



Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
IC Assigned Code: 4379C

RADIO TEST REPORT

FCC part 15.247
RSS-247_Issue 2, February 2017
(Partial Tests)

Company: **OCEASOFT**
Address.....: 720 RUE LOUIS LEPINE
34000 MONTPELLIER

Test item description: **LoRaWAN Daughter Card**
Trade Mark: OCEASOFT
Manufacturer: OCEASOFT
Model/Type reference.....: LoRMur Daughter Card
FCC ID.....: XTLCMABZ
IC: 9337A-CMABZ
Ratings.....: 2.2 to 3.6 Vdc

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

Report Reference No.....: **RR410-20-100209-1A**
Test procedure: FCC IC Certification
Diffusion.....: MR PIGNON
Applicant's name: OCEASOFT
Date of issue.....: 09/03/2020
Total number of pages.....: 71
Revision.....: 0
Modified page(s).....: None
Compiled by.....: Morgan PATEY
Approved by (+ signature).....: David MONTAULON (Technical Manager)



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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of
the whole manufactured products of the tested sample.*



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1. GENERAL INFORMATION

This document submits the results of Radio tests performed on the equipment **LoRaWAN Daughter Card** (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 Laboratory : EMITECH MONTPELLIER laboratory & Open Area Test Site in SALINELLES (30) Address : 145 rue de Massacan 34740 VENDARGUES FRANCE Test procedure. : FCC IC Certification Tested by : Morgan PATEY & Olivier AELBRECHT Test supervisor : David MONTAULON Date of receipt of test item : N/A Date (s) of performance of tests : January, from 17 th to 31 st of 2020			
APPLICANT'S GENERAL INFORMATION:			
Company name : OCEASOFT Company address. : 720 RUE LOUIS LEPINE 34000 MONTPELLIER Person(s) present during the tests. : N/A Responsible. : MR PIGNON			
GENERAL REMARKS:			
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. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. Throughout this report the decimal separator is point.			
POSSIBLE TEST CASE VERDICTS:			
Test case does not apply to the test object. . : N/A Information not communicated. : N/C Test case not performed..... : N/P Test object does meet the requirement..... : P (Pass) Test object does not meet the requirement.. : F (Fail) Test object was not subjected to all tests..... : I (Inconclusive)			
DEFINITIONS AND ABBREVIATIONS:			
E.U.T.	Equipment under test	AE	Ancillary equipment
RBW	Resolution bandwidth	VBW	Video bandwidth
OATS	Open area test site	FAR	Full anechoic room
RF	Radio frequency	NTR	Nothing to report
SRD	Short Range Device	GPS	Global Positioning System

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:

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

FCC part 15

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 2, February 2017

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

RSS/CNR-Gen, Issue 4, November 2014

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

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. : LoRaWAN Daughter Card for OCEASOFT LoRaWAN-enabled products

Model/Type reference..... : LoRMur Daughter Card

Trade Mark. : OCEASOFT

FCC ID..... : XTLCMABZ

IC. : 9337A-CMABZ

Serial number (S/N)..... : N/A

Part number (P/N). : N/A

Software version..... : N/A

Firmware version. : 1

Type of sample. : Serial

Function(s)..... : LoRaWAN Daughter Card for OCEASOFT LoRaWAN-enabled products

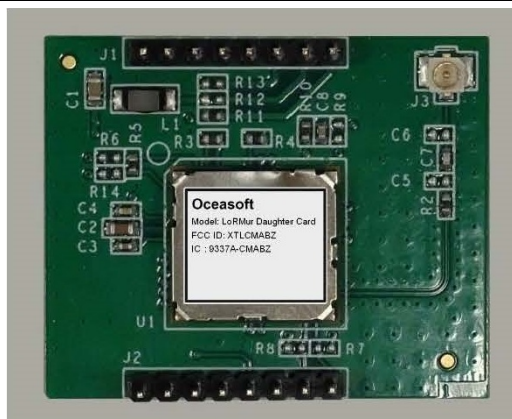
Manufacturer name. : OCEASOFT

Address..... : 720 RUE LOUIS LEPINE
34000 MONTPELLIER

General product information:

N/A

3.2. EUT Electronic board & Marking plate



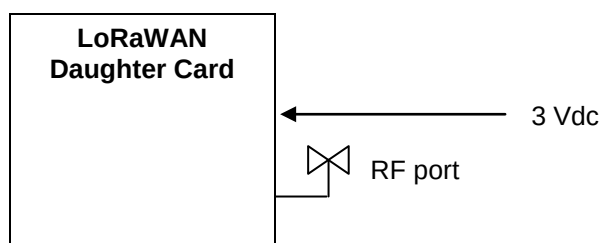
3.3. EUT Mechanical and Electrical Design

Power supply. : 3 Vdc
 Power supply range. : 2.2 to 3.6 Vdc
 Power type. : DC
 Power (W). : 0.45
 Nominal current (A). : 0.13
 Dimensions (L x W x H) (m). : 0.033 x 0.026 x 0.01
 Weight (kg). : 0.01
 Temperature range (°C). : 0 to +50
 Ground bounding strap. : No

Comments:

N/A

3.4. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	PCB	N/A
1	Power supply	DC	N/A	N/A	3V
2	RF antenna	RF	N/A	N/A	915 MHz

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

3.5. Supporting Equipment Used During Test

Sample subject to the tests was tested with following equipment.

PRODUCT TYPE	MANUFACTURER	MODEL	N°EMITECH / COMMENTS
N/A	N/A	N/A	N/A

3.6. EUT Radio Specifications

a) GENERAL INFORMATIONS	
According to manufacturer's declarations :	
EUT type.....	: Transceiver
Technology	: LoRa
Environmental profile.....	: Data transmission
Temperature range.....	: 0 to +50 °C
Antenna type	: External (not dedicated)
Antenna Gain.....	: < 1.04 dBi
Comments:	
N/A	
b) TRANSMITTER PARAMITERS (Tx)	
Frequency bands.....	: 902MHz-928MHz
RF Power.....	: 20 dBm
Number of channels / Separation.....	: 64 + 8 + 8
Modulation type	: LORA
Duty cycle	: Peak transmission is less than 100ms/8s, and never exceeds 8 packets of 100ms per hour. (See original certification)
Tested frequency.....	: 902 MHz to 928 MHz
c) RECEIVER PARAMETERS (Rx)	
Frequency bands.....	: 902 MHz to 928 MHz
Category/Class	: Not communicated
Bandwidth	: Not communicated

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		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		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		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
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		N/P	15.203 / No dedicated antenna
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 and 5725-5850MHz			15.247
- Frequency hopping and digitally modulated		-	a)
- Frequency hopping system		N/P	a) (1)
- Digital modulation system		N/P	a) (2)
- Maximum peak conducted output power		-	b)
- For hopping system in the 2400-2483.5 MHz and 5725-5850 MHz bands		N/A	b) (1)
- For hopping system in the 902-928MHz band		PASS	b) (2) BW : 125kHz
- For system using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands		PASS	b) (3) BW : 500kHz
- 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 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 account of uncertainty associated with the results.

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

5. RF EXPOSURE

Conducted measurement = 11.2dBm

Maximum antenna gain = 6dBi

Maximum EIRP with antenna gain of 6dBi = 52.48 mW (eirp) at 902.3MHz

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

$PSD = EIRP / (4 \cdot \pi \cdot R^2) = 52.48 / (4 \cdot \pi \cdot (20 \text{ cm})^2) = 0.0104 \text{ mW/cm}^2$

Limit= 0.61 mW/cm² (f /1500 if 300<f< 1500 MHz)

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	$\pm 1.2 \%$	$\pm 5 \%$
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 (PAR / PIRE / RNE)		
$f \leq 62.5 \text{ MHz}$	$\pm 5.1 \text{ dB}$	$\pm 6 \text{ dB}$
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	$\pm 5.4 \text{ dB}$	$\pm 6 \text{ dB}$
PIRE and power spectral density with diode	$\pm 5.4 \text{ dB}$	$\pm 6 \text{ dB}$
Radiated emission (magnetic field)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	$\pm 6 \text{ dB}$
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	$\pm 4.4 \%$	$\pm 5 \%$
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	/
30MHz – 1GHz	$\pm 5.2 \text{ dB}$	/
1GHz – 18GHz	$\pm 5.3 \text{ dB}$	/
18GHz – 26GHz	$\pm 5.5 \text{ dB}$	/
26GHz – 40GHz	$\pm 5.5 \text{ dB}$	/

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

7. TEST CONDITIONS AND RESULTS

7.1. Maximum peak conducted power of the intentional radiator

Reference standard:	FCC part 15 Radio part 15.247 and 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. EUT is connected to the measuring receiver via 50Ω attenuator(s). Only the highest levels are recorded.	

TESTED CONFIGURATION	RESULTS	SEVERITY	RESULT TAB.	VERDICT
LoRa 125 kHz	11.2 dBm	1W (30dBm)	EMI6030	PASS
LoRa 500 kHz	11.2 dBm	1W (30dBm)	EMI6031	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	25.3 °C
Relative Humidity	20 to 75 %	44.6 %
Atmospheric pressure	N/A	1021 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Attenuator	Techniwave	TWSMA-10dB-18G-SMA	14672	28/12/2019	28/02/2022
Attenuator	Radiall	R412710124	16490	25/06/2019	25/08/2021
Attenuator		0dB	9999		
Cable	STORM MICROWAVE	N-1.5m	10263	29/10/2018	29/12/2020
Cable	Huber + Suhner	SF102K	16041	28/02/2019	28/04/2021
Cable	Radiall	SMA-0,5m	16557	30/07/2019	30/09/2021
Receiver	Agilent Technologies	E4440A	5824	18/04/2018	18/06/2020
Shielded enclosure	RAY PROOF	C.V1	1123		
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/01/2019	25/03/2021
Thermohygrometer	Testo	608-H1	7561	25/01/2019	25/03/2021

Blank cells = Permanent validity

MAXIMUM PEAK CONDUCTED POWER - TABULATED RESULTS				
LoRA 125 kHz				EMI6030
Frequency (MHz)	P _{conducted} (dBm)	Gain _{dBi}	P _{eirp} (dBm)	Limit _{eirp} (dBm)
902.3	11.2	6dBi (Max)	17.2	36
908.5	11.1	6dBi (Max)	17.1	36
914.9	11	6dBi (Max)	17	36

LoRA 500 kHz				EMI6031
Frequency (MHz)	P _{conducted} (dBm)	Gain _{dBi}	P _{eirp} (dBm)	Limit _{eirp} (dBm)
903	11	6dBi (Max)	17	36
907.8	11.1	6dBi (Max)	17.1	36
914.2	11.2	6dBi (Max)	17.2	36

$P_{erp} = P_{conducted} + \text{antenna Gain}_{dBd}$; $\text{Gain}_{dBd} = \text{Gain}_{dBi} - 2.15dB$

$P_{erp} = P_{conducted} + \text{Gain}_{dBi} - 2.15dB$

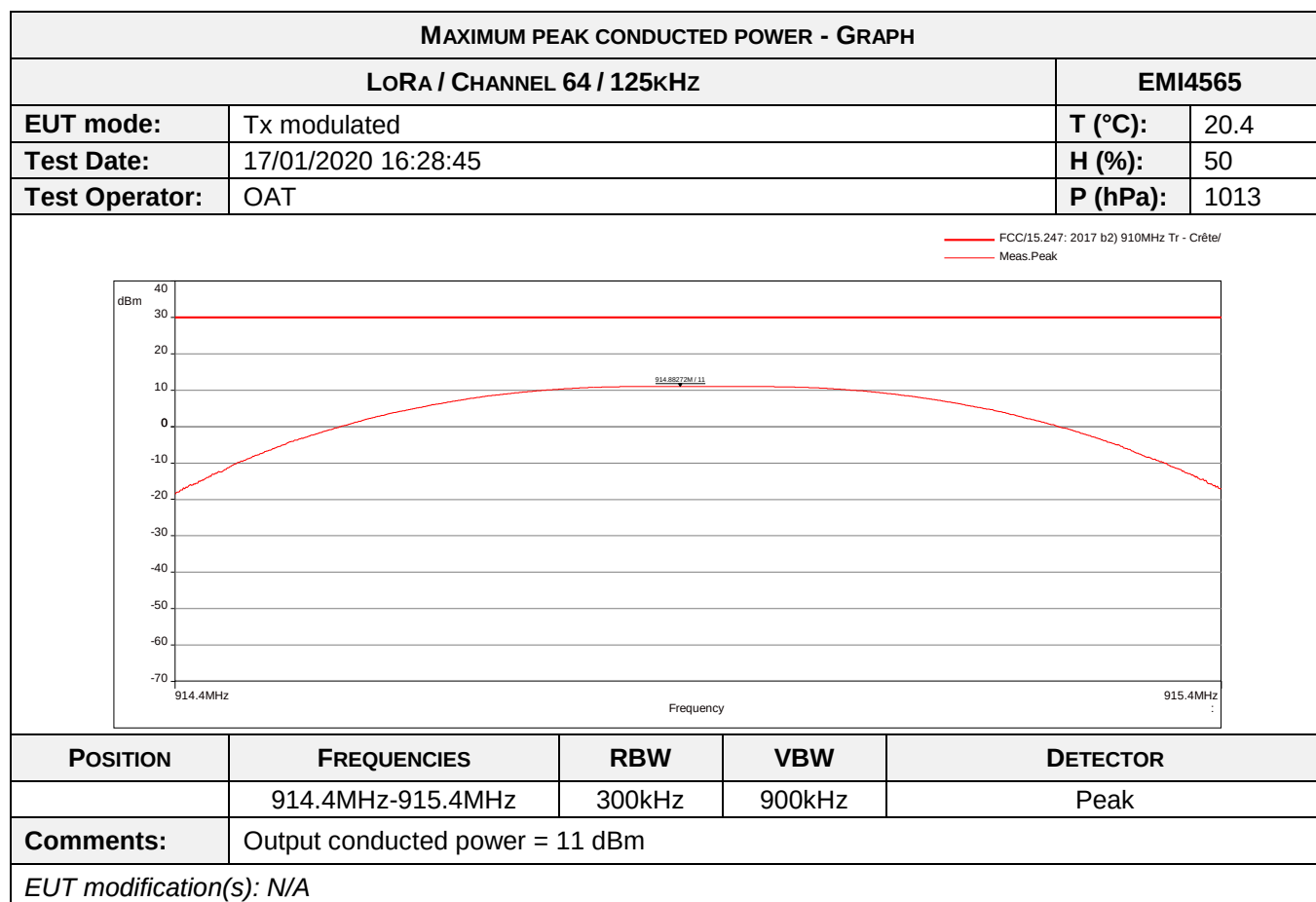
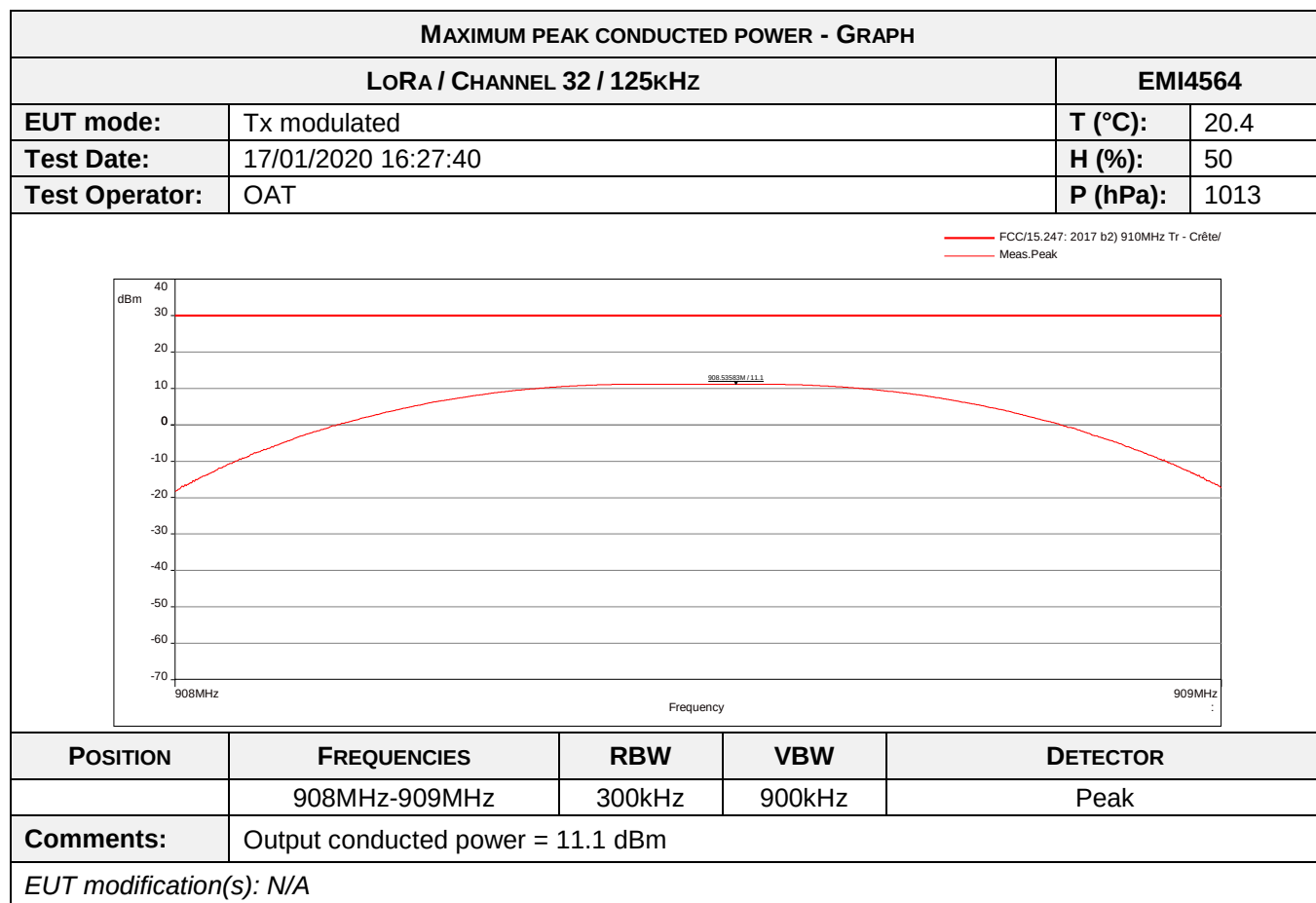
$P_{eirp} = P_{erp} + 2.15dB$

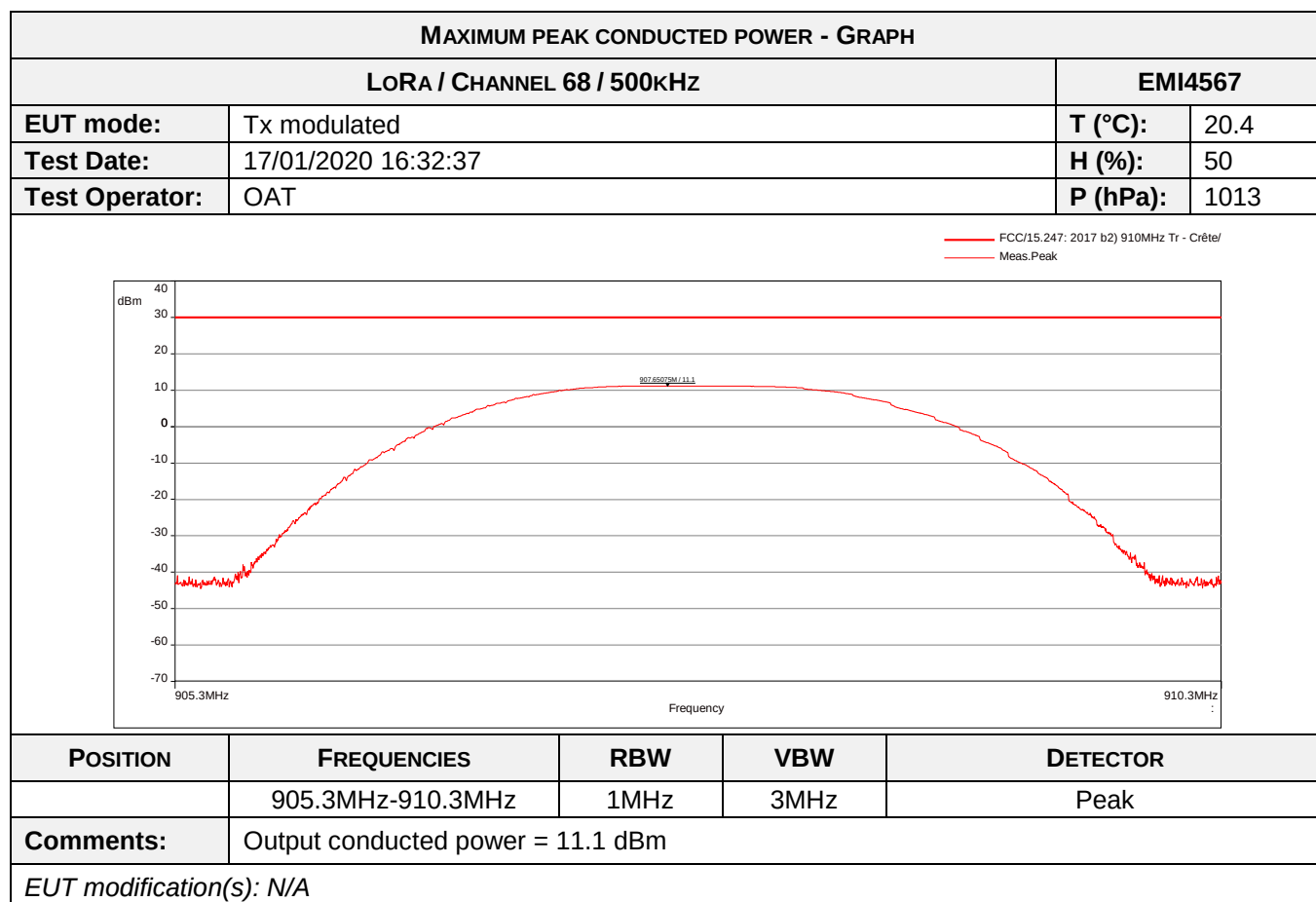
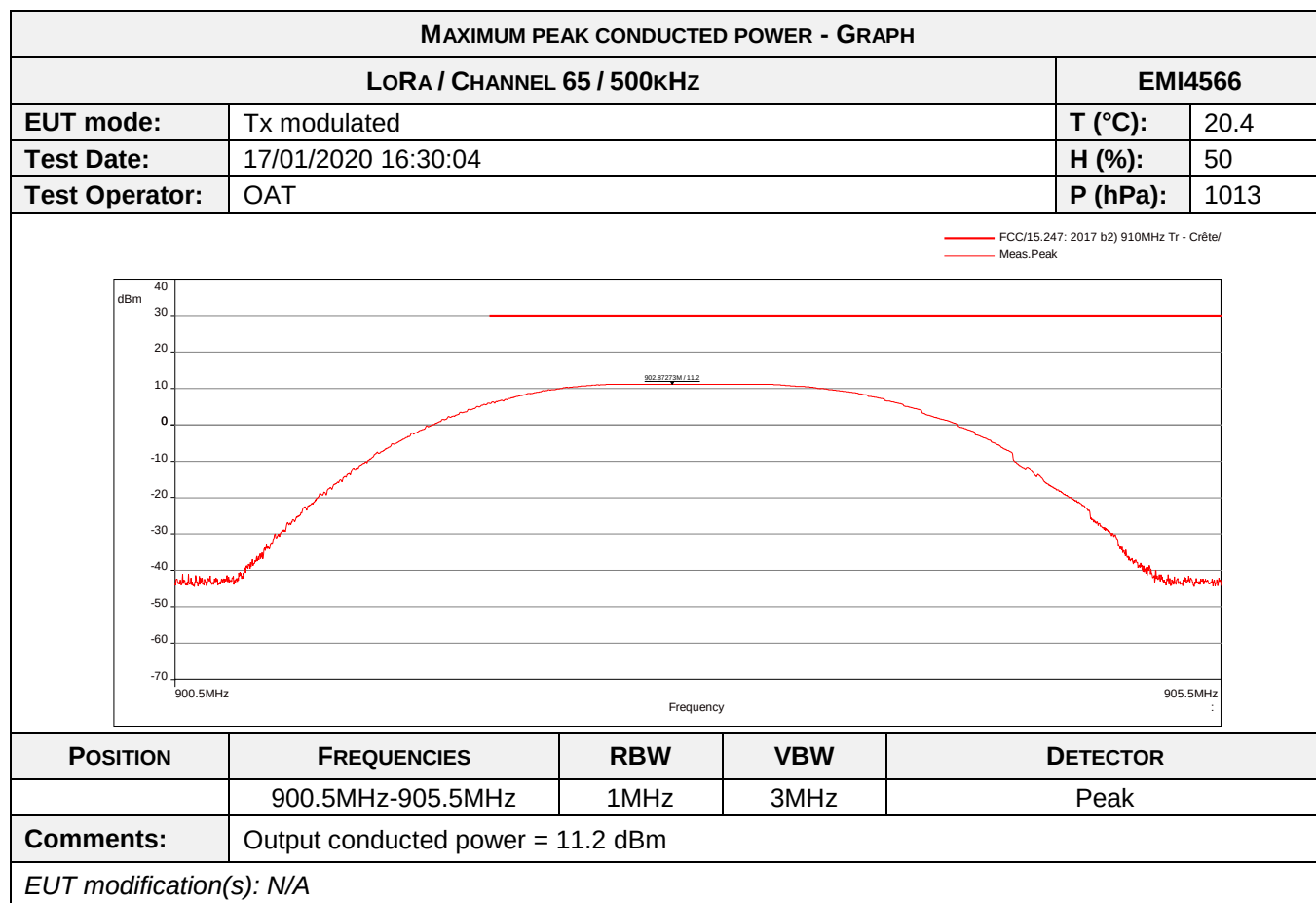
$P_{eirp} = P_{conducted} + \text{Gain}_{dBi}$

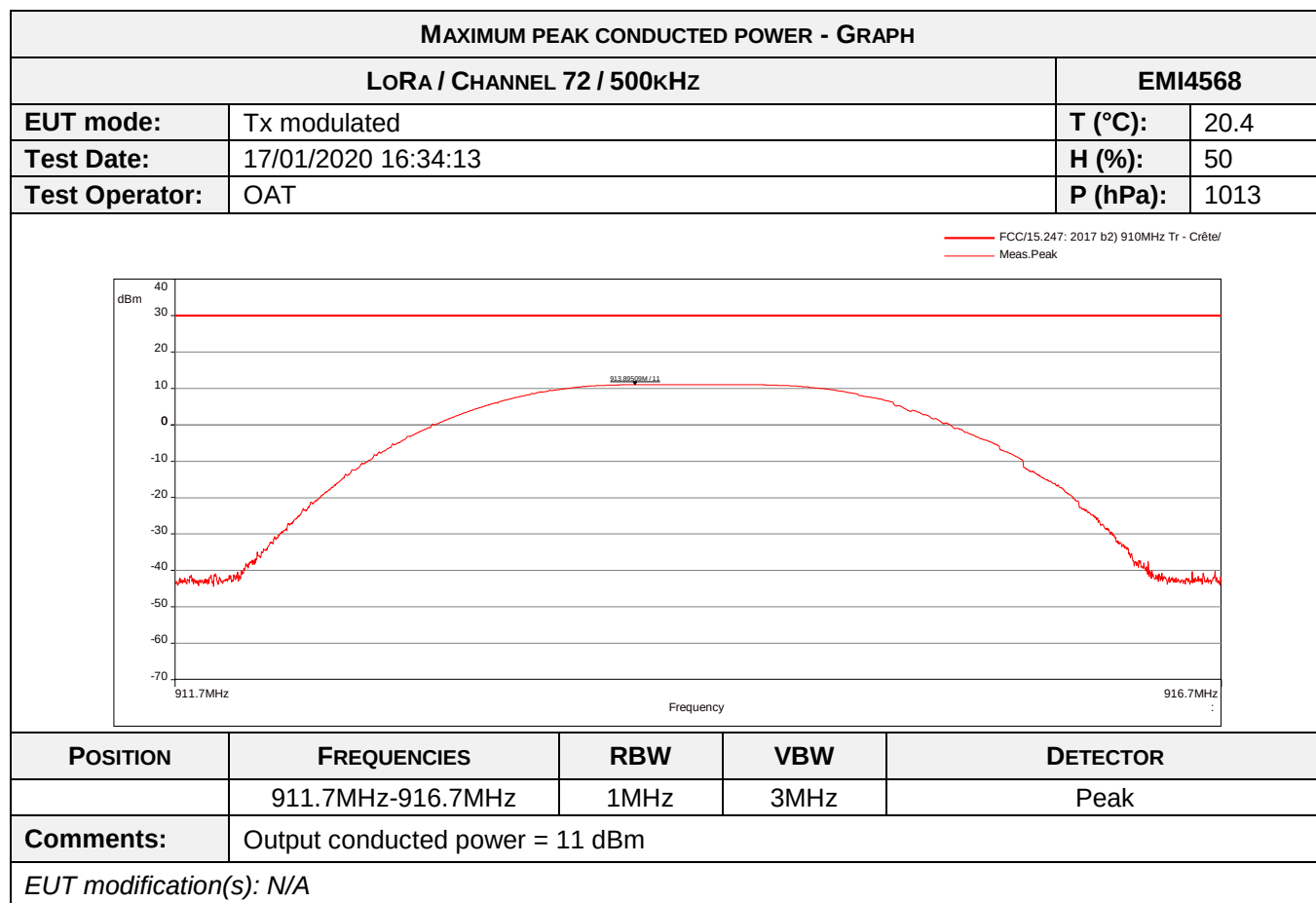
In case of a dedicated antenna the antenna gain (in dB, i.e. relative to a dipole) is declared by the manufacturer.

Using the formula $E_{(V/m)} = \sqrt{(30P_{dBm}G_{dBi})}/d_{(m)}$ where P is the conducted power and G the maximum antenna gain. Equivalent maximum E-field should be approximatively of 112.43dBμV/m.

