



Test report issued under the responsibility of:
EMITECH ILE DE FRANCE Laboratory
MRA US-EU Designation Number: FR0004
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RADIO TESTS REPORT

FCC 47 CFR PART 15: 2022
RSS-210_Issue 10 : 2019
RSS-Gen_Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021

Company : **MASTERNAUT**
Address.....: *1 Avenue des Falaises*
27100 VAL DE REUIL
France

Test item description : **TPMS Wireless Repeater unit**
Trade Mark : MASTERNAUT
Manufacturer..... : MASTERNAUT
Model/Type reference..... : 720-31180 / 720-31181 / 720-31182
Ratings..... : 9 to 32 Vdc

Testing Laboratory : **EMITECH ILE DE FRANCE Laboratory**
Address.....: 30-32, AVENUE DES 3 PEUPLES
78180 MONTIGNY LE BRETONNEUX
FRANCE

Report Reference No..... : **RRA-EMIESS22M181MAS-01A v0**
Test procedure : FCC and CANADA marking
Diffusion..... : Mr SAUDE
Applicant's name : MASTERNAUT
Date of issue..... : November 02nd 2022
Total number of pages..... : 60
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Compiled by..... : C. ZIMMERMANN (Tests Technician)
Approved by (+ signature)

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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.

REPORT INDEX:

1. GENERAL INFORMATION	3
2. REFERENCE DOCUMENTS	4
3. EQUIPMENT TECHNICAL DESCRIPTION.....	5
3.1. TEST CONDITIONS	5
3.2. EUT OVERVIEW	6
3.3. EUT MARKING PLATE	7
3.4. EUT MECHANICAL AND ELECTRICAL DESIGN.....	8
3.5. EUT INPUT/OUTPUT PORTS.....	8
3.6. SUPPORTING EQUIPMENT USED DURING TEST	9
3.7. EUT RADIO SPECIFICATIONS.....	10
4. RESULT SUMMARY	11
5. MEASUREMENT UNCERTAINTY.....	13
6. TEST CONDITIONS AND RESULTS	14
6.1. ON TIME TRANSMISSION AND SILENT PERIOD	14
6.2. 20dB BANDWIDTH AND 99% OCCUPIED BANDWIDTH	20
6.3. TRANSMITTER OUTPUT POWER	26
6.4. INTENTIONAL RADIATED EMISSIONS AND TRANSMITTER UNWANTED EMISSION IN THE BAND 9 KHz – 6 GHz	29
6.5. UNINTENTIONAL RADIATED EMISSIONS IN THE BAND 30 MHz – 6 GHz.....	54

REVISION HISTORY:

Revision	Date	Modified pages	Modifications
v0	02/11/2022	Creation	

1. GENERAL INFORMATION

This document submits the results of Radio tests performed on the equipment (denominated hereafter E.U.T.: equipment under test) according to documents listed in §2 of this test report.

TESTING PROCEDURE AND TESTING LOCATION:			
Testing Laboratory	EMITECH ILE DE FRANCE Laboratory		
Address.	30-32, AVENUE DES 3 PEUPLES 78180 MONTIGNY LE BRETONNEUX FRANCE		
Test procedure.	FCC and CANADA marking		
Tested by	C. ZIMMERMANN		
Test supervisor	-		
Date of receipt of test item	October 06 th 2022		
Dates of performance of tests	October 06 and 07 th 2022		
APPLICANT'S GENERAL INFORMATION:			
Company name	MASTERNAUT		
Company address.	1 Avenue des Falaises 27100 VAL DE REUIL France		
Person present during the tests.	None		
Responsible.	Mr SAUDE		
GENERAL REMARKS:			
<i>The information in italics is declared by the manufacturer and is under his responsibility.</i> 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. "(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)		
Test object was not subjected to all tests...	I (Inconclusive)		
DEFINITIONS AND ABBREVIATIONS:			
E.U.T.	Equiptement under test	AE	Auxiliary /Associated equipment
RBW	Resolution bandwidth	VBW	Video bandwidth
OATS	Open area test site	FAR	Full anechoic room
RF	Radio frequency	NTR	Nothing to report

2. REFERENCE DOCUMENTS

NORMATIVE REFERENCES:

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

FCC 47 CFR Part 15 : 2022

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.

RSS-210_Issue 10 : 2019

Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021

General Requirements and Information for the Certification of Radio Apparatus

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.

ANSI C63.10 : 2013

American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

KDB 558074 D01 DTS Meas Guidance V05 r02

Guidance for performing compliance measurement on Digital Transmission Systems (DTS) operating under § 15.247.

3. EQUIPMENT TECHNICAL DESCRIPTION

3.1. Test Conditions

Test item description. : *TPMS Wireless Repeater unit*

Model/Type reference..... : 720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)
720-31181 (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)
720-31182 (TPMS Wireless Receiver unit 434MHz – F02) (Orange)

Trade Mark. : *Wireless Receiver/Repeater*

Serial number (S/N)..... : 72031110 (TPMS Wireless Receiver unit 434MHz – F01)
72031111 (TPMS Wireless Receiver unit 434MHz – F01)
72031112 (TPMS Wireless Receiver unit 434MHz – F01)

Part number (P/N). : -

Software version..... : v1.469

Firmware version. : v1.469

Fcc ID : 2A8SB31110

N°IC : 29178-31110

Type of sample..... : *Serial production*

Function..... : *Wireless Repeater : repeats the frames send by TPMS sensors installed in vehicle*

Manufacturer name. : *MASTERNAUT*

Address. : 1 Avenue des Falaises
27100 Val de Reuil
France

General product information: No

3.2. EUT Overview



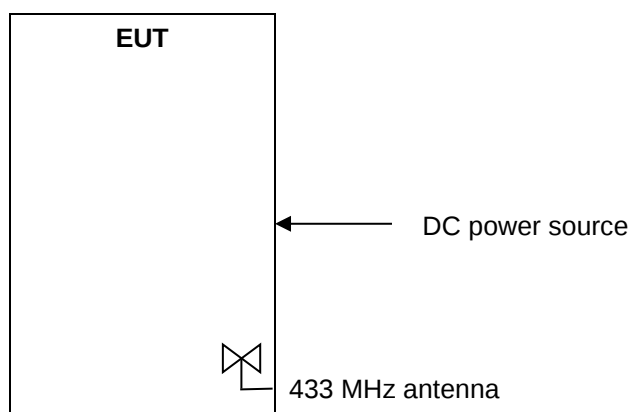
3.3.EUT Marking Plate

3.4. EUT Mechanical and Electrical Design

Power supply : 13.5 Vdc
 Power supply range..... : 9 Vdc to 32 Vdc
 Power type..... : DC
 Power (W)..... : 3
 Nominal current (mA). : 90
 Dimensions (H x W x L) (cm). : 20 * 20 * 3 (full system)
 Weight (g). : 720
 Temperature range (°C). : -40 to +70
 Ground bounding strap..... : No

Comments: -

3.5. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	internal
1	433MHz antenna	RF	N/A	N/A	
2	DC power source	DC	>3m	Unshielded	

AC/DC: AC/DC Converter port

I/O: Input or Output port

N/E: Non Electrical port

AC: Alternative current port

TP: Telecommunication port

DC: Discontinuous current port

RF: Radio frequency port

3.6. Supporting Equipment Used During Test

Sample subject to the tests was tested with following equipment.

PRODUCT TYPE	MANUFACTURER	MODEL	N°EMITECH / COMMENTS
Power supply	Voltcraft	LPS1305	14585

(AE)

-

3.7. EUT Radio Specifications

a) GENERAL INFORMATION	
According to manufacturer's declarations :	
EUT type.....	Transceiver
Technology	433 MHz
Environmental profile.....	Automotive
Temperature range.....	-40°C to + 70°C
Antenna type	Internal
Antenna Gain.....	433.92 MHz : -2.9 dBi
Comments: No	
b) TRANSMITTER PARAMITERS (Tx)	
Frequency bands.....	433.92 MHz
RF Power.....	< 9 dBm
Number of channels / Separation.....	Single / 150kHz (TPMS Wireless Receiver unit 434MHz – F01) (LDL) 150kHz (TPMS Wireless Receiver unit 434MHz – F01) (Orange) 180kHz (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)
Modulation type	ASK (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz) 2 FSK (TPMS Wireless Receiver unit 434MHz – F01) (LDL) 2 FSK (TPMS Wireless Receiver unit 434MHz – F01) (Orange)
Duty cycle	< 1%
Tested frequency.....	433.92 MHz

4. RESULT SUMMARY

Subpart B of the standard FCC part 15 – Unintentional radiators

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
Measurement of conducted emission on AC mains ports	15.107	N/A	Not connected to AC public power supply
Radiated emission limits	15.109	PASS	

Subpart C of the standard FCC part 15 – Intentional radiators

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
Restriction bands of operation	15.205	PASS	Not connected to AC public power supply
Measurement of conducted emission on AC mains ports	15.207	N/A	
Radiated emission limits; general requirements	15.209	PASS	
Periodic operation in band 40.66-40.70 and above 70MHz			
- Manually transmission timeout	15.231 (a)(1)	N/A	
- Automaticaly transmission timeout	15.231 (a)(2)	PASS	
- Field strength of fundamental	15.231 (b) (1)	N/A	
- Field strength of spurious emissions	15.231 (b) (2)	N/A	
- Transmitter timeout	15.231(a)(2)	PASS	
- 20dB bandwidth and 99% Occupied bandwidth	15.231(c)	PASS	
- Field strength of fundamental (periodic transmission)	15.231(e)	PASS	
- Field strength of spurious emissions (periodic transmission)	15.231(e)	PASS	

Standard RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
6 Technical Requirements			
- 6.7 Occupied Bandwidth	-	PASS	
- 6.12 Transmitter Output Power	-	PASS	
- 6.13 Transmitter unwanted emissions	-	PASS	
8.Licence-Exempt radio Apparatus			
- 8.8 AC Power Line Conducted Emission Limits for licence-Exempt Radio Apparatus	-	N/A	Not connected to AC public power supply

Standard RSS-210 Issue 9 : 2016

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
3. Certification Requirements			
- 3.1 RSS-gen compliance	-	N/A	
7. Technical specification			
7.1 Emissions falling within restricted frequency bands	-	PASS	
7.2 General field strength limits	-	PASS	
7.3 Transmitters with wanted and unwanted emissions that are within the general field strength limits	-	PASS	
7.4 Cordless telephones	-	N/A	
Annex A			
A.1.1 (b) Momentarily operated devices	-	PASS	
A.1.2 (a) FIELD STRENGTH OF FUNDAMENTAL	-	N/A	
A.1.2 (b) FIELD STRENGTH OF SPURIOUS EMISSIONS	-	N/A	
A.1.3 Bandwith of momentary signals	-	PASS	
A.1.4 (b) Reduce field strengths – Transmission times	-	PASS	
A.1.4 (b) Reduce field strengths – On time transmission and silent period	-	PASS	
A.1.4 (c) Reduce field strengths – Field strength	-	PASS	
A.1.4 (d) FIELD STRENGTH OF SPURIOUS EMISSIONS – Field strength	-	PASS	

To declare, or not, the compliance with the specifications, it was not explicitly taken account of uncertainty associated with the results.

Modifications : No

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	$\pm 0.8\text{dB}$	$\pm 1 \text{ dB}$
RF power (EN 300328 / EN 301893)	$\pm 1.3\text{dB}$	$\pm 1.5 \text{ dB}$
Power spectral density	$\pm 2.3\text{dB}$	$\pm 3 \text{ dB}$
Occupied bandwidth		
RF power	$\pm 3.8 \%$	$\pm 5 \%$
RF power (EN 300328 / EN 301893)	$\pm 3.8 \%$	$\pm 5 \%$
Maximum frequency deviation		
300 Hz < audio frequency < 6 kHz	$\pm 1.2 \%$	$\pm 5 \%$
6 kHz < audio frequency < 25 kHz	$\pm 1.2 \%$	$\pm 3 \text{ dB}$
Adjacent channel power	$\pm 1.6 \text{ dB}$	$\pm 3 \text{ dB}$
Sensibility of receiver (conducted)	$\pm 2.0 \text{ dB}$	$\pm 3 \text{ dB}$
Blocking	$\pm 4.0 \text{ dB}$	$\pm 4 \text{ dB}$
Transient		
Amplitude	$\pm 8.5 \%$	$\pm 20 \%$
At the frequency	$\pm 166 \text{ Hz}$	$\pm 250 \text{ Hz}$
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)		
$f \leq 62.5 \text{ MHz}$	$\pm 5.7 \text{ dB}$	$\pm 6 \text{ dB}$
62.5 MHz - 1 GHz	$\pm 5.8 \text{ dB}$	$\pm 6 \text{ dB}$
1 GHz - 18 GHz	$\pm 5.6 \text{ dB}$	$\pm 6 \text{ dB}$
18 GHz – 40 GHz	$\pm 5.6 \text{ dB}$	$\pm 6 \text{ dB}$
40 GHz – 110 GHz	$\pm 5.9 \text{ dB}$	Between ± 6 to 10 dB
180-1000 MHz / 1 – 12.75 GHz (EN 301 908-1)	$\pm 3.0 / 2.9 \text{ dB}$	$\pm 3 \text{ dB}$
RF power (EN 300328 / EN 301893)	$\pm 5.3 \text{ dB}$	$\pm 6 \text{ dB}$
PIRE and power spectral density with diode	$\pm 5.7 \text{ dB}$	$\pm 6 \text{ dB}$
Radiated emission (magnetic field)		
9kHz – 30MHz	$\pm 3.4 \text{ dB}$	$\pm 6 \text{ dB}$
RF level for a given BER	$\pm 0.8 \text{ dB}$	$\pm 1.5 \text{ dB}$
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	$\pm 4.4 \%$	$\pm 5 \%$
Adaptivity	$\pm 2.9 \text{ dB}$	/
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 calcul of expanded uncertainty, the confidence interval is 95 % (k=2).

6. TEST CONDITIONS AND RESULTS

6.1. On time transmission and silent period

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10: 2019
Test method:	FCC part 15 § 15.231 (e) RSS-210 Annex A.1.4 (b)
General test setup: E.U.T. is set on an insulating support at 150 cm above the ground reference plane. Measurement are done on a normalized test site.	

