

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
SCANFLEX AFX-110

FCC ID: NQY-30018

Company:
ALLFLEX USA, Inc

Distribution: Mr LANGOUET

(Company: ALLFLEX USA, Inc)

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DESIGNATION OF PRODUCT: SCANFLEX AFX-110

Serial number (S/N): C135-00021

Reference (P/N) / model: 30018 / AFX-110

Software version: 1.20.00

MANUFACTURER: ALLFLEX USA, Inc

COMPANY SUBMITTING THE PRODUCT:

Company: ALLFLEX USA, Inc

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

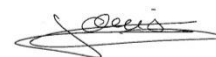
Responsible: Mr LANGOUET

DATE(S) OF TEST: From 12-Feb-18 to 23-Feb-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: **SCANFLEX AFX-110**, in accordance with normative reference.

The device under test integrates a 125 kHz and 134.2 kHz RFID function.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Handheld control terminals
Antenna type and gain:	Integral antenna, gain unknown
Operating frequency range:	125 kHz and 134.2 kHz
Number of channels:	2
Channel spacing:	Not concerned
Frequency generation:	A microcontroller with its 24 MHz crystal and an oscillator circuitry with a 17.1776 MHz crystal
Power source:	7.2 Vdc Ni-MH batteries

The applicant declares that the equipment can't 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
4087	Filtek LP03/1000-7GH	Low Pass Filter	05/06/2016	2	05/06/2018
6796	R&S FSP7	Spectrum Analyzer	12/11/2016	2	12/11/2018
6884	Suhner 1.5m	Cable	19/03/2016	2	19/03/2018
7190	R&S HL223	Antenna	15/05/2016	3	15/05/2019
7240	Emco 3110	Biconical antenna	15/05/2016	3	15/05/2019
7566	Testo 608-Hi	Meteo station	15/04/2016	2	15/04/2018
8511	HP 8447D	Low-noise amplifier	01/02/2018	1	01/02/2019
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/08/2015	3	12/08/2018
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
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8707	R&S ESI7	Test receiver	07/08/2016	2	07/08/2018
8732	Emitech	OATS	11/12/2016	3	11/12/2019
8749	La Crosse Technology WS-9232	Meteo station	23/11/2016	2	23/11/2018
8750	La Crosse Technology WS-9232	Meteo station	23/11/2016	2	23/11/2018
8855	EMITECH	Turntable and mat controller	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
8958	1060C	turntable	/	/	/
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	/	/	/
12911	Huber + Suhner N-2m	cable	28/06/2016	2	28/06/2018
12912	Huber + Suhner N-5m	cable	28/06/2016	2	28/06/2018
14476	Fluke 177	Multimeter	20/05/2017	1	20/05/2018

6. TESTS RESULTS SUMMARY

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		Note 2
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: The applicant declares that the equipment does not emit during charge of batteries.

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:

1/ For Frequency = 134.2 kHz:

Maximum measured power = 75.28 dB μ V/m = **19.4 x 10⁻⁶ mW** at 134.2 kHz.

with $P = (E \times d)^2 / (30 \times G_p)$ with $d = 10$ 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 ½

According this formula:

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

Power threshold, mW = 2295.96 mW

2/ For Frequency = 125 kHz:

Maximum measured power = 75.08 dB μ V/m = **18.9 x 10⁻⁶ mW** at 125 kHz.

with $P = (E \times d)^2 / (30 \times G_p)$ with $d = 10$ 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 ½

According this formula:

Power threshold, mW = $\left[\left[\frac{(50 \times 7.5)}{\sqrt{(0.100)}} + (50-50) \times (100/150) \right] \times [1 + \log(100/0.125)] \times \frac{1}{2} \right]$

Power threshold, mW = 2314.25 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. **RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS**

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 ($F < 1 \text{ GHz}$)
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.

Ambient temperature (°C):	18.4
Relative humidity (%):	37

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

Results:

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	75.28	16.20	45	28.80
134.2	Av	74.18	15.10	25	9.90

With antenna height: 100 cm; Azimuth: 12°; Polarization antenna: Parallel° - Position 1

(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)
402.7	P	51.93	-7.15	35.5	42.65
402.7	Av	50.83	-8.25	15.5	23.75

(3) Noise Floor measured at 10 meters

(4) 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

Sample N° 1: Carrier =125kHz

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)
125	P	75.08	16.00	45	29.00
125	Av	73.98	14.90	25	10.10

With antenna height: 100 cm; Azimuth: 12°; Polarization antenna: Parallel° - Position 1

(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)
375	P	50.39	-8.70	35.5	44.20
375	Av	49.29	-9.70	15.5	25.2

(3) Noise Floor measured at 10 meters

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

Frequencies (kHz)	Detector QP: Q-Peak	Field strength at 10 meters dB μ V/m ⁽⁵⁾	Field strength at 30 meters dB μ V/m ⁽⁶⁾	Limits 30m dB μ V/m	Margin (dB)
500	QP	45.74	26.66	33	6.34

(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

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 (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m) or (dBm)	Margin (dB)
63.37	QP	165	120	V	35.7	25.3	40	14.7
67.38	QP	165	120	V	36.4	26	40	14.0
204	QP	165	120	V	42.9	32.5	43.5	11.0
292	QP	165	120	V	41.3	30.9	46	15.1

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

Applicable limits:

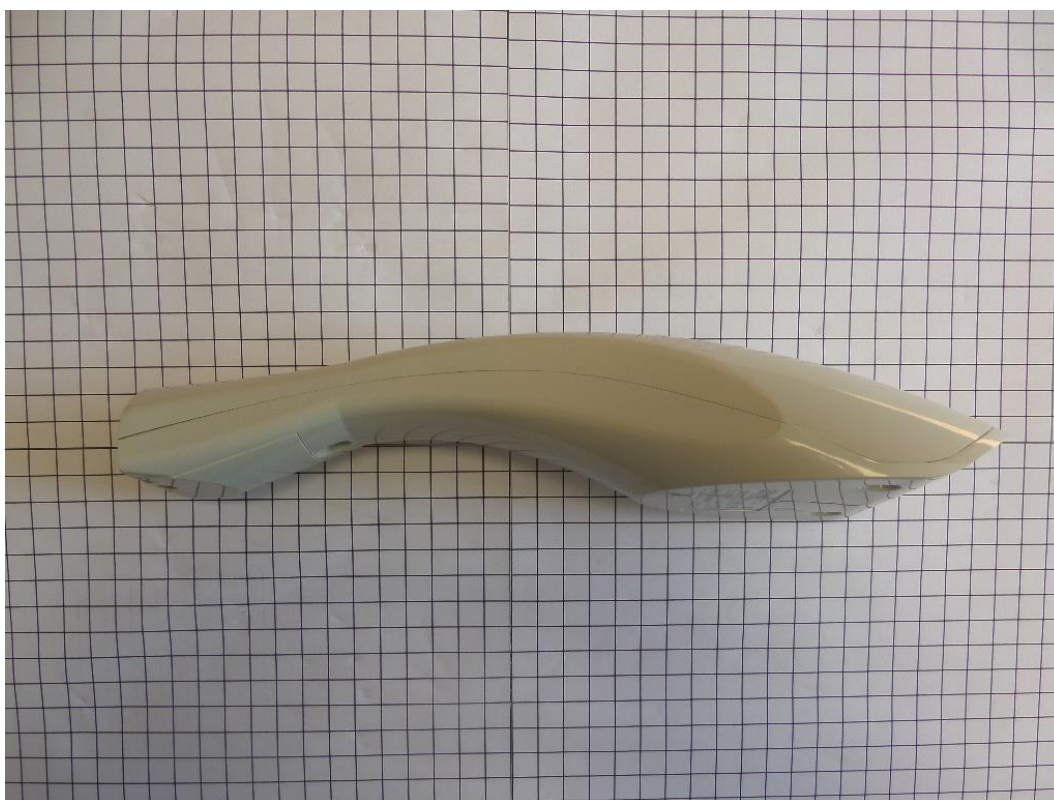
for $9 \text{ kHz} \leq F \leq 490 \text{ kHz}$:	$2400/F(\text{kHz})$ at 300 meters
for $490 \text{ kHz} < F \leq 1.705 \text{ MHz}$:	$24000/F(\text{kHz})$ at 30 meters
for $1.705 \text{ MHz} < F \leq 30 \text{ MHz}$:	29.5 dBμV/m at 30 meters
for $30 \text{ MHz} < F \leq 88 \text{ MHz}$:	40 dBμV/m at 3 meters
for $88 \text{ MHz} < F \leq 216 \text{ MHz}$:	43.5 dBμV/m at 3 meters
for $216 \text{ MHz} < F \leq 960 \text{ MHz}$:	46 dBμV/m at 3 meters
Above 960 MHz :	54 dBμV/m at 3 meters

