Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
Canadian CAB Identifier: FR0003

RADIO TEST REPORT

FCC 47 CFR PART 15.249
RSS-210, issue 10, April 2020

Company ..... :	**UPONOR Inc.**
Address..... :	5925 148th Street West APPLE VALLEY 55124 MINNESOTA - USA

Test item description. ..... :	**Wireless temperature/humidity Sensor**
Trade Mark. ..... :	UPONOR
Manufacturer..... :	WATTS ELECTRONICS FRANCE
Model/Type reference..... :	P08172 / A3800169 (P07146 / T-169 NA)
FCC ID..... :	V9MSM4NA0
IC. ..... :	7664A-SM4NA0
Ratings..... :	3.6Vdc

Testing Laboratory ..... :	**EMITECH MONTPELLIER laboratory**
Address..... :	145 rue de Massacan 34740 VENDARGUES FRANCE

Report Reference No..... :	**RR-EVE-21D571-3A**
Test procedure. ..... :	FCC IC Certification
Diffusion..... :	Mr DORE
Applicant's name. ..... :	WATTS ELECTRONICS FRANCE
Date of issue..... :	June 28, 2022
Total number of pages..... :	38
Revision. ..... :	0
Modified page(s)..... :	Creation
Compiled by..... :	Alexis TOUZET
Approved by (+ signature). ..... :	Olivier HEYER (Laboratory Manager)

Duplication of this test report is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above. This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

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REVISION HISTORY:

Revision	Date	Modified pages	Modifications
0	June 28, 2022	/	Creation

1. GENERAL INFORMATIONS

This document submits the results of Radio tests performed on the equipment **Wireless temperature/humidity Sensor A3800169 – P07146 / T-169 NA** (denominated hereafter E.U.T.: equipment under test) according to document(s) listed in §2 of this test report.

TESTING PROCEDURE AND TESTING LOCATION:	
Testing Location..... :	EMITECH MONTPELLIER laboratory
Address. ..... :	145 rue de Massacan 34740 VENDARGUES FRANCE
Test procedure. ..... :	FCC IC Certification
Tested by..... :	Alexis TOUZET & Morgan PATEY
Test supervisor..... :	None
Date of receipt of test item ..... :	N/A
Date (s) of performance of tests..... :	From July the 06th to the 08th of 2021

APPLICANT'S GENERAL INFORMATIONS:	
Company name..... :	WATTS ELECTRONICS FRANCE for UPONOR Inc.
Company address. ..... :	5925 148th Street West APPLE VALLEY 55124 MINNESOTA - USA
Person(s) present during the tests. ..... :	Mr DESGRANGES
Responsible..... :	Mr DORE

GENERAL REMARKS:

The information in italics is declared by the manufacturer and is under his responsibility
The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report the decimal separator is point.

POSSIBLE TEST CASE VERDICTS:	
Test case does not apply to the test object.:	N/A
Test case not performed..... :	N/P
Test object does meet the requirement..... :	P (Pass)
Test object does not meet the requirement. ..... :	F (Fail)

DEFINITIONS AND ABBREVIATIONS:

E.U.T.	Equipement under test	AE	Ancillary equipment	Pk	Peak detector
RBW	Resolution bandwidth	VBW	Video bandwidth	QP	Quasi-peak detector
OATS	Open area test site	FAR	Full anechoic room	Av	Average detector
VP	Vertical Polarization	HP	Horizontal Polarization	RMS	Root Mean Square
RF	Radio frequency	NTR	Nothing to report	N/C	Not communicated

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:
The following referenced documents are necessary for the application of the present test report. **FCC 47 CRF part 15: April, 2020** Code of federal regulations. Title 47- Telecommunication Chapter 1- Federal Communication Commission. Part 15- Radio frequency devices Subpart B- Unintentional Radiators. Limits and methods of measurement of radio disturbance. Characteristic of information technology equipment. **FCC 47 CRF part 15.249** Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz. **RSS-210, issue 10, April 2020** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence Exempt Local Area Network (LE-LAN) Devices **RSS/CNR-Gen, Issue 5, March 2019** Exigences générales et information relatives à la certification du matériel de radiocommunication **ANSI C 63.10:2013** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices **ANSI C 63.4:2014** American National Standard for Methods of measurement of Radio-Noise from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz Although the product standard uses obsolete technical standards, the latest versions of standards achievable by the laboratory will be used for testing.
INFORMATIVE REFERENCES:
The following referenced documents are not necessary for the application of the present test report but they assist the user with regard to a particular subject area.

3. EQUIPMENT TECHNICAL DESCRIPTION

3.1. Test Conditions

Test item description. ..... :	Wireless temperature/humidity Sensor
Model/Type reference..... :	P08172 / A3800169 (P07146 / T-169 NA)
FCC ID..... :	V9MSM4NA0
IC. ..... :	7664A-SM4NA0
Trade Mark. ..... :	UPONOR
Serial number (S/N)..... :	Not communicated
Part number (P/N). ..... :	Not communicated
Software version..... :	*VE.B*
Firmware version. ..... :	*PRG1393_VEB*
Type of sample. ..... :	Pre-serial
Function(s)..... :	EUT is a wireless single room temperature/humidity Sensor used for temperature regulation in home application for heating/cooling system.
Manufacturer name. ..... :	WATTS ELECTRONICS FRANCE
Address. ..... :	ZA des Tourettes BP 10 43800 ROSIERES FRANCE

General product information:

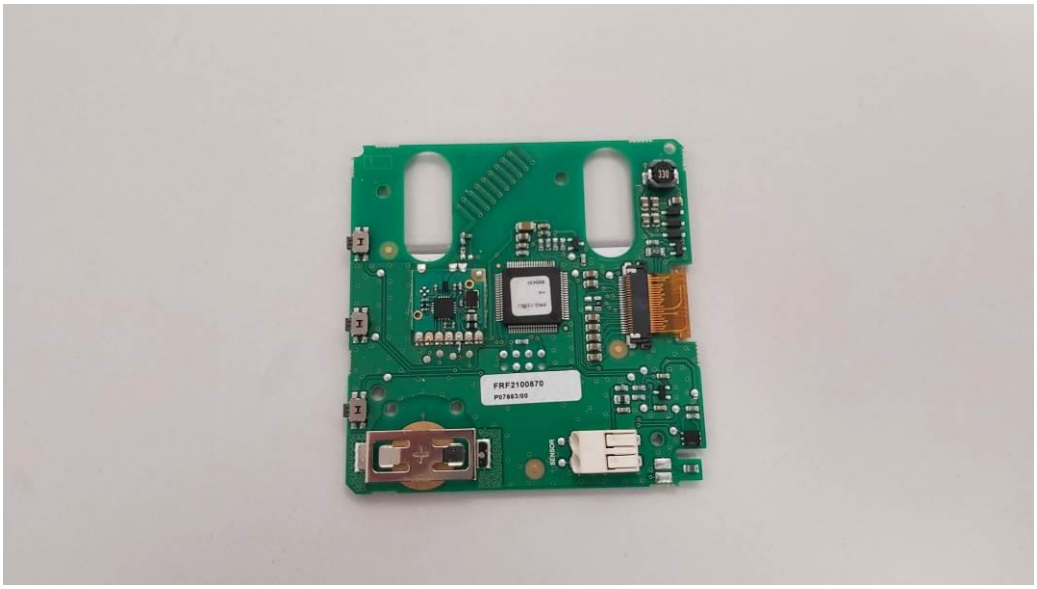
N/A

3.2. EUT Marking plate

During tests, the EUT did not have its marking plate.

3.3. EUT General view

3.4. EUT Internal view



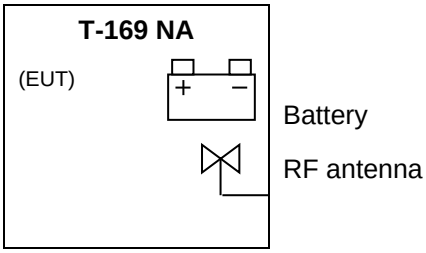
3.5. EUT Mechanical and Electrical Design

Power supply. ..... : *3.6VDC*
Power supply range..... : *Not communicated*
Power type..... : *Battery*
Power (W)..... : *Not communicated*
Nominal current (A). ..... : *Not communicated*
Dimensions (L x W x H) (m). ..... : *0.08 x 0.08 x 0.008*
Weight (kg). ..... : *0.15*
Temperature range (°C). ..... : *0°C to +45°C*
Ground bounding strap..... : *No*

Comments:

N/A

3.6. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	N/A
1	Battery	DC	N/A	N/A	3.6VDC
2	RF antenna	RF	N/A	N/A	912 MHz

AC/DC : AC/DC Converter port
I/O .....: Input or Output port
N/E .....: Non Electrical port
AC..... : Alternative current port
TP ..... : Telecommunication port
DC..... : Discontinuous current port
RF ..... : Radio frequency port