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	25°C
Relative Humidity	10 to 90 %	40 %
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

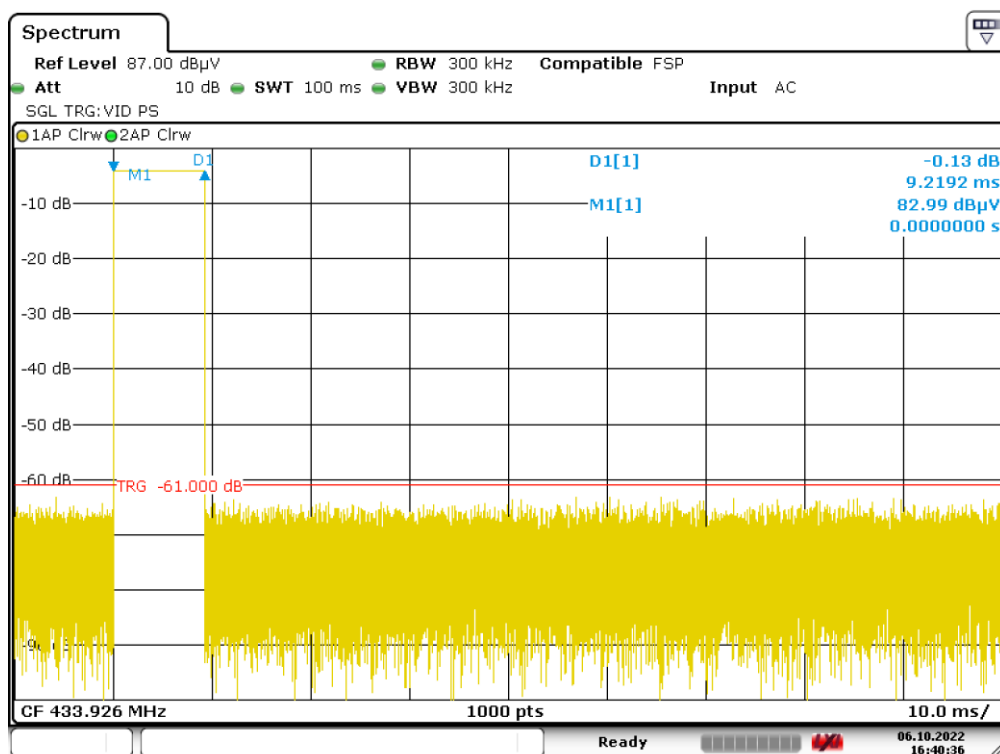
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HL223	00294	21/04/2020	21/06/2023
Cable	C&C	N-5m	11184	25/02/2022	25/04/2024
Cable	C&C	N-4m	14226	25/02/2022	25/04/2024
Cable	Micro-Coax	N-8m	08061	25/02/2022	25/04/2024
Receiver	Rohde & Schwarz	ESRP7	10517	16/08/2022	16/10/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025

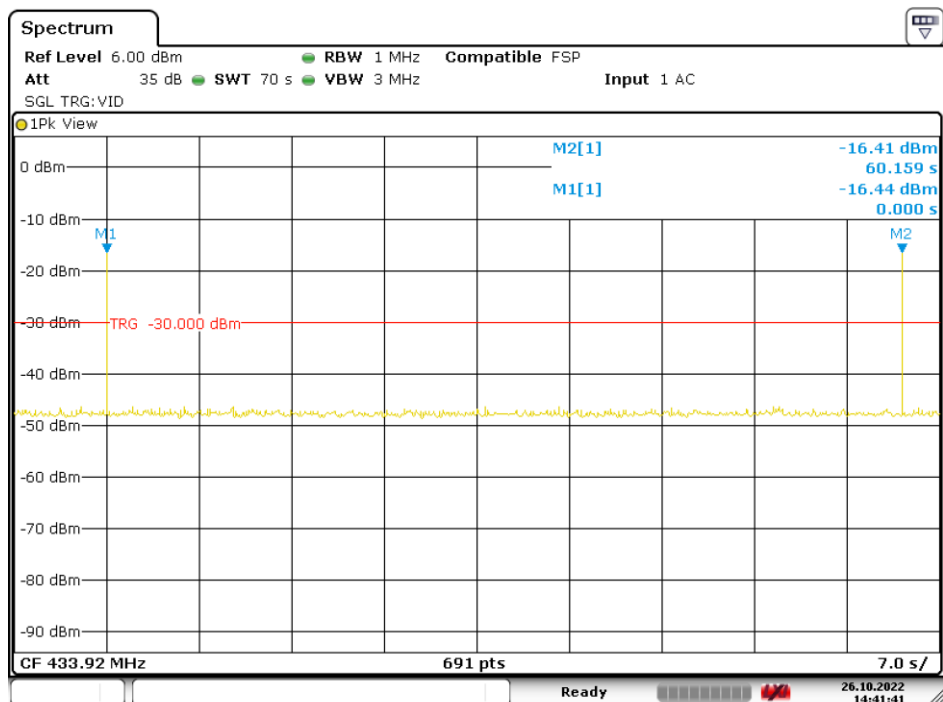
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On time and duty cycle

E.U.T.	Transmission time (On time) (ms)	Limit of transmission time (s)	Silent period (Off time) (ms)	Limit of Silent period (s)
720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)	9.22	≤60	60.159	(1)

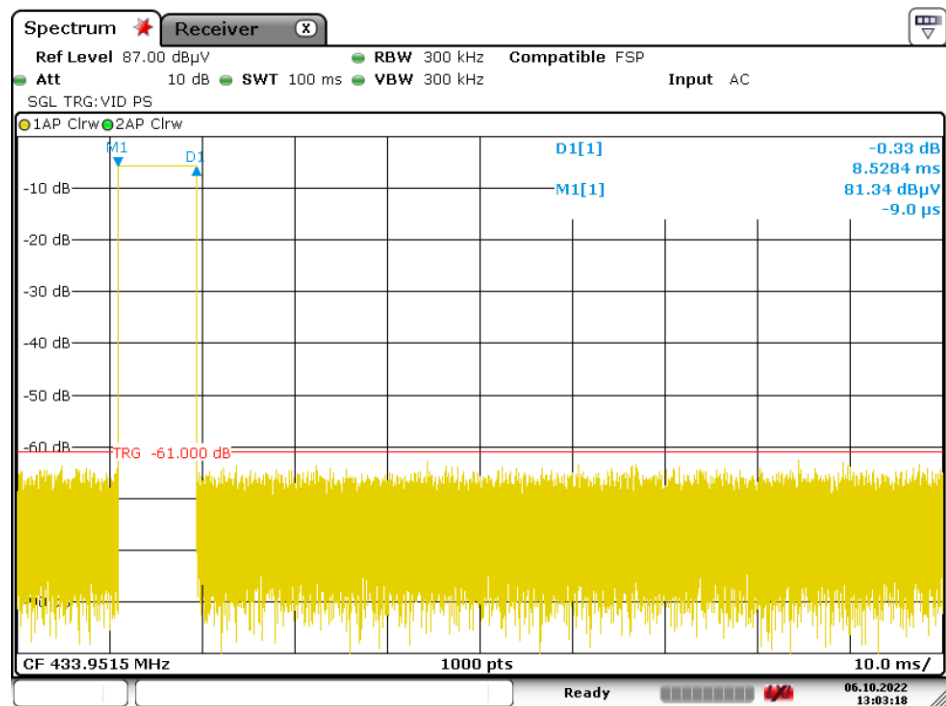
(1): ≥30 time of transmission duration but not less 10s



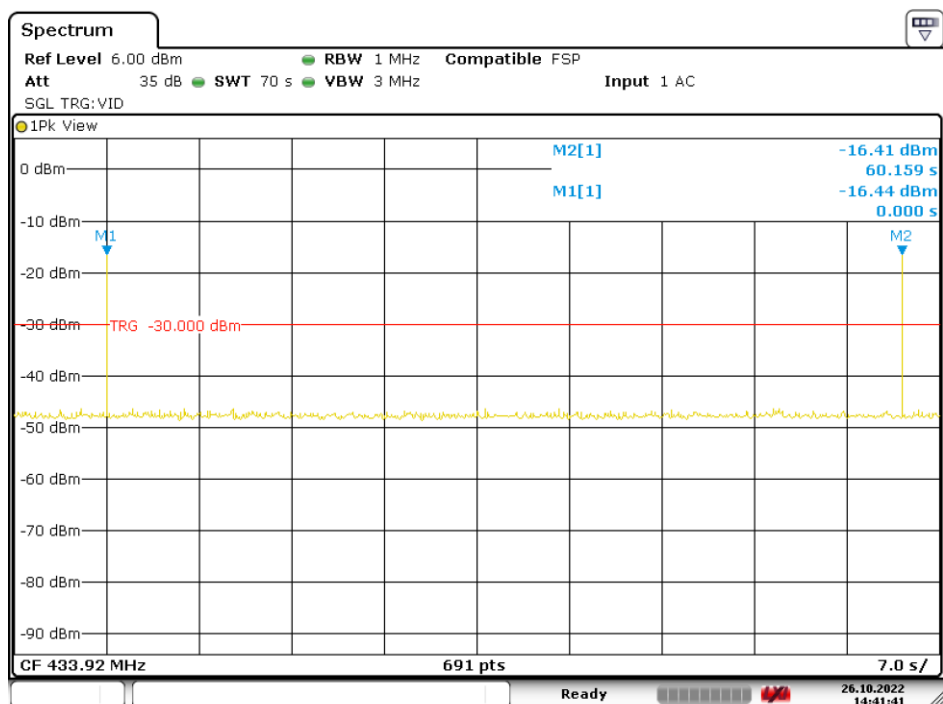


E.U.T.	Transmission time (On time) (ms)	Limit of transmission time (s)	Silent period (Off time) (ms)	Limit of Silent period (s)
720-31181 (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)	8.528	≤60	60.159	(1)

(1): ≥30 time of transmission duration but not less 10s

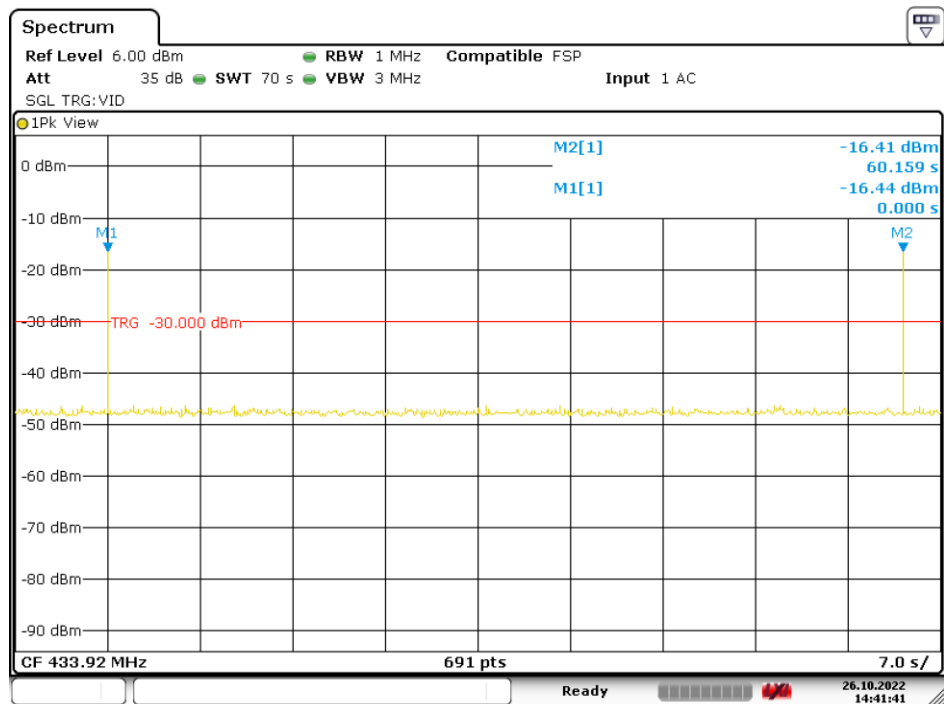
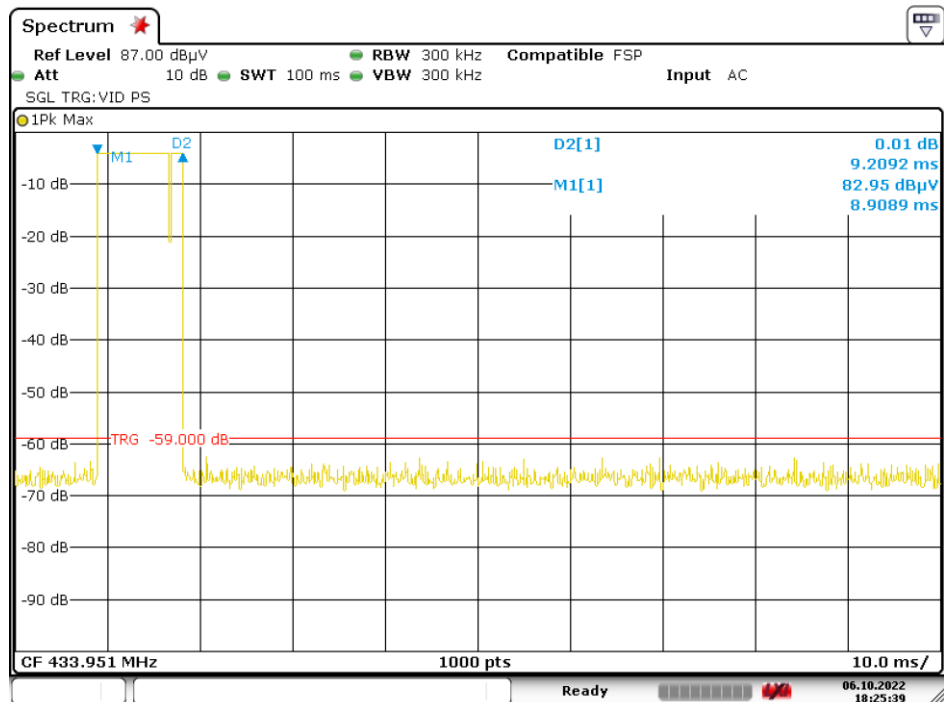


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E.U.T.	Transmission time (On time) (ms)	Limit of transmission time (s)	Silent period (Off time) (ms)	Limit of Silent period (s)
720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)	9.209	≤60	60.159	(1)

(1): ≥30 time of transmission duration but not less 10s

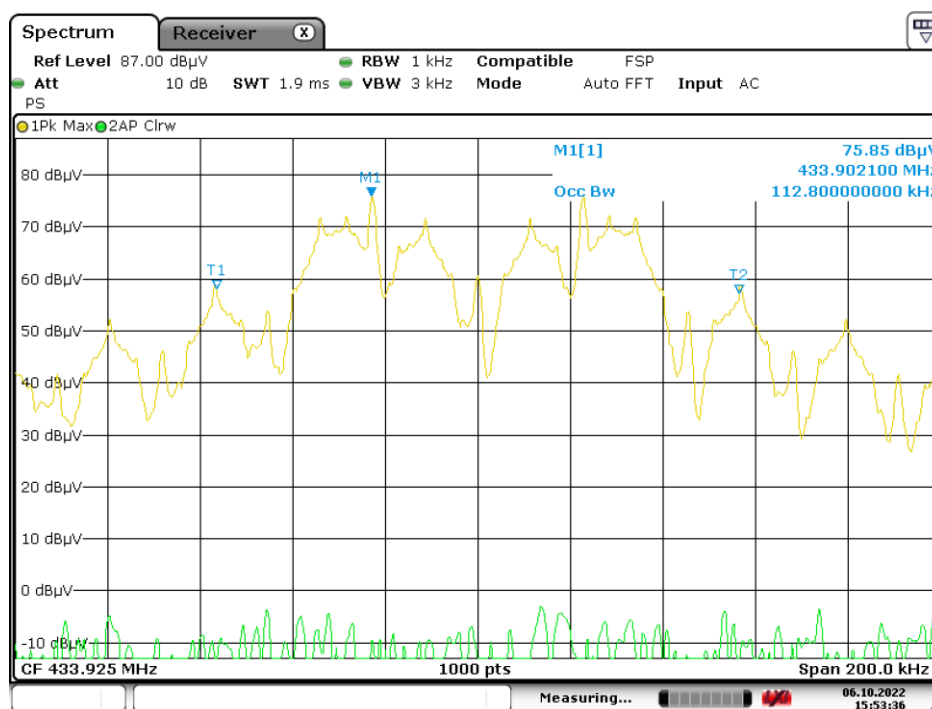


6.2. 20dB bandwidth and 99% Occupied bandwidth

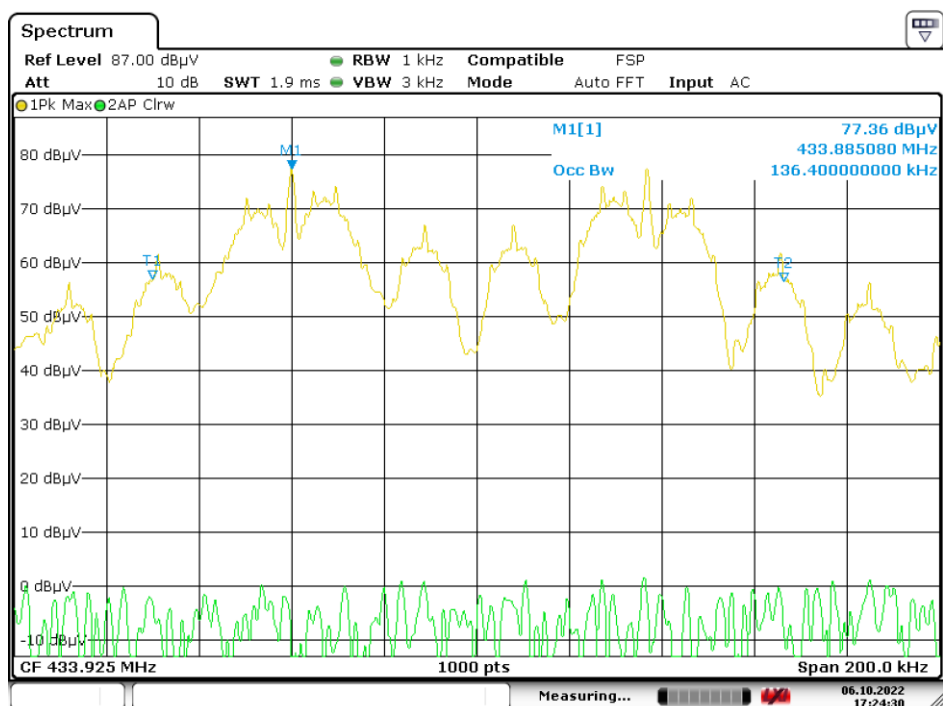
Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10: 2019 RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
Test method:	§ 15.231 (c) of FCC 47 CFR PART 15 : 2022 A.1.3 of RSS-210 Issue 9 : 2016 § 6.7 of RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
General test setup: E.U.T. is set on an insulating support at 150 cm above the ground reference plane. 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 a research of maximum level is done on the 3 axes. Only the highest levels are recorded.	