MAXIMUM PEAK CONDUCTED POWER - GRAPH				
LoRA / CHANNEL 1 / 125kHz			EMI4563	
EUT mode:	Tx modulated		T (°C):	20.4
Test Date:	17/01/2020 16:26:03		H (%):	50
Test Operator:	OAT		P (hPa):	1013
<				







7.2. Power spectral density

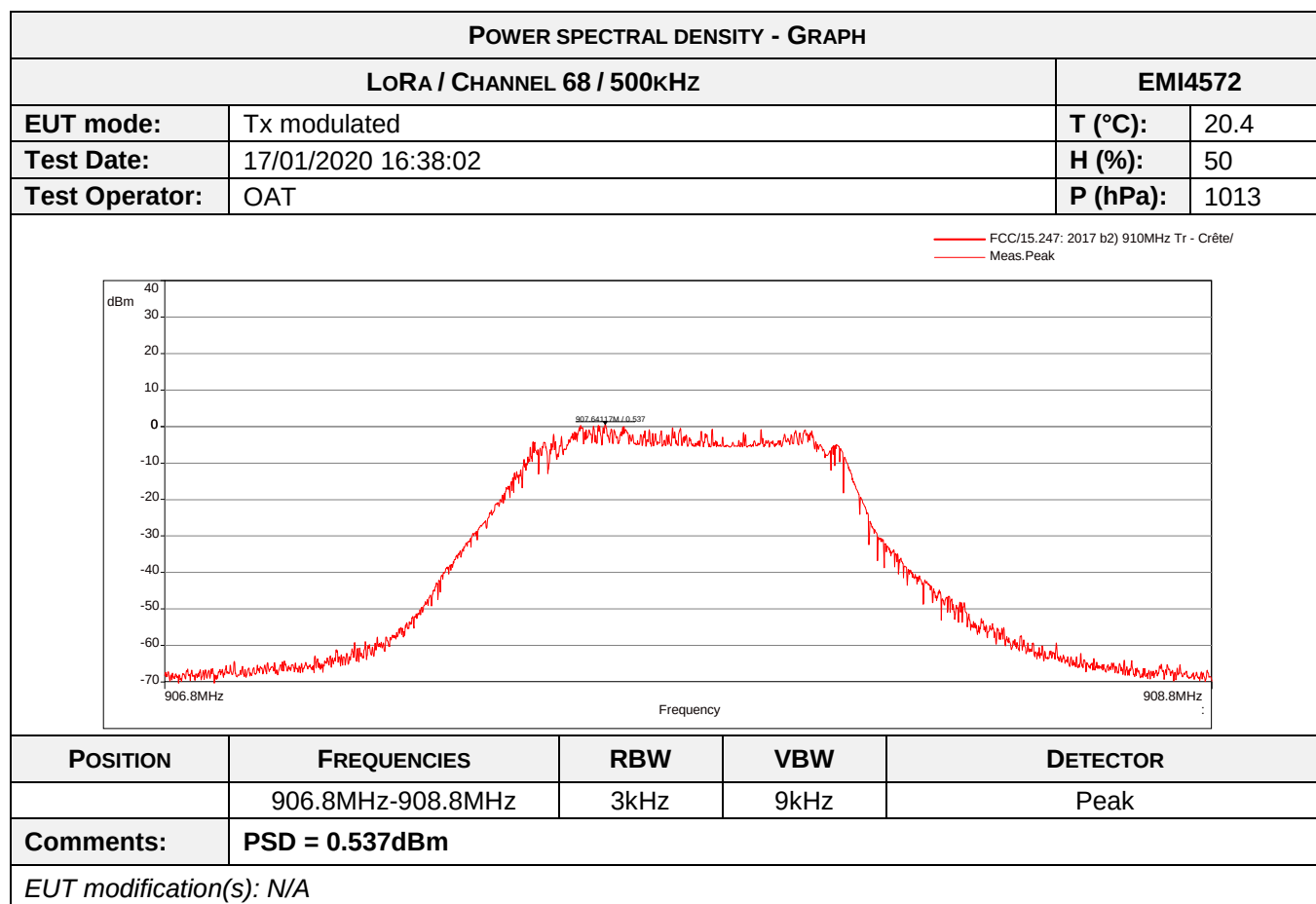
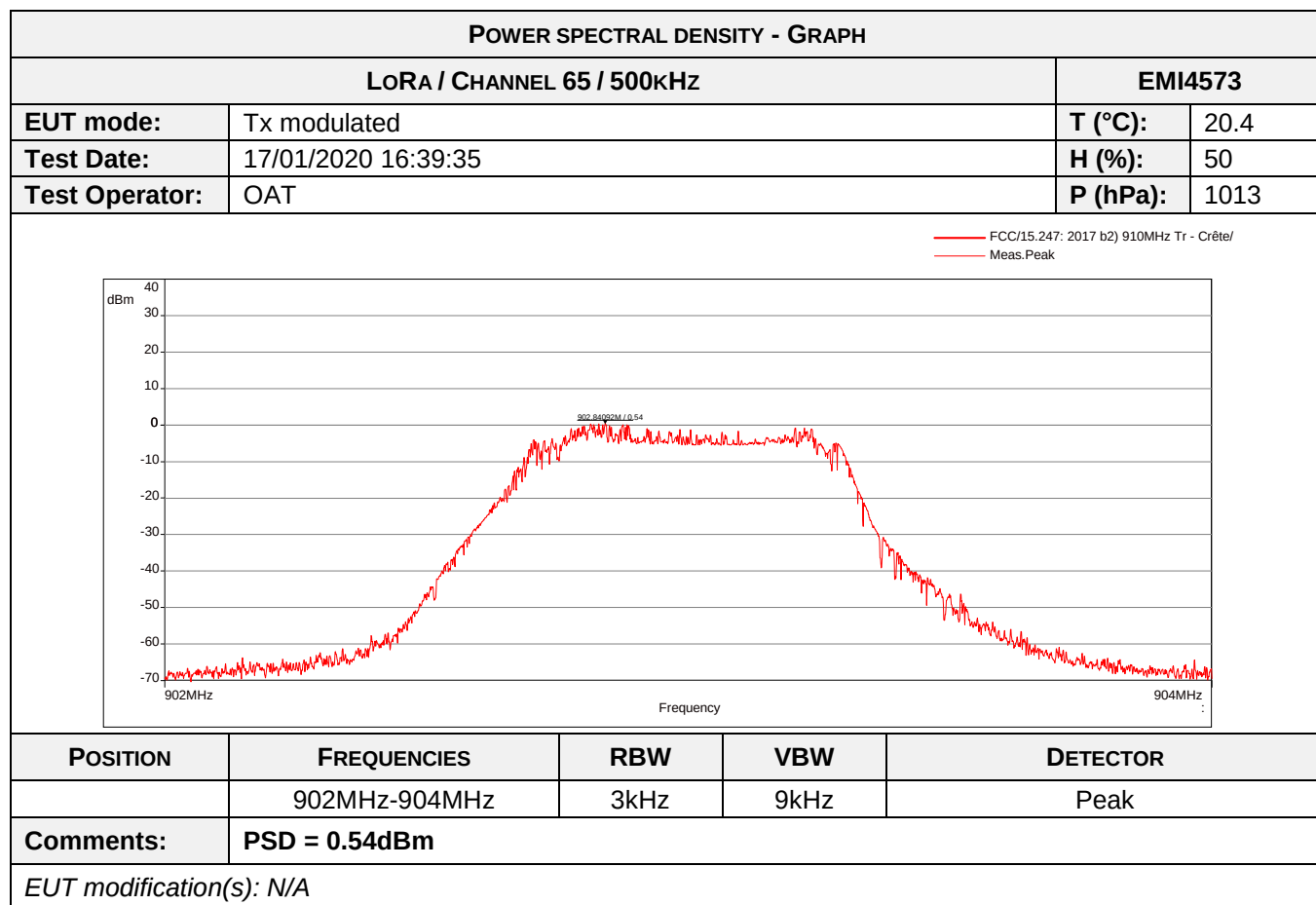
Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	ANSI C63.10: 2013
Test description: e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval 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. EUT is connected to the measuring receiver via 50Ω attenuator(s). Only the highest levels are recorded.	

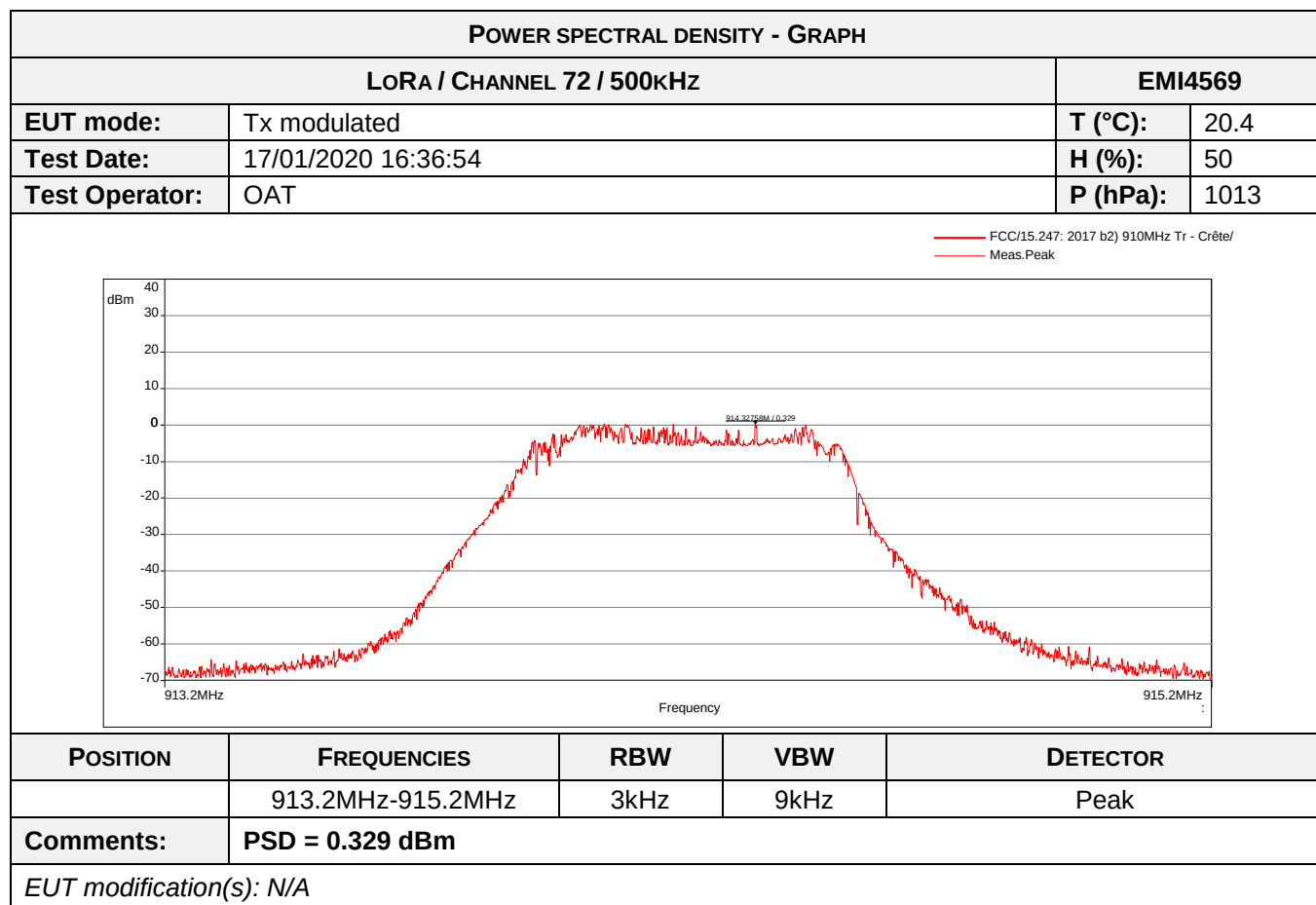
TESTED CHANNEL	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Low channel	Lora 500kHz	8dBm/3kHz	EMI4573	PASS
Mid channel	Lora 500kHz	8dBm/3kHz	EMI4572	PASS
High channel	Lora 500kHz	8dBm/3kHz	EMI4569	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	25.3 °C
Relative Humidity	20 to 75 %	44.6 %
Atmospheric pressure	N/A	1021 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Attenuator	Techniwave	TWSMA-10dB-18G-SMA	14672	28/12/2019	28/02/2022
Attenuator	Radiall	R412710124	16490	25/06/2019	25/08/2021
Attenuator		0dB	9999		
Cable	STORM MICROWAVE	N-1.5m	10263	29/10/2018	29/12/2020
Cable	Huber + Suhner	SF102K	16041	28/02/2019	28/04/2021
Cable	Radiall	SMA-0,5m	16557	30/07/2019	30/09/2021
Receiver	Agilent Technologies	E4440A	5824	18/04/2018	18/06/2020
Shielded enclosure	RAY PROOF	C.V1	1123		
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/01/2019	25/03/2021
Thermohygrometer	Testo	608-H1	7561	25/01/2019	25/03/2021

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7.3. Band-edge compliance

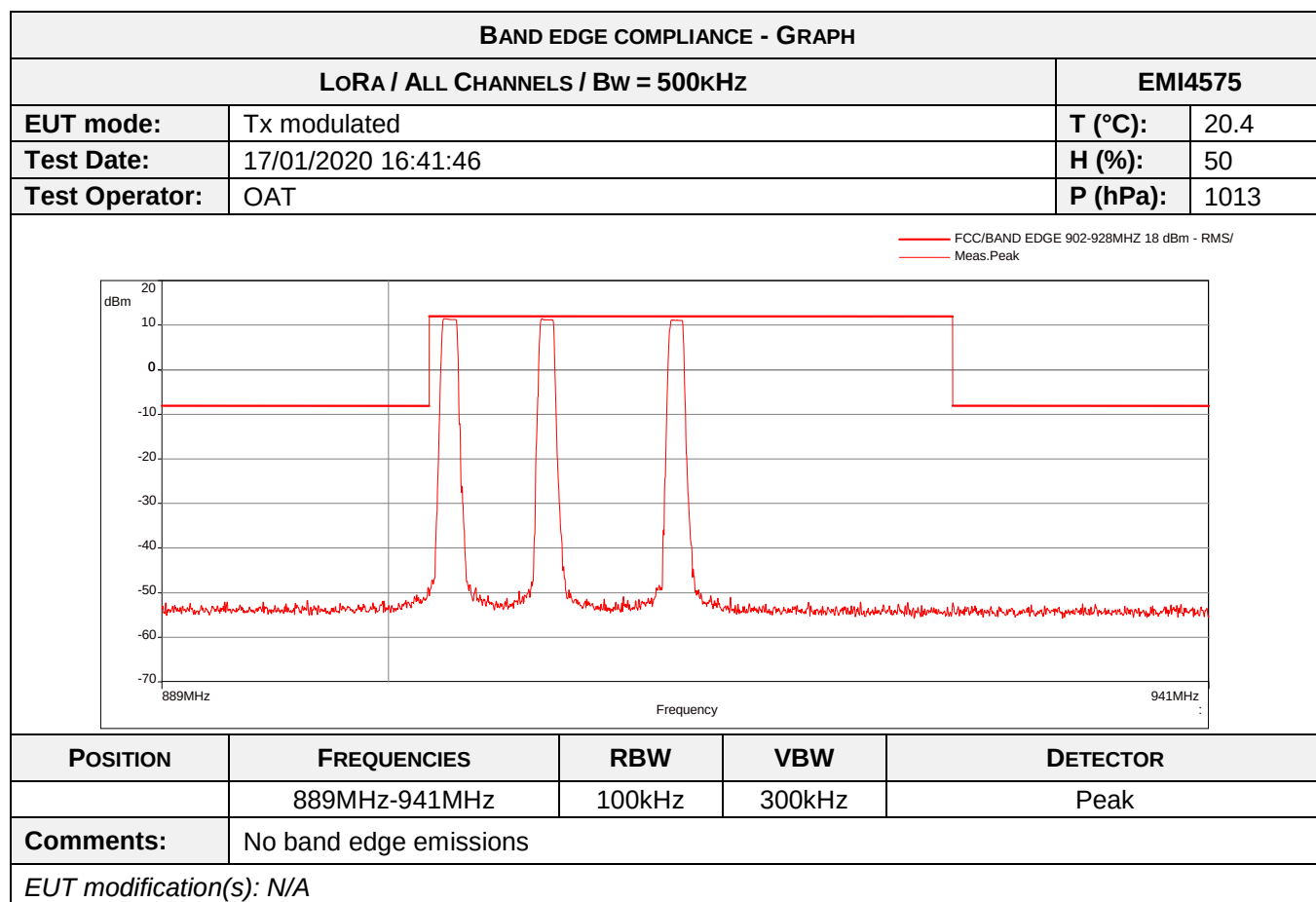
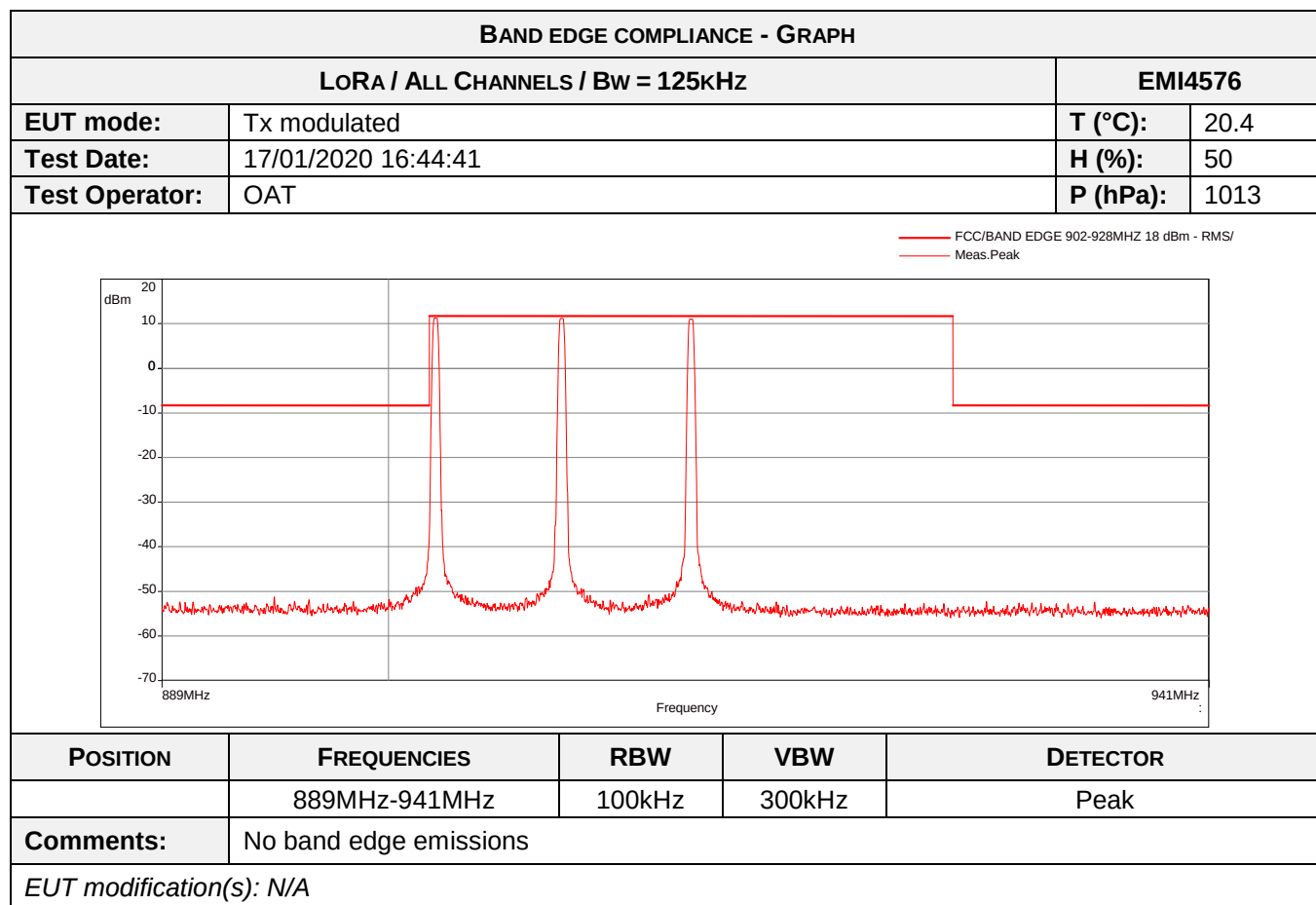
Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 subclause d) and RSS-247
Test description: d) In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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
Lora / 125 kHz	889MHz-941MHz	20dBc	EMI4576	PASS
Lora / 500 kHz	889MHz-941MHz	20dBc	EMI4575	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	23.2°C
Relative Humidity	20 to 75 %	56.7 %
Atmospheric pressure	N/A	1010 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Attenuator	Techniwave	TWSMA-10dB-18G-SMA	14672	28/12/2019	28/02/2022
Attenuator	Radiall	R412710124	16490	25/06/2019	25/08/2021
Attenuator		0dB	9999		
Cable	STORM MICROWAVE	N-1.5m	10263	29/10/2018	29/12/2020
Cable	Huber + Suhner	SF102K	16041	28/02/2019	28/04/2021
Cable	Radiall	SMA-0,5m	16557	30/07/2019	30/09/2021
Receiver	Agilent Technologies	E4440A	5824	18/04/2018	18/06/2020
Shielded enclosure	RAY PROOF	C.V1	1123		
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/01/2019	25/03/2021
Thermohygrometer	Testo	608-H1	7561	25/01/2019	25/03/2021

Blank cells = Permanent validity



7.4. Conducted spurious emissions

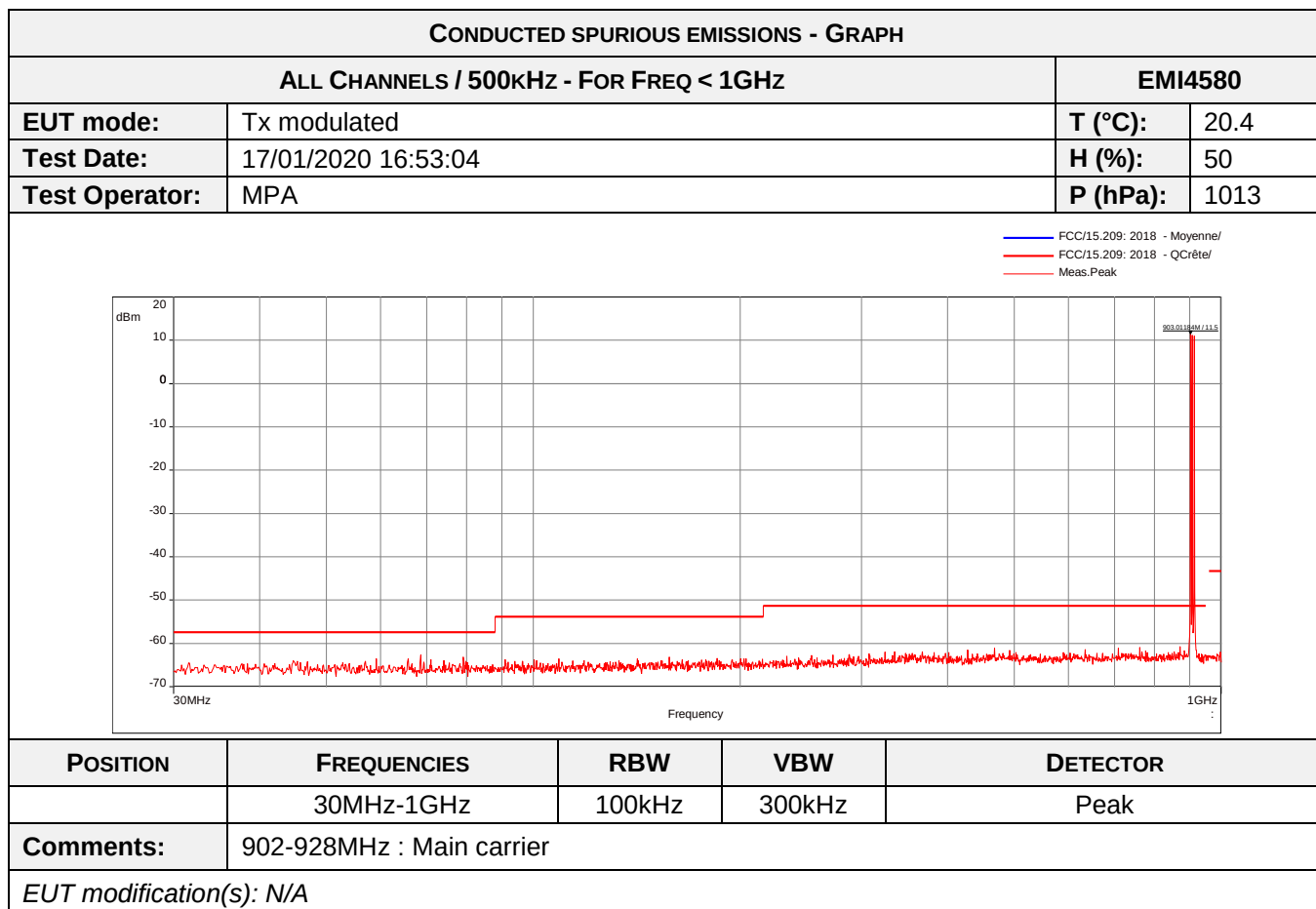
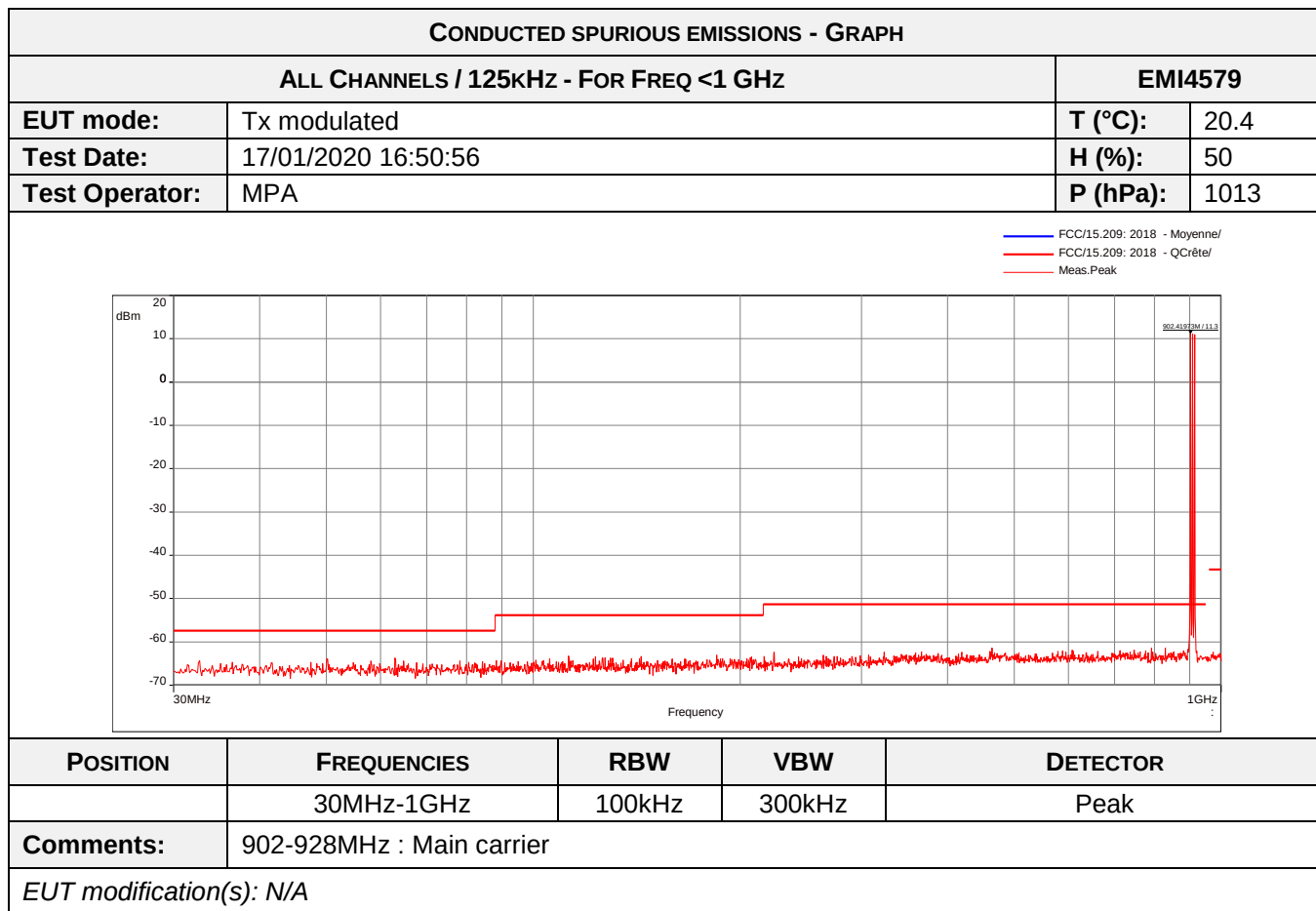
Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	ANSI C63.10: 2013
General test setup: EUT is connected to the measuring receiver via 50Ω attenuator(s). Only the highest levels are recorded.	

