

"This report cancels and replaces the test report N° RRA-EMIESS22L909MAS-02A 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 (§15.225)

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. : *RFID reader*
Trade Mark. : MASTernaut
Manufacturer..... : MASTernaut
Model/Type reference..... : HMI
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-EMIESS22L909MAS-02A v1**
Test procedure. : FCC and CANADA marking
Diffusion..... : Mr. SAUDE
Applicant's name. : MASTernaut
Date of issue..... : 02/11/2022
Total number of pages..... : 34
Revision..... : 2
Compiled by..... : C. ZIMMERMANN (Tests Technician)
Approved by (+ signature). :

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
v0	28/07/2022	Creation	
v1	17/10/2022	1, 5, 6, 7	Correction of EUT description
	02/11/2022	2,28,29,30,31	Add 20 dB bandwidth and 99% Occupied bandwidth chapter

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	21/07/22		
Dates of performance of tests	From 21 to 28/07/2022		
APPLICANT'S GENERAL INFORMATION:			
Company name	MASTERNAUT		
Company address.	1 Avenue des Falaises 27100 VAL DE REUIL France		
Persons 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.	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-Gen Issue 5 : 2018 / AMD1 : 2019 / AMD2 : 2021

General Requirements and Information for the Certification of Radio Apparatus

RSS-210_Issue 10 : December 2019

Licence-Exempt Radio Apparatus: Category I Equipment

ANSI C63.10 : 2013

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

INFORMATIVE REFERENCES:

/

3. EQUIPMENT TECHNICAL DESCRIPTION

3.1. Test Conditions

Test item description. : *RFID Reader*
Model/Type reference..... : *HMI*
Trade Mark. : *MASTERNAUT*
Serial number (S/N)..... : *72031200*
Part number (P/N). : *72031200*
Software version..... : *v1.3.2*
Firmware version. : *v1.3.2*
Fcc ID : *2A8SB30158*
N°IC : *29178-30158*
Type of sample. : *Serial production*
Function..... : *User interface, driver identification and behavior*
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

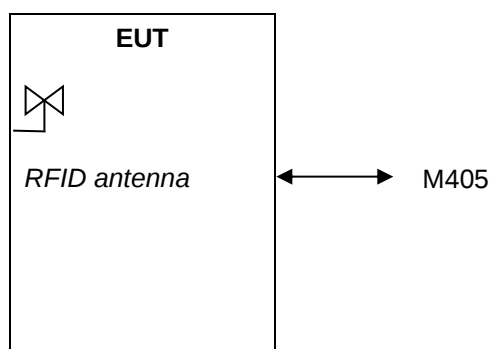
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3.4. EUT Mechanical and Electrical Design

Power supply : 13.5 Vdc
 Power supply range..... : 9 Vdc to 32 Vdc
 Power type..... : DC
 Power (W)..... : 3
 Nominal current (mA). : 90
 Dimensions (L x W x H) (cm). : 20 * 20 * 3 (full system)
 Weight (g). : 350
 Temperature range (°C). : -40 to +70
 Ground bounding strap..... : No

Comments: No

3.5. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Plastic	
2	IHM command	I/O	< 3m	N/A	

