)d=(28)h	-47	-51	16	25	1	151	129	OK	AP121456.D00	120401_04	OBloc_IQ_5_4_01
-6	89999460	(40)d=(28)h	-67	-71	7	25	1	145	130	OK	AP121505.D23	_05	_02
-6	89999460	(40)d=(28)h	-77	-81	0	32	0	149	129	PB	AP121514.D30	_06	_03
-6	89999460	(40)d=(28)h	-77	-81	0	25	0	155	129	OK	AP121653.D32	_16	_13
-3	89999730	(76)d=(4C)h	-47	-51	16	67	0	150	129	OK	AP121524.D21	_07	_04
-3	89999730	(76)d=(4C)h	-67	-71	7	67	0	145	129	OK	AP121539.D05	_08	_05
-3	89999730	(76)d=(4C)h	-77	-81	1	67	0	148	130	OK	AP121548.D09	_09	_06
0	90000000	(126)d=(7E)h	-47	-51	16	126	0	151	133	OK	AP121558.D59	_10	_07
0	90000000	(126)d=(7E)h	-67	-71	7	126	0	146	129	OK	AP121608.D22	_11	_08
0	90000000	(126)d=(7E)h	-77	-81	1	126	0	149	132	OK	AP121617.D16	_12	_09
3	90000270	(196)d=(C4)h	-47	-51	16	216	1	151	129	OK	AP121626.D24	_13	_10
3	90000270	(196)d=(C4)h	-67	-71	7	216	1	145	129	OK	AP121635.D17	_14	_11
3	90000270	(196)d=(C4)h	-77	-81	1	216	1	150	129	OK	AP121644.D10	_15	_12

See BIN files summary (power and frequency) section 13.

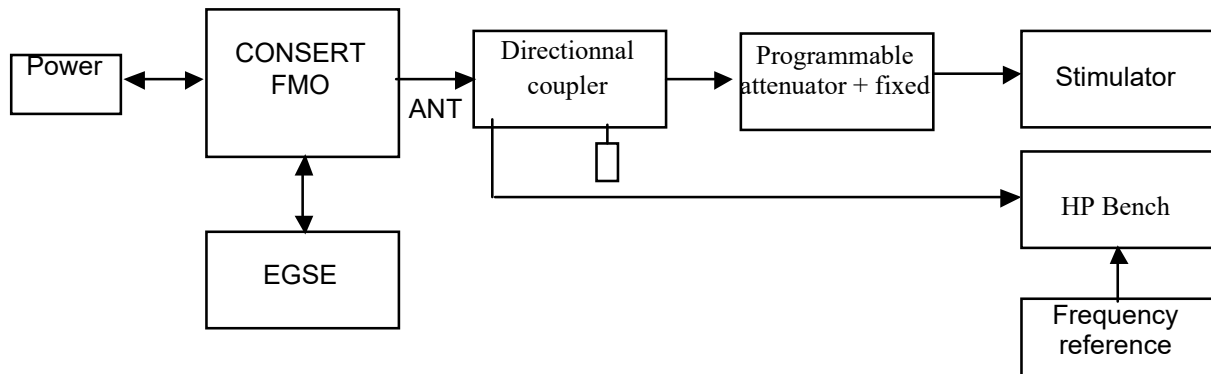


5.5. Ping-pong pulse response with path variable attenuation

Duration: 1 hour

Operation: attenuation modification and recording on the bench by operator

Assembly configuration: long ping-pong experiment and bench coupling



The output signal is verified on the bench and then, to control any drift, 2 binary files of raw acquisition are recorded for each level, without coherent addition, using program:

Acqui_R8_en_TX_derrière_coupleur.vee. Each binary file fills 8 MBytes. Each acquisition needs around 1 minute and 15 seconds (with bus VXI reset). The bench binary data will be processed « offline ». The test ends with the record of 100 soundings on termination for characterization of own noise, with maximal gain, and according to temperature.

Necessary material

Material	Type	Status	
Adjustable power supply	28V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual setting
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	EQML1 dit QML		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Total backup	ok	Acqui_R8_en_TX_derrière_coupleur
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	



Links configuration and properties (see table 12.4):

Loss from FMO to STIM-QML, excluding R&S setting:	-24.3 dB
Round trip delay from FMO to STIM-QML:	213ns
FMO losses at E1473 bench cards input:	-37.4 dB

Pre-condition: having tested the bench after power-up (Bench self-test completed)

Initial configuration:

Bench frequency	=	90 MHz
Orbiter and lander voltage	=	28 V
Fixed attenuation	=	- 20 dB (twice 10 dB coaxial N on input and output RSP)
Variable attenuation	=	4 levels from - 30 dB to -80dB according to « sounding » N°

Mission tables:

Orbiter mission table: MT_FMO_VT (avec DELTATIC = 5s)

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission table MT_QML_VT for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Orbiter parameters report in "Tuning"

GCWT	NBLon (GCW)	NBloff (at STOP)	OCXO setting	INTQ
14	153	129	126	0

Parameters report in Sounding first phase

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
19	CD	17	8

Outputs

Bench = 1 short file TXT, and 8 BIN files of 8 Mo, so 64 Mo.
Orbiter (FMO) = 600 TM Science
Lander (STIM) = 400 TM HK + 120 TM Science

Duration: 3000 seconds in sounding + start, so 1 hour

Bench program:

Test_en_TX_derrière_coupleur.vee,

Acqui_R8_en_TX_derrière_coupleur.vee (see sheet, section 11.2)

Note : In the event of a stop of one of the two EGSE, restart with tuning, control, then recovery at incident level.

Effectively, two incomplete starts, the first one on Lander, and the second one following the Orbiter EGSE blockage, where only the first 60 soundings are taken into account.

TM Lander bad file : 120401_01.xls



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Phase	Sounding N°	Attenuation		EQML1 (stim)			FMO Orbiter			Bench state	
		Rohde & Schwarz	Total attenuation	state	commands	outputs	state	outputs			
					Voltage	GCW	Framing	OCXO	GCW	pic pos.	
Beginning		-50	-74dB		28 V						
Tuning		-50	-74dB	tuning	28 V			Tuning			
Controle	1	-50	-74dB	ping pong	28 V	18, 19	0xDE	ping pong			1 vérif
											2 acq.R8
Gain	40	-30	-54 dB		28 V	28, 29	DE		26, 27		2 acq.R8
	140	-70	-94 dB		28 V	8, 9	DE		7, 8		2 acq.R8
	240	-80	-104 dB		28V	4	DE		3		2 acq.R8
Stim off	340	-80	-104 dB		OFF				0		
Termination	440	na	na		OFF			/termination	0		
Stop	540										

TM files TM FMO Orbiter : AP121046.D40 AP121107.D49
 TM Lander (stimulator) : 120401_02.xls 120401_03.xls

Emission check on HP bench : Test not done, no file on the bench (TBC)
 Integrated PIC level ??? (TBC) dB Bench, soit ??? dBm instrument (see section 12.2)

Emission record, full binary signals files

Setting R&S	First acquisition	Second acquisition
- 50 dB	OBLOC_IQ_5_5_01.bin	OBLOC_IQ_5_5_02.bin
- 30 dB	OBLOC_IQ_5_5_03.bin	OBLOC_IQ_5_5_04.bin
-70dB	OBLOC_IQ_5_5_05.bin	OBLOC_IQ_5_5_06.bin
- 80 dB	OBLOC_IQ_5_5_07.bin	OBLOC_IQ_5_5_08.bin

See BIN files summary (power and frequency) at section 13.

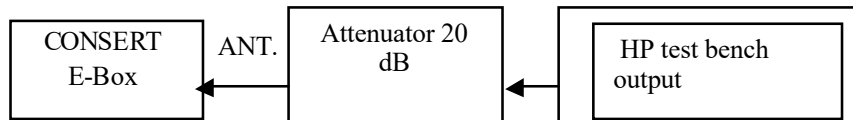


5.6. Receptor and ramp gain linearity TEST (test in H4)

Duration: about 2 hours and 15 minutes, performed on April 12th 2001 from noon to 2 pm

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench and through 20dB attenuator. Consert in receiving face to the bench



The purpose of the test is to verify the receiver linearity on a whole range of GCW attenuator from 0 to 31.

To do this, a synchronous line with coherent addition is sent to Consert FMO antenna. ESGD generator is programmed on 90MHz + H4 frequency, which means 90.15686MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter starting with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E)



Bench programming:

Use program **RX_H4.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4
drift: 0 ppm
min level: -110dBm,
max level: +10dBm,
step: 1dB
step duration: 60s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4): **23.6dB**

121 level steps, with one minute per step, plus starting, so a whole duration around 2 hours and 15 minutes.

Processing TM file, the analysis of the H4 line emitted level by the bench, of its level on Consert receiver I and Q path, and of the value of gain control, enables to calibrate very precisely Consert gain for each GCW value and according to the temperature.

TM FMO file: AP121200.D21

Note: obviously a transitory TM loss

Test perform on April 12th 2001 from noon to 2 pm

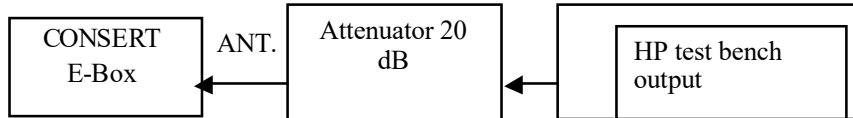


5.7. Variation of receiver noise according to the gain setpoint (with orthogonal line)

Duration: half an hour

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench through 20dB attenuator



The purpose of the test is to measure the variation of broadband noise level at Consert receiver channel output when GCW attenuator control ranges from at least 0 to 14.

To perform it, an orthogonal line with coherent addition is sent on Consert FMO antenna. This line provokes the pinching of gain on the analogic receiver, whereas being strongly rejected by the digital filter.

ESGD generator is programmed on 90MHz frequency + (4+(125/1024))Fcode, which means 90.161650 MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter launching with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E). Some soundings will be performed before activating the generator program (own noises)



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Bench programming:

Use program **RX_ORTHO.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4+(125/1024)
drift: 0 ppm
min level: -65dBm,
max level: -25dBm,
step: 1dB
step duration: 30s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4) : **23.6dB**

Level at receiver input changes from around -88.6 dBm to -48.6 dBm.

GCW remains on 0 for a few steps then grows in average 1 or 2 steps until GCW=18. With 41 level steps, 30 seconds per step, and starting, the test lasts half an hour.

Remote processing TM file will enable the evaluation of broadband noise level, out of line, for each GCW value and at each temperature.

TM FMO file: AP121413.D25

Note: Ok, test done on april 12th 2001, from 2 pm to 2h45 pm



6. TV tests at 0°C, beginning on Friday, April 13th, 2001

6.1. Intentionnaly left blank section

6.2. Intentionnaly left blank section

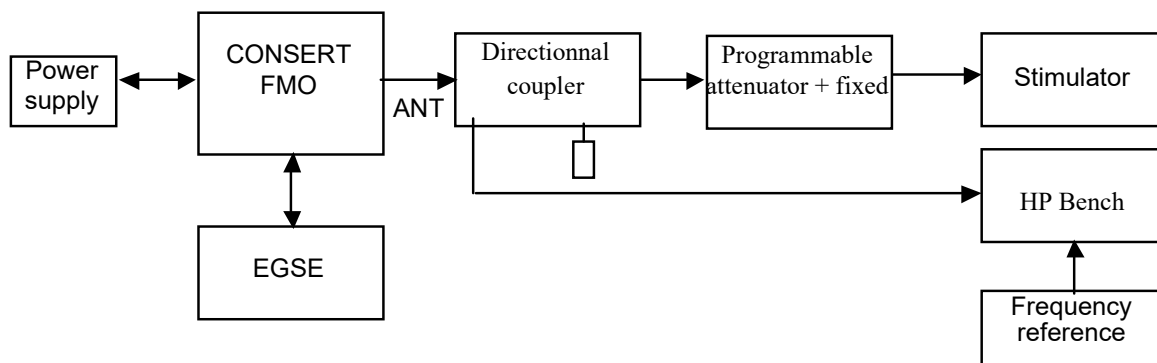
6.3. SOREP quick characterization

Ok, done on April 13th 2001, at 10h30 am

Duration: 60 minutes

Operation: many and regular manual interventions on the bench

Assembly configuration: ping-pong and bench coupling



The purpose of the test is to characterize at each temperature the frequency variability of the 90 MHz carrier depending on the DAC control. Measurements are only made at 28 volts.

As for fine characterization test 4.1.3, measurement of the carrier is made by analysing signals transmitted by the instrument during coded transmission of the Sounding mode in ping-pong (deferred processing in LPG). These signals are recorded on the bench wired to the coupler during ping-pong.

After a normal starting face to the Lander stimulator with standard table mission during the Sounding phase, TC are sent to the Orbiter to change the DAC setpoint and so the frequency of the Orbiter carrier around 90 MHz. A setpoint from 0 to 255 is sent to DAC/OXCO through TC in increments of 11, which means a total of 25 setpoints. In order to achieve it, file to select on the TC window of EGSE Orbiter is OCXO_VT.cmc . Interval to send telecommands is set to 2 minutes.

For each setpoint, a « binary » file of raw acquisition without coherent addition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**. Each file takes up to 8 MByte on the bench. Each acquisition lasts around 1 minute 15 seconds (with bus XVI reset). Adding 2 minutes per setpoint (for a total of 50 minutes) and the initial phase before ping-pong, the total duration of this measurement is one hour and requires the constant presence of an operator for the bench.



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It is necessary to take into account the bench, coupler and cable (external cable and vessel cable that connect the instrument to the BNC connector of crossing vessel) parameters for the auxiliary measurement of the coded transmit power (see table 12.4). **37.40dB** have thus to be added to the measured powers on bench E1437 input card to get the power output of the Orbiter. During the initial test of April 13rd around noon, R&S attenuator is set to -50dB. The attenuation FMO to STIM is therefore 74.3dB (see table12.4)

TM FMO file: AP131034.D03
TM STIM file: 010413_01.xls
Measures Ok on bench of April 13rd 2001

DAC setpoint	TC Hex Param	file name /bench	Carrier frequency measured by calculation	Power /bench 1437	Output power dBm
0	0	OBLOC_6_3_01.bin	-611.98	0.0594	25.89
11	0B	OBLOC_6_3_02.bin	-585.55	0.0593	25.87
22	16	OBLOC_6_3_03.bin	-551.09	0.0594	25.89
33	21	OBLOC_6_3_04.bin	-496.32	0.0597	25.93
44	2C	OBLOC_6_3_05.bin	-415.52	0.0601	25.99
55	37	OBLOC_6_3_06.bin	-338.92	0.0599	25.96
66	42	OBLOC_6_3_07.bin	-271.52	0.0598	25.94
77	4D	OBLOC_6_3_08.bin	-211.78	0.0598	25.94
88	58	OBLOC_6_3_09.bin	-157.78	0.0604	26.03
99	63	OBLOC_6_3_10.bin	-108.38	0.0598	25.94
110	6E	OBLOC_6_3_11.bin	-61.66	0.0614	26.17
121	79	OBLOC_6_3_12.bin	-18	0.0573	25.57
132	84	OBLOC_6_3_13.bin	22.59	0.0613	26.16
143	8F	OBLOC_6_3_14.bin	61.27	0.0625	26.33
154	9A	OBLOC_6_3_15.bin	98.04	0.0614	26.17
165	A5	OBLOC_6_3_16.bin	132.89	0.0591	25.84
176	B0	OBLOC_6_3_17.bin	165.82	0.0607	26.07
187	BB	OBLOC_6_3_18.bin	196.46	0.0611	26.13
198	C6	OBLOC_6_3_19.bin	225.95	0.0609	26.10
209	D1	OBLOC_6_3_20.bin	253.52	0.061	26.12
220	DC	OBLOC_6_3_21.bin	279.18	0.061	26.12
231	E7	OBLOC_6_3_22.bin	303.31	0.0604	26.03
242	F2	OBLOC_6_3_23.bin	325.9	0.0608	26.09
253	FD	OBLOC_6_3_24.bin	347.35	0.0608	26.09
255	FF	OBLOC_6_3_25.bin	350.8	0.0608	26.09

See BIN files summary (power and frequency) section 13



Frequency and power curves depending on the setpoint.

