EMITECH GROUPE

RR051-17-100875-1-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
PERIMETER SURVEILLANCE RADAR

FCC ID: AJK5972410

Company:
ROCKWELL COLLINS FRANCE

Distribution: Mr DE PABLO **(Company:** ROCKWELL COLLINS FRANCE**)**

Number of pages: 32 with 4 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function / Visa
0	1-Sep-17	Creation	M. DUMESNIL, Radio Technical Manager

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.
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DESIGNATION OF PRODUCT: **PERIMETER SURVEILLANCE RADAR**

Serial number (S/N): TRN005

Reference / model (P/N): PSR-500

Software version:

Software	CPN	revision
Processing_Chain (Tracking)	226-0124-071	A
PSRProdControl	226-0120-032	A
PSRSignalAnalyzer	226-0110-000	B
Firmware V1.0	179-2240-001	-

MANUFACTURER: ROCKWELL COLLINS FRANCE

COMPANY SUBMITTING THE PRODUCT:

Company: ROCKWELL COLLINS FRANCE

Address: 6, AVENUE DIDIER DAURAT
PARC INDUSTRIEL AEROPORTUAIRE
31707 BLAGNAC CEDEX 01
FRANCE

Responsible: Mr DE PABLO

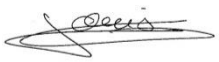
***Person present during the tests*:** Mr GAYRAUD

DATES OF TEST: From 3-Jul-17 to 4-Jul-17

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



CONTENTS

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment:
Perimeter Surveillance Radar PSR-500, in accordance with normative reference.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Perimeter Surveillance Radar
Antenna type and gain:	Network Patch Antenna with a gain of 10dBi
Operating frequency range:	From 5.750GHz to 5.850GHz
Number of channels:	Continuous sweep between 5750MHz and 5850MHz
Modulation:	None (FMCW)
Power source:	48Vdc by POE supplied with 120Vac / 60Hz

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 (2017)	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 Testing Unlicensed Wireless Devices.

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart A –General

Paragraph 19: labelling requirements
Paragraph 21: information to user

Subpart B –Unintentional Radiators

Paragraph 105: information to the user
Paragraph 107: Conducted limits
Paragraph 109: Radiated emission limits
Paragraph 111: Antenna power conduction limits for receivers

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 249: Operation within the bands 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz.

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval	Next calibration due (1)
0000	BAT-EMC V3.6.0.32	Software	/	/	/
1406	EMCO 6502	Loop antenna	13/04/2017	2 years	13/06/2019
1922	Microwave DB C020180F-4B1	Low-noise amplifier	21/12/2016	1 year	21/02/2018
4087	Filtek LP03/1000-7GH	Low Pass Filter	05/04/2016	2 years	05/06/2018
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	2 years	29/12/2017
4354	ALC ALS2640-30-10	Low-noise amplifier	18/11/2016	1 year	18/01/2018
6606	Microtronics LPM 15601	Low Pass Filter	12/05/2015	2 years	12/07/2017
6607	Microtronics HPM 15600	High Pass Filter	12/05/2015	2 years	12/07/2017
7190	R&S HL223	Antenna	15/03/2016	3 years	15/05/2019
7240	Emco 3110	Biconical antenna	15/03/2016	3 years	15/11/2019
7566	Testo 608-Hi	Meteo station	15/02/2016	2 years	15/04/2018
8508	California instruments 1251RP	Power source	12/12/2016	1 year	12/02/2018
8635	R&S EZ-25	High-pass filter	27/10/2016	2 years	27/12/2018
8676	ISOTECH IDM106N	Multimeter	21/05/2015	2 years	21/07/2017
8704	LUCIX Corp S180265L3201 LNA	Low-noise amplifier	02/05/2017	1 year	02/07/2018
8719	Thurbly Thandar Instruments 1600	LISN	06/04/2016	2 years	06/06/2018
8720	R&S ESH3-Z5	LISN	28/11/2016	2 years	28/01/2019
8750	La Crosse Technology WS-9232	Meteo station	23/09/2016	2 years	23/11/2018
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9266	Pasternack PE7004-10	Attenuator 10dB	12/04/2016	2 years	12/06/2018
9403	R&S ESU8	Spectrum Analyzer	11/08/2016	2 years	11/10/2018
9489	Absorber sheath current	Emitech	21/04/2016	2 years	21/06/2018
10730	Mini Circuit ZFL-1000LN	Low-noise amplifier	21/11/2016	1 year	21/01/2018
10739	LUCIX Corp S005180M3201	Low-noise amplifier	29/03/2017	1 year	29/05/2018
10759	SIDT Cage 3	Anechoic chamber	/	/	/
10771	EMCO 3117	Antenna	23/11/2016	3 years	23/01/2020
10788	Emitech	Outside room Hors cage	/	/	/
/	GPIB SHOT	Software	/	/	/

(1) according tolerance of ±2 months apply for all equipments.