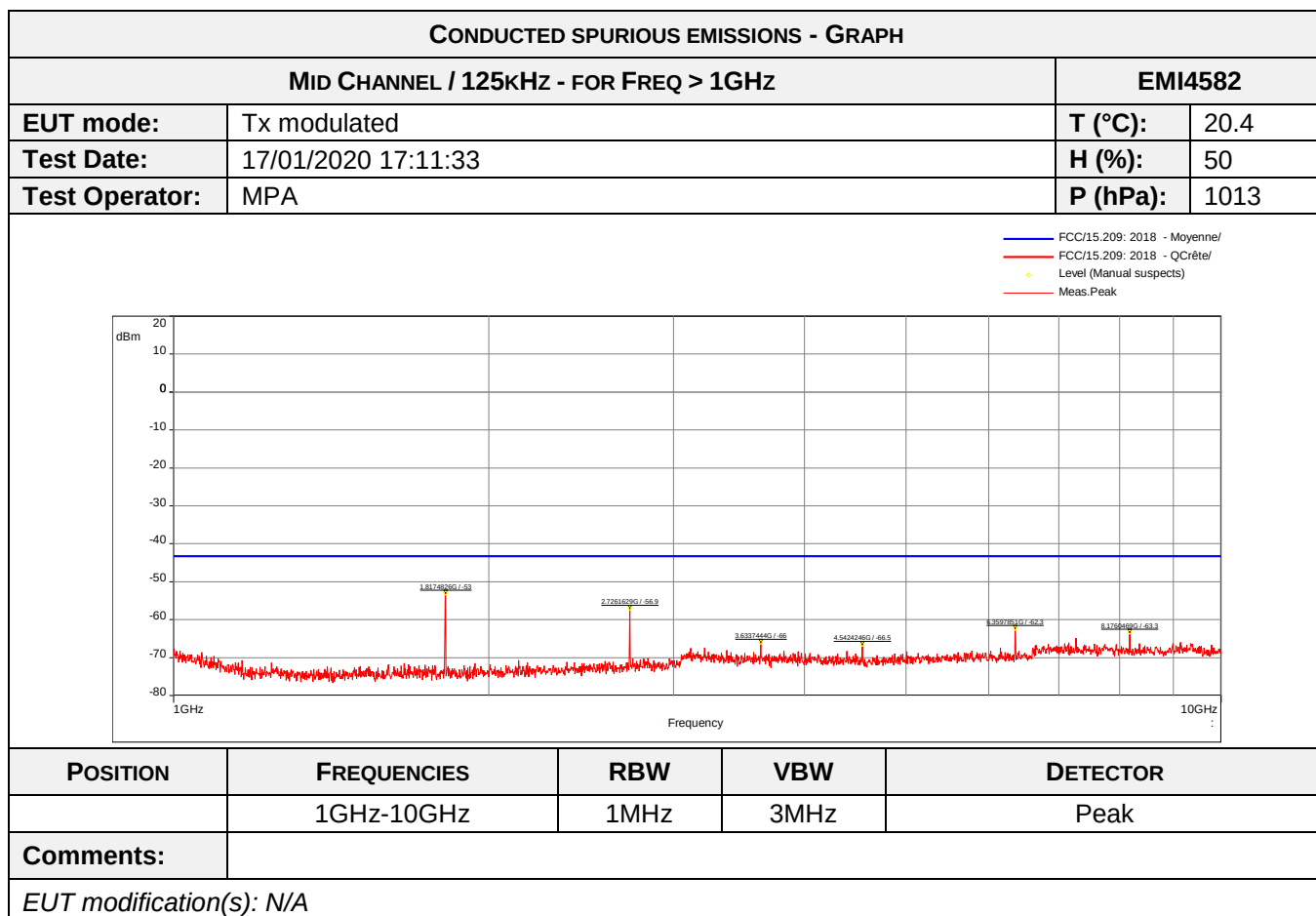
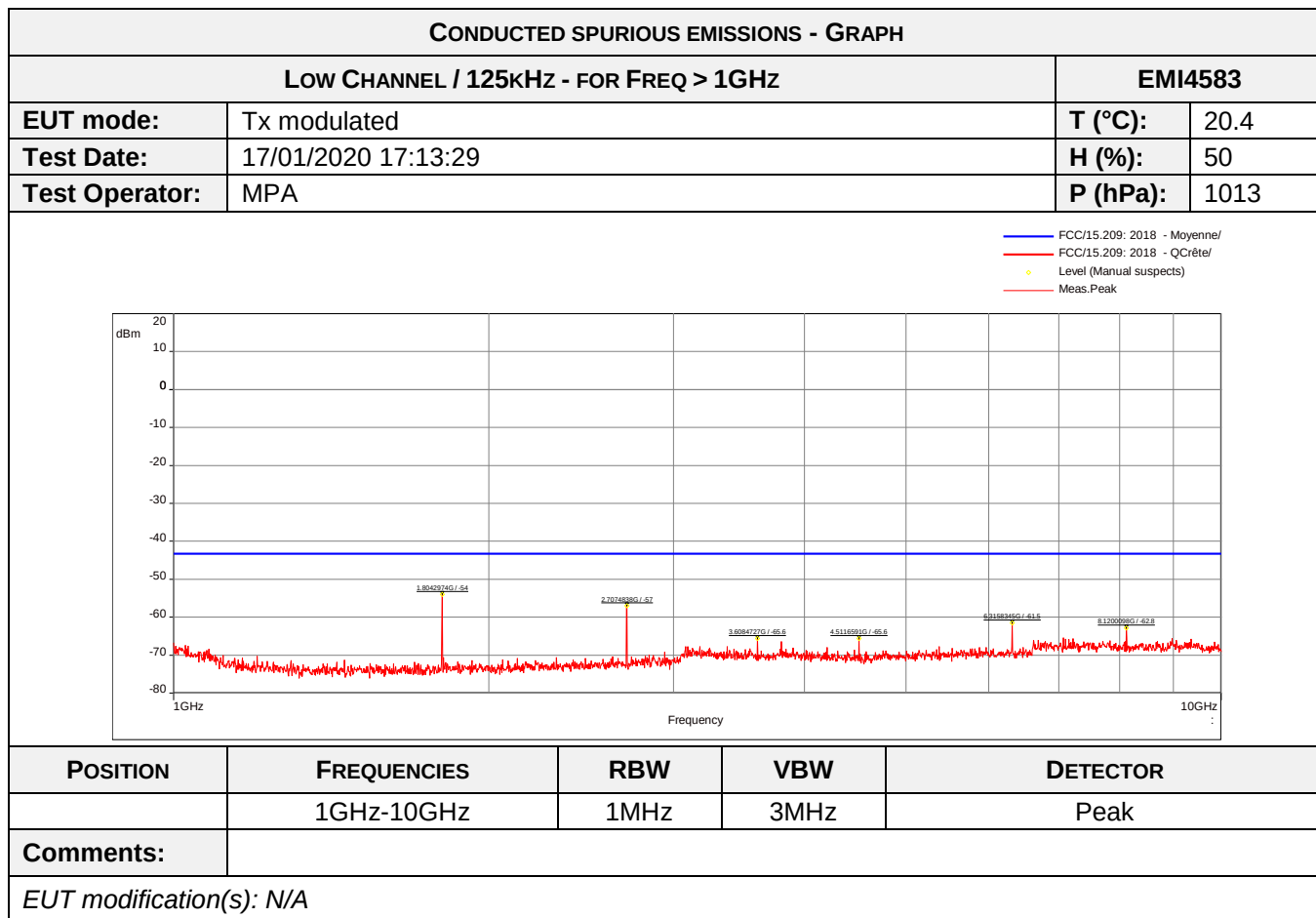
TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
LoRa / Channel 1 / 125 kHz	9kHz-12.75GHz	15.109	See below	PASS
LoRa / Channel 32 / 125 kHz	9kHz-12.75GHz	15.109	See below	PASS
LoRa / Channel 64 / 125 kHz	9kHz-12.75GHz	15.109	See below	PASS
LoRa / Channel 65 / 500 kHz	9kHz-12.75GHz	15.109	See below	PASS
LoRa / Channel 68 / 500 kHz	9kHz-12.75GHz	15.109	See below	PASS
LoRa / Channel 72 / 500 kHz	9kHz-12.75GHz	15.109	See below	PASS

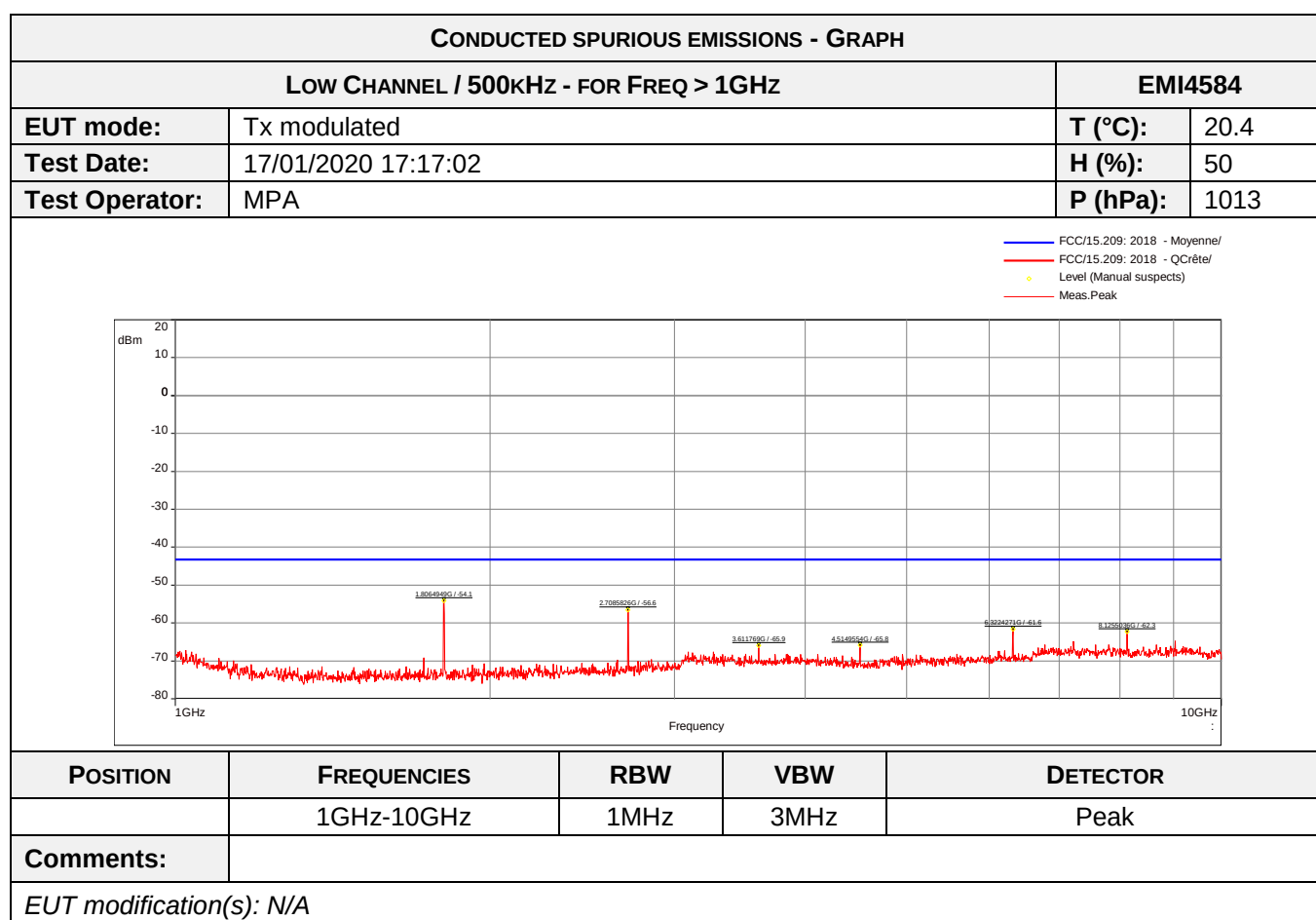
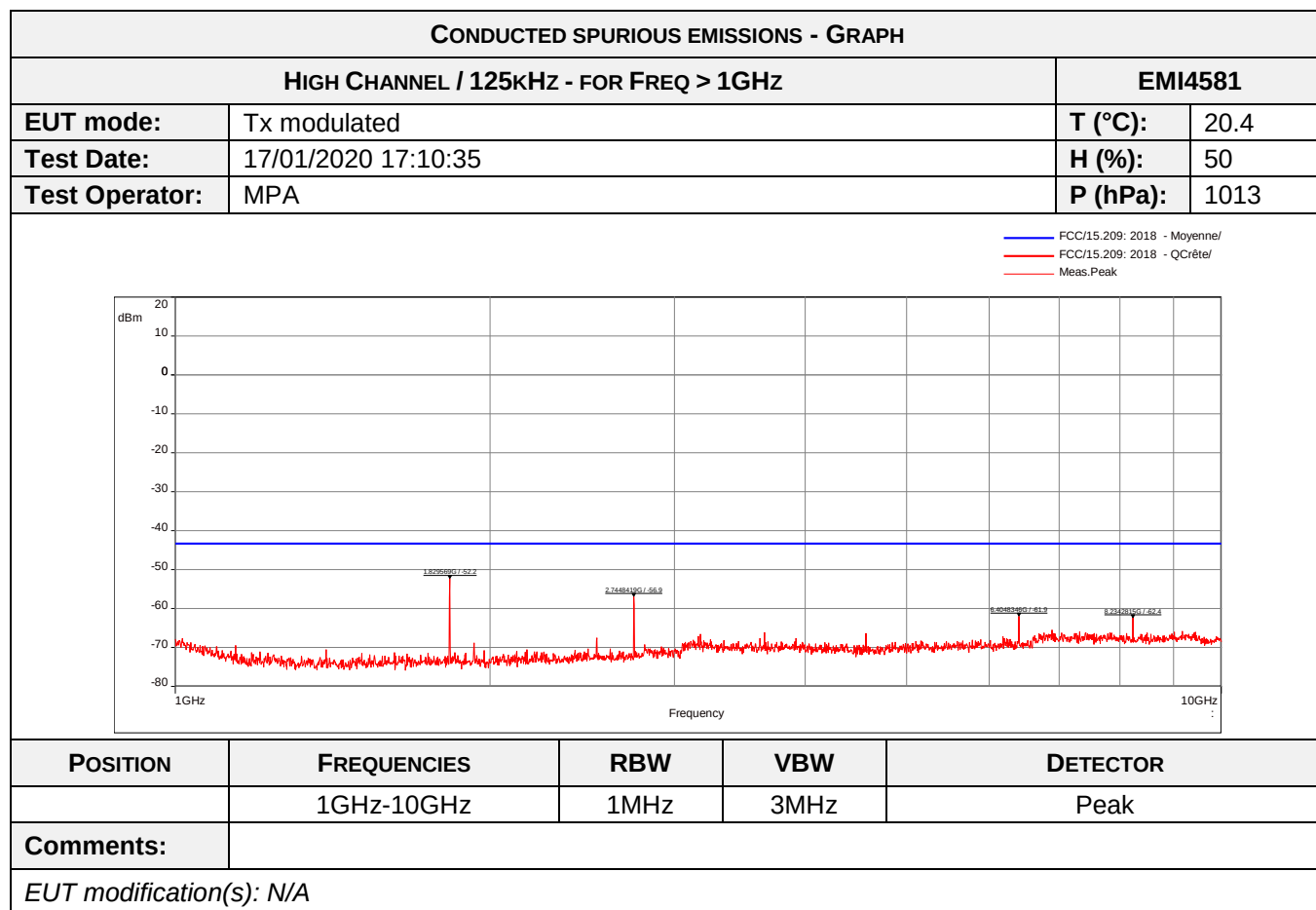
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	20 to 75 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
Test method deviation: N/A		
Supplementary information: Limits provided are calculated using the formula $E_{(V/m)} = \sqrt{(30P_{dBm}G_{dBi})}/d_{(m)}$ where P is the conducted power limit and G the antenna gain (0dBi).		

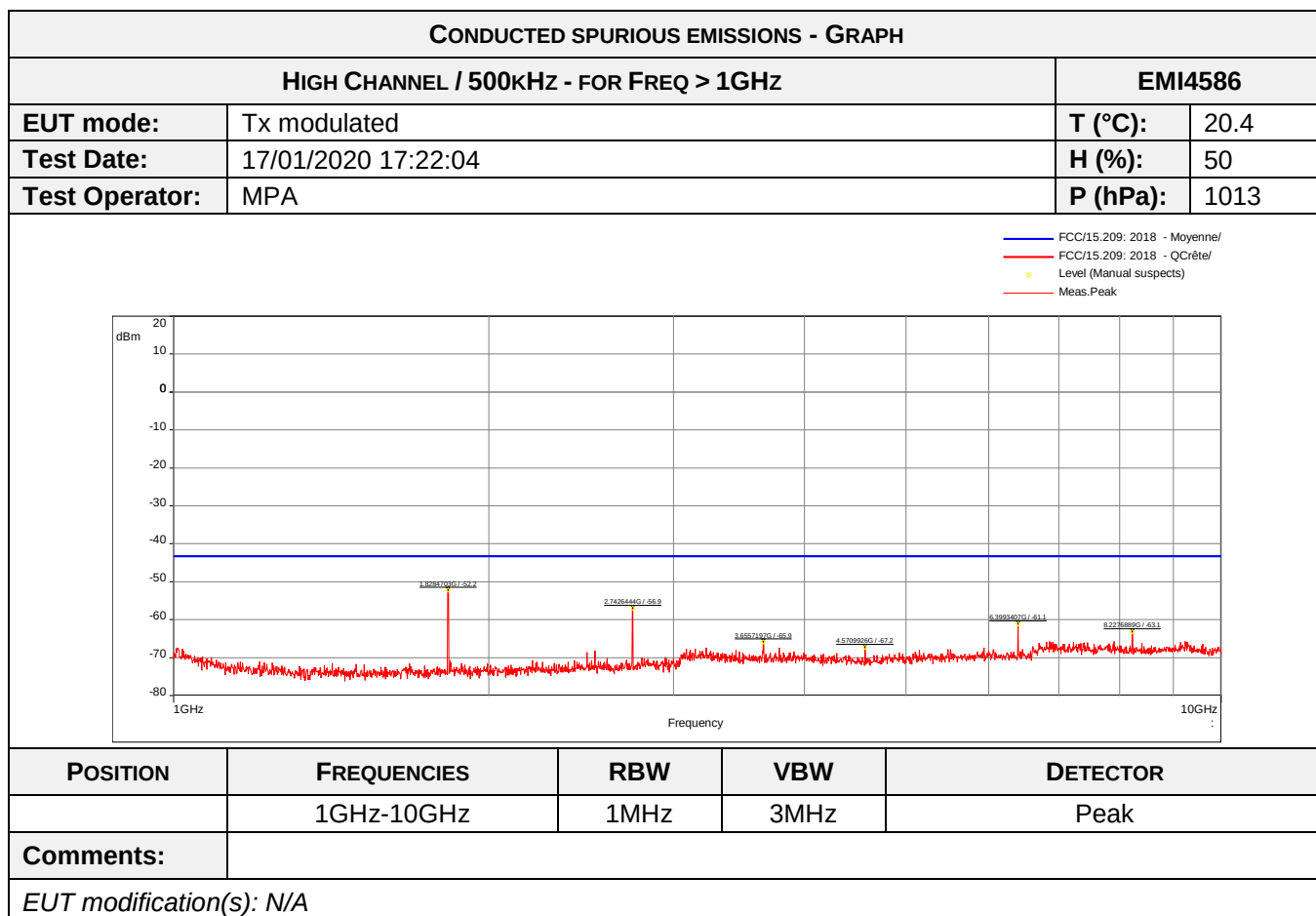
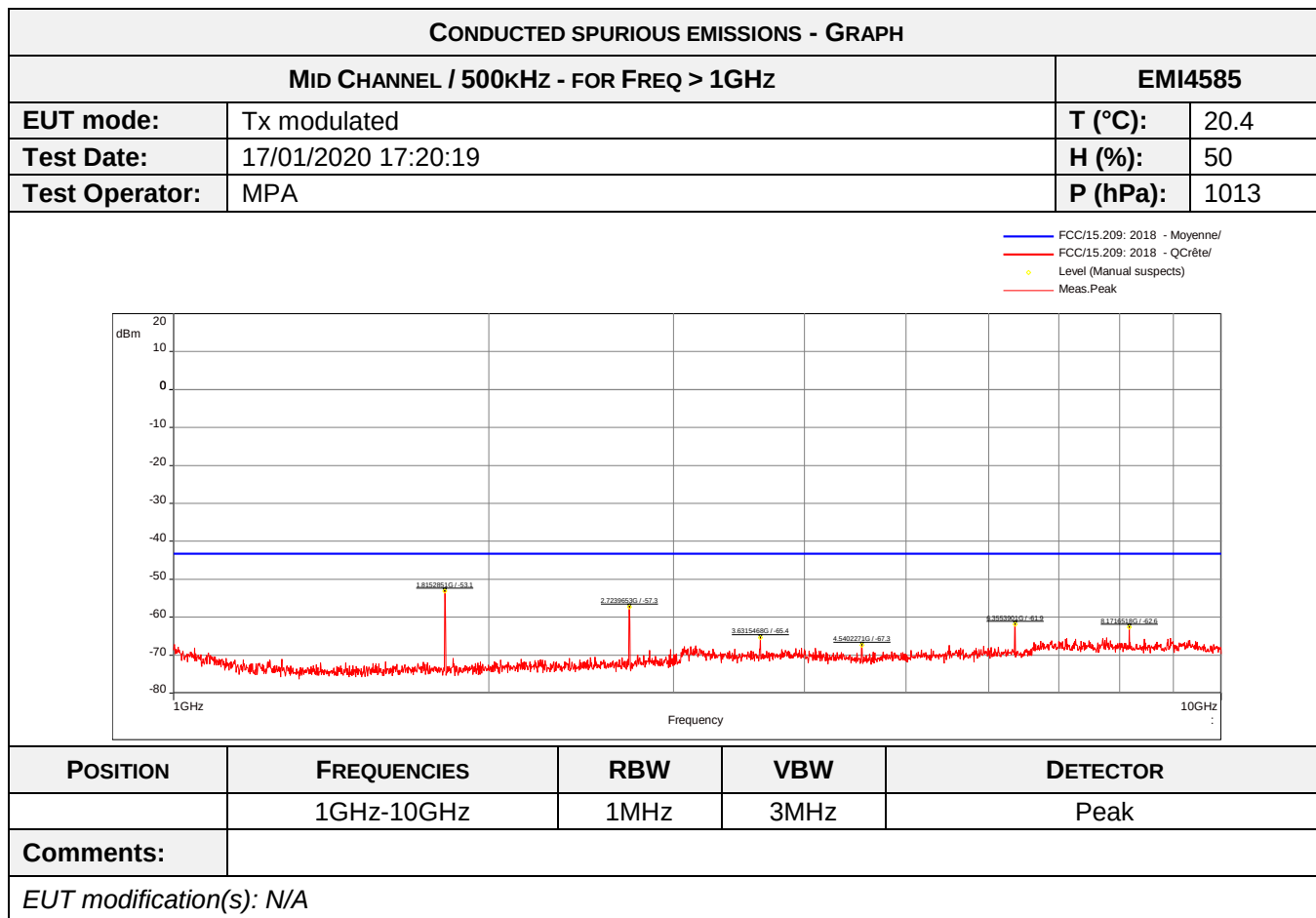
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Attenuator	Techniwave	TWSMA-10dB-18G-SMA	14672	28/12/2019	28/02/2022
Attenuator	Radiall	R412710124	16490	25/06/2019	25/08/2021
Cable	STORM MICROWAVE	N-1.5m	10263	29/10/2018	29/12/2020
Cable	Huber + Suhner	SF102K	16041	28/02/2019	28/04/2021
Cable	Radiall	SMA-0,5m	16557	30/07/2019	30/09/2021
Filter	Micro-Tronics	HPM18865	12843	08/06/2018	08/08/2020
Receiver	Rohde & Schwarz	FSW43	14830	28/12/2018	28/02/2020
Receiver	Agilent Technologies	E4440A	5824	18/04/2018	18/06/2020
Shielded enclosure	RAY PROOF	C.V1	1123		
Software	Nexio		0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/01/2019	25/03/2021
Thermohygrometer	Testo	608-H1	7561	25/01/2019	25/03/2021

Blank cells = Permanent validity









7.5. Radiated spurious emissions

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	ANSI C63.10: 2013
General test setup: 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. The RF port is connected to a 50Ω load.	

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
LoRa / Channel 1 / 125 kHz	9kHz-12.75GHz	15.209	See below	PASS
LoRa / Channel 32 / 125 kHz	9kHz-12.75GHz	15.209	See below	PASS
LoRa / Channel 64 / 125 kHz	9kHz-12.75GHz	15.209	See below	PASS
LoRa / Channel 65 / 500 kHz	9kHz-12.75GHz	15.209	See below	PASS
LoRa / Channel 68 / 500 kHz	9kHz-12.75GHz	15.209	See below	PASS
LoRa / Channel 72 / 500 kHz	9kHz-12.75GHz	15.209	See below	PASS

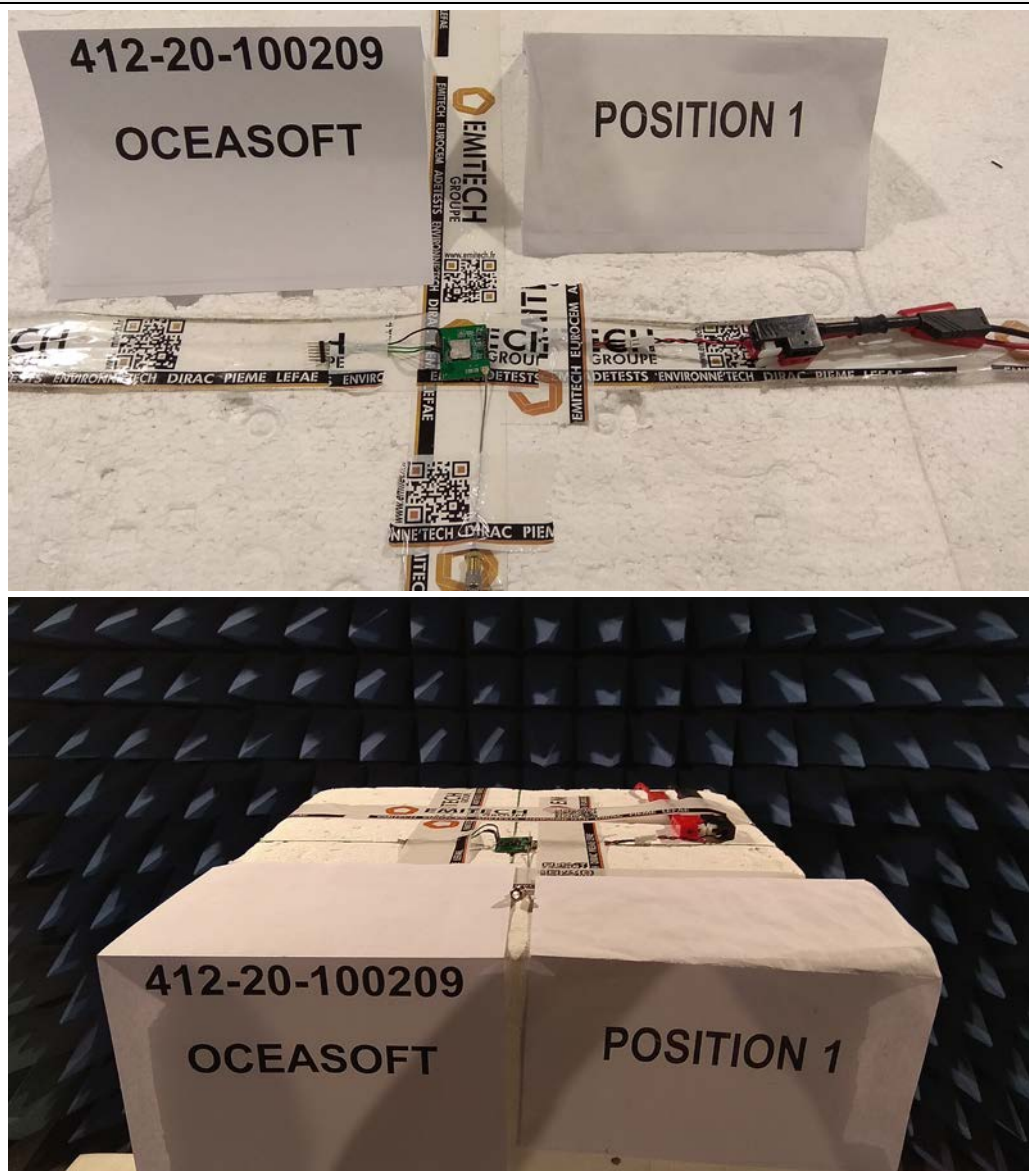
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	20 to 75 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
Test method deviation: N/A		
Supplementary information: From 9 kHz to 30MHz: limit indicated on the curves is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor. From 30MHz to 1GHz Quasi peak limit provided is the limit given in §15.209. Above 1GHz average limit in restricted bands §15.205 is 54dBμV/m. Otherwise, the limit is 20dB under carrier emission level at 3m without averaging.		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Electro Metrics	BIA-30HF	0824	13/06/2018	13/08/2021
Antenna	Rohde & Schwarz	HL223	3126	13/06/2018	13/08/2021
Antenna	Rohde & Schwarz	HFH2-Z2	5825(*)	21/09/2017	21/04/2020

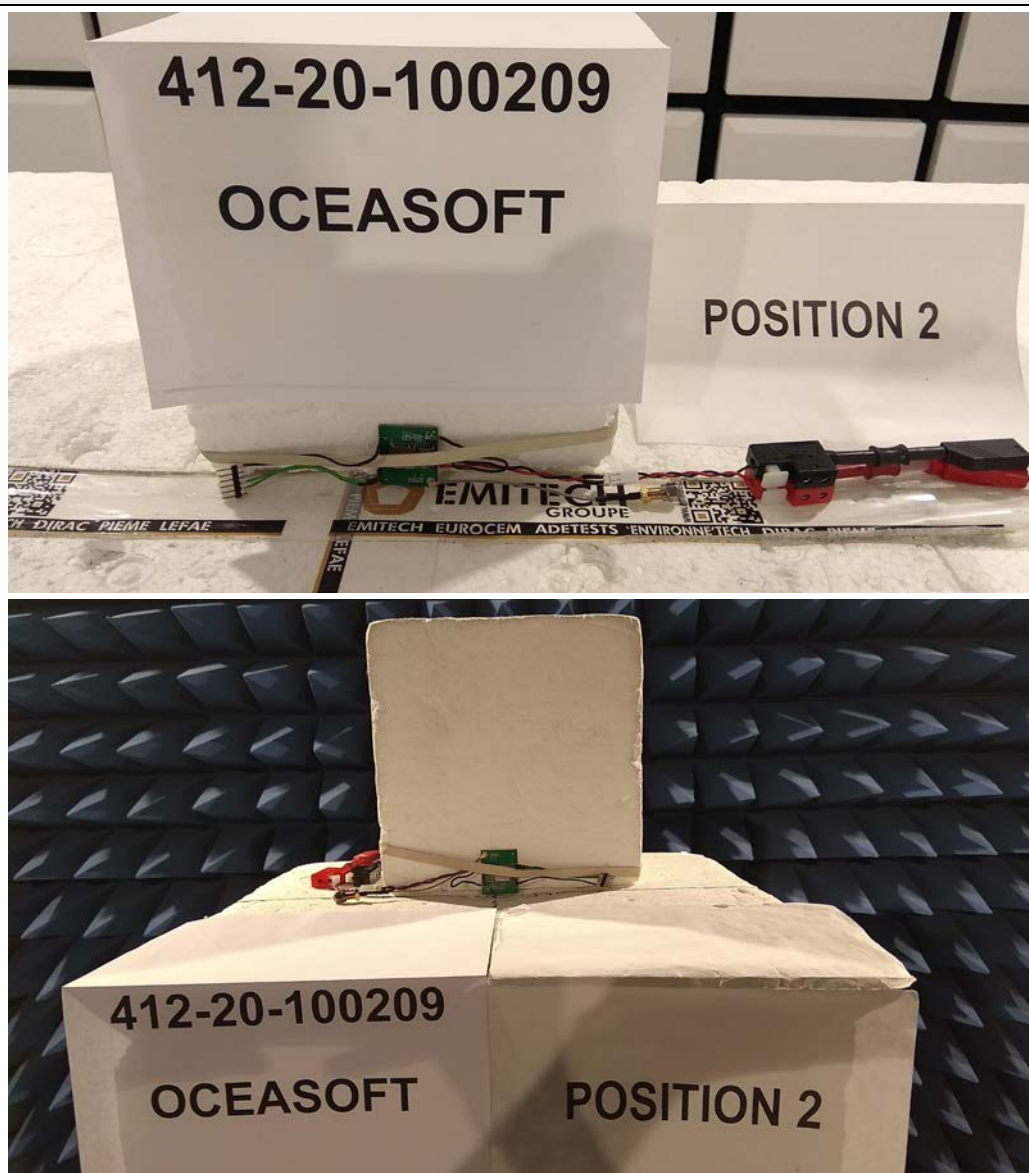
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	ETS-Lindgren	3117	8387	24/07/2019	24/09/2022
Cable	STORM MICROWAVE	N-1.5m	10263	29/10/2018	29/12/2020
Cable	STORM MICROWAVE	N-0.2m	10265	29/10/2018	29/12/2020
Cable	MegaPhase	TM18-N1N1-118	12841	09/05/2018	09/07/2020
Cable	MegaPhase	TM18-N1N1-118	12842	09/05/2018	09/07/2020
Cable	SUCOFLEX	N-3m	14379	25/06/2019	25/08/2021
Cable	SUCOFLEX	N-6,5m	14380	25/07/2019	25/09/2021
Cable	MegaPhase	N-3m	14852	29/10/2018	29/12/2020
Cable	MegaPhase	N-8m	15813	12/11/2018	12/01/2021
Cable	Huber + Suhner	SF102K	16041	28/02/2019	28/04/2021
Cable	MegaPhase	F135N1N28	16664	25/10/2019	25/12/2021
Cable	MegaPhase	F135N1N28	16666	25/10/2019	25/12/2021
Filter	Micro-Tronics	HPM18865	12843	08/06/2018	08/08/2020
Software	Nexio		0000		
Power Supply	TTi	PL303QMD	8496		
Preamplifier	Techniwave	APS16-0087	14040	25/06/2019	25/08/2020
Receiver	Rohde & Schwarz	FSW43	14830	28/12/2018	28/02/2020
Receiver	Agilent Technologies	E4440A	5824	18/04/2018	18/06/2020
Shielded enclosure	RAY PROOF	C.V1	1123		
Shielded enclosure	COMTEST	SAC 3m	14494		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/01/2019	25/03/2021
Thermohygrometer	Testo	608-H2	12269	28/11/2017	28/07/2020
Thermohygrometer	Testo	608-H1	7561	25/01/2019	25/03/2021

