RRA-EMIESS24E212SKF-01Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

RSS GEN – Issue 5
RSS 247 – Issue 3

Equipment under test:

CMWA 6100-EX

FCC ID: 2AJ99-CMWA-6100-EX
IC NUMBER: 26053-CMWA6100EX

Company:

SKF FRANCE

Distribution: Mr LIGNEE **(Company:** SKF FRANCE**)**

Number of pages: 17 with 2 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	18-Mar-25	Creation	M. DUMESNIL, Radio Laboratory 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.
Information in italics are declared by the manufacturer/customer and are under his responsibility

Siège Social : Emitech - 3, rue des Coudriers - Z.A. de l'Observatoire - 78180 MONTIGNY LE BX - France
Siret : 344 545 645 00022 - Tél. : 33 (0)1 30 57 55 55 - Fax : 33 (0)1 30 43 74 48 - E-mail : contact@emitech-group.com - URL : www.emitech.fr
SAS au capital de 1 560 000 € - R.C.S. VERSAILLES 344 545 645 - APE 7112B

Product used for radiated tests: Sample 1

DESIGNATION OF PRODUCT: ***SK-2816 E***

Serial number (S/N): *0001*

Reference / model (P/N): *CMWA 6100-EX*

Software/firmware version: *LX_WEM200_02_WM, SVN Rev 3881*

Product used for conducted tests: Sample 2

DESIGNATION OF PRODUCT: ***LS-SK-2817 C***

Serial number (S/N): *0001*

Reference / model (P/N): *CMWA 6100-EX*

Software/firmware version: *LX_WEM200_02_WM, SVN Rev 3881*

MANUFACTURER: ***SKF FRANCE***

COMPANY SUBMITTING THE PRODUCT:

Company: SKF FRANCE

Address: 204, BOULEVARD CHARLES DE GAULLE
TSA 40208
37542 SAINT-CYR SUR LOIRE CEDEX
FRANCE

Responsible: Mr LIGNEE

Person(s) present during the tests: /

DATE OF TEST: 14-Oct-24

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: B. VOVARD **VISA:**

WRITTEN BY: B. VOVARD

CONTENTS

REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	**14-Oct-24**	/	Creation

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: ***CMWA 6100-EX***, in accordance with normative reference.

The equipment under test integrates:

- BLE transceiver radio part function declared already certified,
- MIRA transceiver radio part function declared already certified, (802.15.4)

These two functions used the same radio part.

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.

In this case, only BLE is measured for conducted output power measurement to determine the antenna gain on the frequencies closest to the BLE and the MIRA 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: -1.95 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
Nominal Channel bandwidth:	2 MHz
Modulation:	GFSK

MIRA radio part :

Number of channel which it can operate:	80
Channel separation:	1 MHz
Nominal Channel bandwidth:	1 MHz
Modulation:	GFSK

Nominal Operating Frequencies:

Sample N°= 1	⇨ 2402 MHz	Radiated measurements- Gain calculation
Sample N°= 1	⇨ 2426 MHz	Radiated measurements- Gain calculation
Sample N°= 1	⇨ 2440 MHz	Radiated measurements- Gain calculation
Sample N°= 1	⇨ 2480 MHz	Radiated measurements- Gain calculation
Sample N°= 2	⇨ 2402 MHz	Conducted measurements - Gain calculation
Sample N°= 2	⇨ 2426 MHz	Conducted measurements - Gain calculation
Sample N°= 2	⇨ 2440 MHz	Conducted measurements - Gain calculation
Sample N°= 1	⇨ 2480 MHz	Conducted measurements - Gain calculation

