FSL
Integration and Calibration

CHANGE RECORDS

ISSUE	DATE	EVOLUTION	AUTHOR
1.0	01/08/01	Version FSL du doc FML	A. Herique
7.3	17/10/01	pendant le Test VT	
8.0	26/04/02	Test VT + complements	N.Souidi
8.1	05/11/02	Modif+compléments NS	N.Souidi
8.2	1/7/03	Finalisation Mise a Jour Bilan de Liaison et liste fichiers	A.Herique
9.0	1/12/17	Translation in english	L.Michaud

TABLE DES MATIERES

1. Introduction

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

This document has been originally written in French language and described all the FSL 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 “Intentionally 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. Intentionally left blank

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4. Test at ambient temperature

Date: 25/07/2001
Place: Service Aéronomie
EGSE control programs used for these tests are:

4.0.1. Lander EGSE

Material:
LANDER EGSE N1: User « Consert », password « consert »
CDMS simulator N°1 (control file: « Noquota.btl »)

Programs:
Piloting and acquisition: C:\fichiers\Consert\Egse\ EGSELand_cal.llb et sous vi
Visualisation: C:\fichiers\Consert\Egse\EGSE_EQM_auto\EGSELand.llb
TC generating: C:\fichiers\Consert\Egse\EGSE_EQM_auto\TcFileGe.vi
Logbook: C:\fichiers\Consert\Egse\EGSE_EQM_auto\FSL Logbook.txt

4.0.2. Orbiter EGSE

Material:
ORBITER EGSE N2: User « Consert », password « consert »
OBDH Simulator N° 6 (control file: « 13102000 »)
Programs:
Piloting and acquisition: EGSE (here)
Visualisation: D:\pascal\SIS_Hongrois\LectSisH21.llb
TC generating: D:\pascal\SIS_Hongrois\LectSisH21.llb

4.0.3. Test bench

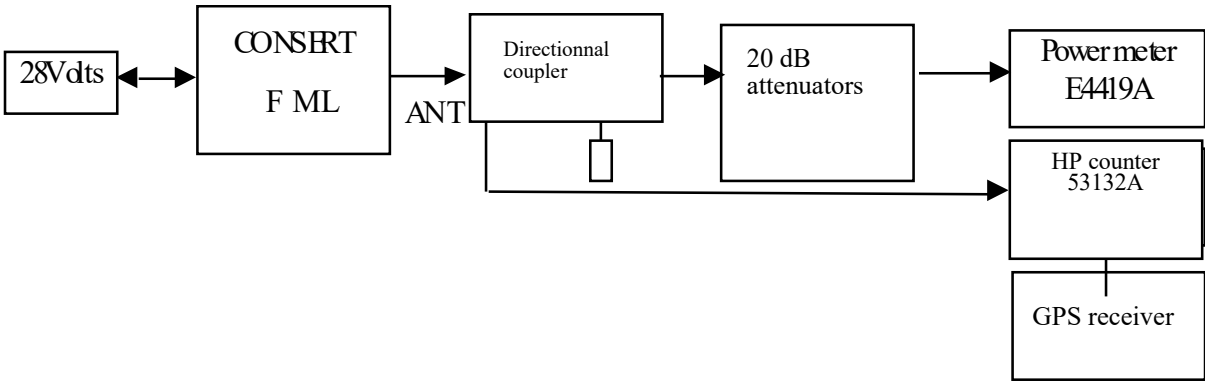
Material:
HP/Agilent test bench dedicated to Consert, and controlled by the computer HP Vectra VL serie 4,
Starting up: see facilitation sheet "**mise_sous_tension_du_banc_agilent_firewire**"
Programs:
Bench preliminary check program: **Test_banc_en_boucle_pnp.vee** (see section 11.)
Test program Consert on transmit: **Test_en_TX_retard_pnp.vee** (see sheet, section 11)
Test program Consert on transmit behind the coupler (during "ping-pong"):
Test_en_TX_derrière_coupleur.vee (see sheet, section 11)
Emitted signal on-going acquisition program behind the coupler (during "ping-pong"):
Acqui_R8_en_TX_derrière_coupleur.vee (see sheet, section 11)
Coded ramp in receiving test program: **Test_en_RX_Rampe_niveau.vee** (see sheet)
Sinus ramp in receiving test program: **RX_H4.vee** (see sheet)
Bandwidth in receiving test program: **RX_Trois_raies.vee** (see sheet)

4.1. Test with RF

For the different integration tests with RF in measuring mode i.e. with speed code (measuring mode), the analysis of the correlation peak is performed each time (peak width and level).
To perform it, it is necessary to synchronize by programming the Lander reference clock beside HP test bench clock fixed time which is fixed and has a better stability (GPS). In the first instance, we have to characterize the internal clock of LANDER model.

4.1.1. SOREP fine characterization

The purpose of the following test is to characterize finely the evolution of the 90 MHz signal, according to the DAC command.
Measurement will be done at 28 Volts only.
The evolution of secondary voltages according to the primary voltage is considered as marginal.



Send following direct TC:
Labview program: EGSELander_cal.lld/EGSE0_sorep.vi

TC Type	TC Para
0B	01
0A	01
08	01
06	01
10	02

Set a 1Hz resolution (door opening 1 second) on HP 53132A counter for all DAC set points.
Correspond to calibration test 2.1a.
Measurement done in the laboratory delta measure 21.3 dB

21.3 dB must be added to all power measurements in the table below to get the output power directly from the transmitter. Measurement is done for each set point value. A quicker control will be done in temperature (see following chapters)

OCXOFSL	Telecommand		Antenna output		
DAC	TC type	TC Param.	Frequ. Hz	Read power	**CW Transmit P. dBm**
0	5	0	89999216	2,17	23,47
1	5	1	219	2,14	23,44
2	5	2	221	2,13	23,43
3	5	3	225	2,12	23,42
4	5	4	230	2,12	23,42
5	5	5	233	2,11	23,41
6	5	6	236	2,11	23,41
7	5	7	239	2,11	23,41
8	5	8	242	2,11	23,41
9	5	9	246	2,11	23,41
10	5	0A	249	2,1	23,4
11	5	0B	252	2,1	23,4
12	5	0C	255	2,1	23,4
13	5	0D	259	2,1	23,4
14	5	0E	263	2,1	23,4
15	5	0 F	267	2,1	23,4
16	5	10	271	2,1	23,4
17	5	11	275	2,1	23,4
18	5	12	279	2,1	23,4
19	5	13	283	2,1	23,4
20	5	14	287	2,1	23,4
21	5	15	292	2,1	23,4
22	5	16	297	2,09	23,39
23	5	17	302	2,09	23,39
24	5	18	307	2,09	23,39
25	5	19	312	2,09	23,39
26	5	1A	318	2,09	23,39
27	5	1B	324	2,09	23,39
28	5	1C	330	2,09	23,39
29	5	1D	336	2,09	23,39
30	5	1E	343	2,09	23,39
31	5	1 F	351	2,09	23,39
32	5	20	359	2,09	23,39
33	5	21	367	2,09	23,39
34	5	22	375	2,09	23,39
35	5	23	383	2,09	23,39
36	5	24	392	2,09	23,39
37	5	25	401	2,09	23,39
38	5	26	410	2,09	23,39

39	5	27	419	2,08	23,38
40	5	28	428	2,08	23,38
41	5	29	438	2,08	23,38
42	5	2A	447	2,08	23,38
43	5	2B	456	2,08	23,38
44	5	2C	465	2,08	23,38
45	5	2D	474	2,08	23,38
46	5	2E	483	2,08	23,38
47	5	2 F	492	2,08	23,38
48	5	30	501	2,08	23,38
49	5	31	509	2,08	23,38
50	5	32	518	2,08	23,38
51	5	33	526	2,08	23,38
52	5	34	534	2,08	23,38
53	5	35	543	2,08	23,38
54	5	36	551	2,08	23,38
55	5	37	559	2,08	23,38
56	5	38	566	2,08	23,38
57	5	39	574	2,08	23,38
58	5	3A	582	2,08	23,38
59	5	3B	590	2,08	23,38
60	5	3C	597	2,08	23,38
61	5	3D	604	2,08	23,38
62	5	3E	612	2,07	23,37
63	5	3 F	619	2,07	23,37
64	5	40	626	2,07	23,37
65	5	41	633	2,07	23,37
66	5	42	640	2,07	23,37
67	5	43	647	2,07	23,37
68	5	44	654	2,07	23,37
69	5	45	661	2,07	23,37
70	5	46	667	2,07	23,37
71	5	47	674	2,07	23,37
72	5	48	681	2,07	23,37
73	5	49	687	2,07	23,37
74	5	4A	694	2,07	23,37
75	5	4B	700	2,07	23,37
76	5	4C	707	2,07	23,37
77	5	4D	713	2,07	23,37
78	5	4E	719	2,07	23,37
79	5	4 F	726	2,07	23,37
80	5	50	732	2,07	23,37
81	5	51	738	2,07	23,37

82	5	52	744	2,07	23,37
83	5	53	750	2,07	23,37
84	5	54	756	2,07	23,37
85	5	55	762	2,07	23,37
86	5	56	768	2,07	23,37
87	5	57	774	2,07	23,37
88	5	58	780	2,07	23,37
89	5	59	786	2,07	23,37
90	5	5A	791	2,07	23,37
91	5	5B	797	2,07	23,37
92	5	5C	803	2,07	23,37
93	5	5D	808	2,07	23,37
94	5	5E	814	2,07	23,37
95	5	5 F	820	2,07	23,37
96	5	60	825	2,07	23,37
97	5	61	831	2,07	23,37
98	5	62	836	2,07	23,37
99	5	63	842	2,07	23,37
100	5	64	847	2,07	23,37
101	5	65	852	2,07	23,37
102	5	66	858	2,07	23,37
103	5	67	863	2,07	23,37
104	5	68	868	2,07	23,37
105	5	69	874	2,07	23,37
106	5	6A	879	2,07	23,37
107	5	6B	884	2,07	23,37
108	5	6C	889	2,07	23,37
109	5	6D	894	2,07	23,37
110	5	6E	899	2,07	23,37
111	5	6 F	905	2,06	23,36
112	5	70	910	2,06	23,36
113	5	71	915	2,06	23,36
114	5	72	920	2,06	23,36
115	5	73	925	2,06	23,36
116	5	74	929	2,06	23,36
117	5	75	934	2,06	23,36
118	5	76	939	2,06	23,36
119	5	77	944	2,06	23,36
120	5	78	949	2,06	23,36
121	5	79	954	2,06	23,36
122	5	7A	959	2,06	23,36
123	5	7B	963	2,06	23,36
124	5	7C	968	2,06	23,36

125	5	7D	973	2,06	23,36
126	5	7E	978	2,06	23,36
127	5	7 F	983	2,06	23,36
128	5	80	988	2,06	23,36
129	5	81	992	2,06	23,36
130	5	82	997	2,06	23,36
131	**5**	**83**	**90000002**	**2,06**	**23,36**
132	5	84	6	2,06	23,36
133	5	85	11	2,06	23,36
134	5	86	15	2,06	23,36
135	5	87	20	2,06	23,36
136	5	88	24	2,06	23,36
137	5	89	29	2,06	23,36
138	5	8A	33	2,06	23,36
139	5	8B	38	2,06	23,36
140	5	8C	42	2,06	23,36
141	5	8D	46	2,06	23,36
142	5	8E	51	2,06	23,36
143	5	8 F	55	2,06	23,36
144	5	90	60	2,06	23,36
145	5	91	64	2,06	23,36
146	5	92	68	2,06	23,36
147	5	93	73	2,06	23,36
148	5	94	77	2,06	23,36
149	5	95	81	2,06	23,36
150	5	96	85	2,06	23,36
151	5	97	89	2,06	23,36
152	5	98	94	2,06	23,36
153	5	99	98	2,06	23,36
154	5	9A	102	2,06	23,36
155	5	9B	106	2,06	23,36
156	5	9C	110	2,06	23,36
157	5	9D	114	2,06	23,36
158	5	9E	118	2,06	23,36
159	5	9 F	123	2,06	23,36
160	5	A0	127	2,06	23,36
161	5	A1	131	2,06	23,36
162	5	A2	135	2,06	23,36
163	5	A3	139	2,06	23,36
164	5	A4	143	2,06	23,36
165	5	A5	147	2,06	23,36
166	5	A6	151	2,06	23,36
167	5	A7	155	2,06	23,36

168	5	A8	158	2,06	23,36
169	5	A9	162	2,06	23,36
170	5	AA	166	2,06	23,36
171	5	AB	170	2,06	23,36
172	5	AC	174	2,05	23,35
173	5	AD	178	2,05	23,35
174	5	AE	181	2,05	23,35
175	5	AF	185	2,05	23,35
176	5	B0	189	2,05	23,35
177	5	B1	193	2,05	23,35
178	5	B2	196	2,05	23,35
179	5	B3	200	2,05	23,35
180	5	B4	204	2,05	23,35
181	5	B5	208	2,05	23,35
182	5	B6	211	2,05	23,35
183	5	B7	215	2,05	23,35
184	5	B8	218	2,05	23,35
185	5	B9	222	2,05	23,35
186	5	BA	226	2,05	23,35
187	5	BB	229	2,05	23,35
188	5	BC	233	2,05	23,35
189	5	BD	236	2,05	23,35
190	5	BE	240	2,05	23,35
191	5	BF	243	2,05	23,35
192	5	C0	247	2,05	23,35
193	5	C1	250	2,05	23,35
194	5	C2	254	2,05	23,35
195	5	C3	257	2,05	23,35
196	5	C4	261	2,05	23,35
197	5	C5	264	2,05	23,35
198	5	C6	267	2,05	23,35
199	5	C7	271	2,05	23,35
200	5	C8	274	2,05	23,35
201	5	C9	277	2,05	23,35
202	5	CA	281	2,05	23,35
203	5	CB	284	2,05	23,35
204	5	CC	287	2,05	23,35
205	5	CD	290	2,05	23,35
206	5	CE	294	2,05	23,35
207	5	CF	297	2,05	23,35
208	5	D0	300	2,05	23,35
209	5	D1	303	2,05	23,35
210	5	D2	307	2,05	23,35

211	5	D3	310	2,05	23,35
212	5	D4	313	2,05	23,35
213	5	D5	316	2,05	23,35
214	5	D6	319	2,05	23,35
215	5	D7	322	2,05	23,35
216	5	D8	325	2,05	23,35
217	5	D9	328	2,05	23,35
218	5	DA	331	2,05	23,35
219	5	DB	334	2,05	23,35
220	5	DC	337	2,05	23,35
221	5	DD	340	2,05	23,35
222	5	DE	343	2,05	23,35
223	5	DF	346	2,05	23,35
224	5	E0	349	2,05	23,35
225	5	E1	352	2,05	23,35
226	5	E2	355	2,05	23,35
227	5	E3	358	2,05	23,35
228	5	E4	361	2,05	23,35
229	5	E5	363	2,05	23,35
230	5	E6	366	2,05	23,35
231	5	E7	369	2,05	23,35
232	5	E8	372	2,05	23,35
233	5	E9	375	2,05	23,35
234	5	EA	377	2,05	23,35
235	5	EB	380	2,05	23,35
236	5	EC	383	2,05	23,35
237	5	ED	386	2,05	23,35
238	5	EE	388	2,05	23,35
239	5	EF	391	2,05	23,35
240	5	F0	394	2,05	23,35
241	5	F1	396	2,05	23,35
242	5	F2	399	2,05	23,35
243	5	F3	402	2,05	23,35
244	5	F4	404	2,05	23,35
245	5	F5	407	2,05	23,35
246	5	F6	409	2,05	23,35
247	5	F7	412	2,05	23,35
248	5	F8	414	2,05	23,35
249	5	F9	417	2,05	23,35
250	5	FA	419	2,05	23,35
251	5	FB	422	2,05	23,35
252	5	FC	424	2,05	23,35
253	5	FD	427	2,05	23,35

254	5	FE	429	2,05	23,35
255	5	FF	90000432	2,05	23,35

Conclusion: For FSL model, the DAC set point to tune the instrument at 90 MHz is:
DAC90 = 0x83 = 131 Decimal

Put back the instrument in its initial situation.