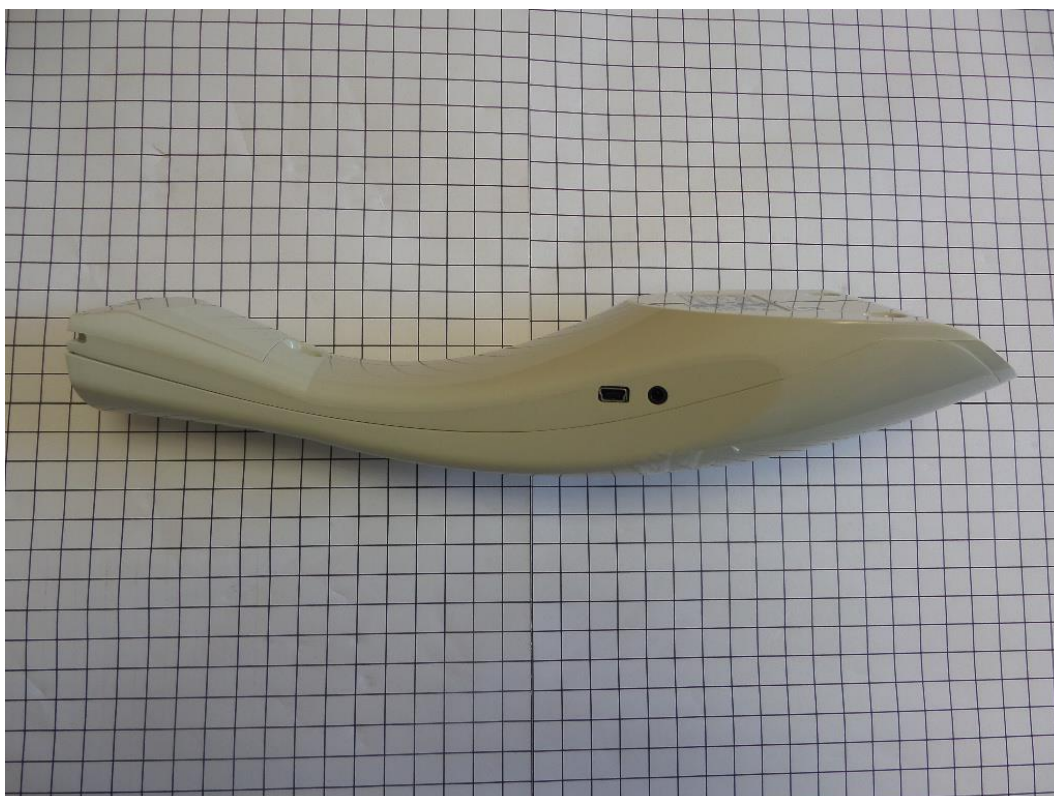
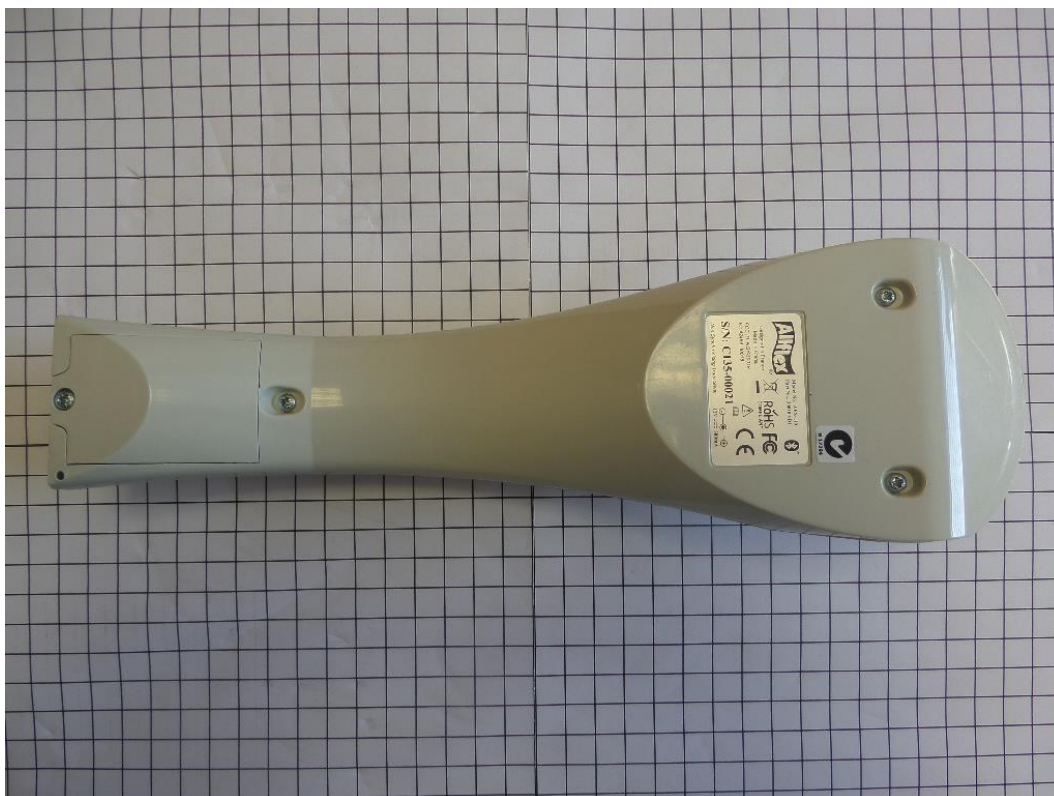
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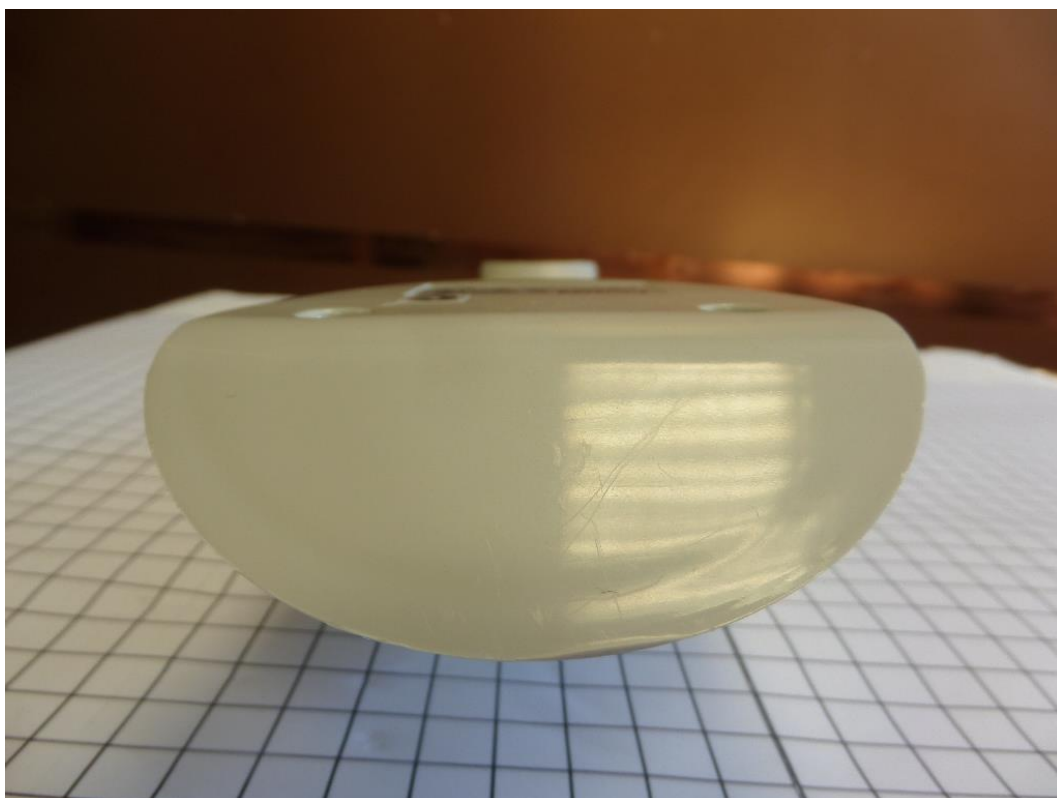
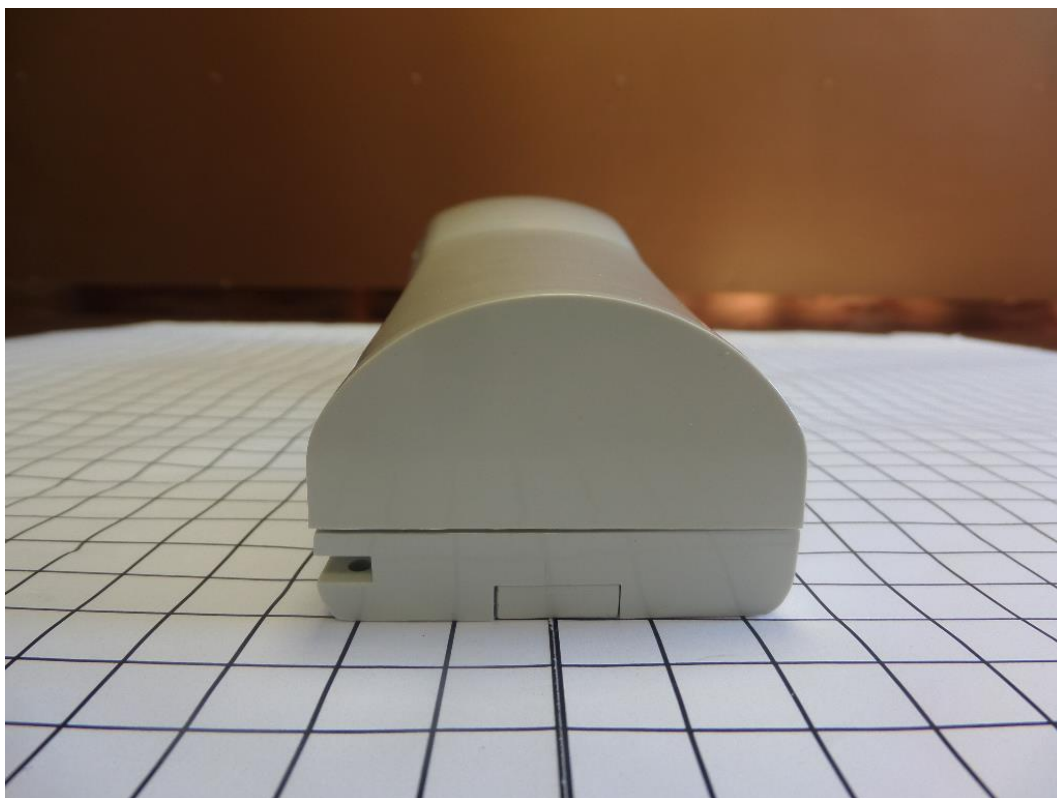
RESPECTED STANDARD

