



Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
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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 actuators for temperature control in home application for heating/cooling system**
Trade Mark. : UPONOR
Manufacturer..... : WATTS ELECTRONICS FRANCE
Model/Type reference..... : P08208 / A3801208 (R-208 NA)
FCC ID..... : V9MSM4NA1
IC : 7664A-SM4NA1
Ratings..... : 120Vac/60Hz

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

Report Reference No. : **RR-EVE-21D571-5A**
Test procedure. : FCC IC Certification
Diffusion..... : Mr DORE
Applicant's name. : WATTS ELECTRONICS FRANCE
Date of issue..... : April 7, 2022
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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:

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0	April 7, 2022	/	Creation

1. GENERAL INFORMATION

This document submits the results of Radio tests performed on the equipment **Wireless actuators for temperature control in domestic applications for heating / cooling system A3801208 – P08208 / R-208 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 6 th to August 4 th of 2021					
APPLICANT'S GENERAL INFORMATION:					
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 <i>italics</i> 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.	Equipment 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

Licence-Exempt Radio Apparatus: Category I Equipment

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 actuators for temperature control in domestic applications for heating / cooling system

Model/Type reference..... : P08208 / A3801208 (R-208 NA)

FCC ID..... : V9MSM4NA1

IC. : 7664A-SM4NA1

Trade Mark. : UPONOR

Serial number (S/N)..... : Not communicated

Part number (P/N). : Not communicated

Software version..... : 414

Firmware version. : Not communicated

Type of sample. : Pre-serial

Function(s)..... : R-208 NA is the antenna part of the BASE part (X-265 – A380265A – P08205) which drives actuators for temperature control in domestic applications for heating / cooling system

Manufacturer name. : WATTS ELECTRONICS FRANCE

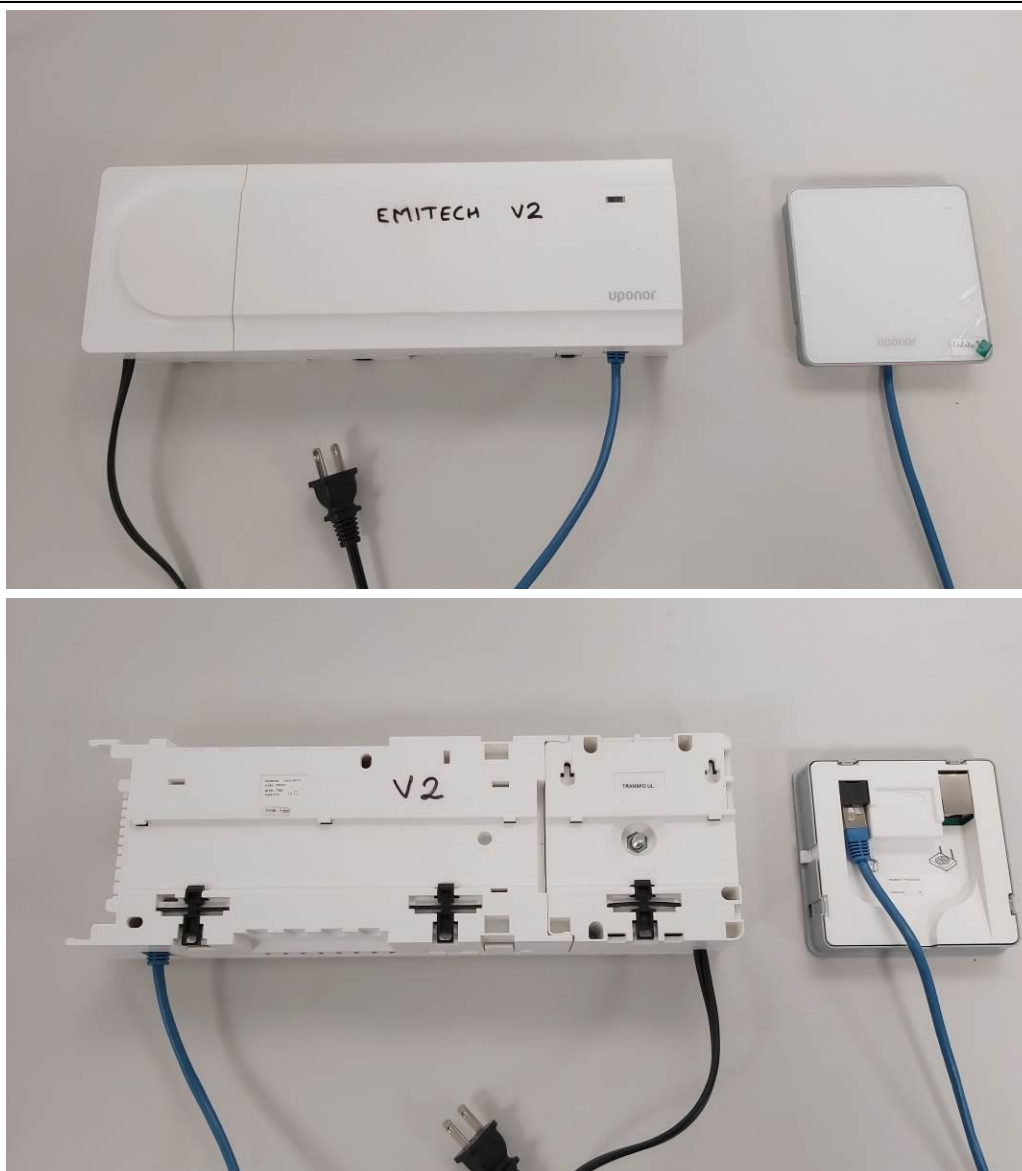
Address. : ZA des Tourettes
BP 10
43800 ROSIERES
FRANCE

General product information:
N/A

3.2. EUT Marking plate

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

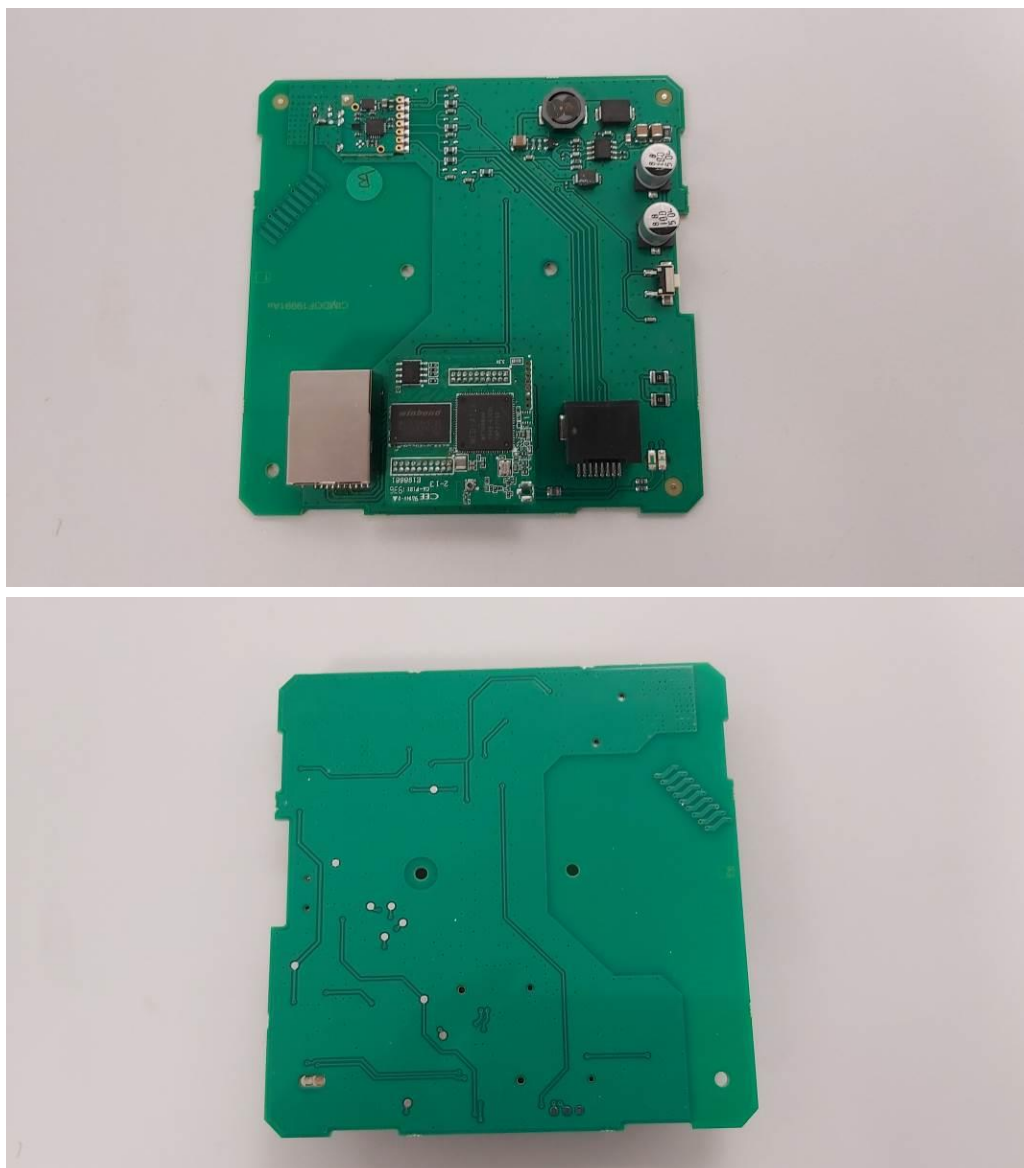
3.3.EUT General view



3.4.EUT Internal view (X-265 – A380265A – P08205)



3.5.EUT Internal view (A3801208 (R-208 NA))



