

RR051-20-103208-4-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
RS430 READER

FCC ID: NQY-30020

Company:
Allflex USA, Inc.

Distribution: Mr LANGOUET

(Company: Allflex USA, Inc.)

Number of pages: 25 with 4 annexes

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S61 RTY 000 INT 00002 [03]

DESIGNATION OF PRODUCT: RS430 READER

Serial number (S/N): C151 00002

Reference / model (P/N): RS430

Software version: 1.00.15 – Sep 24 2020

MANUFACTURER: Allflex USA, Inc.

COMPANY SUBMITTING THE PRODUCT:

Company: Allflex USA, Inc.

Address: 2805 East 14th Street
P.O. Box 612266
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Texas – USA

Responsible: Mr LANGOUET

DATES OF TEST: From 2-Oct-20 to 8-Oct-20

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: T. LEDRESSEUR

VISA:



WRITTEN BY: T. LEDRESSEUR

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1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **RS430 READER**, in accordance with normative reference.

The equipment under test integrates:

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

This report concerns only the NFC part.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Handheld control terminals
Antenna type and gain:	0 dBi / integral antenna
Operating frequency:	13.56 MHz
Number of channels:	1
Channel spacing:	Not concerned
Modulation:	ASK
Power source:	7.4Vdc Ni-MH batteries, Rechargeable by a AC/DC power source

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 (2020) Radio Frequency Devices

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

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 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	24/04/2020	1	24/04/2021
5275	R&S ESPC	Test receiver	10/01/2019	2	09/01/2021
6796	R&S FSP7	Spectrum Analyzer	21/08/2019	2	20/08/2021
7279	SUCOFLEX SF104 N 1.5m	Cable	11/06/2020	2	11/06/2022
7566	Testo 608-H1	Meteo station	22/09/2020	2	22/09/2022
8508	California instruments 1251RP	Power source	(1)	(1)	(1)
8528	Schwarzbeck VHA 9103	Biconical antenna	09/03/2019	3	08/03/2022
8578	N-2GHz	Cable	11/06/2020	2	11/06/2022
8590	RG214 N-5m	Cable	25/02/2020	2	24/02/2022
8635	R&S EZ-25	High-pass filter	02/08/2018	3	01/08/2021
8707	R&S ES17	Test receiver	29/06/2020	1	29/06/2021
8719	Thurbly Thandar Instruments 1600	LISN	26/02/2020	2	25/02/2022
8732	Emitech	OATS	03/07/2019	3	02/07/2022
8750	La Crosse Technology WS-9232	Meteo station	22/09/2020	2	22/09/2022
8783	EMCO 3147	Log periodic antenna	09/03/2019	3	08/03/2022
8855	EMITECH	Turntable and mat controller	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9489	Absorber sheath current	Emitech	20/04/2020	2	20/04/2022
10788	Emitech	Outside room Hors cage	/	/	/
14716	GMH 3710	Precision Termometer	07/01/2020	1	06/01/2021
14831	Fluke 177	Multimeter	25/02/2020	2	24/02/2022
16059	CLIMATS EXCAL ² 1411-TA	Climatic chamber	19/01/2019	2	18/01/2021
-	RSCommander	Software	/	/	/

(1) The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.

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				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) <i>Alternative to general radiated emission limits</i>	X				
	(b) <i>Unwanted emissions outside of §15.225 frequency bands</i>	X				Note 3
	(c) <i>20 dB bandwidth and band-edge compliance</i>	X				
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHZ					
	(a) <i>Field strength within the band 13.553-13.567 MHz</i>	X				
	(b) <i>Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz</i>	X				
	(c) <i>Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz</i>	X				
	(d) <i>Field strength outside the band 13.110-14.010 MHz</i>	X				
	(e) <i>Carrier frequency tolerance</i>	X				
	(f) <i>Powered tags</i>			X		

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna without standard connector.

Note 2: See FCC part 15.225 (d).

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

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) :** 22**Humidity (%HR):** 46**Date :** October 8, 2020**Technician :** T. LEDRESSEUR**Standard:** FCC Part 15**Test procedure:** Paragraph 15.207**Software used:** BAT-EMC V3.17.0.25**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 alternance of emission and reception mode.

