797101-RA-4-A

RADIO test report

according to standard:
CFR 47 FCC Part 15 (2012)

Equipment under test:
TELEMATIC BOX FOR CAR-SHARING
Model: ZIBOX V3.2

FCC ID:
Z57-302111020

Company:
EILEO

DISTRIBUTION: Mr REMOND **Company: EILEO**

Number of pages: 25 including 3 annexes

Ed.	Date	Modified pages	Written by Name Visa	Technical Verification Quality Approval Name Visa
0	24-May-12	Creation	L. BERTHAUD LB	DUMESNIL M.

PRODUCT:	**TELEMATIC BOX FOR CAR-SHARING**
Reference / model:	ZIBOX V3.2
Serial number:	302 00 110831 00 00002
MANUFACTURER:	Goobie (FRANCE)

COMPANY SUBMITTING THE PRODUCT:

Company:	EILEO
Address:	3 impasse de la planchette 75003 PARIS FRANCE
Responsible:	Mr REMOND

TECHNICAL SUPPORT:

Company:	Goobie
Address:	23 avenue Louis Bréguet 78140 Vélizy-Villacoublay FRANCE
Responsible:	Mr HERMANT

DATE(S) OF TEST:	14, 16 and 19 September 2011 28 February 2012 03 April 2012
TESTING LOCATION:	EMITECH ATLANTIQUE laboratory at JUIGNE SUR LOIRE (49) FRANCE FCC 2.948 Listed Site Registration Number: 90469 EMITECH ATLANTIQUE laboratory at BEAUCOUZE (49) FRANCE FCC 2.948 Listed Site Registration Number: 101696
TESTED BY:	A. ABBASSI O. ROY

CONTENTS

TITLE **PAGE**

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: TELEMATIC BOX FOR CAR-SHARING – Model: ZIBOX V3.2 in accordance with normative reference.

The equipment under test integrates a GSM/GPRS module (FCC ID: QIPPH8) and a WiFi/Bluetooth module (FCC ID: U9R-W2CBW003) both already certified under single modular approval rules.

This test report concerns the Zigbee 802.15.4 function of the device under test.

2. PRODUCT DESCRIPTION

ITU Emission code:	5M00G1D
Class:	B (residential environment)
Utilization:	car-mounted device for fleet management automation
Antenna type and gain:	integral antenna, unknown gain
Operating frequency range:	from 2045 MHz to 2480 MHz
Number of channels:	16
Channel spacing:	5 MHz
Frequency generation:	synthesizer
Modulation:	Zigbee 802.15.4
Power source:	12 Vd.c. (vehicle battery)

Power level, frequency range and channels characteristics are not user adjustable.

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.

CFR47 FCC Part 15 (2012)	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.
558074 D01 DTS v01	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 FCC 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. TEST EQUIPMENT CALIBRATION DATES

Emitech number	Model	Type	Last verification	Next verification	Validity
8523	R&S FSEM30	spectrum analyzer	16/05/2011	16/05/2012	16/07/2012
8530	CBL6112A	Bilog antenna	11/06/2011	11/06/2013	11/08/2013
8534	3115	Guide antenna	15/03/2011	15/03/2013	15/05/2013
8592	SIDT	semi-anechoic chamber	12/12/2010	12/12/2012	12/02/2013
8677	IDM106N	Multimeter	05/01/2011	05/01/2013	05/03/2013
8703	HF	Low-noise amplifier	19/10/2011	19/10/2012	19/12/2012
8707	R&S ESPI7	Test receiver	02/06/2011	02/06/2012	02/08/2012
8896	GPS8	GPS receiver	/	/	*
8749	WS-9232	Meteo station	29/04/2010	29/04/2012	29/06/2012

** The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.*

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				*Note*
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable NAs: Not Asked

Note: All RF modules are set in standby/idle mode during this test.

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				*Note 1*
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				*Note 2, Note 3*
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.247 frequency bands	X				*Note 4*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems			X		
	(a) (2) Digital modulation techniques	X				*Note 5*
	(b) Maximum peak output power	X				*Note 6*
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system			X		
	(g) Frequency hopping requirements			X		
	(h) Frequency hopping intelligence			X		
	(i) RF exposure compliance	X				*Note 7*

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.247 (d).

Note3: This test includes co-location measurements.

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 5: The minimum 6 dB bandwidth of the equipment is 1563.1 kHz (see annex 1).

Note 6: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.

*Note 7: PSD= E.I.R.P./4*π*R^2= /4*π*(20 cm)²= 0.002 mW/cm² (limit= 1 mW/cm²).*
The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of CFR 47 FCC Part 1 (§1.1310).

