RR051-12-105795-1/A Ed. 0

RADIO test report

According to the standard(s):

CFR 47 FCC Part 15 (2013)

Equipment under test:
Radio module 81100097

FCC ID:
QVA81100097

Company:
SORHEA

DISTRIBUTION: Mr BOMPARET (Company: SORHEA)

Number of pages: 26 with 5 appendixes

Ed.	Date	Modified pages	Written by Name Visa	Technical Verification and Quality Approval Name Visa
0	12-Apr-13	Creation	M. DUMESNIL M. D.	BERTHAUD L.

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DESIGNATION OF PRODUCT:	Radio module
Serial number (S/N):	35628139 K 7673/12/25 T
Reference / model (P/N):	81100097
Software version:	V2.05
MANUFACTURER:	SOHREA

COMPANY SUBMITTING THE PRODUCT:

Company:	SOHREA
Address:	1, rue du Dauphine 69120 VAULX EN VELIN FRANCE
Responsible:	Mr BOMPARET
Person(s) present(s) during the tests:	Mr LAFAY

TECHNICAL SUPPORT:

Company:	HORIZON TELECOM
Address:	6, rue de Gueugnon 71300 MONTCEAU LES MINES FRANCE
Responsible:	Mr PROVOT
DATE(S) OF TEST:	11/07/2012, 11/19/2012 and 12/07/2012
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE EMITECH ANGERS open area test site in JUIGNE SUR LOIRE (49) FRANCE FCC 2.948 Listed Site Registration Number: 90469 EMITECH ANGERS open area test site in LA POUEZE (49) FRANCE FCC 2.948 Listed Site Registration Number: 101696 FCC Accredited Site Registration Number: 896948
TESTED BY:	M. DUMESNIL

CONTENTS

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: Radio module 81100097, in accordance with normative reference.

The device under test is a 915 MHz transceiver whose transmitter part will be certified as Modular Approval and receiver part will be verified.

2. PRODUCT DESCRIPTION

ITU Emission code: 20K0F7D

Class: B (residential environment)

Utilization: RF module designed to be installed in Soreah's perimeter intrusion detectors

Antenna type and gain: dedicated antenna; 1 dBi declared

Operating frequency range: from 915.025 MHz to 915.275 MHz

Number of channels: 6

Channel spacing: 50 kHz

Frequency generation: crystal

Modulation: G.F.S.K. modulation (Gaussian Frequency-Shift Keying)

Power source: lead battery 4V 5Ah

Power setting: w0

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.

CFR 47 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.

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 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 249: Operation within the bands 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz.

5. TEST EQUIPMENT CALIBRATION DATES

Equipment	Model	Type	Last verification	Next verification	Validity
728	HP 11966C	Biconical antenna	03/09/2012	03/09/2016	03/11/2016
1274	Emitech	OATS	28/01/2010	28/01/2013	28/03/2013
1406	Emco 6502	Loop antenna	13/01/2011	13/01/2013	13/03/2013
1922	Microwave DB C020180F-4B1	Low-noise amplifier 1 to 18 GHz	01/08/2012	01/08/2013	01/10/2013
1999	R&S HL223	Log periodic antenna	03/09/2012	03/09/2016	03/11/2016
6609	Microtronics HPM11630	1 GHz high-pass filter	24/01/2012	24/01/2014	24/03/2014
8511	Hewlett Packard HP8447D	Low-noise amplifier 300kHz to 2 GHz	24/05/2012	24/05/2013	24/07/2013
8523	R&S FSEM30	Spectrum analyzer	07/09/2012	07/09/2014	07/11/2014
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2012	12/06/2016	12/08/2016
8533	R&S HFH2-Z2	Magnetic field antenna	01/05/2012	01/05/2014	01/07/2014
8534	Emco 3115	Horn antenna	30/10/2012	30/10/2016	30/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2012	12/06/2016	12/08/2016
8593	SIDT Cage 2	Full anéchoïc room	06/09/2011	06/09/2013	06/11/2013
8675	AOIP MN5102B	Multimeter	15/01/2013	15/01/2015	15/03/2015
8707	R&S ESI7	Test receiver	03/10/2012	03/10/2014	03/12/2014
8732	Emitech	OATS	09/06/2011	09/06/2013	09/08/2013
8750	La Crosse Technology WS-9232	Meteo station	20/07/2012	20/07/2014	20/09/2014

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				*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*
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 §15.249 frequency bands	X				*Note 3*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz AND 24.0-24.25 GHz					
	(a) Fundamental and harmonics field strength	X				
	(b) Fixed point-to-point operation			X		
	(c) Measurement distance	X				
	(d) Out-of-band emissions	X				
	(e) Field strength limits above 1 GHz	X				

NAp: Not Applicable NAs: Not Asked

Note 1: dedicated antenna. Professionally installed equipment.

Note 2: See FCC part 15.249 (d).

