



Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
IC Assigned Code: FR0003

RADIO TEST REPORT

FCC part 15.247
RSS-247_Issue 3, August 2023
RSS-Gen Issue 5, April 2018
ANSI C 63.10: 2013

Company: **JRI**
Address.....: 16 RUE LOUIS RAMEAU
95870 BEZONS
FRANCE

Test item description.: **Product for acquisition, monitoring and transmission of high-precision physical measurements**
Trade Mark.: JRI
Manufacturer.: JRI
Model/Type reference.....: 06518000 / NovaSPY
FCC ID......: W4513756
IC.: 25800-13756
Ratings.....: 3.2 Vdc to 3.6 Vdc

Testing Laboratory: **EMITECH MONTPELLIER laboratory**
Address.....: 145 RUE DU MASSACAN
34740 VENDARGUES
FRANCE

Report Reference No.: **RR-EVE-24A183-2A**
Test procedure.: CE Marking
Diffusion......: GUILLAUME GAUTHIER
Applicant's name.: JRI
Date of issue.....: September 13, 2024
Total number of pages.....: 44
Revision.: 0
Compiled by.....: Morgan PATEY
Approved by (+ signature).: David MONTAULON (Technical 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	September 13, 2024	/	Creation

1. GENERAL INFORMATIONS

This document submits the results of Radio tests performed on the equipment **Connected measuring device NovaSPY** (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 DU MASSACAN 34740 VENDARGUES FRANCE Test procedure. : FCC IC Certification Tested by : Morgan PATEY Test supervisor : None Date of receipt of test item : N/A Date (s) of performance of tests : From February the 27 th to the 28 th of 2024					
APPLICANT'S GENERAL INFORMATIONS:					
Company name : JRI Company address. : 16 RUE LOUIS RAMEAU 95870 BEZONS FRANCE Person(s) present during the tests. : Mr GAUTHIER Responsible. : GUILLAUME GAUTHIER					
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.	Equipment Under Test	AE	Ancillary Equipment	Pk	Peak detector
RBW	Resolution BandWidth	VBW	Video BandWidth	QP	Quasi-peak detector
FSOATS	Free Space Open Area Test Site	FAR	Full Anechoic Room	Av	Average detector
VP	Vertical Polarization	HP	Horizontal Polarization	RMS	Root Mean Square
RF	Radio Frequency	N.T.R	Nothing To Report	N/C	Not Communicated
SAC	Semi Anechoic Chamber				

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:

The following referenced documents are necessary for the application of the present test report.

FCC part 15: January 2024

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 part 15.247

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850MHz. (frequency hopping and digitally modulated)

RSS-247_Issue 3, August 2023

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence Exempt Local Area Network (LE-LAN) Devices

RSS-Gen, Issue 5, April 2018 / AMD 1: Mar. 2019 / AMD2: Feb. 2021

General Requirements for Compliance of Radio Apparatus

ANSI C 63.10: 2013

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. : Product for acquisition, monitoring and transmission of high-precision physical measurements

Model/Type reference..... : 06518000 / NovaSPY

Trade Mark. : JRI

Serial number (S/N). : PT2320230001

Part number (P/N). : Not communicated

Software version. : N/A

Firmware version. : 1.0.0

Type of sample. : Pre-serial

Function(s). : Measurement and 2.4 GHz data transmission to LINK concentrator in order to send it to cloud platform

Manufacturer name. : JRI

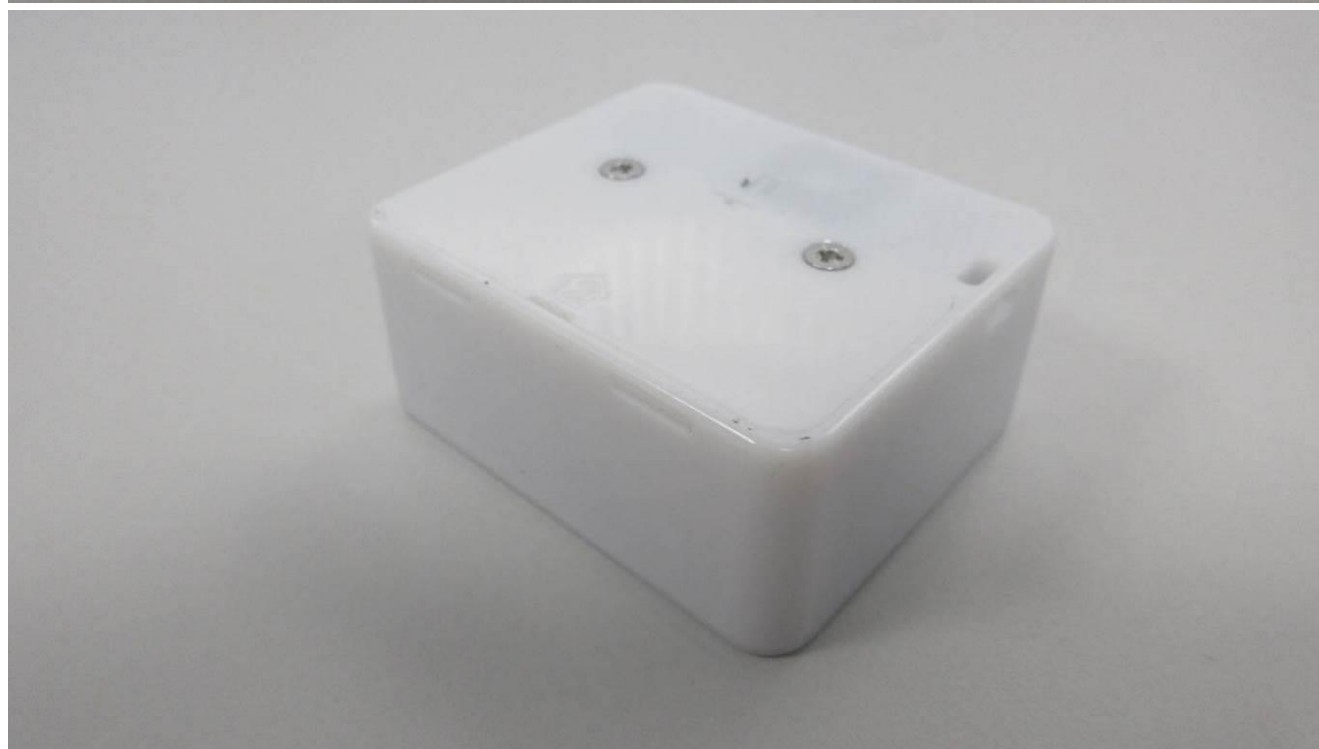
Address..... : 16 RUE LOUIS RAMEAU
95870 BEZONS
FRANCE

General product information:
N/A

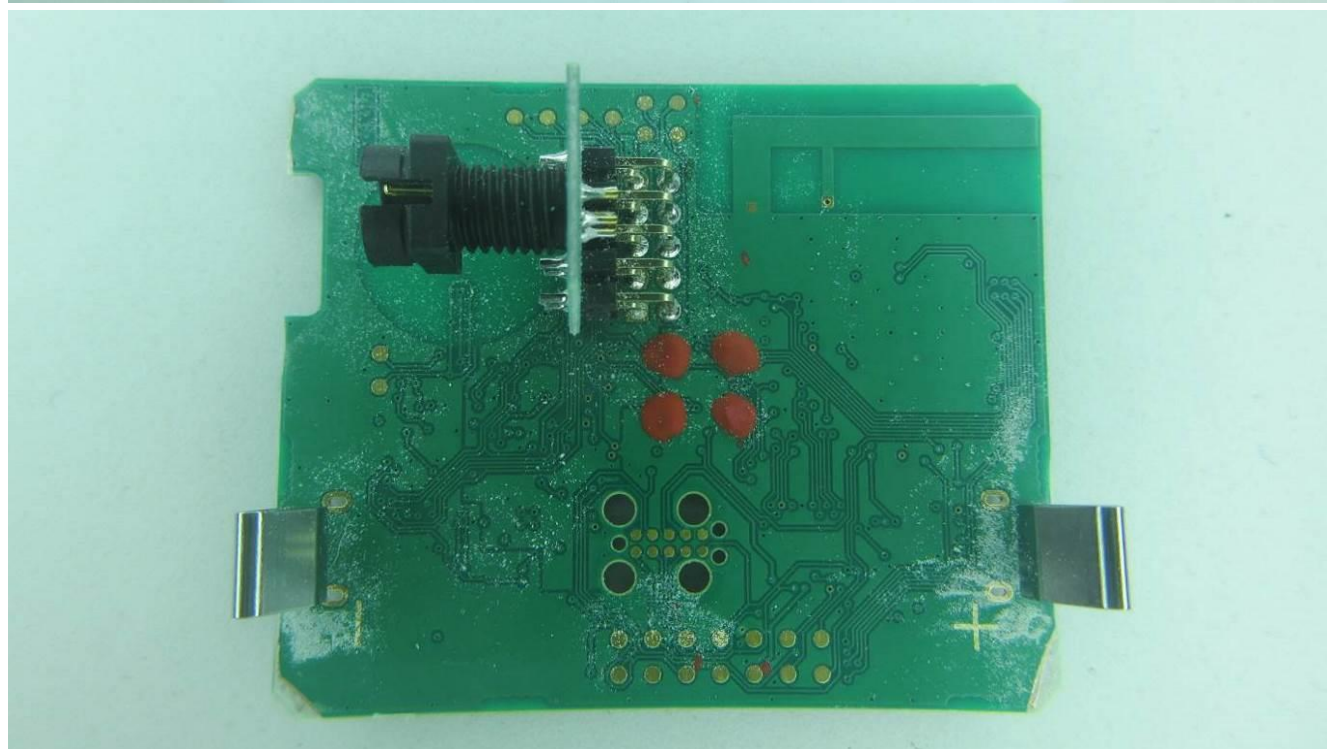
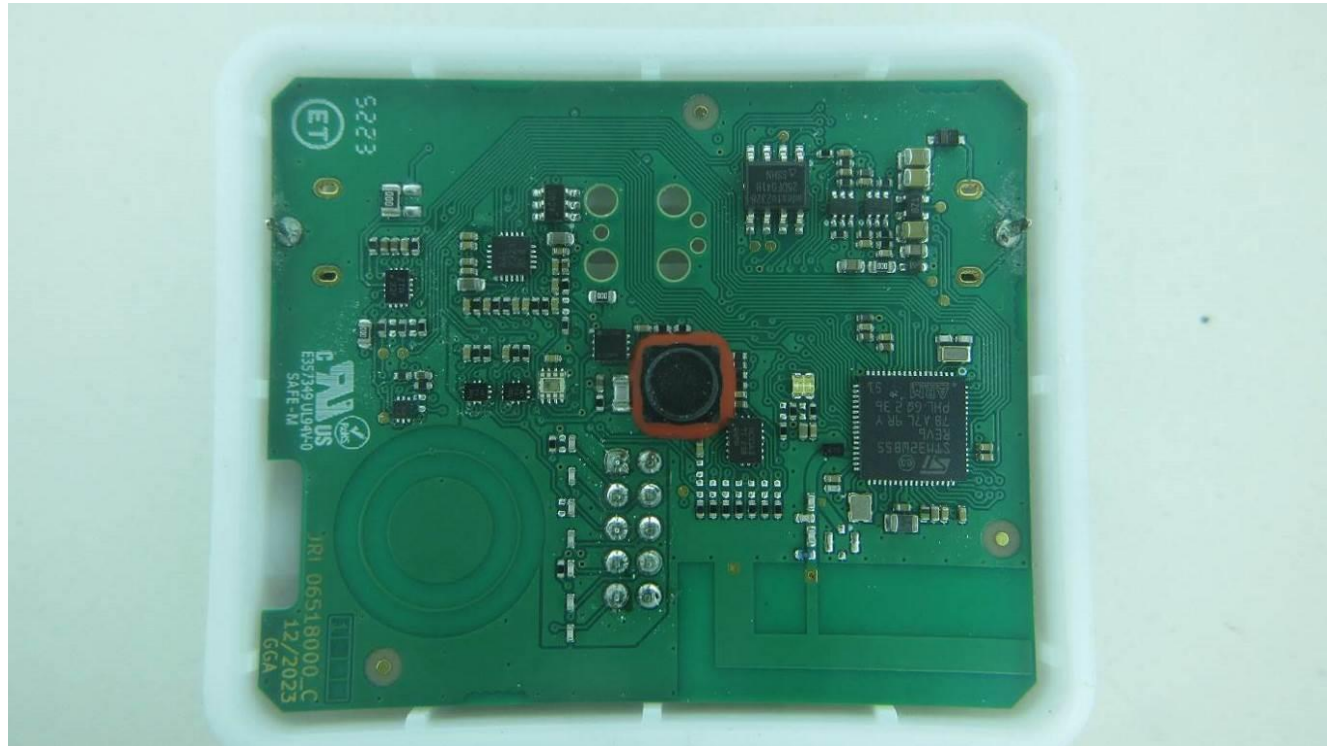
3.2. E.U.T. Marking plate

