EMITECH GROUPE

RR051-17-104577-1-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
EQUADOR STRADA

FCC ID: T2X-SDA-STRADAPAL

Company:
PARKEON

Distribution: Mr EPENOY **(Company: PARKEON)**

Number of pages: 21 with 5 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	30-Mar-18	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.

S51 RTY 000 INT 00002 [00]

DESIGNATION OF PRODUCT:	**EQUADOR STRADA**
Serial number (S/N):	Refer appendix 4
Reference / model (P/N):	Strada PAL
Software version:	Refer appendix 4
MANUFACTURER:	**PARKEON**

COMPANY SUBMITTING THE PRODUCT:

Company:	PARKEON
Address:	PARC LAFAYETTE 6, RUE ISAAC NEWTON 25075 BESANCON CEDEX 9 FRANCE
Responsible:	Mr EPENOY
DATE(S) OF TEST:	From 26-Oct-17 to 27-Oct-17
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49610) FRANCE Parc d'activite de Lanserre 21, rue de la Fuye FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677
TESTED BY:	S. LOUIS ***VISA:***
WRITTEN BY:	S. LOUIS

CONTENTS

1. INTRODUCTION

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

The device under test integrates:

- RFID function not already certified.
- 2G/3G module already certified with FCCID: RI7HE910.

This radio test report concern only test realized for certification of RFID part. Measures for verification of the product (sub part 15B of CFR 47) are reported on report N°RR051-17-104577-2-A Ed. X

The host device of certified module shall be properly labeled to identify the modules within.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Residential
Antenna type and gain:	Integral antenna (unknown gain)
Operating frequency range:	13.56MHz
Number of channels:	1
Channel spacing:	Not concerned
Modulation:	RFID
Power source:	12Vdc by rechargeable lead acid battery

Modification during test: a ferrite referenced 74271132 has been added closest to the RFID module (2 turn).

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 (2016)	Radio Frequency Devices
ANSI C63.4 2014	Methods of measurement of Radio-Noise Emissions from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013 Procedures for ComplianceTesting 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 verification	Next verification	Validity
0	BAT-EMC V3.6.0.32	Software	/	/	/
1211	HP 8901B	Modulation analyzer	08/11/2017	08/11/2019	08/01/2020
1406	EMCO 6502	Loop antenna	13/04/2017	13/04/2019	13/06/2019
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
7045	MPC F0-100	Climatic chamber	/	/	/
8511	HP 8447D	Low-noise amplifier	28/11/2016	28/11/2017	28/01/2018
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2015	12/06/2018	12/08/2018
8528	Schwarzbeck VHA 9103	Biconical antenna	15/03/2016	15/03/2019	15/05/2019
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8707	R&S ESI7	Test receiver	07/06/2016	07/06/2018	07/08/2018
8732	Emitech	OATS	11/10/2016	11/10/2019	11/12/2019
8749	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8750	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8775 (1)	Fontaine FTN 2515B	Power source	/	/	/
8783	EMCO 3147	Log periodic antenna	15/03/2016	15/03/2019	15/05/2019
8864	Champ libre Juigné. V3.4	Software	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
14476	Fluke 177	Multimeter	20/03/2017	20/03/2018	20/05/2018
-	Software	GPIBShot V2.4	/	/	/

(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		*Supplied by battery*
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) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.225 frequency bands	X				*Note 3*
	(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: Dedicated antenna with 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.

RF EXPOSURE:

Maximum measured power = 48.3 dBµV/m = 0.000000867mW at 13.56 MHz
with $P = (E \times d)^2 / (30 \times Gp)$ *with d = 10 m and Gp = 1*

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

$PSD = EIRP/(4*\pi*R^2)$
0.000000867/(4*π*(20 cm)²)= 0.00000000017243 mW/cm² (limit = 0.98 mW/cm²)

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

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	± 0.75dB
Radiated emission valid to 26 GHz F < 62.5 MHz: 62.5 MHz < F < 1 GHz: 1 GHz < F < 26 GHz:	 ± 5.14 dB ± 5.13 dB ± 5.16 dB
AC Power Lines conducted emissions	± 3.38 dB
Temperature	± 1 °C
Humidity	± 5 %

8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Temperature (°C) : 26.1 **Humidity (%HR):** 46 **Date :** October 26, 2017
Technician : S. LOUIS

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 without tag.

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.