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

Conclusion:

The sample of Radio module 81100097 submitted to the tests complies with the regulations of the standard CFR 47 FCC Part 15 (2012) 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 set up:

The system is tested in an open area test site (OATS) for F < 1 GHz and in full anechoic room above 1 GHz.
The EUT is placed on a rotating table. Zero degree azimuth corresponds to the front of the equipment under test.
See photos in appendix 2.

Frequency range: From 30 MHz to 5th harmonic of the highest frequency used (915.275 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

Height support of the equipment under test: 0.8 meter in open area test site.
1.5 meters in full anechoic room.

Antenna height: 1 to 4 meters in open area test site.
1.5 meters in full anechoic room.

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): 20.8
Relative humidity (%): 50

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

Voltage at the beginning of test (V): 4.17
Voltage at the end of test (V): 4.16
Percentage of voltage drop during the test (%): 0.24

Sample N° 1:

Not any spurious has been detected.

Applicable limits: for 30 MHz ≤ F ≤ 88 MHz : 40 dBµV/m at 3 meters
for 88 MHz < F ≤ 216 MHz : 43.5 dBµV/m at 3 meters
for 216 MHz < F ≤ 960 MHz : 46 dBµV/m at 3 meters
Above 960 MHz : 54 dBµV/m at 3 meters

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 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): 21.8
Relative humidity (%): 35

Lower Band Edge: from 900 MHz to 902 MHz
Upper Band Edge: from 928 MHz to 930 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)*
915.070	93.3	Peak	900.673	-48.28	45.02	46	0.98
915.300	93.7	Peak	929.398	-48.29	45.41	46	0.59

* *Marker-Delta method*

The 20 dB bandwidth curves are given in appendix 4; band edge curves are given in appendix 5.

Test conclusion:

RESPECTED STANDARD

9. FUNDAMENTAL AND HARMONICS FIELD STRENGTH

Standard: FCC Part 15

Test procedure: paragraph 15.249 (a)

Test set up:

The system is tested in an open area test site (OATS) for F < 1 GHz and in full anechoic room above 1 GHz. The EUT is placed on a rotating table. 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 (915.275).

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

Height support of the equipment under test: 0.8 meter in open area test site.
1.5 meters in full anechoic room.

Antenna height: 1 to 4 meters in open area test site.
1.5 meters in full anechoic room.

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): 21.6
Relative humidity (%): 35

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

Voltage at the beginning of the test (V): 4.17
Voltage at the end of the test (V): 4.15
Percentage of voltage drop during the test (%): 0.48

Sample N° 1: channel 0

FREQUENCIES (MHz)	Detector	Antenna height (cm)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915.025*	QP	150	120	V	93.3	94	0.7
3660.1	P	150	1000	V	44.5**	74	29.5
4575.1	P	150	1000	H	42.9**	74	31.1

Sample N° 1: channel 3

FREQUENCIES (MHz)	Detector	Antenna height (cm)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915.175*	QP	150	120	V	93.6	94	0.4
1830.3	P	150	1000	V	33.7**	74	40.3
3660.7	P	150	1000	V	44.9**	74	29.1
1575.8	P	150	1000	V	43.6**	74	30.4

Sample N° 1: channel 5

FREQUENCIES (MHz)	Detector	Antenna height (cm)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
915.275*	QP	150	120	V	93.7	94	0.3
3661.1	P	150	1000	V	45.2**	74	28.8
4576.3	P	150	1000	V	43.1**	74	30.9

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

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

Test conclusion:

RESPECTED STANDARD

10. OUT-OF-BAND EMISSIONS

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.249 (d)

Test set up:

The system is tested in an open area test site (OATS) for F < 1 GHz and in full anechoic room above 1 GHz. The EUT is placed on a rotating table. 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 (915.275).

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

Height support of the equipment under test: 0.8 meter in open area test site.
1.5 meters in full anechoic room.

Antenna height: 1 to 4 meters in open area test site.
1.5 meters in full anechoic room.

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):	20.8
Relative humidity (%):	50

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

Voltage at the beginning of test (V):	4.17
Voltage at the end of test (V):	4.16
Percentage of voltage drop during the test (%):	0.24

Sample N° 1: channel 0, 3 and 5

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.

Applicable limits: 15.209 or 50 dB below the level of fundamental emission.

