

RR051-18-100755-3-A Ed. 0

Certification Radio test report

**According to the standard:
CFR 47 FCC PART 15**

**Equipment under test:
RS420NFC_SCR READER**

FCC ID: NQY-30014

**Company:
ALLFLEX USA, Inc**

Distribution: Mr LANGOUET

(Company: ALLFLEX USA, Inc)

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DESIGNATION OF PRODUCT: RS420NFC_SCR Reader

Serial number (S/N): C143 00070

Reference / model (P/N): RS420NFC-60

Software version: 2.31.00 – Apr 4 2018

MANUFACTURER: ALLFLEX USA, Inc

COMPANY SUBMITTING THE PRODUCT:

Company: ALLFLEX USA, Inc

Address: 2805 East 14th Street
P.O. Box 612266
75261-2266 Dallas
Texas
USA

Responsible: Mr LANGOUET

DATE(S) OF TEST: From 16-Apr-18 to 24-Apr-18

TESTING LOCATION: EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE
FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

TESTED BY: S. LOUIS

VISA:



WRITTEN BY: S. LOUIS

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1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **RS420NFC SCR Reader**, in accordance with normative reference.

The equipment under test integrates:

- A Bluetooth radio module, already certified
- A RFID radio module operational at 134.2 kHz,
- A NFC radio module operational at 13.56 MHz.

This report concerns only the RFID part.

2. PRODUCT DESCRIPTION

Class:	A
Utilization:	Handheld control terminals
Antenna type and gain:	Integral antenna, gain unknown
Operating frequency range:	134.2 kHz
Number of channels:	1
Channel spacing:	Not concerned
Frequency generation:	A microcontroller with its 24 MHz crystal and an oscillator circuitry with a 17.1776 MHz crystal
Modulation:	RFID Protocol
Power source:	7.4Vdc Ni-MH batteries 12Vdc by AC / DC Adapter

The applicant declares that the equipment can emit during the recharge of batteries.
The applicant declares that the highest local oscillator used is 24MHz.

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 (2018) Radio Frequency Devices

ANSI C63.10 2013
Procedures for Compliance Testing of Unlicensed Wireless Devices.

447498 D01 General RF RF Exposure procedures and equipment authorization policies for mobile and
Exposure Guidance v06 portable equipment

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

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

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
0000	BAT-EMC V3.16.0.64	Software	/	/	/
1406	EMCO 6502	Loop antenna	13/06/2017	2	13/06/2019
6796	R&S FSP7	Spectrum Analyzer	12/11/2016	2	12/11/2018
7190	R&S HL223	Antenna	15/05/2016	3	15/05/2019
7240	Emco 3110	Biconical antenna	15/05/2016	3	15/05/2019
8508	California instruments 1251RP	Power source	15/01/2018	1	15/01/2019
8511	HP 8447D	Low-noise amplifier	01/02/2018	1	01/02/2019
8528	Schwarzbeck VHA 9103	Biconical antenna	15/05/2016	3	15/05/2019
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/08/2015	3	12/08/2018
8578	—	Cable open area test site	05/06/2016	2	05/06/2018
8590	N-5m	cable	05/06/2016	2	05/06/2018
8707	R&S ESI7	Test receiver	13/04/2018	1	13/04/2019
8719	Thurbly Thandar Instruments 1600	LISN	14/04/2018	2	14/04/2020
8732	Emitech	OATS	11/12/2016	3	11/12/2019
8750	La Crosse Technology WS-9232	Meteo station	23/11/2016	2	23/11/2018
8855	EMITECH	Turntable and mat controller	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9403	R&S ESU8	Spectrum Analyzer	11/10/2016	2	11/10/2018
10523	Absorber sheath current	Emitech	06/04/2018	2	06/04/2020
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	12/02/2018	1	12/02/2019
10759	SIDT Cage 3	Anechoic chamber	/	/	/
10789	MATURO	Turntable and mat controller NCD	/	/	/
11535	R&S EZ-25	High pass filter	13/02/2017	2	13/02/2019
14302	SUCOFLEX N-1m	cable	28/11/2016	2	28/11/2018
14303	SUCOFLEX N-2m	cable	28/11/2016	2	28/11/2018
14304	SUCOFLEX N-2.5m	cable	28/11/2016	2	28/11/2018
14305	SUCOFLEX N-4m	cable	28/11/2016	2	28/11/2018
14831	Fluke 177	Multimeter	12/03/2018	2	12/03/2020

6. TESTS RESULTS SUMMARY

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				

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

RF EXPOSURE:

In accordance with KDB 447498 D01 General RF Exposure Guidance v06, Paragraph 4.3.1.

The product must respect the exclusion limit for 10-g extremity SAR and a separation distances less than 50mm:

Maximum measured power = 85.86 dB μ V/m = **65.4 x 10⁻⁶ mW** at 134.2 kHz.
with $P = (E \times d)^2 / (30 \times G_p)$ with $d = 10 \text{ m}$ and $G_p = 1$

The power threshold determined by the equation in 4.3.1.c) 1) for 50 mm and 100 MHz is multiplied by 1/2

According this formula:

Power threshold, mW = $\left[\left[\left(\frac{50 \times 7.5}{\sqrt{0.100}} \right) + (50 - 50) \times (100/150) \right] \times [1 + \log(100/0.1342)] \times \frac{1}{2} \right]$
Power threshold, mW = 2295.96 mW

The equipment fulfils the requirements on maximum conducted or equivalent isotropically radiated power (e.i.r.p) for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310 at the distance greater than 5 mm between the user and the antenna.