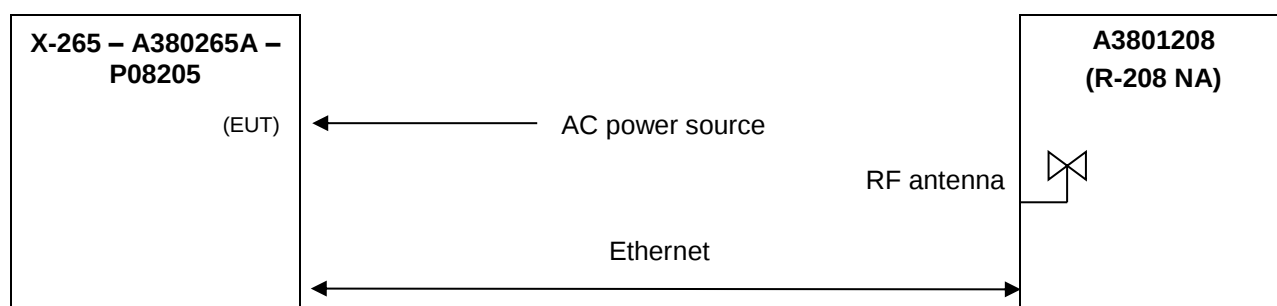
3.6. EUT Mechanical and Electrical Design

Power supply. : 120Vac/60Hz
Power supply range..... : Not communicated
Power type..... : Single phase without earth
Power (W)..... : 60
Nominal current (A). : 0.5
Dimensions (L x W x H) (m). : X-265 – A380265A – P08205: 0.11x0.055x0.34
R-208 NA : 0.11x0.11x0.021
Weight (kg). : 2
Temperature range (°C). : 0° to +45°C
Ground bounding strap..... : No

Comments:

N/A

3.7. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	N/A
1	AC power source	AC/DC	<3m	2P	120Vac/60Hz
2	RF antenna	RF	N/A	N/A	912 MHz
4	Ethernet	DC	<3m	RJ45	Power Over Ethernet

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

3.8. EUT Radio Specifications

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

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	Class B	PASS	15.107
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	15.204
Conducted limits	Class B	PASS	15.207
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	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$
RF power, conducted		
RF power	$\pm 0.8\text{dB}$	$\pm 1 \text{ dB}$
Power spectral density	$\pm 2.3\text{dB}$	$\pm 3 \text{ dB}$
Occupied bandwidth		
RF power	$\pm 3.8 \%$	$\pm 5 \%$
Conducted emission (spurious)		
$f \leq 1 \text{ GHz}$	$\pm 0.8 \text{ dB}$	$\pm 3 \text{ dB}$
1 GHz - 12.75 GHz	$\pm 1.6 \text{ dB}$	
Radiated emission (ERP / EIRP)		
$f \leq 62.5 \text{ MHz}$	$\pm 5.1 \text{ dB}$	$\pm 6 \text{ dB}$
62.5 MHz - 1 GHz	$\pm 5.1 \text{ dB}$	$\pm 6 \text{ dB}$
1 GHz - 18 GHz	$\pm 5.2 \text{ dB}$	$\pm 6 \text{ dB}$
18 GHz – 26 GHz	$\pm 5.1 \text{ dB}$	$\pm 6 \text{ dB}$
26 GHz – 40 GHz	$\pm 5.4 \text{ dB}$	$\pm 6 \text{ dB}$
EIRP and power spectral density with diode	$\pm 5.2 \text{ dB}$	$\pm 6 \text{ dB}$
Radiated emission (magnetic field)		
9kHz – 30MHz	$\pm 3 \text{ dB}$	$\pm 6 \text{ dB}$
Supply voltages	$\pm 3 \%$	$\pm 3 \%$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 5 \%$	$\pm 5 \%$
Time / Duty cycle	$\pm 4.4 \%$	$\pm 5 \%$
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	/
30MHz – 1GHz	$\pm 5.0 \text{ dB}$	/
1GHz – 18GHz	$\pm 5.6 \text{ dB}$	/
18GHz – 26GHz	$\pm 5.7 \text{ dB}$	/
26GHz – 40GHz	$\pm 5.7 \text{ dB}$	/

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

7. RF EXPOSURE

Maximum field strength level at 3 meters is 89.6dBμV/m

Based on formula $E(\text{dB}\mu\text{V/m}) = P(\text{dBm EIRP}) + 95.2$ to convert a peak field strength level at 3 meters

EIRP = -5.6dBm (0.275 mW) at 912MHz

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

$\text{PSD} = \text{EIRP} / (4 * \pi * R^2) = 0.275 / (4 * \pi * (20 \text{ cm})^2) = 0.000055 \text{ mW/cm}^2$

Limit = 1 mW/cm²

8. TEST CONDITIONS AND RESULTS

8.1. Conducted limits

Reference standard:	FCC part 15.107, 15.207 RSS-Gen
Test method:	ANSI C63.4: 2014
General test setup: EUT is set on an insulating support at 40cm from the ground reference plane. All power was connected to the system through Artificial Mains Network (AMN). The AMN is placed at 80cm from the boundary of the EUT and bonded to a ground reference plane.	

TESTED CABLE	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
120Vac/60Hz power supply / X265 + R208	150kHz-30MHz	15.207	EMI5059	PASS

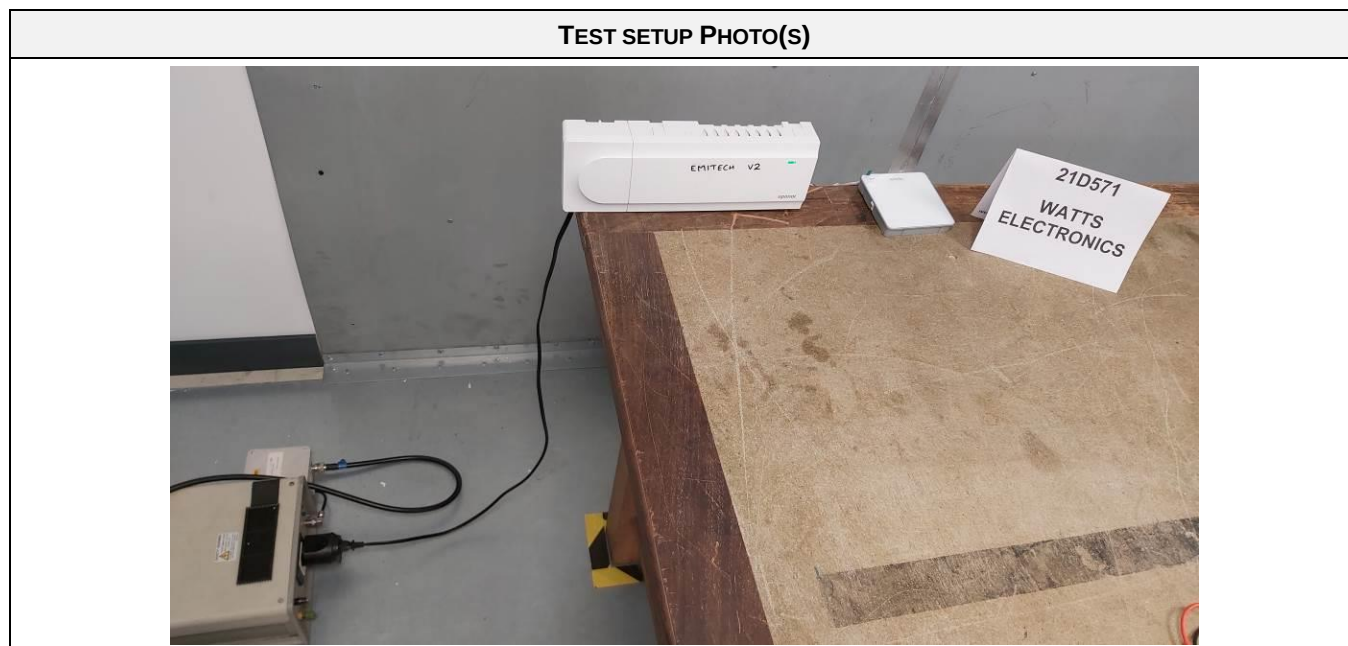
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	30 to 60 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
Test method deviation: N/A		
Supplementary information: N/A		

