

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
EABA75-300-QRX

FCC ID: 2APE2-EABQRX

Company:
ETS GEORGES RENAULT

Distribution: Mrs RINALDO

(Company: ETS GEORGES RENAULT)

Number of pages: 26 with 5 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	26-Feb-21	Creation	T. LEDRESSEUR, Radio Technician	

*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.*



DESIGNATION OF PRODUCT: EABA75-300-QRX

Serial number (S/N): 19M68399

Reference / model (P/N): QR ACCESSORY READER

Software version: A6.00.01-SP02

MANUFACTURER: ETS GEORGES RENAULT

COMPANY SUBMITTING THE PRODUCT:

Company: ETS GEORGES RENAULT

Address: ZAC de la Lorie
38 rue Bobby SANDS
44818 Saint-Herblain
FRANCE

Responsible: Mrs RINALDO

Person(s) present during the tests: -

DATES OF TEST: From 23-Sep-19 to 26-Sep-19

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: M. DUMESNIL

VISA:

WRITTEN BY: M. DUMESNIL



CONTENTS

<i>TITLE</i>	<i>PAGE</i>
1. INTRODUCTION.....	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE.....	4
4. TEST METHODOLOGY.....	5
5. TEST EQUIPMENT CALIBRATION DATES	5
6. TESTS RESULTS SUMMARY.....	6
7. RF EXPOSURE:.....	7
8. MEASUREMENT UNCERTAINTY.....	8
9. OPERATION WITHIN THE BAND 13.110 – 14.010 MHZ.....	9
10. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.01 MHZ	12
APPENDIX 1: PHOTOS OF THE EQUIPMENT UNDER TEST.....	14
APPENDIX 2: TEST SET UP	22
APPENDIX 3: TEST EQUIPMENT LIST	24
APPENDIX 4: 99% BANDWIDTH	25
APPENDIX 5: BAND EDGE	26

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **EABA75-300-QRX**, in accordance with normative reference.

The device under test integrates RFID function not certified.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	screwdriver with RFID function
Antenna type and gain:	loop antenna (unknown gain)
Operating frequency range:	From 13.110 MHz to 14.010 MHz
Number of channels:	1
Channel spacing:	Not concerned
Modulation:	RFID
Power source:	18 or 36Vdc (pack 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.

CFR 47 FCC Part 15 (2019)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and 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
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 225: Operation within the band 13.110-14.010 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
0	BAT-EMC V3.17.0.25	Software	/	/	/
1406	EMCO 6502	Loop antenna	17/04/2019	1	16/04/2020
4088	R&S FSP40	Spectrum Analyzer	21/02/2018	2	21/02/2020
7240	Emco 3110	Biconical antenna	08/03/2019	3	07/03/2022
7566	Testo 608-H1	Meteo station	24/09/2018	2	23/09/2020
8528	Schwarzbeck VHA 9103	Biconical antenna	08/03/2019	3	07/03/2022
8707	R&S ESI7	Test receiver	04/07/2019	1	03/07/2020
8773	E3612A	Power source	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	14/03/2019	1	13/03/2020
10759	SIDT Cage 3	Anechoic chamber	/	/	/
14474	Oregon Scientific BAR206	Meteo station	27/11/2017	2	27/11/2019
14716	GMH 3710	Precision Thermometer	20/11/2018	1	20/11/2019
14831	Fluke 177	Multimeter	12/01/2018	2	12/01/2020
15666	R&S FSV40	Spectrum Analyzer	19/07/2018	2	18/07/2020
16059	CLIMATS EXCAL ² 1411-TA	Climatic chamber	18/01/2019	2	17/01/2021

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 3
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 §15.225 frequency bands	X				Note 4
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHZ					
	(a) Field strength within the band 13.553-13.567 MHz	X				
	(b) Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	X				
	(c) Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	X				
	(d) Field strength outside the band 13.110-14.010 MHz	X				
	(e) Carrier frequency tolerance	X				
	(f) Powered tags			X		

NAP: Not Applicable NAs: Not Asked

Note 1: Integral / dedicated antenna without standard connector.

Note 2: pack battery recharged without equipment under test

Note 3: See FCC part 15.225 (d).

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

7. 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 for 10-g extremity SAR.

Maximum measured power = -19.99 dBμV/m = **3 x 10⁻⁹ mW** at 13.56 MHz

with $P = (E \times d)^2 / (30 \times G_p)$ with $d = 30\text{ m}$ and $G_p = 1$

For test separation distances ≤ 50 mm

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:

For 10-g SAR power exclusion threshold is:

Power threshold, mW = $\left[\left[\frac{50 \times 7.5}{\sqrt{0.100}} \right] + (50 - 50) \times (100 / 150) \right] \times [1 + \log(100 / 13.56)] \times \frac{1}{2}$

Power threshold, mW = 1107.43 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.