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the result(s)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	$\pm 0.75\text{dB}$
Radiated emission valid to 26 GHz	
F < 62.5 MHz:	$\pm 5.14\text{ dB}$
62.5 MHz < F < 1 GHz:	$\pm 5.13\text{ dB}$
1 GHz < F < 26 GHz:	$\pm 5.16\text{ dB}$
AC Power Lines conducted emissions	$\pm 3.38\text{ dB}$
Temperature	$\pm 1\text{ }^\circ\text{C}$
Humidity	$\pm 5\%$

8. CONDUCTED LIMITS**Temperature (°C) :** 23**Humidity (%HR):** 50**Date :** April 20, 2018**Technician :** S. LOUIS**Standard:** FCC Part 15**Test procedure:** Paragraph 15.207**Software used:** BAT-EMC V3.6.0.32**Test set up:**

The EUT is isolated and placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

See photos in appendix 2

Frequency range: 150 kHz - 30 MHz**Detection mode:** Peak / Quasi-peak / Average**Bandwidth:** 10 kHz / 9 kHz**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: Sample N° 1:

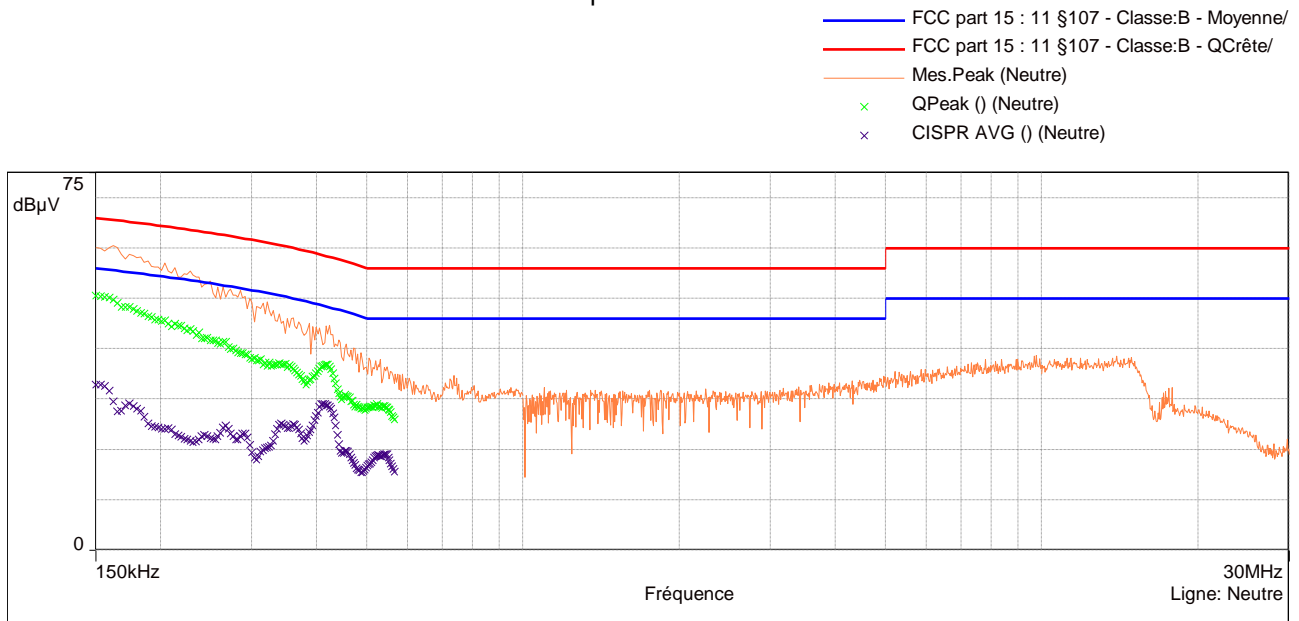
Measurement on the mains power supply:

The measurement is first realized with peak detector.

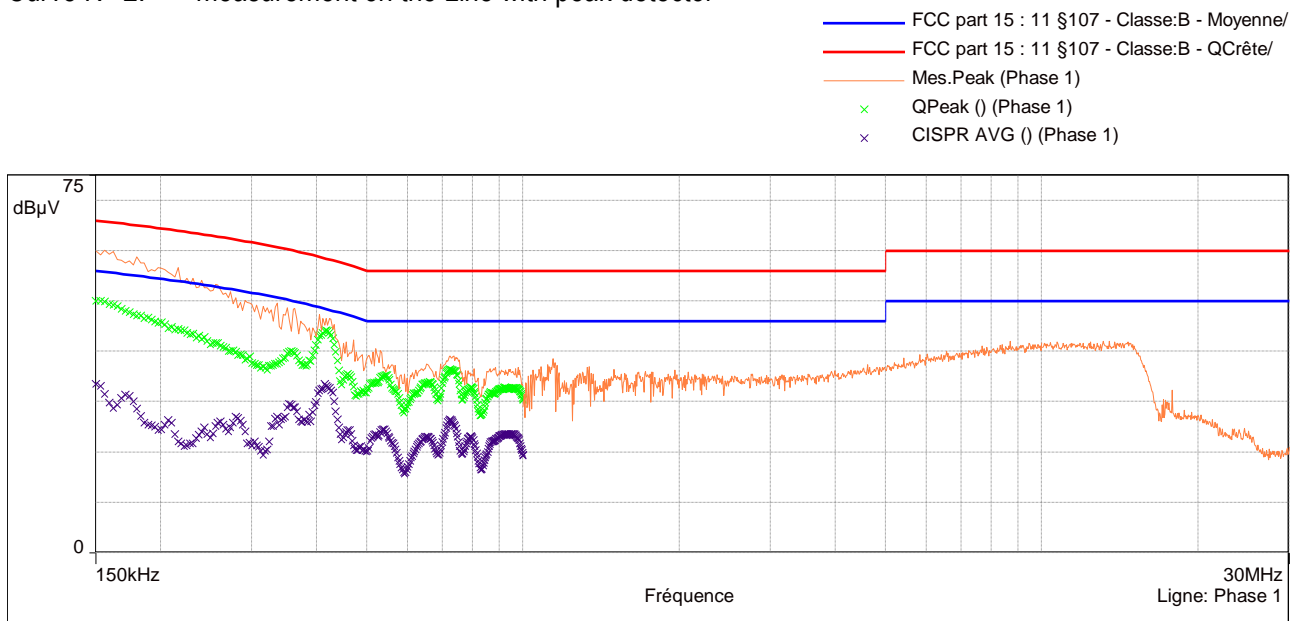
The frequencies which are not 6 dB under the Quasi-peak limit are then analyzed with Quasi-peak detector.

The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



Test conclusion:

RESPECTED STANDARD

9. RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS**Temperature (°C) :** 17 to 22**Humidity (%HR):** 32 to 45**Date :** April 16, 2018 and
April 17, 2018**Technician :** S. LOUIS**Standard:** FCC Part 15**Test procedure:** paragraph 209**Test set up:**

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site, the EUT 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 appendix 2.

Frequency range: From 9 kHz to 1GHz (the highest local oscillator frequency used is 24MHz)**Detection mode:** Quasi-peak ($F < 1$ GHz)
Except for the frequency bands 9-90kHz, 110-490kHz. Radiated emission limits in these three bands are based on measurements employing an average detector**Bandwidth:** 200Hz ($9 \text{ kHz} < F < 150\text{kHz}$)
9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)
120 kHz ($30 \text{ MHz} < F < 1 \text{ GHz}$)
1 MHz ($F > 1 \text{ GHz}$)**Distance of antenna:** 10 meters (in open area test site)**Antenna height:** 1 to 4 meters (in open area test site)**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.

