

RRA-EMIESS25B839SKF-03Av1

This report cancels and replaces the test report N° RRA-EMIESS25B839SKF-03Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

RSS GEN – Issue 5

RSS 247 – Issue 3

Equipment under test:

WEM-200/US

WEM-200/32

WEM-200/EU

FCC ID: 2AJ99-WEM200

IC NUMBER: 26053-WEM200

Company:

SKF FRANCE SAS

Distribution: Mrs THOMAS

(Company: SKF FRANCE SAS)

Number of pages: 23 with 3 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
1	17-Sep-25	1, 2, 4, 23	M. DUMESNIL, Radio Laboratory Manager	

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Information in italics are declared by the manufacturer/customer and are under his responsibility

Products used for radiated tests:**DESIGNATION OF PRODUCT:***Sample 1: WEM-200/US**Sample 2: WEM-200/32**Sample 3: WEM-200/EU**Sample not tested: WEM-200/USPP**Sample not tested: WEM-200/32PP**Sample not tested: WEM-200/EUPP***Serial number (S/N):***Sample 1: C4BD6A 0105 F7**Sample 2: C4BD6A 0105 F2**Sample 3: C4BD6A 0106 1B***Reference / model (P/N):***WEM-200***Software version:***BSS11***Product used for conducted tests:****DESIGNATION OF PRODUCT:***Sample 4: WEM-200***Serial number (S/N):***C4BD6A FFFE23***Reference / model (P/N):***WEM-200***Software version:***BSS11*

MANUFACTURER: SKF FRANCE

COMPANY SUBMITTING THE PRODUCT:

Company: SKF FRANCE

Address: 204, BOULEVARD CHARLES DE GAULLE
TSA 40208
37540 SAINT-CYR SUR LOIRE
FRANCE

Responsible: Mrs THOMAS

DATE OF TEST: 27-Jun-25

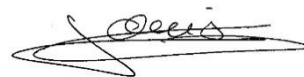
TESTING LOCATION: EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE

FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

ISED Accredited under CANADA-EU MRA Designation Number: FR0001
Industry Canada Registration Number: 4452A

TESTED BY: S. LOUIS

VISA:

A handwritten signature in black ink, appearing to read "S. Louis", with a large, stylized flourish underneath.

WRITTEN BY: S. LOUIS

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REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	27-Jun-25	/	Creation
1	17-Sep-25	1, 2, 4, 23	Add of Three variants : WEM-200/USPP, WEM-200/32PP, WEM-200/EUPP Add of Antenna Characteristics

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **WEM-200**, in accordance with normative reference.

The devices under test integrate a BLE radio function not already certified.

The radio is the same on the three equipment. The only difference is mechanical (refer photos).

This report is a justification statement for antenna as stated in 'Timco' newsletter for Part 15 applications with equipment classes DTS, DSS, NII, 6ID, etc. which require the antenna gain for compliance with EIRP limits.

This report concerns only antenna gain calculation of 2.4 GHz Radio part.

The three advertising frequencies of one E.U.T are measured for conducted output power measurement to determine the antenna gain by comparing radiated and conducted equipment.

2. PRODUCT DESCRIPTION

Category of equipment (ISED): I

Class: B

Utilization: Industrial

Antenna type and gain: Integrated Antenna (Maximum gain: -6.50 dBi)

Operating frequency range: From 2400 MHz to 2483.5 MHz

BLE radio part :

Number of channel, which it can operate: 40

Channel separation: 2 MHz

Modulation: GFSK

Nominal Operating Frequencies:

Sample N°= 1, 2, 3	⇒ 2402 MHz	Radiated measurements- Gain calculation
Sample N°= 1, 2, 3	⇒ 2426 MHz	Radiated measurements- Gain calculation
Sample N°= 1, 2, 3	⇒ 2480 MHz	Radiated measurements- Gain calculation

Sample N°= 4	⇒ 2402 MHz	Conducted measurements - Gain calculation
Sample N°= 4	⇒ 2426 MHz	Conducted measurements - Gain calculation
Sample N°= 4	⇒ 2440 MHz	Conducted measurements - Gain calculation

Power source: 3Vdc by battery

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 (2025) Radio Frequency Devices

ANSI C63.10 2020 + Corrigendum (2023) + Amendment 1 (2024)
Procedures for Compliance Testing of Unlicensed Wireless Devices.

558074 D01 15.247 Meas Guidance v05r02
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.

RSS-247 Issue 3, August 2023
Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

4. TEST METHODOLOGY

Justification statement:

For antenna as stated in 'Timco' newsletter for Part 15 applications with equipment classes DTS, which require the antenna gain for compliance with EIRP limits.

Radio performance tests procedures given in CFR 47 part 15:

Subpart C – Intentional Radiators

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

Radio performance tests procedures given in RSS-247:

Paragraph 5 - Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration (DD/MM/YYYY)	Calibration interval (years)	Next calibration due (DD/MM/YYYY)
0	BAT-EMC V3.18.0.26	Software	/	/	/
7566	Testo 608-H1	Meteo station	17/12/2024	2	17/12/2026
8548	Midwest Microwave 10dB	Attenuator	08/02/2023	3	07/02/2026
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10771	EMCO 3117	Antenna	30/11/2022	3	30/11/2025
10789	MATURO	Turntable and mat controller NCD	/	/	/
12590	LUCIX Corp S005180M3201	Low-noise amplifier	23/05/2025	1	23/05/2026
14831	Fluke 177	Multimeter	22/12/2023	2	21/12/2025
15666	R&S FSV40	Spectrum Analyzer	09/04/2025	2	09/04/2027
19877	HYTEM - N - 5m	Cable	30/08/2024	2	30/08/2026
19887	HYTEM - N - 1m	Cable	30/08/2024	2	30/08/2026
19898	HYTEM - N - 2.5m	Cable	30/08/2024	2	30/08/2026
19907	HYTEM - N - 5.8m	Cable	30/08/2024	2	30/08/2026
20040	COMTEST FAR-2	Anechoic chamber	/	/	/

6. TESTS RESULTS SUMMARY

6.1 CFR 47 part 15 requirements

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(b) Maximum peak output power	X				Note 1

NAp: Not Applicable

NAs: Not Asked

Note 1: First, a measurement was performed using the radiated method on integral antenna, then a conducted measurement was performed by an UFL connector.

Gain antenna is calculated by subtracting conducted power measurement from radiated power measurement and added to radio report RRA-EMIESS25B839SKF-01Av0.

6.2 RSS-247 requirements

Test Procedure RSS-247	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
Paragraph 5	Standard specifications for frequency hopping system and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz					
5.4	Transmitter output power and equivalent isotropically radiated power (e.i.r.p.) requirements	X				Note 1

NAp: Not Applicable

NAs: Not Asked

Note 1: First, a measurement was performed using the radiated method on integral antenna, then a conducted measurement was performed by an UFL connector.

Gain antenna is calculated by subtracting conducted power measurement from radiated power measurement and added to radio report RRA-EMIESS25B839SKF-01Av0.