8. 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	$\pm 5\%$

9. OPERATION WITHIN THE BAND 13.110 – 14.010 MHZ**Temperature (°C) :** 25.7**Humidity (%HR):** 46.4**Date :** September 23, 2019 and
September 24, 2019 and
September 25, 2019 and
September 26, 2019**Technician :** M. DUMESNIL**Standard:** FCC Part 15**Test procedure:** paragraph 15.225 (a), (b), (c), (e)**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 system is tested in an open area test site (OATS). The EUT 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.

See photos in appendix 2

The frequency stability measure is realized in near-field with the product in a climatic chamber.

Detection mode: Peak ($F < 1 \text{ GHz}$)**Bandwidth:** 10 kHz ($150 \text{ kHz} < F < 30 \text{ MHz}$)**Distance of antenna:** 3 meters**Antenna height:** 1 meter**Antenna polarization:** oriented in the vertical plane. The lowest point of the loop is 1m above ground level.**Equipment under test operating condition:**

The equipment under test is blocked in alternance of emission and reception mode.

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

Results:

Sample N° 1:

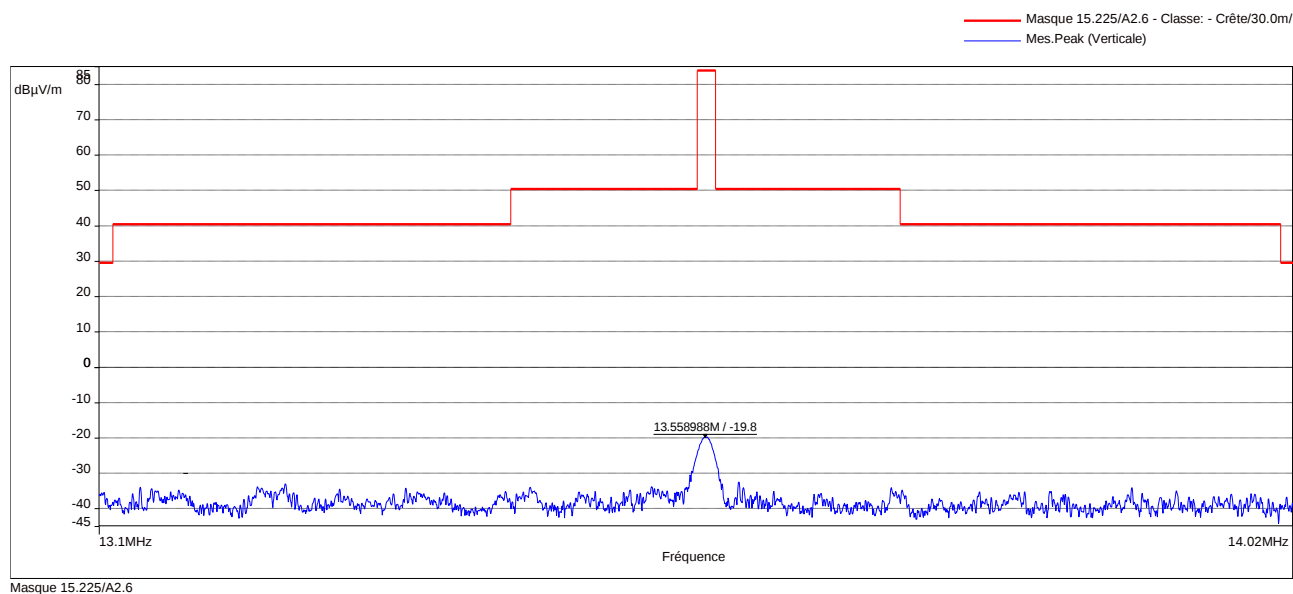
Carrier field strength

	Field strength (dBμV/m) at frequency: 13.56 MHz
Normal test conditions measure at 3 m	20.01
Normal test conditions correlated at 30 m	-19.99
Limits at 30m (dBμV/m)	84
Margin (dB)	103.99

Polarization of test antenna: perpendicular at the equipment at 0 degree.