Tests are performed in charging mode and with battery fully charged.

Results:

Power source: We used for power source the AC/DC adapter provided by the applicant regulated to 120Vac.

Sample N° 1: Carrier = 134.2 kHz

Frequencies (kHz)	Detector P: Peak Av: Average	Field strength at 10 meters dB μ V/m ⁽¹⁾	Field strength at 300 meters dB μ V/m ⁽²⁾	Limits 300m dB μ V/m	Margin (dB)
134.2	P	85.86	26.77	45	15.88
134.2	Av	83.88	24.80	25	0.2

With antenna height: 100 cm; Azimuth: 268°; Polarization antenna: Parallel° - Position 2

(1) Field strength measured at 10 meters

(2) Field strength extrapolated at 300 meters using 40dB/decade fall off

Sample 1: Harmonics:

Frequencies (kHz)	Detector P: Peak Av: Average	Field strength at 10 meters dB μ V/m ⁽³⁾	Field strength at 300 meters dB μ V/m ⁽⁴⁾	Limits 300m dB μ V/m	Margin (dB)
268.4	P	54.3	-4.78	39	43.78
268.4	Av	53.3	-5.78	19	4.78

(3) Noise Floor measured at 10 meters

(4) Noise Floor extrapolated at 300 meters using 40dB/decade fall off

Frequencies (kHz)	Detector P: Peak Av: Average	Field strength at 10 meters dB μ V/m ⁽⁵⁾	Field strength at 300 meters dB μ V/m ⁽⁶⁾	Limits 300m dB μ V/m	Margin (dB)
402.7	P	51.9	-7.15	35.5	42.65
402.7	Av	49.9	-9.18	15.5	24.68

(5) Noise Floor measured at 10 meters

(6) Noise Floor extrapolated at 300 meters using 40dB/decade fall off

Applicable limits:	for 9 kHz \leq F \leq 490 kHz :	2400/F(kHz) at 300 meters
	for 490 kHz < F \leq 1.705 MHz :	24000/F(kHz) at 30 meters
	for 1.705 MHz < F \leq 30 MHz :	29.5 dB μ V/m at 30 meters
	for 30 MHz < F \leq 88 MHz :	40 dB μ V/m at 3 meters
	for 88 MHz < F \leq 216 MHz :	43.5 dB μ V/m at 3 meters
	for 216 MHz < F \leq 960 MHz :	46 dB μ V/m at 3 meters
	Above 960 MHz :	54 dB μ V/m at 3 meters

Power source: We used for power source the internal battery of the equipment fully charged

Sample N° 1: Carrier = 134.2 kHz

Frequencies (kHz)	Detector P: Peak Av: Average	Field strength at 10 meters dB μ V/m ⁽¹⁾	Field strength at 300 meters dB μ V/m ⁽²⁾	Limits 300m dB μ V/m	Margin (dB)
134.2	P	85.63	26.55	45	18.45
134.2	Av	83.65	24.57	25	0.43

With antenna height: 100 cm; Azimuth: 261°; Polarization antenna: Parallel° - Position 2

(1) Field strength measured at 10 meters

(2) Field strength extrapolated at 300 meters using 40dB/decade fall off

Applicable limits:	for 9 kHz \leq F \leq 490 kHz :	2400/F(kHz) at 300 meters
	for 490 kHz < F \leq 1.705 MHz :	24000/F(kHz) at 30 meters
	for 1.705 MHz < F \leq 30 MHz :	29.5 dB μ V/m at 30 meters
	for 30 MHz < F \leq 88 MHz :	40 dB μ V/m at 3 meters
	for 88 MHz < F \leq 216 MHz :	43.5 dB μ V/m at 3 meters
	for 216 MHz < F \leq 960 MHz :	46 dB μ V/m at 3 meters
	Above 960 MHz :	54 dB μ V/m at 3 meters

Sample N° 1

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m) or (dBm)	Margin (dB)
209.29	QP	—	120	V	20.01	30.51	43.5	12.99
249	QP	340	120	V	26.22	36.62	46	9.38