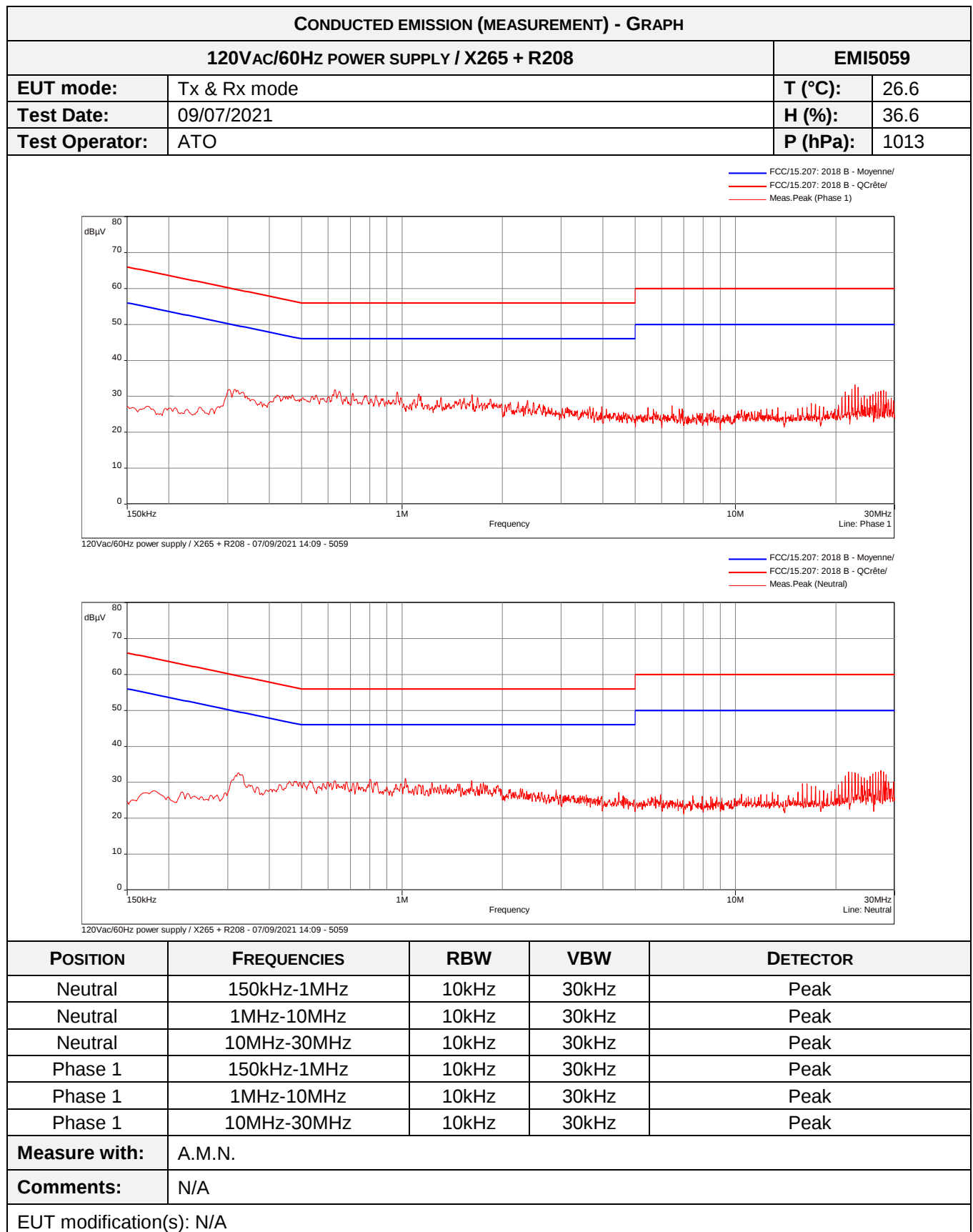
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
AC power source	KIKUSUI	PCR 4000L	15322		
Cable	EMITECH	Current absorber sheath	9491	23/06/2020	23/08/2022
Cable	C&C	N-3m	14333	18/03/2021	18/05/2023
LISN	PMM	L2-16	1209	08/06/2020	08/08/2022
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
Receiver	Rohde & Schwarz	FPL1003	16027	14/08/2020	14/10/2021
Software	Nexio	BAT EMC	0000		
Surges Suppressor	Hewlett Packard	11947A	0238	20/12/2019	20/02/2023
Thermohygrometer	Testo	608-H2	12268	07/05/2020	07/07/2022
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023

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CONDUCTED EMISSION (MEASUREMENT) - TABULATED RESULTS							
120VAC/60Hz POWER SUPPLY / X265 + R208						EMI5059	
Terminal	Test Frequency (MHz)	Meter Reading dB (μV)	Detector (Pk/QP/Av)	Gain/Loss Factor (dB)	Level dB (μV)	Limit dB (μV)	Margin (dB)
/	/	/	/	/	/	/	/
Supplementary information: No spurious emissions were detected.							





No spurious emissions were detected.

8.2. Radiated emission limits

Reference standard:	FCC part 15.109, 15.249 RSS-210, RSS-Gen
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 equipments 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	EMI4530	PASS
Radiated measurement / 45°	9kHz-30MHz	15.209	EMI4531	PASS
Radiated measurement / 90°	9kHz-30MHz	15.209	EMI4532	PASS
Radiated measurement / Tx mode / For Freq < 1GHz	30MHz-1GHz	15.209	EMI4688	PASS
Radiated measurement / Tx mode / For Freq >1GHz	1GHz-10GHz	15.209	EMI4686	PASS
Radiated measurement / Rx mode / For Freq < 1GHz	30MHz-1GHz	15.109 Class B	EMI5067	PASS
Radiated measurement / Rx mode / For Freq >1GHz	1GHz-10GHz	15.109 Class B	EMI4528	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
AC power source	GW Instek	APS-1102	17754	02/03/2021	02/05/2022
AC power source	KIKUSUI	PCR4000L	3074	25/07/2019	25/09/2021
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
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
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

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TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES < 30MHz - TABULATED RESULTS					
RADIATED MEASUREMENT / 0°				EMI4530	
Frequency MHz	Detector (Pk/QP/Av)	Gain/Loss Factor (dB)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)
1.336	Peak	-32.41	-8.4	13.59	-21.98
1.542	Peak	-32.41	-9.84	12.34	-22.18
4.425	Peak	-32.58	2.61	18.04	-15.43
4.631	Peak	-32.59	4.51	18.04	-13.53
Supplementary information: N/A					

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES < 30MHz - TABULATED RESULTS					
RADIATED MEASUREMENT / 45°				EMI4531	
Frequency MHz	Detector (Pk/QP/Av)	Gain/Loss Factor (dB)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)
0.516	Peak	-32.45	-2.29	21.86	-24.15
1.336	Peak	-32.41	-9.85	13.59	-23.44
1.542	Peak	-32.41	-10.37	12.34	-22.71
4.425	Peak	-32.58	1.02	18.04	-17.02
4.628	Peak	-32.59	3.49	18.04	-14.55
4.698	Peak	-32.6	-1.54	18.04	-19.58
Supplementary information: N/A					

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES < 30MHz - TABULATED RESULTS					
RADIATED MEASUREMENT / 90°				EMI4532	
Frequency MHz	Detector (Pk/QP/Av)	Gain/Loss Factor (dB)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)
0.515	Peak	-32.45	-0.88	21.87	-22.75
0.720	Peak	-32.44	-6.12	18.95	-25.08
0.926	Peak	-32.43	-8.29	16.77	-25.07
1.131	Peak	-32.42	-10.11	15.04	-25.15
4.219	Peak	-32.56	-8.07	18.04	-26.11
Supplementary information: N/A					

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 / 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.					

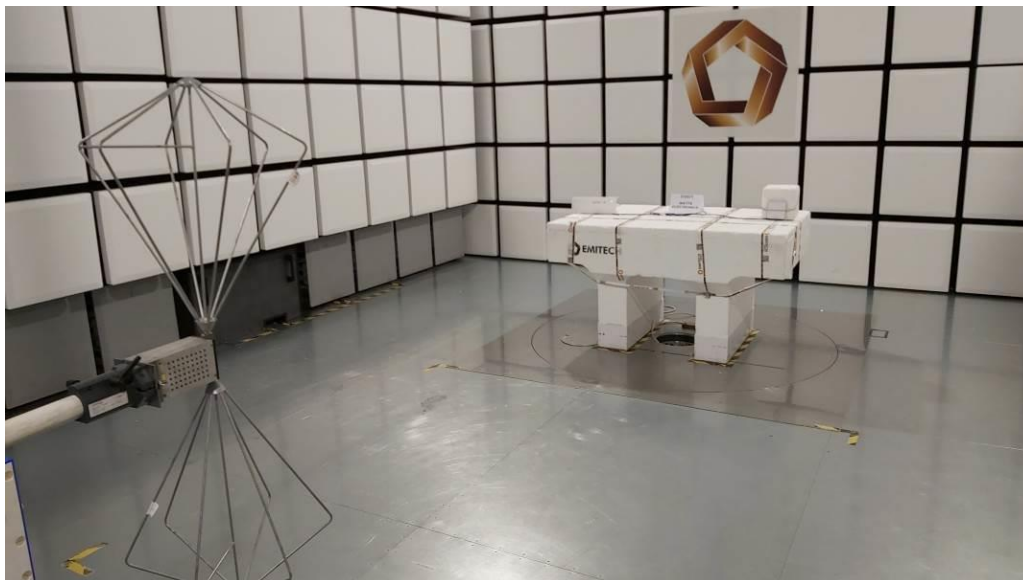
TEST SETUP PHOTO(S) - RADIATED MEASUREMENT