Blank cells = Permanent validity
(*) Under derogation EQS DER 000 S41 00068

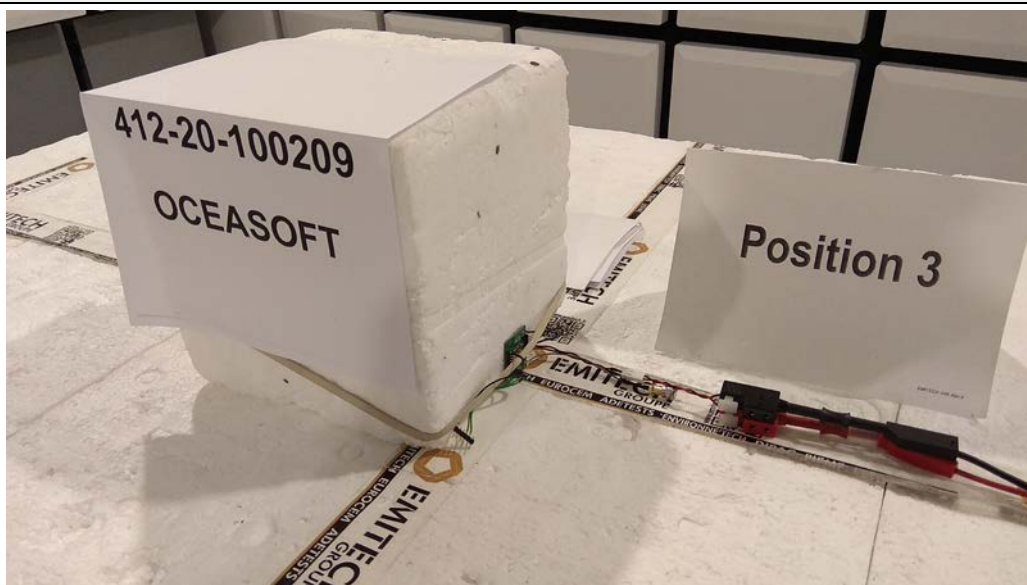
TEST SETUP PHOTO(S) - EUT POSITIONS



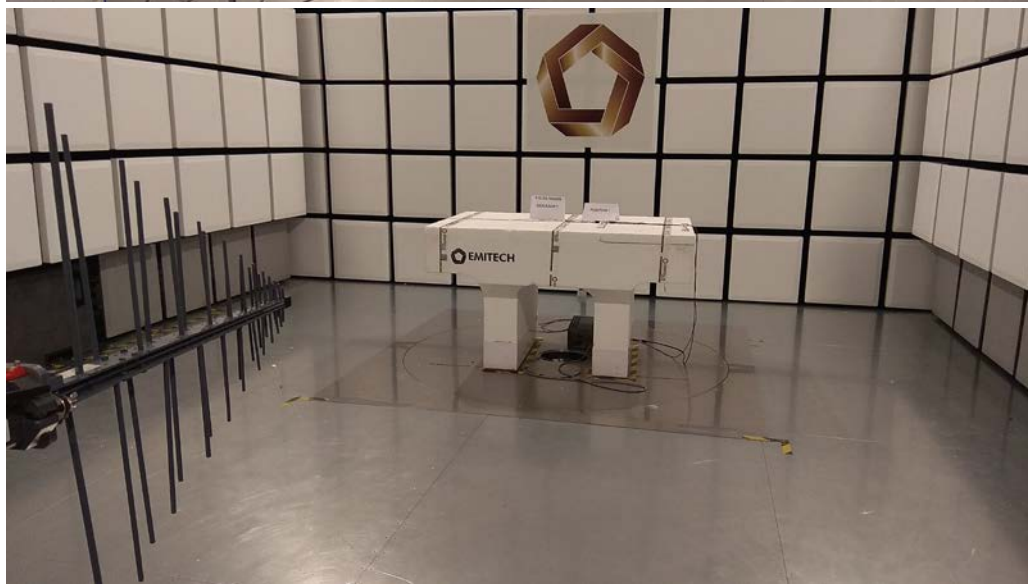
TEST SETUP PHOTO(S) - EUT POSITIONS



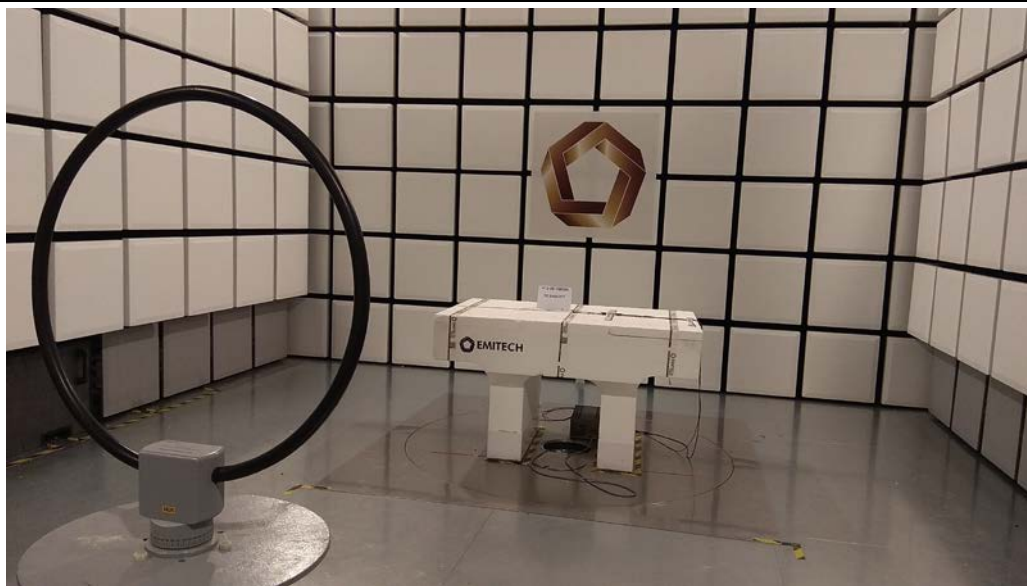
TEST SETUP PHOTO(S) - EUT POSITIONS



TEST SETUP PHOTO(S) RADIATED EMISSIONS (30MHz-1GHz)

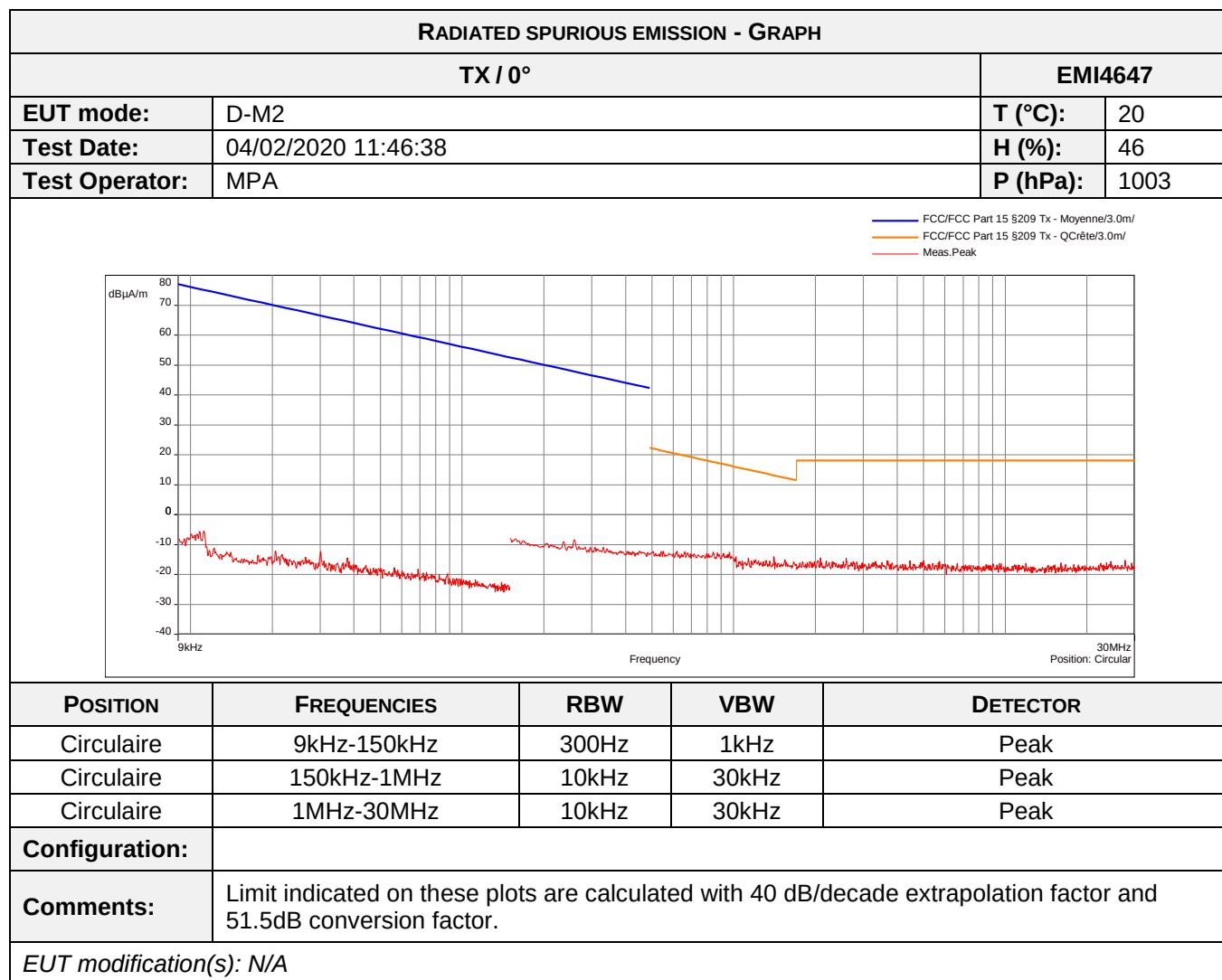


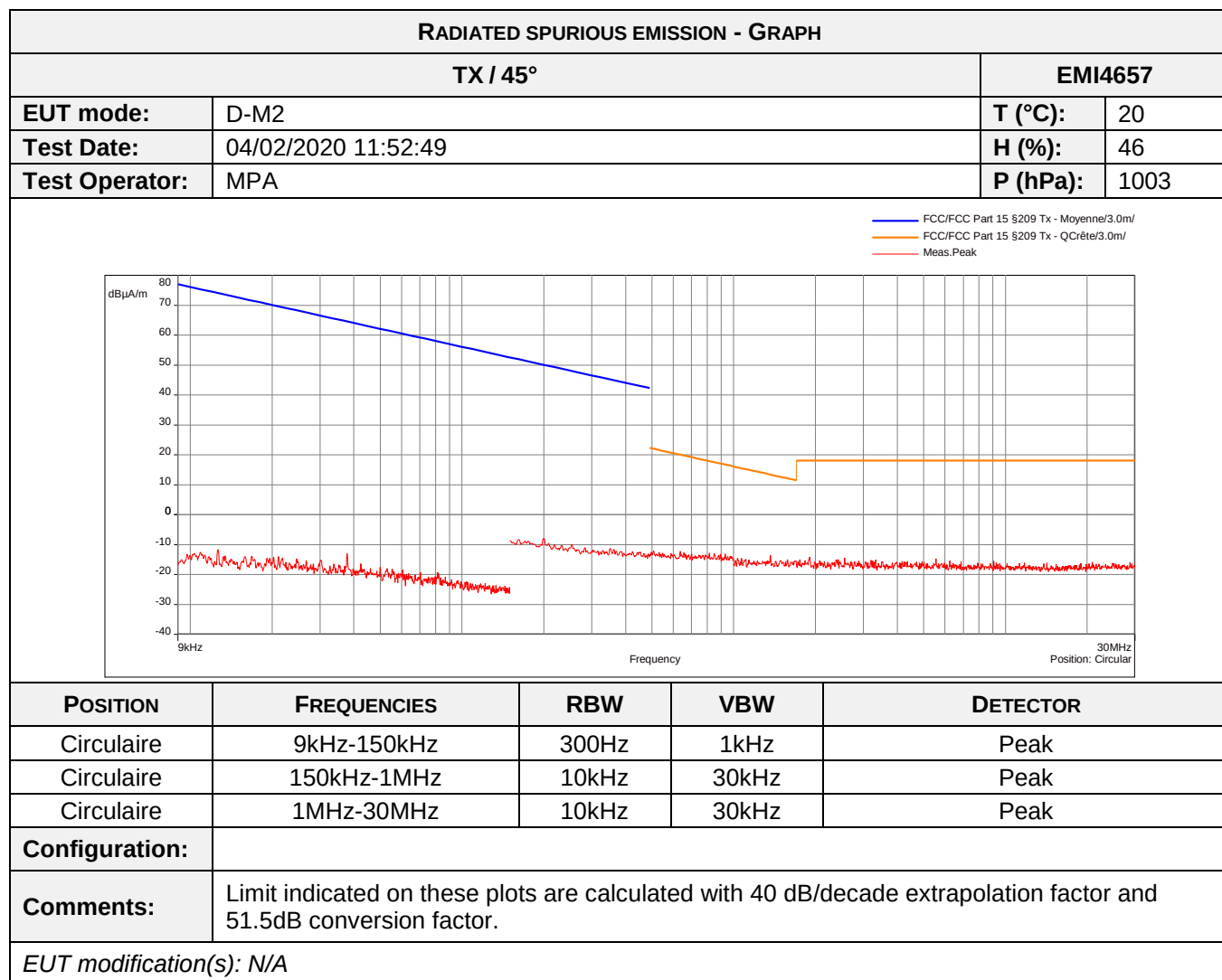
TEST SETUP PHOTO(S) RADIATED EMISSION($F < 30\text{MHz}$)

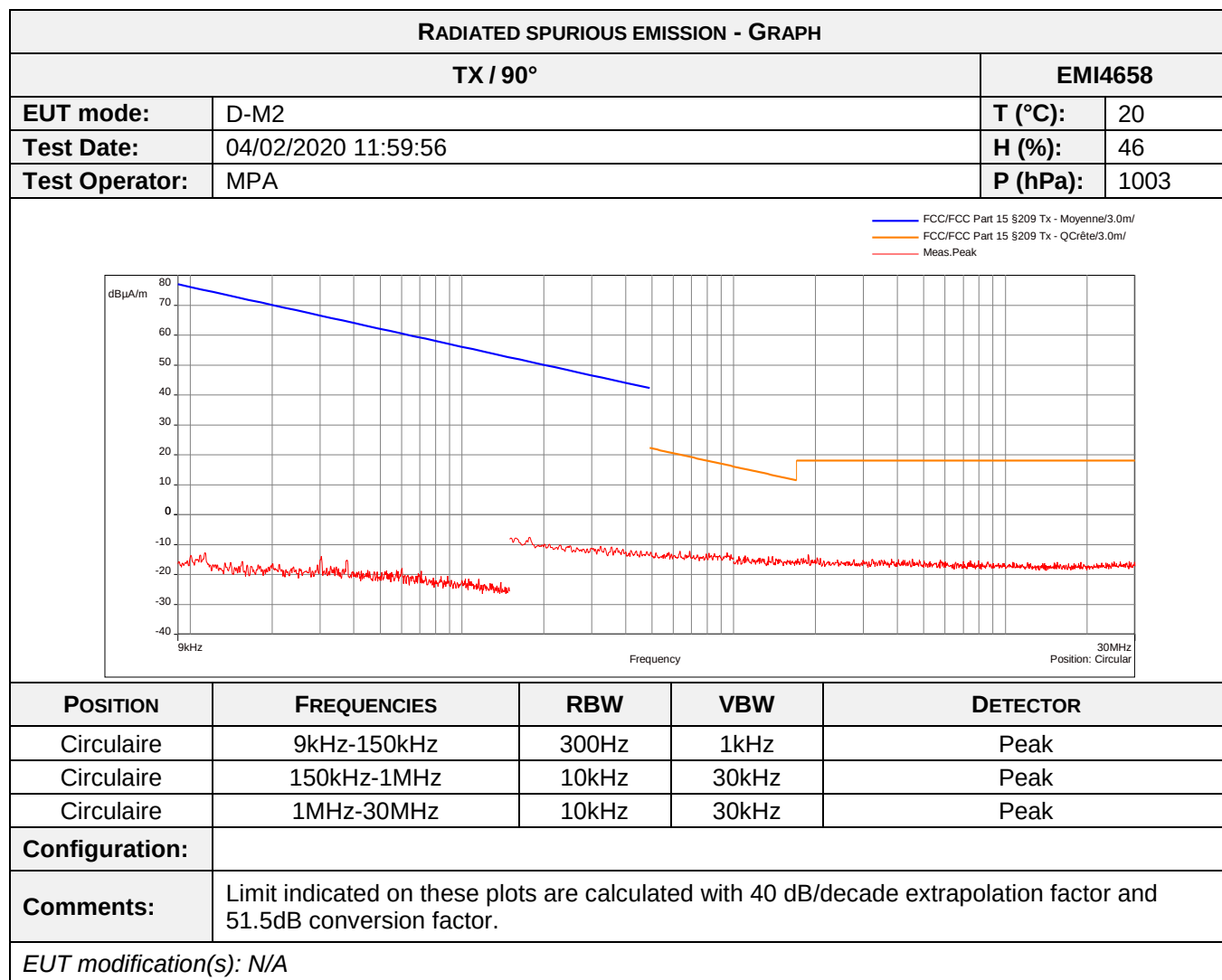


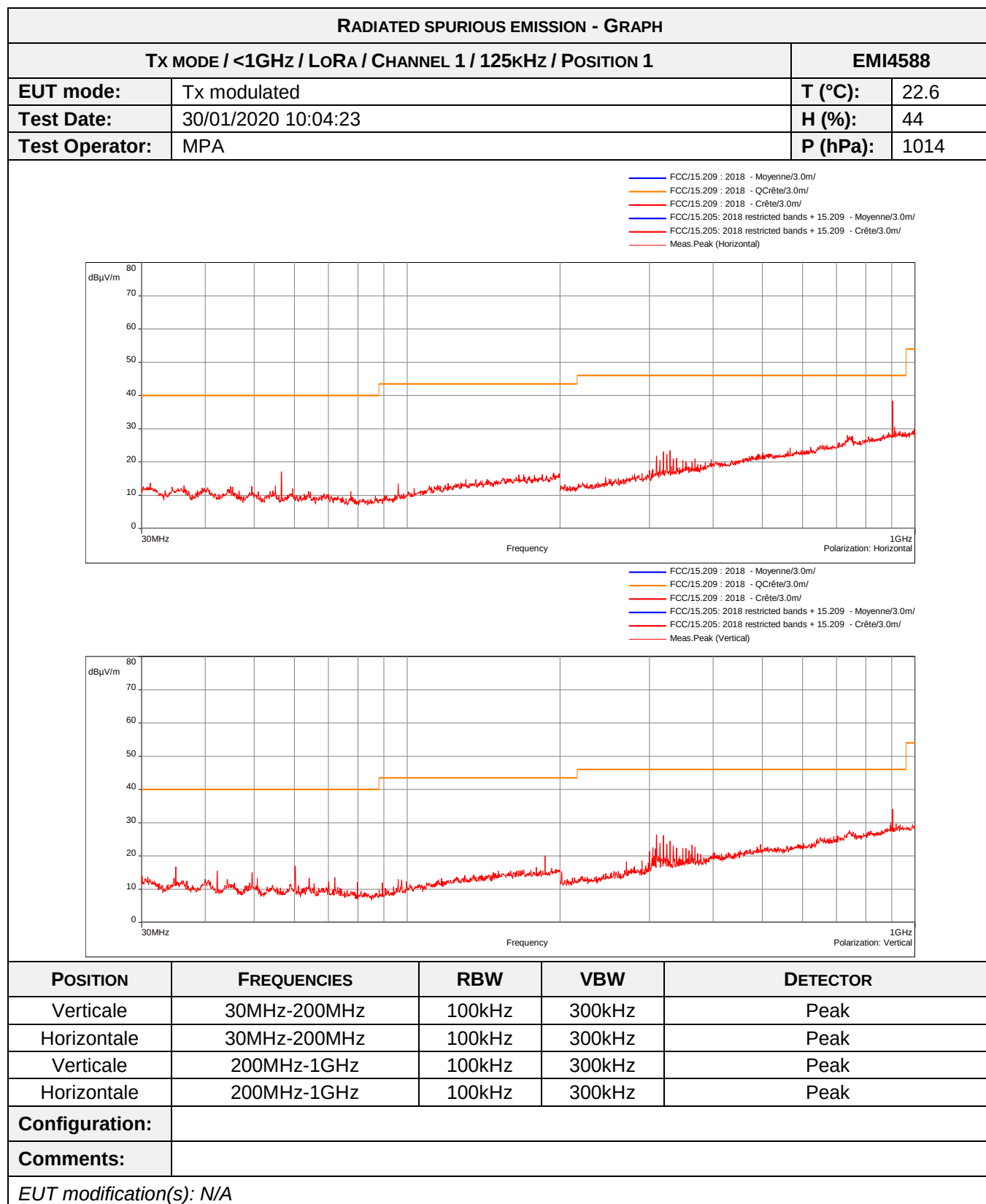
TEST SETUP PHOTO(S) RADIATED EMISSIONS ($F > 1\text{GHz}$)