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	$\pm 0.8\text{dB}$
Radiated emission valid to 26 GHz	
9kHz – 30MHz	$\pm 4.3\text{ dB}$
30MHz – 1GHz	$\pm 5.9\text{ dB}$
1GHz – 18GHz	$\pm 4.8\text{ dB}$
18GHz – 40GHz	$\pm 5.9\text{ dB}$
AC Power Lines conducted emissions	$\pm 3.7\text{ dB}$
Temperature	$\pm 0.95\text{ }^{\circ}\text{C}$
Humidity	$\pm 4.6\text{ \%}$

8. ANTENNA GAIN CALCULATION – 2.4 GHZ RADIO PART

Temperature (°C) : 23 / 26

Humidity (%HR): 45 / 48

Date : June 3, 2025 and June 27, 2025

Technician : S. LOUIS

Standard: FCC Part 15
RSS-247**Test procedure:**

For FCC Part 15: paragraph 15.247 (b)

For RSS-247: paragraph 5.4

Radiated Method Measurement: RBW≥DTS bandwidth method of paragraph 11.9.1.1 of ANSI C63.10**Test set up:**

First an exploratory radiated measurement was performed.

During this phase the product is oriented in these two normal positions.

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

The system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5 m from a ground plane.

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

Distance of antenna: 3 meters**Antenna height:** 1 to 2.5 meters**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

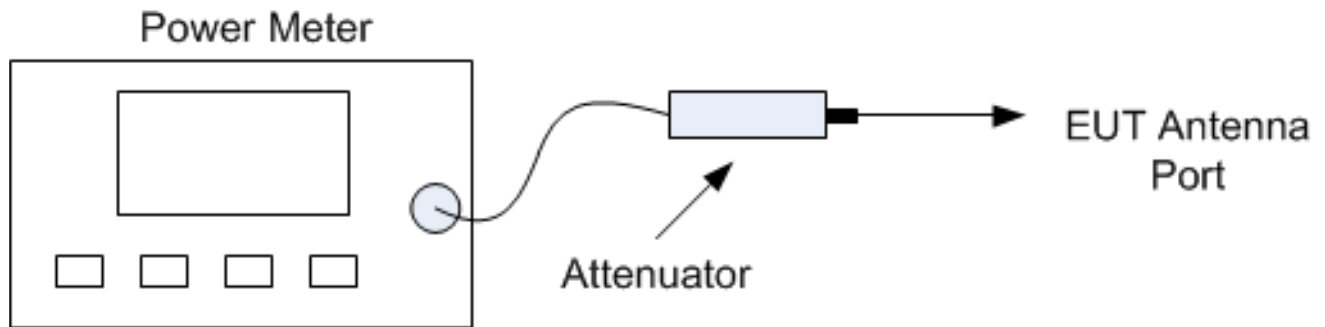
The measurement of the radiated electro-magnetic field is realized with an analyser and peak detector. The resolution bandwidth is adjusted at 1 MHz and video bandwidth at 3 MHz. (11.9.1.1 of ANSI C63.10)

Finally the radiated electro-magnetic field is converted in dBm with the following formula:

$$EIRP(dBm) = E (dB\mu V/m) + 20\log(D) - 104.8;$$
 where D is the measurement distance in meters and antenna with a Gain (unit in dBi) different following the frequencies used.

Conducted Method Measurement: RBW $\geq$ DTS bandwidth method of paragraph 11.9.1.1 of ANSI C63.10

Conducted test



The measure is realized in conducted mode.

The power meter is replaced with an spectrum analyser and peak detector. The resolution bandwidth is adjusted at 1 MHz and video bandwidth at 3 MHz. (11.9.1.1 of ANSI C63.10)

Equipment under test operating condition:

The equipment under test is blocked in discontinuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 3Vdc by battery

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

Results:

Sample N° 1 (Radiated) & Sample N°4 (Conducted) at: 2402 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	89.3	-5.96	1.97	-7.93

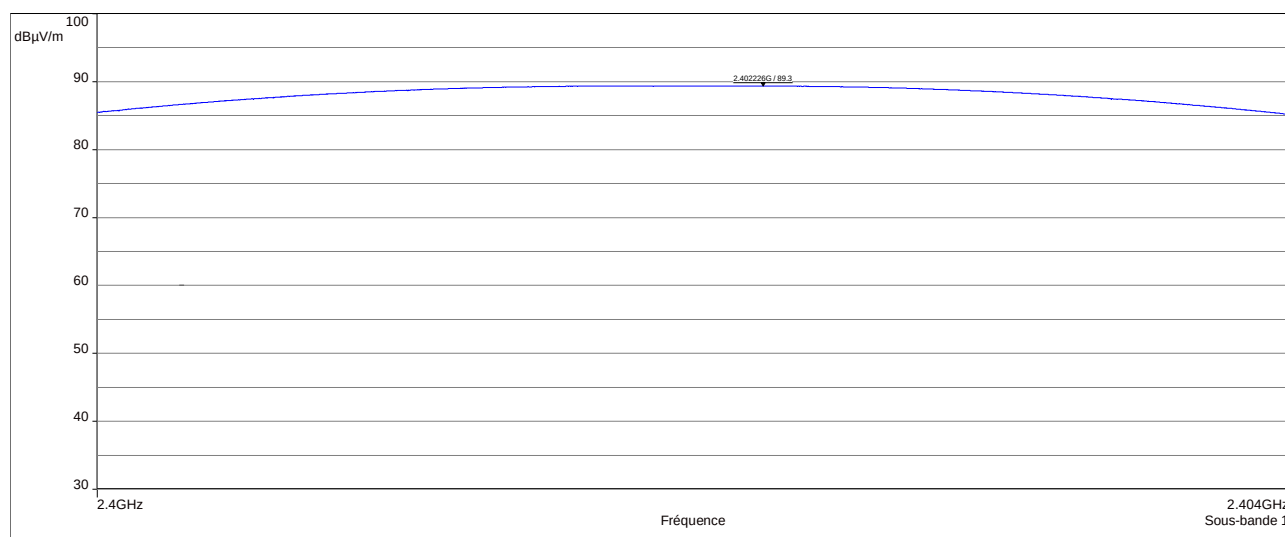
Polarization of test antenna: Horizontal (height: 125 cm)

Position of equipment: 1 (azimuth: 305 degrees)

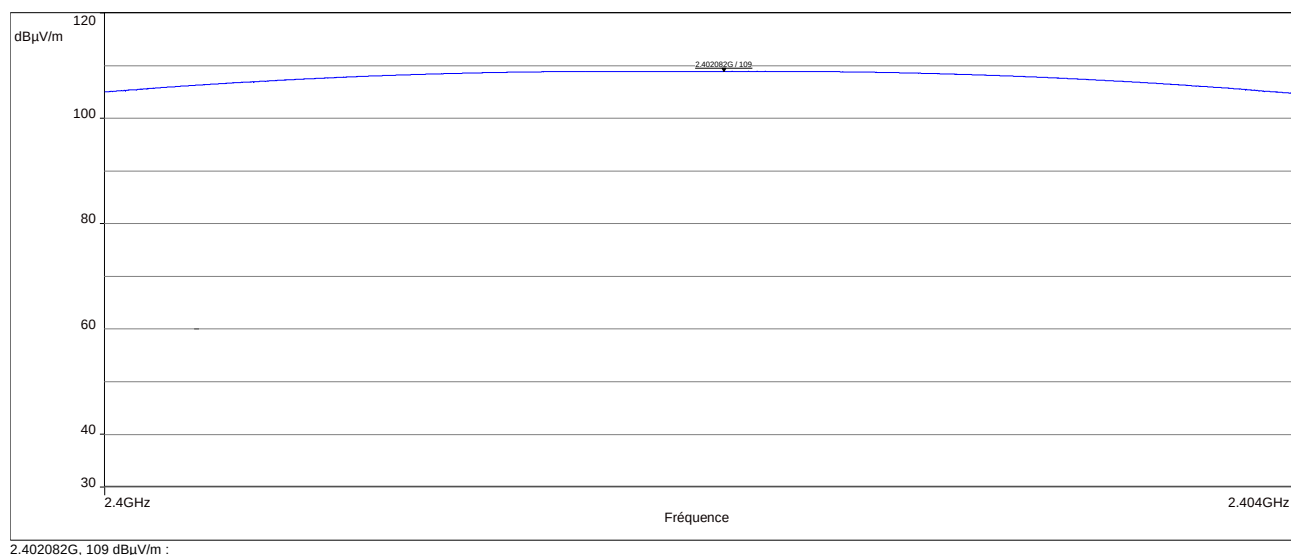
(1) Conducted output power:

EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Sample N° 1 (Radiated) & Sample N°4 (Conducted) at: 2426 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	89.4	-5.86	2.06	-7.92

Polarization of test antenna: Vertical (height: 195 cm)

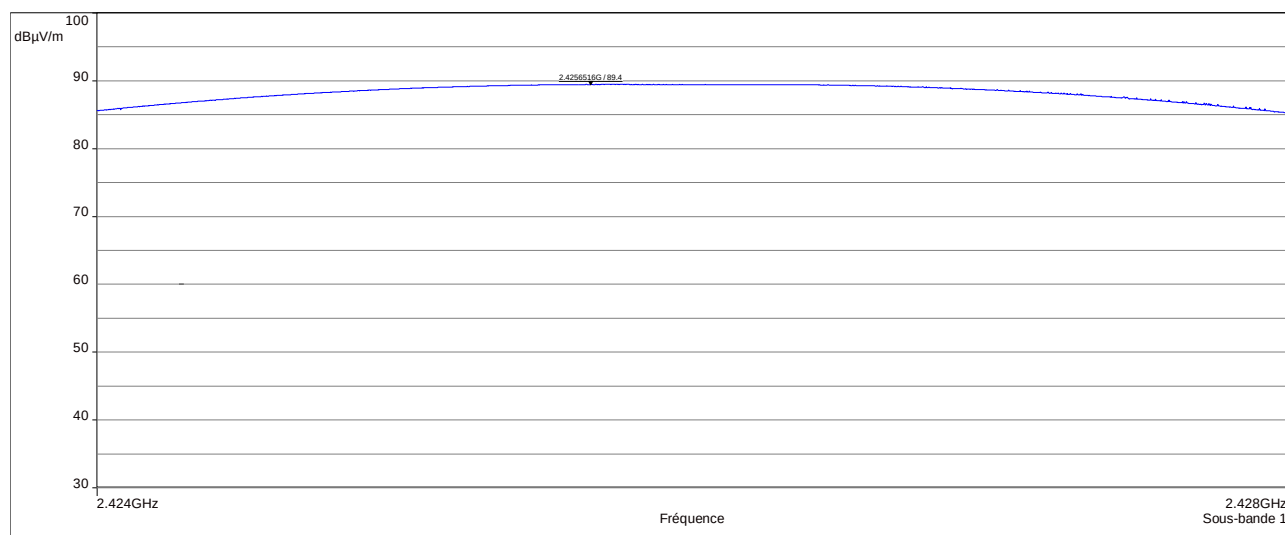
Position of equipment: 2 (azimuth: 180 degrees)

(1) Conducted output power:

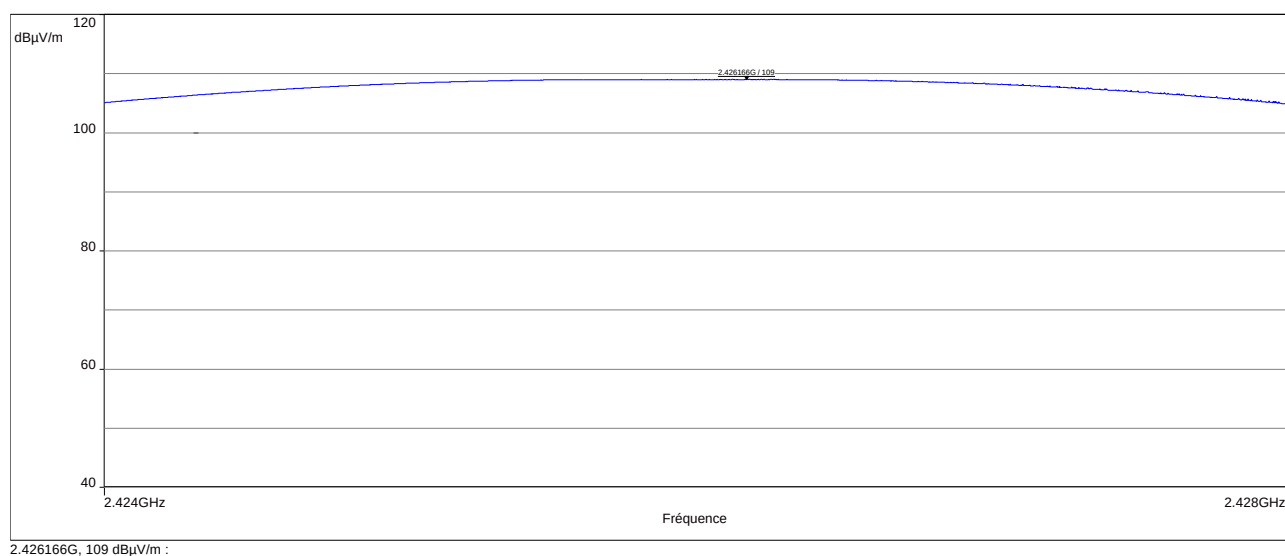
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Sample N° 1 (Radiated) & Sample N°4 (Conducted) at: 2480 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	89.5	-5.76	2.41	-8.17

Polarization of test antenna: Vertical (height: 190 cm)

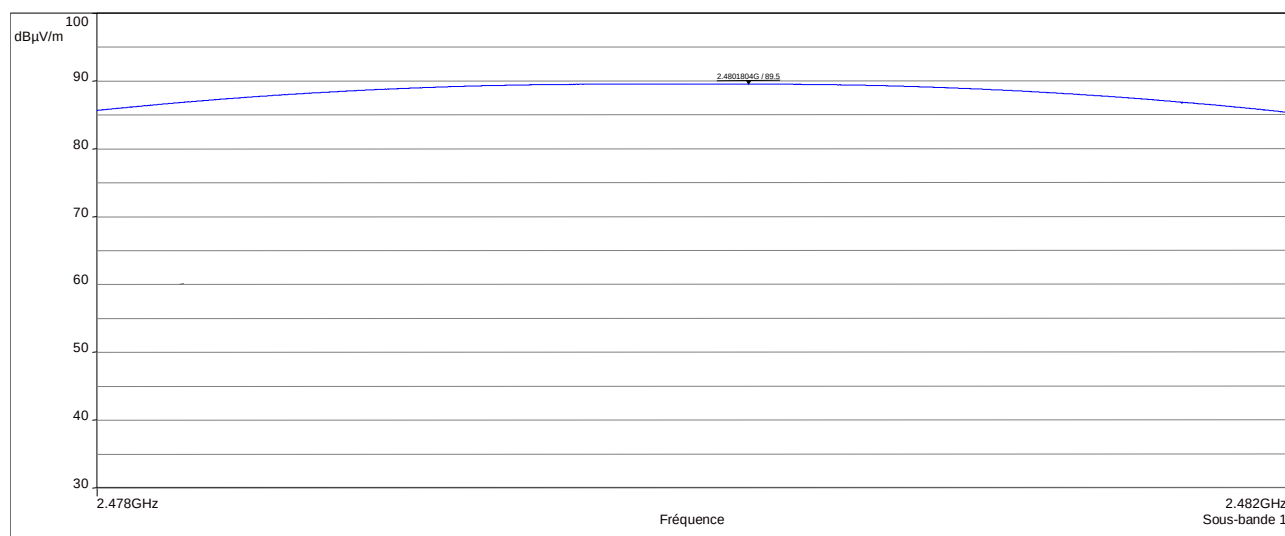
Position of equipment: 2 (azimuth: 180 degrees)