3.7. EUT Radio Specifications

a) General Informations
According to manufacturer's declarations : EUT type..... : *Transceiver* Technology ..... : *SRD* Environmental profile..... : *Data transmissions* Temperature range..... : *0°C to +45°C* Antenna type ..... : *Internal* Antenna Gain..... : *Not communicated* **Comments:** *N/A*
b) Transmitter Parameters (Tx)
Frequency bands..... : *902 MHz to 928 MHz* RF Power..... : *12 dBm (max)* Number of channels / Separation..... : *1 channel* Modulation type ..... : *GFSK* Duty cycle ..... : *< 0.1%* Tested frequency..... : *912 MHz*
c) Receiver Parameters (Rx)
Frequency bands..... : *902 MHz to 928 MHz* Bandwidth..... : *100 kHz*

4. OPINION(S) AND INTERPRETATION(S)

Test(s) performed	Deviation(s) to test method(s)
FCC part 15.249, RSS-210	N/A
FCC part 15.109, 15.209, 15.205, 15.215, 15.249 RSS-210, CNR Gen	N/A
FCC part 15.109, 15.209, 15.205, 15.215 RSS-210, CNR Gen	N/A
FCC part 15 Radio part 15.215 c) and RSS Gen	N/A
ANSI C63.4: 2014	N/A
ANSI C63.10: 2013	N/A

Comments: N/A

5. RESULT SUMMARY

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
SUBPART A - GENERAL			
Labeling requirements		N/P	15.19 / See certification documents
Information to user		N/P	15.21 / See certification documents
Home-built devices		N/A	15.23
Kits		N/A	15.25
Special Accessories		N/A	15.27
Inspection by the Commission		N/A	15.29
Measurement standards		PASS	15.31
Test procedure for CPU boards and computer power supplies		N/A	15.32
Frequency range of radiated measurements		PASS	15.33
Measurement detector functions and bandwidths		PASS	15.35
Transition provisions for compliance with the rules		N/P	15.37 / See certification documents
SUBPART B – UNINTENTIONAL RADIATORS			
Equipment authorization			15.101
- Verification		N/P	
- Declaration of Conformity		N/P	
CPU boards and power supplies used in personal computers		N/A	15.102
Exempted device		N/A	15.103
Information to the user		N/P	15.105 / See certification documents
Conducted limits		N/A	15.107 / Battery powered equipment
Radiated emission limits	Class B	PASS	15.109
Antenna power conduction limits for receivers		N/A	15.111
Power line carrier systems		N/A	15.113
TV interface devices, including cable system terminal devices		N/A	15.115
TV broadcast receivers		N/A	15.117
Cable ready consumer electronics equipment		N/A	15.118
Program blocking technology requirements for TV receivers		N/A	15.120
Scanning receivers and frequency converters used with scanning receivers		N/A	15.121

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
Labeling of digital cable ready products		**N/A**	**15.123**
SUBPART C –INTENTIONAL RADIATORS			
Equipment authorization requirement		**PASS**	**15.201 / Transmitter part is subject to Certification procedure**
Certified operating frequency range		**N/A**	**15.202**
Antenna requirement		**PASS**	**15.203 / Antenna gain limitation to 6dBi**
External radio frequency power amplifiers and antenna modifications		**N/A**	**15.204**
Restricted bands of operation		**PASS**	**15.205**
Conducted limits		**N/A**	**15.207 / Battery powered equipment**
Radiated emission limits; general requirements	**Class B**	**PASS**	**15.209**
Tunnel radio systems		**N/A**	**15.211**
Modular transmitters		**N/A**	**15.212**
Cable locating equipment		**N/A**	**15.213**
Cordless telephones		**N/A**	**15.214**
Additional provisions to the general radiated emission limits		**PASS**	**15.215**
Operation within the band 902-928MHz, 2400-2483.5MHz, 5725-5850MHz, and 24.0-24.25GHz			**15.249**
- **Field strength of fundamental**		**PASS**	**a)**
- **Point to point system**		**N/A**	**b)**
- Field strength in the band		N/A	b) (1)
- Frequency tolerance of the carrier signal		N/A	b) (2)
- Antenna gain		N/A	b) (3)
- **Field strength limits**		**PASS**	**c)**
- **Emissions radiated outside of the specified frequency bands**		**PASS**	**d)**
- **Field strength limits for frequencies above 1000 MHz**		**PASS**	**e)**

Sample subject to the test complies for tests done with the requirements of the reference document(s) listed in §2 of this test report and, where applicable, with deviation(s) specified in this document.

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the results with the exception of emission tests based on CISPR standards.

TEST(S) PERFORMED	MODIFICATION(S)
FCC part 15.249, RSS-210	N/A
FCC part 15.109, 15.209, 15.205, 15.215, 15.249 RSS-210, CNR Gen	N/A
FCC part 15.109, 15.209, 15.205, 15.215 RSS-210, CNR Gen	N/A
FCC part 15 Radio part 15.215 c) and RSS Gen	N/A
ANSI C63.4: 2014	N/A
ANSI C63.10: 2013	N/A

6. MEASUREMENT UNCERTAINTY

PARAMETER	MAXIMAL EMITECH UNCERTAINTY	MINIMAL STANDARD UNCERTAINTY
Radio frequency	± 1 x 10^{-7}	±1 x 10^{-7}
RF power, conducted		
RF power	± 0.8dB	± 1 dB
Power spectral density	± 2.3dB	± 3 dB
Occuped bandwidth		
RF power	± 3.8 %	± 5 %
Conducted emission (spurious)		
f ≤ 1 GHz	± 0.8 dB	± 3 dB
1 GHz - 12.75 GHz	± 1.6 dB	
Radiated emission (ERP / EIRP)		
f ≤ 62.5 MHz	± 5.1 dB	± 6 dB
62.5 MHz - 1 GHz	± 5.1 dB	± 6 dB
1 GHz - 18 GHz	± 5.2 dB	± 6 dB
18 GHz – 26 GHz	± 5.1 dB	± 6 dB
26 GHz – 40 GHz	± 5.4 dB	± 6 dB
EIRP and power spectral density with diode	± 5.2 dB	± 6 dB
Radiated emission (magnetic field)		
9kHz – 30MHz	± 3 dB	± 6 dB
Supply voltages	± 3 %	± 3 %
Temperature	± 1 °C	± 1°C
Humidity	± 5 %	± 5 %
Time / Duty cycle	± 4.4 %	± 5 %
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	± 2.7 dB	/
30MHz – 1GHz	± 5.0 dB	/
1GHz – 18GHz	± 5.6 dB	/
18GHz – 26GHz	± 5.7 dB	/
26GHz – 40GHz	± 5.7 dB	/

For the calculation of expanded uncertainty, the confidence interval is 95 % (k=2).

7. RF EXPOSURE

Maximum field strength level at 3 meters is 90.90dBµV/m
Based on formula E(dBuV/m) = P(dBm EIRP) + 95.2 to onvert a peak field strength level at 3 meters
EIRP = -4.30dBm (0.371 mW) at 912MHz

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:
PSD= EIRP/(4*π*R2)=0.371/(4*π*(20 cm)²)= 0.000074 mW/cm²
Limit= 1 mW/cm²

In accordance with RSS-102, Issue 5, Section 2.5.2., as EIRP is lower than 1.38W at 912 MHz, routine evaluation exemption of RF exposure for ISED can be considered for a distance > 20cm.

8. TEST CONDITIONS AND RESULTS

8.1. Radiated emission limits

Reference standard:	FCC part 15 Radio part 15.249 and RSS-210
Test method:	ANSI C63.4 : 2014 ANSI C63.10 : 2013

Test description for measurement below 30MHz : Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation**.**

EUT is set on an insulating support at 80cm above the ground reference plane.

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter in a anechoic chamber. The EUT was rotated 360°in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°).

Final measurements (quasi-peak) were then performed in a 10-meter Open Area Test Site that complies to CISPR 16 in the same measurement conditions.

All frequencies were investigated, where applicable.

Test description for measurement above 30MHz : EUT is set on an insulating support at 80(f<1GHz), 150cm(f>1GHz)cm above the ground reference plane.

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities.

Final measurements (quasi-peak or average) were then performed in a semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. The EUT was rotated 360° about its azimuth and adjusting the receive antenna height from 1 to 4 m.

All frequencies were investigated, where applicable.