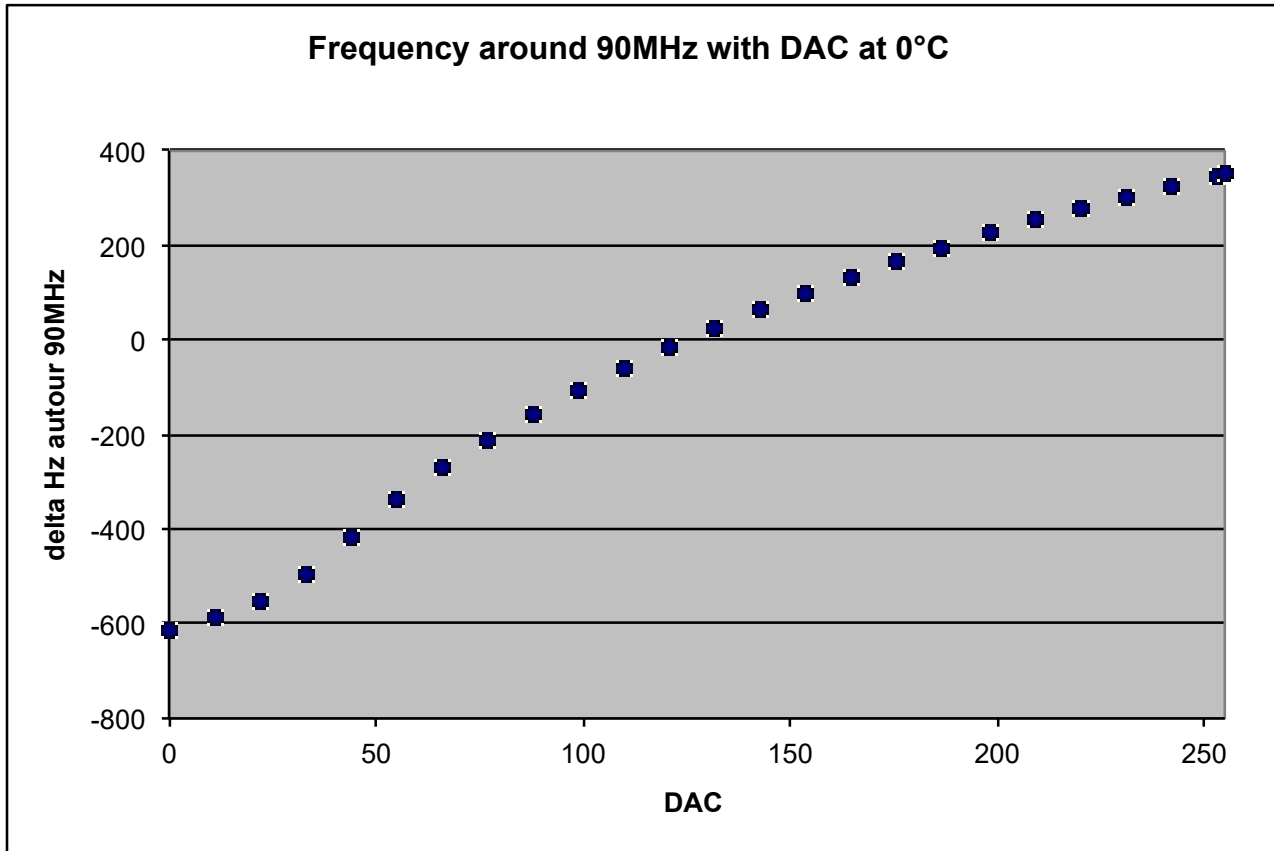


Figure 6.3a : Carrier frequency variation according to DAC setpoint

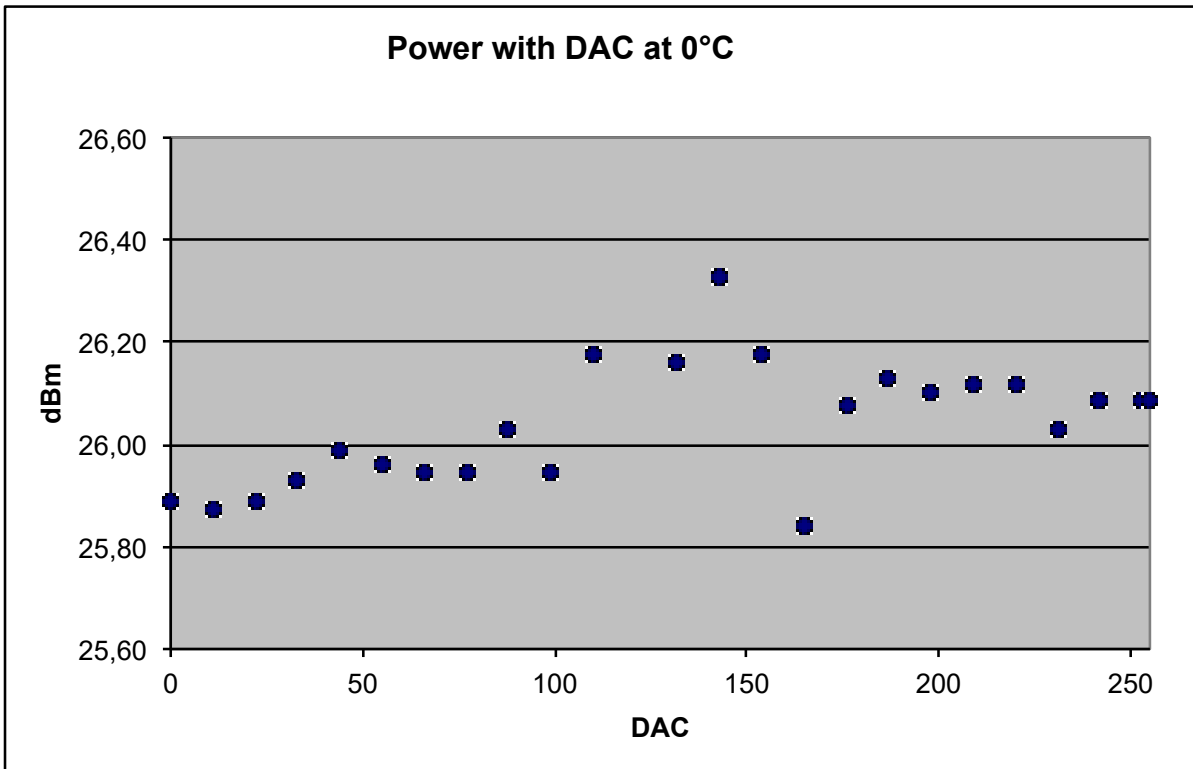


Figure 6.3b : Output power variation according to DAC setpoint

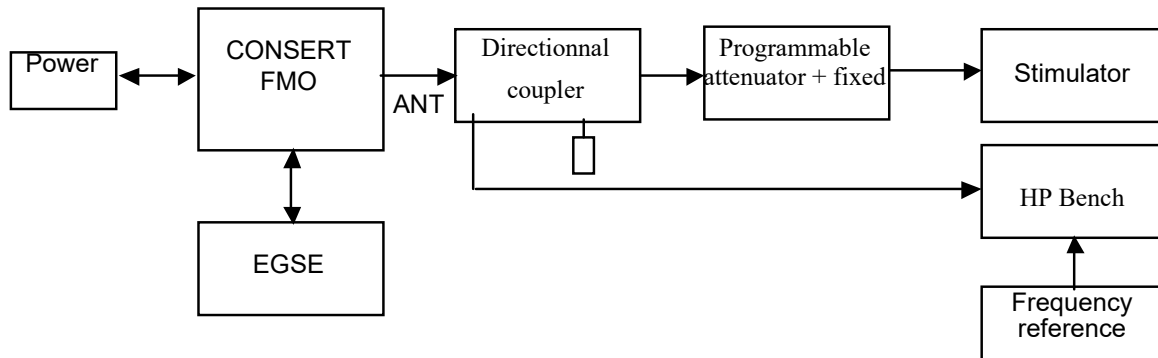


6.4. Tuning mode test

Duration: less than 3 hours

Operation: regular reconfiguration of the instrument and bench controlled by operator

Assembly configuration: ping-pong and bench coupling



A real tuning is done with Lander instrument (stimulator), near the 4 reference frequencies and for 3 attenuation levels on the path (12 starts)

The recording of Orbiter and lander TM is extended after the end of Tuning, and the 10 first soundings are recorded. A full R8 binary file of Orbiter emission for the 12 tunings is also recorded on the bench (parameters sets, frequency and level)

The carrier frequency will be measured by calculation in this file, and the quality of rendezvous and coherent addition will be checked both on Orbiter and Lander TM. The test lasts around 12 minutes for each parameters set, for a total around 2 hours and a half.

Link budgets (see 12.4)

Attenuation FMO to STIM-QML (dB) :	24.3 dB + Tuning R&S
Attenuation FMO to E1437in / bench (dB) :	37.4 dB
QML output power on the Delta line :	20 dBm



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Ref.	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tuning	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
-6	89999460	(40)d=(28)h	-47	-51	16	25	1	149	129	OK	AP181057.D23	010418_03	OBloc_IQ_6_4_01
-6	89999460	(40)d=(28)h	-67	-71	6	25	1	149	129	OK	AP181112.D18	_04	_02
-6	89999460	(40)d=(28)h	-77	-81	1	25	1	147	129	OK	AP181122.D45	_05	_03
-3	89999730	(76)d=(4C)h	-47	-51	16	67	1	149	129	OK	AP181132.D10	_06	_04
-3	89999730	(76)d=(4C)h	-67	-71	6	67	1	149	129	OK	AP181141.D29	_07	_05
-3	89999730	(76)d=(4C)h	-77	-81	1	220	1	147	130	OK	AP181150.D54	_08	_06
0	90000000	(126)d=(7E)h	-47	-51	16	127	1	149	130	OK	AP181200.D32	_09	_07
0	90000000	(126)d=(7E)h	-67	-71	5	127	1	152	130	OK	AP181211.D20	_10	_08
0	90000000	(126)d=(7E)h	-77	-81	1	127	1	146	129	OK	AP181219.D30	_11	_09
3	90000270	(196)d=(C4)h	-47	-51	16	217	0	149	131	OK	AP181228.D31	_12	_10
3	90000270	(196)d=(C4)h	-67	-71	6	217	0	148	129	OK	AP181243.D53	_13	_11
3	90000270	(196)d=(C4)h	-77	-81	1	217	0	145	129	OK	AP181253.D16	_14	_12

Notes:

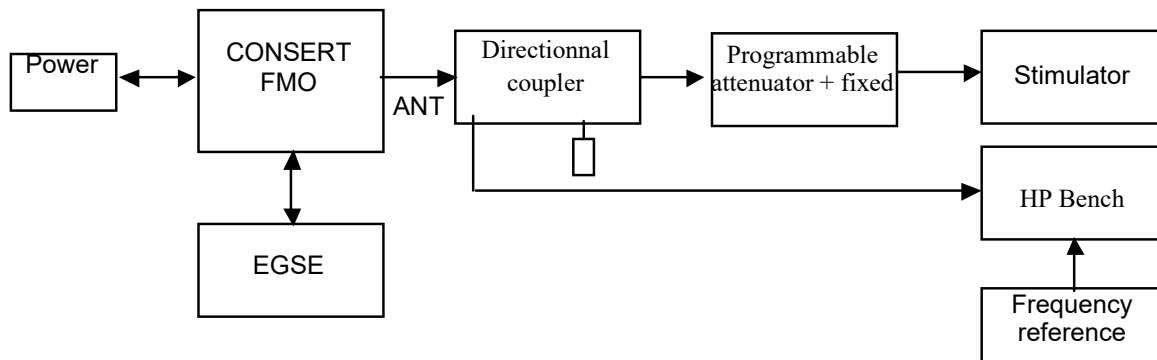
There was a mistake at first start, with files AP181048.D04 and 010418_02.xls
 There has been a problem with TM Lander during "warming up" phase on file 010418_06.xls
 See summary of BIN files (power and frequencies) at section 13.



6.5. Ping-pong pulse response with path variable attenuation

Duration: 1 hour, test done on April 18th around 9h45 am
Operation: attenuation modification and recording on the bench by operator
Assembly configuration: long ping-pong experiment and bench coupling

ATTENTION: Results have not been reported in the table in real time during the test (to be completed in analysing) (TBC)



The output signal is verified on the bench and then, to control any drift, 2 binary files of raw acquisition are recorded for each level, without coherent addition, using program: **Acqui_R8_en_TX_derrière_coupleur.vee**. Each binary file fills 8 MBytes. Each acquisition needs around 1 minute and 15 seconds (with bus VXI reset). The bench binary data will be processed « offline ». The test ends with the record of 100 soundings on termination for characterization of own noise, with maximal gain, and according to temperature.

Necessary material

Material	Type	Statut	
Adjustable power supply	28V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual setting
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	EQML1 dit QML		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Total backup	ok	Acqui_R8_en_TX_derrière_coupleur
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	



Links configuration and properties (see table 12.4):

Loss from FMO to STIM-QML, excluding R&S setting: -24.3 dB
Round trip delay from FMO to STIM-QML: 213ns
FMO losses at E1473 bench cards input: -37.4 dB

Pre-condition: having tested the bench after power-up (Bench self-test completed)

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (twice 10 dB coaxial N on input and output RSP)
Variable attenuation = 4 levels from - 30 dB to -80dB according to « sounding » N°

Mission tables:

Orbiter mission tables: MT_FMO_VT (avec DELTATIC = 5s)

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission table MT_QML_VT for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Orbiter parameters report in "Tuning" (not reported during the test) (TBC)

GCWT	NBLon (GCW)	NBLoff (at STOP)	OCXO setting	INTQ

Parameters report in Sounding first phase (not reported during the test) (TBC)

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION

Outputs

Bench = 1 short file TXT, and 8 BIN files of 8 Mo, soit 64 Mo.
Orbiter (FMO) = 600 TM Science
Lander (STIM) = 400 TM HK + 120 TM Science

Duration: 3000 seconds in sounding + start, so 1 hour

Bench program:

Test_en_TX_derrière_coupleur.vee,

Acqui_R8_en_TX_derrière_coupleur.vee (see sheet, section 11)

Note : In the event of a stop of one of the two EGSE, restart with tuning, control then recovery at incident level.