Power source: 3.6 Vdc 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 (2024)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for ComplianceTesting 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	Calibration interval (years)	Next calibration due
0	BAT-EMC V3.18.0.26	Software	/	/	/
4088	R&S FSP40	Spectrum Analyzer	10/06/2024	2	10/06/2026
6796	R&S FSP7	Spectrum Analyzer	19/07/2023	2	18/07/2025
7566	Testo 608-H1	Meteo station	12/12/2022	2	11/12/2024
8548	Midwest Microwave 10dB	Attenuator	08/02/2023	3	07/02/2026
8750	La Crosse Technology WS-9232	Meteo station	20/11/2023	1	19/11/2024
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9399	N-1m	Cable	29/01/2024	2	28/01/2026
10759	COMTEST Cage 3	Anechoic chamber	/	/	/
10771	EMCO 3117	Antenna	30/11/2022	3	30/11/2025
10789	MATURO	Turntable and mat controller NCD	/	/	/
14303	SUCOFLEX N-2m	cable	01/12/2022	2	30/11/2024
14903	Fluke 177	Multimeter	22/12/2023	2	21/12/2025
15812	COMP-POWER PAM-118A	Low-noise amplifier 18GHz	31/05/2024	1	31/05/2025
19246	HYTEM - N - 5m	Cable	22/01/2024	2	21/01/2026
19249	HYTEM - N - 2.5m	Cable	22/01/2024	2	21/01/2026

6. TESTS RESULTS SUMMARY

6.1 CFR 47 part 15requirements

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 by a UFL connector.

Gain antenna is calculated by subtracting conducted power measurement from radiated power measurement and added to radio report **RRA-EMIESS22Q160SKF-01Av1**.

6.2 RSS-247 requirements

Test Procedure RSS-247	Description of test	Criteria respected ?				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 by a UFL connector.

Gain antenna is calculated by subtracting conducted power measurement from radiated power measurement and added to radio report **RRA-EMIESS22Q160SKF-01Av1**.

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	± 0.8dB
Radiated emission valid to 26 GHz 9kHz – 30MHz 30MHz – 1GHz 1GHz – 18GHz 18GHz – 40GHz	 ± 4.3 dB ± 5.9 dB ± 4.8 dB ± 5.9 dB
AC Power Lines conducted emissions	± 3.7 dB
Temperature	± 0.95 °C
Humidity	± 4.6 %

8. ANTENNA GAIN CALCULATION – 2.4 GHZ RADIO PART

Temperature (°C) : 22 **Humidity (%HR):** 61 **Date :** October 14, 2024 and October 15, 2024

Technician : B. VOVARD

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

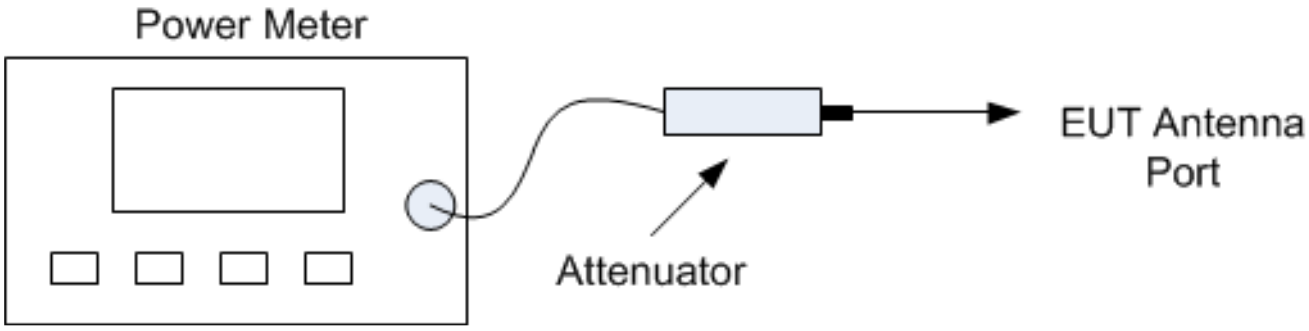
Antenna polarization: vertical and horizontal (only the highest level is recorded)

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 (dBµV/m) + 20log(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≥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: 3.6 Vdc by battery
Percentage of voltage variation during the test (%): ± 1

Results:

Sample N° 1 (Radiated) & Sample N°2 (Conducted) at: 2402 MHz

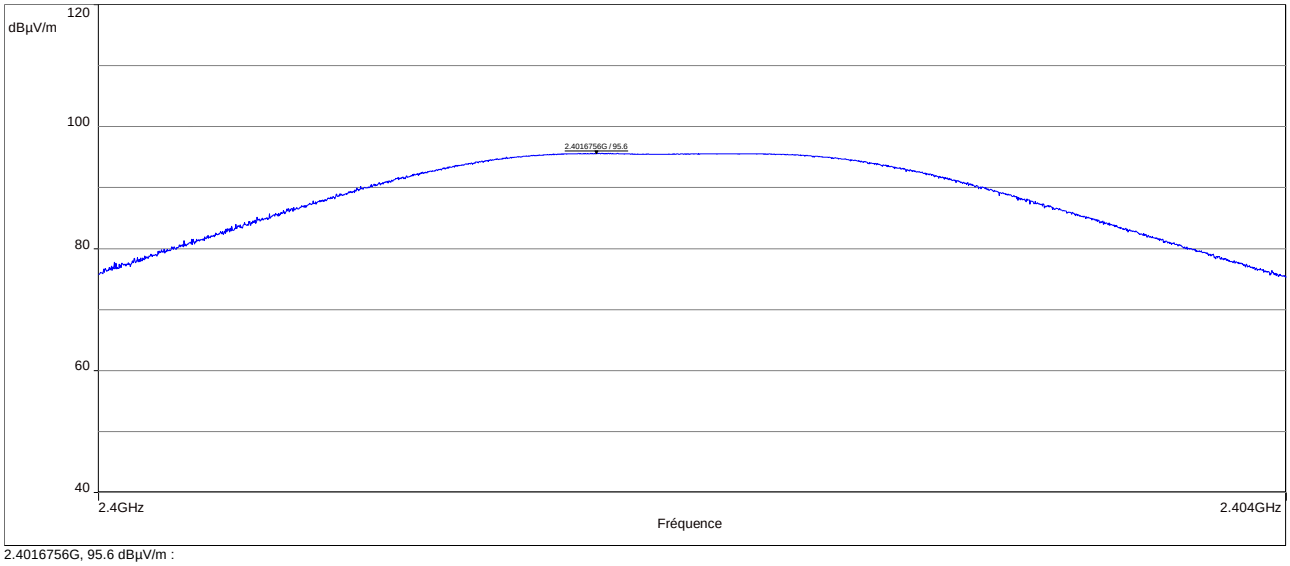
	Radiated Output power measured at 3 meters (dBµV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3.6 Vdc	95.60	0.34	2.30	-1.95

Polarization of test antenna: horizontal (height: 167 cm)
Position of equipment: Flat Position - (azimuth: 250 degrees)

(1) Conducted output power:

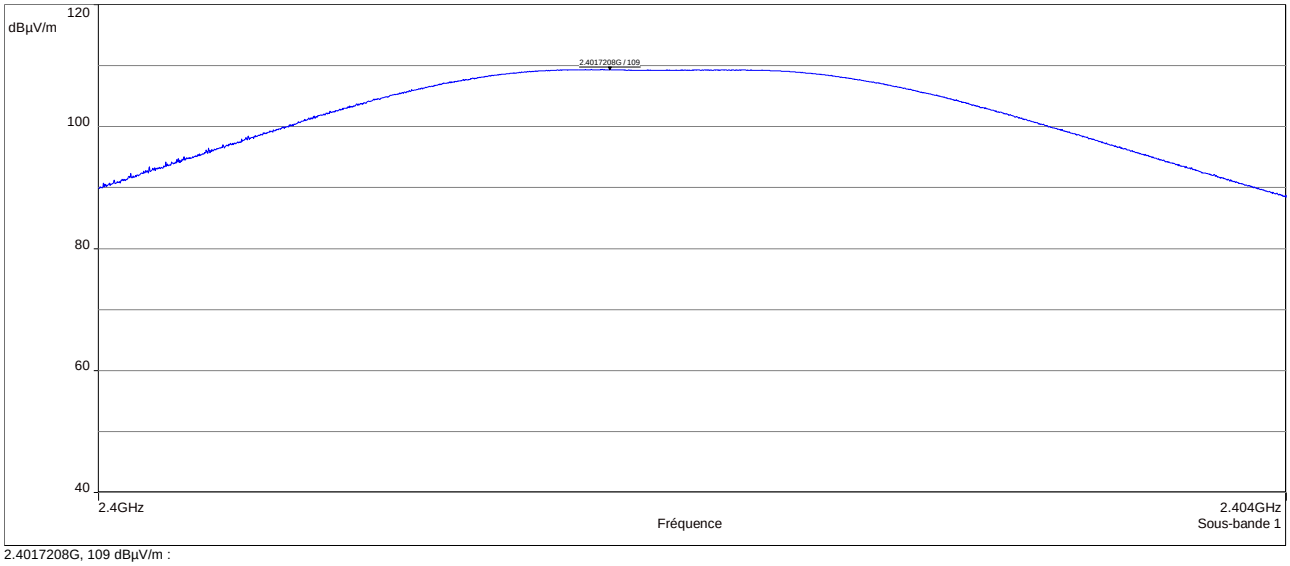
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBµV/m at 3 meters) :