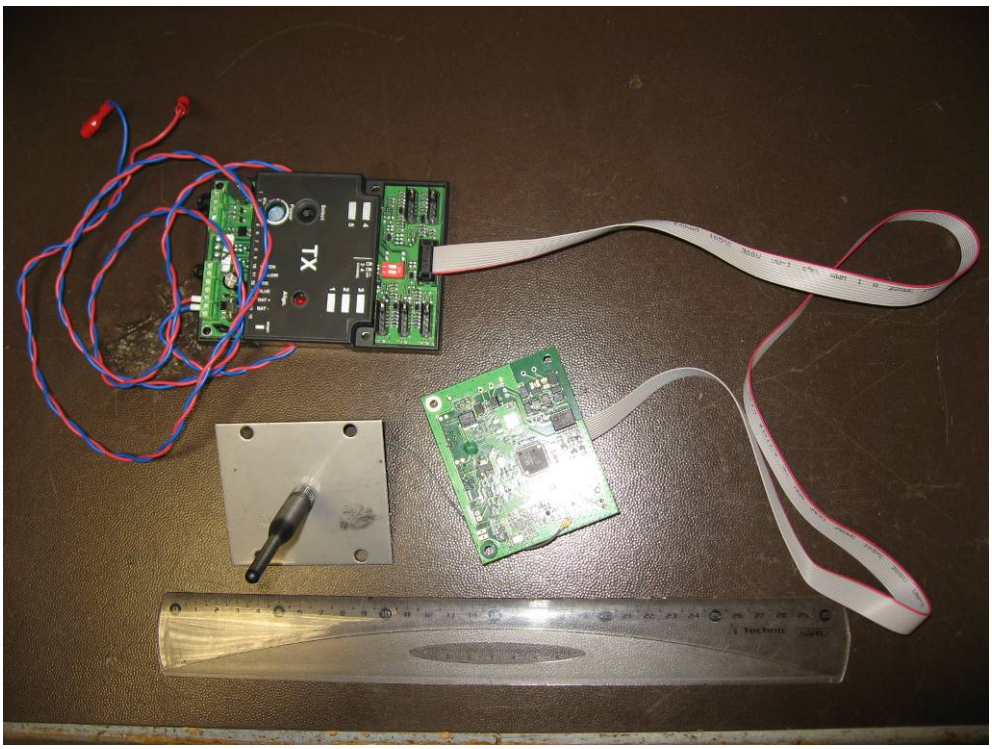
Test conclusion:

RESPECTED STANDARD

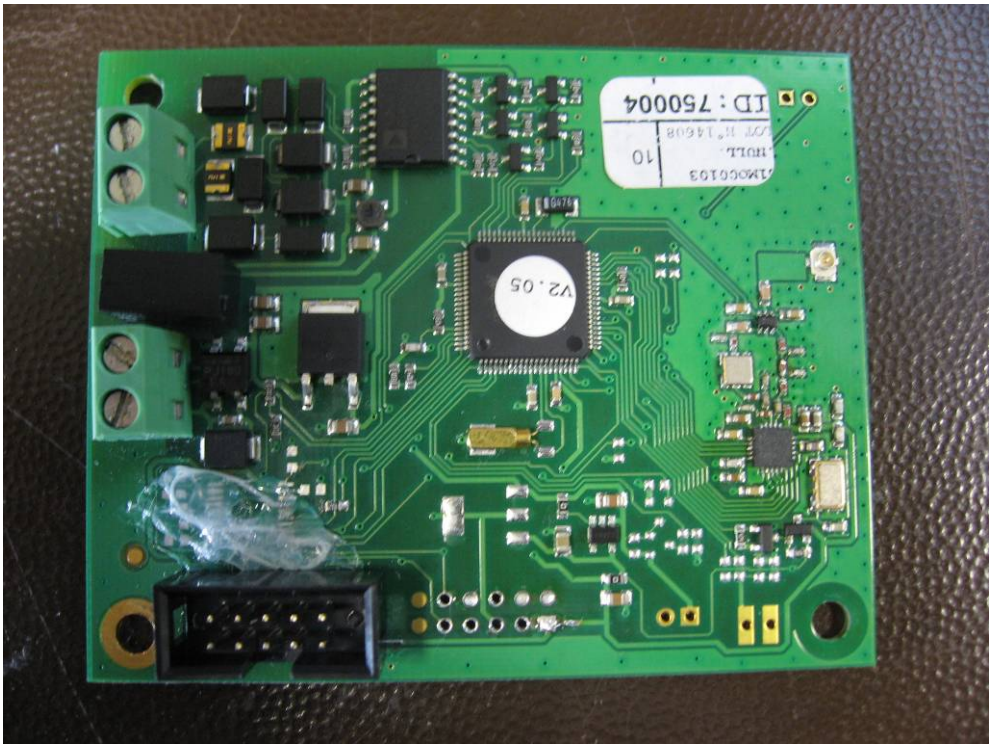
□□□ End of report, 5 appendixes to be forwarded □□□