Conclusion:

The sample of TELEMATIC BOX FOR CAR-SHARING – Model : ZIBOX V3.2 submitted to the tests complies with the regulations of the standard CFR 47 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
Semi-anechoic chamber 11mx7mx5m	SIDT	8592
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
EMI receiver ESI7	Rohde & Schwarz	8707
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
Antenna Bilog CBL 6112A	CHASE	8530
Horn antenna 1-18GHz 3115	EMCO	8534
Amplifier 0.5-18GHz S005180L3201	LUCIX Corporation	8703
Power source MC2030BCD	P. FONTAINE	-
Multimeter IDM106N	ISO-TECH	8677
Small meteorological station WS9232	La Crosse Technology	8749

Test set up:

The system is tested in a semi-anechoic chamber. The test unit is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuths correspond to the front of the device under test.

See photos in annex 3.

Frequency range: From 30 MHz 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):	21
Relative humidity (%):	36

Power source: 13.2 Vd.c. provided by an external stabilized power source

Not any spurious has been detected.

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 FSP 40	Rohde & Schwarz	4088
Double ridged guide antenna EM 6961	Electrometrics	1204
Power source E3610A	Hewlett Packard	4195
Multimeter 77-2	Fluke	0812

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): 20.5
Relative humidity (%): 33

Power source: 13.2 Vd.c. provided by an external stabilized power source

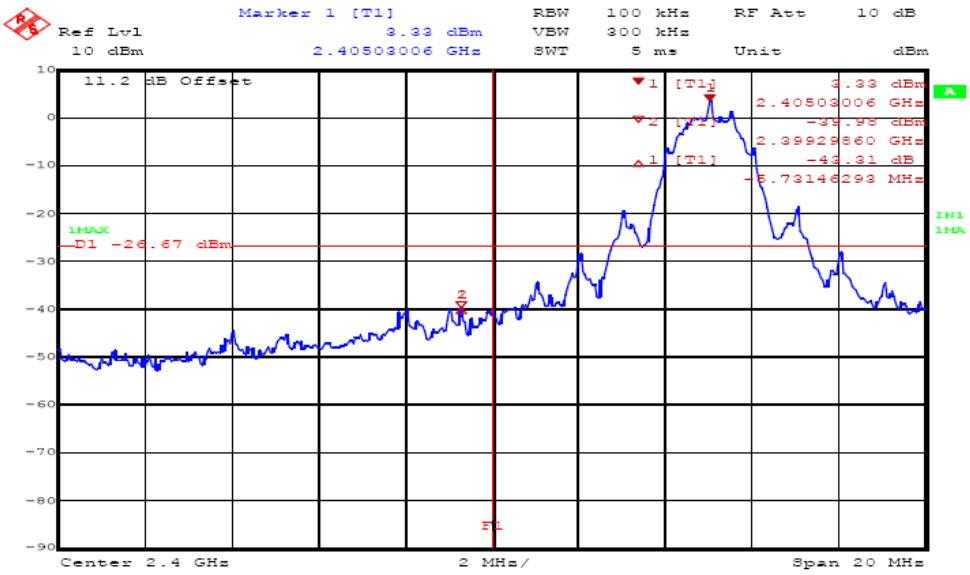
Sample n°1:

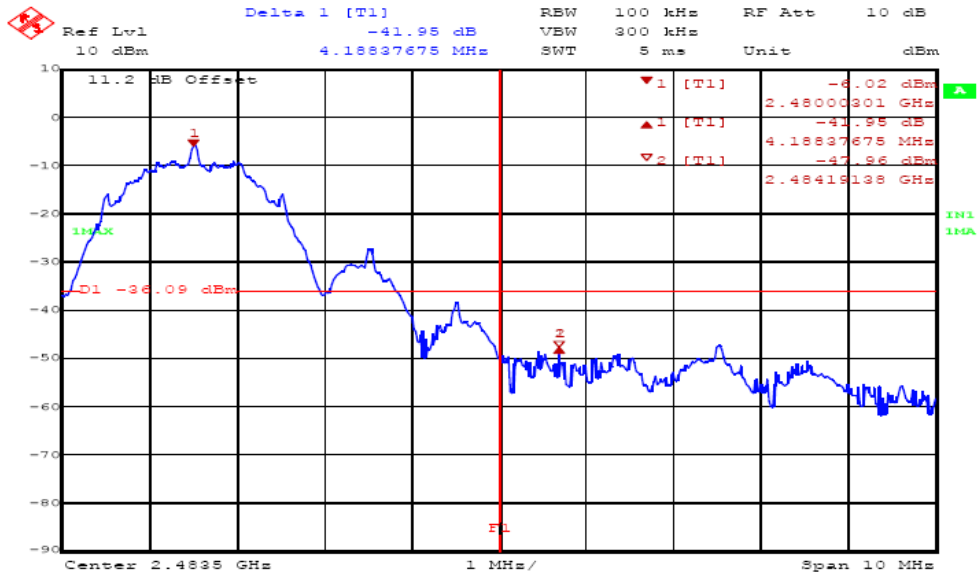
Lower Band Edge: 2400 MHz
Upper Band Edge: 2483.5 MHz

