

"This report cancels and replaces the test report N° RRA-EMIESS22L010CED-1A v0"



Test report issued under the responsibility of:
EMITECH ILE DE FRANCE Laboratory
MRA US-EU Designation Number: FR0004
IC Assigned Code: 4379A

RADIO TESTS REPORT

FCC 47 CFR PART 15 : 2022

RSS-247_Issue 2 : 2017

RSS-Gen_Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021

Company : **TRAXENS**
Address..... : 16 Rue Louis Leprince Ringuet
Heliopolis III
13013 MARSEILLE - FRANCE

Test item description : **TRAXENS – BOX V3 DRY**
Trade Mark : TRAXENS
Manufacturer..... : TRAXENS
Model/Type reference..... : BOX0029
Ratings..... : N/C

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

Report Reference No..... : **RRA-EMIESS22L010CED-1A v1**
Test procedure : FCC and CANADA marking
Diffusion..... : Mr. YOUSSEF
Applicant's name : TRAXENS
Date of issue..... : 02/01/2023
Total number of pages..... : 60
Revision : 1
Compiled by..... : C. ZIMMERMANN (Tests Technician)
Approved by (+ signature)

Certain services reported in this document are not covered by the accreditation. They are identified by the symbol (*).

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	16/11/2022	Creation	
1	02/01/2023	1, 3, 5	Modification of customer's name

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		None	
Date of receipt of test item		17/10/2022	
Dates of performance of tests		From 17 to 20/10/2022	
APPLICANT'S GENERAL INFORMATION:			
Company name		TRAXENS	
Company address.		16 Rue Louis Leprince Ringuet Heliopolis III 13013 MARSEILLE FRANCE	
Person present during the tests.		Mr. BRETON	
Responsible		Mr. YOUSSEF	
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.	Equipement 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-247 Issue 2 : 2017

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

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.

KDB 558074 D01 DTS Meas Guidance V05 r02

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

ANSI C63.10 : 2013

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

3. EQUIPMENT TECHNICAL DESCRIPTION

3.1. Test Conditions

Test item description. : *TRAXENS – BOX V3 DRY*

Model/Type reference..... : *BOX0029*

Trade Mark. : *TRAXENS*

Serial number (S/N)..... : *N/C*

Part number (P/N). : *N/C*

Software version..... : *N/C*

Firmware version. : *V1.4*

Fcc ID : *2AH6TRBV3*

N°IC : *25616-TRBV3*

Type of sample. : *Pre serial*

Function..... : *Geolocation and traceability box for maritime dry containers*

Manufacturer name. : *TRAXENS*

Address. : *Heliopolis III*
16 rue Louis Leprince Ringuet
13013 MARSEILLE - FRANCE

General product information: -

3.2.E.U.T Overview



3.3.E.U.T Marking Plate

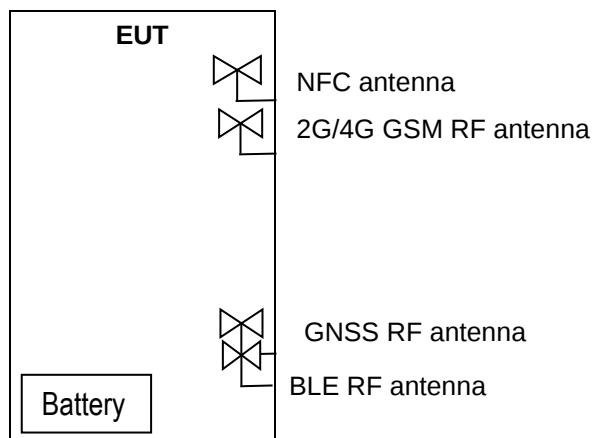
No marking plate

3.4. E.U.T Mechanical and Electrical Design

Power supply : 3.6 Vdc
 Power supply range..... : N/C
 Power type..... : Battery
 Power (W)..... : N/C
 Nominal current (mA). : 20
 Dimensions (H x W x L) (mm). : 374 x 101 x 58
 Weight (kg). : 1.7
 Temperature range (°C). : -30 to +70
 Ground bounding strap..... : No

Comments: -

3.5. E.U.T Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	-
1	2G / 4G GSM RF antenna	RF	N/A	N/A	Internal
2	Battery	DC	N/A	N/A	-
3	GNSS RF antenna	RF	N/A	N/A	Internal
4	BLE RF antenna	RF	N/A	N/A	Internal
5	NFC RF antenna	RF	N/A	N/A	Internal

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
Radiocommunication analyzer	Rohde & Schwarz	CMW500	17771

(AE)
-

3.7. E.U.T Radio Specifications

a) GENERAL INFORMATION	
According to manufacturer's declarations :	
EUT type.....	<i>Transceiver</i>
Technology	<i>BLE</i>
Environmental profile.....	<i>Maritime</i>
Temperature range.....	<i>-30°C to + 70°C</i>
Antenna type	<i>Internal</i>
Antenna Gain.....	<i>+4 dBi</i>
Comments: -	
b) TRANSMITTER PARAMITERS (Tx)	
Frequency bands.....	<i>BLE : appairing mode</i>
RF Power.....	<i>N/C</i>
Number of channels / Separation.....	<i>BLE : 37 + 3</i>
Modulation type	<i>BLE : GFSK</i>
Duty cycle	<i>N/C</i>
Tested frequency.....	<i>BLE : 2402 MHz / 2442 MHz / 2480 MHz</i>

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	

For BLE module :

Subpart C of the standard FCC part 15 – Intentional radiators

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
Restriction bands of operation	15.205	PASS	Battery power supply
Measurement of conducted emission on AC mains ports	15.207	N/A	
Radiated emission limits; general requirements	15.209	PASS	
Additional provision to the general radiated emission limitations	15.215		
- (a) Alternative to general radiated emission limits	-	N/A	
- (b) Unwanted emissions outside of § 15.247 frequency bands	-	N/A	
- (c) Band-edge compliance	-	PASS	
Intentional radiated emissions	15.247		
- a) frequency hopping and digitally modulated	-	N/A	
- a) (1) hopping mode	-	N/A	
- a) (1) (i) frequency hopping in the band 902-928 MHz	-	N/A	
- a) (1) (ii) frequency hopping in the band 5725-5850 MHz	-	N/A	
- a) (1) (iii) frequency hopping in the band 2400-2483.5 MHz	-	N/A	
- a) (2) systems using digital modulation in the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz (6 dB bandwidth)	-	PASS	
- b) maximum peak conducted	-	N/A	
- b) (1) frequency hopping in the bands 2400-2483.5 MHz or 5725-5850 MHz	-	N/A	
- b) (2) frequency hopping in the band 902-928 MHz	-	N/A	
- b) (3) systems using digital modulation in the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz	-	PASS	
- b) (4) maximum peak conducted > 6 dBi	-	N/A	
- b) (4) (i) frequency hopping in the band 2400-2483.5 MHz	-	N/A	
- b) (4) (ii) frequency hopping in the band 5725-5850 MHz	-	N/A	
- b) (4) (iii) fixed, point-to-point	-	N/A	
- c) directional antenna > 6 dBi	-	N/A	

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TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
6 Technical Requirements			
- 6.6 Occupied Bandwidth	-	PASS	
- 6.12 Transmitter Output Power	-	PASS	
- 6.13 Transmitter unwanted emissions	-	PASS	
7.2 Measurement Methods and Standard Specifications			
- 7.2.1 Measurement Bandwidths and Detector Functions	-	N/A	
- 7.2.2 Emissions Falling Within Restricted Frequency Bands	-	N/A	
- 7.2.3 Devices Employing Pulsed Operation	-	N/A	
- 7.2.4 AC Power Line Conducted Emissions Limits	-	N/A	Battery power supply
- 7.2.5 Transmitter Spurious Emission Limits	-	N/A	
- 7.2.6 Transmitter Frequency Stability	-	N/A	
- 7.2.7 Measurement Distance	-	N/A	
8.Licence-Exempt radio Apparatus			
- 8.8 AC Power Line Conducted Emission Limits for licence-Exempt Radio Apparatus	-	N/A	

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	$\pm 4.0 \text{ dB}$	$\pm 4 \text{ dB}$
Transitory		
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)		
$f \leq 62.5 \text{ MHz}$	$\pm 5.1 \text{ dB}$	$\pm 6 \text{ dB}$
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	$\pm 5.4 \text{ dB}$	$\pm 6 \text{ dB}$
RF power (EN 300328 / EN 301893)	$\pm 5.3 \text{ dB}$	$\pm 6 \text{ dB}$
PIRE and power spectral density with diode	$\pm 5.4 \text{ dB}$	$\pm 6 \text{ dB}$
Radiated emission (magnetic field)		
9kHz – 30MHz	$\pm 3 \text{ dB}$	$\pm 6 \text{ dB}$
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	$\pm 2.9 \text{ dB}$	/
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	/
30MHz – 1GHz	$\pm 5.0 \text{ dB}$	/
1GHz – 18GHz	$\pm 5.6 \text{ dB}$	/
18GHz – 26GHz	$\pm 5.7 \text{ dB}$	/
26GHz – 40GHz	$\pm 5.7 \text{ dB}$	/

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

6. TEST CONDITIONS AND RESULTS

6.1. Digital modulation systems

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-247 Issue 2 : 2017 RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
Test method:	§ 15.247 a) (2) of FCC 47 CFR PART 15 : 2022 § 5.2 a) of RSS-247 Issue 2 : 2017 § 6.6 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 E.U.T.(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.	

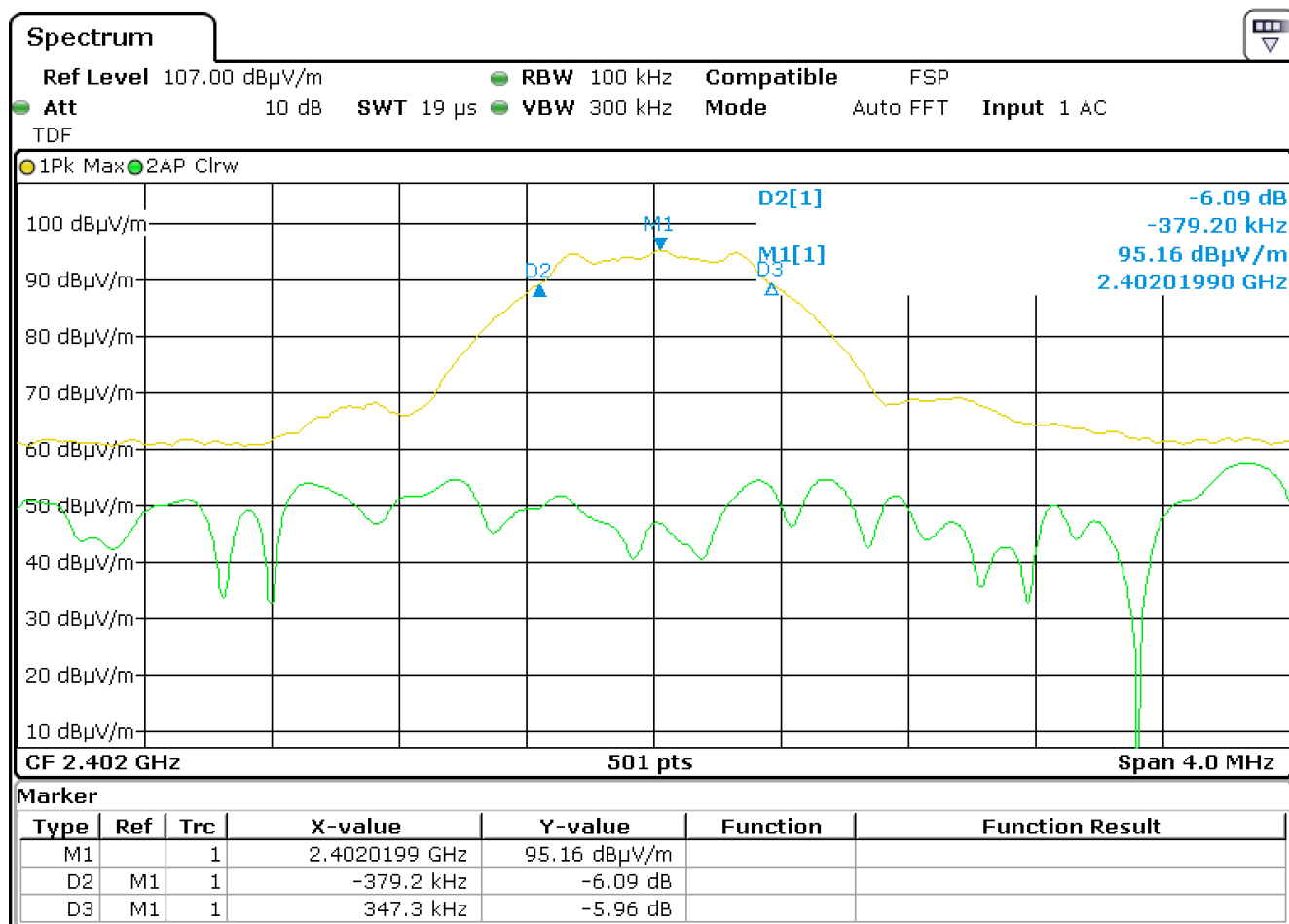
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	25°C
Relative Humidity	10 to 90 %	40 %
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Emco	3115	0941	01/03/2022	01/05/2025
Cable	C&c	N-4M	14228	10/06/2022	10/08/2024
Cable	Huber + suhner	N-6M	17270	10/06/2022	10/08/2024
Cable	Huber + suhner	N-10M	17272	01/07/2022	01/09/2024
Shielded enclosure	Comtest	SAC 3M	14622	27/04/2022	27/06/2025
Spectrum analyzer	Rohde & schwarz	ESR7	12811	11/03/2022	11/05/2023