P= Peak, QP=Quasi-peak, Av=Average

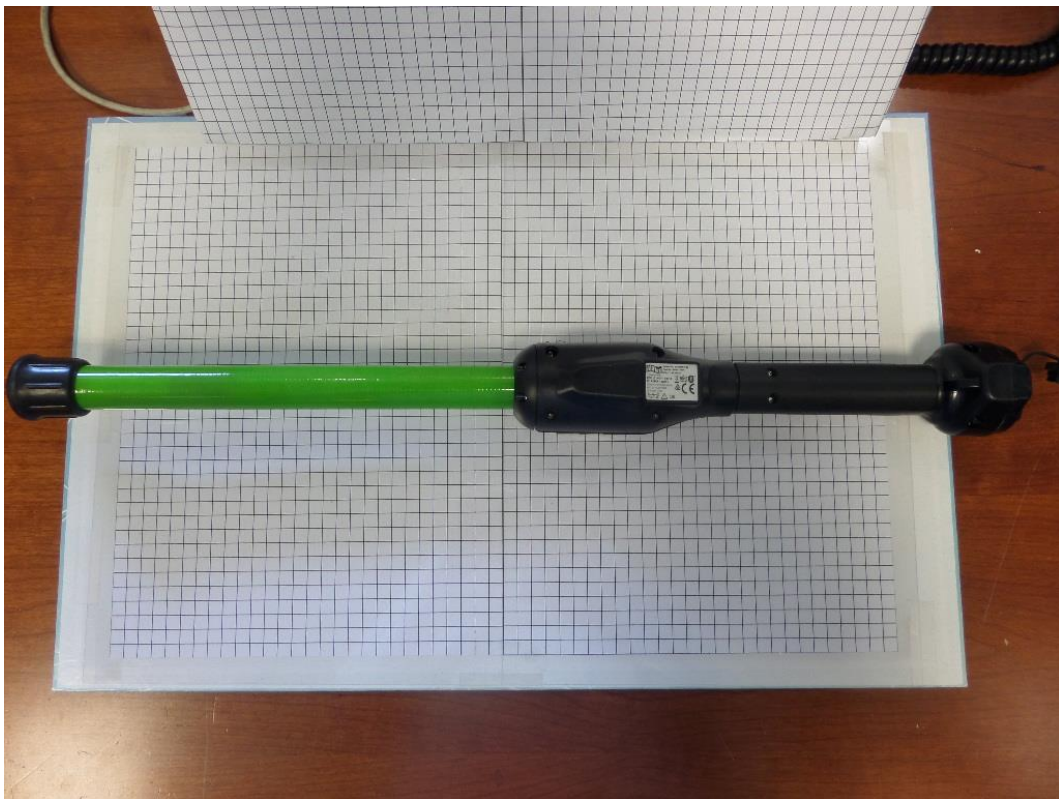
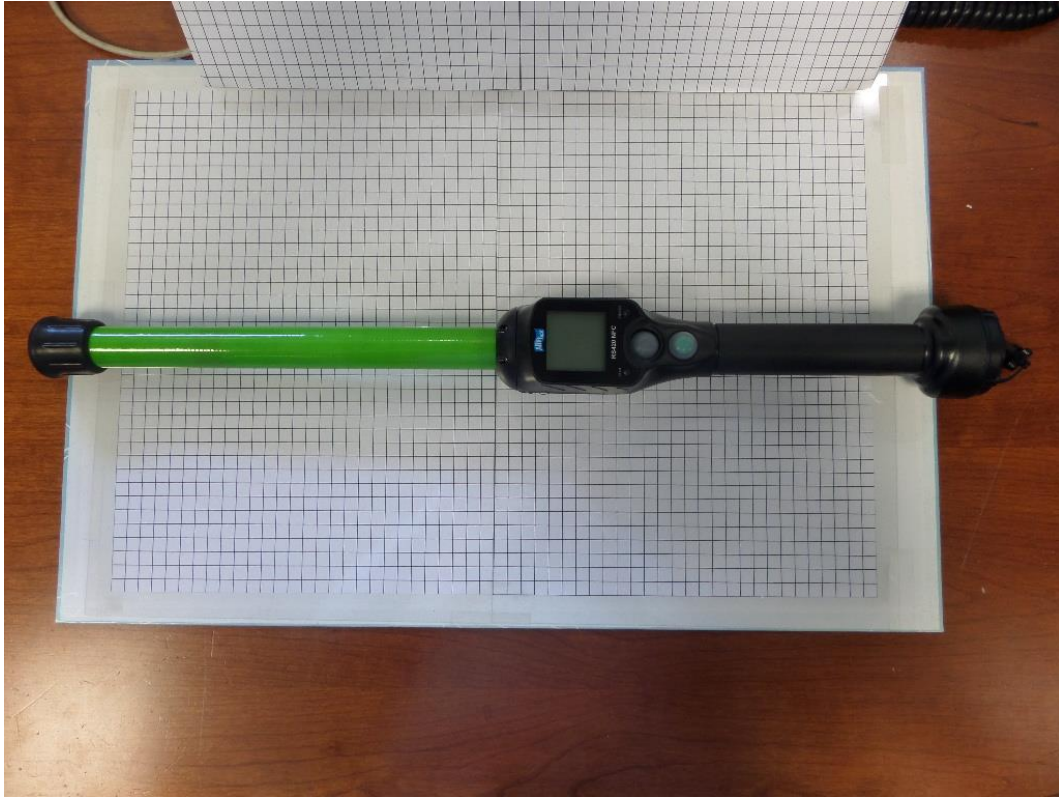
Applicable limits:	for 9 kHz \leq F \leq 490 kHz :	2400/F(kHz) at 300 meters
	for 490 kHz < F \leq 1.705 MHz :	24000/F(kHz) at 30 meters
	for 1.705 MHz < F \leq 30 MHz :	29.5 dB μ V/m at 30 meters
	for 30 MHz < F \leq 88 MHz :	40 dB μ V/m at 3 meters
	for 88 MHz < F \leq 216 MHz :	43.5 dB μ V/m at 3 meters
	for 216 MHz < F \leq 960 MHz :	46 dB μ V/m at 3 meters
	Above 960 MHz :	54 dB μ V/m at 3 meters