We used for power source the internal battery of the equipment and we noted:
Voltage at the beginning of test (Vdc): 12.74
Voltage at the end of test (Vdc): 12.62
Percentage of voltage drop during the test (%): 0.94

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:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
13.56	48.3	Peak	13.053	-35.26	13.04	48.63	35.59
13.56	48.3	Peak	14.043	-35.49	12.81	48.63	35.82

(1) Marker-Delta method

20 dB bandwidth curves are given in appendix 3; band-edge curves are given in appendix 5.

Test conclusion:

RESPECTED STANDARD

9. OPERATION WITHIN THE BAND 13.110 – 14.010 MHZ

Temperature (°C) : 15.3 **Humidity (%HR):** 44 **Date :** October 26, 2017
Technician : S. LOUIS

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 this normal position.

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 tolerance measure is realized in near-field.

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

Bandwidth: 9 kHz (150 kHz < F < 30MHz)

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 without tag.

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.

Power source:

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

Voltage at the beginning of test (Vdc): 12.74

Voltage at the end of test (Vdc): 12.62

Percentage of voltage drop during the test (%): 0.94

Results:

Sample N° 1:

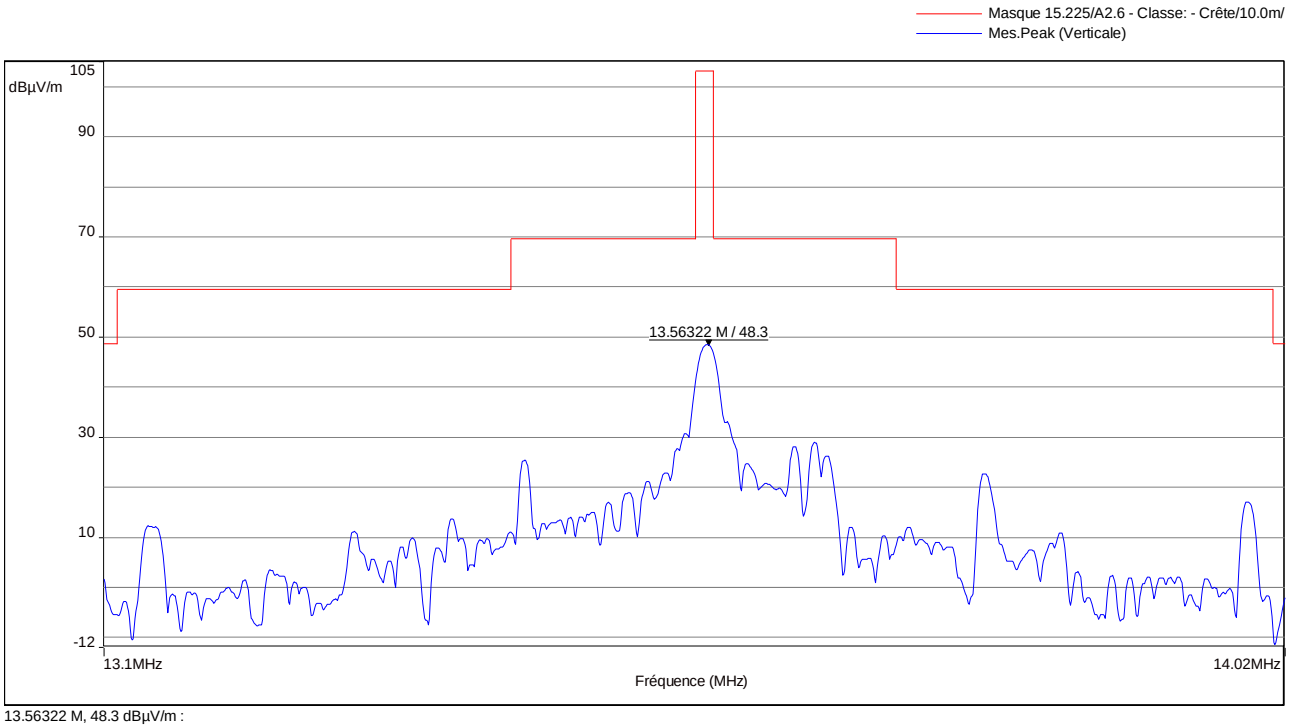
Carrier field strength

	Field strength (dBµV/m) at frequency: 13.56 MHz
Normal test conditions measure at 10 m	48.3
Normal test conditions correlated at 30 m	29.22
Limits at 30m (dBµV/m)	84
Margin (dB)	54.78

