

R051-24-10-103051-3/A Ed. 1

“This report cancels and replaces the test report N°R051-24-10-103051-3/A Edition 0”

RADIO test report

**according to standard:
FCC Part 15**

**Equipment under test:
M2M tracking system CV90-J8100
Bluetooth part**

**Company:
TES Electronic Solutions**

DISTRIBUTION: Mr LE TORC'H

Company: TES Electronic Solutions

Number of pages: 39 including 6 annexes

Ed.	Date	Modified pages	Written by		Technical Verification Quality Approval	
			Name	Visa	Name	Visa
0	27-Jan-11	2,7	L. BERTHAUD	LB		

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.
This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.



PRODUCT: M2M tracking system CV90-J8100

Reference / model: CV90-J8100

Trade mark: Qualcomm Incorporated

Serial number: not communicated

MANUFACTURER: TES Electronic Solutions

COMPANY SUBMITTING THE PRODUCT:

Company: Qualcomm Incorporated

Address: 5775 Morehouse Drive
San Diego, CA 92121, 1714
USA

Responsible: Mr RICHARDS

TECHNICAL SUPPORT:

Company: TES Electronic Solutions

Address: 50 place du Président Sadate
29337 QUIMPER Cedex
FRANCE

Responsible: Mr LE TORC'H

DATE(S) OF TEST: 13 December 2010
07 January 2010

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUENZE (49)
FRANCE
FCC Registration Number: 101696/FRN: 0006 6490 08

TESTED BY: L. BERTHAUD

CONTENTS

TITLE	PAGE
1. INTRODUCTION.....	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE.....	4
4. TEST METHODOLOGY	5
5. ADD ATTACHMENTS FILES	5
6. TESTS AND CONCLUSIONS	6
6.1 unintentional radiator (subpart B)	6
6.2 intentional radiator (subpart C)	6
7. RADIATED EMISSION LIMITS.....	8
8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS	10
CURVE N°1	12
CURVE N°2	13
9. MAXIMUM PEAK OUTPUT POWER	14
10. INTENTIONAL RADIATOR	16
ANNEX 1: 20 dB BANDWIDTH AND CHANNEL SEPARATION.....	18
ANNEX 2: NUMBER OF HOPPING FREQUENCIES	24
ANNEX 3: DWELL TIME	28
ANNEX 4: EQUAL HOPPING FREQUENCY USE	31
ANNEX 5: PHOTOS OF THE EQUIPMENT UNDER TEST	34
ANNEX 6: TEST SET UP AND OPEN AREA TEST SITE	38

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: M2M tracking system CV90-J8100 – Bluetooth part in accordance with normative reference.

This device contains a third party modem (FCC ID: RI7GE863G).

2. PRODUCT DESCRIPTION

ITU Emission code:	1M00F7D
Class:	B (residential environment)
Utilization:	tracking unit with Bluetooth function
Antenna type and gain:	integral PCB antenna, unknown gain
Operating frequency range:	from 2402 MHz to 2480 MHz
Number of channels:	79
Channel spacing:	1 MHz
Frequency generation:	synthesizer
Modulation:	Frequency Hopping Spread Spectrum
Power source:	12 Vd.c

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

FCC Part 15 (2009)	Radio Frequency Devices
ANSI C63.4 (2003)	Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.
Public Notice DA 00-705	Filing and Measurement Guideline for Frequency Hopping Spread Spectrum Systems.

4. TEST METHODOLOGY

Radio performance tests procedures given in part 15:

Subpart B –Unintentional Radiators

Paragraph 107: Conducted limits

Paragraph 109: Radiated emission limits

Paragraph 111: Antenna power conduction limits for receivers

Subpart C – Intentional Radiators

Paragraph 203: Antenna requirement

Paragraph 205: Restricted bands of operation

Paragraph 207: Conducted limits

Paragraph 209: Radiated emission limits; general requirements

Paragraph 212: Modular transmitter

Paragraph 215: Additional provisions to the general radiated emission limitations

Paragraph 247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

5. ADD ATTACHMENTS FILES

“Synoptic “

“Block diagram “

“External photos and Product labeling “

“Assembly of components “

“Internal photos “

“Layout pcb “

“Bil of materials “

“Schematics “

“Product description “

“User guide “

6. TESTS AND CONCLUSIONS

6.1 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.107	CONDUCTED LIMITS			X		
FCC Part 15.109	RADIATED EMISSION LIMITS	X				
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable

NAs: Not Asked

6.2 intentional radiator (subpart C)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				<i>Note 1</i>
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				<i>Note 2</i>
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	<i>(a) Alternative to general radiated emission limits</i>	X				
	<i>(b) Unwanted emissions outside of §15.247 frequency bands</i>	X				<i>Note 3</i>
	<i>(c) 20 dB bandwidth and band-edge compliance</i>	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHZ and 5725-5850 MHZ					
	<i>(a) (1) Hopping systems</i>	X				<i>Note 4</i>
	<i>(a) (2) Digital modulation techniques</i>			X		
	<i>(b) Maximum peak output power</i>	X				
	<i>(c) Operation with directional antenna gains > 6 dBi</i>			X		
	<i>(d) Intentional radiator</i>	X				
	<i>(e) Peak power spectral density</i>			X		
	<i>(f) Hybrid system</i>			X		
	<i>(g) Frequency hopping requirements</i>			X		
	<i>(h) Frequency hopping intelligence</i>			X		
	<i>(i) RF exposure compliance</i>	X				<i>Note 5</i>

NAp: Not Applicable

NAs: Not Asked

Note 1: Integral antenna. Professionally installed equipment.

Note 2: See FCC part 15.247 (d). All modulations have been tested (DH1, DH3, DH5, 2-DH5, 3-DH5). Only the case with the highest output power level (DH1) is reported for conducted and radiated measurements

Note 3: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 4: The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (796 kHz; see annex 1).

The frequency hopping system uses 79 channels (see annex 2).

The timing by channel is 2952 μ s (see annex 3) on worst case (3-DH5 packet type).

*During 79 channels \times 0.4 s = 31.6 s, any channel is used 20 times (see annex 4), then 20 * 2952 μ s = 59.04 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 seconds multiplied by the number of hopping channels employed, in normal operating mode.*

Note 5: This equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from Oet 65c).

This device is categorically excluded from routine environmental, because it operates at very low power level. The equipment is deemed to comply with SAR or MPE limits without testing due to its very low power level (EIRP <25mW).

Conclusion:

The sample of M2M tracking system CV90-J8100 – Bluetooth part submitted to the tests complies with the regulations of the standard FCC Part 15 in accordance with the limits or criteria defined in this report.

7. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESH3	1058
Test receiver	Rohde & Schwarz ESVS10	1219
Spectrum analyzer	Rohde & Schwarz FSP40	4088
Loop antenna	EMCO 6502	1406
Biconical antenna	Hewlett Packard 11966 C	0728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Double ridged guide antenna	Electrometrics EM 6961	1204
Preamplifier 1 to 18 GHz	DBS Microwave DB97-1852	2648
High pass filter	Micro-tronics HPM11630	6609
Open area test site	EMITECH	1274
Power source	Hewlett Packard E3610A	4195
Multimeter	Fluke 77-2	0812
Meteo station	Bioblock Scientific meteostar	0943

Test set up:

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuths correspond to the front of the equipment under test.

Frequency range: From 9 kHz to 5th harmonic of the highest frequency used (2480 MHz).

Detection mode: Quasi-peak (F < 1 GHz) Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz) 1 MHz (F > 1 GHz)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is blocked in standby / reception mode.

Results:

Ambient temperature (°C): 17
Relative humidity (%): 53

Power source: 12 Vd.c

Not any spurious has been detected.

