

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

Equipment under test:

RS420

FCC ID: NQY-30021

Company:

ALLFLEX USA, Inc

Distribution: Mr LANGOUET

(Company: ALLFLEX USA, Inc)

Number of pages: 14 with 3 annexes

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Siège Social : Emitech - 3, rue des Coudriers - Z.A. de l'Observatoire - 78180 MONTIGNY LE BX - France

Siret : 344 545 645 00022 - Tél. : 33 (0)1 30 57 55 55 - Fax : 33 (0)1 30 43 74 48 - E-mail : contact@emitech.fr - URL : www.emitech.fr

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DESIGNATION OF PRODUCT: RS420

Serial number (S/N): C088 32546

Reference / model (P/N): RS420

Software version: 2.12.00 – Feb 17 2017

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

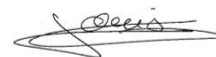
Responsible: Mr LANGOUET

DATE(S) OF TEST: 14-May-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: S. LOUIS

VISA:

A handwritten signature in black ink, appearing to read "Louis", with a long horizontal stroke extending to the right.

WRITTEN BY: S. LOUIS

CONTENTS

<i>TITLE</i>	<i>PAGE</i>
1. INTRODUCTION	4
2. PRODUCT DESCRIPTION	5
3. NORMATIVE REFERENCE	5
4. TEST METHODOLOGY	5
5. TEST EQUIPMENT CALIBRATION DATES	6
6. TESTS RESULTS SUMMARY	7
7. MEASUREMENT UNCERTAINTY	8
8. CONDUCTED LIMITS	9
9. RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS	12
APPENDIX 1: TEST EQUIPMENT LIST	14

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **RS420-60 Reader**, in accordance with normative reference.

The equipment under test integrates:

- A Bluetooth radio module, already certified in single modular (FCC ID: X3ZBTMOD3)
- A RFID radio module operational at 134.2 kHz.

This test report concerns only 134.2 kHz RFID radio part.

This equipment is a depopulated version of RS420NFC_SCR reader already certified (FCC ID: NQY-30014). Refer Emitech test report RR051-18-100755-3-A Ed. 0.
In this new version, NFC radio part is removed (13.56MHz).

So, limited tests are performed in the most critical mode to validate this version (in accordance with KDB 484596 D01).

- Measure of the field strength of the power.
- Measure of the Harmonics H2 and H3.

These tests are completed by conducted emissions measurement on RS420-60 reader with 134.2 kHz RFID transmission mode.

All tests have been realized with representative AC / DC Adapter (Model: FJ-SW20181201500).

For RF exposure see report N°RR051-18-100755-10-A Ed. 0 used during initial certification.

2. **PRODUCT DESCRIPTION**

Class:	B
Utilization:	Handheld control terminals
Antenna type and gain:	Integral antenna, gain unknown
Operating frequency range:	134.2kHz
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 (2020)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
484596 D01 Referencing Test Data v01	Guidance for referencing EMC and radio parameter test data in equipment authorization applications

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 (1)
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
6884	Suhner 1.5m	Cable	30/05/2018	2	29/05/2020
7011	California instruments 1251RP	Power source	(1)	(1)	(1)
8511	HP 8447D	Low-noise amplifier	25/02/2020	1	25/02/2021
8526	Schwarzbeck VHBB 9124	Biconical antenna	17/08/2018	3	16/08/2021
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	17/08/2018	3	16/08/2021
8590	RG214 N-5m	Cable	25/02/2020	2	25/02/2022
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8719	Thurbly Thandar Instruments 1600	LISN	25/02/2020	2	25/02/2022
8732	Emitech	OATS	03/07/2019	3	02/07/2022
8750	La Crosse Technology WS-9232	Meteo station	25/09/2018	2	24/09/2020
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	/	/	/
11535	R&S EZ-25	High pass filter	22/03/2019	2	21/03/2021
12911	Huber + Suhner N-2m	cable	30/5/2018	2	29/05/2020
14474	Oregon Scientific BAR206	Meteo station	19/11/2019	2	18/11/2021
14736	MATURO	Turntable and mat controller MCU	/	/	/
14831	Fluke 177	Multimeter	24/02/2020	2	24/02/2022
15882	SUCOFLEX	cable N 5m	28/11/2018	2	27/11/2020

(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				<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.