For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Radiated measurement / 0°	9kHz-30MHz	15.209	EMI5021	**PASS**
Radiated measurement / 45°	9kHz-30MHz	15.209	EMI5022	**PASS**
Radiated measurement / 90°	9kHz-30MHz	15.209	EMI5023	**PASS**
Radiated measurement / Tx mode / For Freq < 1GHz	30MHz-1GHz	15.209	EMI4818	**PASS**
Radiated measurement / Tx mode / For Freq >1GHz	1GHz-10GHz	15.209	EMI5011	**PASS**
Radiated measurement / Rx mode / For Freq < 1GHz	30MHz-1GHz	15.109 Class B	EMI4987	**PASS**
Radiated measurement / Rx mode / For Freq >1GHz	1GHz-10GHz	15.109 Class B	EMI5012	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
Test method deviation: N/A		
Supplementary information: Limit indicated on measurement curves below 30MHz is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HFH2-Z2	5825	24/04/2020	24/06/2022
Antenna	ETS-Lindgren	3117	5456	24/07/2019	24/09/2022
Antenna	Electro Metrics	BIA-30HF	1107	13/06/2018	13/08/2021
Antenna	Rohde & Schwarz	HL223	1137	13/06/2018	13/08/2021
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Cable	MegaPhase	F135N1N28	16667	25/10/2019	25/12/2021
Cable	MegaPhase	F135N1N28	16668	25/10/2019	25/12/2021
Cable	/	N-1m	3625	27/01/2021	27/03/2023
Cable	SUCOFLEX	N-3m	14378	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-3m	14379	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-5,5m	14381	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-6,5m	14380	25/07/2019	25/09/2021
Cable	MegaPhase	N-8m	15813	14/01/2021	14/03/2023
Cable	Huber + Suhner	SF102K	16042	24/03/2021	24/05/2023
Cable	MegaPhase	TM18-N1N1-118	12841	14/08/2020	14/10/2022
Filter	Micro-Tronics	HPM18865	12843	09/06/2018	09/08/2021
Filter	Wainwright Instruments	WTRCTV5-700-1000-20-60	12838	27/06/2018	27/08/2021
Preamplifier	IMPULSE	CA118-546ACN	9169	13/01/2021	13/03/2022
Receiver	Rohde & Schwarz	ESW26	17791	14/04/2021	14/06/2022
Receiver	Rohde & Schwarz	FSW43	14830	29/07/2020	29/09/2021
Shielded enclosure	RAY PROOF	C.V2	1423	04/10/2019	04/12/2022
Shielded enclosure	COMTEST	SAC 3m	14494	02/10/2019	02/12/2022
Software	Nexio		0000		
Thermohygrometer	Testo	608-H1	7562	09/06/2021	09/08/2023
Thermohygrometer	Testo	608-H2	12269	07/05/2020	07/07/2022
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023

BAT-EMC software version : V3.18.0.26 Blank cells = Permanent validity

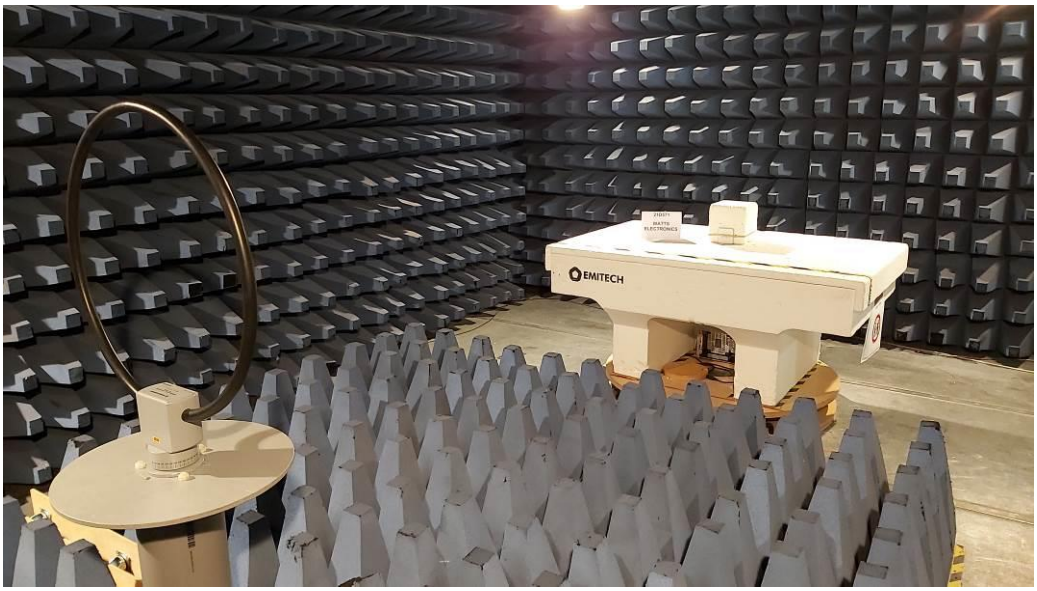
TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES < 30MHZ - TABULATED RESULTS			
Frequency (MHz)	**Antenna Position**	**Level (dBµA/m)**	**Limit (dBµA/m)**
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES > 30MHZ - TABULATED RESULTS					
RADIATED MEASUREMENT / FOR FREQ <1GHZ					
Frequency MHz	**Polarization**	**Peak level dBµV/m**	**Avg level dBµV/m**	**Avg Limit dBµV/m**	**Margin dB**
N/A	N/A	N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.					

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - TABULATED RESULTS					
RADIATED MEASUREMENT / TX MODE / FOR FREQ >1GHZ				EMI5011	
Frequency MHz	**Polarization**	**Peak level dBµV/m**	**Avg level dBµV/m**	**Avg Limit dBµV/m**	**Margin dB**
3647.97	Vertical	47.897	46.245	54.00	-7.755
4559.43	Vertical	49.205	47.966	54.00	-6.034
5472.09	Vertical	52.081	50.856	54.00	-3.144
5471.49	Horizontal	54.117	53.365	54.00	-0.635

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - TABULATED RESULTS					
RADIATED MEASUREMENT / RX MODE / FOR FREQ >1GHZ				EMI5012	
Frequency MHz	**Polarization**	**Peak level dBµV/m**	**Avg level dBµV/m**	**Avg Limit dBµV/m**	**Margin dB**
547.89	Horizontal	51.078	51.316	54.00	-2.684

TEST SETUP PHOTO(S) - RADIATED MEASUREMENT

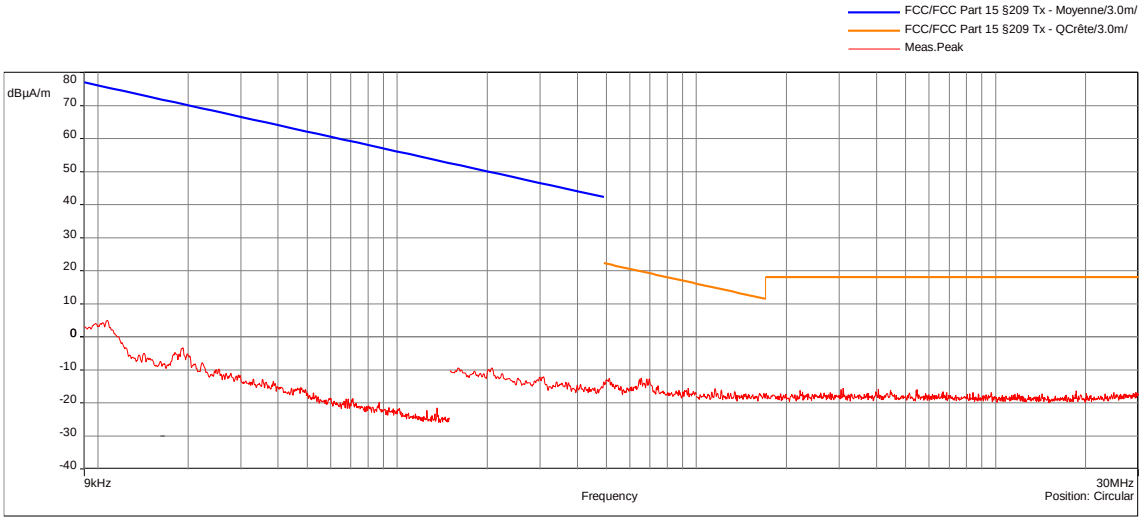
TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / FOR FREQ <30MHZ


TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / 30MHZ TO 200MHZ

TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / 200MHZ TO 1GHZ

TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / FOR FREQ >1GHZ

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - GRAPH			
RADIATED MEASUREMENT / 0°		EMI5021	
EUT mode:	Tx & Rx mode	**T (°C):**	25.6
Test Date:	08/07/2021	**H (%):**	46.0
Test Operator:	ATO	**P (hPa):**	1010

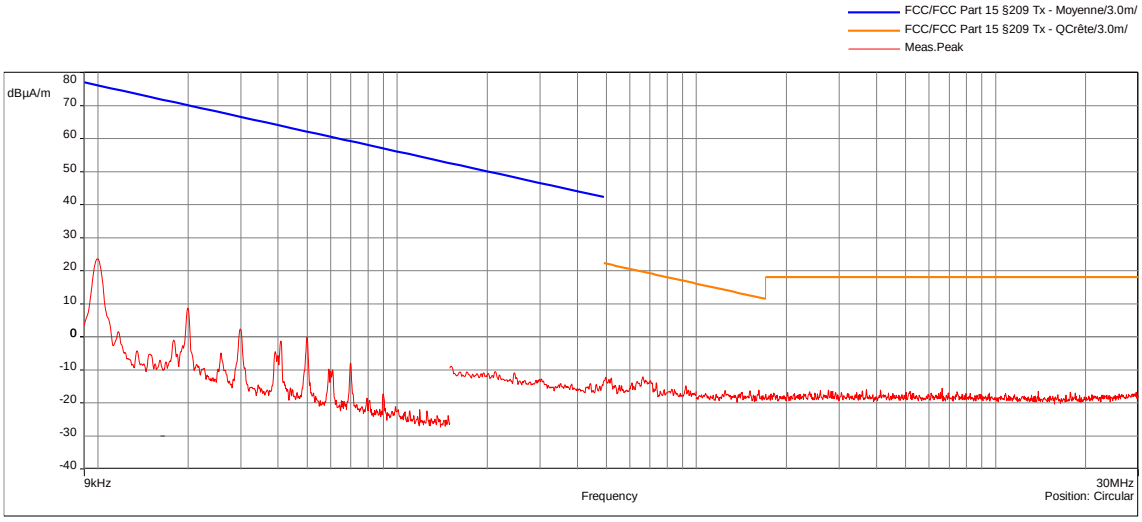


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak
Configuration:	N/A			
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			

EUT modification(s): N/A

No spurious emissions were detected.

