

RA-24-09100050-2/A Ed. 0

**FCC CERTIFICATION
RADIO Measurement
Technical Report**

**Standard to apply:
FCC Part 15.249**

**Equipment under test:
BOAT EQUIPMENTS REMOTE CONTROL**

**FCC ID:
W6Z-MPOP5720**

**Company:
MAX POWER**

DISTRIBUTION: Mr HELIE

Company: MAX POWER

Number of pages: 21 including 3 annexes

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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: Boat equipments remote control

Reference / model: MPOP5720/US

Serial number: not communicated

MANUFACTURER: MAX POWER

COMPANY SUBMITTING THE PRODUCT:

Company: MAX POWER

Address: 10, allée François Coli
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FRANCE

Responsible: Mr HELIE

DATE(S) OF TEST: 20 and 24 February 2009

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)
FRANCE

Registration Number by FCC: 101696/FRN: 0006 6490 09

TESTED BY: L. BERTHAUD

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1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: Boat equipments remote control in accordance with normative reference.

2. PRODUCT DESCRIPTION

Class: B (residential environment)

Utilization: radio command for boat equipments

Antenna type: PCB antenna

Operating frequency range: 915.24 MHz

Number of channels: 1

Channel spacing: not concerned

Frequency generation: ☐ SAW Resonator ☐ Crystal ☒ Synthesizer

Modulation: ☐ Amplitude ☐ Digital ☒ Frequency ☐ Phase

Power source: 6 Vd.c. (lithium batteries)

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 (2008) Code of Federal Regulations
Title 47 - Telecommunication
Chapter 1 - Federal Communications Commission
Part 15 - Radio frequency devices
Subpart C - Intentional Radiators

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.

4. TEST METHODOLOGY

Radio performance tests procedures given in part 15:

- Paragraph 33: frequency range of radiated measurements
- Paragraph 35: measurement detector functions and bandwidths
- Paragraph 109: radiated emission limits
- Paragraph 203: antenna requirement
- Paragraph 209: radiated emission limits; general requirements
- Paragraph 249: operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz and 24.0 - 24.25 GHz

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 Subpart C: Intentional radiators

Test procedure	Description of test	Respected criteria ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 1
FCC Part 15.207	CONDUCTED LIMITS			X		
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHZ, 5725-5875 MHZ AND 24.0-24.25 GHZ					
	(a) field strength fundamental and harmonics	X				
	(b) fixed point-to-point operation			X		
	(c) field strength distance	X				Note 3
	(d) radiated emissions outside specified frequency bands	X				
	(e) peak measurements	X				
	(f) requirement note of section 15.37 (d)			X		Note 4

NAP: Not Applicable

NAs: Not Asked

Note 1: internal PCB antenna (see photos in annex 1).

Note 2: see FCC part 15.249 (d).

Note 3: radiated measurements are realized at a distance of 3 meters.

Note 4: $F_{carrier} = 915.24 \text{ MHz}$.

6.2 Subpart B: Unintentional radiators

Test procedure	Description of test	Respected criteria ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.109	RADIATED EMISSION LIMITS	X				

Conclusion:

The sample Boat equipments remote control submitted for testing complies with the standard prescriptions FCC Part 15 according to limits or criteria defined in this report.

7. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESVS 10	1219
Biconical antenna	Hewlett Packard HP 11966C	728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Double ridged guide antenna	Electrometrics EM 6961	1204
Spectrum analyzer	Rohde & Schwarz FSP 40	4088
Open area test site	Emitech	1274
Preamplifier 1 to 18 GHz	DBS Microwave DB97-1852	2648
High pass filter	Micro-Tronics HPM 11630	1673
Multimeter	Fluke 77-2	812

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 30 MHz to harmonic 10 ($F_{\text{carrier}} \leq 1 \text{ GHz}$)

Detection mode: Quasi-peak ($F < 1 \text{ GHz}$)
Peak ($F > 1 \text{ GHz}$)

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$)
1 MHz ($F > 1 \text{ GHz}$)

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 mode.

Results:

Ambient temperature (°C):	20
Relative humidity (%):	43

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

Voltage at the beginning of test (V):	6.87
Voltage at the end of test (V):	6.73

Not any spurious has been detected.

