EMITECH GROUPE

RR051-18-105689-1-A Ed. 0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

Equipment under test:

Handeld Portable Reader Lite
HPR Lite

FCC ID: NQY-30019

Company:

ALLFLEX USA, Inc

DISTRIBUTION: Mr LANGOUET (**Company:** ALLFLEX USA, Inc)

Number of pages: 64 with 10 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	5-Nov-18	Creation	M. DUMESNIL, Radio Technical Manager	

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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:	**Handheld Portable Reader Lite - HPR Lite**
Serial number (S/N):	DP0000
Reference / model (P/N):	30019-xA0
Software version:	1.03.00
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
DATES OF TEST:	From 25-OCT-2018 to 26-OCT-2018
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

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1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: **Handeld Portable Reader Lite - HPR Lite**, in accordance with normative reference.

The device under test integrates a Bluetooth module already certified (FCCID: X3ZBTMOD4).
This module was certified as limited modular approval because this module does not possess a shield.
That's why all tests were realized to certify this function directly with the product. For exigence protocol use see original certification.
The E.U.T can be supplied by an adapter AC/USB or by 7.4Vdc batteries.
The host device of certified modules shall be properly labeled to identify the modules within.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Handheld control terminals
Antenna type and gain:	Integral antenna, 2.1 dBi
Operating frequency range:	From 2402 MHz to 2480 MHz
Frequency tested:	2402 MHz (low channel) 2440 MHz (central channel) 2480 MHz (high channel)
Number of channels:	79
Channel spacing:	1MHz
Frequency generation:	A microcontroller with its 24 MHz crystal and an oscillator circuitry with a 17.1776 MHz crystal
Power source:	AC / DC Adapter 120Vac/60Hz – 5Vdc 7.4 Vdc Ni-MH batteries

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 (2018)	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.
558074 D01 DTS v05	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules.
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 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

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 247:	Operation within the bands 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last verification	Next verification	Validity
0000	BAT-EMC V3.16.0.64	Software	/	/	/
1406	EMCO 6502	Loop antenna	13/04/2017	2	13/04/2019
4087	Filtek LP03/1000-7GH	Low Pass Filter	29/03/2018	2	29/03/2020
4088	R&S FSP40	Spectrum Analyzer	21/02/2018	2	21/02/2020
5625	BL Microwave BP2442-84-7CS	Band pass filter	29/03/2018	2	29/03/2020
7190	R&S HL223	Antenna	15/03/2016	3	15/03/2019
7240	Emco 3110	Biconical antenna	15/03/2016	3	15/03/2019
7299	Microtronics BRM50702	Reject band filter	13/11/2017	2	13/11/2019
7566	Testo 608-H1	Meteo station	24/09/2018	2	24/09/2020
8508	California instruments 1251RP	Power source	15/01/2018	1	15/01/2019
8535	EMCO 3115	Antenna	10/02/2017	3	10/02/2020
8590	RG214 N-5m	Cable	29/03/2018	2	29/03/2020
8704	LUCIX Corp S180265L3201 LNA	Low-noise amplifier	09/08/2018	1	09/08/2019
8707	R&S ESI7	Test receiver	13/02/2018	1	13/02/2019
8719	Thurbly Thandar Instruments 1600	LISN	14/02/2018	2	14/02/2020
8786	ETS Lindgren 3160-09	Antenna	16/05/2016	3	16/05/2019
8893	Emitech	Outside room	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9398	N-1.5m	cable	29/03/2018	2	29/03/2020
9489	Absorber sheath current	Emitech	30/03/2018	2	30/03/2020
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	12/02/2018	1	12/02/2019
10759	SIDT Cage 3	Anechoic chamber	/	/	/
10771	EMCO 3117	Antenna	23/11/2016	3	23/11/2019
11535	R&S EZ-25	High pass filter	13/12/2016	2	13/12/2018
12590	LUCIX Corp S005180M3201	Low-noise amplifier	27/09/2018	1	27/09/2019
12912	Huber + Suhner N-5m	cable	29/03/2018	2	29/03/2020
14302	SUCOFLEX N-1m	cable	28/11/2016	2	28/11/2018
14303	SUCOFLEX N-2m	cable	28/11/2016	2	28/11/2018
14304	SUCOFLEX N-2.5m	cable	28/11/2016	2	28/11/2018
14831	Fluke 177	Multimeter	12/01/2018	2	12/01/2020
15666	R&S FSV40	Spectrum Analyzer	19/07/2018	1	19/07/2019
/	GPIBShot V2.4	Software	/	/	/

6. TESTS AND CONCLUSIONS

6.1 general (subpart A)

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

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 – Note 1*
FCC Part 15.109	RADIATED EMISSION LIMITS	X				*Class B – Note 2*
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable NAs: Not Asked

Note 1: Refer paragraph FCC 15.207.

Note 2: Refer paragraph FCC 15.209.

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 §15.247 frequency bands	X				*Note 3*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems	X				*Note 4*
	(a) (2) Digital modulation techniques			X		
	(b) Maximum peak output power	X				*Note 5*
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density			X		
	(f) Hybrid system			X		
	(g) Frequency hopping requirements	X				
	(h) Frequency hopping intelligence	X				
	(i) RF exposure compliance	X				

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.247 (d).

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

Note 4: The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (see appendix 5 and 10).

The frequency hopping system uses 79 channels (see appendix 10).

The maximum timing by channel is 333 µs (see appendix 9).

During 79 channels × 0.4 s = 31.6 s, any channel is used at maximum 27 times (see appendix 9), then 27 x 333 µs = 8.991 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 seconds multiplied by the number of hopping channels employed, in normal operating mode.

Number of channels	Observation period (0.4s * Nbr of channel) (s)	Maximal Duration of each burst (µs)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
79	31.6	333	27	0.008991	0.4

Note 5: Conducted measurement is not possible (integral antenna), so we used the radiated method in anechoic room.

RF EXPOSURE:

In accordance with KDB 447498 D01 General RF Exposure Guidance v06, Paragraph 4.3.1.

Maximum measured power = 97.8 dBµV/m = 1.115 mW at 2480 MHz
with $P = (E \times d)^2 / (30 \times Gp)$ *with d = 3 m and Gp = 1.62*

<u>The product must respect the exclusion limit for 10-g extremity SAR.</u>
*[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [√f(GHz)] ≤ 7.5*

According this formula:
*Min. test separation distance, mm ≥ [(max. power of channel, including tune-up tolerance, mW) * √f(GHz)] / 7.5*
Min. test separation distance, mm ≥ [1.115(mW) *√(2.48)] / 7.5
Min. test separation distance, mm ≥ 0.23 mm (with a minimum value of 5 mm)

The minimum distance between the user and the antenna is greater than 5 mm (see photos in appendix 1).

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

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. CONDUCTED LIMITS

Temperature (°C) : 21.7 **Humidity (%HR):** 45 **Date :** October 26, 2018
Technician : S. LOUIS

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Software used: BAT-EMC V3.16.0.64

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over a 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:

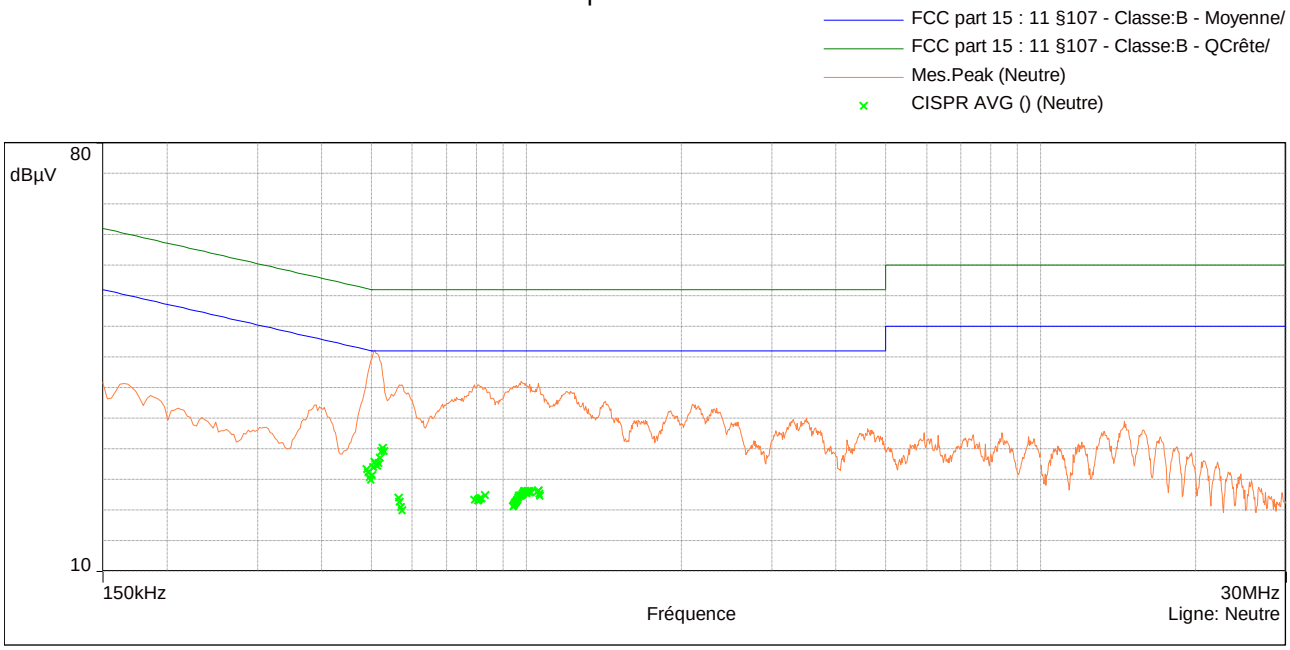
The equipment under test is blocked in continuous modulated hopping transmission mode, at the highest output power level at which the transmitter is intended to operate.
Worst case measurement performed with Bluetooth activated in hopping mode.

Results: Sample N° 1

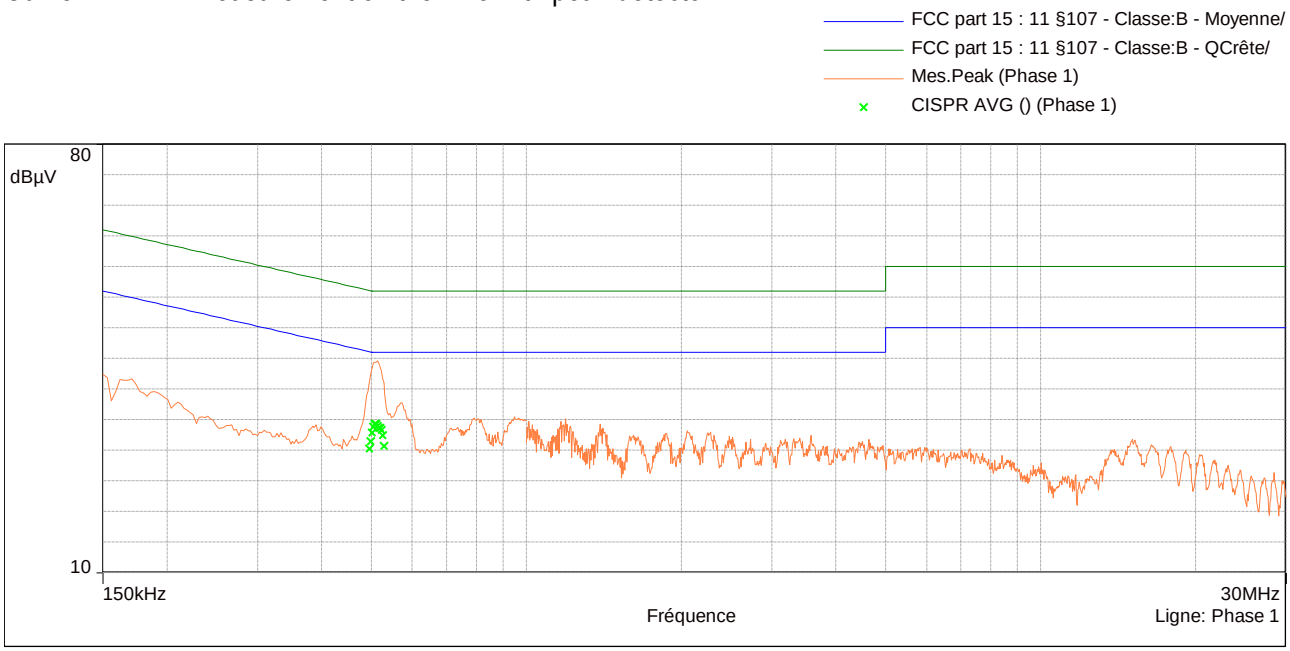
Measurement on the mains power supply:

The measurement is first realized with Peak detector.
The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

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



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



Test conclusion:

RESPECTED STANDARD

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

Ambient temperature (°C):	21.2
Relative humidity (%):	41

Power source: AC / DC Adapter 120Vac/60Hz – 5Vdc

- ⇨ Worst case measurement with the maximum Peak Output Power measure

Results:

Following FCC part 15.247:

Lower Band Edge: 2398 MHz to 2400 MHz
Upper Band Edge: 2483.5 MHz to 2485.5 MHz

Sample N° 1 with hopping mode off

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	95.5	PEAK	2399.79	-38.0	57.5	77.8	20.3
2480	97.8	PEAK	2483.60	-38.8	59.0	74	15.0
2480	97.8	AVERAGE	2483.58	-63.5	34.3	54	19.7

* *Marker-Delta method*

Sample N° 1 with hopping mode on

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	95.5	PEAK	2399.9	-39.6	55.9	77.8	21.9
2480	97.8	PEAK	2484.08	-34.0	63.8	74	10.2
2480	97.8	AVERAGE	2483.62	-47.4	50.4	54	3.6

* *Marker-Delta method*

20 dB bandwidth curves are given in appendix 5; band-edge curves are given in appendix 7.

Test conclusion:

RESPECTED STANDARD

10. MAXIMUM PEAK OUTPUT POWER

Temperature (°C) : 24 **Humidity (%HR):** 42 **Date :** October 25, 2018
Technician : S. LOUIS

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)
Method of paragraph 7.8.5 of ANSI C63.10

Test set up:

First an exploratory radiated measurement was performed.
During this phase the product is oriented in three orthogonal planes supplied by AC/DC adapter regulated to 120VAC/60Hz then with 7.4Vdc internal battery.

Then the final measurement is realized with the product on the most critical orientation and the most critical power supply.

The measure is realized in anechoic chamber above 1 GHz.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.50m from a ground plane.

See photos in appendix 2.

The measurement of the electro-magnetic field is realized, with a resolution bandwidth adjusted at 1MHz and video bandwidth at 3MHz.

Distance of antenna: 3 meters (in anechoic room)

Antenna height: 1.50 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 modulated hopping transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Power source: AC / DC Adapter 120Vac/60Hz – 5Vdc

- ⇨ Worst case measurement with the maximum Peak Output Power measure

Results:

Sample N° 1:

Low channel

	Radiated output power (dBµV/M)	Radiated power (W)	Limit (W)
Nominal supply voltage: 120Vac	95.5	0.656×10^{-3}	1

Polarization of test antenna: Horizontal (height: 150 cm)
Position of equipment: Position 1 with AC/DC adapter, see appendix 2 (azimuth: 264 degrees)

Central channel

	Radiated output power (dBµV/M)	Radiated power (W)	Limit (W)
Nominal supply voltage: 120Vac	92.2	0.307×10^{-3}	1

Polarization of test antenna: Horizontal (height: 150 cm)
Position of equipment: Position 1 with AC/DC adapter, see appendix 2 (azimuth: 264 degrees)

High channel

	Radiated output power (dBµV/M)	Radiated power (W)	Limit (W)
Nominal supply voltage: 120Vac	97.8	1.115×10^{-3}	1

Polarization of test antenna: Horizontal (height: 150 cm)
Position of equipment: Position 1 with AC/DC adapter, see appendix 2 (azimuth: 264 degrees)

with Radiated power = $(E \times d)^2 / (30 \times Gp)$ *with* $d = 3$ *m and* $Gp = 1.62$

Test conclusion:

RESPECTED STANDARD

11. INTENTIONAL RADIATOR

Temperature (°C) : 24 **Humidity (%HR):** 42 **Date :** October 25, 2018
Technician : S. LOUIS

Standard: FCC Part 15

Test procedure: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)
Emissions in non-restricted frequency bands method of paragraph 11.11 of ANSI C63.10
Emissions in restricted frequency bands method of paragraph 11.12 of ANSI C63.10

Test set up:

First an exploratory radiated measurement was performed.
During this phase the product is oriented in three orthogonal planes supplied by AC/DC adapter regulated to 120VAC/60Hz then with 7.4Vdc internal battery.

Then the final measurement is realized with the product on the most critical orientation and the most critical power supply.

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, 1.50m 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 (2480 MHz)

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)
100 kHz / 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) / 1.50 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 modulated hopping transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Power source: AC / DC Adapter 120Vac/60Hz – 5Vdc

Position of the product: Position 1 with AC/DC adapter.

Sample N° 1 Low Channel (F=2402MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7206	P	150	100	V	66.9	77.8	10.9

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

Sample N° 1 Central Channel (F=2440MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7320	P	150	1000	V	63.1	74	10.9
7320	Av	150	1000	V	48.5	54	5.5

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

Sample N° 1 High Channel (F=2480MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7440	P	150	1000	V	67	74	7.0
7440	Av	150	1000	V	52.4	54	1.6

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

Position of the product: Position 2 with AC/DC adapter.