6. TESTS AND CONCLUSIONS

6.1 general

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.19	LABELLING REQUIREMENTS	X				*See certification documents*
FCC Part 15.21	INFORMATION TO USER	X				*See certification documents*

NAp: Not Applicable NAs: Not Asked

LABEL SHALL CONTAIN

The label shall be located in a conspicuous location on the device
The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase

§15.19: (can be placed in the user manual if the product is too small)
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

USER NOTICE SHALL CONTAIN

The user notice, not provided during tests, shall include the following informations:

§15.21:
*Any changes or modifications to this equipment not expressly approved by **ROCKWELL COLLINS FRANCE** may cause, harmful interference and void the FCC authorization to operate this equipment*

6.2 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.105	INFORMATION TO THE USER	X				*See certification documents*
FCC Part 15.107	CONDUCTED LIMITS	X				*Class B*
FCC Part 15.109	RADIATED EMISSION LIMITS	X				*Class B*
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable NAs: Not Asked

USER NOTICE SHALL CONTAIN

The user notice, not provided during tests, shall include the following informations:

§ 15.105:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference's by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and the receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

6.3 intentional radiator (subpart C)

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) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.249 frequency bands	X				*Note 3*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz, 5725-5850 MHz AND 24.0-24.25 GHz					
	(a) Fundamental and harmonics field strength	X				
	(b) Fixed point-to-point operation			X		
	(c) Measurement distance	X				
	(d) Out-of-band emissions	X				
	(e) Field strength limits above 1 GHz	X				

NAp: Not Applicable NAs: Not Asked

Note 1: dedicated antenna.

Note 2: See FCC part 15.249 (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 = 108.05 dBµV/m = 19.15mW at 5800 MHz
with $P = (E \times d)^2 / (30 \times Gp)$ *with d = 3 m and Gp = 1*

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

PSD= $EIRP/(4*\pi*R^{2)}$

⇨ $19.15/(4*\pi*(20\ cm)^2)$= ***0.00381 mW/cm² (limit = 1mW/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. MEASUREMENT OF THE CONDUCTED DISTURBANCES

Standard: FCC Part 15

Test procedure: Paragraph 15.107

Limits: Class B

Software used: BAT-EMC V3.6.0.32

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 is blocked in Mute mode.

Results:

Ambient temperature (°C): 26.2
Relative humidity (%): 51

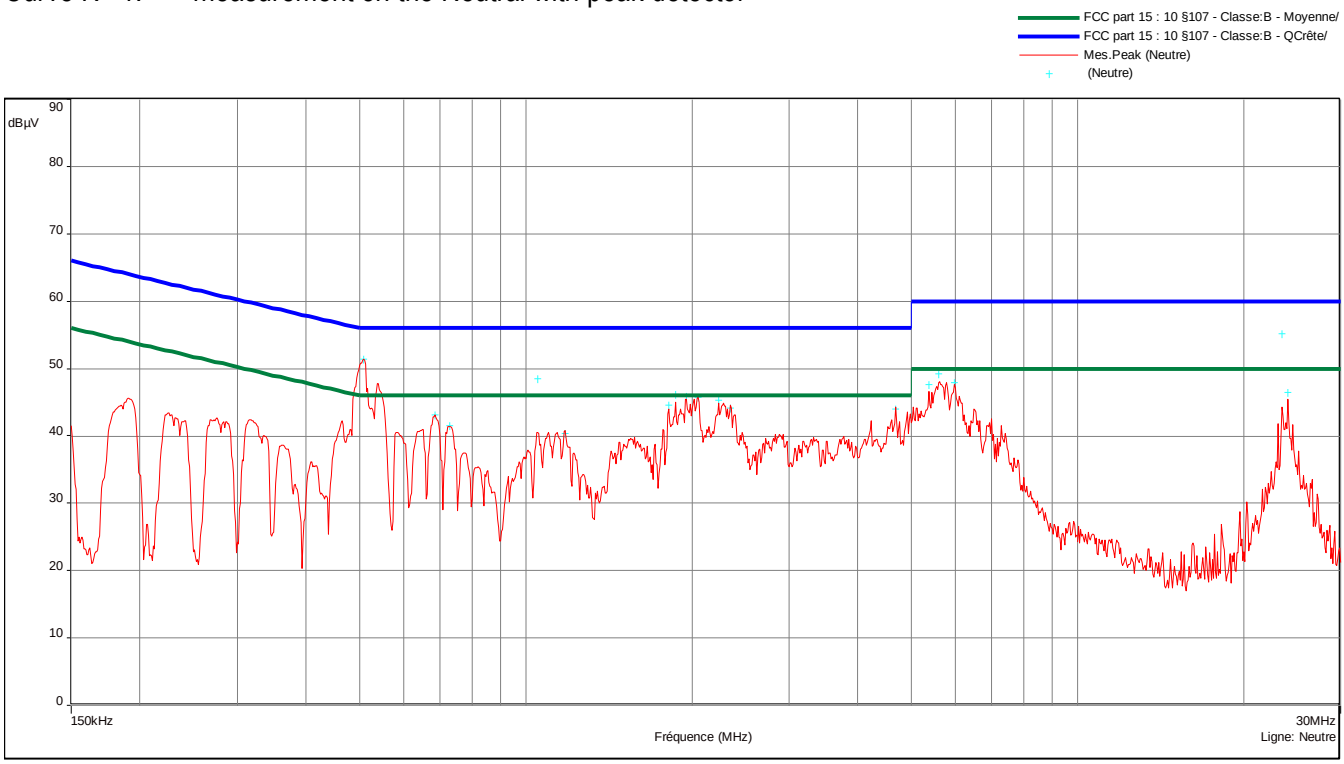
Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Sample N° 1:

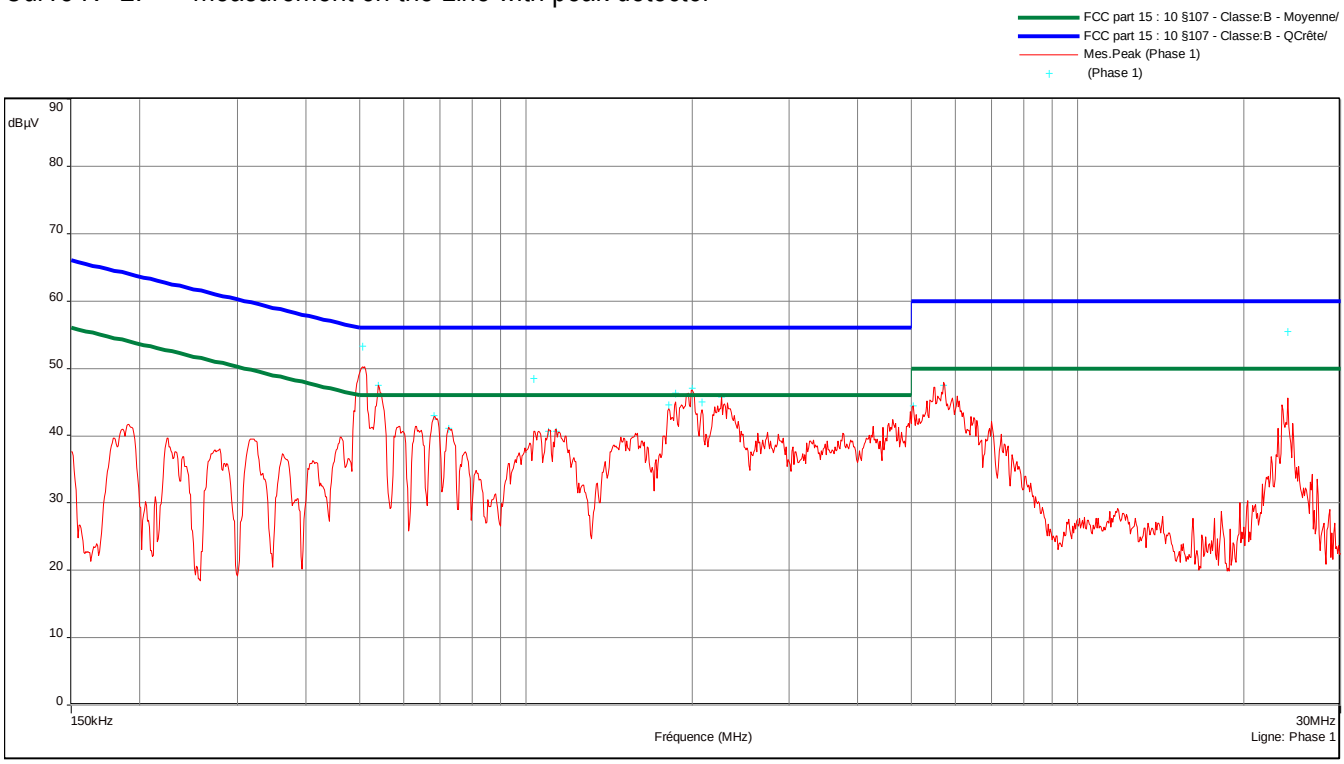
Measurement on the mains power supply:

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 frequencies which are not 6 dB under the Average limit are then analyzed with Average detector and Quasi-peak detector:

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

Frequency (MHz)	Quasi-peak (dBµV)	QP Limit (dBµV)	QP margin (dB)
0.508275	49.6	56.000	6.400
0.684905	40.73	56.000	15.270
0.726725	39.47	56.000	16.530
1.0495	37.560	56.000	18.440
1.1764	37.020	56.000	18.980
1.8172	39.930	56.000	16.070
1.8685	41.46	56.000	14.540
1.9522	42.41	56.000	13.590
2.0566	41.42	56.000	14.580
2.2366	40.55	56.000	15.450
2.3527	39.53	56.000	16.470
4.6864	37.94	56.000	18.060
5.3884	41.5	60.000	18.500
5.608	43.91	60.000	16.090
5.9905	41.83	60.000	18.170
23.518	39.98	60.000	20.020
24.108	42.56	60.000	17.440