TC Type	TC Para
10	00
06	00
08	00
0A	00
0B	00

File TM 250701_1.xls

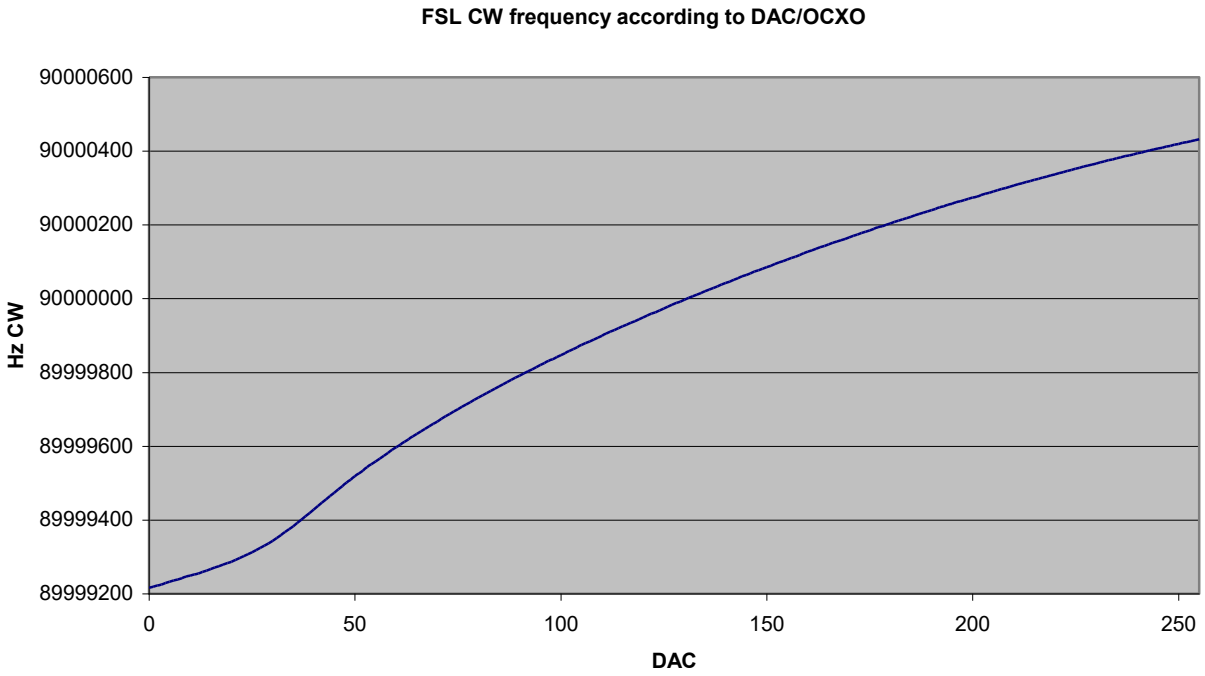


Figure 4.1.1a: Variation of the CARRIER frequency according to the DAC set point

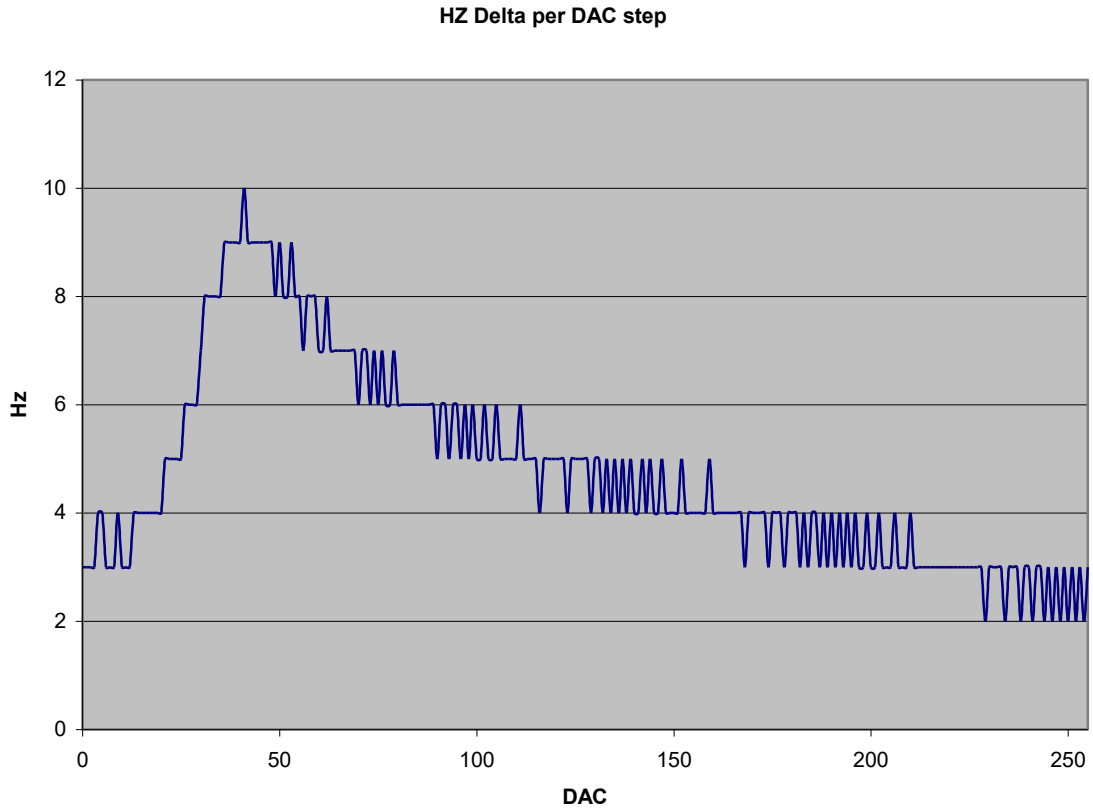


Figure 4.1.1c: Frequency delta per DAC set point step

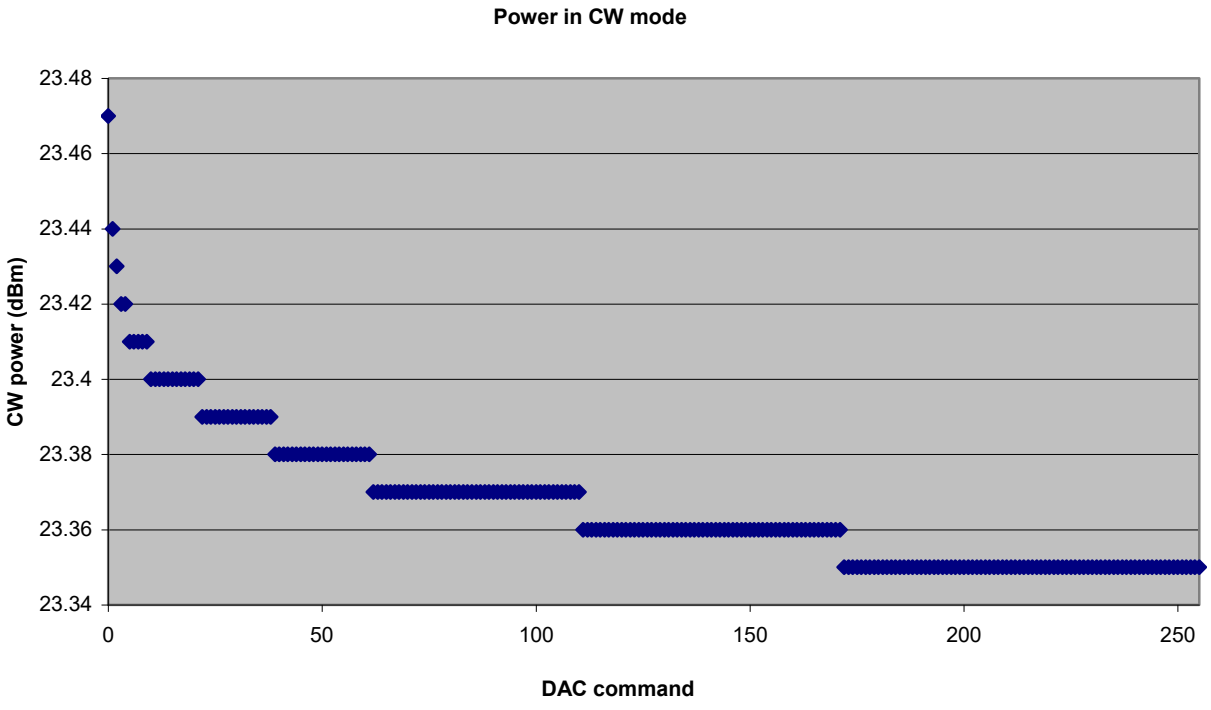


Figure 4.1.1b: Variation of the output power according to the DAC set point

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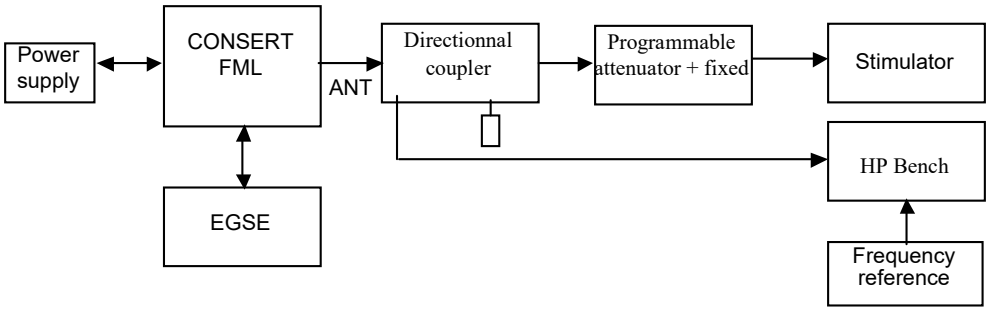
4.2. Intentionally left blank

4.3. Calibration tests

The purpose of this test is to get reference signals to calibrate the instrument and evaluate its performance while experiments conditions vary.

4.3.1. Ping-pong with variable external parameters

Description:
It is an experiment of long ping-pong with bench coupling.
Test performed in laboratory and at ambient temperature, it is very hot (30°C), for other temperatures see sections 5.5, 6.5, 7.5, 8.5.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	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
Power JFW attenuator	10dB	Ok	At QMO output
Stimulator	QMO		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Full backup	ok	Acqui_R8_en_TX_derrière_coupleur
Bench program	Tuning	n.av.	1 ms/s (60 x) **not available program**
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	

Cable losses properties:

	Nature	Length(m)	Approx. delay(ns)	Losses (dB)
Cable adapter Lepra BNC	Coax RG178	0.3	1.5ns	0.25
FSL cable to coupler	Coax KX4	10	50	0.6
Directionnal coupler feedthrough		0.15	0.5ns	0.1
R&S attenuator and its fixed attenuators		0.6	3ns	0.45
Attenuator cable to Stim	coax KX4	2	10	0.12
JFW fixed power attenuator			(10)	
Cable adapter Lepra BNC	Coax RG178	0.3	1.5ns	0.25
Cable total losses in PING PONG (one way)				**1.80dB**
Go and return Ping Pong delay			**133ns**	
Coupler to bench cable	Coax KX4	2		0.12

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (two times 10 dB coaxial N on RSP input and output)
JFW attenuator = -10dB
Variable attenuation = from - 20 dB to -80dB according to "sounding" N° (20dB step here)
EGSE = classical

LANDER Mission Table:

Mission Table LONG RUN FSL (10 16bits Words)	
TC data words	Signification
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
0064	NBSOUNDING = 50000
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 0) & PAD Field (=0)

Outputs:

Bench	= 1 TXT file and 3 BIN files of 8 Mo
Lander	= 2300 HK + 230 Science
Orbiter	= 2200 Science

Bench program: 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.

Test performed at 30°C

		Attenuation		FSL				Orbiter			Bench	Calib. test.	
		command		Status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding N°**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Freq**		**GCW**	**peak pos.**			
Start		**-40**	-71.8dB		28 V								
Tuning		**-40**	-71.8dB	tuning	28 V			tuning			TBC		2.4
Control	1	**-40**	-71.8dB	ping pong	28 V	20		ping pong	17	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	1000	**-60**	-91.8 dB		28 V	10					1 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	1800	**-20**	51.8dB		28 V	29					1 acq.R8		
	2008	**-80**	-111.8dB		28 V	1					1 acq.R8		
Noise	2200	**-80**	-111.8 dB		28 V			arrêt			marche	1.1b	
Stop	2300			arrêt									

FSL file: 270701_1.xls
QMO file: JL271155.D00
Bench file: FSL_Labo_270701_001 à 003.bin (name mistake on the initial report)
FSL_coupleur_270701_1.txt (TBC)

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	151	128	127	1

Parameters in sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
		16-18 (@RS=50dB)	8

Visu ok on lander FSL, TM viewing problem on QMO

4.3.2. Ping-pong with variable DAC/OCXO command (not done on FSL)

It is a long ping pong experiment, similar to the previous one, but where DAC/OCXO commands are varied by TC during the experiment. Experiment pattern and material are the same.

4.4 Ping-pong at ambient temperature

Experiment pattern and material are the same.

This is a long term nominal ping-pong test. The objective is also to test the proper functioning of the QMO after the long lasting short-circuit due to the storm which occurred during the DELTATIC=100s test on 27/07/2001 (this technical test is not included in this document version).

The path attenuation is set on 70 dB (TBC) (plus cable losses, so a total of **71.8dB**, see 12.)

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
RSP variable attenuation	= - 70 dB,
Additional fixed attenuation	= - 20 dB (2 attenuators of 10 dB on RSP input and output)

Lander mission table:

TC data words	Signification
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)
	DELTATIC = 5 seconds
0064	NBSOUNDING = 50000
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Lander file: 300701_1.xls Orbiter file: JL301021.D00

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	150	129	127	0

Parameters in Sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
20	DE	18	8

Bench record: FSL_en_tx_ 300701_1.txt, peak 103dBm so 22.2 dBm/FSL
Binary file: FSL_LABO_004.bin (peak at 103 dBm too)

Stop at soundings 2038. (pb EGSE)

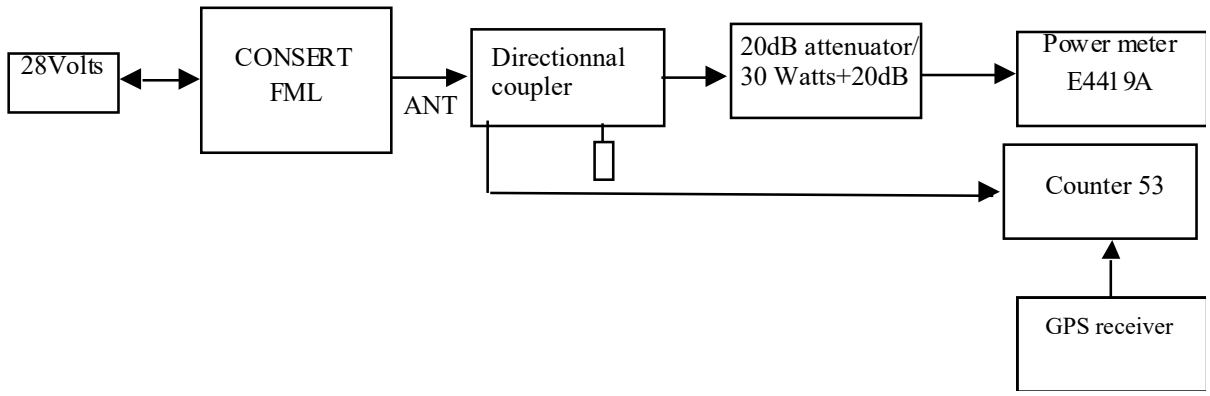
5. Tests at +50°C

5.1. Intentionally left blank

5.2. Intentionally left blank

5.3. SOREP quick characterization

The purpose of the test is to characterize finely the frequency variability of the 90 MHz carrier depending on the DAC control



A 20 dB attenuator is set up between coupler and wattmeter.
In the library EGSE_Lander_Cal, use subroutine EGSE0_Sorep
(select TC table: OCXO quick 20 seconds per level).
Counter PM6665 is replaced by the new accurate counter HP53132A opt 012 .
Measurement is done at each tens of set point value
Before starting the TC automatic sequence, 5 minutes warming is necessary for OCXO, then press the SEND button of TC sequence, so called quick OCXO !!!
In the VT/FSL configuration, 23,40 dBm has to be added to the read power.
File 181001_7.xls

	Telecommand		Antenna output		
DAC set point	TC type	TC para	Frequency (Hz)	Read power	CW FSL power (dBm)
0	5	0	89999212	-0.43	22.97dBm
10	5	0A	241	-0.47	22.93 dBm
20	5	14	279	-0.47	
30	5	1E	332	-0.48	
40	5	28	415	-0.48	
50	5	32	505	-0.49	
60	5	3C	585	-0.49	
70	5	46	656	-0.49	
80	5	50	721	-0.49	
90	5	5A	781	-0.49	

100	5	64	837	-0.49	
110	5	6E	889	-0.49	
120	5	78	939	-0.49	4,8 Hz/pas DACOCXO#133
130	5	82	987	-0.49	
140	5	8C	90000032	-0.49	
150	5	96	076	-0.49	
160	5	A0	117	-0.49	
170	5	AA	157	-0.49	22.91dBm
180	5	B4	195	-0.49	
190	5	BE	231	-0.49	
200	5	C8	265	-0.49	
210	5	D2	298	-0.49	
220	5	DC	329	-0.49	
230	5	E6	358	-0.49	
240	5	F0	385	-0.49	
250	5	FA	411	-0.49	
255	5	FF	90000424	-0.49	
000	5	00	89999212	-0.50	22.90 dBm

By interpolation we deduce that OCXO value 133 is the nearest to 90 MHz at 50°C

Frequency and power curves according to the set point

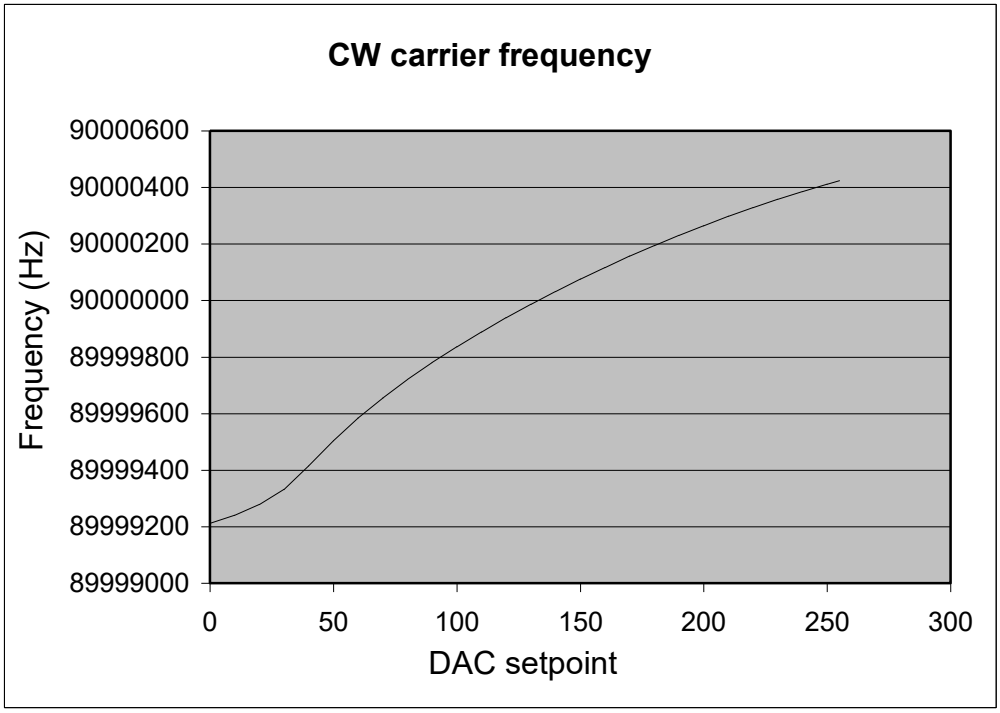


Figure 53a: Carrier frequency variation according to the DAC set point

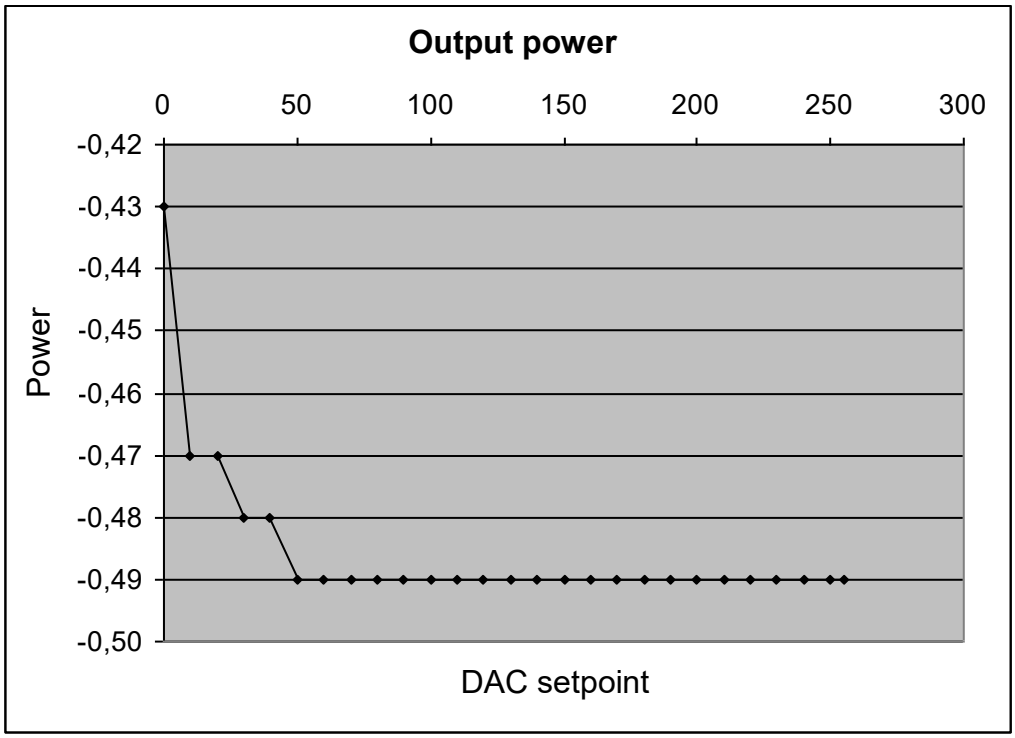


Figure 53b: Output power variation according to the DAC set point

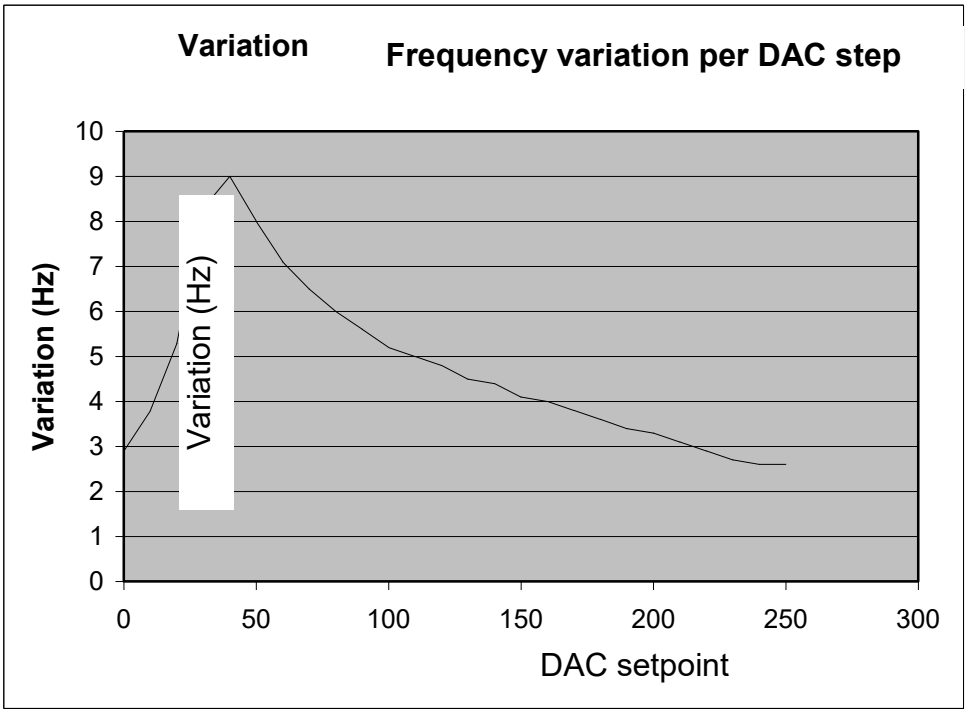


Figure 53c: Frequency delta per DAC set point step

5.4. Emission test in tuning mode

The purpose of the test is to measure the output power with the HP E4419A dual channel power meter and to perform a spectral analysis of the emitted signal with HP spectrum analyzer.
Output power (dBm): 24 dBm (O dBref)
H3- level: -10dB/H1 soit -13 dBref
H3+ level: same power (-13 dBref)
OCXO set with set point #DAC90 = 131D = 0x83

This test corresponds to the calibration test 2.4.