(1) Conducted output power:

EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

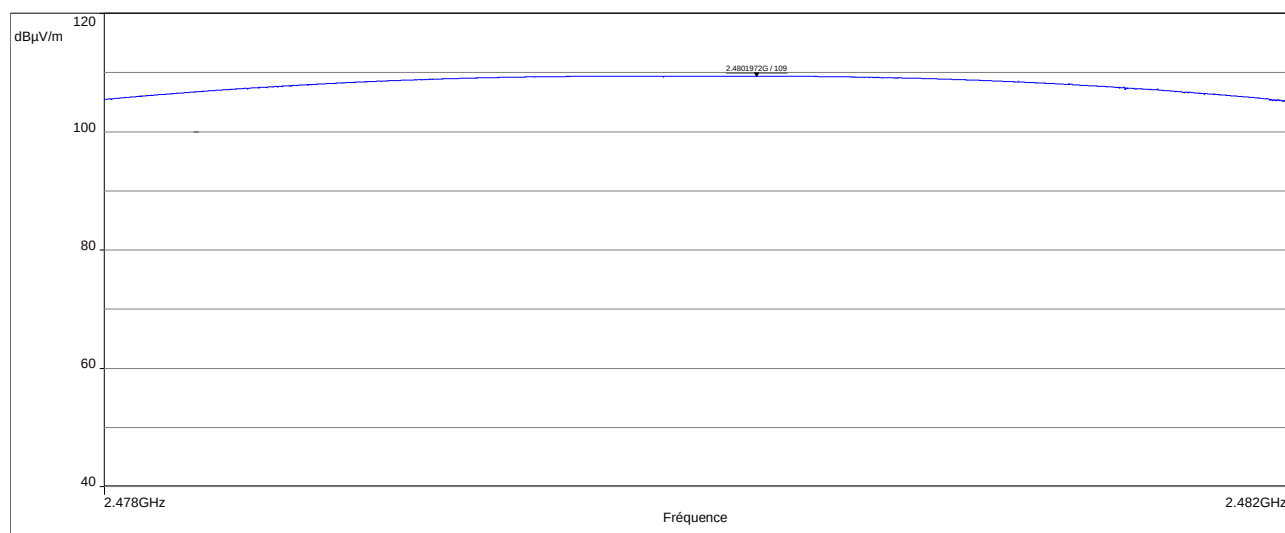
Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



2.4801804G, 89.5 dBμV/m :

Conducted result (dBμV) :



2.4801972G, 109 dBμV/m :

Results:

Sample N° 2 (Radiated) & Sample N°4 (Conducted) at: 2402 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	88.6	-6.66	1.97	-8.63

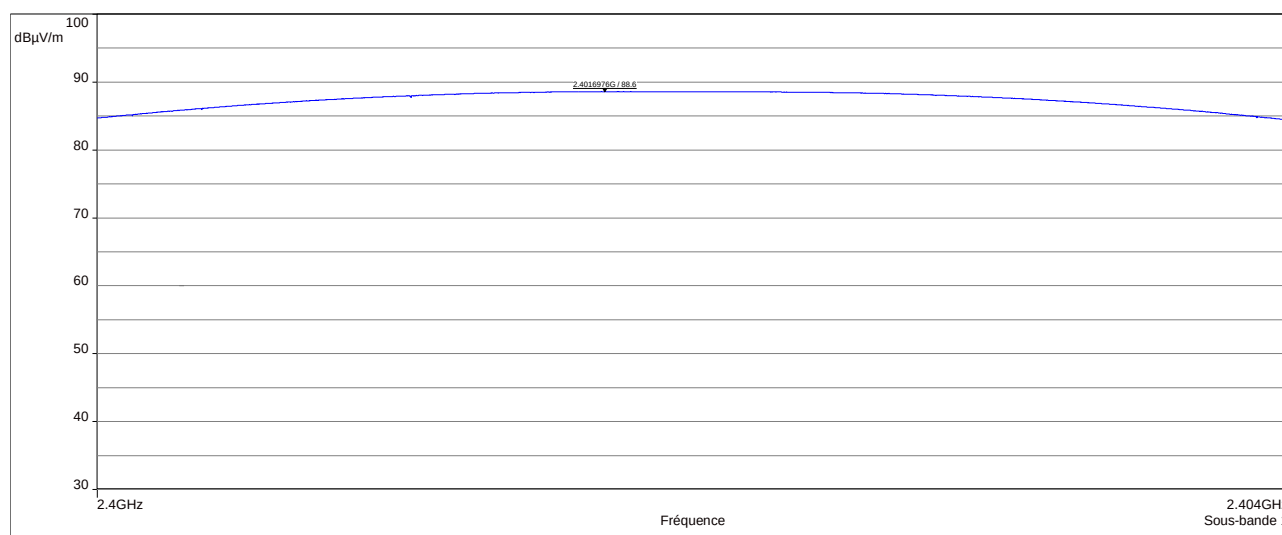
Polarization of test antenna: Horizontal (height: 160 cm)

Position of equipment: 1 (azimuth: 225 degrees)

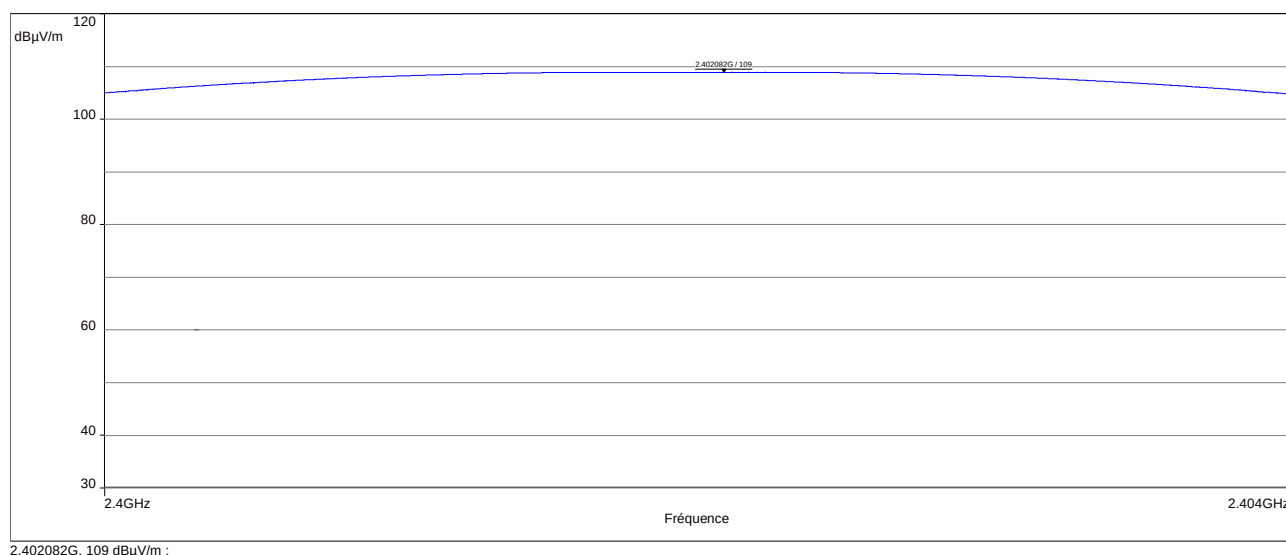
(2) Conducted output power:

EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Sample N° 2 (Radiated) & Sample N°4 (Conducted) at: 2426 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	88.9	-6.36	2.06	-8.42

Polarization of test antenna: Vertical (height: 155 cm)

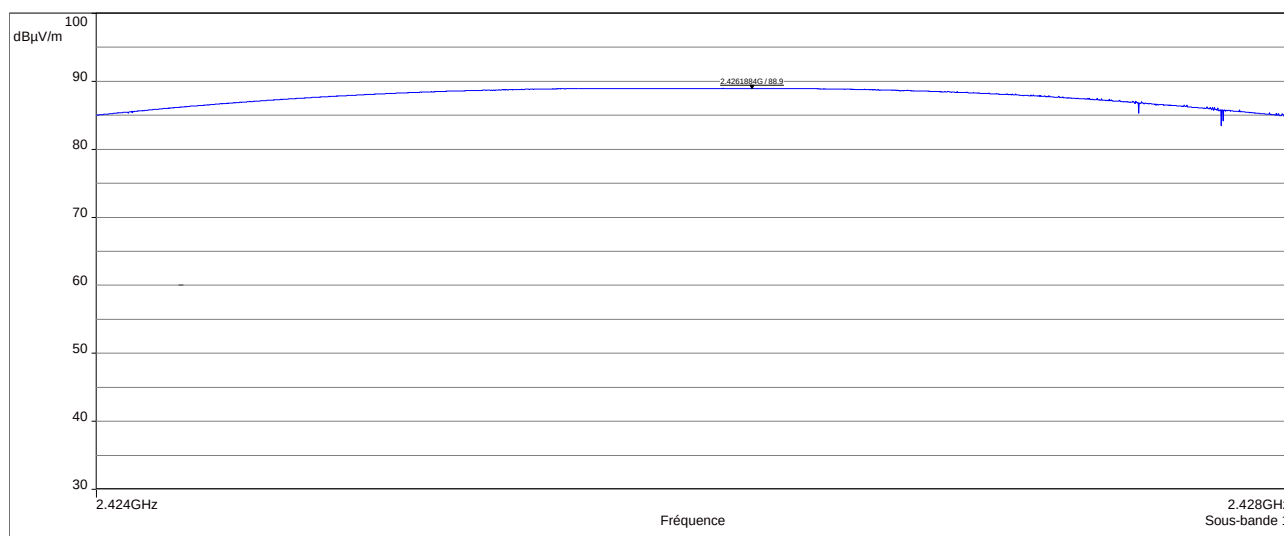
Position of equipment: 2 (azimuth: 180 degrees)

(2) Conducted output power:

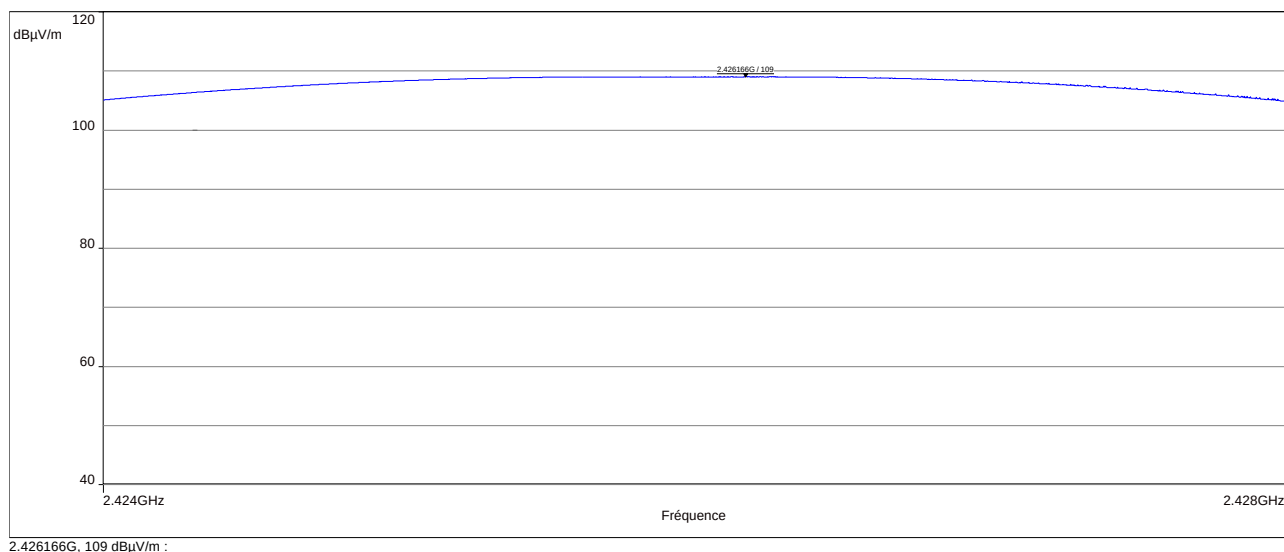
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Sample N° 2 (Radiated) & Sample N°4 (Conducted) at: 2480 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	89.4	-5.86	2.41	-8.27

Polarization of test antenna: Vertical (height: 105 cm)

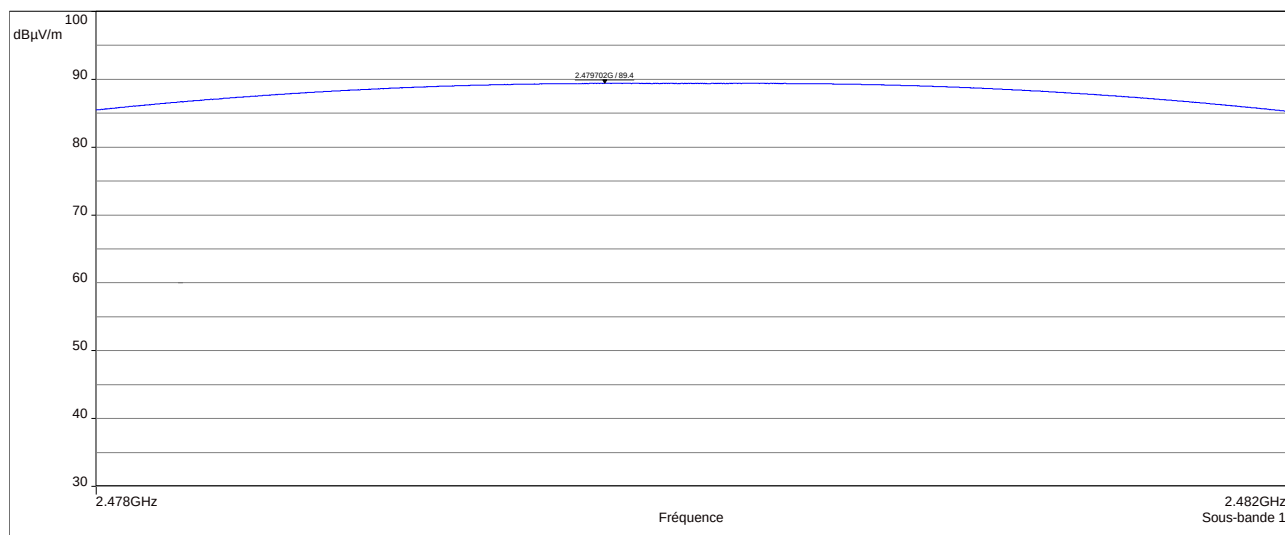
Position of equipment: 2 (azimuth: 175 degrees)