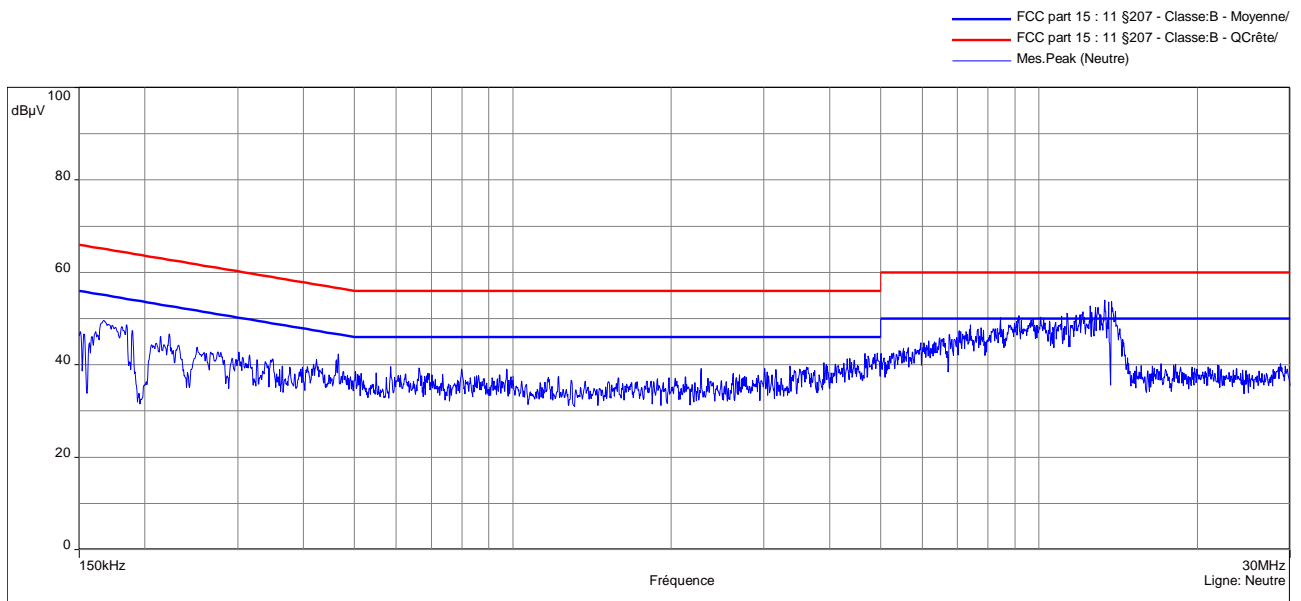
Results:

Sample N° 1:

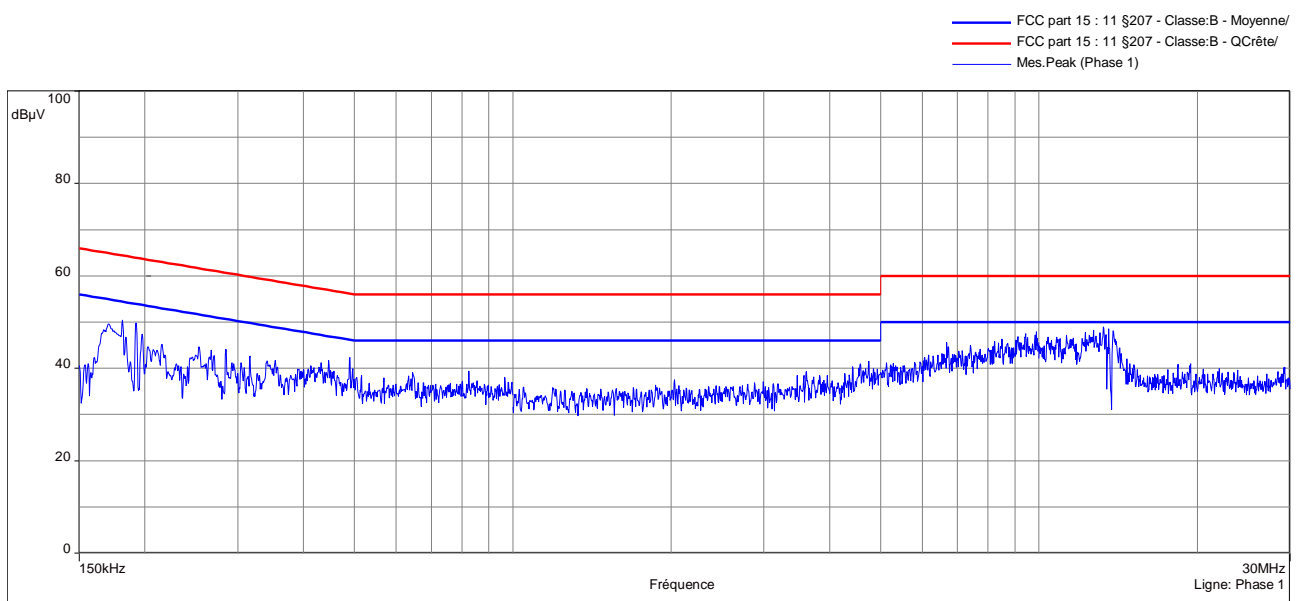
Measurement on the mains power supply:

The measurement is first realized with peak detector.