Frequency (MHz)	Average (dBµV)	Average Limit (dBµV)	Average margin (dB)
0.508275	38.09	46.000	7.910
0.684905	29.31	46.000	16.690
0.726725	27.5	46.000	18.500
1.0495	29.37	46.000	16.630
1.1764	24.7	46.000	21.300
1.8172	26.96	46.000	19.040
1.8685	29.57	46.000	16.430
1.9522	31.55	46.000	14.450
2.0566	30.33	46.000	15.670
2.2366	27.32	46.000	18.680
2.3527	29.62	46.000	16.380
4.6864	31.72	46.000	14.280
5.3884	35.12	50.000	14.880
5.608	37.54	50.000	12.460
5.9905	34.93	50.000	15.070
23.518	34.93	50.000	15.070
24.108	38.24	50.000	11.760

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

Frequency (MHz)	Quasi-peak (dBµV)	QP Limit (dBµV)	QP margin (dB)	Frequency (MHz)	Average (dBµV)	Average Limit (dBµV)	Average margin (dB)
0.50632	48.69	56.000	7.310	0.50632	37.03	46.000	8.970
0.54117	45.02	56.000	10.980	0.54117	32.42	46.000	13.580
0.68329	40.62	56.000	15.380	0.68329	28.88	46.000	17.120
0.724855	39	56.000	17.000	0.724855	26.43	46.000	19.570
1.036	36.88	56.000	19.120	1.036	22.74	46.000	23.260
1.1008	38.35	56.000	17.650	1.1008	25.84	46.000	20.160
1.1341	37.82	56.000	18.180	1.1341	25.65	46.000	20.350
1.8136	39.72	56.000	16.280	1.8136	27.15	46.000	18.850
1.8685	41.69	56.000	14.310	1.8685	29.62	46.000	16.380
2.0008	42.95	56.000	13.050	2.0008	31.78	46.000	14.220
2.0845	39.83	56.000	16.170	2.0845	28.52	46.000	17.480
2.2645	41.19	56.000	14.810	2.2645	28.62	46.000	17.380
5.0347	38.62	60.000	21.380	5.0347	32.5	50.000	17.500
5.7115	42.15	60.000	17.850	5.7115	35.42	50.000	14.580
24.11	42.44	60.000	17.560	24.11	38.4	50.000	11.600

Test conclusion:

RESPECTED STANDARD

9. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: Paragraph 109

Limit class: Class B

Test set up:

The final measurement is realized with the product placed in his normal orientation.

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, 1.65m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2.

Frequency range: From 30 MHz to 40 GHZ.

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

Bandwidth: 120 kHz (F < 1 GHz) 1 MHz (F > 1 GHz)

Distance of antenna: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.65 meter (in anechoic room)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is blocked in mute mode.

Results:

Ambient temperature (°C): 23.7
Relative humidity (%): 38

Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Sample N° 1: Low, Central and High Channel

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)
70.53	QP	400	92	120	V	14.07	24.47	40	15.53
83.36	QP	100	0	120	V	29.26	39.66	40	0.34
110	QP	100	102	120	V	27.63	38.03	43.5	5.47
159.27	QP	100	343	120	V	28.85	39.25	43.5	4.25
218.06	QP	381	0	120	H	32.94	43.34	46	2.66
500	QP	274	117	120	H	28.48	38.88	46	7.12
2500	P	—	—	1000	V	—	43.6 (1)	74	30.4

P= Peak, QP=Quasi-peak, Av=Average
(1) The peak level is lower than the average limit

Applicable limits: 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

10. MEASUREMENT OF THE CONDUCTED DISTURBANCES

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Software used: BAT-EMC V3.6.0.32

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.

Results:

Ambient temperature (°C): 26.2
Relative humidity (%): 51

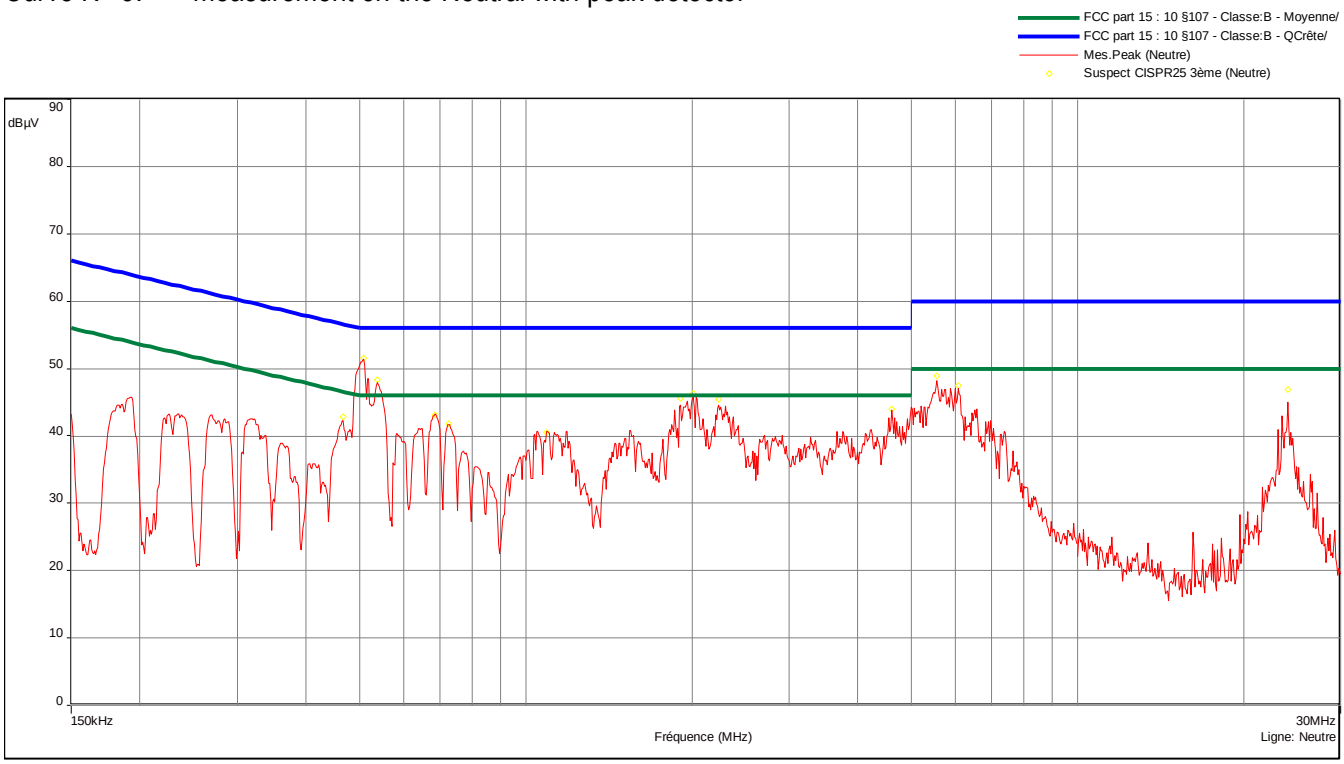
Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Sample N° 1:

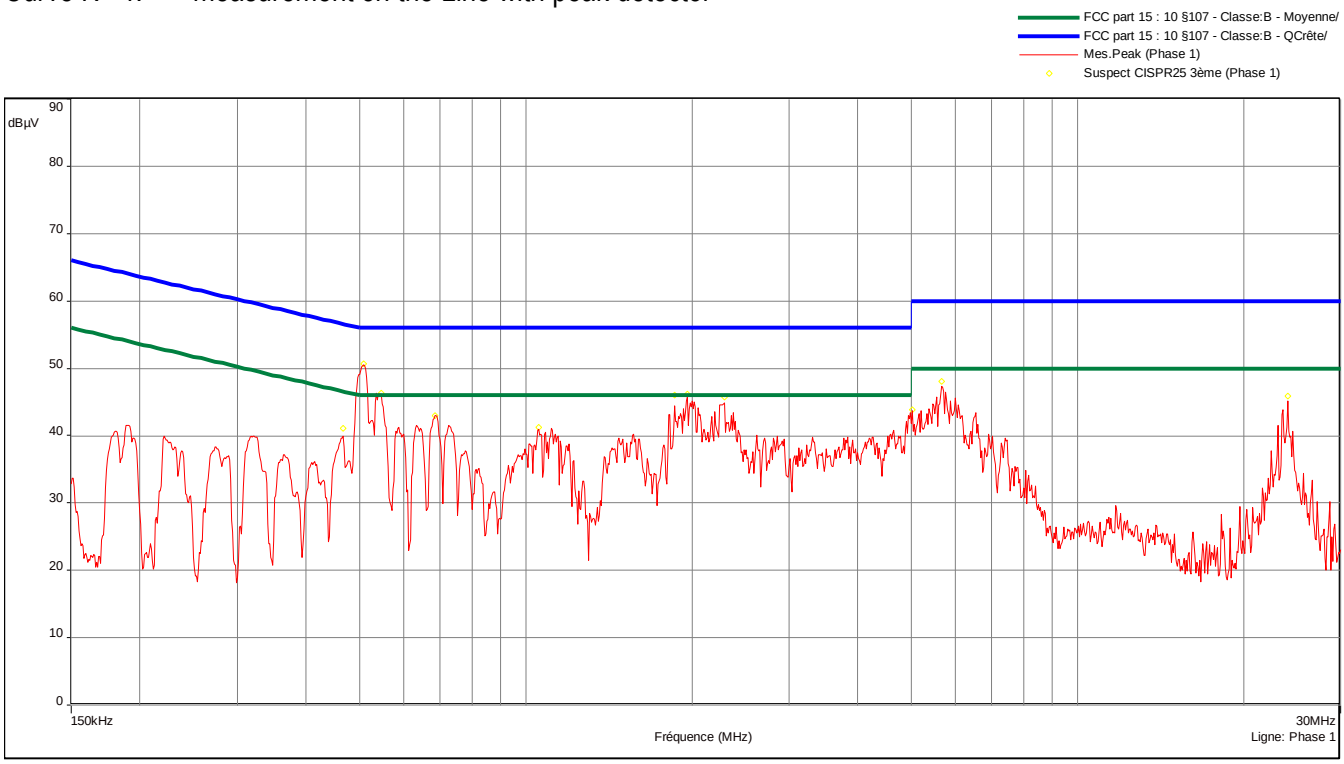
Measurement on the mains power supply:

The measurement is first realized with Peak detector.