(2) Conducted output power:

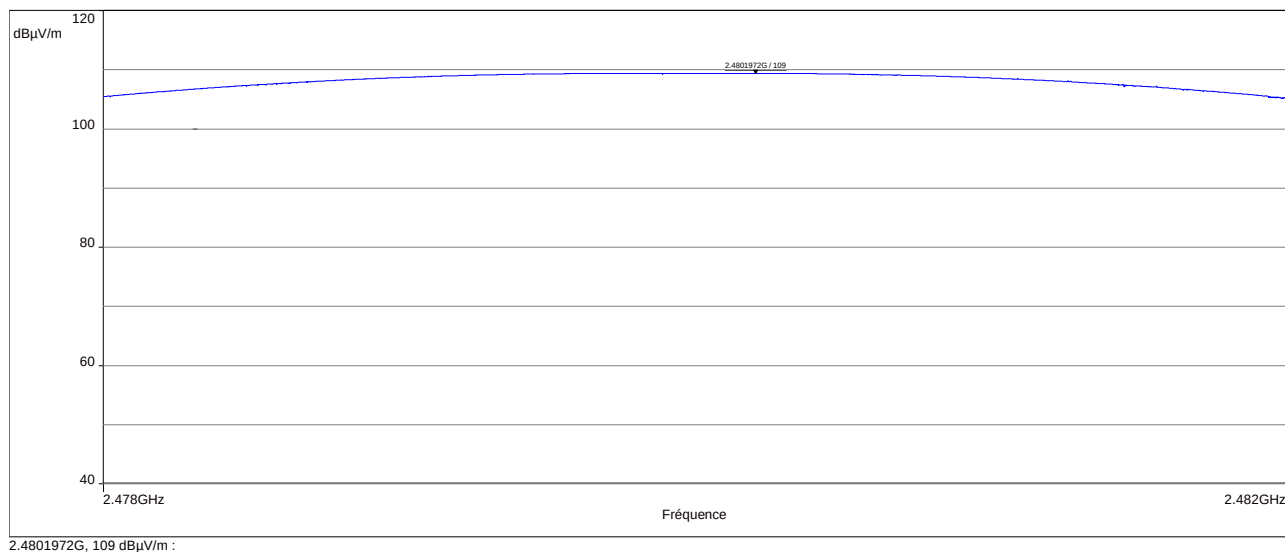
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Results:

Sample N° 3 (Radiated) & Sample N°4 (Conducted) at: 2402 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	90.7	-4.56	1.97	-6.53

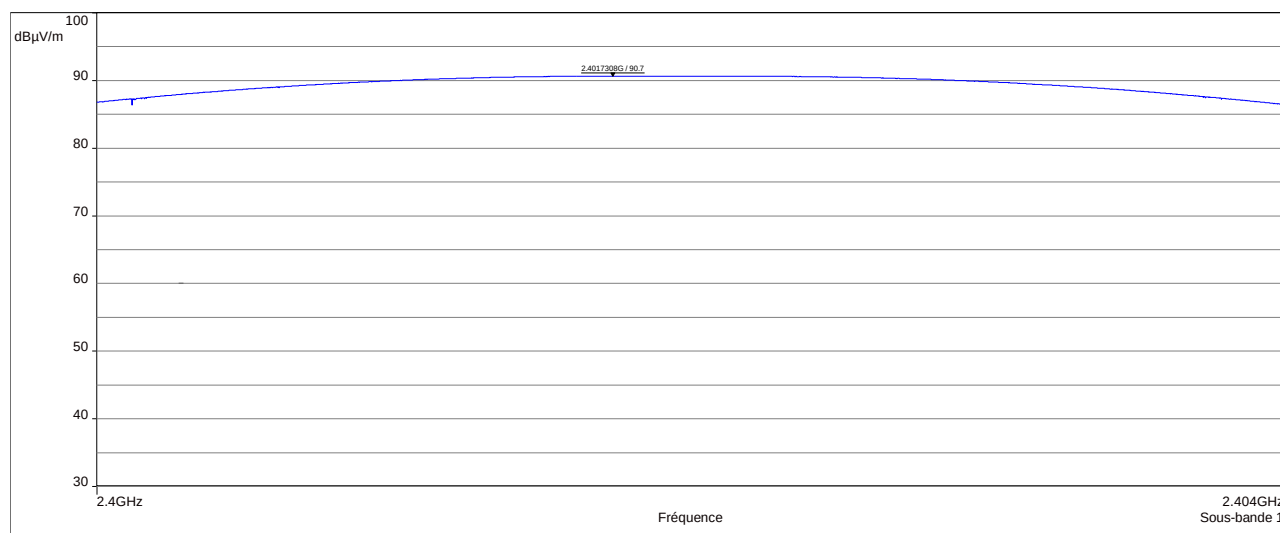
Polarization of test antenna: Horizontal (height: 190 cm)

Position of equipment: 1 (azimuth: 190 degrees)

(3) Conducted output power:

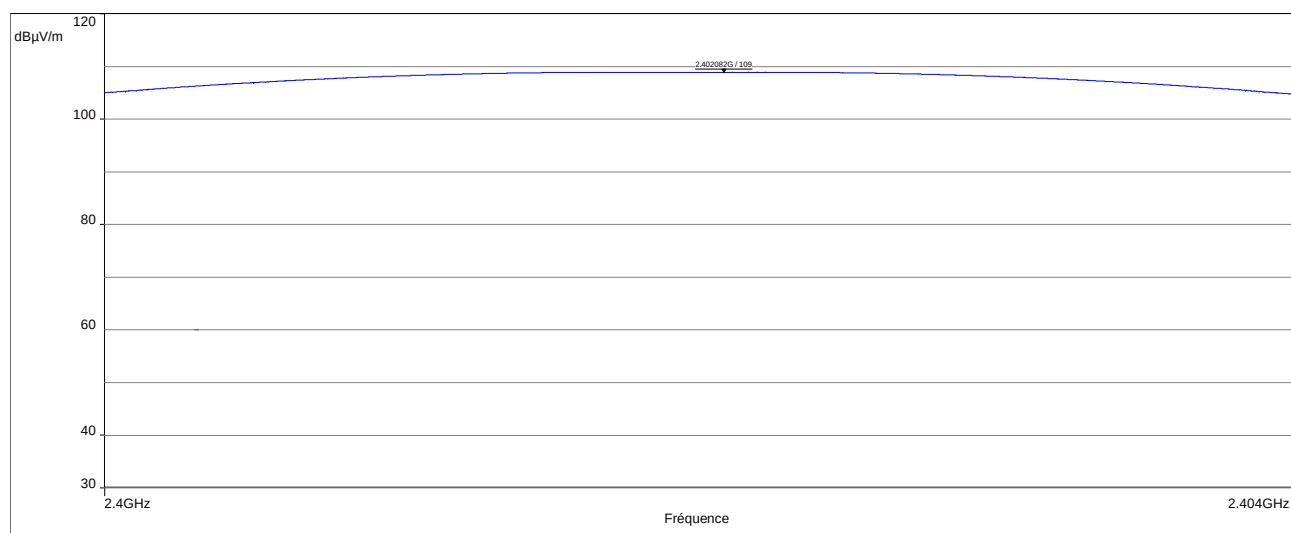
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