AC/DC: AC/DC Converter port

I/O: Input or Output port

N/E: Non Electrical port

AC: Alternative current port
 TP: Telecommunication port

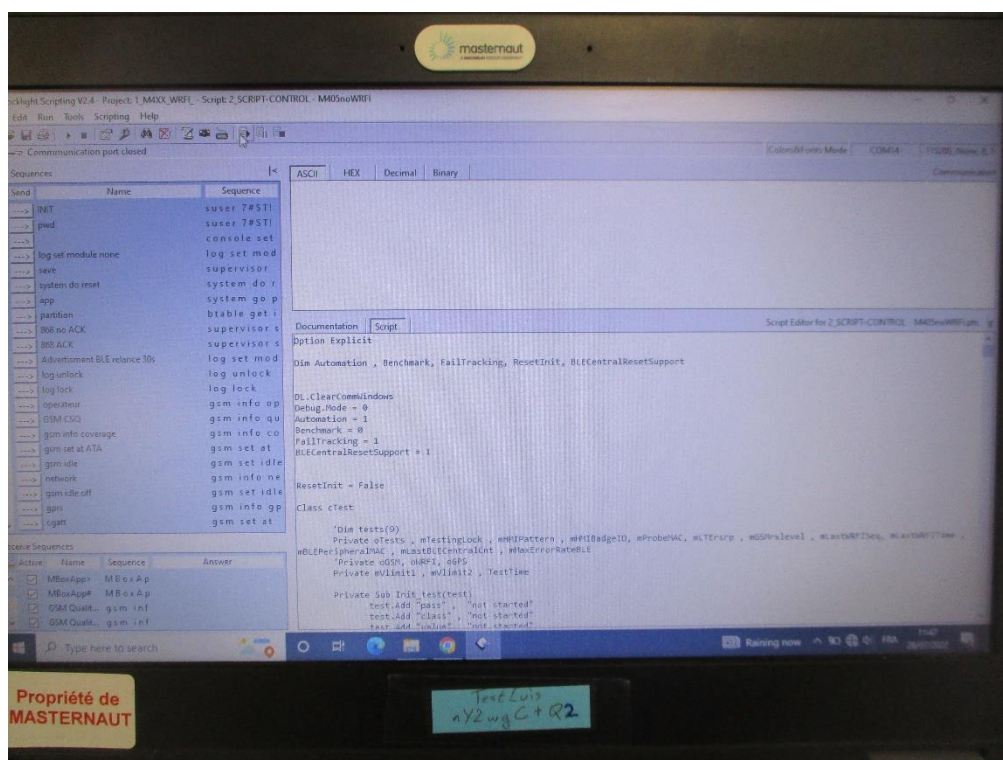
DC: Discontinuous current port
 RF: Radio frequency port

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	RFID
Environmental profile.....	Data transmission
Temperature range.....	Low extreme conditions: - 40°C High extreme conditions: + 70°C
Antenna type	External
Antenna Gain.....	Not communicated
Comments: No	
b) TRANSMITTER PARAMITERS (Tx/Rx)	
Frequency bands.....	13.553 MHz – 13.567 MHz
RF Power.....	+38.5 dBμV/m @ 3 m
Number of channels / Separation.....	Not communicated
Modulation type	ASK
Duty cycle	Not communicated
Tested frequency.....	13.56 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 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 supply
Measurement of conducted emission on AC mains ports	15.207	N/A	
Radiated emission limits; general requirements	15.209	PASS	
Operation within the band 13.110-14.010 MHz	15.225		
- (a) The field strength of any emissions within the band 13.553-13.567 MHz	-	PASS	
- (b) Spurious emission in the 13.410-13.553 MHz and 13.567-13.710 MHz bands	-	PASS	
- (c) Spurious emission in the 13.110-13.410 MHz and 13.710-14.010 MHz bands	-	PASS	
- (d) Spurious emission outside the 13.110-14.010 MHz band	-	PASS	
- (e) The frequency tolerance of the carrier signal	-	PASS	

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

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
6 Technical Requirements			Not connected to AC public supply
- 6.12 Transmitter Output Power	-	N/A	
- 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	
- 8.9 Transmitter Emission Limits	-	PASS	

Standard RSS-210 Issue 10 : December 2019

TEST DESIGNATION	TEST PROCEDURE	VERDICT	COMMENTS
7 Technical specifications - 7.1 Emission falling within restricted frequency bands - 7.2 General field strength limits - 7.3 Transmitters with wanted and unwanted emissions that are within the general field strength limits - 7.4 Cordless telephones	-	PASS	
	-	PASS	
	-	PASS	
	-	N/A	
Annex B.Devices operating in frequency bands for any application - B.6 Band 13.110-14.010	-	PASS	

Sample subject to the test **complies** with the requirements of the reference document listed in §2 of this test report and, where applicable, with deviations 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.