Sample N° 1 Low Channel (F=2402MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7206	P	150	100	H	65.1	77.8	12.7

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

Sample N° 1 Central Channel (F=2440MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7320	P	150	1000	H	62.2	74	11.8
7320	Av	150	1000	H	47.6	54	6.4

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

Sample N° 1 High Channel (F=2480MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7440	P	150	1000	H	68.4	74	5.6
7440	Av	150	1000	H	53.8	54	0.2

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

Power source: Battery fully charged 7.4Vdc

Position of the product: Position 1 with battery

Sample N° 1 Low Channel (F=2402MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7206	P	150	100	V	62.1	77.8	15.7

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

Sample N° 1 Central Channel (F=2440MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7320	P	150	1000	V	61.9	74	12.1
7320	Av	150	1000	V	47.3	54	6.7

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

Sample N° 1 High Channel (F=2480MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7440	P	150	1000	V	64.8	74	9.2
7440	Av	150	1000	V	50.2	54	3.8

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

Position of the product: Position 2 with battery

Sample N° 1 Low Channel (F=2402MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7206	P	150	100	H	62.1	77.8	15.7

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

Sample N° 1 Central Channel (F=2440MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7320	P	150	1000	H	61.4	74	12.6
7320	Av	150	1000	H	46.6	54	7.4

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

Sample N° 1 High Channel (F=2480MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7440	P	150	1000	H	63.8	74	10.2
7440	Av	150	1000	H	49	54	5.0

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

Position of the product: Position 3 with battery

Sample N° 1 Low Channel (F=2402MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7206	P	150	100	V	62.1	77.8	15.7

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

Sample N° 1 Central Channel (F=2440MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7320	P	150	1000	V	62.3	74	11.7
7320	Av	150	1000	V	47.5	54	6.5

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

Sample N° 1 High Channel (F=2480MHz)

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
7440	P	150	1000	V	65.7	74	8.3
7440	Av	150	1000	V	50.9	54	3.1

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

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

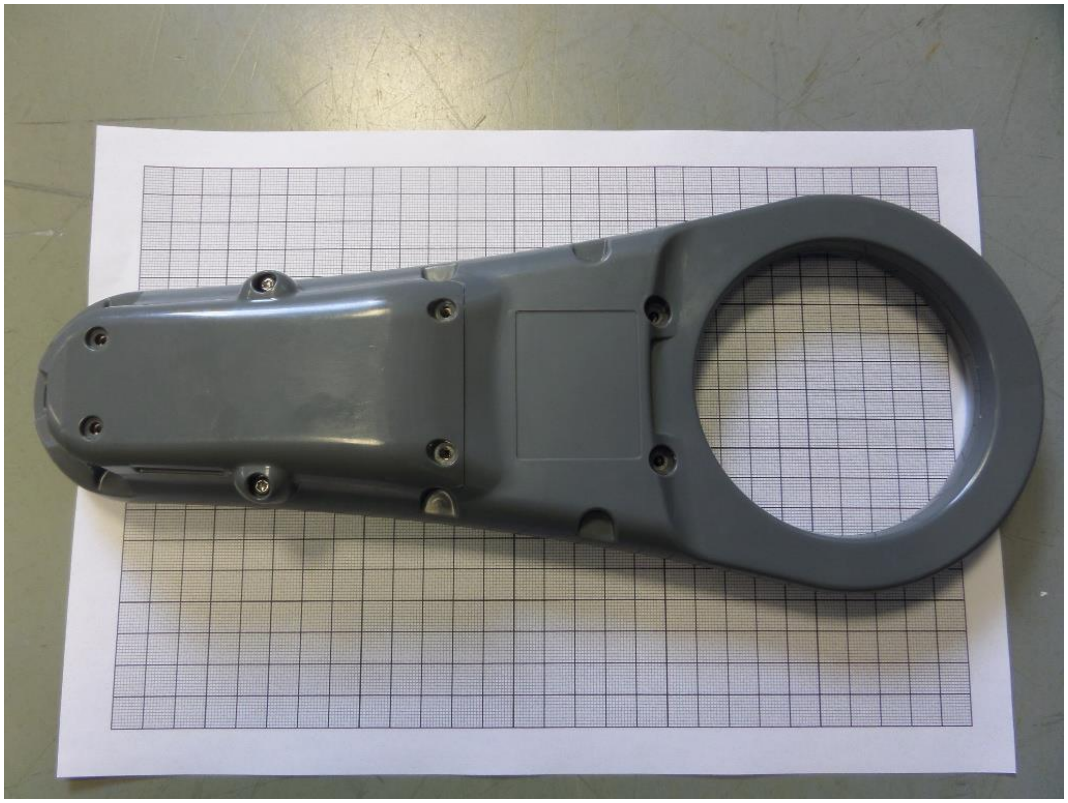
The highest level recorded in a 100 kHz bandwidth is 97.8 dBµV/m on High channel.
So the applicable limit is 77.8 dBµV/m.
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Test conclusion:

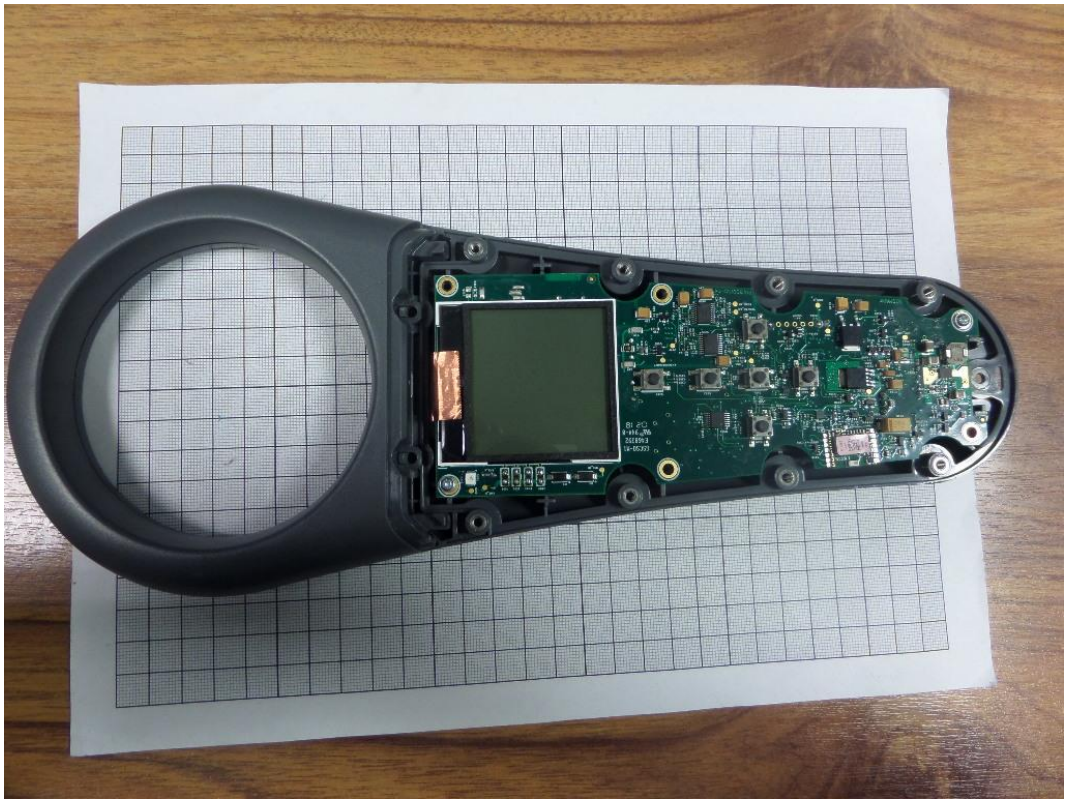
RESPECTED STANDARD

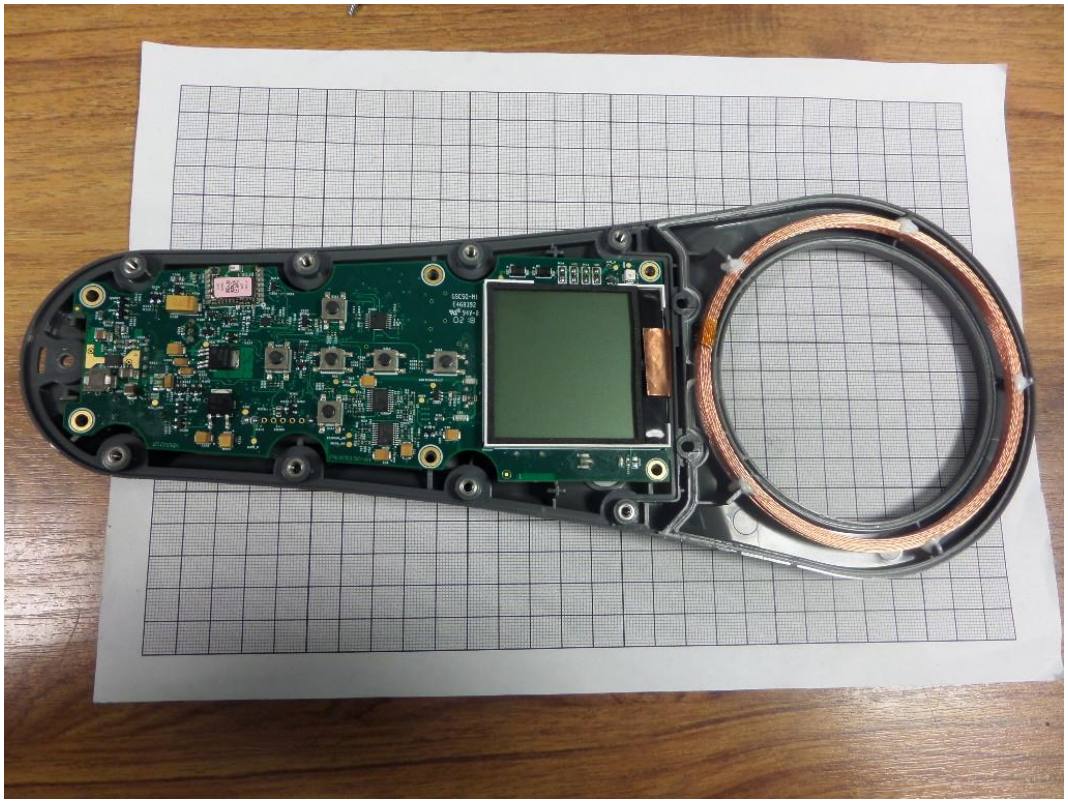
End of report, 10 appendixes to be forwarded

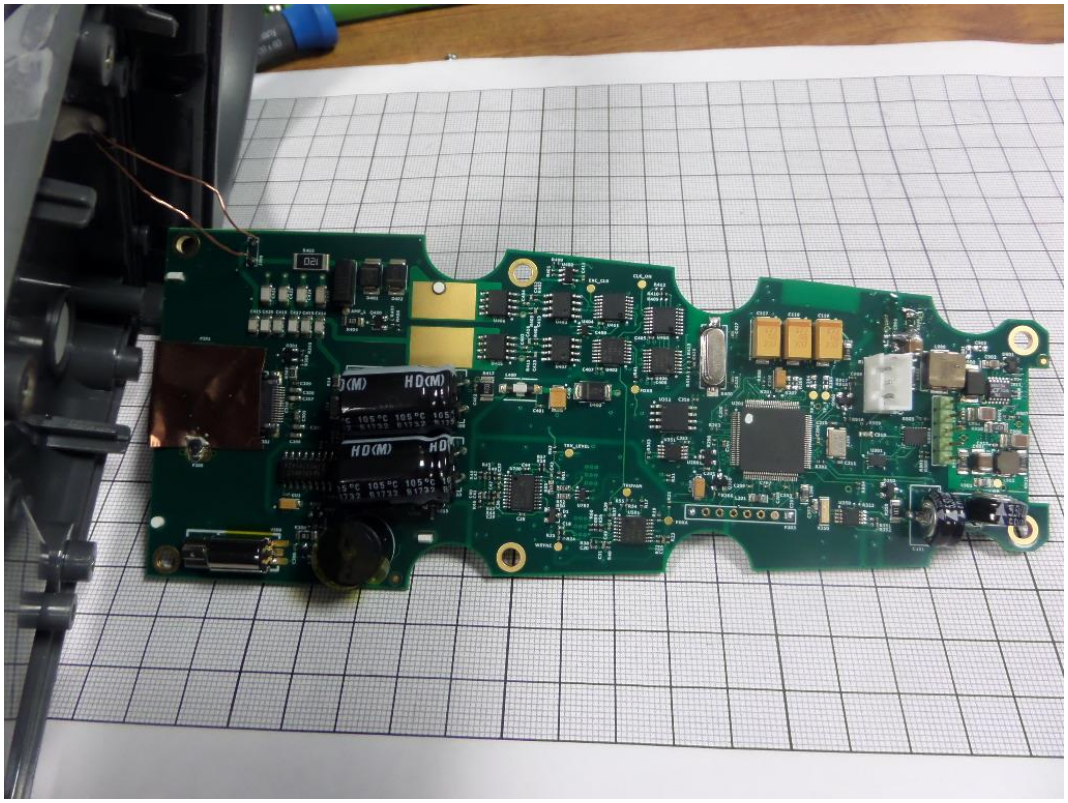
APPENDIX 1: Photos of the equipment under test

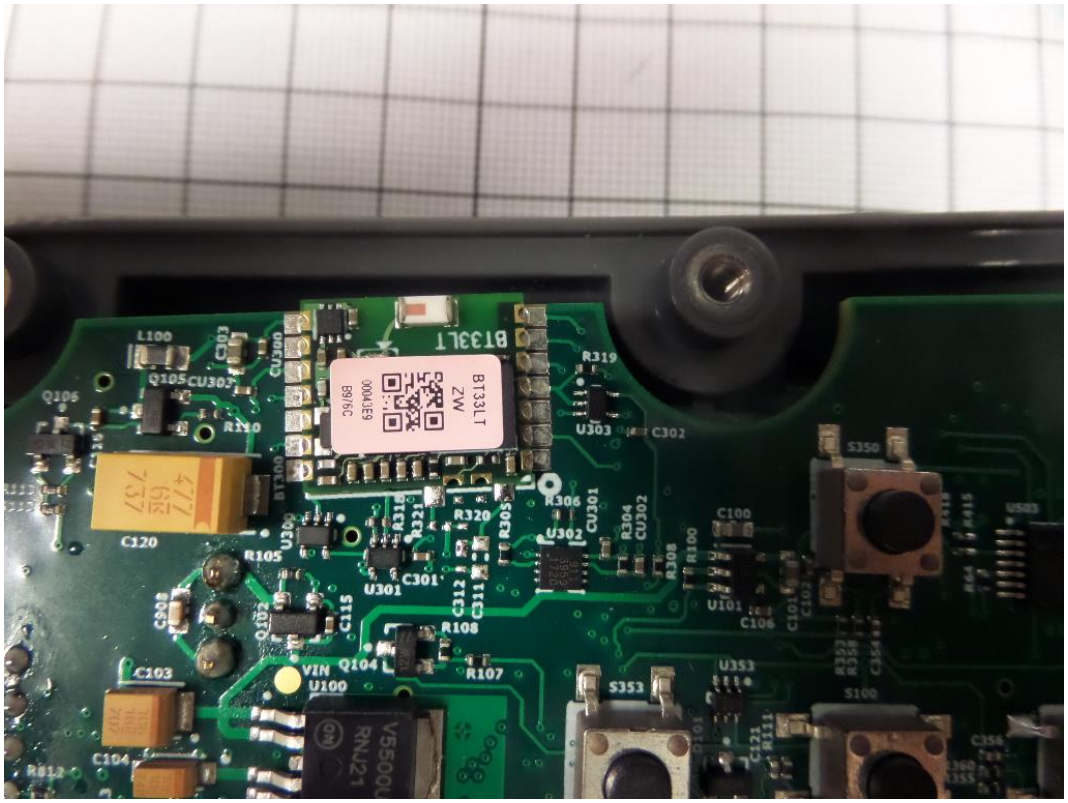


PowerPax PXXYY
AC ADAPTOR P/N:SW4678F
MODEL:KSA29B0500210D5
INPUT:100-240V~50/60Hz 0.5A
OUTPUT:5.0V ⎓ 2.1A
1(-) 4(+)
c UL us
80ZN
E215890 LISTED
I.T.E. POWER SUPPLY
UL DE
GS
VI
LPS
PowerPax
Unit 10 The Markham Centre, Station Road, Theale, Reading, Berkshire,
RG7 4PE, United Kindom
MADE IN CHINA