2.4016756G, 95.6 dBµV/m :

Conducted result (dBµV) :



2.4017208G, 109 dBµV/m :

Sample N° 1 (Radiated) & Sample N°2 (Conducted) at: 2426 MHz

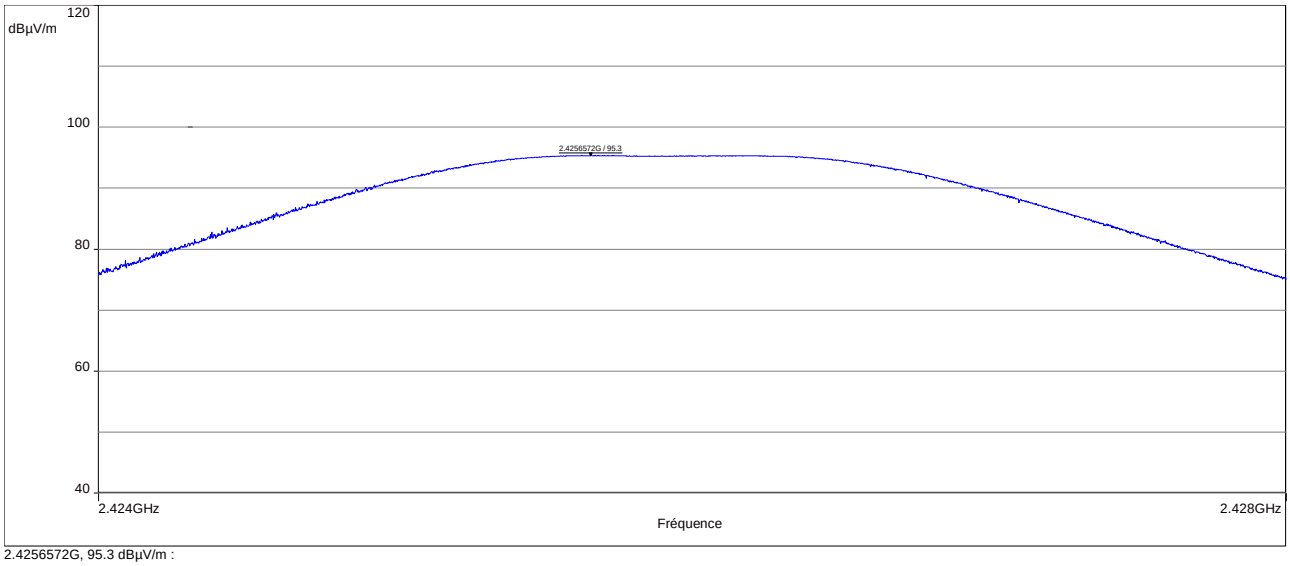
	Radiated Output power measured at 3 meters (dBµV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3.6 Vdc	95.30	0.04	2.45	-2.40

Polarization of test antenna: horizontal (height: 128 cm)
Position of equipment: Flat Position - (azimuth: 250 degrees)

(1) Conducted output power:

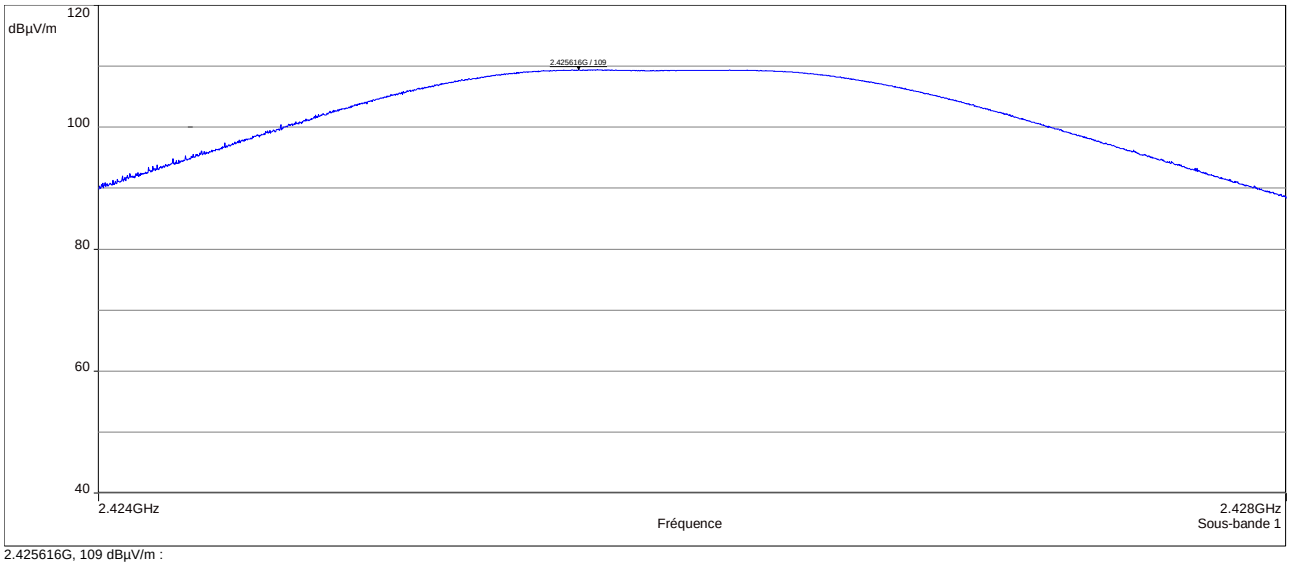
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBµV/m at 3 meters) :



2.4256572G, 95.3 dBµV/m :

Conducted result (dBµV) :



2.425616G, 109 dBµV/m :

Sample N° 1 (Radiated) & Sample N°2 (Conducted) at: 2440 MHz

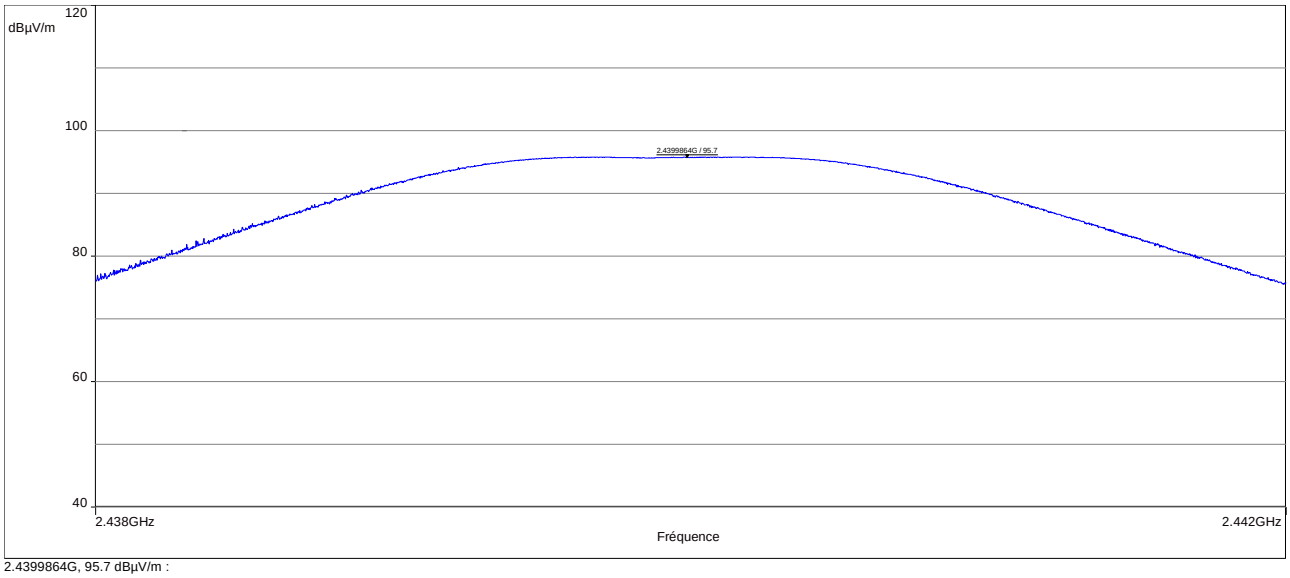
	Radiated Output power measured at 3 meters (dBµV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3.6 Vdc	95.70	0.44	2.60	-2.15