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. Unintentional radiated emissions in the band 9kHz – 1GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10 : 2019
Test method:	§ 15.109 of FCC 47 CFR PART 15 : 2022 ANSI C63.10 : 2013
General test setup: E.U.T. is set on an insulating support at 0.8 m (>30MHz) 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. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. E.U.T. is set on an insulating support at 0.8 m (<30MHz) above the ground reference plane. For maximum meter reading at each frequency, the antenna height is 1 m above the ground plane. A 360 degrees rotation of the EUT is performed in parallel, perpendicular and 45° loop antenna.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Radio Off	9kHz-30MHz	PASS
Maxhold 360° - Radio Off	30MHz-1GHz	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	20°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	Mini-circuit	ZFL-1000N	5023	06/04/2022	06/06/2023
Antenna	Emco	6502	9579	16/08/2021	16/10/2023
Antenna	Schwarzbeck	VHA 9103	3426	05/10/2020	05/12/2023
Antenna	Schwarzbeck	UHALP 9108A	3106	02/10/2020	02/12/2023
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17265	10/06/2022	10/08/2024
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14803		
Software	Nexio	BAT EMC	0000		

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

TEST SETUP PHOTO - 9kHz – 30MHz



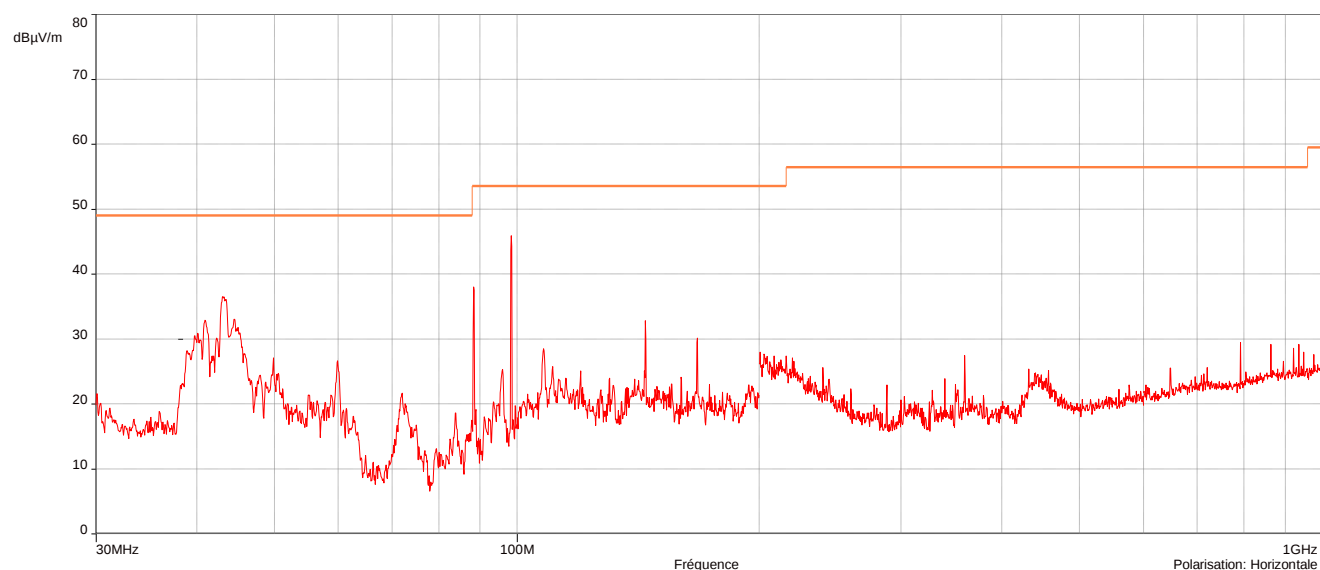
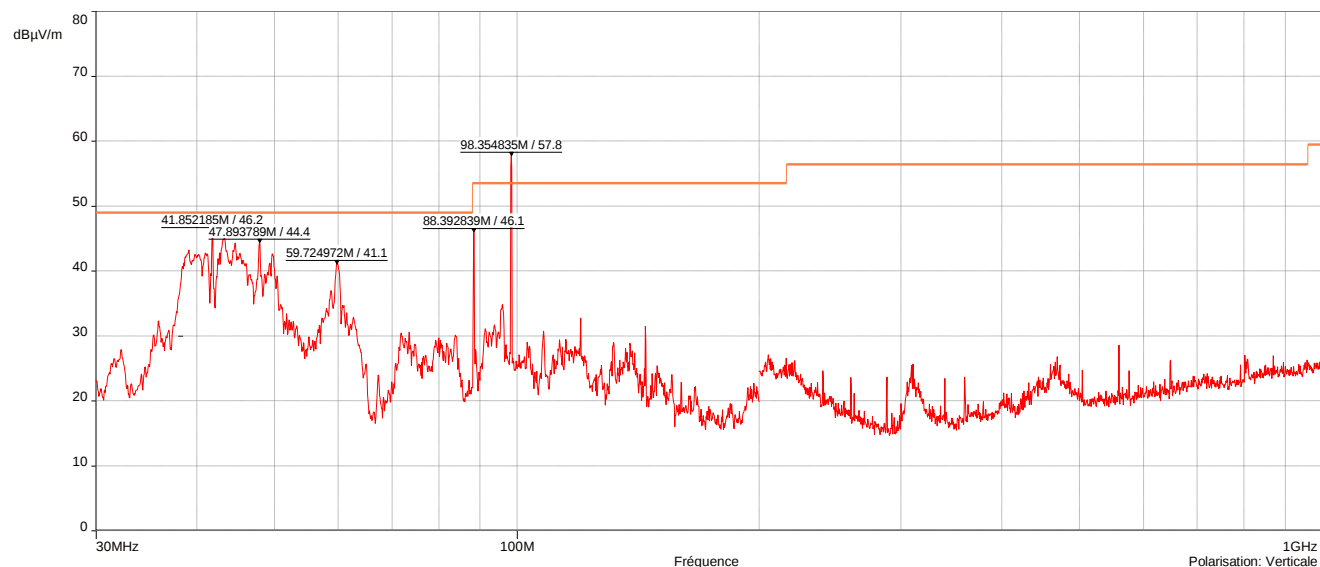
TEST SETUP PHOTO - 9kHz – 30MHz