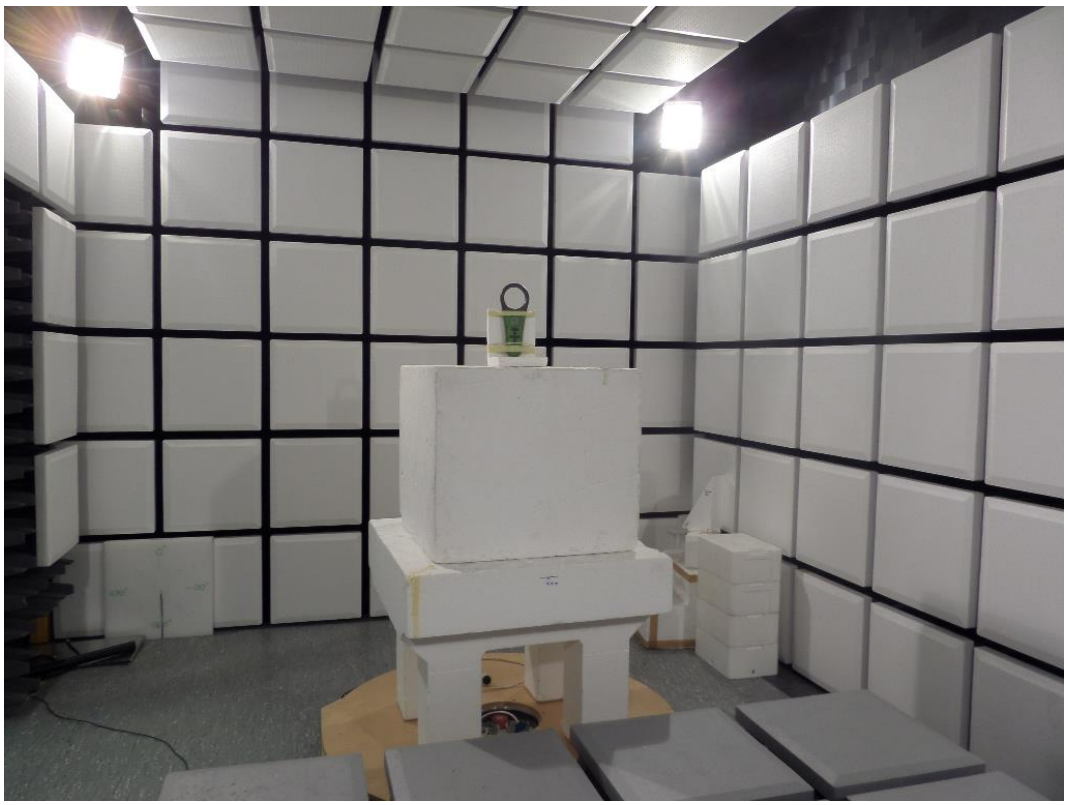


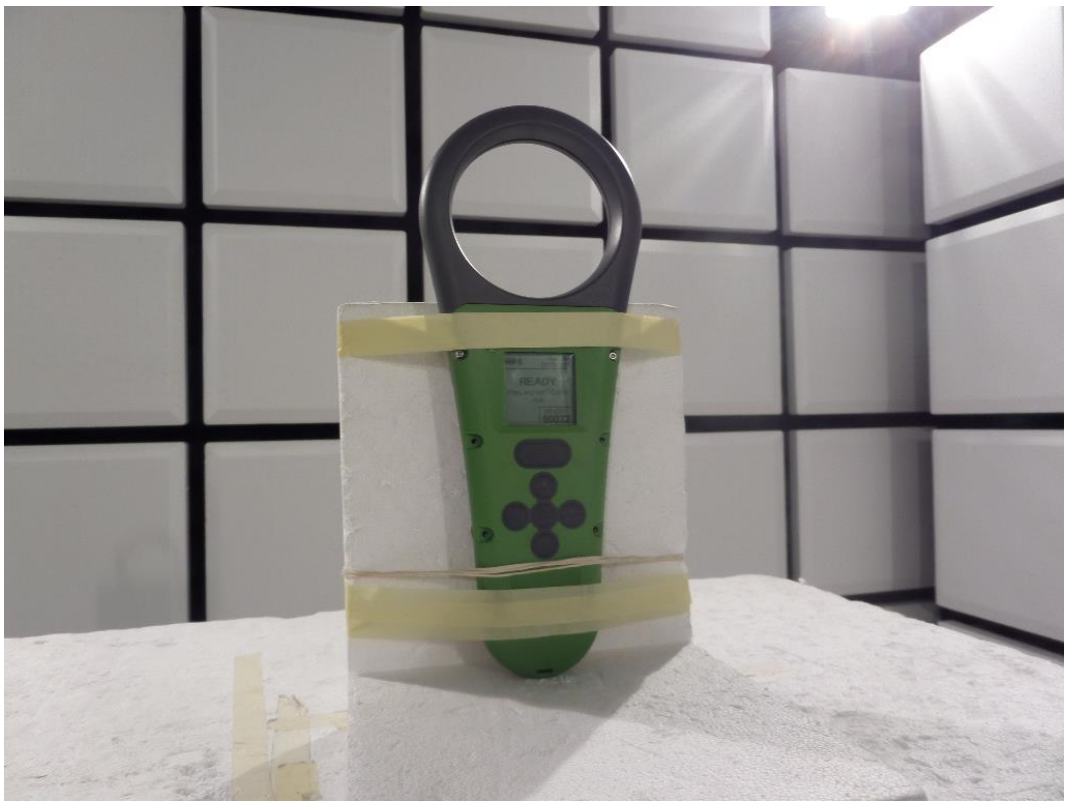



BT33LT
ZW
L100
Q105
CU303
Q106
R110
R319
U303
C302
S350
R306
R320
R305
U302
CU301
R304
CU302
C100
R105
U301
C301
C312
C311
R308
R100
U101
C106
C120
C115
R108
Q104
R107
VIN
U100
C103
C104
S353
U353
S100
C121
R111
C356

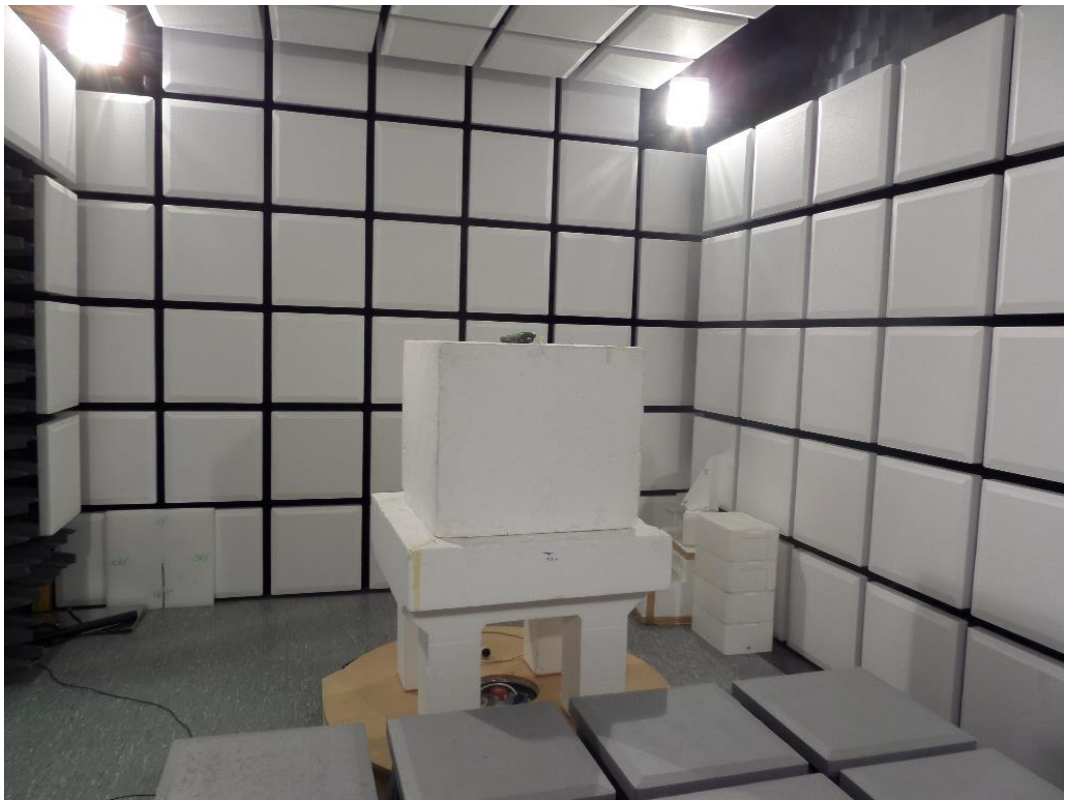
APPENDIX 2: Test set up

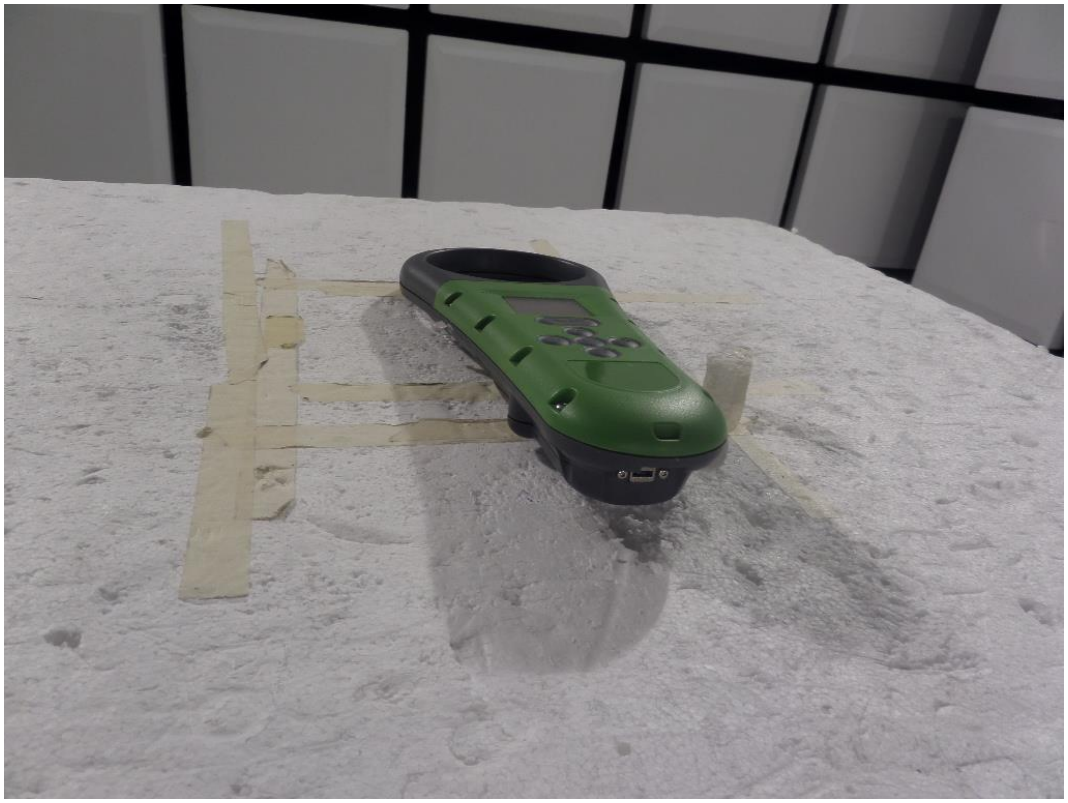
Anechoic room – Position 1 supplied by battery



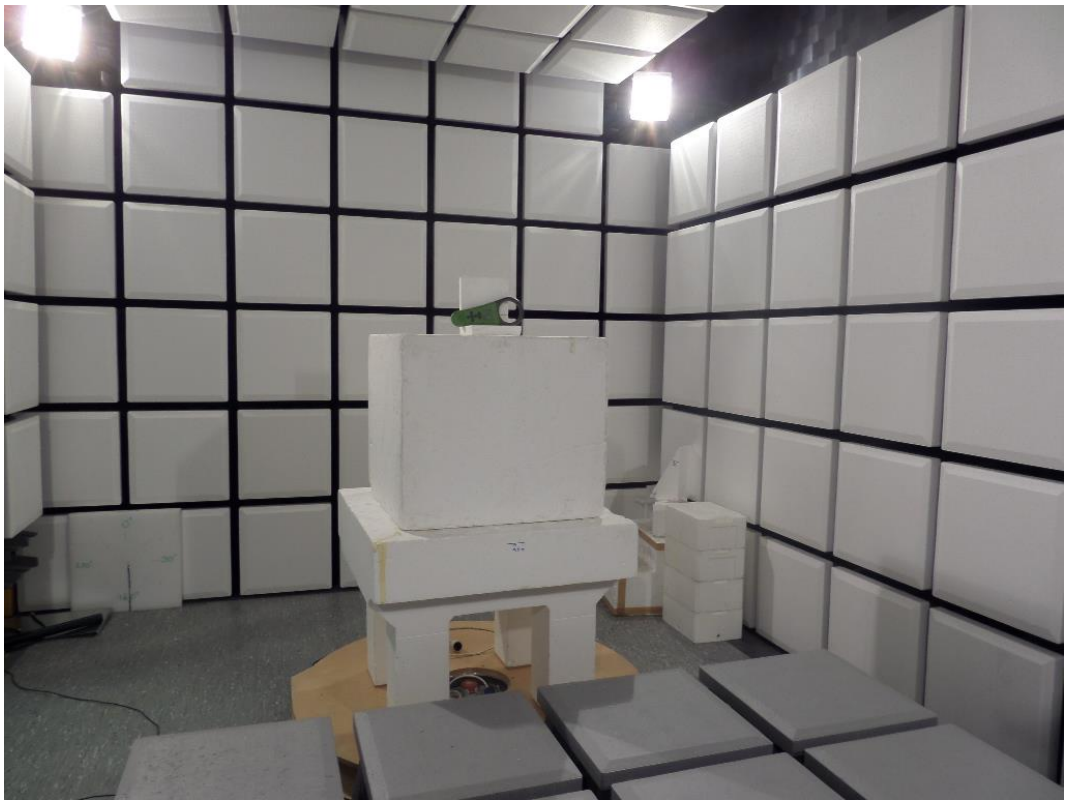


Anechoic room – Position 2 supplied by battery

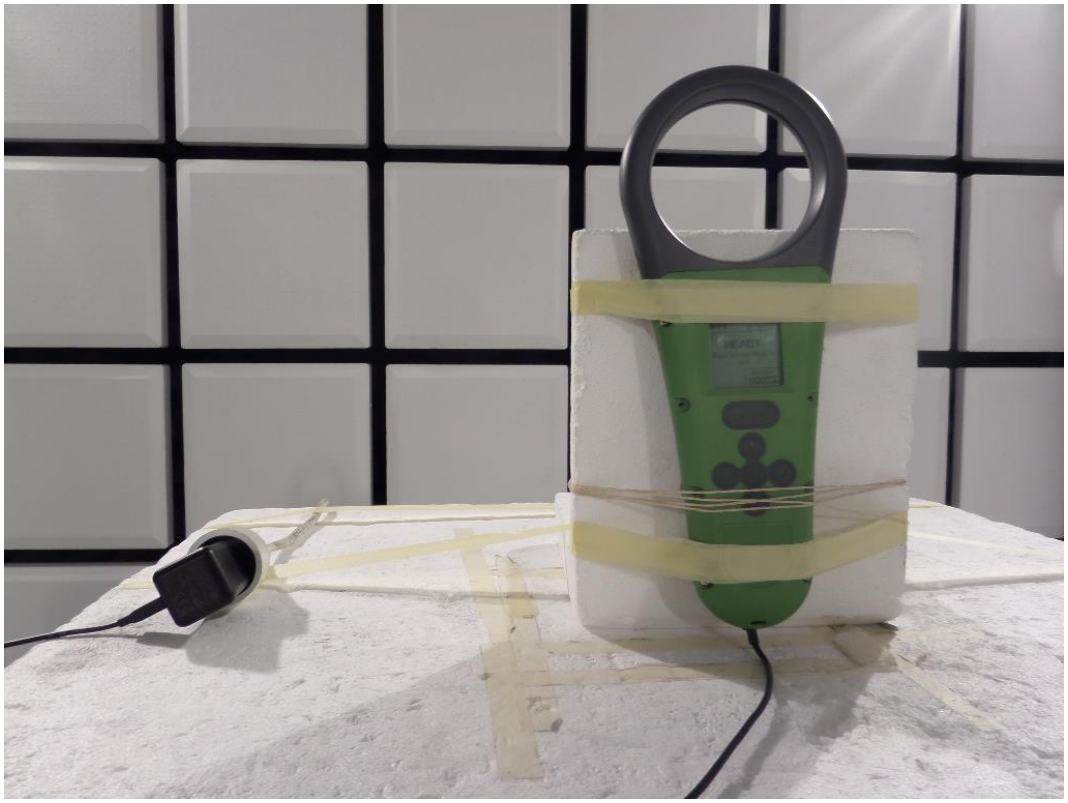




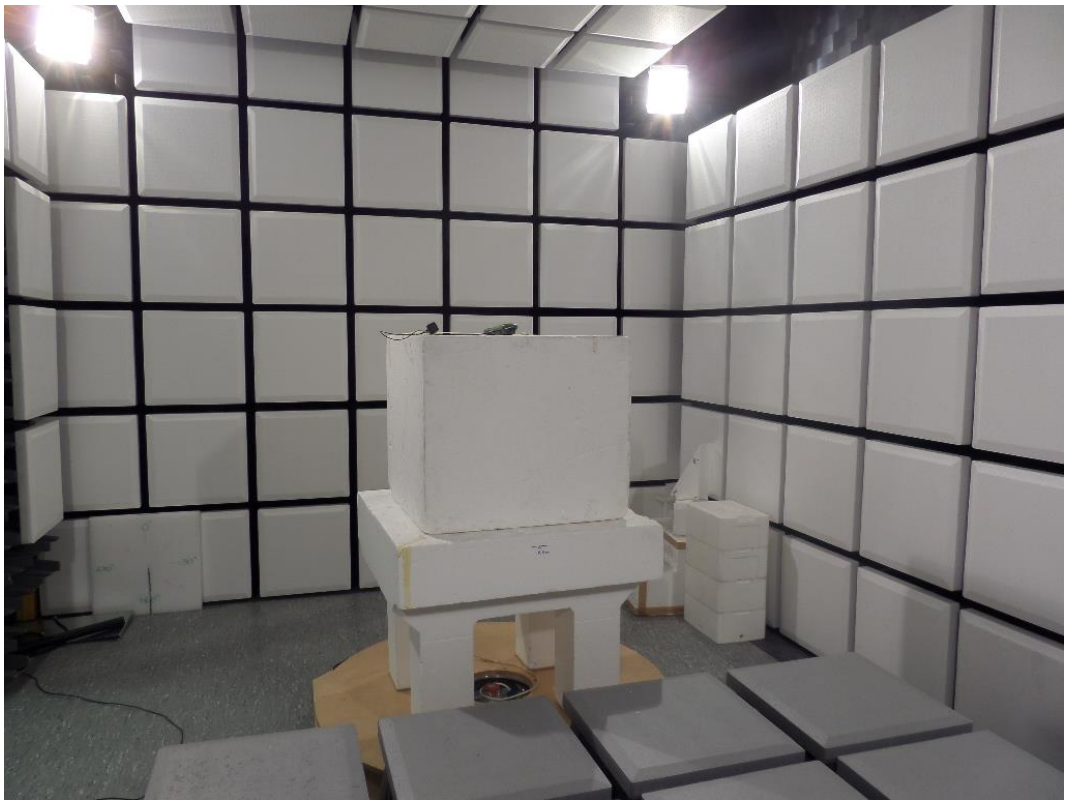
Anechoic room – Position 3 supplied by battery