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



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



The highest frequencies are then analyzed with Quasi-peak detector and Average detector

Table N° 1: measurement on the Neutral, for the frequency range:

Frequency	Quasi-peak	QP Limit	QP margin	Frequency	Average	Average Limit	Average margin
(MHz)	(dB μ V)	(dB μ V)	(dB)	(MHz)	(dB μ V)	(dB μ V)	(dB)
0.167	40.86	65.1	24.24	0.167	32.25	55.1	22.85
0.222	34.53	62.7	28.20	0.222	27.1	52.7	25.63
0.466	26.78	56.6	29.81	0.466	21.23	46.6	25.36
2.279	24.42	56.0	31.58	2.279	15.89	46.0	30.11
7.402	35.88	60.0	24.12	7.402	27.18	50.0	22.82
9.154	37.53	60.0	22.47	9.154	28.91	50.0	21.09
12.510	39.53	60.0	20.47	12.510	31.27	50.0	18.73
13.328	42.68	60.0	17.32	13.328	33.29	50.0	16.71
13.742	45.28	60.0	14.72	13.742	33.66	50.0	16.34
13.962	37.15	60.0	22.85	13.962	28.65	50.0	21.35

Table N° 2: measurement on the Line, for the frequency range:

Frequency	Quasi-peak	QP Limit	QP margin	Frequency	Average	Average Limit	Average margin
(MHz)	(dB μ V)	(dB μ V)	(dB)	(MHz)	(dB μ V)	(dB μ V)	(dB)
0.171	43.72	64.9	21.21	0.171	34.21	54.9	20.72
0.181	41.35	64.4	23.08	0.181	29.63	54.4	24.80
0.192	40.16	63.9	23.78	0.192	29.2	53.9	24.74
0.490	31.05	56.2	25.12	0.490	22.18	46.2	23.99
9.892	39.5	60.0	20.50	9.892	31.77	50.0	18.23
13.856	40.94	60.0	19.06	13.856	31.42	50.0	18.58

Test conclusion:

RESPECTED STANDARD

9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS
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Temperature (°C) : 22

Humidity (%HR): 46

Date : October 8, 2020

Technician : T. LEDRESSEUR

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 alternance of emission and reception mode.

Charging mode:

Power source: 120 Vac by an external power supply

Percentage of voltage variation during the test (%): ± 1

Battery mode:

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

Voltage at the beginning of test (Vdc): 7.4Vdc

Percentage of voltage drop during the test (%): ± 1

Results:

Lower Band Edge: From 13.090 MHz to 13.110 MHz

Upper Band Edge: From 14.010 MHz to 14.030 MHz

Sample N° 1:

Measure realized in charging mode and repeated with the battery only

Charging mode

Fundamental frequency (MHz)	Field Strength Level of fundamental at 10m (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level at 10m (dB μ V/m)	Limit at 10m (dB μ V/m)	Margin (dB)
13.56	61.7	Peak	13.108022	44.3	17.4	48.63	31.23
13.56	61.7	Peak	14.029796	38.8	22.9	48.63	25.73

(1) Marker-Delta method

Battery mode

Fundamental frequency (MHz)	Field Strength Level of fundamental at 10m (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level at 10m (dB μ V/m)	Limit at 10m (dB μ V/m)	Margin (dB)
13.56	48.05	Peak	13.090988	44.56	3.49	48.63	45.14
13.56	48.05	Peak	14.030000	40.17	7.88	48.63	40.75

(1) Marker-Delta method

Bandwidth curves and band-edge curves are given in appendix.

Test conclusion:

RESPECTED STANDARD

10. OPERATION WITHIN THE BAND 13.110 – 14.010 MHZ

Temperature (°C) : 20

Humidity (%HR): 60

Date : October 7, 2020

Technician : T. LEDRESSEUR

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 Test setup document

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

Detection mode: Quasi-peak ($F < 1$ GHz)**Bandwidth:** 9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)**Distance of antenna:** 10 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.