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



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

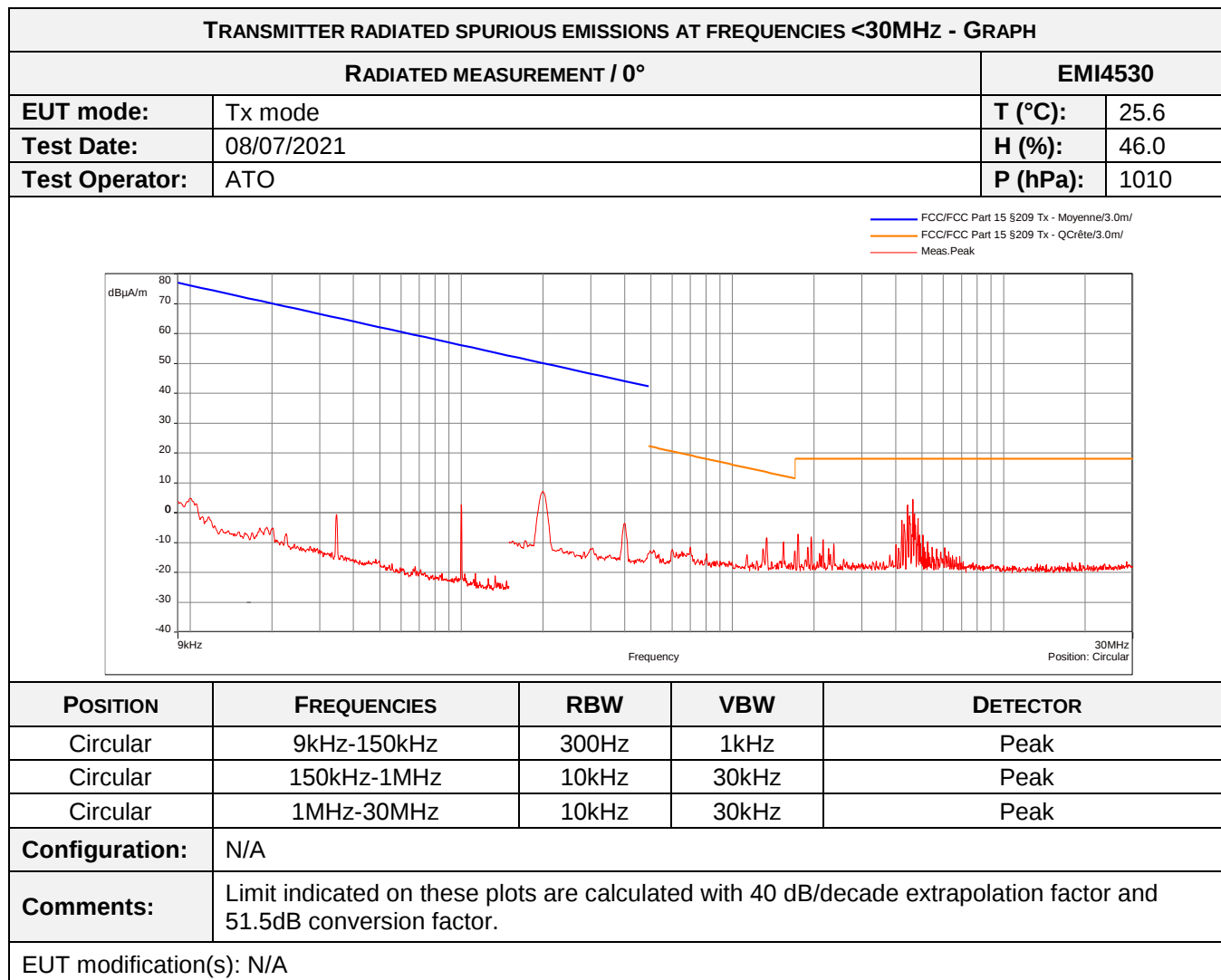


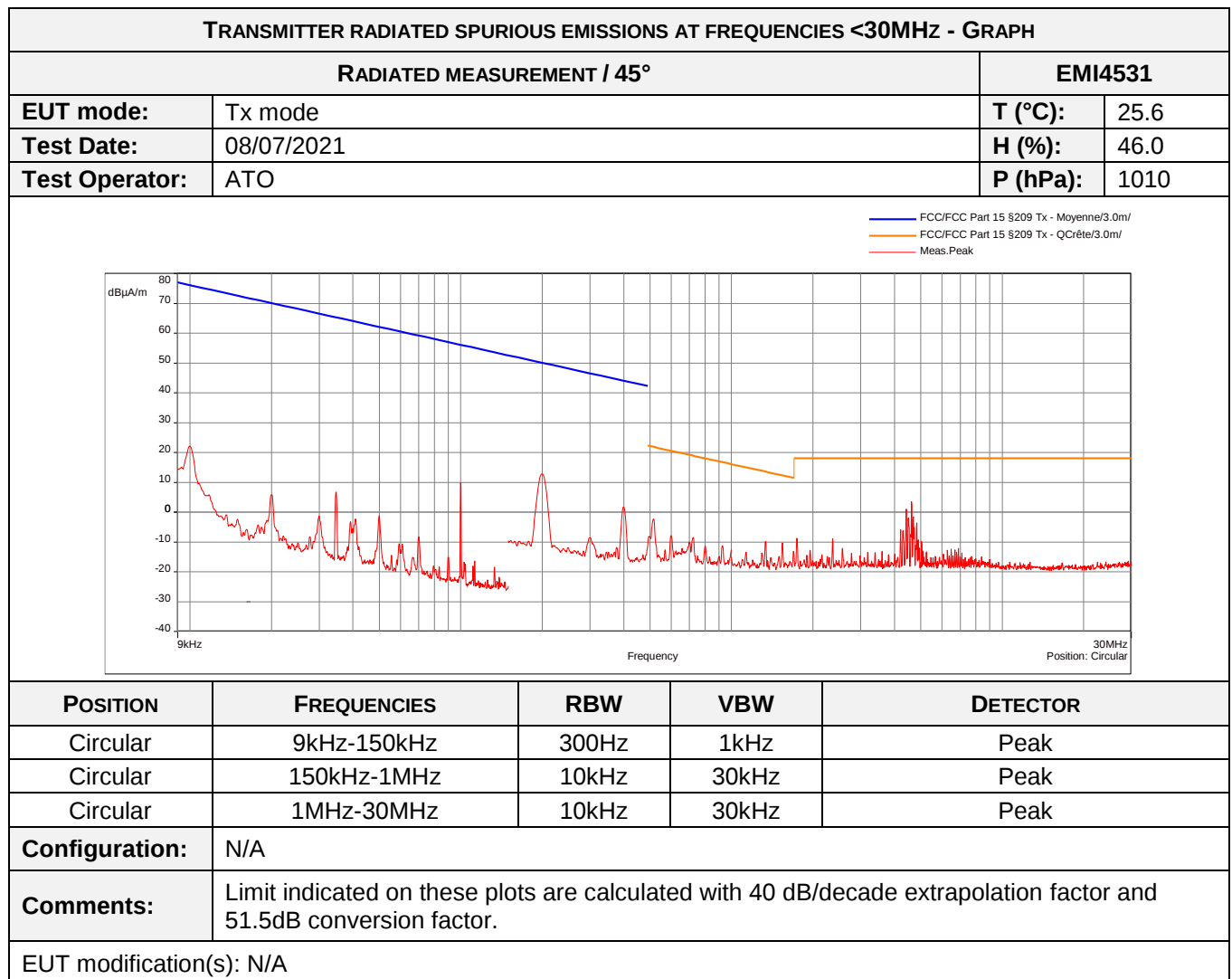
TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / 200MHZ TO 1GHZ