Applicable limits: for $30 \text{ MHz} \leq F < 88 \text{ MHz}$:	40 dB μ V/m
$88 \text{ MHz} \leq F < 216 \text{ MHz}$:	43.52 dB μ V/m
$216 \text{ MHz} \leq F < 960 \text{ MHz}$:	46.02 dB μ V/m
Above 960 MHz:	53.98 dB μ V/m

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: FCC Part 15

Test procedure: Paragraph 15.215

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer	Rohde & Schwarz FSP 40	4088
Double ridged guide antenna	Electrometrics EM 6961	1204
Power source	Hewlett Packard E3610A	4195
Multimeter	Fluke 77-2	0812
Meteo station	Oregon Scientific AB888	1539

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power

Test operating condition of the equipment:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21
 Relative humidity (%): 34

Lower Band Edge: from 2310 MHz to 2390 MHz
 Upper Band Edge: from 2483.5 MHz to 2500 MHz

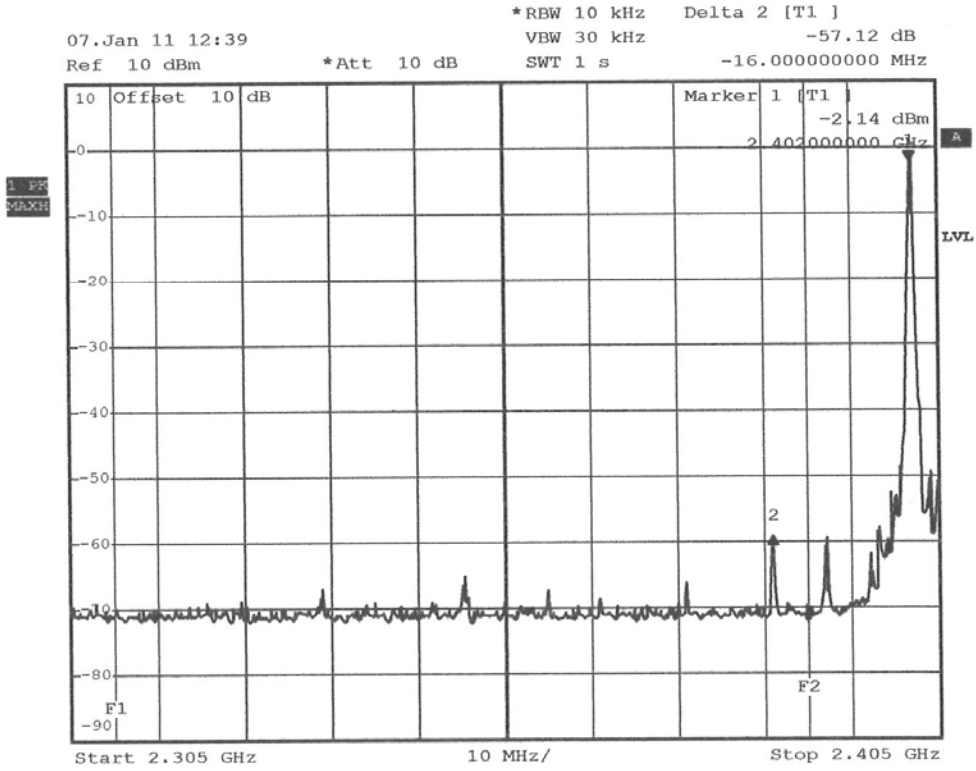
Sample n°1:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	105.2	Peak	2386	-57.1	48.1**	74	25.9
2480	103.3	peak	2491.324	-57.7	45.6**	74	28.4

* *Marker-Delta method*

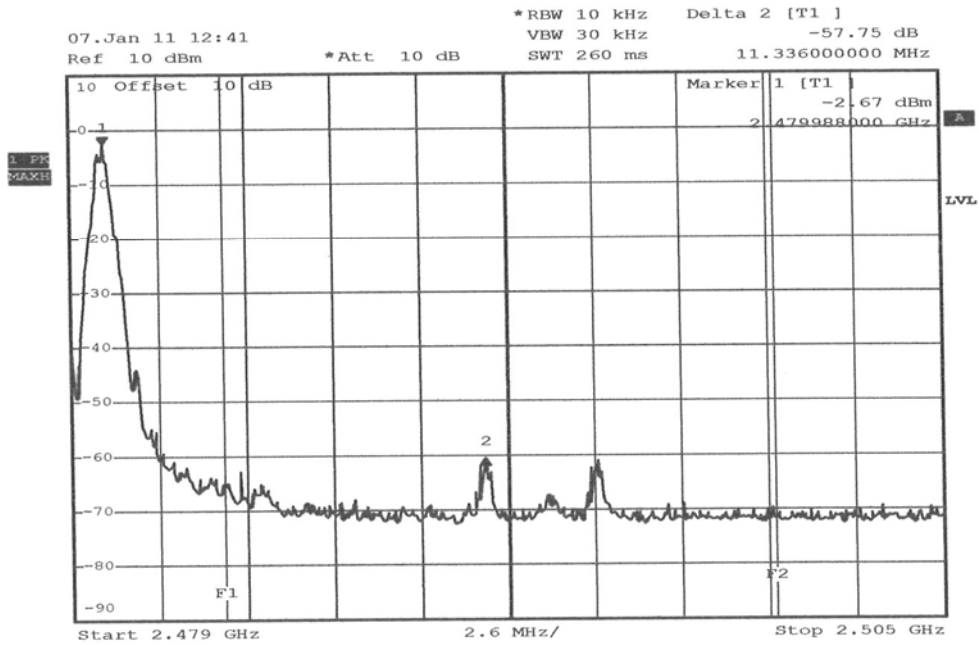
** *The peak level is lower than the average limit (54 dBμV/m).*

CURVE N°1



Date: 7.JAN.2011 12:39:30

CURVE N°2



Date: 7.JAN.2011 12:41:31

Test conclusion:

RESPECTED STANDARD

9. MAXIMUM PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer	Rohde & Schwarz FSP40	4088
Power meter	Gigatronics 8541B	3479
Power sensor	Gigatronics 80401A	3182
Power source	Hewlett Packard E3610A	4195
Multimeter	Fluke 77-2	0812
50 Ω -10 dB attenuator	Hewlett Packard 8491A	2506
Meteo station	Oregon Scientific AB888	1539

Test set up:

The measure is realized in conducted mode through a 50 Ω attenuator with a calibrated peak power responding power meter.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 17
Relative humidity (%): 53

Power source: 12 Vd.c

Sample n° 1

Channel 1 (lowest channel)

		P (W)	Limit (W)
Normal test conditions	Nominal power source (V): 12	3.16×10^{-3}	1

Channel 40 (middle channel)

		P (W)	Limit (W)
Normal test conditions	Nominal power source (V): 12	2.82×10^{-3}	1

Channel 79 (highest channel)

		P (W)	Limit (W)
Normal test conditions	Nominal power source (V): 12	2.57×10^{-3}	1

Test conclusion:

RESPECTED STANDARD

10. INTENTIONAL RADIATOR

Standard: FCC Part 15

Test procedure: paragraph 15.205
 paragraph 15.209
 paragraph 15.247 (d)

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESH3	1058
Test receiver	Rohde & Schwarz ESVS10	1219
Spectrum analyzer	Rohde & Schwarz FSP40	4088
Loop antenna	EMCO 6502	1406
Biconical antenna	Hewlett Packard 11966 C	0728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Double ridged guide antenna	Electrometrics EM 6961	1204
Low-noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter	Filtek HP12/3200-5AA	
Open area test site	EMITECH	1274
Power source	Hewlett Packard E3610A	4195
Multimeter	Fluke 77-2	0812
Meteo station	Bioblock Scientific meteostar	0943

Test set up:

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test (see test set-up photos in annex 6).

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency.

Bandwidth: 120 kHz (F < 1 GHz) or 100 kHz, following 15.205 or 15.247
 1 MHz (F > 1 GHz) or 100 kHz, following 15.205 or 15.247

Distance of antenna: between 30 m and 3 m according the frequencies and the limits.

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal, only the highest level is recorded.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 17.5
 Relative humidity (%): 54

Power source: 12 Vd.c

Channel 1 (lowest channel)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4804	P	245	200	1000	H	49.7	74*	24.3
7206	P	270	0	100	H	51.6	84.7	33.1

Channel 40 (middle channel)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4882	P	175	255	1000	H	49.5	74*	24.5
7323	P	245	175	1000	H	53.8	74*	20.2

Channel 79 (highest channel)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4960	P	170	260	1000	H	48.2	74*	25.8

* Restricted bands of operation in 15.205, this limit corresponding at the 15.209 section. All peak measurement results are below the average measurement limit (54 dBµV/m).

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 104.7 dBµV/m on channel 1.

So the applicable limit is 84.7 dBµV/m.