99% Bandwidth

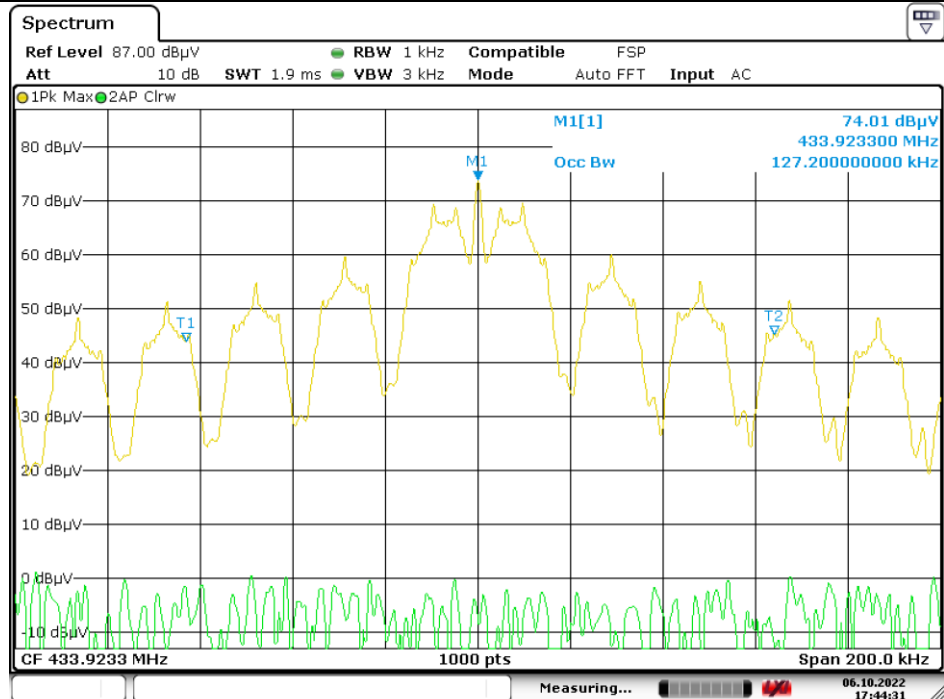
E.U.T.	Antenna type	Frequency	Results (kHz)	Limit (MHz)
720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)	internal	433.92	112.8	1.08



E.U.T. position	Antenna type	Frequency	Results (kHz)	limit (MHz)
720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)	internal	433.92	136.4	1.08



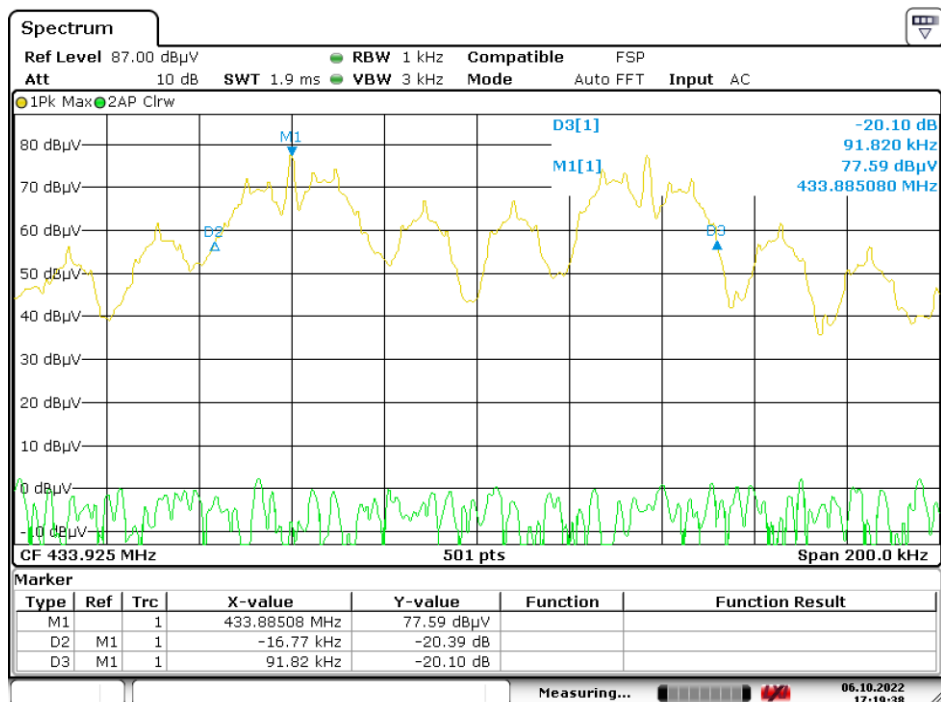
E.U.T. position	Antenna type	Frequency	Results (KHz)	Limit (MHz)
720-31181 (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)	internal	433.92	127.2	1.08



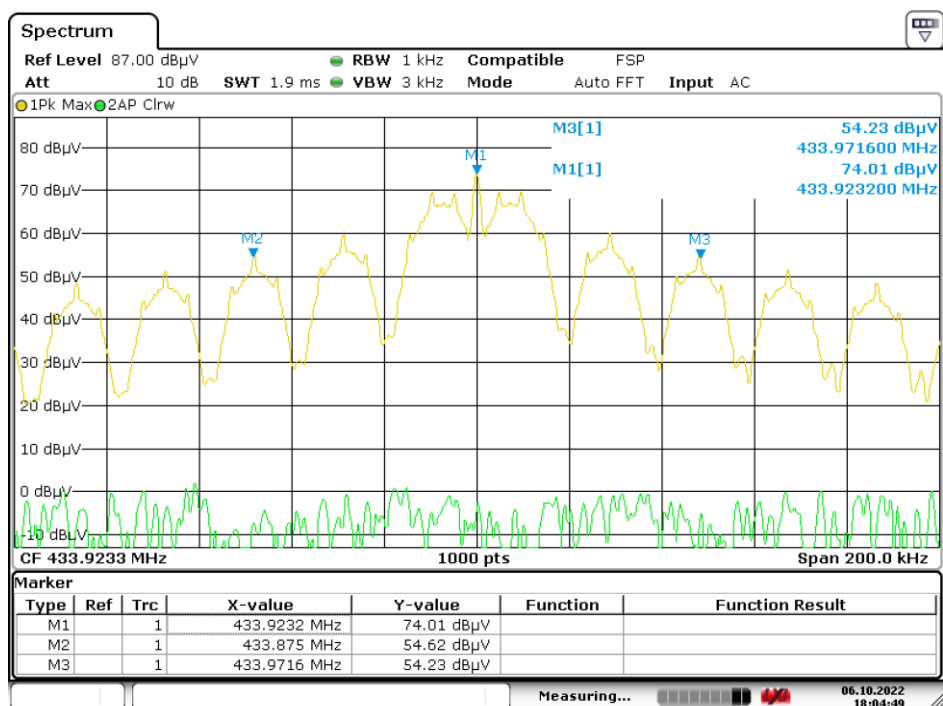
E.U.T.	Antenna type	Frequency	Results (kHz)	Limit (MHz)
720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)	internal	433.92	80.6	1.08



E.U.T. position	Antenna type	Frequency	Results (kHz)	limit (MHz)
720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)	internal	433.92	108.6	1.08



E.U.T. position	Antenna type	Frequency	Results (kHz)	limit (MHz)
720-31181 (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)	internal	433.92	96.6	1.08



6.3. Transmitter output power

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 9 : 2016
Test method:	§ 15.231(e) of FCC 47 CFR PART 15 : 2022 § A.1.4 © of RSS-210 Issue 9 : 2016
General test setup: E.U.T. is set on an insulating support at 150 cm above the ground reference plane. Measurement are done on a normalized test site. 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 a research of maximum level is done on the 3 axes. Only the highest levels are recorded.	

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	25°C
Relative Humidity	10 to 90 %	40 %
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	ETS lindgren	3142E	14287	18/03/2021	18/05/2024
Antenna	Emco	3121C-DB4	14695	27/08/2020	27/10/2023
Cable	C&C	N-5m	11184	25/02/2022	25/04/2024
Cable	C&C	N-4m	14226	25/02/2022	25/04/2024
Cable	Huber + Suhner	N-2m	11417	25/02/2022	25/04/2024
Cable	Micro-Coax	N-8m	08061	25/02/2022	25/04/2024
Cable	Huber + Suhner	N-10m	17268	03/12/2020	03/02/2023
Milliwattmeter	Rohde & Schwarz	NRVD	14419	07/04/2021	07/06/2023
Power probe	Rohde & Schwarz	NRV-Z1	14420	01/03/2021	01/05/2023
Receiver	Rohde & Schwarz	ESRP7	10517	16/08/2022	16/10/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Synthesizer	Rohde & Schwarz	SMB100A	12817	22/01/2021	22/03/2024

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FCC results

E.U.T.	Frequency	Electro-magnetic field(*) (dBμV/m)	Duty cycle factor (dB) (1)	Final Result (dBμV/m)	Limit (dBμV/m)
720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)	433.92 MHz	100.8	31.9	68.9	80.8
720-31181 (TPMS Wireless Receiver unit 434MHz – A01) (Gobiz)		103.7	31.9	71.8	80.8
720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)		105.1	32.6	72.5	80.8

(1) Duty cycle factor = $20\log(T_{on}/T_{off})$

(2) Linear interpolation with, f, MHz: For 260-470MHz: Field strength ($\mu V/m$) = $(41.67 \cdot f) - 7083$

E.U.T. position:



6.4. Intentional radiated emissions and transmitter unwanted emission in the band 9 kHz – 6 GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-Gen Issue 9 : 2016 RSS-210 Issue 9: 2016
Test method:	§ 15.205; § 15.209 and § 15.231 (e) of FCC 47 CFR PART 15 : 2022 § 6.13 of RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021 A.1.4(d) of RSS-210 Issue 9: 2016
General test setup: E.U.T. is set on an insulating support at 0.8 m (<1GHz) and 1.5 m (>1GHz) above the ground reference plane. For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane for 9 kHz - 25 GHz. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Horizontal polarization	1GHz-6GHz	PASS
Maxhold 360° - Vertical polarization	1GHz-6GHz	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	25°C
Relative Humidity	10 to 90 %	40%
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information:		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Amplifier	Hewlett Packard	8447F H64	16970	28/03/2022	28/05/2023
Antenna	Rohde & Schwarz	HL223	00294	21/04/2020	21/06/2023
Antenna	Rohde & Schwarz	HK116	00293	30/09/2021	30/11/2024
Antenna	Emco	3115	00941	01/03/2022	01/05/2025
Antenna	Emco	6502	09579	16/08/2021	16/10/2023
Cable	C&C	N-5m	11184	25/02/2022	25/04/2024
Cable	C&C	N-4m	14226	25/02/2022	25/04/2024
Cable	Huber + Suhner	N-2m	11417	25/02/2022	25/04/2024
Cable	Micro-Coax	N-8m	08061	25/02/2022	25/04/2024
Filter	Trilithic	5EHLX500-3-KK	01529	20/10/2022	20/12/2025
Receiver	Rohde & Schwarz	ESRP7	10517	16/08/2022	16/10/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Software	Nexio	BAT EMC	00000		