Charging mode:

Power source: 120 Vac by an external power supply

Percentage of voltage variation during the test (%): ± 1 Battery mode:

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

Voltage at the beginning of test (Vdc): 7.4Vdc

Percentage of voltage drop during the test (%): ± 1

Results:

Sample N° 1:

Carrier field strength

Measure realized in charging mode and repeated with the battery only

Charging mode

	Field strength (dBμV/m) at frequency: 13.56 MHz
Normal test conditions measure at 10 m	61.7
Normal test conditions correlated at 30 m	42.62
Limits at 30m (dBμV/m)	84
Margin (dB)	41.38

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

Position of equipment: Position 1, see photos in Test setup document (azimuth: 80°)

Battery mode

	Field strength (dBμV/m) at frequency: 13.56 MHz
Normal test conditions measure at 10 m	48.05
Normal test conditions correlated at 30 m	28.97
Limits at 30m (dBμV/m)	84
Margin (dB)	55.03

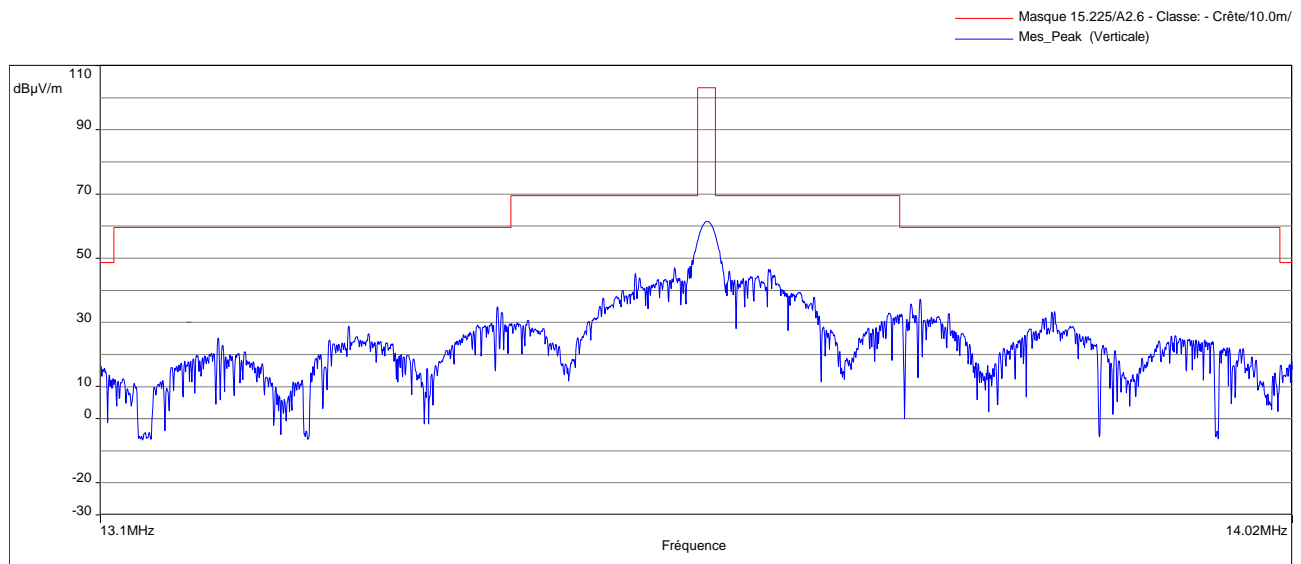
Polarization of test antenna: parallel at the equipment at 0 degree.

Position of equipment: Position 1, see photos in Test setup document (azimuth: 80°)