TEST SETUP PHOTO - 30MHz – 1GHz



RADIATED SPURIOUS EMISSIONS - GRAPH			
MAXHOLD 360° - 9KHz – 30 MHz			
EUT mode: Radio Off			
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:	Measurements maximized at 360° in peak maxhold mode. Measurements have been made in 0° / 45° / 90° position antenna.		
Comments:	No curve – measurements have been performed manually → N.T.R		
EUT modification: No			

RADIATED SPURIOUS EMISSIONS - GRAPH
MAXHOLD 360° - 30 MHz – 1 GHz
EUT mode: Radio Off


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Vertical	200MHz-400MHz	100kHz	300kHz	Peak
Vertical	400MHz-600MHz	100kHz	300kHz	Peak
Vertical	600MHz-1GHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	200MHz-400MHz	100kHz	300kHz	Peak
Horizontal	400MHz-600MHz	100kHz	300kHz	Peak
Horizontal	600MHz-1GHz	100kHz	300kHz	Peak

Configuration: Measurements maximized at 360° in peak maxhold mode.

Comments: -

EUT modification: No

RECEIVER 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)
59.72	/	QP	Vertical	80	100	/	38.4	49.0	10.6
47.89	/	QP	Vertical	200	100	/	41.4	49.0	7.6
41.85	/	QP	Vertical	0	100	/	33.4	49.0	15.6
Supplementary information: No									

6.2. Unintentional radiated emissions and transmitter unwanted emission in the band 9 kHz – 1GHz

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-Gen Issue 5 : 2018 RSS-210 Issue 10 : 2019
Test method:	§ 15.209 & § 15.225 of FCC 47 CFR PART 15 : 2022 ANSI C63.10 : 2013
General test setup: E.U.T. is set on an insulating support at 0.8 m (>30MHz) 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. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. E.U.T. is set on an insulating support at 0.8 m (<30MHz) above the ground reference plane. For maximum meter reading at each frequency, the antenna height is 1 m above the ground plane. A 360 degrees rotation of the EUT is performed in parallel, perpendicular and 45° loop antenna.	