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

Position of equipment: see photos in appendix 2 (azimuth: 277°)

Field strength within the band 13.110-14.010 MHz



13.56322 M, 48.3 dBµV/m :

Frequency stability

Results for temperature variation

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

Temperature (°C)	Mesure 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	13.5610236	1.0236	13.5610211	1.0211	13.5610285	1.0285	13.5610236	1.0236	± 1.356 (a)
40	13.561072	1.072	13.561063	1.063	13.561062	1.062	13.561068	1.068	
30	13.561116	1.116	13.561102	1.102	13.561097	1.097	13.561098	1.098	
20	13.561170	1.17	13.561150	1.15	13.561146	1.146	13.561146	1.146	
10	13.561214	1.214	13.561204	1.204	13.561199	1.199	13.561199	1.199	
0	13.561248	1.248	13.561238	1.238	13.561233	1.233	13.561233	1.233	
-10	13.561272	1.272	13.561263	1.263	13.561263	1.263	13.561258	1.258	
-20	13.561263	1.263	13.561263	1.263	13.561262	1.262	13.561263	1.263	

(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)
102	13.561170	1.17	± 1.356 (b)
120	13.561180	1.18	
138	13.561160	1.16	

(b) ±0.01% of the operating frequency

Test conclusion:

RESPECTED STANDARD

10. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.01 MHZ

Temperature (°C) : 21.6 **Humidity (%HR):** 52 **Date :** October 26, 2017
Technician : S. LOUIS

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 this normal position.

The measure is realized on open area test site under 1 GHz and in anechoic chamber above 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.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.65 m 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

Detection mode: Quasi-peak (F < 1 GHz) Peak / Average (F > 1 GHz)

Bandwidth: 200Hz (9 kHz < F < 150kHz)
9 kHz (150 kHz < F < 30MHz)
120 kHz (30 MHz < F < 1 GHz)
1 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 without tag.

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.

Power source:

We used for power source the internal battery of the equipment and we noted:
Voltage at the beginning of test (Vdc): 12.77
Voltage at the end of test (Vdc): 12.62
Percentage of voltage drop during the test (%): 1.17

Results:

Sample N° 1:

Below 30 MHz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization (Parallel Perpendicular Horizontal)	Field strength Measured at 10 m (dBµV/m)	Field strength Computed at 30 m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
27.12	QP	100	164	9	perpendicular	17.65 (1)	-1.44	29.5	30.94

(1) Noise Floor

Above 30 MHz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	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)
189.87	QP	100	358	120	V	31.60	42	43.5	1.5
203.46	QP	100	255	120	V	32.02	42.42	43.5	1.08
230.5	QP	173	0	120	H	25.09	35.49	46	10.51
244.22	QP	160	41	120	H	31.48	41.98	46	4.02
257.66	QP	140	93	120	H	28.22	38.62	46	7.38

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

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

Test conclusion:

RESPECTED STANDARD

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

APPENDIX 1: Test equipment list

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

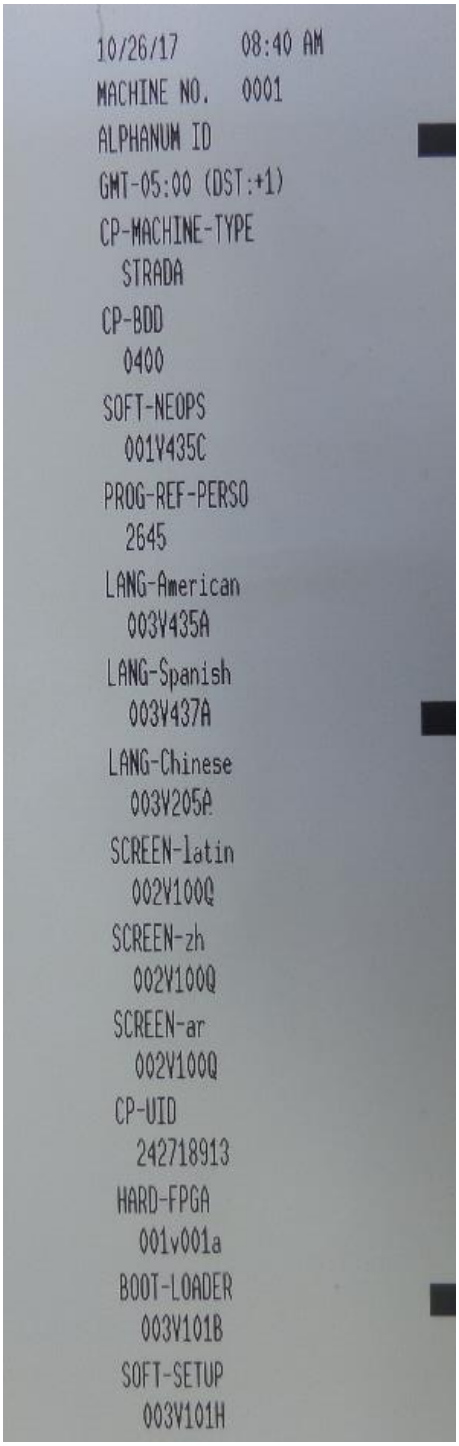
Operation within the band 13.110 – 14.010 MHz