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)
2405	89.6	Peak	2399.3	-43.3	46.3	74**	27.7
2480	92.5	Peak	2484.2	-41.9	50.6	74**	23.4

* *Marker-Delta method*

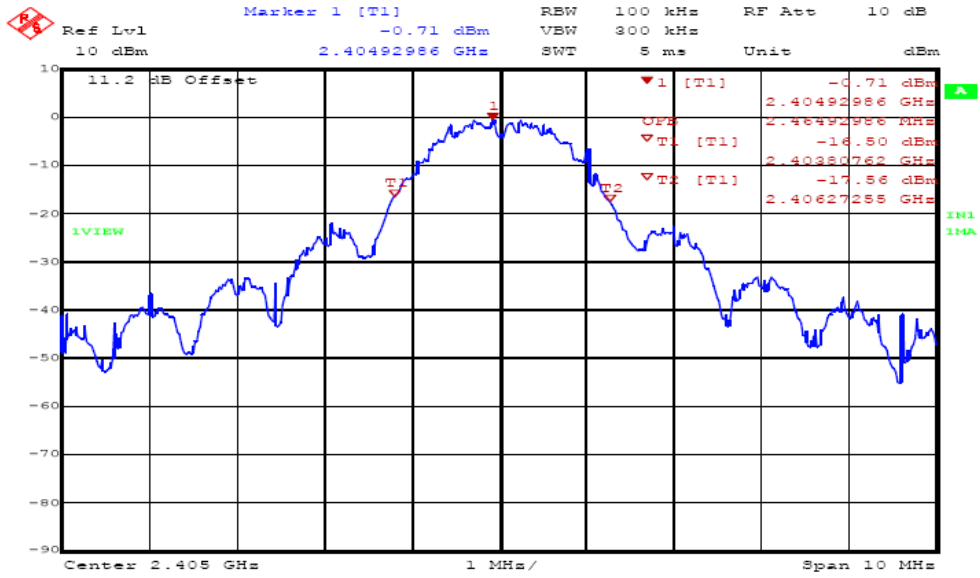
** *The peak level is lower than the average limit (54 dBµV/m).*



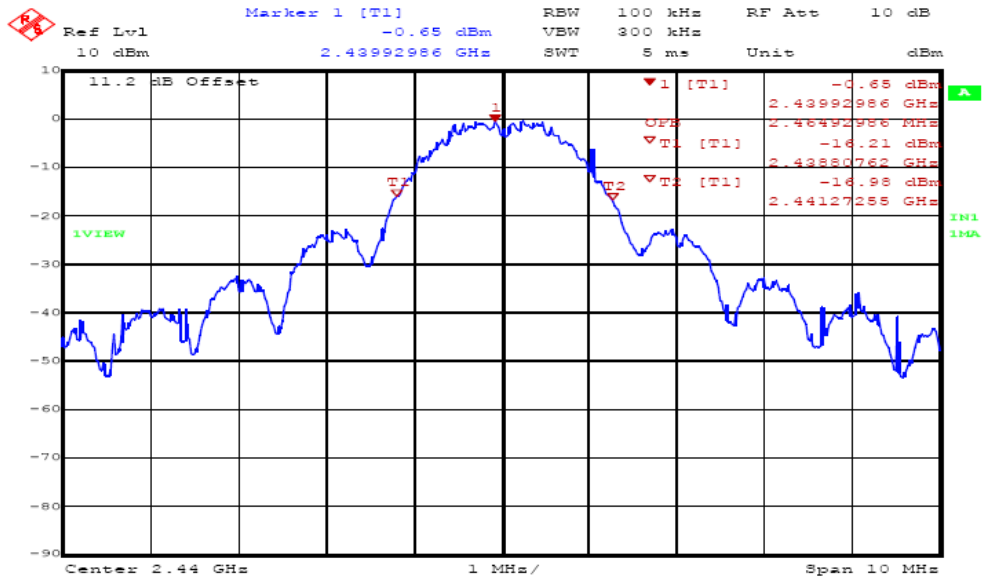


20 dB bandwidth:

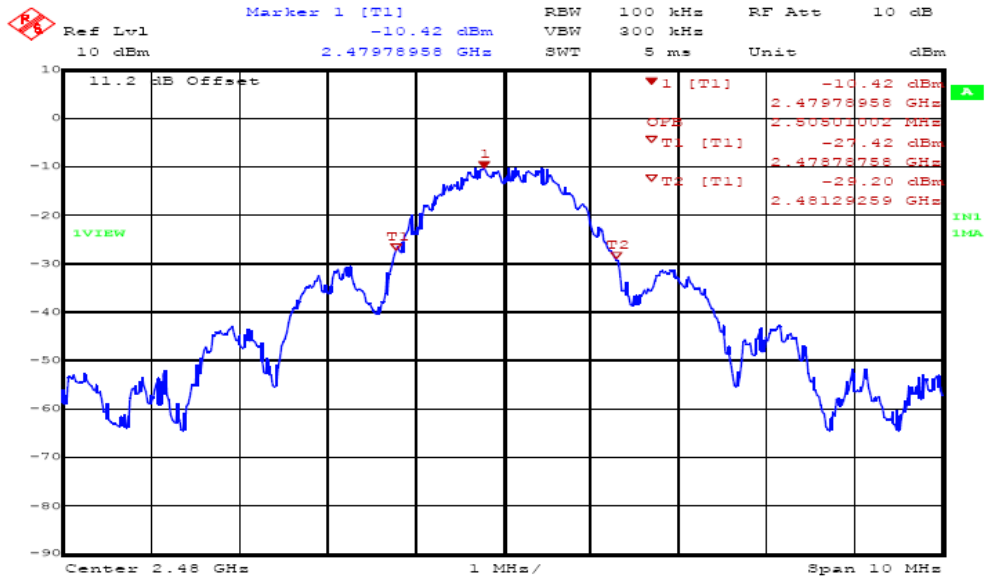
Lowest channel (channel 11 : 2045 MHz)



Central channel (channel 18 : 2440 MHz)



Highest channel (channel 26 : 2480 MHz)



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
Semi-anechoic chamber 11mx7mx5m	SIDT	8592
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
Horn antenna 1-18GHz 3115	EMCO	8534
Power source MC2030BCD	P. FONTAINE	-
Multimeter IDM106N	ISO-TECH	8677
Small meteorological station WS9232	La Crosse Technology	8749

Test set up:

The system is tested in a semi-anechoic chamber. The test unit is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuth corresponds to the front of the device under test.

The measurement of the electro-magnetic field is realized, with a resolution and video bandwidth adjusted at 10 MHz (measurement procedure PK1 of 558074).

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

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

Results:

Ambient temperature (°C): 21
Relative humidity (%): 36

Power source: 13.2 Vd.c. provided by an external stabilized power source

Sample n° 1

Lowest channel (channel 11 : 2405 MHz)

	Electro-magnetic field (dBµV/m):	Conducted power (W)*	Limit (W)
Nominal supply voltage:	89.6	$2.7 * 10^{-4}$	1

Polarization of test antenna: horizontal (height: 150 cm)
Position of equipment: see photos in annex 3 (azimuth: 90 degrees)

Central channel (channel 18 : 2440 MHz)

	Electro-magnetic field (dBµV/m):	Conducted power (W)*	Limit (W)
Nominal supply voltage:	91.1	$3.9 * 10^{-4}$	1

Polarization of test antenna: horizontal (height: 150 cm)
Position of equipment: see photos in annex 3 (azimuth: 90 degrees)

Highest channel (channel 26 : 2480 MHz)

	Electro-magnetic field (dBµV/m):	Conducted power (W)*	Limit (W)
Nominal supply voltage:	92.5	$5.3 * 10^{-4}$	1

Polarization of test antenna: horizontal (height: 150 cm)
Position of equipment: see photos in annex 3 (azimuth: 90 degrees)

** $P = (E \times d)^2 / (30 \times Gp)$ with $d = 3$ m and $Gp = 1$*

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
Semi-anechoic chamber 11mx7mx5m	SIDT	8592
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
EMI receiver ESI7	Rohde & Schwarz	8707
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
Antenna Bilog CBL 6112A	CHASE	8530
Horn antenna 1-18GHz 3115	EMCO	8534
Amplifier 0.5-18GHz S005180L3201	LUCIX Corporation	8703
Power source MC2030BCD	P. FONTAINE	-
Multimeter IDM106N	ISO-TECH	8677
Small meteorological station WS9232	La Crosse Technology	8749

Test set up:

The system is tested in a semi-anechoic chamber. The test unit is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuths correspond to the front of the device under test.