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - GRAPH			
RADIATED MEASUREMENT / 45°		EMI5022	
EUT mode:	Tx mode	**T (°C):**	25.6
Test Date:	08/07/2021	**H (%):**	46.0
Test Operator:	ATO	**P (hPa):**	1010

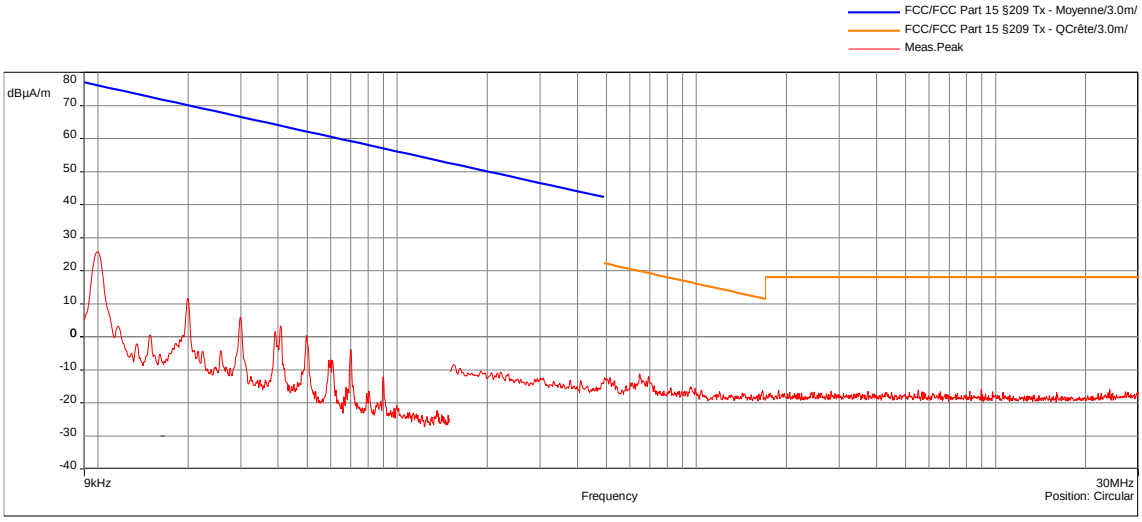


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak
Configuration:	N/A			
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			

EUT modification(s): N/A

No spurious emissions were detected.

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - GRAPH			
RADIATED MEASUREMENT / 90°		EMI5023	
EUT mode:	Tx mode	**T (°C):**	25.6
Test Date:	08/07/2021	**H (%):**	46.0
Test Operator:	ATO	**P (hPa):**	1010

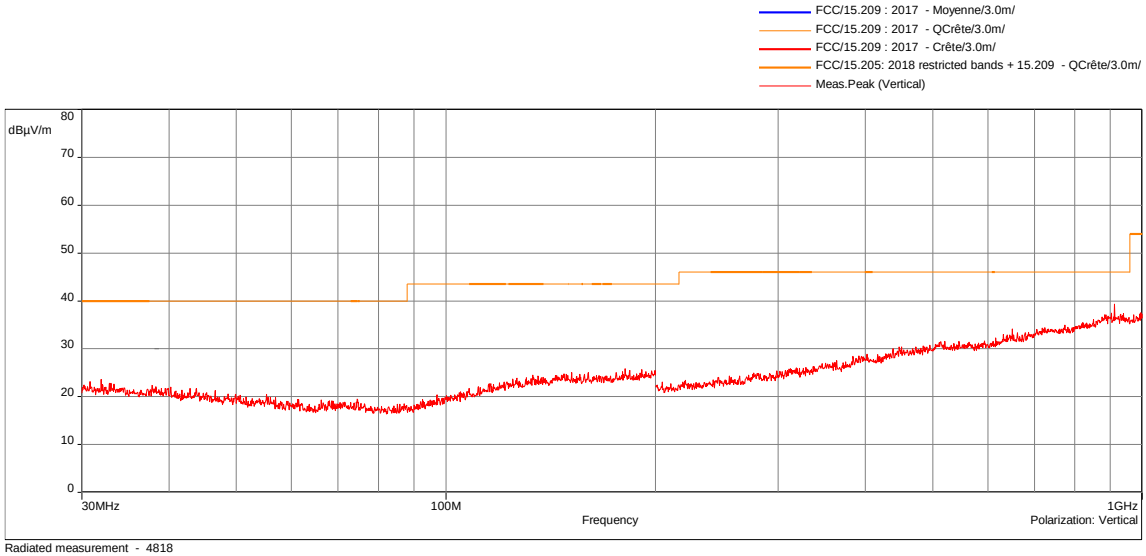


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak
Configuration:	N/A			
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			

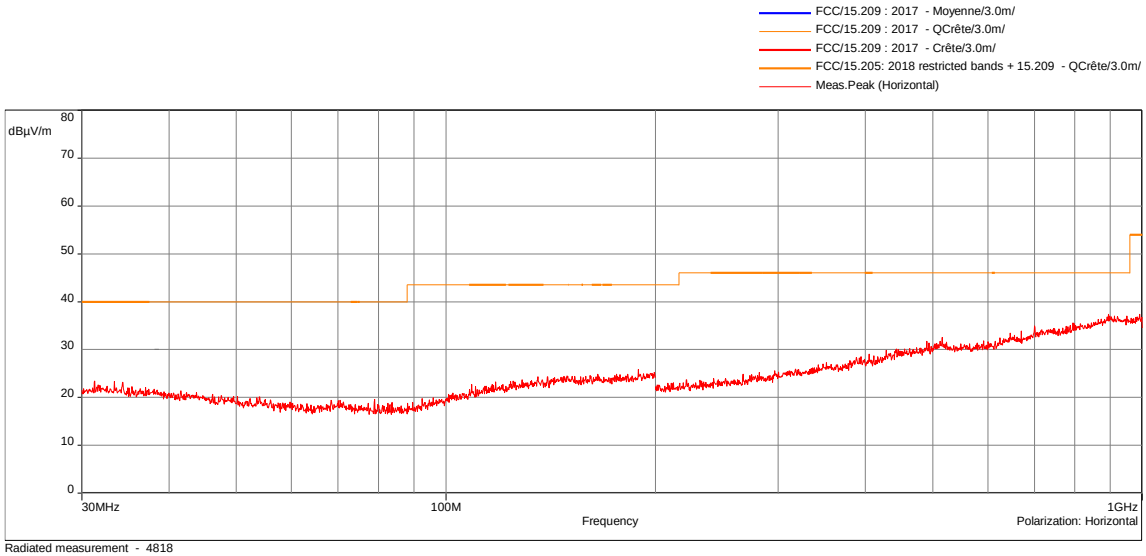
EUT modification(s): N/A

No spurious emissions were detected.

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - GRAPH			
RADIATED MEASUREMENT / TX MODE / FOR FREQ < 1GHZ		EMI4818	
EUT mode:	Tx mode	**T (°C):**	23.0
Test Date:	06/07/2021	**H (%):**	74.1
Test Operator:	ATO	**P (hPa):**	1009