EUT did not have a marking plate during tests

3.3.E.U.T. General view



3.4. E.U.T. Internal view & Electronic board



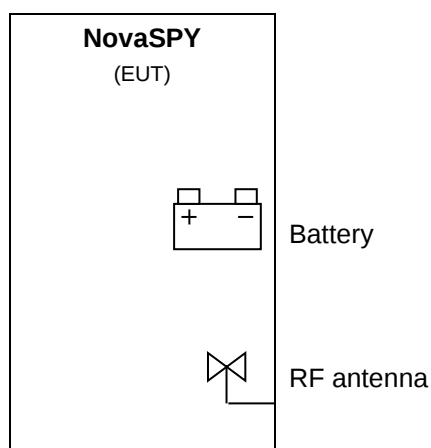
3.5.E.U.T. Mechanical and Electrical Design

Power supply. : 3.6 Vdc
Power supply range..... : 3.2 Vdc to 3.6 Vdc
Power type..... : Battery powered
Power : 0.3 mW (average), 300 mW (maximum)
Nominal current : 80 μ A (average), 80 mA (maximum)
Dimensions (L x W x H) (mm). : 64 x 54 x 28
Weight (kg). : 0.080
Temperature range (°C). : -40 to +80
Ground bounding strap..... : No

Comments:

N/A

3.6.E.U.T. Input/Output ports



PORT	NAME	TYPE	LENGTH	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	N/A
1	Battery	DC	N/A	N/A	3.6 Vdc
2	RF antenna	RF	N/A	N/A	2480 MHz

AC/DC : AC/DC Converter port

AC : Alternative current port

DC : Direct current port

I/O..... : Input or Output port

TP : Telecommunication port

RF..... : Radio frequency port

N/E : Non Electrical port

3.7. EUT Radio Specifications

a) GENERAL INFORMATIONS	
According to manufacturer's declarations :	
EUT type.....	<i>Transceiver</i>
Technology	<i>LP WPAN</i>
Environmental profile	<i>Data transmissions</i>
Temperature range	<i>-40°C to +80°C</i>
Antenna type	<i>Integrated</i>
Antenna Gain.....	<i>Not communicated</i>
Comments:	
<i>N/A</i>	
b) TRANSMITTER PARAMETERS (Tx)	
Frequency bands.....	<i>2400 MHz to 2483.5 MHz</i>
RF Power.....	<i>Not communicated</i>
Modulation type	<i>OQPSK</i>
Adaptative equipment.....	<i>No</i>
Nominal channel bandwidth	<i>2 MHz</i>
Duty cycle	<i>Not communicated</i>
Number of channels / Separation.....	<i>1</i>
Tested frequency.....	<i>2480 MHz</i>
c) RECEIVER PARAMETERS (Rx)	
Frequency bands.....	<i>2400 MHz to 2483.5 MHz</i>
Category/Class	<i>Not communicated</i>
Bandwidth	<i>Not communicated</i>

4. RESULT SUMMARY

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
SUBPART A - GENERAL			
Labeling requirements		PASS	15.19 / See certification documents
Information to user		PASS	15.21 / See certification documents
Home-built devices		N/A	15.23
Kits		N/A	15.25
Special Accessories		PASS	15.27 / See certification documents
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		PASS	15.37 / See certification documents
SUBPART B – UNINTENTIONAL RADIATORS			
Equipment authorization			15.101
- Verification		N/A	
- Declaration of Conformity		N/A	
CPU boards and power supplies used in personal computers		N/A	15.102
Exempted device		N/A	15.103
Information to the user		PASS	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
Labeling of digital cable ready products		N/A	15.123
SUBPART C –INTENTIONAL RADIATORS			

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
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 / Dedicated integral antenna
External radio frequency power amplifiers and antenna modifications		N/A	15.204
Restricted bands of operation		PASS	15.204
Conducted limits	Class B	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 and 5725-5850MHz			15.247
- Frequency hopping and digitally modulated		-	a)
- Frequency hopping system		N/A	a) (1) Non-FHSS equipment
- Digital modulation system		PASS	a) (2) -6dB BW > 500kHz
- Maximum peak conducted output power		-	b)
- For hopping system in the 2400-2483.5 MHz and 5725-5850 MHz bands		N/A	b) (1) Non-FHSS equipment
- For hopping system in the 902-928MHz band		N/A	b) (2) Non-FHSS equipment
- For system using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands		PASS	b) (3)
- Operation with directional antenna gains > 6 dBi		N/A	c)
- Out-of-band emissions		PASS	d)
- Power spectral density conducted		PASS	e)
- Hybrid system		N/A	f)
- Frequency hopping additional requirements		N/P	g) See certification documents
- Frequency hopping intelligence		N/P	h) See certification documents
- RF exposure compliance		PASS	i)

Sample subject to the test complies 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 account of uncertainty associated with the results.

Opinion(s) and interpretation(s): N/A

5. 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	$\pm 3.8 \%$	$\pm 5 \%$
Blocking	$\pm 4.0 \text{ dB}$	$\pm 4 \text{ dB}$
Radiated emission (ERP / EIRP)		
$f \leq 62.5 \text{ MHz}$	$\pm 5.7 \text{ dB}$	$\pm 6 \text{ dB}$
62.5 MHz - 1 GHz	$\pm 5.8 \text{ dB}$	$\pm 6 \text{ dB}$
1 GHz - 18 GHz	$\pm 5.6 \text{ dB}$	$\pm 6 \text{ dB}$
EIRP and power spectral density with diode	$\pm 5.7 \text{ dB}$	$\pm 6 \text{ dB}$
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	$\pm 4.4 \%$	$\pm 5 \%$
Conducted emission (FCC)		
(Artificial Mains Network) 150kHz – 30MHz	$\pm 3.4 \text{ dB}$	$\pm 3.4 \text{ dB}$
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	/
30MHz – 1GHz	$\pm 5.0 \text{ dB}$	/
1GHz – 18GHz	$\pm 5.3 \text{ dB}$	/
18GHz – 40GHz	$\pm 6.1 \text{ dB}$	/
40GHz – 140GHz	$\pm 5.7 \text{ dB}$	/

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

6. RF EXPOSURE

RF EXPOSURE – TABULATED RESULT		
FREQUENCY (MHz)	MAXIMUM EIRP (dBm)	MAXIMUM EIRP (mW)
2480	4.98	3.15
In accordance with KDB 447498 D01 General RF Exposure Guidance v06: $PSD = \frac{EIRP_{mW}}{4 \times \pi \times d^2}$ <i>d : distance of use in centimeter</i> $PSD = \frac{3.15}{4 \times \pi \times 20cm^2}$		
RESULT		LIMIT
0.0006 mW/cm ²		0.610 mW/cm ²

7. TEST CONDITIONS AND RESULTS

7.1. Radiated emission limits

Reference standard:	CFR 47 FCC Part 15.247, 15.209, 15.205, 15.109 RSS-247, RSS-Gen
Test method:	ANSI C63.10: 2013
Test description: : For $f < 30\text{MHz}$, 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 semi-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. For $f > 30\text{MHz}$, EUT is set on an insulating support at 80cm above the ground reference plane (150cm for $f > 1\text{GHz}$). 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 / 30 MHz to 1 GHz / Position 1	30MHz-1GHz	part 15.209	EMI4534	PASS
Radiated measurement / 30 MHz to 1 GHz / Position 2	30MHz-1GHz	part 15.209	EMI4535	PASS
Radiated measurement / 1 GHz to 18 GHz / Position 1	1GHz-18GHz	part 15.209	EMI4528	PASS
Radiated measurement / 1 GHz to 18 GHz / Position 2	1GHz-18GHz	part 15.209	EMI4529	PASS
Radiated measurement / 18 GHz to 25 GHz / Position 1	18GHz-25GHz	part 15.209	EMI4538	PASS
Radiated measurement / 18 GHz to 25 GHz / Position 2	18GHz-25GHz	part 15.209	EMI4539	PASS
Radiated measurement (Rx) / 1 GHz to 12.75 GHz / Position 1	1GHz-12.75GHz	part 15.109	EMI4541	PASS
Radiated measurement (Rx) / 1 GHz to 12.75 GHz / Position 2	1GHz-12.75GHz	part 15.109	EMI4543	PASS

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

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	ETS lindgren	3142E	14523	27/01/2022	27/03/2025
Antenna	ETS lindgren	3160-09	14690	17/01/2024	17/03/2027
Antenna	AARONIA	Powerlog 70180	15306	04/01/2023	04/03/2026
Antenna	ETS-Lindgren	3117	5456	09/09/2022	09/11/2025
Cable	SUCOFLEX	N-3m	14378	17/08/2023	17/10/2025
Cable	SUCOFLEX	N-3m	14379	17/08/2023	17/10/2025
Cable	SUCOFLEX	N-6,5m	14380	17/08/2023	17/10/2025
Cable	SUCOFLEX	N-5,5m	14381	17/08/2023	17/10/2025
Cable	Huber + Suhner	K-5m	14459	19/01/2022	19/03/2024
Cable	JYE BAO	K30K30-5003-40G1	14887	29/01/2024	29/03/2026
Cable	Techniwave	N-1.5m	18341	17/08/2023	17/10/2025
Cable	Techniwave	N-1.5m	18342	25/01/2022	25/03/2024
Cable	Techniwave	N-8m	18349	17/08/2023	17/10/2025
Cable	/	N-1m	3625	02/05/2023	02/07/2025
Cable	câbles et connectiques	N-1.5m	4203	03/03/2023	03/05/2025
Filter	Micro-Tronics	HPM18865	12843	24/08/2021	24/10/2024
Filter	Micro-Tronics	HPM15162	16973	26/06/2023	26/08/2026
Filter	Wainwright Instruments	WRCGV 2402/2480- 2380/2500- 40/10EE-200W	9771	28/09/2023	28/11/2026
Preamplifier	Techniwave	APS16-0087	14040	22/05/2023	22/07/2024
Preamplifier	Wright Technologie	ASL40-B3015	14851	29/01/2024	29/03/2025
Preamplifier	IMPULSE	CA118-546ACN	9169	15/06/2023	15/08/2024
Receiver	Rohde & Schwarz	FSW43	14830	10/08/2022	10/10/2024
Receiver	Rohde & Schwarz	ESW26	17791	08/02/2023	08/04/2024
Receiver	Agilent Technologies	E4440A	5824	12/04/2023	12/06/2025
Shielded enclosure	COMTEST	SAC 3m	14494	08/08/2023	08/10/2026
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Testo	608-H1	7562	28/09/2023	28/11/2025

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

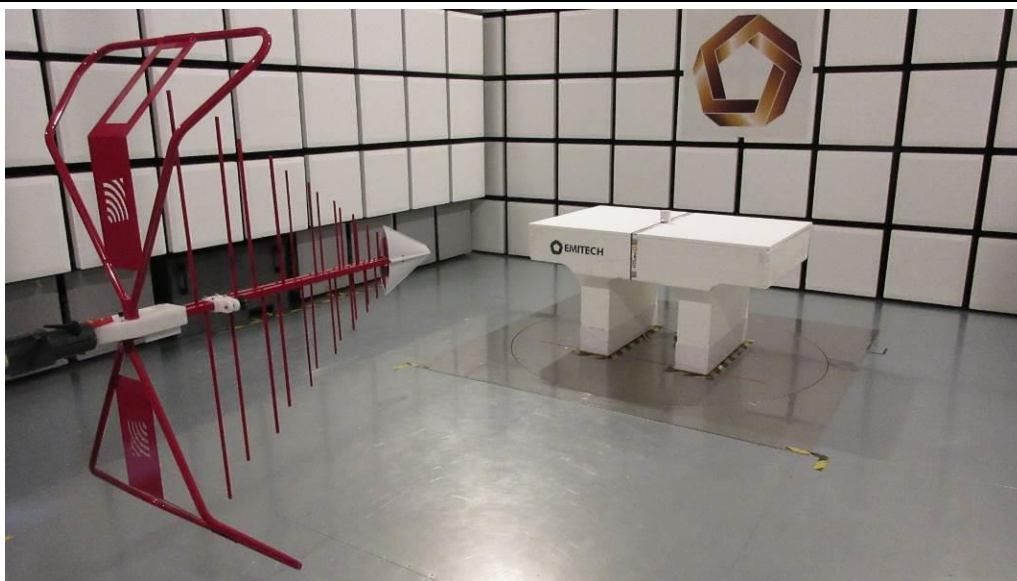
TEST SETUP PHOTO(S) – EUT POSITION 1



TEST SETUP PHOTO(S) – EUT POSITION 2



TEST SETUP PHOTO(S) – 30 MHz TO 1 GHz



TEST SETUP PHOTO(S) – 1 GHz TO 18 GHz



TEST SETUP PHOTO(S) – 18 GHz TO 25 GHz



RADIATED EMISSION LIMITS – TABULATED RESULT

RADIATED MEASUREMENT / 30 MHz TO 1 GHz / POSITION 1						EMI4534	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBμV/m)	QPEAK LEVEL(dBμV/m)	LIMIT (dBμV/m)	MARGIN (dB)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comments:		No spurious emissions were detected.					