Curve N° 3: measurement on the Neutral with peak detector



Curve N° 4: measurement on the Line with peak detector



The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector and Quasi-peak detector:

Table N° 3: average measurement on the Neutral, for the frequency range:

Frequency (MHz)	Quasi-peak (dBµV)	QP Limit (dBµV)	QP margin (dB)
0.46569	39.62	56.590	16.970
0.508105	49.66	56.000	6.340
0.538705	45.19	56.000	10.810
0.685755	40.99	56.000	15.010
0.72613	39.58	56.000	16.420
1.0927	37.94	56.000	18.060
1.9045	41.78	56.000	14.220
2.008	42.49	56.000	13.510
2.2375	40.29	56.000	15.710
4.6045	38.71	56.000	17.290
5.5585	43.28	60.000	16.720
6.0841	41.81	60.000	18.190
24.102	42.77	60.000	17.230

Frequency (MHz)	Average (dBµV)	Average Limit (dBµV)	Average margin (dB)
0.46569	28.5	46.590	18.090
0.508105	37.62	46.000	8.380
0.538705	31.87	46.000	14.130
0.685755	28.88	46.000	17.120
0.72613	27.14	46.000	18.860
1.0927	25.45	46.000	20.550
1.9045	30.43	46.000	15.570
2.008	30.98	46.000	15.020
2.2375	26.86	46.000	19.140
4.6045	31.38	46.000	14.620
5.5585	36.63	50.000	13.370
6.0841	34.3	50.000	15.700
24.102	38.29	50.000	11.710

Table N° 4: average measurement on the Line, for the frequency range:

Frequency (MHz)	Quasi-peak (dBµV)	QP Limit (dBµV)	QP margin (dB)
0.46654	37.07	56.575	19.505
0.508785	48.76	56.000	7.240
0.546355	44.43	56.000	11.570
0.685415	40.9	56.000	15.100
1.054	38.09	56.000	17.910
1.8622	41.58	56.000	14.420
1.9612	42.41	56.000	13.590
2.2897	41.28	56.000	14.720
5.0176	38.5	60.000	21.500
5.6845	42.41	60.000	17.590
24.102	41.87	60.000	18.130

Frequency (MHz)	Average (dBµV)	Average Limit (dBµV)	Average margin (dB)
0.46654	25.51	46.575	21.065
0.508785	35.59	46.000	10.410
0.546355	32.33	46.000	13.670
0.685415	28.39	46.000	17.610
1.054	25.8	46.000	20.200
1.8622	29.49	46.000	16.510
1.9612	31.35	46.000	14.650
2.2897	29.86	46.000	16.140
5.0176	31.74	50.000	18.260
5.6845	35.13	50.000	14.870
24.102	35.59	50.000	14.410

Test conclusion:

RESPECTED STANDARD

11. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

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 continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21.3
Relative humidity (%): 46

Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Lower Band Edge: band from 5723 MHz to 5725 MHz
Upper Band Edge: band from 5875 MHz to 5877 MHz

Sample N° 1:

Low Channel:

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)
5750	107.75	Peak	5724.92	36.45	71.3	74	2.7
5750	107.75	Av	5724.92	67.61	40.14	54	13.86
5850	107.64	Peak	5875.07	36.50	71.14	74	2.86
5850	107.64	Av	5875.07	68.71	38.93	54	15.07

(1) Marker-Delta method

Band-edge curves are given in appendix 4.

Test conclusion:

RESPECTED STANDARD

12. FUNDAMENTAL AND HARMONICS FIELD STRENGTH

Standard: FCC Part 15

Test procedure: paragraph 15.249 (a)

Test set up:

The final measurement is realized with the product placed in his normal orientation.

The system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.65m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2.

Frequency range: From 1 GHz to 40 GHz.

Detection mode: Peak / Average (F > 1 GHz)

Bandwidth: 1 MHz (F > 1 GHz)

Distance of antenna: 3 meters (in anechoic room)

Antenna height: 1.65 meter (in anechoic room)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21.3
Relative humidity (%): 46

Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Sample N° 1 Low Channel

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) or (dBm)	Margin (dB)
5750*	P	165	355	1000	V	107.75	114	6.25

P= Peak, QP=Quasi-peak, Av=Average
**Fundamental emission*

Sample N° 1 Central Channel

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) or (dBm)	Margin (dB)
5800*	P	165	355	1000	V	108.05	114	5.95

P= Peak, QP=Quasi-peak, Av=Average
**Fundamental emission*

Sample N° 1 High Channel

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) or (dBm)	Margin (dB)
5850*	P	165	353	1000	V	107.64	114	6.36

P= Peak, QP=Quasi-peak, Av=Average
**Fundamental emission*

Applicable limits: table 15.249 a)

Test conclusion:

RESPECTED STANDARD

13. OUT-OF-BAND EMISSIONS

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.249 (d)

Test set up:

The final measurement is realized with the product placed in his normal orientation.