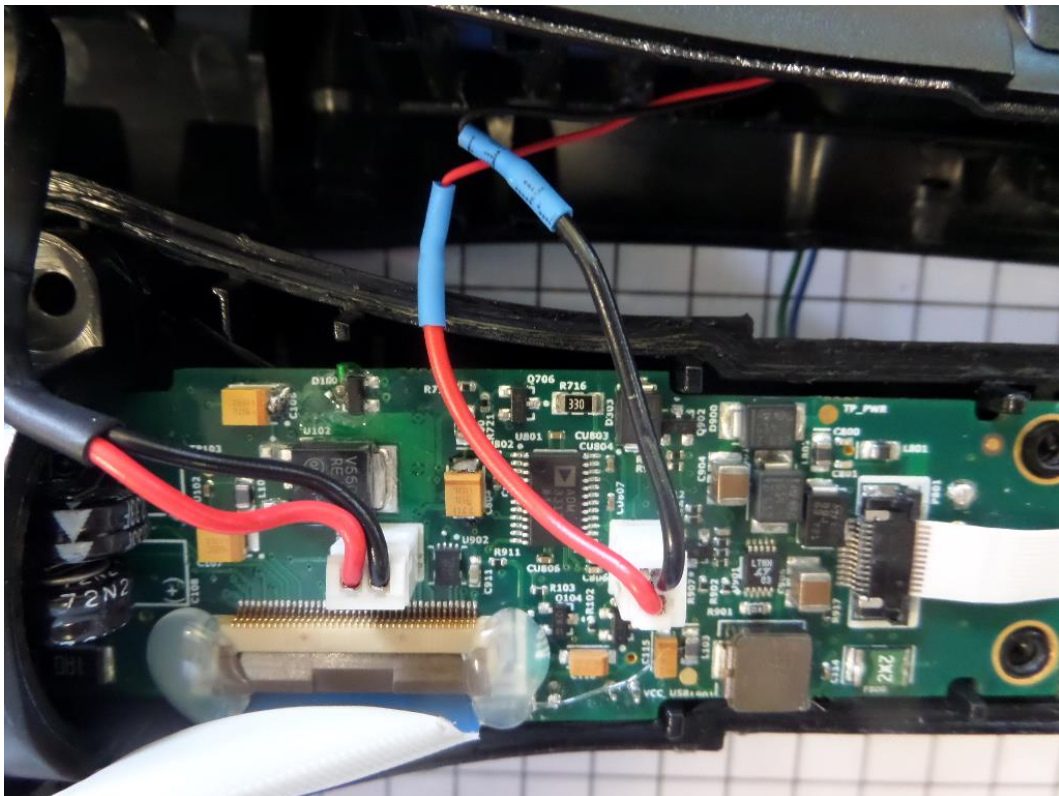
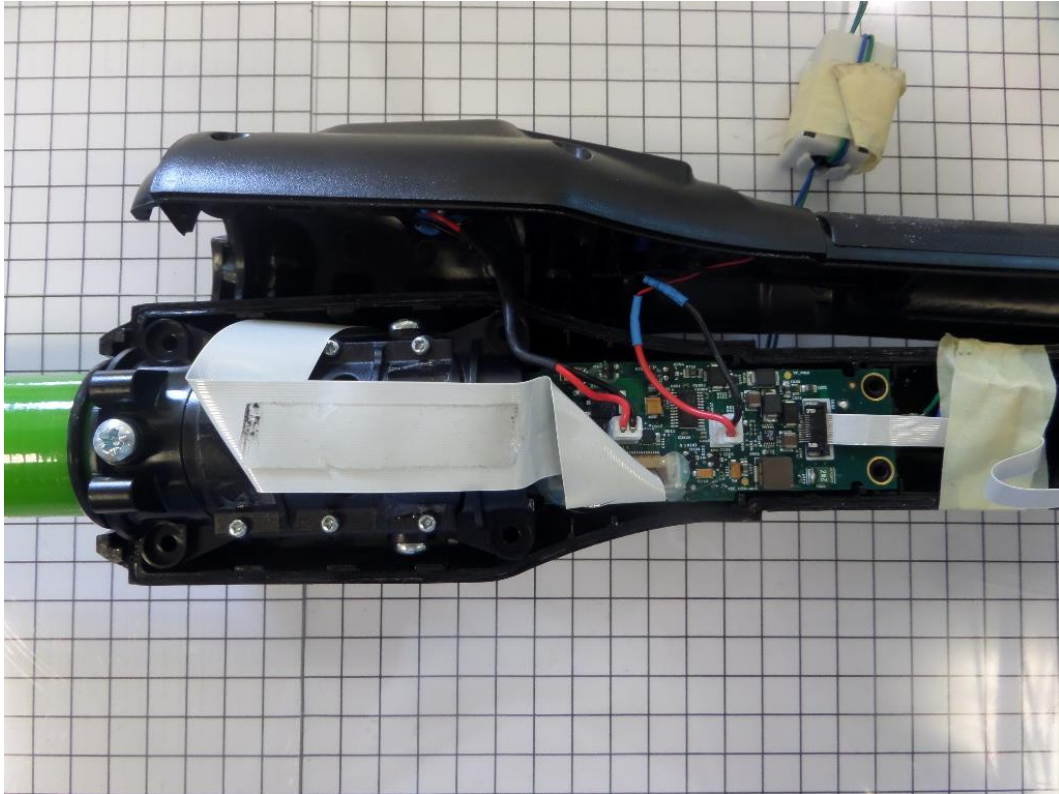
Test conclusion:

RESPECTED STANDARD

□□□ End of report, 4 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test











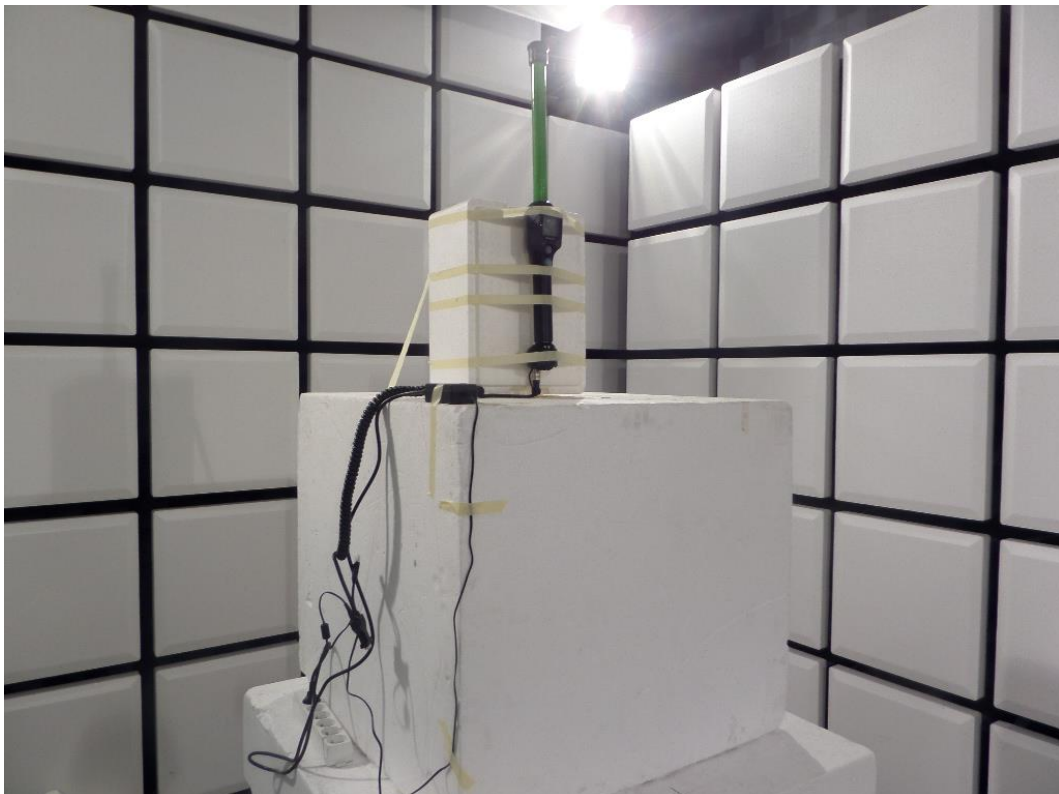
Label



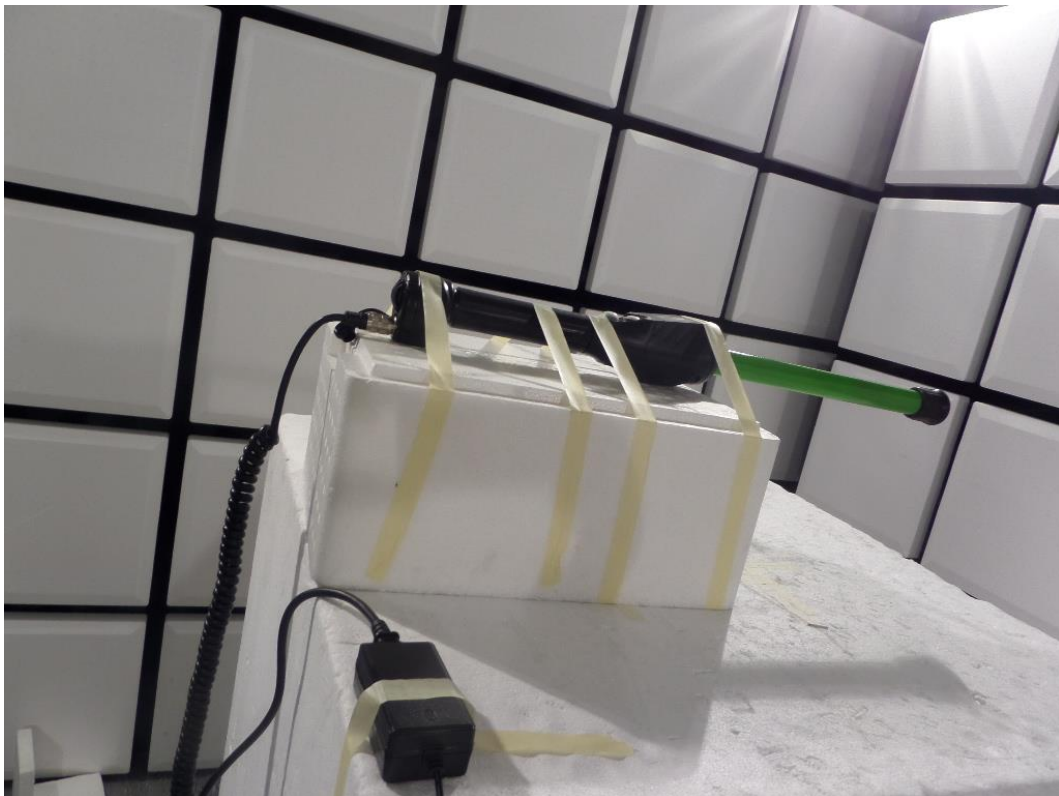
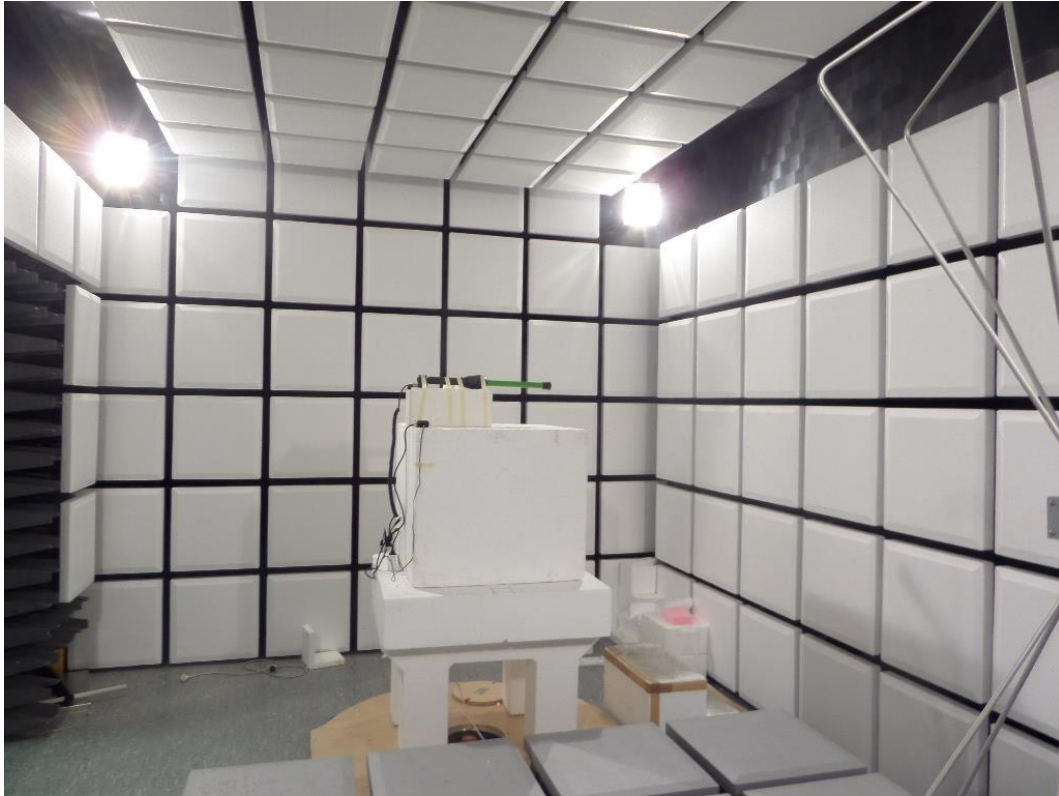
APPENDIX 2: Test set up