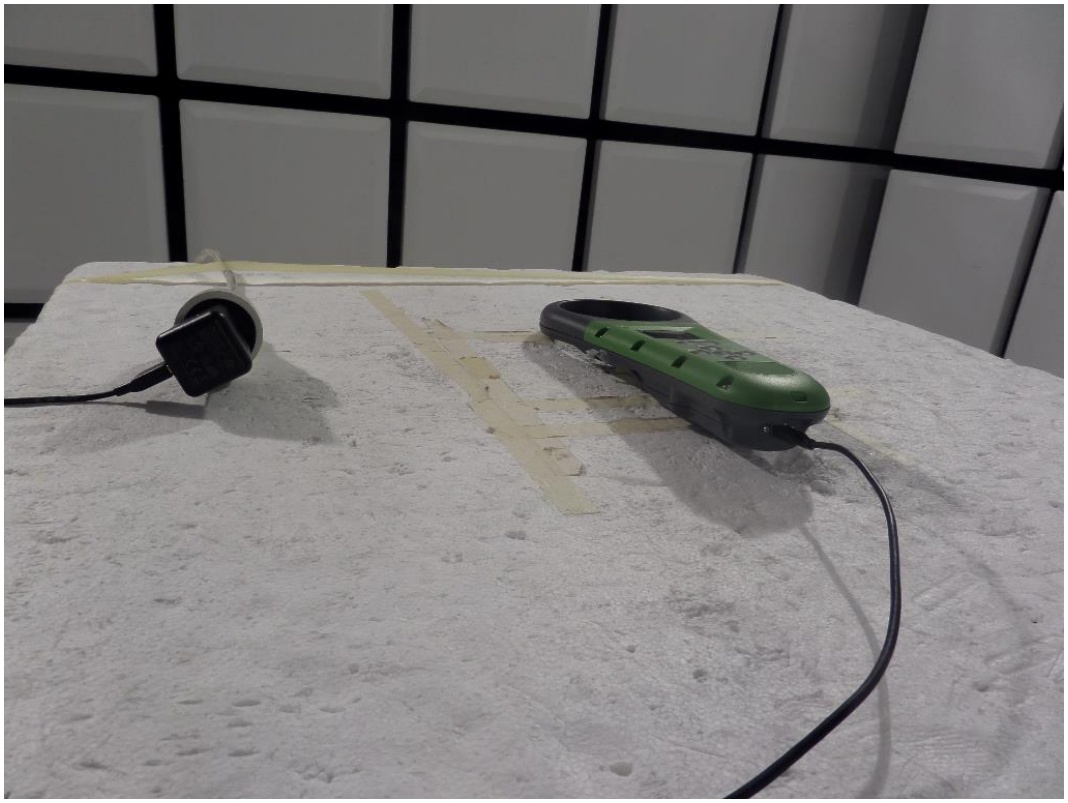


Anechoic room – Position 1 supplied by AC/DC Adapter

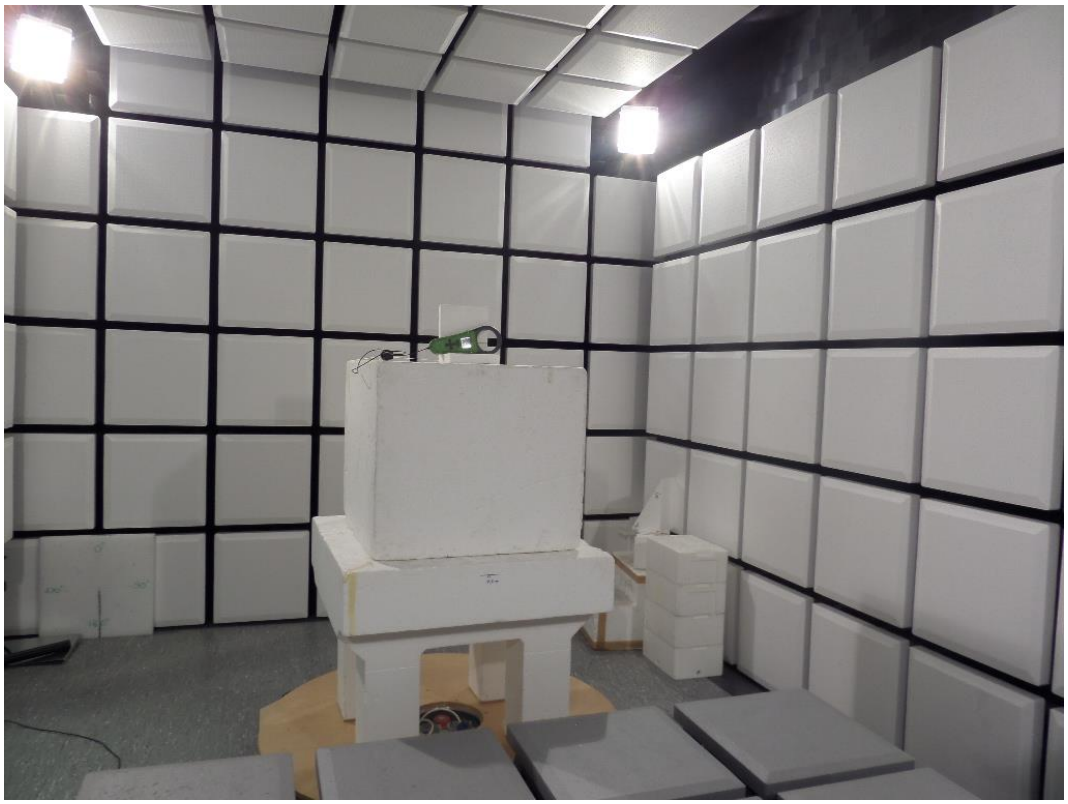


Anechoic room – Position 2 supplied by AC/DC Adapter

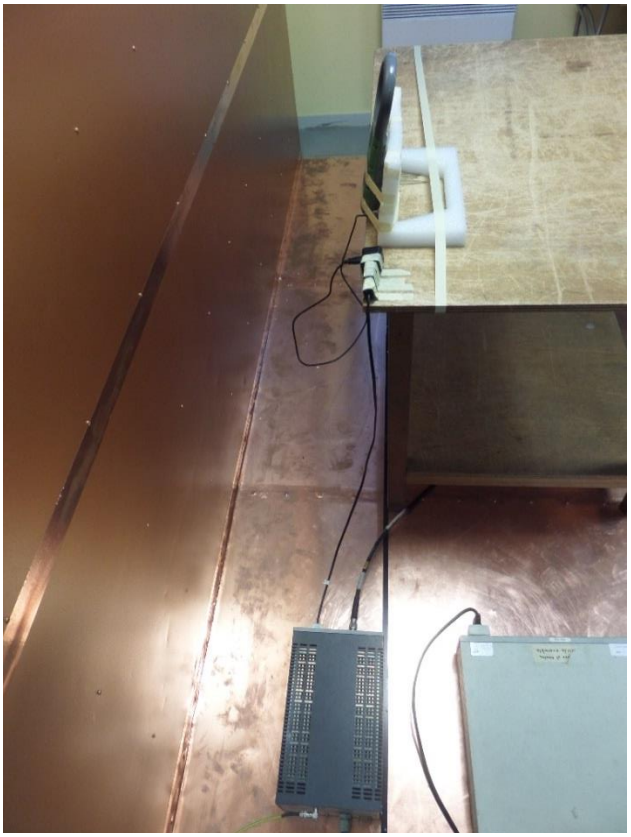




Anechoic room – Position 3 supplied by AC/DC Adapter



Conducted measurement



APPENDIX 3: Test equipment list

Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer ESI7	Rohde & Schwarz	8707
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ25	R&S	11535
Absorber sheath current	Emitech	9489
Power source 1251RP	California instruments	8508
Cable 5m - RG214N	GYL Technologies	8590
Multimeter 177	FLUKE	14831
Meteo station	Testo 608-H1	7566
Software	BAT-EMC V3.16.0.64	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Full anechoic chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-5m-18GHz Cable	Huber + Suhner	12912
N-2m-18GHz Cable	Sucoflex	14303
N-2.5m-18GHz Cable	Sucoflex	14304
N-1.5m-18GHz Cable	/	9398
Antenna 3117	ETS-Lindgren	10771
Antenna 3115	EMCO	8535
Multimeter 177	FLUKE	14831
Meteo station	Testo 608-H1	7566
Software	GPIBShot V2.4	-

Maximum peak output power

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
N-5m-18GHz Cable	Huber + Suhner	12912
N-2m-18GHz Cable	Sucoflex	14303
N-2.5m-18GHz Cable	Sucoflex	14304
N-1.5m-18GHz Cable	/	9398
Low-noise Amplifier S00518M3201	LUCIX Corp.	12590
Antenna 3117	ETS-Lindgren	10771
Band-Pass Filter BP2442-84-7CS	BL Microwave	5625
Power source 1251RP	California instruments	8508
Multimeter 177	FLUKE	14831
Meteo station	Testo 608-H1	7566
Software	BAT-EMC V3.16.0.64	0000

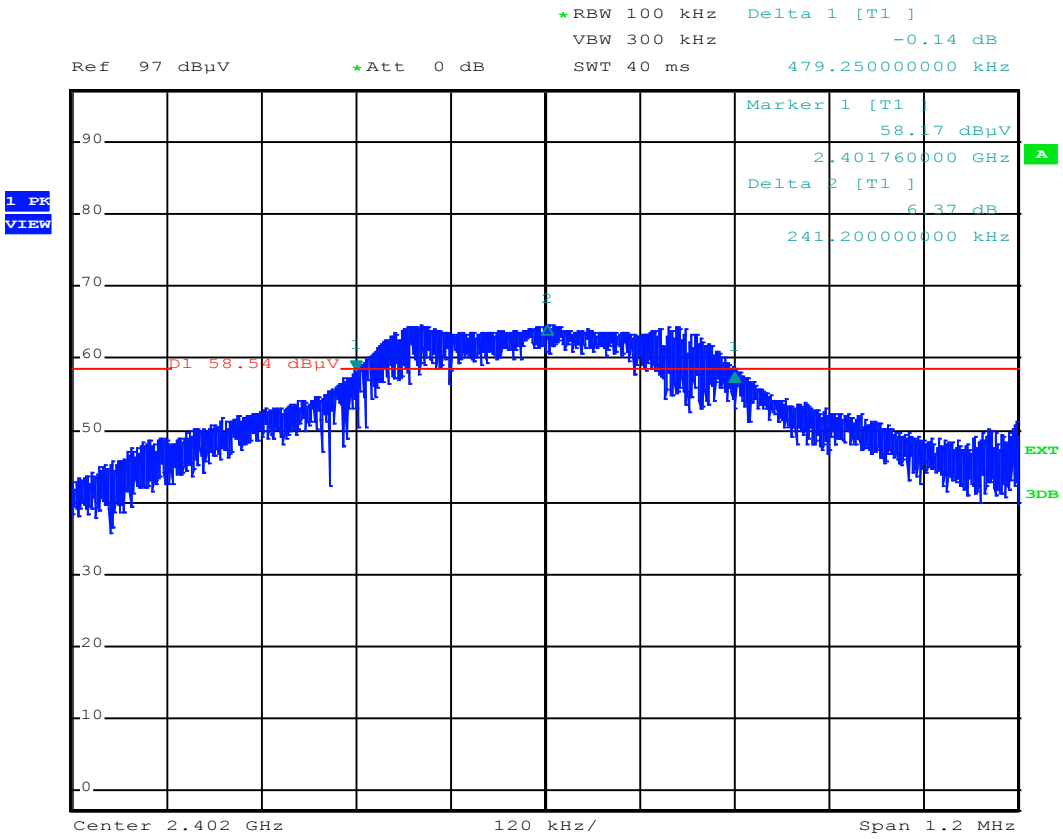
Intentional radiator

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber	EMITECH	10759
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
N-5m-18GHz Cable	Huber + Suhner	12912
N-1m-18GHz Cable	Sucoflex	14302
N-2m-18GHz Cable	Sucoflex	14303
N-2.5m-18GHz Cable	Sucoflex	14304
N-1.5m-18GHz Cable	/	9398
Loop antenna 6502	EMCO	1406
Biconical antenna 3110	Emco	7240

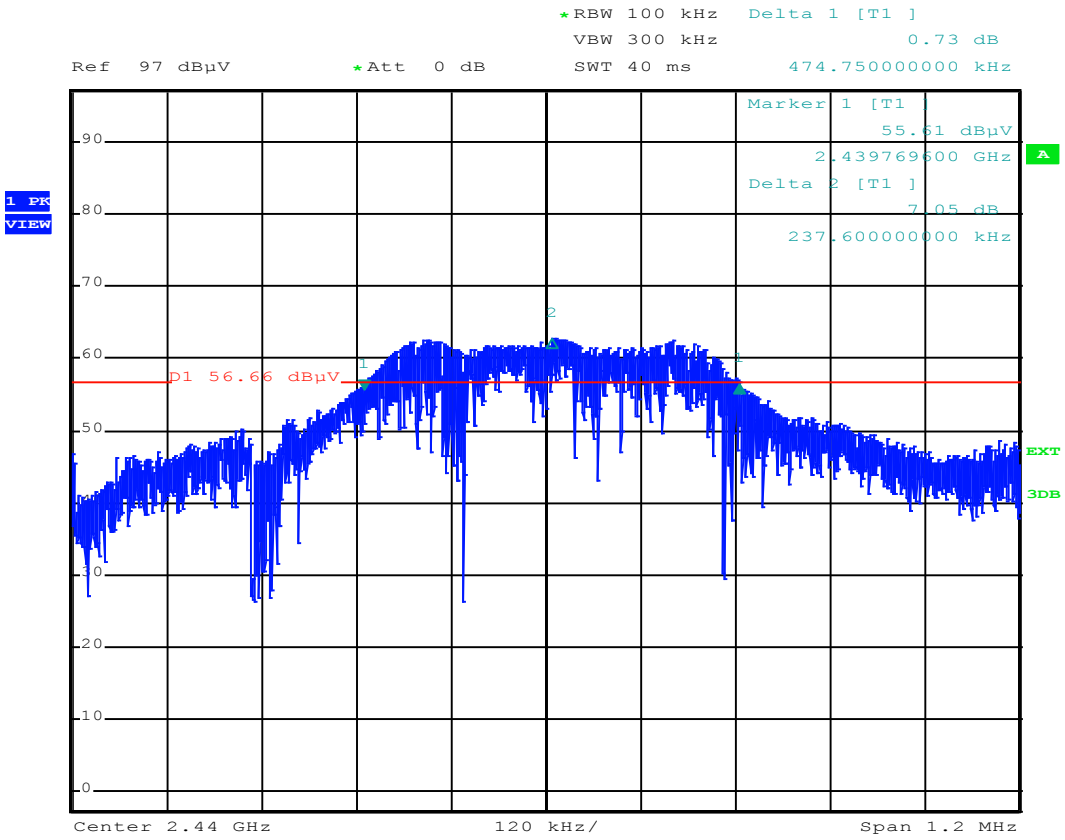
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	ETS-Lindgren	10771
Antenna 3160-09	ETS Lindgren	8786
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Low-noise Amplifier S00518M3201	LUCIX Corp.	12590
Low-noise amplifier S180265L3201	LUCIX Corp.	8704
Low pass filter LP03/1000-7GH	Filtek	4087
Reject band filter BRM50702	Microtronics	7299
Multimeter 177	FLUKE	14831
Meteo station	Testo 608-H1	7566
Software	BAT-EMC V3.16.0.64	0000