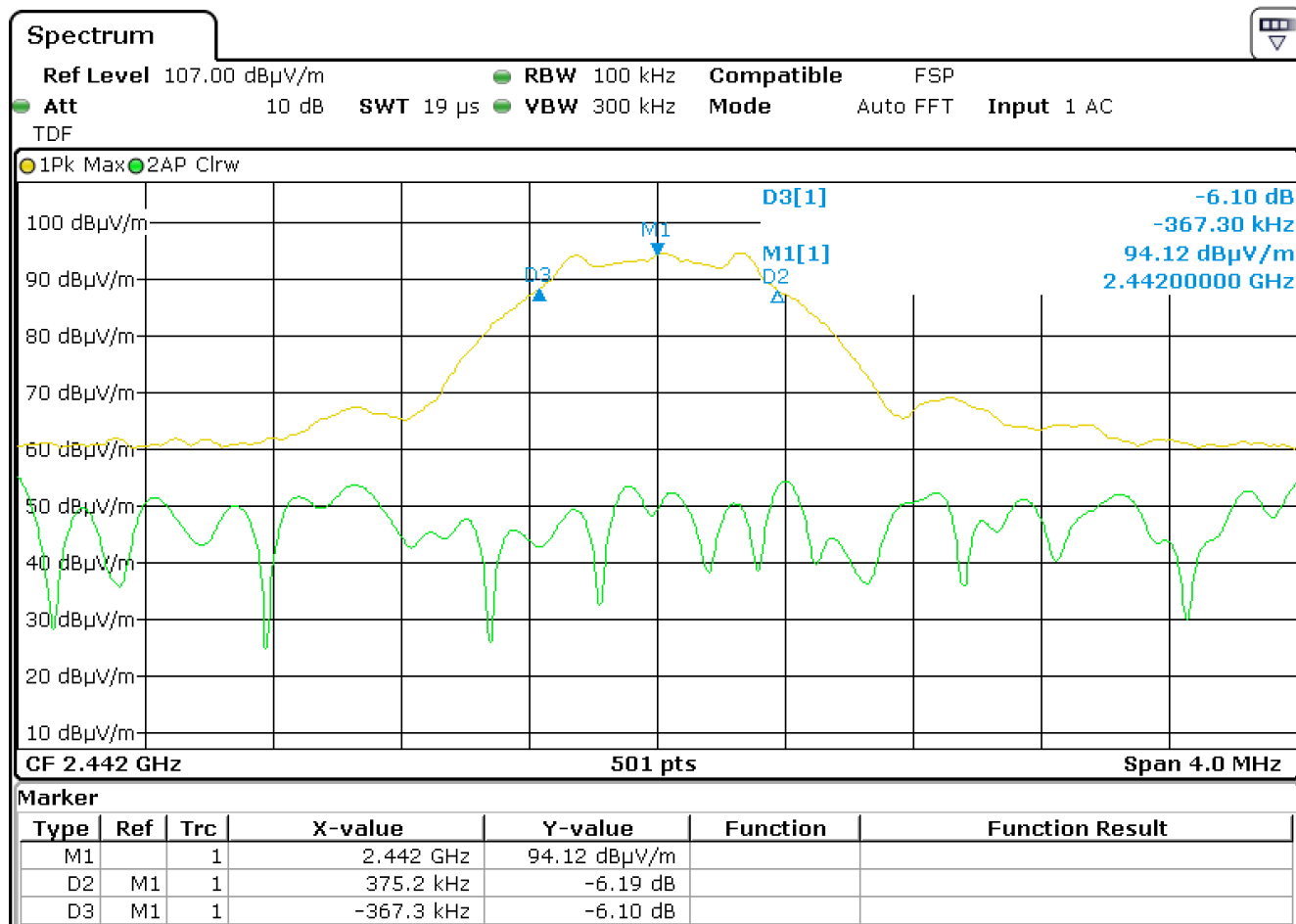
Blank cells = Permanent validity

-6 dB Bandwidth

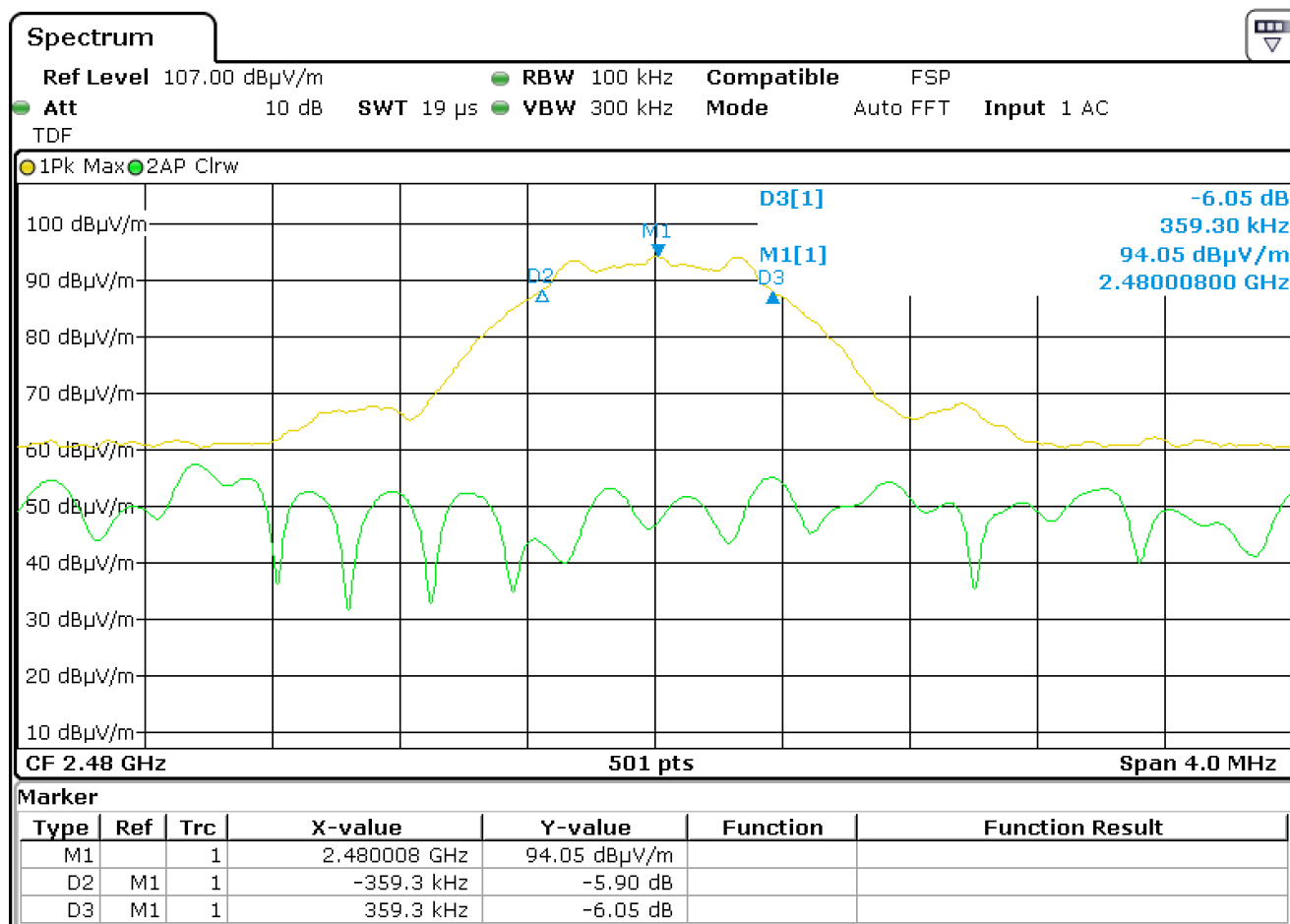
E.U.T. position	Frequency	Results (KHz)
On the table	2402 MHz	726.5