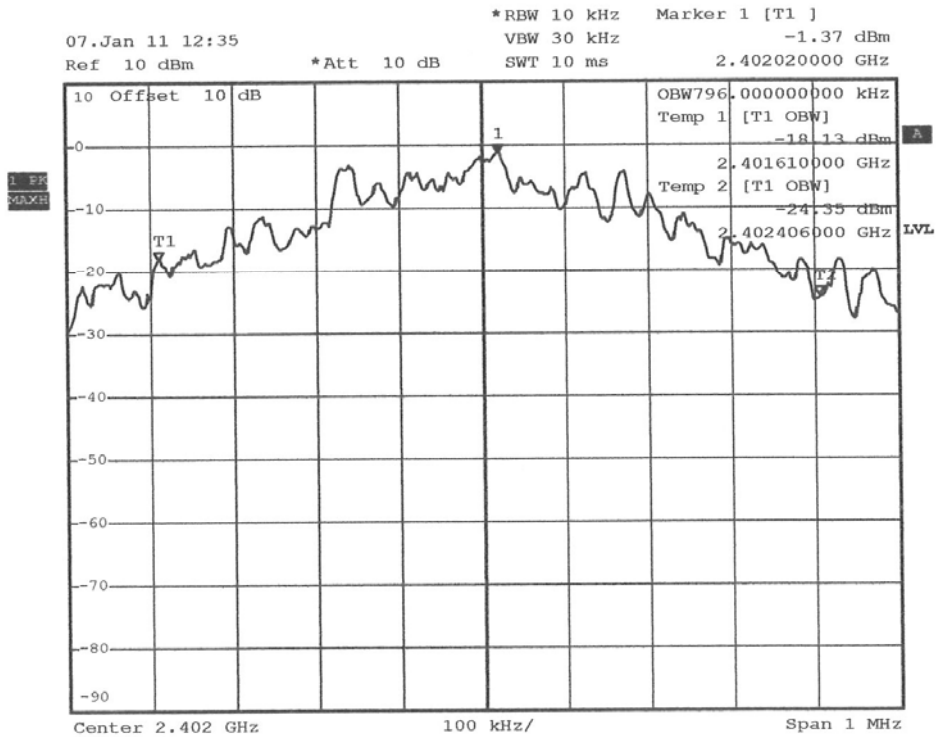
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Test conclusion:

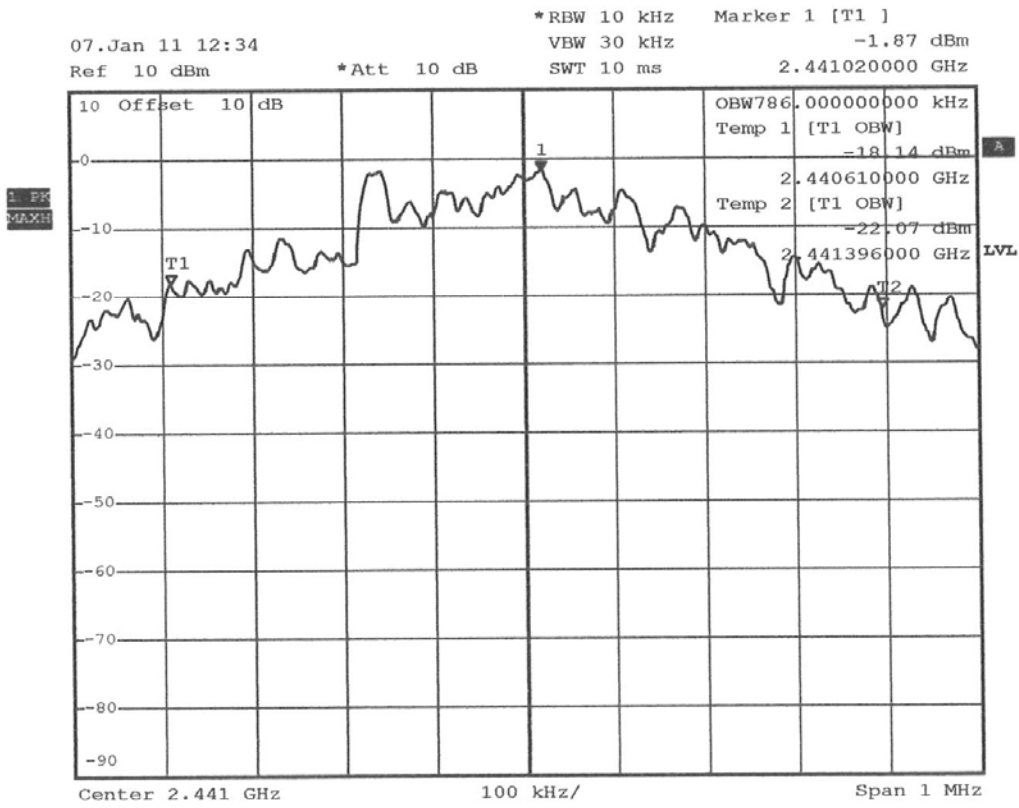
RESPECTED STANDARD

□□□ End of report, 6 annexes to be forwarded □□□

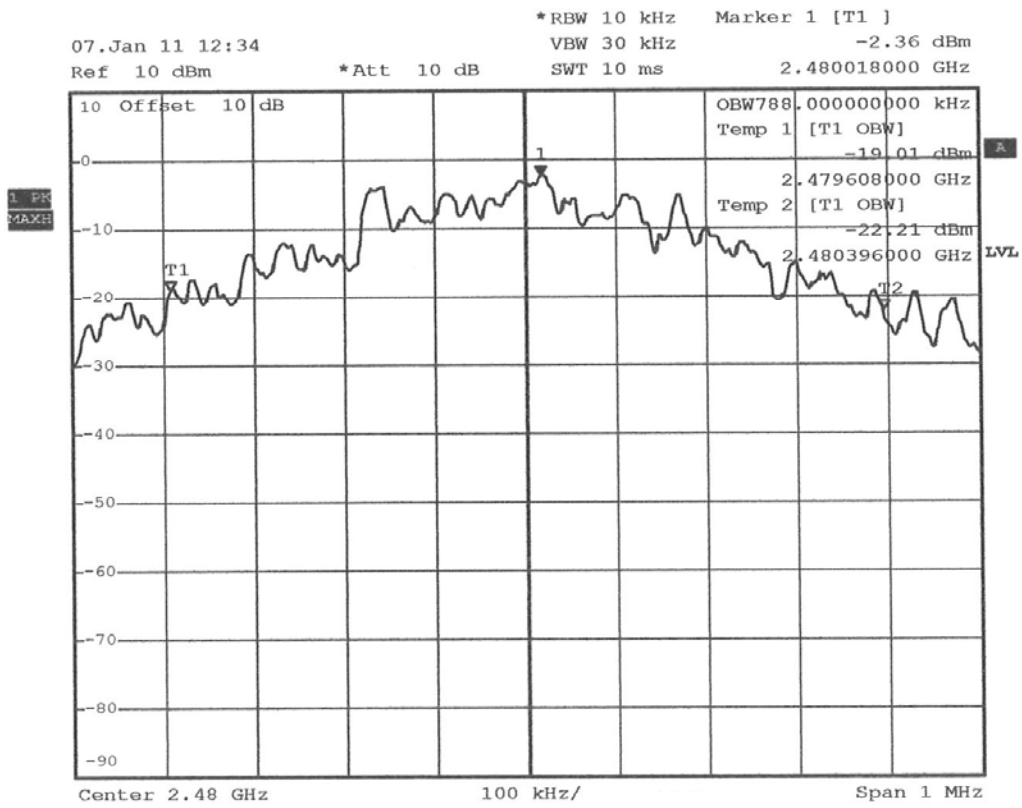
ANNEX 1: 20 dB BANDWIDTH AND CHANNEL SEPARATION