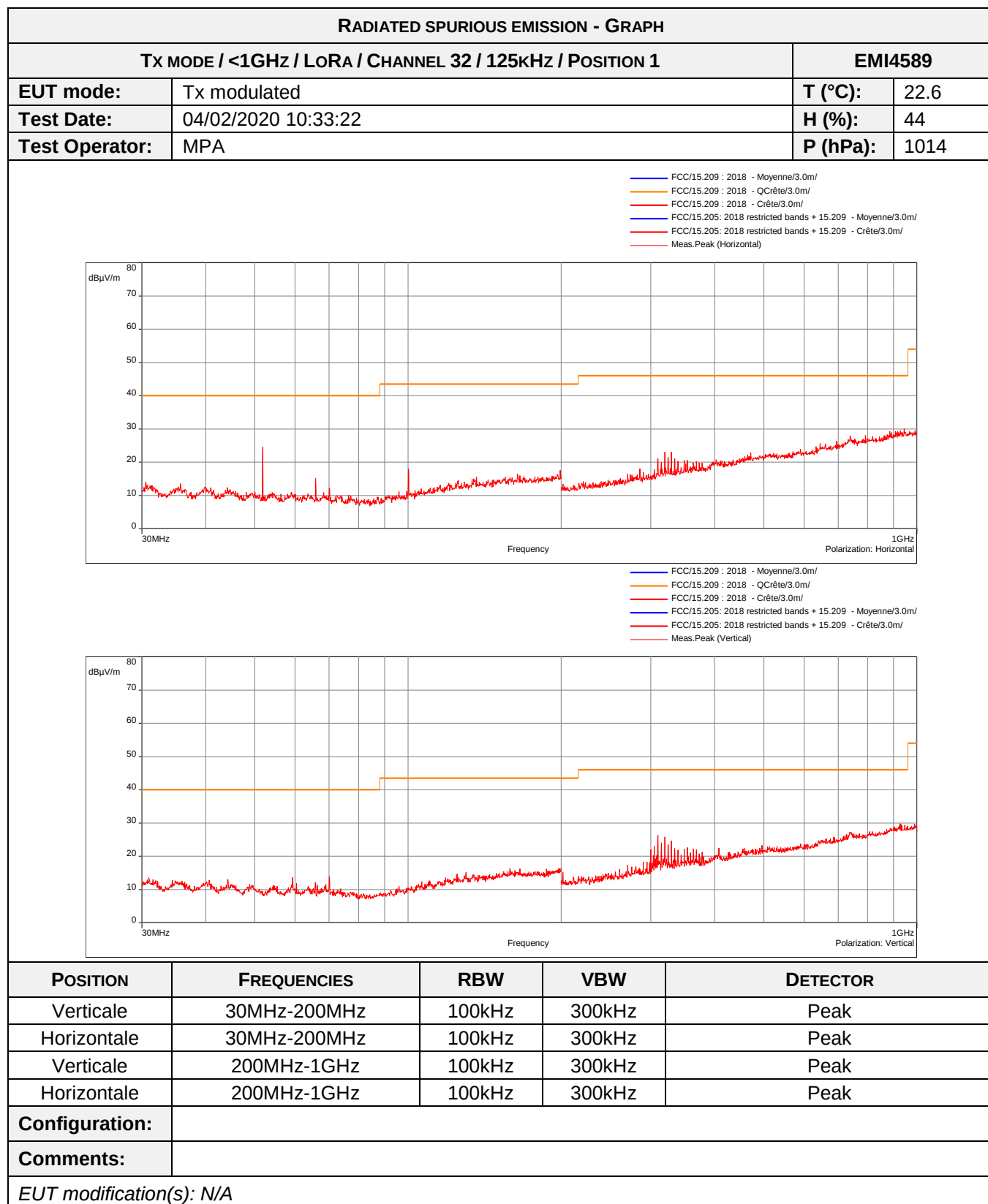


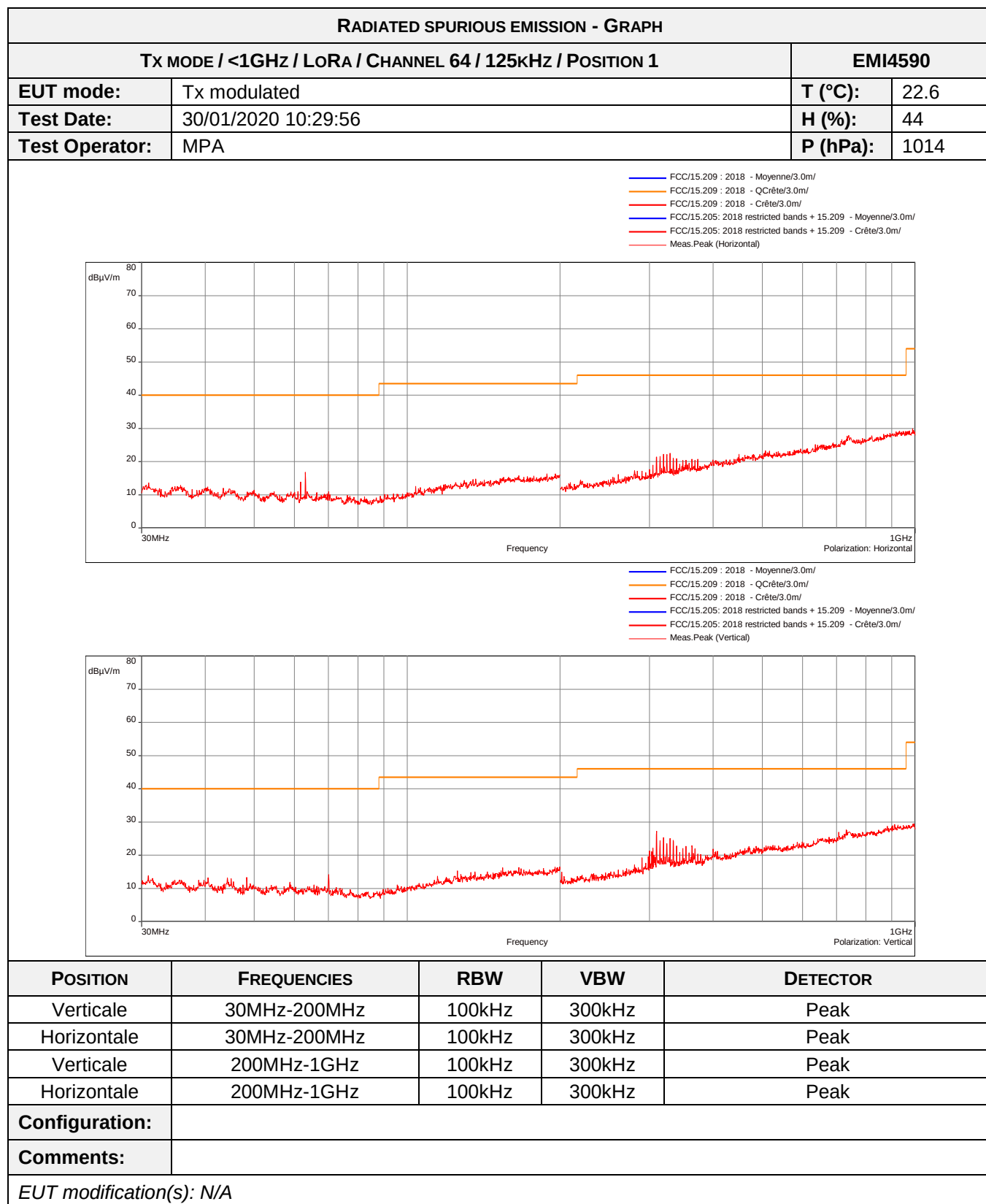


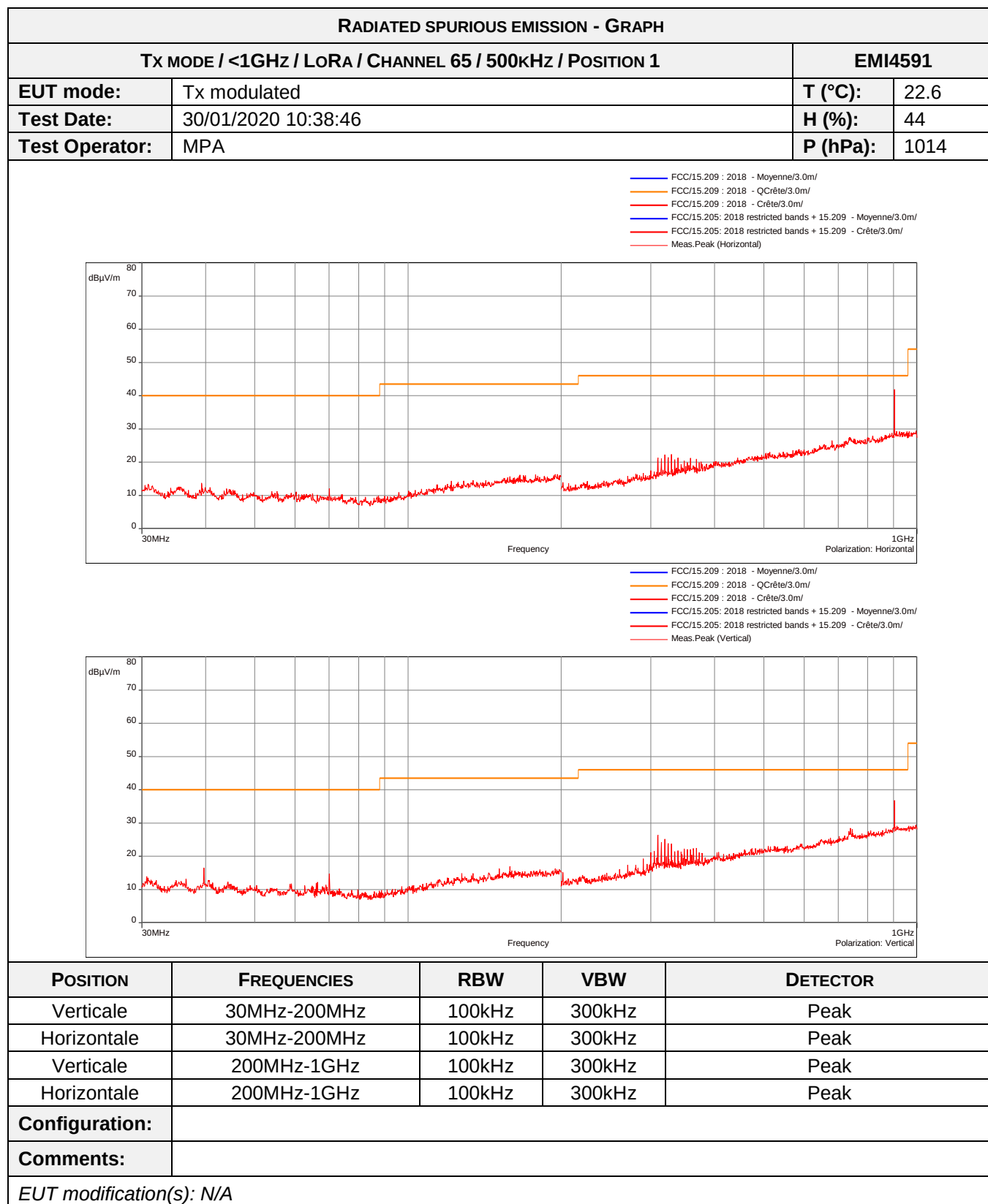


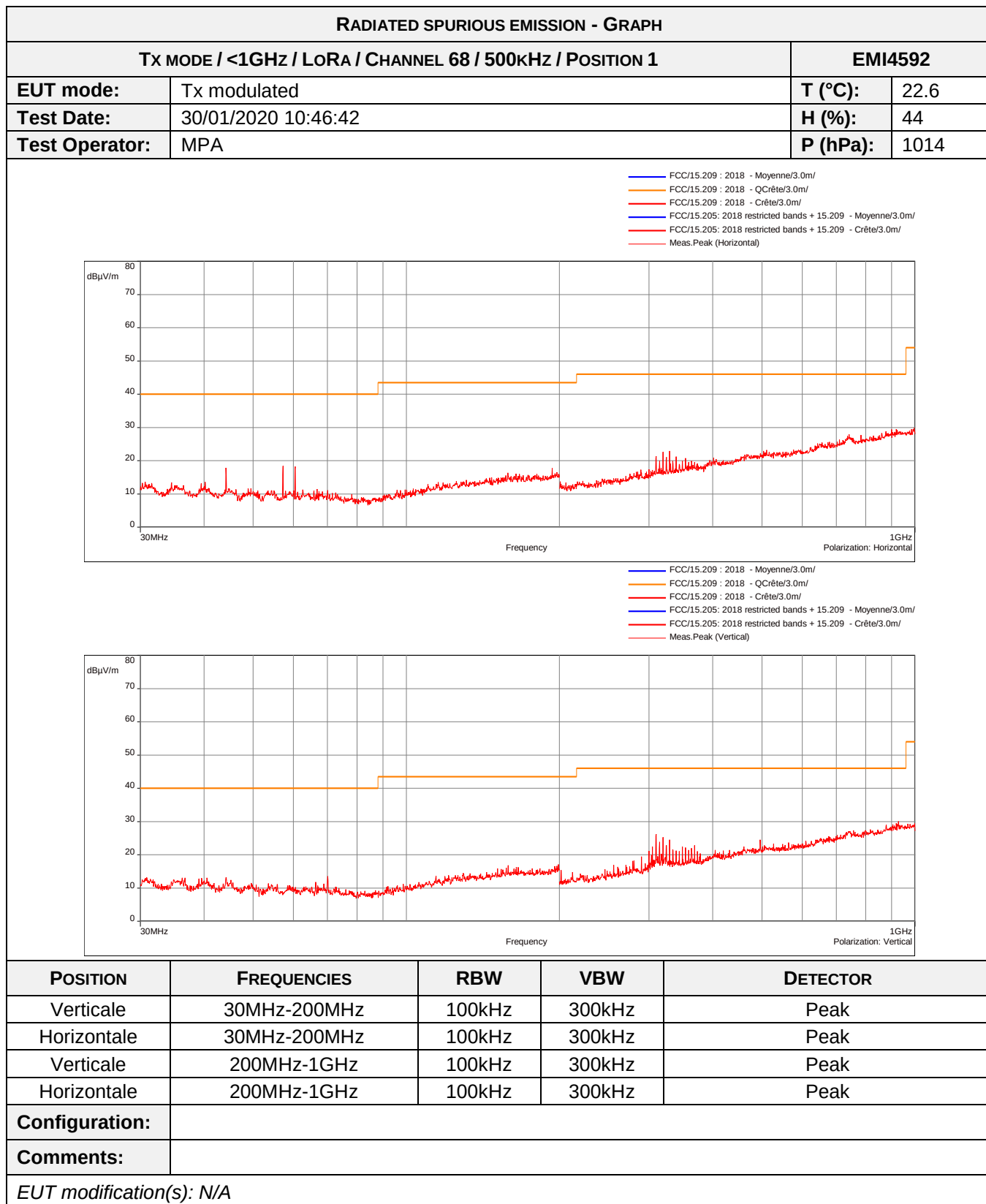


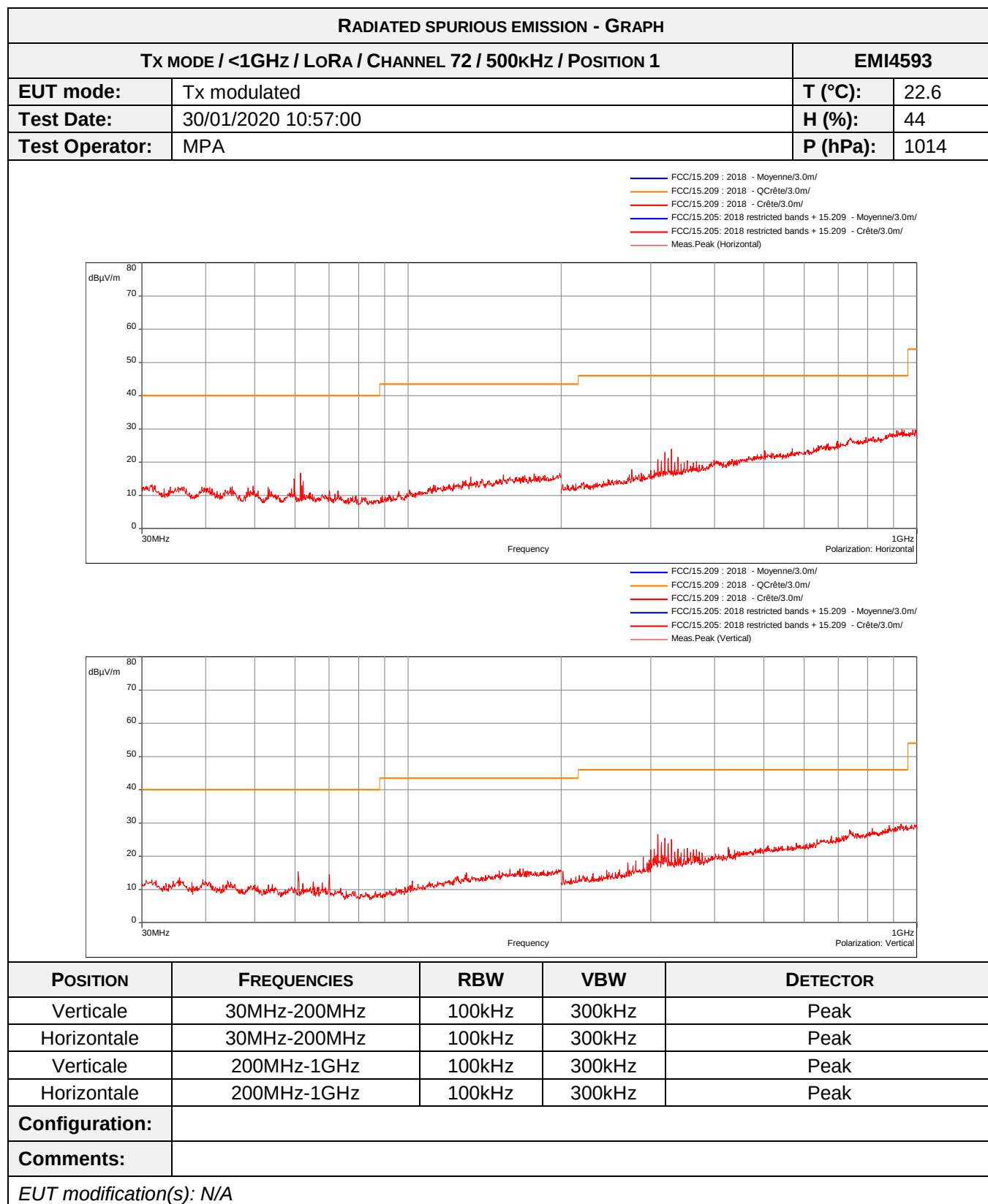


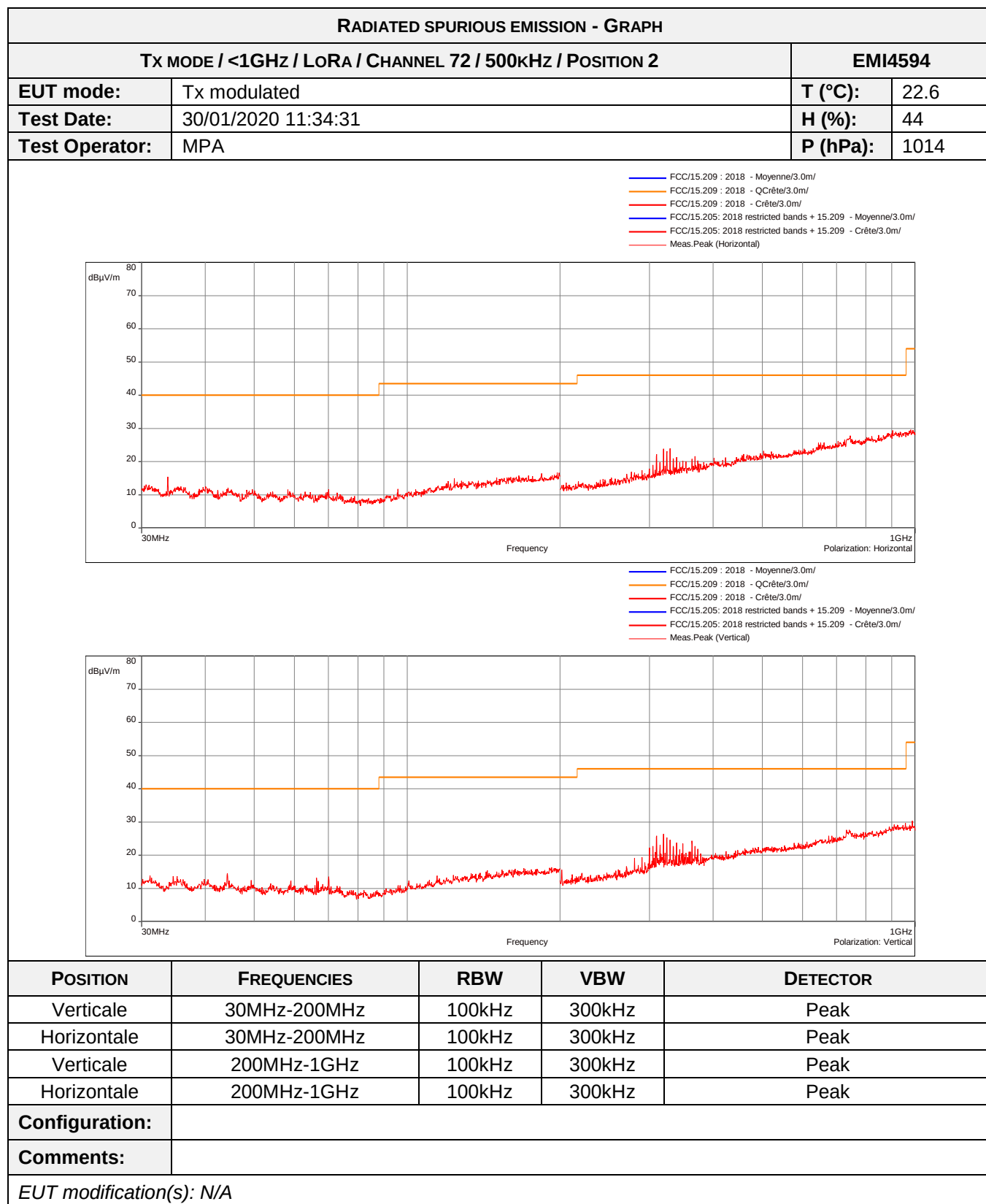


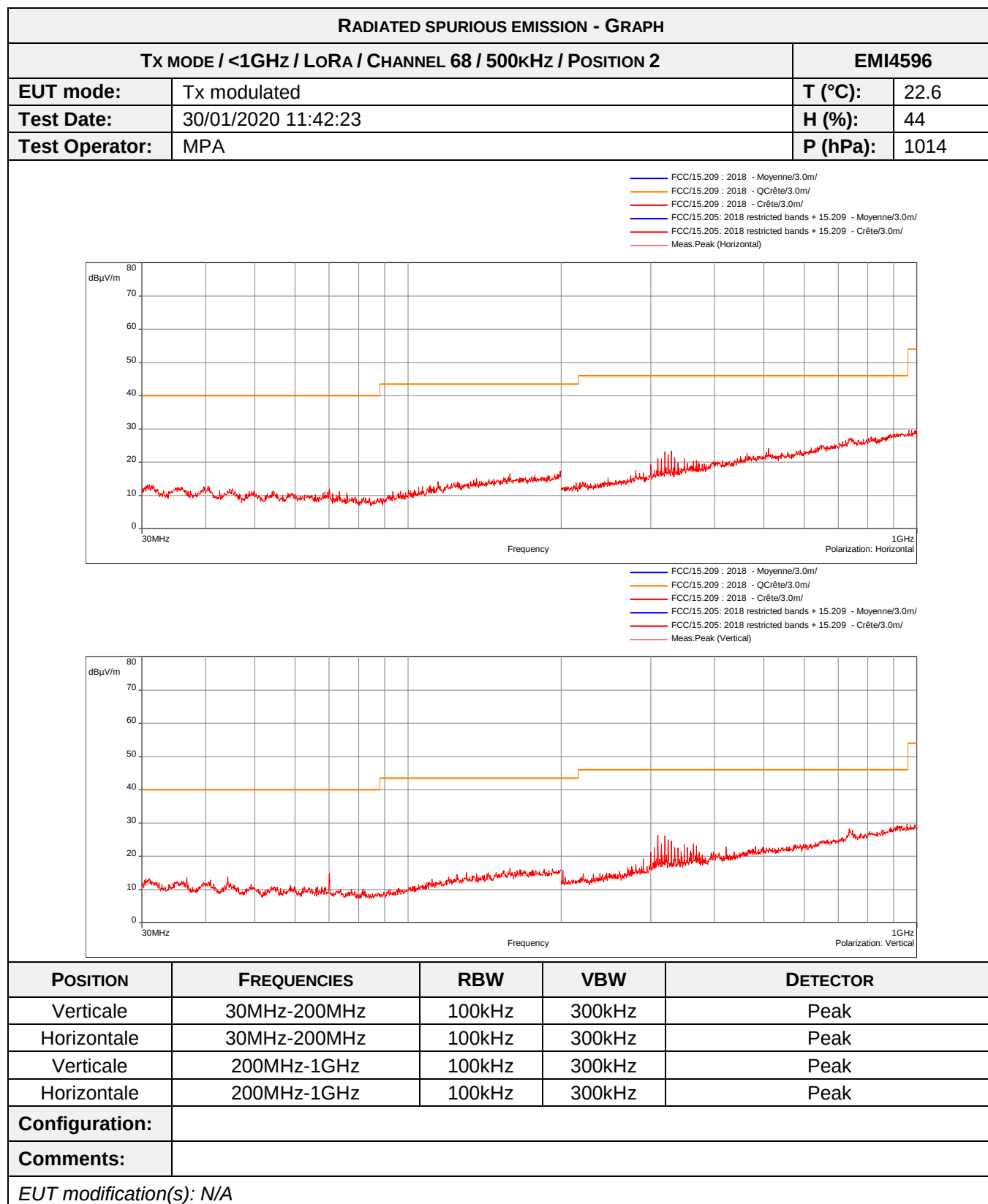


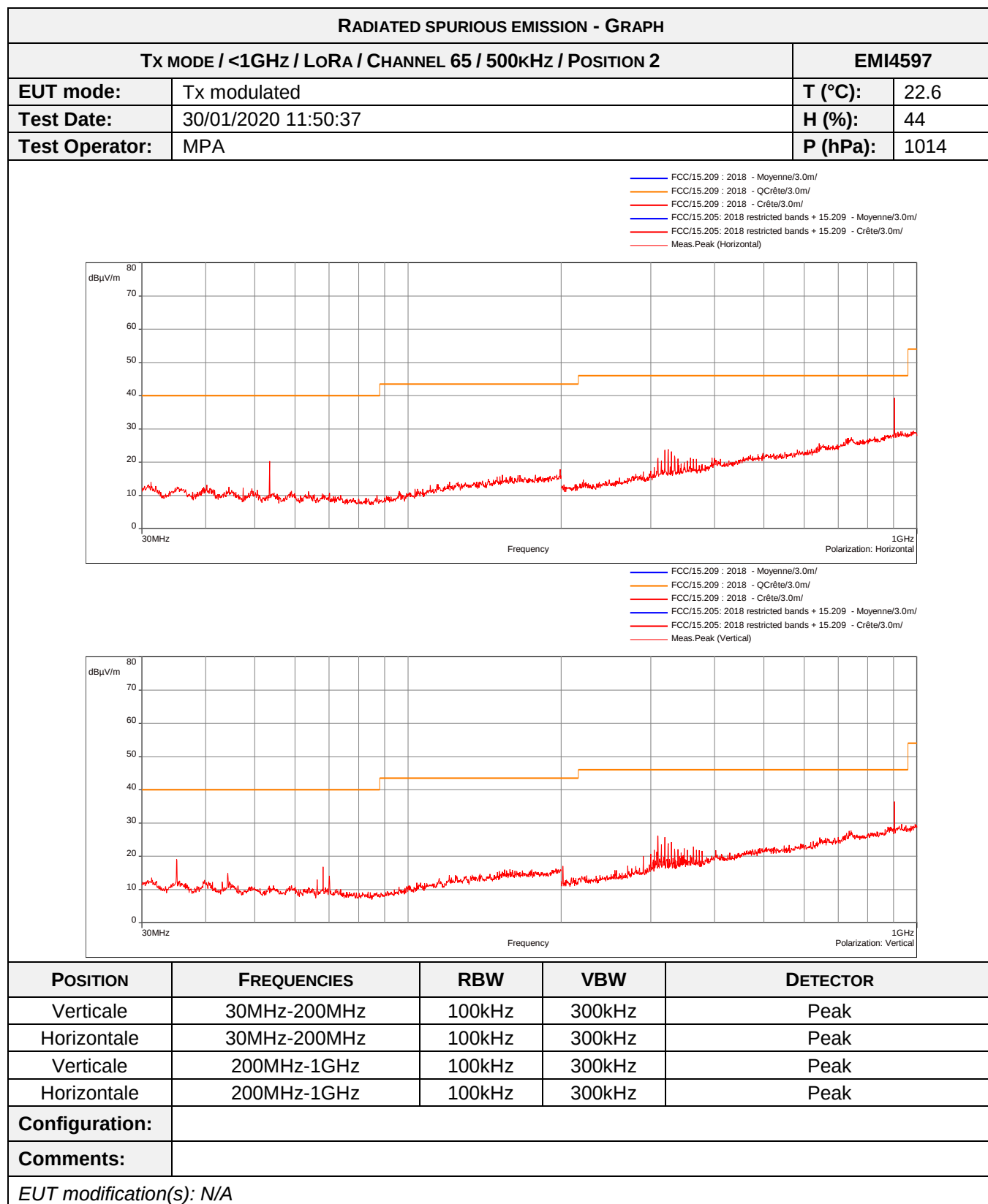


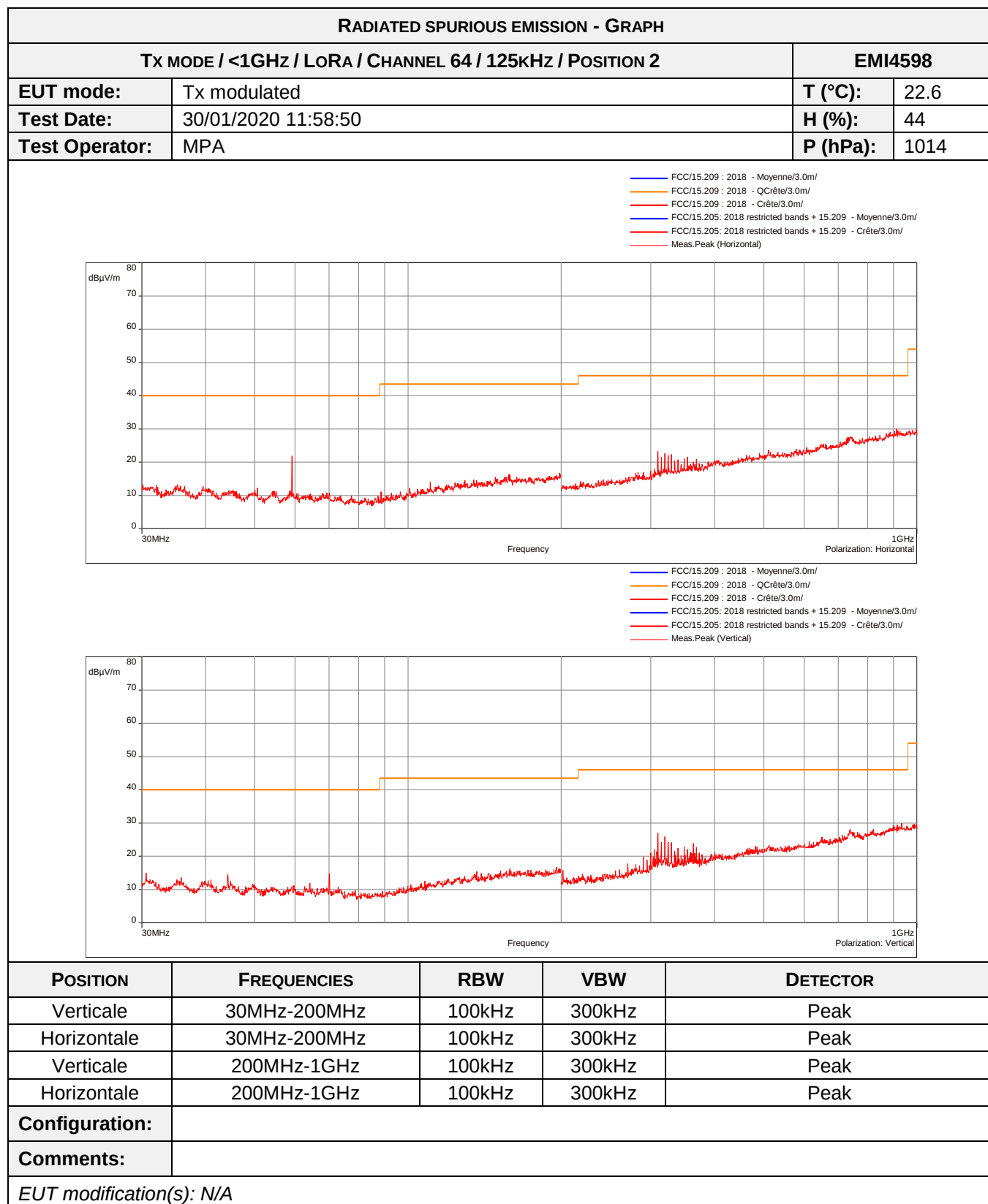