RADIATED EMISSION LIMITS – TABULATED RESULT

RADIATED MEASUREMENT / 30 MHz TO 1 GHz / POSITION 2						EMI4535	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBμV/m)	QPEAK LEVEL(dBμV/m)	LIMIT (dBμV/m)	MARGIN (dB)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comments:		No spurious emissions were detected.					

RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT / 1 GHz TO 18 GHz / POSITION 1								EMI4528	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBμV/m)	PEAK LIMIT (dBμV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBμV/m)	AVERAGE LIMIT (dBμV/m)	AVERAGE MARGING (dB)
3636.04	Vertical	N/P	N/P	42.5	74	-32.5	N/P	54	-12.5
4960.18	Vertical	0	150	54.1	74	-19.9	50.5	54	-3.5
7438.29	Vertical	0	150	55.4	74	-18.6	51.9	54	-2.1
9918.46	Vertical	N/P	N/P	49.0	80*	31.0	N/P	60*	-11.0
12398.62	Vertical	90	150	52.7	74	-24.3	48.0	54	-6.0
17357.95	Vertical	350	150	54.5	80*	-25.5	49.2	60*	-10.8
4204.08	Horizontal	N/P	N/P	43.3	74	-30.7	N/P	54	-10.7
4959.13	Horizontal	N/P	N/P	47.2	74	-26.8	N/P	54	-6.8
6829.25	Horizontal	N/P	N/P	45.4	74	-28.6	N/P	54	-8.6
7441.29	Horizontal	N/P	N/P	47.1	74	-26.9	N/P	54	-6.9
12402.62	Horizontal	190	150	52.2	74	-21.8	48.4	54	-5.6
17357.95	Horizontal	100	150	56.6	80*	-23.4	52.2	60*	-7.8
Comments:		* According in paragraph (d) §15.247, outside restricted bands the limit is 20 dBc (in this case 100 dBμV/m – 20 dB = 80 dBμV/m)							

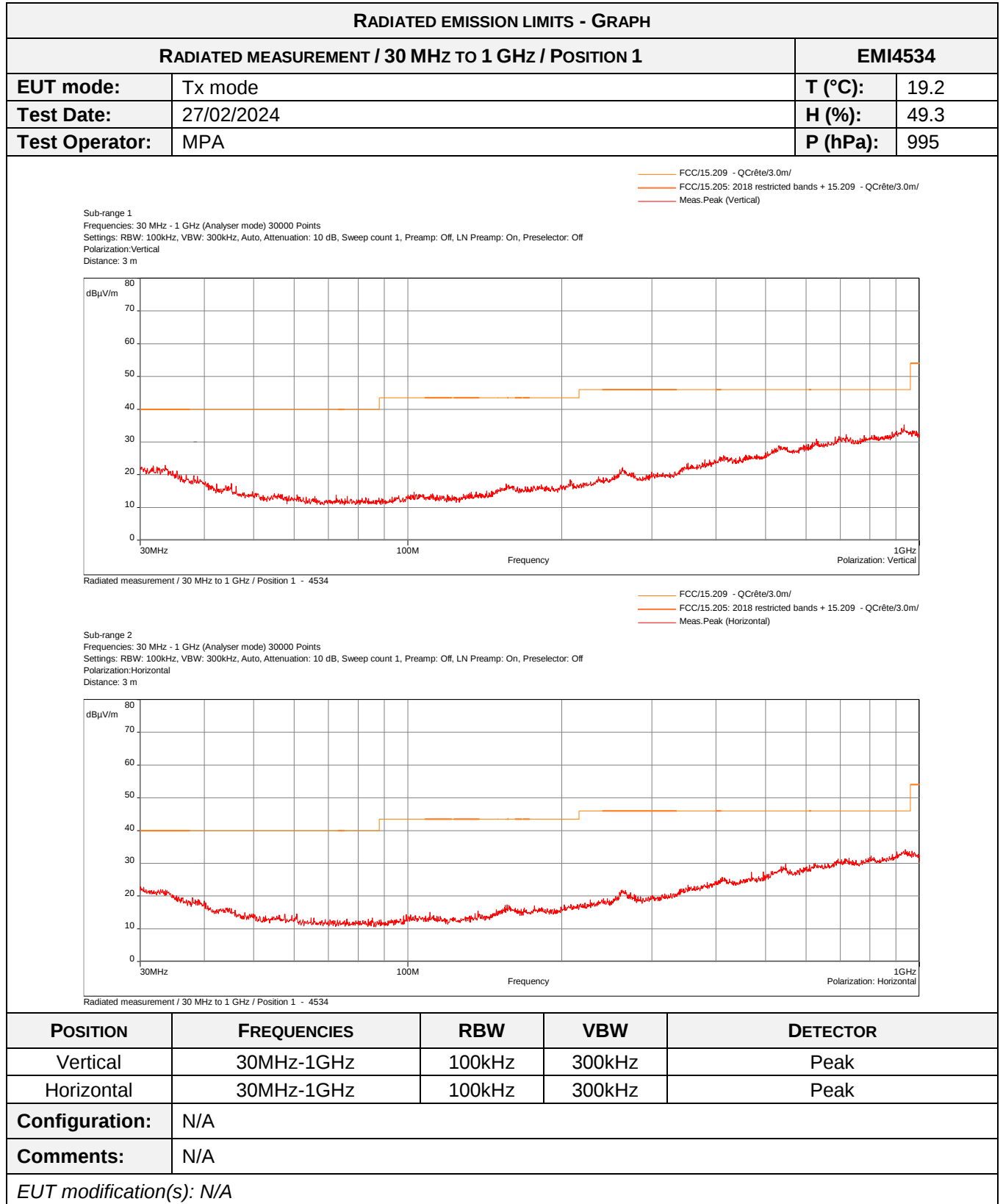
RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT / 1 GHz TO 18 GHz / POSITION 2								EMI4529	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBμV/m)	PEAK LIMIT (dBμV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBμV/m)	AVERAGE LIMIT (dBμV/m)	AVERAGE MARGING (dB)
4959.13	Vertical	0	150	48.5	74	-25.5	44.5	54	-9.5
6961.26	Vertical	N/P	N/P	45.8	81	-35.2	N/P	61	-55.2
7438.29	Vertical	0	150	53.8	74	-20.2	49.9	54	-4.1
8258.35	Vertical	N/P	N/P	47.3	74	-26.7	N/P	54	-6.7
12402.62	Vertical	350	150	54.1	74	-19.9	49.2	54	-4.8
17357.95	Vertical	170	150	56.1	81	-24.9	51.5	61	-44.9
4961.13	Horizontal	N/P	N/P	45.8	74	-28.2	N/P	54	-8.2
7438.29	Horizontal	160	150	49.4	74	-24.6	43.1	54	-10.9
8531.36	Horizontal	N/P	N/P	47.8	81	-33.2	N/P	61	-53.2
9918.46	Horizontal	N/P	N/P	47.6	81	-33.4	N/P	61	-53.4
12398.62	Horizontal	150	150	52.7	74	-21.3	47.2	54	-6.8
17357.95	Horizontal	150	150	55.5	81	-25.5	51.9	61	-45.5
Comments:		*According to the paragraph (d) §15.247, outside restricted bands the limit is 20 dBc (in this case 101 dBμV/m – 20 dB = 81 dBμV/m)							

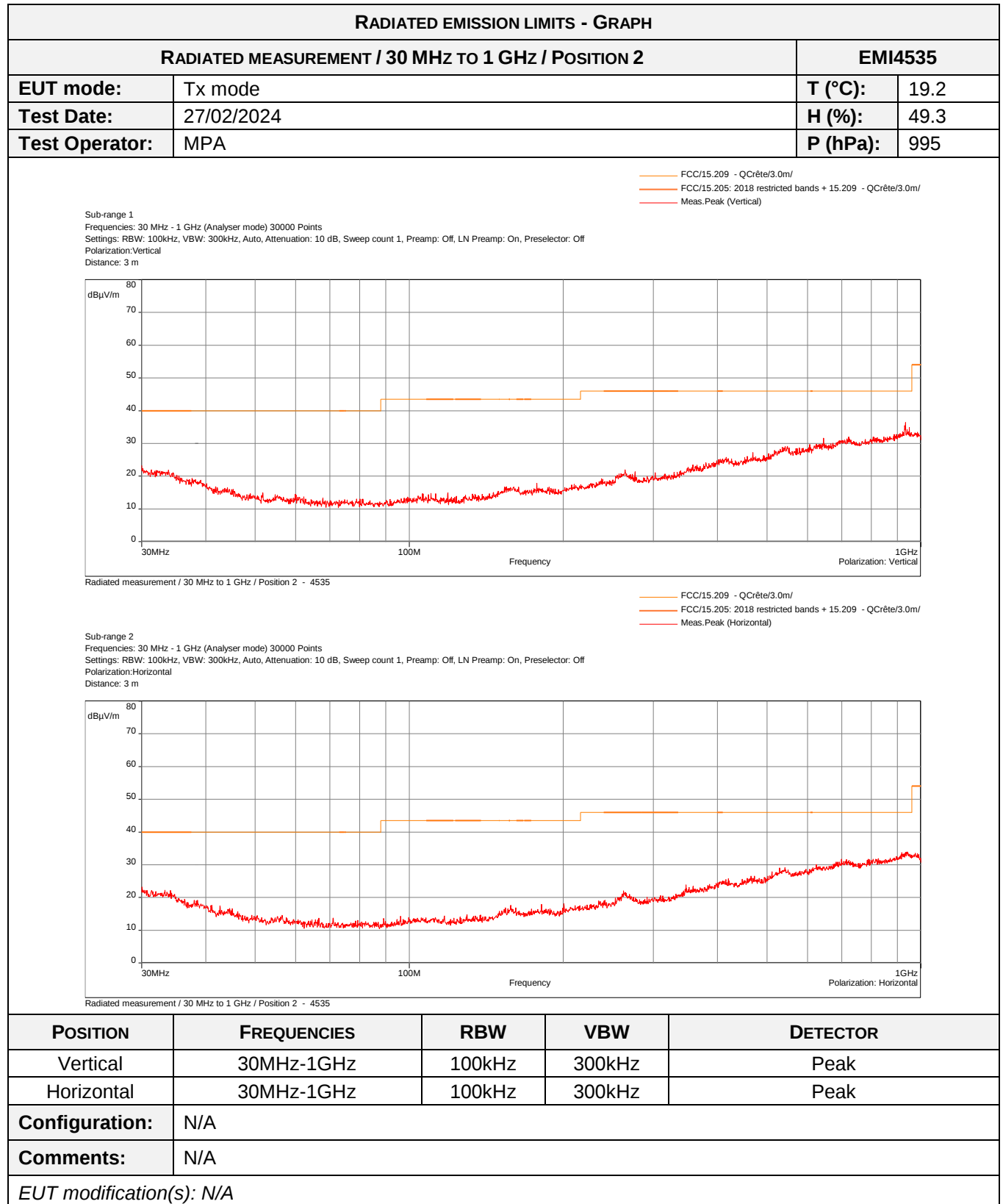
RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT / 18 GHz TO 25 GHz / POSITION 1								EMI4538	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBµV/m)	PEAK LIMIT (dBµV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBµV/m)	AVERAGE LIMIT (dBµV/m)	AVERAGE MARGING (dB)
19836.92	Vertical	N/P	N/P	55.8	83.52*	-27.7	N/P	63.52*	-47.7
19844.39	Vertical	N/P	N/P	55.8	83.52*	-27.7	N/P	63.52*	-47.7
19836.92	Horizontal	N/P	N/P	56.3	83.52*	-27.2	N/P	63.52*	-47.2
19844.39	Horizontal	N/P	N/P	56.6	83.52*	-26.9	N/P	63.52*	-46.9
Comments:		*In order to improve the dynamics, the measurement was carried out at a distance of 1 m. The limit was calculated with 20 dB/decade extrapolation factor.							