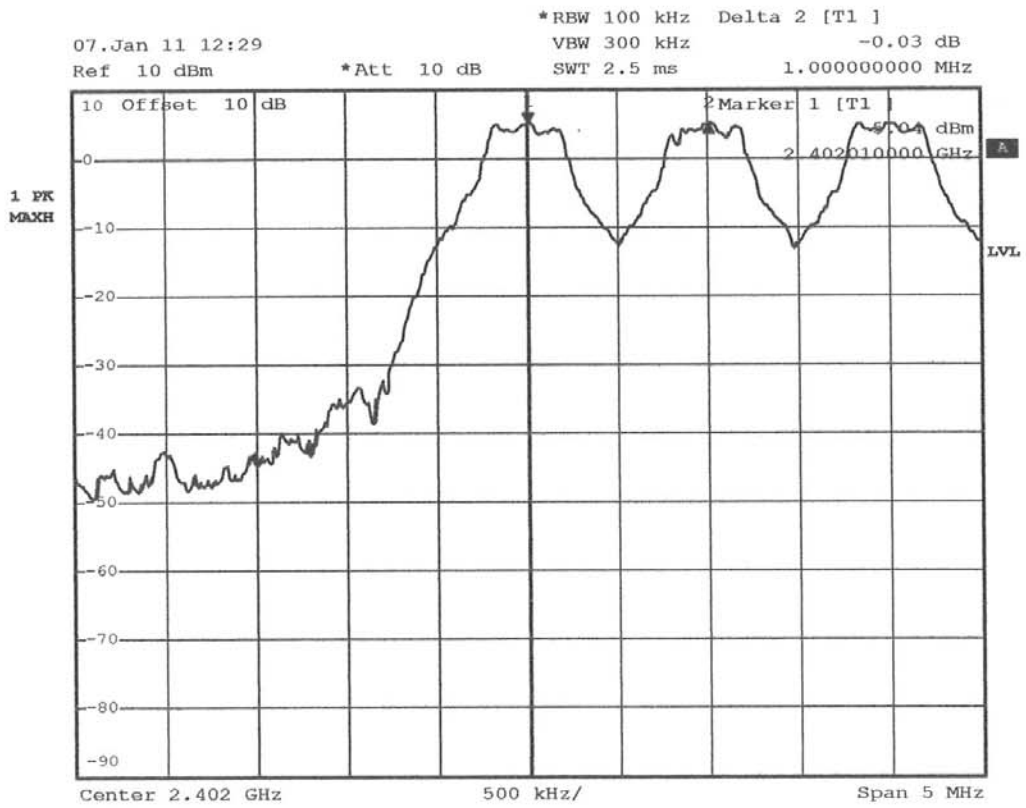
Date: 7.JAN.2011 12:35:25



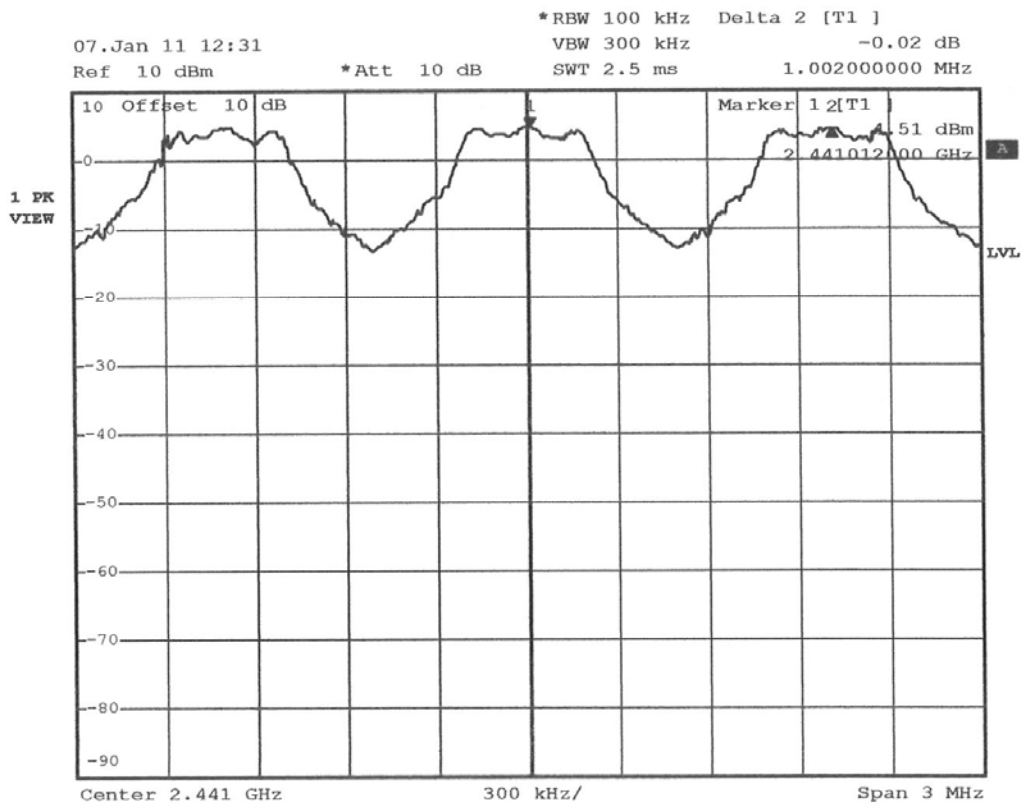
Date: 7.JAN.2011 12:34:58



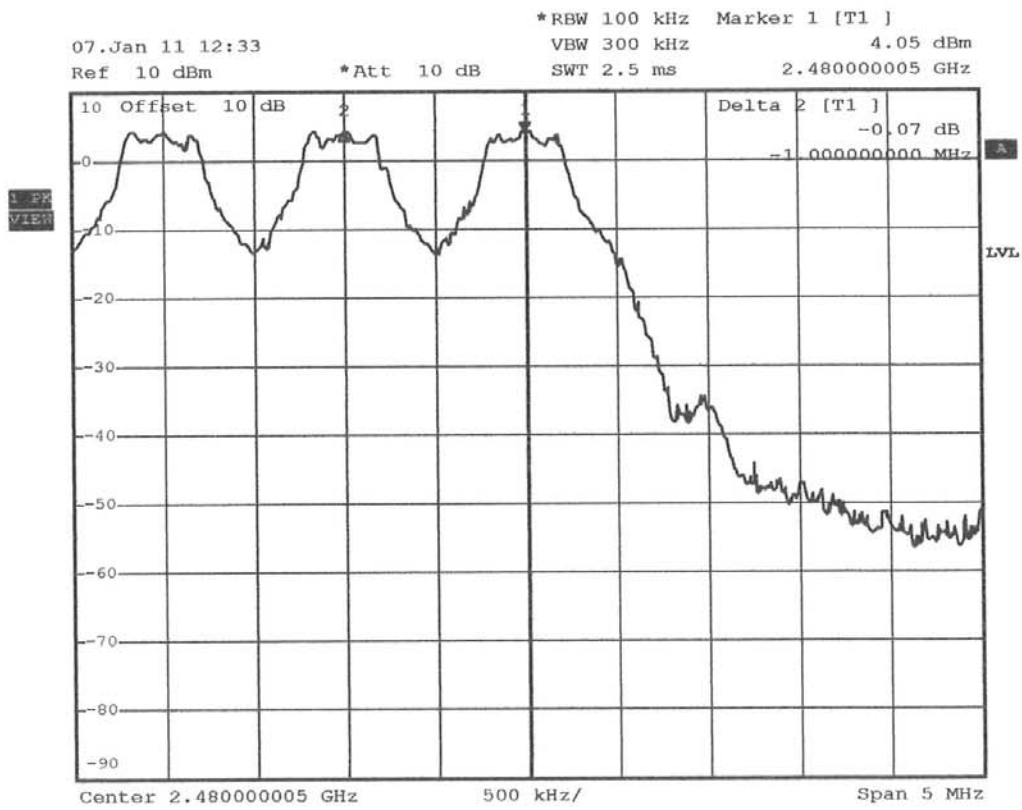
Date: 7.JAN.2011 12:34:06



Date: 7.JAN.2011 12:29:22

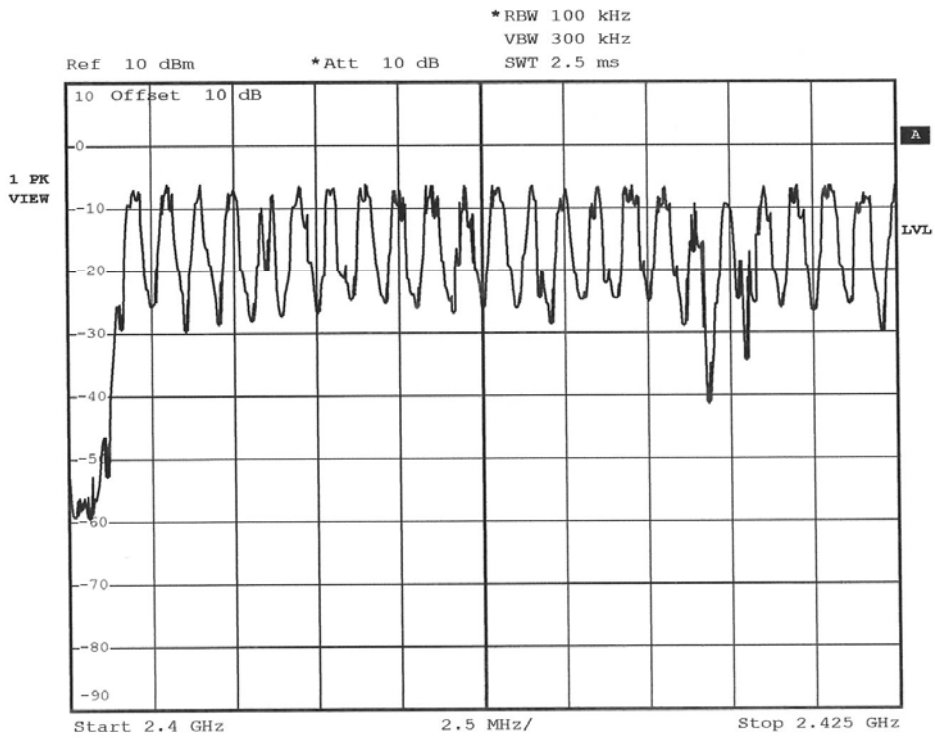


Date: 7.JAN.2011 12:31:25