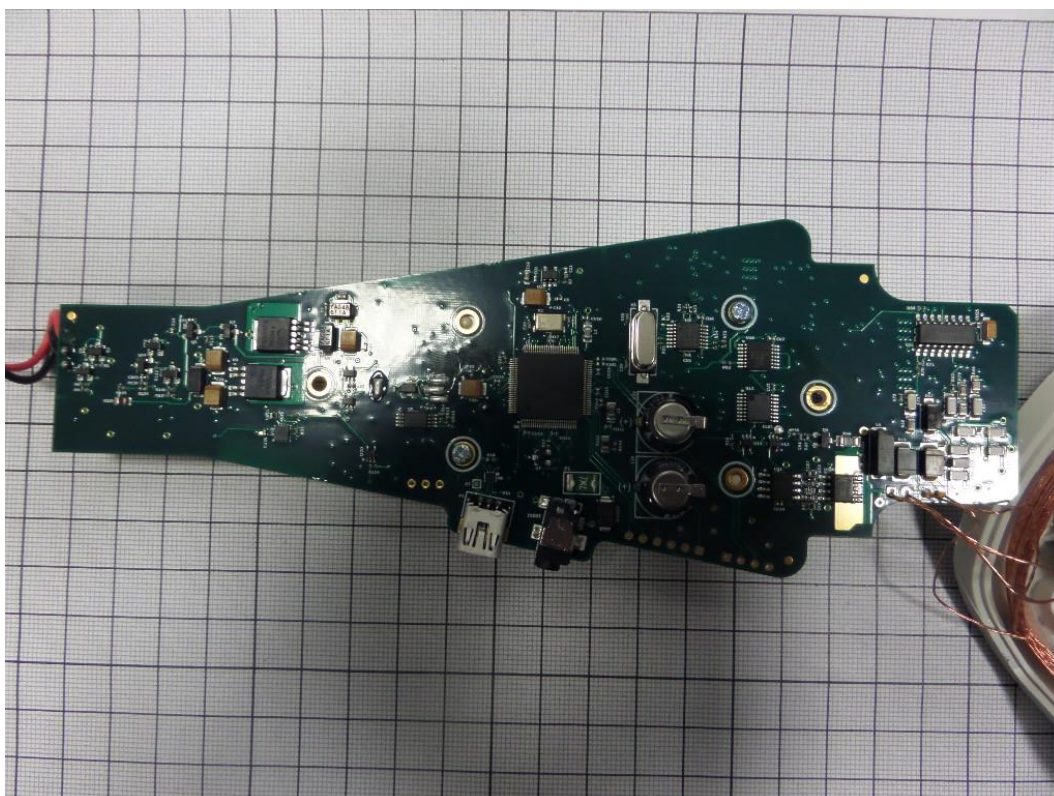
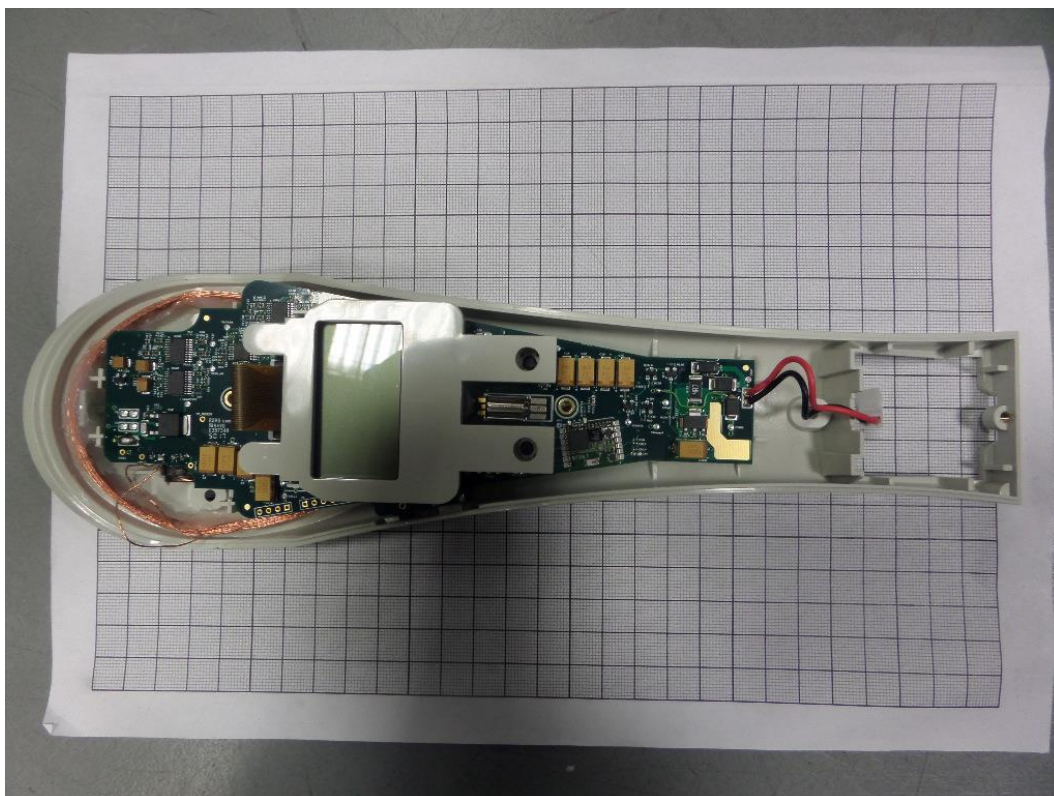
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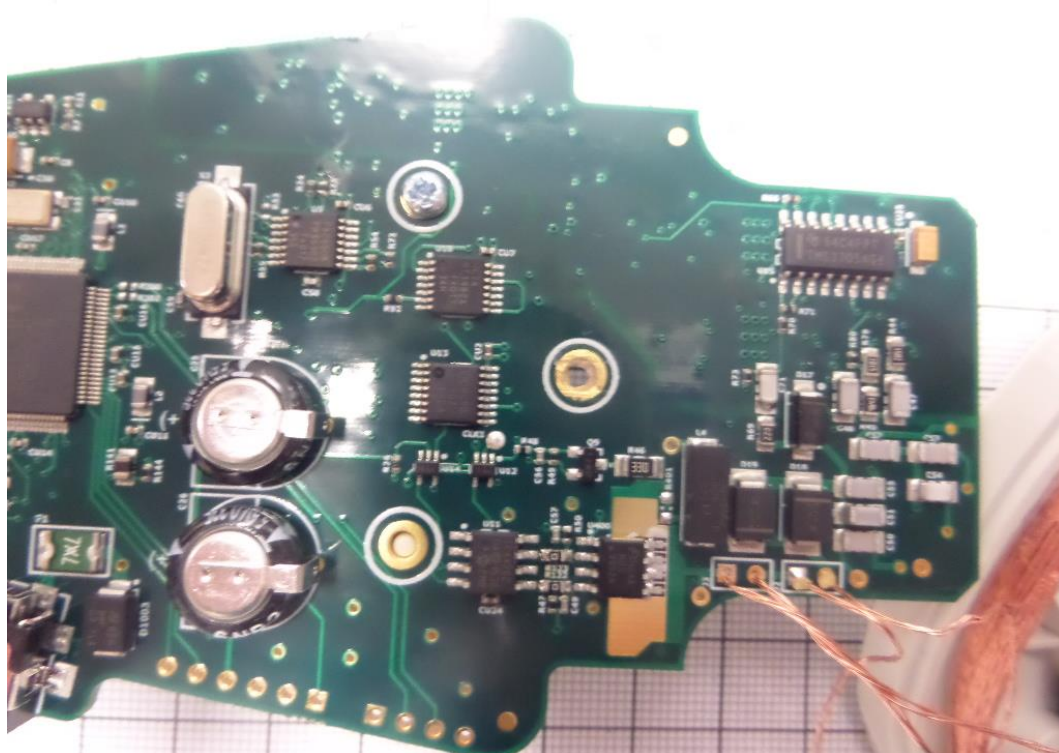
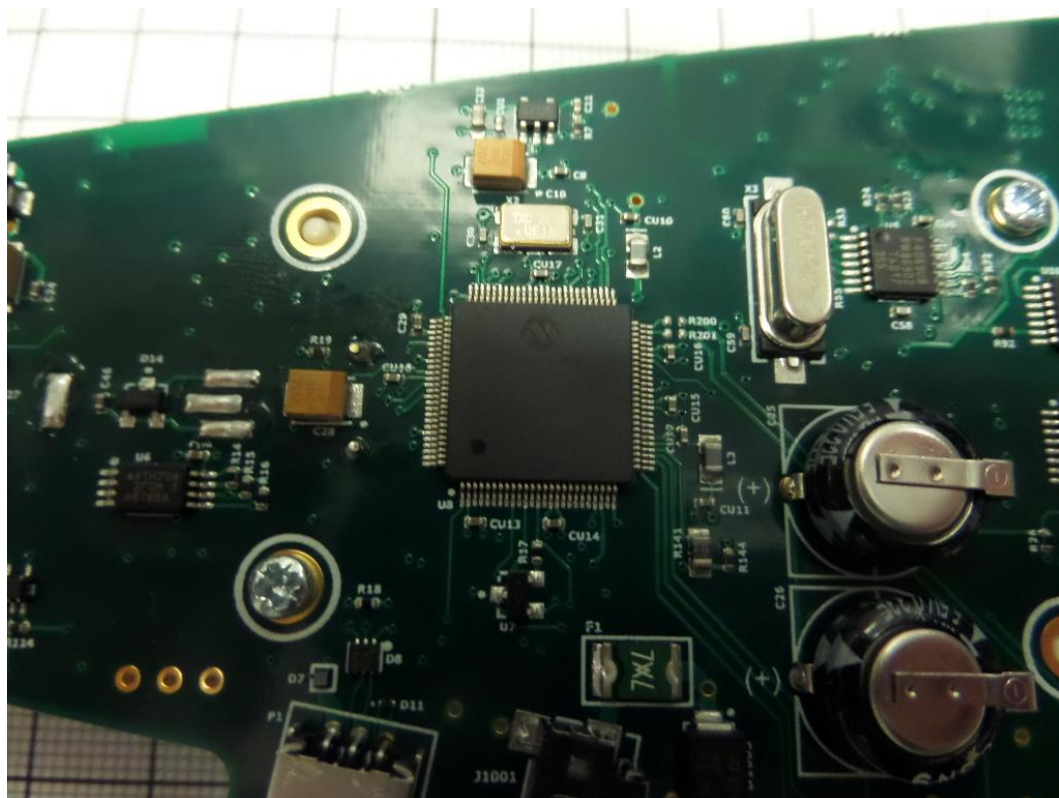
APPENDIX 1: Photos of the equipment under test