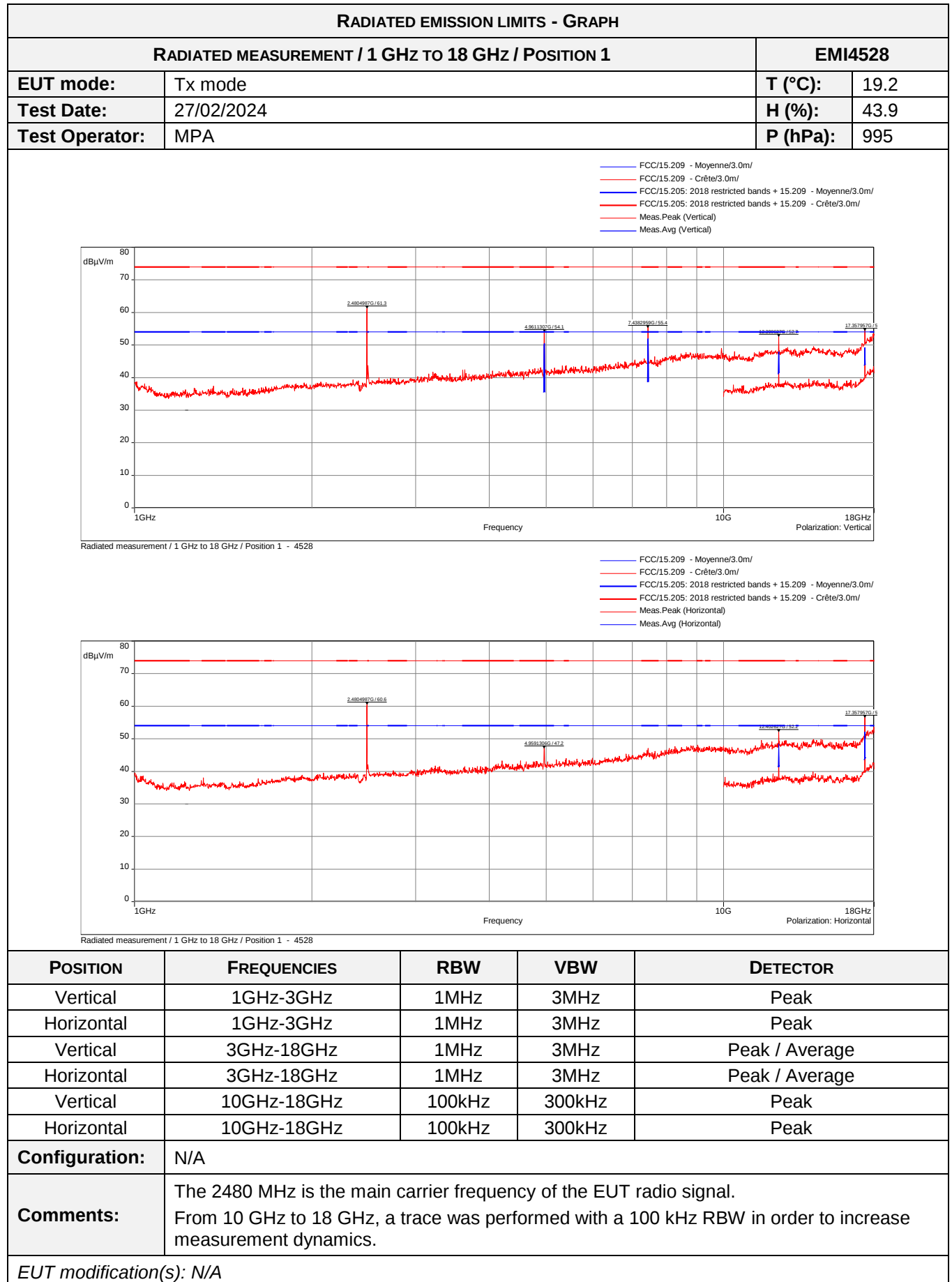
RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT / 18 GHz TO 25 GHz / POSITION 2								EMI4539	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBµV/m)	PEAK LIMIT (dBµV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBµV/m)	AVERAGE LIMIT (dBµV/m)	AVERAGE MARGING (dB)
19837.38	Vertical	N/P	N/P	54.5	83.52*	-29.0	N/P	63.52*	-49.0
19844.39	Vertical	N/P	N/P	56.1	83.52*	-27.4	N/P	63.52*	-47.4
19836.45	Horizontal	N/P	N/P	55.5	83.52*	-28.0	N/P	63.52*	-48.0
19843.92	Horizontal	N/P	N/P	56.2	83.52*	-27.3	N/P	63.52*	-47.3
Comments:		*In order to improve the dynamics, the measurement was carried out at a distance of 1 m. The limit was calculated with 20 dB/decade extrapolation factor.							

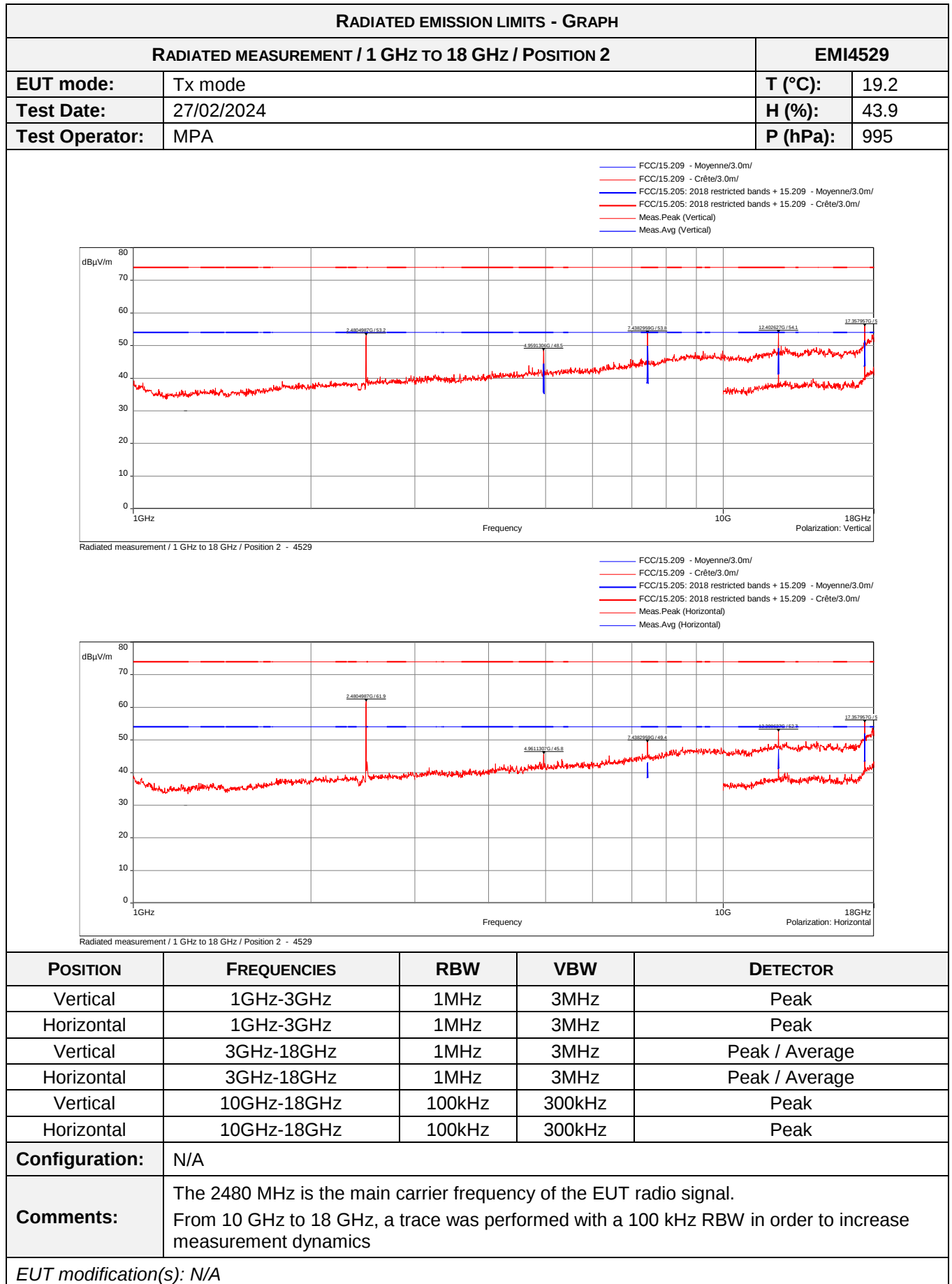
RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT (Rx) / 1 GHz TO 12.75 GHz / POSITION 1								EMI4541	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBµV/m)	PEAK LIMIT (dBµV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBµV/m)	AVERAGE LIMIT (dBµV/m)	AVERAGE MARGING (dB)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comments:		No spurious emissions were detected.							

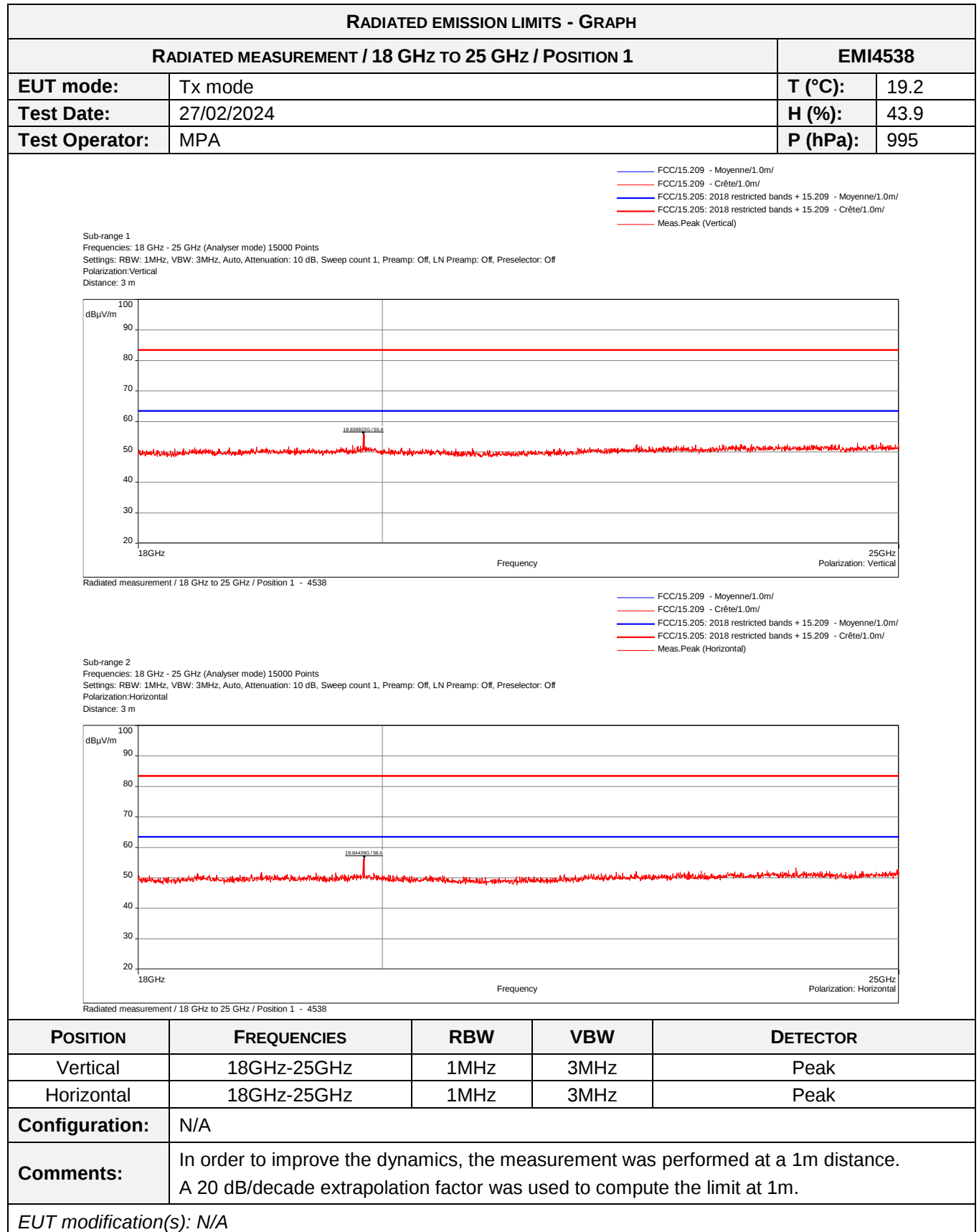
RADIATED EMISSION LIMITS - GRAPH									
RADIATED MEASUREMENT (Rx) / 1 GHz TO 12.75 GHz / POSITION 2								EMI4543	
FREQUENCY (MHz)	POLARIZATION	AZIMUTH (°)	ANTENNA HEIGHT (cm)	PEAK LEVEL (dBµV/m)	PEAK LIMIT (dBµV/m)	PEAK MARGING (dB)	AVERAGE LEVEL (dBµV/m)	AVERAGE LIMIT (dBµV/m)	AVERAGE MARGING (dB)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comments:		No spurious emissions were detected.							