This measurement is regularly done each 10 seconds during tuning duration to measure the output power variation.

23.40 dB has to be added to find the total output power. The 312 delta line is at –3dB.

Time	Read power(dBm)	Output power (dBm)	H3- level	H3+ level
T = 0	-0.84	22.56 dBm	-13dBref	-13dBref
T = 10 s	-0.86	22.54		
T = 20 s	-0.86	22.54		
T = 30 s	-0.87	22.53		
T = 40 s	-0.87	22.53		
T = 50 s	-0.87	22.53		
T = 1 mn	-0.88	22.53		

TM/FSL file: 181001_8.xls

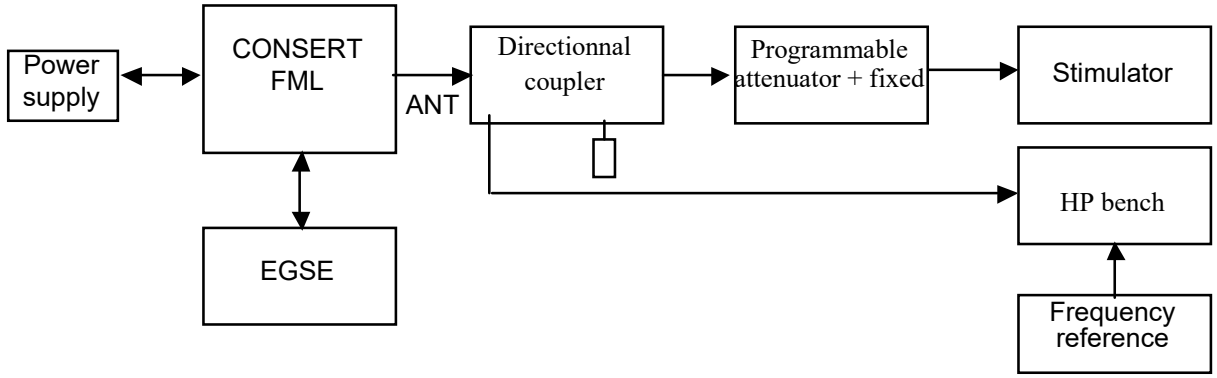
5.5. Calibration tests

Check the bench after power up (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and estimate its performances while varying experiment conditions. The data will be subsequently processed.
50 °C, October 18th 2001.

5.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual stting
Fixed attenuators	10 dB and 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	QMO		
HP bench	Emission quality test	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
Cables			See below
Termination	50 ohms coax N	ok	

Cables configuration and properties (as in 4.3. Calibration tests).

Initial configuration:

Bench Frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10 dB coaxial N on RSP inputs and outputs)
Variable attenuation	= from - 30 dB to -90dB according to "sounding" number (per step of 20dB here)
EGSE	= classical

Mission tables:

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT

TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Outputs:

Bench	= 26 files of 8 Mb, so a total of 200 Mb.
Lander	= 2400 HK + 240 Science
Orbiter	= 2400 Science

Bench program: **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.

1st run

		Attenuation		FSL				Orbiter			Bench	Calibration test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	Bench
Phase	**N° sounding**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Framing**		**OCXO 126**				
Start		**-50**			28 V				GCWT 14	INTQ 0			
Tuning		**-50**		tuning	28 V			tuning	146	130	TBC		2.4
Control	1	**-50**		ping pong	28 V	18	DE	ping pong	16	8	2 acq.R8	1.1 + 1.2	3.3, 3.4

Files Lander: 181001_1.xls
Orbiter: OC181000.D00
HP bench

Total att.	First acquisition	Second acquisition
tuning	FSL_VT_551_0.bin[1]	
50 +D	_1	_2

Test of Lander emission level and quality on the bench through the coupler:
file: test_en_tx_551.txt
integrated peak level 100dBm so 21.8 dBm /FSL
Lander stop after 100 soundings because soundings FSL nb=100 in error in MT

2nd run: same problem: Lander stop after 100 soundings because soundings FSL nb=100 in error in MT
Files Lander: 181001_2.xls
Orbiter: OC181020.D46

A third test is performed with attenuator at - 70dB next sheet.

[1] File name mistake in the initial report (555_0).

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding number**	**Rohde & Schwarz**	**Att. totale**		**Voltage**	**GCW**	**Framing**		**OCXO 128**	**peak pos.**			
Start		**-70**			28 V				GCW3	INTQ0			
Tuning		**-70**		tuning	28 V			tuning	NBLH 152	NBLL 128	TBC		2.4
Control	1	**-70**		ping pong	28 V	9	DD	ping pong	7	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	200	**-30**			28 V	pas	noté		pas	noté	2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	400	**-90**			28 V	1	DE		0	8	2 acq.R8		
Noise	600	**-50**			28 V	0	9A	stop	n.a.	n.a.	on	1.1b	
	800	**not applicable**		termination	28V	0	9A	unplugged	n.a.	n.a.	unplugged	4.3	
Stop	950			stop									

Files Lander: 181001_3.xls
Orbiter: OC181040.D11

HP bench

Total Att.	First acquisition	Second acquisition
70+D dB	FSL_VT_551_3.bin	_4
30+D dB	_5	_6
90+D dB	_7	_8

D=23,87dB

5.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC. In the case this EGSE was not developed at the date of the test, both tests could merge.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10dB coax N on RSP input and output)
Variable attenuation	= - 50 dB
EGSE	With automated TC: Program name: EGSELander_Cal.llb Name of used vi: EGSE1.vi Command table: TCL_IFM.txt

Lander Mission Table (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Orbiter Mission Table: MTO_VT

TC data words	Signification
0100	Mission table indicator & table index
0001	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
8300	INIT FREQ (=131) & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

Bench Program	Full backup	ok	**Acqui_R8_en_TX_derrière_coupleur.vee**

Instrument integrated peak check: File:
Integrated peak measured on the bench:

Attention: Full execution of the program (with backup of the big file) requires 60 seconds +- 5 seconds and the refresh of VXI link, to be triggered manually, takes 15 seconds (see sheet). It is therefore better to foresee 20 soundings per parameter value.

Outputs:

Bench = 26 R8 files of 8 Mb so 216 Megabytes
Lander 181001_4.xls[2]
Orbiter OC181209.D36
Failure, on termination, start again at 12h25

Lander 181001_5.xls
Orbiter OC181225.D53 [3]

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
13	150	128	126	0

Parameters in Sounding @ RS=50dB (total attenuation of the path FSL QMO 73,87 dB)

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

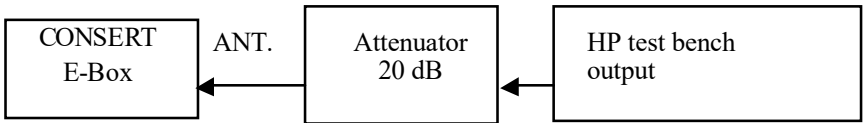
[2] This file is not referenced in the info version 7.3
[3] This file is not referenced in the info version 7.3

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sound nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB						**OCXO**	**INTQ**		
Tuning		-50dB	tuning		131		**GCWT 13**	**126**	**0**	TBC	
							NBL(H/L)	**150**	**128**		
Control	1	-50dB	ping pong		131	18/DE	ping pong	16	8	2 acq.	FSL_VT_552_01 et 02
frequency	100	-50dB		05 01	**1**	17/A9		16	34	1 acq.	03
	120	-50dB			**11**	17/B9		16	31	1 acq.	04
	140	-50dB			**22**	17/B9		16	30	1 acq.	05
	160	-50dB			**33**	18/B9		16	28	1 acq.	06
	180	-50dB			**44**	18/B9		16	26	1 acq.	07
	200	-50dB			**55**	18/B9		16	23	1 acq.	08
	220	-50dB			**66**	17/C9		16	20	1 acq.	09
	240	-50dB			**77**	17/C9		16	18	1 acq.	10
	260	-50dB			**88**	19/B9		17	15	1 acq.	11
	280	-50dB			**99**	16/BB		17	13	1 acq.	12
	300	-50dB			**110**	19/DA		15	12	1 acq.	13
	320	-50dB			**121**	18/CC		16	10	1 acq.	14
	340	-50dB			**132**	17/DD		16	8	1 acq.	15
	360	-50dB			**143**	18/DC		16	7	1 acq.	16
	380	-50dB			**154**	18/CB		16	5	1 acq.	17
	400	-50dB			**165**	18/DA		17	3	1 acq.	18
	420	-50dB			**176**	17/CA		16	2	1 acq.	19
	440	-50dB			**187**	17/BA		17	1	1 acq.	20
	460	-50dB			**198**	15/CA		16	0	1 acq.	21
	480	-50dB			**209**	15/DA		15	253	1 acq.	22
	500	-50dB			**220**	17/CA		15	251	1 acq.	23
	520	-50dB			**231**	16/CA		15	250	1 acq.	24
	540	-50dB			**242**	15/CA		14	249	1 acq.	25
	560	-50dB			**253**	16/B9		14	247	1 acq.	26
reconfig	580				**131**	0/9A	**stop**	N.A.	N.A.	N.A.	N.A.
/termination	670						Read GCW				
noise	700	disconnected	termination							disconnected	

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

Experiment performed twice (21V /OCXO131, then Power supply 28V/OCXO133)

Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.

LANDER FSL starting with the mission table

Mission Table FSL VT

TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 5.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO ; we found DAC=133 should be used, as in 5.7. Here we let the value of 131 for the first run, which is the nominal value of FSL DAC/OCXO at ambient temperature (20°). Which means a carrier shifted of about 10Hz (loss of about 0.9 dB on the lobe of the integration transfer function TBC) Moreover, we realize that the power supply is 21V, therefore there is 2 non nominal parameters, and we decide to start the test again.

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 FSL antenna input in the tank (see 13.4): 23.63dB

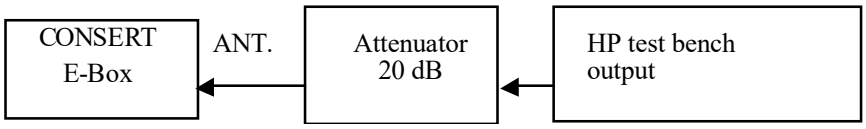
121 level steps, with one minute per step, plus starting, so a whole duration around 2 hours and 15 minutes.

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.

1st Run: file TM FSL: 181001_12.xls, power supply 21V, OCXO 131 until–74dBm
Late MT sending, we start again:
2nd Run: file TM FSL: 181001_13.xls, power supply 28V, OCXO 133 until –74dBm

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

Duration: half an hour
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.

LANDER FSL starting with the mission table

Mission Table FSL VT

TC data words	Signification
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
850A	**INIT FREQ (=133) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 5.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO ; we found DAC=133 has to be used.

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 FSL antenna input in the tank (see 12.4) (see 13.4): 23.63dB

Level at receiver input changes from about -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.

Ramp is begun at sounding 10.

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

TM FSL file: 181001_9.xls
Stop at sounding 307.

5.8. Transition + 50°C → +20°C

It is a long ping-pong experiment (by night) to use temperature transitions and gain signal. The schema of the experiment and the material are the same.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
RSP variable attenuation	= - 50 dB
Fixed attenuation	= - 20 dB (two 10 dB attenuators on RSP input and output)
EGSE	= classical

Mission table:

Mission Table (10 16bits Words)

TC data words	Signification
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)
17D7	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
8364	INIT FREQ (=131) & FIOW RATIO (=100)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Outputs:

Lander	181001_14.xls	= HK + Science
Orbiter	OC181921.D44	= science

DELTATIC at 10 s corresponds to a nominal table (long mission)

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	146	132	126	0

Parameters in Sounding at the beginning at 50°C

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

		Att prg	FSL		Orbiter			Bench	Calibration test	
Phase	Sound. nber	att/RSP	status	GCW	status	GCW	peak pos.	status	pingpong	Bench
Beginning		-50dB						Rx		1.1c
Tuning		-50dB	tuning		tuning			TBC		2.4, 1.6 TBC
Control	1	**-50dB**	ping pong	18/19	ping pong			Some gains	1.2, 1.5	3.3, 2.3, 2.1
In the morning	20°C									FSL_VT_58_1.bin
										FSL_VT_58_2.bin
										Test_en_tx_58.txt
	5000				Orbiter off					

The test in tx gives a peak at 101.4 dBm so 22.7 dBm but we may be detuned because we tuned at 50°C.
Stop of the lander TM on a part of the experiment

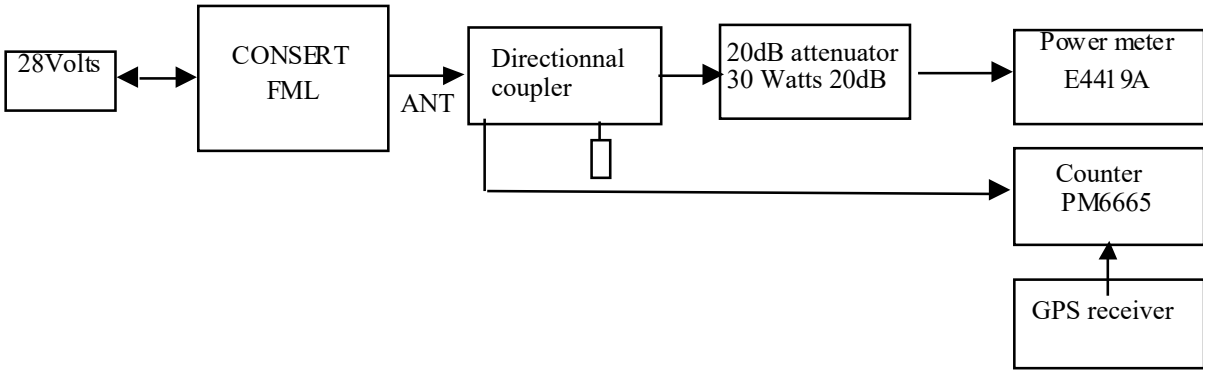
6. Tests at + 20°C

6.1. Intentionally left blank

6.2. Intentionally left blank

6.3. SOREP quick characterization

The purpose of the following test is to finely characterize the evolution of signal 90MHz according to the DAC control.



A 20 dB attenuator has replaced the 10dB attenuator.
In the library CAL_LAND, use program EGSE0_Sorep
(with quick OCXO set point change, 20 seconds per level).
Counter PM6665 is replaced by the new precision meter HP53132A opt 012 .
Measurement is done at each ten of the set point value
23,80 dBm

	Telecommand		Antenna output		
DAC set point	TC type	TC para	[4]	Read power (dBm)	Frequency (Hz)
0	5	0		0.40	999217
10	5	0A		0.38	9247
20	5	14		0.36	284
30	5	1E		0.35	337
40	5	28		0.34	420
50	5	32		0.34	510
60	5	3C		0.33	590
70	5	46		0.33	661
80	5	50		0.32	727
90	5	5A		0.32	786.3
100	5	64		0.32	842.5
110	5	6E		0.32	895
120	5	78		0.31	945
130	5	82		0.31	993
140	5	8C		0.31	0.38
150	5	96		0.31	0.82
160	5	A0		0.31	124

[4] Row delated compared to 7.3 info

170	5	AA		0.30	163
180	5	B4		0.30	201
190	5	BE		0.30	237
200	5	C8		0.30	272
210	5	D2		0.30	304
220	5	DC	335	0.30	335
230	5	E6	364	0.30	364
240	5	F0	392	0.30	392
250	5	FA	418	0.30	418
255	5	FF	90000431	0.30	431
00	5	00	89999217	0.31	999217

23,70 dBm

FILE 191001_7.XLS

Frequency and Power curves depending on the set point.

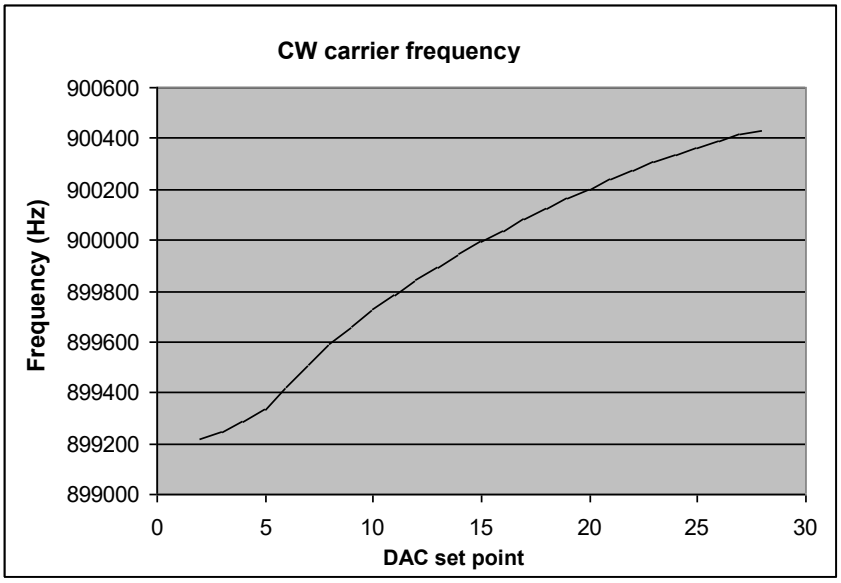


Figure 6.3a: Carrier frequency variation depending on DAC set point

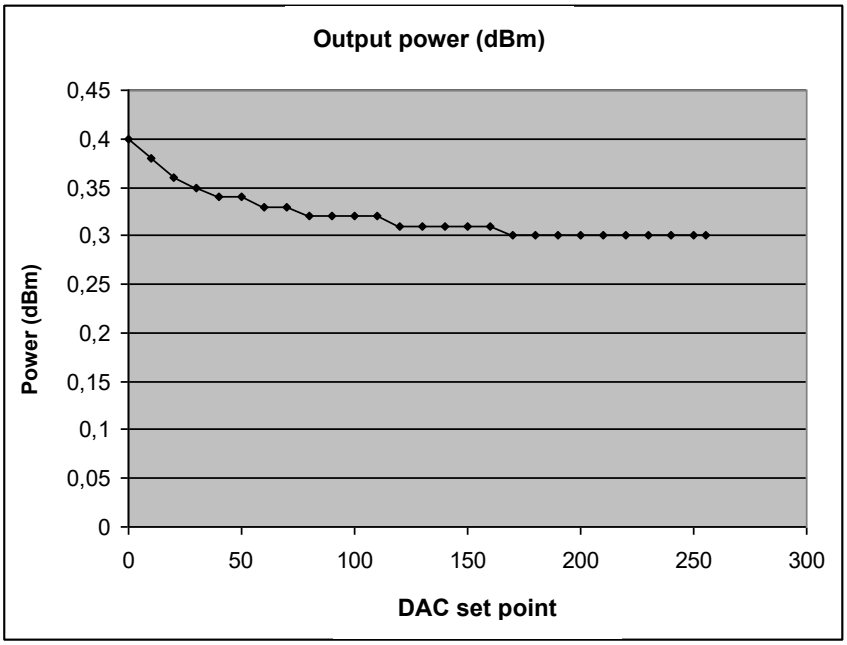


Figure 6.3b: Output power variation according to DAC set point

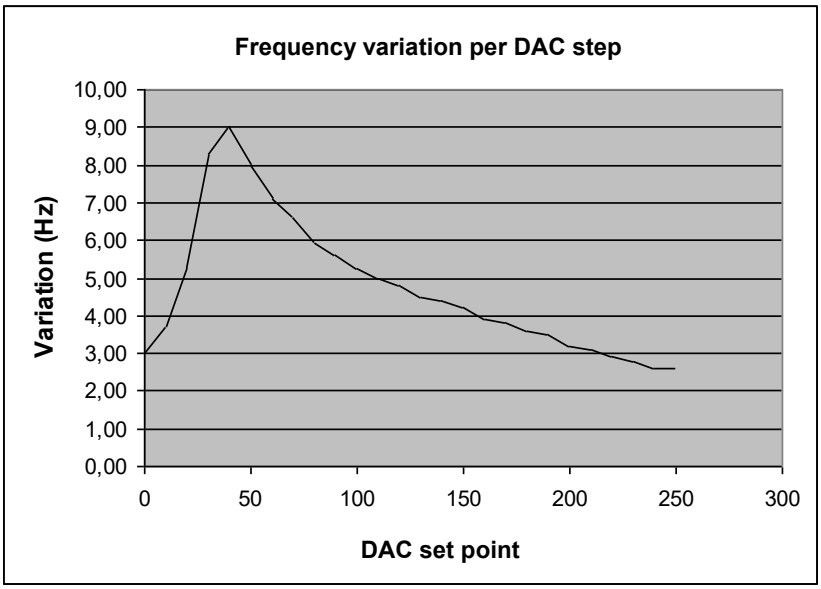


Figure 6.3c: Frequency delta per step of the DAC set point

6.4. Emission test in tuning mode

The purpose of this test is to measure the transmitted power with the HP E4419A power meter and to perform a spectral analysis of the emitted signal with the HP spectrum analyser.
Output power (dBm): 24 dBm (O dBref)
H3 - level: -10dB/H1 so -13 dBref
H3 + level: same power (-13 dBref)
OCXO set with set point #DAC90 = 131D = 0x83

This test corresponds to the calibration test 2.4.