E.U.T. position	Frequency	Results (KHz)
On the table	2442 MHz	742.5

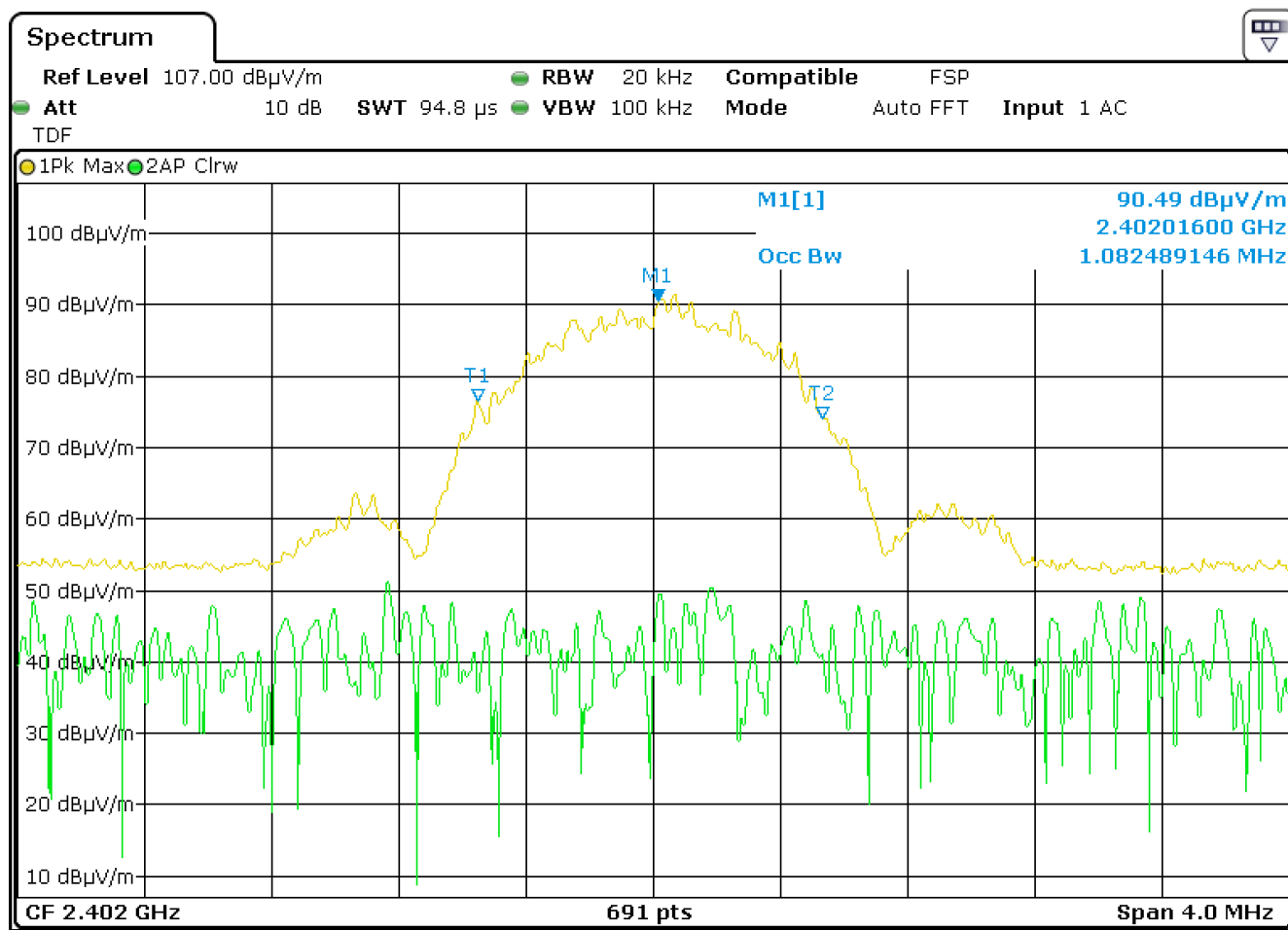


E.U.T. position	Frequency	Results (KHz)
On the table	2480 MHz	718.6

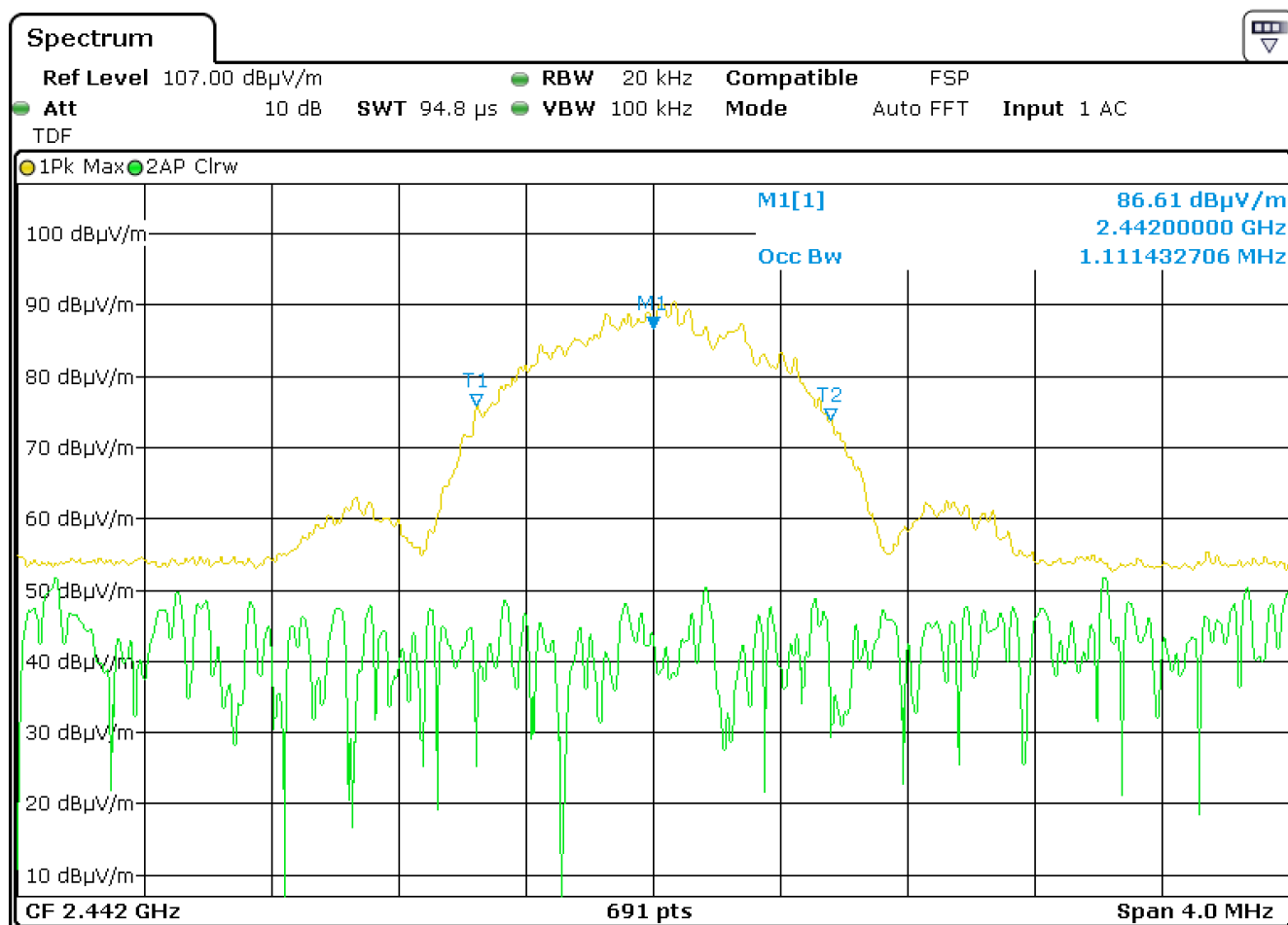


99% Bandwidth

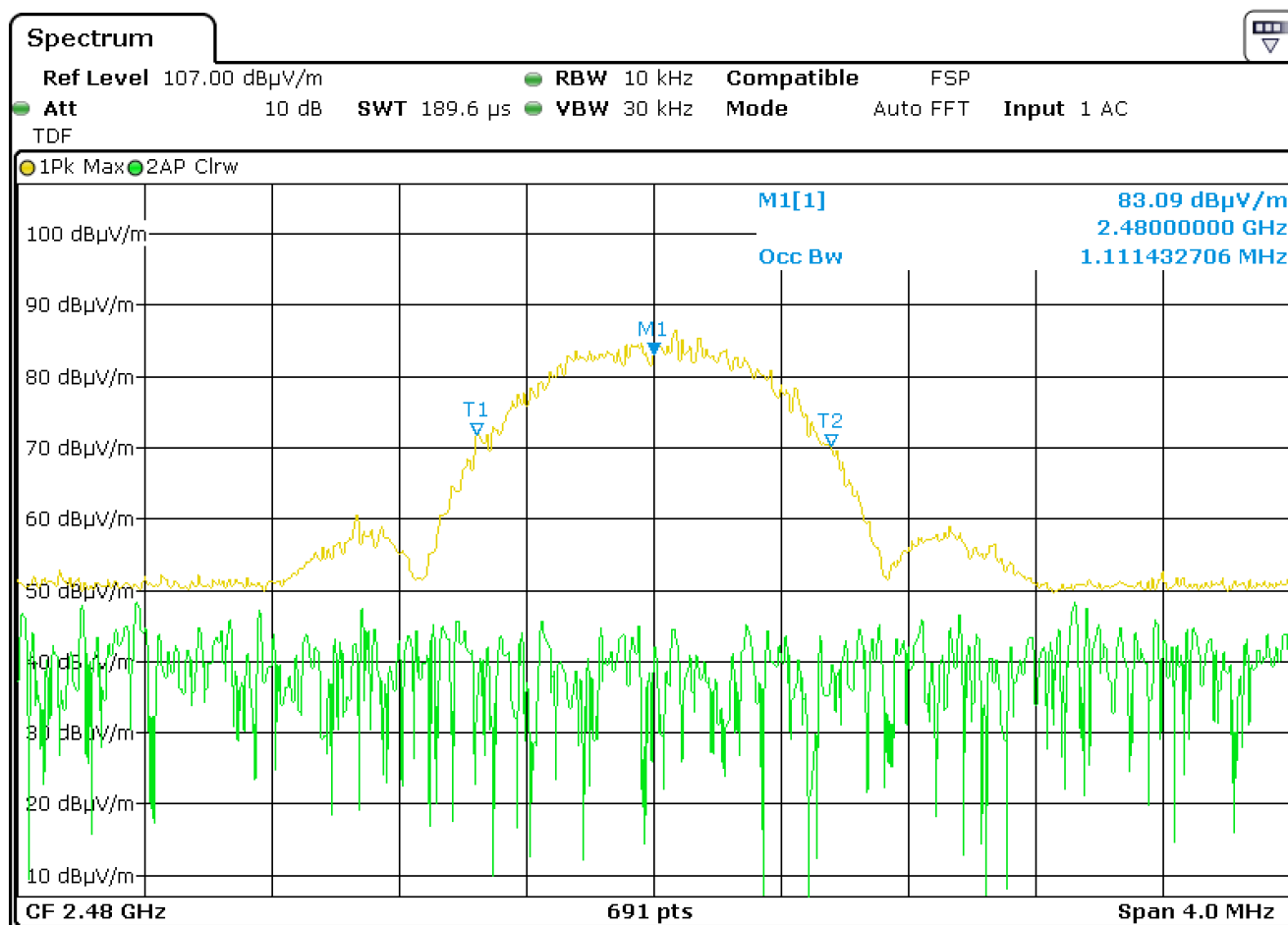
E.U.T. position	Frequency	Results (MHz)
On the table	2402 MHz	1.08



E.U.T. position	Frequency	Results (MHz)
On the table	2442 MHz	1.11



E.U.T. position	Frequency	Results (MHz)
On the table	2480 MHz	1.11



6.2. Transmitter output power

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-247 Issue 2 : 2017
Test method:	§ 15.247 b) (3) of FCC 47 CFR PART 15 : 2022 § 5.4 of RSS-247 Issue 2 : 2017
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 E.U.T.(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	Emco	3115	0941	01/03/2022	01/05/2025
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17272	01/07/2022	01/09/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	11/03/2022	11/05/2023

Blank cells = Permanent validity

FCC results

E.U.T. position	Frequency	Electro-magnetic field (dB μ V/m)	TP* (dBm)	Limit (dBm)
On the table	2402 MHz	95.6	-1.8	+ 30
On the table	2442 MHz	94.9	-2.5	+ 30
On the table	2480 MHz	94.6	-2.8	+ 30

* TP = $(E \times d)^2 / (30 \times 1.64)$ for d = 3 m

IC results

E.U.T. position	Frequency	Electro-magnetic field (dB μ V/m)	TP* (dBm)	Limit (dBm)
On the table	2402 MHz	95.7	-1.7	+ 30
On the table	2442 MHz	95.0	-2.4	+ 30
On the table	2480 MHz	94.6	-2.8	+ 30

* TP = $(E \times d)^2 / (30 \times 1.64)$ for d = 3 m

E.U.T. position:



6.3. Power Spectral Density

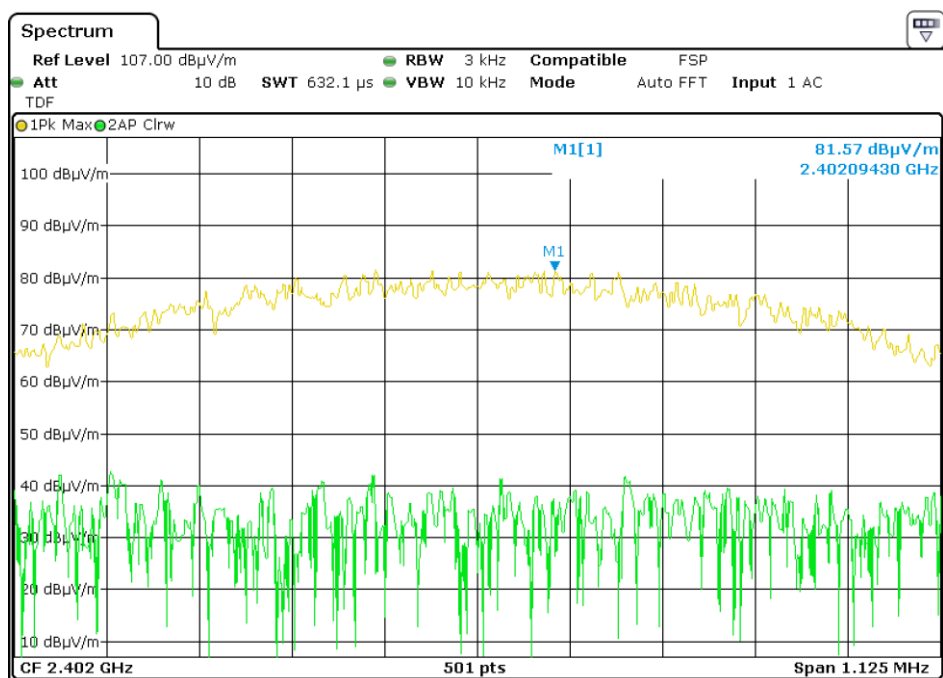
Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-247 Issue 2 : 2017
Test method:	§ 15.247 e) of FCC 47 CFR PART 15 : 2022 § 5.4 of RSS-247 Issue 2 : 2017
General test setup: E.U.T. is set on an insulating support at 150 cm above the ground reference plane. Measurement are done on a normalized test site. 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 E.U.T.(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: -		

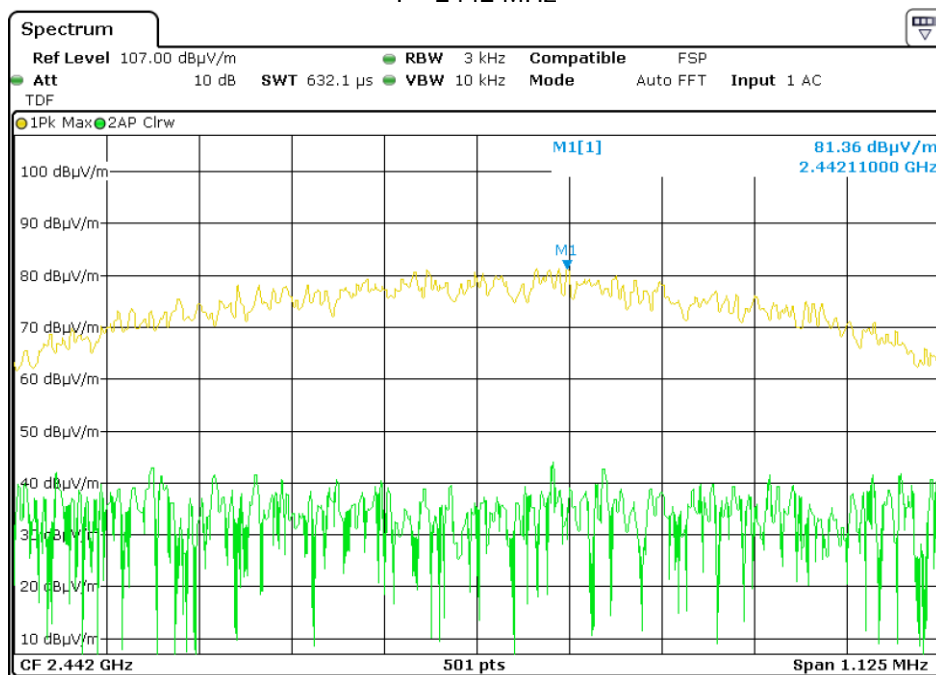
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Emco	3115	0941	01/03/2022	01/05/2025
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17272	01/07/2022	01/09/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	11/03/2022	11/05/2023

E.U.T. position	Frequency	Density level (dB μ V/m)	Density level (dBm)	Limit (dBm)
On the table	2402 MHz	81.6	-15.8	+ 8
On the table	2442 MHz	81.4	-16.0	+ 8
On the table	2480 MHz	80.9	-16.5	+ 8

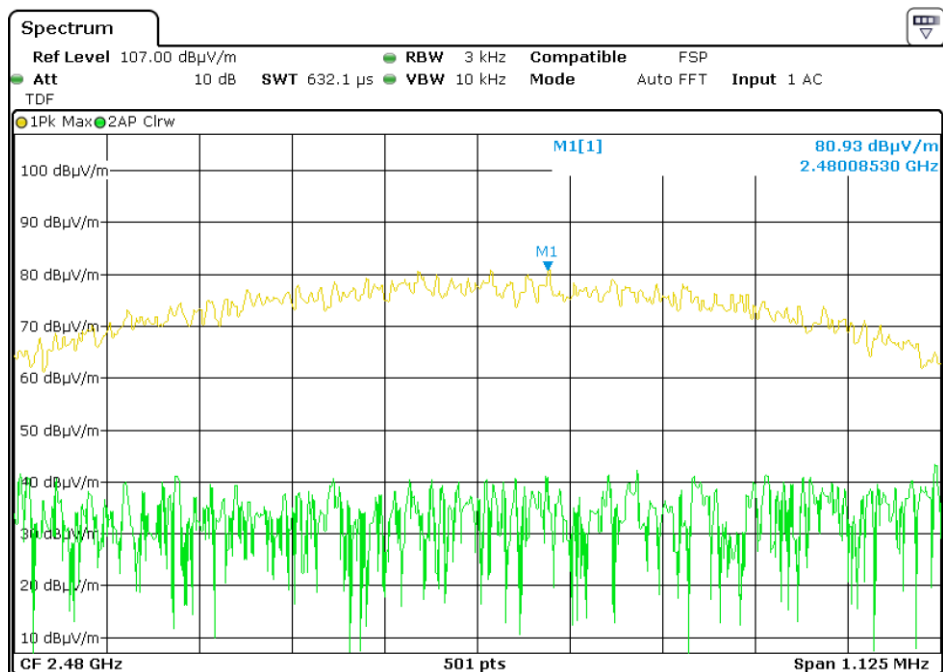
F=2402 MHz



F= 2442 MHz



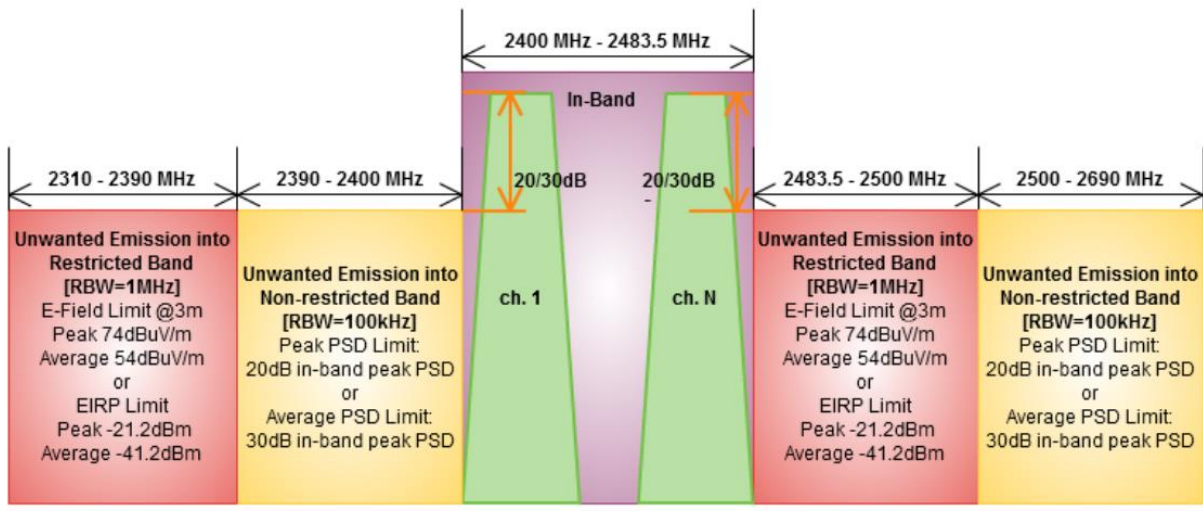
F= 2480 MHz



E.U.T. position:



6.4. Band edge

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-247 Issue 2 : 2017
Test method:	§ 15.247 (d) of FCC 47 CFR PART 15 : 2022
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 E.U.T.(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.	
 2.4GHz Band - Bandedge Emissions Limit	