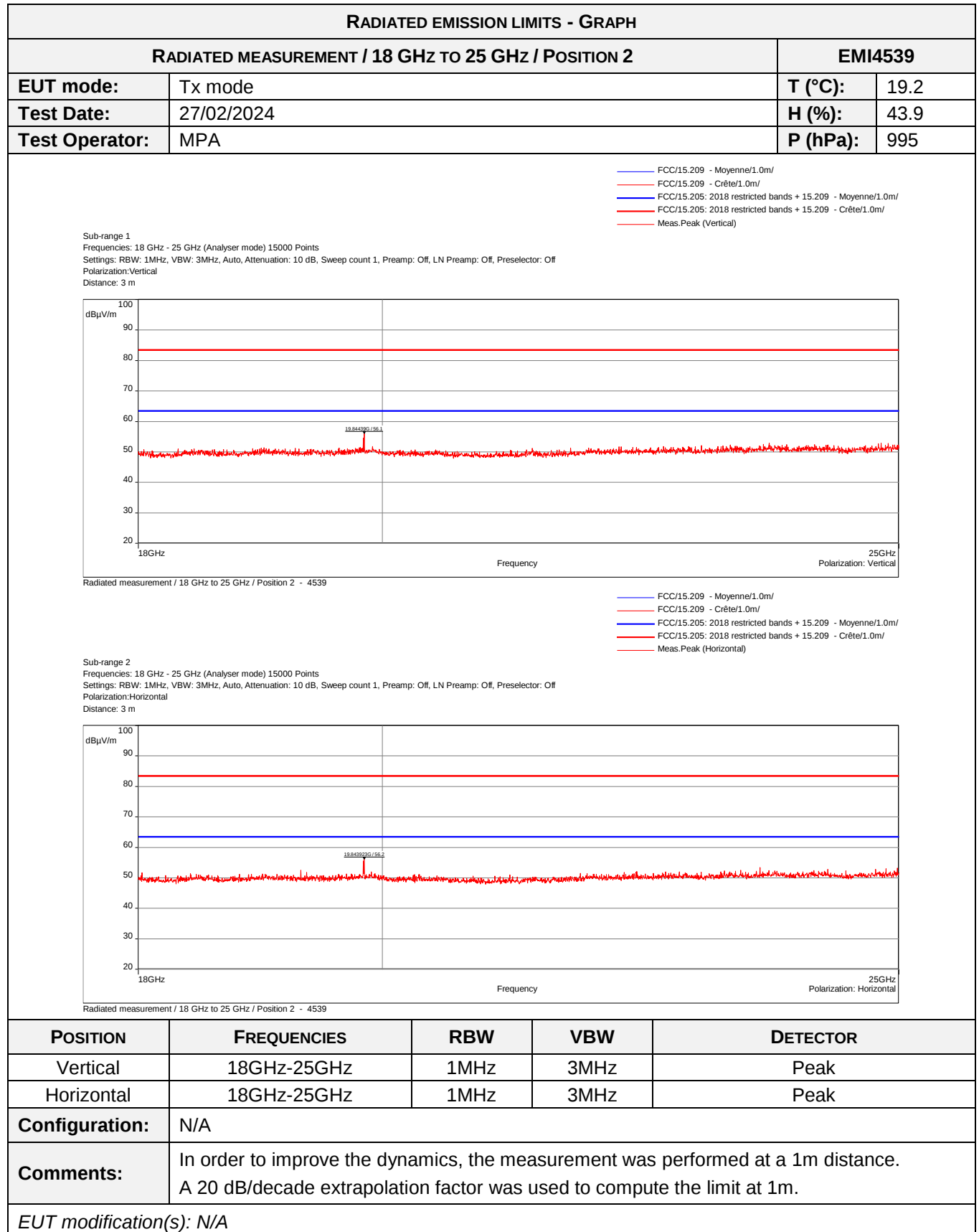


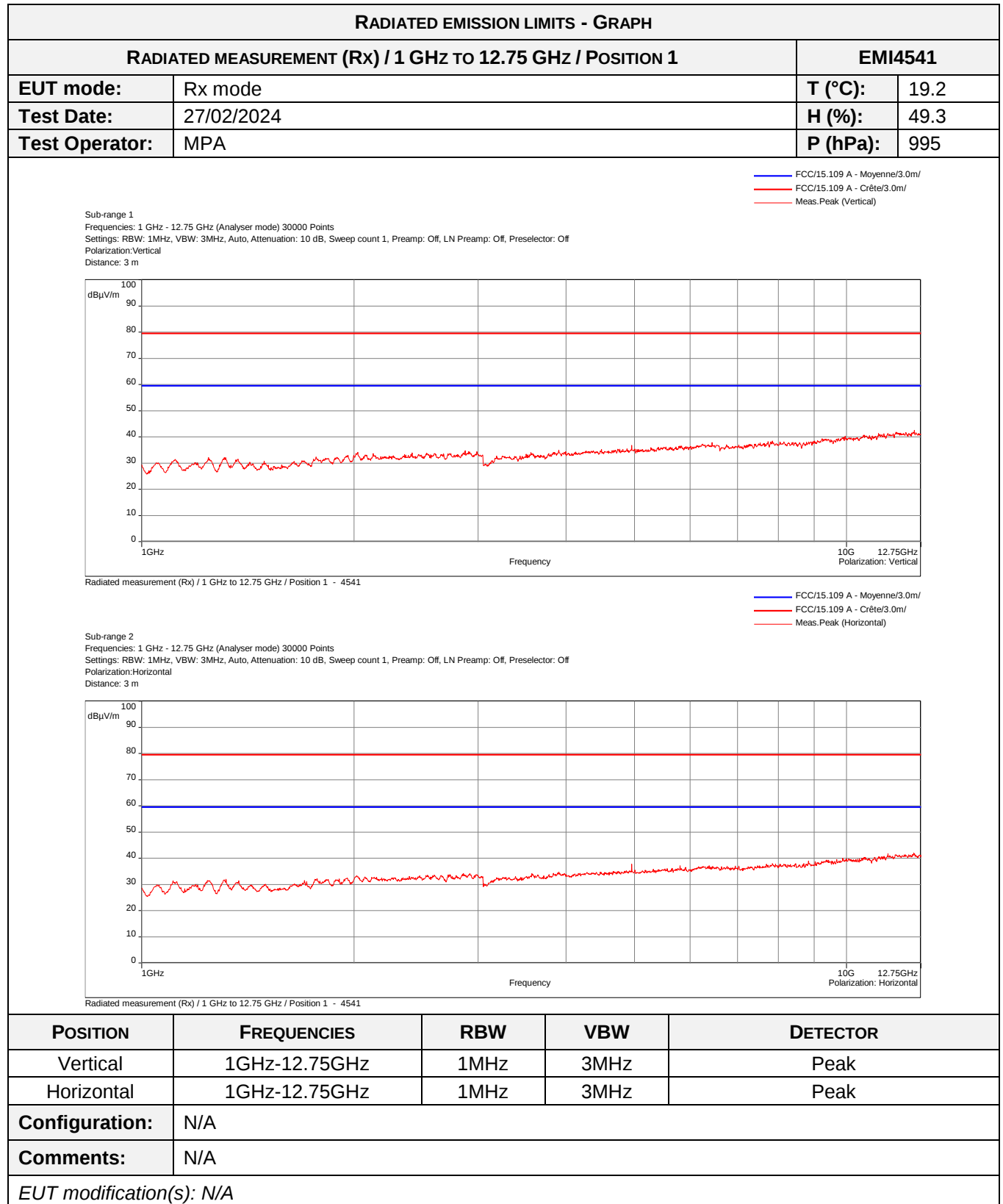


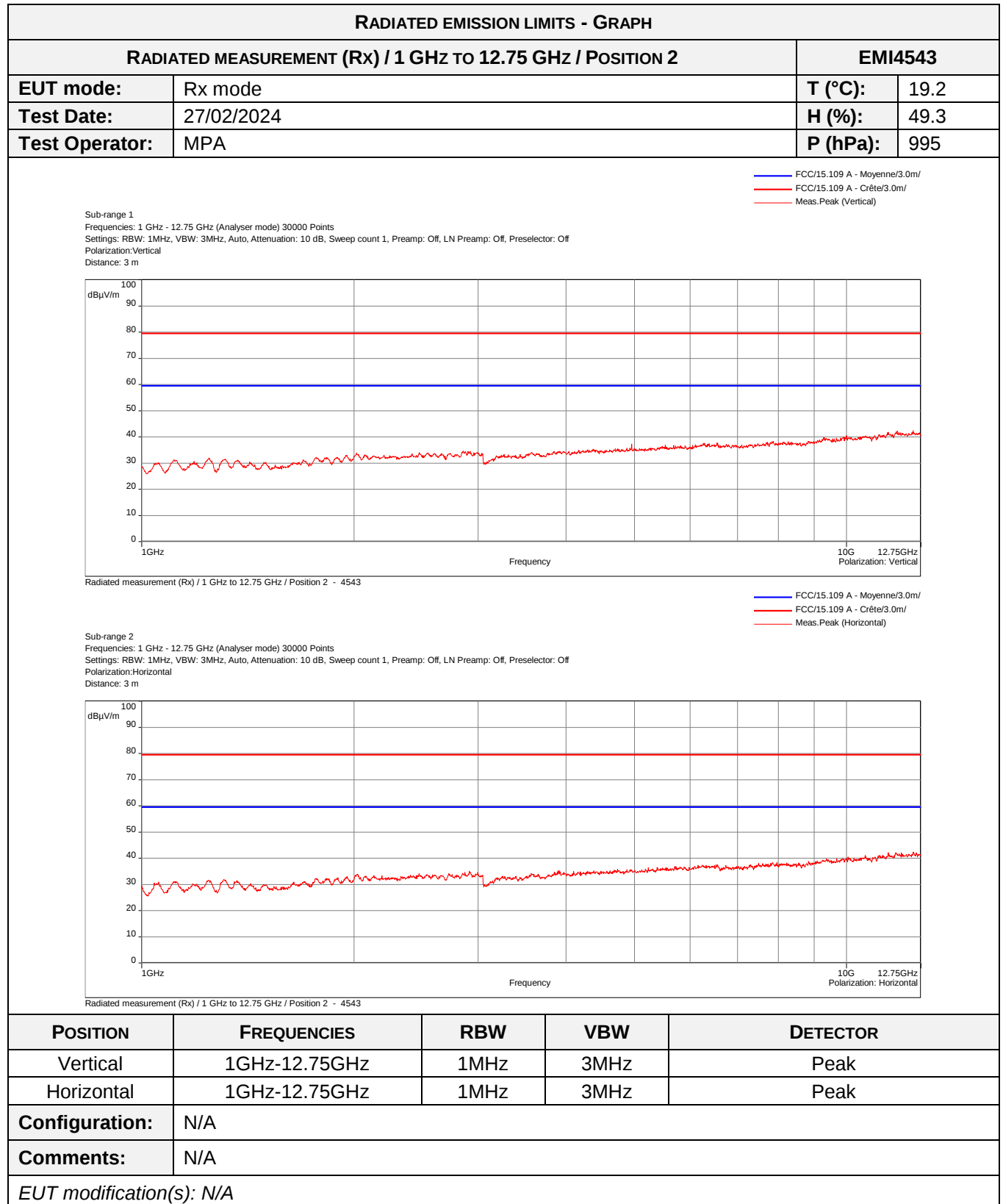












7.2.6dB bandwidth & 99% Occupied Bandwidth

Reference standard:	FCC part 15 Radio part 15.247, 15.215 RSS-247 & RSS-GEN
Test method:	ANSI C63.10: 2013
Test description: a) (2): Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. EUT is connected to the measuring receiver via 50Ω attenuator(s). Tests are done in max-hold mode in order to capture all channels.. The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls. The residual part of the total power being denoted as β , which, in cases of symmetrical spectra, splits up into $\beta/2$ on each side of the spectrum. Unless otherwise specified, $\beta/2$ is taken as 0,5 %. The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions. EUT is connected to the measuring receiver via 50Ω attenuator(s).	