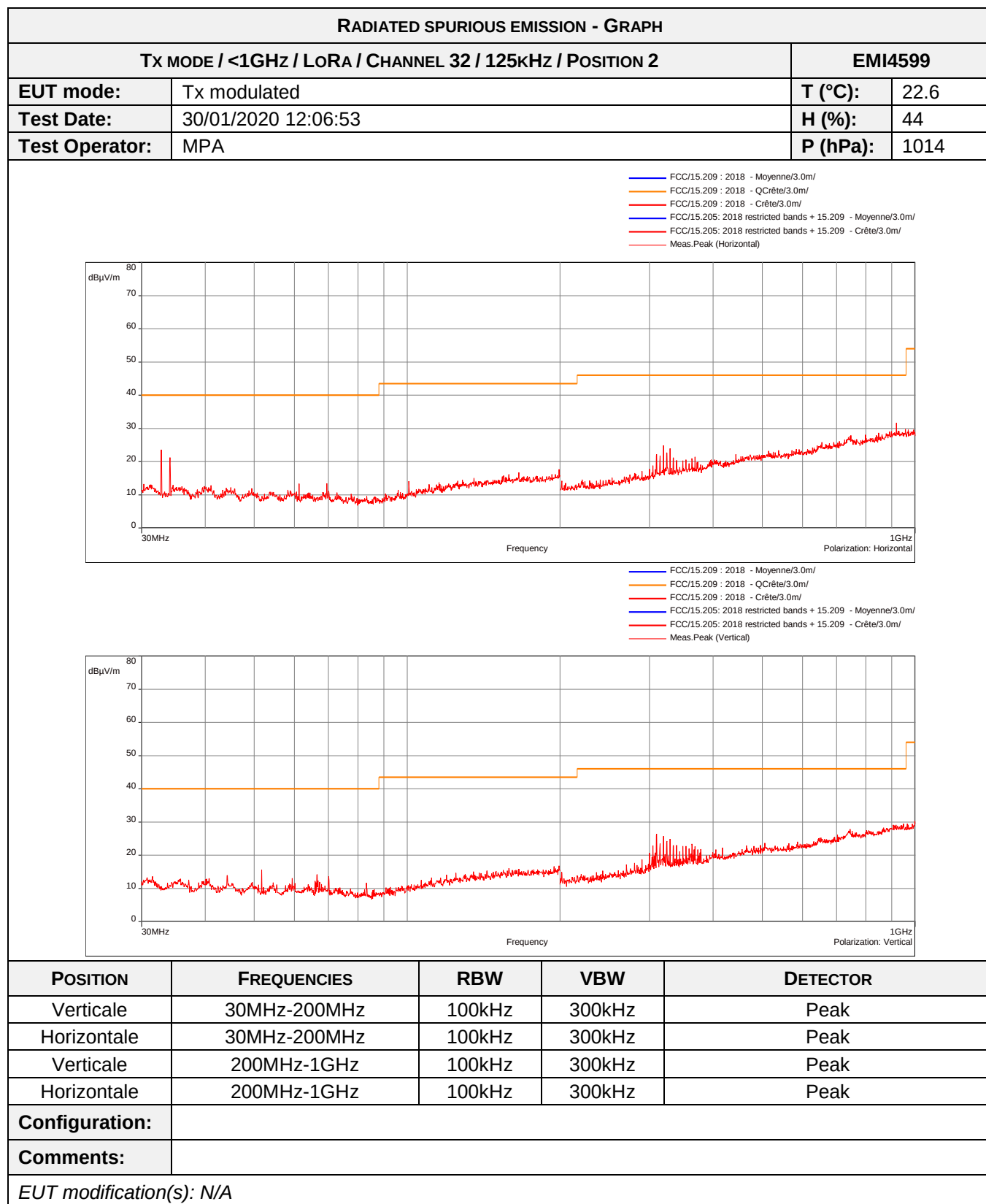


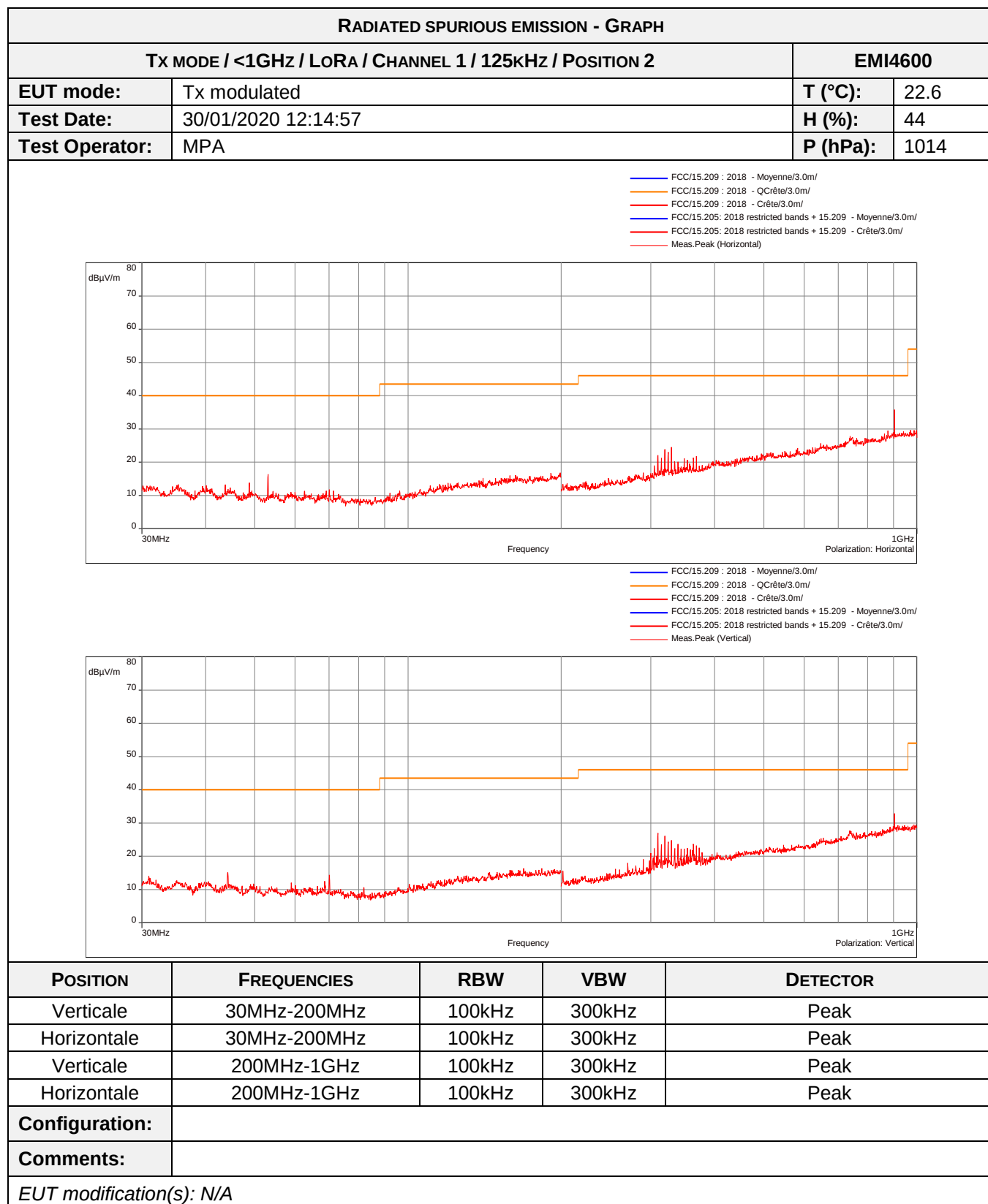


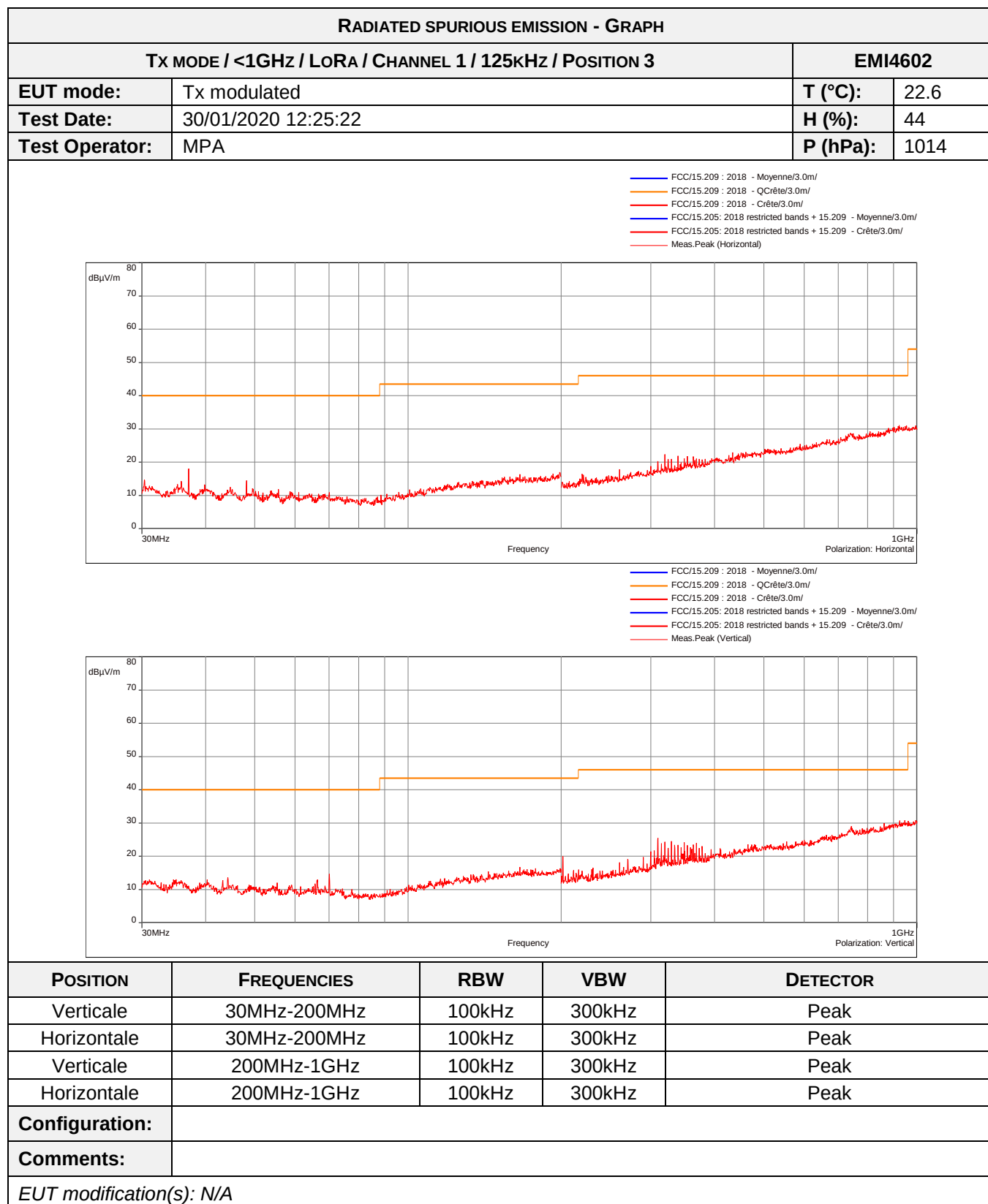


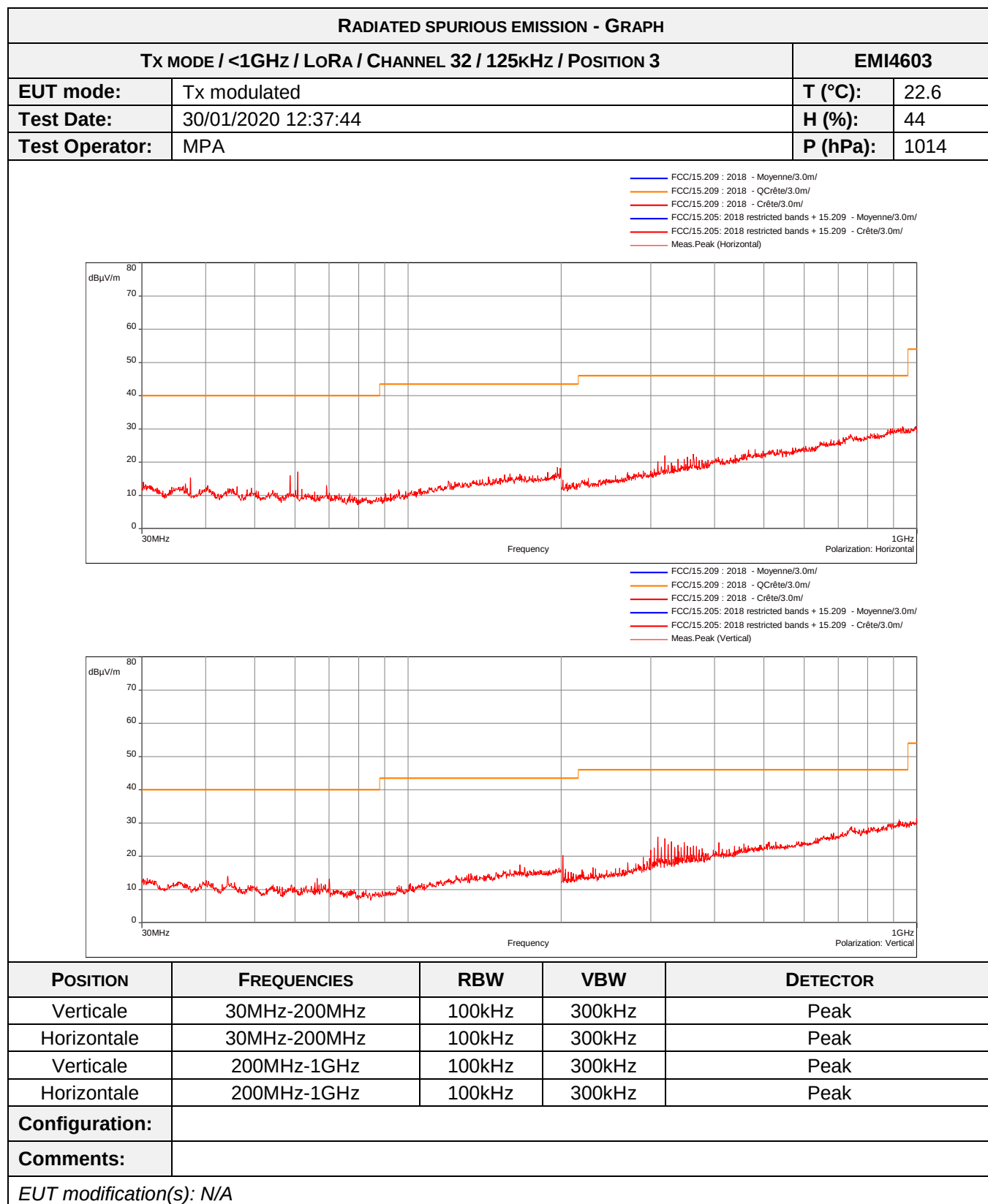


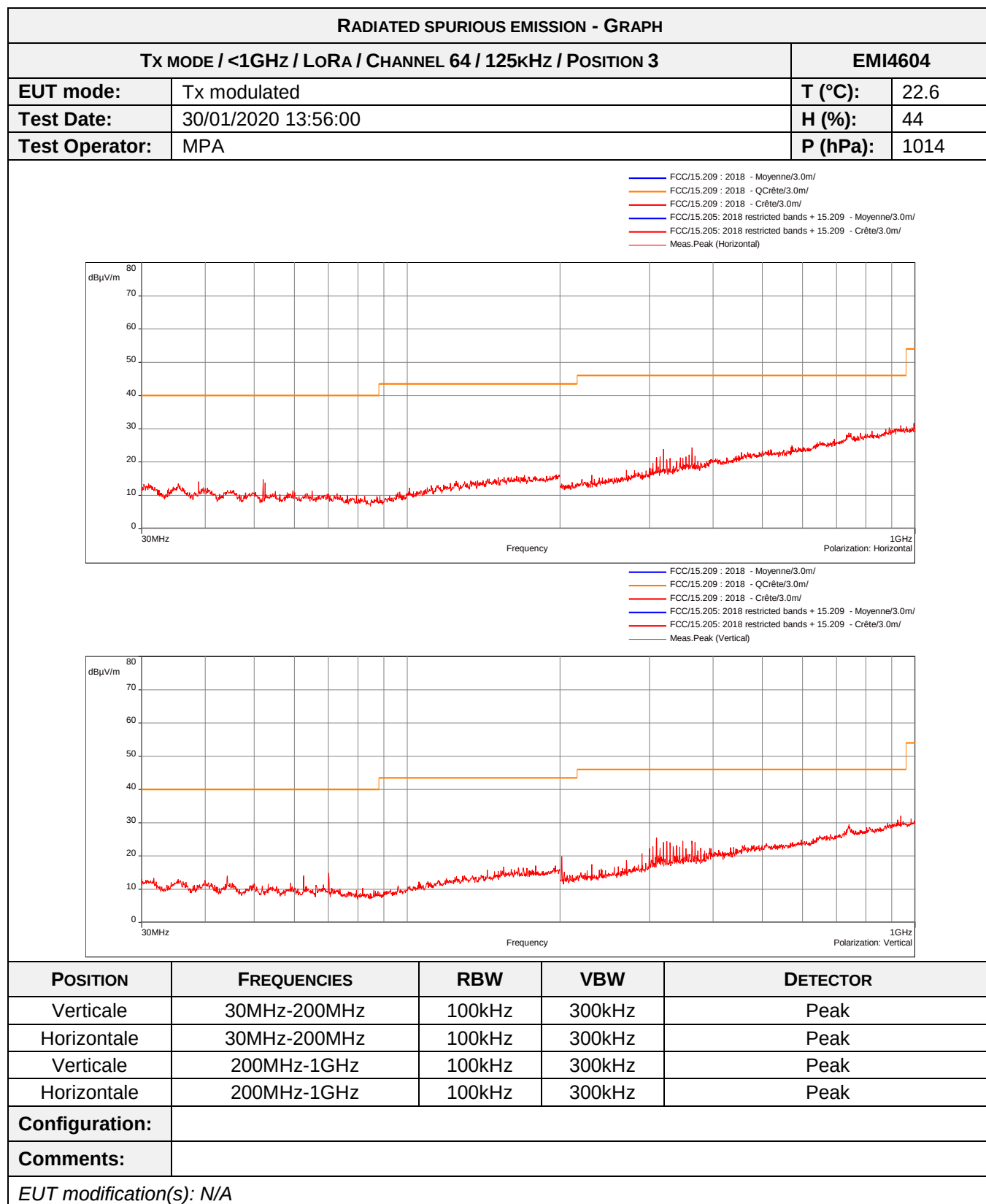


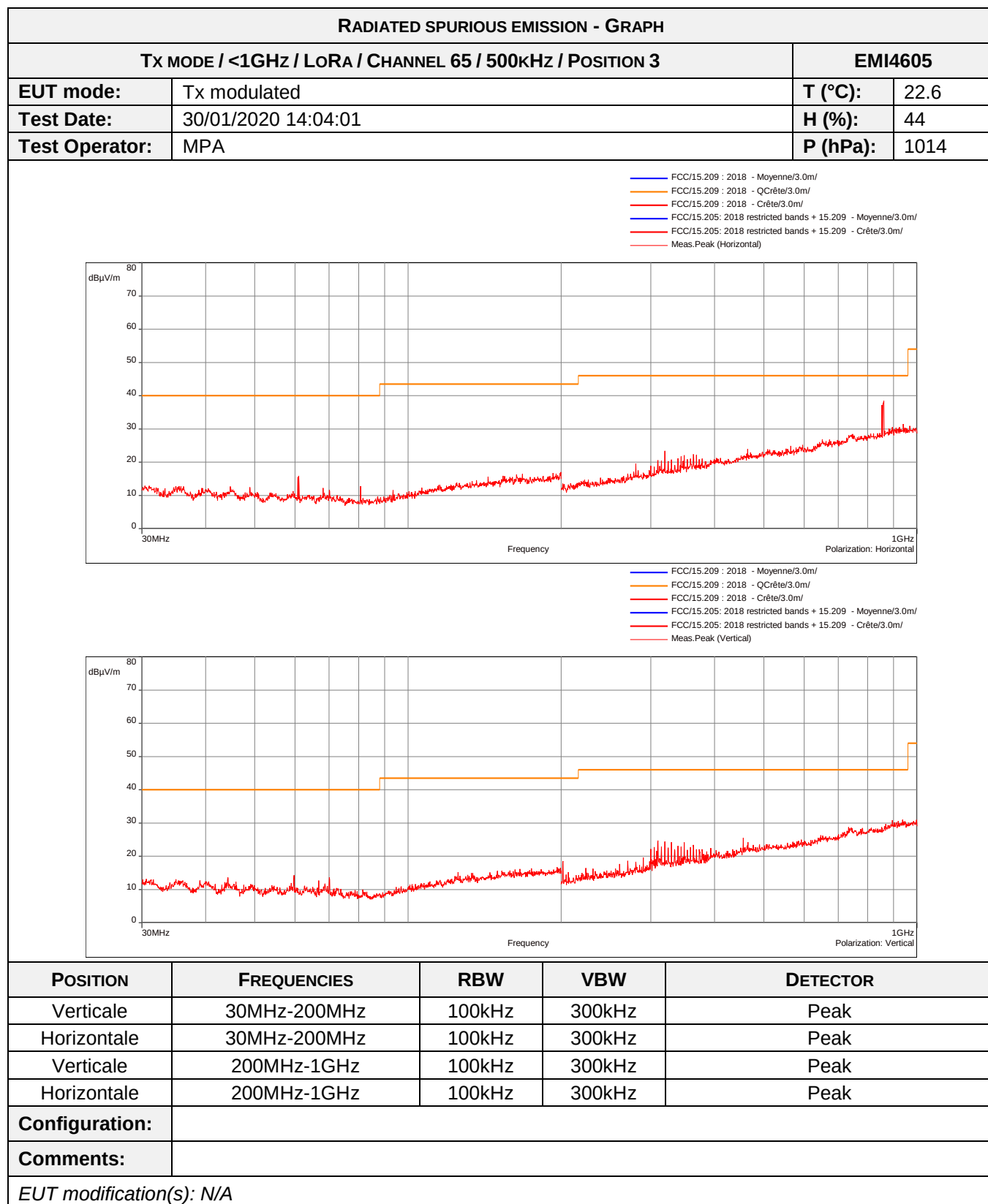


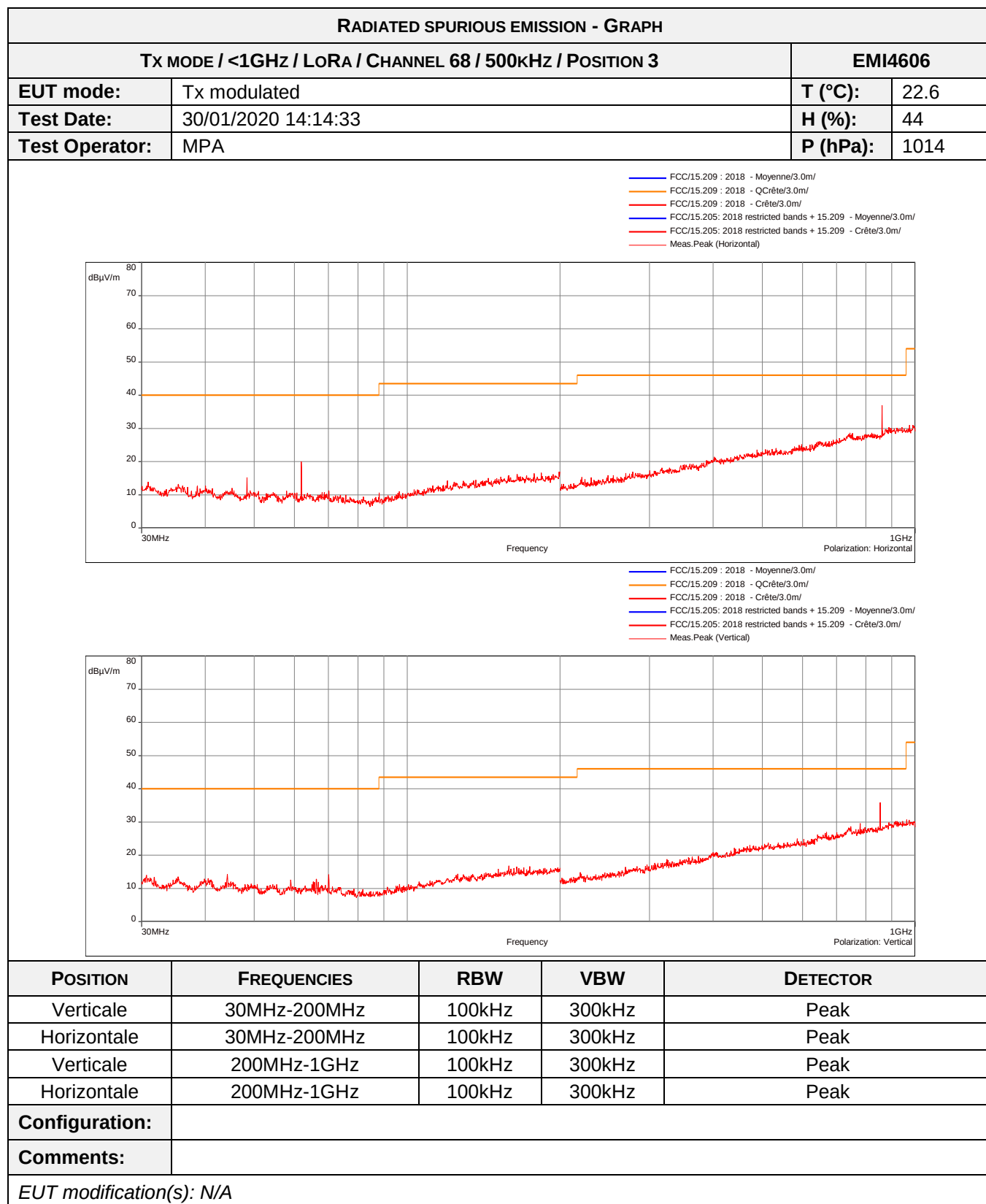


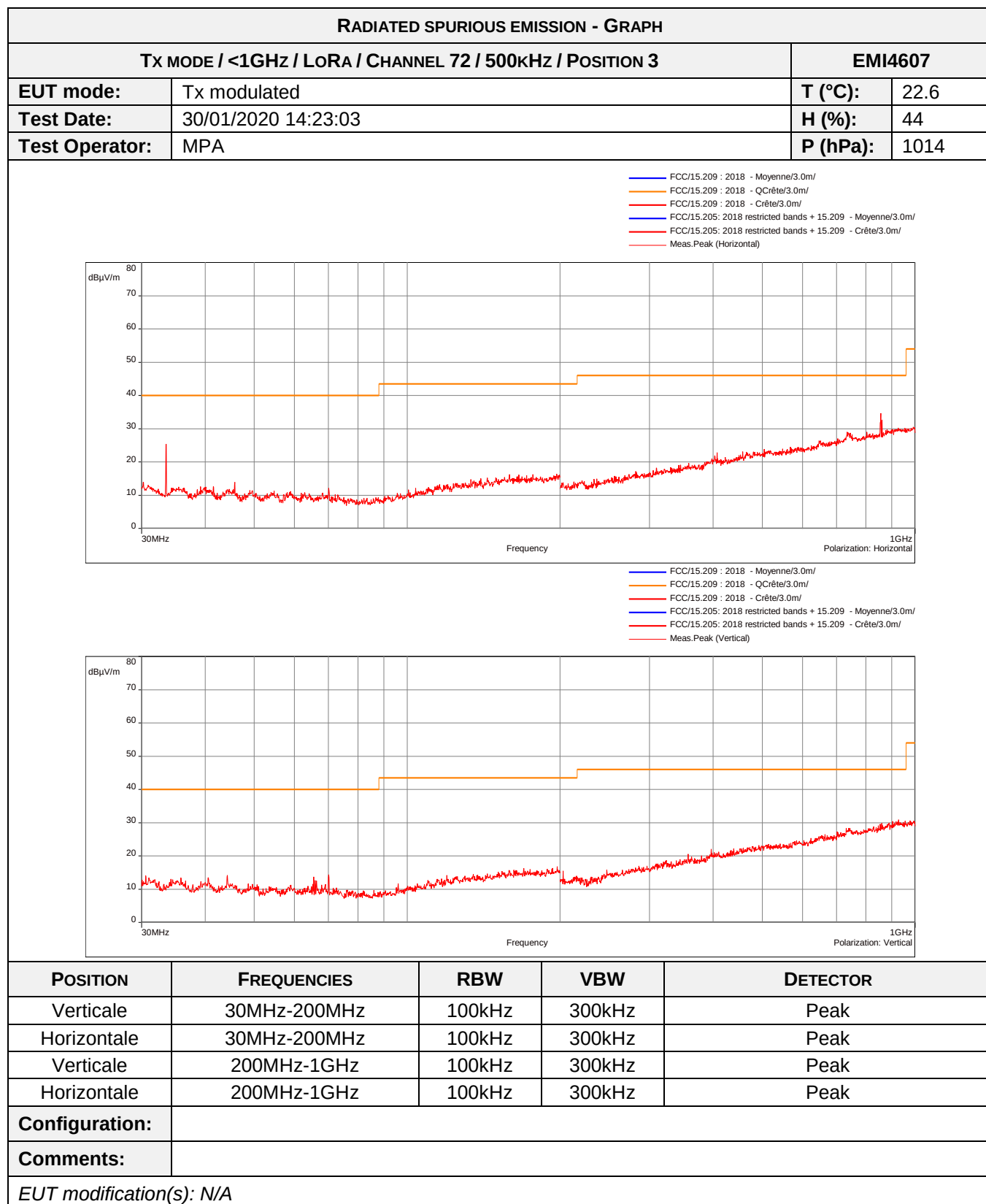


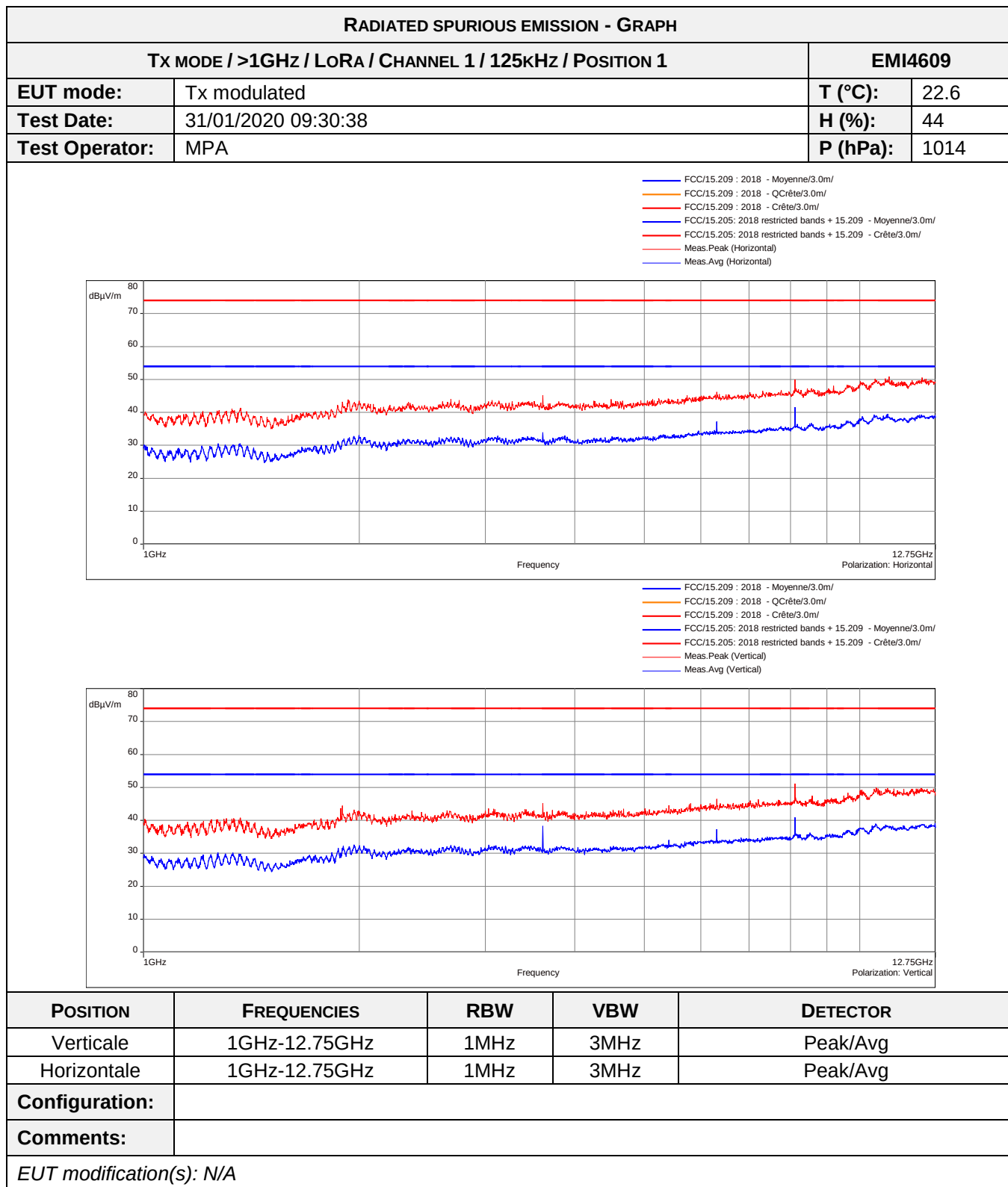