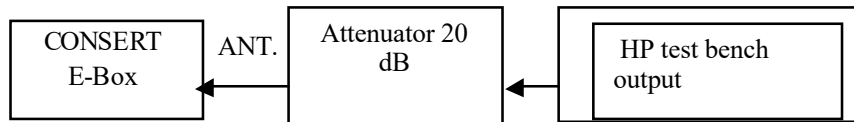


6.6. Receiver and ramp gain linearity TEST (test in H4)

Duration: 2 hours and about 15 minutes, test performed on april 13th around noon.

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench and through 20dB attenuator. Consert in receiving face to the bench



The purpose of the test is to verify the receiver linearity on a whole range of GCW attenuator from 0 to 31.

To do this, a synchronous line with coherent addition is sent to Consert FMO antenna. ESGD generator is programmed on 90MHz + H4 frequency, which means 90.15686MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter starting with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E)



Bench programming:

Use program **RX_H4.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4
drift: 0 ppm
min level: -110dBm,
max level: +10dBm,
step: 1dB
step duration: 60s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4): **23.6dB**

121 level steps, with one minute per step, plus starting, so a whole duration about 2 hours and 15 minutes.

Processing TM file, the analysis of the H4 line emitted level by the bench, of its level on Consert receiver I and Q path, and of the value of gain control, enables to calibrate very precisely Consert gain for each GCW value and according to the temperature.

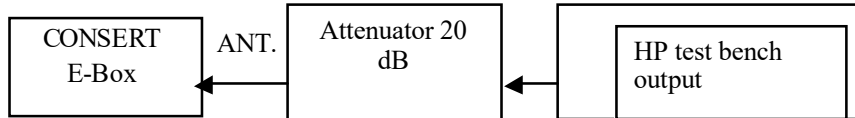
TM FMO file: AP131204.D41

At the end of the file, acquisition of noise only, from sounding 1539, on termination, and from SND=1564.



6.7. Variation of receiver noise according to the gain setpoint (with orthogonal line)

Duration: half an hour, test performed on April 13th 2001, 14h30
 Operation: Automatic test after FMO TC setting and bench starting
 Assembly configuration: FMO in receiving face to the bench through 20dB attenuator



The purpose of the test is to measure the variation of broadband noise level at Consert receiver channel output when GCW attenuator control ranges from at least 0 to 14. To perform it, an orthogonal line with coherent addition is sent on Consert FMO antenna. This line provokes the pinching of gain on the analogic receiver, whereas being strongly rejected by the digital filter. ESGD generator is programmed on 90MHz frequency + (4+(125/1024))Fcode, which means 90.161650 MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter starting with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E). Some soundings will be performed before activating the generator program (own noises)



Bench programming:

Use program **RX_ORTHO.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4+(125/1024)
drift: 0 ppm
min level: -65dBm,
max level: -25dBm,
step: 1dB
step duration: 30s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4) : **23.6dB**

Level at receiver input changes from around -88.6 dBm to -48.6 dBm.

GCW remains at 0 for a few steps then grows in average 1 or 2 steps until GCW=18. With 41 level steps, 30 seconds per step, and starting, the test lasts half an hour.

Remote processing TM file will enable the evaluation of broadband noise level, out of line, for each GCW value and at each temperature.

TM FMO file: AP121413.D25



7. TV tests at +20°C

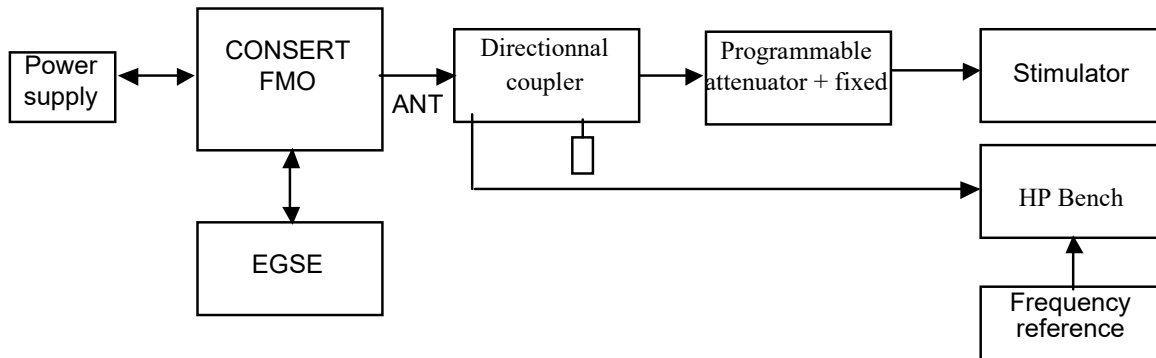
7.1. Intentionnaly left blank section

7.2. Intentionnaly left blank section



7.3.a. SOREP quick characterization test in laboratory, ambient conditions

Duration: 60 minutes
Operation: many and regular manual interventions on the bench
Assembly configuration: ping-pong and bench coupling



The purpose of the test is to characterize at each temperature the frequency variability of the 90 MHz carrier depending on the DAC control. Measurements are only made at 28 volts.

As for fine characterization test 4.1.3, measurement of the carrier is made by analysing signals transmitted by the instrument during coded transmission of the Sounding mode in ping-pong (*deferred processing in LPG*). These signals are recorded on the bench in by-pass through the coupler during ping-pong.

After a normal starting face to the Lander stimulator (with standard mission tables except DAC Lander = 123), at the beginning of the Sounding phase, TC are sent to the Orbiter to change the DAC setpoint and so the frequency of the Orbiter carrier around 90MHz. A setpoint from 0 to 255 is sent to DAC/OXCO through TC in increments of 11, which means a total of 25 setpoints. In order to achieve it, file to select on the TC window of EGSE Orbiter is OCXO_VT.cmc. Interval to send telecommands is set to 2 minutes.

For each setpoint, a binary file of raw acquisition without coherent addition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**. Each file takes up to 8 MByte on the bench. Each acquisition lasts about 1 minute 15 seconds. Adding 2 minutes per setpoint (for a total of 50 minutes) and the initial phase before ping-pong, the total duration of this measurement is one hour and requires the constant presence of an operator for the bench.

It is necessary to take into account the bench, coupler and cable parameters for the auxiliary measurement of the coded transmit power (see table 12.4). **During lab tests, 35.30 dB have thus to be added to the measured powers on bench 1437 input card** to get the power output of the Orbiter. During the laboratory test of April 4th around 3 pm, the R&S attenuator is set to -50 dB (see table 12.4). The attenuation FMO to STIM is therefore **72.2 dB** (see table 12.4).



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Caution :

For this first test, tuning has been done with DAC/QML1 set to 123. This has no impact on the following of the test.

TM FMO file: AP041521.D36

TM STIM file: 040401_1.xls

Initial measurements on bench – April 4, 2001 – end of the test around 16:45 (on April 4th, not the 12th /AH)

DAC setpoint	TC Hex Param	File name / bench	Carrier frequency measured by calculation	Power / bench 1437	Output power dBm
0	0	OBLOC_7_3_01_T.bin	-613.51	0.0719	25.44
11	0B	OBLOC_7_3_02_T.bin	-587.09	0.0721	25.47
22	16	OBLOC_7_3_03_T.bin	-552.24	0.072	25.46
33	21	OBLOC_7_3_04_T.bin	-552.24	0.0717	25.42
44	2C	OBLOC_7_3_05_T.bin	-416.28	0.0719	25.44
55	37	OBLOC_7_3_06_T.bin	-339.69	0.0721	25.47
66	42	OBLOC_7_3_07_T.bin	-272.67	0.0717	25.42
77	4D	OBLOC_7_3_08_T.bin	-212.93	0.0724	25.51
88	58	OBLOC_7_3_09_T.bin	-158.93	0.0726	25.53
99	63	OBLOC_7_3_10_T.bin	-109.53	0.074	25.69
110	6E	OBLOC_7_3_11_T.bin	-63.19	0.0746	25.77
121	79	OBLOC_7_3_12_T.bin	-19.91	0.0704	25.26
132	84	OBLOC_7_3_13_T.bin	21.45	0.0756	25.88
143	8F	OBLOC_7_3_14_T.bin	60.13	0.0756	25.88
154	9A	OBLOC_7_3_15_T.bin	96.89	0.0725	25.52
165	A5	OBLOC_7_3_16_T.bin	131.36	0.0738	25.67
176	B0	OBLOC_7_3_17_T.bin	164.29	0.0725	25.52
187	BB	OBLOC_7_3_18_T.bin	195.31	0.073	25.58
198	C6	OBLOC_7_3_19_T.bin	224.8	0.0732	25.60
209	D1	OBLOC_7_3_20_T.bin	251.99	0.0739	25.68
220	DC	OBLOC_7_3_21_T.bin	278.03	0.0725	25.52
231	E7	OBLOC_7_3_22_T.bin	301.78	0.0728	25.55
242	F2	OBLOC_7_3_23_T.bin	324.75	0.0733	25.61
253	FD	OBLOC_7_3_24_T.bin	345.82	0.0732	25.60
255	FF	OBLOC_7_3_25_T.bin	349.65	0.0733	25.61

See BIN files summary (power and frequency) section 13



Carrier frequency variation depending on DAC setpoint at 20°C in laboratory.

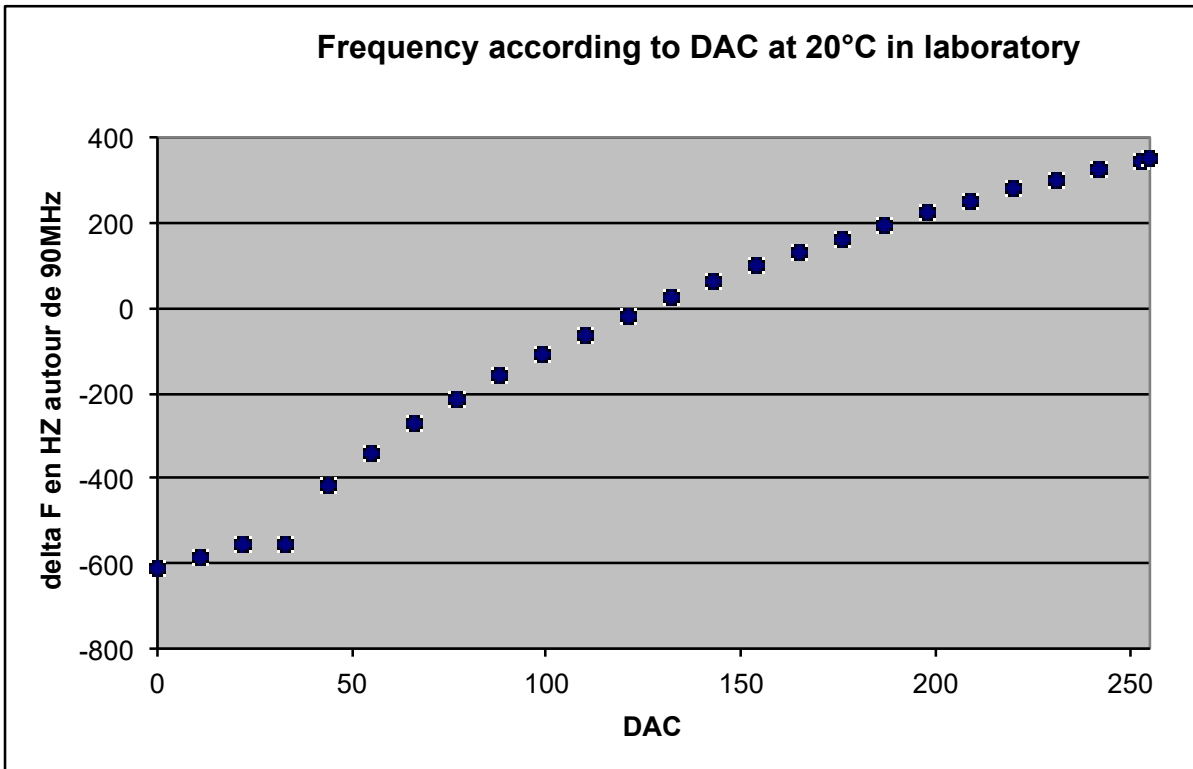


Figure 7.3a.a : Carrier frequency variation depending on DAC setpoint

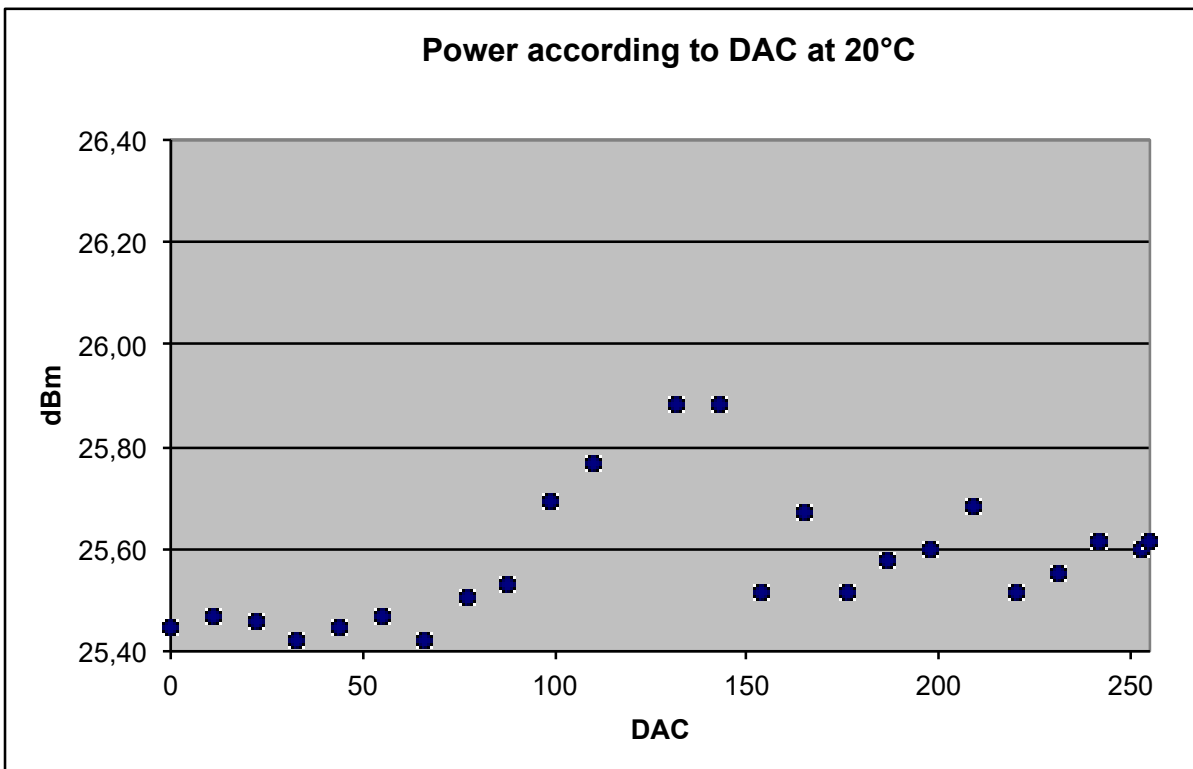
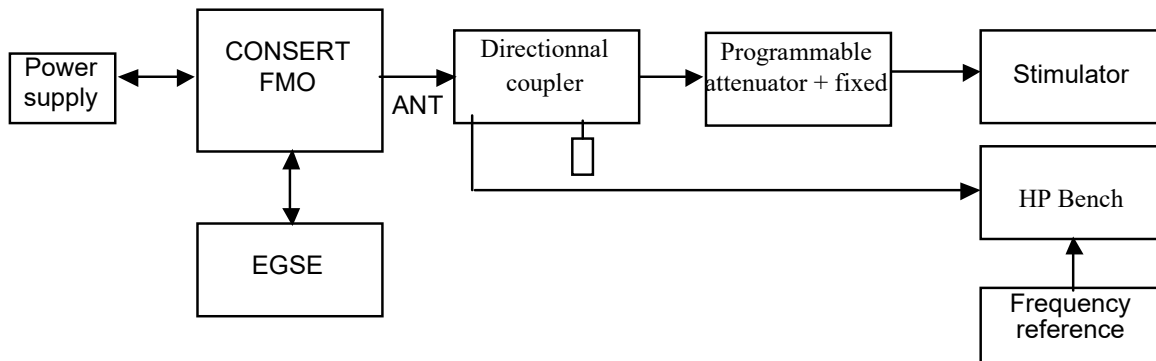


Figure 7.3a.b : Transmit power variation depending on DAC setpoint



7.3.b. SOREP quick characterization in TV at 20°C

Duration: 60 minutes
Operation: many and regular manual interventions on the bench
Assembly configuration: ping-pong and bench coupling



The purpose of the test is to characterize at each temperature the frequency variability of the 90 MHz depending on the DAC control. Measurements are only made at 28 volts.