Polarization of test antenna: horizontal (height: 158 cm)
Position of equipment: Flat Position - (azimuth: 245 degrees)

(1) Conducted output power:

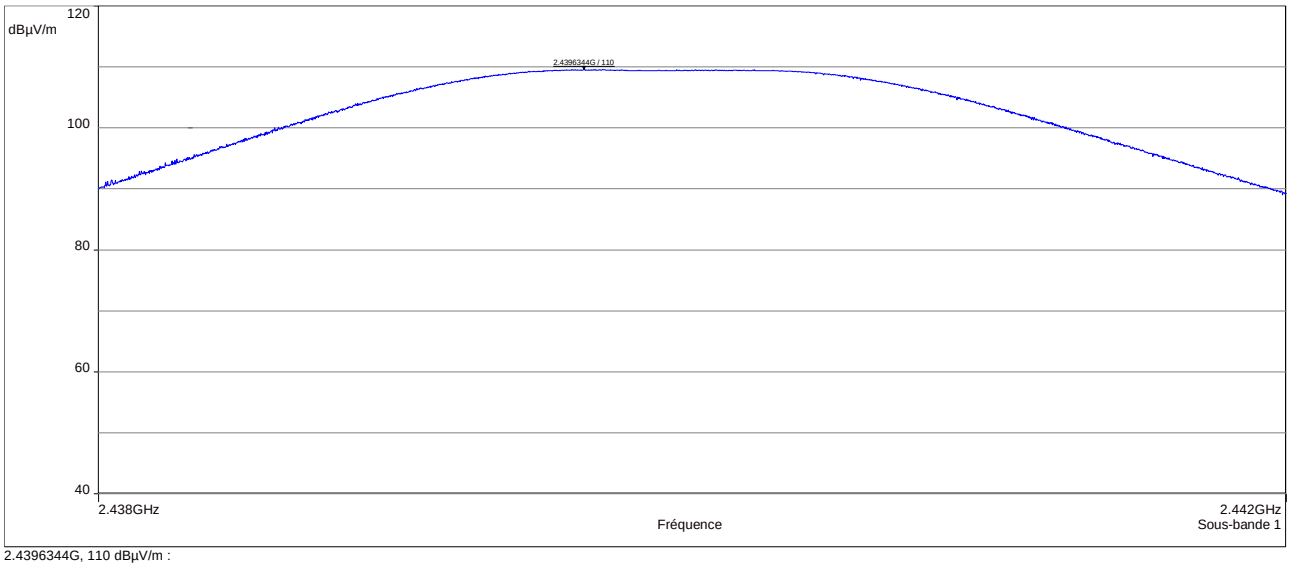
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBµV/m at 3 meters) :



2.4399864G, 95.7 dBµV/m :

Conducted result (dBµV) :



2.4396344G, 110 dBµV/m :