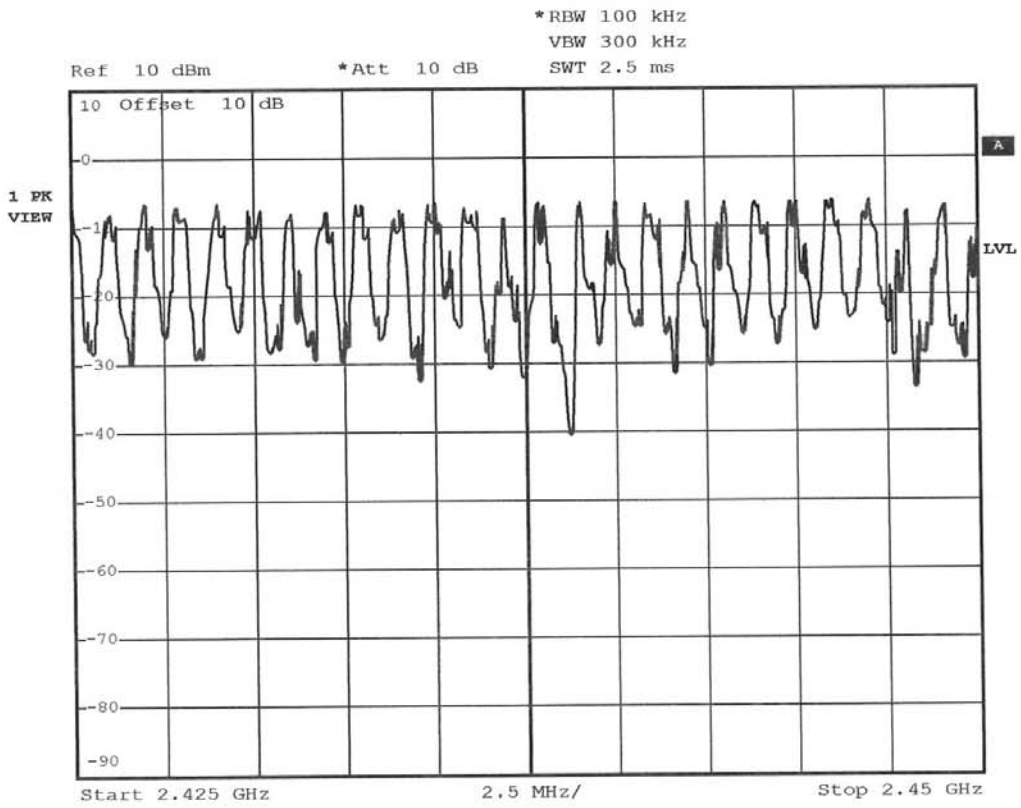


Date: 7.JAN.2011 12:33:27

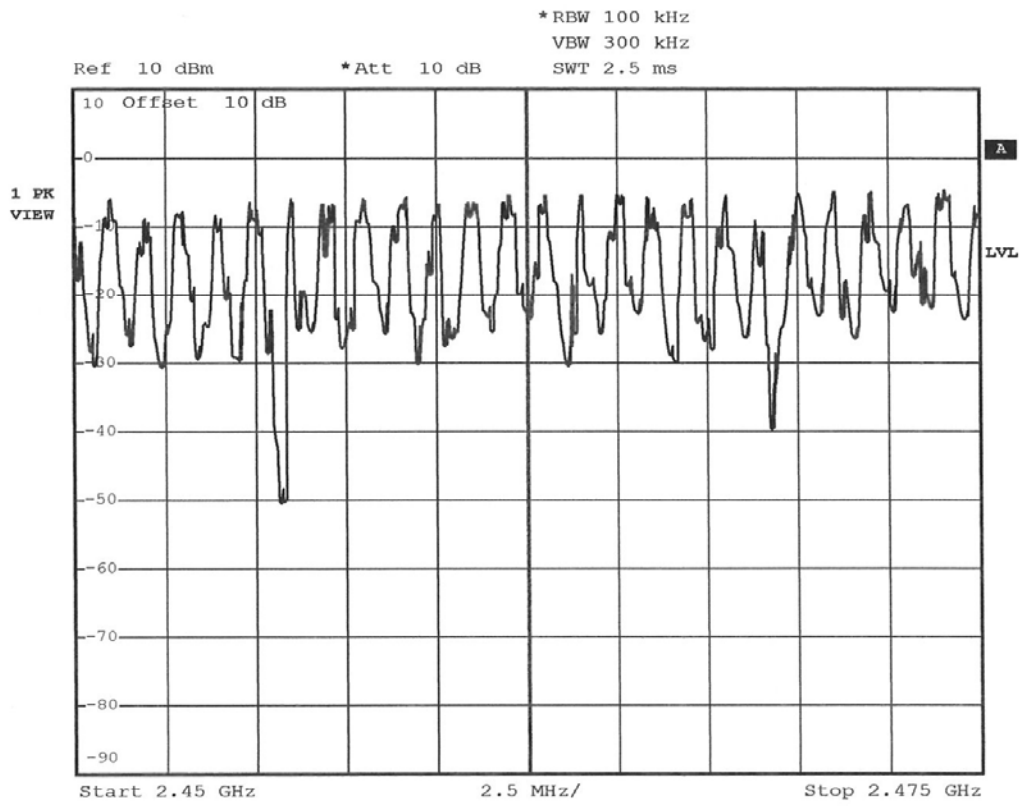
ANNEX 2: NUMBER OF HOPPING FREQUENCIES



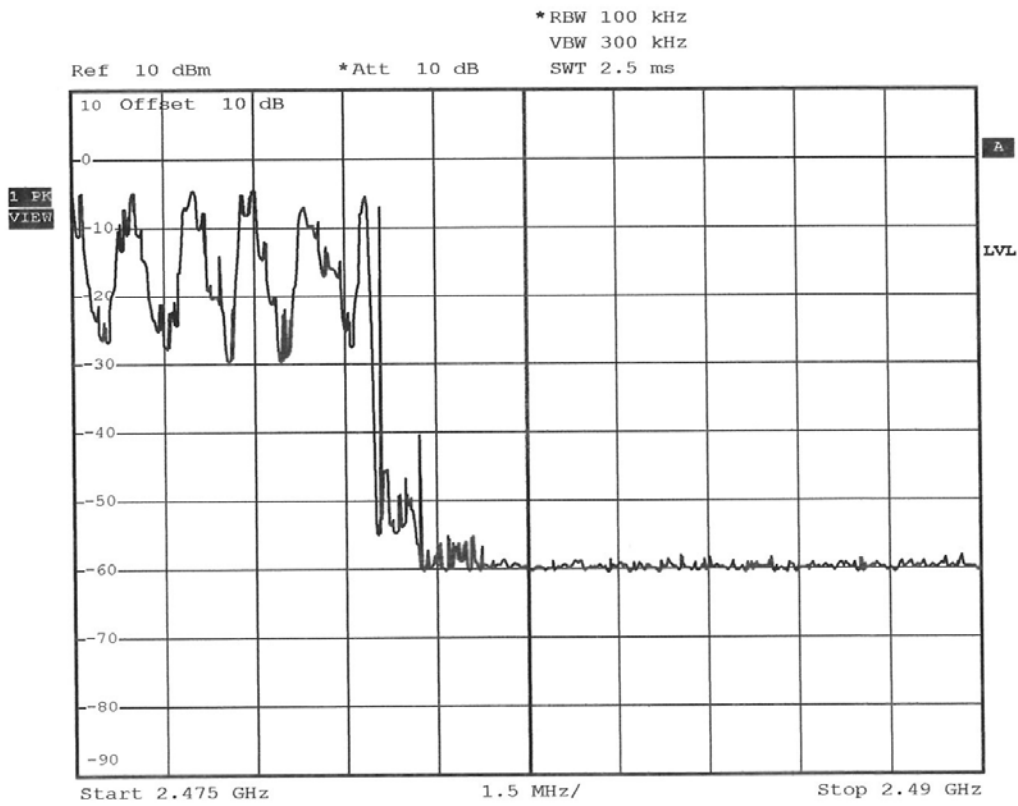
Date: 7.JAN.2011 10:27:27



Date: 7.JAN.2011 12:15:55

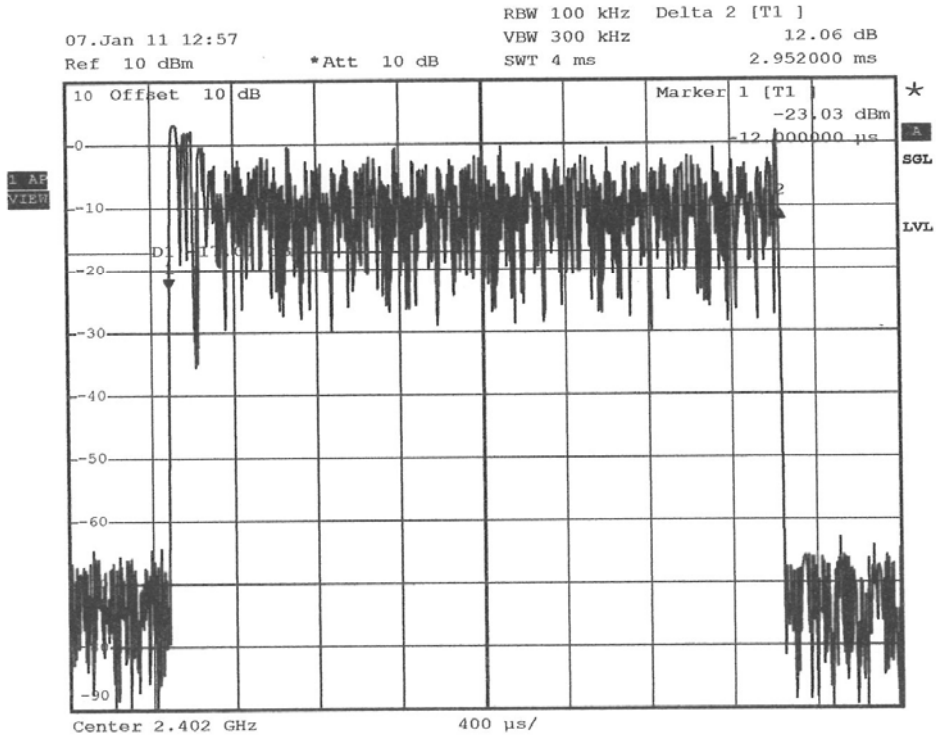


Date: 7.JAN.2011 11:33:30