FILE 191001_8.XLS

This measurement is done regularly each 10 seconds during the tuning phase duration to measure the transmitted power variation.

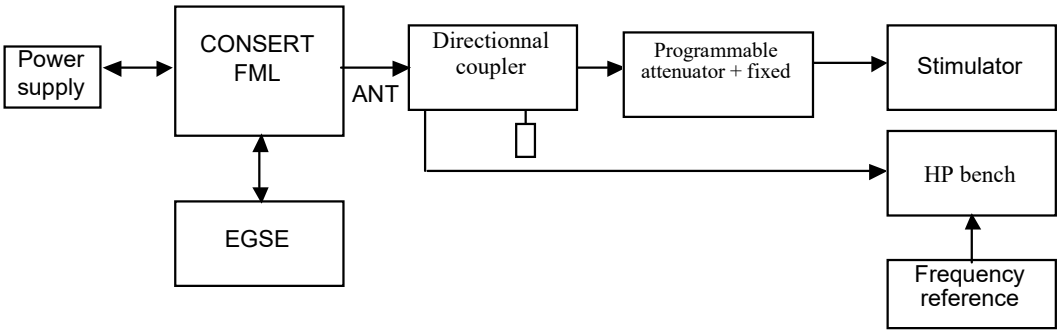
Time	Read power (dBm)	Output power (dBm)	H3- level	H3+ level
T = 0	0.00	23.40	-13 dBREF	-13dBREF
T = 10 s	-0.02			
T = 20 s	-0.03			
T = 30 s	-0.04			
T = 40 s	-0.05			
T = 50 s	-0.05			
T = 1 mn	-0.05	23.35		

6.5. Calibration tests

Check the bench after starting (Auto-Test).
The purpose of these tests is to get reference signals to be able to calibrate the instrument and evaluate its performances while varying the experiment conditions. Data will be processed subsequently.

6.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	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	QMO		
HP bench	Emission quality test	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Full backup	ok	Acqui_R8_en_TX_derrière_coupleur
Bench program	Tuning	n.av.	1 ms/s (60 x) **prg not available**
Frequency reference	Frequency meter +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	

Configuration and cable properties (as in 4.3. Calibration tests).
Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (2x 10 dB coaxial N on RSP input and output)
Variable attenuation = de - 30 dB à -90dB depending on sounding number (per step of 20dB)
EGSE = classical

Mission tables:

Mission Table Lander (10 16bits Words)	
TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT	
TC data words	Signification
0100	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 300[5] 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))

Outputs:

Bench	= 26 files de 8 Mbyte, so a total of 200 Mbyte.
Lander	191001_2.xls
Orbiter	OC191026.D37

False start:

Lander	191001_3.xls
Orbiter	OC191029.D26

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	148	128	127	0

Parameters in Sounding at the beginning (RS=50 dB)

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

[5] Valeur donnée par la version papier, 300 ou 323 ?

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding nber [6]**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Framing**		**GCW OCXO**	**peak pos.**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning			1 acq		651_0
Control	1	**-50**		ping pong	28 V	18	DE	ping pong	16	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	200	**-30**			28 V	29	DE		27	8	2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	409	**-70**			28 V	8	DE		6	8	2 acq.R8		
	603	**-90**			28 V	0	DE		0	8	2 acq.R8		
Noise	810	**-50**			28 V	0	9A	stop			start	1.1b	
	1000	**NA**		termination				disconnected			disconnected	4.3	
End	1209			stop									

Files Lander: False start 191001_2.xls Ok: 191001_3.xls
Orbiter: False start OC191026.D37 Ok: OC191029.D26
HP bench D=23,87dB

Total Att.	First acquisition	Second acquisition
Tuning	FSL_VT_651_00.bin	
50+D	FSL_VT_651_01.bin	FSL_VT_651_02.bin
30+D dB	FSL_VT_651_03.bin	FSL_VT_651_04.bin
70+D dB	FSL_VT_651_05.bin	FSL_VT_651_06.bin
90+D dB	FSL_VT_651_07.bin	FSL_VT_651_08.bin

Lander emission level and quality check on HP bench through the coupler:
file: TEST_en_TX_651.txt
integrated peak level 101.7dBm, so 23dBm output FSL

[6] Difference between paper and numerical version about sounding numbers

6.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC. In the case this EGSE was not developed at the date of the test, both tests could merge.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice coax N 10dB on RSP input and output)
Variable attenuation	= - 50 dB
EGSE	with automatized TC: Program name: EGSELander_Cal.llb Used vi name: EGSE1.vi Command table: TCL_IFM.txt

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter: MTO_VT

TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Bench program	Full backup		**Acqui_R8_en_TX_derrière_coupleur.vee**

Bench program	Integrated peak checking		**Test_en_tx_derrière_coupleur**

Emitted integrated peak checking
File:
Integrated peak measured on the bench:

Attention: the program full execution (with backup of the big file) needs 60 seconds +- 5 seconds, and the refresh of the VXI link, which has to be manually started, needs 15 seconds (see sheet). It is therefore better to foresee 20 soundings per parameter value.

Outputs:

Bench	= 26 R8 files of 8 Mbyte so 216 Mbyte
Lander	= 1070 HK + 107 "Science"
Orbiter	= 580 "Science"

Lander file: 191001_5.xls
Orbiter file: OC191343.D34

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	148	128	127	0

Parameters in Sounding at the beginning

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

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sound. nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB						**OCXO**	**INTQ**		
Tuning		-50dB	tuning		131		**GCWT 14**	**127**	**0**	TBC	
							NBL(H/L)	**148**	**128**		
Control	1	-50dB	ping pong		131	19/DE	ping pong	17	8	2 acq.	652_01 et 652_02
freque.	100	-50dB		05 01	**1**	17/B9		17	34	1 acq.	03
	120	-50dB			**11**	17/B9		17	36	1 acq.	04*
	140	-50dB			**22**	18/AA		17	29	1 acq.	05
	160	-50dB			**33**	17/BA		16	28	1 acq.	06
	180	-50dB			**44**	17/BA		16	26	1 acq.	07
	200	-50dB			**55**	19/BA		15	23	1 acq.	08
	220	-50dB			**66**	18/CA		14	19	1 acq.	09
	240	-50dB			**77**	19/CA		17	17	1 acq.	10
	260	-50dB			**88**	19/CA		16	16	1 acq.	11
	280	-50dB			**99**	16/BB		18	13	1 acq.	12
	300	-50dB			**110**	19/BB		17	12	1 acq.	13
	320	-50dB			**121**	19/CC		17	10	1 acq.	14
	340	-50dB			**132**	19/DE		17	8	1 acq.	15
	360	-50dB			**143**	19/DC		16	6	1 acq.	16
	380	-50dB			**154**	19/CB		16	4	1 acq.	17
	400	-50dB			**165**	15 /CB		17	3	1 acq.	18
	420	-50dB			**176**	17/CA		17	1	1 acq.	19
	440	-50dB			**176**					1 acq.	20 *
	460	-50dB			**176**						
	480	-50dB			**176**						
	500	-50dB			**OFF**						

*STOP FOLLOWING A LONG CRASH OF TM AND TC. AUTOMATIC TC CRASH. A SECOND RUN IS STARTED WITH MANUAL TC FOR THE VALUES REMAINING TO BE TESTED

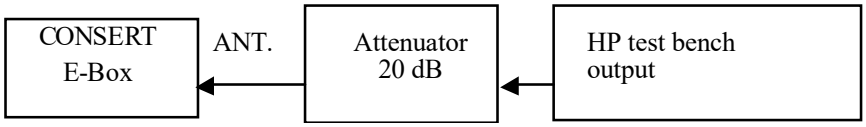
2ND RUN FOLLOWING THE CRASH OF TM AND TC LANDER

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sound. nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB						**OCXO**	**INTQ**		
Tuning		-50dB	tuning		131		**GCWT 14**	**127**	**0**	TBC	
							NBL(H/L)	**148**	**128**		
											21 EN TUNING
Control	1	-50dB	ping pong		131	19/DE	ping pong	17	8	1 acq.	652_ 22
freque.	50	-50dB		05 0B	**11**	19/A9		15	36	1 acq.	23
	63	-50dB		05 B0	**176**			14	3	1 acq.	24
	78	-50dB		05 BB	**187**	19/CA		13	0	1 acq.	25
	92	-50dB		05 C6	**198**	17/BA		17	254	1 acq.	26
	102	-50dB		05 D1	**209**	17/BA		16	252	1 acq.	27
	115	-50dB		05 DC	**220**	19/BA		18	251	1 acq.	28
	126	-50dB		05 E7	**231**	18/CA		15	250	1 acq.	29
	139	-50dB		05 F2	**242**	19/BA		17	249	1 acq.	30
	151	-50dB		05 FD	**253**	19/BA		16	247	1 acq.	31
	165	-50dB		0583	**131**	20/DD		17	8	1 acq.	32
	174	-50dB			**131**	0/AA	OFF				
	203		TERMINATION								
	227		STOP								

FILES
191001_6.XLS
OC191435.D17

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

Duration: 2 hours and a half
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL in receiving face to the bench and through 20dB attenuator.



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 FSL 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.

Lander starting with the standard VT mission table

Mission Table FSL VT

TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

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**

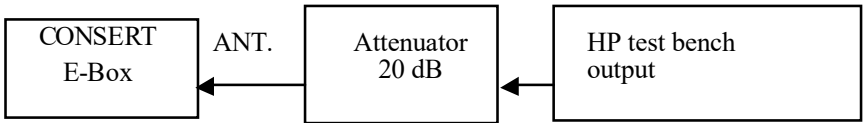
ESGD generator losses / Bench at FSL antenna input in the tank (see 13.4): 23.63dB

121 level steps, with one minute per step, plus starting, so a whole duration about 2 hours and 15 minutes.
Starting of the ramp au sounding 14.
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.

file TM FSL: 191001_9.XLS starting around 3h45pm

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

Duration: half an hour
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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

Mission Table FSL VT

TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

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 FSL antenna input in the tank (see 13.4): -23.63dB[7]

Level at receiver input changes from around -88.6 dBm à -48.6 dBm.
GCW remains at 0 for a few steps then grows in average 1 for 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.

file TM FSL: 191001_4.xls stop at sounding 800[8]

6.8. Transition + 20°C → 0°C

FSL TESTS ARE STOPPED AT 20°C, THIS TRANSITION DOES NOT OCCUR (see 10)

[7] Left out in the paper version
[8] Left out in the paper version

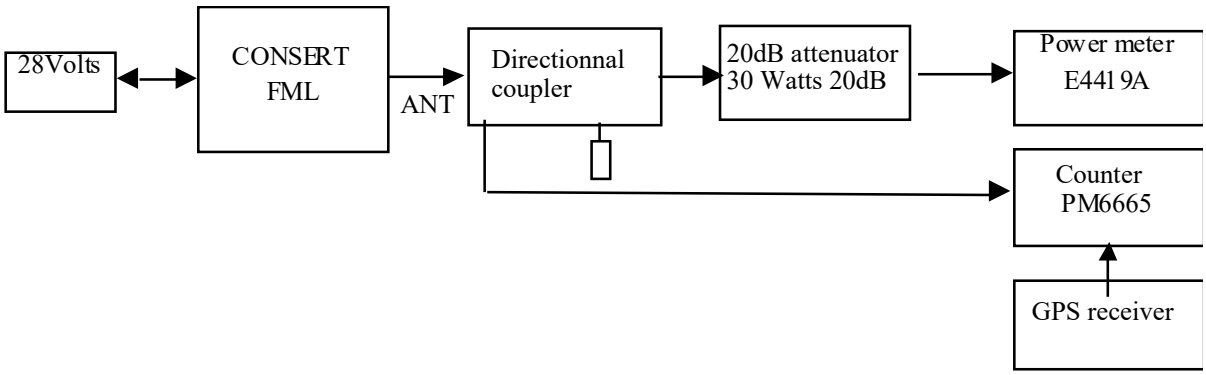
7. Tests at 0°C

7.1. Intentionally left blank

7.2. Intentionally left blank

7.3. SOREP quick characterization

The purpose of the following test is to characterize finely the evolution of the 90MHz signal depending on the DAC control.



A 20 dB attenuator has been set up between the coupler and the wattmeter. The link budget is 23.40 dB.
Use the subroutine EGSE0_Sorep (OCXO quick 20 seconds per level) of the EGSElander_cal library.
Counter PM6665 is replaced by the new precision meter HP53132A opt 012 .
Measurement is done at each tens value of the set point. We wait 5 minutes before sending the file.
File 171001_4.xls

	Telecommand		Antenna output		
DAC set point	TC type	TC para	Frequency (Hz)	Read power dBm	CW FSL power (dBm)
0	5	0	89999222	0.81	24,22
10	5	0A	251	0.76	24.16[9]
20	5	14	289	0.74	24.14
30	5	1E	342	0.73	24.13
40	5	28	424	0.72	24.12
50	5	32	514	0.72	24.12
60	5	3C	594	0.71	24.11
70	5	46	665	0.71	24.11
80	5	50	731	0.70	24.10

[9] These values are left out in the paper version

90	5	5A	790	0.70	24.10
100	5	64	847	0.70	24.10
110	5	6E	900	0.69	24.09
120	5	78	950	0.69	24.09
130	5	82	998	0.69	24.09
140	5	8C	90000043	0,68	24.08
150	5	96	90000086	0.68	24.08
160	5	A0	128	0.68	24.08
170	5	AA	168	0.68	24.08
180	5	B4	206	0.67	24.07
190	5	BE	242	0.67	24.07
200	5	C8	276	0.67	24.07
210	5	D2	309	0.67	24.07
220	5	DC	340	0.67	24.07
230	5	E6	369	0.67	24.07
240	5	F0	397	0.66	24.06
250	5	FA	423	0.66	24.06
255	5	FF	435	0.66	24.06
0	0	00	221	0.69	24.09

There is a 10 sec. power interruption between measure 255 and 0: i.e. temperature has changed.

Frequency and power curves depending on the set point.

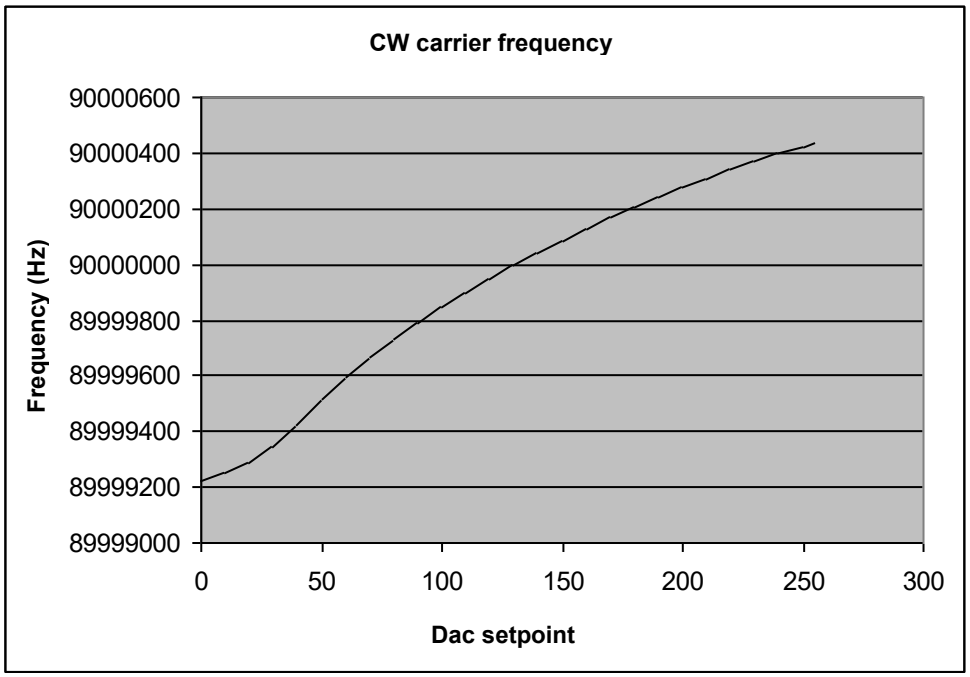


Figure 73a: Carrier frequency variation depending on the DAC set point

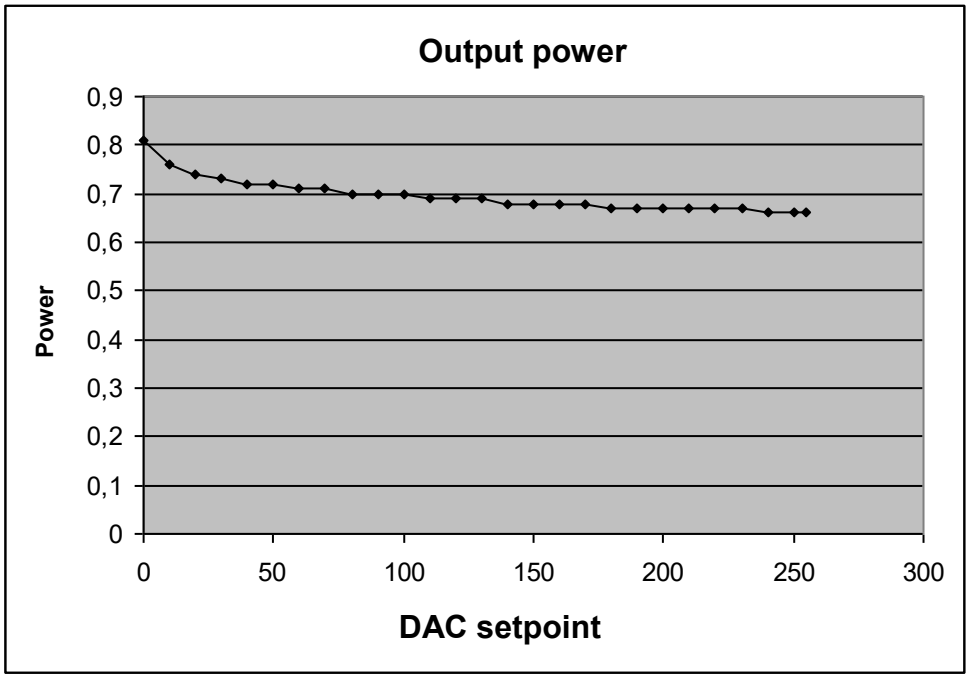


Figure 73b: Emitted power variation depending on the DAC set point

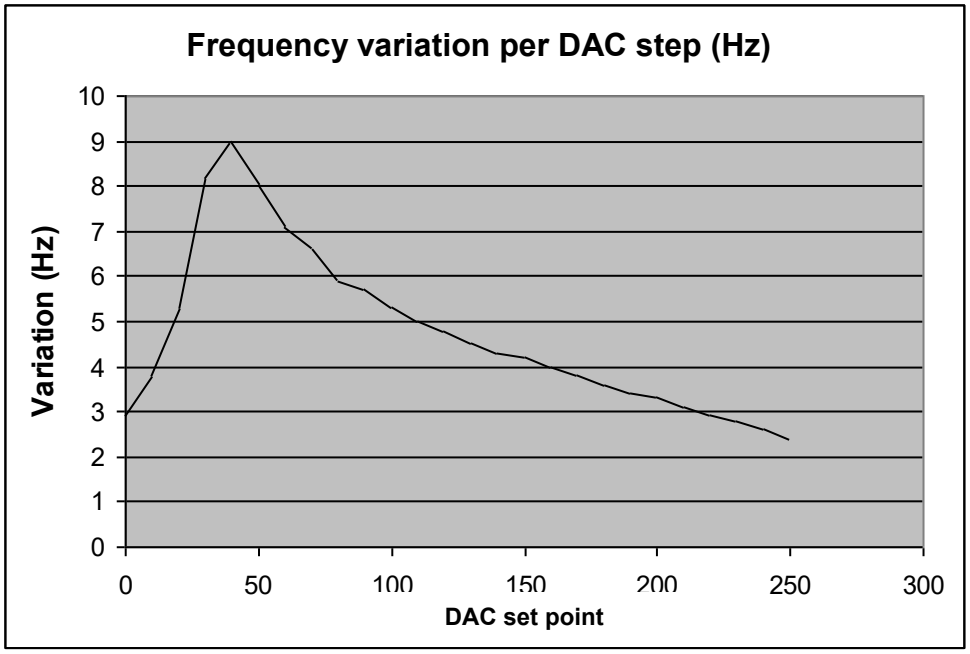


Figure 73c: Frequency delta per DAC set point step

7.4. Emission test in tuning mode

The purpose of this test is to measure the output power with the HP E4419A power meter and to perform a spectral analysis of the emitted signal with the HP spectrum analyser.
Output power (dBm): 24 dBm (O dBref)
H3 - level: -10dB/H1 so -13 dBref
H3 + level: same power (-13 dBref)
OCXO set with set point #DAC90 = 131D = 0x83

This test corresponds to the calibration test 2.4.