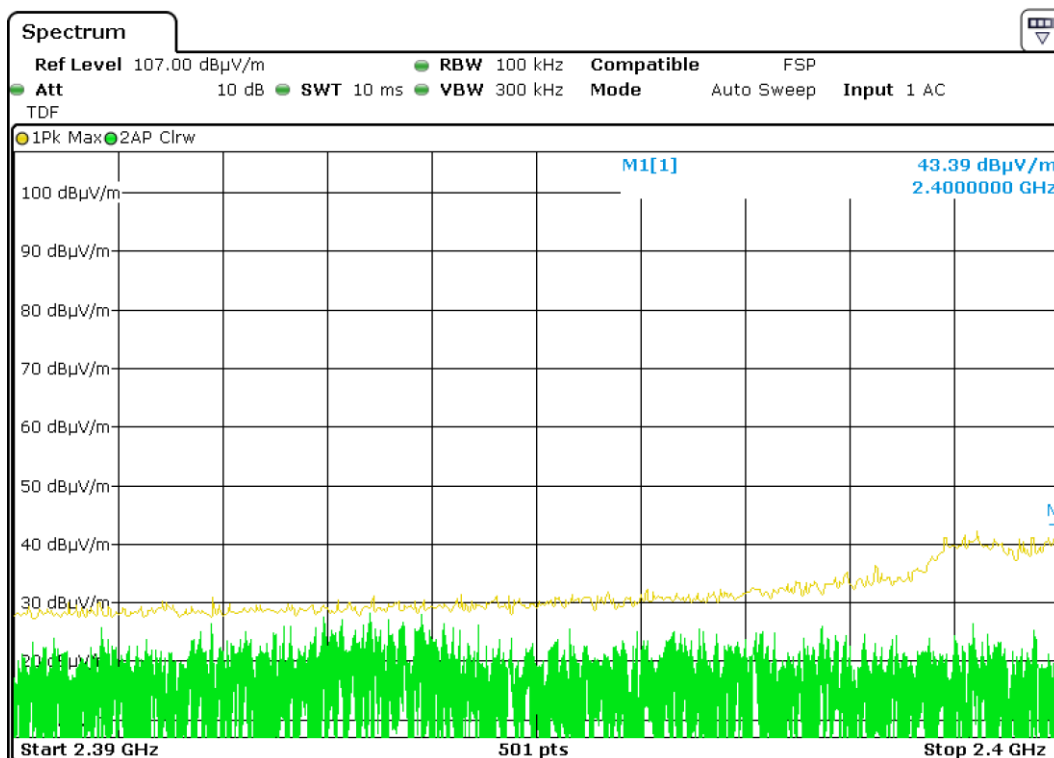
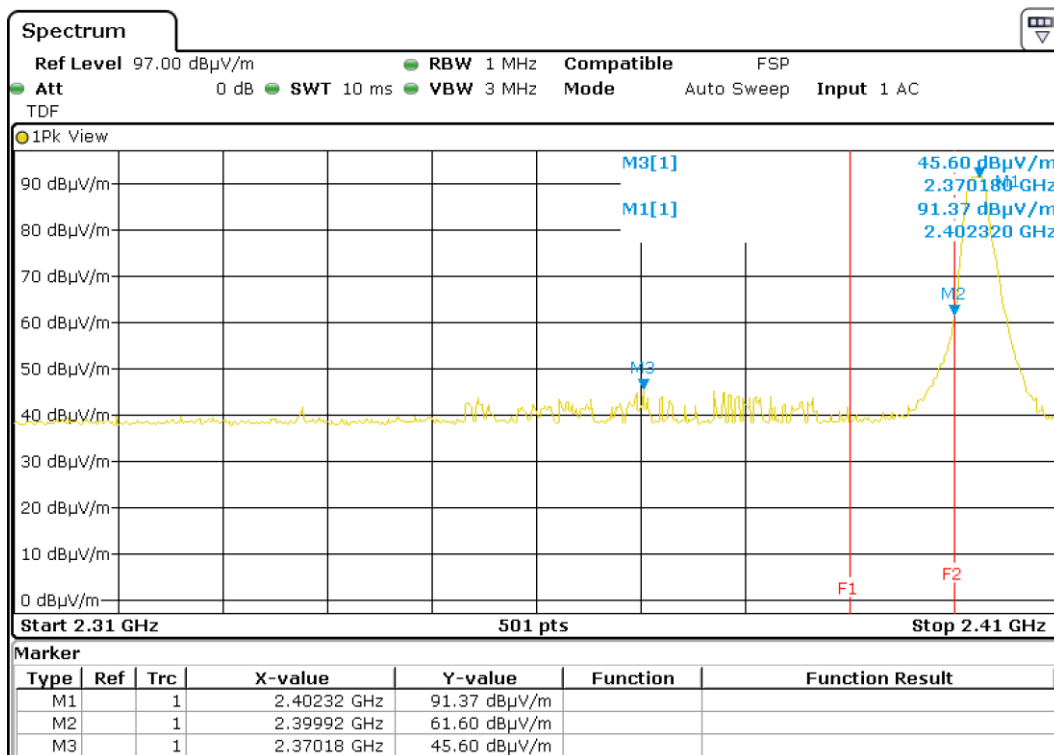
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	25°C
Relative Humidity	10 to 90 %	40 %
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

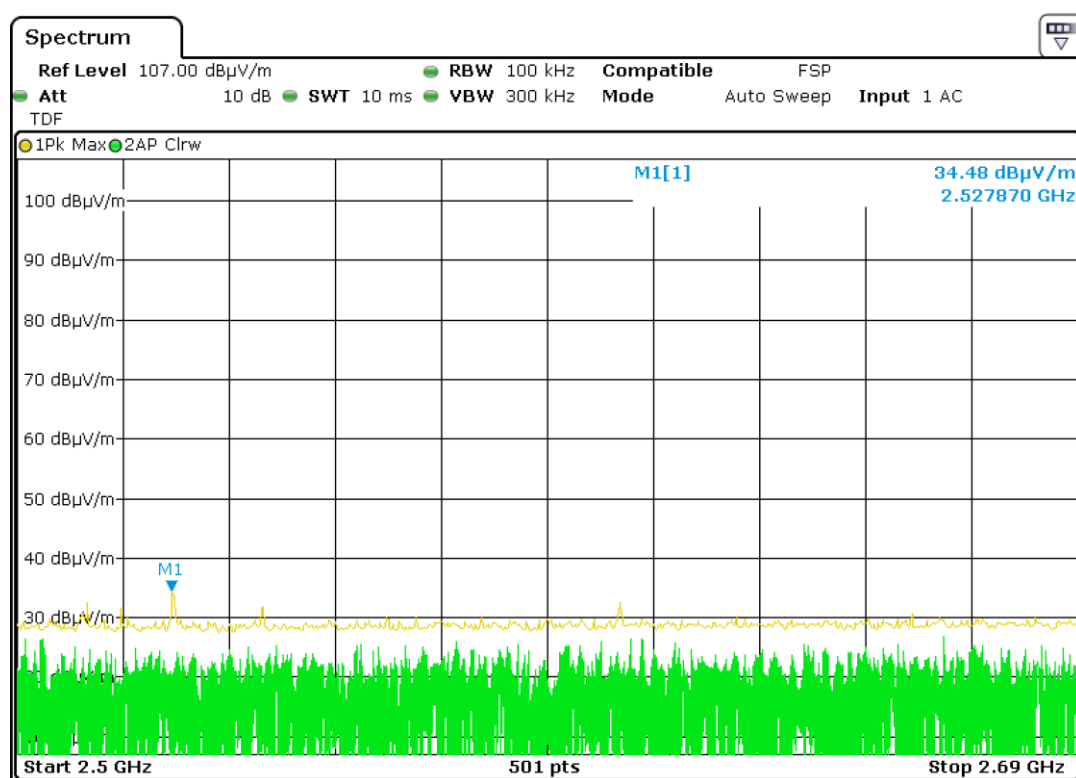
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Emco	3115	0941	01/03/2022	01/05/2025
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17272	01/07/2022	01/09/2024
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	11/03/2022	11/05/2023

E.U.T. position:

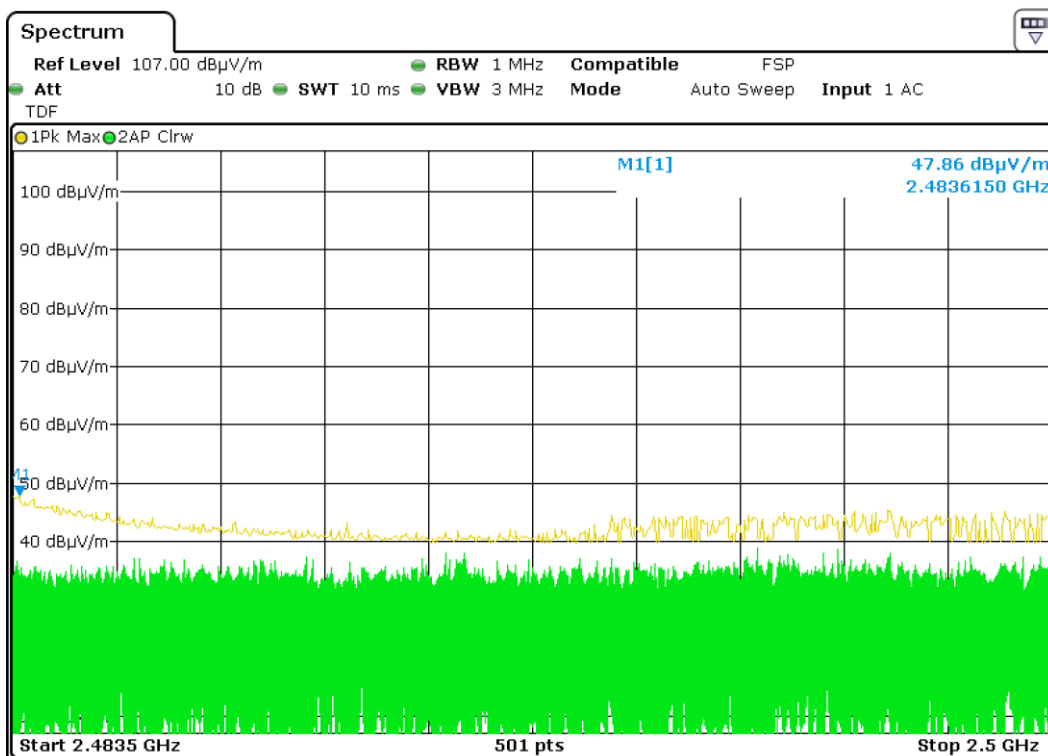
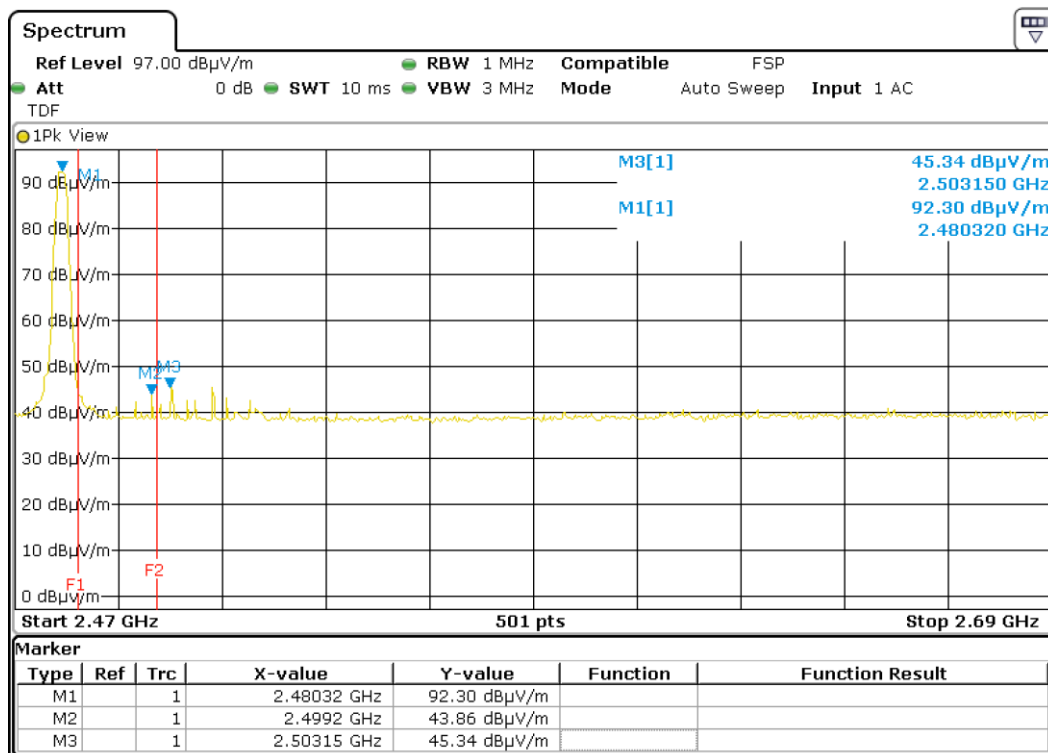