Sample N° 1 (Radiated) & Sample N°2 (Conducted) at: 2480 MHz

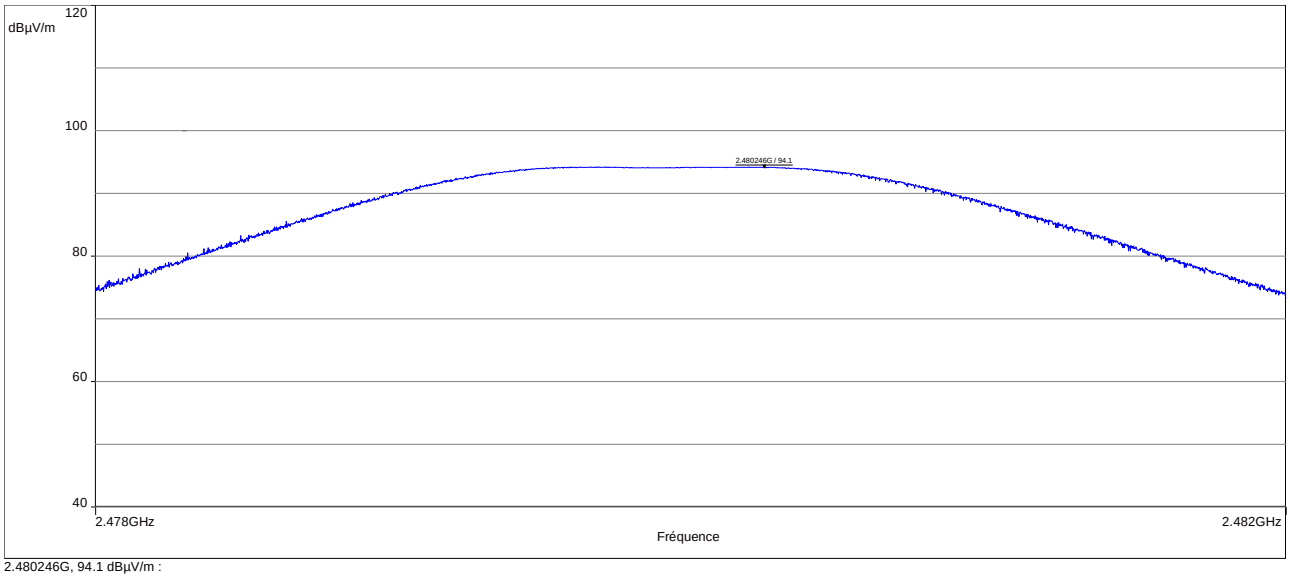
	Radiated Output power measured at 3 meters (dBµV/m):	Conducted Output Power computed (1) (dBm)	Conducted Output Power measured (dBm)	Antenna Gain calculation (dBi)
Nominal supply voltage: 3.6 Vdc	94.10	-1.15	2.31	-3.46

Polarization of test antenna: horizontal (height: 124 cm)
Position of equipment: Flat Position - (azimuth: 246 degrees)

(2) Conducted output power:

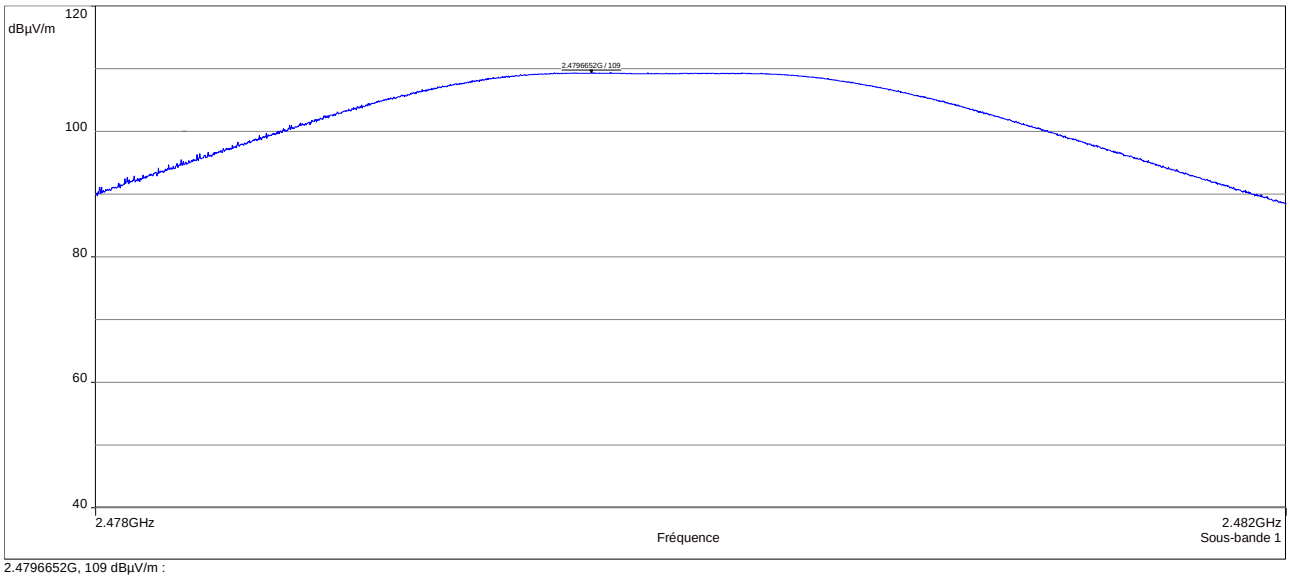
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 0dBi (considered)