Position of equipment: position 2, see photos in appendix 2 (azimuth: 70°)

Field strength within the band 13.110-14.010 MHz



Frequency stability

Results for temperature variation

Realized with a power source at 120 Vac – 60 Hz through a variac

Temperature (°C)	Measure at startup		Measure at 2 min		Measure at 5 min		Measure at 10 min		Drift limit (kHz)
	Frequency measured (MHz)	Frequency drift (kHz)	Frequency measured (MHz)	Frequency drift (kHz)	Frequency measured (MHz)	Frequency drift (kHz)	Frequency measured (MHz)	Frequency drift (kHz)	
50	13.559481	-0.519	13.559477	-0.523	13.559478	-0.522	13.559478	-0.522	± 1.356 (a)
40	13.559499	-0.501	13.559490	-0.510	13.559493	-0.507	13.559492	-0.508	
30	13.559539	-0.461	13.559537	-0.463	13.559535	-0.465	13.559534	-0.466	
20	13.559584	-0.416	13.559569	-0.431	13.559570	-0.430	13.559568	-0.432	
10	13.559618	-0.382	13.559605	-0.395	13.559603	-0.397	13.559603	-0.397	
0	13.559643	-0.357	13.559640	-0.360	13.559639	-0.361	13.559639	-0.361	
-10	13.559638	-0.362	13.559651	-0.349	13.559652	-0.348	13.559653	-0.347	
-20	13.559633	-0.367	13.559643	-0.357	13.559645	-0.355	13.559640	-0.360	

(a) ±0.01% of the operating frequency

Results for power supply variation

Realized at +20 °C

Power supply (Vac)	Frequency measured (MHz)	Frequency drift (kHz)	Drift limit (kHz)
30.6	13.559568	-0.432	± 1.356 (b)
41.4	13.559568	-0.432	

(b) ±0.01% of the operating frequency

Test conclusion:

RESPECTED STANDARD

10. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.01 MHZ**Temperature (°C) :** 27.9**Humidity (%HR):** 42.4**Date :** September 23, 2019 and
September 24, 2019**Technician :** M. DUMESNIL**Standard:** FCC Part 15**Test procedure:** paragraph 209
paragraph 15.225 (d)**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 under 1 GHz.

When the system is tested in an open area test site (OATS), 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 10th harmonic of the highest fundamental frequency (13.56 MHz).

Detection mode: Quasi-peak ($F < 1$ GHz)

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: 3 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 alternance of emission and reception mode.

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

Results:

Sample N° 1:

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
138.05	QP	100	0	120	V	23.33	43.50	20.17
139.17	QP	100	0	120	V	23.23	43.50	20.27
140.36	QP	100	0	120	V	24.20	43.50	19.30
180.50	QP	400	0	120	H	26.83	43.50	16.67

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 $1.705 \text{ MHz} < F \leq 30 \text{ MHz}$: $29.5 \text{ dB}\mu\text{V/m}$ at 30 meters
for $30 \text{ MHz} < F \leq 88 \text{ MHz}$: $40 \text{ dB}\mu\text{V/m}$ at 3 meters
for $88 \text{ MHz} < F \leq 216 \text{ MHz}$: $43.5 \text{ dB}\mu\text{V/m}$ at 3 meters
for $216 \text{ MHz} < F \leq 960 \text{ MHz}$: $46 \text{ dB}\mu\text{V/m}$ at 3 meters
Above 960 MHz : $54 \text{ dB}\mu\text{V/m}$ 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

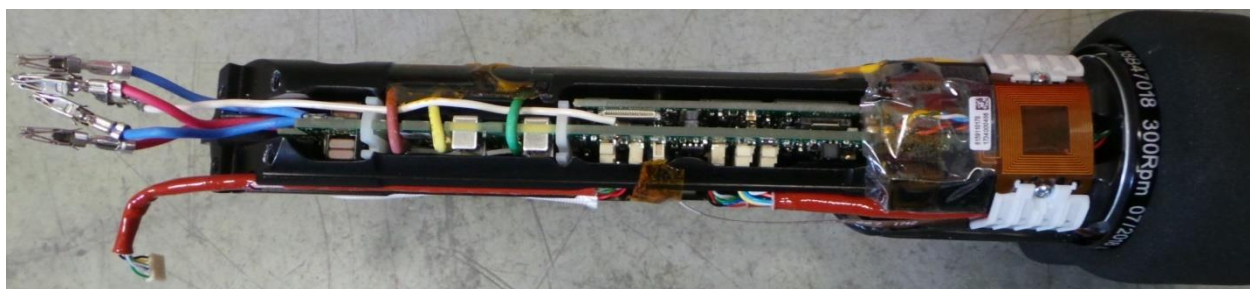
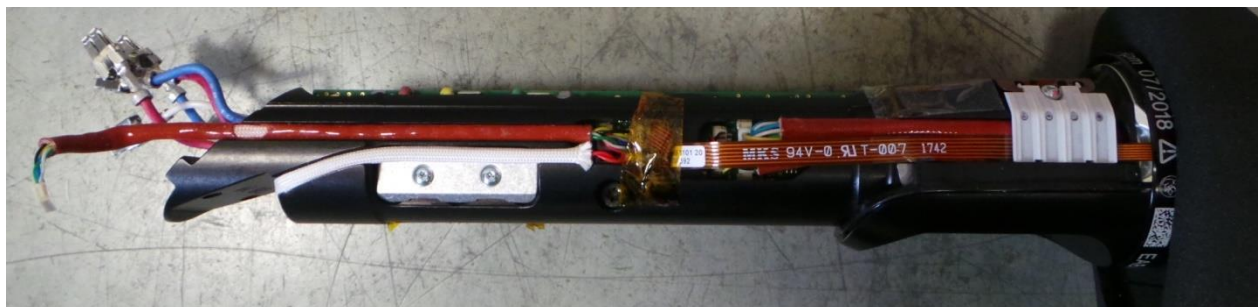
□□□ End of report, 5 annexes to be forwarded □□□

