



R051-24-11-101687-2/A Ed. 2

« This report cancels and replaces the test report N° R051-24-11-101687-2/A Edition 1 »

RADIO test report

**according to standard:
FCC Part 15.247**

**Equipment under test:
UHF RFID READER
RFID UHF-CAQ1-NEO**

**FCC ID:
GM3UHFCAQNEO**

**Company:
PSION**

DISTRIBUTION: Mr BARRY

Company: PSION

Number of pages: 23 including 2 annexes

Ed.	Date	Modified pages	Written by		Technical Verification Quality Approval	
			Name	Visa	Name	Visa
2	20-Jul-11	4, 6, 7 & 16	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: UHF RFID READER

Reference / model: RFID UHF-CAQ1-NEO

Serial number: PXOCUA500041

MANUFACTURER: PSION

COMPANY SUBMITTING THE PRODUCT:

Company: PSION

Address: 135 rue René Descartes
Parc de la Duranne
13591 AIX EN PROVENCE
FRANCE

Responsible: Mr BARRY

DATE(S) OF TEST: 7, 8, 14 and 20 April 2011

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

TESTED BY: J. L. JAMET

TUTOR: 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. MAXIMUM PEAK OUTPUT POWER	8
8. INTENTIONAL RADIATOR	11
9. RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS CO-LOCATION MEASUREMENT.....	16
ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST	18
ANNEX 2: TEST SET UP AND OPEN AREA TEST SITE	23

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment:
UHF RFID READER - RFID UHF-CAQ1-NEO in accordance with normative reference.

- 2 | This device contains an already certified UHF RFID module (FCC ID: [UVECAENRFID010](#)).

2. PRODUCT DESCRIPTION

Class: B (residential environment)

Utilization: UHF RFID reader

Antenna type and gain: incorporated antenna with two optional antennas
- UHF-CAQ1-A5-NEO=Linear antenna; 1.9 dBi
- UHF-CAQ1-AC5-NEO=Circular antenna; 2 dBi

Operating frequency range: from 902.75 MHz to 927.25 MHz

Number of channels: 50

Channel spacing: 500 kHz

Frequency generation: synthesizer

Modulation: DSB-ASK 40 kHz

Power source: 120 V.a.c charging dock; 3.7 V.d.c internal battery

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 (2010) Radio Frequency Devices

ANSI C63.4 (2009) 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

2 **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 1
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				Note 2
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 3 Note 5
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	Note 1
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems				X	Note 1
	(a) (2) Digital modulation techniques			X		
	(b) Maximum peak output power	X				Note 7
	(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 8

NAp: Not Applicable

NAs: Not Asked

- 2 *Note 1: Module already certified (FCC ID: [UVECAENRFID010](#)).*
- Note 2: Integral antenna.*
- Note 3: See FCC part 15.247 (d).*
- Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.*
- Note 5: Concerning the co-location measurement, UHF RFID, Bluetooth and Wifi modules are transmitting simultaneously.*
- Note 7: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.*
- Note 8: This equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from O et 65c).*

Conclusion:

The sample of UHF RFID READER-RFID UHF-CAQ1-NEO 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. 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
Spectrum analyzer	Rohde & Schwarz FSP7	6796
Log periodic antenna	Rohde & Schwarz HL 223	1999
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	0812
Meteo station meteostar	Bioblock scientific	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.

We use for this measure outdoor test site. The measuring distance between the equipment and the test antenna is 3 m. The test antenna has been oriented in the two polarizations, we have recorded only the highest level.

A measurement of the electro-magnetic field is realized, with a resolution bandwidth and video bandwidth adjusted at 100 kHz.

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 transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results: linear antenna

Ambient temperature (°C): 21
Relative humidity (%): 46

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 3.64
Voltage at the end of test (V): 3.52
Percentage of voltage drop during the test (%): 3.3

Sample n° 1 Channel 902.75 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	95.5	3.22	21.11	119.8	186.3	1

Polarization of test antenna: horizontal (height: 100 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

Sample n° 1 Channel 915.25 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	95	3.24	21.16	119.4	168.7	1

Polarization of test antenna: horizontal (height: 100 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

Sample n° 1 Channel 927.25 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	94.5	3.27	21.21	119	153.2	1

Polarization of test antenna: horizontal (height: 100 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