Radiated result (dBµV/m at 3 meters) :



2.480246G, 94.1 dBµV/m :

Conducted result (dBµV) :



2.4796652G, 109 dBµV/m :

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

APPENDIX 1: Test equipment list

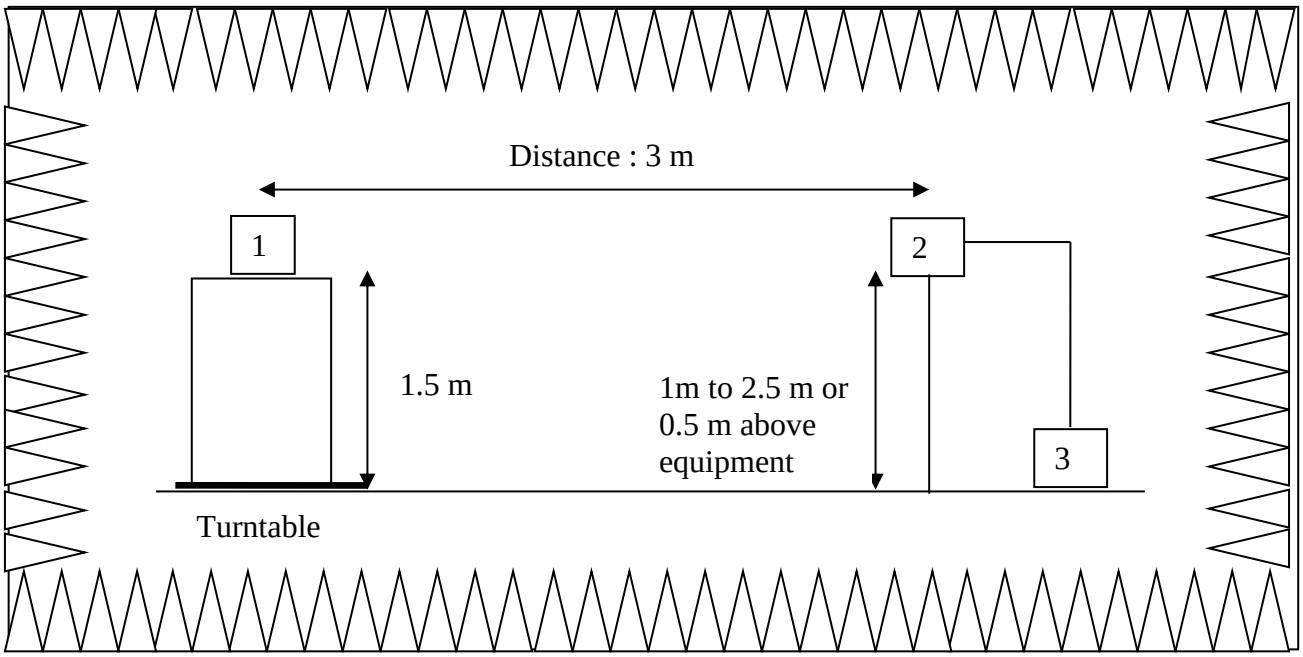
Antenna Gain Calculation

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Antenna 3117	ETS-Lindgren	10771
Low-noise amplifier PAM-118A	COM-POWER	15812
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Attenuator 10dB	Midwest Microwave	8548
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Meteo station WS-9232	La Crosse Technology	8750
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