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

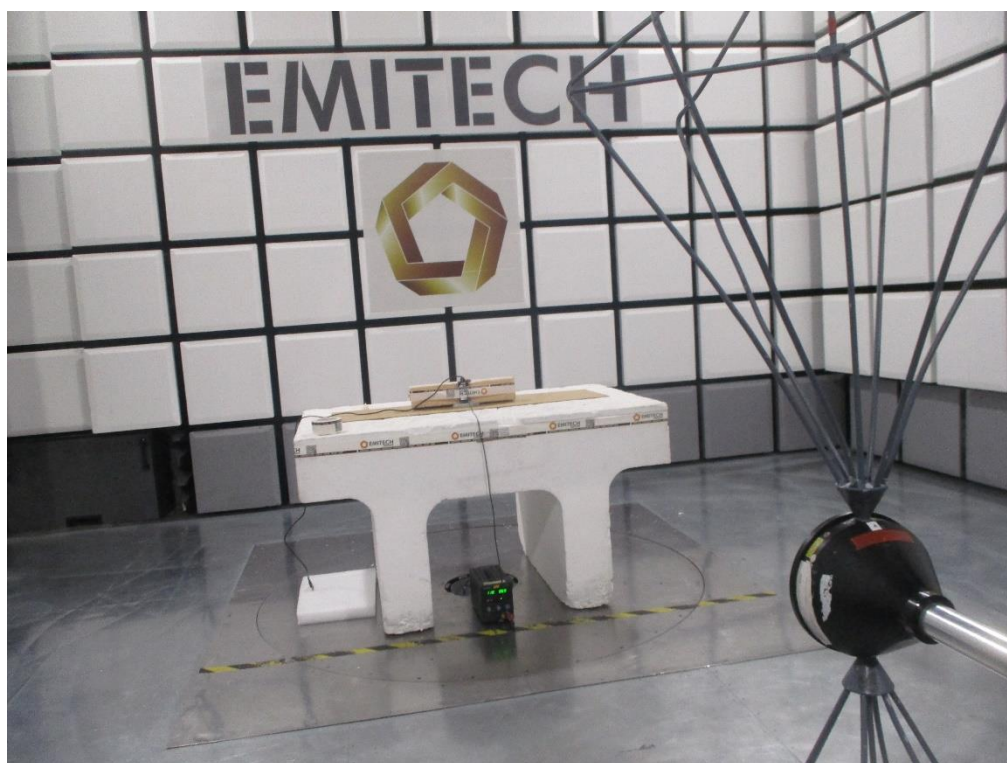
TEST SETUP PHOTOS - 9kHz – 30MHz



TEST SETUP PHOTOS - 9kHz – 30MHz

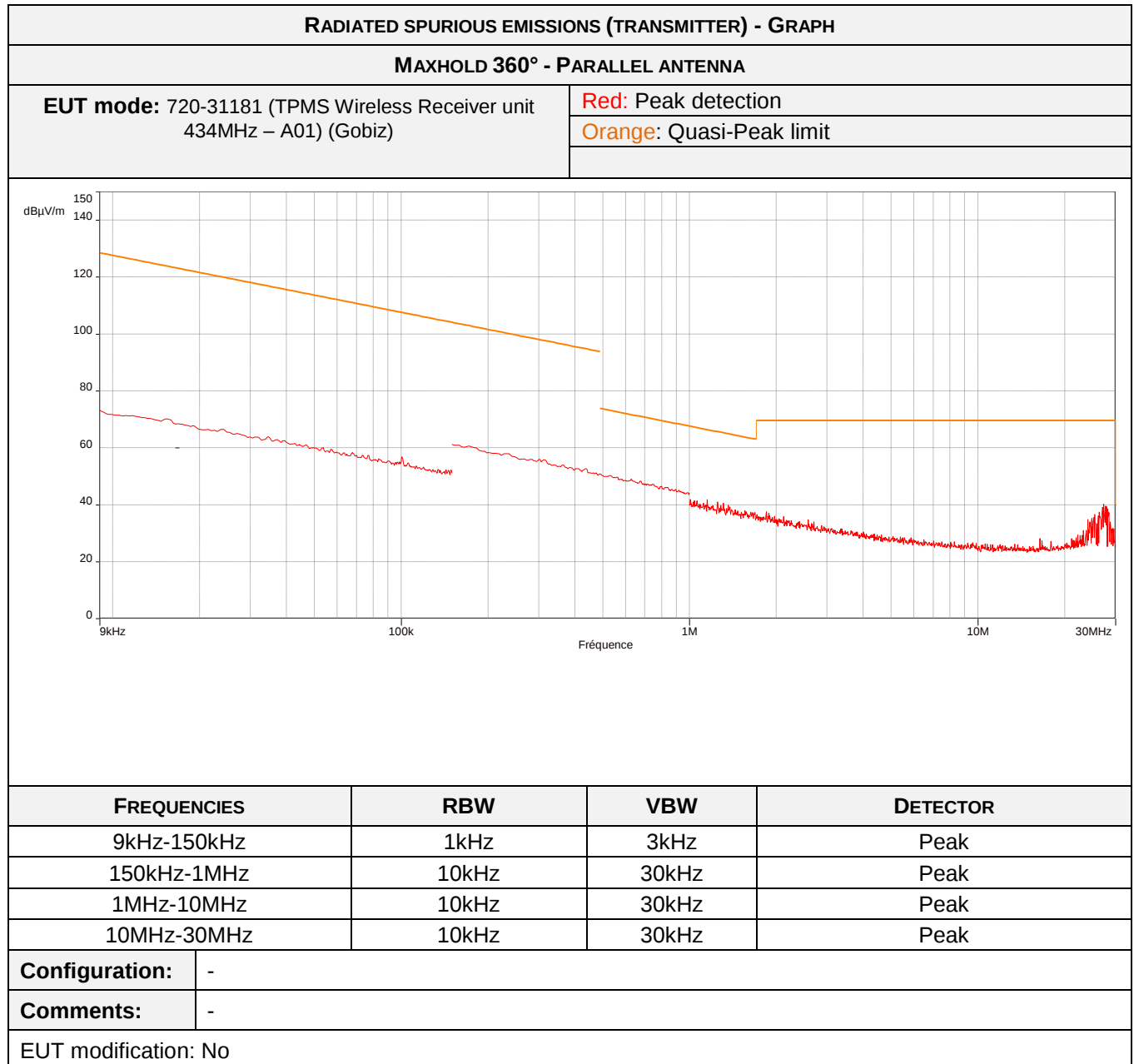


TEST SETUP PHOTOS - 30MHz – 1GHz



TEST SETUP PHOTO - 1GHz – 6GHz

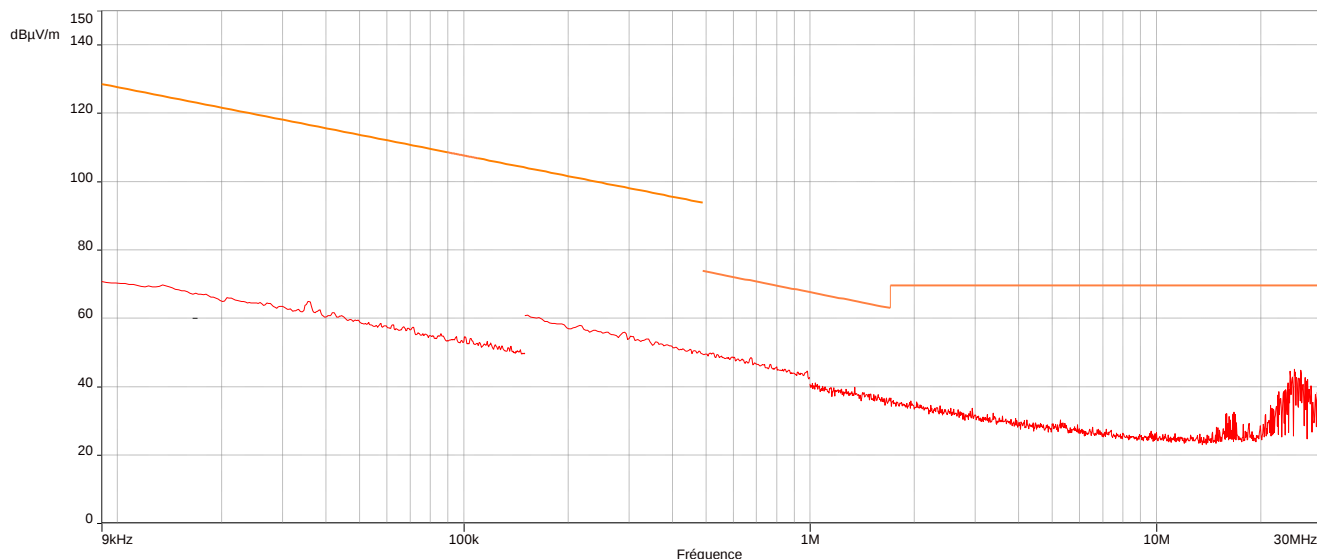




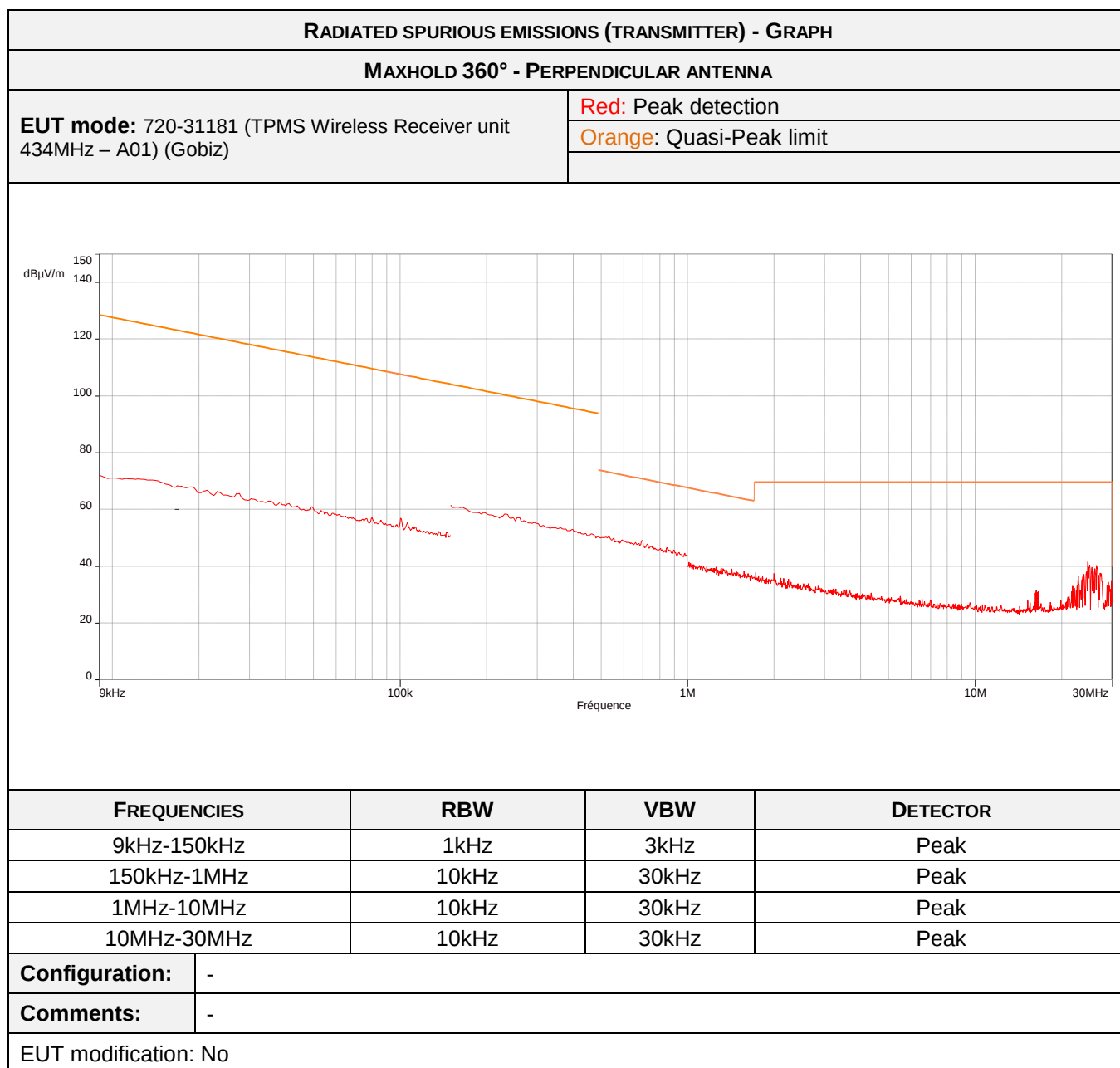
RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360° - 45° ANTENNA
EUT mode: 720-31181 (TPMS Wireless Receiver unit
434MHz – A01) (Gobiz)