Results: circular antenna

Ambient temperature (°C): 19
Relative humidity (%): 38

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 3.67
Voltage at the end of test (V): 3.56
Percentage of voltage drop during the test (%): 3

Sample n° 1 Channel 902.75 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	90.6	3.22	21.11	114.9	58.9	1

Polarization of test antenna: horizontal (height: 160 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

Sample n° 1 Channel 915.25 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	92.7	3.24	21.16	117.1	97.1	1

Polarization of test antenna: vertical (height: 130 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

Sample n° 1 Channel 927.25 MHz

	Level dB μ V	Cable loss dB	Antenna factor dB	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (W)
Normal test conditions	91.3	3.27	21.21	115.8	71.6	1

Polarization of test antenna: horizontal (height: 165 cm)

Position of equipment: see annex 2 (azimuth: 0 degrees)

* $P = (E \times d)^2 / (30 \times G_p)$ with $d = 3$ m and $G_p = 1.585$ for circular antenna and $G_p = 1.549$ for linear antenna

Test conclusion:

RESPECTED STANDARD

8. 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 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
Preamplifier 1 to 18 GHz	DBS Microwave DB97-1852	2648
High pass filter	Filtek	7310
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	0812
Test receiver	Rohde & Schwarz ESH3	1058
Meteo station meteostar	Bioblock scientific	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.

Frequency range:

From 9 kHz to 10th harmonic of the highest fundamental frequency (927.25 MHz).

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: linear antenna

Ambient temperature (°C): 21
 Relative humidity (%): 46

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 3.65
 Voltage at the end of test (V): 3.58
 Percentage of voltage drop during the test (%): 1.92

Channel 902.75 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)
1805.5	P	100	301	100	V	40.0	99.8	59.8
2708.2	P	100	360	1000	H	46.9	74.0*	27.1
3611.0	P	100	360	1000	H	51.1	74.0*	22.9

Channel 915.25 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)
1830.5	P	182	0	100	H	42.4	99.8	57.4
2745.7	P	100	360	1000	H	44.9	74.0*	29.1

Channel 927.25 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)
1854.5	P	100	0	100	H	42.6	99.8	57.2
2781.7	P	100	0	1000	V	45.4	74*	28.6

* restricted bands of operation in 15.205, this limit corresponding at the 15.209 section. The peak levels measured are below the average measurements 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 119.8 dB μ V/m on channel 902.75 MHz.

So the applicable limit is 99.8 dB μ V/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)).

Results: circular antenna

Ambient temperature (°C): 19
 Relative humidity (%): 38

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 3.67
 Voltage at the end of test (V): 3.56
 Percentage of voltage drop during the test (%): 3

Channel 902.75 MHz

Frequencies (MHz)	Detector P: Peak QP: Quasi-Peak A: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1805.5	P	125	0	100	V	42.4	97.1	54.7
2708.2	P	130	0	1000	V	46.9	74.0*	27.1
3611.0	P	130	0	1000	V	51.1	74.0*	22.9

Channel 915.25 MHz

Frequencies (MHz)	Detector P: Peak QP: Quasi-Peak A: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1830.5	P	133	0	100	V	40.9	97.1	56.2
2745.7	P	130	0	1000	V	46.9	74.0*	27.1

Channel 927.25 MHz

Frequencies (MHz)	Detector P: Peak QP: Quasi-Peak A: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1854.5	P	130	0	100	V	40	97.1	57.1
2781.7	P	130	0	1000	H	46.6	74.0*	27.4

* Restricted bands of operation in 15.205, this limit corresponding at the 15.209 section. The peak levels measured are below the average measurements 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 117.1 dB μ V/m on channel 915.25 MHz.

So the applicable limit is 97.1 dB μ V/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

9. RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS CO-LOCATION MEASUREMENT

Standard: FCC Part 15

Test procedure: paragraph 209

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESVS10	1219
Spectrum analyzer	Rohde & Schwarz FSP40	4088
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	FILTEK	7310
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	0812
High pass filter	Filtek HP12/3200-5AA	1922
Radio communication tester	Rohde & Schwarz CMD55	3591
Meteo station meteostar	Bioblock Scientific	0943
Loop antenna	EMCO 6502	1406
Test receiver	Rohde & Schwarz ESH3	1058
Biconical antenna	Hewlett Packard 11966C	0728

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 10th harmonic of the highest frequency.