2.4017308G, 90.7 dBμV/m :

Conducted result (dBμV) :



2.402082G, 109 dBμV/m :

Sample N° 3 (Radiated) & Sample N°4 (Conducted) at: 2426 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	90.3	-4.96	2.06	-7.02

Polarization of test antenna: Vertical (height: 145 cm)

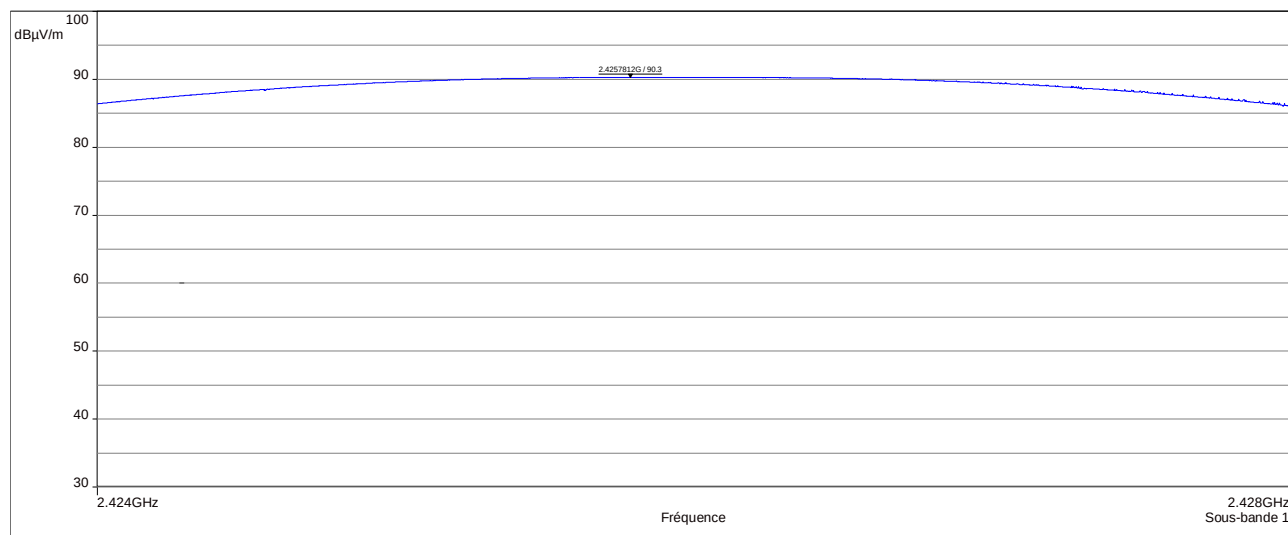
Position of equipment: 2 (azimuth: 180 degrees)

(3) Conducted output power:

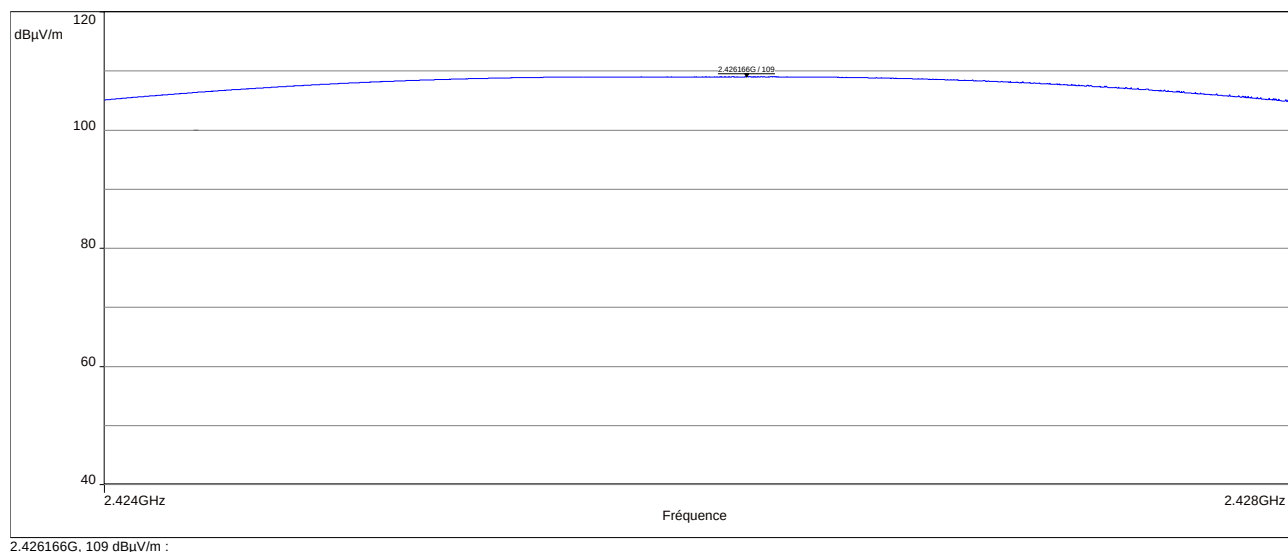
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



Sample N° 3 (Radiated) & Sample N°4 (Conducted) at: 2480 MHz

	Radiated Output power measured at 3 meters (dBμV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3Vdc	90.3	-4.96	2.41	-7.37

Polarization of test antenna: Vertical (height: 110 cm)

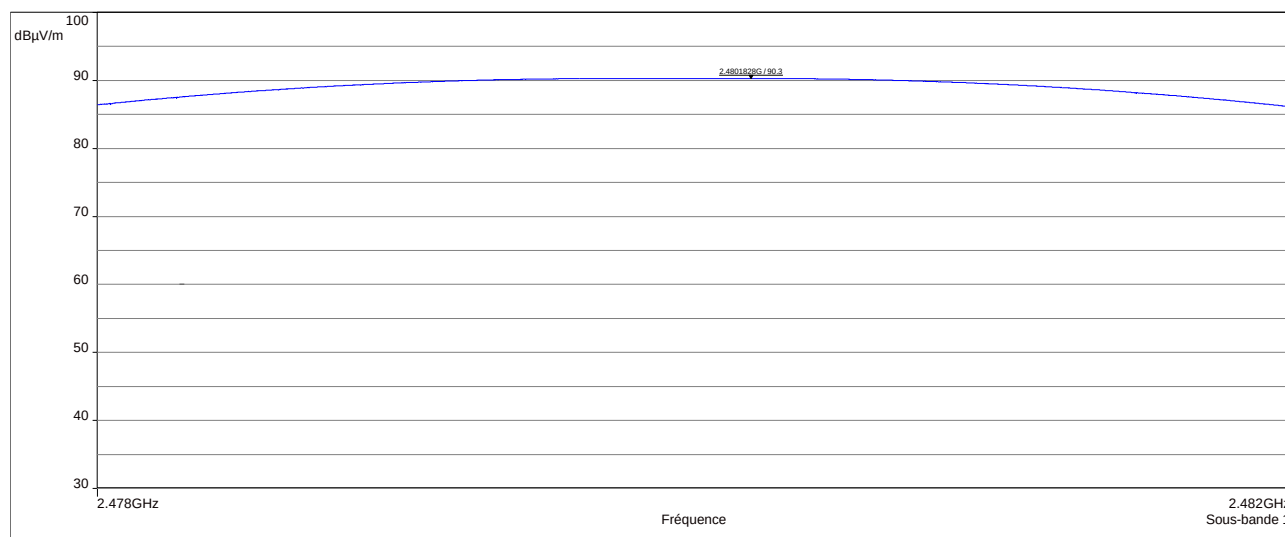
Position of equipment: 2 (azimuth: 160 degrees)