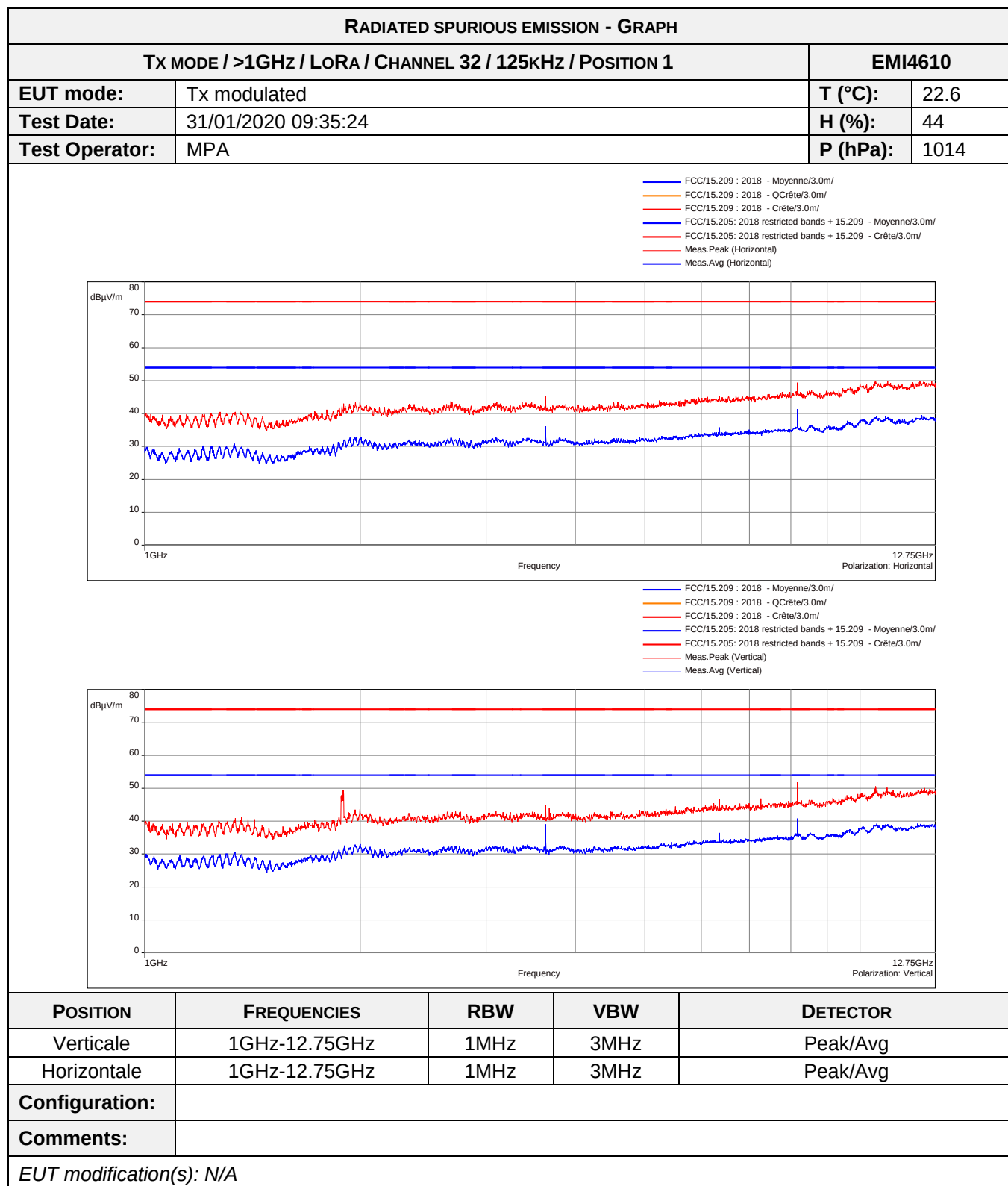


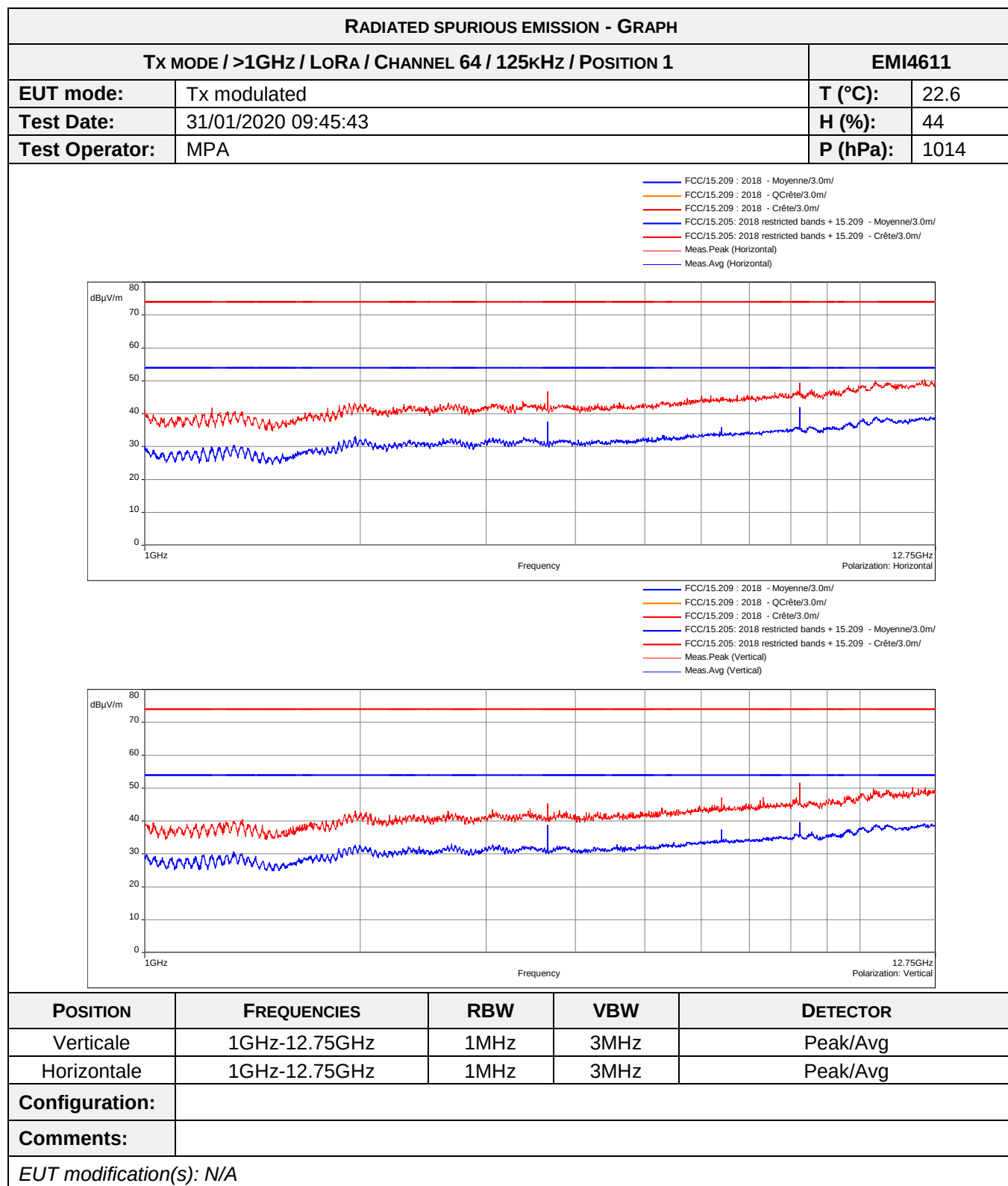


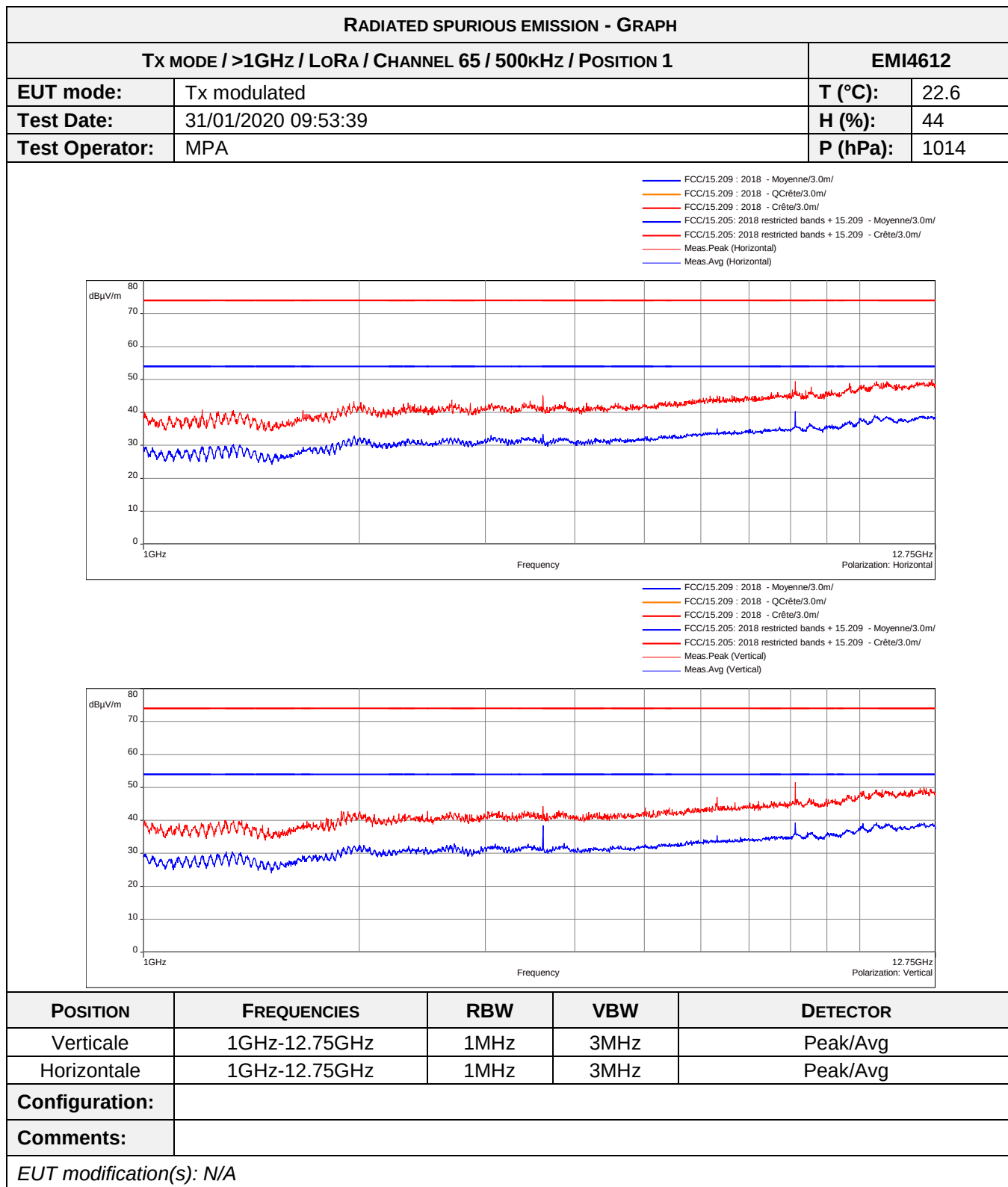


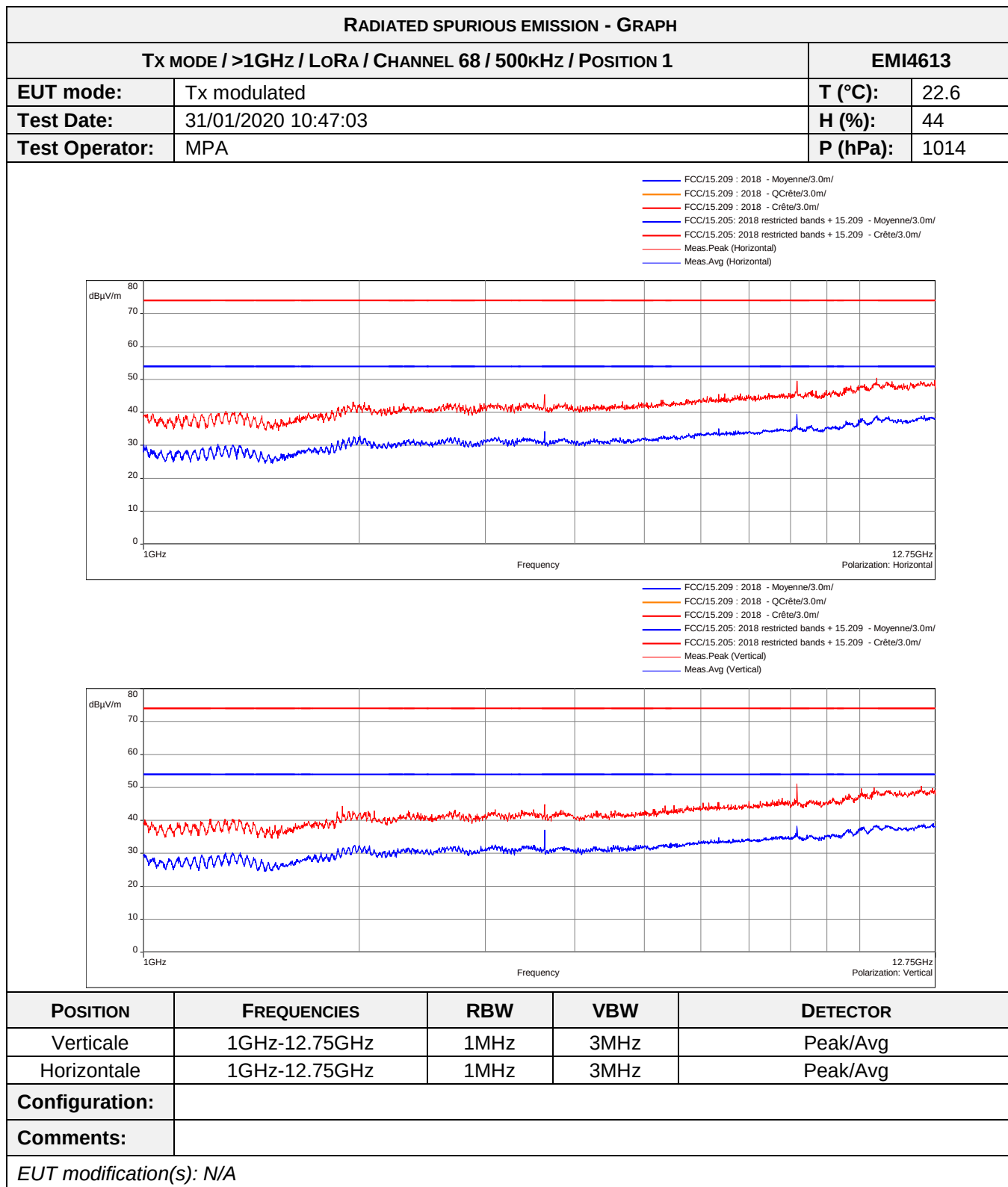


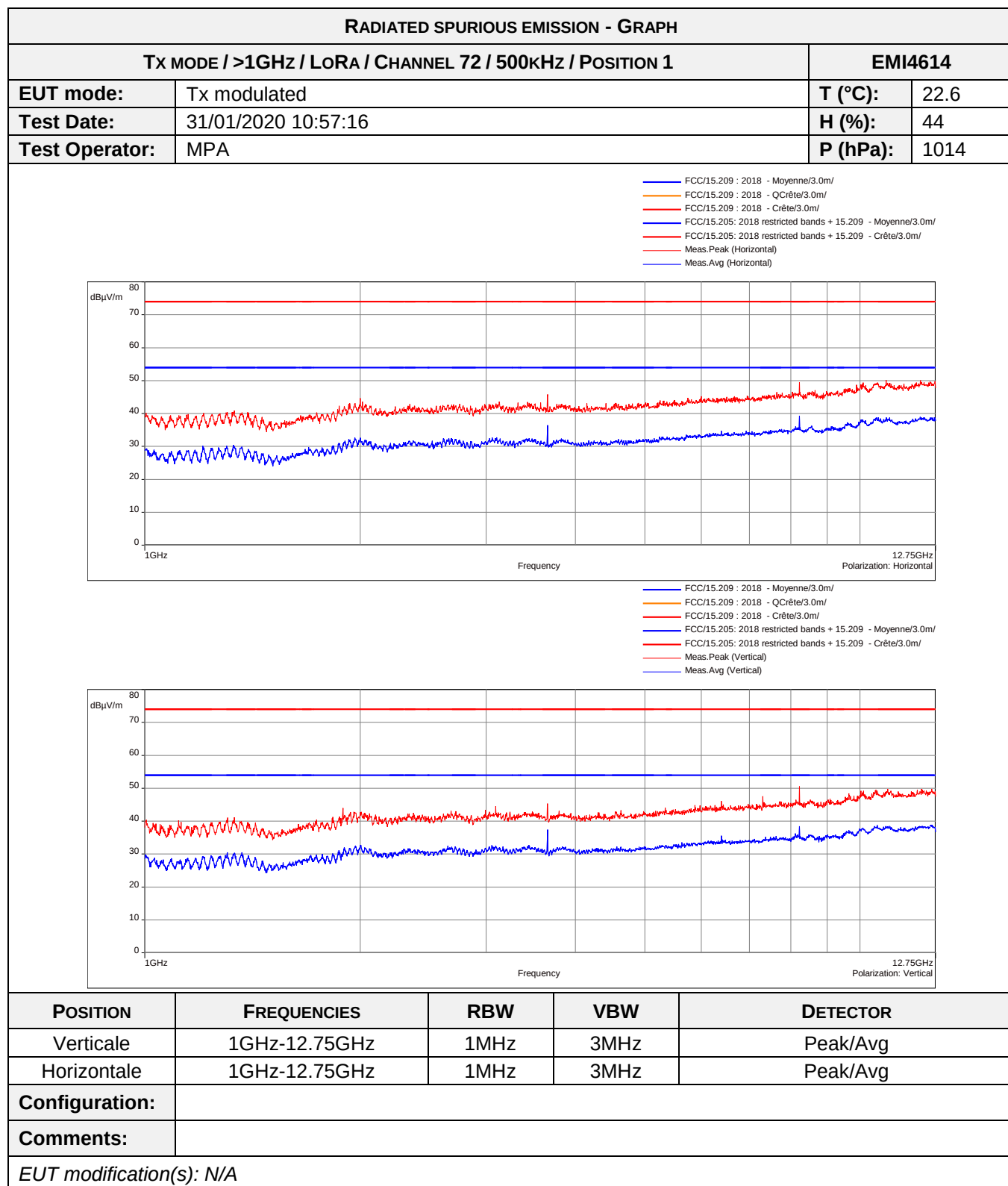


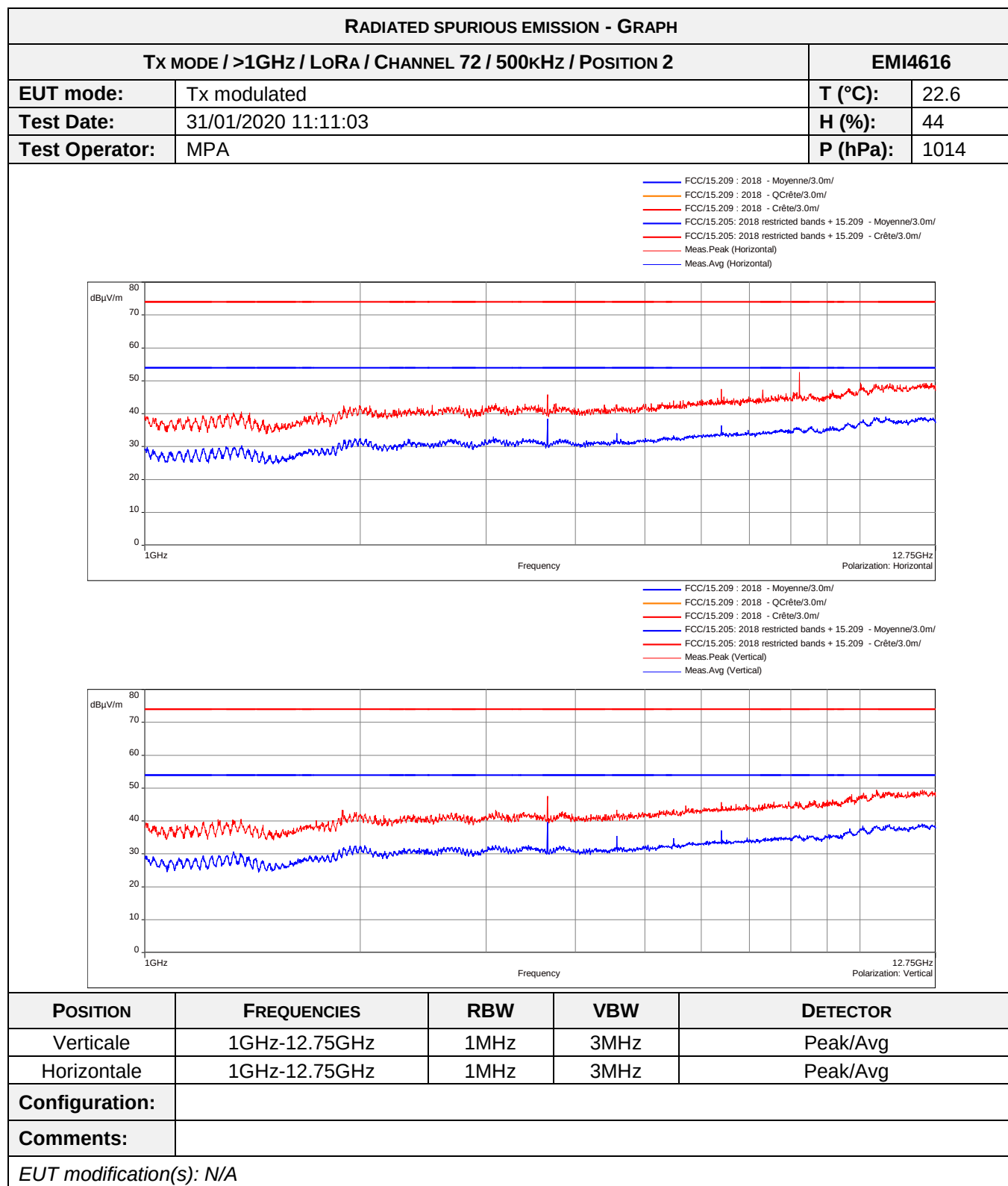


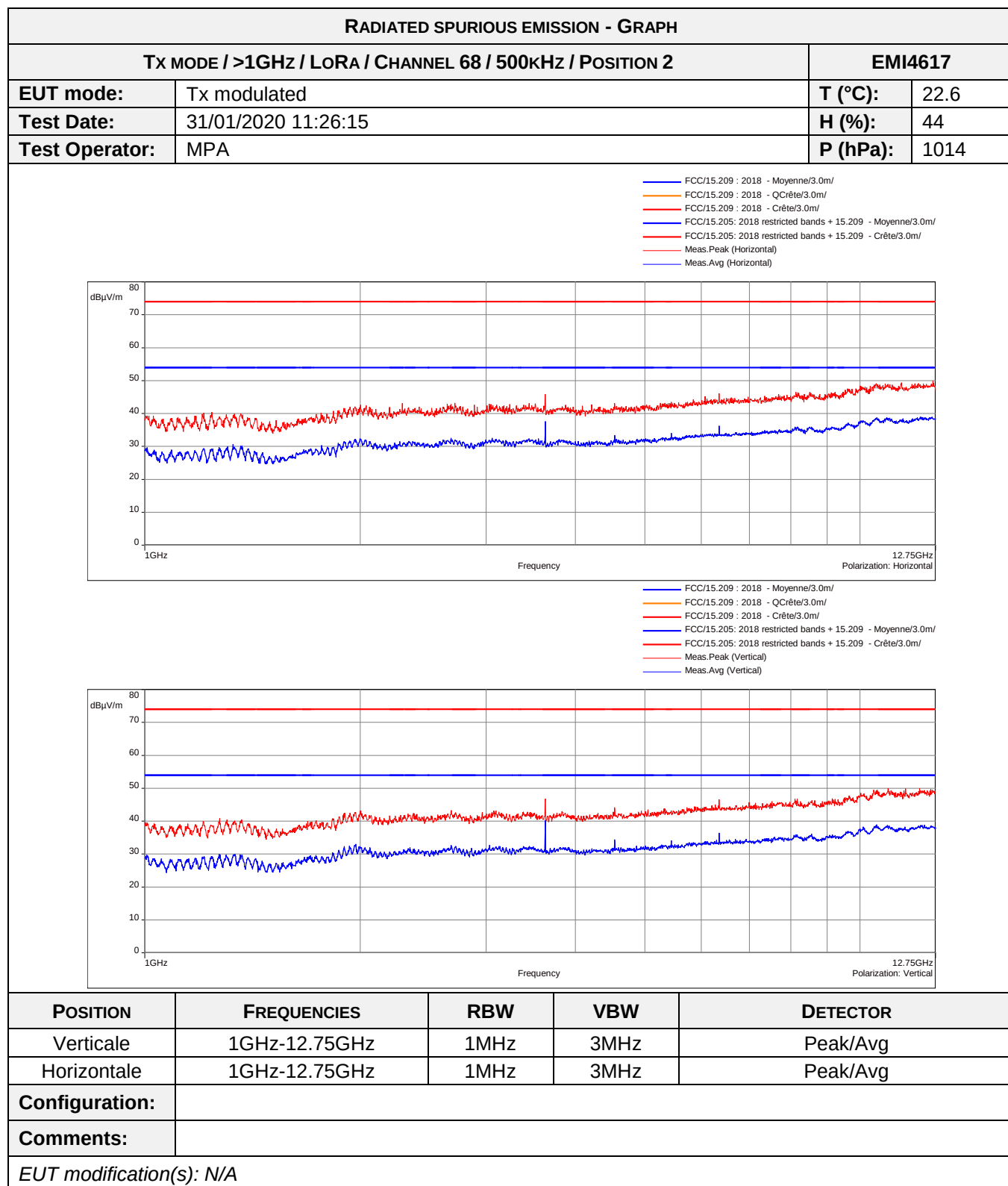


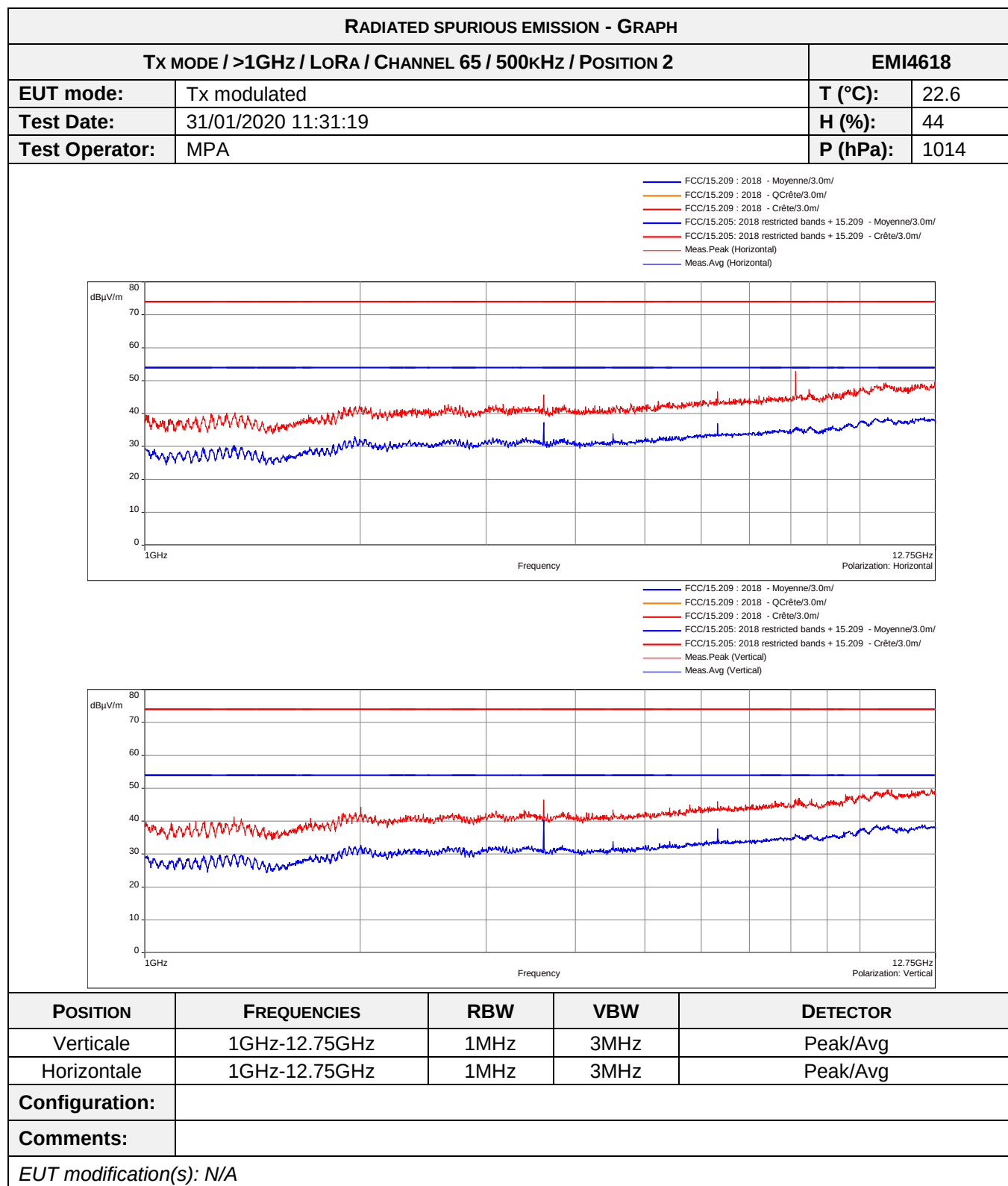


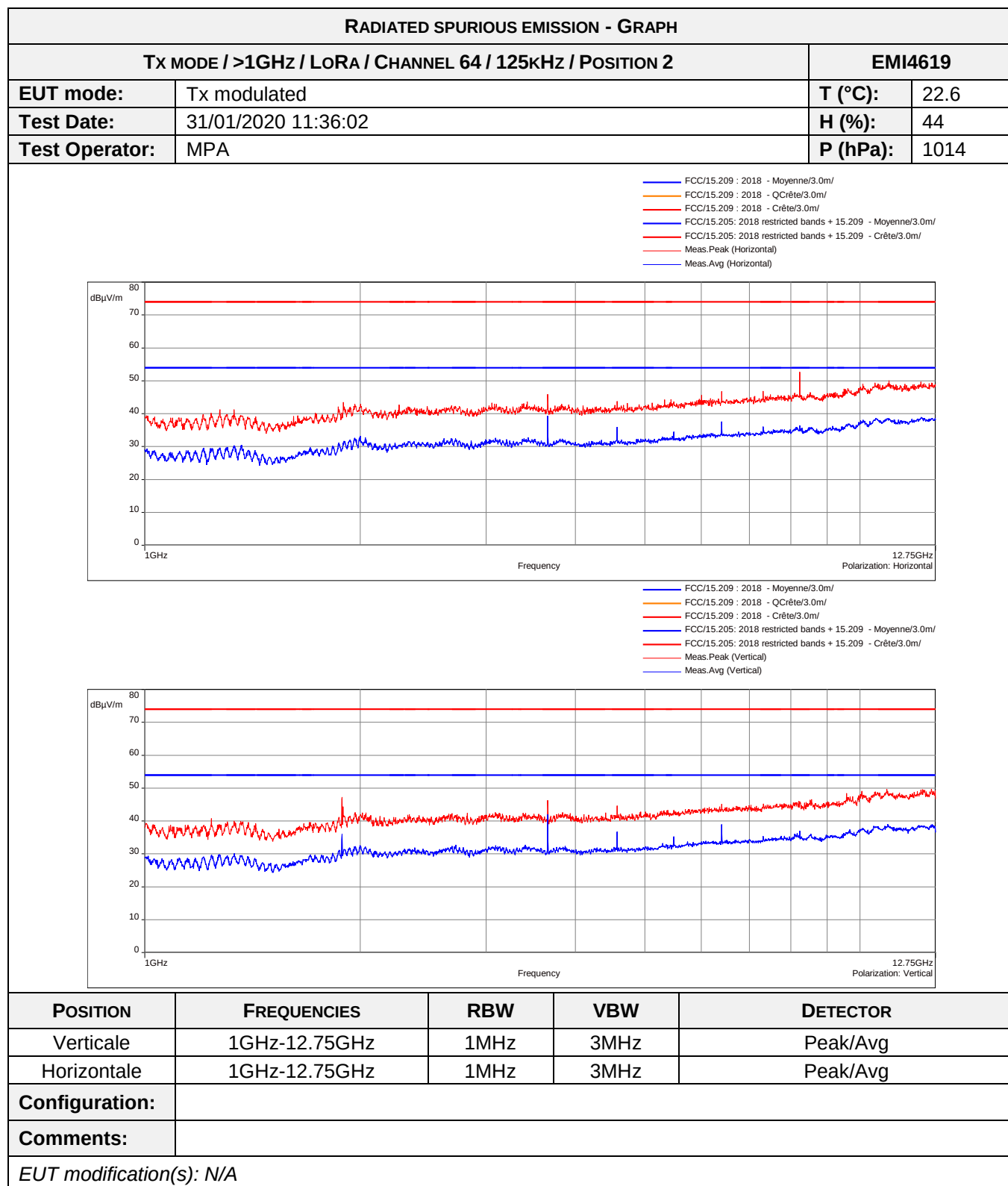