FILE 191001_8.XLS

This measurement is done regularly each 10 seconds during the tuning phase duration to measure the output power variation. The link budget is the same 23.4dB

File 171001_5.xls

Time	Read power (dBm)[10]	Emitted power (dBm)	H3- level	H3+ level
T = 0	23.82	24.01	-13dBref	-13dBref
T = 10 s	23.76		-13dBref	-13dBref
T = 20 s	23.75		-13dBref	-13dBref
T = 30 s	23.74		-13dBref	-13dBref
T = 40 s	23.74		-13dBref	-13dBref
T = 50 s	23.73		-13dBref	-13dBref
T = 1 mn	23.73		-13dBref	-13dBref

[10] These values do not match those of the paper version

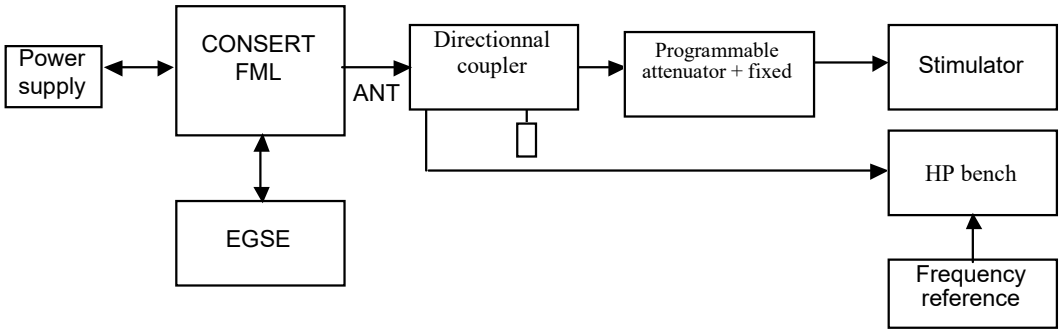
7.5. Calibration tests

Check the bench after starting (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and evaluate its performances while varying the experiment conditions. Data will be processed subsequently.

7.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual tuning
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	QMO		
HP bench	Emission quality test	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
Cables			See below
Termination	50 ohms coax N	ok	

Cable configuration and properties:
Coupler output direct on attenuator,
KX4 2m cable between attenuator and QMO,
KX4 2m cable between coupler and bench (see 4.3. Calibration tests).

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10 dB coaxial N on RSP input and output)
Variable attenuation	= from - 30 dB to -90dB according to « sounding » number (per 20dB step here)
EGSE	= classical

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT

TC data words	Signification
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))

Outputs:

Bench	= 26 8 Mbyte files, so a total of 200 Mbyte.
Lander	= 2400 HK + 240 Science
Orbiter	= 2400 Science

Bench program: **Acqui_R8_en_TX_derrière_coupleur.vee** (see sheet, section 11)

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding nber**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Framing**		**GCW OCXO**	**pos. peak**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning	128	IntQ1	TBC		2.4
Control	1	**-50**		ping pong	28 V	19-20	DD	ping pong	16-17	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	200	**-30**			28 V	29	DD-DE		26-28	8	2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	400	**-70**			28 V	9-10	DD-DE		6-8	8	2 acq.R8		
	615	**-90**			28 V	0-2	DE		0	8	2 acq.R8		
Noise	834	**-50**			28 V			stop			start	1.1b	
	1008	**NA**		termination				disconnected			disconnected	4.3	
End	1200			stop									

File Lander: 171001_1.xls
Orbiter: OC171053.d26

HP bench

Total Att.	First acquisition	Second acquisition
50+D dB	FSL_VT_751_1	FSL_VT_751_2
30+D dB	FSL_VT_751_3	FSL_VT_751_4
70+D dB	FSL_VT_751_5	FSL_VT_751_6
90+D dB	FSL_VT_751_7	FSL_VT_751_8

D=23.63 dB

Lander emission level and quality check on HP bench through the coupler:
file: Test_en_tx_751.txt
integrated peak level: 101.8dBm on the bench so 23.1 dBm on FSL

7.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC. In the case this EGSE was not developed at the date of the test both tests could merge.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10dB coax N on RSP input and output)
Variable attenuation	= - 50 dB
EGSE	with automatised TC:
	Program name: EGSELander_Cal.llb
	Used vi name: EGSE1.vi
	Command table: TCL_IFM.txt
	from repertory EGSE/EGSE_cal_FML

Mission tables:

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter: MTO_VT

TC data words	Signification
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))

Bench program	Full backup	ok	**Acqui_R8_en_TX_derrière_coupleur.vee**

Emitted integrated peak checking: File:
Integrated peak measured on the bench:

Attention: the program full execution (with backup of the big file) needs 60 seconds +- 5 seconds, and the refresh of the VXI link, which has to be manually started, needs 15 seconds (see sheet). It is therefore better to foresee 20 soundings per parameter value.
Outputs:

Bench	= 26 R8 files of 8 Mbyte so 216 Mbyte
Lander 171001_7.xls	order of magnitude= 1070 HK + 107 "Science"
Orbiter OC171656.D25	= 580 "Science"

Lander file:
Orbiter file:

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	149	132	128	1

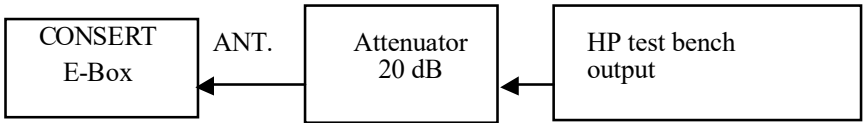
Parameters in Sounding at the beginning

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

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sounding nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB						**OCXO**	**INTQ**		
Tuning		-50dB	tuning		131		**GCWT 14**	**128**	**1**	TBC	
							NBL(H/L)	**149**	**132**		
								GCW	Position		
Control	1	-50dB	ping pong		131	19/DE	ping pong	17	8	1 acq.	FSL-VT-752_01
freque.	100	-50dB		05 01	**1**	18/BA		17	34	1 acq.	FSL-VT-752_02
	120	-50dB			**11**	18/AA		17	33	1 acq.	FSL-VT-752_03
	140	-50dB			**22**	18/AA		17	32	1 acq.	FSL-VT-752_04
	160	-50dB			**33**	**18/AA**		16	30	1 acq.	FSL-VT-752_05
	180	-50dB			**44**	**18/BA**		15	26	1 acq.	FSL-VT-752_06
	200	-50dB			**55**	18/BA		16	23	1 acq.	FSL-VT-752_07
	220	-50dB			**66**	19/BA		14	20	1 acq.	FSL-VT-752_08
	240	-50dB			**77**	**19/BA**		17	17	1 acq.	FSL-VT-752_09
	260	-50dB			**88**	**16/DA**		16	16	1 acq.	FSL-VT-752_10
	280	-50dB			**99**	18/BB		16	13	1 acq.	FSL-VT-752_11
	300	-50dB			**110**	**19/BB**		17	11	1 acq.	FSL-VT-752_12
	320	-50dB			**121**	**20/CB**		17	9	1 acq.	FSL-VT-752_13
	340	-50dB			**132**	**17/DC**		17	8	1 acq.	FSL-VT-752_14
	360	-50dB			**143**	**20/DB**		16	6	1 acq.	FSL-VT-752_15
	380	-50dB			**154**	15/DC		17	5	1 acq.	FSL-VT-752_16 bad TM
	400	-50dB			**165**	14/CC		18	3	1 acq.	FSL-VT-752_17
	420	-50dB			**176**	**19/BA**		16	3	1 acq.	FSL-VT-752_18
	440	-50dB			**187**	**19/BA**		16	2	1 acq.	FSL-VT-752_19
	460	-50dB			**198**	19/BA		15	1	1 acq.	FSL-VT-752_20
	480	-50dB			**209**	**20/BA**		17	253	1 acq.	FSL-VT-752_21
	500	-50dB			**220**	**17/CA**		17	252	1 acq.	FSL-VT-752_22
	520	-50dB			**231**	**18/CA**		16	251	1 acq.	FSL-VT-752_23
	540	-50dB			**242**	**20/BA**		16	249	1 acq.	FSL-VT-752_24
	560	-50dB			**253**	18/BA		17	248	1 acq.	FSL-VT-752_25
reconfig	580				**131**		**stop**				
/termination	690						GCW lu				
noise	725	disconnected	termination							disconnected	

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

Duration:
Operation: Automatic test after FSL TC setting and bench starting
Configuration de Montage: FSL 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 FSL 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.

FSL lander starting with the table

Mission Table FSL VT

TC data words	Signification
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
820A	**INIT FREQ (=130) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 7.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO, the set point is evaluated at 130

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 FSL antenna input in the tank (voir 13.4): 23.63dB

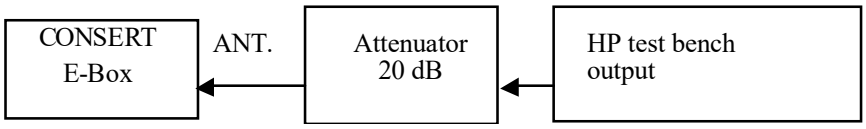
121 level steps, with one minute per step, plus starting, so a whole duration around 2 hours and 15 minutes.

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.

file TM FSL: 171001_2.xls

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

Duration: half an hour
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.
Lander FSL starting with the VT mission table

Mission Table FSL VT

TC data words	Signification
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
820A	**INIT FREQ (=130) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE: In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 7.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO: here we use 130.

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 FSL antenna input in the tank (see 12.4) (see 13.4): 23.63dB
Level at receiver input changes from about -88.6 dBm à -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 FSL file[11]: 171001_3.xls

[11] Left out from the paper version

7.8. Transition 0°C → -20°C

It is a long ping-pong experiment (by night) to use temperature transitions and gain signal. The schema of the experiment and the material are the same.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
RSP variable attenuation	= - 50 dB
Fixed attenuation	= - 20 dB (two 10 dB attenuators on RSP input and output)
EGSE	= classical

Mission table:

Mission Table (10 16bits Words)

TC data words	Signification
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)
17D7	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
8364	INIT FREQ (=131) & FIOW RATIO (=100)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Outputs:

Lander	= HK + Science
Orbiter	= science

DELTATIC at 10 s corresponds to a nominal table (long mission)

		Att prg	FSL		Orbiter			Bench	Calib test	
Phase	Sound. nber	att/RSP	status	GCW	status	GCW	pos. peak	status	ping pong	bench
Beginning		-50dB						Rx		1.1c
Tuning		-50dB	tuning		tuning			TBC		2.4, 1.6 TBC
Control	1	**-50dB**	ping pong	18/19	ping pong			some acq.	1.2, 1.5d	3.3, 2.3, 2.1

Lander FSL file 171001_9.xls
Orbiter QMO file OC171817.D23

ORB

GCWT	14
OCXO Setting	128
INTQ	1
NBLH/L	149/128

SOUNDING

LDR	GCW/FRAM	20/DD
ORB	GCW/POSIT	18/8

OK 18h33 sounding 50

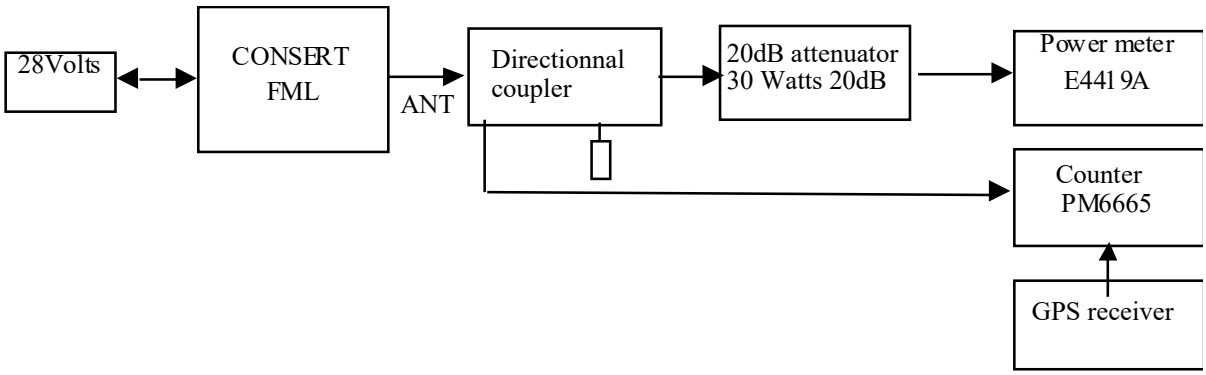
8. Tests at -40°C

8.1. Intentionally left blank

8.2. Intentionally left blank

8.3. SOREP quick characterization

The purpose of the following test is to finely characterize the evolution of signal 90MHz according to the DAC control.



A 20 dB attenuator has been set up between the coupler and the wattmeter.
Use subroutine EGSE0_Sorep (OCXO quick 20 seconds per level), after 5mn warming up.
Counter PM6665 is replaced by the new accurate counter HP53132A opt 012.
Measurement is done at each tens of set point value
File 151001_1.xls

	Telecommand		Antenna output		
DAC Set point	TC type	TC para	Frequency (Hz)	Read power	Power CW FSL(dBm)
0	5	0	89999229	1,59	← 2nd run 1,43
10	5	0A	259	1,52	
20	5	14	296	1,49	
30	5	1E	349	1,47	
40	5	28	431	1,46	
50	5	32	521	1,45	
60	5	3C	602	1,44	
70	5	46	673	1,43	
80	5	50	739	1,43	
90	5	5A	799	1,42	
100	5	64	855	1,42	
110	5	6E	908	1,42	
120	5	78	958	1,41	
130	5	82	006	1,41	
140	5	8C	90000052	1,41	
150	5	96	95	1,40	

160	5	A0	137	1,40	
170	5	AA	177	1,40	
180	5	B4	215	1,40	
190	5	BE	251	1,40	
200	5	C8	285	1,39	
210	5	D2	318	1,39	
220	5	DC	349	1,39	
230	5	E6	379	1,39	
240	5	F0	406	1,39	
250	5	FA	432	1,39	
255	5	FF	90000445	1,39	