Full anechoic room

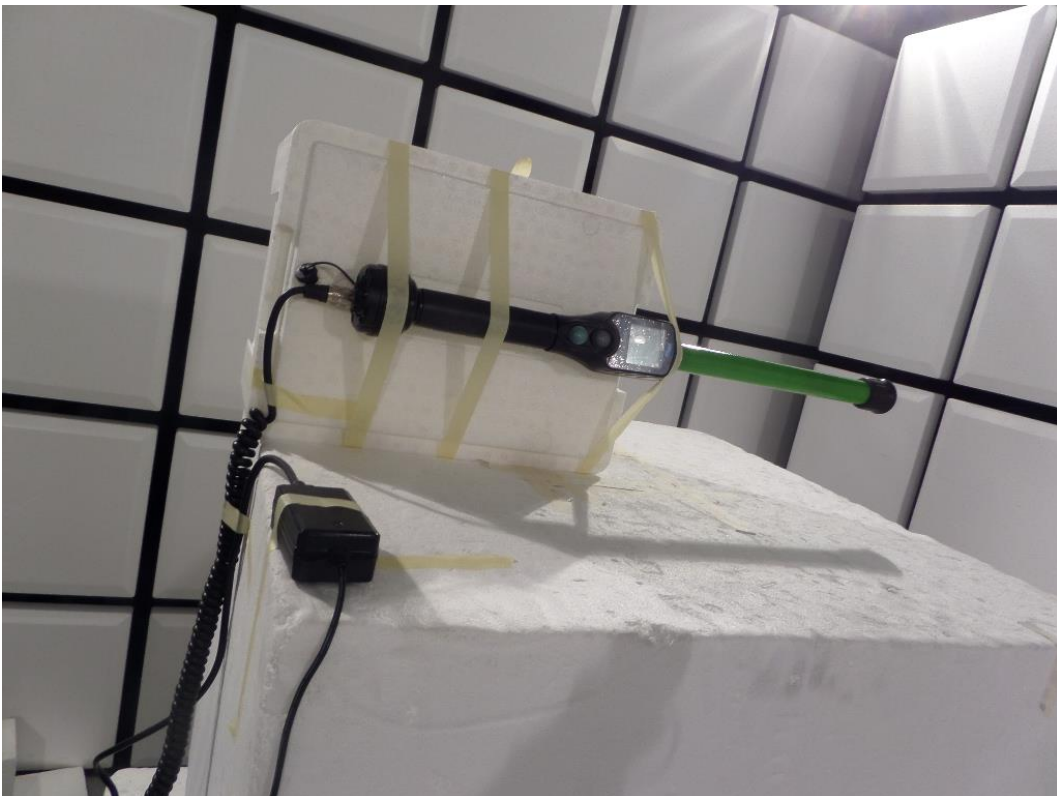
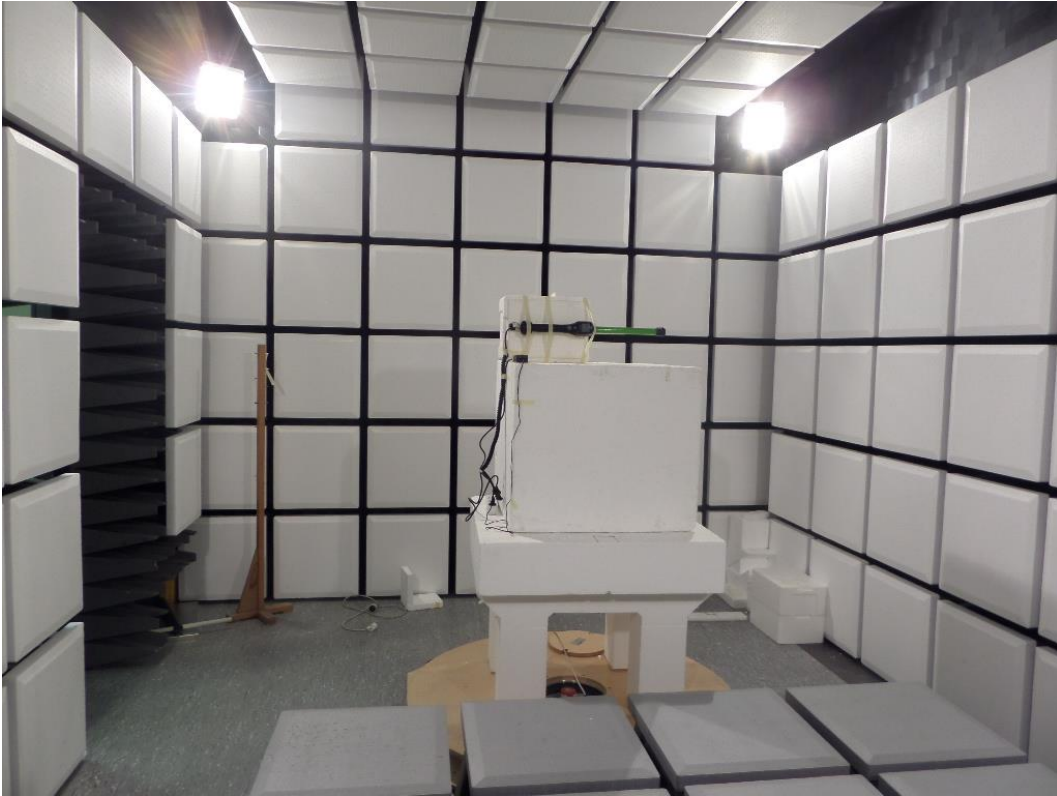
Position 1 in charging mode