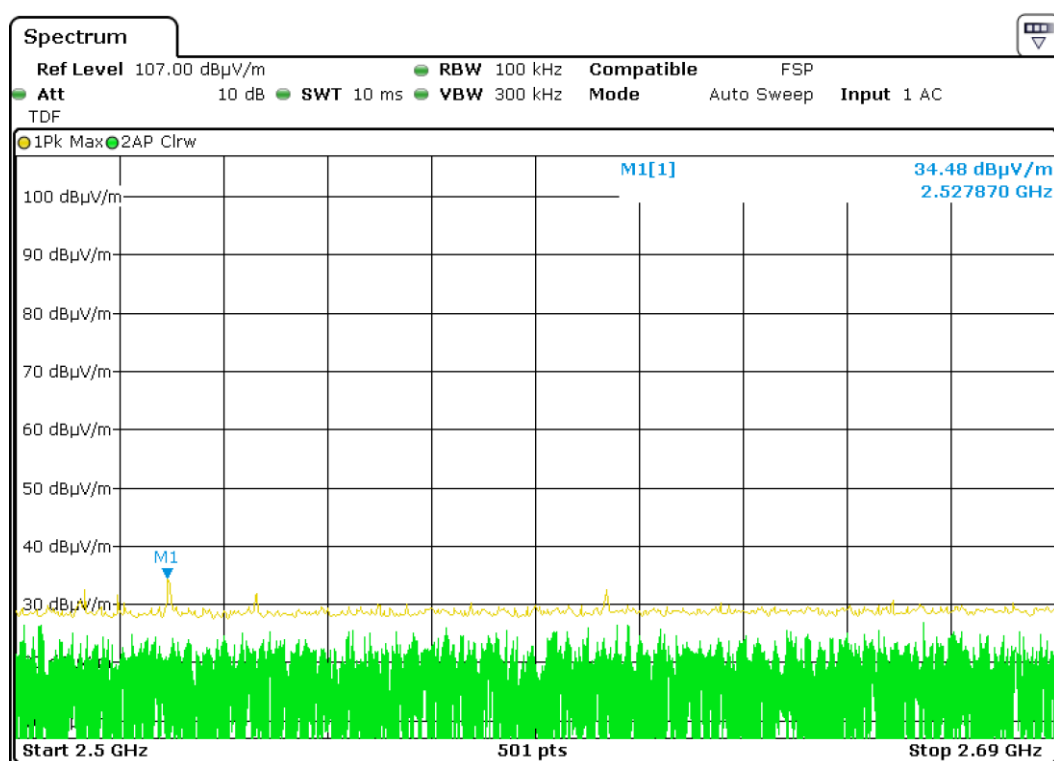
Frequency = 2402 MHz





Frequency = 2480 MHz





6.5. Intentional radiated emissions and transmitter unwanted emission in the band 9 kHz – 25 GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
Test method:	§ 15.205; § 15.209 and § 15.247 of FCC 47 CFR PART 15 : 2022 § 6.13 of RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
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 E.U.T. is performed in vertical and horizontal polarization.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Tx 2402 MHz channel - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Parallel antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2402 MHz channel - 45° antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2442 MHz channel - 45° antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2480 MHz channel - 45° antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2402 MHz channel - Perpendicular antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Perpendicular antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Perpendicular antenna	9kHz-30MHz	PASS
Maxhold 360° - Tx 2402 MHz channel - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2402 MHz channel - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Tx 2402 MHz channel - Horizontal polarization	1GHz-25GHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Horizontal polarization	1GHz-25GHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Horizontal polarization	1GHz-25GHz	PASS
Maxhold 360° - Tx 2402 MHz channel - Vertical polarization	1GHz-25GHz	PASS
Maxhold 360° - Tx 2442 MHz channel - Vertical polarization	1GHz-25GHz	PASS
Maxhold 360° - Tx 2480 MHz channel - Vertical polarization	1GHz-25GHz	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: The measurements are carried out manually, between 8 GHz and 25 GHz.		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Amplifier	HP	8447F H64	16970	28/03/2022	28/05/2023
Amplifier	HP	8449B	14524		
Antenna	Emco	6502	9579	16/08/2021	16/10/2023
Antenna	Schwarzbeck	VHA 9103	3426	05/10/2020	05/12/2023
Antenna	Oritel	CM 42/25	1045	01/03/2022	01/05/2025
Antenna	Schwarzbeck	UHALP 9108A	3106	02/10/2020	02/12/2023
Antenna	Emco	3115	0941	01/03/2022	01/05/2025
Antenna	A.H. Systems	SAS-571	5836	02/05/2022	02/07/2025
Cable	C&C	K-2m	11133	28/09/2022	28/11/2024
Cable	C&C	K-4m	11134	23/09/2022	23/11/2024
Cable	Huber + Suhner	N-10m	17265	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17272	01/07/2022	01/09/2024
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Filter	Trilithic	6HC1300-2.5-KK	1097	13/06/2022	13/08/2025
Filter	Micro-Tronics	HPM 14758	4691	13/06/2022	13/08/2025
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Shielded enclosure	Comtest	SAC 3m	14803		
Software	Nexio	BAT EMC	0000		
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	11/03/2022	11/05/2023