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	$\pm 5\text{ \%}$

8. CONDUCTED LIMITS**Temperature (°C) :** 19.6**Humidity (%HR):** 36**Date :** May 14, 2020**Technician :** S. LOUIS**Standard:** FCC Part 15**Test procedure:** Paragraph 15.207**Limits:** Class B**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 continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (134.2 kHz RFID activated). Tests are performed in charging mode with AC/DC Adapter referenced FJ-SW20181201500.

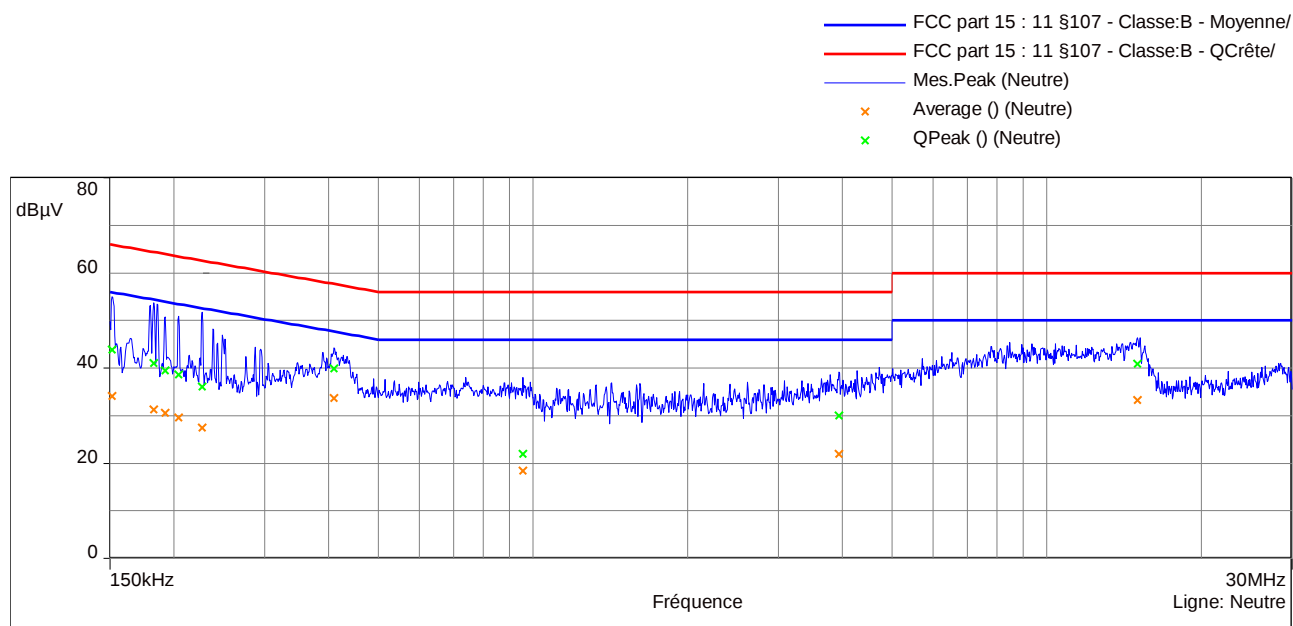
Results:

Sample N° 1

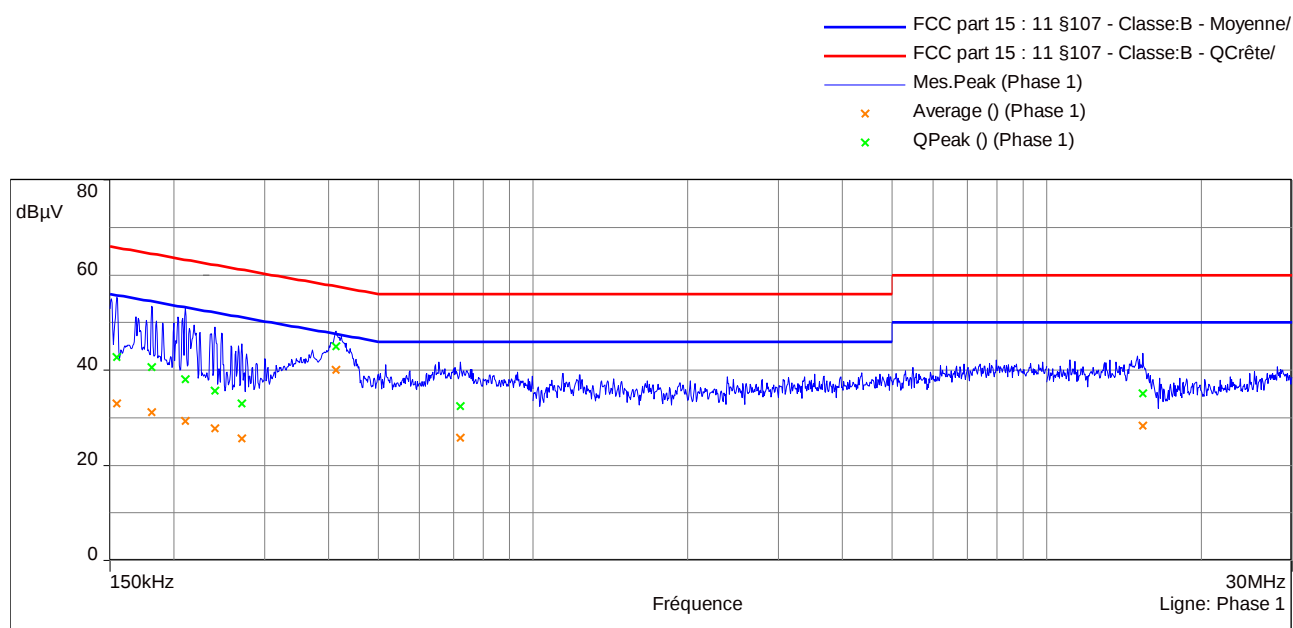
Measurement on the mains power supply:

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 (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.151	43.81	65.9	22.12
0.182	40.95	64.4	23.42
0.192	39.39	63.9	24.56
0.204	38.61	63.4	24.84
0.227	36.00	62.6	26.57
0.410	39.84	57.7	17.81
0.955	21.96	56.0	34.04
3.941	29.91	56.0	26.09
15.017	40.83	60.0	19.17

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.151	34.04	55.9	21.89
0.182	31.32	54.4	23.05
0.192	30.55	53.9	23.40
0.204	29.52	53.4	23.93
0.227	27.37	52.6	25.20
0.410	33.71	47.7	13.94
0.955	18.32	46.0	27.68
3.941	21.91	46.0	24.09
15.017	33.20	50.0	16.80

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

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.155	42.75	65.7	23.00
0.181	40.57	64.4	23.87
0.210	38.04	63.2	25.15
0.240	35.65	62.1	26.45
0.271	32.91	61.1	28.19
0.413	44.98	57.6	12.61
0.721	32.36	56.0	23.64
15.385	35.12	60.0	24.88

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.155	32.93	55.7	22.82
0.181	31.13	54.4	23.31
0.210	29.33	53.2	23.86
0.240	27.68	52.1	24.42
0.271	25.53	51.1	25.57
0.413	39.98	47.6	7.61
0.721	25.73	46.0	20.27
15.385	28.30	50.0	21.70

Test conclusion:

RESPECTED STANDARD

9. RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS**Temperature (°C) :** 18.9**Humidity (%HR):** 29**Date :** May 14, 2020**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)Peak / Average ($F > 1$ GHz)

Except for the frequency bands 9-90 kHz, 110-490 kHz. 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 (134.2 kHz RFID activated).

Tests are performed in charging mode with AC/DC Adapter referenced FJ-SW20181201500.

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	83.51	24.43	45	20.57
134.2	Av	81.49	22.41	25	2.59

With antenna height: 100 cm; Azimuth: 257°; Polarization antenna: Parallel° - Position 3

(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	48.12	-10.96	39	49.96
268.4	Av	47.05	-12.03	19	31.03

(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	41.43	-17.65	35.5	53.15
402.7	Av	40.22	-18.96	15.5	34.46

(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

□□□ End of report, 1 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	11535
Absorber sheath current	Emitech	9489
Cable N-5m RG214	GYL Technologies	8590
Power source 1251RP	California instruments	7011
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.17.0.25	0000

Radiated emission limits; general requirements

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Anechoic Chamber	EMITECH	8593
Turntable controller 1060C	MATURO	14736
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESPC	Rohde & Schwarz	5275
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Low-noise amplifier 8447D	Hewlett Packard	8511
N-1.5M Cable	Huber + Suhner	6884
N-2M Cable	Huber + Suhner	12911
N-5M Cable	SUCOFLEX	15882
Power source 1251RP	California instruments	7011
Multimeter 177	Fluke	14831
Meteo station BAR 206	Oregon Scientific	14474
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.17.0.25	0000