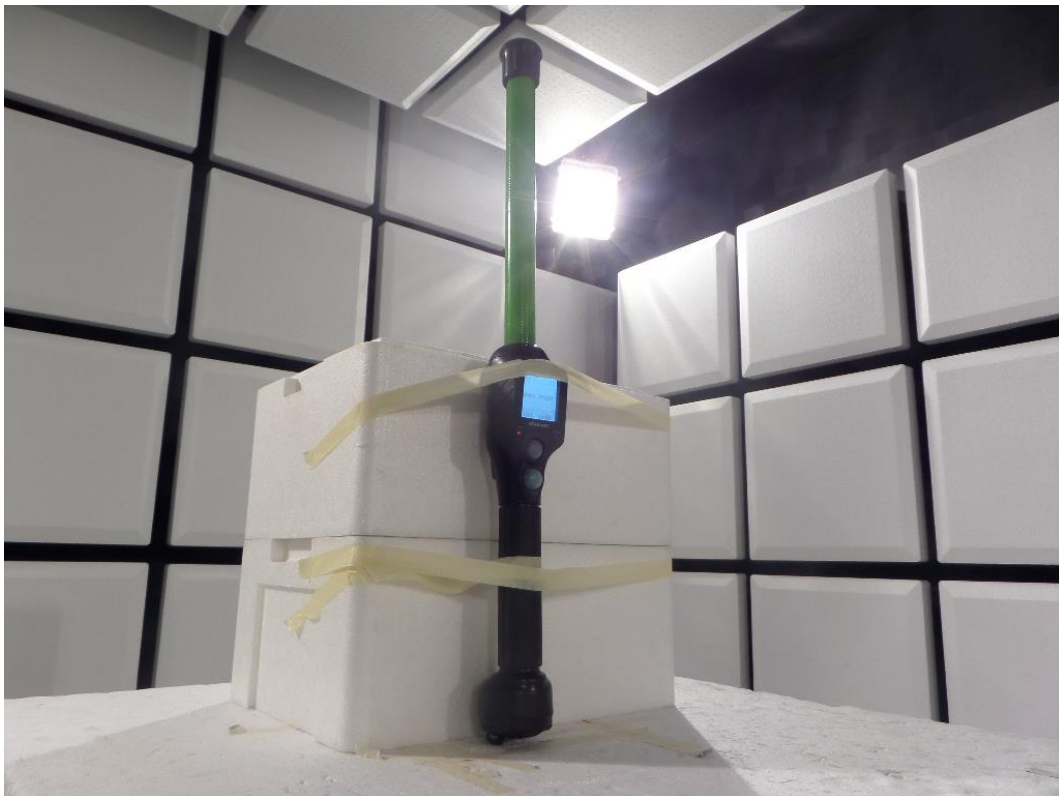
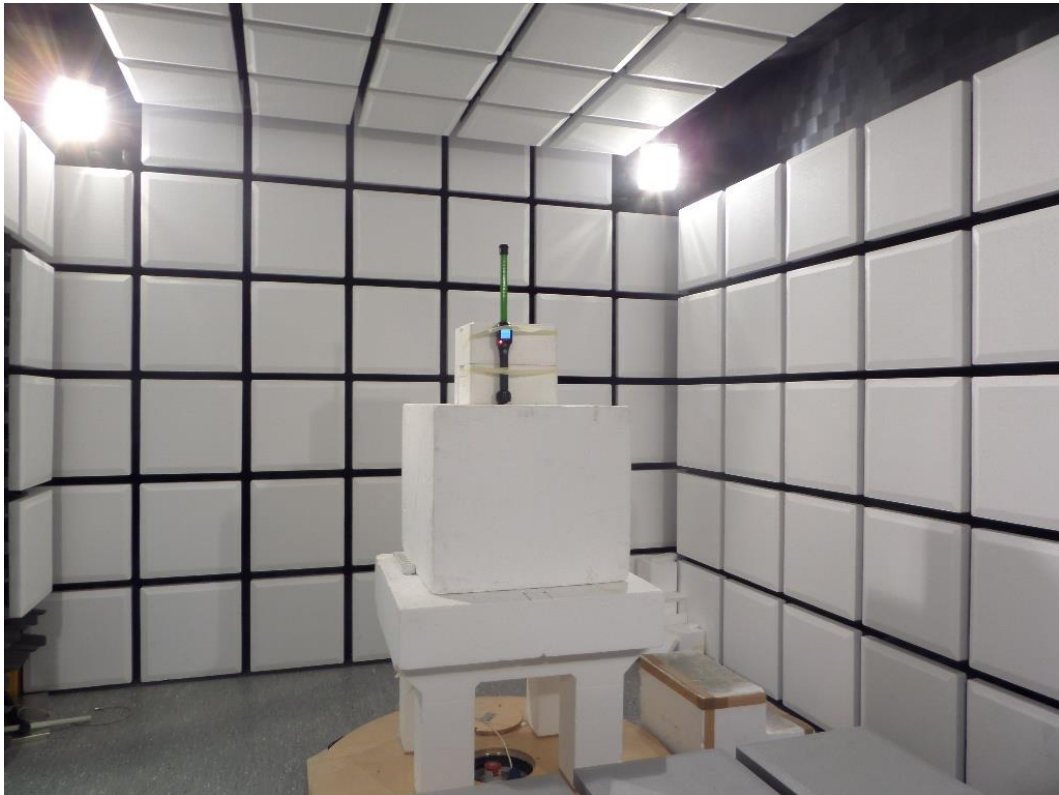
Position 2 in charging mode



Position 3 in charging mode



Position 1 supplied by battery



Position 2 supplied by battery



Position 3 supplied by battery



Open test area

Position 1 in charging mode



Position 2 in charging mode



Position 3 in charging mode



Position 1 supplied by battery



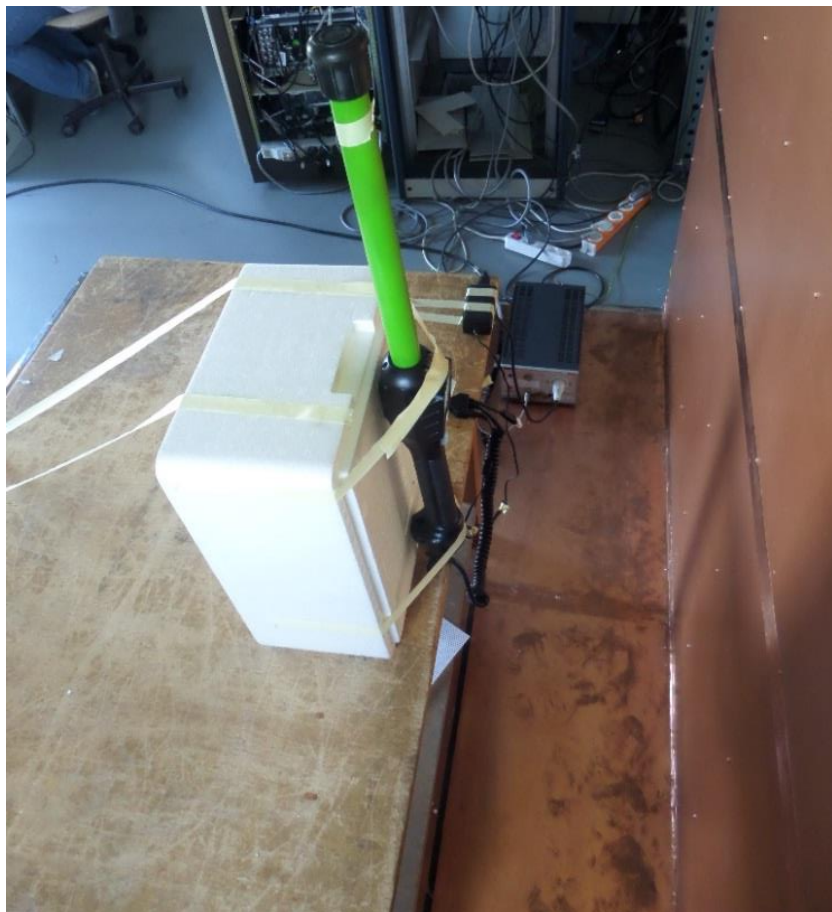
Position 2 supplied by battery



Position 3 supplied by battery



Conducted Emissions



APPENDIX 3: Test equipment list

Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer ESU8	Rohde & Schwarz	9403
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ25	Rohde & Schwarz	11535
Cable N-5m	—	8590
Absorber sheath current	Emitech	10523
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Radiated emission limits; general requirements

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Loop antenna 6502	EMCO	1406
Biconical antenna 3110	Emco	7240
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna HL223	Rohde & Schwarz	7190
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Cable open area test site	—	8578
Cable N-1m	SUCOFLEX	14302
Cable N-2m	SUCOFLEX	14303
Cable N-2.5m	SUCOFLEX	14304
Cable N-4m	SUCOFLEX	14305
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.16.0.64	0000

Charging Mode