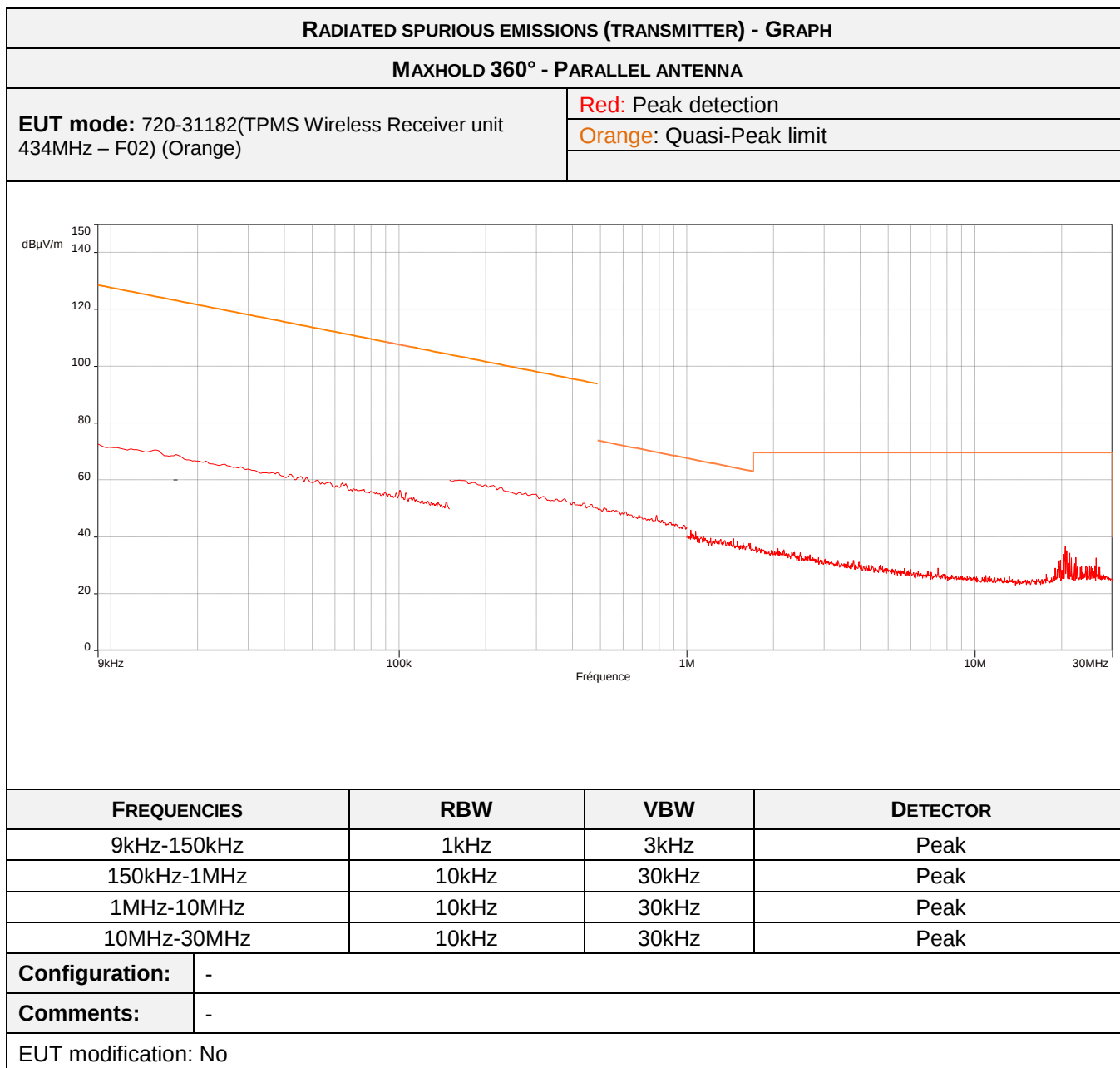
Red: Peak detection

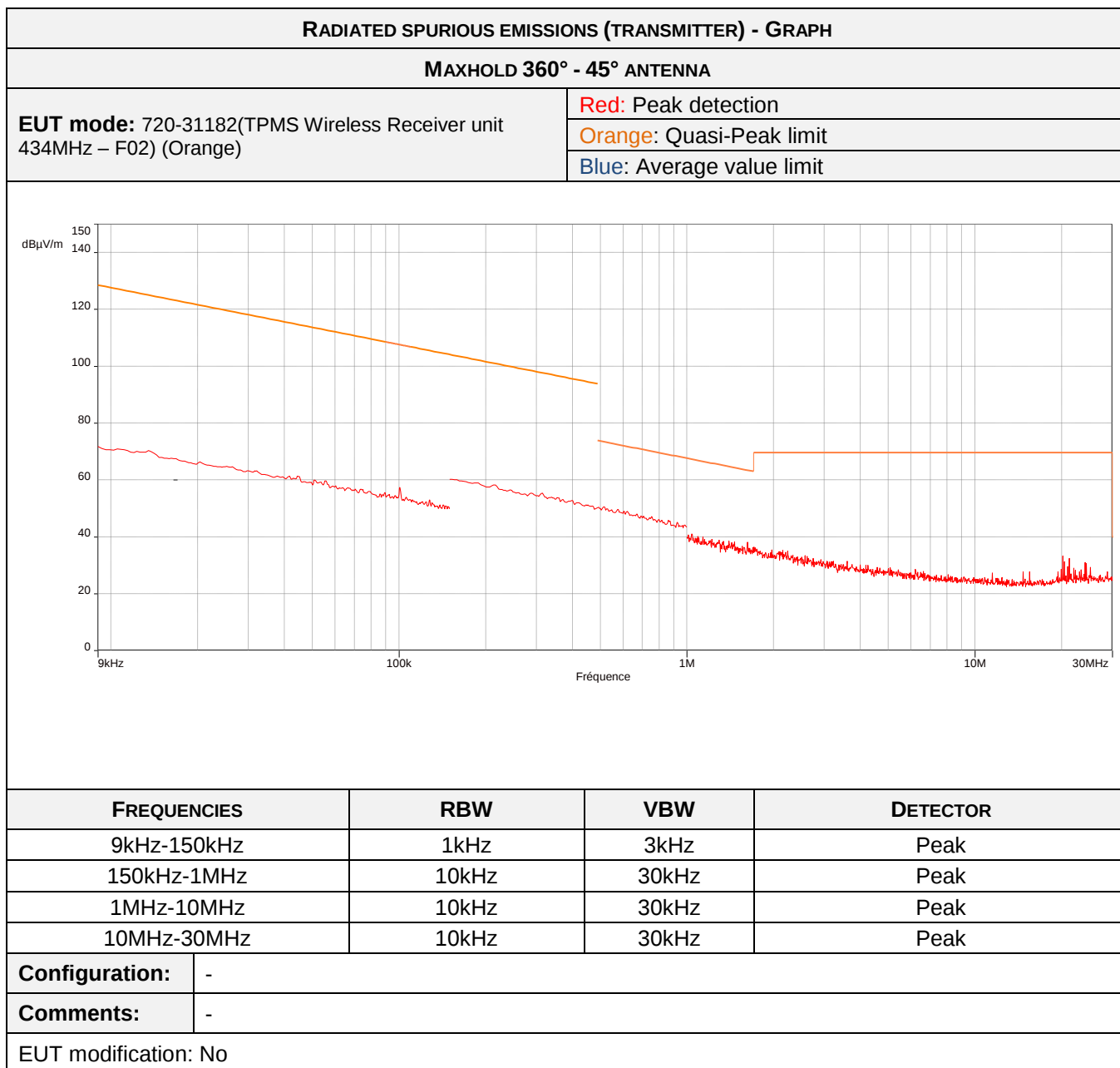
Orange: Quasi-Peak limit

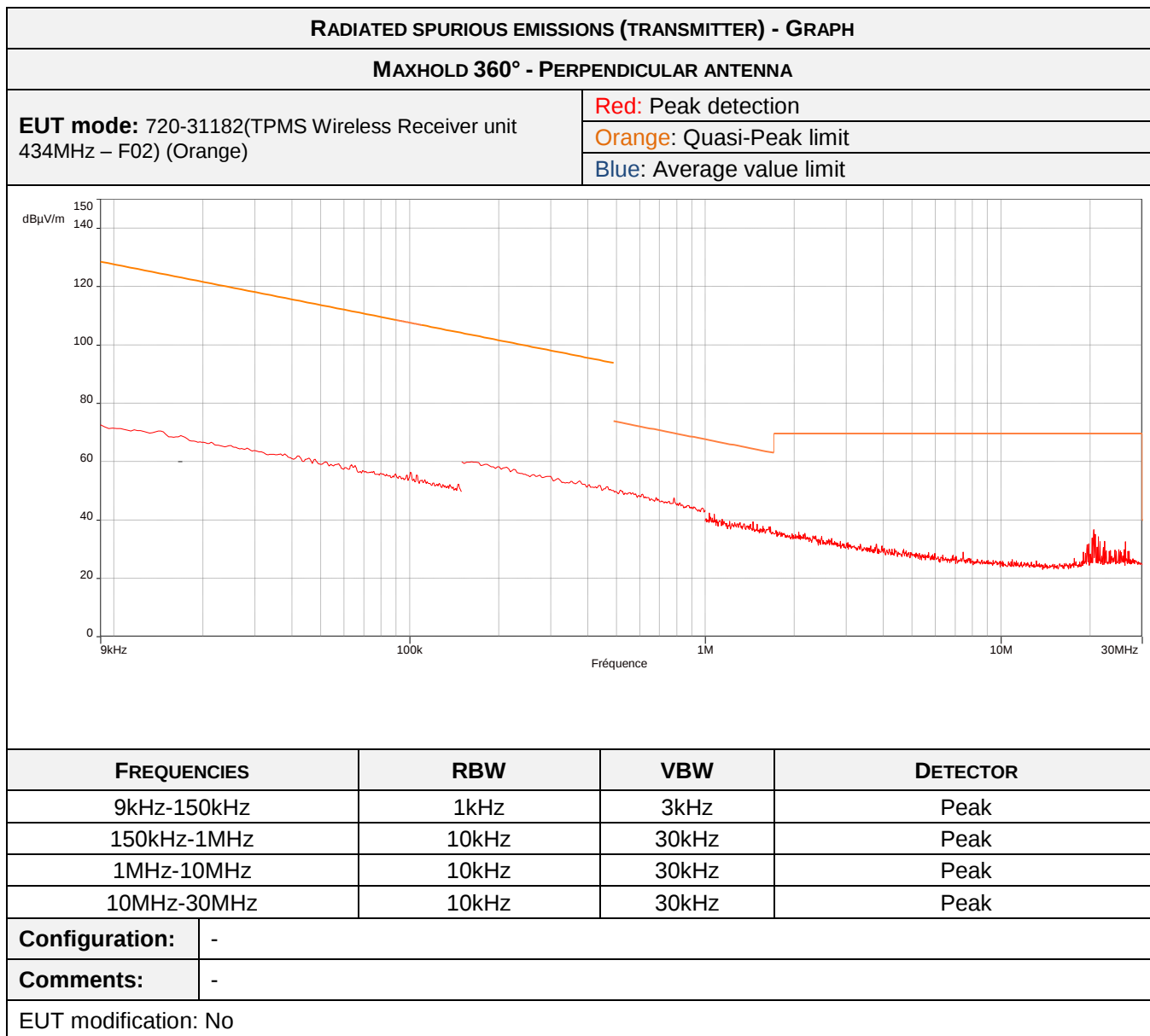
Blue: Average value limit


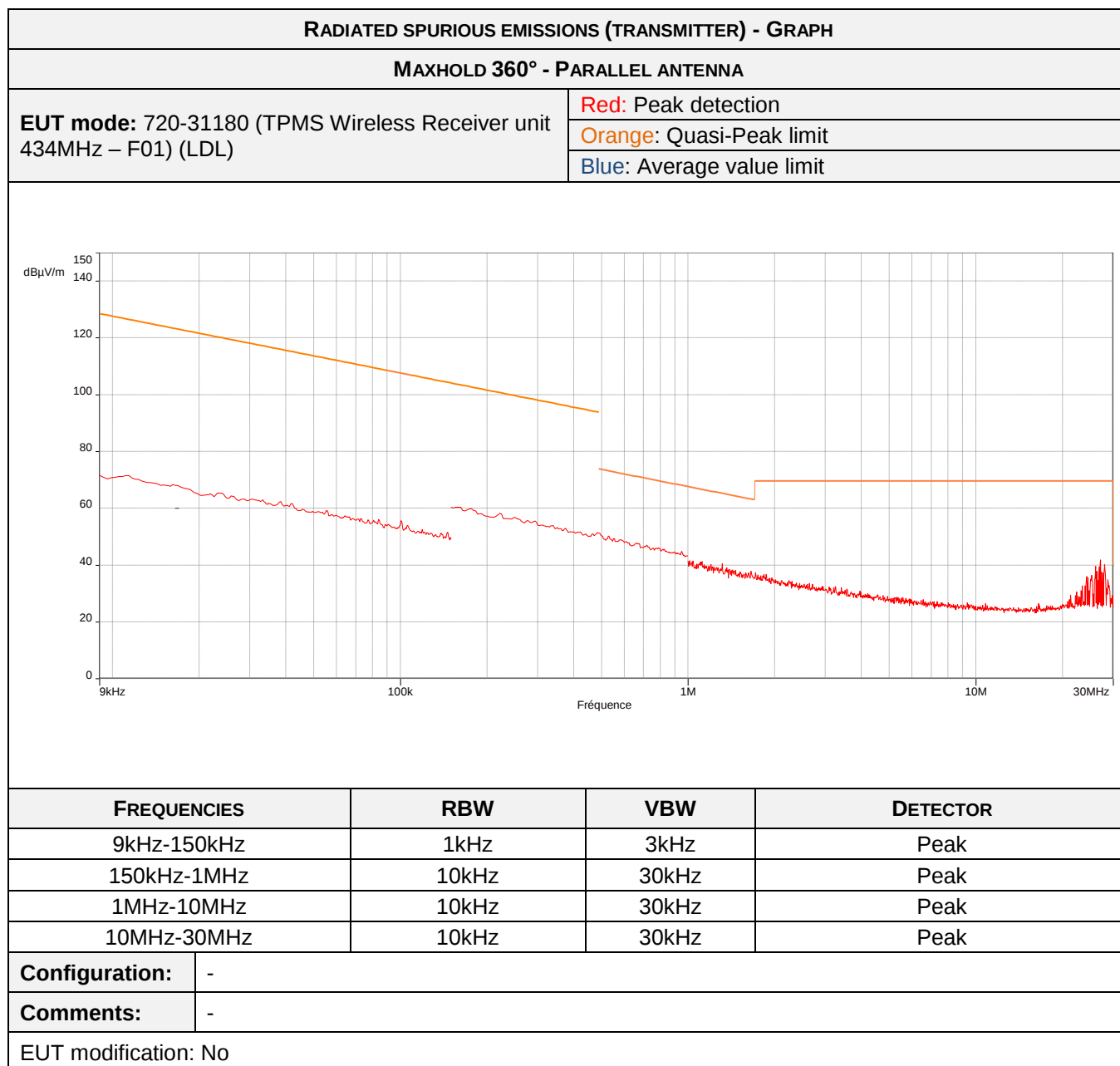
FREQUENCIES		RBW	VBW	DETECTOR
9kHz-150kHz		1kHz	3kHz	Peak
150kHz-1MHz		10kHz	30kHz	Peak
1MHz-10MHz		10kHz	30kHz	Peak
10MHz-30MHz		10kHz	30kHz	Peak
Configuration:	-			
Comments:	-			
EUT modification: No				