TESTED PARAMETER	RESULT	SEVERITY	RESULT TAB.	VERDICT
6 dB bandwidth	2615.8 kHz	≥ 500 kHz	EMI6003	PASS

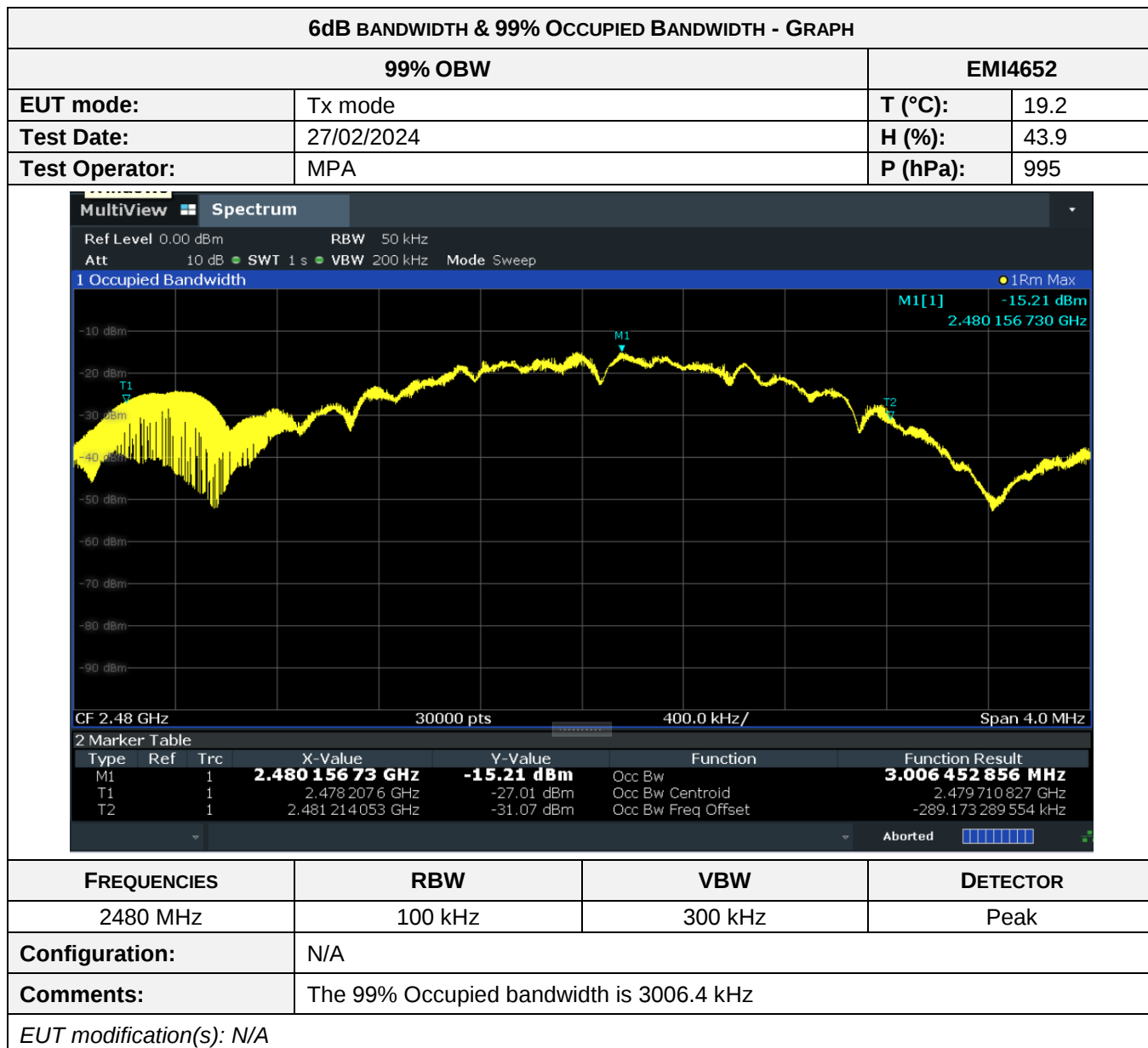
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	20 to 75 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	AARONIA	Powerlog 70180	15306	04/01/2023	04/03/2026
Attenuator	Radiall	R412710124	17328	17/08/2023	17/10/2026
Cable	Techniwave	N-1.5m	18341	17/08/2023	17/10/2025
Cable	Techniwave	N-1.5m	18342	25/01/2022	25/03/2024
Cable	/	N-1m	3625	02/05/2023	02/07/2025
Preamplifier	IMPULSE	CA118-546ACN	9169	15/06/2023	15/08/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Spectrum analyzer	Rohde & Schwarz	FSW43	14830	10/08/2022	10/10/2024
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

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7.3. Maximum peak power of the intentional radiator

Reference standard:	FCC part 15 Radio part 15.247 RSS-247
Test method:	ANSI C63.10: 2013
Test description: b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode. For EUT without dedicated or integral antenna, EUT is connected to the measuring receiver via 50Ω attenuator(s). Radiated power limit applies to the maximum measured conducted power value adjusted by the antenna gain and beamforming gain. For EUT with integral or dedicated antenna, measurements are done on a normalized test site. EUT is set on an insulating support at 150 cm above the ground reference plane. Measurement is done on a normalized test site by the substitution method. The test antenna is oriented in the two polarizations (vertical and horizontal), and the product is rotated at 360° in the horizontal plane (See photo(s) for initial position of the EUT(0°)). If applicable the test antenna was raised and lowered through the specified range of height until a maximum signal level is detected. For portable equipments: - For frequencies < 1GHz a research of maximum level is done on 3 axes - For frequencies > 1GHz styrofoam wedges, precut to the 30°, 60°, and 90° angles, are used to support the EUT in the 6 different orientations. Only the highest levels are recorded.	

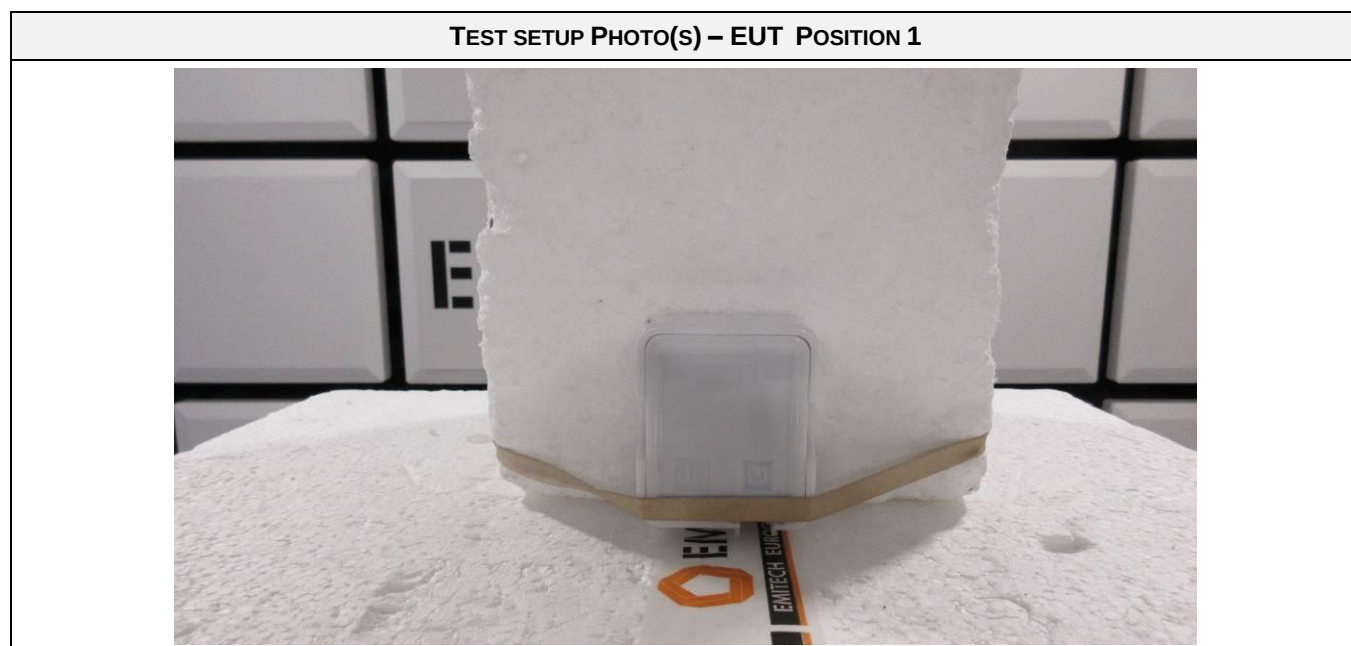
TESTED CONFIGURATION	RESULTS	SEVERITY	RESULT TAB.	VERDICT
EIRP / Position 1	4.88 dBm	1W (30dBm)	EMI4532	PASS
EIRP / Position 2	4.98 dBm	1W (30dBm)	EMI4530	PASS

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		

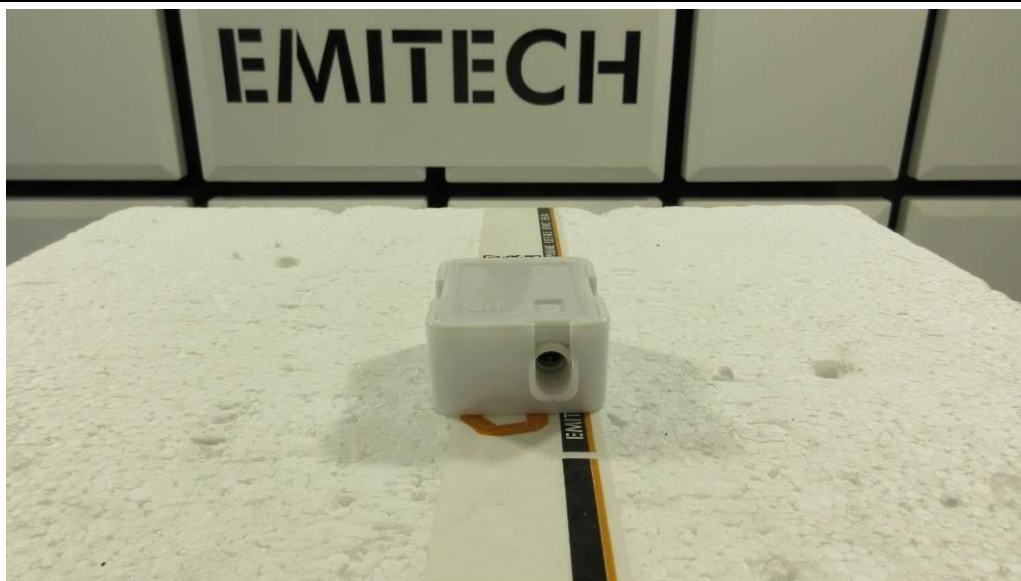
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	AARONIA	Powerlog 70180	15306	04/01/2023	04/03/2026
Attenuator	Radiall	R412710124	17328	17/08/2023	17/10/2026
Attenuator	EMITECH	SUB.V4-H	18112	10/03/2023	10/05/2024
Cable	Techniwave	N-1.5m	18341	17/08/2023	17/10/2025
Cable	Techniwave	N-1.5m	18342	25/01/2022	25/03/2024
Filter	BL Microwave	BP2442-84-7CS	8441	28/09/2023	28/11/2026
Power probe	Keysight	L2062XA	17083	21/09/2022	21/11/2024
Preamplifier	IMPULSE	CA118-546ACN	9169	15/06/2023	15/08/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