Radiated measurement - 4818

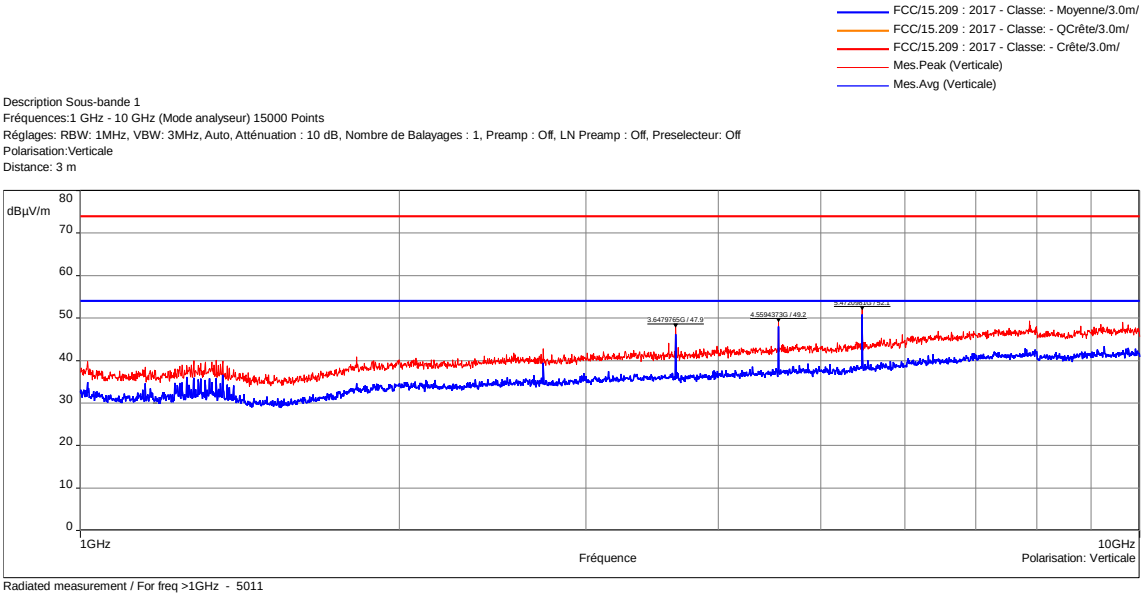


Radiated measurement - 4818

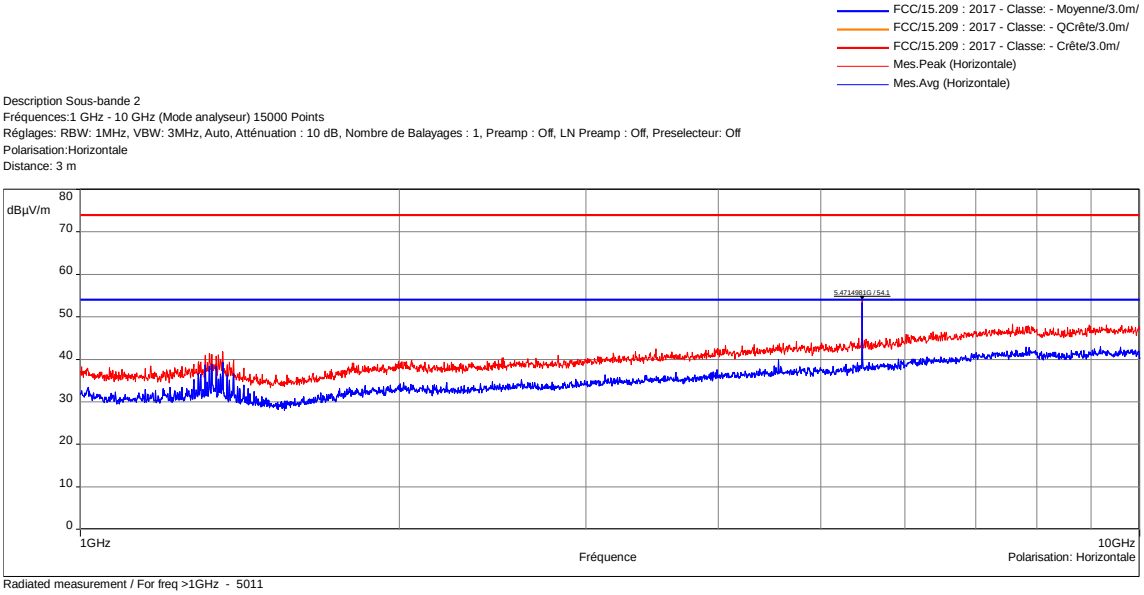
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Vertical	200MHz-1GHz	100kHz	300kHz	Peak
Horizontal	200MHz-1GHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

No spurious emissions were detected.

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - GRAPH			
RADIATED MEASUREMENT / TX MODE / FOR FREQ >1GHZ		EMI5011	
EUT mode:	Tx mode	**T (°C):**	29.0
Test Date:	07/07/2021	**H (%):**	57.5
Test Operator:	ATO	**P (hPa):**	1004



Radiated measurement / For freq >1GHz - 5011

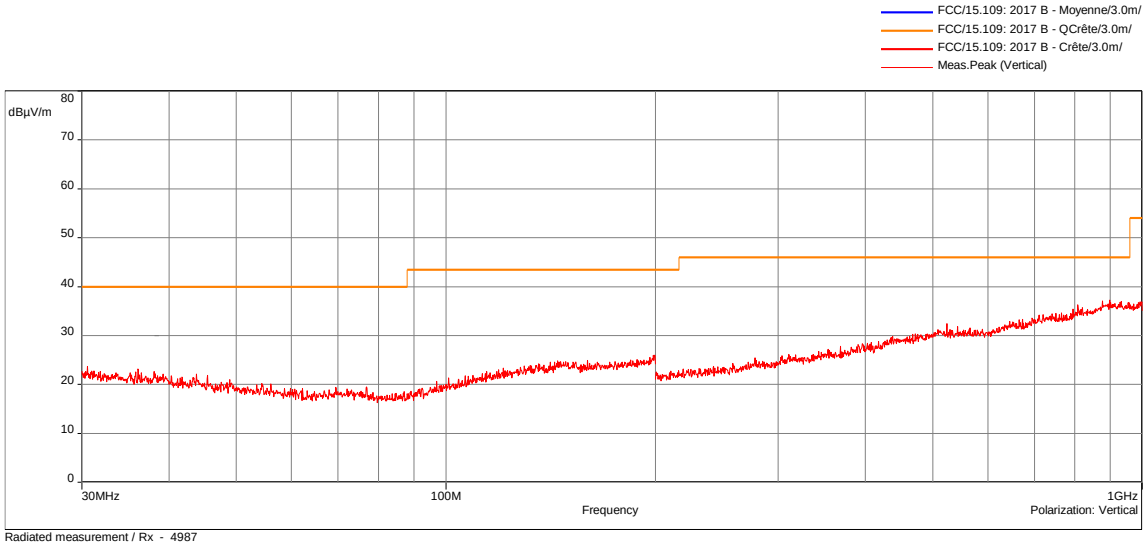


Radiated measurement / For freq >1GHz - 5011

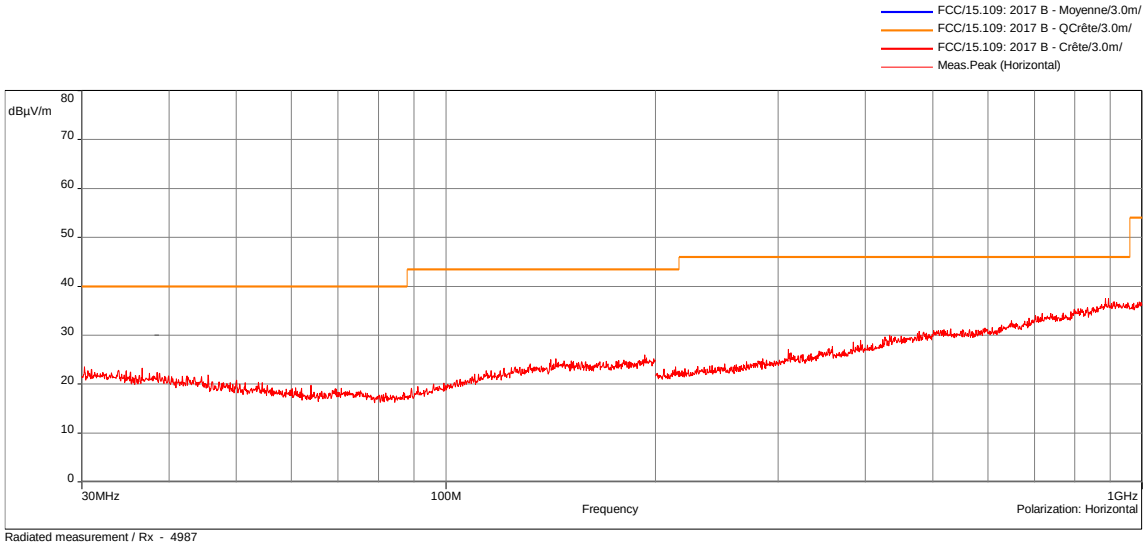
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	1GHz-10GHz	1MHz	3MHz	Peak / Avg
Horizontal	1GHz-10GHz	1MHz	3MHz	Peak / Avg
Configuration:	N/A			
Comments:	N/A			

EUT modification(s): N/A

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - GRAPH			
RADIATED MEASUREMENT / RX MODE / FOR FREQ < 1GHZ		EMI4987	
EUT mode:	Rx mode	**T (°C):**	22.6
Test Date:	07/07/2021	**H (%):**	67.9
Test Operator:	ATO	**P (hPa):**	1004