See photos in annex 3.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency used (2480 MHz).

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

Bandwidth: 120 kHz (F < 1 GHz) 100 kHz / 1 MHz (F > 1 GHz)

Distance of antenna: 3 / 10 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 under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21
Relative humidity (%): 36

Power source: 13.2 Vd.c. provided by an external stabilized power source

Sample n° 1

Lowest channel (channel 11 : 2405 MHz)

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)
4809.6	P	150	90	1000	V	45.7	74*	28.3
4809.6	Av	150	90	1000	V	34.9	54*	19.1

Central channel (channel 18 : 2440 MHz)

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)
4879.5	P	150	90	1000	V	48.1	74*	25.9
4879.5	Av	150	90	1000	V	36.9	54*	17.1

Highest channel (channel 26 : 2480 MHz)

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)
4959.4	P	150	90	1000	V	47.9	74*	26.1
4959.4	Av	150	90	1000	V	35.5	54*	18.5

* restricted bands of operation in 15.205

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

Test conclusion:

RESPECTED STANDARD

11. PEAK POWER DENSITY

Standard: FCC Part 15

Test procedure: paragraph 15.247 (e)

Test equipments used:

TYPE	MANUFACTURER	EMITECH NUMBER
Semi-anechoic chamber 11mx7mx5m	SIDT	8592
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
Horn antenna 1-18GHz 3115	EMCO	8534
Power source MC2030BCD	P. FONTAINE	-
Multimeter IDM106N	ISO-TECH	8677
Small meteorological station WS9232	La Crosse Technology	8749

Test set up:

The system is tested in a semi-anechoic chamber. The test unit is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuth corresponds to the front of the device under test.

The measurement of the peak power spectral density is realized, with a resolution bandwidth of 100 kHz and a resolution bandwidth of 300 KHz with a Peak detector (measurement procedure PKPSD of 558074).

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

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

Results:

Ambient temperature (°C): 21
Relative humidity (%): 36

Power source: 13.2 Vd.c. provided by an external stabilized power source

Sample n° 1

Lowest channel (channel 11 : 2405 MHz)

	Peak power density at frequency: 2405 MHz
Normal test conditions	-5.6 dBm
Limits	+8 dBm

Central channel (channel 18 : 2440 MHz)

	Peak power density at frequency: 2440 MHz
Normal test conditions	-4.1 dBm
Limits	+8 dBm

Highest channel (channel 26 : 2480 MHz)

	Peak power density at frequency: 2480 MHz
Normal test conditions	-2.7 dBm
Limits	+8 dBm

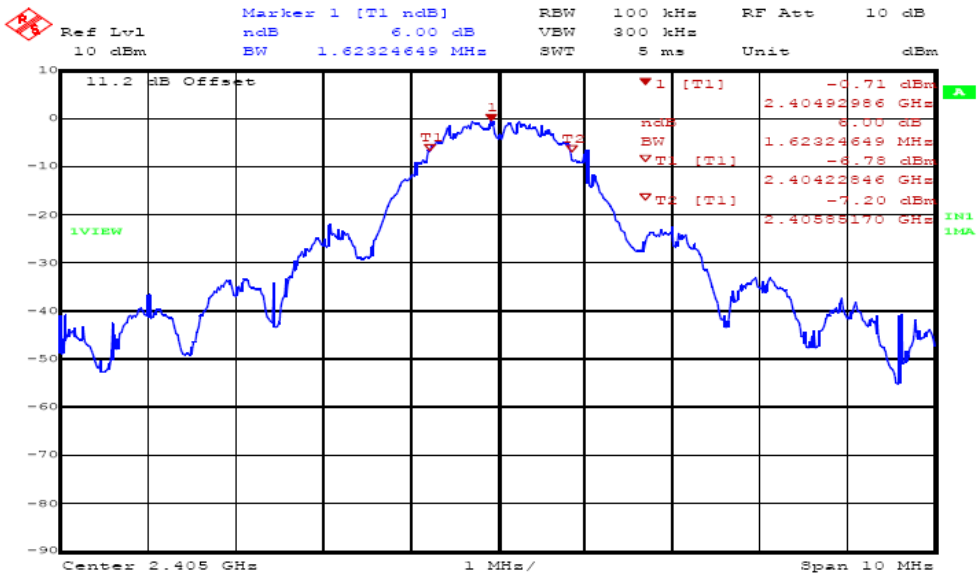
Test conclusion:

RESPECTED STANDARD

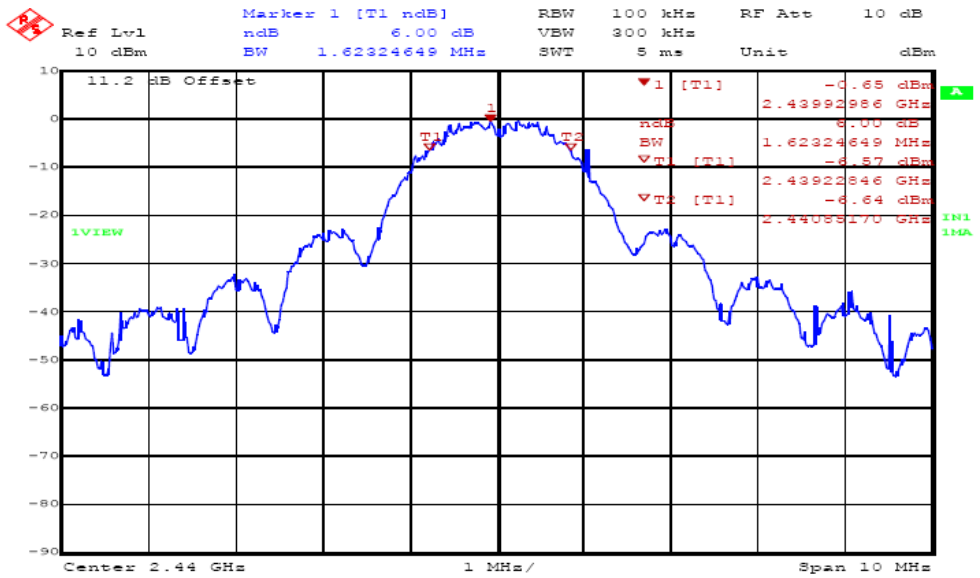
□□□ End of report, 3 annexes to be forwarded □□□

ANNEX 1 6 dB BANDWIDTH

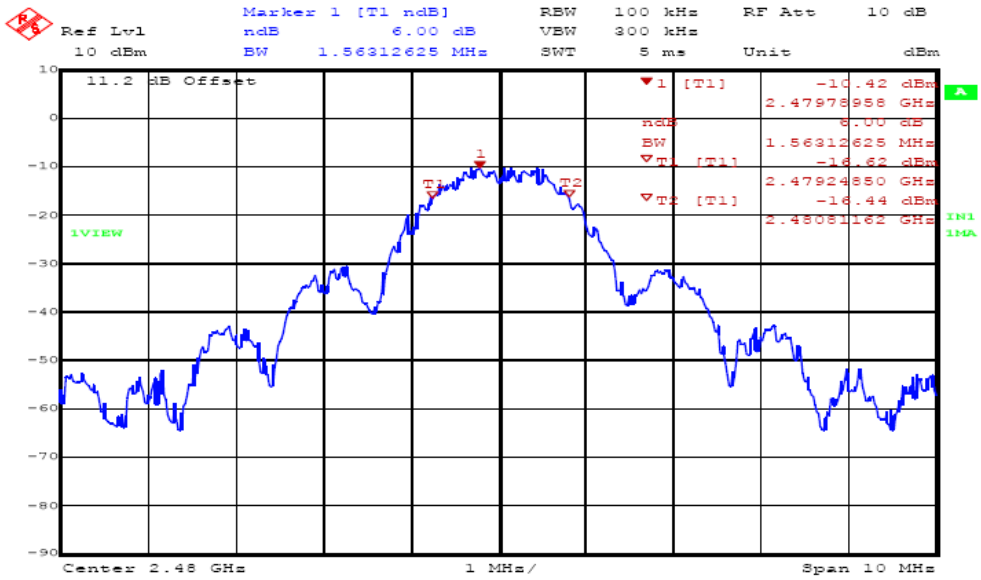
Lowest channel (channel 11 : 2045 MHz)



Central channel (channel 18 : 2440 MHz)