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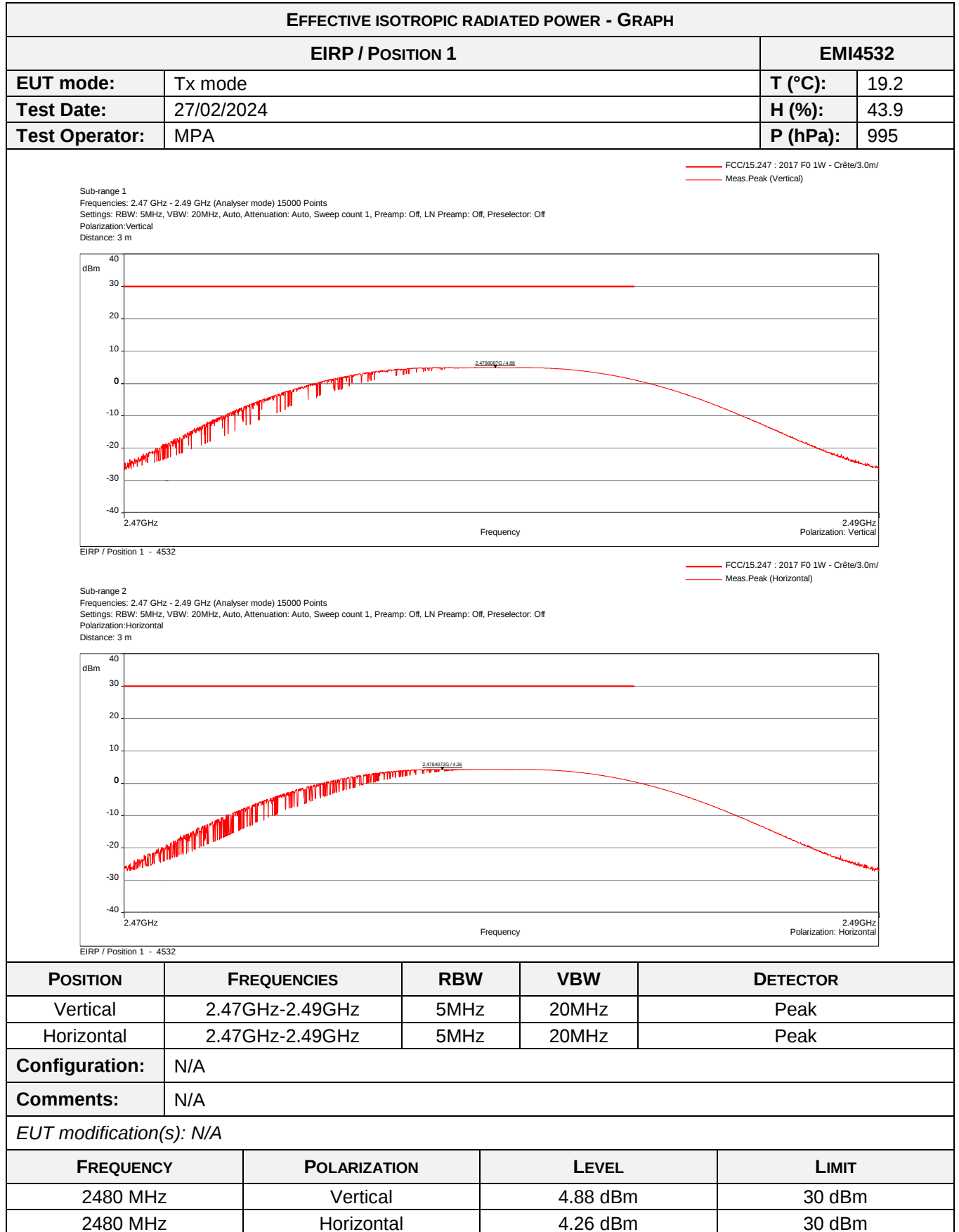


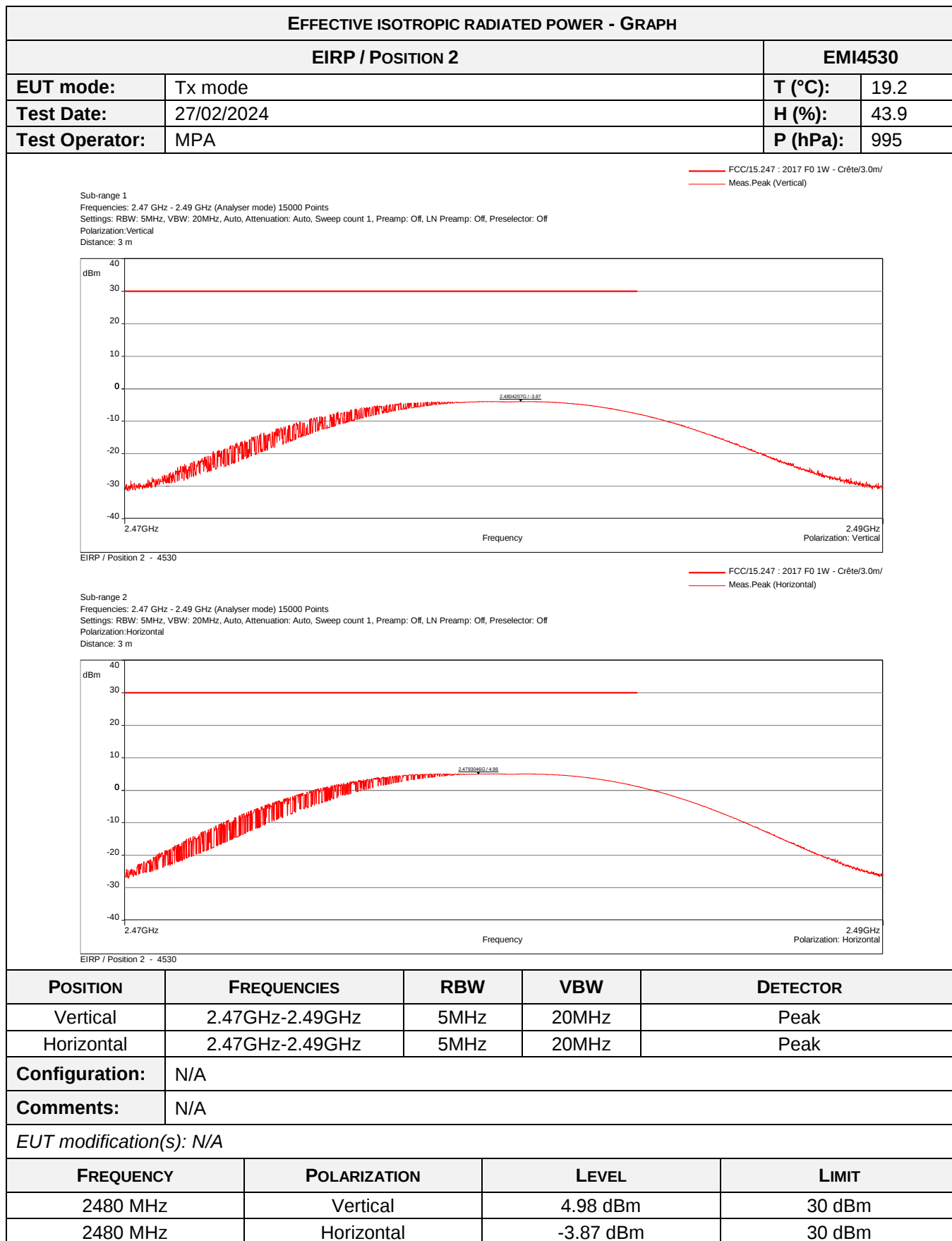
TEST SETUP PHOTO(S) – EUT POSITION 2



TEST SETUP PHOTO(S)







7.4. Power Spectral Density

Reference standard:	FCC part 15 Radio part 15.247 RSS-247
Test method:	ANSI C63.10: 2013
Test description: e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density. For EUT without dedicated or integral antenna, EUT is connected to the measuring receiver via 50Ω attenuator(s). Radiated power limit applies to the maximum measured conducted power value adjusted by the antenna gain and beamforming gain. For EUT with integral or dedicated antenna, measurements are done on a normalized test site. EUT is set on an insulating support at 150 cm above the ground reference plane. Measurement is done on a normalized test site by the substitution method. The test antenna is oriented in the two polarizations (vertical and horizontal), and the product is rotated at 360° in the horizontal plane (See photo(s) for initial position of the EUT(0°)). If applicable the test antenna was raised and lowered through the specified range of height until a maximum signal level is detected. For portable equipments: - For frequencies < 1GHz a research of maximum level is done on 3 axes - For frequencies > 1GHz styrofoam wedges, precut to the 30°, 60°, and 90° angles, are used to support the EUT in the 6 different orientations. Only the highest levels are recorded.	

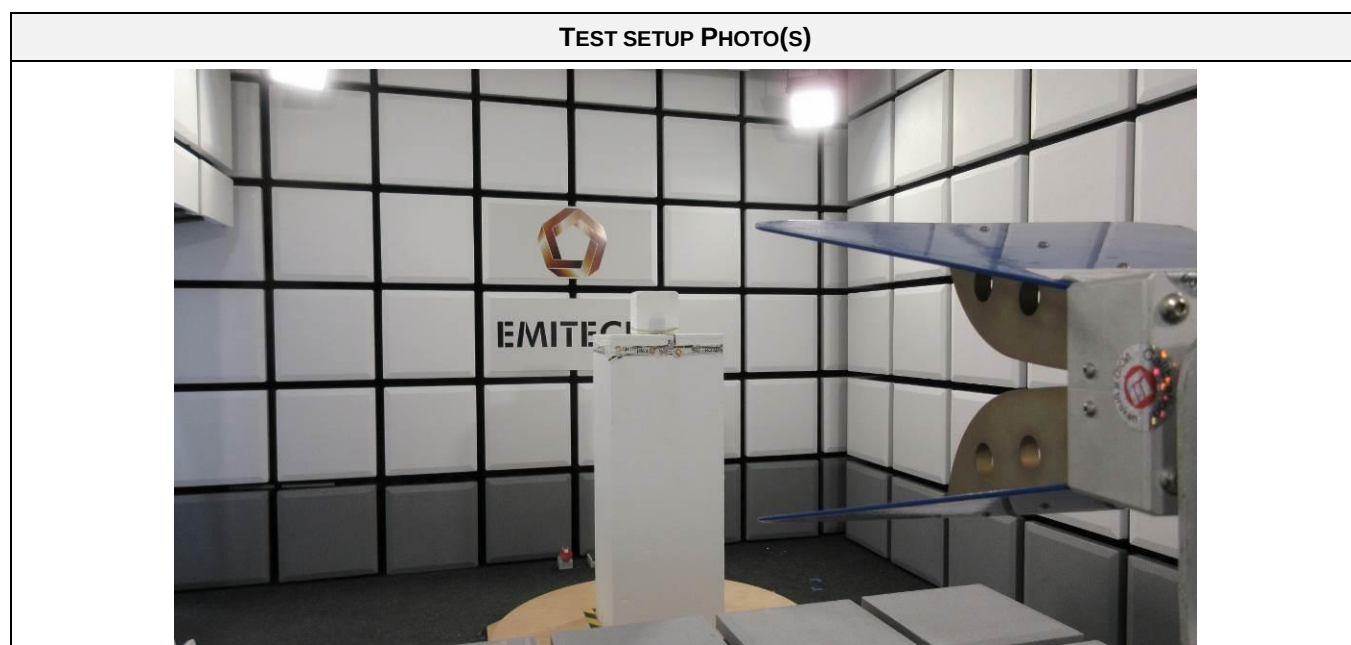
TESTED CONFIGURATION	RESULT	SEVERITY	RESULT TAB.	VERDICT
PSD	-8.72 dBm/3kHz	8 dBm/3kHz	EMI4547	PASS