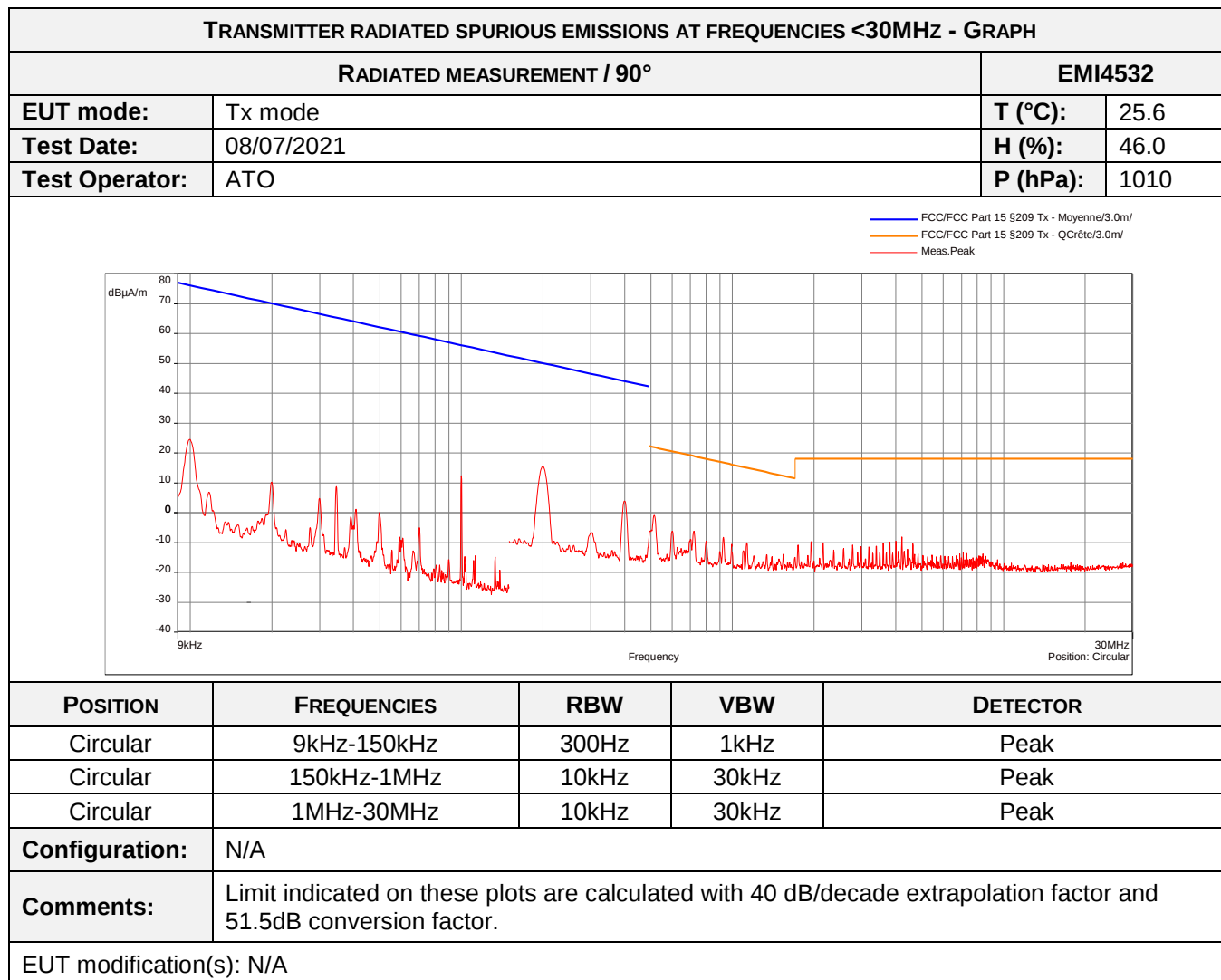


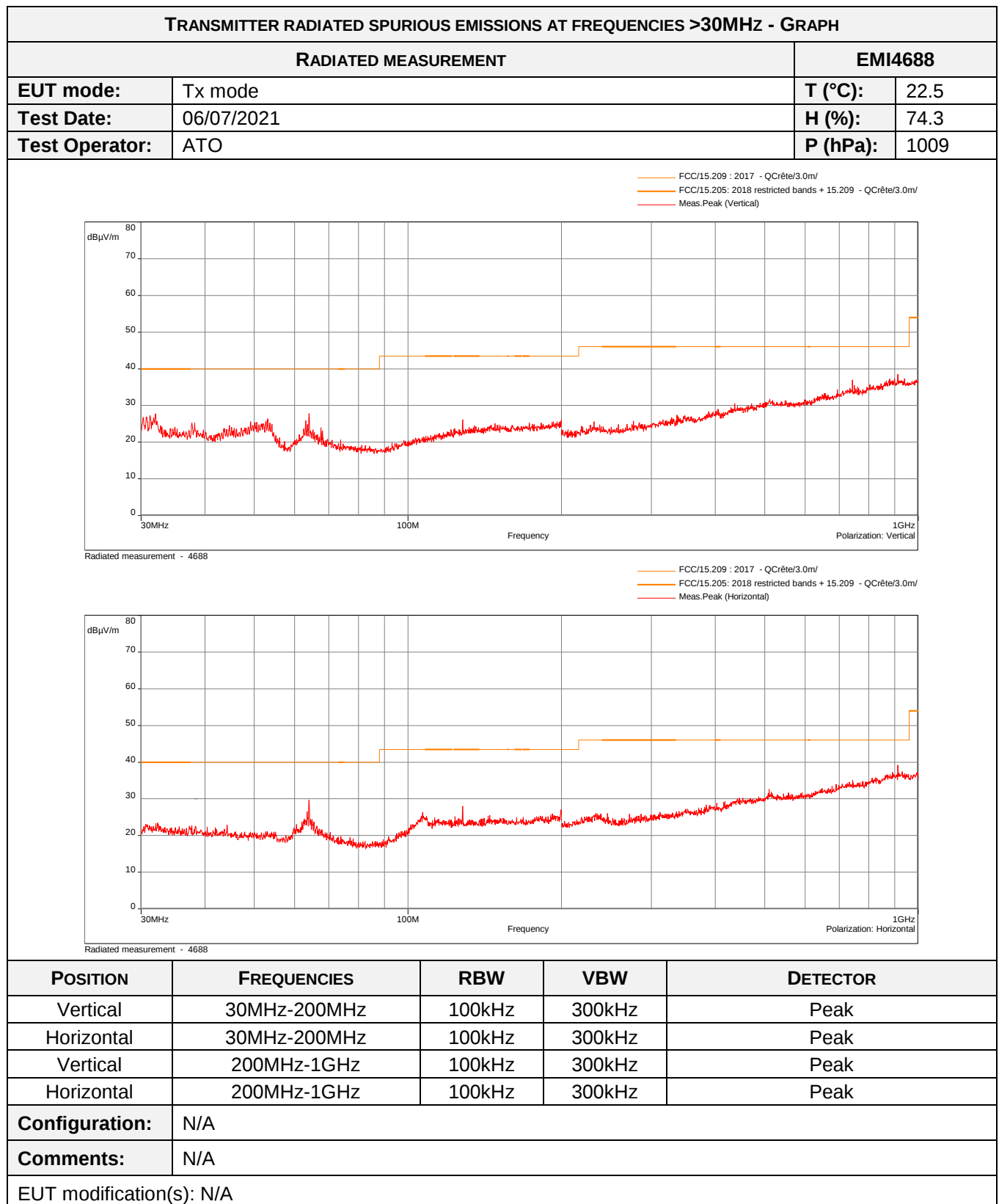
TEST SETUP PHOTO(S) - RADIATED MEASUREMENT / FOR FREQ >1GHZ

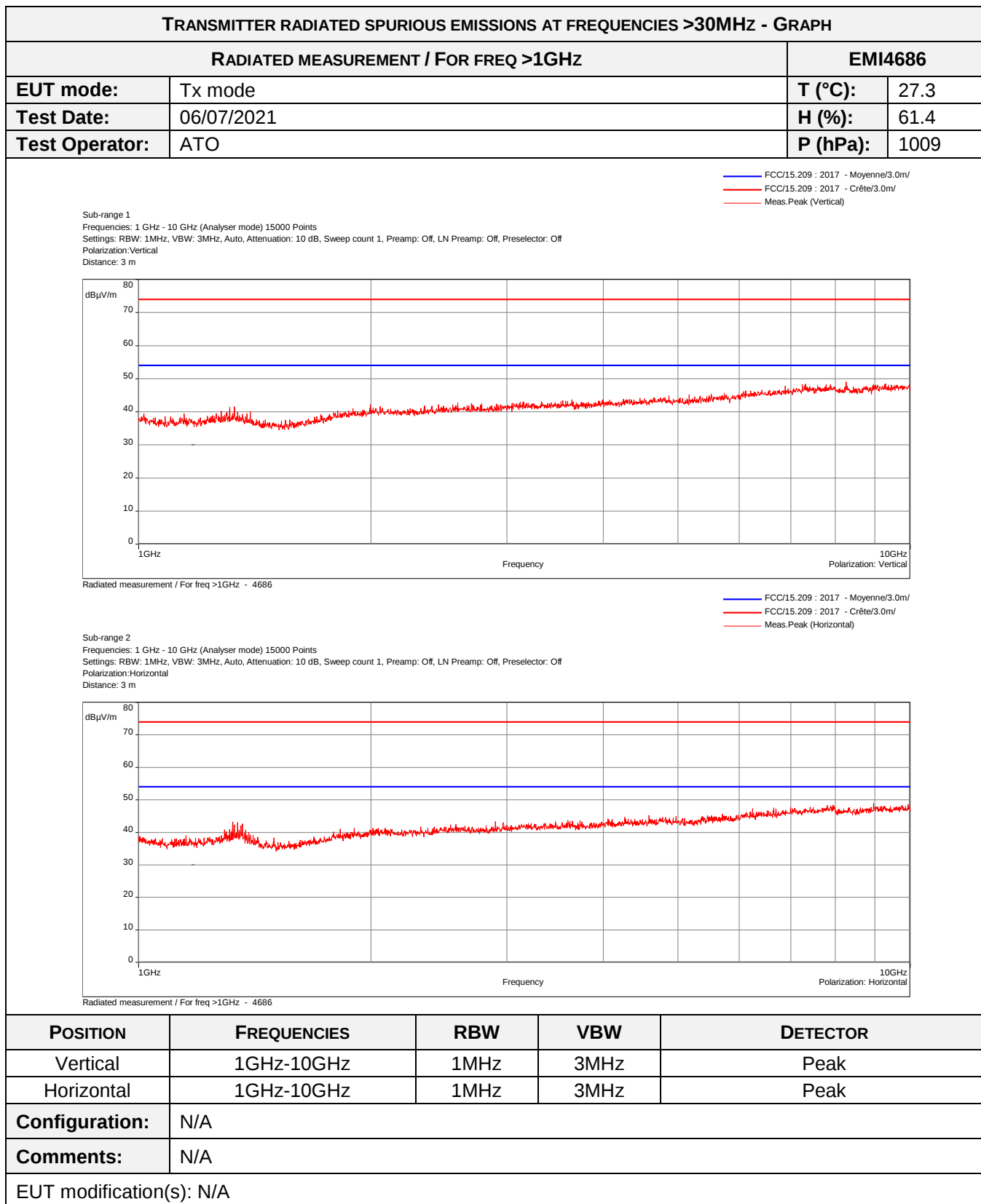




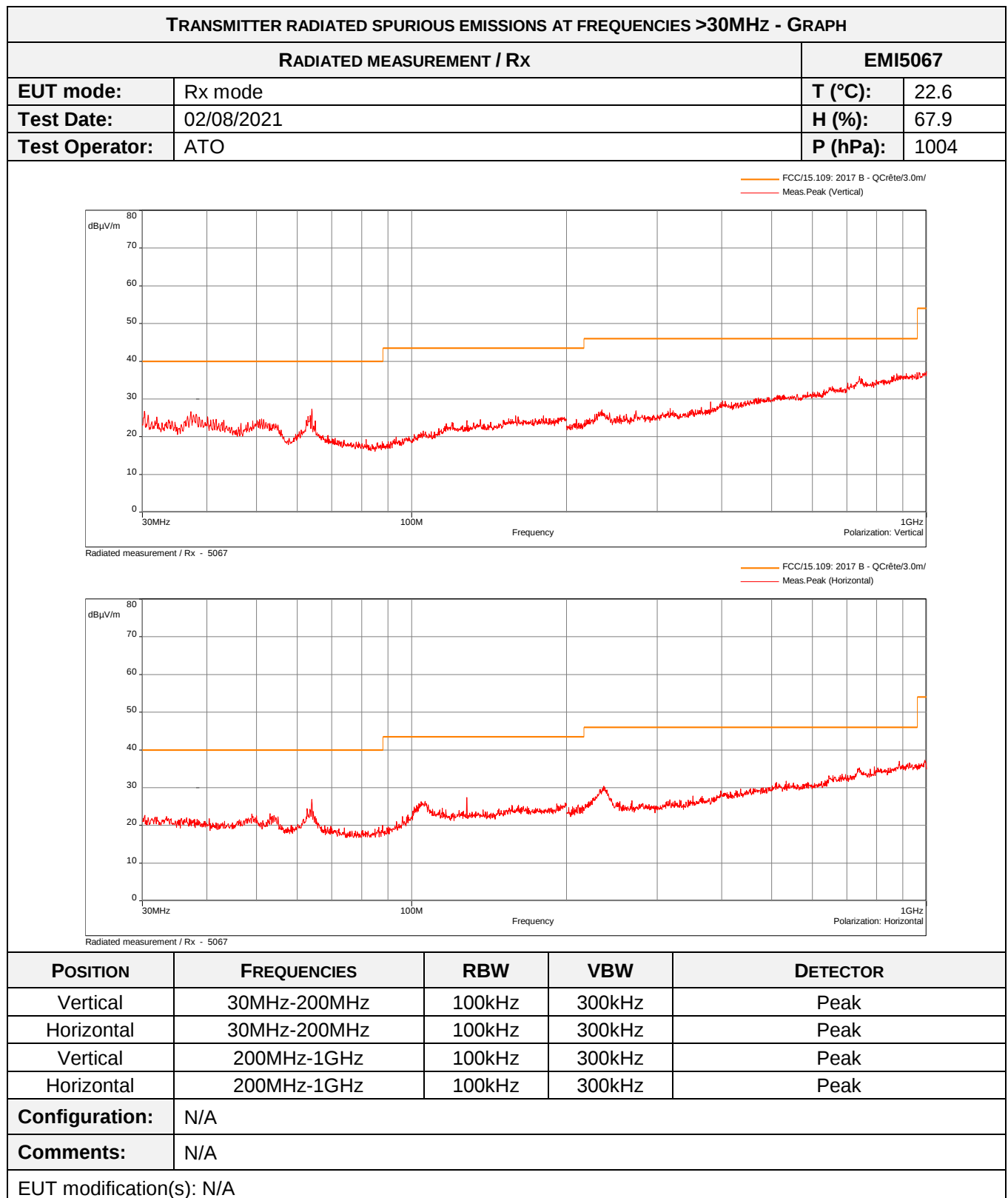




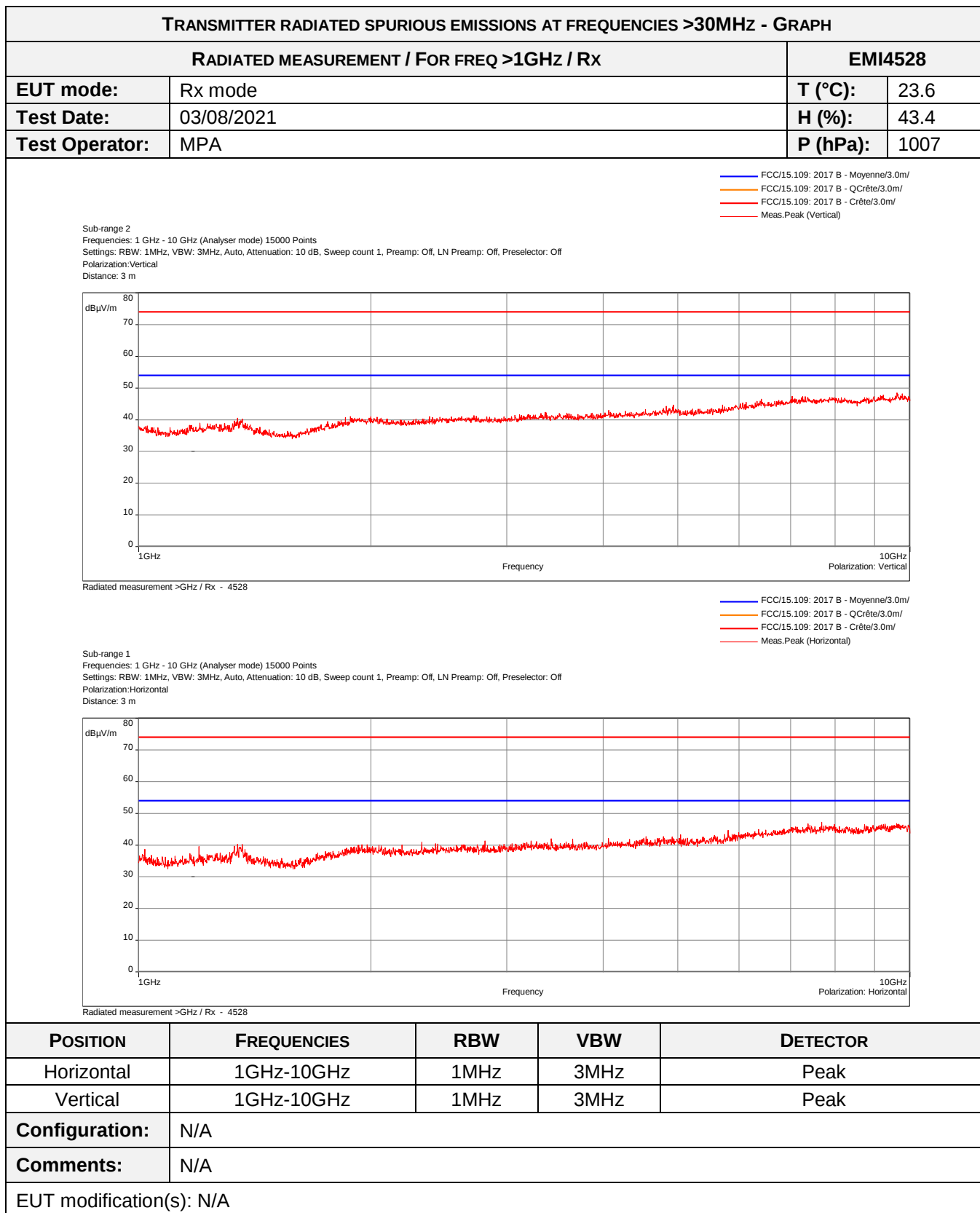




No spurious emissions were detected.



No spurious emissions were detected.



No spurious emissions were detected.