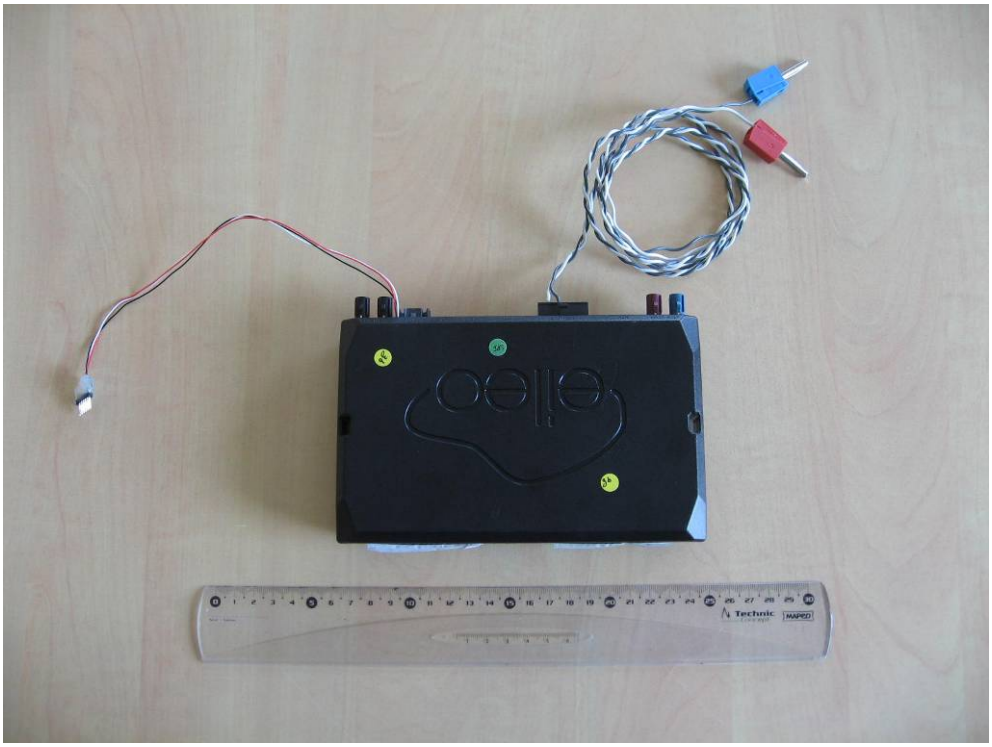


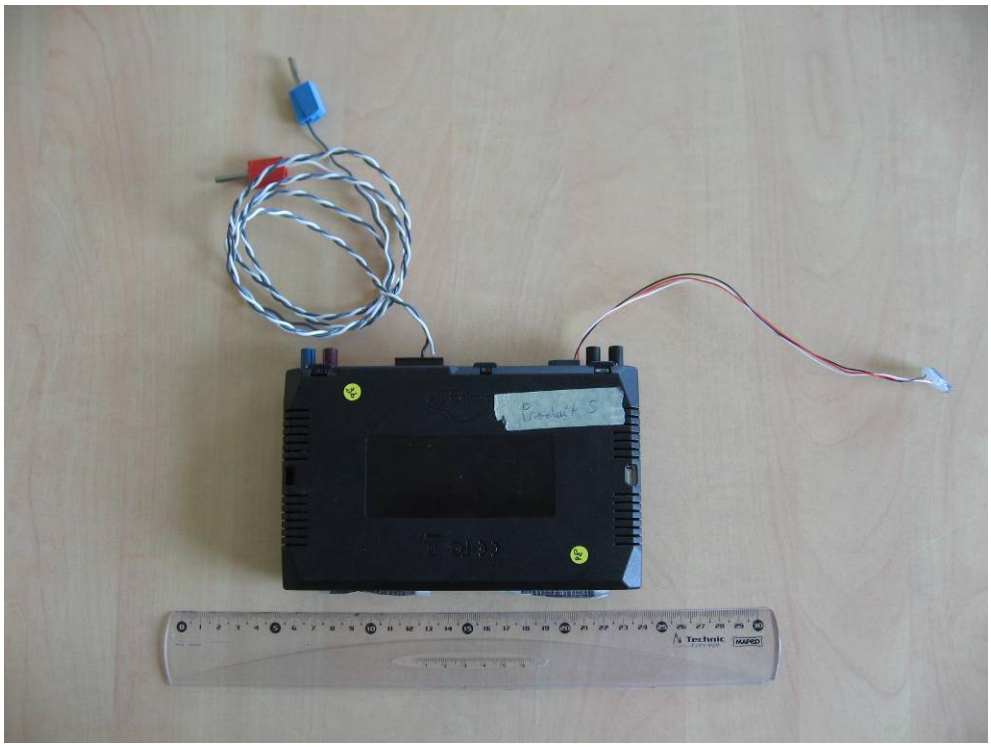
Highest channel (channel 26 : 2480 MHz)