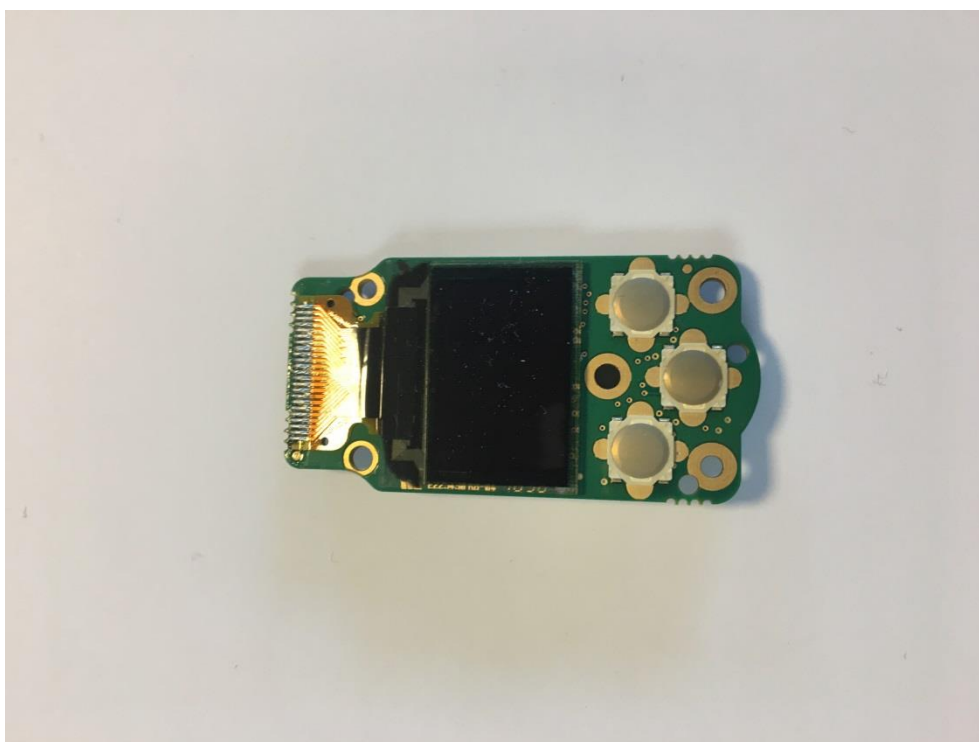
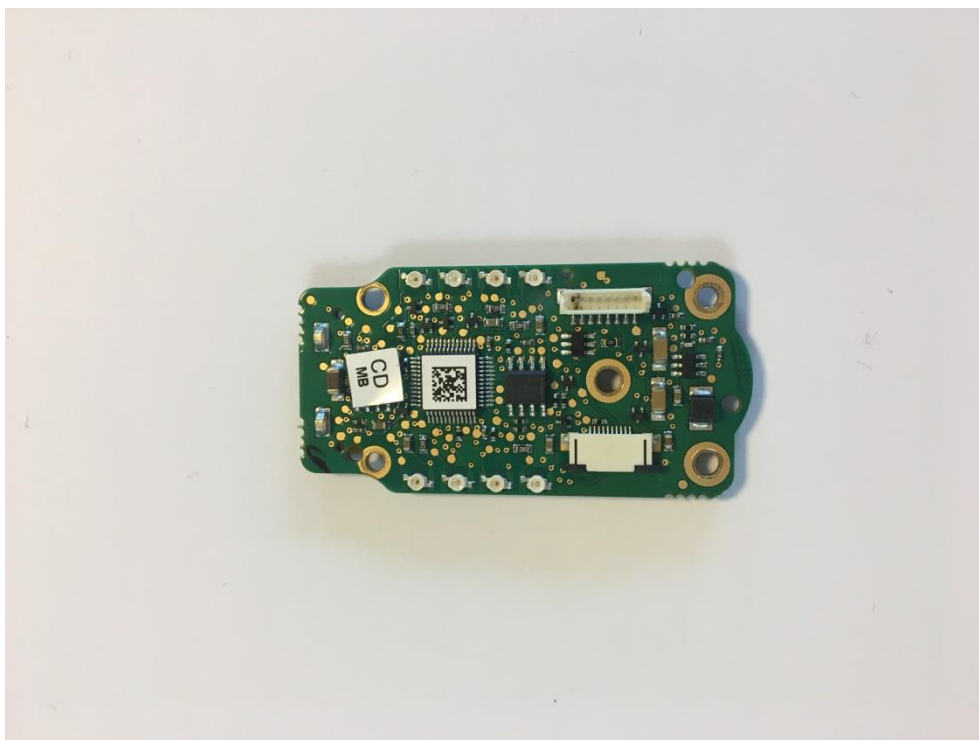
APPENDIX 1: Photos of the equipment under test