APPENDIX 4: 6 dB bandwidth

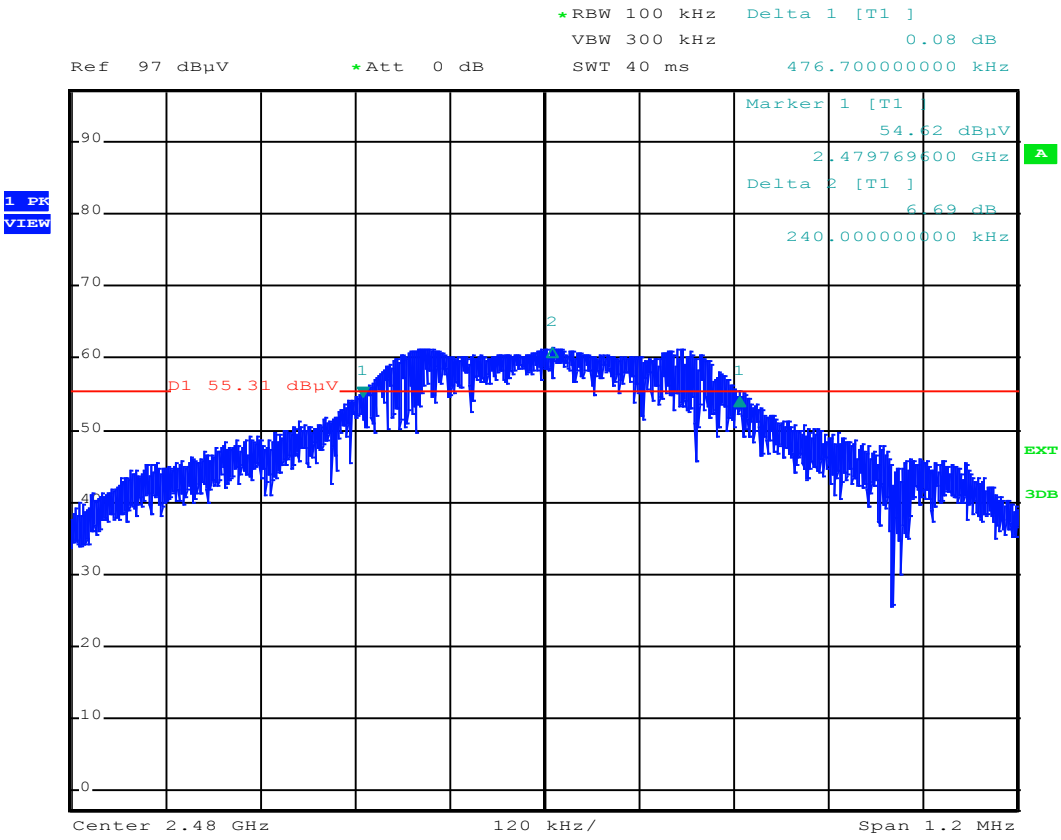
Low channel



Central channel

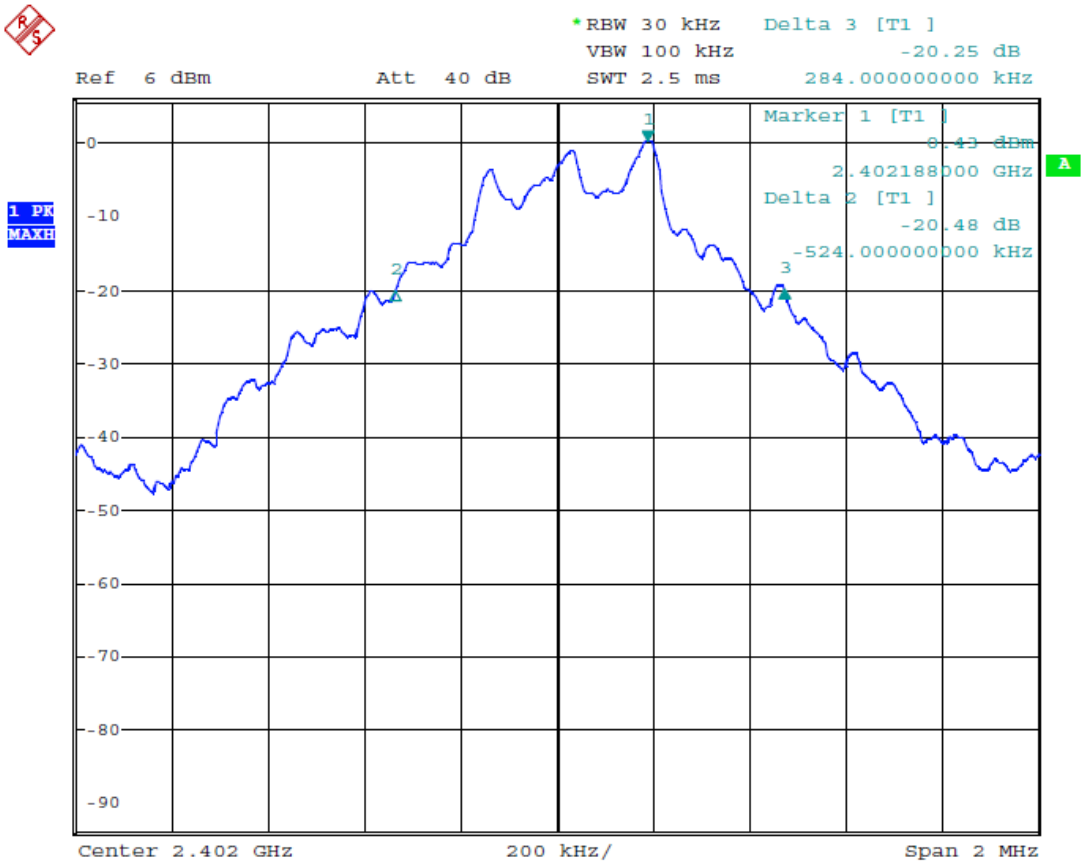


High channel

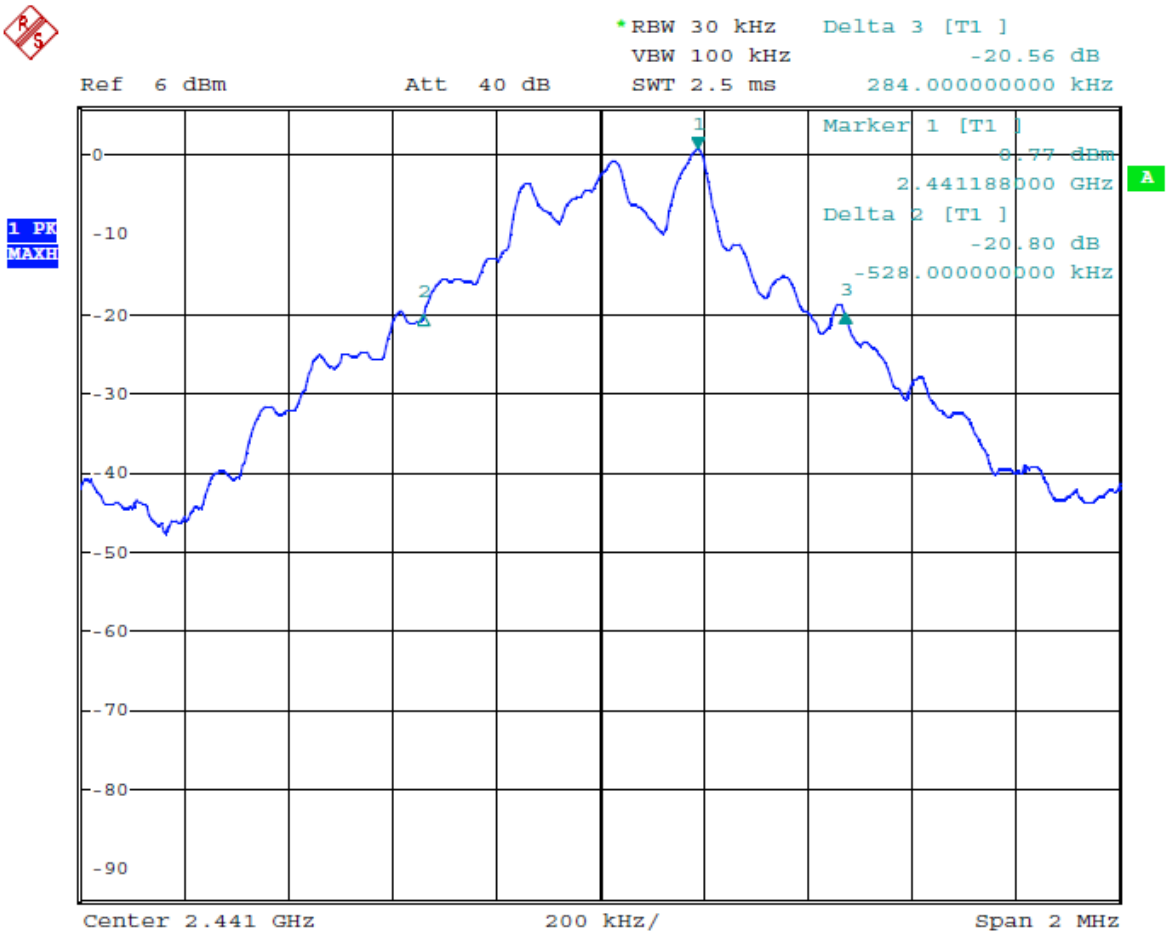


APPENDIX 5: 20 dB bandwidth

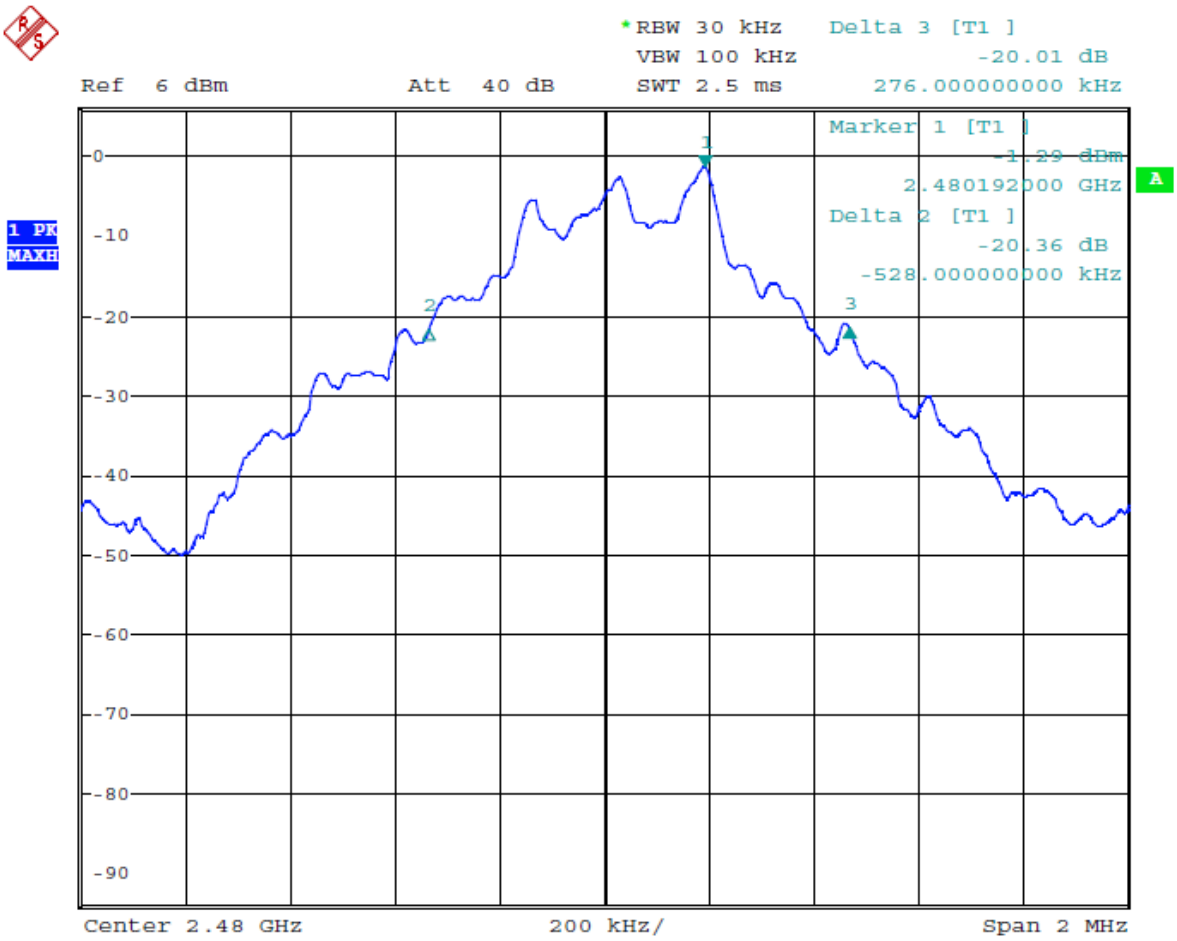
Low channel



Central channel

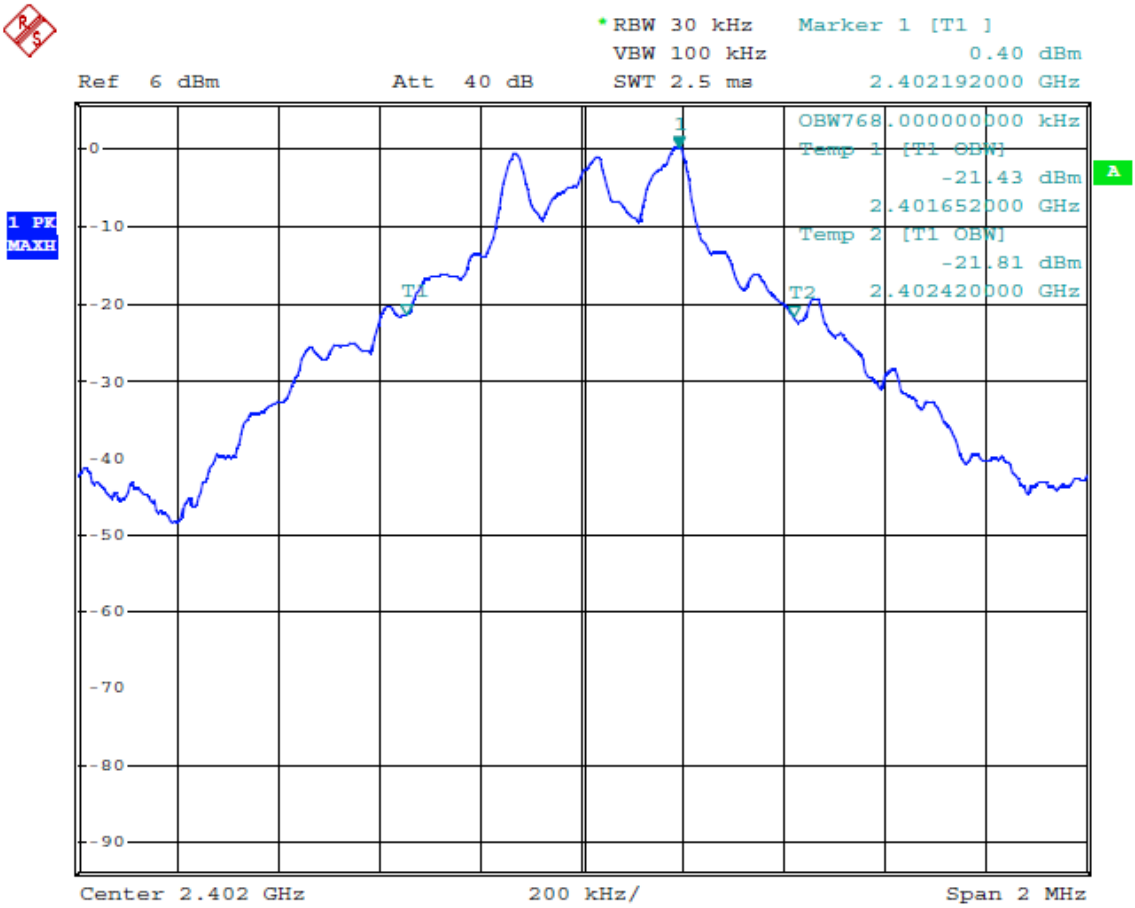


High channel

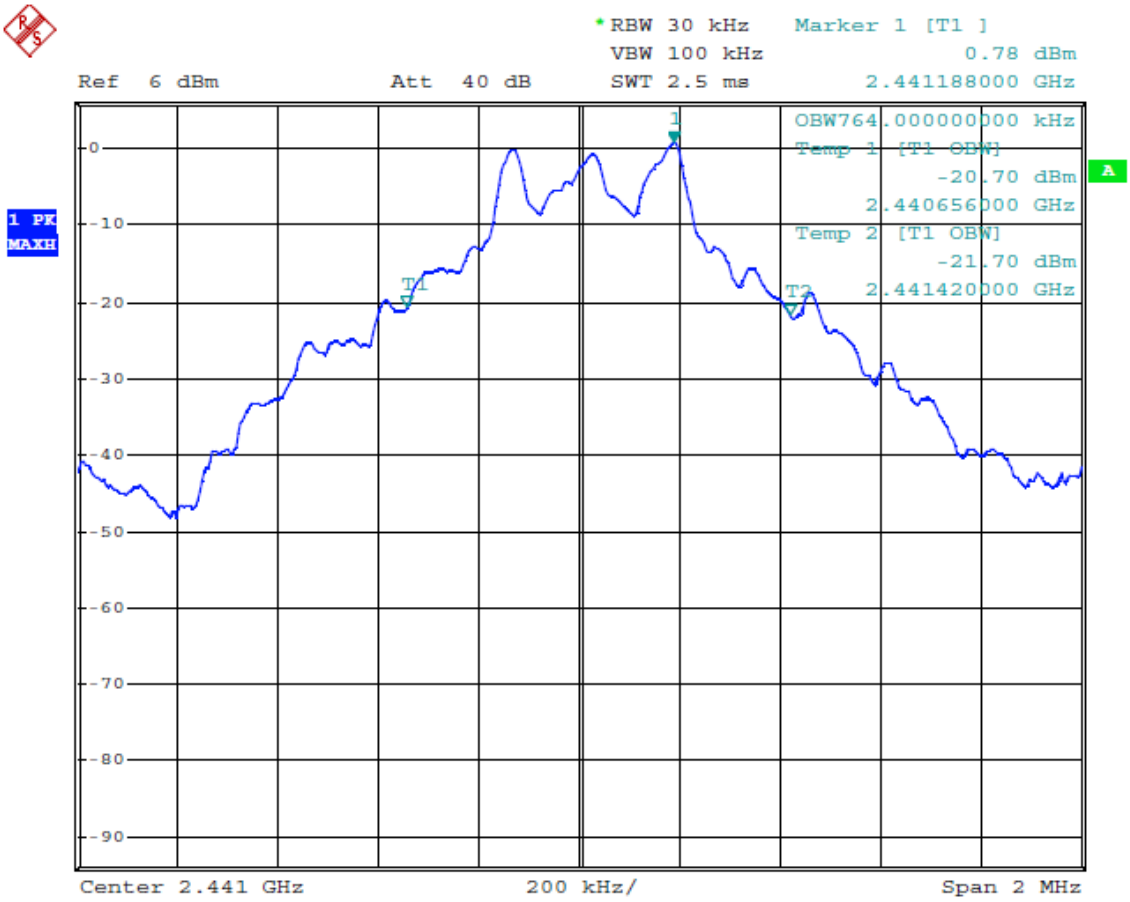