As for fine characterization test 4.1.3, measurement of the carrier is made by analysing signals transmitted by the instrument during coded transmission of the Sounding mode in ping-pong (*deferred processing in LPG*). These signals are recorded on the bench in by-pass through the coupler during ping-pong.

After a normal starting in front of the Lander stimulator with standard table mission during the Sounding phase, TC are sent to the Orbiter to change the DAC setpoint and so the frequency of the Orbiter carrier around 90 MHz. A setpoint from 0 to 255 is sent to DAC/OXCO through TC in increments of 11, which means a total of 25 setpoints. In order to achieve it, file to select on the TC window of EGSE Orbiter is OXCO_VT.cmc . Interval to send telecommands is set to 2 minutes.

For each setpoint, a « binary » file of raw acquisition without coherent addition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**. Each file takes up to 8 MByte on the bench. Each acquisition lasts about 1 minute 15 seconds (with bus XVI reset). Adding 2 minutes per setpoint (for a total of 50 minutes) and the initial phase before ping-pong, the total duration of this measurement is one hour and requires the constant presence of an operator for the bench.

It is necessary to take into account the bench, coupler and cable (external cable and vessel cable that connect the instrument to the BNC connector of crossing vessel) parameters for the auxiliary measurement of the coded transmit power (see table 12.4). **37.40dB** have thus to be added to the measured powers on bench 1437 input card to get the power output of the Orbiter.

During the test of April 19th around 4 pm, R&S attenuator is set to -50dB . The attenuation FMO to STIM is therefore **74.3 dB** (see table 12.4).

TM FMO file : AP191555.D08



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TM STIM file : 010419_06.xls

Measurements on bench on April 19th

DAC setpoint	TC Hex Param	File name / bench	Carrier frequency measured by calculation	Power /bench 1437	Output power dBm
Tuned		VT_FMO_7_3_00.bin	3.06	0.0599	25.96
0	0	VT_FMO_7_3_01.bin	-613.51	0.0584	25.74
11	0B	VT_FMO_7_3_02.bin	-587.09	0.0583	25.72
22	16	VT_FMO_7_3_03.bin	-552.24	0.0582	25.71
33	21	VT_FMO_7_3_04.bin	-497.09	0.058	25.68
44	2C	VT_FMO_7_3_05.bin	-415.9	0.058	25.68
55	37	VT_FMO_7_3_06.bin	-339.31	0.0583	25.72
66	42	VT_FMO_7_3_07.bin	-272.29	0.0585	25.75
77	4D	VT_FMO_7_3_08.bin	-212.55	0.058	25.68
88	58	VT_FMO_7_3_09.bin	-158.55	0.0582	25.71
99	63	VT_FMO_7_3_10.bin	-109.15	0.0597	25.93
110	6E	VT_FMO_7_3_11.bin	-62.42	0.06	25.97
121	79	VT_FMO_7_3_12.bin	-19.15	0.0569	25.51
132	84	VT_FMO_7_3_13.bin	21.83	0.0575	25.60
143	8F	VT_FMO_7_3_14.bin	60.51	0.0567	25.48
154	9A	VT_FMO_7_3_15.bin	96.89	0.0573	25.57
165	A5	VT_FMO_7_3_16.bin	131.74	0.0581	25.69
176	B0	VT_FMO_7_3_17.bin	165.06	0.0587	25.78
187	BB	VT_FMO_7_3_18.bin	195.7	0.0589	25.81
198	C6	VT_FMO_7_3_19.bin	225.18	0.0593	25.87
209	D1	VT_FMO_7_3_20.bin	252.37	0.0584	25.74
220	DC	VT_FMO_7_3_21.bin	278.42	0.0584	25.74
231	E7	VT_FMO_7_3_22.bin	302.54	0.0589	25.81
242	F2	VT_FMO_7_3_23.bin	324.75	0.0589	25.81
253	FD	VT_FMO_7_3_24.bin	346.2	0.059	25.83
255	FF	VT_FMO_7_3_25.bin	350.03	0.059	25.83



Frequency and power curves depending on the setpoint.

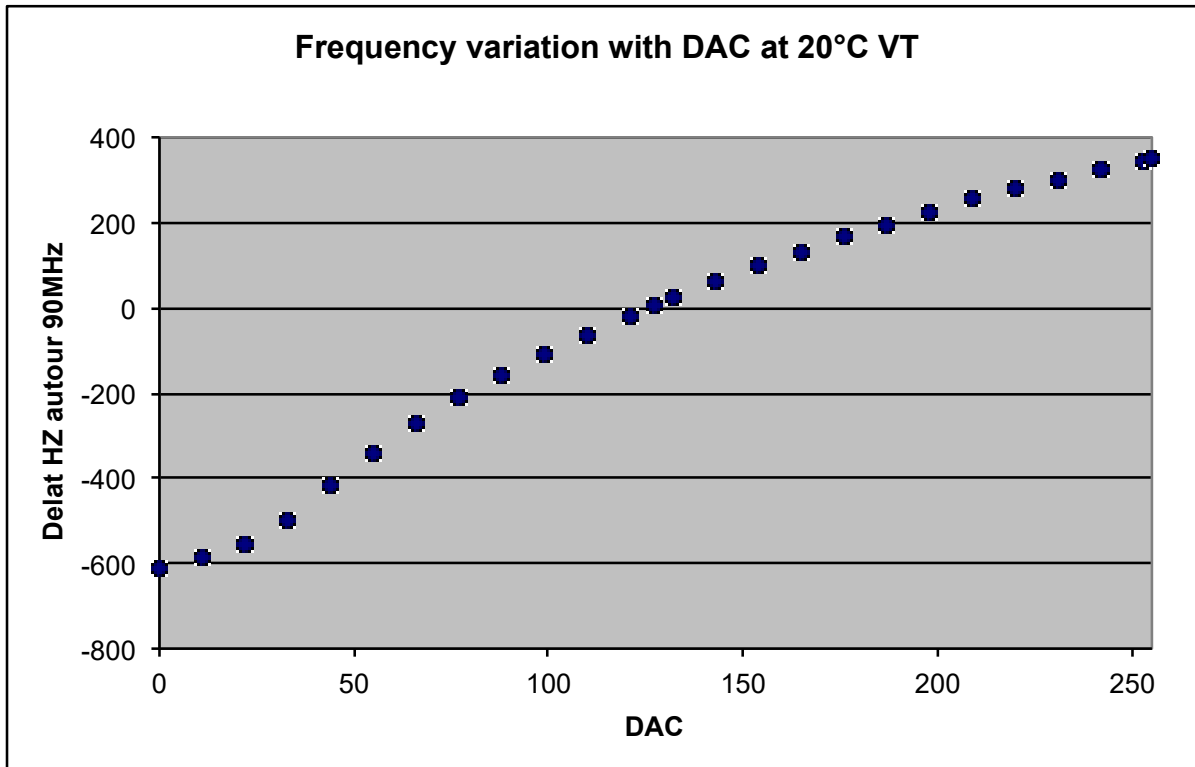


Figure 7.3b.a : Carrier frequency variation depending on DAC setpoint

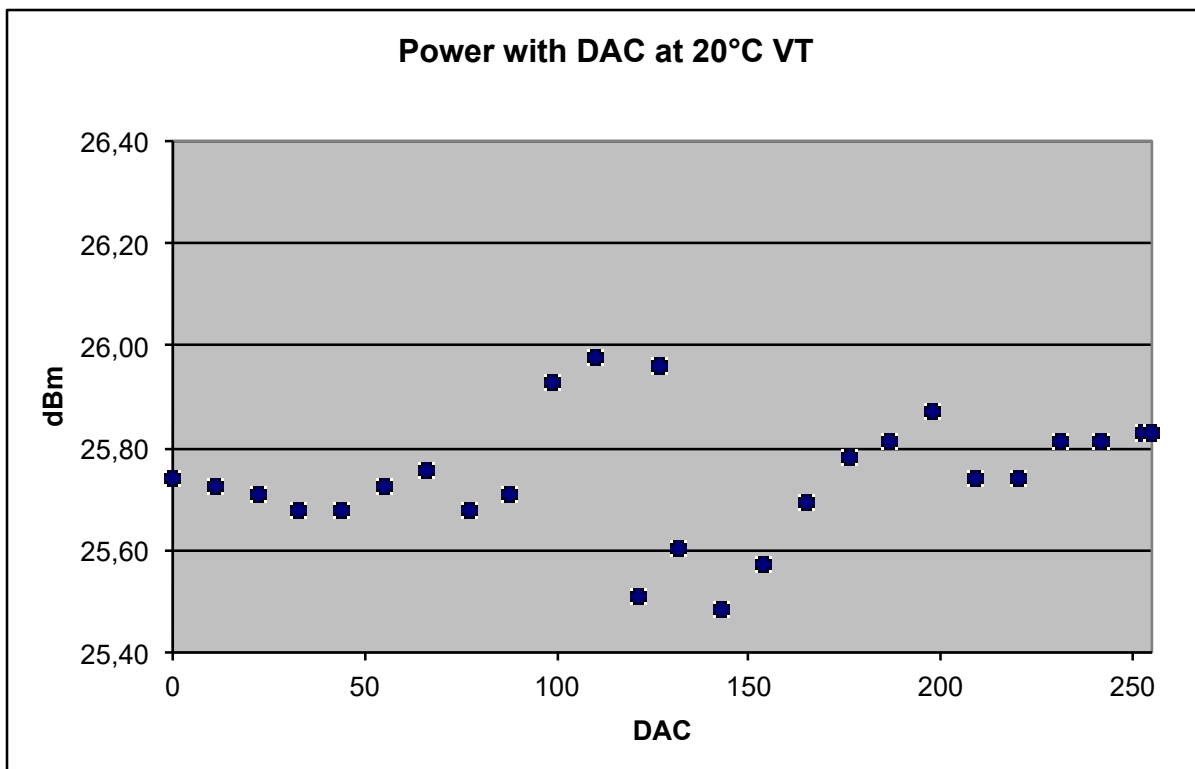
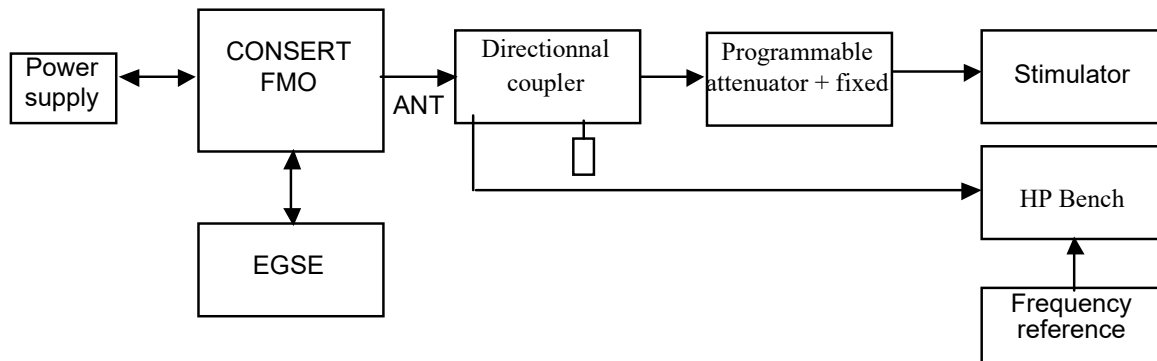


Figure 7.3b.b : Variation of output power according to the DAC setpoint



7.4.a. Tuning mode short preliminary test in laboratory at around 20°C

Duration: less than an hour, performed on April 4th 2001
Operation: Instrument regular reconfiguration and bench controlled by operator
Assembly configuration: ping-pong and bench coupling



A real tuning is done with Lander instrument (stimulator), near the reference frequency 90 000 000 Hz, for 3 attenuation level on the path (3 starts).

The recording of Orbiter and Lander is extended after the end of Tuning and the 10 first soundings are recorded. A full R8 binary file of Orbiter emission for the 3 tunings is also recorded on the bench (parameters level)

The carrier frequency will be measured by calculation in this file, and the quality of rendezvous and coherent addition will be checked both on Orbiter and Lander TM. The test lasts about 15 minutes for each parameters set, for a total of less than an hour.

Caution:

During this test, we notice that 123 value of DAC setpoint used on QML1 stimulator for this first test in laboratory does not exactly match 90MHz (Because Orbiter OCXO is not 126 as expected (following characterization (see chapter 4.1.1.)).

It is due to a wrong original characterisation of QML1 OCXO. This difference is surely due to a malfunctioning of the GPS receiver during the characterization of QML1. This defect of GPS receiver has been brought to light later.

After this acknowledgment, a control « Tuning » is done with DAC/QML1=126. The Orbiter locks on as if it received reference carrier perfectly centered (OCXO setting=126). For all further TV test, the reference setpoint for DAC90/QML1 is 126.

Laboratory link budgets (see 12.4)

Attenuation FMO to STIM-QML (dB) :	22.2 dB + Tuning R&S
Attenuation FMO to E1437in / bench (dB) :	35.3 dB
QML output power on the Delta Line:	20 dBm



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Ref.	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tun	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
"0"	<90000000	(123)d=(7B)h	-50	-52	14	123	1	153	132	OK	AP041659.D39	040401_3	OBLOC_IQ_7_4_1T
"0"	<90000000	(123)d=(7B)h	-70	-72	5	123	1	150	132	OK	AP041710.D42	_4	_2T
"0"	<90000000	(123)d=(7B)h	-80	-82	2	123	1	148	130	OK	AP041722.D59	_5	_3T
"0"	<90000000	(126)d=(7E)h	-80	-82	2	126	1	150	129	OK	AP041733.D51	_6	_4T

FMO Tuning operates, and we also conclude that the DAC90/QML1 setpoint is rather 126 than 123.