Power changes at 2nd run for DAC=0 it is 1,43

Frequency and power curves according to the set point

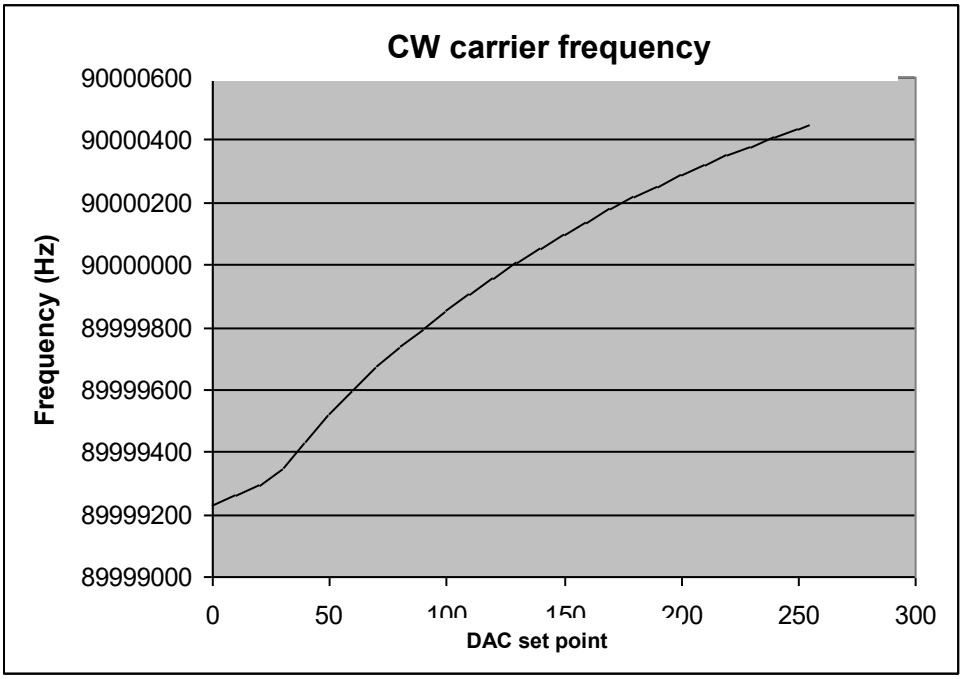


Figure 8.3a: Carrier frequency variation according to the DAC set point

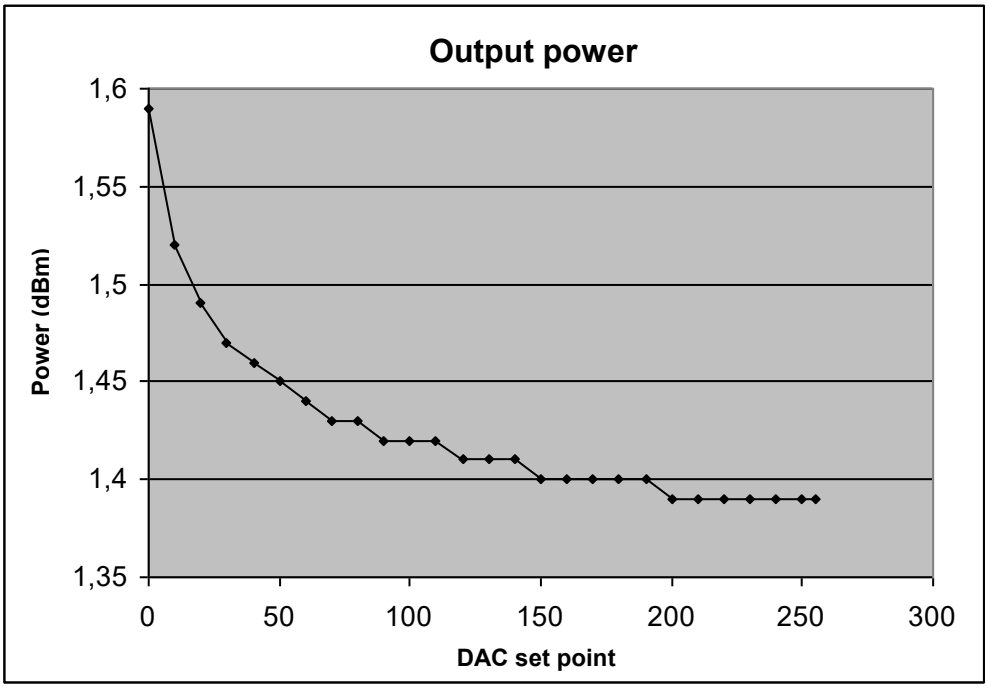


Figure 8.3b: Output power variation according to the DAC set point

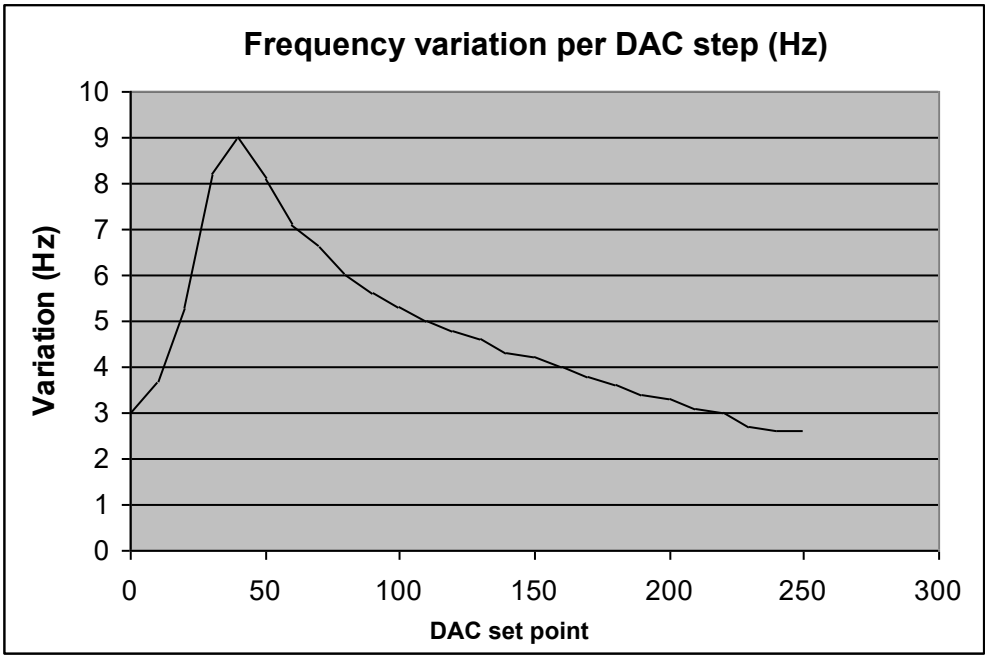


Figure 8.3c: Frequency delta per DAC set point step

8.4. Emission test in tuning mode

The purpose of the test is to measure the output power with the HP E4419A dual channel power meter and to perform a spectral analysis of the emitted signal with HP spectrum analyser.
Output power (dBm): 24 dBm (O dBref)
H3- level: -10dB/H1 soit -13 dBref
H3+ level: same power (-13 dBref)
OCXO set with setpoint #DAC90 = 131D = 0x83

This test corresponds to the calibration test 2.4.

This measurement is regularly done each 10 seconds during tuning duration to measure the output power variation.

Same configuration as 8.3 with an attenuator –20dB. It seems the power is weaker than the FML!! TBC

Time	Read power(dBm)	Emitted power (dBm)	H3- level	H3+ level
T = 0	1,23		-13dBRef	-13 dBref
T = 10 s	1,16		-13dBref	-13dBref
T = 20 s	1,13		-13dBref	-13dBref
T = 30 s	1,12		-13dBref	-13dBref
T = 40 s	1,11		-13dBref	-13dBref
T = 50 s	1,10		-13dBref	-13dBref
T = 1 mn	1,10		-13dBref	-13dBref

File 151001_2.xls ??? (AH 07/03)

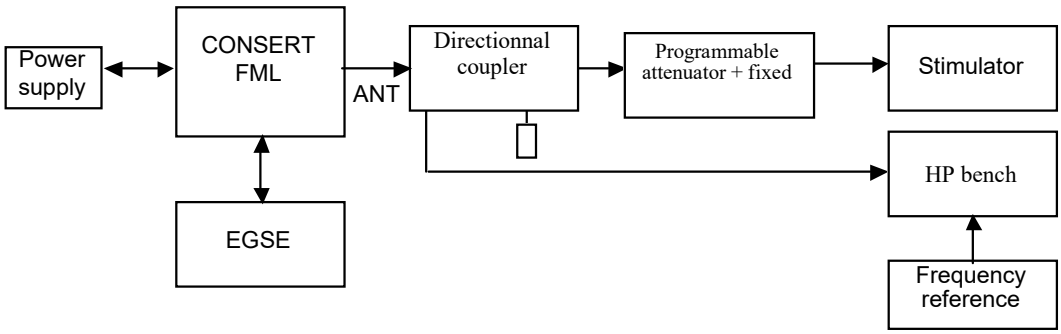
8.5. Calibration tests

Check the bench after power up (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and estimate its performances while varying experiment conditions. The data will be subsequently processed.

8.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.
Duration 2h30.



Necessary material:

Material	**Type**	**Status**	
Adjustable power supply	21/ 31 V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual tuning
Fixed attenuators	10 dB et 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	QMO		
HP bench	Emission quality test	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
Cables			See below
Termination	50 ohms coax N	ok	

Cables configuration and properties (as 4.3. Calibration tests).

Initial configuration:

Bench Frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (twice 10 dB coaxial N on RSP input and output)
Variable attenuation = from - 30 dB to -90dB according to "sounding" N° (per step of 20dB here)
EGSE = classical

Mission tables:

Mission Table Lander (10 16bits Words)	
TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT	
TC data words	Signification
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)[12] & MODE BYTE (= 0)
001F	MIN ATT (= 0) & MAX ATT (= 31)
9585	NBL Level (= 149) & NBL zero (= 133))

Outputs

Bench = 26 files of 8 Mb, so a total of 200 Mb.
Lander = 2400 HK + 240 Science
Orbiter = 2400 Science

Bench program: **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.

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	150	128	130 (à vérifier)	1

Parameters in Sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
19	DE	16	7 à 8

[12] Difference with the paper version

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**N° sounding**	**Rohde & Schwarz**	**Att. totale**		**Voltage**	**GCW**	**Framing**		**GCW OCXO 128**	**peak pos.**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning	128		TBC		2.4
Control	1	**-50**		ping pong	28 V	19	DE	ping pong	16	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	218	**-30**			28 V	29-30	DE		27-28	8	2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	400	**-70**			28 V	9	DE		8	8	2 acq.R8		
	633	**-90**			28 V	1-2	DE		1	8	2 acq.R8		
Noise	830	**-50**			28 V			stop			start	1.1b	
	950	**NA**		termination				disconnected			disconnected	4.3	
End	1100			stop									

Files Lander:.1st Run: 151001_4.xls 2nd Run: 151001_5.xls
Orbiter:.1st Run OC151708.d20 2nd Run: OC151732.d35
HP bench

Total Att.	First acquisition	Second acquisition
50 + D 1er Run	1st run FSL_VT_851_1.bin	1st run FSL_VT_851_2.bin
50 + D	2nd run FSL_VT_851_3.bin	2nd run FSL_VT_851_4.bin
30 +D dB	2nd run FSL_VT_851_5.bin	2nd run FSL_VT_851_6.bin
70 +D dB	2nd run FSL_VT_851_7.bin	2nd run FSL_VT_851_8.bin
90+D	2nd run FSL_VT_851_9.bin	2nd run FSL_VT_851_10.bin

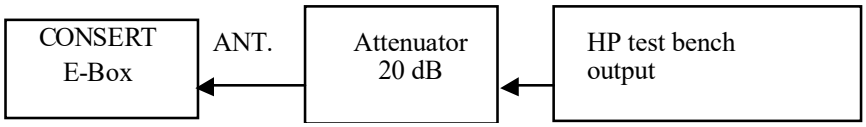
Direct checking of Lander emission level and quality on the bench through the coupler: TEST en TX COUPLEUR
file: test_en_tx_851
integrated peak level 101.7dBm
Rohde&Schwarz has been set on –50dB at 848 after –90 dB.

8.5.2. Ping-pong with variable experiment command

TEST NOT DONE at –40°C (lack of time on first day, October 15th, 2001)

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

Duration:
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.

Start Orbiter with the standard VT mission table

Mission Table: FSL_VT

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE: In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 7.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO

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 FSL antenna input in the tank (see 13.4): 23.63dB

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.

file TM FSL: 151001_3 H4 starts up sounding 11

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

TEST NOT DONE AT –40°C

8.8. Transition -40C → -20°C

It is a long ping-pong experiment (by night) to use temperature transitions and gain signal. The schema of the experiment and the material are the same (night of 15 to 16 october).

RSP variable attenuation = - 50 dB
Fixed attenuation = - 20 dB (two 10 dB attenuators on RSP input and output)

Mission Table Orbiter (10 "16bits Words"): MT_QMO_10

TC data words	Signification
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 Lander (10 "16bits Words"): MT_FSL_10

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Files:

Lander	151001_6.xls	= HK + Science
Orbiter	OC151916.D12	= science

		Prg att	FSL		Orbiter			Bench	Calib test	
Phase	Sound. nber	att/RSP	status	GCW	status	GCW	pos. peak	status	ping pong	bench
Beginning		-50dB					INTQ1	Rx		1.1c
Tuning		-50dB	tuning		tuning	14	OCXO 130	TBC		2.4, 1.6 TBC
Control	1	**-50dB**	ping pong	18/DE	ping pong	17	7	some acq.	1.2, 1.5d	3.3, 2.3, 2.1

The temperature change is foreseen at 2 am with a loss of 30°C per hour.

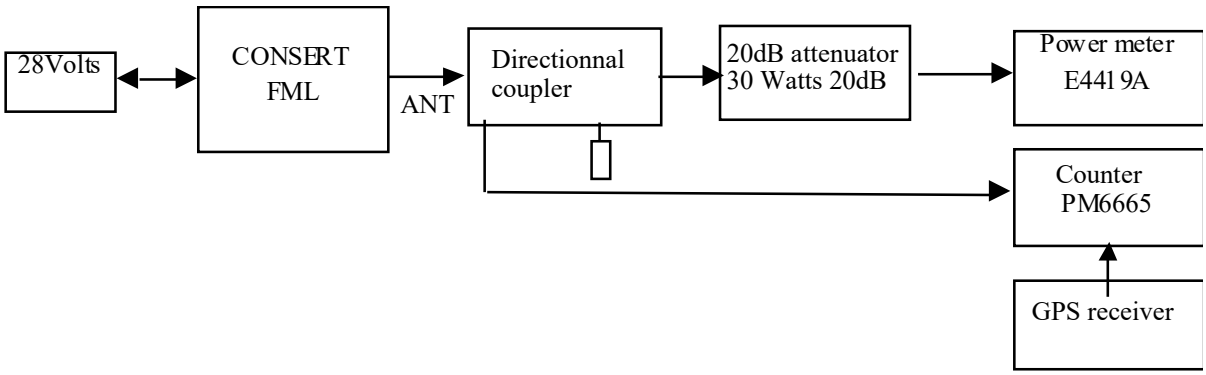
9. Tests at –20°C

9.1. Intentionally left blank

9.2. Intentionally left blank

9.3. SOREP quick characterization

The purpose of the test is to characterize finely the frequency variability of the 90 MHz carrier depending on the DAC control



The 20 dB attenuator has been left out during this test[13]!
Use the subroutine EGSE0_Sorep (OCXO quick 20 seconds per level).
Counter PM6665 is replaced by the new precision meter HP53132A opt 012.
Measurement is done at each tens value of the set point.

	Telecommand		Antenna output		+3.05 dB
DAC set point	TC type	TC para	Frequency (Hz)	Read power (dBm)	CW FSL power (dBm)
0	5	0	89999216	21.77	
10	5	0A	256	21.72	
20	5	14	293	21.70	
30	5	1E	346	21.69	
40	5	28	428	21.68	
50	5	32	518	21.68	
60	5	3C	598	21.67	
70	5	46	670	21.67	
80	5	50	736	21.67	
90	5	5A	795	21.66	
100	5	64	852	21.66	
110	5	6E	904	21.66	
120	5	78	954	21.66	
130	5	82	90000003	21.66	

[13] The comment does not fit the paper version

140	5	8C	90000048	21.66	
150	5	96	92	21.66	
160	5	A0	133	21.65	
170	5	AA	173	21.65	
180	5	B4	211	21.65	
190	5	BE	247	21.65	
200	5	C8	282	21.65	
210	5	D2	314	21.65	
220	5	DC	345	21.65	
230	5	E6	375	21.65	
240	5	F0	402	21.65	
250	5	FA	428	21.65	
255	5	FF	90000441	21.64	
00	5	00	89999225	21.66	

File 161001_4.xls

Frequency and power curves depending on the set point

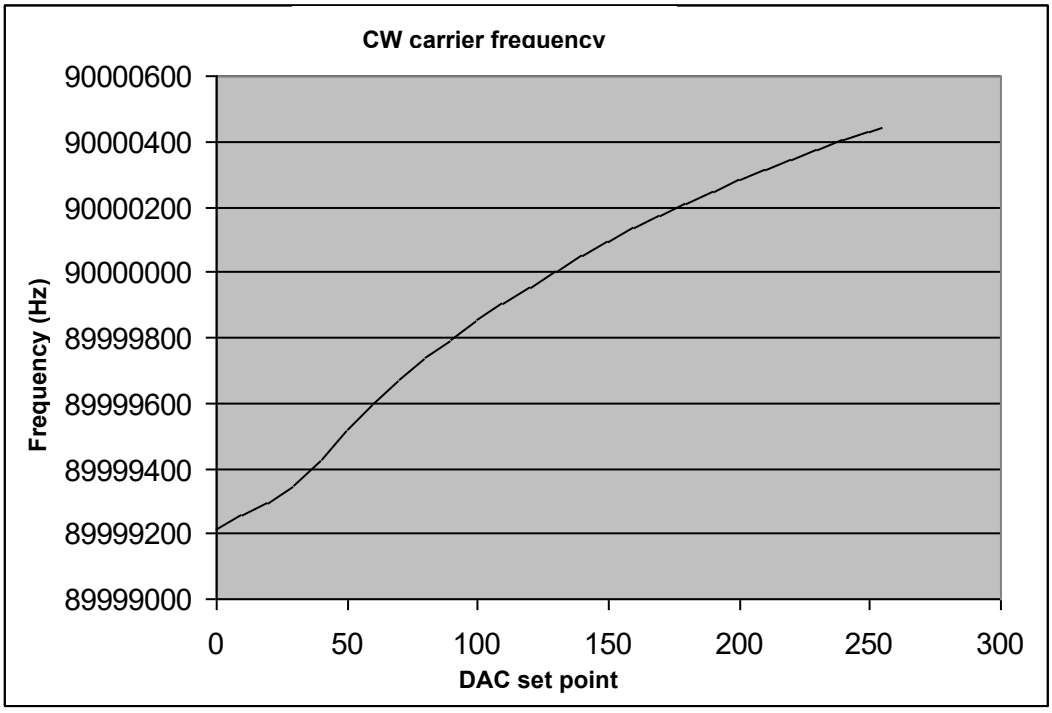


Figure 9.3a: Carrier frequency variation depending on the DAC setpoint

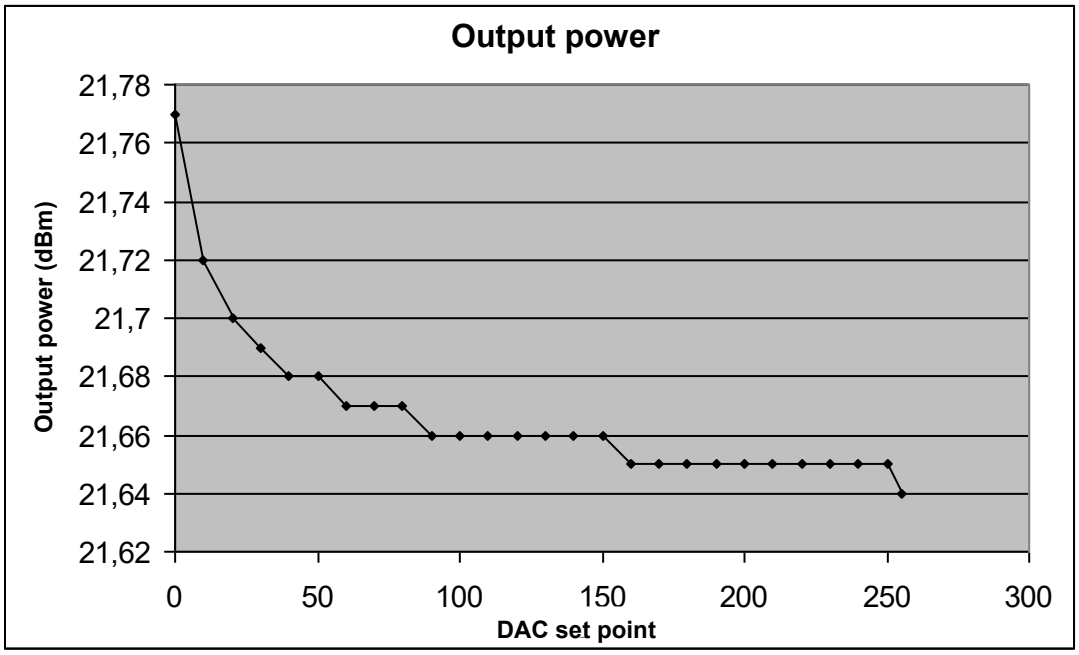
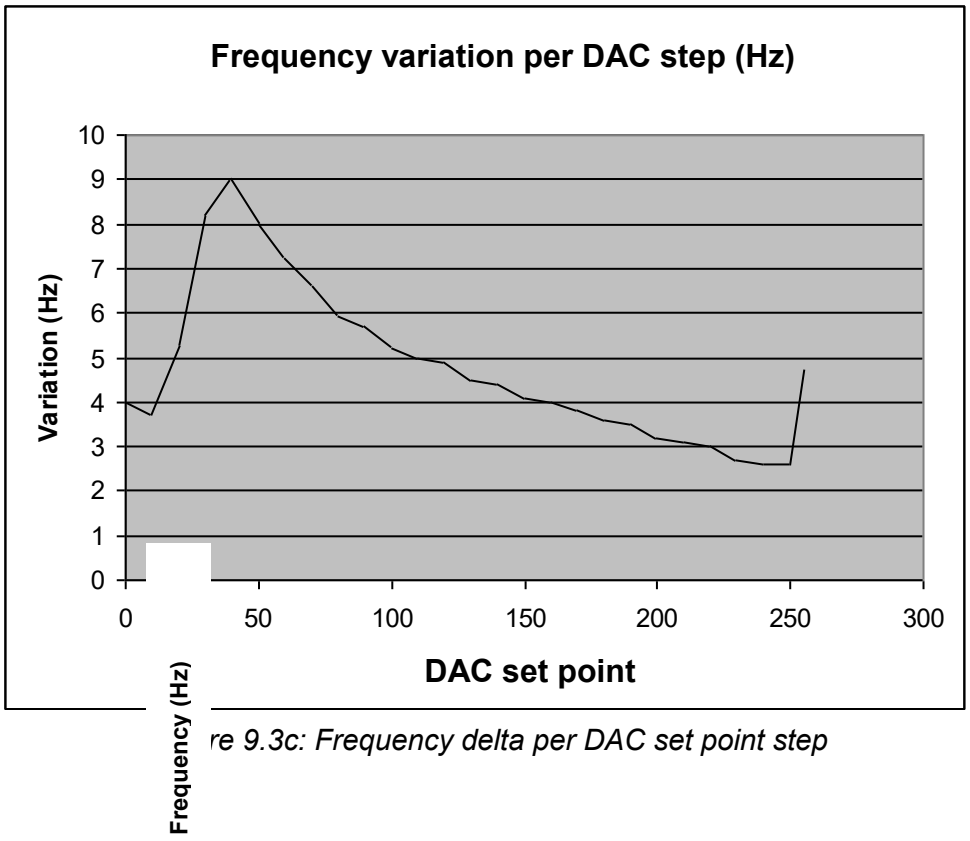


Figure 9.3b: Emitted power variation depending on time and DAC



re 9.3c: Frequency delta per DAC set point step

9.4. Emission test in tuning mode

EGSE 15.
The purpose of this test is to measure the output power with the HP E4419A power meter and to perform a spectral analysis of the emitted signal with the HP spectrum analyser.