TESTED CONFIGURATION	PARAMETER	VERDICT
Maxhold 360° - Radio On	9kHz-30MHz	PASS
Maxhold 360° - Radio On	30MHz-1GHz	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40 °C	20°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	Mini-circuit	ZFL-1000N	5023	06/04/2022	06/06/2023
Antenna	Emco	6502	9579	16/08/2021	16/10/2023
Antenna	Schwarzbeck	VHA 9103	3426	05/10/2020	05/12/2023
Antenna	Schwarzbeck	UHALP 9108A	3106	02/10/2020	02/12/2023
Cable	C&C	N-4m	17265	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14803		
Software	Nexio	BAT EMC	0000		

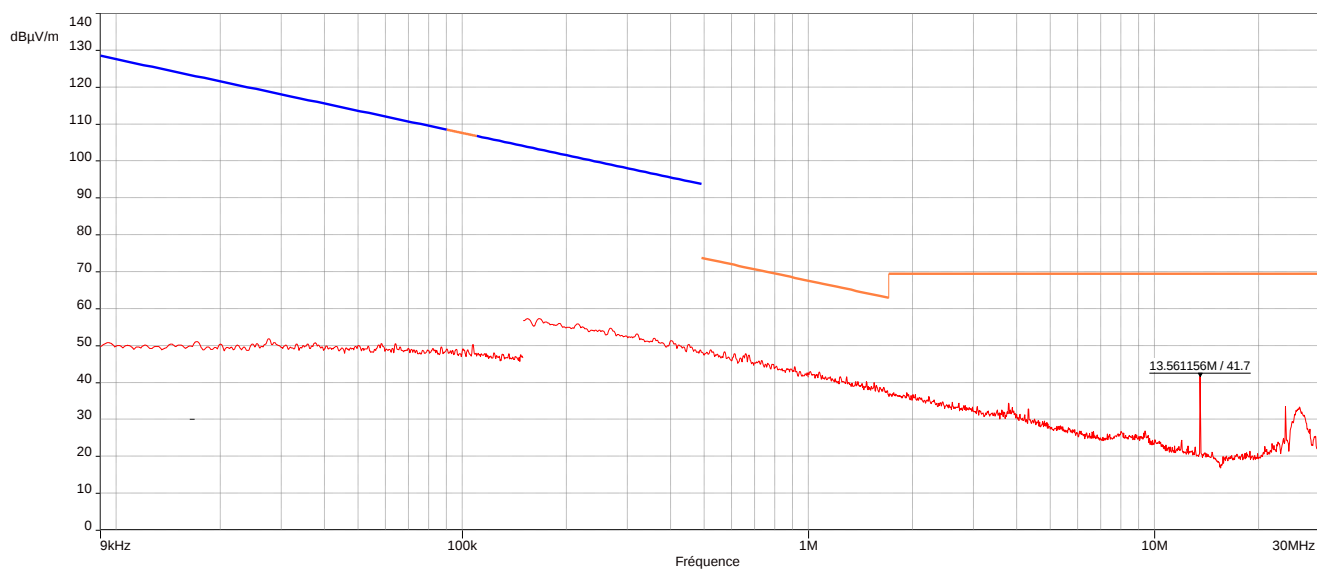
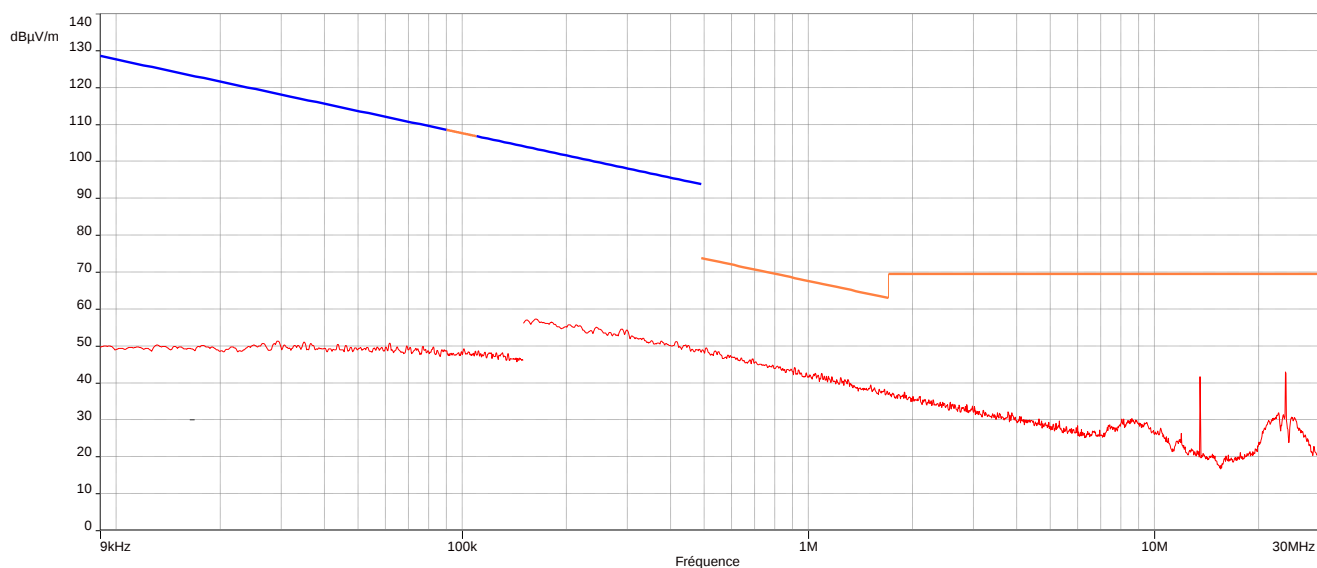
BAT-EMC software version: V3.18.0.26
Blank cells = Permanent validity