Radiated measurement / Rx - 4987

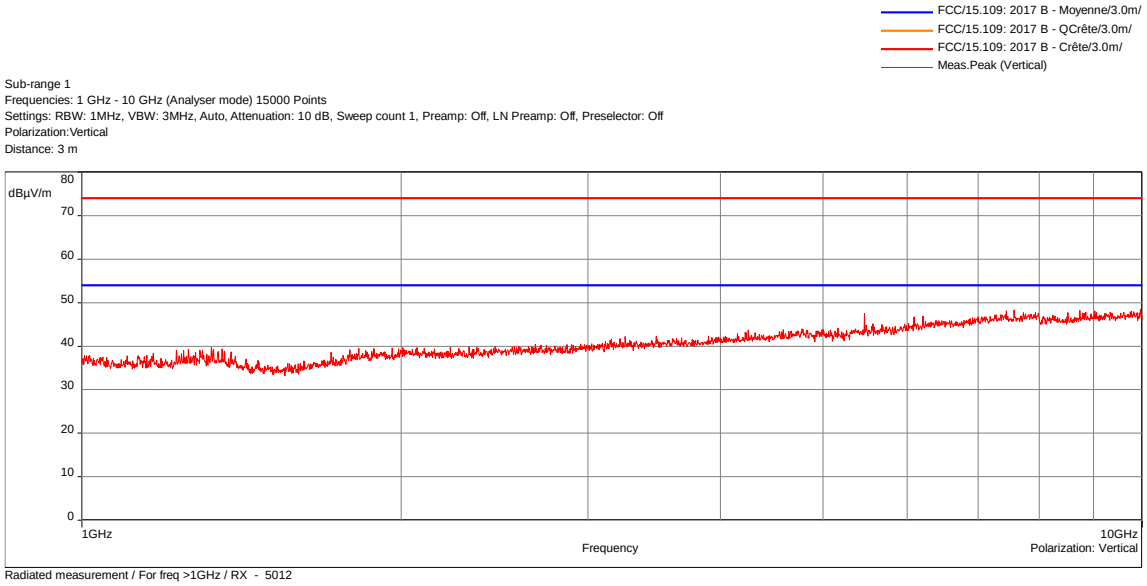


Radiated measurement / Rx - 4987

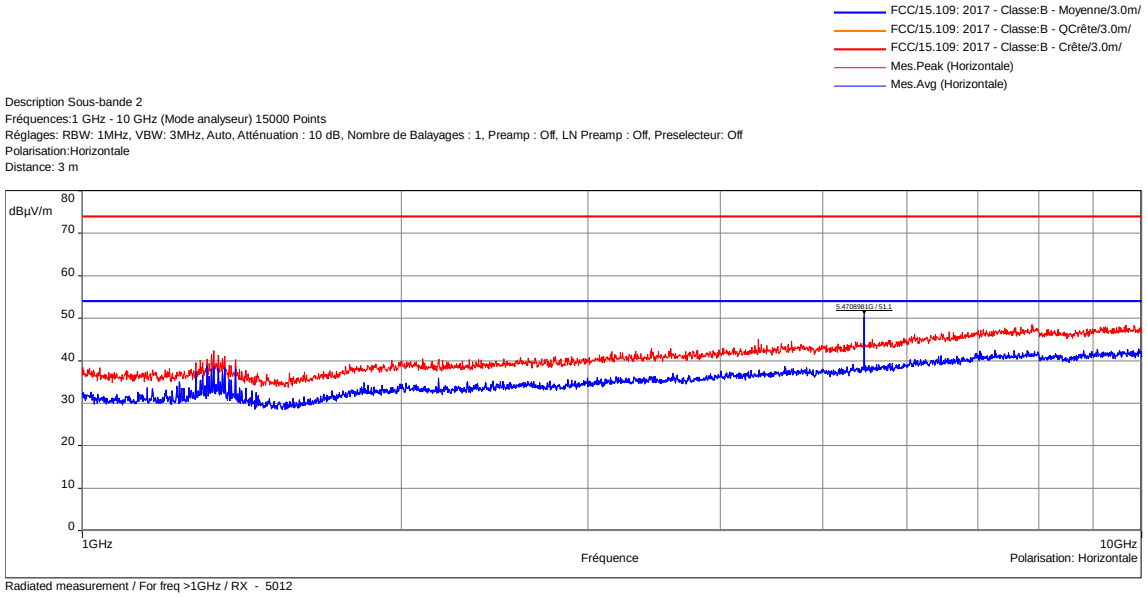
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Vertical	200MHz-1GHz	100kHz	300kHz	Peak
Horizontal	200MHz-1GHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

No spurious emissions were detected.

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - GRAPH			
RADIATED MEASUREMENT / RX MODE / FOR FREQ >1GHZ		EMI5012	
EUT mode:	Rx mode	**T (°C):**	29.0
Test Date:	07/07/2021	**H (%):**	57.5
Test Operator:	ATO	**P (hPa):**	1004



Radiated measurement / For freq >1GHz / RX - 5012



Radiated measurement / For freq >1GHz / RX - 5012

POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	1GHz-10GHz	1MHz	3MHz	Peak
Horizontal	1GHz-10GHz	1MHz	3MHz	Peak / AVG
Configuration:	N/A			
Comments:	N/A			

EUT modification(s): N/A

8.2. Band-edge compliance

Reference standard:	FCC part 15 Radio part 15.249 and RSS-210
Test method:	FCC part 15.249 subclause d) and RSS-210

Test description: d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT is set on an insulating support at 80cm above the ground reference plane (150cm for f >1GHz).

Masurements were performed in a semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. The EUT was rotated 360° about its azimuth and adjusting the receive antenna height from 1 to 4 m.

For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Radiated measurement / Band Edge	876MHz-954MHz	15.249	EMI5009	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
TEST METHOD DEVIATION: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Cable	SUCOFLEX	N-3m	14378	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-5,5m	14381	25/06/2019	25/08/2021
Cable	Huber + Suhner	SF102K	16042	24/03/2021	24/05/2023
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Receiver	Rohde & Schwarz	FSW43	14830	29/07/2020	29/09/2021
Shielded enclosure	RAY PROOF	C.V2	1423	04/10/2019	04/12/2022
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023
Thermohygrometer	Testo	608-H1	7562	09/06/2021	09/08/2023

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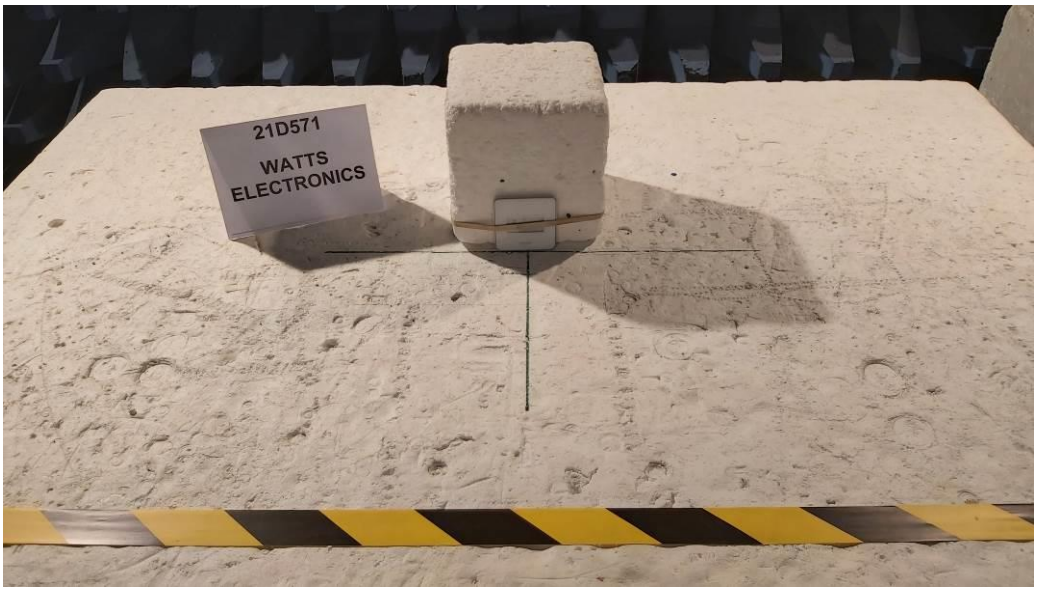
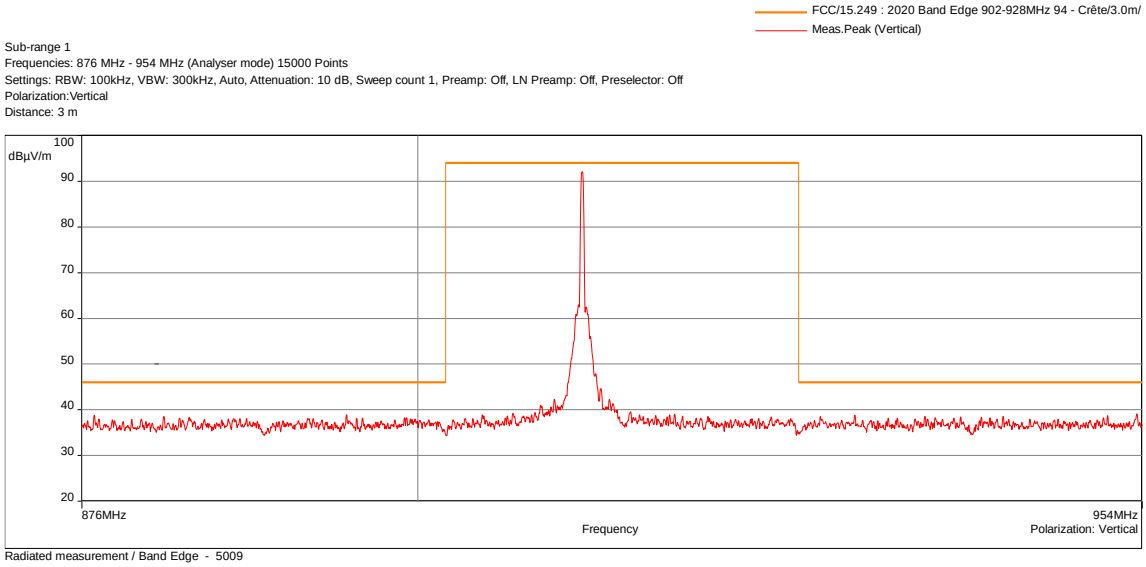
BAND-EDGE COMPLIANCE- TABULATED RESULTS			
RADIATED MEASUREMENT / BAND EDGE			EMI5009
Frequency (MHz)	Polarization	Level (dBµV/m)	Limit (dBµ/m)
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			