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

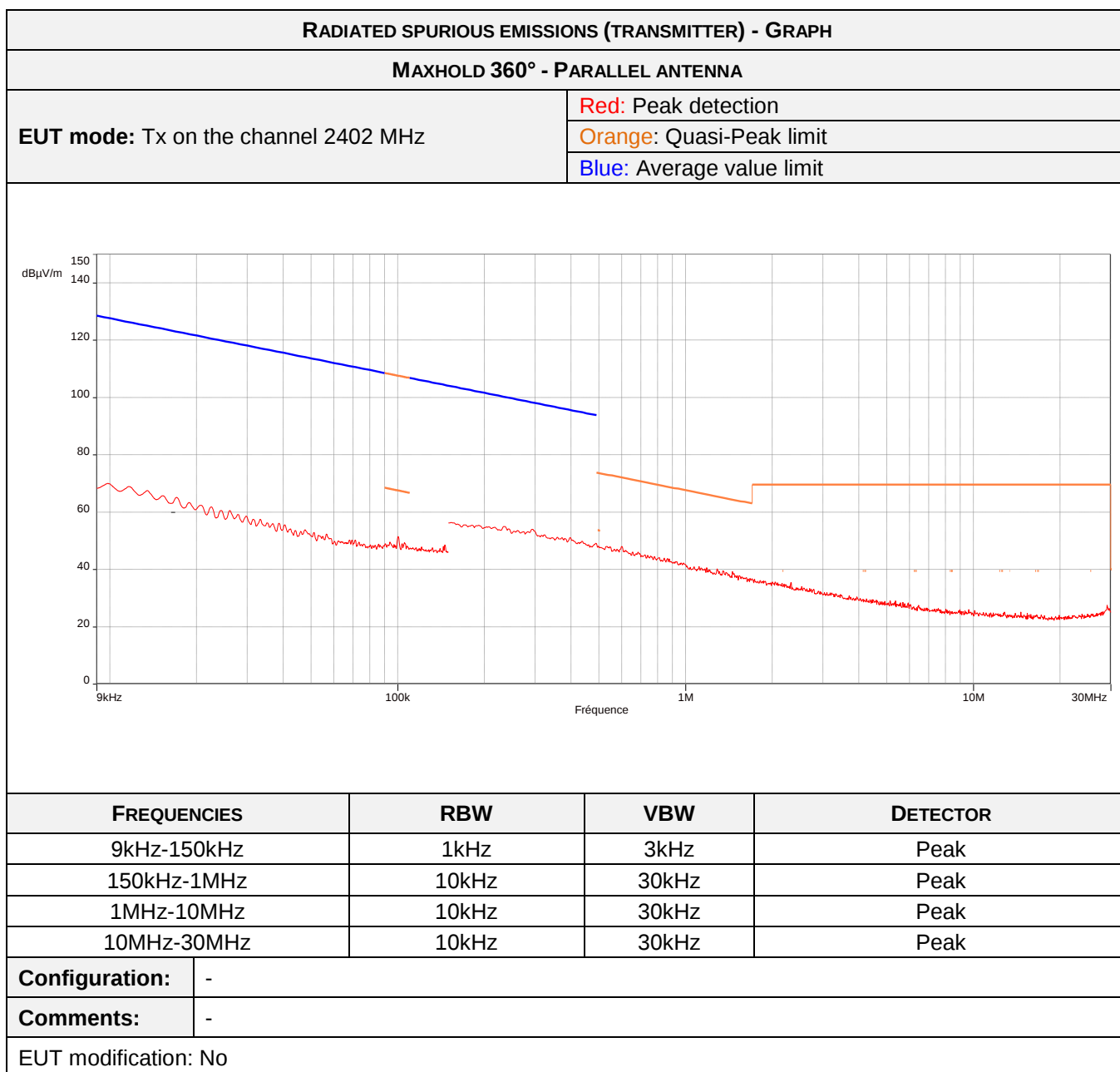


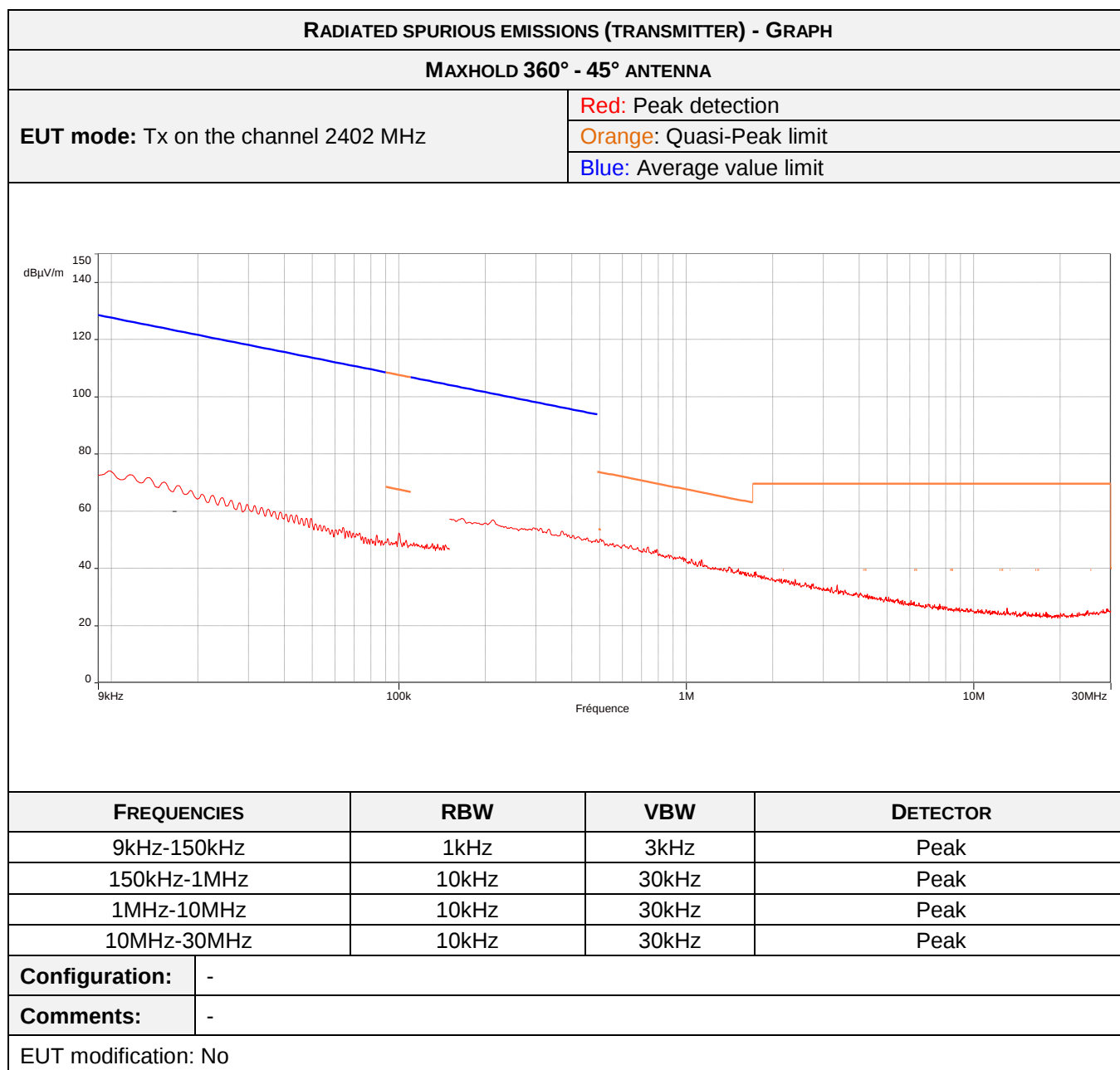
TEST SETUP PHOTO - 1GHz – 18GHz

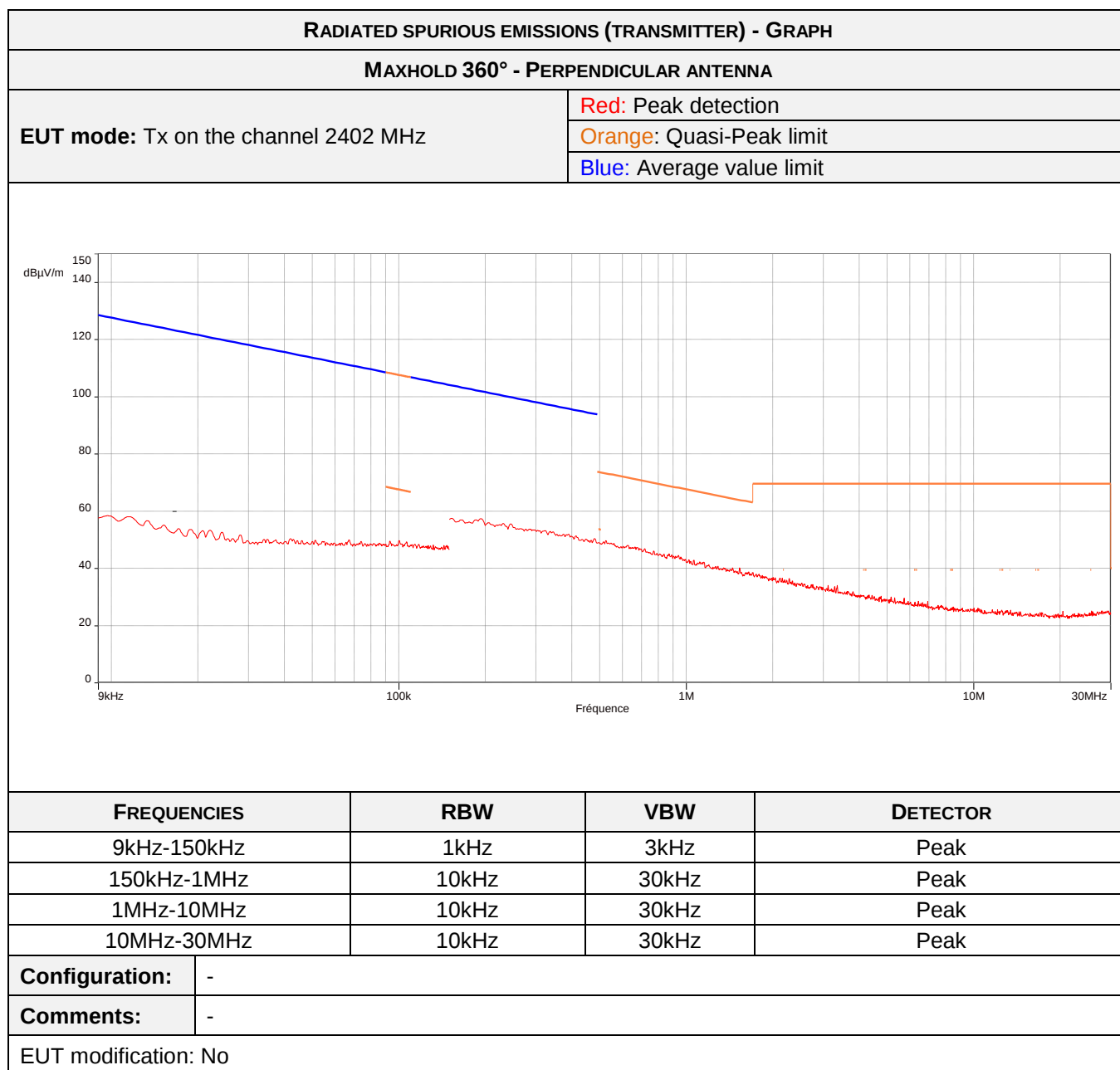


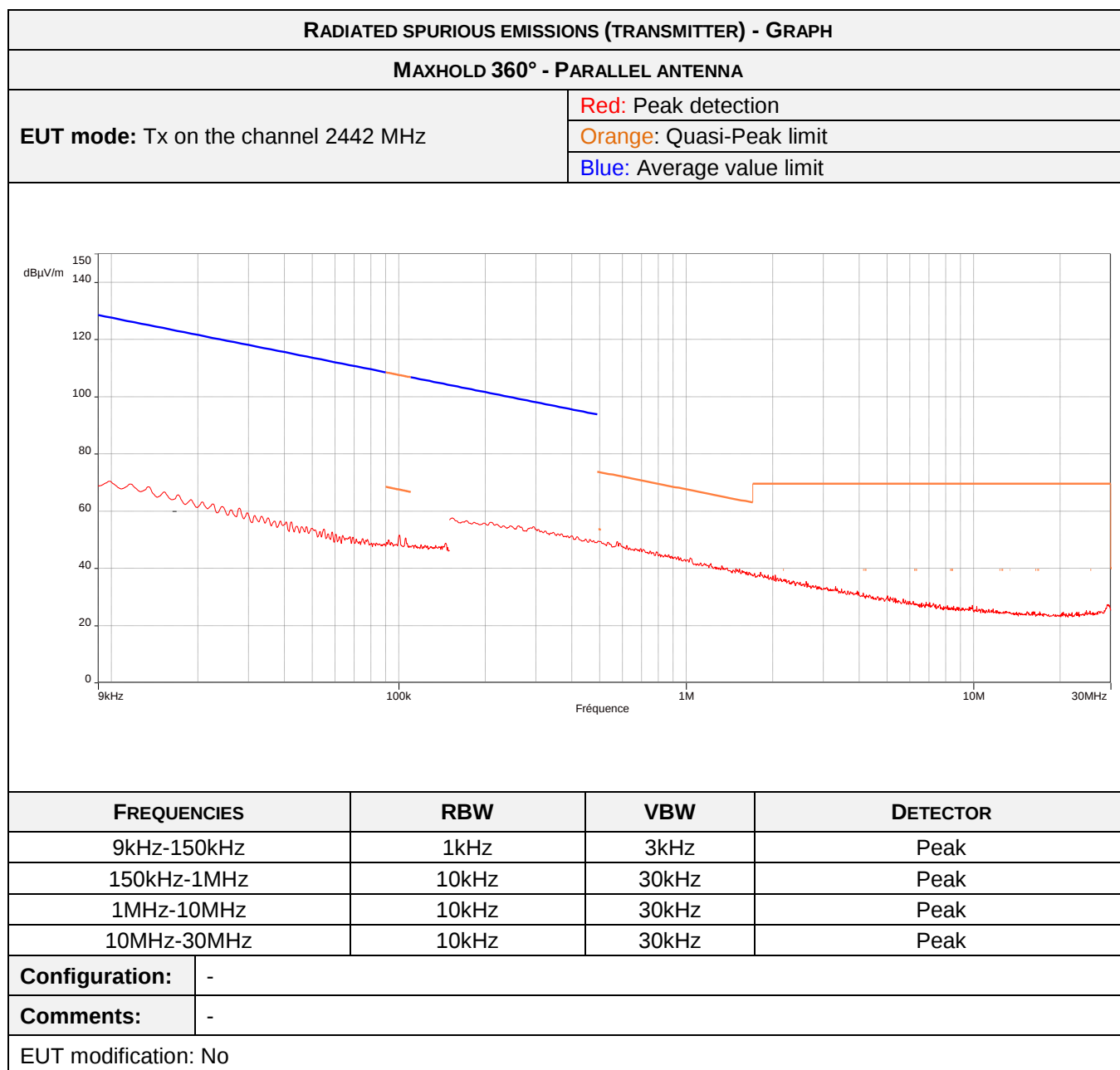
TEST SETUP PHOTO - 18GHz – 25GHz

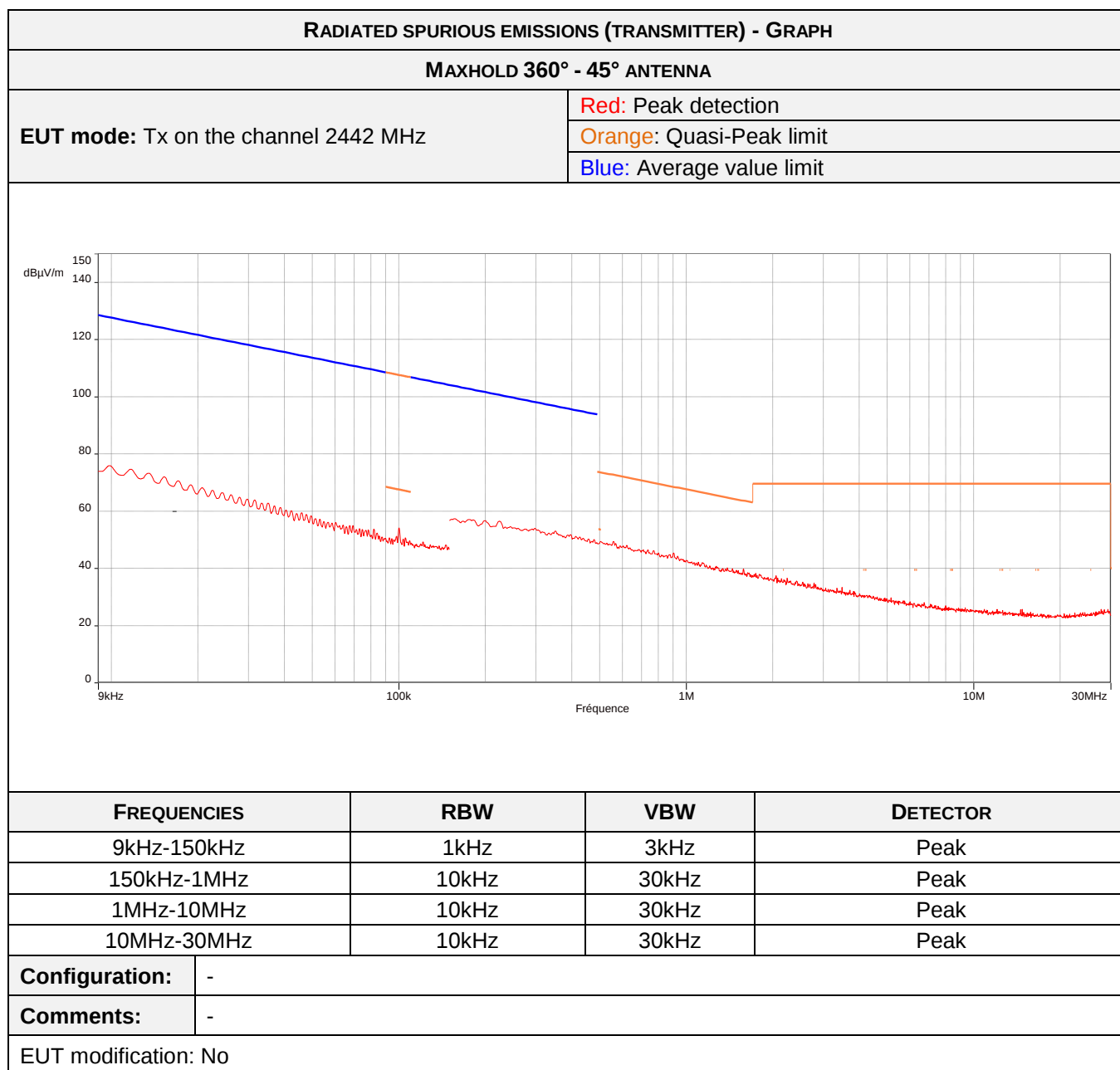


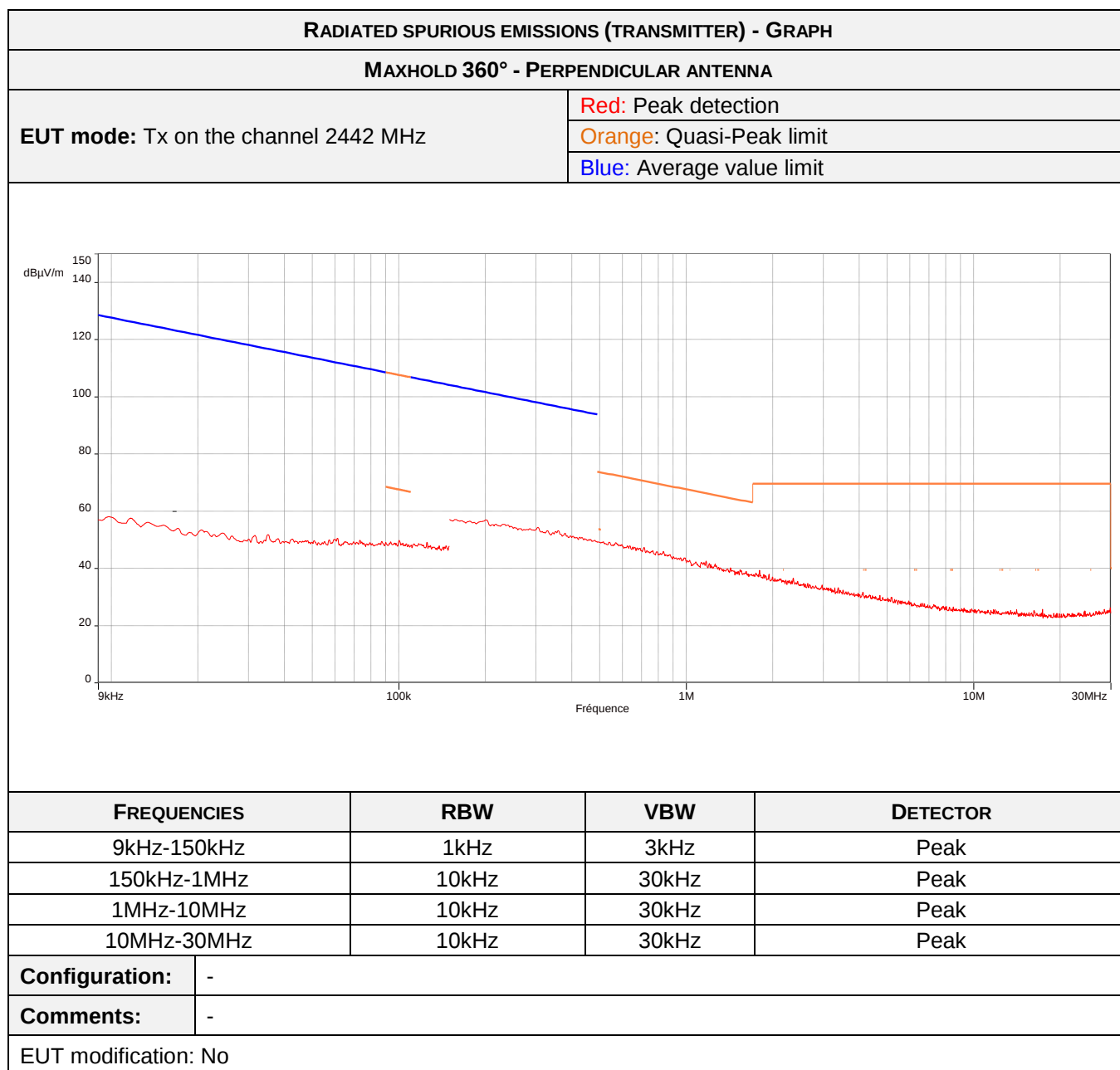








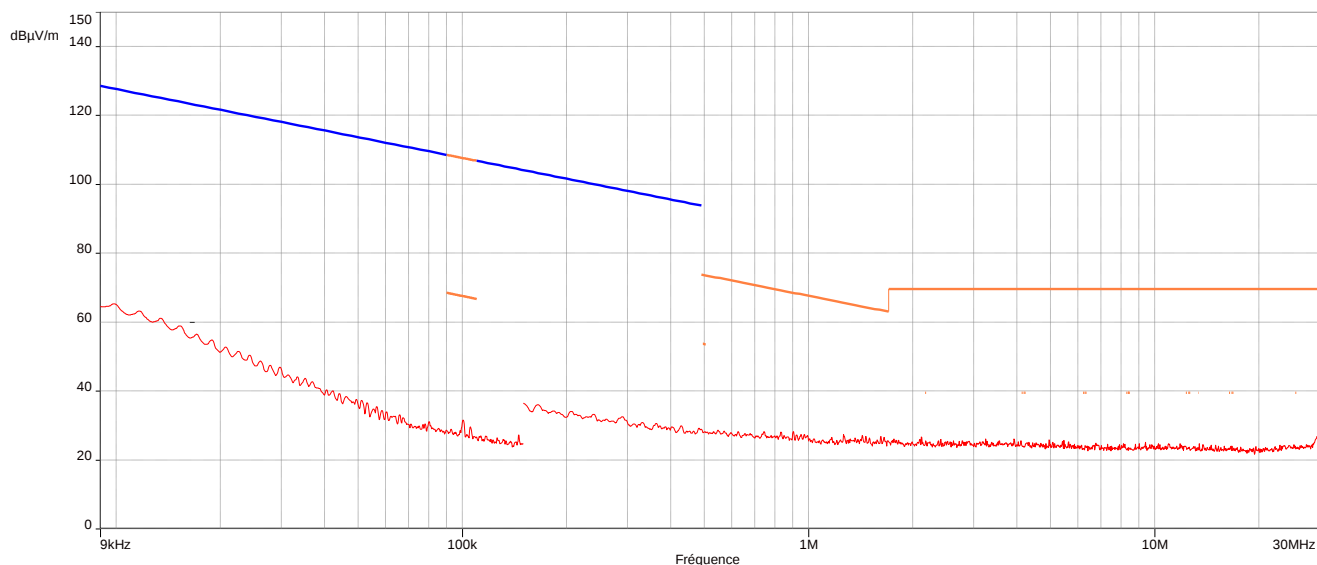




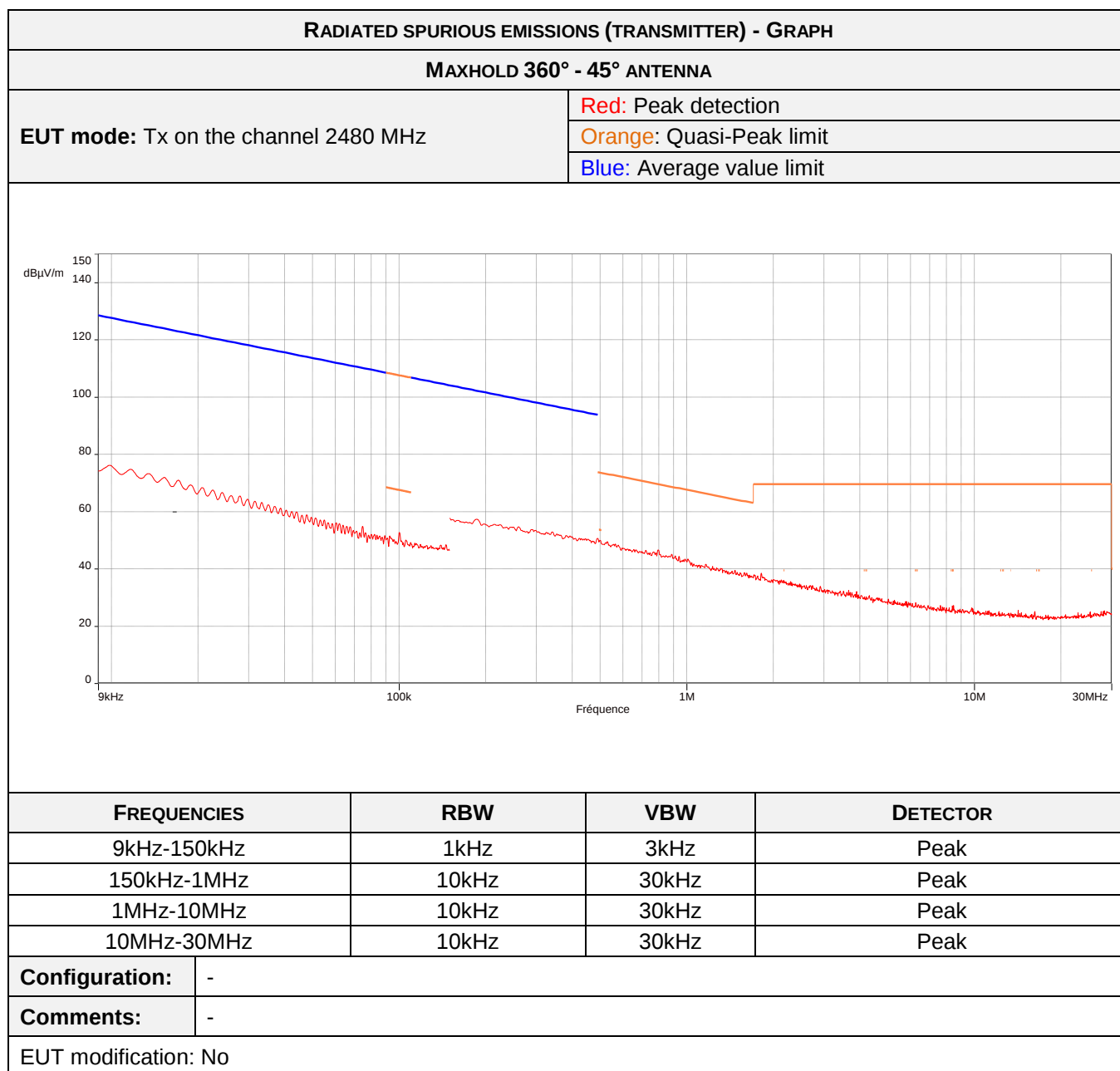
RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360° - PARALLEL ANTENNA
EUT mode: Tx on the channel 2480 MHz

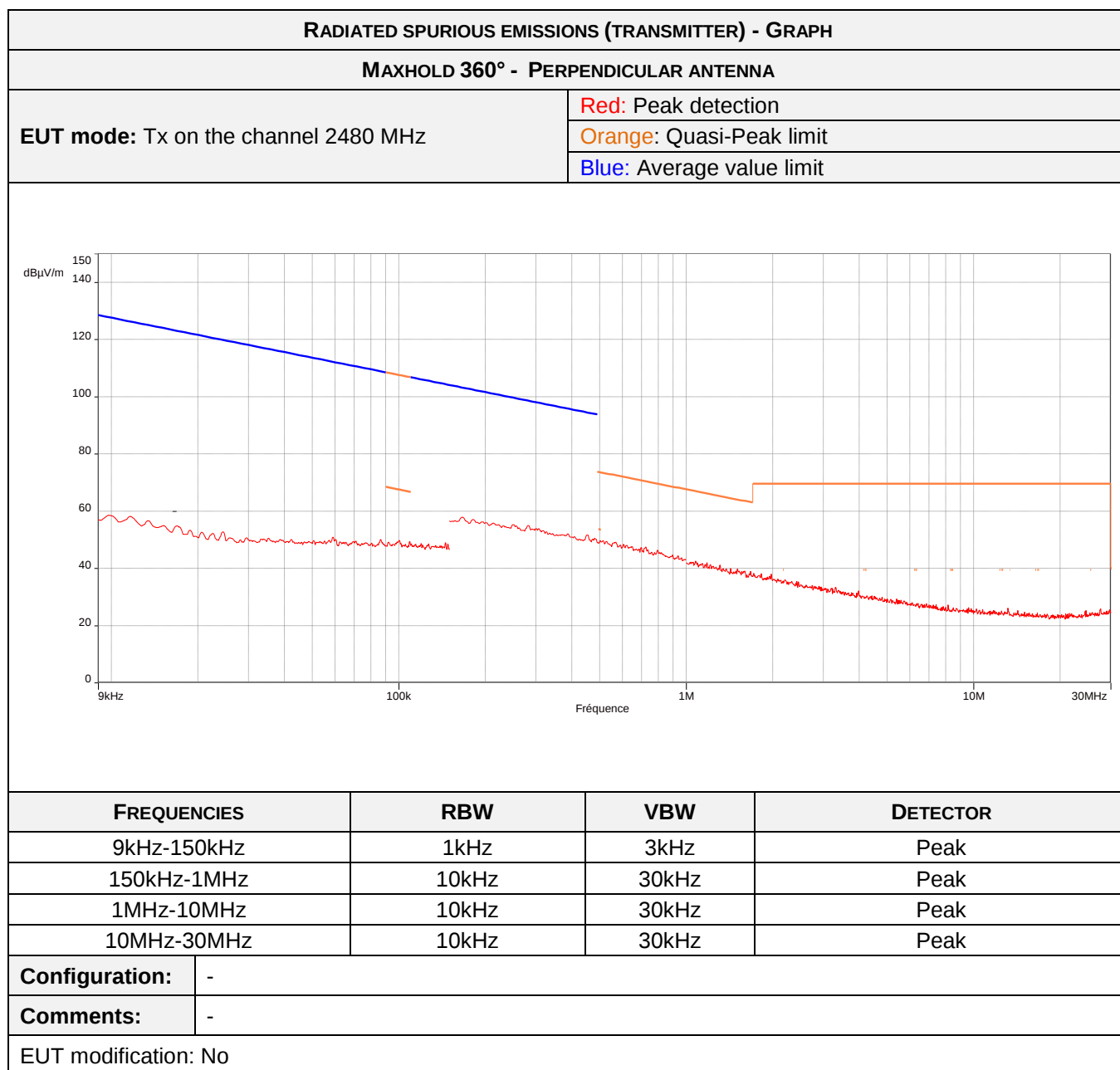
Red: Peak detection

Orange: Quasi-Peak limit

Blue: Average value limit


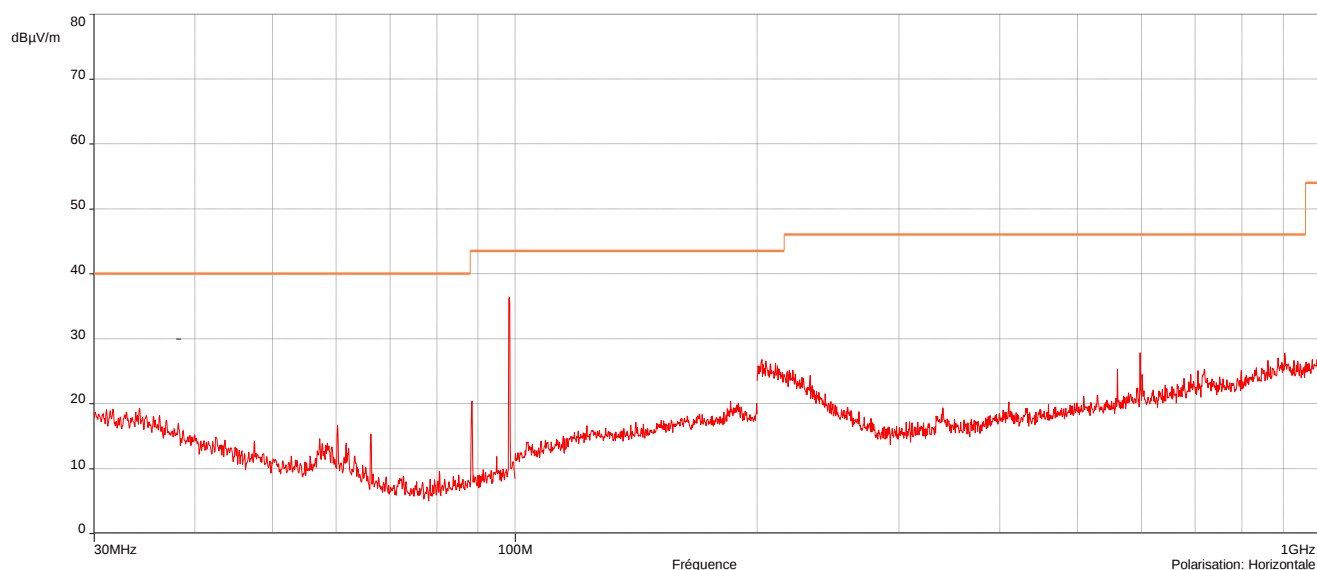
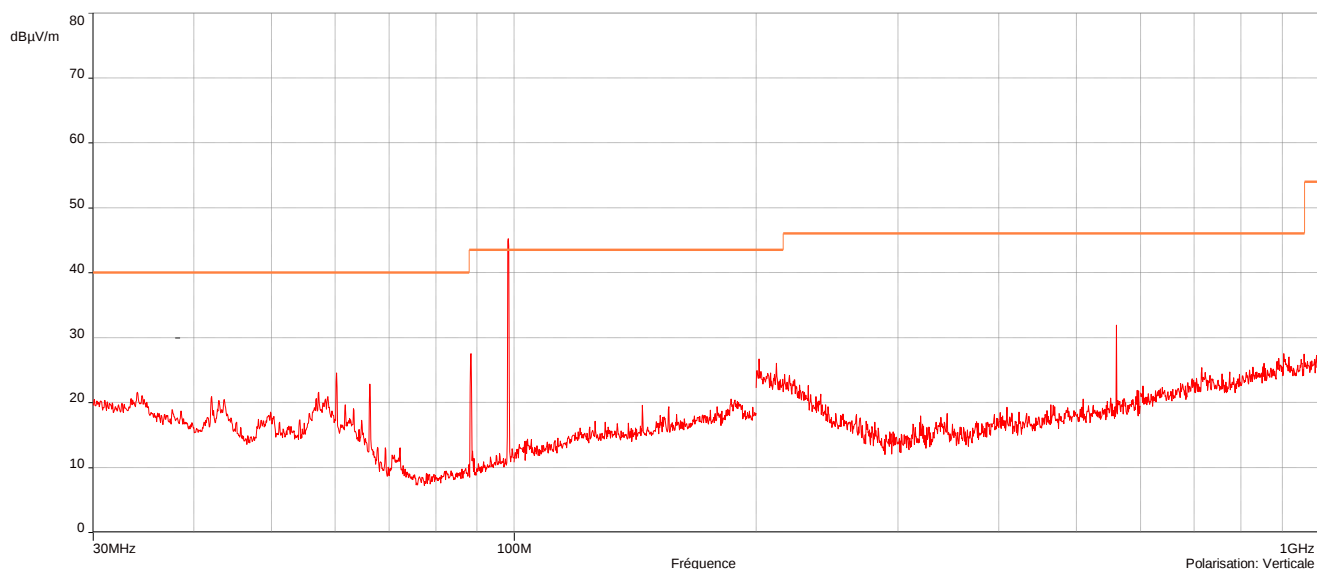
FREQUENCIES		RBW	VBW	DETECTOR
9kHz-150kHz		1kHz	3kHz	Peak
150kHz-1MHz		10kHz	30kHz	Peak
1MHz-10MHz		10kHz	30kHz	Peak
10MHz-30MHz		10kHz	30kHz	Peak
Configuration:	-			
Comments:	-			
EUT modification: No				





RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: Tx on the channel 2402 MHz

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:

The peaks frequencies at 88.4 MHz and 98.4 MHz are external frequencies due to emitters near the measurement site.

EUT modification: No

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH			
MAXHOLD 360°			
EUT mode: Tx on the channel 2442 MHz			
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 curves, measurements have been performed manually → N.T.R		
EUT modification: No			