TEST SETUP PHOTO - 9kHz – 30MHz



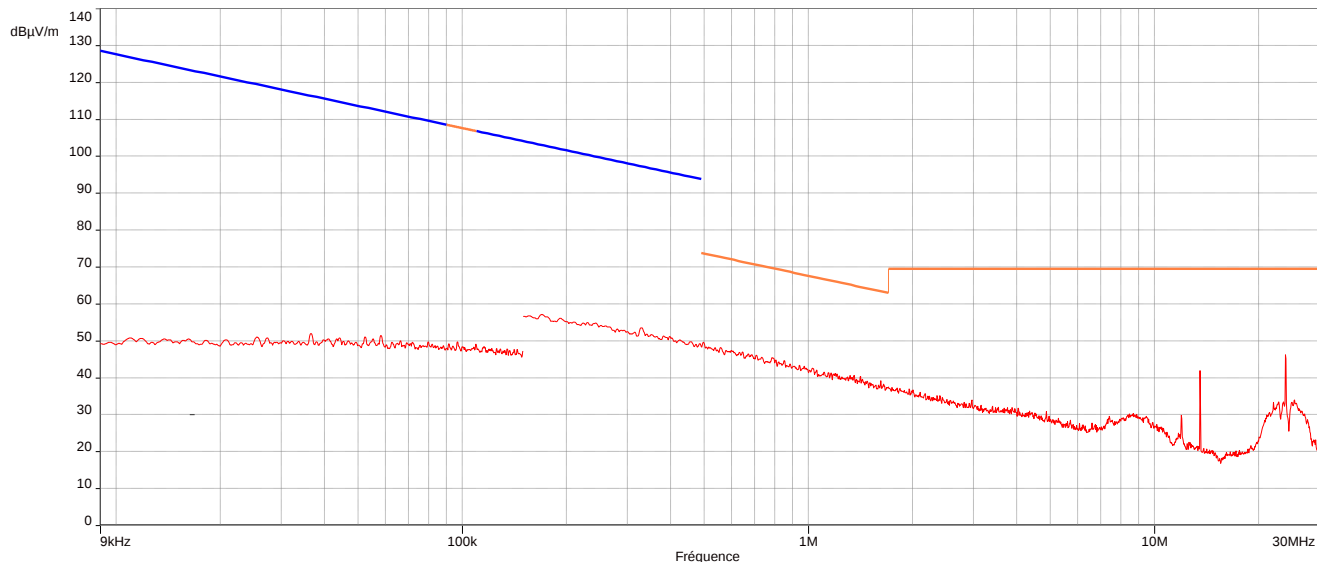
TEST SETUP PHOTOS - 30MHz – 1GHz



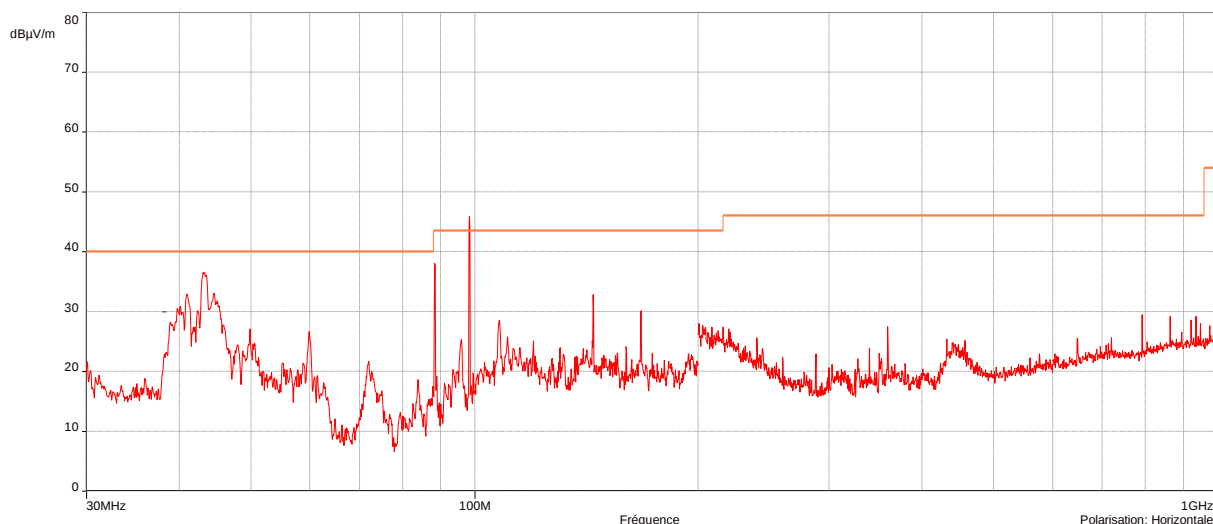