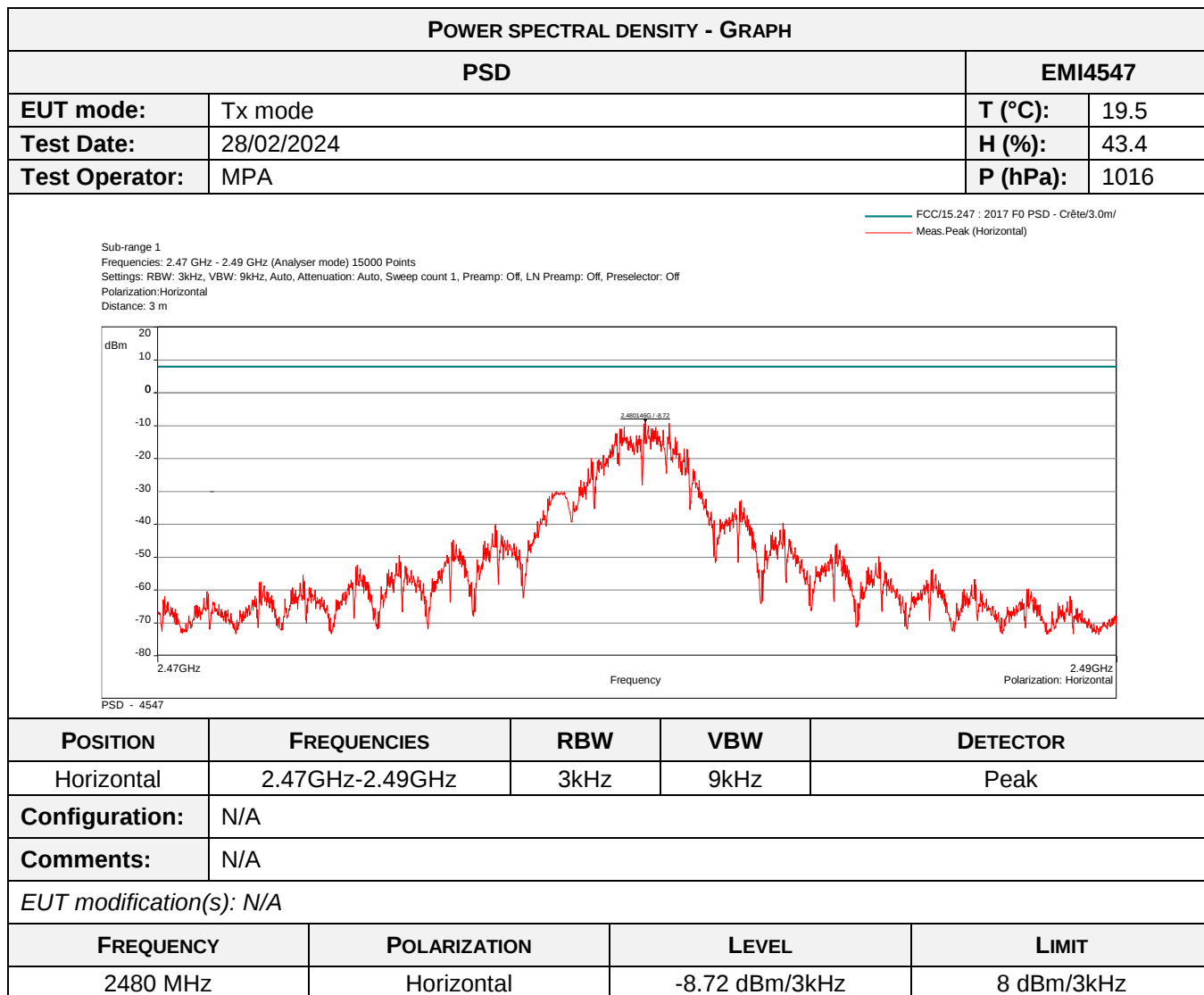
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(s)
Relative Humidity	20 to 75 %	See Graph(s)
Atmospheric pressure	N/A	See Graph(s)
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	AARONIA	Powerlog 70180	15306	04/01/2023	04/03/2026
Attenuator	Radiall	R412710124	17328	17/08/2023	17/10/2026
Cable	Techniwave	N-1.5m	18341	17/08/2023	17/10/2025
Cable	Techniwave	N-1.5m	18342	25/01/2022	25/03/2024
Cable	/	N-1m	3625	02/05/2023	02/07/2025
Preamplifier	IMPULSE	CA118-546ACN	9169	15/06/2023	15/08/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Spectrum analyzer	Rohde & Schwarz	FSW43	14830	10/08/2022	10/10/2024
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

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7.5. Band-edge compliance of emissions

Reference standard:	FCC part 15 Radio part 15.247 RSS-247
Test method:	ANSI C63.10: 2013
Test description: d) In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. EUT is connected to the measuring receiver via 50Ω attenuator(s). Only the highest levels are recorded.	

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Band edge	2.38GHz- 2.5035GHz	20 dBc	EMI4546	PASS

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

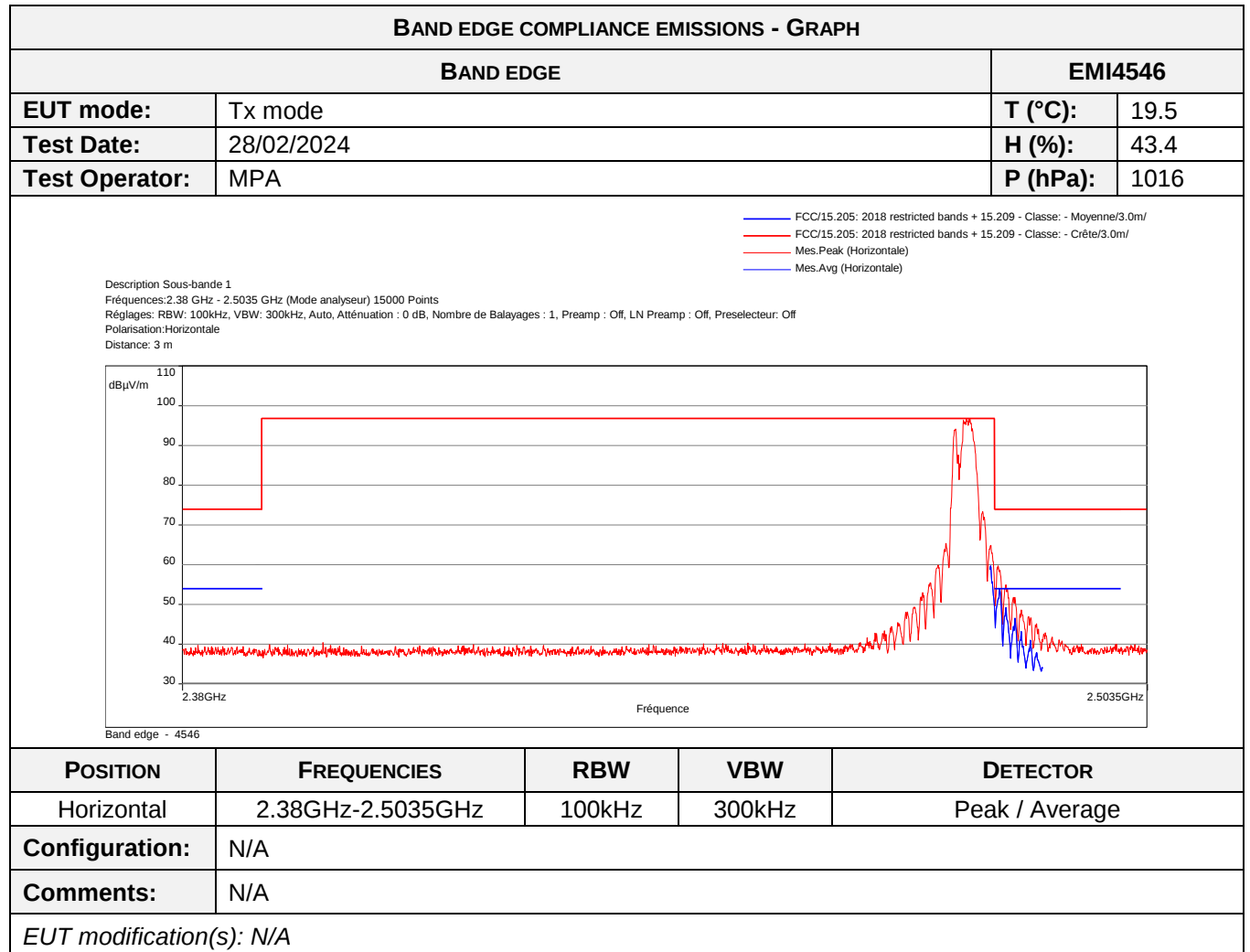
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	AARONIA	Powerlog 70180	15306	04/01/2023	04/03/2026
Attenuator	Radiall	R412710124	17328	17/08/2023	17/10/2026
Cable	Techniwave	N-1.5m	18341	17/08/2023	17/10/2025
Cable	Techniwave	N-1.5m	18342	25/01/2022	25/03/2024
Cable	/	N-1m	3625	02/05/2023	02/07/2025
Preamplifier	IMPULSE	CA118-546ACN	9169	15/06/2023	15/08/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Spectrum analyzer	Rohde & Schwarz	FSW43	14830	10/08/2022	10/10/2024
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

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TEST SETUP PHOTO(S) – BAND EDGE





7.6. Frequency Stability

Reference standard:	FCC part 15 Radio part 15.215 RSS-Gen
Test method:	ANSI C63.10: 2013
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).	

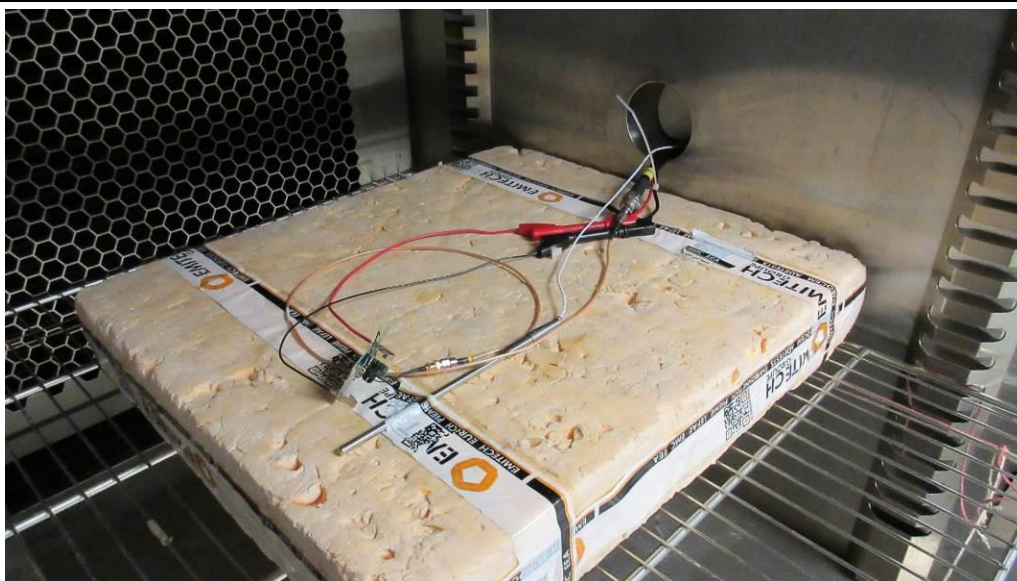
TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
Tx mode	Tx mode	2400MHz- 2483.5MHz	-	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	19.8 °C
Relative Humidity	20 to 75 %	43.4 %
Atmospheric pressure	N/A	1016 hPa
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
Attenuator	Radiall	R412710124	17329	17/08/2023	17/10/2026
Cable	N	3m	16411	16/08/2023	16/10/2025
Climatic enclosure	CLIMATS	EXCAL 7714-HA	14261		
Multimeter	Agilent Technologies	U1252A	6138	29/06/2023	29/08/2024
Power supply	TTI	PL303QMD	8496		
Spectrum analyzer	Rohde & Schwarz	FPL1007	17908	04/12/2023	04/02/2025
Thermohygrometer	Testo	608-H1	7562	28/09/2023	28/11/2025
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025
Thermometer contactless	GHM Greisinger	GMH 3710	12968	28/02/2023	28/04/2025

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TEST SETUP PHOTO(S)



FREQUENCY STABILITY - TABULATED RESULTS

Test Case	Temperature (°C)	Power supply (Vdc)	Frequency (MHz)	Frequency error (kHz)
Normal conditions	+25	3.6	2479.710	-
Extremes voltage tests conditions		3.2	2479.680	-30
Extremes temperature tests conditions	-40	3.6	2479.660	-50
Extremes temperature tests conditions	+80		2479.660	-50

EUT MODIFICATIONS	OPERATOR	TEST DATE	RESULT TAB.
N/A	MPA	28/02/2024	-

End of test report