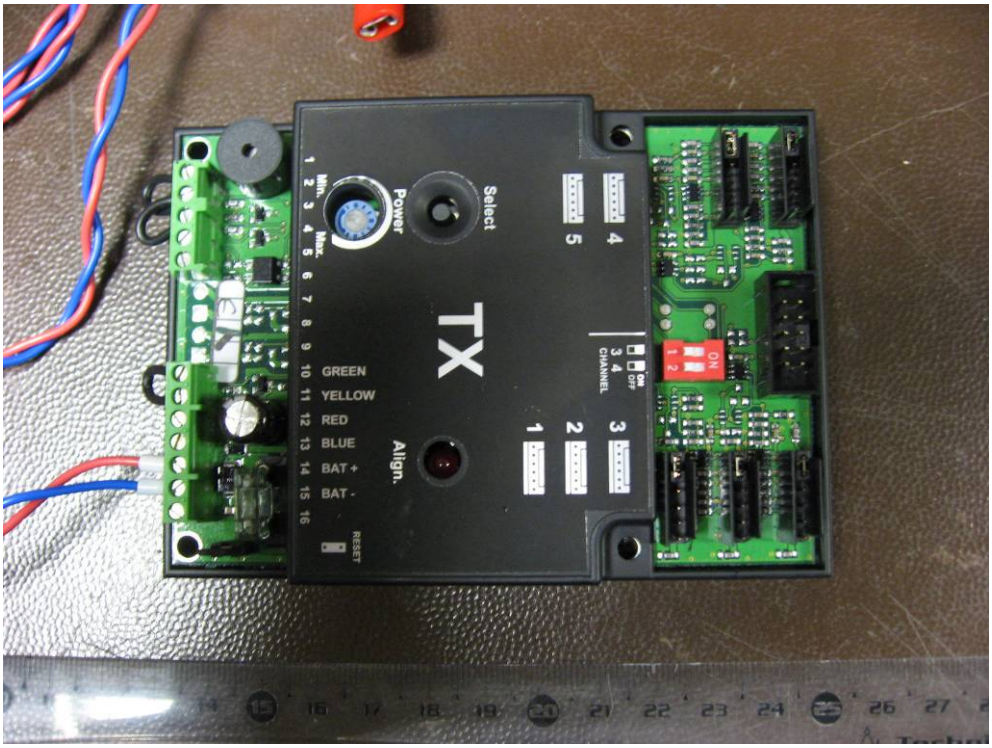
APPENDIX 1: Photos of the equipment under test