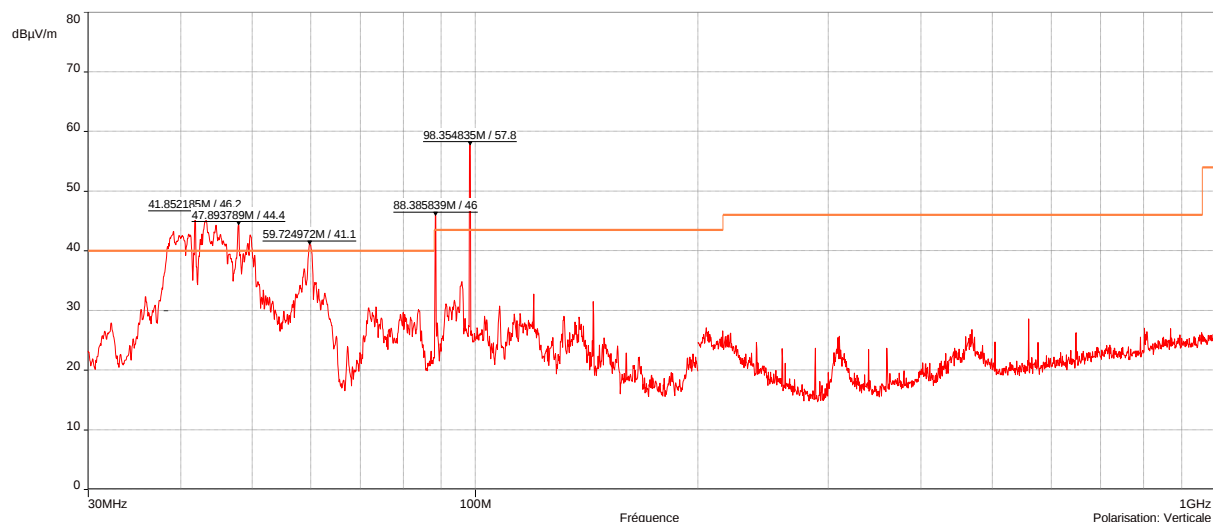
RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360° - RADIO ON
EUT mode: RFID 13.56 MHz
0° antenna position