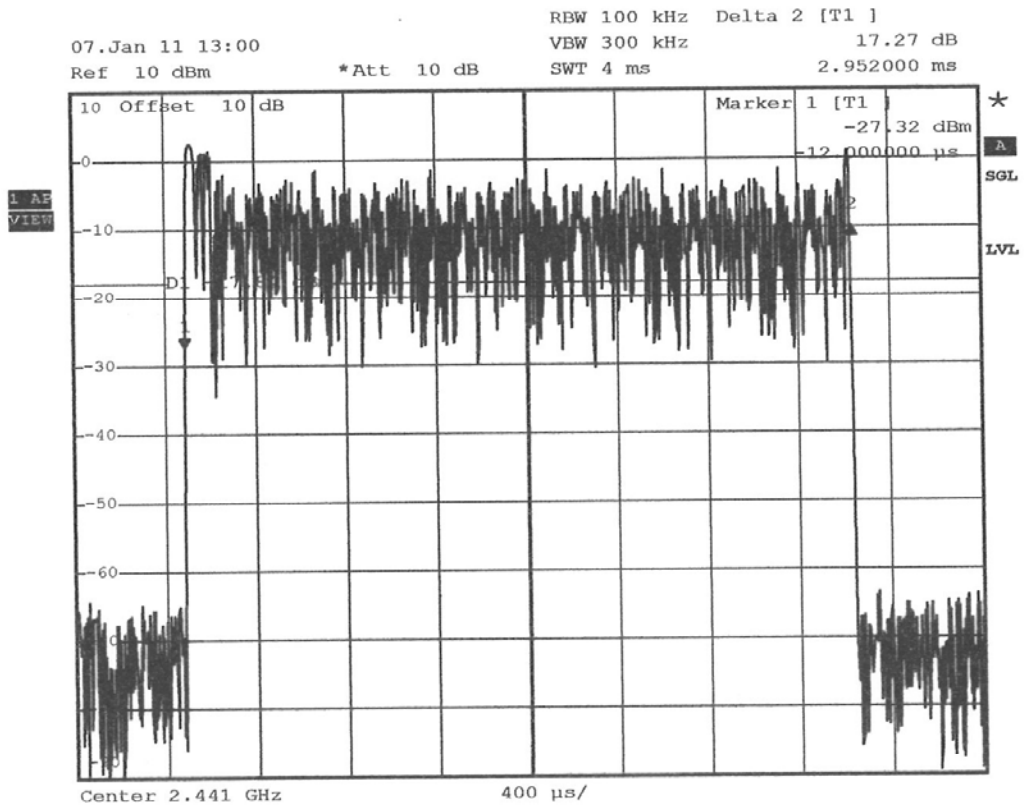


Date: 7.JAN.2011 11:57:50

ANNEX 3: DWELL TIME

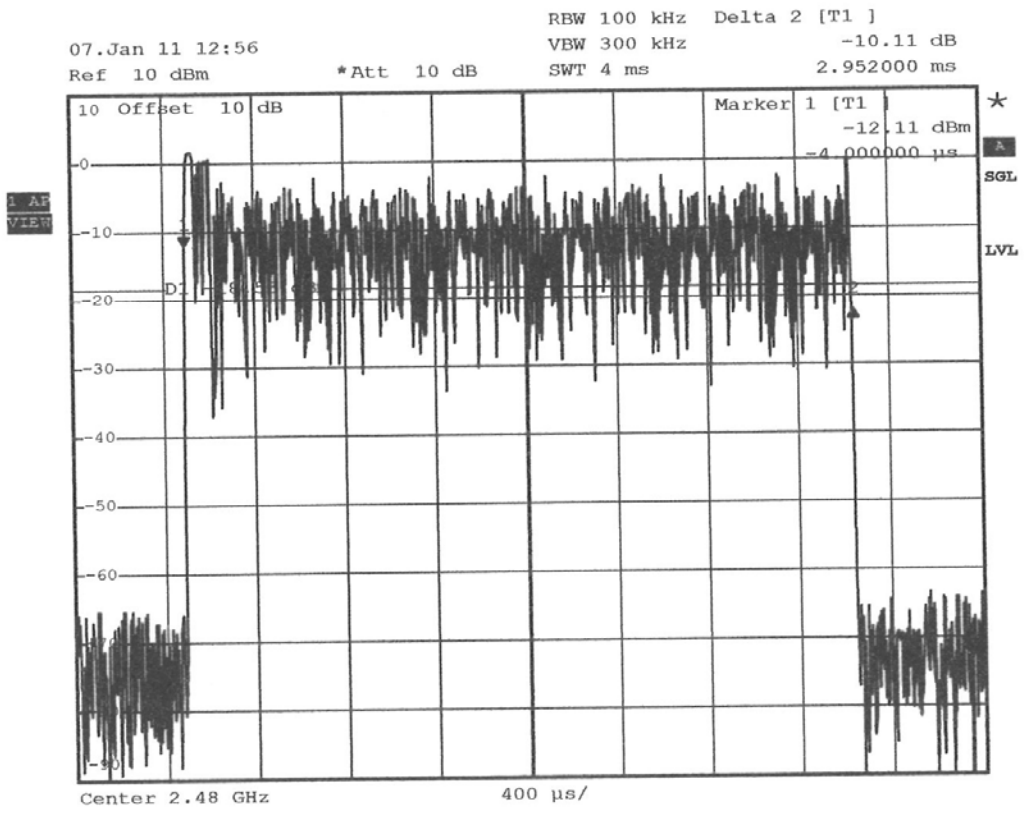


Date: 7.JAN.2011 12:57:28 3-DHS



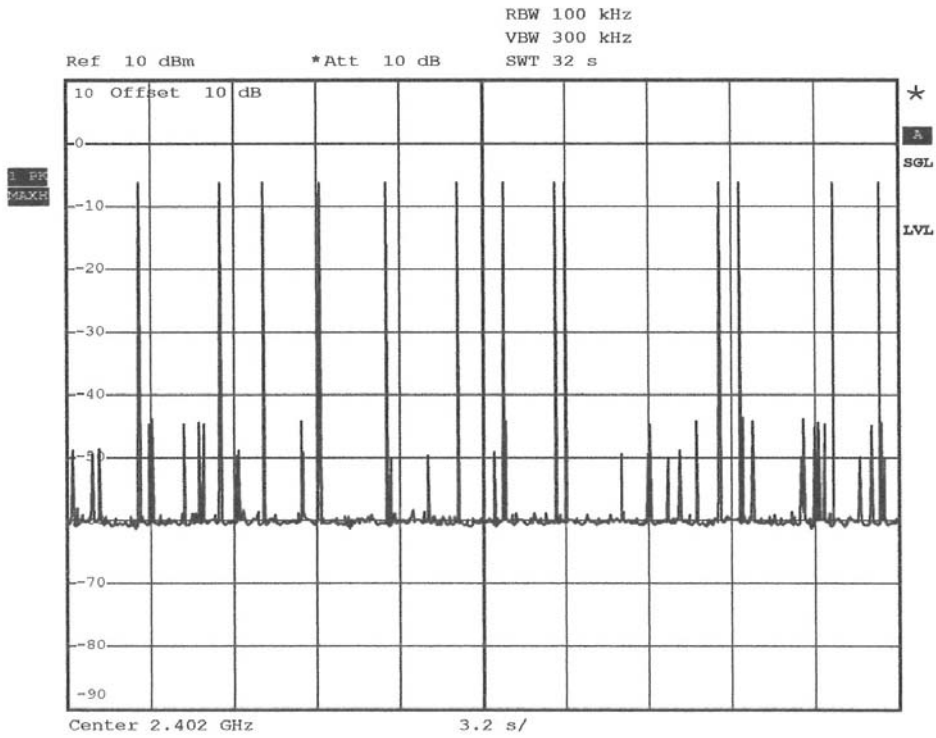
Date: 7.JAN.2011 13:00:41

3-DHS

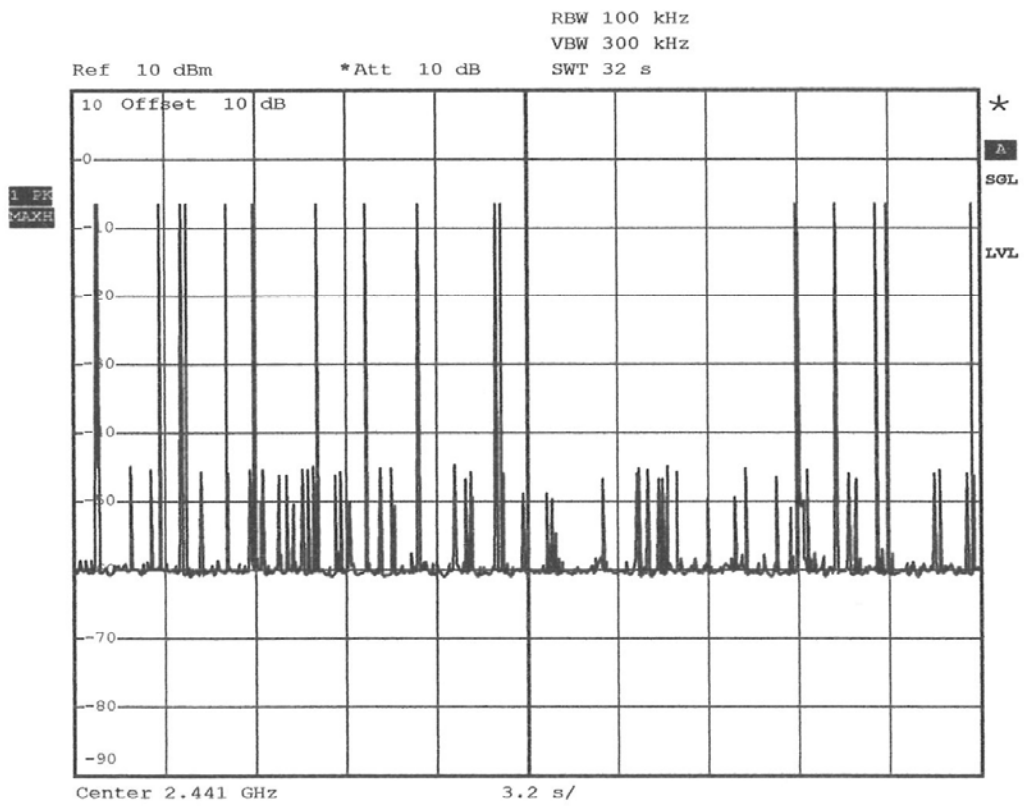


Date: 7.JAN.2011 12:56:31 3-DH5