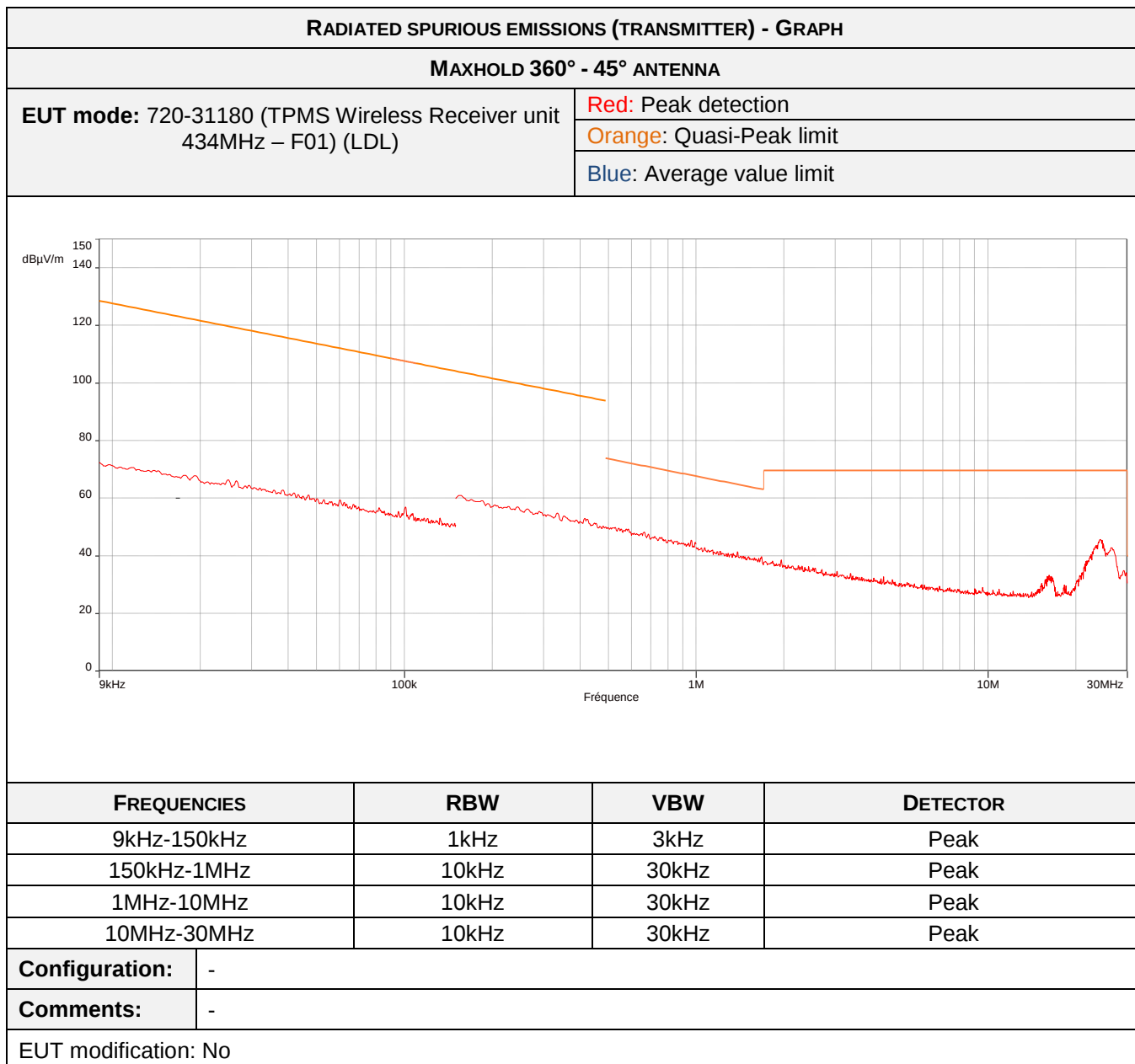


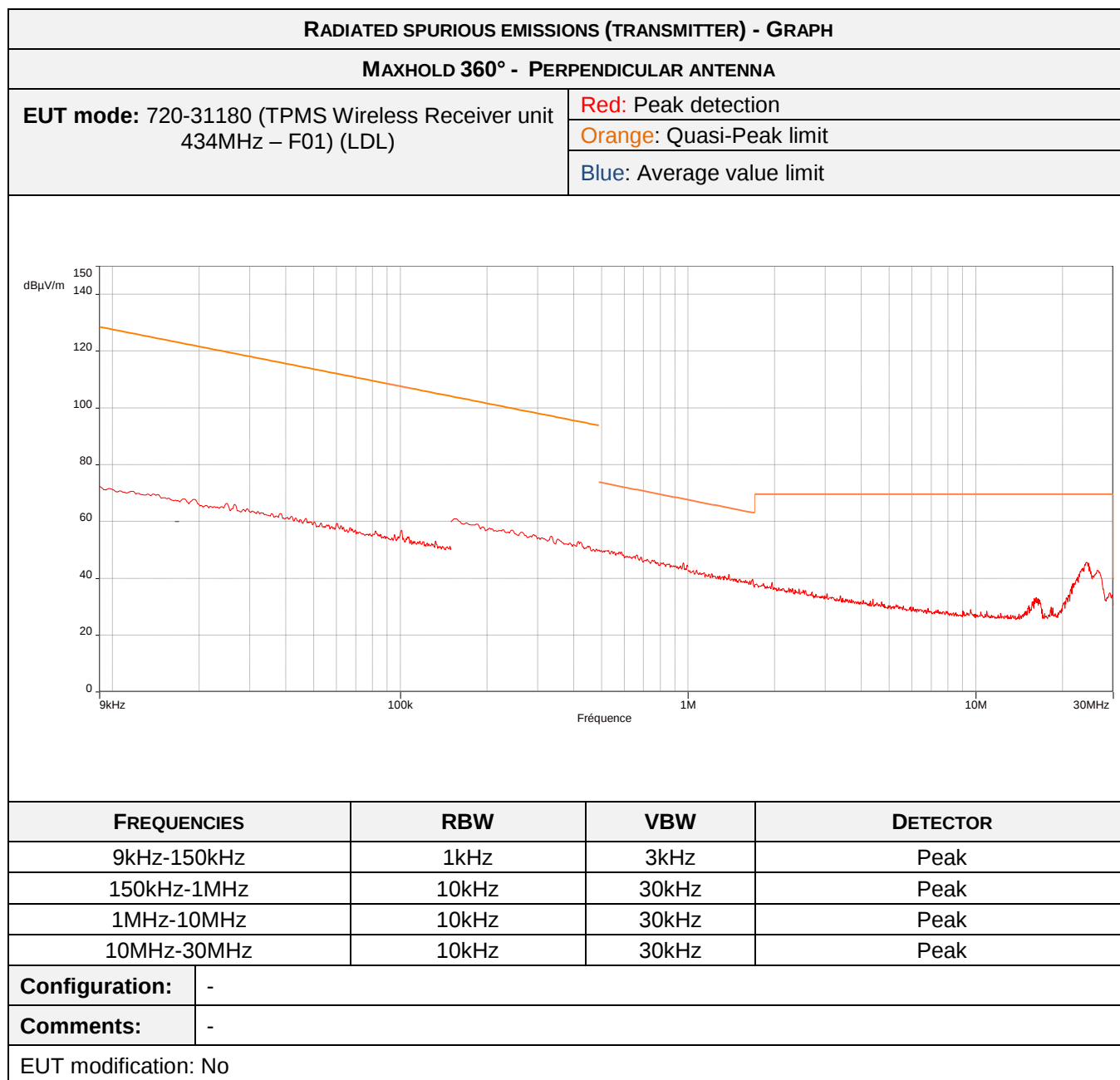






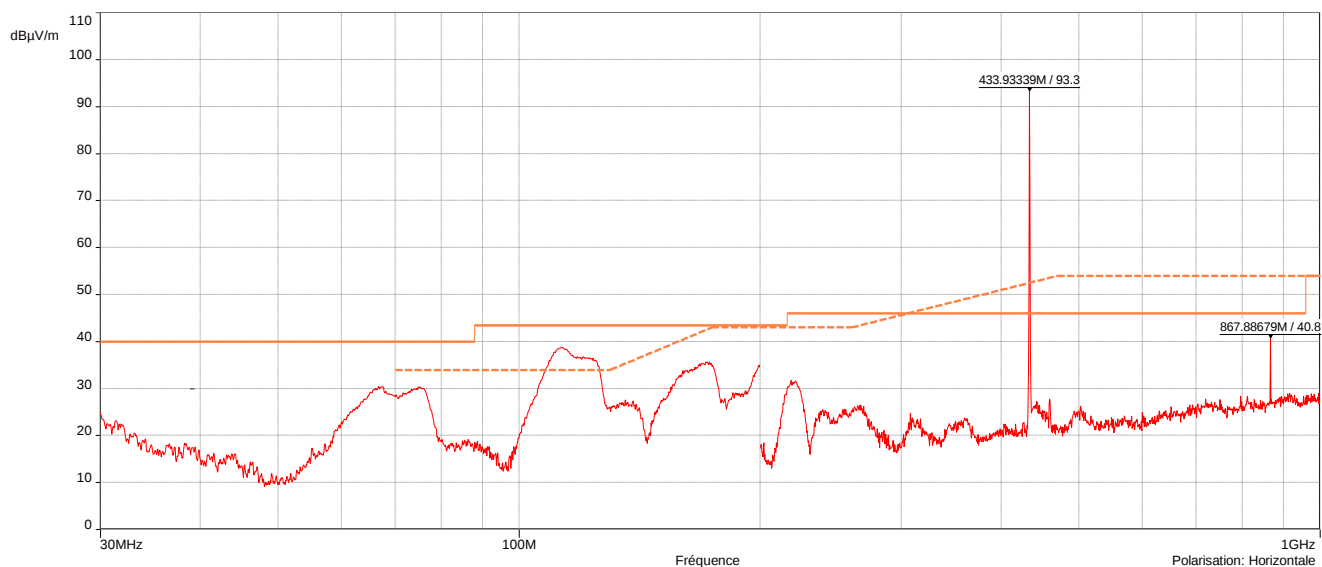
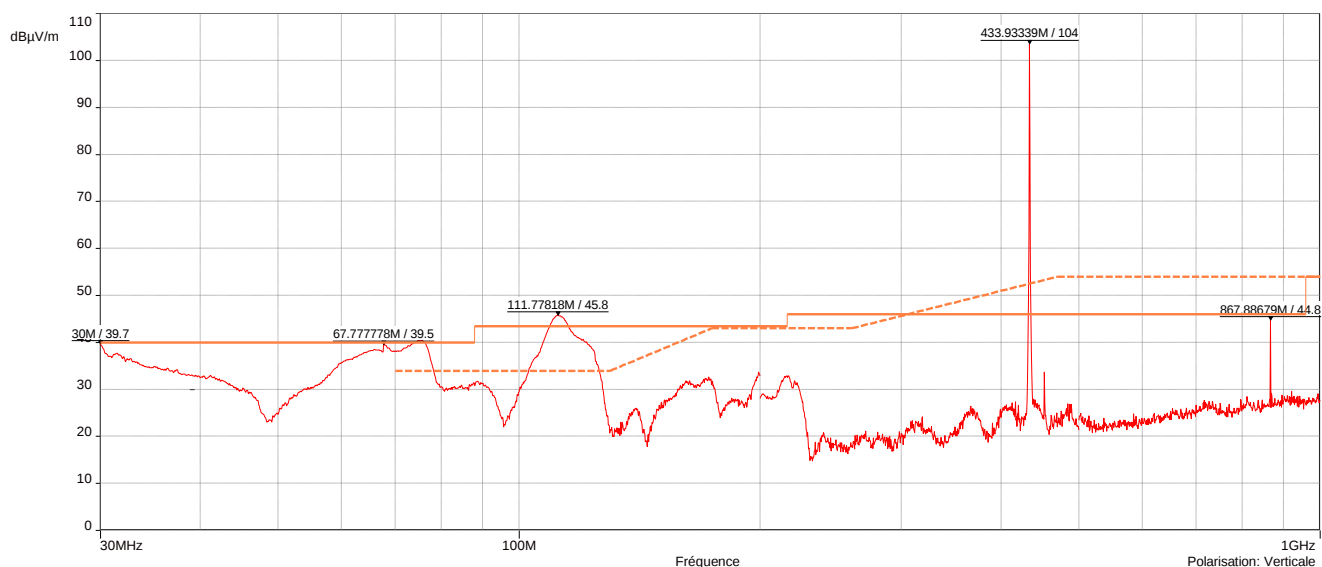






RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: 720-31180 (TPMS Wireless Receiver unit
434MHz – F01) (LDL)

Red: detection maxhold

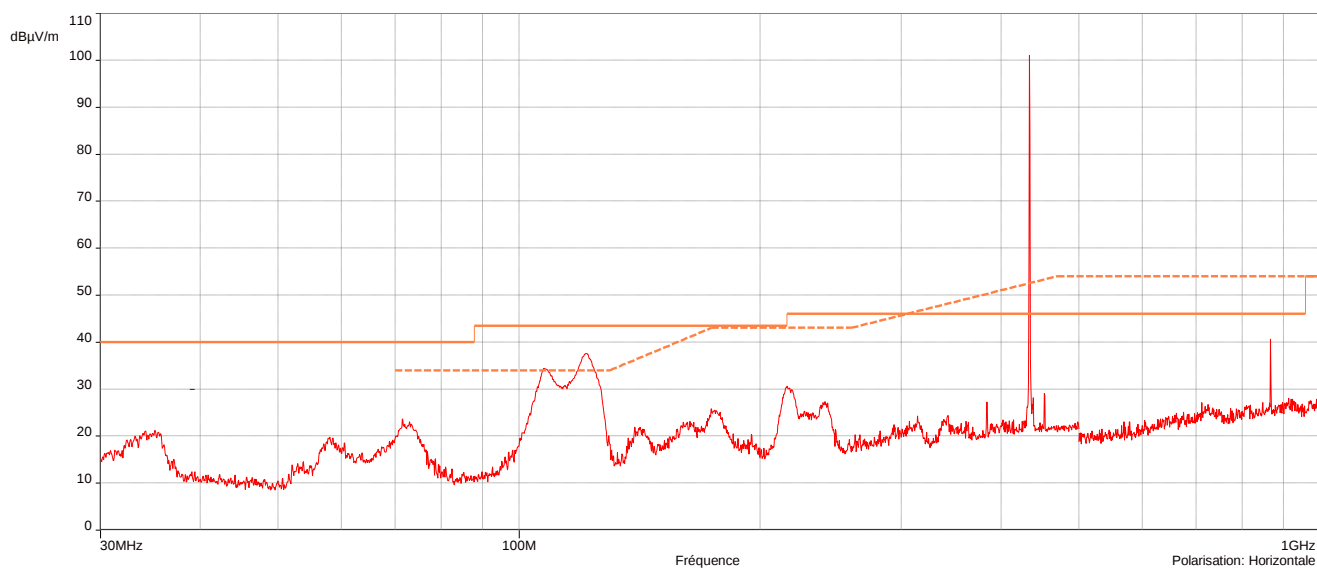
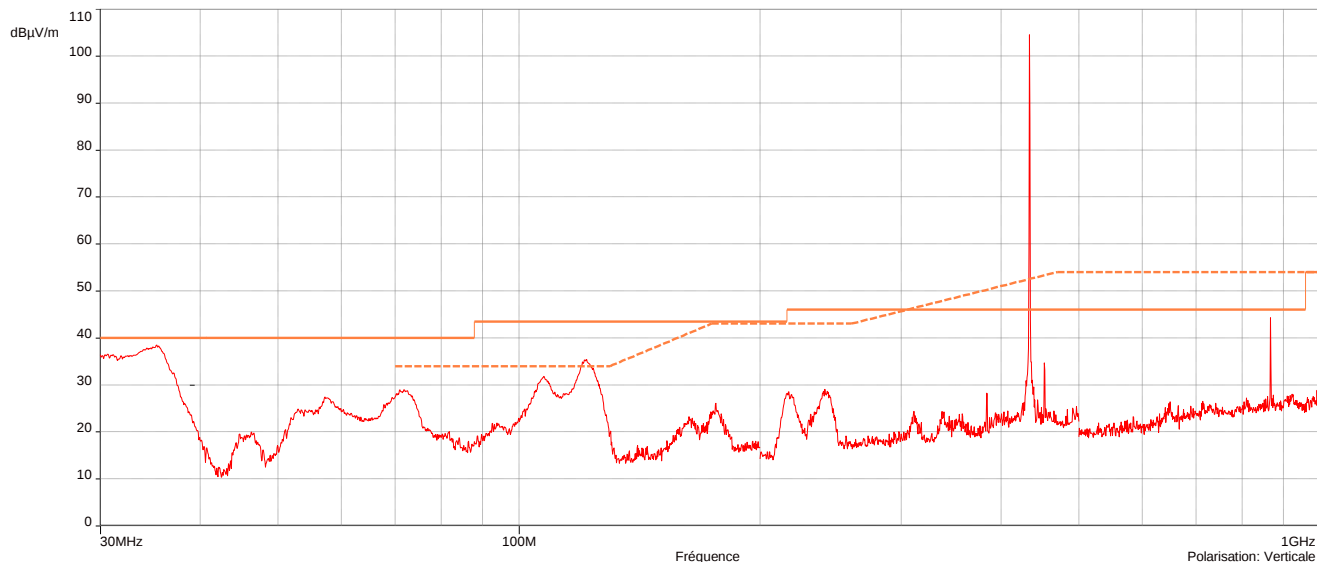
Orange: limit Quasi-Peak 15.209 and 15.231


FREQUENCIES		RBW	VBW	DETECTOR
30MHz-140MHz		100kHz	300kHz	Peak
140MHz-300MHz		100kHz	300kHz	Peak
300MHz-600MHz		100kHz	300kHz	Peak
600MHz-1GHz		100kHz	300kHz	Peak
Configuration:	-			
Comments:	433.93 MHz is carrier frequency.			
EUT modification: No				

RECEIVER SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 30 MHz – 1 GHz									
Test Freq. (MHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azimuth (°)	Ant. Height (cm)	Cor. Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0	/	QP	Vertical	0	100	/	36.6	40	3.7
65.6	/	QP	Vertical	70	100	/	35.0	40	5.0
112.0	/	QP	Vertical	250	100	/	28.4	43.5	15.1
867.8	/	QP	Vertical	0	100	/	42.5	54	11.5
Supplementary information: No									

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: 720-31182(TPMS Wireless Receiver unit
434MHz – F02) (Orange)

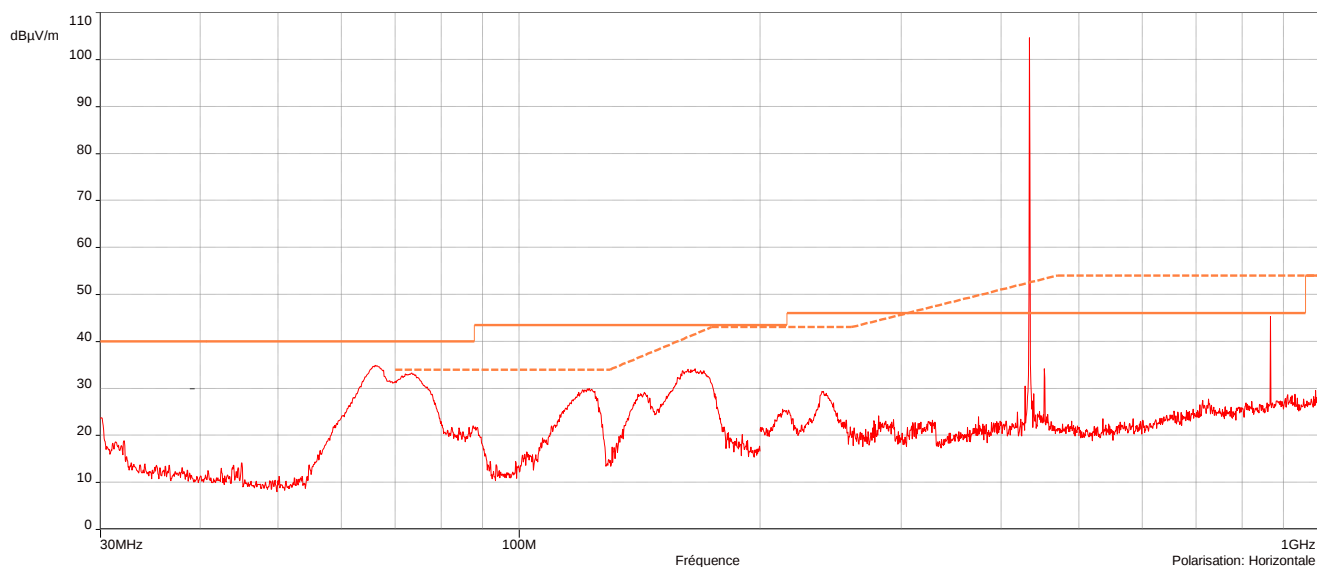
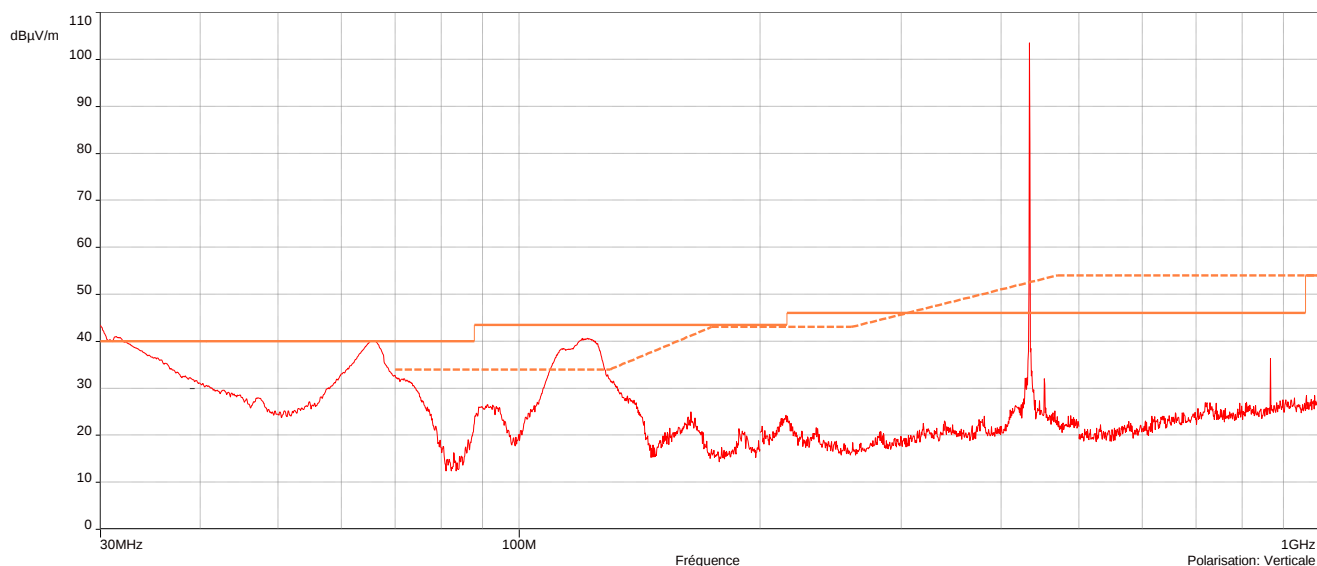
Red: detection maxhold