APPENDIX 6: 99% bandwidth

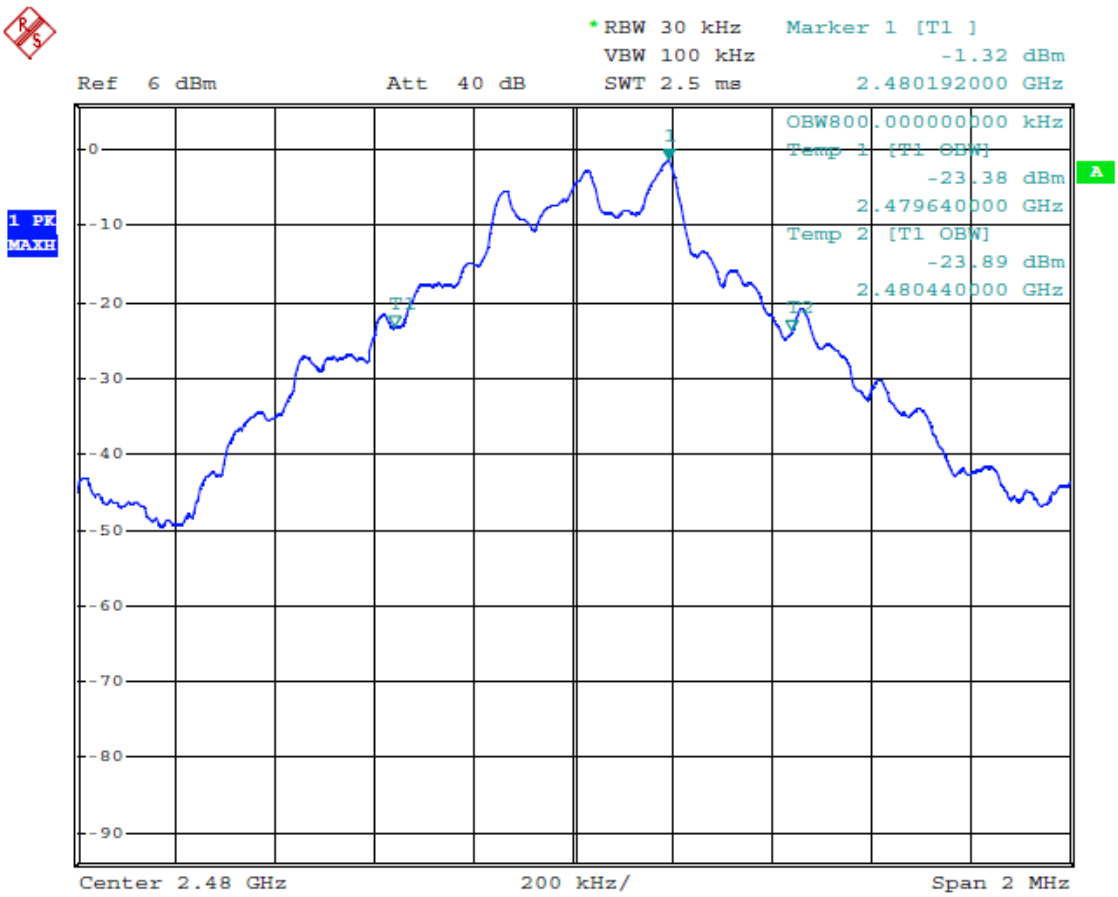
Low channel



Central channel

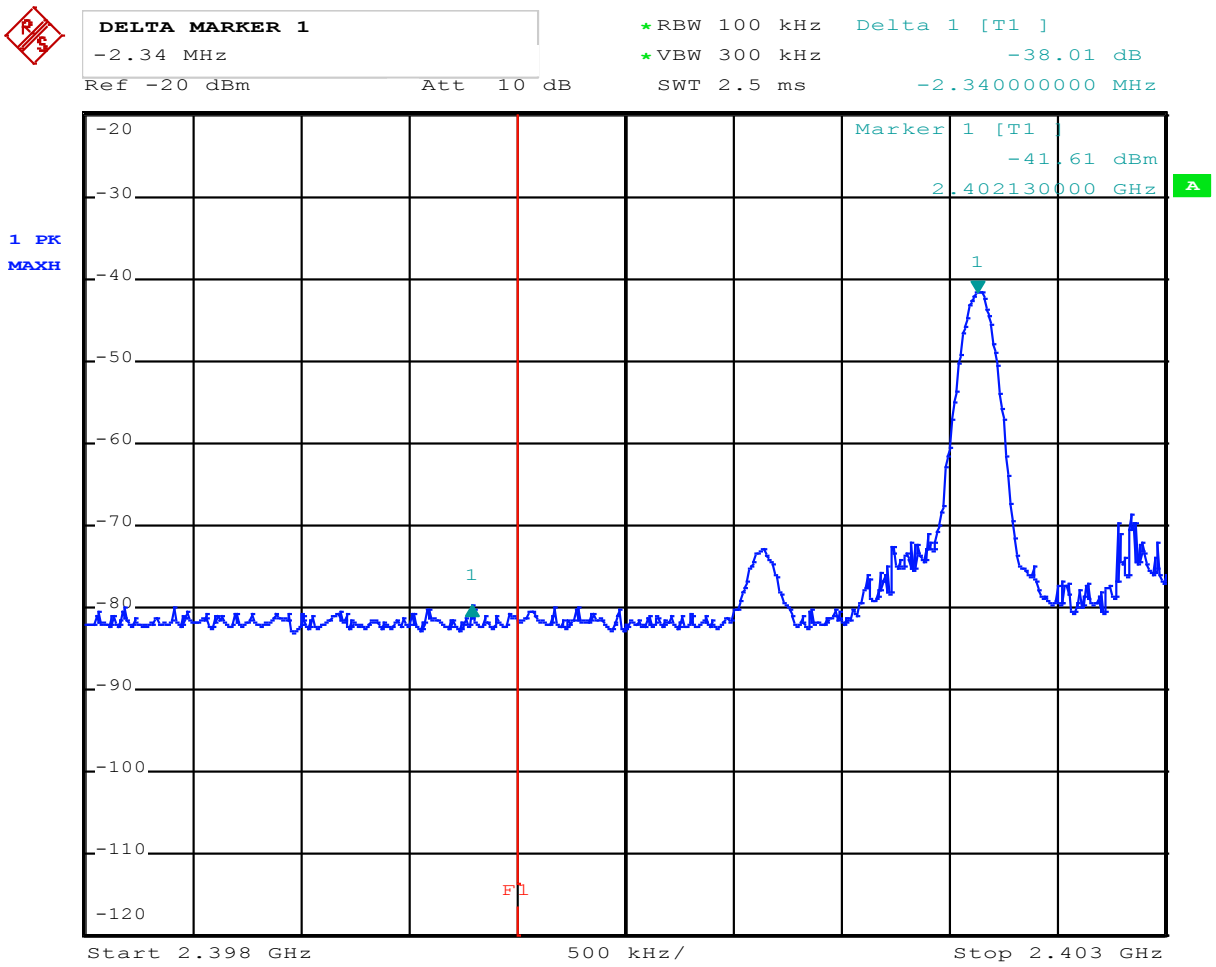


High channel

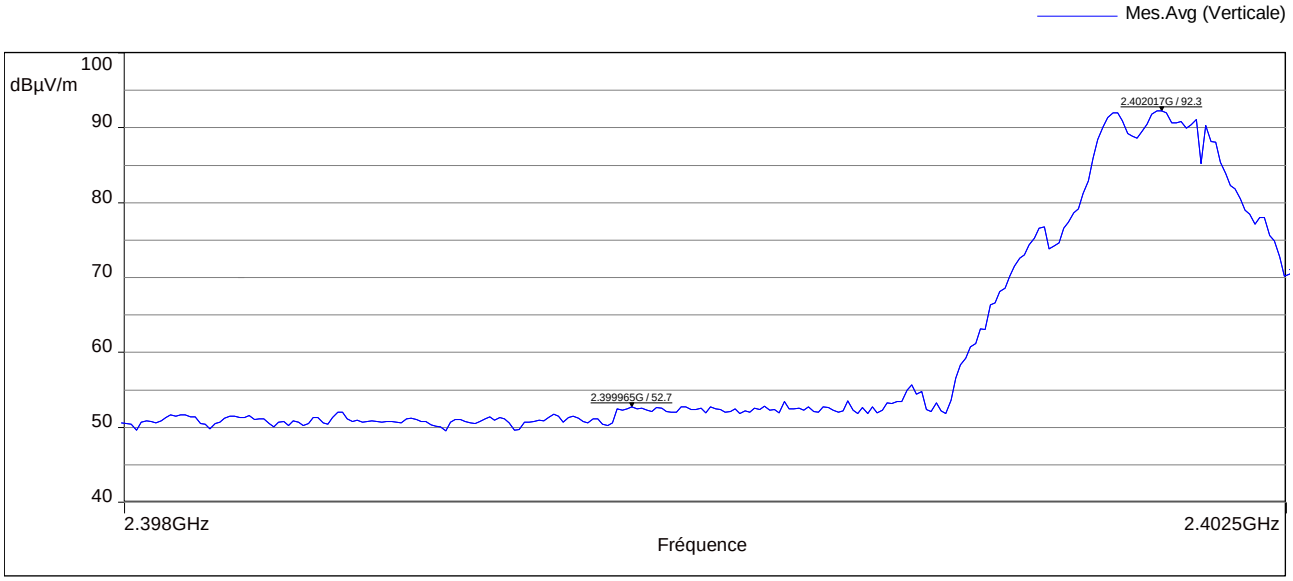


APPENDIX 7: Band edge

Low channel with hopping mode off

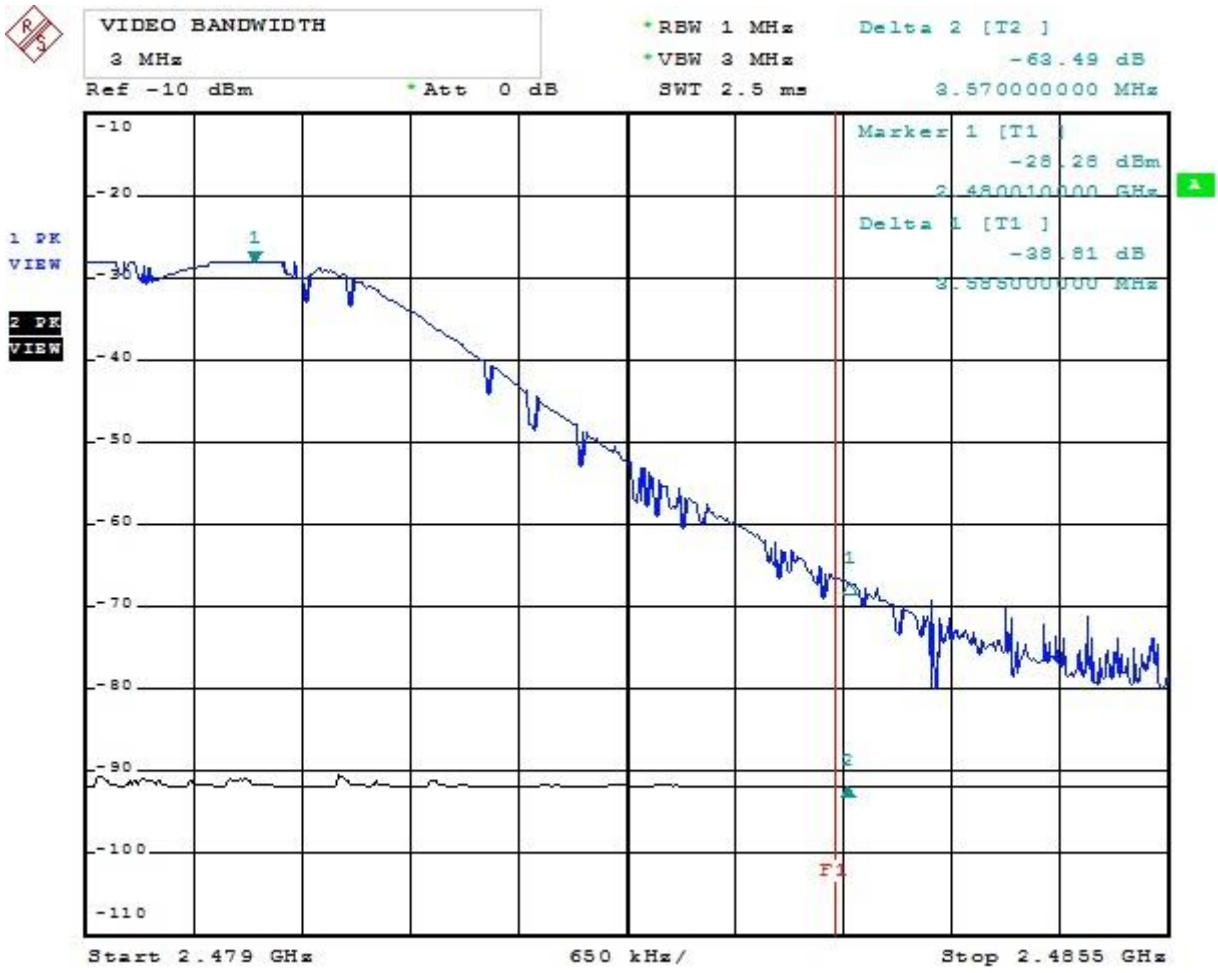


Low channel with hopping mode on

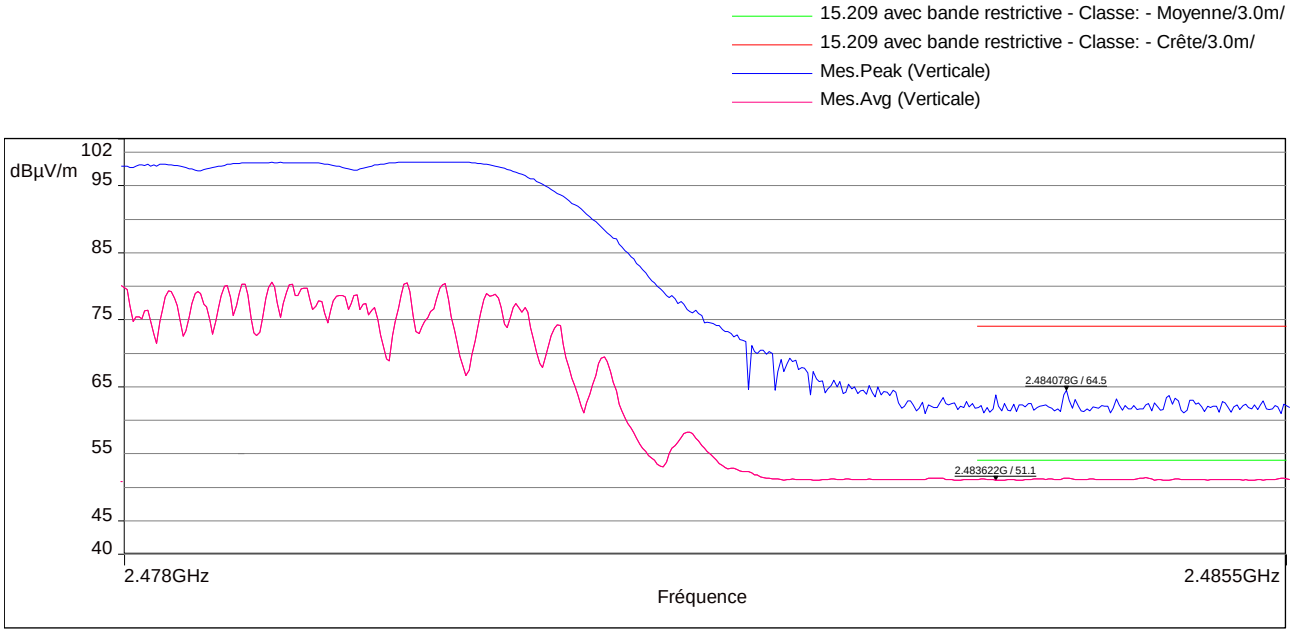


2.399965G, 52.7 dBµV/m : 2.402017G, 92.3 dBµV/m :