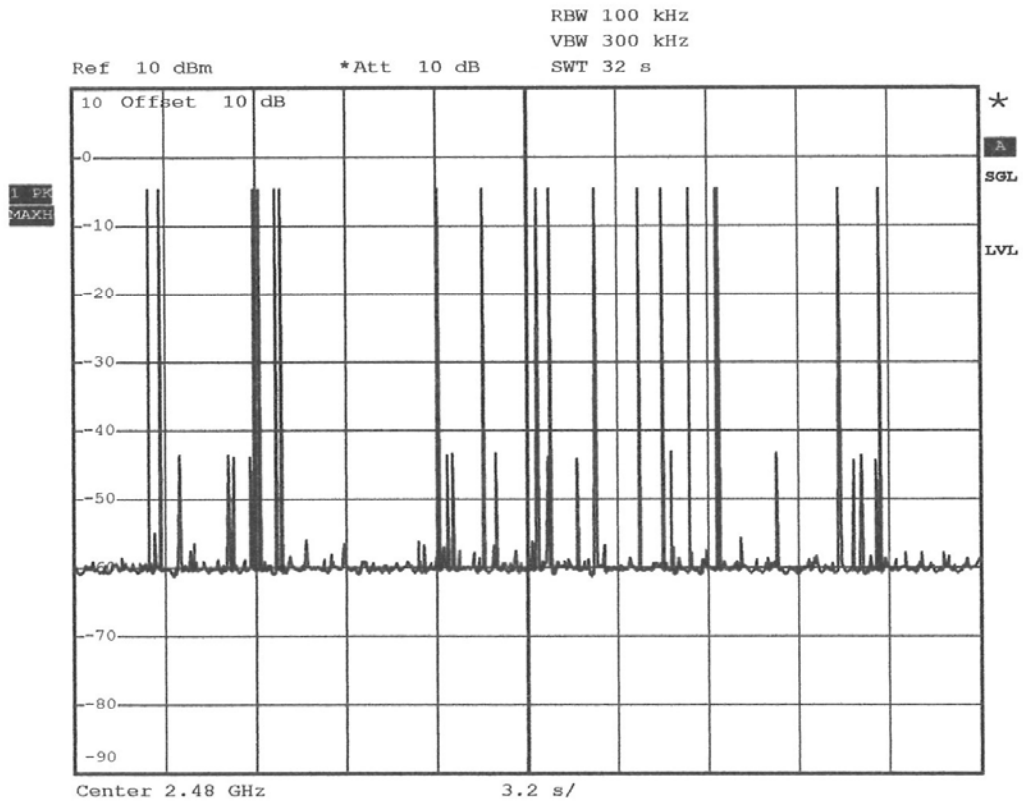
ANNEX 4: EQUAL HOPPING FREQUENCY USE



Date: 7.JAN.2011 12:19:15



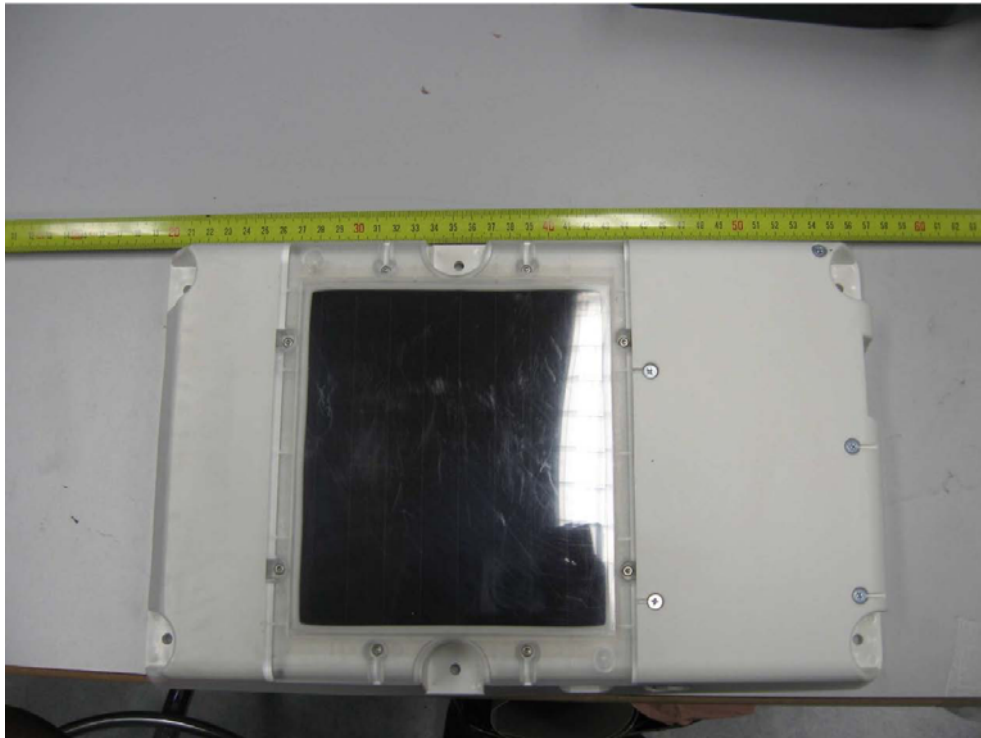
Date: 7.JAN.2011 12:22:44



Date: 7.JAN.2011 12:23:33

ANNEX 5: PHOTOS OF THE EQUIPMENT UNDER TEST

TOP VIEW OF THE EUT



BOTTOM VIEW OF THE EUT



INTERNAL VIEW