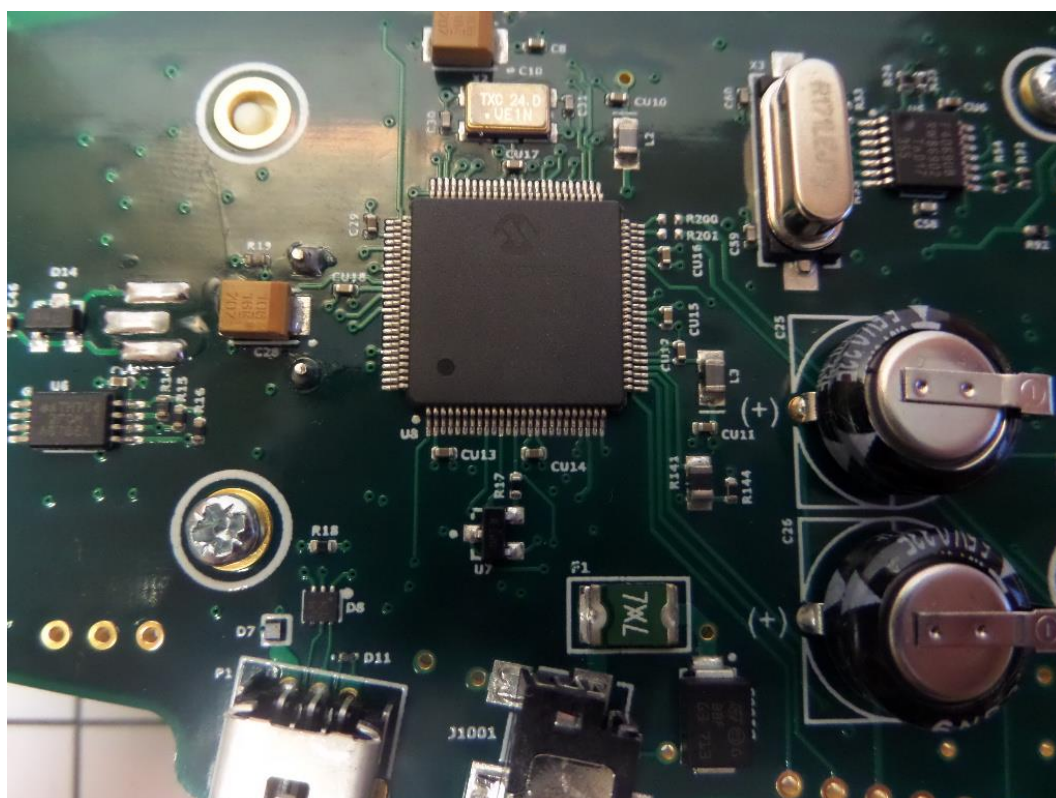
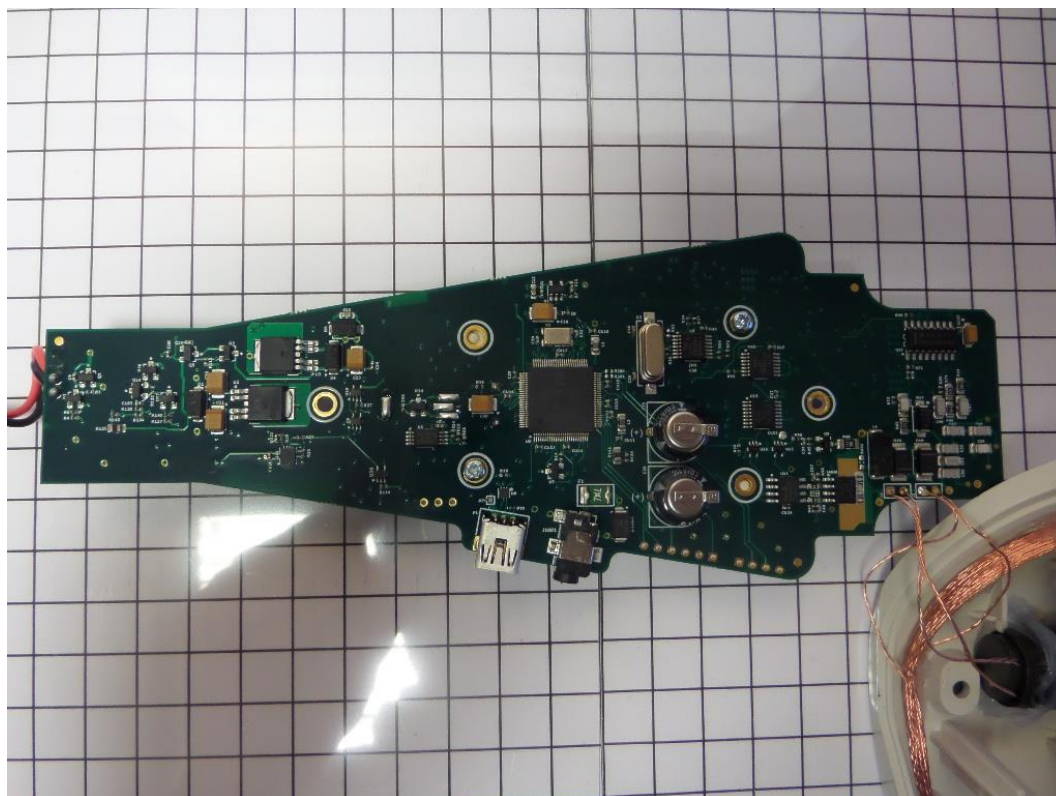