General view

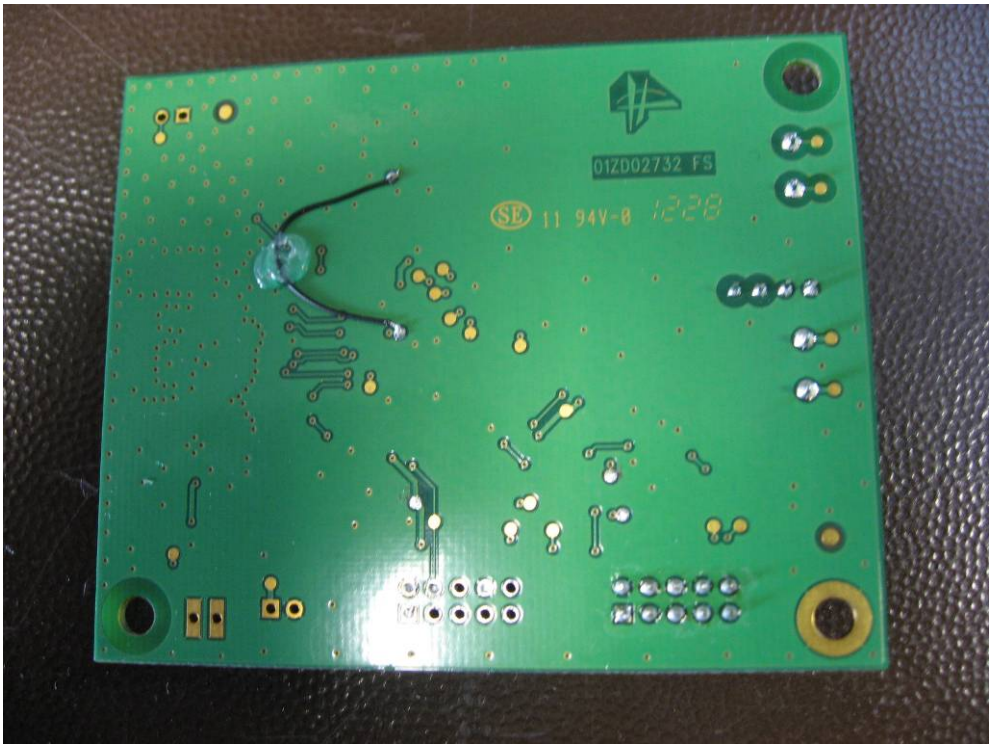


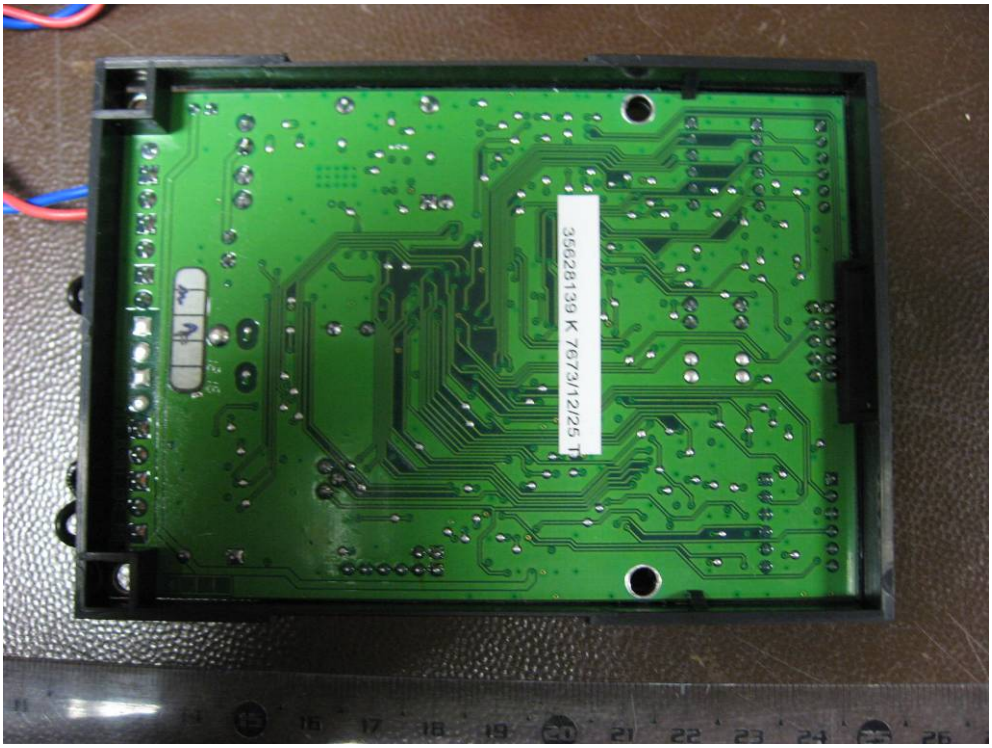
Printed circuit board face 1



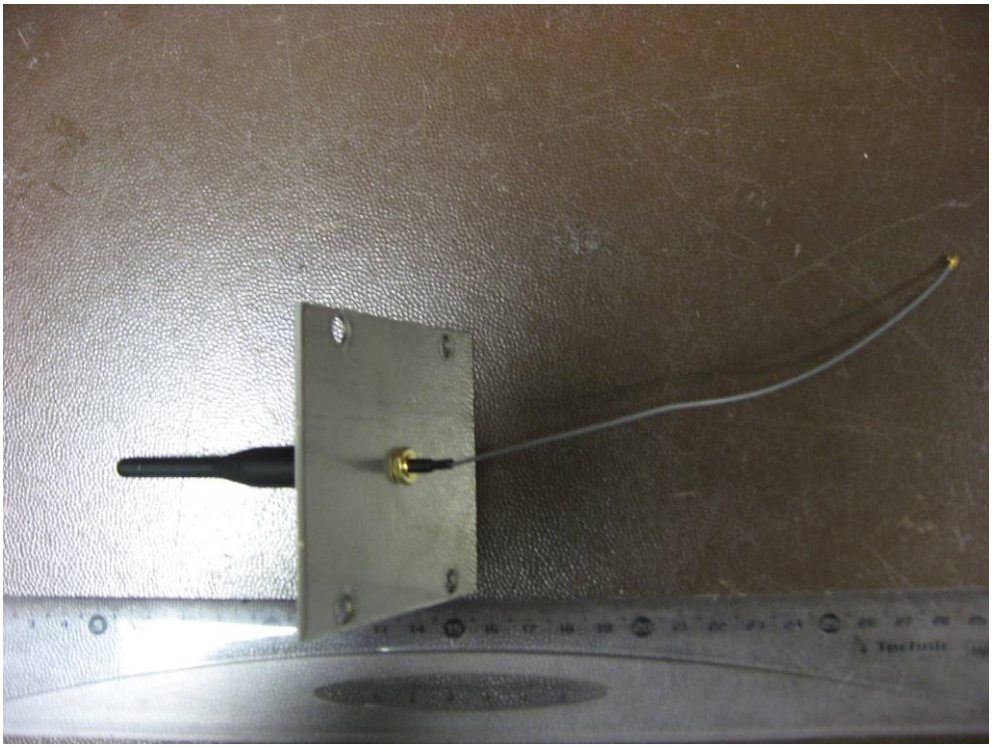


Printed circuit board face 2





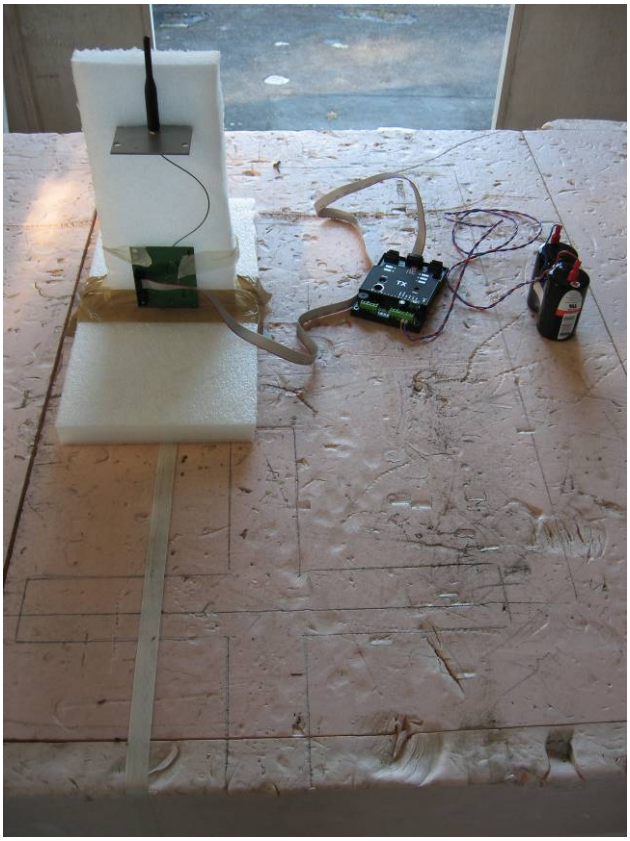
Antenna



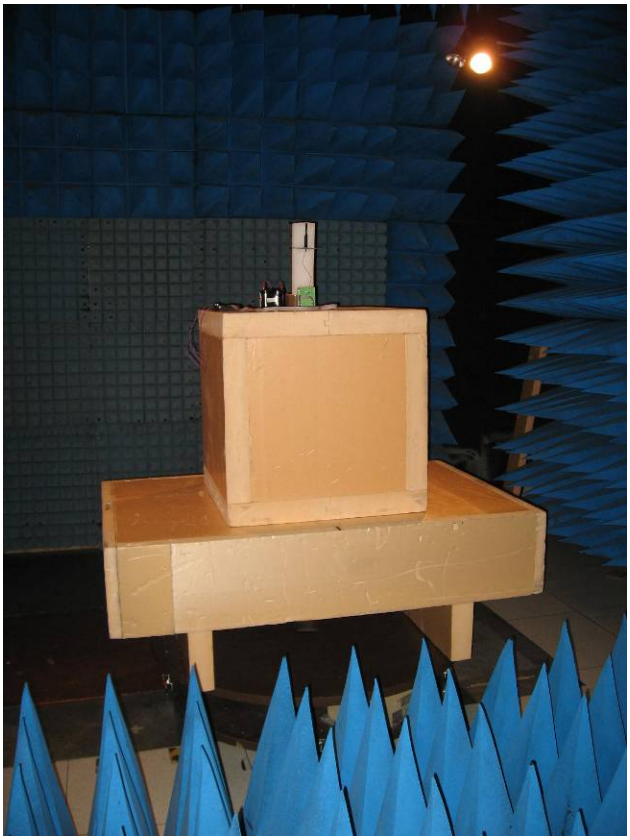
Battery

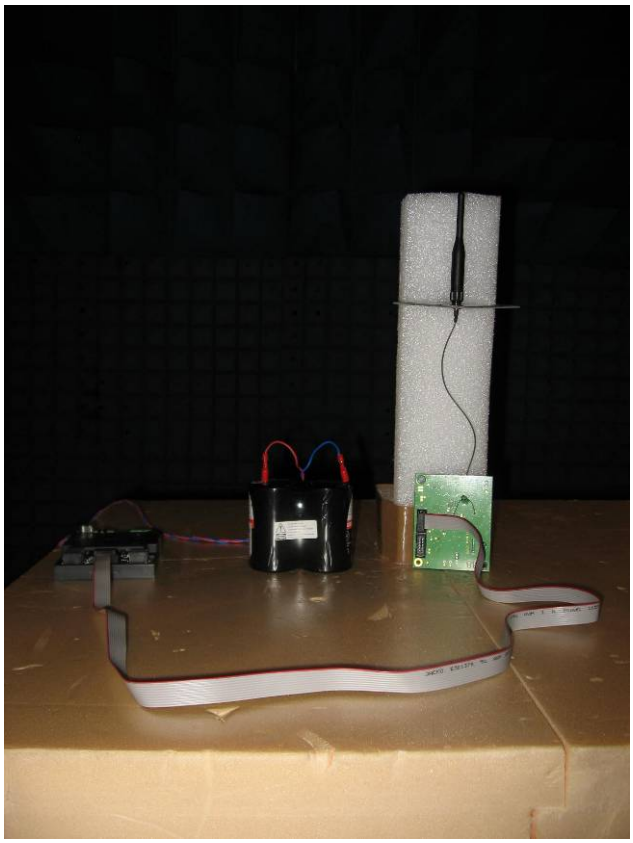
APPENDIX 2: Test set up

Open area test site



Full anechoic room





APPENDIX 3: Test equipment list

Radiated emission limits

TYPE	BRAND	EMITECH NUMBER
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
10 m open area test site	EMITECH	8732
Open area test site	Emitech	1274
Anechoic Chamber	EMITECH	8593
Magnetic field antenna HFH2-Z2	Rohde & Schwarz	8533
Loop antenna 6502	Emco	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna 11966C	Hewlett Packard	0728
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Logperiodic antenna HL223	Rohde & Schwarz	1999
Antenna 3115	Emco	8534
Préamplificateur 8447D	Hewlett Packard	8511
Low-noise amplifier 1 to 18 GHz	Microwave DB	1922
High pass filter HPM11630	Micro-tronics	6609
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750