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, 1.65m 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 40 GHz.

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) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.65 meter (in anechoic room)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 27.5
Relative humidity (%): 44

Power source: We used for power source the POE provided by the customer supplied with 120Vac / 60Hz.

Sample N° 1: Low, Central and High Channel

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)
70.53	QP	400	92	120	V	14.07	24.47	40	15.53
83.36	QP	100	0	120	V	29.26	39.66	40	0.34
110	QP	100	102	120	V	27.63	38.03	43.5	5.47
159.27	QP	100	343	120	V	28.85	39.25	43.5	4.25
218.06	QP	381	0	120	H	32.94	43.34	46	2.66
500	QP	274	117	120	H	28.48	38.88	46	7.12
2500	P	—	—	1000	V	—	43.6 (1)	74	30.4

P= Peak, QP=Quasi-peak, Av=Average
(1) The peak level is lower than the average limit

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, 4 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test

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APPENDIX 2: Test set up

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APPENDIX 3: Test equipment list

Measurement of the conducted disturbances

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESU8	Rohde & Schwarz	9403
LISN 1600	Thurbly Thandar Instruments	8719
LISN ESH3-Z5	Rohde & Schwarz	8720
High-pass filter EZ-25	Rohde & Schwarz	8635
Absorber sheath current	Emitech	9489
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750

Radiated emission limits; general requirements

TYPE	MANUFACTURER	EMITECH NUMBER
Full Anechoic Chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Biconical antenna 3110	EMCO	7240
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	EMCO	10771
Low-noise amplifier ZFL-1000LN	Mini Circuit	10730
Low-noise amplifier S005180M3201	LUCIX Corp	10739
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Low-noise amplifier S180265L3201	LUCIX Corp.	8704
Low-noise amplifier ALS2640-30-10	ALC	4354
Attenuator 10dB	Pasternack	9266
Low pass filter LP03/1000-7GH	Filtek	4087
Low Pass Filter LPM15601	Microtronics	6606
High Pass Filter LPM15600	Microtronics	6607
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station 608-Hi	Testo	7566
Software	BAT-EMC V3.6.0.32	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Full Anechoic Chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3117	EMCO	10771
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station 608-Hi	Testo	7566
Software	GPIBShot V2.4	-

Fundamental and harmonics field strength

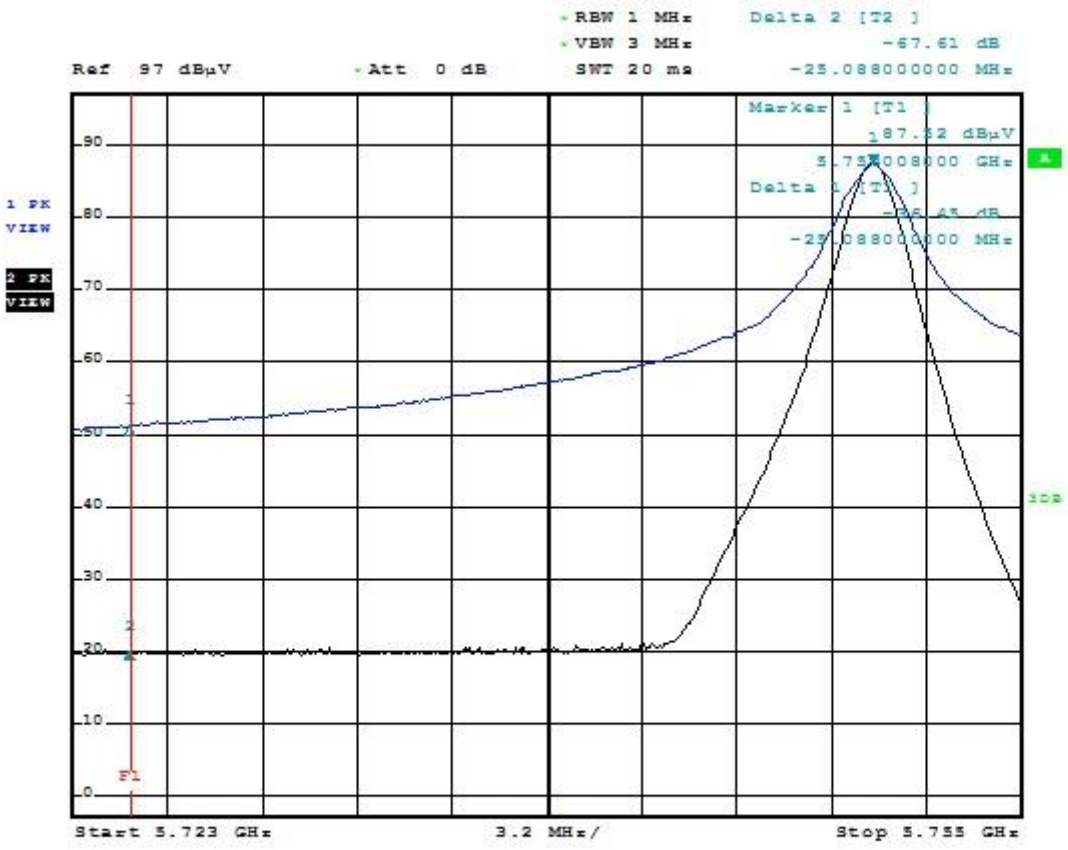
TYPE	MANUFACTURER	EMITECH NUMBER
Full Anechoic Chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3117	EMCO	10771
Low-noise amplifier S005180M3201	LUCIX Corp	10739
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Low-noise amplifier S180265L3201	LUCIX Corp.	8704
Low-noise amplifier ALS2640-30-10	ALC	4354
Attenuator 10dB	Pasternack	9266
Low Pass Filter LPM15601	Microtronics	6606
High Pass Filter LPM15600	Microtronics	6607
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station 608-Hi	Testo	7566
Software	BAT-EMC V3.6.0.32	0000