Verification through measurement at counter HP132A of QML1 in CW emission:

DAC=126 F0 = 89 999 999.95 Hz

DAC=127 F0 = 90 000 004.44 Hz

See summary of BIN files (power and frequency) at section 13

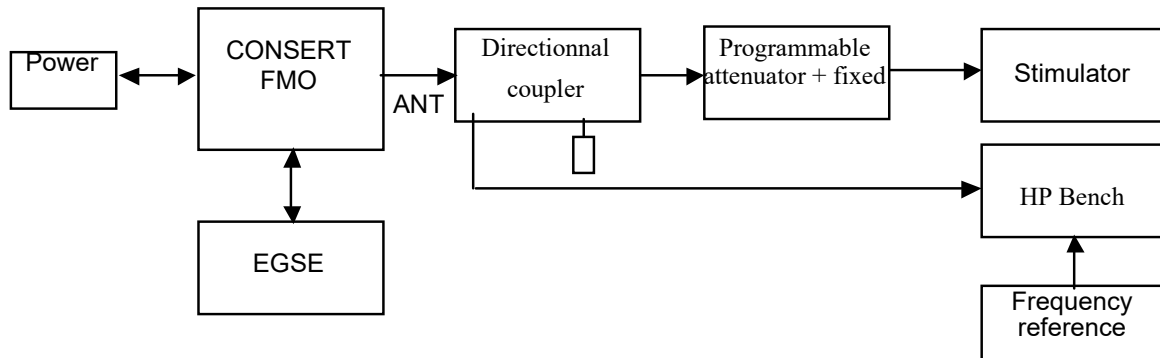


7.4.b. Tuning mode test in TV at 20°C

Duration: about 3 hours

Operation: regular reconfiguration of the instrument and bench controlled by operator

Assembly configuration: ping-pong and bench coupling



A real tuning is done with Lander instrument (stimulator), near the 4 reference frequencies and for 3 attenuation levels on the path (12 starts)

The recording of Orbiter and lander TM is extended after the end of Tuning, and the 10 first soundings are recorded. A full R8 binary file of Orbiter emission for the 12 tunings is also recorded on the bench (parameters sets, frequency and level)

The carrier frequency will be measured by calculation in this file, and the quality of rendezvous and coherent addition will be checked both on Orbiter and Lander TM. The test lasts around 15 minutes for each parameters set, for a total about 3 hours.

Link budgets (see 12.4)

Attenuation FMO to STIM-QML (dB) :	24.3 dB + Tuning R&S
Attenuation FMO to E1437in / bench (dB) :	37.4 dB
QML output power on the Delta line :	20 dBm



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Ref.	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tuning	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
-6	89999460	(40)d=(28)h	-47	-51	16	26	0	146	129	OK	AP171359.D51	010417_03	FMO_VT_7_4_1
-6	89999460	(40)d=(28)h	-67	-71	6	26	0	150	129	OK	AP171415.D18	_04	_2
-6	89999460	(40)d=(28)h	-77	-81	1	26	0	149	130	OK	AP171425.D53	_05	_3
-3	89999730	(76)d=(4C)h	-47	-51	16	68	1	146	129	OK	TBD	_06	_4
-3	89999730	(76)d=(4C)h	-67	-71	6	68	1	149	129	OK	AP171439.D40	_07	_5
-3	89999730	(76)d=(4C)h	-77	-81	1	68	1	149	129	OK	AP171503.D50	_08	_6
0	90000000	(126)d=(7E)h	-47	-51	16	127	0	146	129	OK	AP171517.D45	_09	_7
0	90000000	(126)d=(7E)h	-67	-71	5	127	0	149	129	OK	AP171538.D17	_10	_8
0	90000000	(126)d=(7E)h	-77	-81	1	127	0	148	130	OK	AP171549.D52	_11	_9
3	90000270	(196)d=(C4)h	-47	-51	16	218	1	146	129	OK	AP171601.D06	_12	_10
3	90000270	(196)d=(C4)h	-67	-71	6	218	1	148	129	OK	AP171612.D41	_13	_11
3	90000270	(196)d=(C4)h	-77	-81	1	218	1	147	133	OK	AP171623.D59	_14	_12

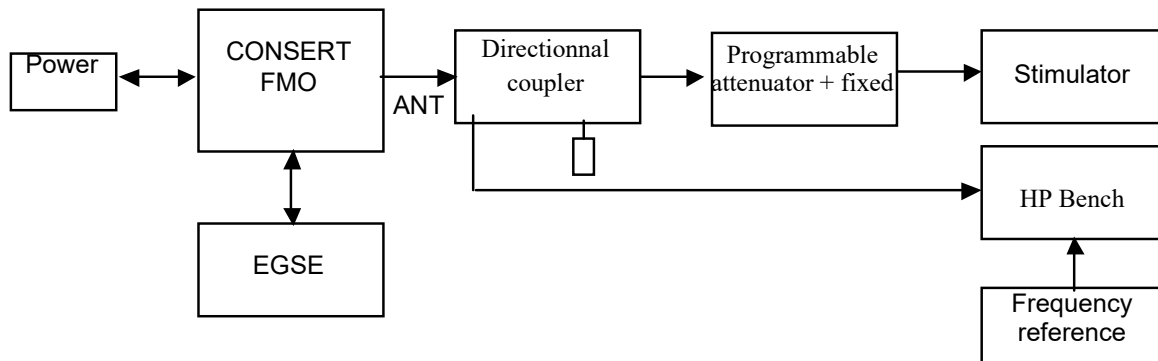
Notes:

During the last test (DAC196,-81dBm), Lander is stopped at the beginning of soundings. Afterwards the Orbiter records noises. For bench file number_11, I path have no data. The board is read too early. As we already encountered this problem, we lengthened the wait time before reading in vee program for the following tests.



7.5. Ping-pong pulse response with path variable attenuation

Duration: 1 hour, performed on April 17th 2001 around 11 am.
Operation: attenuation modification and recording on the bench by operator
Assembly configuration: ping-pong long experiment with bench coupling



The output signal is verified on the bench and then, to control any drift, 2 binary files of raw acquisition are recorded for each level, without coherent addition, using program:

Acqui_R8_en_TX_derrière_coupleur.vee. Each binary file fills 8 MBytes. Each acquisition needs around 1 minute and 15 seconds (with bus VXI reset). The bench binary data will be processed « offline ». The test ends with the record of 100 soundings on termination for characterization of own noise, with maximal gain, and according to temperature.

Necessary material:

Matériel	Type	Statut	
Adjustable power supply	28V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual setting
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N sur RSP
Stimulator	EQML1 dit QML		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Total backup	ok	Acqui_R8_en_TX_derrière_coupleur
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	



Links configuration and properties (see table 12.4):

Loss from FMO to STIM-QML, excluding R&S setting: -24.3 dB
Round trip delay from FMO to STIM-QML: 213ns
FMO losses at E1473 bench cards input: -37.4 dB

Pre-condition: having tested the bench after power-up (Bench self-test completed)

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (twice 10 dB coaxial N on input and output RSP)
Variable attenuation = 4 levels from - 30 dB to -80dB according to « sounding » N°

Mission tables:

Orbiter mission tables: MT_FMO_VT (avec DELTATIC = 5s)

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission Table MT_QML_VT for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Orbiter parameters report in "Tuning"

GCWT	NBLon (GCW)	NBloff (at STOP)	OCXO setting	INTQ
14	148	128	127	0

Parameters report in Sounding first phase

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
19	DE	17	8

Outputs

Bench = 1 short file TXT, and 8 BIN files of 8 Mo, so 64 Mo.
Orbiter (FMO) = 600 TM Science
Lander (STIM) = 400 TM HK + 120 TM Science

Duration: 3000 seconds in sounding + start, so 1 hour

Bench program:

Test_en_TX_derrière_coupleur.vee,

Acqui_R8_en_TX_derrière_coupleur.vee (see sheet, section 11)

Note : In the event of a stop of one of the two EGSE, restart with tuning, control then recovery at incident level.



ATTENTION: Results haven't been reported in the table en real time during the test (to be completed in analysing) (TBC)

Phase	N° sounding	Attenuation		EQML1 (stim)			FMO Orbiter			Banc status	
		Rohde & Schwarz	Att. totale	status	com- mands	output	status	outputs			
					Voltage	GCW	Framing	OCXO	GCW	pic pos.	
Start		-50	-74dB		28 V						
Tuning		-50	-74dB	tuning	28 V			Tuning	14		
Controle	1	-50	-74dB	ping pong	28 V	18	DE	ping pong	17	9	
											2 acq.R8
Gain	101	-30	-54 dB		28 V		visu off		26	8	2 acq.R8
	201	-70	-94 dB		28 V		visu off		7	8	2 acq.R8
	301	-80	-104 dB		28V		visu off		2	8	2 acq.R8
stim off	401	-80	-104 dB		OFF		visu off		0	na	
terminati on	501	na	na		OFF			/terminati on	0		
Stop	600										

TM files

TM FMO Orbiter : AP171112.D55

TM Lander (stimulator) : 010417_01.xls (during the test, the viewing is blocked on screen but the instrument still cycles)

Emission checked on HP bench: file FMO_en_TX_7_5_1.txt (this test might be missing) (TBC)

Integrated PIC level ??? dB Bench, so ??? dBm instrument (see section 12.4)

FMO emission record, full binary signals files

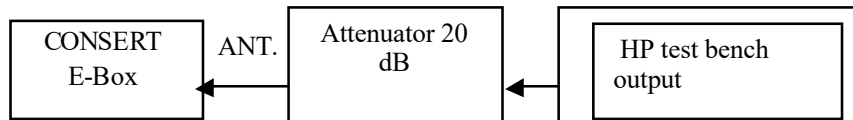
R&S settings	First acquisition	Second acquisition
- 50 dB	OBLOC_IQ_7_5_01.bin	OBLOC_IQ_7_5_02.bin
- 30 dB	OBLOC_IQ_7_5_03.bin	OBLOC_IQ_7_5_04.bin
-70 dB	OBLOC_IQ_7_5_05.bin	OBLOC_IQ_7_5_06.bin
- 80 dB	OBLOC_IQ_7_5_07.bin	OBLOC_IQ_7_5_08.bin

See BIN files summary (power and frequency) at section 13.



7.6. Receiver and ramp gain linearity TEST (test in H4)

Duration: about 4 hours and 15 minutes, performed on April 17th around 4.30 pm
Operation: automatic test after FMO TC setting and bench starting
Assembly configuration: FMO in receiving face to the bench and through 20 dB attenuator
Consert in receiving face to the bench



The purpose of the test is to verify the receiver linearity on a whole range of GCW attenuator from 0 to 31.

To do this, a synchronous line with coherent addition is sent to Consert FMO antenna. ESGD generator is programmed on 90MHz + H4 frequency, which means 90.15686MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter starting with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO a the closest of 90MHz with DAC90 (=0x7E)



Bench programming:

Use program **RX_H4.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4
drift: 0 ppm
min level: -110dBm,
max level: +10dBm,
step: 1dB
step duration: 120s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4) : **23.6 dB**

By processing TM file, the analysis of the H4 line emitted level by the bench, of its level on Consert receiver I and Q path, and of the value of gain control, enables to calibrate very precisely Consert gain for each GCW value and according to the temperature.

As we have enough time and as it is a reference measurement at ambient temperature, so easily reproducible, 120 seconds are let per level (instead of 60 seconds for other temperatures)

The test starts at 4h38 pm. With 121 level steps and 2 minutes per step, plus starting, we will have about 4 hours and 15 minutes before signal disappears. The test goes on during the whole night, records noises and creates a TM file thereafter.

Note that up midnight, the efficient test being over since a long time, the temperature drops to 0°C and remains at that level. We will notice or not an incidence on the noise level. The test is stopped in the morning of April 18th 2001 around 8h30 am.

TM FMO file: AP171638.D52

Then noise alone in following file AP180535.D36

Note:

As there is no carrier for tuning, it fails, with parameters INTQ=7 and OCXO=221

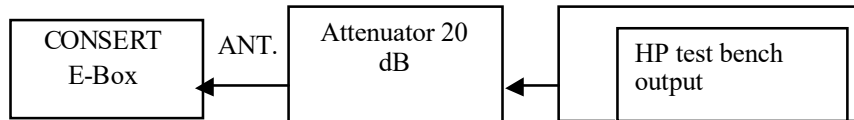


7.7. Variation of receiver noise according to the gain setpoint (with orthogonal line)

Duration: half an hour

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench through 20dB attenuator



The purpose of the test is to measure the variation of broadband noise level at Consert receiver channel output when GCW attenuator control ranges from at least 0 to 14.

To perform it, an orthogonal line with coherent addition is sent on Consert FMO antenna.

This line provokes the pinching of gain on the analogic receiver, whereas being strongly rejected by the digital filter.

ESGD generator is programmed on 90MHz frequency + (4+(125/1024))Fcode, which means 90.161650 MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Start the Orbiter with the standard TV mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E). Some soundings will be performed before activating the generator program (own noises).



Bench programming:

Use program **RX_ORTHO.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4+(125/1024)
drift: 0 ppm
min level: -65dBm,
max level: -25dBm,
step: 1dB
step duration: 30s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4) : **23.6dB**

Level at receiver input changes from around -88.6 dBm to -48.6 dBm.

GCW remains on 0 for a few steps then grows in average 1 or 2 steps until GCW=18. With 41 level steps, 30 seconds per step, and starting, the test lasts half an hour.

Remote processing TM file will enable the evaluation of broadband noise level, out of line, for each GCW value and at each temperature.

TM FMO file: AP171224.D19

Normal failure of tuning with INTQ= 9 and OCXO setting=222.

The generation via the bench is started around sounding 32, GCW remains on 0 until sounding 71, then slow growth.

The equivalent input level (EIL) decreases contracts 2dB per GCW growing step until around GCW=15. EIL indicator does not change afterwards.



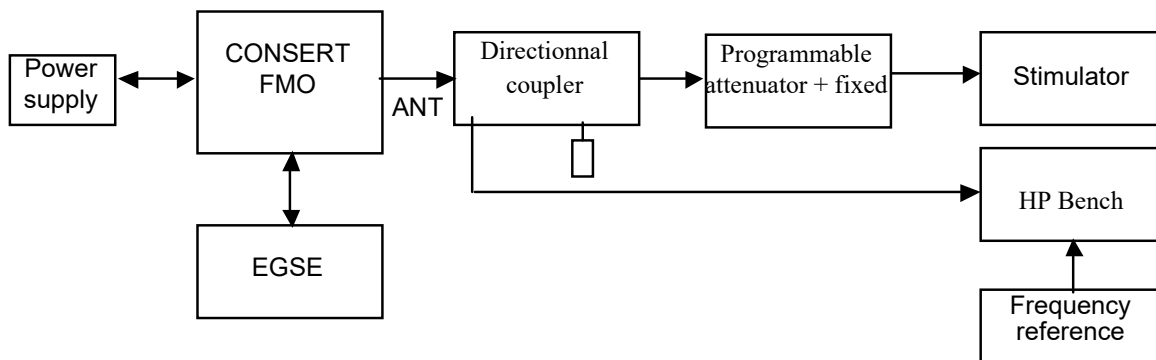
8. TV tests at +50°C

8.1. Intentionnaly left blank section

8.2. Intentionnaly left blank section

8.3. SOREP quick characterization

Duration : 60 minutes
Operation : many and regular manual interventions on the bench
Assembly configuration : ping-pong and bench coupling
Caution: termination on coupler has been forgotten



The purpose of the test is to characterize at each temperature the frequency variability of the 90 MHz carrier depending on the DAC control. Measurements are only made at 28 volts.