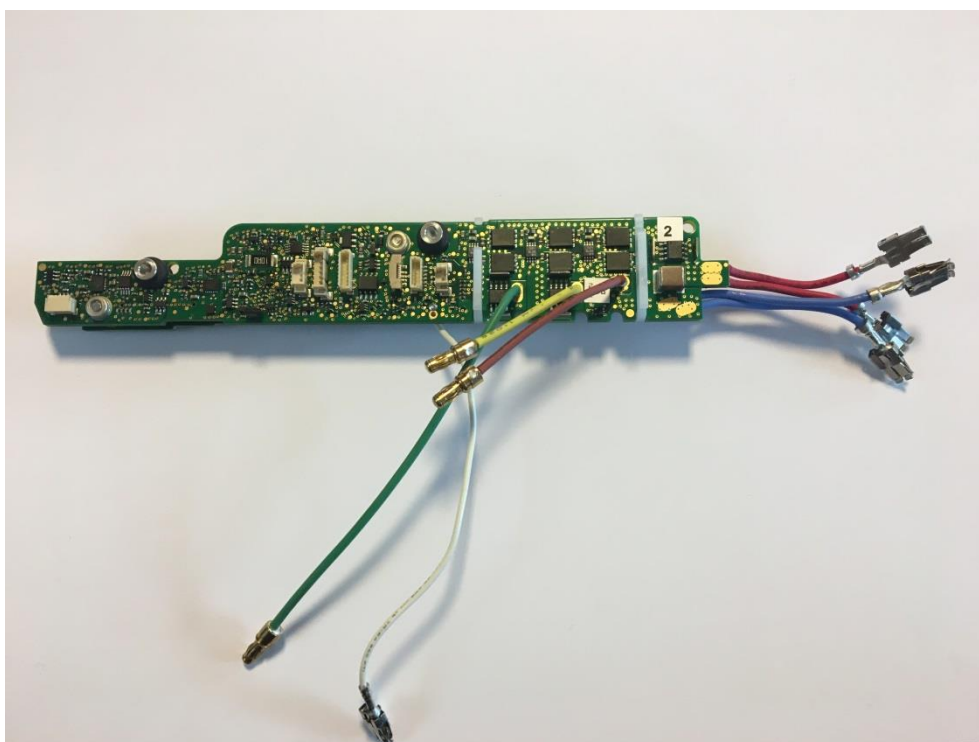
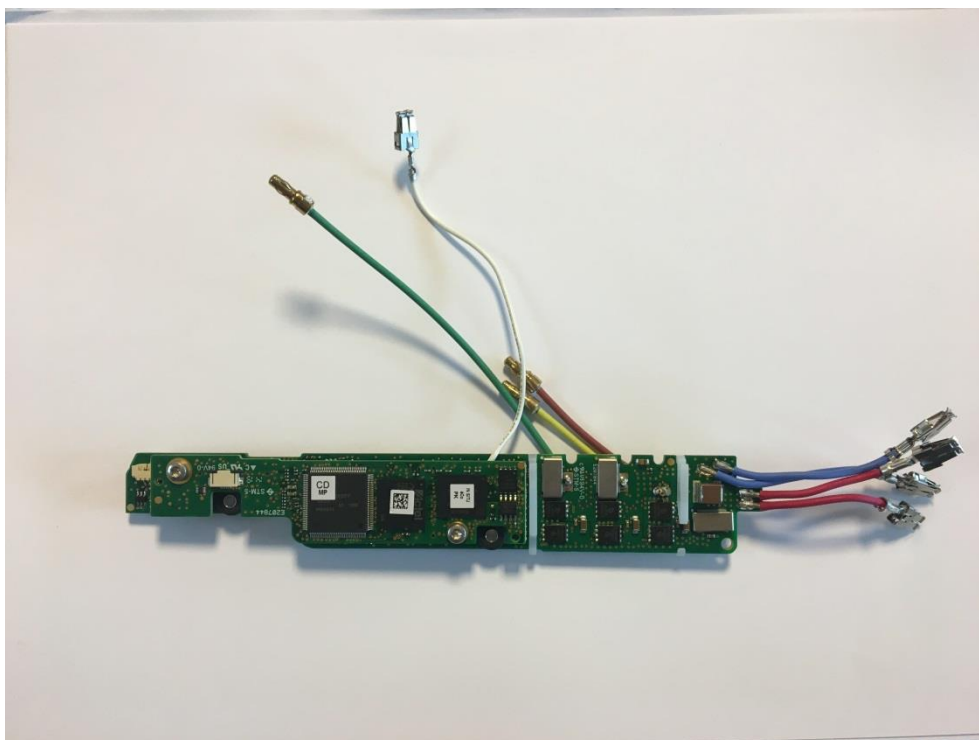
General view