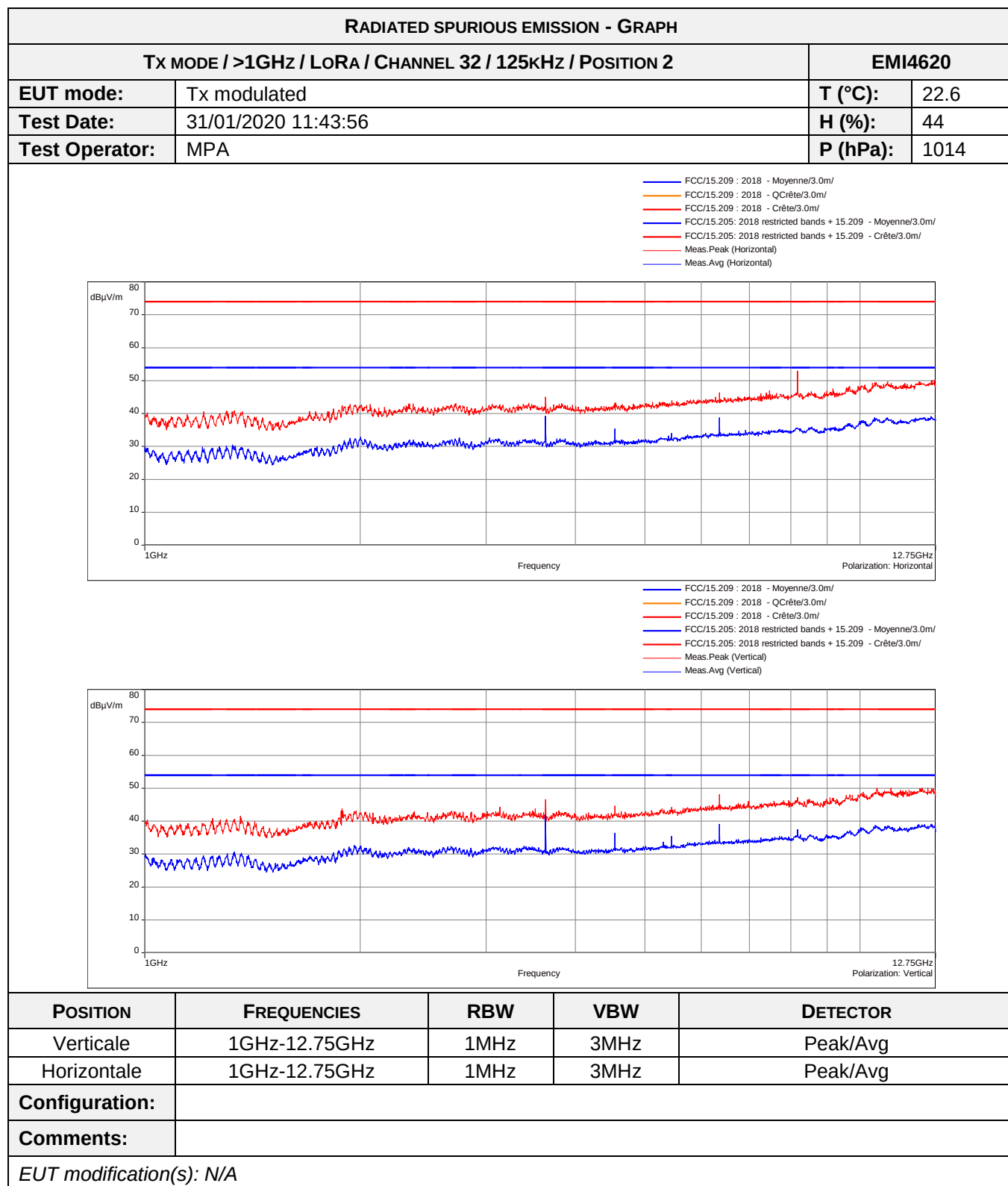


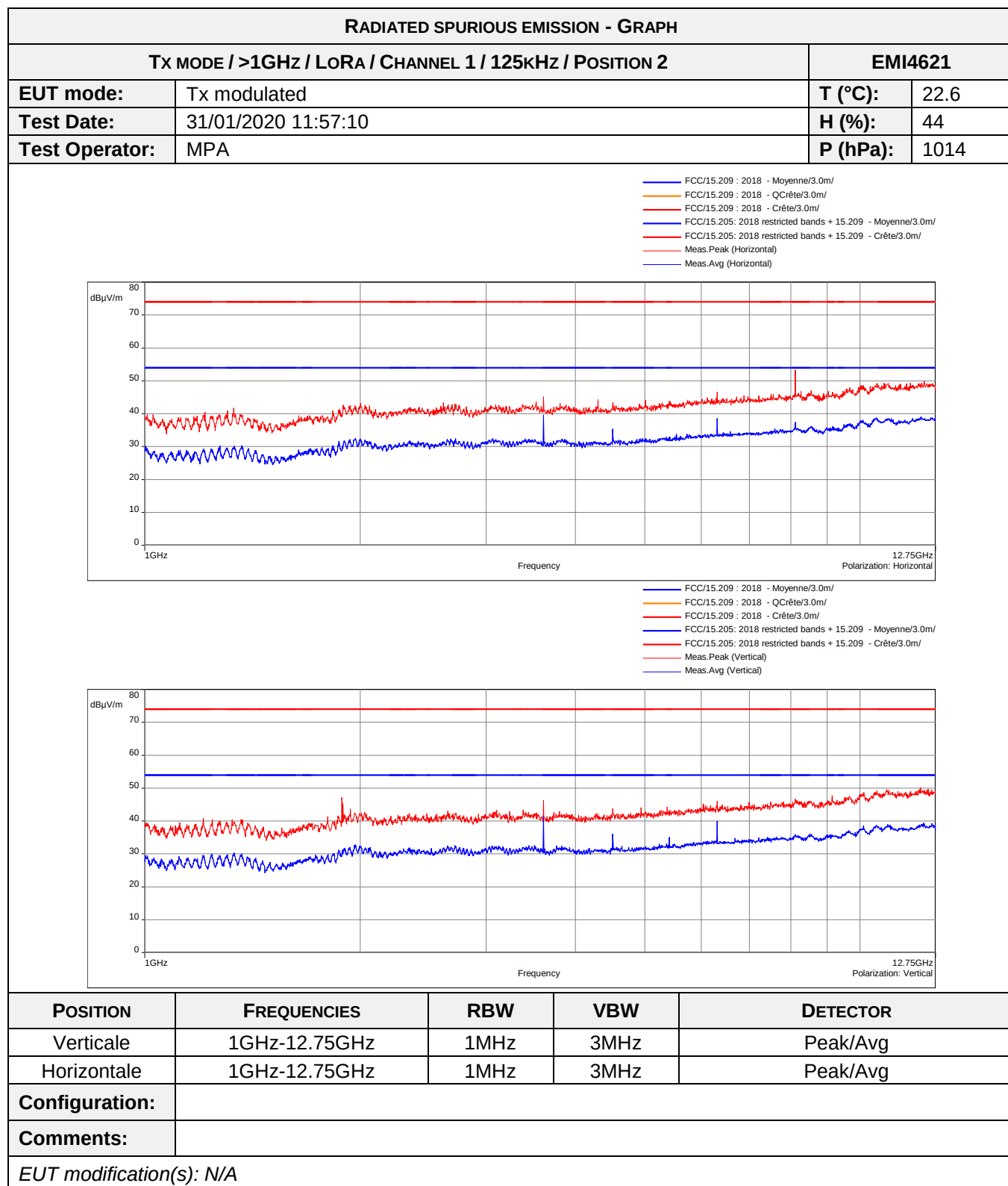


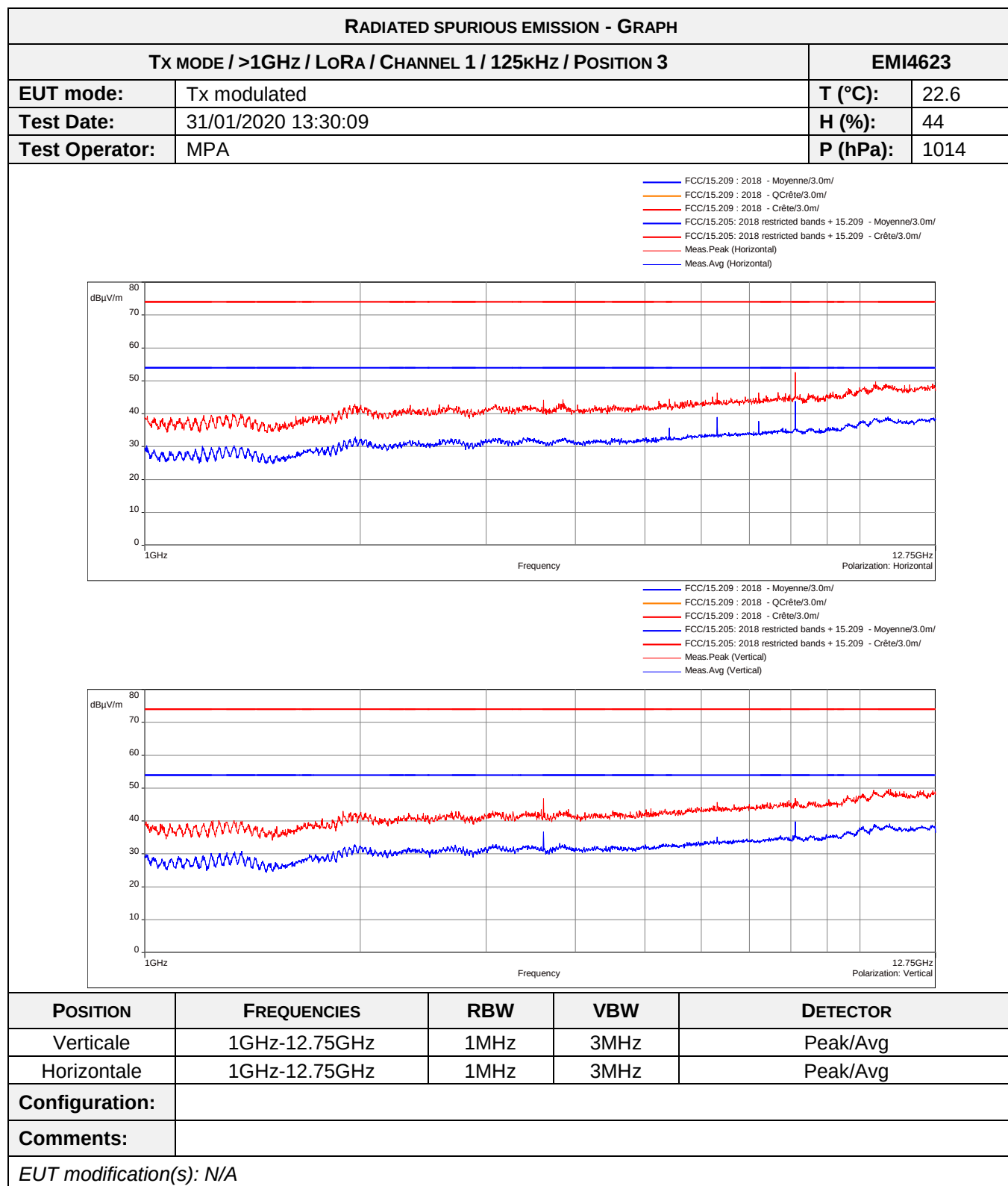


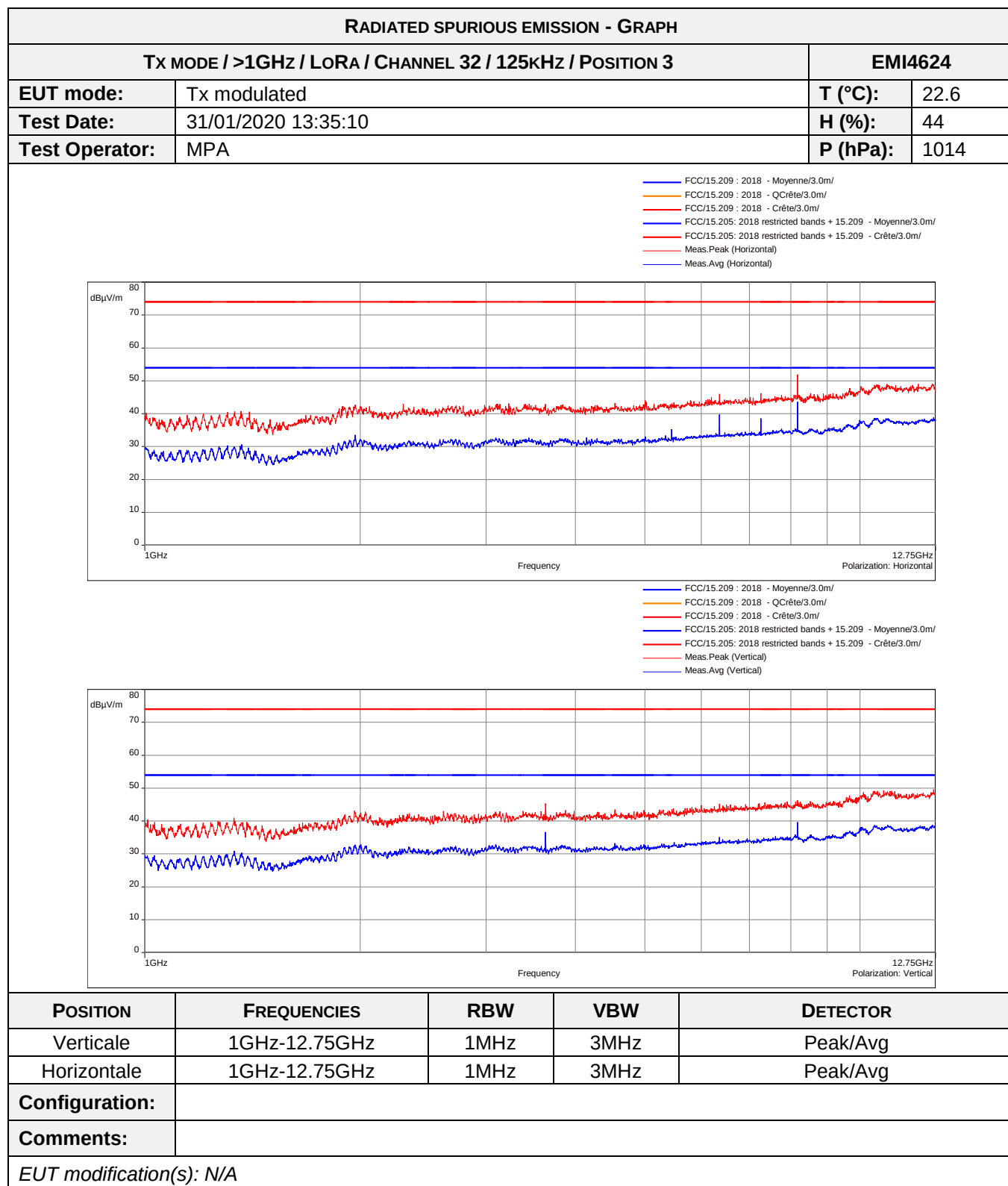


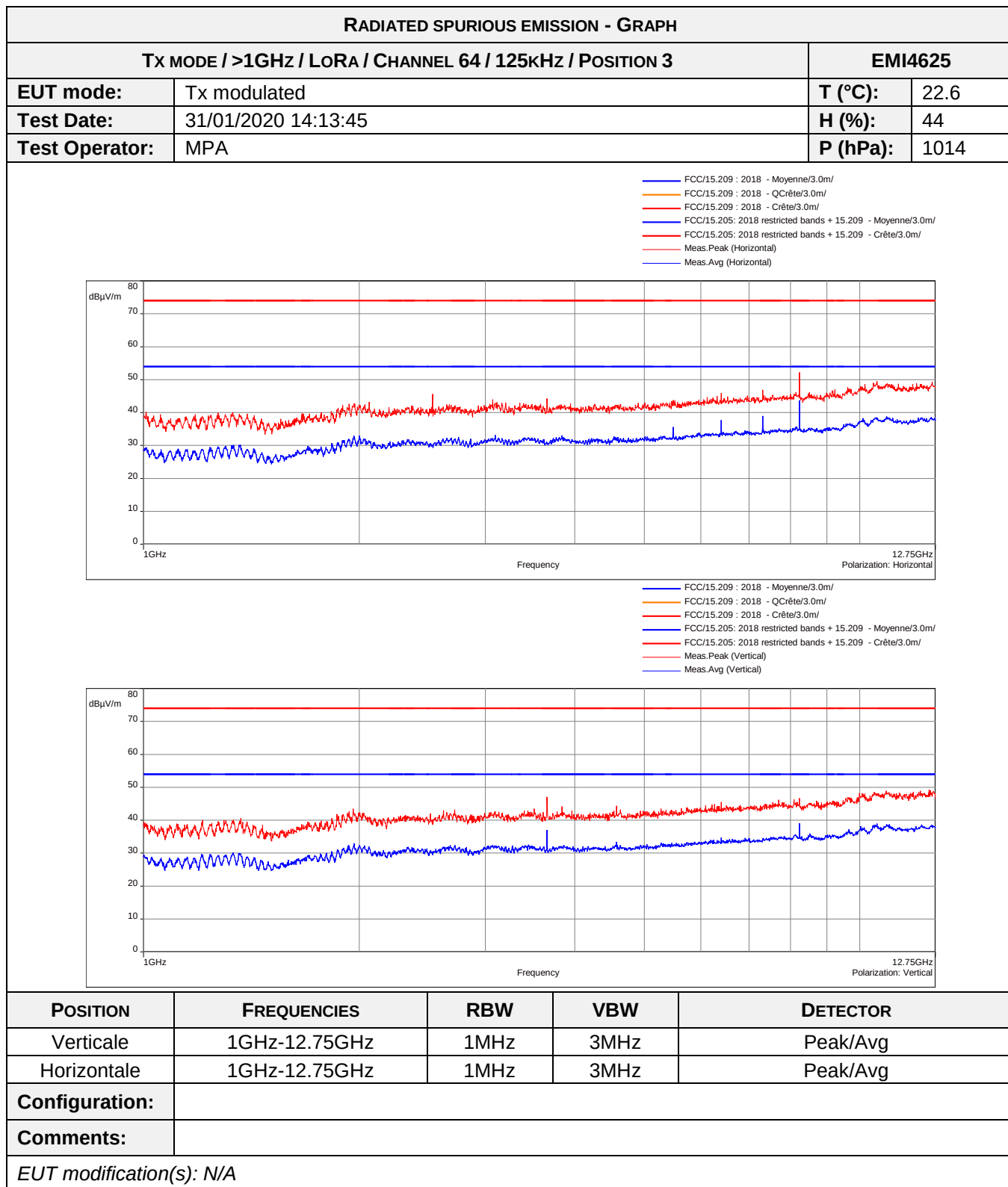


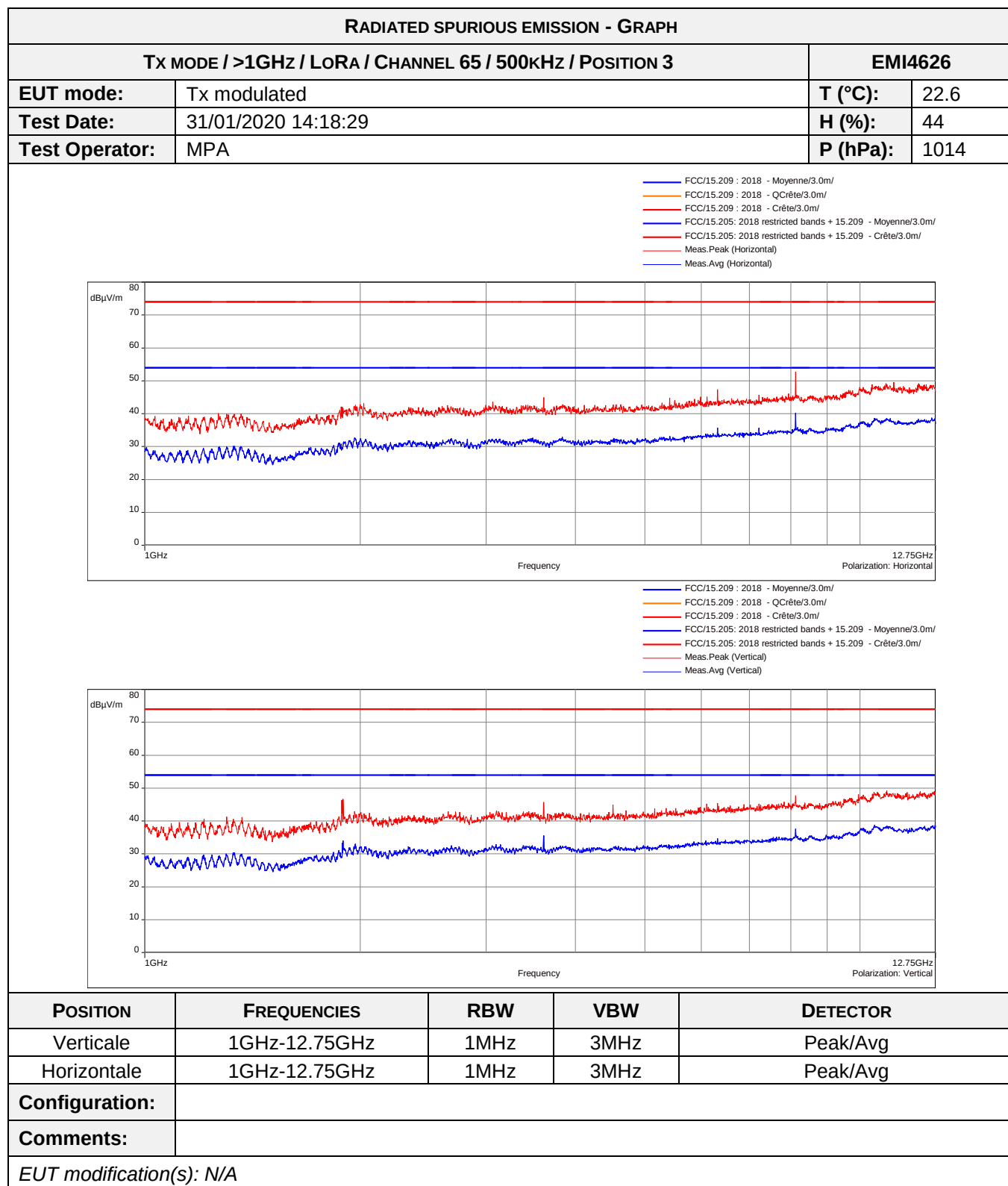


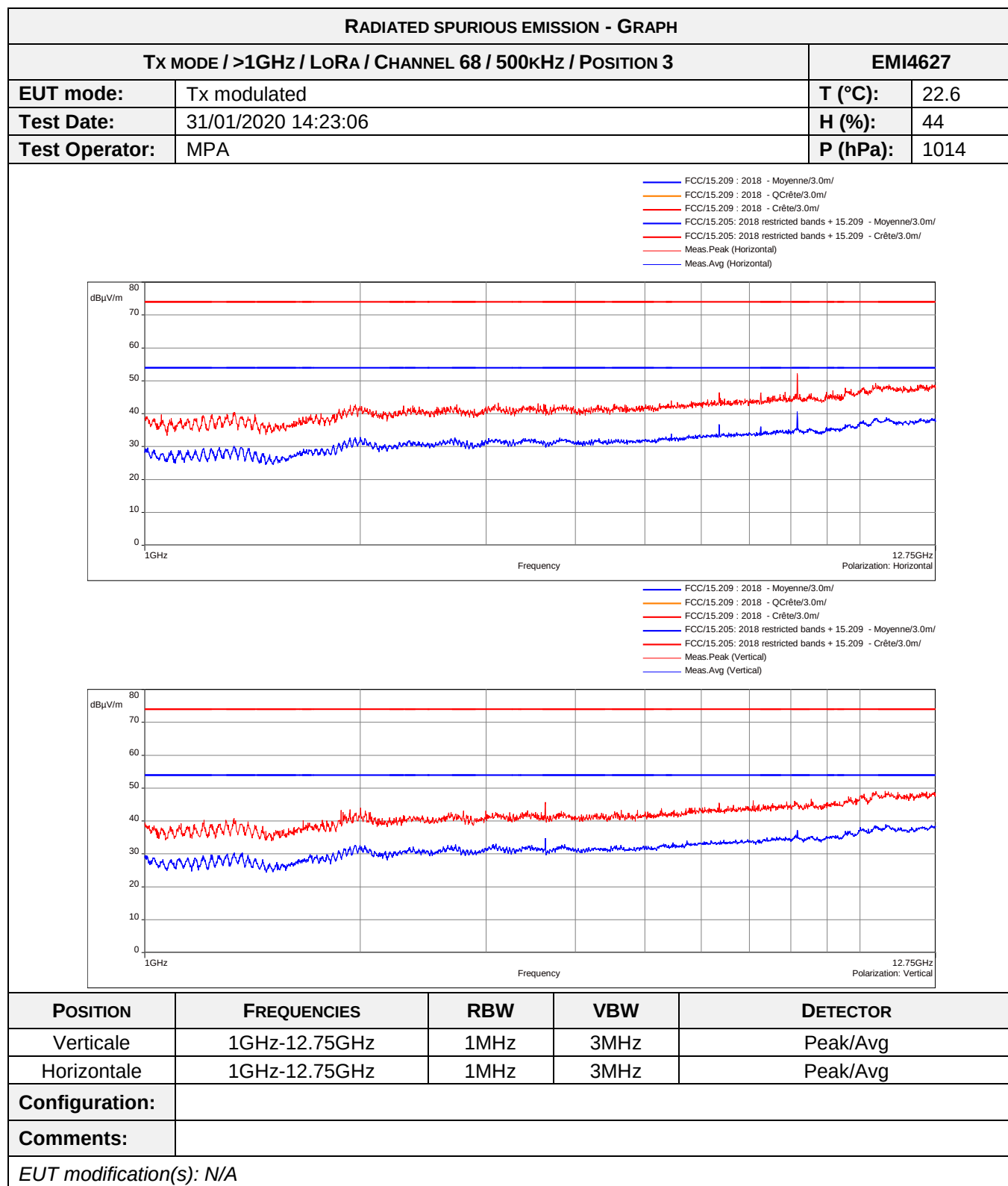


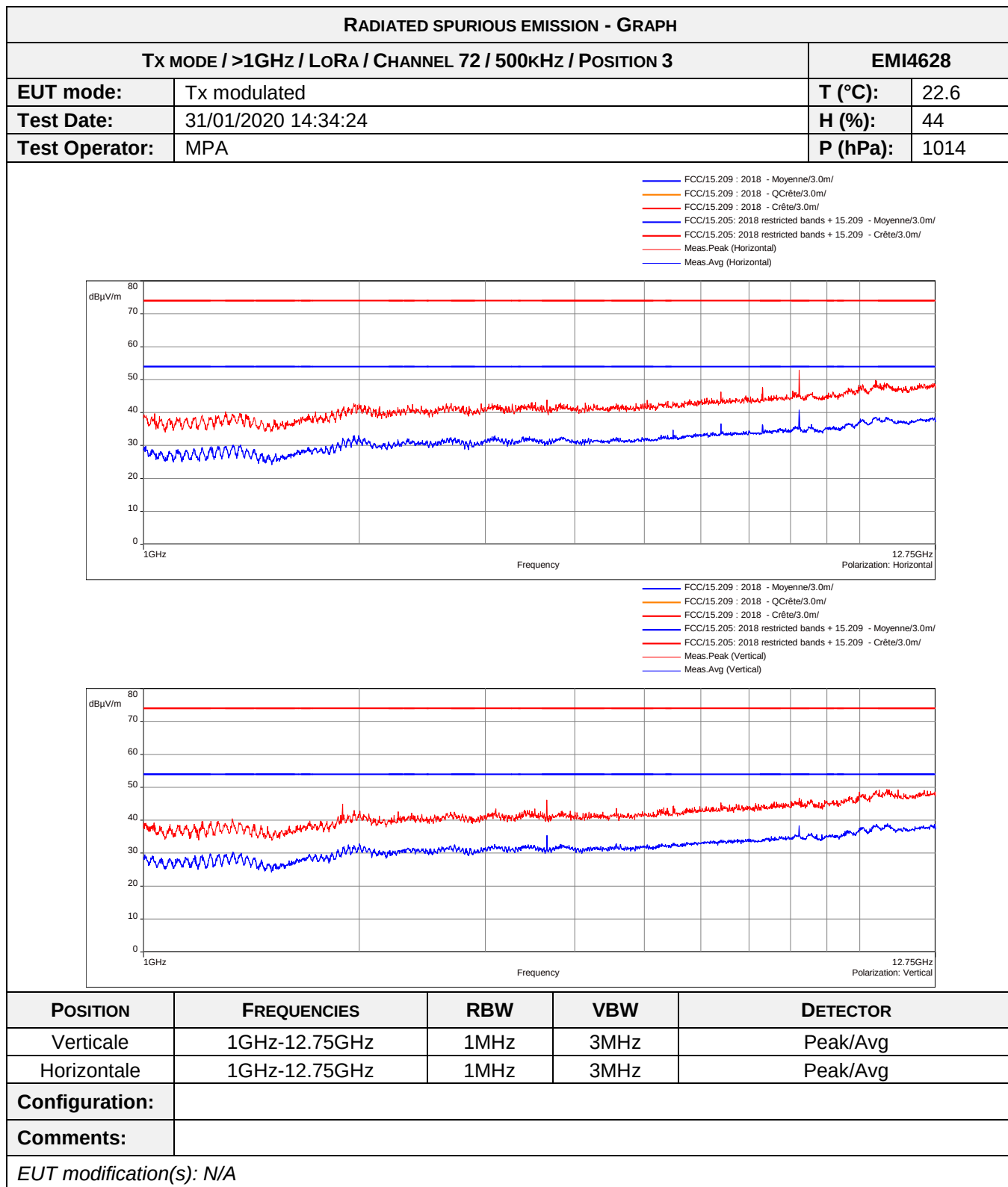












◆◆◆ End of test report ◆◆◆