8.3. 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 $f > 1\text{GHz}$). 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 equipments 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	EMI4559	PASS

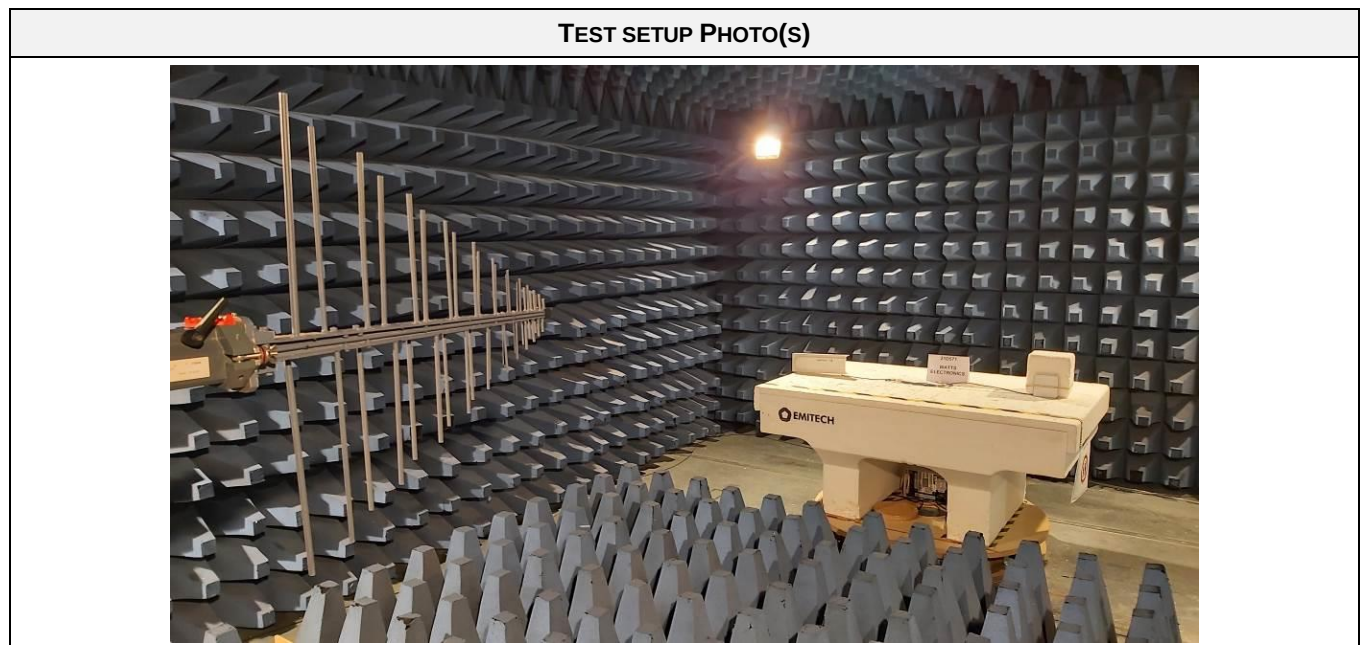
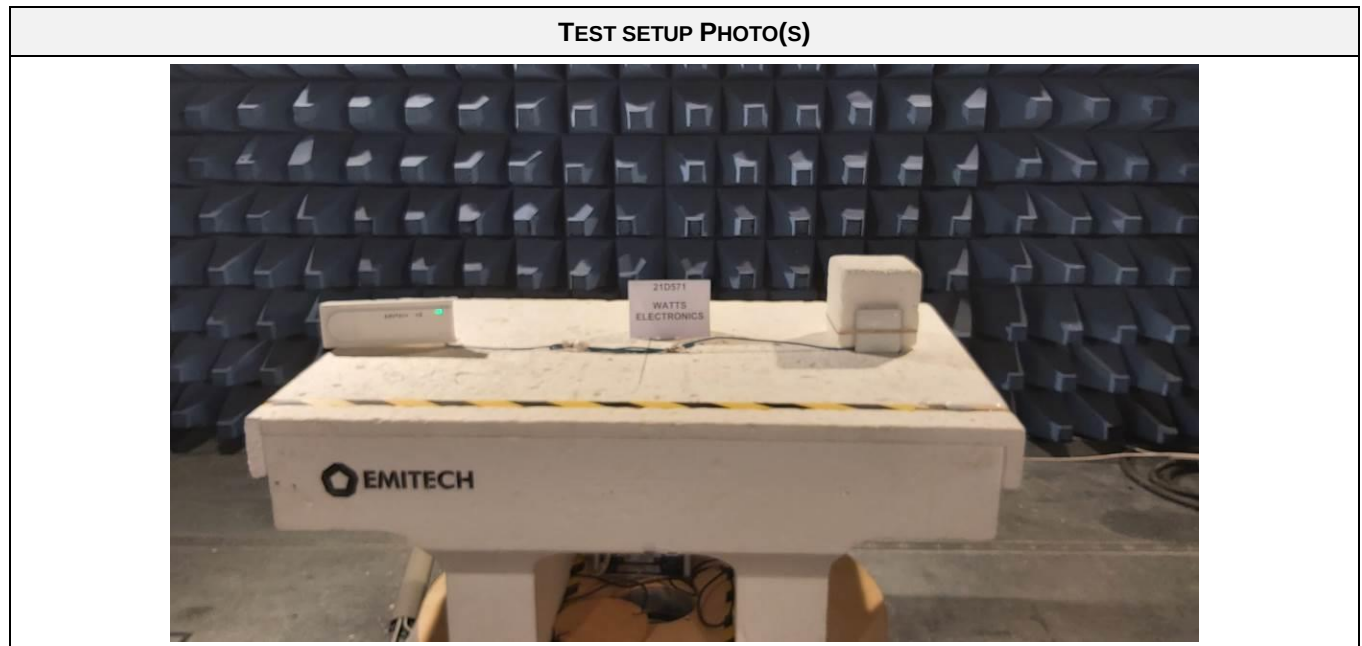
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	20 to 75 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
TEST METHOD DEVIATION: N/A		
Supplementary information: N/A		