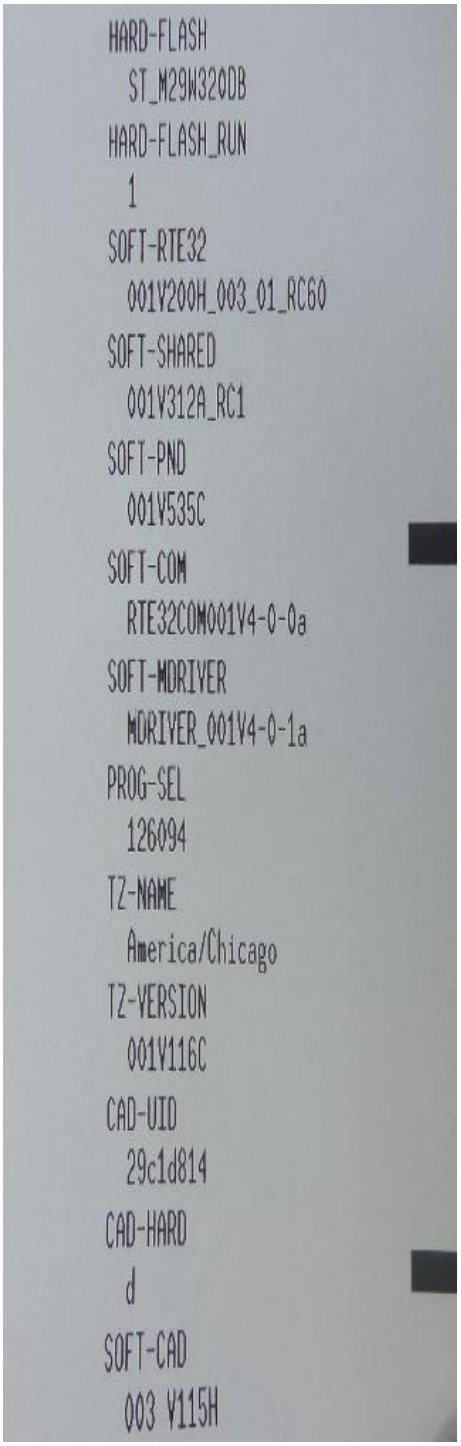
TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Modulation analyzer HP 8901B	Hewlett Packard	1211
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Climatic chamber F0-100	MPC	7045
Power source FTN 2515B	Fontaine	8775
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.5	8864

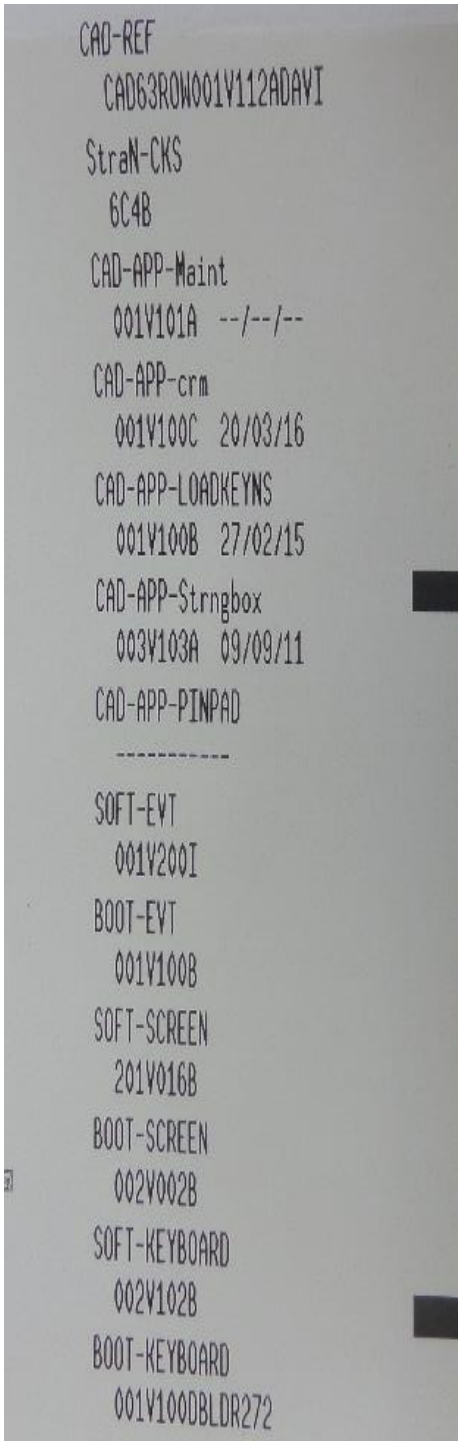
Field strength outside the band 13.110-14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Low-noise amplifier 8447D	Hewlett Packard	8511
Power source FTN 2515B	Fontaine	8775
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.5	8864