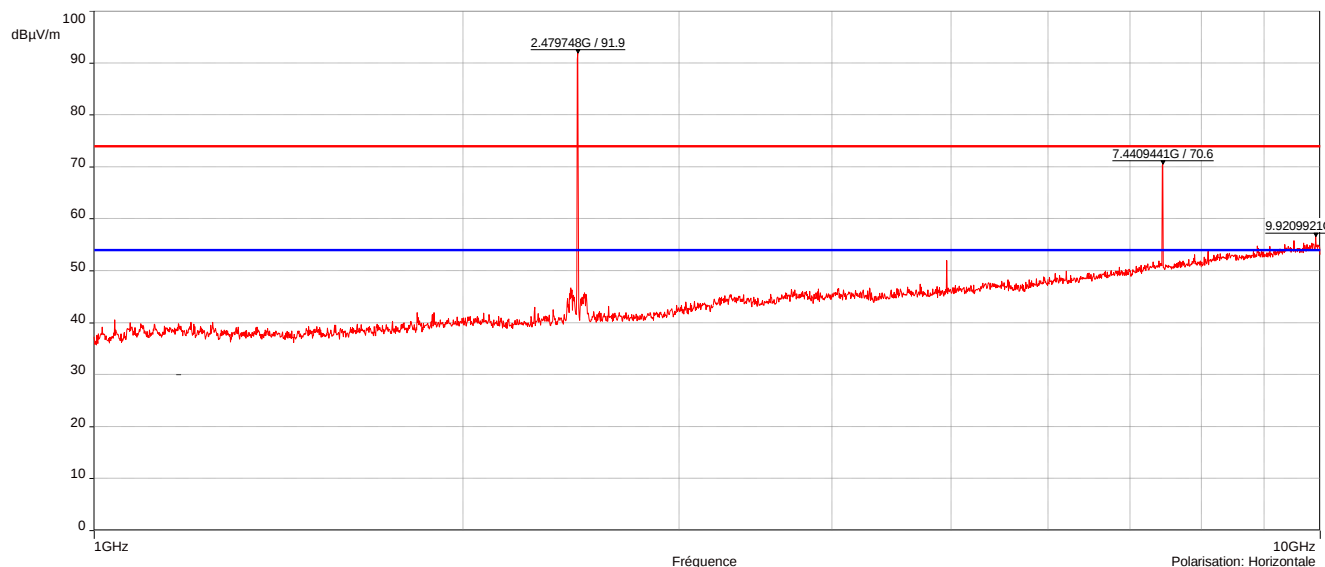
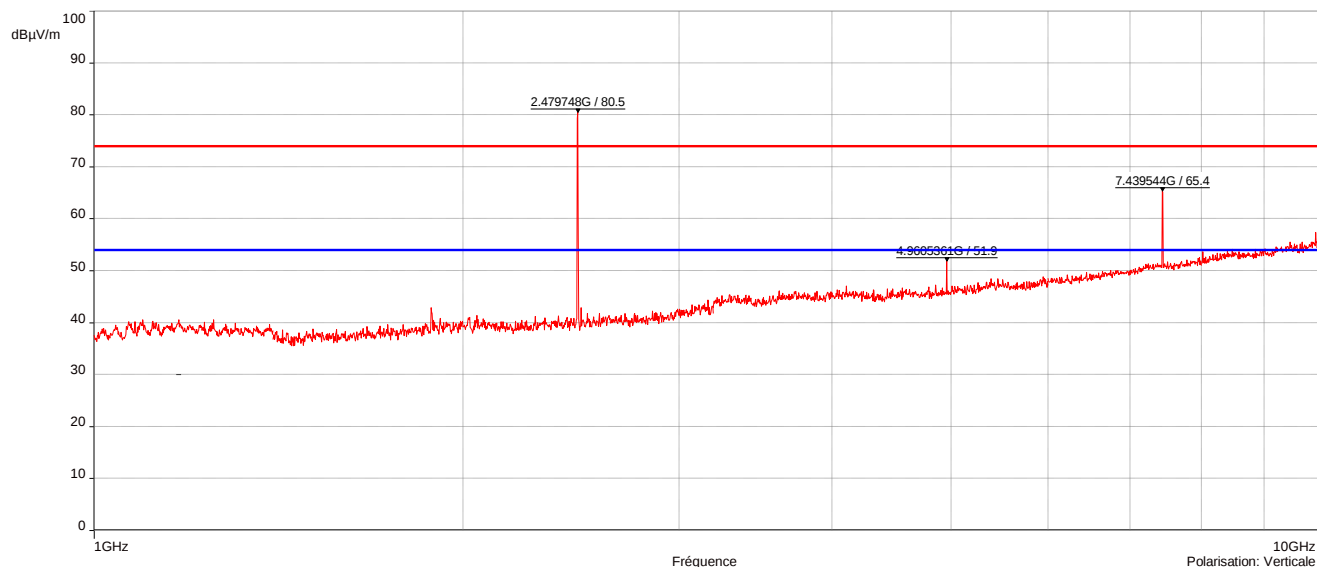
RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH			
MAXHOLD 360°			
EUT mode: Tx on the channel 2480 MHz			
FREQUENCIES	RBW	VBW	DETECTOR
30MHz-140MHz	100kHz	300kHz	Peak
140MHz-300MHz	100kHz	300kHz	Peak
300MHz-600MHz	100kHz	300kHz	Peak
600MHz-1GHz	100kHz	300kHz	Peak
Configuration:	-		
Comments:	No curves, measurements have been performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH			
MAXHOLD 360°			
EUT mode: Tx on the channel 2402MHz			
FREQUENCIES	RBW	VBW	DETECTOR
1GHz-3.2GHz	1MHz	3MHz	Peak
3.2GHz-6GHz	1MHz	3MHz	Peak
6GHz-9GHz	1MHz	3MHz	Peak
9GHz-12.75GHz	1MHz	3MHz	Peak
12.75GHz-15GHz	1MHz	3MHz	Peak
15GHz-18GHz	1MHz	3MHz	Peak
18GHz-20GHz	1MHz	3MHz	Peak
20GHz-23GHz	1MHz	3MHz	Peak
23GHz-25GHz	1MHz	3MHz	Peak
Configuration:	-		
Comments:	No curves, measurements have been performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH			
MAXHOLD 360°			
EUT mode: Tx on the channel 2442MHz			
FREQUENCIES	RBW	VBW	DETECTOR
1GHz-3.2GHz	1MHz	3MHz	Peak
3.2GHz-6GHz	1MHz	3MHz	Peak
6GHz-9GHz	1MHz	3MHz	Peak
9GHz-12.75GHz	1MHz	3MHz	Peak
12.75GHz-15GHz	1MHz	3MHz	Peak
15GHz-18GHz	1MHz	3MHz	Peak
18GHz-20GHz	1MHz	3MHz	Peak
20GHz-23GHz	1MHz	3MHz	Peak
23GHz-25GHz	1MHz	3MHz	Peak
Configuration:	-		
Comments:	No curves, measurements have been performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360°
EUT mode: Tx on the channel 2480MHz

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
6GHz-9GHz		1MHz	3MHz	Peak
9GHz-12.75GHz		1MHz	3MHz	Peak
12.75GHz-15GHz		1MHz	3MHz	Peak
15GHz-18GHz		1MHz	3MHz	Peak
18GHz-20GHz		1MHz	3MHz	Peak
20GHz-23GHz		1MHz	3MHz	Peak
23GHz-25GHz		1MHz	3MHz	Peak
Configuration:	-			
Comments:	Between 8GHz to 25GHz, measurements have been made in manually. No significant frequency has been found. 2.48 GHz is carrier frequency of BLE.			
EUT modification: No				

SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 30 MHz – 1 GHz									
Test Freq. (GHz)	Meter Reading (dBμV)	Detector (Pk/QP/Av)	Ant. position	Azimuth (°)	Ant. Height (cm)	Duty cycle factor* (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4.96	/	Av	Horizontal	15	180	20	47.2	54.0	6.8
7.44	/	Av	Horizontal	140	140	20	29.0	54.0	25.0
9.92	/	Av	Horizontal	0	150	20	44.7	54.0	9.3
Supplementary information: No									

*: With a duty cycle of 10% for more information see ANSI C63.10 §11.12.2.5.2

6.6. Unintentional radiated emissions in the band 30 MHz – 25 GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
Test method:	§ 15.109 of FCC 47 CFR PART 15 : 2022 § 6.13 of RSS-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021
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 E.U.T. is performed in vertical and horizontal polarization.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Radio OFF - Horizontal polarization	30MHz-1GHz	PASS
Maxhold 360° - Radio OFF - Vertical polarization	30MHz-1GHz	PASS
Maxhold 360° - Radio OFF - Horizontal polarization	1GHz-25GHz	PASS
Maxhold 360° - Radio OFF - Vertical polarization	1GHz-25GHz	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	HP	8447F H64	16970	28/03/2022	28/05/2023
Amplifier	HP	8449B	14524		
Antenna	Schwarzbeck	VHA 9103	3426	05/10/2020	05/12/2023
Antenna	Oritel	CM 42/25	1045	01/03/2022	01/05/2025
Antenna	Schwarzbeck	UHALP 9108A	3106	02/10/2020	02/12/2023
Antenna	Emco	3115	0941	01/03/2022	01/05/2025
Antenna	A.H. Systems	SAS-571	5836	02/05/2022	02/07/2025
Cable	C&C	K-2m	11133	28/09/2022	28/11/2024
Cable	C&C	K-4m	11134	23/09/2022	23/11/2024
Cable	Huber + Suhner	N-10m	17265	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17272	01/07/2022	01/09/2024
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Filter	Trilithic	6HC1300-2.5-KK	1097	13/06/2022	13/08/2025
Filter	Micro-Tronics	HPM 14758	4691	13/06/2022	13/08/2025
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14622	27/04/2022	27/06/2025
Shielded enclosure	Comtest	SAC 3m	14803		
Software	Nexio	BAT EMC	0000		
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	11/03/2022	11/05/2023

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

TEST SETUP PHOTOS - 30MHz – 1GHz

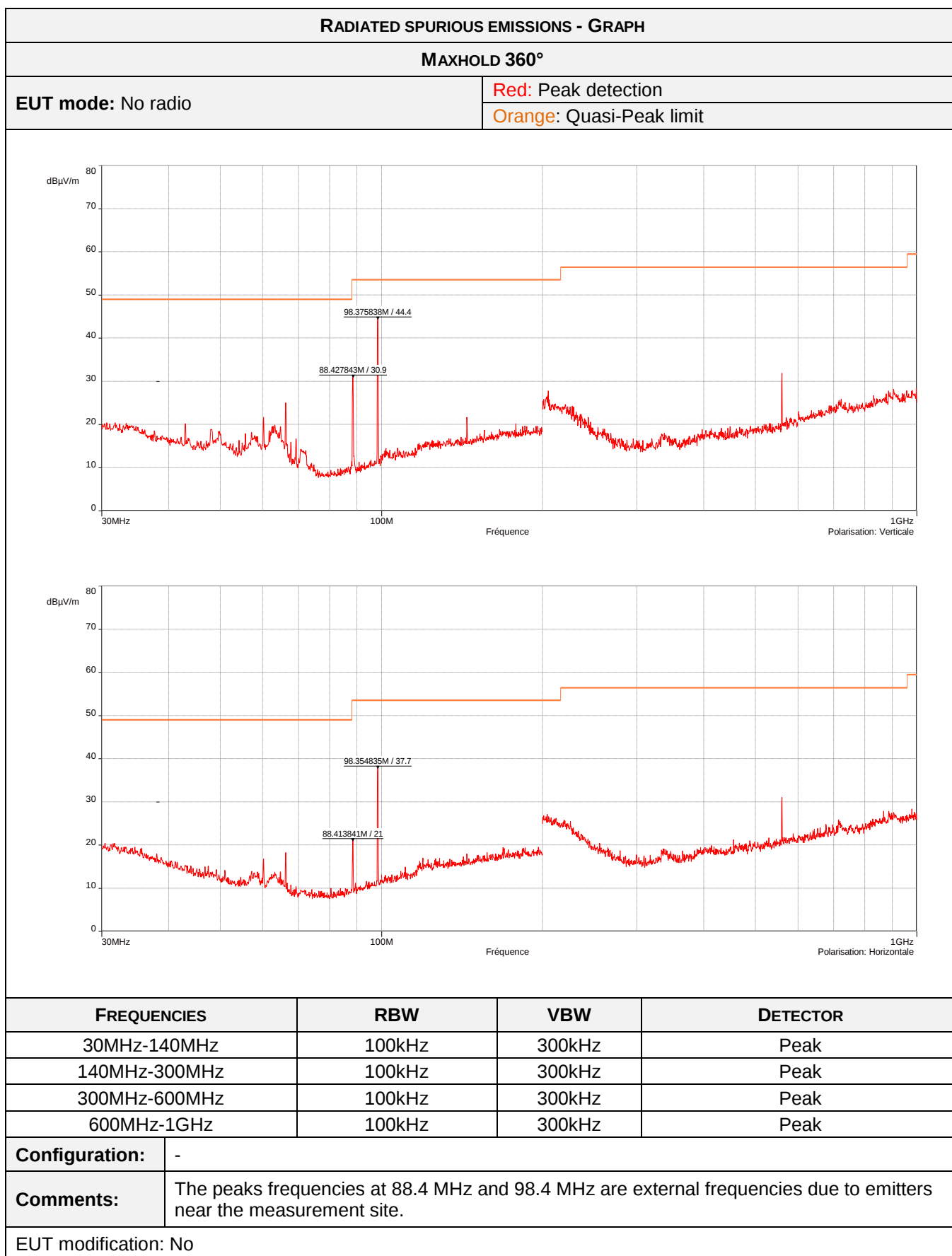


TEST SETUP PHOTO - 1GHz – 18GHz

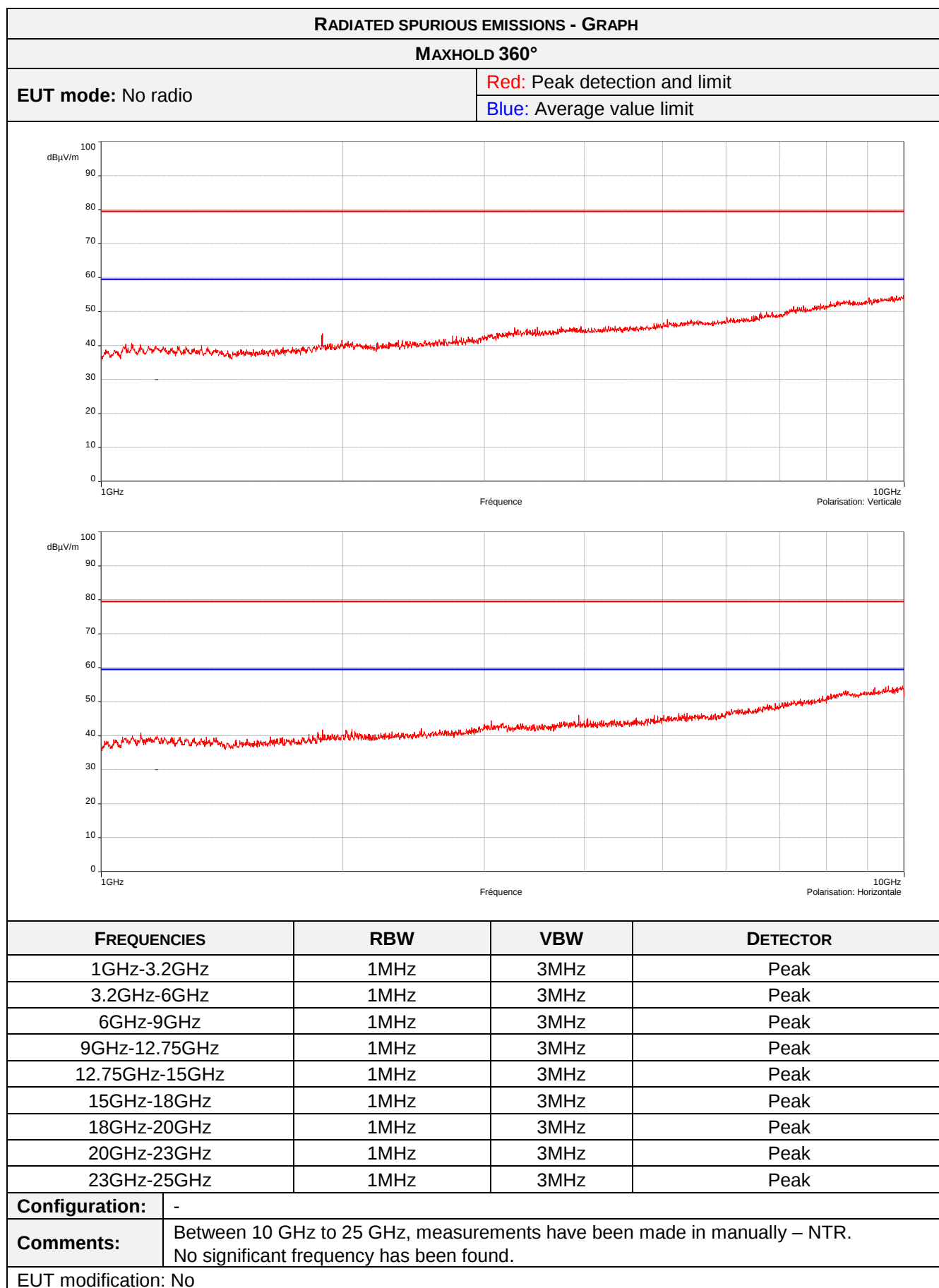


TEST SETUP PHOTO - 18GHz – 25GHz





SPURIOUS EMISSIONS - TABULATED RESULTS									
MAXHOLD 360° - 30 MHz – 1 GHz – RADIO OFF									
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)
-	-	-	-	-	-	-	-	-	-
Supplementary information: No									



End of test report