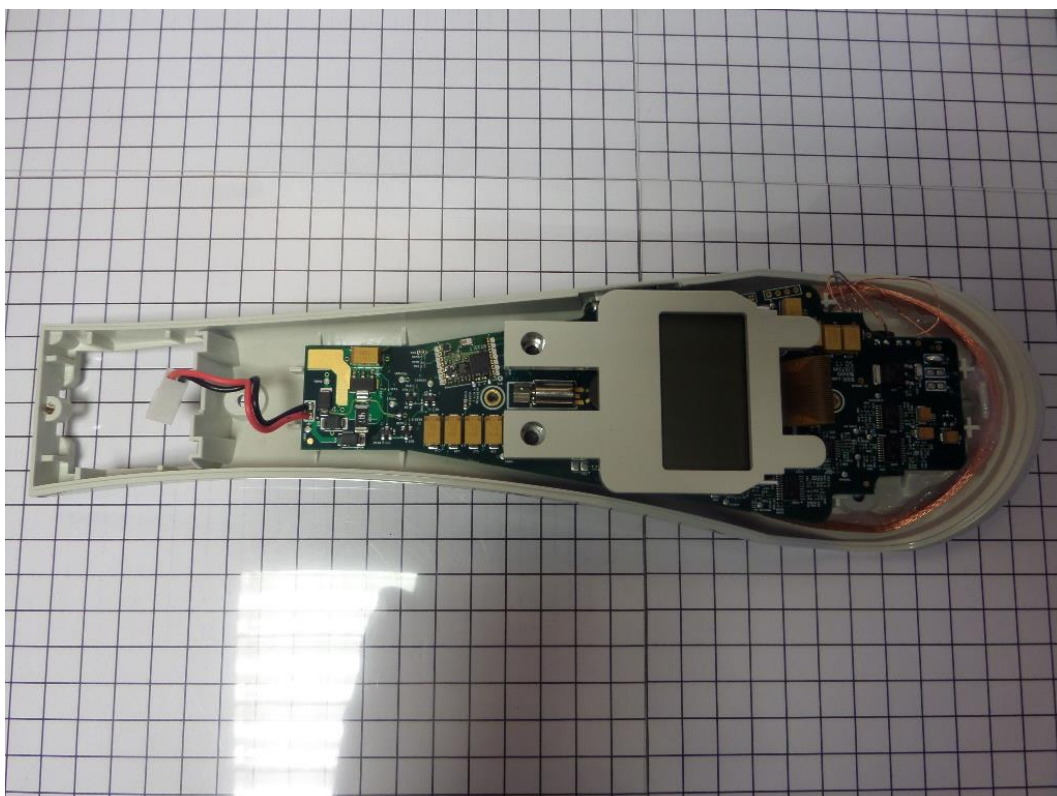
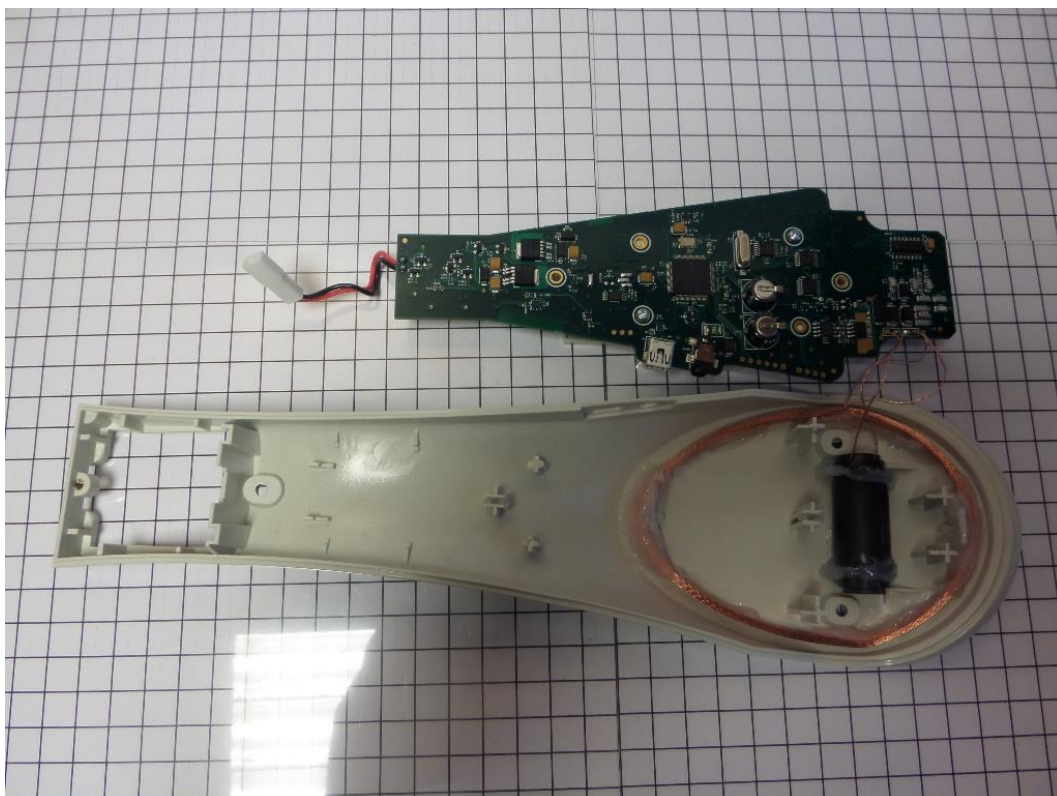