Output power (dBm): 24 dBm (O dBref)
H3 - level: -10dB/H1 so -13 dBref
H3 + level: same power (-13 dBref)
OCXO set with setpoint #DAC90 = 131D = 0x83

This test corresponds to the calibration test 2.4.

This measurement is done regularly each 10 seconds during the tuning phase duration to measure the output power variation.

Time	Read power (dBm)	Emitted power (dBm)	H3- level	H3+ level
T = 0	21.40		-13 dBref	-13 dBref
T = 10 s	21.36			
T = 20 s	21.34			
T = 30 s	21.33			
T = 40 s	21.32			
T = 50 s	21.32			
T = 1 mn	21.31			

File 161001_5.xls

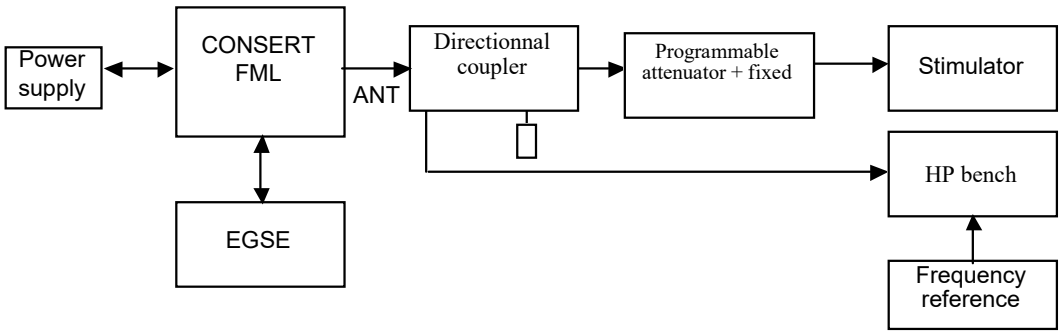
9.5. Calibration tests

Check the bench after turning on (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and estimate its performances while varying experiment conditions. The data will be subsequently processed.

9.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Material	**Type**	**Status**	
Adjustable power supply	21/ 31 V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual stting
Fixed attenuators	10 dB and 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	QMO		
HP bench	Emission quality test	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
Cables			See below
Termination	50 ohms coax N	ok	

<u>Cables configuration and properties</u>
Coupler output directly on attenuator,
2m KX4 cable between attenuator and QMO,
2m KX4 cable between coupler and bench.

Initial configuration:

Bench Frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10 dB coaxial N on RSP input and output)
Variable attenuation	= from - 30 dB to -90dB according to "sounding" N° (per step of 20dB)
EGSE	= classical

Mission tables:

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT

TC data words	Signification
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))

ATTENTION: During sounding from 0 to 100, power supply varies from 28 to 23V and from 23V to 30V then back to 28V to measure the primary current.
Test actual start after sounding 100

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
15	145	128	130	1

Parameters in Sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION
18 à 20	DD-DE	17	8

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding nber**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Framing**		**GCW OCXO 128**	**pos. peak**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning			TBC		2.4
DeltaV	0-100	**-50**											
Control	100-300	**-50**		ping pong	28 V	18	DE	ping pong	17	8	2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	300-505	**-30**			28 V	29	DE		28	8	2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	505-705	**-70**			28 V	9	DE		6to8	8	2 acq.R8		
	705-938	**-90**			28 V	1to3	DE		0or1		2 acq.R8		
Noise	938-1120	**-50**			28 V			stop			start	1.1b	
	1120-1300	**NA**		termination				disconnected			disconnected	4.3	
End	1300			stop									

Files Lander: 161001_1.xls
Orbiter: OC161036.D41
HP bench

Total Att.	First acquisition	Second acquisition
50+D dB	FSL_VT_951_1	FSL_VT_951_2
30+D dB	FSL_VT_951_3	FSL_VT_951_4
70+D dB	FSL_VT_951_5	FSL_VT_951_6
90+D dB	FSL_VT_951_7	FSL_VT_951_8

With D=23.87 dB

Test of Lander emission level and quality on the bench through the coupler:
file: test_en_tx_951_2.txt[14]
integrated peak level: 102 dBm so 23.3 dBm/FSL (caution to the clock difference for interpretation !)

[14] test_en_tx_951.txt in the numerical version!

9.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC.

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (twice 10dB coax N on RSP input and output
Variable attenuation = - 50 dB
EGSE With automated TC:
Program name: EGSELander_Cal.llb
Name of used vi: EGSE1.vi
Command table: TCL_IFM.txt

(Caution: this FML CONTROL file restores the DAC at 118!!! at the end)

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter: MTO_VT

TC data words	Signification
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))

Bench program	Total backup	ok	**Acqui_R8_en_TX_derrière_coupleur.vee**

Instrument integrated peak check: File:
Integrated peak measured on the bench:

Attention: Full execution of the program (with backup of the big file) requires 60 seconds +- 5 seconds and the refresh of VXI link, to be triggered manually, takes 15 seconds (see sheet). It is therefore better to forsee 20 soundings per parameter value.

Outputs

Bench = 26 R8 files of 8 Mb so 216 Megabytes
Lander = 1070 HK + 107 "Science"
Orbiter = 580 "Science"

Lander file: 161001_7.xls
Orbiter file: OC161716.D44
FSL_VT_952_01

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ
14	150	128	130	1

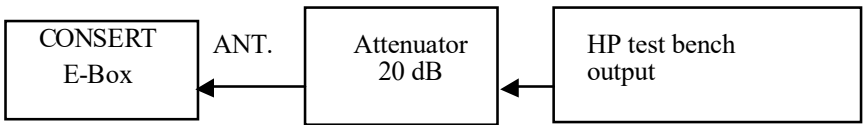
Parameters in Sounding

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	N° sound	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB						**OCXO**	**INTQ**		
Tuning		-50dB	tuning		131		**GCWT 14**	**130**	**1**	TBC	
							NBL(H/L)	**150**	**128**		
Control	1	-50dB	ping pong		131		ping pong			**1 acq**.	FSL_VT_952_01
freque.	100	-50dB		05 01	**1**	tbc				1 acq.	_03
	120	-50dB			**11**					1 acq.	04
	140	-50dB			**22**					1 acq.	05
	160	-50dB			**33**					1 acq.	06
	180	-50dB			**44**					1 acq.	07
	200	-50dB			**55**					1 acq.	08
	220	-50dB			**66**					1 acq.	09
	240	-50dB			**77**					1 acq.	10
	260	-50dB			**88**					1 acq.	11
	280	-50dB			**99**					1 acq.	12
	300	-50dB			**110**					1 acq.	13
	320	-50dB			**121**					1 acq.	BAD TC
	340	-50dB			**132**					1 acq.	15
	360	-50dB			**143**					1 acq.	16
	380	-50dB			**154**					1 acq.	17
	400	-50dB			**165**					1 acq.	18
	420	-50dB			**176**					1 acq.	19
	440	-50dB			**187**					1 acq.	20
	460	-50dB			**198**					1 acq.	21
	480	-50dB			**209**					1 acq.	22
	500	-50dB			**220**					1 acq.	23
	520	-50dB			**231**					1 acq.	24
	540	-50dB			**242**					1 acq.	25
	560	-50dB			**253**					1 acq.	26
reconfig	580				**131**		**stop**				
/termination	660						GCW lu				
noise	700	disconnected	termination							disconnected	

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

Duration:
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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 VT standard mission table

Mission Table FSL VT

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE: In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 7.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO. We did not take it into account for this temperature!

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 FSL antenna input in the tank (voir 13.4): 23.63dB

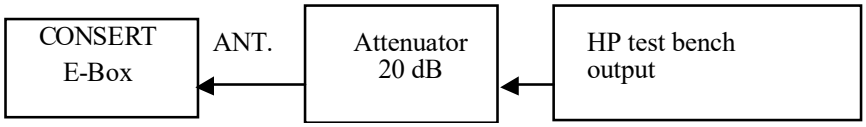
121 level steps, with one minute per step, plus starting, so a whole duration around 2 hours and 15 minutes.

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 FSL file: 161001_2.xls

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

Duration: half an hour, performed on October 16th 2001
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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 VT standard mission table

Mission Table FSL VT

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 5.3 that measures the emitted frequency in CW each 10 steps of DAC/OCXO. Here we used 131.

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 FSL antenna input in the tank (see 13.4): 23.63dB

Level at receiver input changes from about -88.6 dBm à -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 FSL file: 161001_3.xls

9.8. Transition –20°C → -0°C

It is a long ping-pong experiment (by night) to use temperature transitions and gain signal. The schema of the experiment and the material are the same (night of 15th to 16th october).

RSP variable attenuation = - 70 dB
Fixed attenuation = - 20 dB (two 10 dB attenuators on RSP input and output)

Mission Table Orbiter (10 "16bits Words"): MT_QMO_10

TC data words	Signification
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 Lander (10 "16bits Words"): MT_FSL_10

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Files:

Start at 6h30pm.

Lander	161001_8.xls	= HK + Science
Orbiter	OC161830.D36	= science

To be performed again because Lander on termination.

The temperature change is foreseen at 2am with a loss of 30°C per hour

Start 7h07pm
Lander 161001_9.xls
Orbiter OC161901.D20

Orbiter

GCWT 5	OCXO Setting 130	INTQ	1
GCWS 7	position 8		

Lander

GCW 9	FRAM DE

At the end in the morning at 9h30 am and 0°C current measurement at 23 V, 28 V and 30V.

10. Internal noise measurement in temperature cycling

Performed up from Friday night, October 19th 2001-10-19

Reporting of the experiment internal noise level during a quick temperature cycle with the instrument in the tank and a termination on output.

Variable temperature Ambient -> min T -> max T -> ambient
Cycle over a night TBC.

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Termination

File 191001_10.xls

Start on Friday, 0ctober 19th, 2001
Level at 20°C until 2am
Rise at + 50°C at 20°/h, reached at about 3h30am
Level from 3am at + 50°C until 6h30 am
Decrease at 20°C per hour until –40°C, reached at 11am
Then level until Monday morning

Mission table:

Mission Table FSL VT

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Outputs

Lander = HK + Science

Min gain is free.
Max gain is controlled by patch (TBC) with a command each 30 seconds and a step of one to scan the whole within 30 minutes (does not work on EML and QMO)
(Corresponds to 4.3. Calibration tests)

11. Measuring instruments and devices list

Power measurement	HP Power Meter E4419A
Spectrum analyser	HP 8590A
Vector network analyser	HP 8753C
Universal frequency counter	HP53132/012
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)
Multimeter	Wavetek 27XT
Micrometer	RCNF1
Laboratory power supply	HP HPE3632A
Bidirectionnal coupler (à -30 dB)	**Werlatone modèle 01569**
Current probe	Tektronix TCP202.
Frequency reference	**USO of HP53132/012 (see counter)**

CDR blank disks for data archiving on bench Vectra PC

12. Intentionally left blank

13. Tables for link budgets and files

13.1 Link budget

		1	2	3	4a	4b	5
Total attenuation (dB)		Model Coupl. Stim	Model Coupl. ADC	Model ADC PEAK	GENE CW Model	GENE Coded Model	GENE Coded PEAK
FSL	VT nov	**-23.87**	-37.40	88.72	-23.43	-23.63	121.67
	VT mai	-24.27	-37.40	88.72	-23.43	-23.63	121.67
	Labo	**-21.77**	-35.30	90.82	**-21.20**	**-21.40**	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 Characterization appendix

13.2 Files correlation table

FSL File name	Size (Kb)	QMO File name	Size (Kb)	Ping Pong	Bench File name	Rx	Tx	Section
250701_1.xls	5							4.1.1
250701_2.xls	52							4.1.2.1
260701_1.xls	52						x	4.1.3.2
250701_4.xls	823						x	4.1.3.3
300701_3.xls	5659						x	4.1.3.3
250701_3.xls	748						x	4.1.3.4
260701_2.xls	1480						x	4.1.3.5
300701_2.xls	1525						x	4.1.3.5
270701_4.xls	7	JL271601.D07	13					4.2.1
270701_5.xls	49	JL271625.D43	109					4.2.1
270701_2.xls	24	JL271515.D01	38					4.2.2
270701_3.xls	46	JL271531.D27	117					4.2.2
270701_1.xls	1124	JL271155.D00	2222	x	FSL_LABO_001.bin FSL_LABO_003.bin	x		4.3.1
300701_1.xls	1049	JL301021.D00	2163	x	FSL_LABO_004.bin	x		4.4
181001_11.xls	15							5.2.0
181001_10.xls	35							5.2.1
181001_7.xls	4							5.3
181001_8.xls	9							5.4
181001_1.xls	65	OC181000.D00	138	x	FSL_VT_551_0.bin ---------- FSL_VT_551_2.bin	x		5.5.1
181001_2.xls	62	OC181020.D46	117	x		x		5.5.1
181001_3.xls	460	OC181040.D11	637	x	FSL_VT_551_3.bin FSL_VT_551_8.bin	x		5.5.1
181001_4.xls	15	OC181209.D36	25					
181001_5.xls	331	OC181225.D53	616	x	FSL_VT_552_01.bin FSL_VT_552_26.bin	x		5.5.2
181001_12.xls	214						x	5.6
181001_13.xls	740						x	5.6
181001_9.xls	137						x	5.7
181001_14.xls	2585	OC181921.D44	5285		FSL_VT_58_1.bin FSL_VT_58_2.bin	x		5.8
191001_7.xls	4							6.3
191001_8.xls	10							6.4
191001_2.xls	1	OC191026.D37	1	x				6.5.1
191001_3.xls	582	OC191029.D26	859	x	FSL_VT_651_00.bin FSL_VT_651_08.bin	x		6.5.1
191001_5.xls	241	OC191343.D34	546	x	FSL_VT_652_01.bin FSL_VT_652_20.bin	x		6.5.2
191001_6.xls	114	OC191435.D17	187	x	FSL_VT_652_21.bin FSL_VT_652_32.bin	x		6.5.2
191001_9.xls	751						x	6.6
191001_4.xls	337						x	6.7
171001_4.xls	4							7.3
171001_5.xls	9							7.4
171001_1.xls	582	OC171053.D26	882	x	FSL_VT_751_1.bin FSL_VT_751_8.bin	x		7.5.1
171001_7.xls	338	OC171656.D25	617	x	FSL_VT_752_01.bin FSL_VT_752_25.bin	x		7.5.2
171001_2.xls	760						x	7.6
171001_3.xls	125						x	7.7
171001_9.xls	2812	OC171817.d23	5806	x		x		7.8

151001_1.xls	4							8.3
151001_2.xls	32							8.4
151001_4.xls	77	OC151708.D20	141	x	FSL_VT_851_1.bin FSL_VT_851_2.bin	x		8.5.1
151001_5.xls	559	OC151732.D35	885	x	FSL_VT_851_3.bin FSL_VT_851_10.bin	x		8.5.1
151001_3.xls	759						x	8.6
151001_6.xls	2698	OC151916.D12	5550	x				8.8
161001_4.xls	4							9.3
161001_5.xls	9						x	9.4
161001_1.xls	649	OC161036.D41	761	x	FSL_VT_951_1.bin FSL_VT_951_8.bin	x		9.5.1
161001_7.xls	338	OC161716.D44	707	x	FSL_VT_952_01.bin FSL_VT_952_03.bin FSL_VT_952_26.bin	x		9.5.2
161001_2.xls	890						x	9.6
161001_3.xls	177						x	9.7
161001_8.xls	38	OC161830.D36	86	x				9.8
161001_9.xls	2755	OC161901.d20	5709	x				9.8
191001_10.xls	18740							10
160402_1.xls	80	AP161111d33	160	x	FSL_VT_test1.bin FSL_VT_test2.bin	x		14
160402_2.xls	645	AP161132.D29	961	x	FSL_VT_1451_1.bin FSL_VT_1451_13.bin	x		14.5.1
160402_5.xls	2	AP161632.D29	???	x				14.5.2
160402_6.xls	334	AP161633.D19	733	x	FSL_VT_1452_1.bin FSL_VT_1452_28.bin			14.5.2
160402_3.xls	740						x	14.6
160402_4.xls	114						x	14.7
170402_5.xls	71	AP171443.D17	10	x	FSL_VT_1551_1.bin FSL_VT_1551_2.bin	x		15.5.1
170402_6.xls	584	AP171500.D50	849	x	FSL_VT_1551_3.bin FSL_VT_1551_11.bin	x		15.5.1
170402_01.xls	366	AP171010.D06	631	x	FSL_VT_1552_01.bin FSL_VT_1552_28.bin	x		15.5.2
170402_03.xls	1021						x	15.6
170402_02.xls	199						x	15.7
170402_04.xls	222						x	15.7
160402_7.xls	1818	AP161802.D53	5902		FSL_VT_161_1.bin FSL_VT_161_5.bin	x		16.1
170402_07.xls	1912							16.3

14. Tests at +50°C

test experiment
160402_1.xls
AP161111d33
FSL_VT_test1.bin; FSL_VT_test2.bin;

14.1. Intentionally left blank

14.2. Intentionally left blank

14.4. Emission test in tuning mode

not done

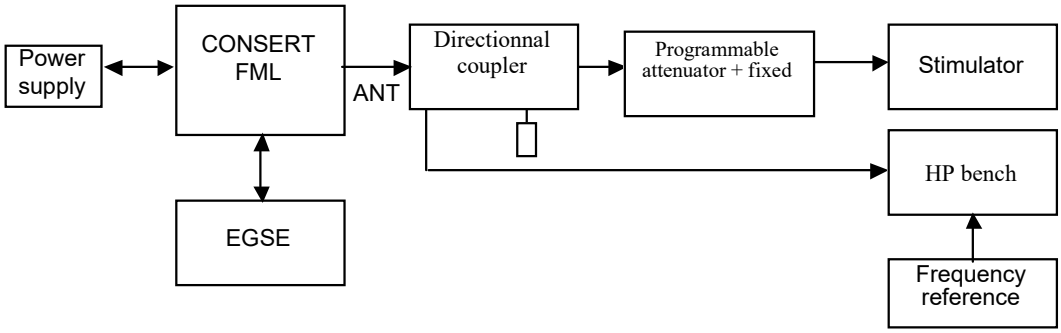
14.5. Calibration tests

Check the bench after power up (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and evaluate its performances while varying the experiment conditions. Data will be processed subsequently.
This test is performed on April 16th 2002 at 11h30 am.

14.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	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	QMO		
HP bench	test qualité émission	ok	Test_en_TX_derrière_coupleur.vee
Bench program	Sauvegarde totale	ok	Acqui_R8_en_TX_derrière_coupleur
Bench program	Tuning	n.av.	1 ms/s (60 x) **prg not available**
Frequency reference	Fréquencemètre +USO	Ok	HP53132/012
Cables			See below
Termination	50 ohms coax N	ok	

Cable configuration and properties (as in 4.3. Calibration tests).

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Fixed attenuation = - 20 dB (2x 10 dB coaxial N on RSP input and output)
Variable attenuation = de - 30 dB à -90dB depending on sounding number (per step of 20dB)
EGSE = classical

Mission tables:

Mission Table Lander (10 16bits Words)	
TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT	
TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Outputs:

Bench = 26 files de 8 Mbyte, so a total of 200 Mbyte.
Lander = 2400 HK + 240 Science
Orbiter = 2400 Science

Bench program: **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.