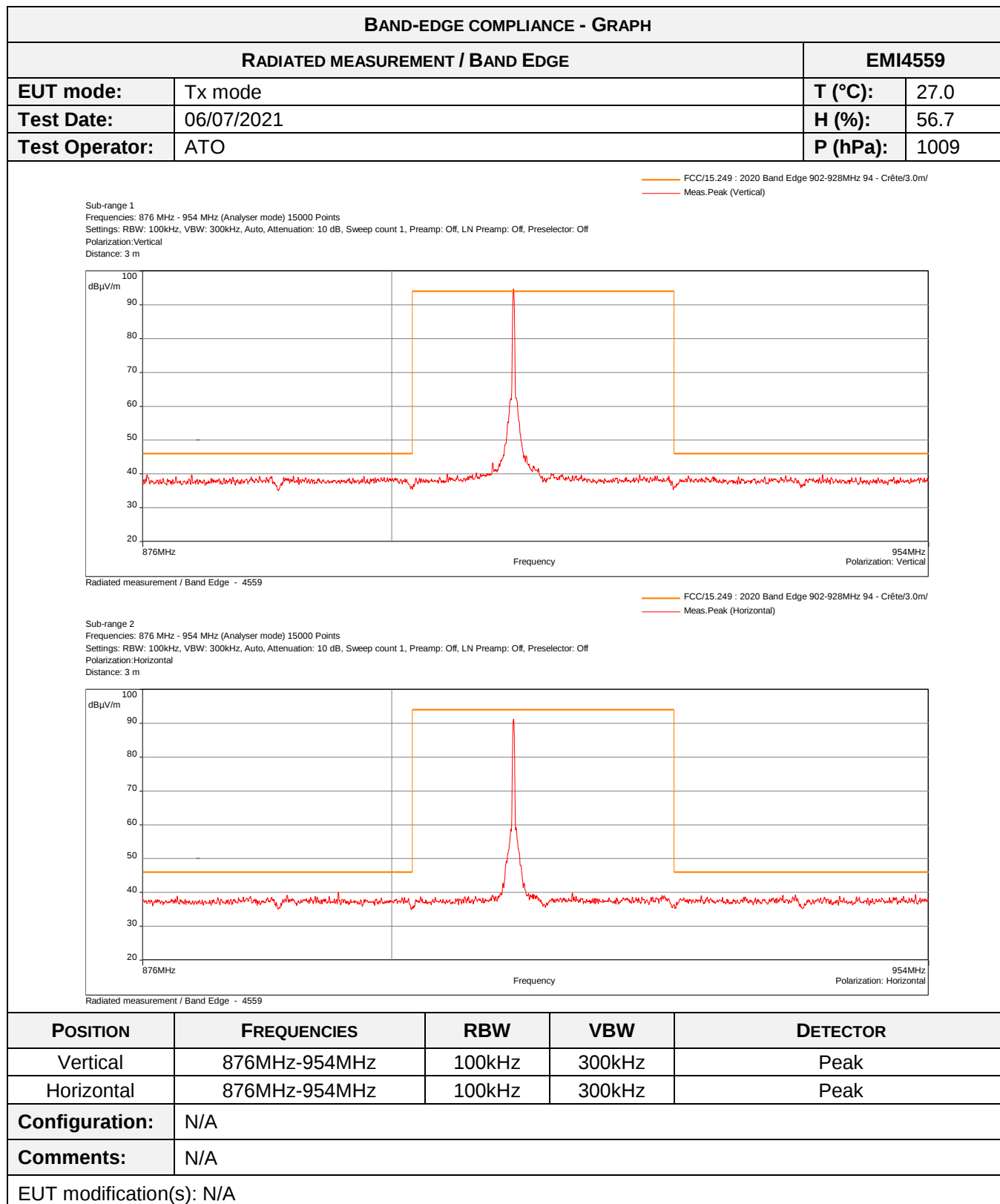
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
AC power source	GW Instek	APS-1102	17754	02/03/2021	02/05/2022
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Cable	SUCOFLEX	N-3m	14378	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-5,5m	14381	25/06/2019	25/08/2021
Cable	Huber + Suhner	SF102K	16042	24/03/2021	24/05/2023
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
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	BAT EMC	0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	07/06/2021	07/08/2023
Thermohygrometer	Testo	608-H1	7562	09/06/2021	09/08/2023

BAT-EMC software version: V3.18.0.26

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BAND-EDGE COMPLIANCE- TABULATED RESULTS			
RADIATED MEASUREMENT / BAND EDGE			EMI4559
Frequency (MHz)	Polarization	Level (dB μ V/m)	Limit (dB μ /m)
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			





No spurious emissions were detected.

8.4. 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 equipments 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)	EMI4989	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
AC power source	GW Instek	APS-1102	17754	02/03/2021	02/05/2022
Antenna	Rohde & Schwarz	HL223	1137	13/06/2018	13/08/2021
Cable	MegaPhase	TM18-N1N1-118	12841	14/08/2020	14/10/2022
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	16668	25/10/2019	25/12/2021
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
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	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12269	07/05/2020	07/07/2022

BAT-EMC software version: V3.18.0.26

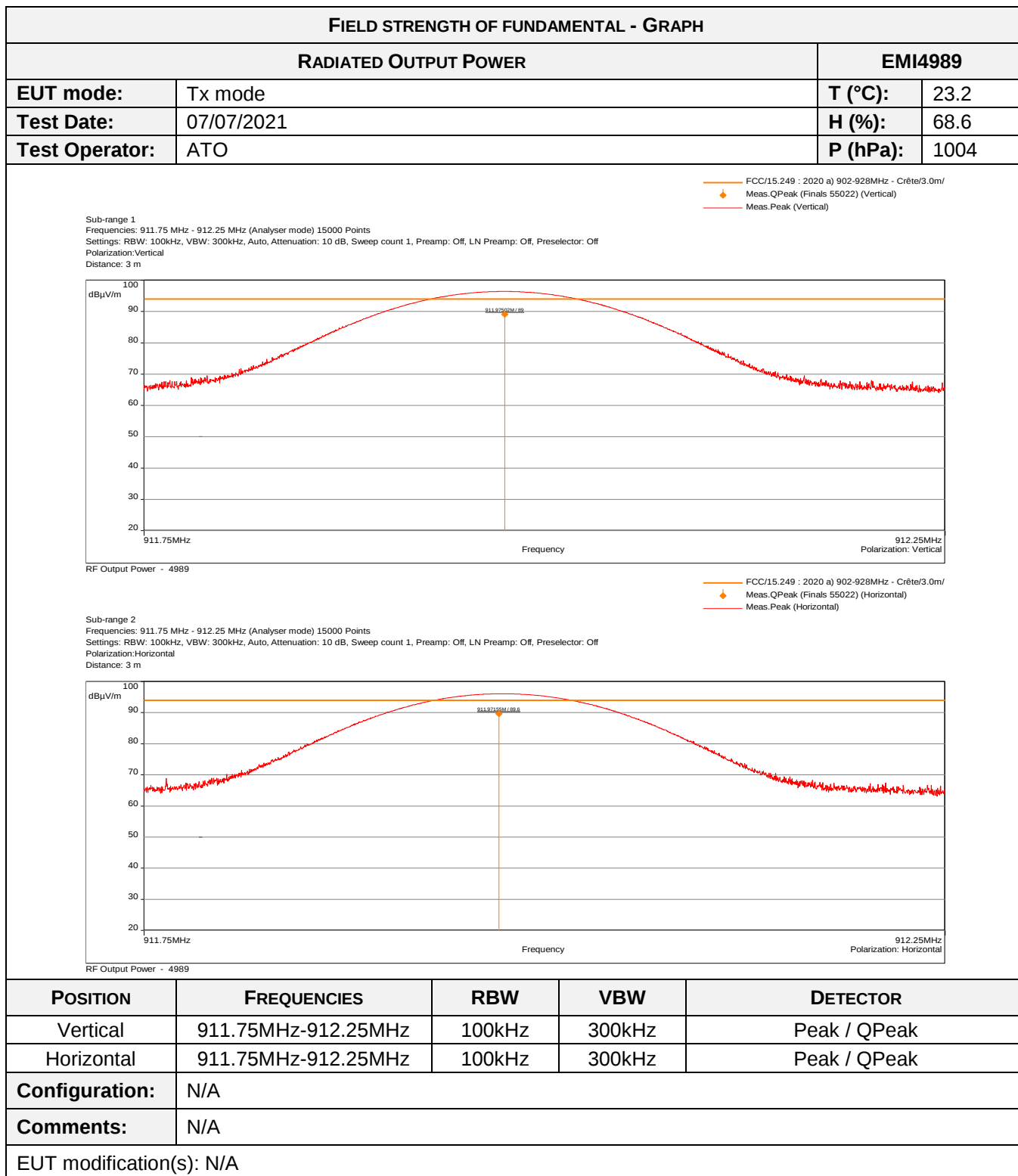
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TEST SETUP PHOTO(S)