Additional provisions of the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
Antenna 3115	Emco	8354
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750

Fundamental and harmonics field strength

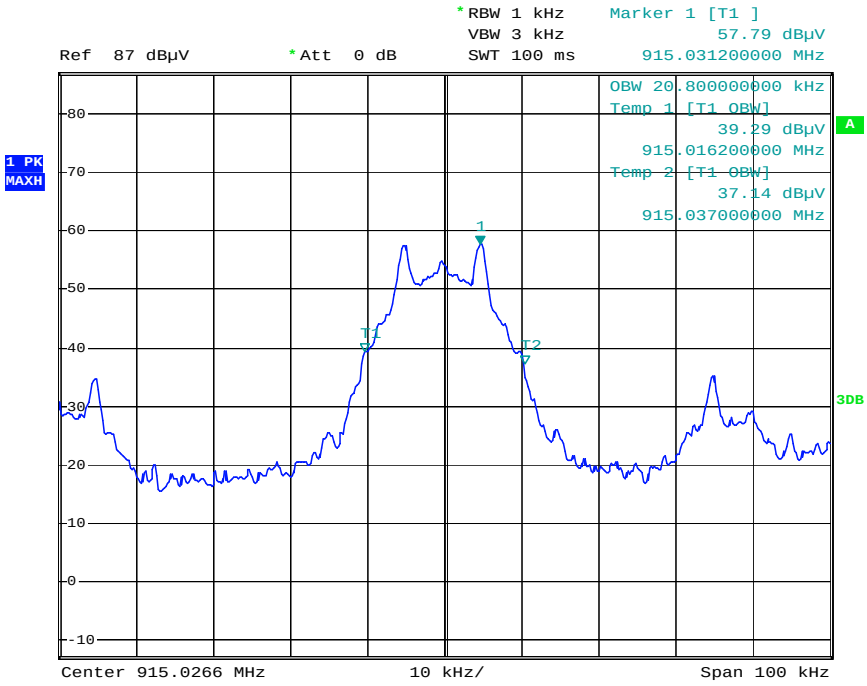
TYPE	BRAND	EMITECH NUMBER
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
10 m open area test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Magnetic field antenna HFH2-Z2	Rohde & Schwarz	8533
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Antenna 3115	Emco	8534
Préamplificateur 8447D	Hewlett Packard	8511
Low-noise amplifier 1 to 18 GHz	Microwave DB	1922
High pass filter HPM11630	Micro-tronics	6609
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750

Out of band emissions

TYPE	BRAND	EMITECH NUMBER
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum analyzer FSEM30	Rohde & Schwarz	8523
10 m open area test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Magnetic field antenna HFH2-Z2	Rohde & Schwarz	8533
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Antenna 3115	Emco	8534
Préamplificateur 8447D	Hewlett Packard	8511
Low-noise amplifier 1 to 18 GHz	Microwave DB	1922
High pass filter HPM11630	Micro-tronics	6609
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750

APPENDIX 4: 20 dB bandwidth

Channel 0



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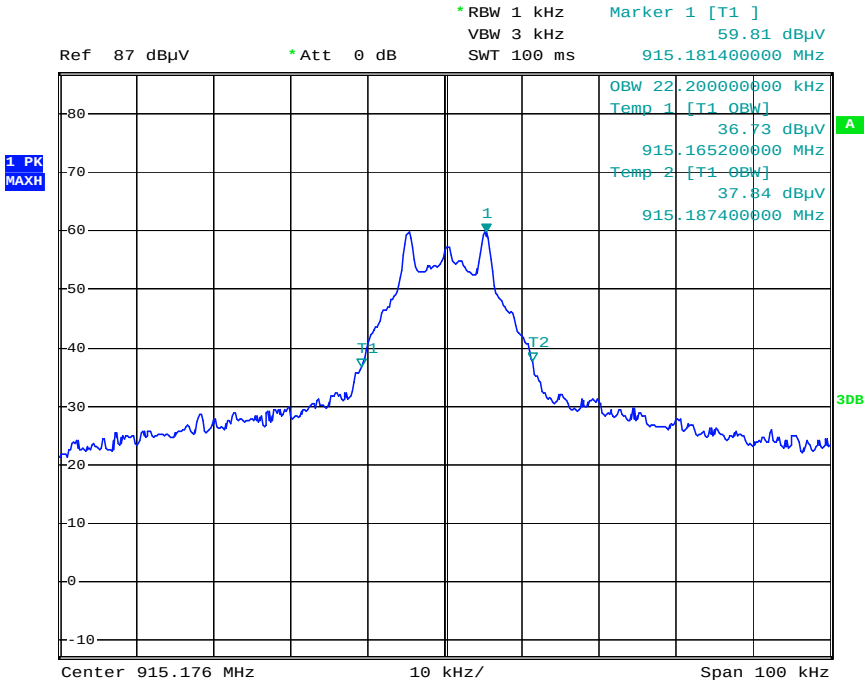
Channel 3