Orange: limit Quasi-Peak 15.209 and 15.231


FREQUENCIES		RBW	VBW	DETECTOR
30MHz-140MHz		100kHz	300kHz	Peak
140MHz-300MHz		100kHz	300kHz	Peak
300MHz-600MHz		100kHz	300kHz	Peak
600MHz-1GHz		100kHz	300kHz	Peak
Configuration:	-			
Comments:	433.92 MHz is carrier frequency			
EUT modification: No				

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: 720-31180 (TPMS Wireless Receiver unit
434MHz – F01) (LDL)

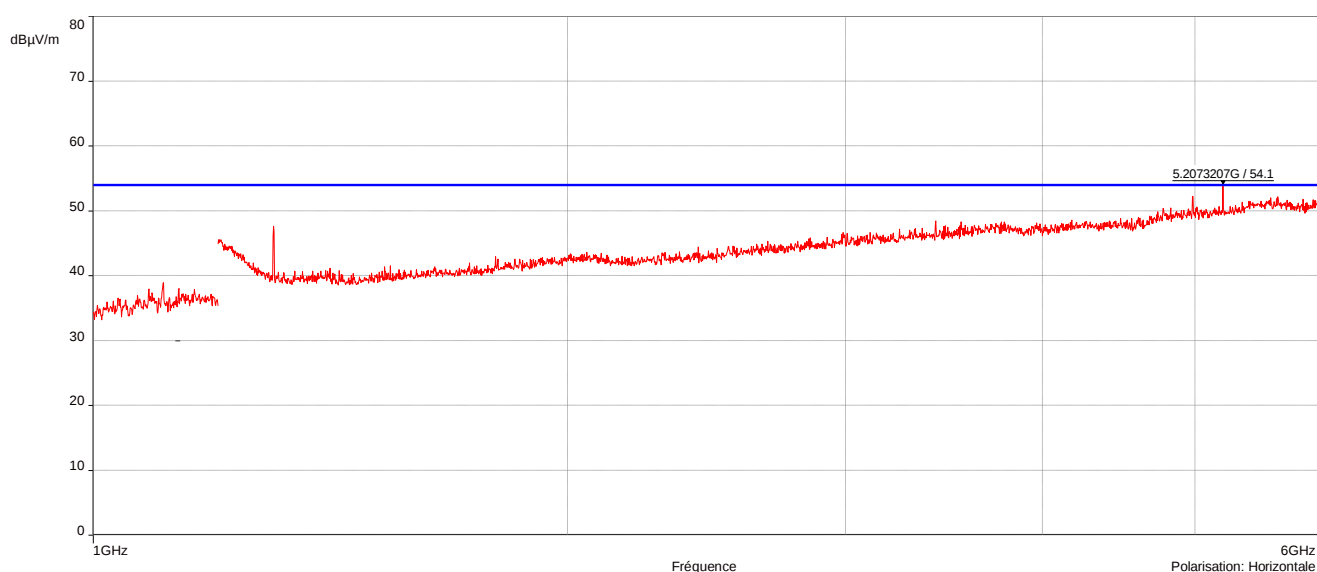
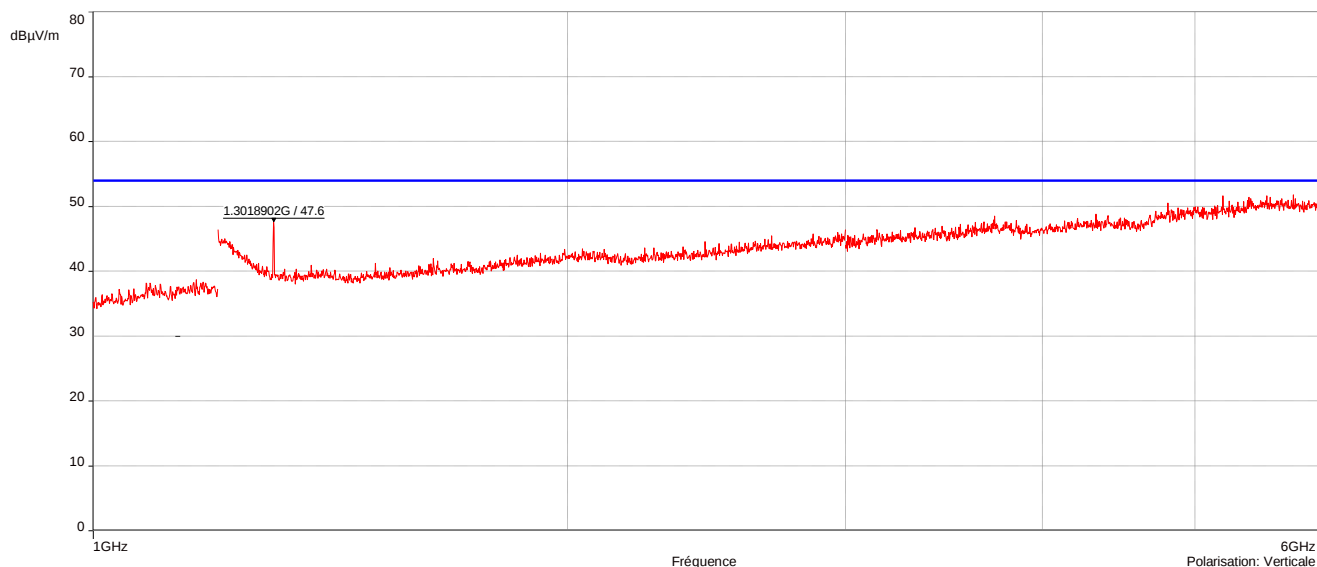
Red: detection maxhold

Orange: limit Quasi-Peak 15.209 and 15.231


FREQUENCIES		RBW	VBW	DETECTOR
30MHz-140MHz		100kHz	300kHz	Peak
140MHz-300MHz		100kHz	300kHz	Peak
300MHz-600MHz		100kHz	300kHz	Peak
600MHz-1GHz		100kHz	300kHz	Peak
Configuration:	-			
Comments:	433.92 MHz is carrier frequency.			
EUT modification: No				

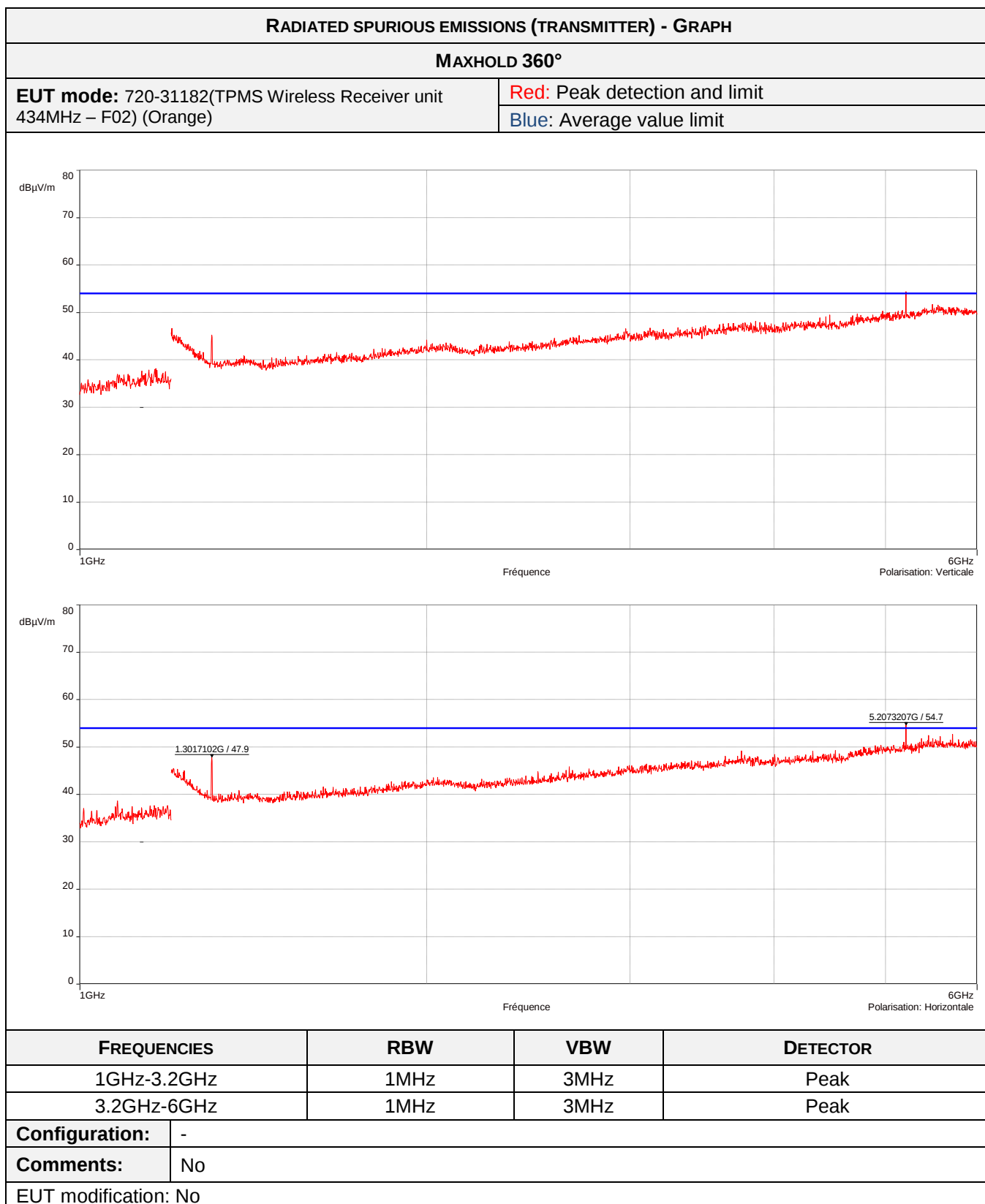
RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: 720-31180 (TPMS Wireless Receiver unit
434MHz – F01) (LDL)

Red: Peak detection and limit

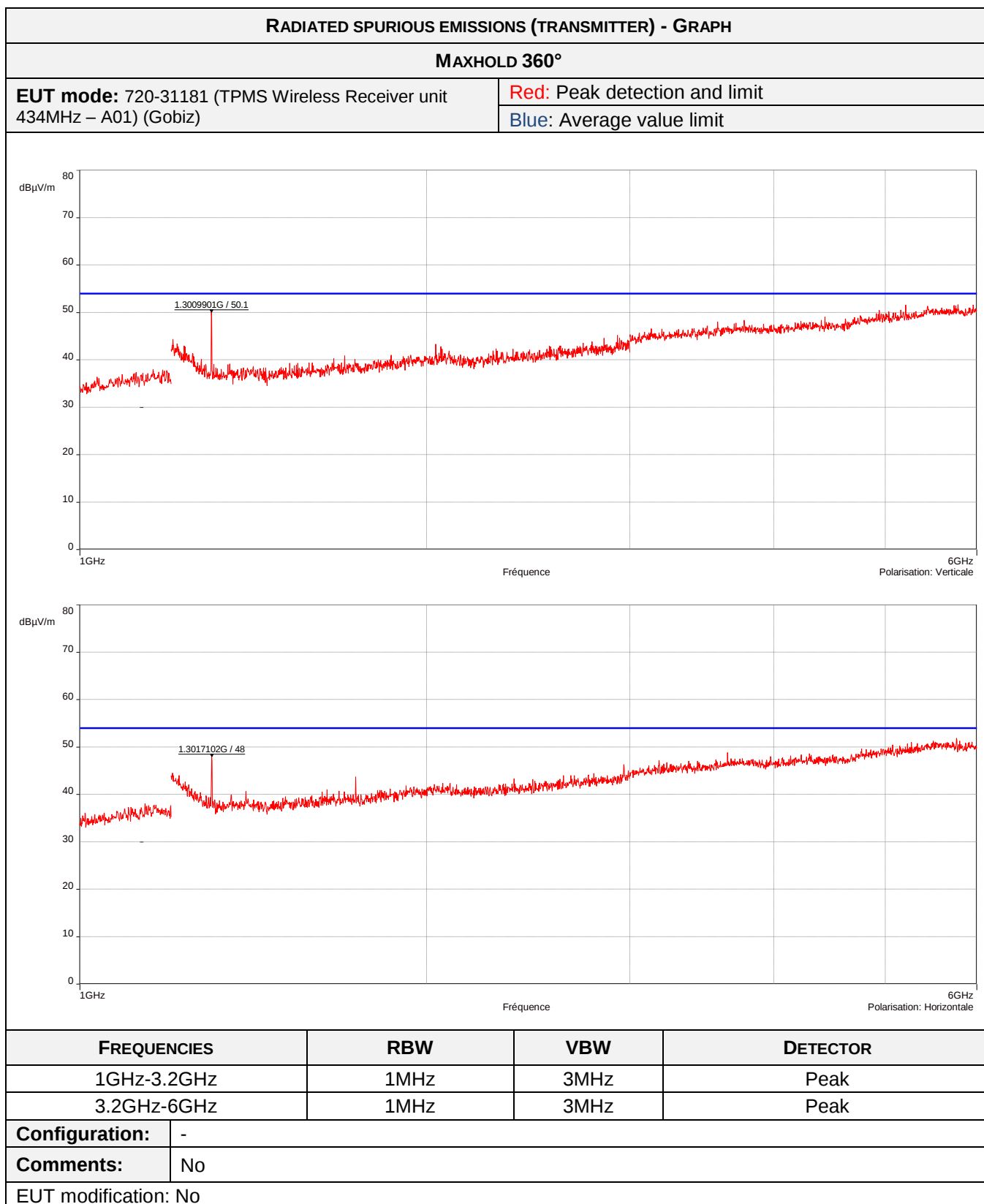
Blue: Average value limit


FREQUENCIES		RBW	VBW	DETECTOR
1GHz-3.2GHz		1MHz	3MHz	Peak
3.2GHz-6GHz		1MHz	3MHz	Peak
Configuration:	-			
Comments:				
EUT modification: No				