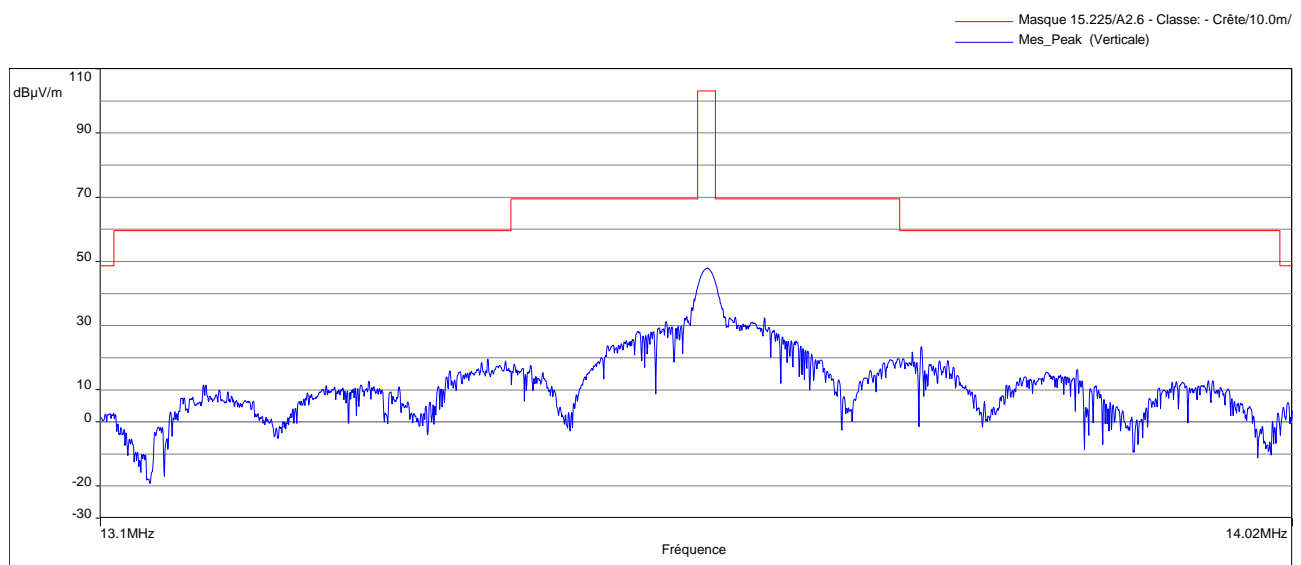
Field strength within the band 13.110-14.010 MHz

Measure realized in charging mode and repeated with the battery only

Charging mode



Battery mode



Frequency stability

Results for temperature variation

Realized with a power source at 120 Vac – 60 Hz by an external power supply

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	13.560512	0.512	13.560516	0.516	13.560512	0.512	13.560508	0.508	± 1.356 (a)
40	13.560550	0.550	13.560552	0.552	13.560548	0.548	13.560550	0.550	
30	13.560584	0.584	13.560584	0.584	13.560584	0.584	13.560584	0.584	
20	13.560622	0.622	13.560618	0.618	13.560624	0.624	13.560620	0.620	
10	13.560660	0.660	13.560658	0.658	13.560656	0.656	13.560660	0.660	
0	13.560692	0.692	13.560690	0.690	13.560686	0.686	13.560686	0.686	
-10	13.560686	0.686	13.560688	0.688	13.560692	0.692	13.560692	0.692	
-20	13.560678	0.678	13.560648	0.648	13.560652	0.652	13.560660	0.660	

(a) ±0.01% of the operating frequency

Results for power supply variation

Measure realized in charging mode and repeated with the battery only

Realized at +20 °C

Power supply (Vac)	Frequency measured (MHz)	Frequency drift (kHz)	Drift limit (kHz)
102	13.560614	0.614	± 1.356 (b)
120	13.560612	0.612	
138	13.560618	0.618	

(b) ±0.01% of the operating frequency

Power supply (Vdc)	Frequency measured (MHz)	Frequency drift (kHz)	Drift limit (kHz)
6.29	13.560620	0.620	± 1.356 (c)
7.4	13.560614	0.614	

(c) ±0.01% of the operating frequency

Test conclusion:

RESPECTED STANDARD

11. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.01 MHZ

Temperature (°C) : 20

Humidity (%HR): 60

Date : October 7, 2020

Technician : T. LEDRESSEUR

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 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 Test setup document

Frequency range: From 9 kHz to 1 GHz**Detection mode:** Quasi-peak (F < 1 GHz)**Bandwidth:** 200Hz (9 kHz < F < 150kHz)
9 kHz (150 kHz < F < 30MHz)
120 kHz (30 MHz < F < 1 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 alternance of emission and reception mode.