Any spurious which has more than 20 dB of margin compared to the limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

8. FIELD STRENGTH OF FUNDAMENTAL AND HARMONICS

Standard: FCC Part 15

Test procedure: paragraph 15.249 (a)

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESVS10	1219
Log periodic antenna	Rohde & Schwarz HL223	1999
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	812

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.

Detection mode: Quasi-peak

Bandwidth: 120 kHz

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 17.5
Relative humidity (%): 44

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

Voltage at the beginning of the test (V): 6.87
Voltage at the end of the test (V): 6.73

Sample n° 1

	Fcarrier	Electro-magnetic field (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization	Antenna height (cm)	Azimuth (degrees)
Fundamental	915.188	75.9	93.98	18.08	QP	H	100	313
Harmonics	1830.56	48.76	53.98	5.22	Avg	V	135	0
	1830.56	48.76	73.98	25.22	Peak	V	135	0

QP: Quasi-Peak

Avg: Average

H: Horizontal

V: Vertical

Test conclusion:

RESPECTED STANDARD

9. RADIATED EMISSION OUTSIDE SPECIFIED FREQUENCY BANDS

Standard: FCC Part 15

Test procedure: paragraph 15.249 (d)

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Loop antenna	EMCO	1406
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Antenna RGA-60	Electrometrics	1204
Multimeter 77-2	Fluke	812

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 harmonic 10 ($F_{\text{carrier}} \leq 10 \text{ GHz}$)

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$)
1 MHz ($F > 1 \text{ GHz}$)

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 is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 20
Relative humidity (%): 43

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

Voltage at the beginning of the test (V): 6.87
Voltage at the end of the test (V): 6.73

The polarity column refers to the antenna polarity at which the maximum emissions level is measured.

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
825.19	QP	100	0	120	H	33.4	46.02*	12.62

QP: Quasi-peak

Avg: Average

* general radiated emission limits in Section 15.209.

Any spurious which has more than 20 dB of margin compared to the limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

10. BAND EDGE COMPLIANCE

Standard: FCC part 15

Test procedure: Public Notice DA 00-705, Delta Marker method.

Test equipment used:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP 40	Rohde & Schwarz	4088

Test set up:

An in band field strength measurement of the fundamental Emission using the RBw and detector function required by C63.4-2003 and FCC Rules.

These measurements are realized in near field. The field strength levels are correlated with the open site measurements.

Test operating condition of the equipment:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Lower Band Edge: from 608 MHz to 614 MHz (curve n° 1)

Upper Band Edge: from 960 MHz to 1240 MHz (curve n° 2)

Sample n° 1:

Fundamental Frequency (MHz)	Field Strength Level of fundamental (dBμ V/m)	Peak Or Average	Frequency of maximum Band- edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out of Band Emission Level (dBμ V/m)**	Limit (dBμ V/m)	Margin (dB)
915.24	75.9	Peak	609.62	-47.95	27.95 ⁽¹⁾	66.02	38.07
915.24	75.9	Peak	1186.67	-42.67	33.23 ⁽¹⁾	73.98	40.75