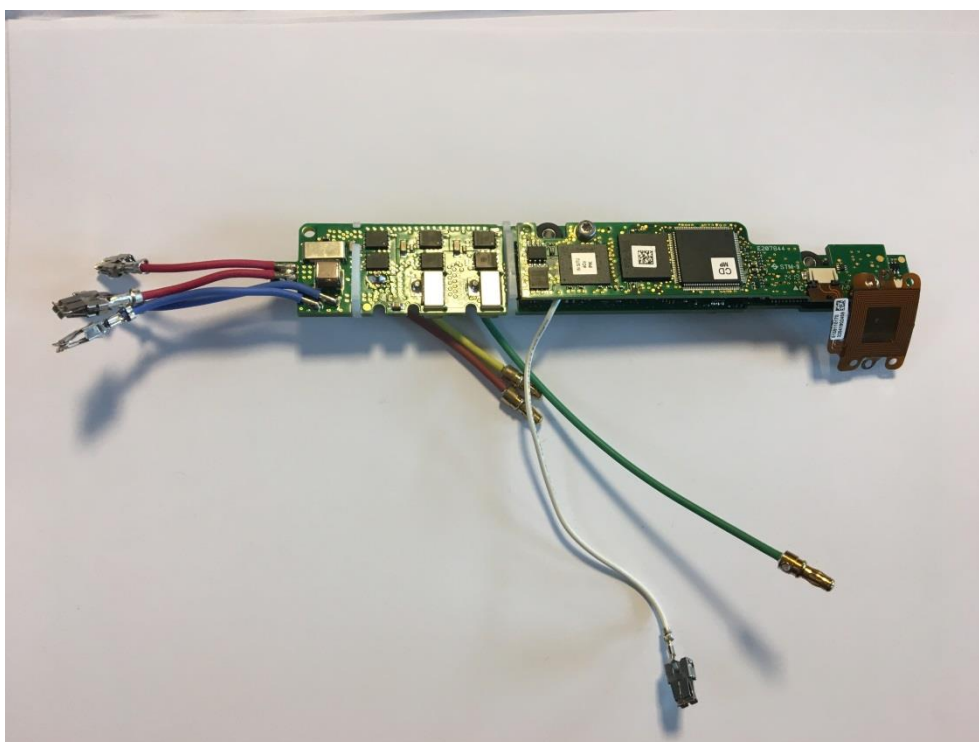
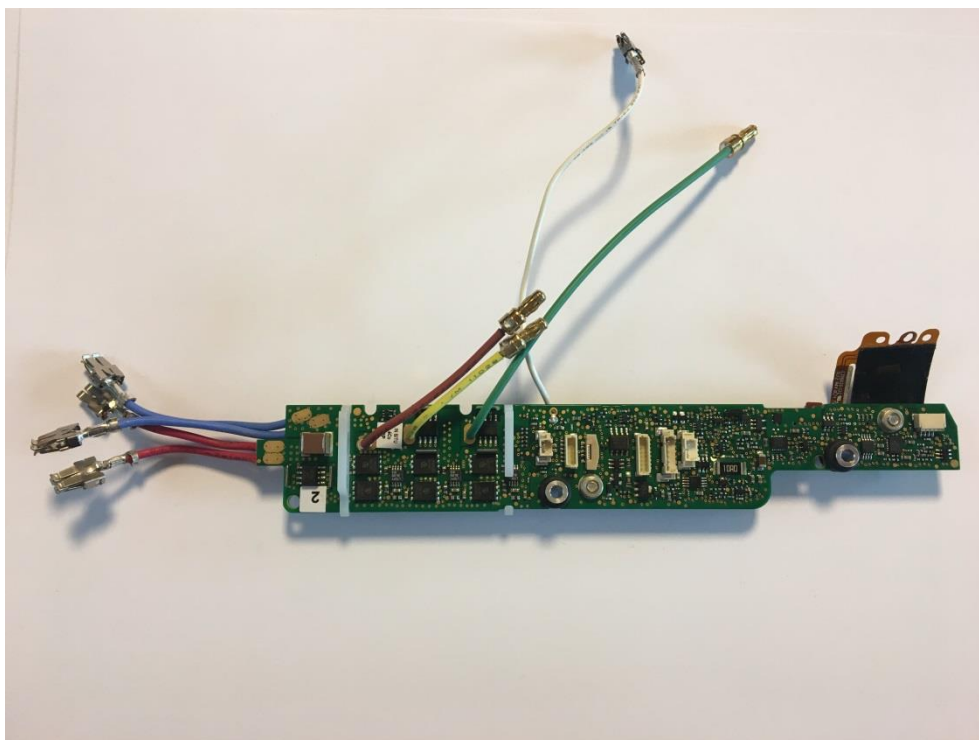