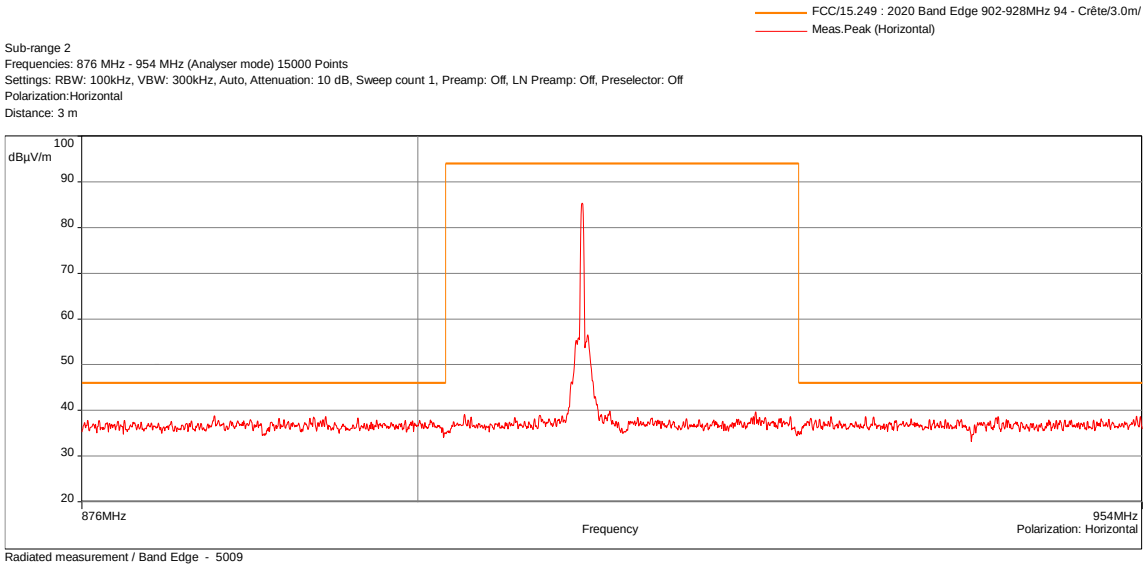
TEST SETUP PHOTO(S)



TEST SETUP PHOTO(S)

BAND-EDGE COMPLIANCE - GRAPH			
RADIATED MEASUREMENT / BAND EDGE		EMI5009	
EUT mode:	Tx mode	**T (°C):**	26.8
Test Date:	07/07/2021	**H (%):**	57.4
Test Operator:	ATO	**P (hPa):**	1005





POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	876MHz-954MHz	100kHz	300kHz	Peak
Horizontal	876MHz-954MHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

No spurious emissions were detected.

8.3. Field strength of fundamental

Reference standard:	FCC part 15 Radio part 15.249 and RSS-210
Test method:	FCC part 15.249, RSS-210

General test setup: EUT is set on an insulating support at 80cm above the ground reference plane.

Measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights (1m to 4m) in horizontal and vertical polarities.

For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Radiated Output Power	911.75MHz-912.25MHz	50 mV/m (93.98 dBµV/m)	EMI5000	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
TEST METHOD DEVIATION: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Cable	MegaPhase	TM18-N1N1-118	12842	02/12/2020	02/02/2023
Cable	SUCOFLEX	N-6,5m	14380	25/07/2019	25/09/2021
Cable	MegaPhase	N-8m	15813	14/01/2021	14/03/2023
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Receiver	Rohde & Schwarz	ESW26	17791	14/04/2021	14/06/2022
Shielded enclosure	COMTEST	SAC 3m	14494	02/10/2019	02/12/2022
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023
Thermohygrometer	Testo	608-H2	12269	07/05/2020	07/07/2022

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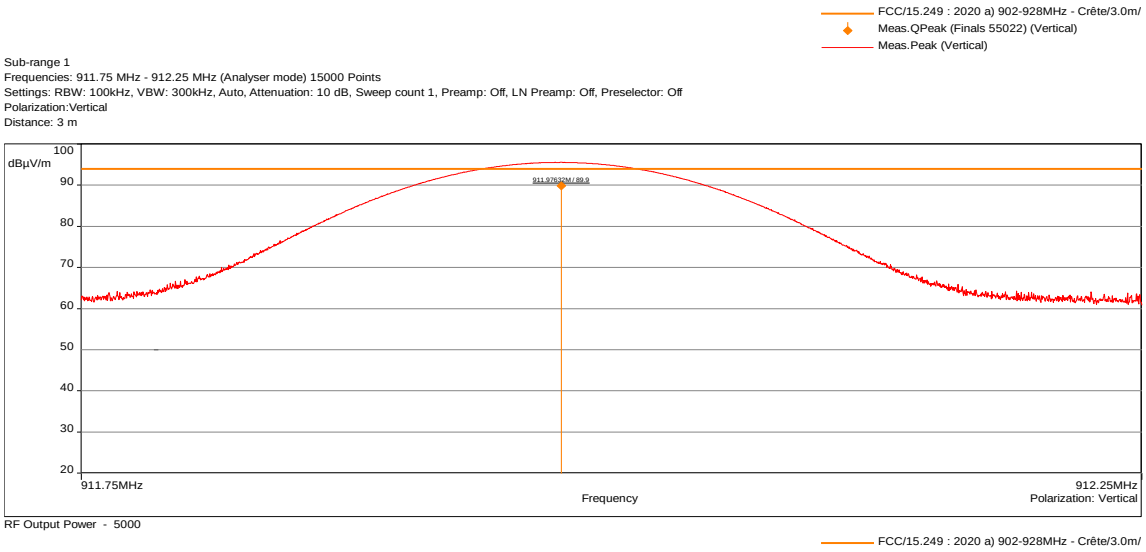
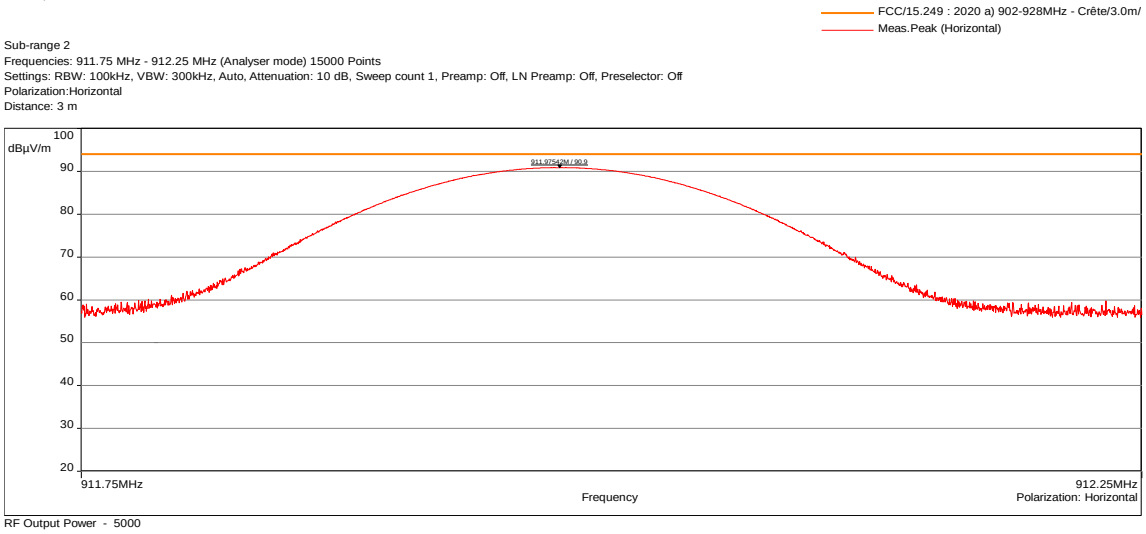
TEST SETUP PHOTO(S)

TEST SETUP PHOTO(S)

FIELD STRENGTH OF FUNDAMENTAL - GRAPH			
RADIATED OUTPUT POWER		EMI5000	
EUT mode:	Tx mode	**T (°C):**	23.2
Test Date:	07/07/2021	**H (%):**	68.6
Test Operator:	ATO	**P (hPa):**	1004





POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	911.75MHz-912.25MHz	100kHz	300kHz	Peak / QPeak
Horizontal	911.75MHz-912.25MHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

FIELD STRENGTH OF FUNDAMENTAL- TABULATED RESULTS				
RADIATED OUTPUT POWER				EMI5000
Frequency (MHz)	**Polarization**	**Detector**	**Level (dBµV/m)**	**Limit (dBµV/m)**
912.000	Vertical	QPeak	89.90	93.98
912.000	Horizontal	Peak	90.90	93.98

8.4. Occupied Bandwidth

Reference standard:	FCC part 15 Radio part 15.215 c)
Test method:	FCC part 15 Radio part 15.215 c) and RSS Gen
Test description: The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. EUT is connected to the measuring receiver via 50Ω attenuator(s).	