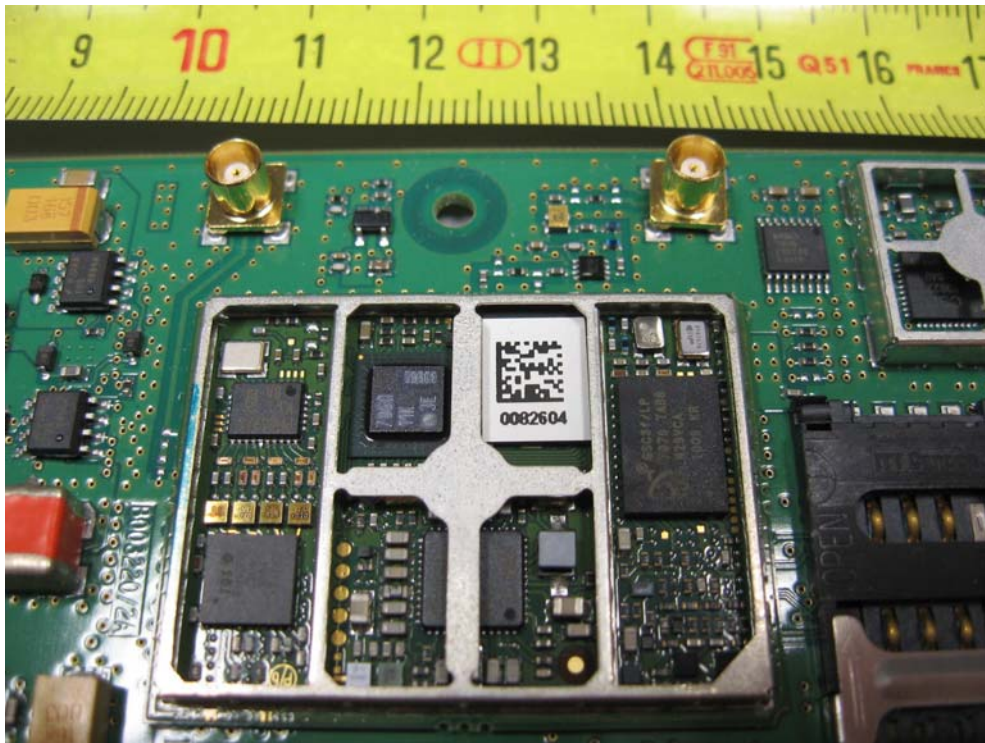


BT antenna

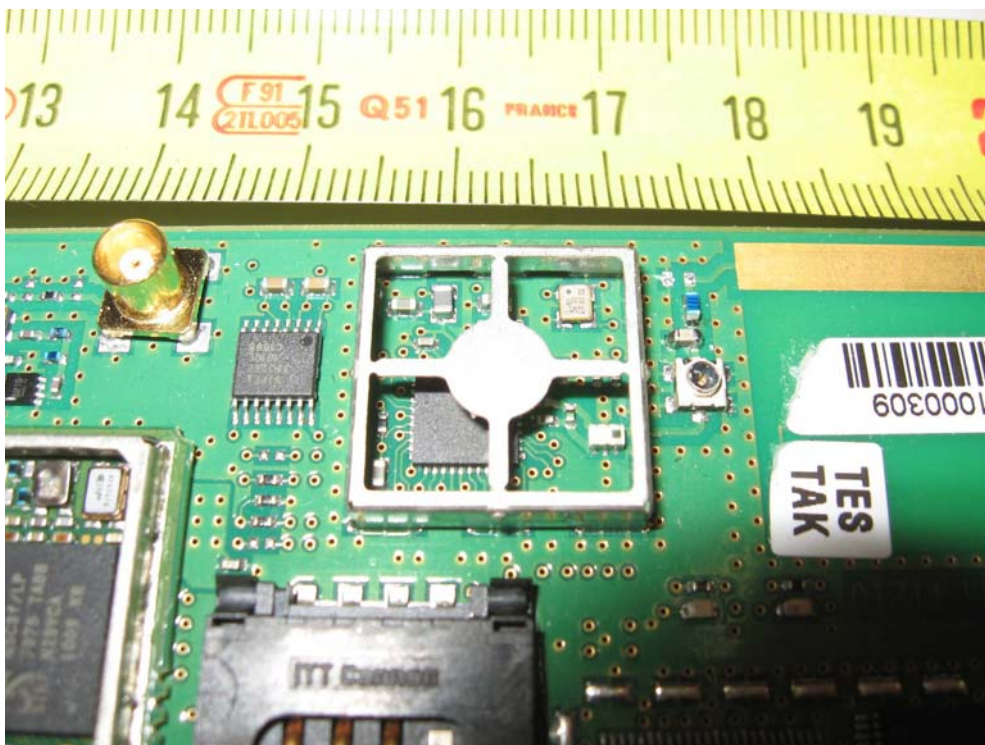
GSM antenna

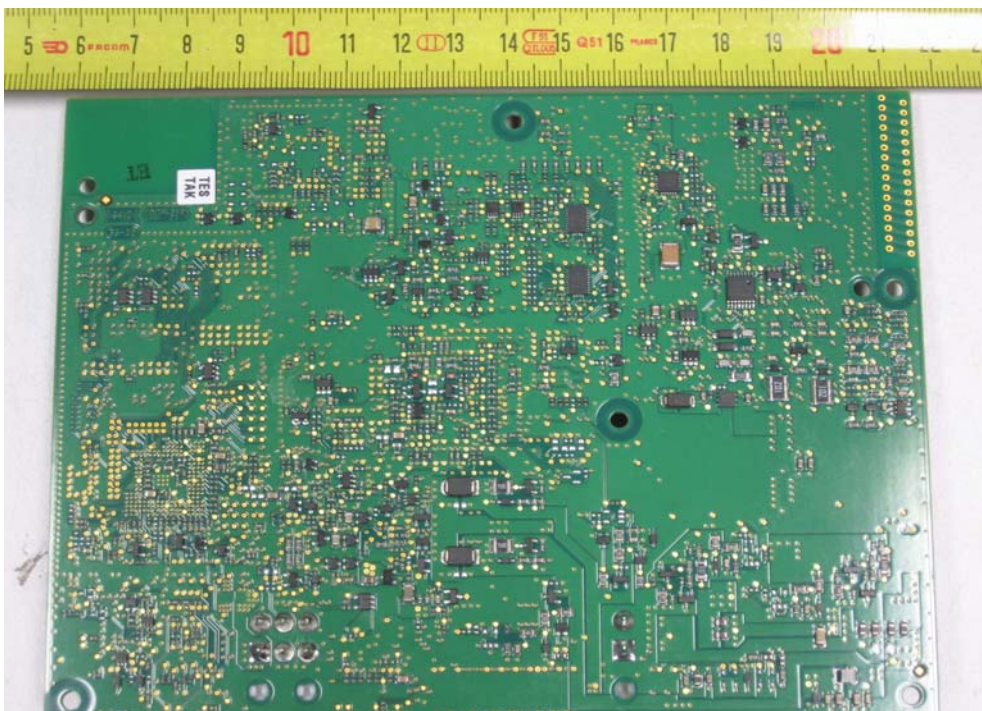
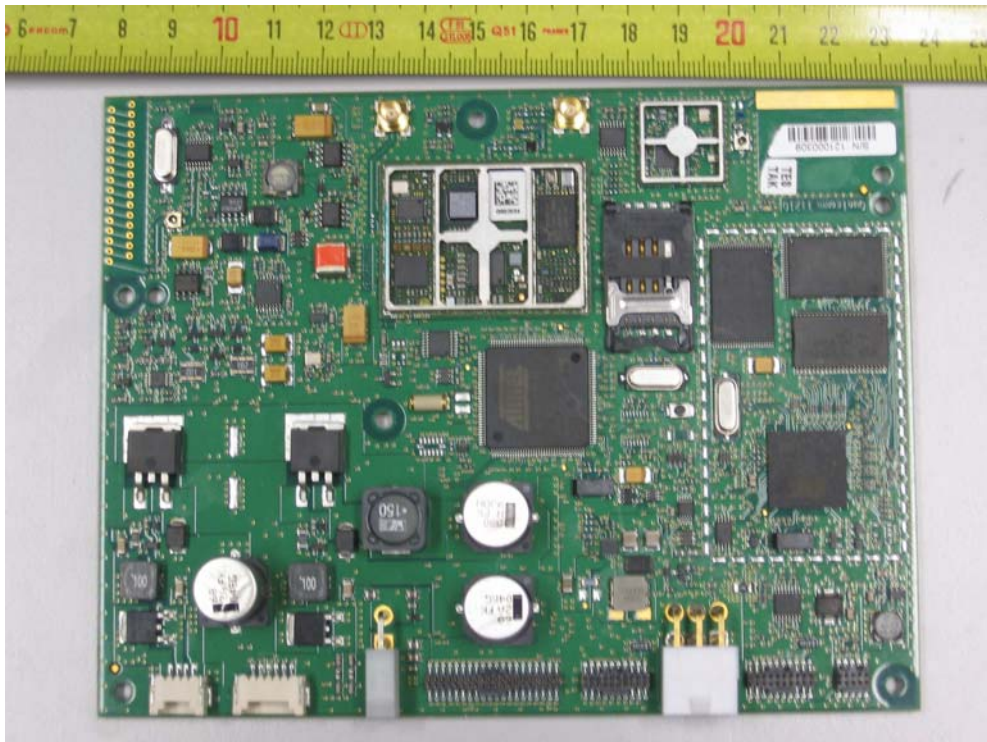
GPS antenna

GSM MODULE



BT MODULE





ANNEX 6: TEST SET UP AND OPEN AREA TEST SITE

RADIATED MEASUREMENTS



OPEN AREA TEST SITE