Charging mode:

Power source: 120 Vac by an external power supply

Percentage of voltage variation during the test (%): ± 1

Battery mode:

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

Voltage at the beginning of test (Vdc): 7.4Vdc

Percentage of voltage drop during the test (%): ± 1

Results:
Sample N° 1:

Measure realized in charging mode and repeated with the battery only

Charging mode

Below 30 MHz

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization (Parallel Perpendicular)	Field strength Measured at 10 m (dB μ V/m)	Field strength Computed at 30 m (dB μ V/m)	Limits at 30 m (dB μ V/m)	Margin (dB)
27.12	QP	9	Perpendicular	10.47	-8.61	29.5	38.11

Above 30 MHz

Frequencies (MHz)	Detector P QP Av	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 at 3 m (dB μ V/m)	Margin (dB)
197.562	QP	120	H	32.65	43.11	43.5	0.39
203.826	QP	120	H	31.97	42.43	43.5	1.07
255.828	QP	120	H	28.45	38.91	46	7.09
276.807	QP	120	H	30.16	40.62	46	5.38
283.422	QP	120	H	32.88	43.34	46	2.66

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

Battery mode

Below 30 MHz

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization (Parallel Perpendicular)	Field strength Measured at 10 m (dB μ V/m)	Field strength Computed at 30 m (dB μ V/m)	Limits at 30 m (dB μ V/m)	Margin (dB)
27.12	QP	9	Perpendicular	6.4	-12.68	29.5	42.18

Above 30 MHz

Frequencies (MHz)	Detector P QP Av	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 at 3 m (dB μ V/m)	Margin (dB)
154.59	QP	120	V	33.1	43.46	43.5	0.04
171.78	QP	120	V	30.13	40.59	43.5	2.91
188.955	QP	120	H	28.88	39.34	43.5	4.16
206.13	QP	120	H	31.05	41.51	43.5	1.99
249.09	QP	120	V	27.59	38.05	46	7.95
283.44	QP	120	H	30.28	40.74	46	5.26

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, (4) annexes to be forwarded □□□

APPENDIX 1: Test equipment list

Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESPC	Rohde & Schwarz	5275
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ-25	Rohde & Schwarz	8635
Absorber sheath current	Emitech	9489
Cable N-5m RG214	GYL Technologies	8590
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.17.0.25	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Loop antenna 6502	EMCO	1406
N-1.5M Cable	SUCOFLEX	7279
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	RSCCommander	-

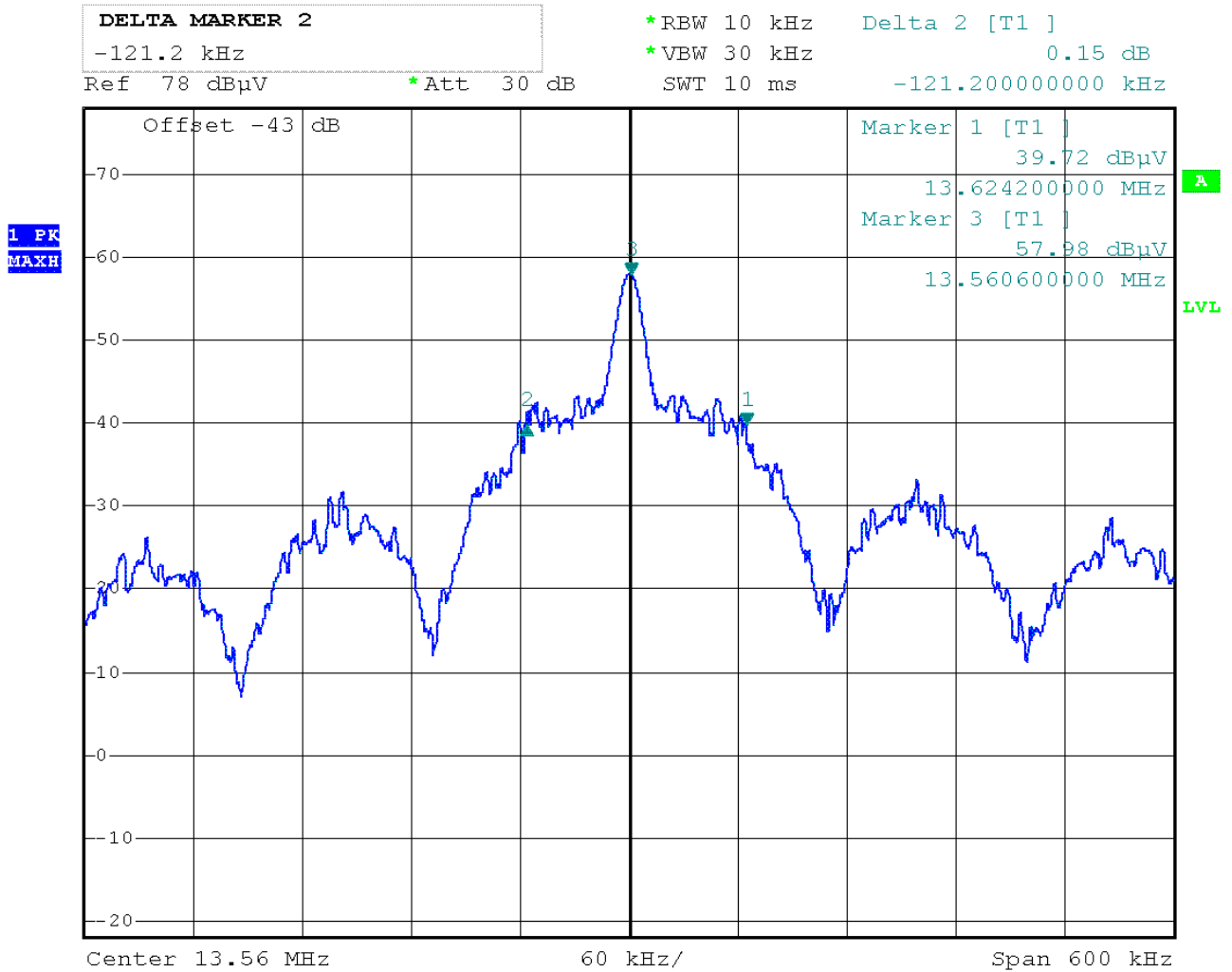
Operation within the band 13.110 – 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Loop antenna 6502	EMCO	1406
Climats EXCAL ² 1411-TA	CLIMATS	16059
Precision thermometer GMH 3710	GHM Greisinger	14716
Cable	EMITECH	8578
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.17.0.25	0000