Out-of-band emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Full Anechoic Chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna 3110	EMCO	7240
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	EMCO	10771
Low-noise amplifier ZFL-1000LN	Mini Circuit	10730
Low-noise amplifier S005180M3201	LUCIX Corp	10739
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Low-noise amplifier S180265L3201	LUCIX Corp.	8704
Low-noise amplifier ALS2640-30-10	ALC	4354
Attenuator 10dB	Pasternack	9266
Low pass filter LP03/1000-7GH	Filtek	4087
Low Pass Filter LPM15601	Microtronics	6606
High Pass Filter LPM15600	Microtronics	6607
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station 608-Hi	Testo	7566
Software	BAT-EMC V3.6.0.32	0000

APPENDIX 4: Band Edge

Lower Band Edge – Worst case measurement



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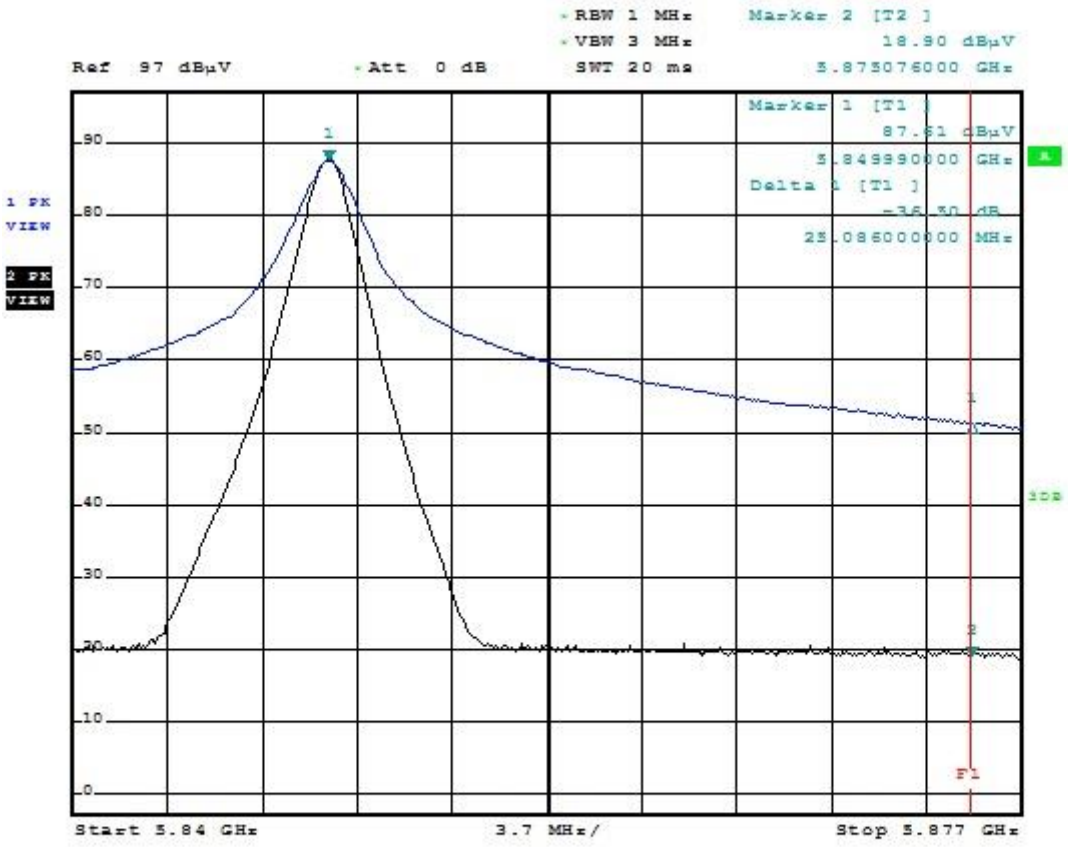
Upper Band Edge – Worst case measurement



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