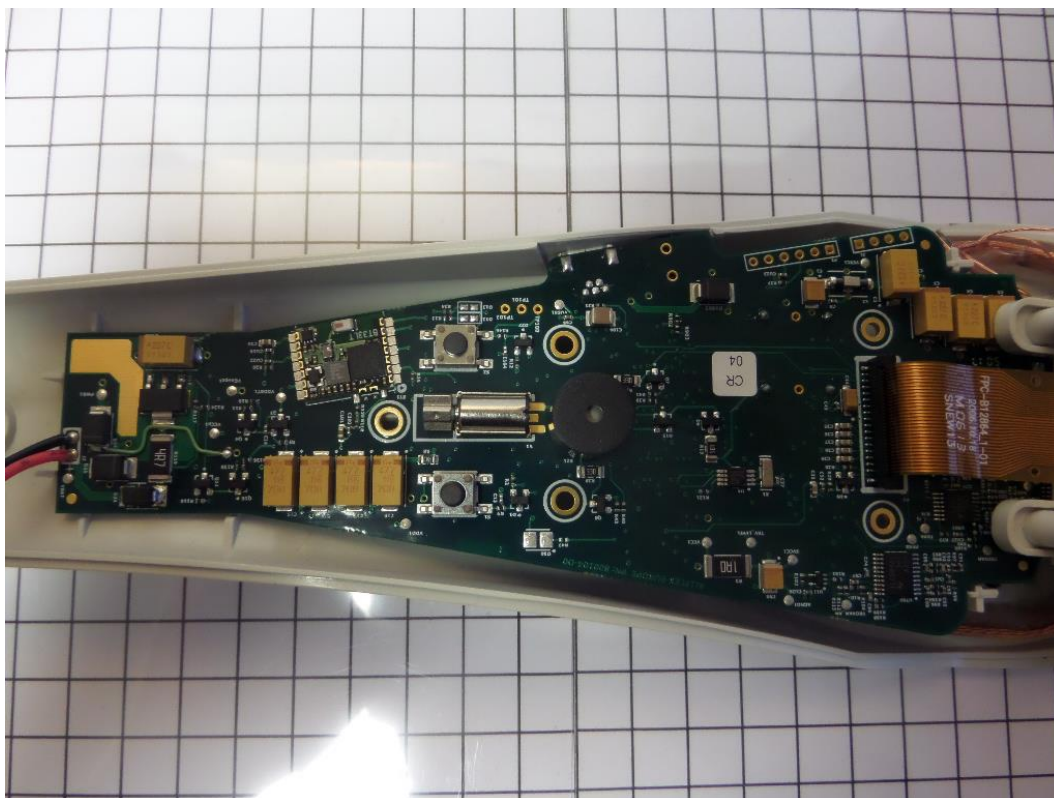


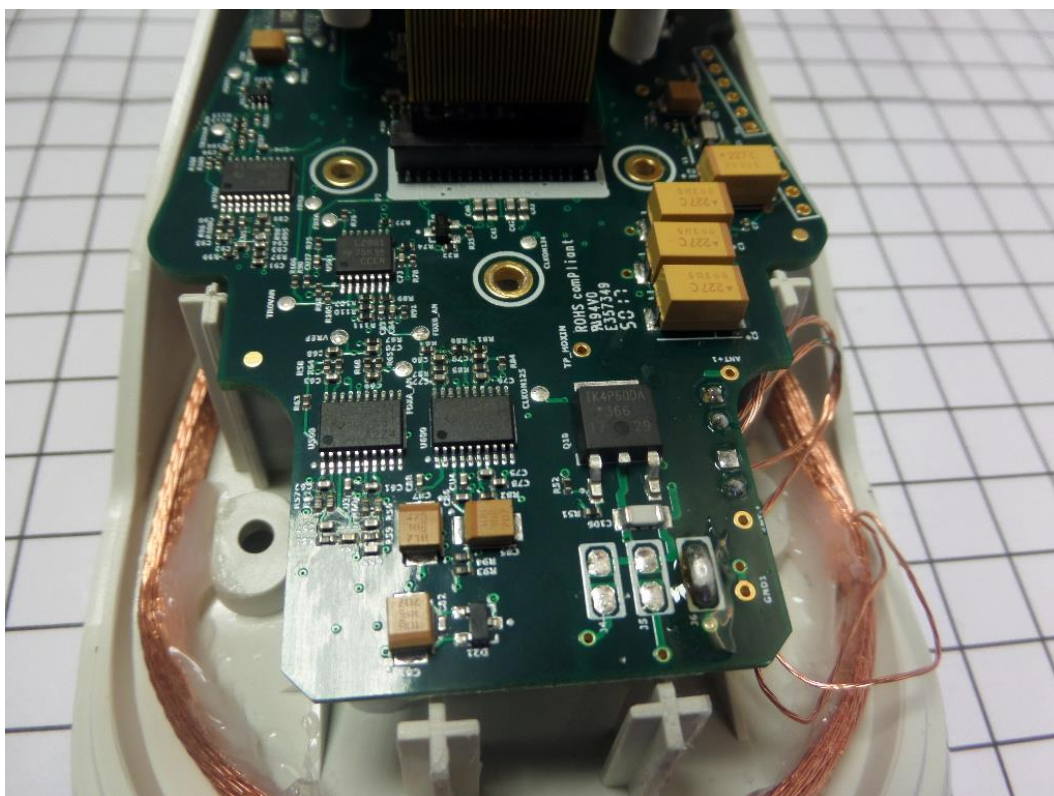
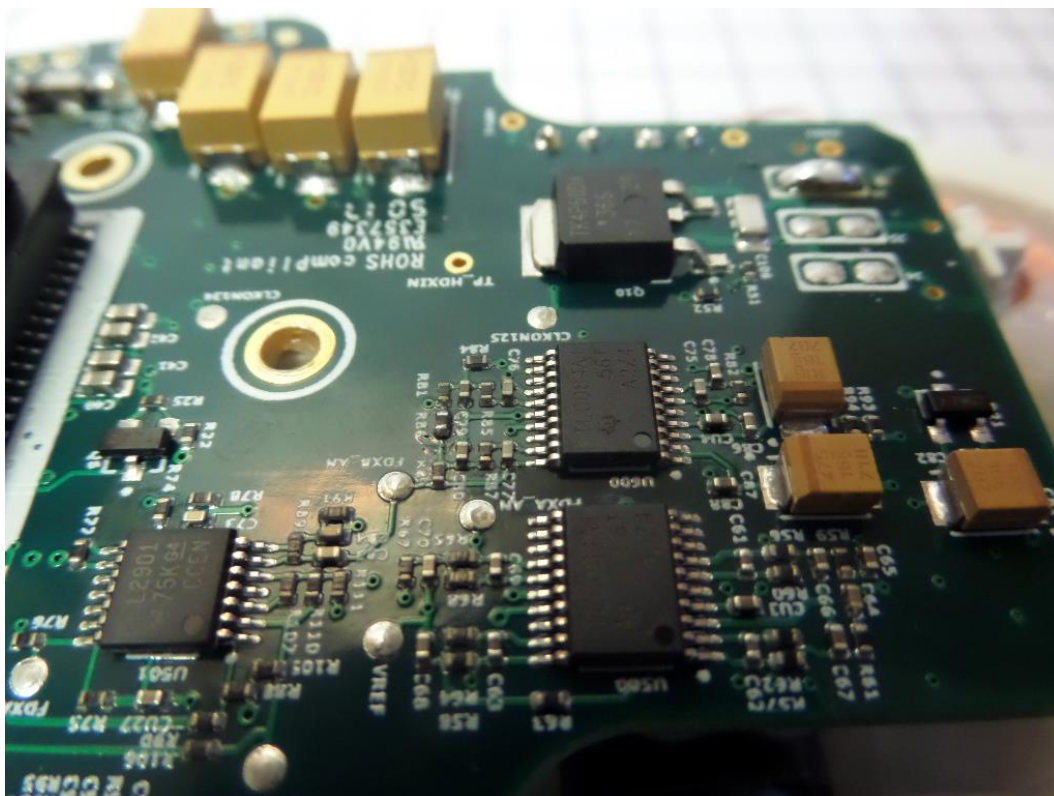