APPENDIX 2: Software version - Model – Serial Number



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001V200I
BOOT-EVT
001V100B
SOFT-SCREEN
201V016B
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002V002B
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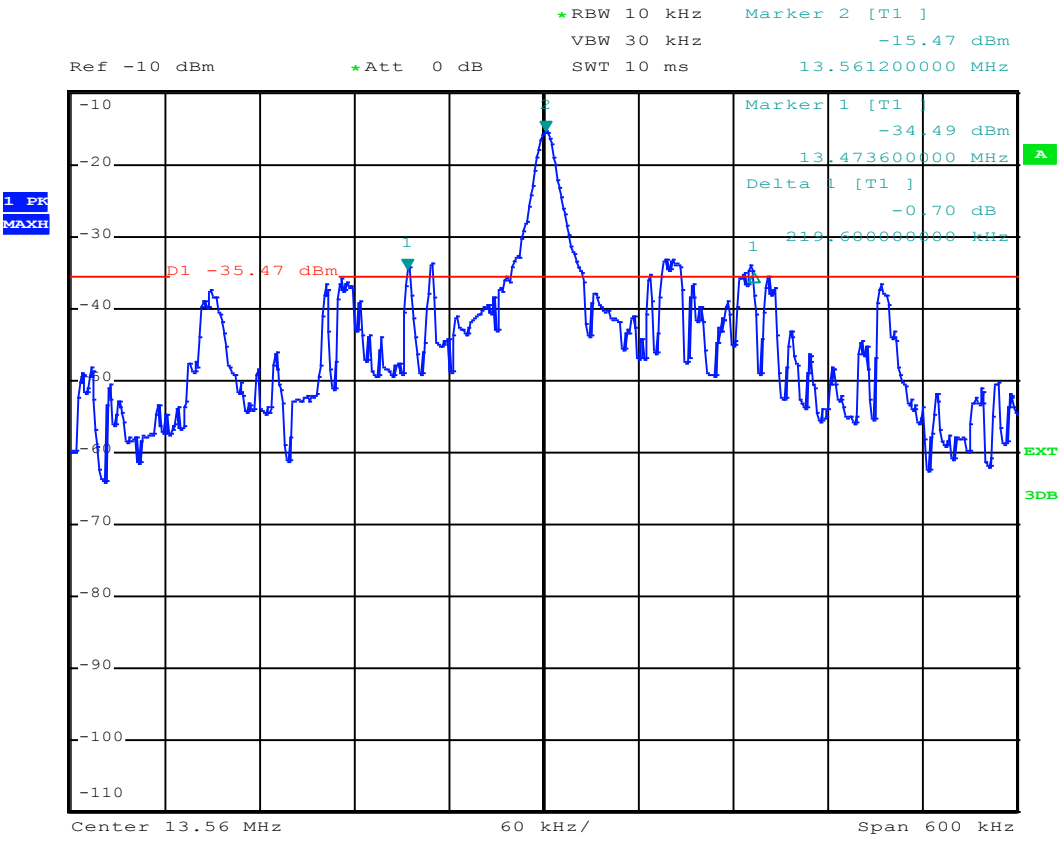
APPENDIX 3: 20 dB bandwidth



APPENDIX 4: 99% bandwidth

APPENDIX 5: Band edge