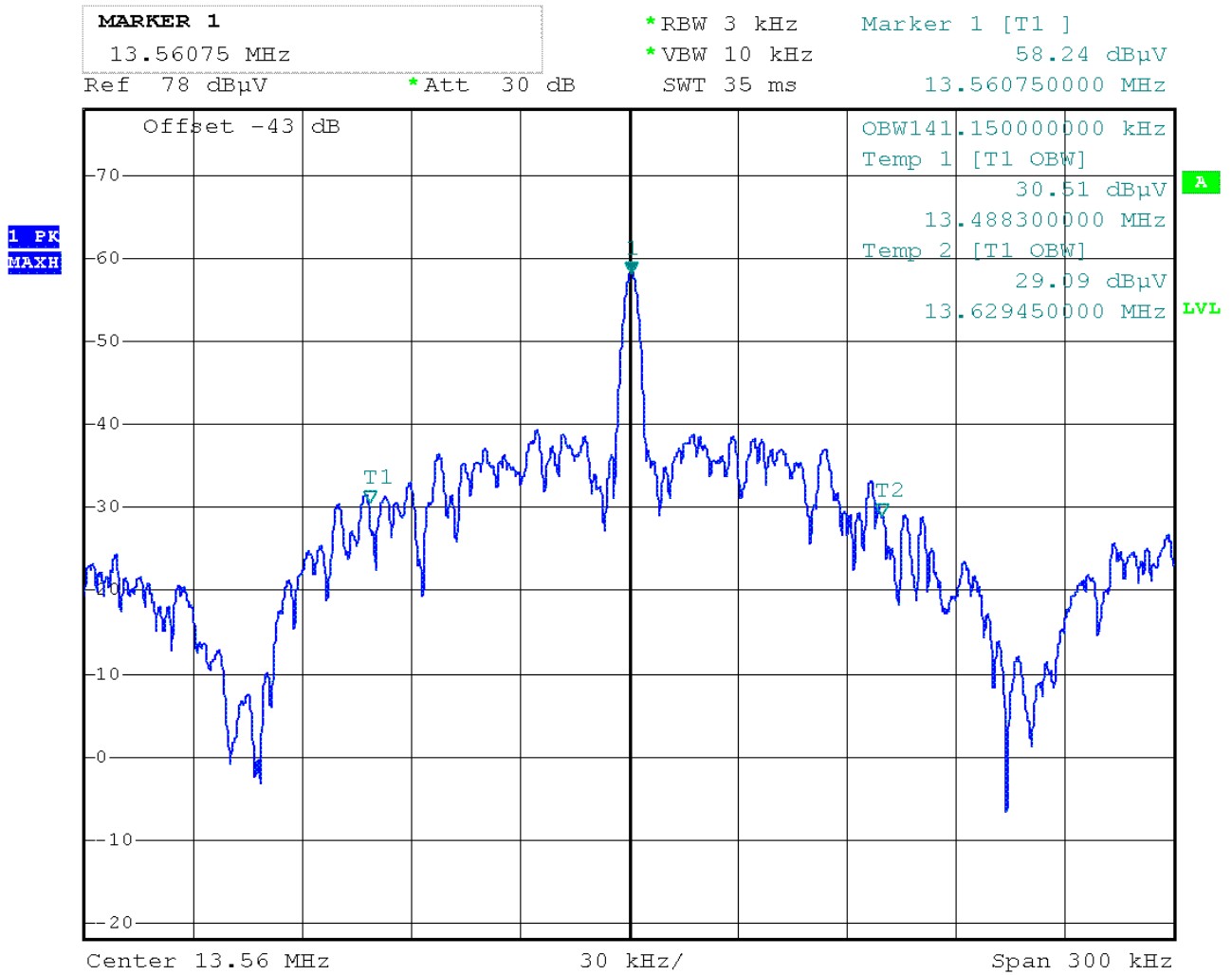
Field strength outside the band 13.110-14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Loop antenna 6502	EMCO	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna 3147	EMCO	8783
Cable	EMITECH	8578
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.17.0.25	0000