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 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. The UHF, Bluetooth and Wifi modules are transmitting simultaneously.

2 |

Results: linear antenna

Ambient temperature (°C): 19
 Relative humidity (%): 53

Voltage at the beginning of test (V): 3.65
 Voltage at the end of test (V): 3.53
 Percentage of voltage drop during the test (%): 3.3

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak A: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915.25 ①	P	100	0	100	H	118.3	/	/
2401.98 ②	P	141	172	1000	H	85.6	/	/
2437.90③	P	220	360	10000	H	106.6	/	/

- ① UHF
- ② Bluetooth carrier
- ③ Wifi

Not any spurious due to the co-location has been detected.

Results: circular antenna

Ambient temperature (°C): 21
 Relative humidity (%): 33

Voltage at the beginning of test (V): 3.64
 Voltage at the end of test (V): 3.52
 Percentage of voltage drop during the test (%): 3.3

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak A: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915.25 ①	P	100	0	100	H	118	/	/
2402.00 ②	P	134	260	1000	H	85	/	/
2438.00③	P	178	0	10000	V	104.6	/	/

- ① UHF
- ② Bluetooth carrier
- ③ Wifi

Not any spurious due to the co-location has been detected.

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 2 annexes to be forwarded □□□

ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST

GENERAL VIEW



CHARGING DOCK



INTERNAL VIEW WITH CIRCULAR ANTENNA



CIRCULAR ANTENNA VIEW 1



CIRCULAR ANTENNA VIEW 2



LINEAR ANTENNA

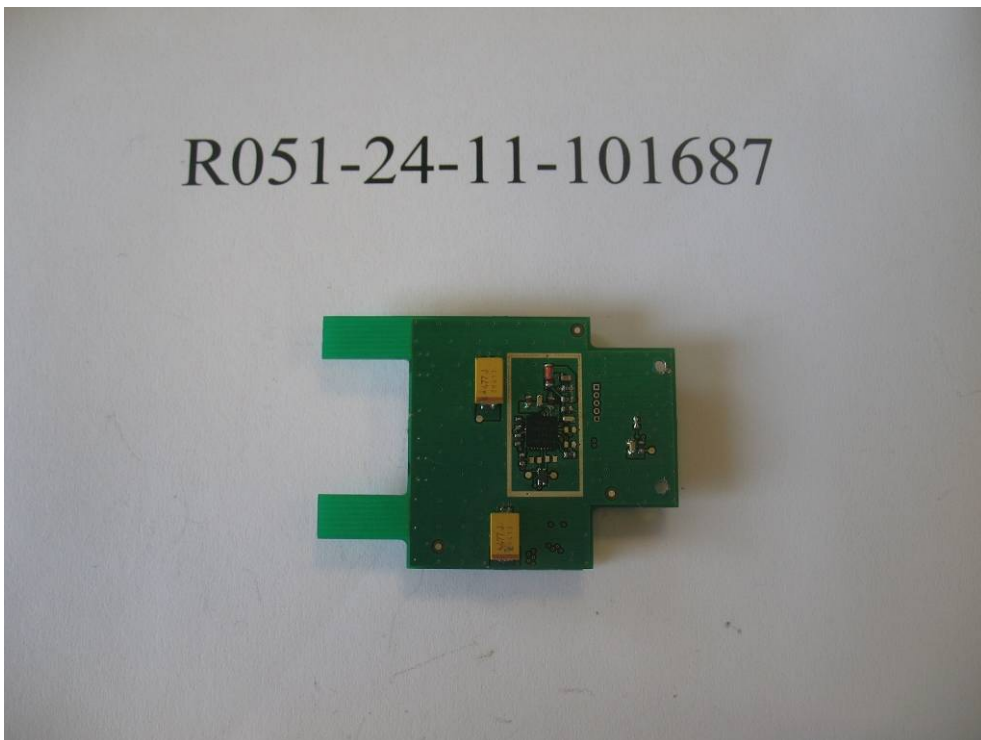


ANTENNA BOARD

R051-24-11-101687



R051-24-11-101687



ANNEX 2: TEST SET UP AND OPEN AREA TEST SITE



OPEN AREA TEST SITE