As for fine characterization test 4.1.3, measurement of the carrier is made by analysing signals transmitted by the instrument during coded transmission of the Sounding mode in ping-pong (deferred processing in LPG). These signals are recorded on the bench wired to the coupler during ping-pong.

After a normal starting face to the Lander stimulator with standard table mission during the Sounding phase, TC are sent to the Orbiter to change the DAC setpoint and so the frequency of the Orbiter carrier around 90 MHz. A setpoint from 0 to 255 is sent to DAC/OXCO through TC in increments of 11, which means a total of 25 setpoints. In order to achieve it, file to select on the TC window of EGSE Orbiter is OCXO_VT.cmc . Interval to send telecommands is set to 2 minutes.

For each setpoint, a « binary » file of raw acquisition without coherent addition is recorded on the bench with the program **Acqui_R8_en_TX_derrière_coupleur.vee**. Each file takes up to 8 MByte on the bench. Each acquisition lasts about 1 minute 15 seconds (with bus XVI reset). Adding 2 minutes per setpoint (for a total of 50 minutes) and the initial phase before ping-pong, the total duration of this measurement is one hour and requires the constant presence of an operator for the bench.



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It is necessary to take into account the bench, coupler and cable (external cable and vessel cable that connect the instrument to the BNC connector of crossing vessel) parameters for the auxiliary measurement of the coded transmit power (see table 12.4). **37.40dB** have thus to be added to the measured powers on bench 1437 input card to get the power output of the Orbiter. During the test of April 11th around 5 pm, R&S attenuator is set to 50dB. The attenuation FMO to STIM is therefore 74.3dB (see table12.4).

Note : Having forgotten termination may less disturb coupling. Signals emitted by Lander and reflected on coupler's open output are too attenuated to start the bench and they are not simultaneous with those of the Orbiter to disturb measured amplitudes.

TM FMO file: AP111103.D17

TM STIM file: 110401_02.xls

Bench measurements

DAC setpoint	TC Hex Param	File name / bench	Carrier frequency measured by calculation	Power/ bench 1437	Output power dBm
0	0	OBLOC_IQ_8_3_01.bin	-613.89	0.0546	25.15
11	0B	OBLOC_IQ_8_3_02.bin	-587.47	0.0543	25.11
22	16	OBLOC_IQ_8_3_03.bin	-552.62	0.0544	25.12
33	21	OBLOC_IQ_8_3_04.bin	-497.09	0.0545	25.14
44	2C	OBLOC_IQ_8_3_05.bin	-415.9	0.0549	25.20
55	37	OBLOC_IQ_8_3_06.bin	-339.31	0.0547	25.17
66	42	OBLOC_IQ_8_3_07.bin	-272.67	0.0543	25.11
77	4D	OBLOC_IQ_8_3_08.bin	-212.93	0.0552	25.25
88	58	OBLOC_IQ_8_3_09.bin	-158.93	0.055	25.22
99	63	OBLOC_IQ_8_3_10.bin	-109.53	0.0548	25.19
110	6E	OBLOC_IQ_8_3_11.bin	-63.19	0.0549	25.20
121	79	OBLOC_IQ_8_3_12.bin	-19.53	0.0543	25.11
132	84	OBLOC_IQ_8_3_13.bin	21.06	0.0573	25.57
143	8F	OBLOC_IQ_8_3_14.bin	59.74	0.0569	25.51
154	9A	OBLOC_IQ_8_3_15.bin	96.51	0.0544	25.12
165	A5	OBLOC_IQ_8_3_16.bin	131.36	0.0547	25.17
176	B0	OBLOC_IQ_8_3_17.bin	163.91	0.055	25.22
187	BB	OBLOC_IQ_8_3_18.bin	194.93	0.0549	25.20
198	C6	OBLOC_IQ_8_3_19.bin (PB ???)	224.42	0.0548	25.19
209	D1	OBLOC_IQ_8_3_20.bin	251.61	0.055	25.22
220	DC	OBLOC_IQ_8_3_21.bin	277.65	0.0556	25.31
231	E7	OBLOC_IQ_8_3_22.bin	301.39	0.0554	25.28
242	F2	OBLOC_IQ_8_3_23.bin	323.99	0.0552	25.25
253	FD	OBLOC_IQ_8_3_24.bin	345.44	0.0552	25.25
255	FF	OBLOC_IQ_8_3_25.bin	349.26	0.0551	25.23

Check if there has been a problem for bench reading card 1437 for file OBLOC_8_3_19.bin

A first set of TM files correspond to a failure because of incomplete cabling:

TM FMO file (FAILED) : AP111052.D29

TM STIM file (FAILED) : 110401_01.xls

See summary of BIN files (power and frequency) at section 13.



Frequency and power curves according to the setpoint

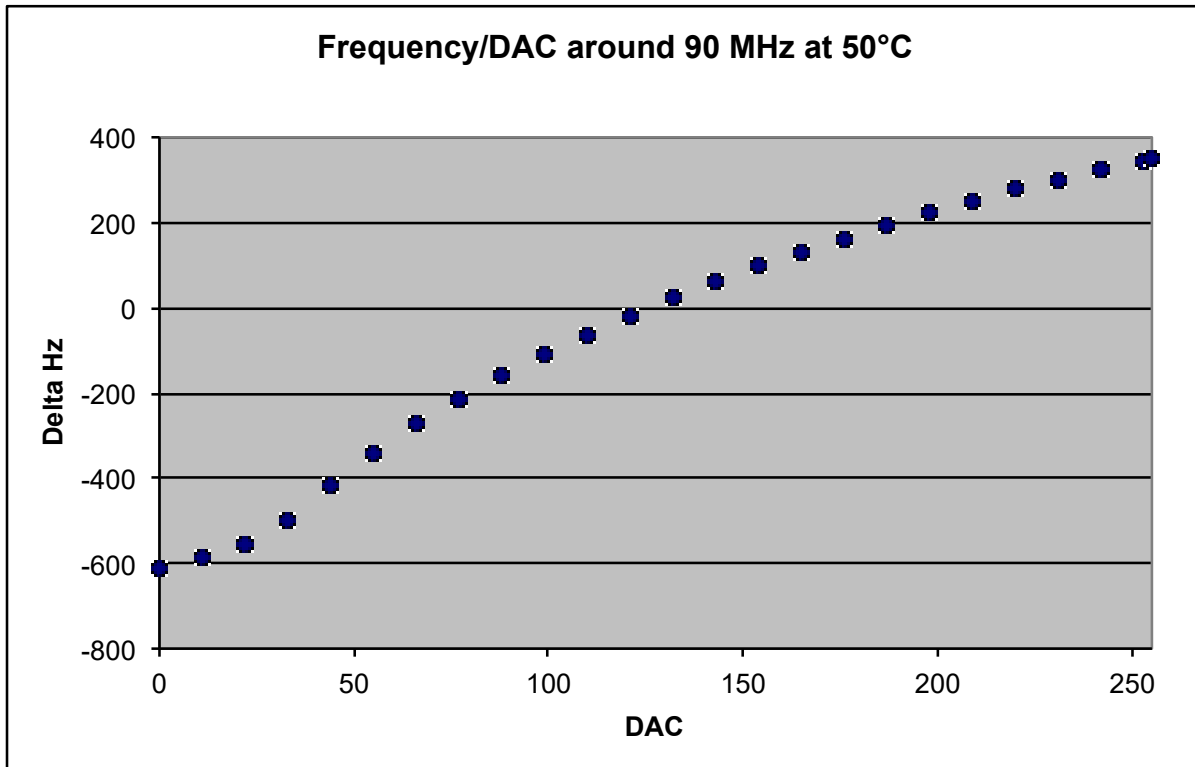


Figure 8.3.a : Carrier frequency variation depending on DAC setpoint

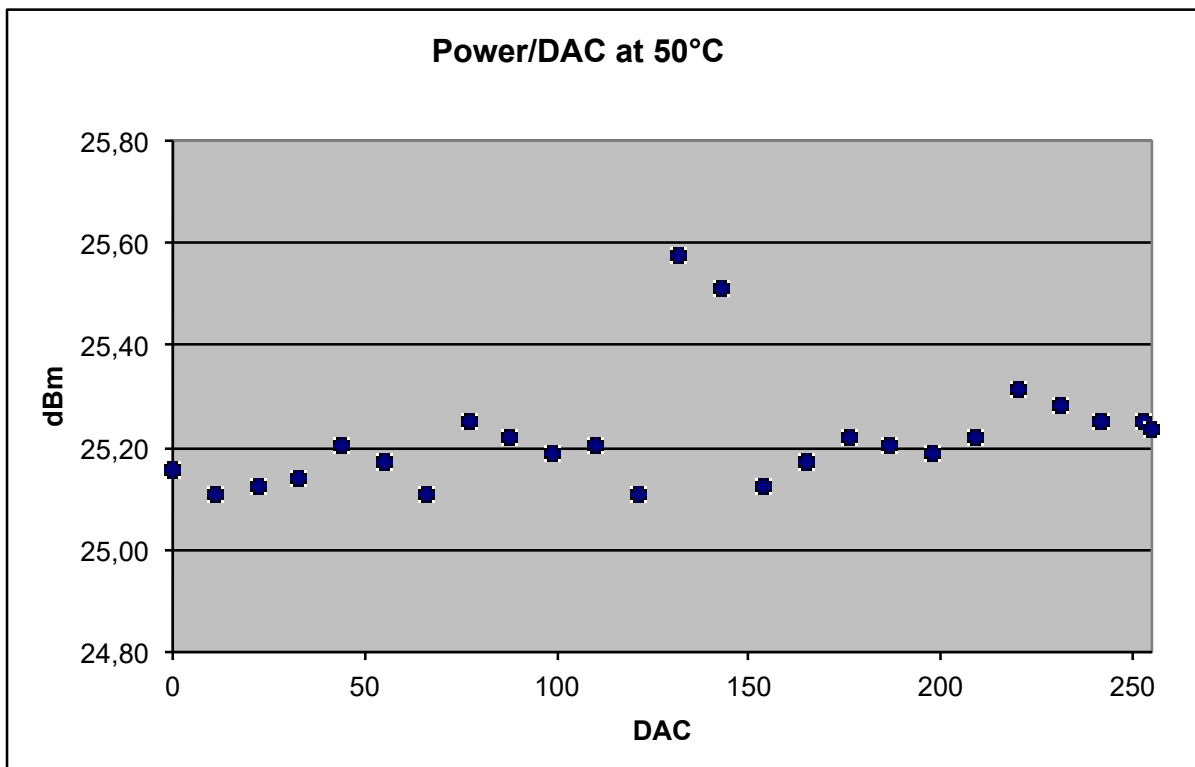


Figure 8.3b : Output power variation depending to DAC setpoint

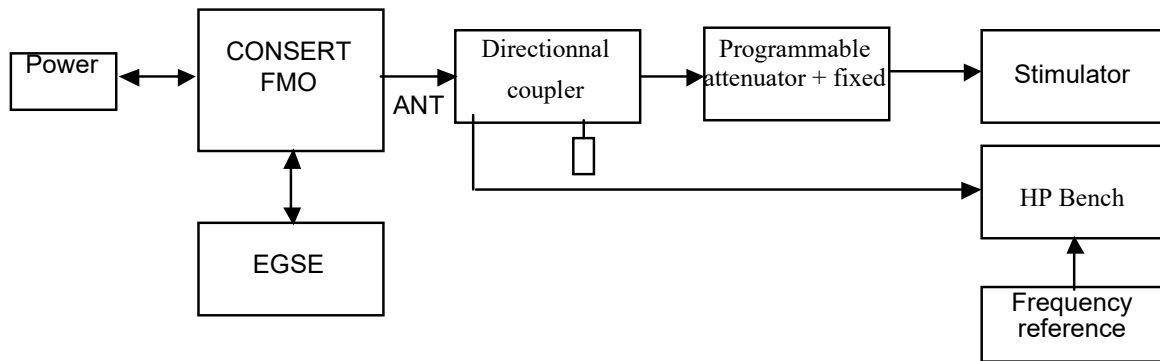


8.4. Tuning mode test

Duration: about 3 hours

Operation: regular reconfiguration of the instrument and bench controlled by operator

Assembly configuration: ping-pong and bench coupling



A real tuning is done with Lander instrument (stimulator), near the 4 reference frequencies and for 3 attenuation levels on the path (12 starts)

The recording of Orbiter and lander TM is extended after the end of Tuning, and the 10 first soundings are recorded. A full R8 binary file of Orbiter emission for the 12 tunings is also recorded on the bench (parameters sets, frequency and level)

The carrier frequency will be measured by calculation in this file, and the quality of rendezvous and coherent addition will be checked both on Orbiter and Lander TM. The test lasts about 15 minutes for each parameters set, for a total about 3 hours.

Link budgets (see 12.4)

Attenuation FMO to STIM-QML (dB) :	24.3 dB + Tuning R&S
Attenuation FMO to E1437in / bench (dB) :	37.4 dB
QML output power on the Delta line :	20 dBm



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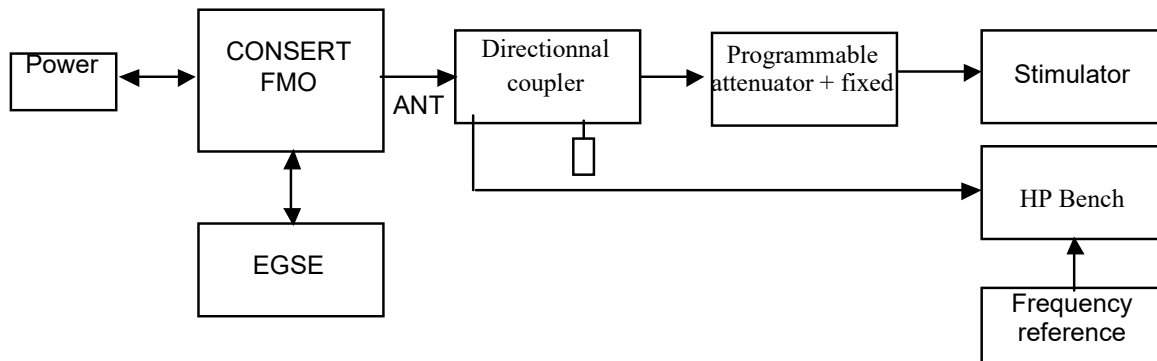
Ref.	Carrier	DAC/OCXO	ATTR&S	FMO Input	GCWT	OCXO	INTQ	NBL	NBL	Tuning	TM FMO	TM STIM	HP Bench
ppm	Hz	STIM-EQML1	(dB)	app~ dBm	Tuning	setting		GCW	STOP	ok?	File	File (.xls)	R8 File (.bin)
-6	89999460	(40)d=(28)h	-47	-51	14	25	1	151	129	OK	AP111631.D21	110401_05	OBloc_IQ_8_4_01
-6	89999460	(40)d=(28)h	-67	-71	5	25	1	145	129	OK	AP111646.D11	_06	_02
-6	89999460	(40)d=(28)h	-77	-81	0	25	1	146	129	OK	AP111656.D41	_07	_03
-3	89999730	(76)d=(4C)h	-47	-51	14	67	1	151	128	OK	AP111706.D48	_08	_04
-3	89999730	(76)d=(4C)h	-67	-71	5	67	1	145	132	OK	AP111721.D07	_09	_05
-3	89999730	(76)d=(4C)h	-77	-81	0	220	1	145	129	OK	AP111730.D33	_10	_06
0	90000000	(126)d=(7E)h	-47	-51	14	127	1	151	128	OK	AP111739.D38	_11	_07
0	90000000	(126)d=(7E)h	-67	-71	5	127	1	145	132	OK	AP111752.D54	_12	_08
0	90000000	(126)d=(7E)h	-77	-81	0	127	1	143	129	OK	AP111801.D53	_13	_09
3	90000270	(196)d=(C4)h	-47	-51	14	217	0	151	132	OK	AP111810.D57	_14	_10
3	90000270	(196)d=(C4)h	-67	-71	5	217	0	145	129	OK	AP111819.D48	_15	_11
3	90000270	(196)d=(C4)h	-77	-81	1	217	0	146	131	OK	AP111828.D44	_16	_12

See summary of BIN files (power and frequency) at section 13.