* According to step 2 of Marker-Delta Method DA 00-705

** According to step 3 of Marker-Delta Method:

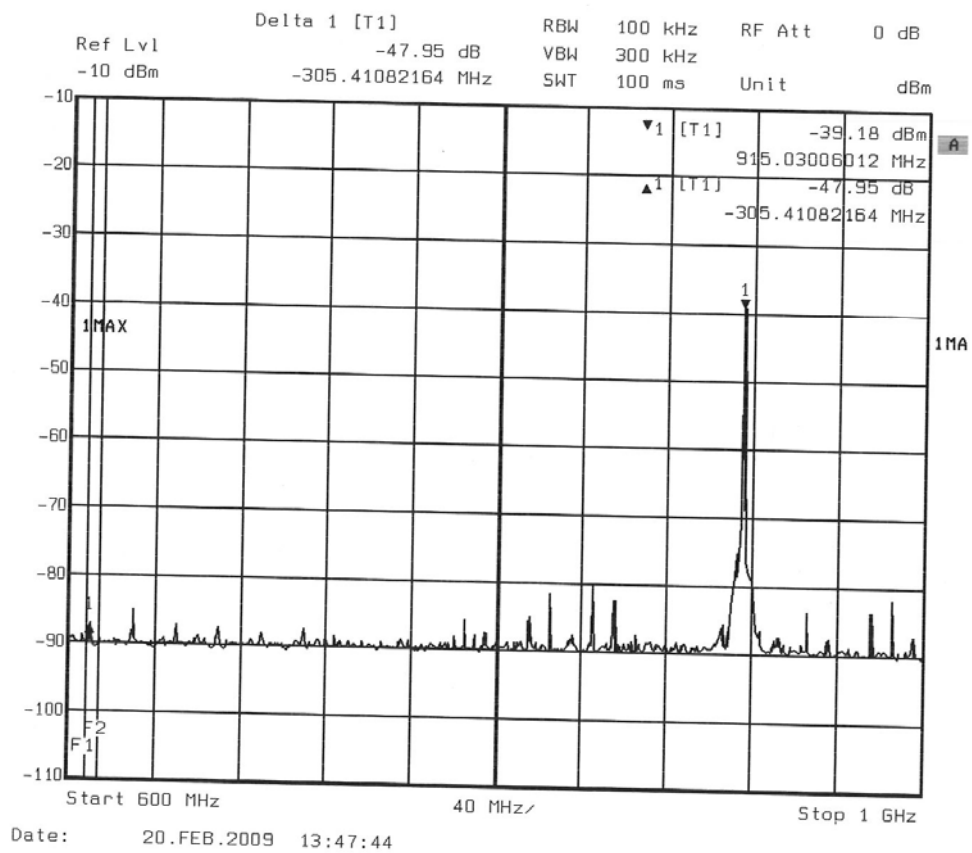
Calculated Emission Level = Field Strength Level – Delta Marker Level

⁽¹⁾ the peak level recorded is below the average applicable limit.

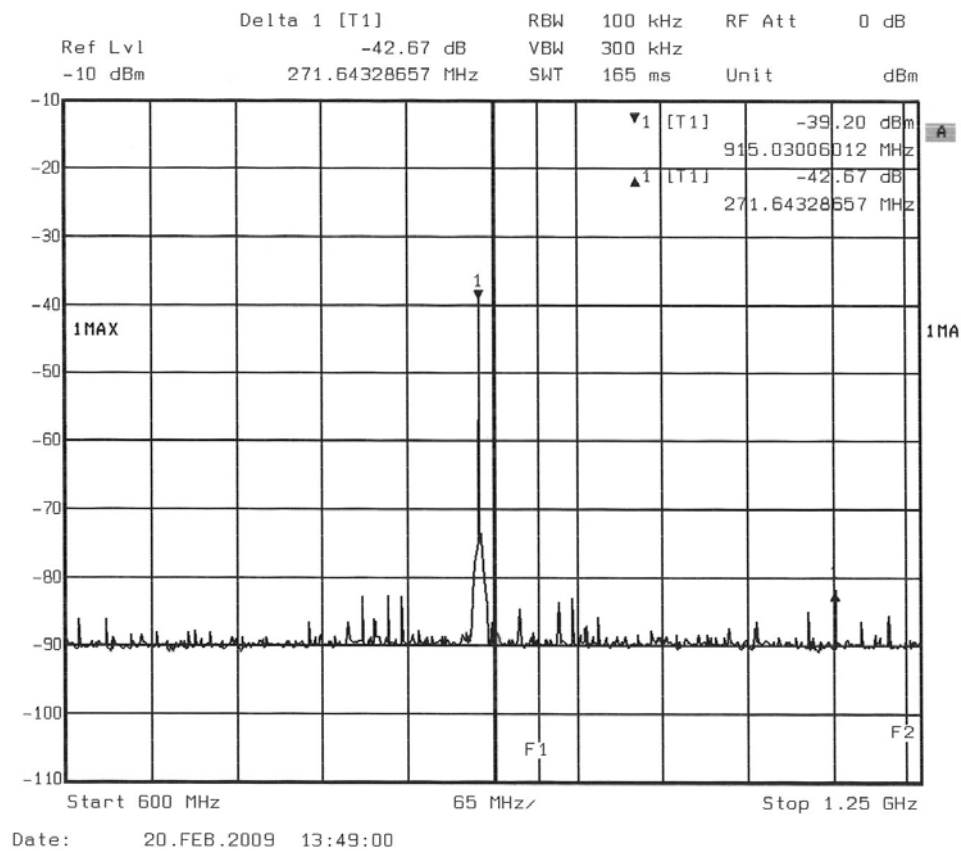
Test conclusion:

RESPECTED PUBLIC NOTICE

CURVE N°: 1.



CURVE N°: 2.



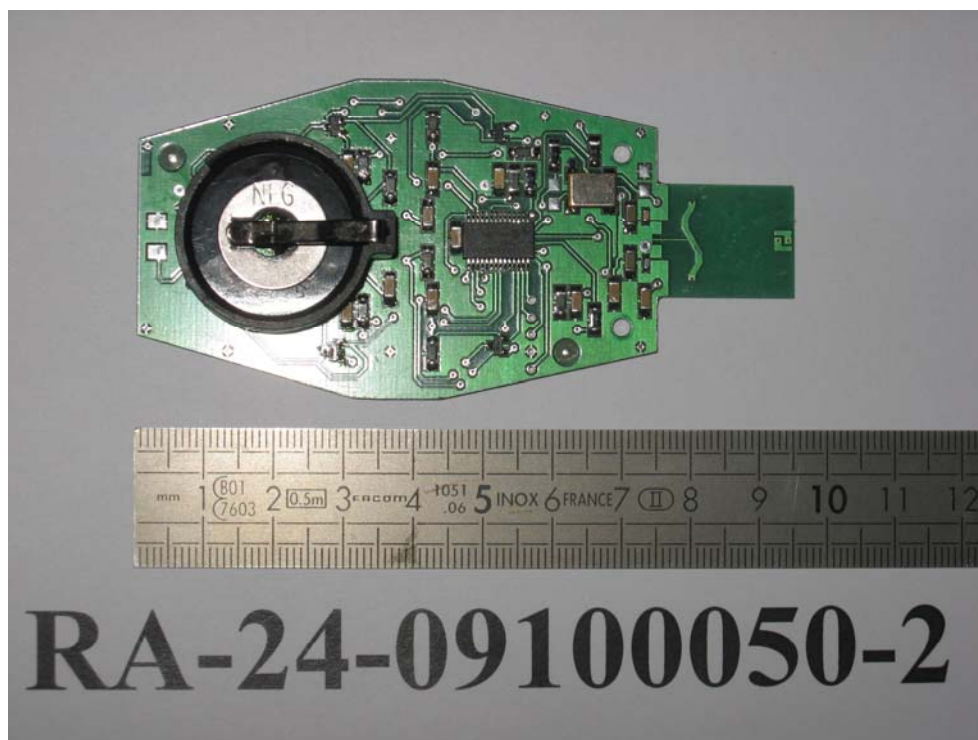
□□□ End of report, 3 annexes to be forwarded □□□

ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST

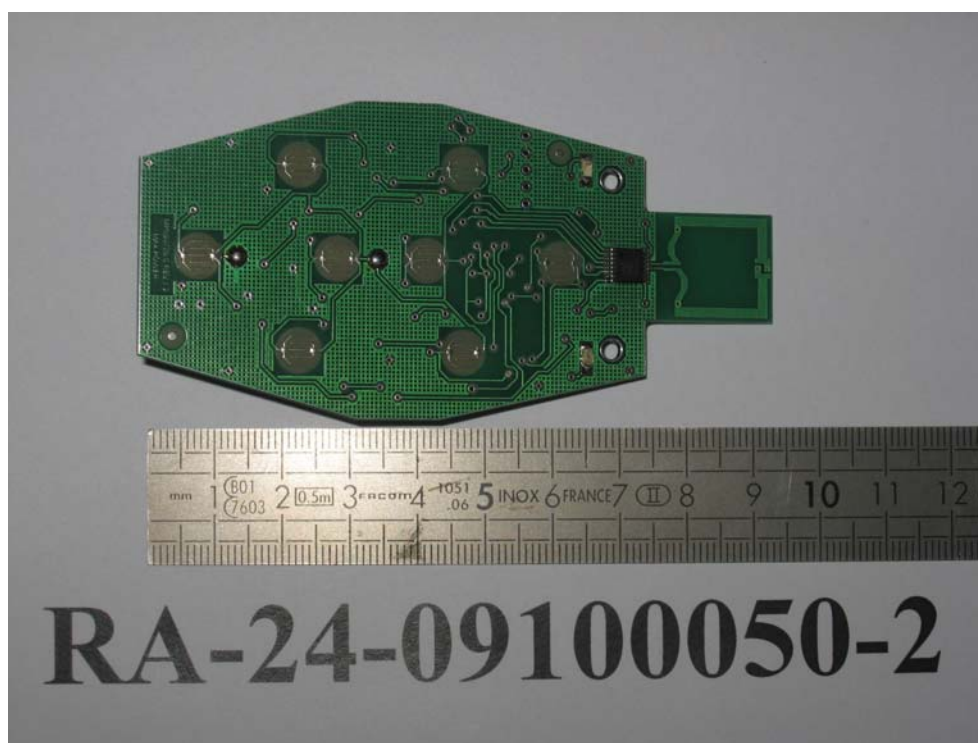
GENERAL VIEW



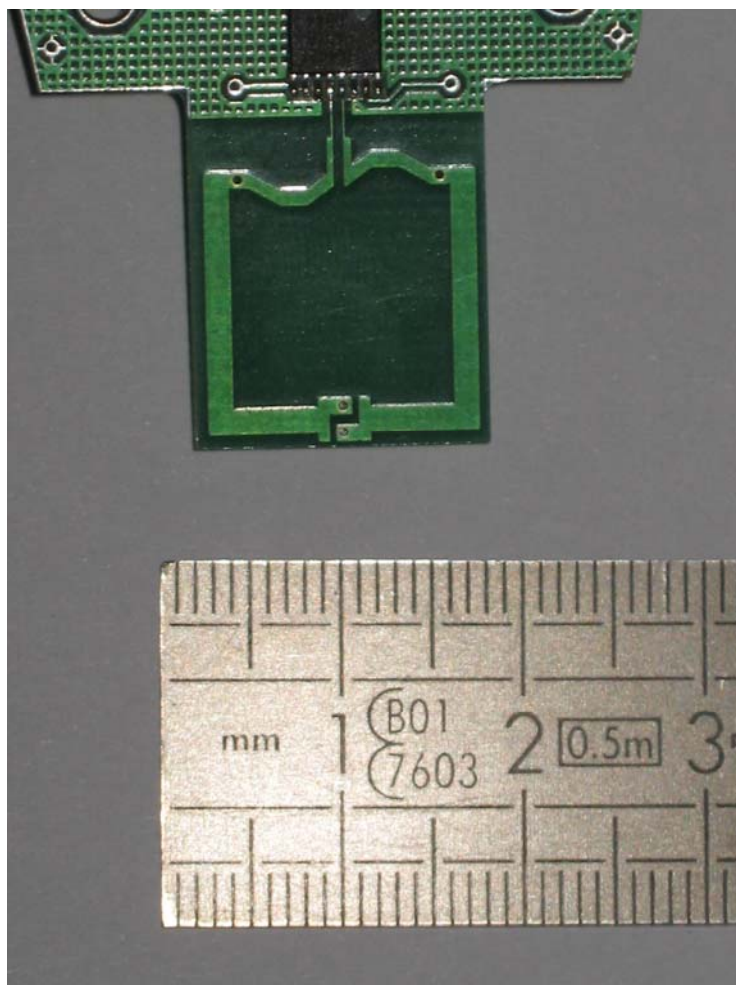
Printed circuit board: face 1



Printed circuit board: face 2



PCB antenna



ANNEX 2: TEST SET UP

TEST SET UP RADIATED MEASUREMENT



Open area test site



ANNEX 3: OCCUPIED BANDWIDTH