(1) Conducted output power:

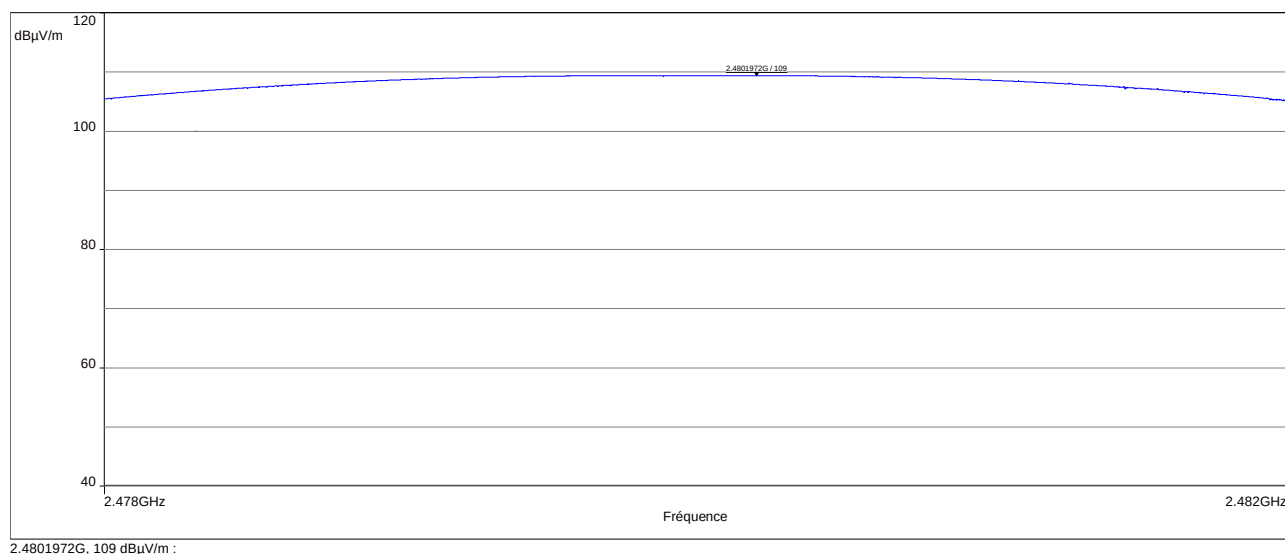
EIRP(dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0dBi (considered)

Radiated result (dBμV/m at 3 meters) :



Conducted result (dBμV) :



□□□ End of report, 1 appendix to be forwarded □□□

APPENDIX 1: Test equipment list

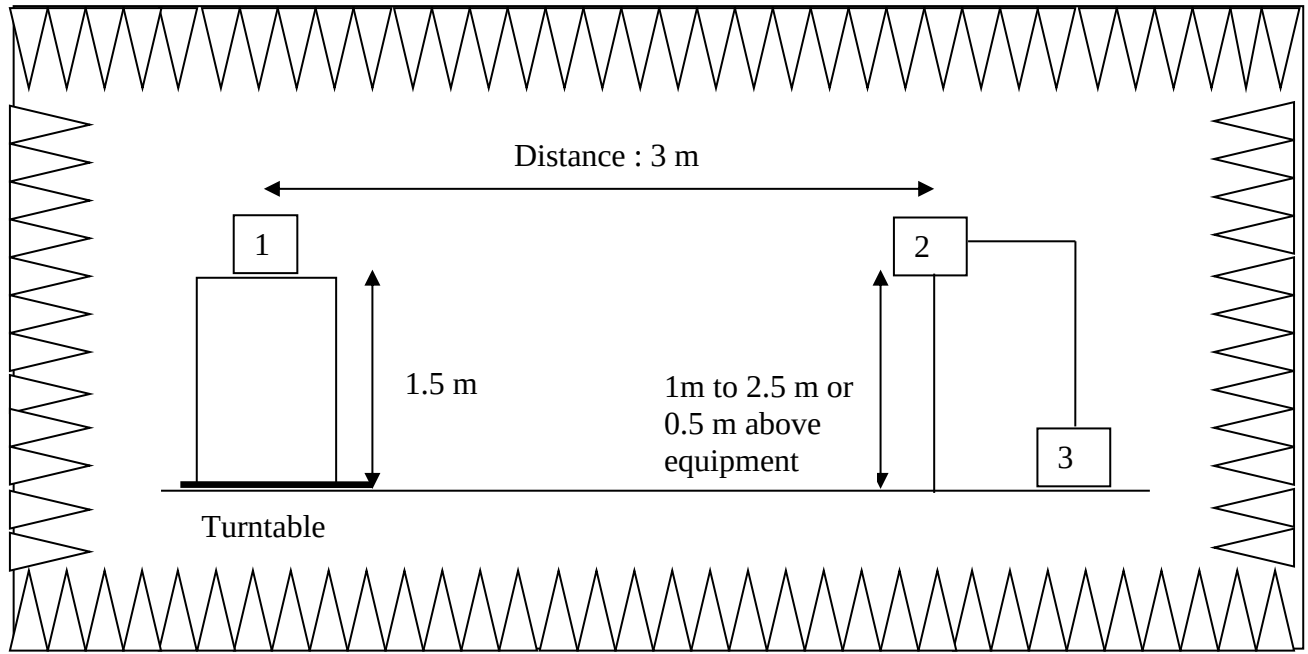
Antenna Gain Calculation

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber 2	EMITECH	20040
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Antenna 3117	ETS-Lindgren	10771
Low-noise amplifier S005180M3201	LUCIX Corp.	12590
N-1M Cable	HYTEM	19887
N-2.5M Cable	HYTEM	19898
N-5M Cable	HYTEM	19877
N-5.8M Cable	HYTEM	19907
Attenuator 10dB	Midwest Microwave	8548
Multimeter 177	Fluke	14831
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000

APPENDIX 2: Radiated Test Setup

Anechoic chamber setup

Above 1 GHz



- 1: Equipment Under Test
- 2: Measurement antenna
- 3: Measurement equipment

APPENDIX 3: Antenna Characteristics



Trax (WEM-200) Antenna Characteristics

Documentation of the design:

- SMD lands on MM PCB
 - Width 1mm, length 1.6mm
 - Length under substrate 1.2mm
- SMD lands antenna 0.8mm width, length 1.1mm
- Drill with 0.6mm diameter thus rest-rig 0.8mm

A PCB SMD mounted PIFA antenna is used.