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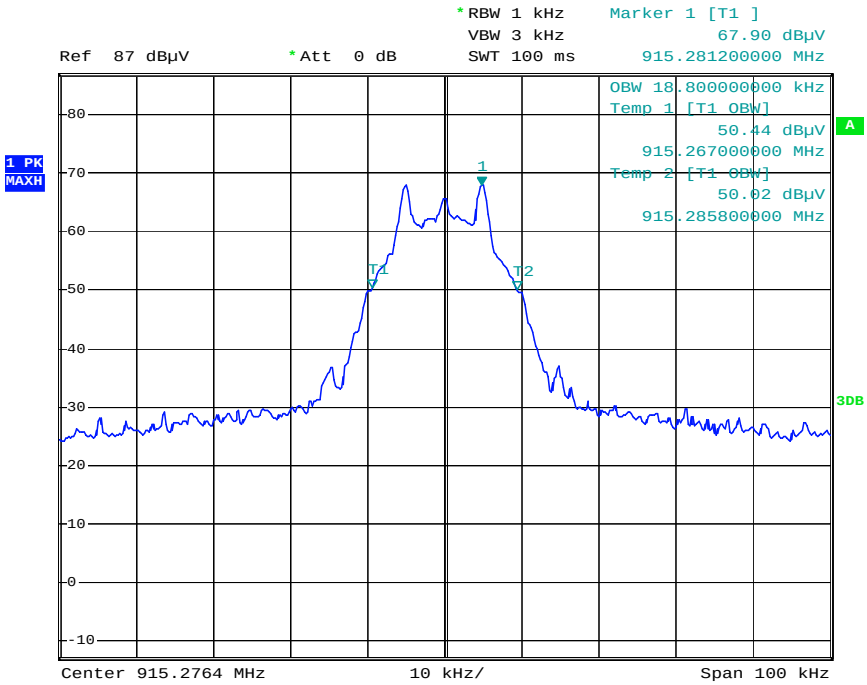
Channel 5



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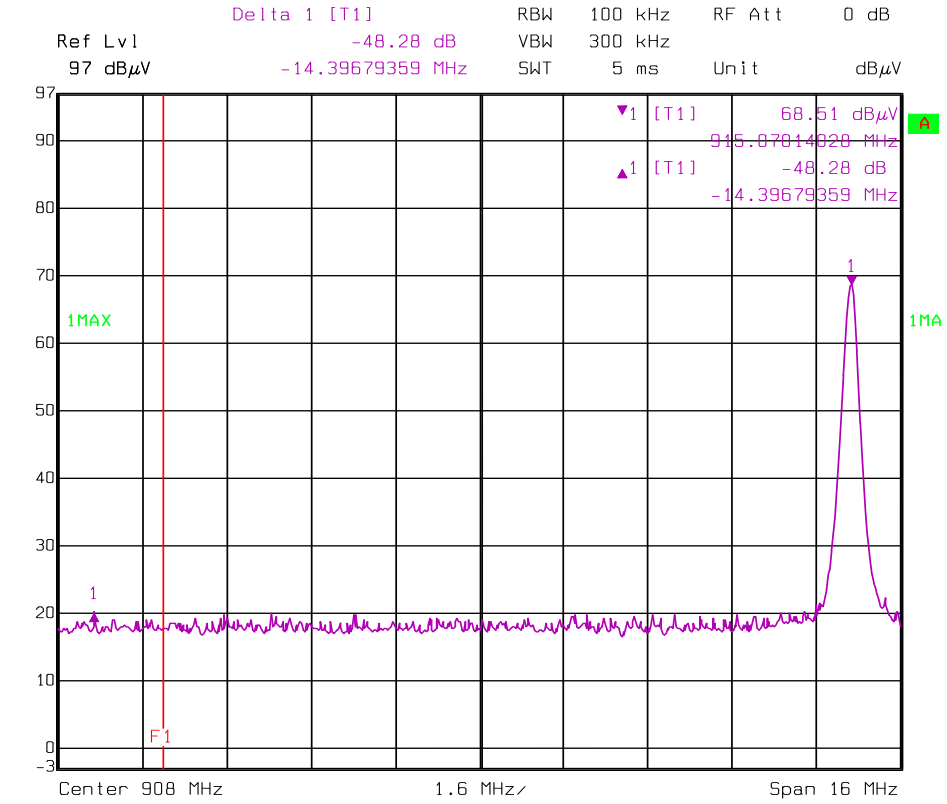
APPENDIX 5: Band edge

Channel 0



Channel 5