High channel with hopping mode off



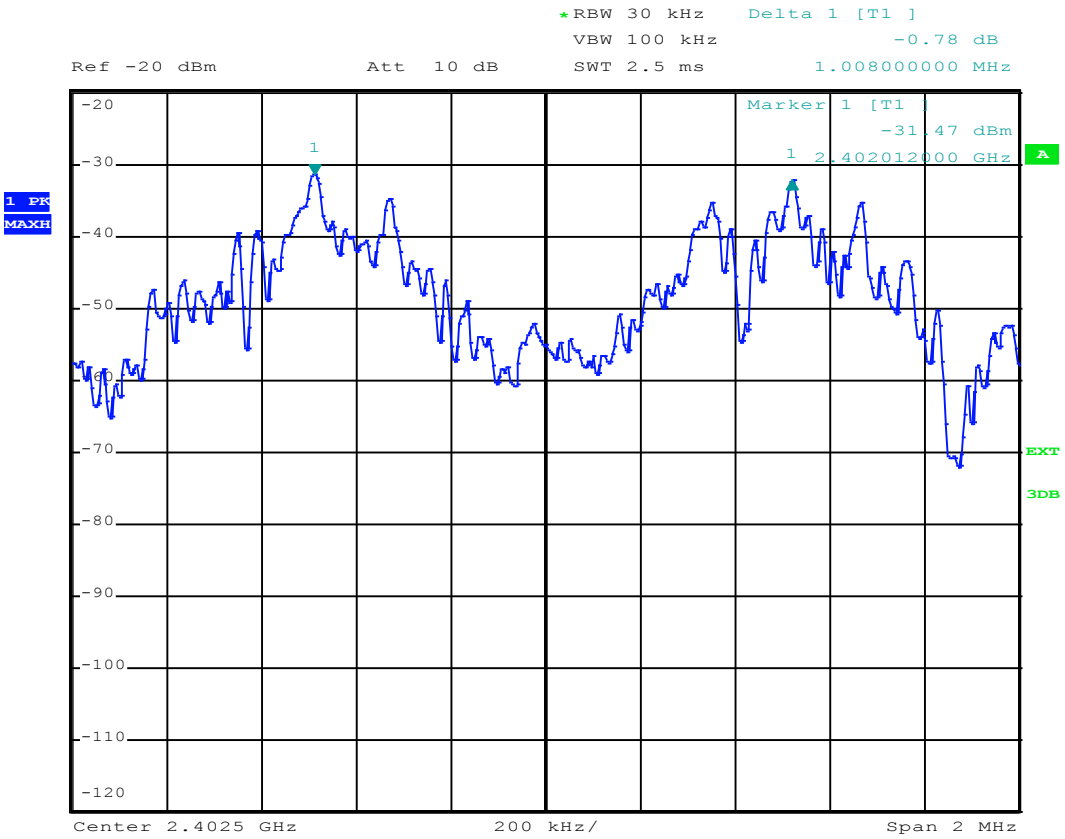
High channel with hopping mode on



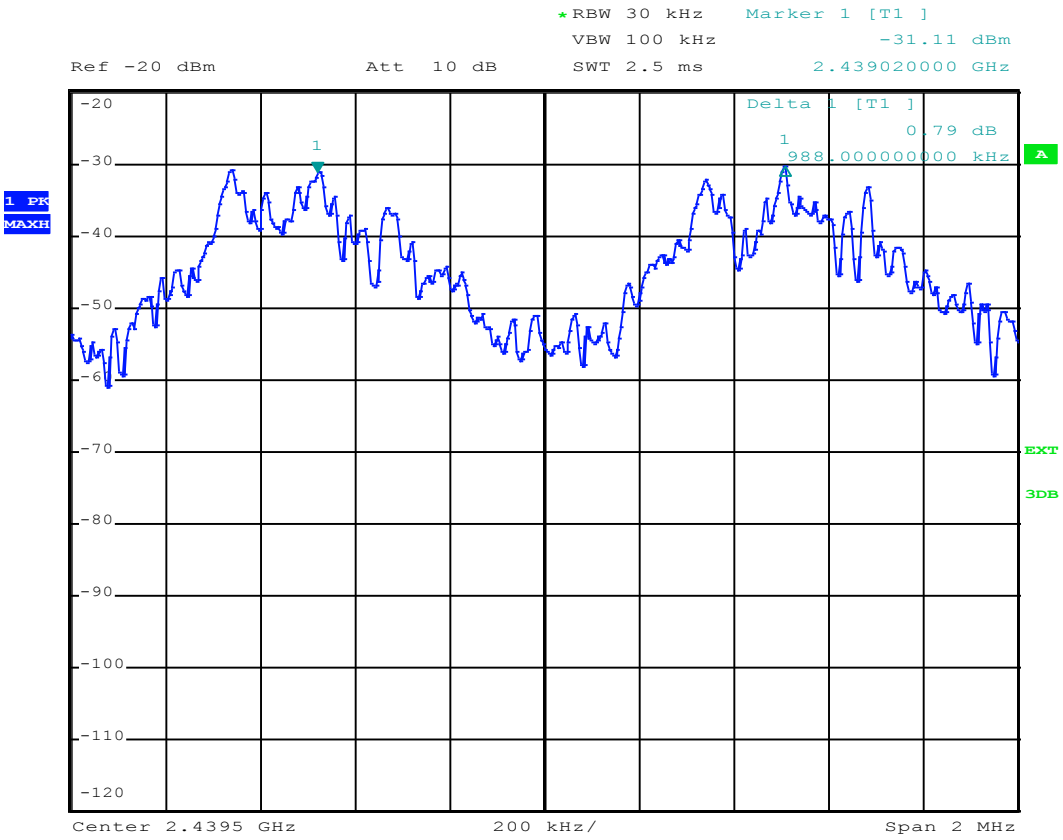
2.483622G, 51.1 dBµV/m : 2.484078G, 64.5 dBµV/m :

APPENDIX 8: Channel spacing

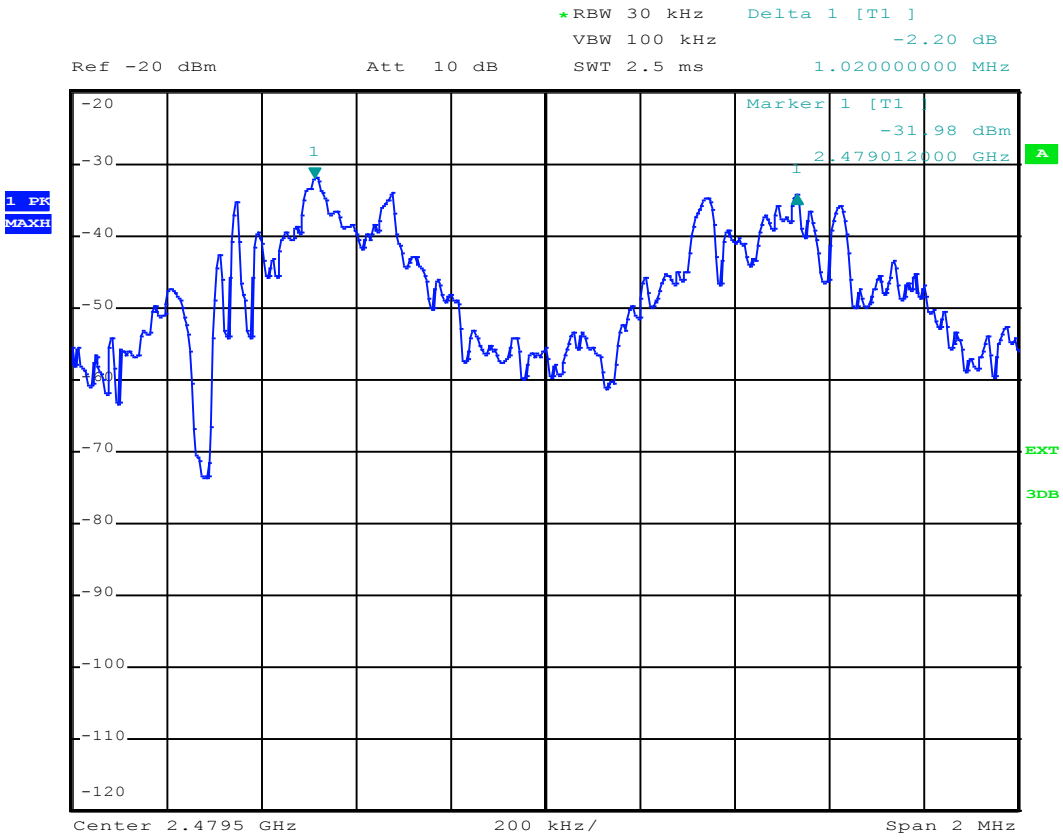
Low Channel



Central Channel

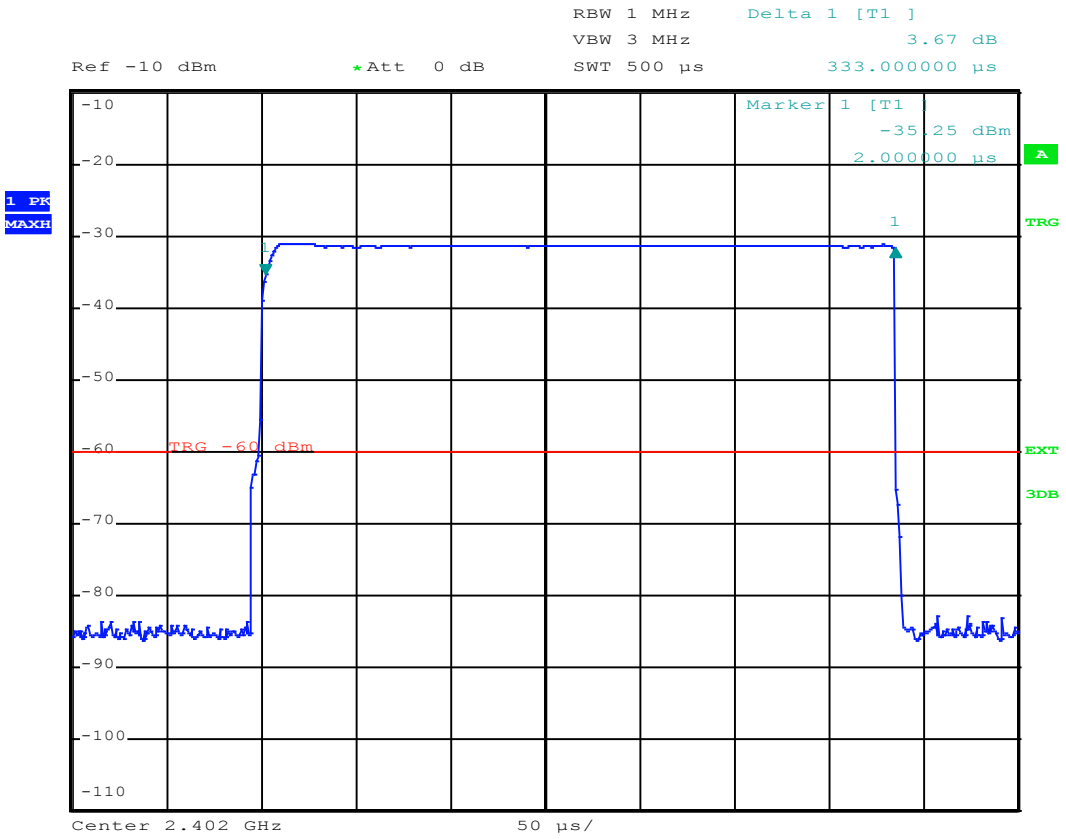


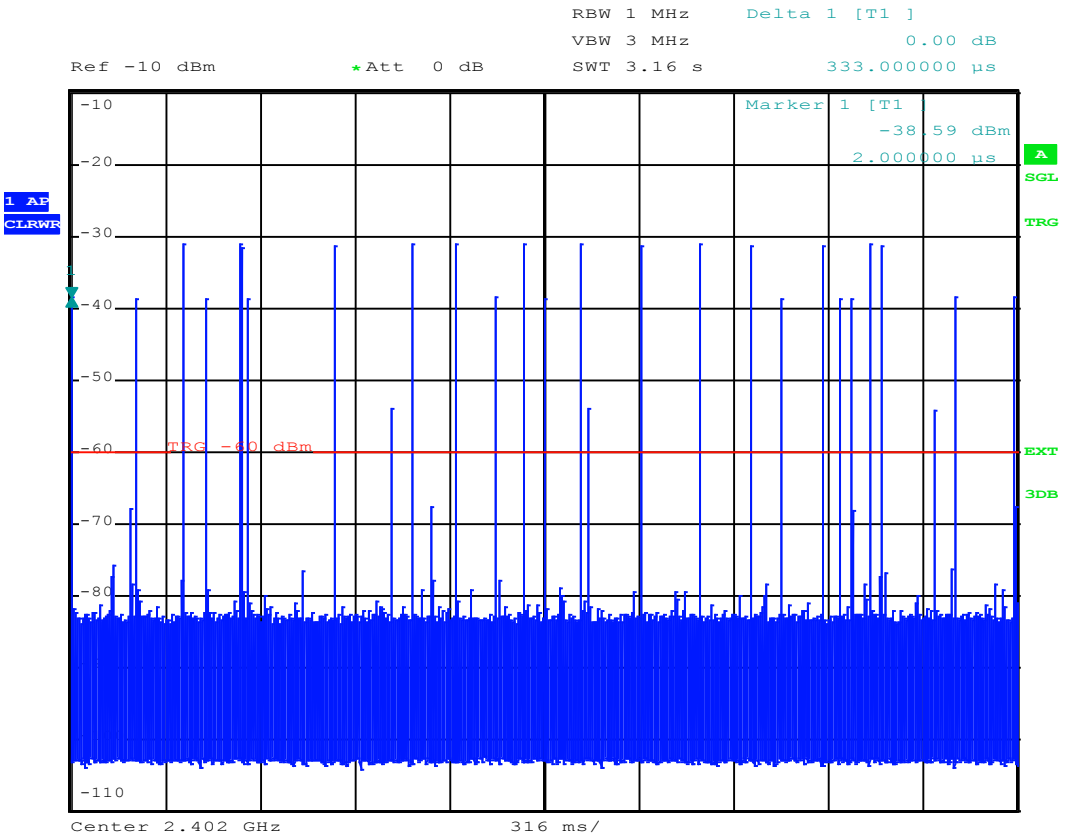
High Channel



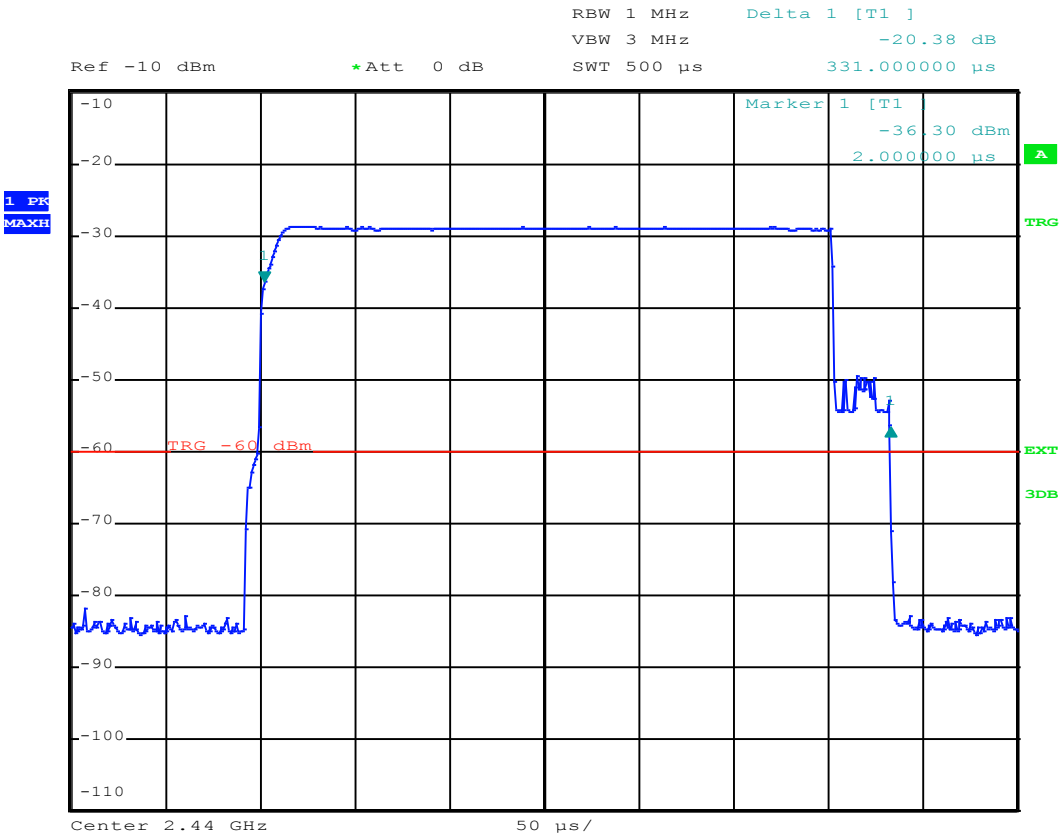
APPENDIX 9: Time of occupancy on any frequency

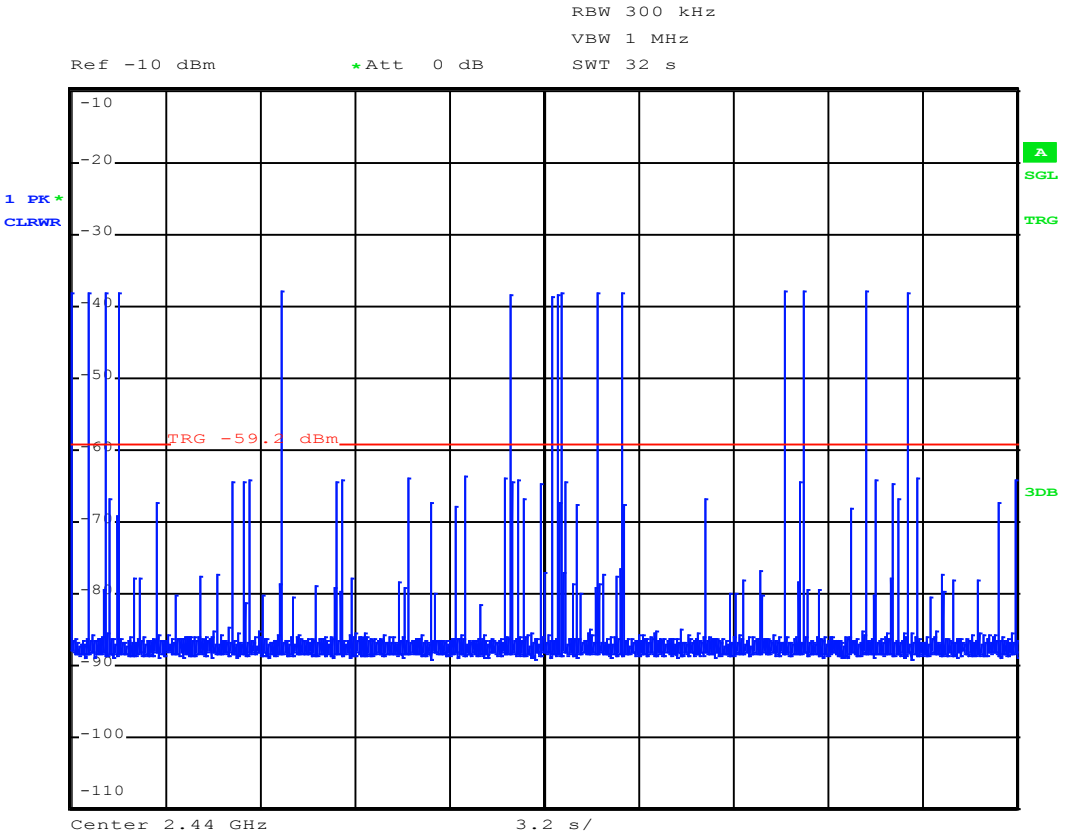
Low Channel



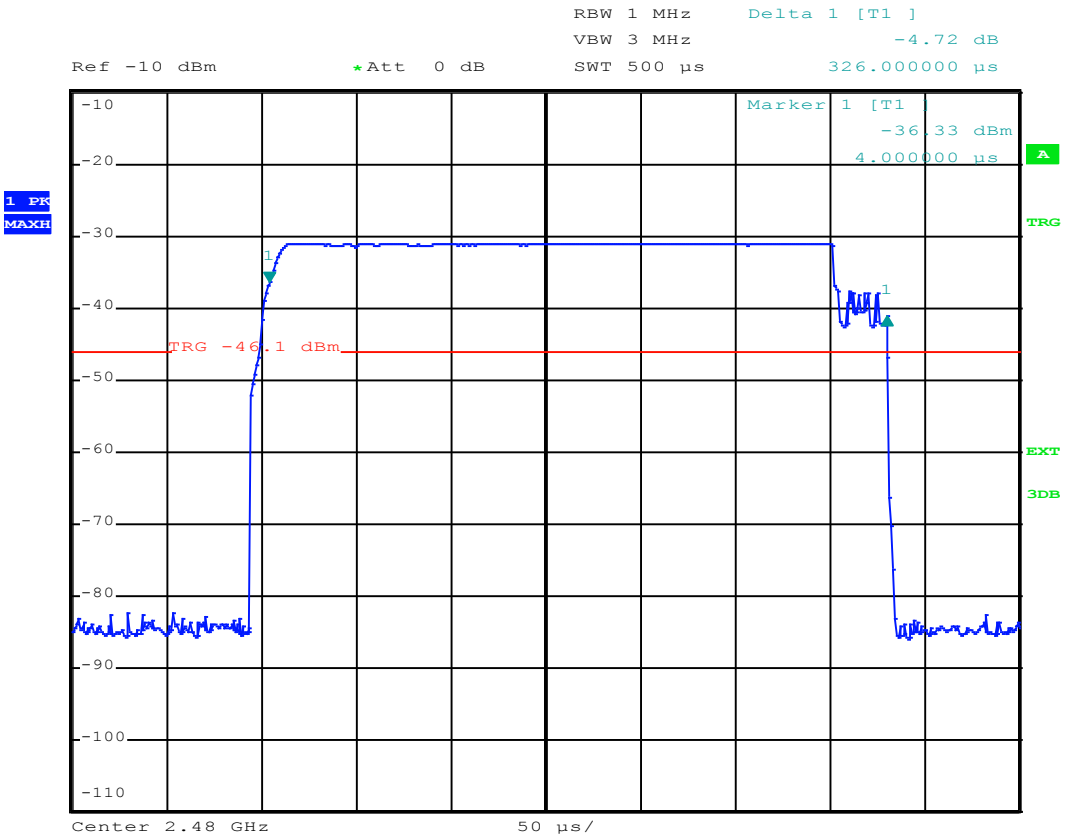

RBW 1 MHz
VBW 3 MHz
SWT 3.16 s
Delta 1 [T1]
0.00 dB
333.000000 µs
Ref -10 dBm
*Att 0 dB
Marker 1 [T1]
-38.59 dBm
2.000000 µs
1 AP
CLRWR
A
SGL
TRG
EXT
3DB
TRG -60 dBm
-10
-20
-30
-40
-50
-60
-70
-80
-110
Center 2.402 GHz
316 ms/