8.5. Ping-pong pulse response with path variable attenuation

Duration: 1 hour
 Operation: attenuation modification and recording on the bench by operator
 Assembly configuration: long ping-pong experiment and bench coupling



The output signal is verified on the bench and then, to control any drift, 2 binary files of raw acquisition are recorded for each level, without coherent addition, using program:

Acqui_R8_en_TX_derrière_coupleur.vee. Each binary file fills 8 MBytes. Each acquisition needs about 1 minute and 15 seconds (with bus VXI reset). The bench binary data will be processed « offline ». The test ends with the record of 100 soundings on termination for characterization of own noise, with maximal gain, and according to temperature.

Necessary material :

Material	Type	Status	
Adjustable power supply	28V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual setting
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	EQML1 dit QML		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Total backup	ok	Acqui_R8_en_TX_derrière_coupleur
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	



Links configuration and properties (see table 12.4):

Loss from FMO to STIM-QML, excluding R&S setting: -24.3 dB
 Round trip delay from FMO to STIM-QML: 213ns
 FMO losses at E1473 bench cards input: -37.4 dB

Pre-condition: having tested the bench after power-up (Bench self-test completed)

Initial configuration:

Bench frequency = 90 MHz
 Orbiter and lander voltage = 28 V
 Fixed attenuation = - 20 dB (twice 10 dB coaxial N on input and output RSP)
 Variable attenuation = 4 levels from - 30 dB to -80dB according to « sounding » N°

Mission tables:

Orbiter mission table: MT_FMO_VT (with DELTATIC = 5s)

<u>Mission Table Orbiter (10 "16bits Words") : MT FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission table MT_QML_VT for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_VT</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Orbiter parameters report in "Tuning"

GCWT	NBLon (GCW)	NBloff (at STOP)	OCXO setting	INTQ
12	153	129	127	1

Parameters report in Sounding first phase

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
16	DE	15	8

Outputs

Bench = 1 short file TXT, and 8 BIN files of 8 Mo, so 64 Mo.
Orbiter (FMO) = 600 TM Science
Lander (STIM) = 400 TM HK + 120 TM Science

Duration: 3000 seconds in sounding + launch, so 1 hour

Bench program:

Test_en_TX_derrière_coupleur.vee,

Acqui_R8_en_TX_derrière_coupleur.vee (see sheet, section 11)

Note :

In the event of a stop of one of the two EGSE, restart with tuning, control, then recovery at incident level.



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Note: Conditions R&S -30dB and -70dB are switched for this set

Phase	N° sounding	Attenuation command		EQML1 (stim)			FMO Orbiter			Bench status	
		Rohde & Schwarz	Att. totale	status	com- mands	outputs	status	outputs			
					Voltage	GCW	Framing	OCXO	GCW	pic pos.	
Beginning		-50	-74dB		28 V						
Tuning		-50	-74dB	tuning	28 V			Tuning			
Control	1	-50	-74dB	ping pong	28 V			ping pong			1 vérif
						15	DD		12	8 ou 9	2 acq.R8
Gain	101	-70	-94 dB		28 V	7	DD		6	8 ou 9	2 acq.R8
	201	-30	-54 dB		28 V	27	DE		26	9	2 acq.R8
	301	-80	-104 dB		28V	3	DE		1	8 ou 9	2 acq.R8
stim off	401	-80	-104 dB		OFF				0		
termination	501	na	na		OFF			/terminati on	0		
Stop	600										

TM file : Test performed in two stages after RGSE Orbiter crash

First set: TM FMO Orbiter : AP111510.D37 TM Lander (stimulator) : 110401_03.xls
 Second set (after crash): TM FMO Orbiter : AP111527.D36 TM Lander (stimulator) : 110401_04.xls

Emission check on HP bench : fichier FMO_en_TX_6_5_1.txt (this test might be missing) (TBC)

Emission record on bench, binary signals files, **attention:** 4 files with R&S set to 50dB (2 of them on 1st Run).

R&S tuning	First acquisition	Second acquisition
- 50 dB	OBLOC_IQ_8_5_01.bin	OBLOC_IQ_8_5_02.bin
- 50 dB	OBLOC_IQ_8_5_03.bin	OBLOC_IQ_8_5_04.bin
-70 dB	OBLOC_IQ_8_5_05.bin	OBLOC_IQ_8_5_06.bin
- 30 dB	OBLOC_IQ_8_5_07.bin	OBLOC_IQ_8_5_08.bin
- 80 dB	OBLOC_IQ_8_5_09.bin	OBLOC_IQ_8_5_10.bin

See summary of BIN files (power and frequency) at section 13.

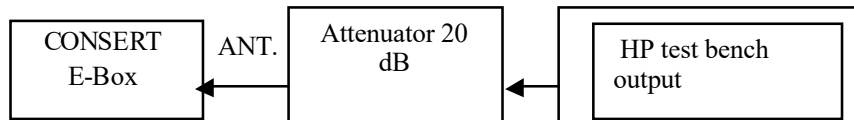


8.6. Receiver and ramp gain linearity TEST (test in H4)

Duration: about 2 hours and 15 minutes, performed on April 11th around noon.

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench and through 20dB attenuator. Consert in receiving face to the bench



The purpose of the test is to verify the receiver linearity on a whole range of GCW attenuator from 0 to 31.

To do this, a synchronous line with coherent addition is sent to Consert FMO antenna. ESGD generator is programmed on 90MHz + H4 frequency, which means 90.15686MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter launching with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E)



Bench programming:

Use program **RX_H4.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4
drift: 0 ppm
min level: -110dBm,
max level: +10dBm,
step: 1dB
step duration: 60s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4): **23.6dB**

121 level steps, with one minute per step, plus starting, so a whole duration about 2 hours and 15 minutes.

Processing TM file, the analysis of the H4 line emitted level by the bench, of its level on Concert receiver I and Q path, and of the value of gain control, enables to calibrate very precisely Concert gain for each GCW value and according to the temperature.

TM FMO file: AP111218.D32

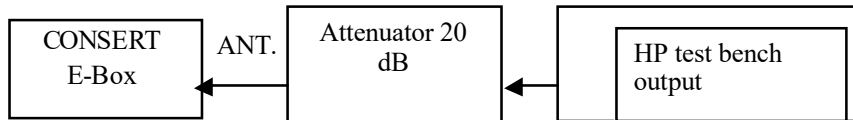


8.7. Variation of receiver noise according to the gain setpoint (with orthogonal line)

Duration: half an hour

Operation: Automatic test after FMO TC setting and bench starting

Assembly configuration: FMO in receiving face to the bench through 20dB attenuator



The purpose of the test is to measure the variation of broadband noise level at Consert receiver channel output when GCW attenuator control ranges from at least 0 to 14.

To perform it, an orthogonal line with coherent addition is sent on Consert FMO antenna. This line provokes the pinching of gain on the analogic receiver, whereas being strongly rejected by the digital filter.

ESGD generator is programmed on 90MHz frequency + (4+(125/1024))Fcode, which means 90.161650 MHz, and the RF power level is varied with step of 1dB, as specified in the bench parameters table.

Orbiter launching with the standard VT mission table

<u>Mission Table Orbiter (10 "16bits Words") : FMO VT</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E). Some soundings will be performed before activating the generator programm (own noises)



Bench programming:

Use program **RX_ORTHO.vee** (see sheet, section 11)

Before starting, choose the following ramp parameters:

Line number: 4+(125/1024)
drift: 0 ppm
min level: -65dBm,
max level: -25dBm,
step: 1dB
step duration: 30s

ESGD generator losses / Bench at FMO antenna input in the tank (see 12.4) : **23.6dB**

Level at receiver input changes from around -88.6 dBm to -48.6 dBm.

GCW remains at 0 for a few steps then grows in average 1 or 2 steps until GCW=18. With 41 level steps, 30 seconds per step, and starting, the test lasts half an hour.

Remote processing TM file will enable the evaluation of broadband noise level, out of line, for each GCW value and at each temperature.

TM FMO file: AP111431.D53



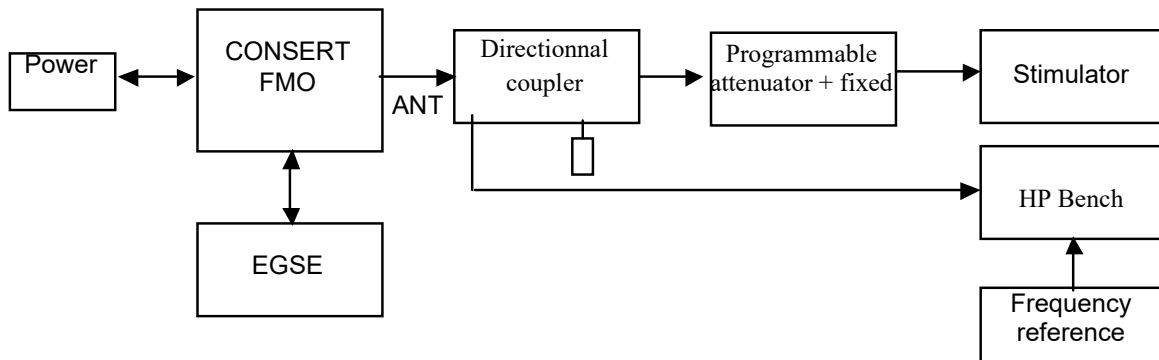
9. Measurement in transition or temperature cycling

9.1. Ping-pongs in temperature transitions or during a temperature cycle

Duration: variable according to the transition or cycle duration, until several days

Operation: automatic, after initial control on the bench

Assembly configuration: long term ping-pong experiment with bench coupling



Initial configuration:

Orbiter and lander voltage = 28 V

Total attenuation = - 90 dB (with - 20 dB fixed, and -70dB on RSP) + cables

Orbiter mission table: MT_FMO_10 with nominal 10 seconds DELTATIC intervals

<u>Mission Table Orbiter (10 "16bits Words") : MT_FMO_10</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
17D8	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
8000	INIT FREQ (=128) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))



Mission table MT_QML_10 for STIMULATOR EQML1:

<u>Mission Table Lander (10 "16bits Words") : MT_QML_10</u>	
<u>TC data words</u>	<u>Signification</u>
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
17D8	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
7E0A	INIT FREQ (=126) & FLOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

This experiment will be launched at each usable temperature transition period or during a full cycle of temperature variation.

9.1.1. Transition from -20°C to 0°C

Test begun on April 12th at 6h40 pm and pursued until April 13rd 2001 in the morning.
Set Rohde & Schwarz attenuator to 70dB for the total attenuation of **94.3 dB** (see 12.4).

Orbiter parameters report in "Tuning" (TBD)

GCWT	NBLon (GCW)	NBLOff (at STOP)	OCXO setting	INTQ

Parameters report of first sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION

Output control by FMO on the bench:

A raw R8 acquisition will be done at the beginning of soundings, at the end of the test, and if possible a few times during the test (with several attempts if necessary, because the shot interval is long)

Bench file beginning: OBLOC_IQ_9_1_1_01.bin et _02.bin
Other R8 files: _03.bin and _04.bin sounding 5200

See summary of BIN files (power and frequency) at section 13.

TM output

Orbiter (FMO)	TM file:	AP121840.D21
Lander (STIM)	TM file:	120401_18.xls



9.1.2. MultiCycle from -20°C to 50°C over 4 days

This test lasts for 4 days, during Easter weekend from Friday, April 13rd to Tuesday April 17th in the morning. We begin at 0°C and we end at 20°C, with 4 cycles between -20°C to +50°C.

Rohde & Schwarz attenuator is set to 50dB for a total attenuation of **74.3dB** (see 12.4).

Orbiter parameters report in "Tuning"

GCWT	NBLon (GCW)	NBLOff (at STOP)	OCXO setting	INTQ
14	148	130	128	0

Parameters report of first sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
19	DE	17	8 à 9

Output control by FMO on the bench:

A raw R8 acquisition will be done at the beginning of soundings, at the end of the test, and if possible a few times during the test (with several attempts if necessary, because the shot interval is long)

Bench file beginning: OBLOC_IQ_9_1_2_01.bin
Other bench file beginning: _02,_03,_04.bin
File at the end, on 17th in the morning: OBLOC_IQ_9_1_2_05.bin

See summary of BIN files (power and frequency) at section 13.

TM outputs

For the Orbiter, TM are distributed successively and automatically in 4 files:

Orbiter (FMO) TM file: AP131512.D01
Orbiter (FMO) TM file: AP141122.D51
Orbiter (FMO) TM file: AP151303.D24
Orbiter (FMO) TM file: AP161443.D58

Lander (STIM) single TM file: 010413_03.xls



9.2. Internal noise measurement in cycling of temperature

Duration : from 1 pm to 9h15 pm on April 18th 2001 (8 hours)
Operation: automatic after TC setting on DAC90 (=0x7E)
Assembly configuration : on termination 50 Ohms

Reporting of internal noise level of the test during a rapid cycling of temperature with the instrument in the tank and an output termination.

The test begins at 0°C, rises until +50°C, then dips to -20°C and remains at -20°C until stopped.

Orbiter Voltage Configuration = 28 V

Orbiter mission table: MT_FMO_5

<u>Mission Table Orbiter (10 "16bits Words") : MT_FMO_5</u>	
<u>TC data words</u>	<u>Signification</u>
0100	Mission table indicator & table index
0003	TUNETIC (B3 & B2) = 323 seconds
0218	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
17D8	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
8000	INIT_FREQ (=128) & MODE_BYTE (= 0)
001F	MIN_ATT (= 0) & MAX_ATT (= 31)
9585	NBL_Level (= 149) & NBL_zero (= 133)

TC DAC/OCXO:

After Orbiter tuning phase failure, which is done without stimulator neither injection of sub-carrier, it is necessary to send the TC to set FMO at the closest of 90MHz with DAC90 (=0x7E).