TEST SETUP PHOTO(S)





FIELD STRENGTH OF FUNDAMENTAL- TABULATED RESULTS				
RADIATED OUTPUT POWER				EMI4989
Frequency (MHz)	Polarization	Detector	Level (dBµV/m)	Limit (dBµV/m)
912.000	Vertical	QPeak	89.0	93.98
912.000	Horizontal	QPeak	89.6	93.98

8.5. 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	80.42 kHz	Flow > 904.6MHz Fhigh < 925.4MHz	EMI5994	PASS
99% Bandwidth	70.292 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
AC power source	GW Instek	APS-1102	17754	02/03/2021	02/05/2022
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
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
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

BAT-EMC software version: V3.18.0.26

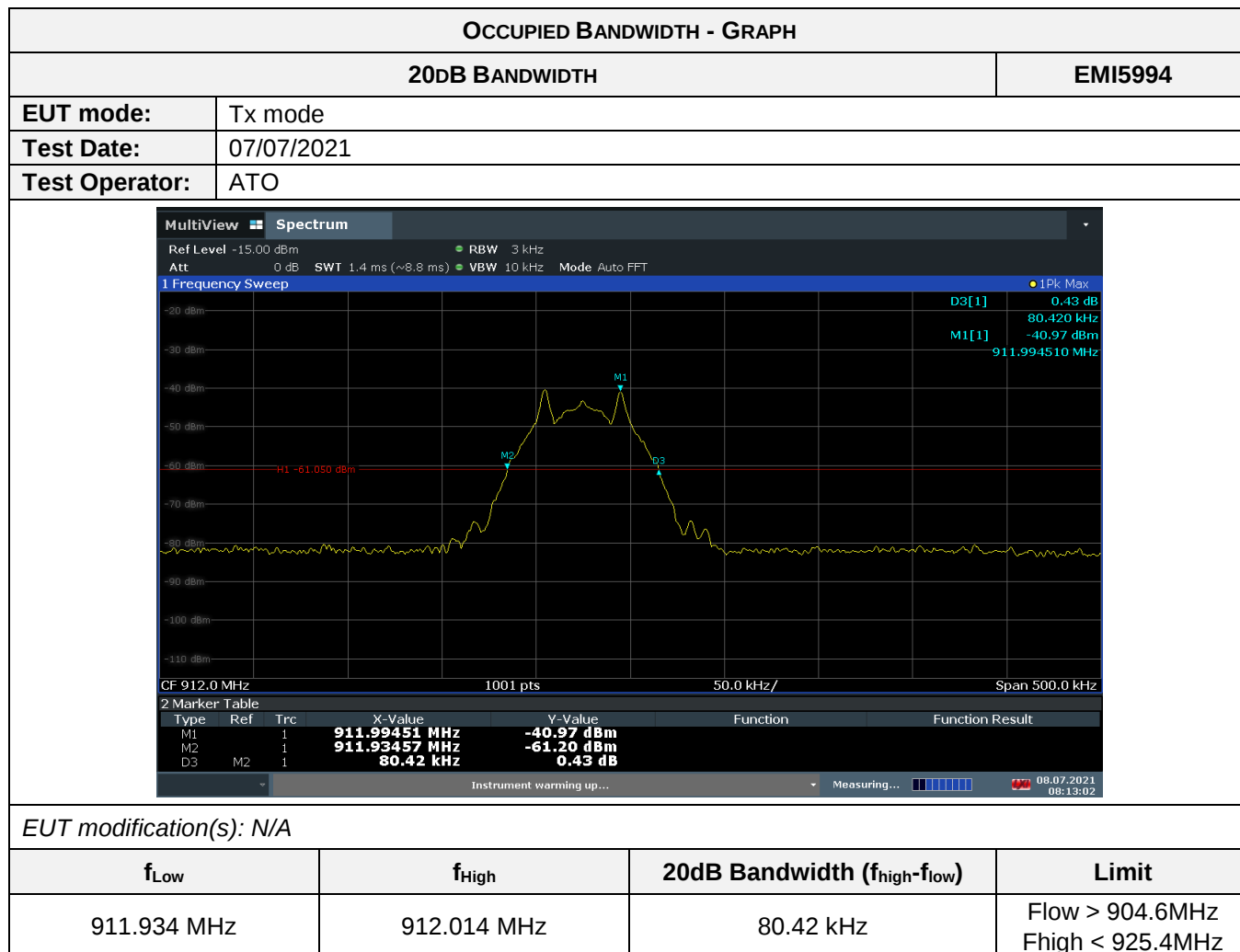
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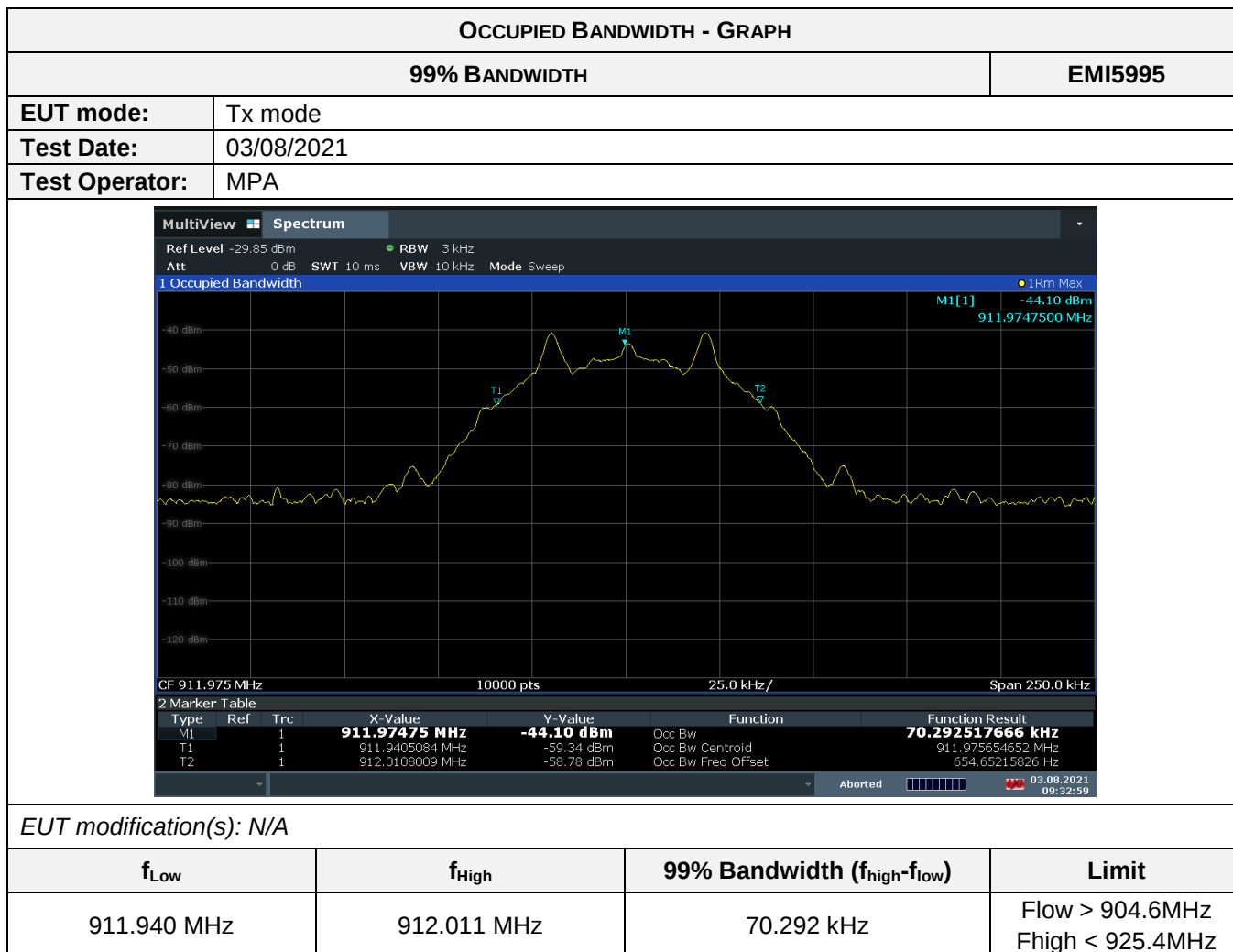
TEST SETUP PHOTO(S)



TEST SETUP PHOTO(S)







8.6. 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 Power supply conditions / -15%	Continuous unmodulated Tx		EMI5072	PASS
Extremes Power supply conditions / +15%	Continuous unmodulated Tx		EMI5073	PASS
Extremes Temperature conditions	Continuous unmodulated Tx		EMI5074	PASS
Extremes Temperature conditions	Continuous unmodulated Tx		EMI5075	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: EUT power supply is replaced by a stabilized power supply.		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
AC power source	GW Instek	APS-1102	17754	02/03/2021	02/05/2022
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
Multimeter	FLUKE	8808A	12446	29/09/2020	29/11/2021
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

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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 Power supply conditions -15%	25	102Vac/60Hz	911. 97099		EMI5072
Extremes Power supply conditions +15%	25	138Vac/60Hz	911. 97055		EMI5073
Extremes Temperature conditions	0	120Vac/60Hz	911.98150		EMI5074
Extremes Temperature conditions	45	120Vac/60Hz	911.96694		EMI5075

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

End of test report