		Attenuation		FSL				Orbiter			Bench	Calib. test.	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**N° sounding**	**Rohde & Schwarz**	**Att. totale**		**Voltage**	**GCW**	**Framing**		**GCW OCXO 126**	**peak pos.**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning			TBC		2.4
DeltaV	0-100	**-50**											
Control	100-300	**-50**		ping pong	28 V	17/18	DE	ping pong	16		2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	300-505	**-30**			28 V	27	DD				2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	505-705	**-70**			28 V	7	DD		6/5		2 acq.R8		
	705-905	**-90**			28 V	0	CD				2 acq.R8		
Noise	905-1104	**-50**			28 V	0	9A	stop			start	1.1b	
	1105-1300	**NA**		termination		0	9A	disconnected			disconnected	4.3	
End	1300			stop									

Files Lander: 160402_2.xls
Orbiter: AP161132.D29

False start, wrong mission table, restart in the same file.

HP bench

Bench mounting problem:

For the first files (test1, test2, _1, _2 et _3), coupler –20dB at bench input + bench programmable attenuator–20 dB, problems with too weak signals.

With _4 et _5, coupler –20 dB and internal attenuator at 0dB.

After _6, without coupler and attenuator at –20 dB.

Total att.	First acquisition	Second acquisition
Tuning	FSL_VT_1451_1.bin	Non
50+D dB	_2.bin et _3.bin / _4.bin et _5.bin	_6.bin et _7.bin
30+D dB	FSL_VT_1451_8.bin	FSL_VT_1451_9.bin
70+D dB	FSL_VT_1451_10.bin	FSL_VT_1451_11.bin
90+D dB	FSL_VT_1451_12.bin	FSL_VT_1451_13.bin

Up _4, bench internal attenuation set at 0dB.

14.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC. In the case this EGSE was not developed at the date of the test both tests could merge.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10dB coaxial N on RSP input and output)
Variable attenuation	= - 50 dB
EGSE	with automatized TC: Program name: EGSELander_Cal.llb Used vi name: EGSE1.vi Command table: TCL_IFM.txt

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter: MTO_VT

TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Bench program	Full backup	ok	**Acqui_R8_en_TX_derrière_coupleur.vee**

Integrated peak measured on the bench:

Attention: the program full execution (with backup of the big file) needs 60 seconds +- 5 seconds, and the refresh of the VXI link, which has to be manually started, needs 15 seconds (see sheet). It is therefore better to foresee 20 soundings per parameter value.

Outputs:

Bench = 26 R8 files of 8 Mbyte so 216 Mbyte
Lander: 160402_6.xls
Orbiter: AP161633.D19

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ

Parameters in Sounding @ RS=50dB (total attenuation FSL QMO path 73,87 dB)

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION

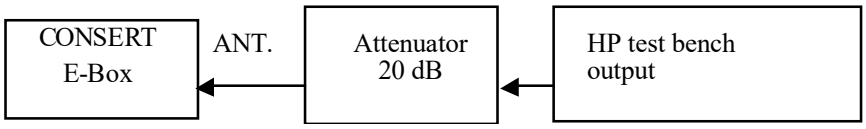
Several misses, 160402_5.xls and
Orbiter files AP161632.D29

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sound nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB									
Tuning		-50dB	tuning		131					TBC	FSL_VT_1452_01
Control	1	-50dB	ping pong		131		ping pong			2 acq.	FSL_VT_1452_02.bin et FSL_VT_1452_03.bin
freque.	100	-50dB		05 01	1					1 acq.	FSL_VT_1452_04.bin
	120	-50dB		5 OB	11					1 acq.	FSL_VT_1452_05.bin
	140	-50dB		5 16	22					1 acq.	FSL_VT_1452_06.bin
	160	-50dB		5 21	33					1 acq.	FSL_VT_1452_07.bin
	180	-50dB		5 2C	44					1 acq.	FSL_VT_1452_08.bin
	200	-50dB		5 37	55					1 acq.	FSL_VT_1452_09.bin
	220	-50dB		5 42	66					1 acq.	FSL_VT_1452_10.bin
	240	-50dB		5 4D	77					1 acq.	FSL_VT_1452_11.bin
	260	-50dB		5 58	88					1 acq.	FSL_VT_1452_12.bin
	280	-50dB		5 63	99					1 acq.	FSL_VT_1452_13.bin
	300	-50dB		5 6E	110					1 acq.	FSL_VT_1452_14.bin
	320	-50dB		5 79	121					1 acq.	FSL_VT_1452_15.bin
	340	-50dB		5 84	132					1 acq.	FSL_VT_1452_16.bin
	360	-50dB		5 8F	143					1 acq.	FSL_VT_1452_17.bin
	380	-50dB		5 9A	154					1 acq.	FSL_VT_1452_18.bin
	400	-50dB		5 A5	165					1 acq.	FSL_VT_1452_19.bin
	420	-50dB		5 BO	176					1 acq.	FSL_VT_1452_20.bin
	440	-50dB		5 BB	187					1 acq.	FSL_VT_1452_21.bin
	460	-50dB		5 66	198					1 acq.	FSL_VT_1452_22.bin
	480	-50dB		5 D1	209					1 acq.	FSL_VT_1452_23.bin
	500	-50dB		5 DC	220					1 acq.	FSL_VT_1452_24.bin
	520	-50dB		5 E7	231					1 acq.	FSL_VT_1452_25.bin
	540	-50dB		5 F2	242					1 acq.	FSL_VT_1452_26.bin
	560	-50dB		5 FD	253					1 acq.	FSL_VT_1452_27.bin
reconfig	580			5 83	118						FSL_VT_1452_28.bin
/termination	670										
noise	700	disconnected	termination							disconnected	

End on 118 and not 131 at 5h40pm

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

Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL in receiving face to the bench and through 20,3 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 FSL 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.
Test performed on 16/04/2002 at 1h30pm

LANDER FSL starting with mission table

Mission Table FSL VT

TC data words	Signification
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
830A	**INIT FREQ (=131) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE: In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 14.5.2

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 FSL antenna input in the tank (see 13.4): 23.63dB

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

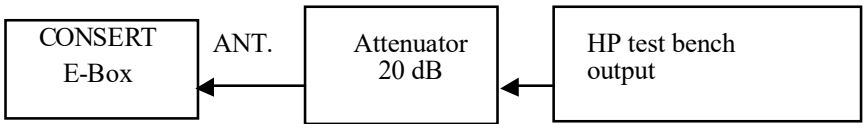
Processing TM file, the analysis of the H4 line emitted level by the bench, of its level on Consert receiver I and Q path, and of the value of gain control, enables to calibrate very precisely Consert gain for each GCW value and according to the temperature.

file TM FSL: 160402_3.xls

Bench begins to emit at sounding 41/42.
Transition -109 dB / -108 dB at sounding 65/66.
End of the test at 3h50pm

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

Duration: half an hour
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.
Test performed on 16/04/2002 at 3h50pm.

LANDER FSL starting with mission table

Mission Table FSL VT

TC data words	Signification
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
850A	**INIT FREQ (=133) & FIOW RATIO (=10)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 14.5.2

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 FSL antenna input in the tank (see 13.4): 23.63dB

Level at receiver input changes from about -88.6 dBm à -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.

Ramp is begun at sounding 10.

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

TM FSL file: 160402_4.xls

Bench started at sounding 8.
End of the test at 4h18 pm.

15. Tests at -40°C

15.1. Intentionally left blank

15.2. Intentionally left blank

15.3. Intentionally left blank

15.4. Intentionally left blank

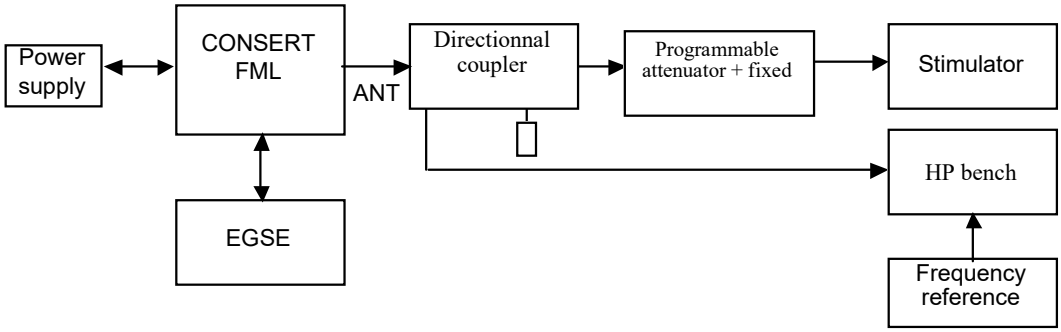
15.5. Calibration tests

Check the bench after power up (Auto-Test).

The purpose of these tests is to get reference signals to be able to calibrate the instrument and estimate its performances while varying experiment conditions. The data will be subsequently processed.

15.5.1. Ping-pong with variable external parameters

It is a long ping-pong experiment with bench coupling.



Necessary material:

Material	Type	Status	
Adjustable power supply	21/ 31 V	ok	
Coupler	Werlatone -30 dB	ok	
Variable attenuator	Rohde & Schwarz RSP	ok	Attenuation manual setting
Fixed attenuators	10 dB and 10 dB	ok	2 coaxial attenuators N on RSP
Stimulator	QMO		
HP bench	Emission quality test	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
Cables			See below
Termination	50 ohms coax N	ok	

Cables configuration and properties (as in 4.3. Calibration tests).

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Variable attenuation = de - 30 dB à -90dB depending on sounding number (per step of 20dB here)
EGSE = classical

Mission tables:

Mission Table Lander (10 16bits Words)	
TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter (10 16bits Words): MTO_VT	
TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Outputs

Bench = 26 files de 8 Mbyte, so a total of 200 Mbyte.
Lander = 2400 HK + 240 Science
Orbiter = 2400 Science

Bench program: **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.

		Attenuation		FSL				Orbiter			Bench	Calib. test	
		command		status	com-mands	outputs		status	outputs		status	ping pong	bench
Phase	**Sounding nber**	**Rohde & Schwarz**	**Total att.**		**Voltage**	**GCW**	**Framing**		**GCW OCXO 128**	**peak pos.**			
Beginning		**-50**			28 V								
Tuning		**-50**		tuning	28 V			tuning			TBC		2.4
Control	0-201	**-50**		ping pong	28 V	19	DD	ping pong			2 acq.R8	1.1 + 1.2	3.3, 3.4
Gain	201-401	**-30**			28 V	29	DE				2 acq.R8	1.2a, 1.5, 1.6	3.3, 3.4
	401-601	**-70**			28 V	9	DD				2 acq.R8		
	601-801	**-90**			28 V	0	CD				2 acq.R8		
Noise	801-997	**-50**			28 V	0	AA	stop			start	1.1b	
	997-1201	**NA**		termination		0	AA	disconnected			disconnected	4.3	
End	1300			stop									

Lander redundancy test on 170402_5.xls and _6.xls

Files Lander: 170402_5.xls
Orbiter: AP171443.D17

Problem sysH.

Files Lander: 170402_6.xls
Orbiter: AP171500.D50
HP bench

Total att.	First run	Second run
Tunning	FSL_VT_1551_1.bin	_3.bin
50+D dB	FSL_VT_1551_2.bin	_4.bin et _5.bin
30+D dB		_6.bin et _7.bin
70+D dB		_8.bin et _9.bin
90+D dB		_10.bin et _11.bin

15.5.2. Ping-pong with variable experiment command

It is a long ping-pong experiment like the previous one but the experiment command are varied by TC during the test. Experiment pattern and material are the same. This test is based on EGSE with automated TC. In the case this EGSE was not developed at the date of the test both tests could merge.
Test performed on 17/04/2002 at 9h45am.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
Fixed attenuation	= - 20 dB (twice 10dB coax N on RSP input and output)
Variable attenuation	= - 50 dB
EGSE	With automated TC: Program name: EGSELander_Cal.llb Name of used vi: EGSE1.vi Command table: TCL_IFM.txt TCL_IFM_modif.txt

Mission Table Lander (10 16bits Words)

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Mission Table Orbiter: MTO_VT

TC data words	Signification
0100	Mission table indicator & table index
0002	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))

Bench program	Full backup	ok	**Acqui_R8_en_TX_derrière_coupleur.vee**

Instrument integrated peak check: File:

Integrated peak measured on the bench:

Attention: Full execution of the program (with backup of the big file) requires 60 seconds +-5 seconds and the refresh of VXI link, to be triggered manually, takes 15 seconds (see sheet). It is therefore better to foresee 20 soundings per parameter value.

Outputs

Bench = 26 R8 files of 8 Mb so 216Mégabytes
Lander: 170402_01.xls
Orbiter: AP171010.D06

Orbiter parameters in "Tuning"

GCWT	NBLafterGCW	NBLat stop	OCXO setting	INTQ

Parameters in Sounding @ RS=50dB (total attenuation of FSL QMO path 73,87 dB)

LDR GCW	LDR FRAMING	ORBITER GCW	ORB Peak POSITION

False start, 2 starts in the .xls file

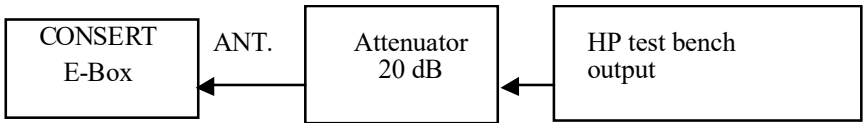
End of the test at 11h15 am

		Atten -70dB	FSL				Orbiter			Bench	File sBLOC_IQ_*.bin
		Command	status	command			status	outputs		status	
Phase	Sound nber	**ATT/R&S**		TC / patch	DAC	GCW/FRA					
Beginning		-50dB									
Tuning		-50dB	tuning							TBC	FSL_VT_1552_01.bin
Control	1	-50dB	ping pong		131		ping pong			2 acq.	FSL_VT_1552_02.bin et FSL_VT_1552_03.bin
freque.	100	-50dB		05 01	**1**					1 acq.	FSL_VT_1552_04.bin
	120	-50dB		05 OB	**11**					1 acq.	FSL_VT_1552_05.bin
	140	-50dB		05 16	**22**					1 acq.	FSL_VT_1552_06.bin
	160	-50dB		05 21	**33**					1 acq.	FSL_VT_1552_07.bin
	180	-50dB		5 2C	**44**					1 acq.	FSL_VT_1552_08.bin
	200	-50dB		5 37	**55**					1 acq.	FSL_VT_1552_09.bin
	220	-50dB		5 42	**66**					1 acq.	FSL_VT_1552_10.bin
	240	-50dB		5 4D	**77**					1 acq.	FSL_VT_1552_11.bin
	260	-50dB		5 58	**88**					1 acq.	FSL_VT_1552_12.bin
	280	-50dB		5 63	**99**					1 acq.	FSL_VT_1552_13.bin
	300	-50dB		5 6^{E}	**110**					1 acq.	FSL_VT_1552_14.bin
	320	-50dB		5 79	**121**					1 acq.	FSL_VT_1552_15.bin
	340	-50dB		5 84	**132**					1 acq.	FSL_VT_1552_16.bin
	360	-50dB		5 8F	**143**					1 acq.	FSL_VT_1552_17.bin
	380	-50dB		5 9A	**154**					1 acq.	FSL_VT_1552_18.bin
	400	-50dB		5 A5	**165**					1 acq.	FSL_VT_1552_19.bin
	420	-50dB		5 B0	**176**					1 acq.	FSL_VT_1552_20.bin
	440	-50dB		5 BB	**187**					1 acq.	FSL_VT_1552_21.bin
	460	-50dB		5 C6	**198**					1 acq.	FSL_VT_1552_22.bin
	480	-50dB		5 D1	**209**					1 acq.	FSL_VT_1552_23.bin
	500	-50dB		5 DC	**220**					1 acq.	FSL_VT_1552_24.bin
	520	-50dB		5 E7	**231**					1 acq.	FSL_VT_1552_25.bin
	540	-50dB		5 F2	**242**					1 acq.	FSL_VT_1552_26.bin
	560	-50dB		5 FD	**253**					1 acq.	FSL_VT_1552_27.bin
	580			5 83	**131**						FSL_VT_1552_28.bin
	597										
	635	disconnected	termination							disconnected	

597 orbiter stopped
635 termination 695 stop

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

Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.
Test performed on 17/04/2002 at noon.

LANDER FSL starting with the mission table

Mission Table FSL VT

TC data words	Signification
0301	Mission table indicator & table index
0002	TUNETIC (B3 & B2) = 170 seconds
CB41	TUNETIC (B1 & B0)
0000	STARTTIC(B3 & B2) = 60 seconds
8F0D	STARTTIC(B1 & B0)
0BEC	DELTATIC = 5 seconds
C350	NBSOUNDING = 50000
830A	**INIT FREQ (=131) & FIOW RATIO (=6)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 15.5.2

Bench programming:
Use program **RX_H4.vee (voir 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 FSL antenna input in the tank (voir 13.4): 23.63dB

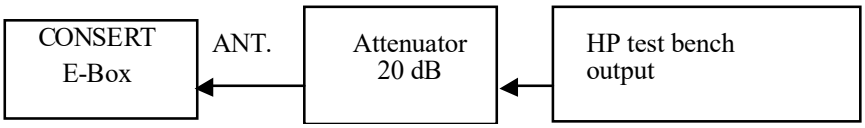
121 level steps, with one minute per step, plus starting, so a whole duration around 2 hours and 15 minutes.

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 FSL file: 170402_03.xls
End of the test at 2 pm.

15.7. Variation of receiver noise according to the gain set point (with orthogonal line)

Duration: half an hour
Operation: Automatic test after FSL TC setting and bench starting
Assembly configuration: FSL 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 FSL 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.
Test performed on 17/04/2002 at 11h30 am.

LANDER FSL starting with the mission table

Mission Table FSL VT

TC data words	Signification
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
850A	**INIT FREQ (=133) & FIOW RATIO (=5)**
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

NOTE:
In the mission table, the DAC/OCXO value should be the one which gives the absolute frequency the nearest to 90MHz for the current temperature while interpolating the results of test 15.5.2

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 FSL antenna input in the tank (see 13.4): 23.63dB

Level at receiver input changes from about -88.6 dBm à -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.

Ramp is begun at sounding 10.

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

TM FSL file:
170402_2.xls
Real start at sounding 19, OK no problem
OCXO=132 by mistake

Redone with OCXO=131
170402_4.xls
Real start at sounding 34

16. Long term test in thermal cycling

16.1. Cycling in ping-pong (+50°C to –40°C)

It is a long ping-pong experiment (by night) to use temperature transitions and gain signal.
The schema of the experiment and the material are the same
Test performed from 16/04/2002 in the evening to 17/04/2002 in the morning.

Initial configuration:

Bench frequency	= 90 MHz
Orbiter and lander voltage	= 28 V
RSP variable attenuation	= - 50 dB
Fixed attenuation	= - 20 dB (two 10 dB attenuators on RSP input and output)
EGSE	= classical

Mission table:

Mission Table (10 16bits Words)

TC data words	Signification
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)
17D7	DELTATIC = 10 seconds
C350	NBSOUNDING = 50000
8364	INIT FREQ (=131) & FIOW RATIO (=20)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

160402_07.xls
AP161802.D53

Bench tuning: FSL_VT_161_1.bin

Beginning: FSL_VT_161_2.bin and _3.bin on 16/04/2001 at 6h pm.
End: FSL_VT_161_4.bin and _5.bin on 17/04/2002 at 9h30 am.

Test OK
Noise measurement

16.2. Cycling in ping-pong (not done)

16.3 Internal noise measurement in temperature cycling

Reporting of the internal noise level of the experiment during a quick temperature cycle with the instrument in the tank and a termination on output.
Variable temperature

Initial configuration:

Bench frequency = 90 MHz
Orbiter and lander voltage = 28 V
Termination

Mission table:

Mission Table FSL VT

TC data words	Signification
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
830A	INIT FREQ (=131) & FIOW RATIO (=10)
0000	MODE BYTE (= 0) & MIN ATT (= 0)
1F00	MAX ATT (= 31) & PAD Field (=0)

Outputs

Lander = HK + Science

170402_7.xls
Redundant use Lander/CDMS

END