APPENDIX 2: 20 dB bandwidth



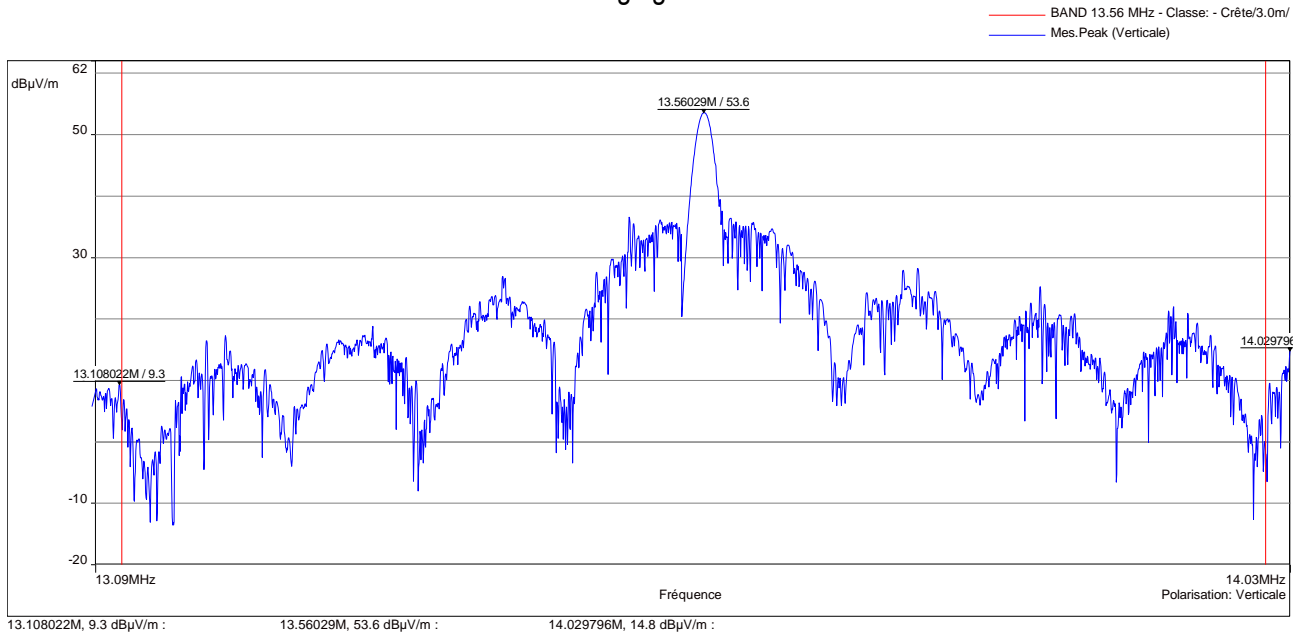
APPENDIX 3: 99% bandwidth



APPENDIX 4: Band edge

Measure realized in charging mode and repeated with the battery only

Charging mode



Battery mode