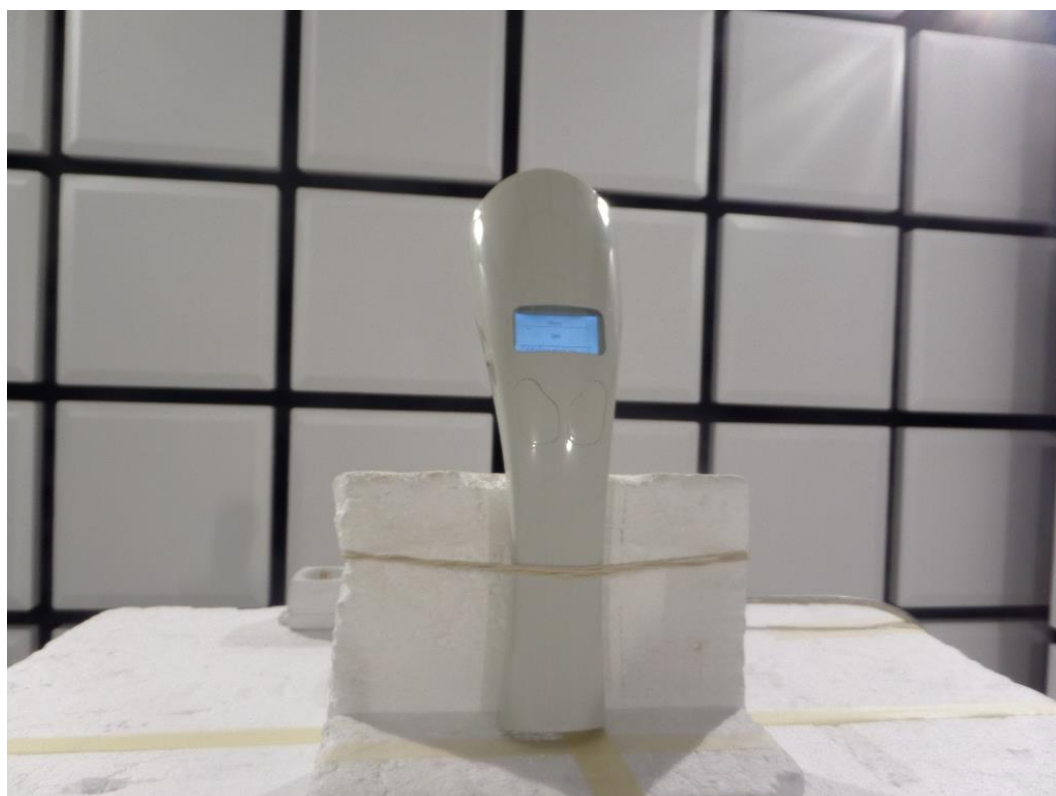
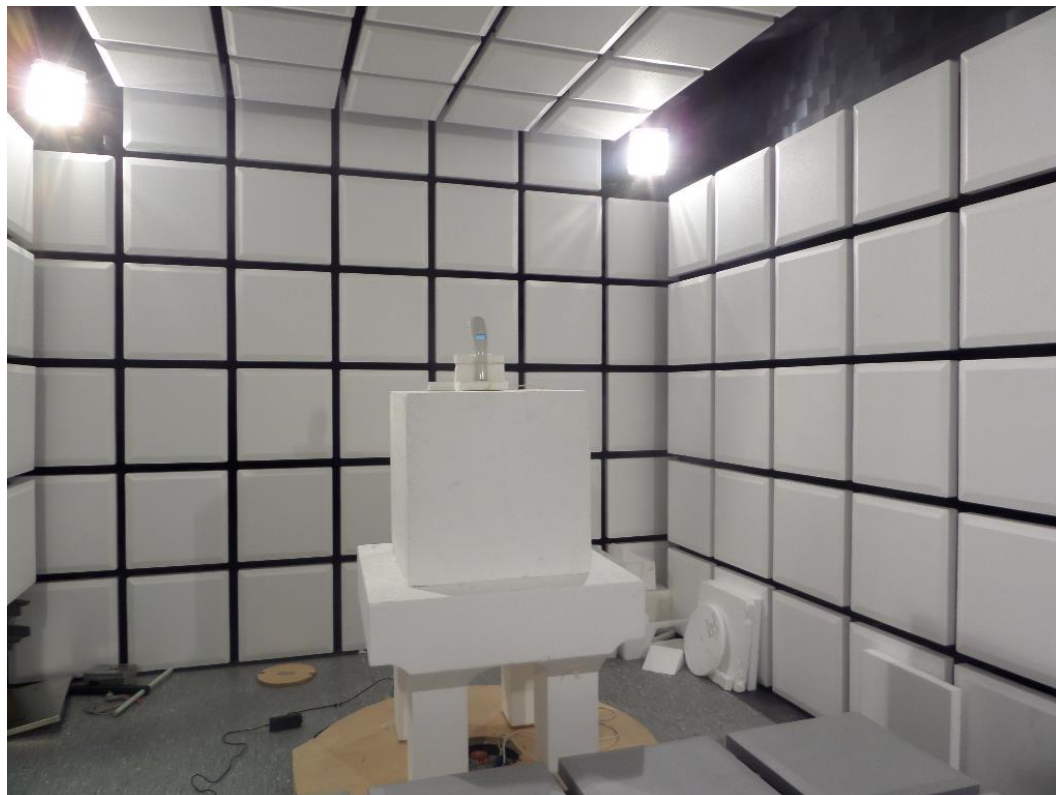


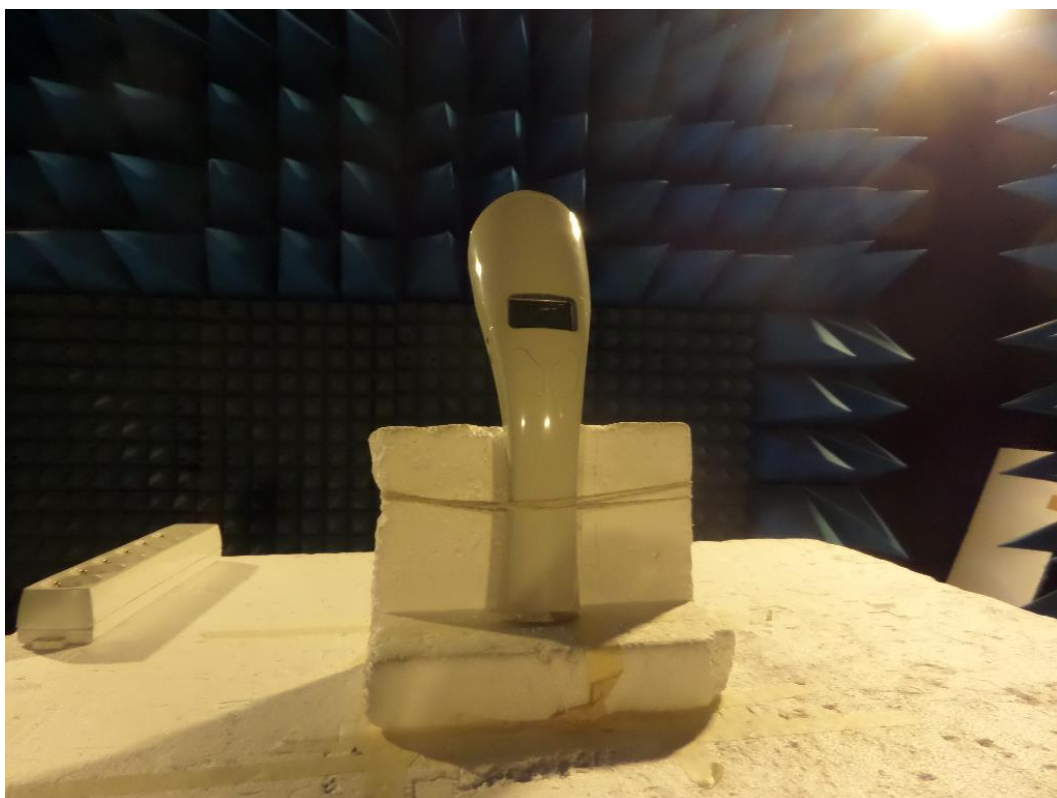
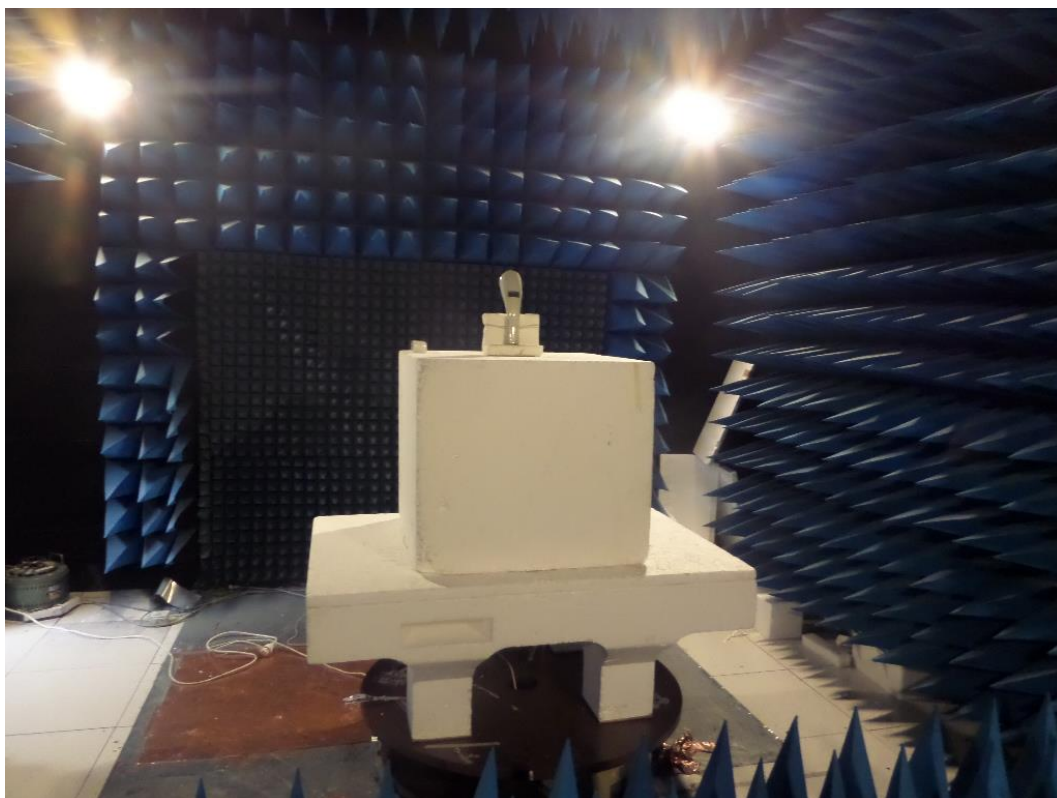