RECEIVER SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 1 GHz – 6 GHz									
Test Freq. (GHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azimuth (°)	Ant. Height (cm)	Cor. Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.3018	/	Av	Vertical	30	130	/	27.9	54.0	26.1
5.2073	/	Av	Horizontal	170	130	/	35.6	54.0	18.4
Supplementary information: No									



RECEIVER SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 1 GHz – 6 GHz									
Test Freq. (GHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azimuth (°)	Ant. Height (cm)	Cor. Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.3018	/	Av	Vertical	30	130	/	27.9	54.0	26.1
5.2073	/	Av	Horizontal	170	130	/	35.6	54.0	18.4
Supplementary information: No									



RECEIVER SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 1 GHz – 6 GHz									
Test Freq. (GHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azimuth (°)	Ant. Height (cm)	Cor. Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.3018	/	Av	Vertical	30	130	/	27.9	54.0	26.1
Supplementary information: No									

6.5. Unintentional radiated emissions in the band 30 MHz – 6 GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 9 : 2016
Test method:	§ 15.231(e) of FCC 47 CFR PART 15 : 2022 § A.1.4 © of RSS-210 Issue 9 : 2016
General test setup: E.U.T. is set on an insulating support at 0.8 m (<1GHz) and 1.5 m (>1GHz) above the ground reference plane. For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane for 30 MHz - 25 GHz. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Horizontal polarization	1GHz-6GHz	PASS
Maxhold 360° - Vertical polarization	1GHz-6GHz	PASS

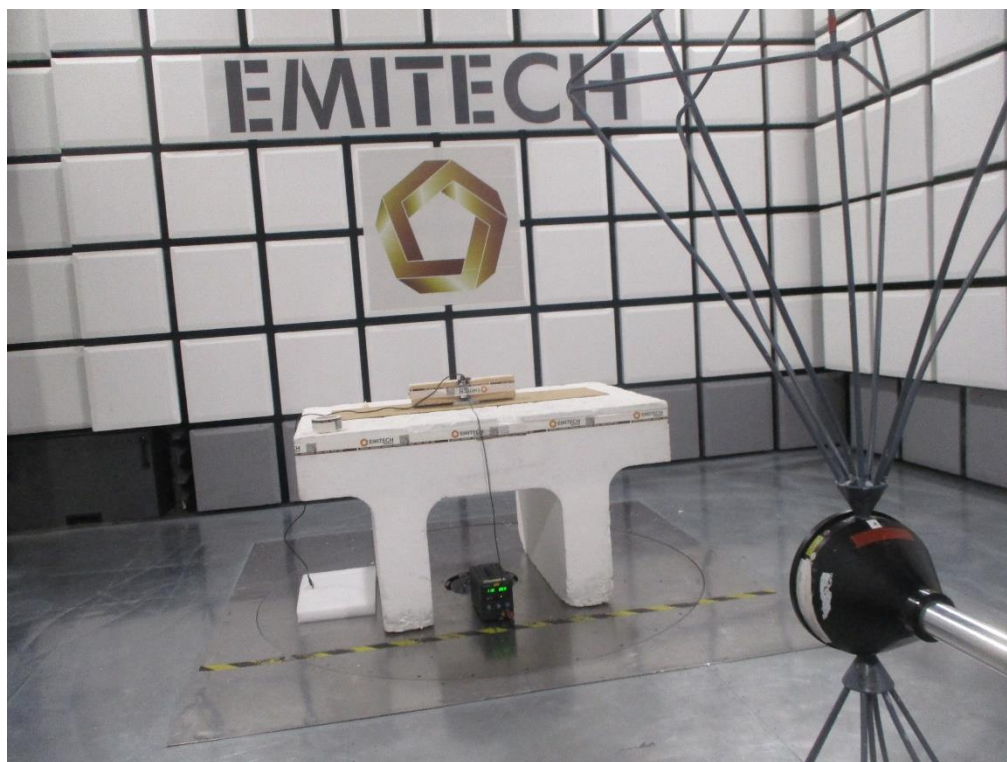
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	24°C
Relative Humidity	10 to 90 %	40%
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Amplifier	Hewlett Packard	8447F H64	16970	28/03/2022	28/05/2023
Antenna	Rohde & Schwarz	HL223	00294	21/04/2020	21/06/2023
Antenna	Rohde & Schwarz	HK116	00293	30/09/2021	30/11/2024
Antenna	Emco	3115	00941	01/03/2022	01/05/2025
Antenna	Emco	6502	09579	16/08/2021	16/10/2023
Cable	C&C	N-5m	11184	25/02/2022	25/04/2024
Cable	C&C	N-4m	14226	25/02/2022	25/04/2024
Cable	Huber + Suhner	N-2m	11417	25/02/2022	25/04/2024
Cable	Micro-Coax	N-8m	08061	25/02/2022	25/04/2024
Filter	Trilithic	5EHLX500-3-KK	01529	20/10/2022	20/12/2025
Receiver	Rohde & Schwarz	ESRP7	10517	16/08/2022	16/10/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Software	Nexio	BAT EMC	00000		

BAT-EMC software version: V3.18.0.26

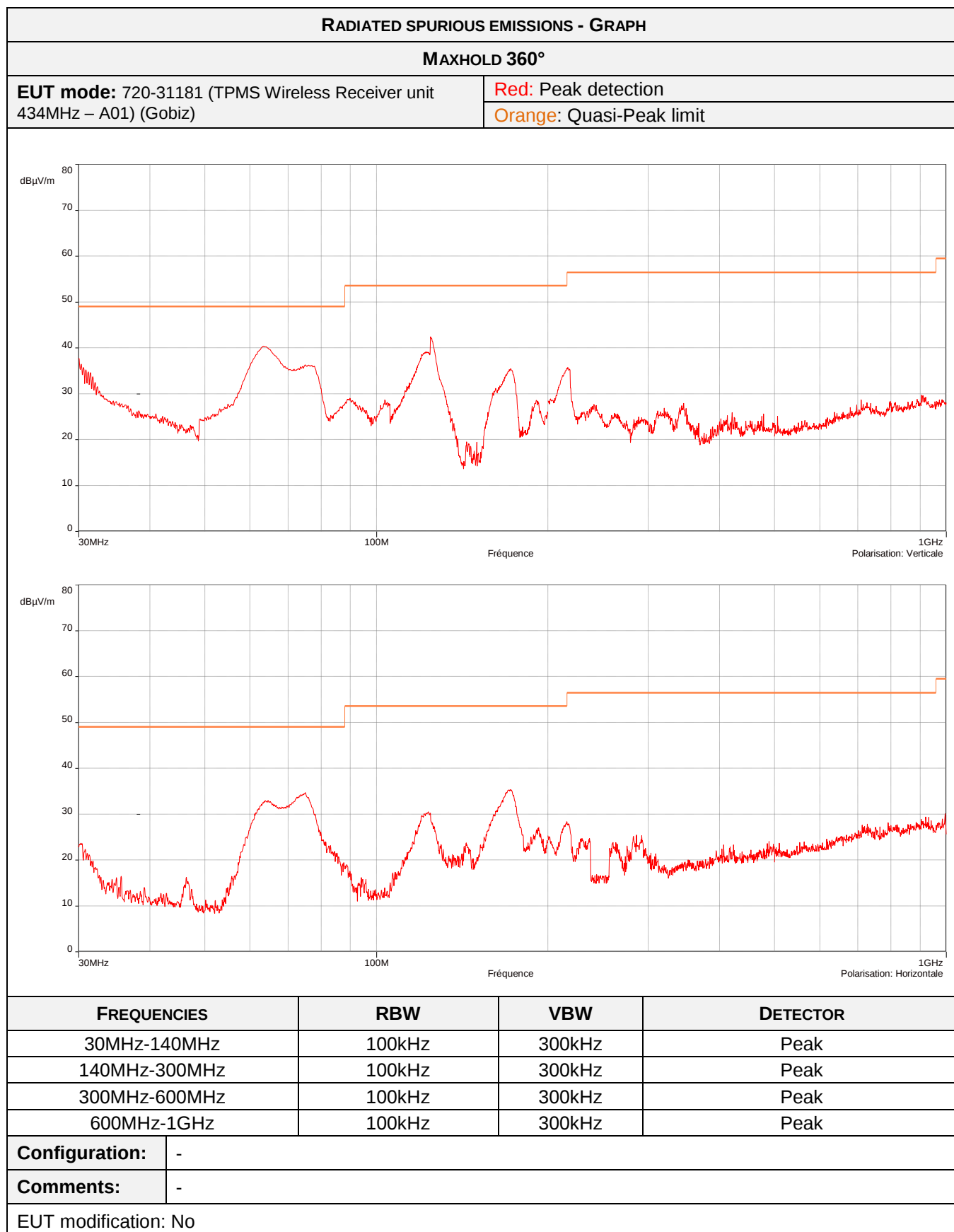
Blank cells = Permanent validity

TEST SETUP PHOTOS - 30MHz – 1GHz



TEST SETUP PHOTO - 1GHz – 6GHz

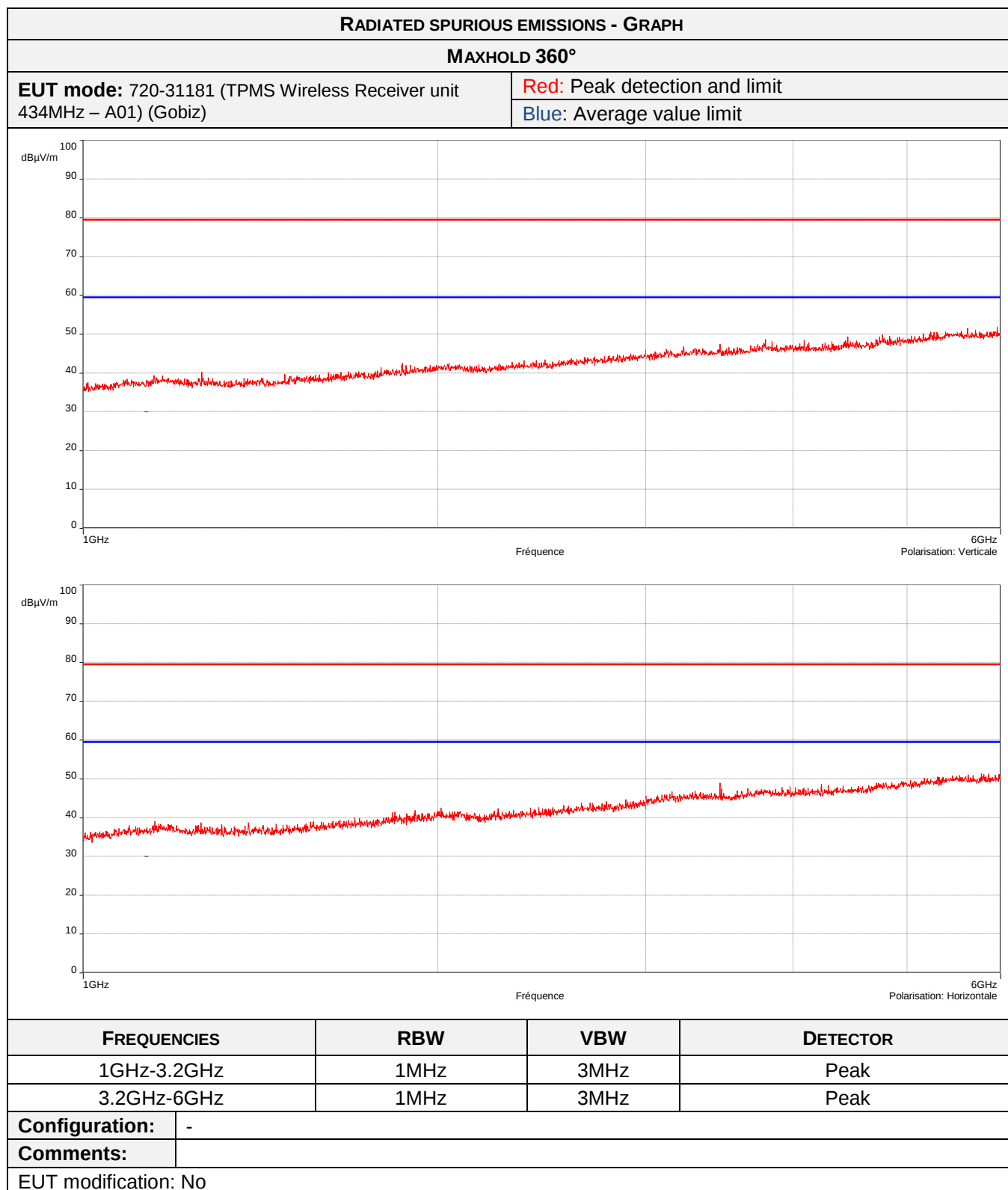




RECEIVER SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 30 MHz – 1 GHz – RX GOBIZ									
Test Freq. (MHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azim uth (°)	Ant. Height (cm)	Cor. Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
-	-	-	-	-	-	-	-	-	-
Supplementary information: No									

RADIATED SPURIOUS EMISSIONS - GRAPH			
MAXHOLD 360°			
EUT mode: 720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)		Red: Peak detection	
		Orange: Quasi-Peak limit	
FREQUENCIES	RBW	VBW	DETECTOR
30MHz-140MHz	100kHz	300kHz	Peak
140MHz-300MHz	100kHz	300kHz	Peak
300MHz-600MHz	100kHz	300kHz	Peak
600MHz-1GHz	100kHz	300kHz	Peak
Configuration:	-		
Comments:	No curve, measurement performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS - GRAPH			
MAXHOLD 360°			
EUT mode: 720-31180 (TPMS Wireless Receiver unit 434MHz – F01) (LDL)		Red: Peak detection	
		Orange: Quasi-Peak limit	
FREQUENCIES	RBW	VBW	DETECTOR
30MHz-140MHz	100kHz	300kHz	Peak
140MHz-300MHz	100kHz	300kHz	Peak
300MHz-600MHz	100kHz	300kHz	Peak
600MHz-1GHz	100kHz	300kHz	Peak
Configuration:	-		
Comments:	No curve, measurement performed manually → N.T.R		
EUT modification: No			



RADIATED SPURIOUS EMISSIONS - GRAPH			
MAXHOLD 360°			
EUT mode: 720-31182(TPMS Wireless Receiver unit 434MHz – F02) (Orange)		Red: Peak detection and limit	
		Blue: Average value limit	
FREQUENCIES	RBW	VBW	DETECTOR
1GHz-3.2GHz	1MHz	3MHz	Peak
3.2GHz-6GHz	1MHz	3MHz	Peak
Configuration:	-		
Comments:	No curve, measurement performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS - GRAPH			
MAXHOLD 360°			
EUT mode: Rx LDL		Red: Peak detection and limit	
		Blue: Average value limit	
FREQUENCIES	RBW	VBW	DETECTOR
1GHZ-3.2GHZ	1MHZ	3MHZ	Peak
3.2GHZ-6GHZ	1MHZ	3MHZ	Peak
Configuration:	-		
Comments:	No curve, measurement performed manually → N.T.R		
EUT modification: No			

●●● End of test report ●●●