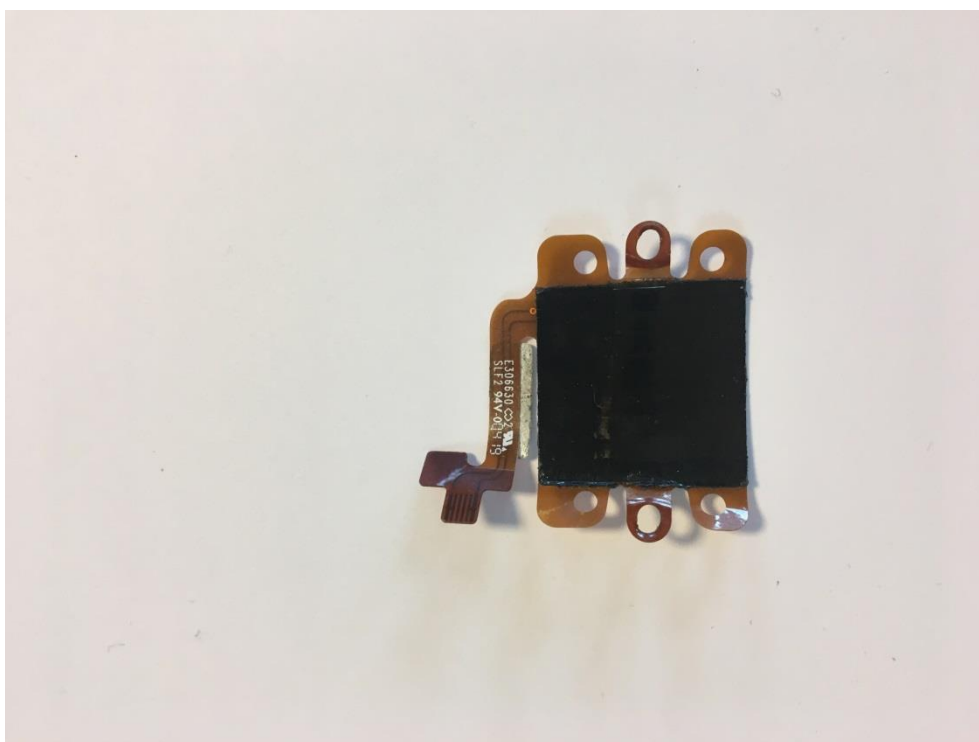
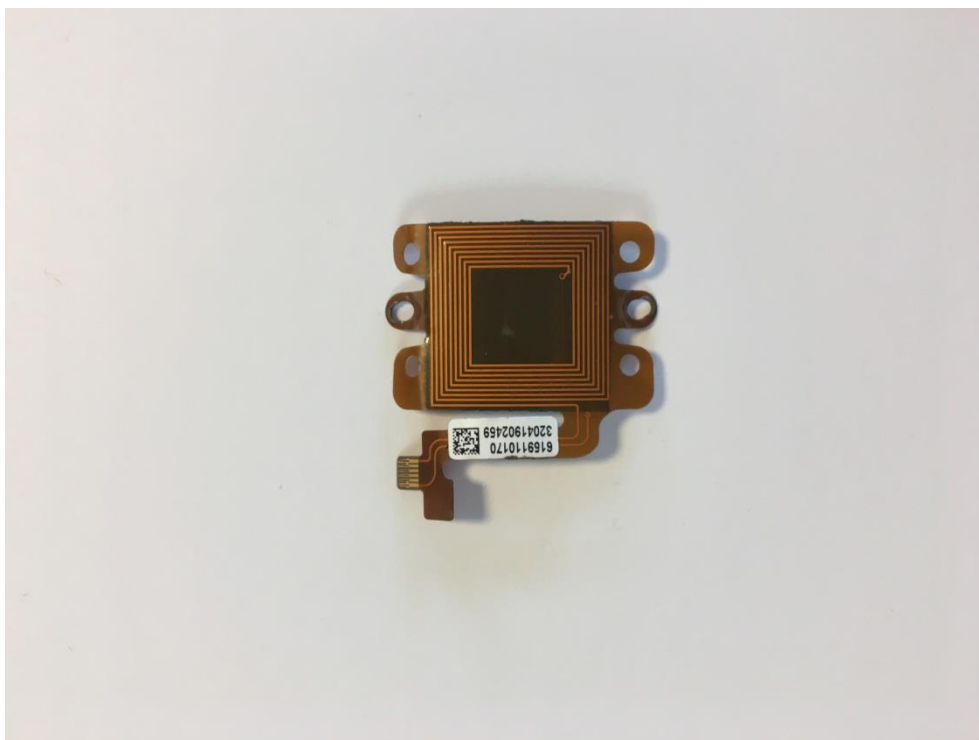
Inside views:











Battery:



Labels



APPENDIX 2: Test set up

Position 1



Position 2



Position 3



APPENDIX 3: Test equipment list

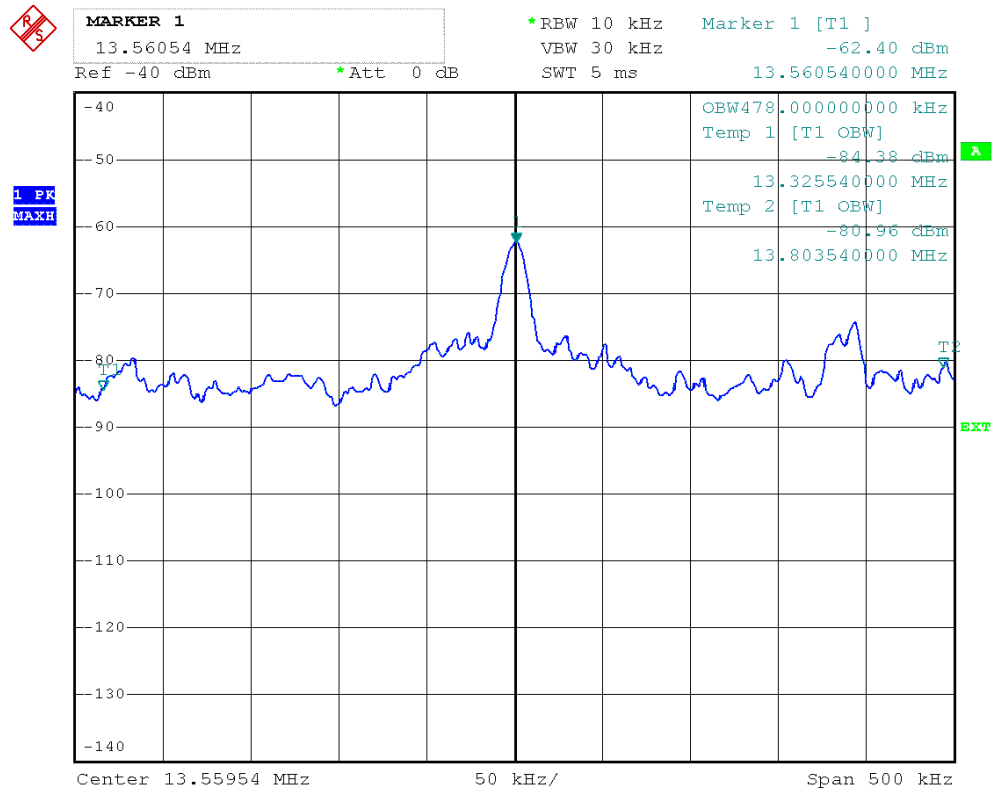
Operation within the band 13.110 – 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Climatic chamber EXCAL ² 1411-TA	CLIMATS	16059
Precision thermometer GMH 3710	GHM Greisinger	14716
Active loop antenna 6502	Emco	1406
Power source E3612A	Hewlett Packard	8773
Multimeter 177	Fluke	14831
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.17.0.25	0000

Field strength outside the band 13.110-14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Active loop antenna 6502	Emco	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Biconical antenna 3110	Emco	7240
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Meteo station 608-H1	Testo	7566
Meteo station BAR206	Oregon Scientific	14474
Software	BAT-EMC V3.17.0.25	0000

APPENDIX 4: 99% bandwidth



APPENDIX 5: Band edge