APPENDIX 2: Test set up

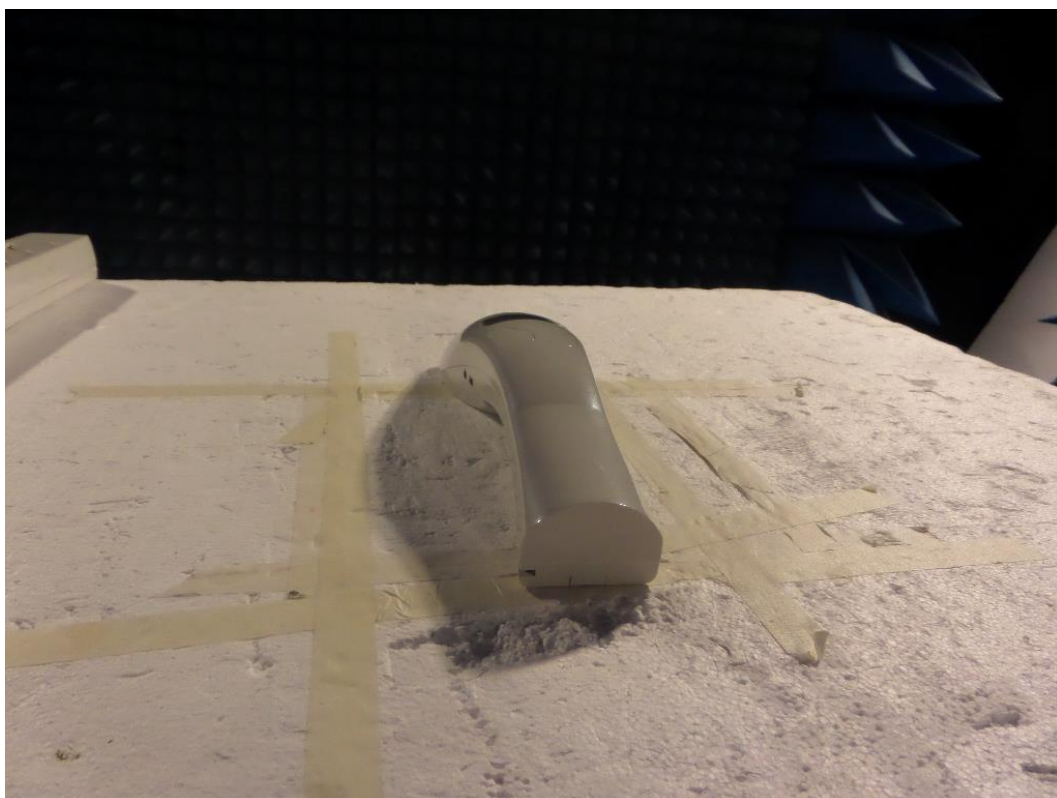
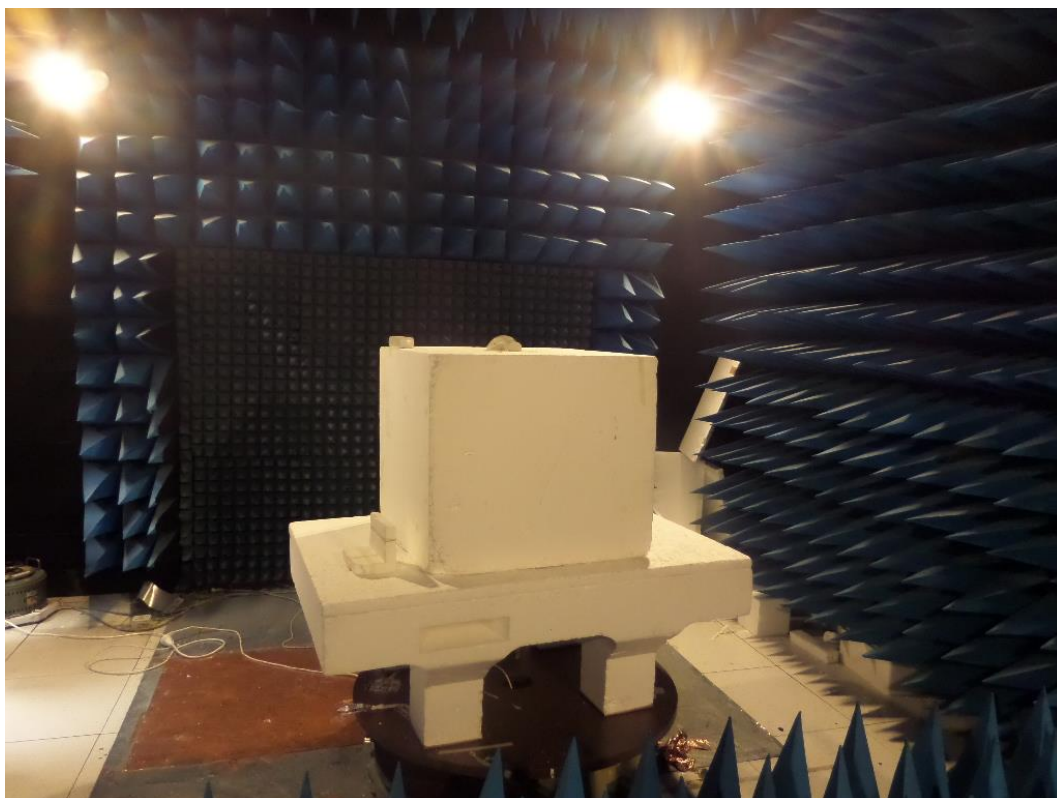
Position 1





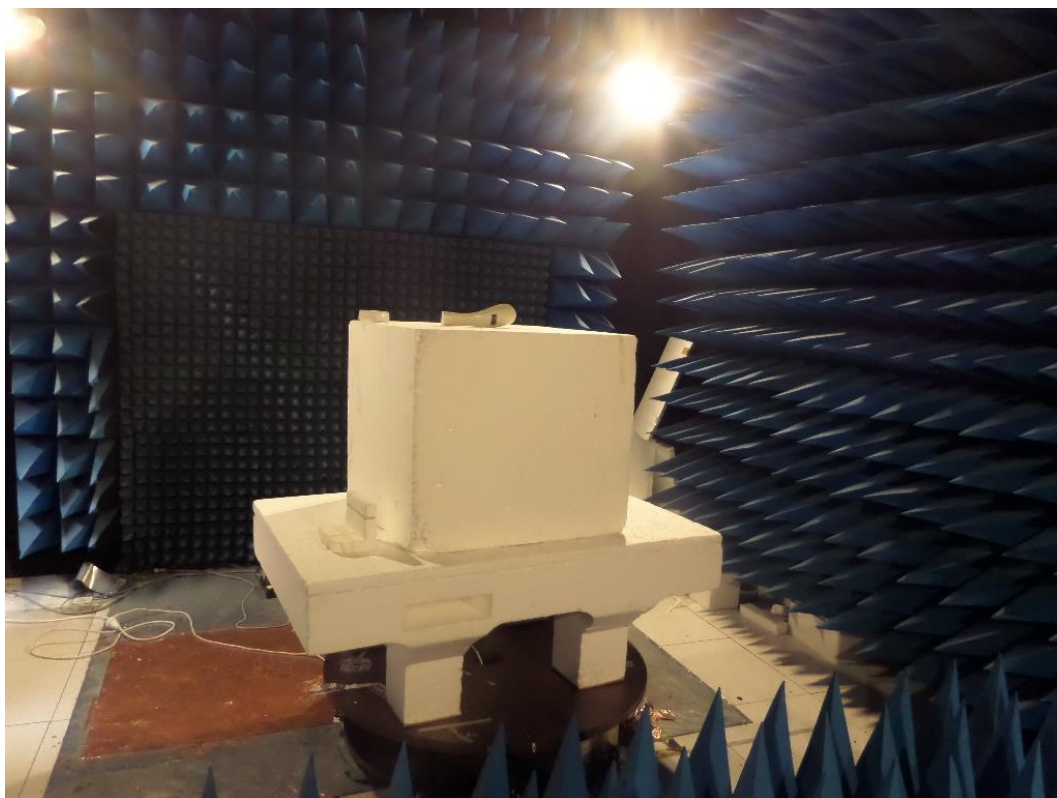
Position 2





Position 3





Open test area

Position 1



Position 2



Position 3



APPENDIX 3: Test equipment list

Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Anechoic Chamber	EMITECH	8593
Turntable controller 1060C	EMCO	8958
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 VHBB 9124	Schwarzbeck	8526
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
Low pass filter LP03/1000-7GH	Filtek	4087
Cable N-2m	Huber + Suhner	12911
Cable N-5m	Huber + Suhner	12912
Cable N-1.5m	Suhner	6884
Cable open area test site	—	8578
Multimeter 177	Fluke	14476
Meteo station 608-H1	Testo	7566
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.16.0.64	0000

APPENDIX 4: 99% bandwidth