TESTED PARAMETER	OBW	SEVERITY	RESULT TAB.	VERDICT
20dB Bandwidth	79.92 kHz	Flow > 904.6MHz Fhigh < 925.4MHz	EMI5994	**PASS**
99% Bandwidth	70.381 kHz	Flow > 904.6MHz Fhigh < 925.4MHz	EMI5995	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	22.6 °C
Relative Humidity	20 to 75 %	58.3 %
Atmospheric pressure	N/A	1004 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Cable	MegaPhase	TM18-N1N1-118	12842	02/12/2020	02/02/2023
Cable	SUCOFLEX	N-6,5m	14380	25/07/2019	25/09/2021
Cable	MegaPhase	N-8m	15813	14/01/2021	14/03/2023
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Receiver	Rohde & Schwarz	ESW26	17791	14/04/2021	14/06/2022
Shielded enclosure	COMTEST	SAC 3m	14494	02/10/2019	02/12/2022
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023
Thermohygrometer	Testo	608-H2	12269	07/05/2020	07/07/2022

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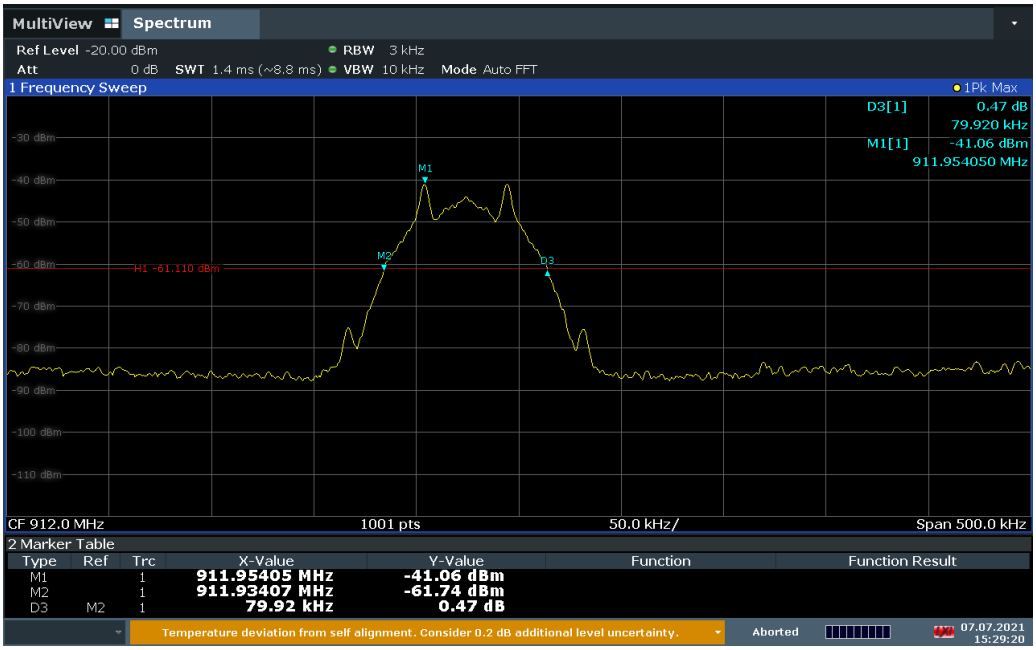
TEST SETUP PHOTO(S)

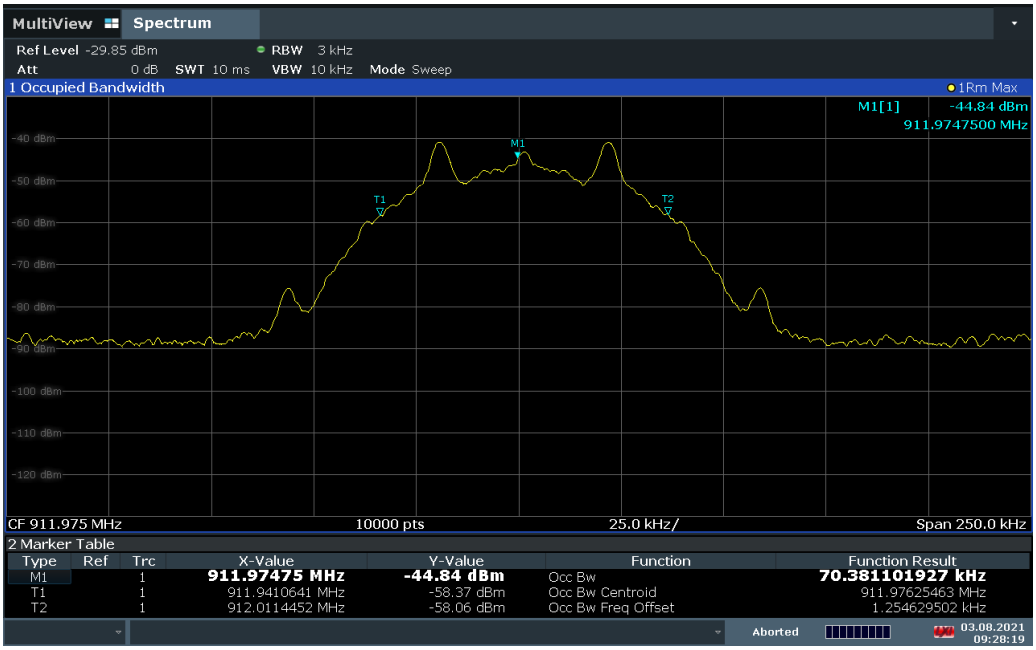
TEST SETUP PHOTO(S)

OCCUPIED BANDWIDTH - GRAPH	
20DB BANDWIDTH	EMI5994
EUT mode:	Tx mode
Test Date:	07/07/2021
Test Operator:	ATO



Results:	OBW = 79.92 kHz		
f_{Low}	f_{High}	20dB Bandwidth (f_{high}-f_{low})	Limit
911.93 MHz	911.95 MHz	79.92 kHz	Flow > 904.6MHz Fhigh < 925.4MHz

OCCUPIED BANDWIDTH - GRAPH	
99% BANDWIDTH	EMI5995
EUT mode:	Tx mode
Test Date:	03/08/2021
Test Operator:	MPA



EUT modification(s): N/A

f_{Low}	f_{High}	99% Bandwidth (f_h-f_l)	Limit
911.941 MHz	912.011 MHz	70.381 kHz	Flow > 904.6MHz Fhigh < 925.4MHz

8.5. Frequency Error

Reference standard:	FCC part 15 Radio part 15.215 c)
Test method:	FCC part 15 Radio part 15.215 c) and RSS Gen

General test setup: The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

EUT is set inside the climatic enclosure. EUT is connected to the measuring receiver via 50Ω attenuator(s).

TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
Normal conditions	Continuous unmodulated Tx	Within 904.6MHz To 925.4MHz	EMI5071	**PASS**
Extremes Temperature conditions	Continuous unmodulated Tx		EMI5072	**PASS**
Extremes Temperature conditions	Continuous unmodulated Tx		EMI5073	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	21.7
Relative Humidity	20 to 75 %	66.4
Atmospheric pressure	N/A	1004
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	EMITECH	3.5 cm	4653		
Cable	C&C	N-3m	14331	18/03/2021	18/05/2023
Cable	Huber + Suhner	SF102K	16042	24/03/2021	24/05/2023
Cable	Radiall	SMA-1m	16564	29/07/2019	29/09/2021
Climatic enclosure	CLIMATS	EXCAL 7714-HA	14261	07/04/2021	07/06/2022
Spectrum analyzer	Rohde & Schwarz	FSW43	14830	29/07/2020	29/09/2021
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023
Thermohygrometer	Testo	608-H2	7611	09/06/2021	09/08/2023
Thermometer contactless	GHM Greisinger	GMH 3710	12968	06/10/2020	06/12/2021

Blank cells = Permanent validity

FREQUENCY ERROR - TABULATED RESULTS					
Test Case	**Temperature (°C)**	**Power supply**	**Frequency (MHz)**	**LIMIT**	**RESULT TAB.**
Normal conditions	25	120Vac/60Hz	911.97193	Within 904.6MHz To 925.4MHz	EMI5071
Extremes Temperature conditions	0	120Vac/60Hz	911.98150		EMI5072
Extremes Temperature conditions	45	120Vac/60Hz	911.96694		EMI5073

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EUT MODIFICATIONS	OPERATOR	TEST DATE	RESULT TAB.
N/A	MPA	04/08/2021	-

End of test report