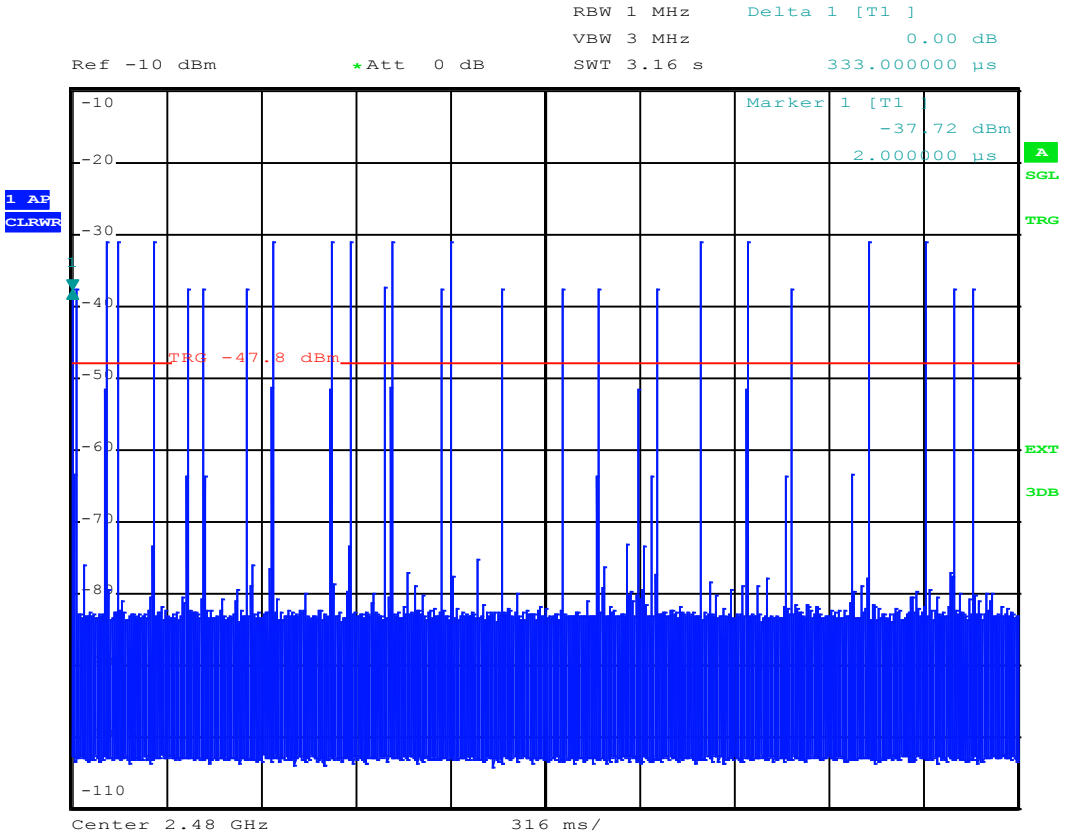
Central Channel



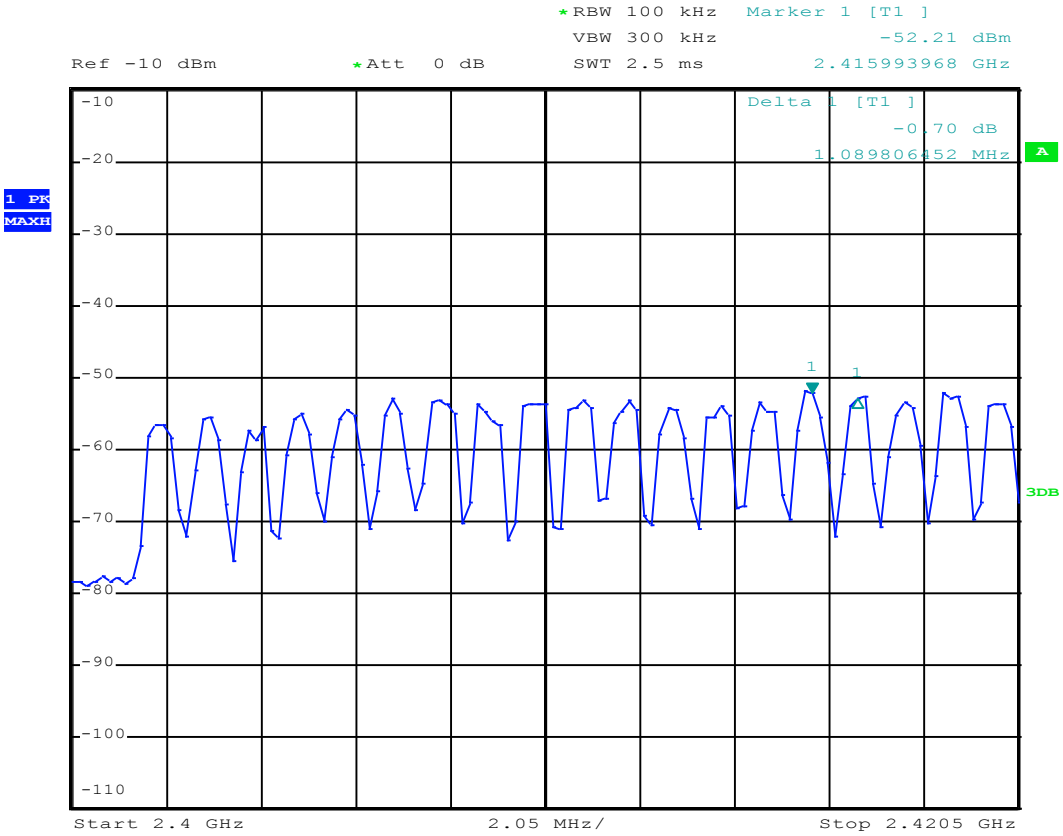

RBW 300 kHz
VBW 1 MHz
SWT 32 s
Ref -10 dBm
*Att 0 dB
1 PK *
CLRWR
A
SGL
TRG
3DB
TRG -59.2 dBm
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 2.44 GHz
3.2 s/

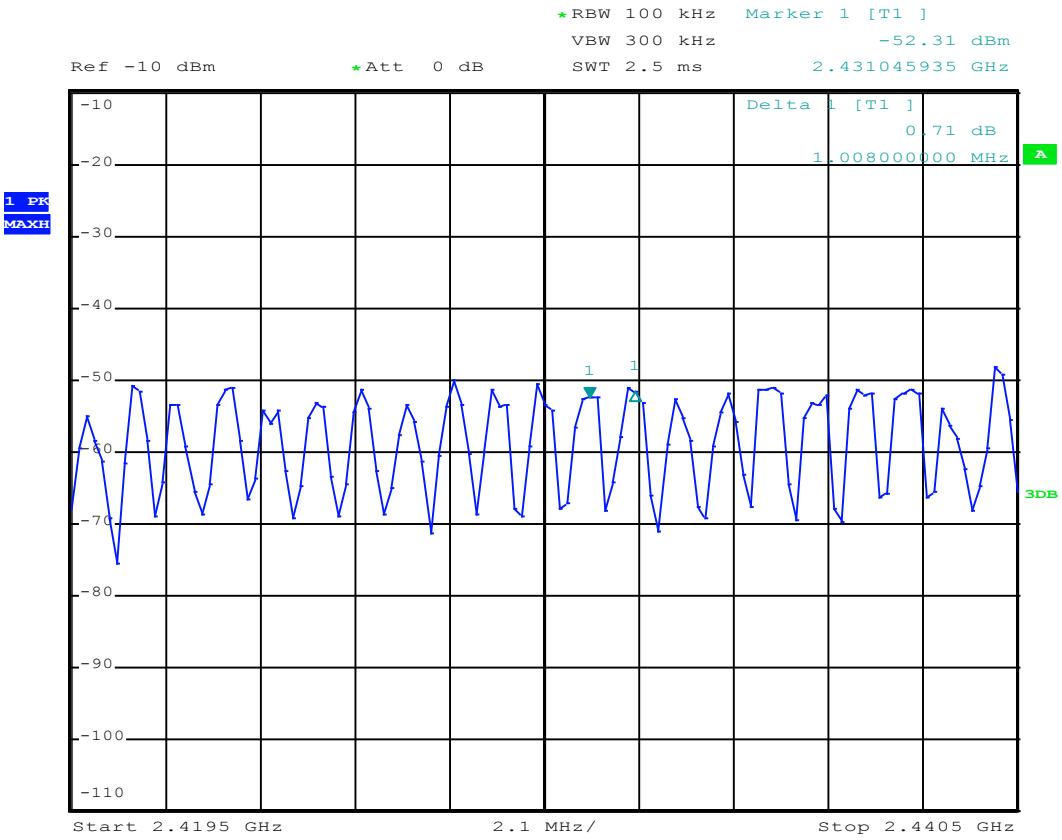
High Channel

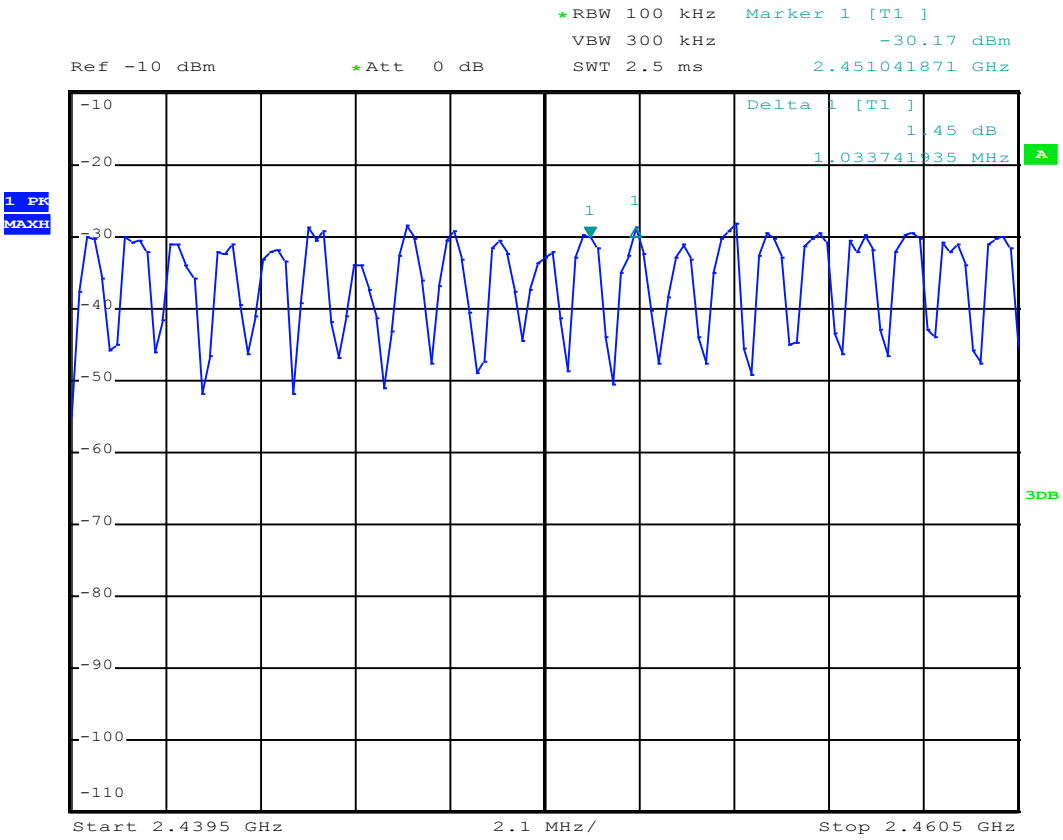


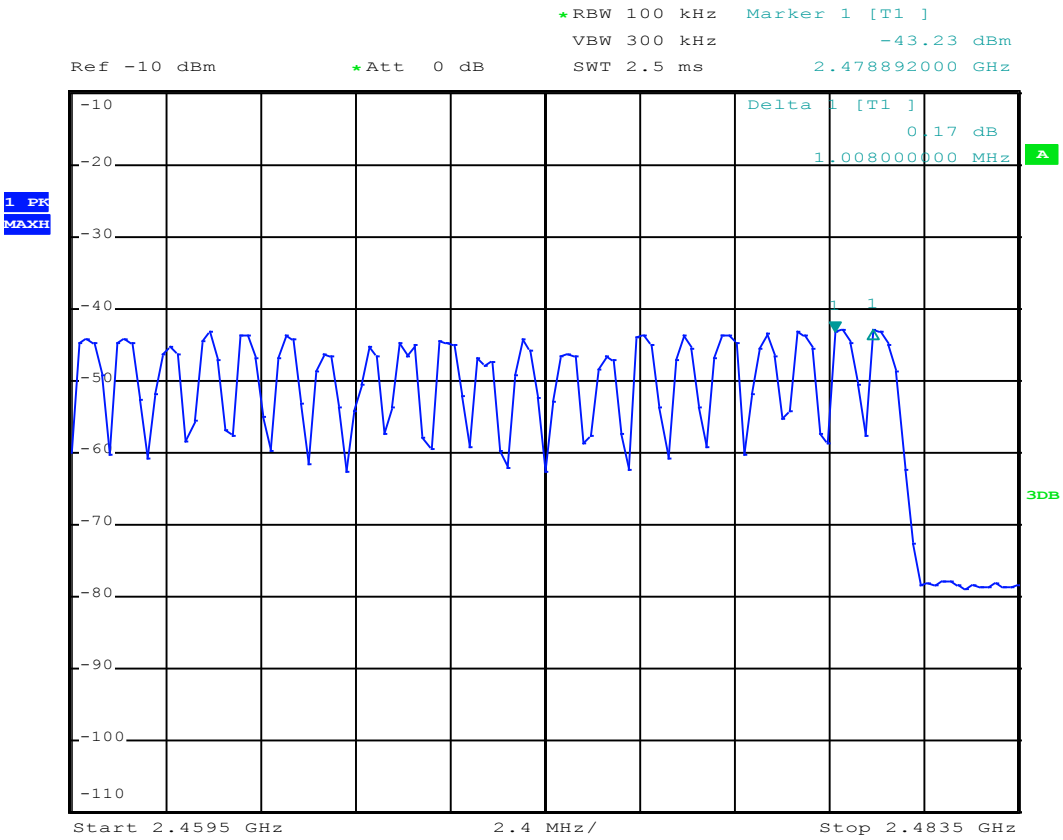

RBW 1 MHz
VBW 3 MHz
SWT 3.16 s
Delta 1 [T1]
0.00 dB
333.000000 µs
Ref -10 dBm
Att 0 dB
Marker 1 [T1]
-37.72 dBm
2.000000 µs
1 AP
CLRWR
A
SGL
TRG
EXT
3DB
TRG -47.8 dBm
-10
-20
-30
-40
-50
-60
-70
-80
-110
Center 2.48 GHz
316 ms/

APPENDIX 10: Number of hopping channels




RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-52.31 dBm
2.431045935 GHz
Ref -10 dBm
Att 0 dB
Delta 1 [T1]
0.71 dB
1.008000000 MHz
1 PK
MAXH
A
3DB
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Start 2.4195 GHz
2.1 MHz/
Stop 2.4405 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-30.17 dBm
2.451041871 GHz
Ref -10 dBm
Att 0 dB
Delta 1 [T1]
1.45 dB
1.033741935 MHz
A
1 PK
MAXH
3DB
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Start 2.4395 GHz
2.1 MHz/
Stop 2.4605 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-43.23 dBm
2.478892000 GHz
Ref -10 dBm
Att 0 dB
Delta 1 [T1]
0.17 dB
1.008000000 MHz
1 PK
MAXH
A
3DB
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Start 2.4595 GHz
2.4 MHz/
Stop 2.4835 GHz