FMO TM file: AP181303.D46



10. Measuring instruments and devices

Power measurement	HP Power Meter E4419A
Spectrum analyser	HP 8590A
Vector network analyser	HP 8753C
Universal frequency counter	HP53132/012 (also used as frequency reference)
Digital Oscilloscope	Tektronix TDS544A
Consert measure bench	HP/Agilent (including a generator ESG-D)
Bench controlling computer	HP Vectra VL
Step attenuator RSP	Rohde & Schwarz RSP 831.3515.02
Fixed attenuator connectorized N	Radiall -10dB (2 units on input and output of the RSP)
Fixed attenuator connectorized N	Radiall -20dB (at output of the ESGD generator of the bench)
Multimeter	Wavetek 27XT
Micrometer	RCNF1
Laboratory power supply	HP HPE3632A
Bidirectionnal coupler (to -30 dB)	Werlatone model 01569
Current probe	Tektronix TCP202.
Frequency reference	USO of HP53132/012 (see counter)
Multipath device	3 paths (0m, cables UR67 100m and 200m long) Coupled and +/- 1dB equalized paths in a Zargal trunk 60cm x 60cm x 80cm

CDR blank disk for data archiving on bench Vectra PC



11. Intentionnaly left blank section



12. Calibration table for power calculation and link budgets

		1	2	3	4a	4b	5
Total attenuation (dB)		Coupl. Model	Coupl. Model	ADC Model	CW GENE Model	Coded GENE Model	Coded GENE PIC
		Stim	ADC	PIC	Model	Model	PIC
FMO	VT	-24.27	-37.40	88.72	-23.43	-23.63	121.67
	Labo	-22.17	-35.30	90.82	-21.33	-21.53	121.67

Table 1 : Overview of link budgets – All models
Differences with FMO in bold

Link budget detailed and older versions in
RO-OCN-TN-3818 Test Bench Characterisation
RO-OCN-TN-3819 Test Bench Characterisation appendix



13. Files correlation table

File name	Size	File name	Size	Ping Pong	Bench File name	Rx	Tx	Paragra-ph
AP031333.D33	55						x	4.1.1
AP031348.D55	25						x	4.1.1
AP031359.D37	3						x	4.1.1
AP031407.D37	2						x	4.1.1
AP031414.D48	3						x	4.1.1
AP031422.D36	2						x	4.1.1
AP031429.D33	3						x	4.1.1
AP031436.D44	3						x	4.1.1
AP031443.D42	2						x	4.1.1
AP031450.D57	2						x	4.1.1
AP031458.D37	3						x	4.1.1
AP031506.D06	2						x	4.1.1
AP050953.D04	68	050401_01.xls	40		OBloc_IQ_4_1b_01.bin	x		4.1.2
AP051007.D08	37	050401_02.xls	22		OBloc_IQ_4_1b_02.bin	x		4.1.2
AP051017.D36	32	050401_03.xls	21		OBloc_IQ_4_1b_03.bin	x		4.1.2
AP051601.D31	62	050401_26.xls	36		OBloc_IQ_4_1b_26.bin	x		4.1.2
AP051027.D58	59	050401_04.xls	35		OBloc_IQ_4_1b_04.bin	x		4.1.2
AP051041.D02	9	050401_05.xls	15		OBloc_IQ_4_1b_05.bin	x		4.1.2
AP051051.D44	41	050401_06.xls	16		OBloc_IQ_4_1b_06.bin	x		4.1.2
AP051051.D44	41	050401_07.xls	17		OBloc_IQ_4_1b_07.bin	x		4.1.2
AP051110.D41	203	050401_08.xls	31		OBloc_IQ_4_1b_08.bin	x		4.1.2
AP051550.D03	42	050401_25.xls	27		OBloc_IQ_4_1b_25.bin	x		4.1.2
AP051110.D41	203	050401_09.xls	77		OBloc_IQ_4_1b_09.bin	x		4.1.2
AP051142.D08	25	050401_10.xls	17		OBloc_IQ_4_1b_10.bin	x		4.1.2
AP051151.D44	19	050401_11.xls	15		OBloc_IQ_4_1b_11.bin	x		4.1.2
AP051201.D43	21	050401_12.xls	16		OBloc_IQ_4_1b_12.bin	x		4.1.2
AP051210.D37	31	050401_13.xls	21		OBloc_IQ_4_1b_13.bin	x		4.1.2
AP051534.D28	48	050401_24.xls	31		OBloc_IQ_4_1b_24.bin	x		4.1.2
AP051220.D45	28	050401_14.xls	20		OBloc_IQ_4_1b_14.bin	x		4.1.2
AP051230.D34	20	050401_16.xls	20		OBloc_IQ_4_1b_16.bin	x		4.1.2
AP051404.D06	68	050401_17.xls	41		OBloc_IQ_4_1b_17.bin	x		4.1.2
AP051420.D51	29	050401_18.xls	22		OBloc_IQ_4_1b_18.bin	x		4.1.2
AP051428.D40	63	050401_19.xls	31		OBloc_IQ_4_1b_19.bin	x		4.1.2
AP051441.D42	23	050401_20.xls	21		OBloc_IQ_4_1b_20.bin	x		4.1.2
AP051524.D26	27	050401_23.xls	22		OBloc_IQ_4_1b_23.bin	x		4.1.2
AP051452.D02	30	050401_21.xls	31		OBloc_IQ_4_1b_21.bin	x		4.1.2
AP051506.D56	111	050401_22.xls	56		OBloc_IQ_4_1b_22.bin	x		4.1.2
TBD		TBD		x	FMO_000.bin à FMO_255.bin	x		4.1.3
AP031142.D50	383							4.4.2.b
AP040910.D51	233						x	4.4.3
AP040941.D17	2446						x	4.4.3
AP031525.D02	1556						x	4.4.4
AP031845.D13	9766							4.4.5
AP040742.D25	1058							4.4.5
AP061111.D23	264	060401_01.xls	131	x				4.5.1
AP051748.D29	9766	050401_29.xls	7847	x	OBloc_IQ_4_5_2_1.bin à OBloc_IQ_4_5_2_7.bin	x		4.5.2
AP052310.D41	5022	050401_29.xls	7847	x				4.5.2



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AP041948.D31	8	040401_9.xls	2	x				4.6
AP041958.D18	5228	040401_10.xls	2525	x	OBloc_IQ_4_6_1.bin à OBloc_IQ_4_6_5.bin	x		4.6
AP051621.D23	259	050401_27.xls	80	x				4.7
AP051649.D56	611	050401_28.xls	291	x				4.7
AP120914.D51	114							5.0
AP121706.D40	1033	120401_17.xls	479	x	OBloc_IQ_5_3_01.bin à OBloc_IQ_5_3_25.bin	x		5.3
AP191120.D53	370	010419_04.xls	170	x	FMO_VT_5_3_00.bin à FMO_VT_5_3_08.bin	x		5.3
AP121456.D00	17	120401_04.xls	4		OBloc_IQ_5_4_01.bin	x		5.4
AP121505.D23	11	120401_05.xls	16		OBloc_IQ_5_4_02.bin	x		5.4
AP121514.D30	11	120401_06.xls	16		OBloc_IQ_5_4_03.bin	x		5.4
AP121653.D32	32	120401_16.xls	21		OBloc_IQ_5_4_13.bin	x		5.4
AP121524.D21	6	120401_07.xls	31		OBloc_IQ_5_4_04.bin	x		5.4
AP121539.D05	19	120401_08.xls	16		OBloc_IQ_5_4_05.bin	x		5.4
AP121548.D09	37	120401_09.xls	26		OBloc_IQ_5_4_06.bin	x		5.4
AP121558.D59	23	120401_10.xls	16		OBloc_IQ_5_4_07.bin	x		5.4
AP121608.D22	14	120401_11.xls	16		OBloc_IQ_5_4_08.bin	x		5.4
AP121617.D16	18	120401_12.xls	16		OBloc_IQ_5_4_09.bin	x		5.4
AP121626.D24	15	120401_13.xls	16		OBloc_IQ_5_4_10.bin	x		5.4
AP121635.D17	12	120401_14.xls	15		OBloc_IQ_5_4_11.bin	x		5.4
AP121644.D10	17	120401_15.xls	16		OBloc_IQ_5_4_12.bin	x		5.4
AP121046.D40	163	120401_02.xls	88	x	OBloc_IQ_5_5_01.bin à OBloc_IQ_5_5_08.bin	x		5.5
AP121107.D49	574	120401_03.xls	184	x		x		5.5
AP121200.D21	1589						x	5.6
AP121413.D25	329						x	5.7
AP130920.D26	118							6.0
AP131034.D03	748	010413_01.xls	320	x	OBloc_6_3_01.bin à OBloc_6_3_25.bin	x		6.3
AP181048.D04	1	010418_02.xls	11				x	6.4
AP181057.D23	79	010418_03.xls	48	x	OBloc_IQ_6_4_01.bin	x		6.4
AP181112.D18	28	010418_04.xls	21	x	OBloc_IQ_6_4_02.bin	x		6.4
AP181122.D45	15	010418_05.xls	15	x	OBloc_IQ_6_4_03.bin	x		6.4
AP181132.D10	19	010418_06.xls	16	x	OBloc_IQ_6_4_04.bin	x		6.4
AP181141.D29	19	010418_07.xls	16	x	OBloc_IQ_6_4_05.bin	x		6.4
AP181150.D54	15	010418_08.xls	15	x	OBloc_IQ_6_4_06.bin	x		6.4
AP181200.D32	28	010418_09.xls	21	x	OBloc_IQ_6_4_07.bin	x		6.4
AP181211.D20	15	010418_10.xls	14	x	OBloc_IQ_6_4_08.bin	x		6.4
AP181219.D30	18	010418_11.xls	16	x	OBloc_IQ_6_4_09.bin	x		6.4
AP181228.D31	97	010418_12.xls	51	x	OBloc_IQ_6_4_10.bin	x		6.4
AP181243.D53	22	010418_13.xls	17	x	OBloc_IQ_6_4_11.bin	x		6.4
AP181253.D16	34	010418_14.xls	22	x	OBloc_IQ_6_4_12.bin	x		6.4
AP180943.D58	681	010418_01.xls	213	x	OBloc_IQ_6_5_01.bin à OBloc_IQ_6_5_09.bin	x		6.5
AP131204.D41	1743						x	6.6
AP131429.D29	390						x	6.7
AP041521.D36	845	040401_01.xls	1	x	OBloc_7_3_01_T.bin à OBloc_7_3_25_T.bin	x		7.3.a
AP191555.D08	790	010419_06.xls	43	x	VT_FMO_7_3_00.bin à VT_FMO_7_3_25.bin	x		7.3.b
AP041659.D39	27	040401_3.xls	21	x	OBloc_IQ_7_4_1_T.bin	x		7.4.a
AP041710.D54?	24	040401_4.xls	17	x	OBloc_IQ_7_4_2_T.bin	x		7.4.a
AP041722.D59	33	040401_5.xls	31	x	OBloc_IQ_7_4_3_T.bin	x		7.4.a
AP041733.D51	33	040401_6.xls	21	x	OBloc_IQ_7_4_4_T.bin	x		7.4.a
AP171359.D51	32	010417_03.xls	28		FMO_VT_7_4_1.bin	x		7.4.b



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AP171415.D18	17	010417_04.xls	32		FMO_VT_7_4_2.bin	x		7.4.b
AP171425.D53	7	010417_05.xls	50		FMO_VT_7_4_3.bin	x		7.4.b
TBD		010417_06.xls	44		FMO_VT_7_4_4.bin	x		7.4.b
AP171439.D40	4	010417_07.xls	29		FMO_VT_7_4_5.bin	x		7.4.b
AP171503.D50	29	010417_08.xls	37		FMO_VT_7_4_6.bin	x		7.4.b
AP171517.D45	23	010417_09.xls	26		FMO_VT_7_4_7.bin	x		7.4.b
AP171538.D17	19	010417_10.xls	18		FMO_VT_7_4_8.bin	x		7.4.b
AP171549.D52	32	010417_11.xls	31		FMO_VT_7_4_9.bin	x		7.4.b
AP171601.D06	22	010417_12.xls	22		FMO_VT_7_4_10.bin	x		7.4.b
AP171612.D41	19	010417_13.xls	19		FMO_VT_7_4_11.bin	x		7.4.b
AP171623.D59	35	010417_14.xls	10		FMO_VT_7_4_12.bin	x		7.4.b
AP171112.D55	654	010417_01.xls	11	x	OBloc_IQ_7_5_01 .bin à OBloc_IQ_7_5_08 .bin	x		7.5
AP171638.D52	9766						x	7.6
AP180535.D36	2872						x	7.6
AP171224.D19	306						x	7.7
AP110909.D33	113							8.0
AP111052.D29	24	110401_01.xls	16	x		x		8.3
AP111103.D17	841	110401_02.xls	367	x	Obloc_IQ_8_3_01 .bin à Obloc_IQ_8_3_25 .bin	x		8.3
AP111631.D21	83	110401_05.xls	47		Obloc_IQ_8_4_01 .bin	x		8.4
AP111646.D11	27	110401_06.xls	21		Obloc_IQ_8_4_02 .bin	x		8.4
AP111656.D41	25	110401_07.xls	20		Obloc_IQ_8_4_03 .bin	x		8.4
AP111706.D48	17	110401_08.xls	16		Obloc_IQ_8_4_04 .bin	x		8.4
AP111721.D07	21	110401_09.xls	17		Obloc_IQ_8_4_05 .bin	x		8.4
AP111730.D33	17	110401_10.xls	16		Obloc_IQ_8_4_06 .bin	x		8.4
AP111739.D38	20	110401_11.xls	16		Obloc_IQ_8_4_07 .bin	x		8.4
AP111752.D54	15	110401_12.xls	16		Obloc_IQ_8_4_08 .bin	x		8.4
AP111801.D53	15	110401_13.xls	16		Obloc_IQ_8_4_09 .bin	x		8.4
AP111810.D57	14	110401_14.xls	16		Obloc_IQ_8_4_10 .bin	x		8.4
AP111819.D48	18	110401_15.xls	16		Obloc_IQ_8_4_11 .bin	x		8.4
AP111828.D44	19	110401_16.xls	16		Obloc_IQ_8_4_12 .bin	x		8.4
AP111510.D37	113	110401_03.xls	63	x	Obloc_IQ_8_5_01 .bin à Obloc_IQ_8_5_10 .bin	x		8.5
AP111527.D36	681	110401_04.xls	215	x	Obloc_IQ_8_5_01 .bin à Obloc_IQ_8_5_10 .bin	x		8.5
AP111218.D32	1596						x	8.6
AP111431.D53	321						x	8.7
AP121840.D21	1894	120401_18.xls	2681	x	Obloc_IQ_9_1_1_01 .bin à Obloc_IQ_9_1_1_04 .bin	x		9.1.1
AP131512.D01	7635	010413_03.xls	17024	x	Obloc_IQ_9_1_2_01 .bin à Obloc_IQ_9_1_2_05 .bin	x		9.1.2
AP141122.D51	9767	010413_03.xls	17024	x	Obloc_IQ_9_1_2_01 .bin à Obloc_IQ_9_1_2_05 .bin	x		9.1.2
AP151303.D24	9767	010413_03.xls	17024	x	Obloc_IQ_9_1_2_01 .bin à Obloc_IQ_9_1_2_05 .bin	x		9.1.2
AP161443.D58	7773	010413_03.xls	17024	x	Obloc_IQ_9_1_2_01 .bin à Obloc_IQ_9_1_2_05 .bin	x		9.1.2
AP181303.D46	6163							9.2
AP191101.D43	118	010419_03.xls	67	x		x		9.3.2
AP201003.D23	190							9.3.3

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