ANNEX 2 PHOTOS OF THE DEVICE UNDER TEST

GENERAL VIEW



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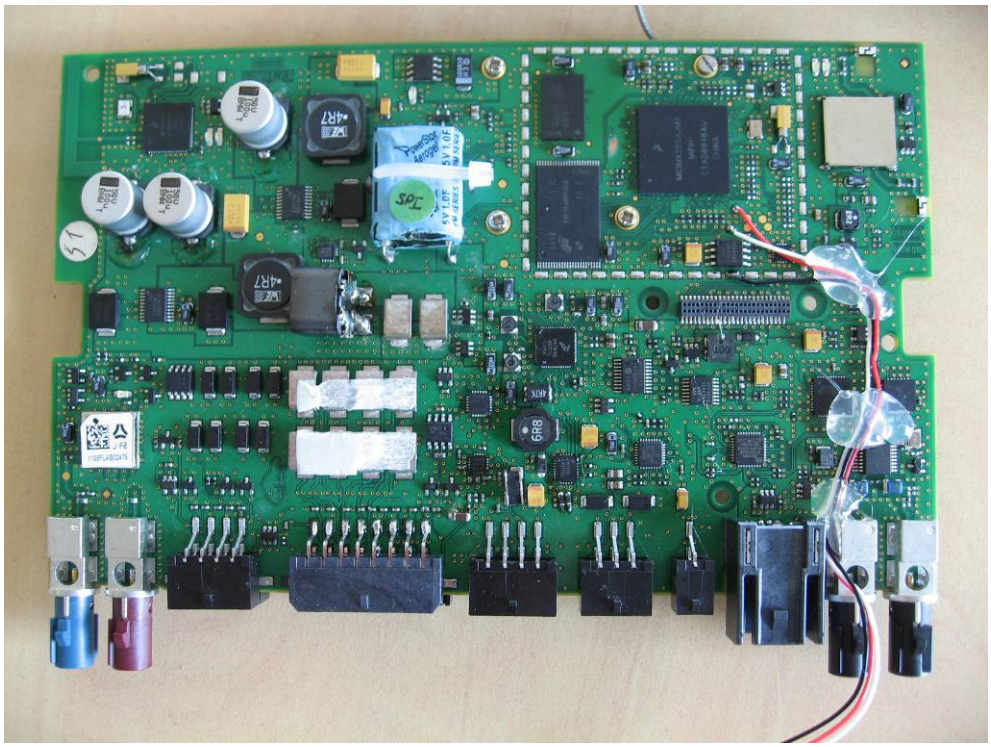
PRINTED CIRCUIT BOARD FACE 1



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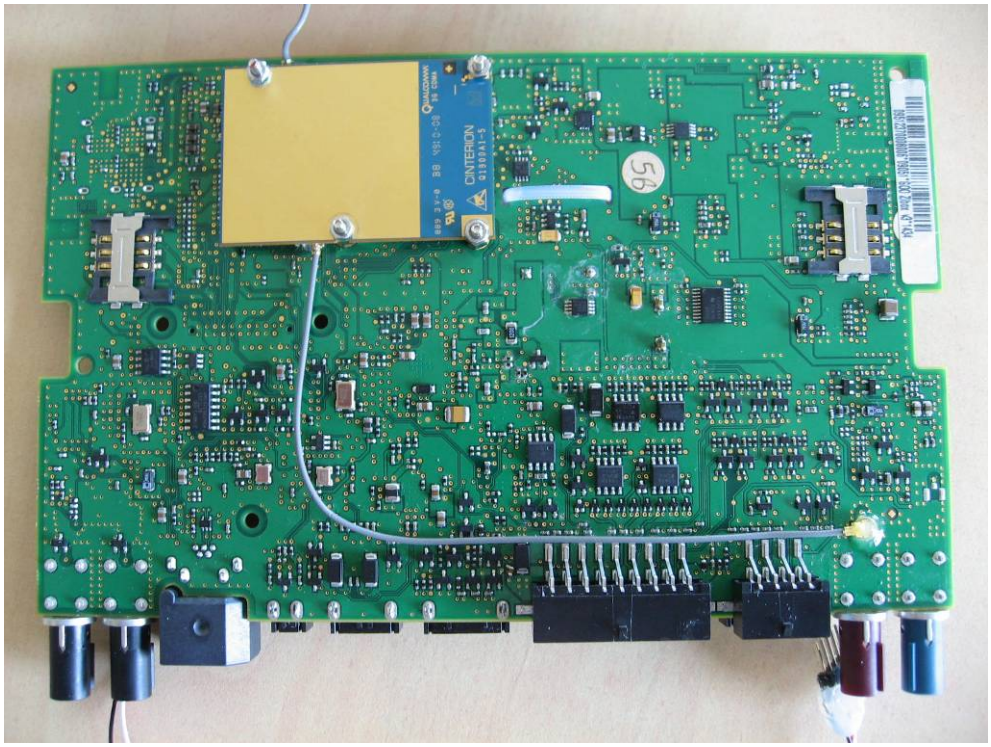

ANNEX 3 TEST SET-UP