45° antenna position


RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360° - RADIO ON

90° antenna position



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:	Measurements maximized at 360° in peak maxhold mode.			
Comments:	-			
EUT modification: No				

RADIATED SPURIOUS EMISSIONS (TRANSMITTER) - GRAPH
MAXHOLD 360° - RADIO ON
EUT mode: RFID 13.56 MHz


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Vertical	200MHz-400MHz	100kHz	300kHz	Peak
Vertical	400MHz-600MHz	100kHz	300kHz	Peak
Vertical	600MHz-1GHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	200MHz-400MHz	100kHz	300kHz	Peak
Horizontal	400MHz-600MHz	100kHz	300kHz	Peak
Horizontal	600MHz-1GHz	100kHz	300kHz	Peak

Configuration: Measurements maximized at 360° in peak maxhold mode.

Comments: Frequencies before 100 MHz are relevants of 15.109 limit.
88.4 MHz and 98.4 MHz are externals frequencies.

EUT modification: No

6.3. The field strength of any emission

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10 : 2019
Test method:	ANSI C63.10 : 2013
General test setup: E.U.T. is set on an insulating support at 80 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	20°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	6502	9579	16/08/2021	16/10/2023
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17265	10/06/2022	10/08/2024
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14803		

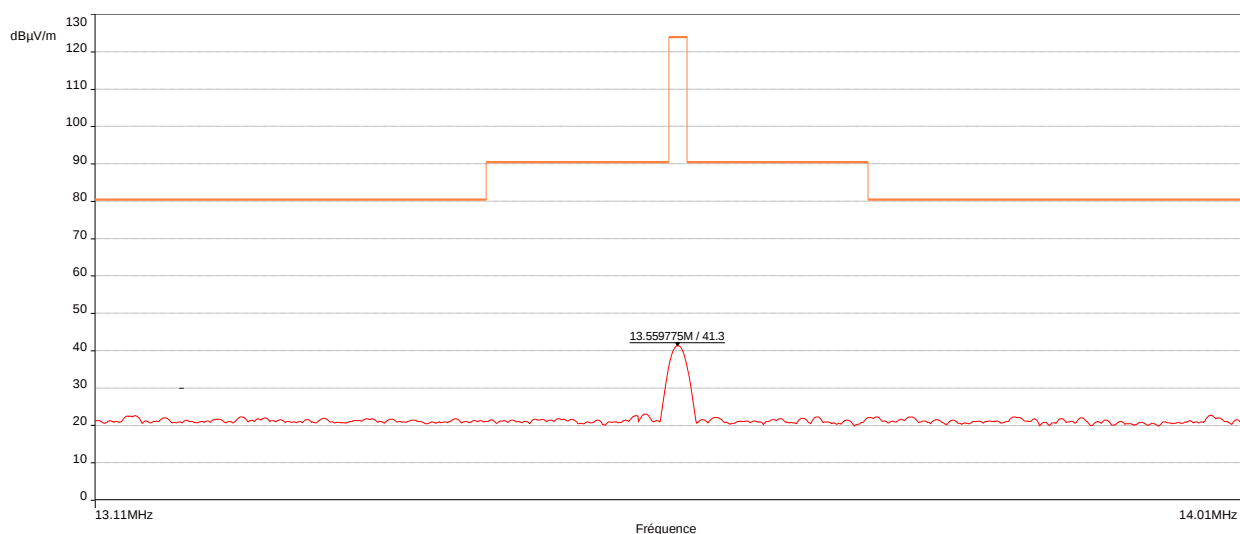
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E.U.T. position:

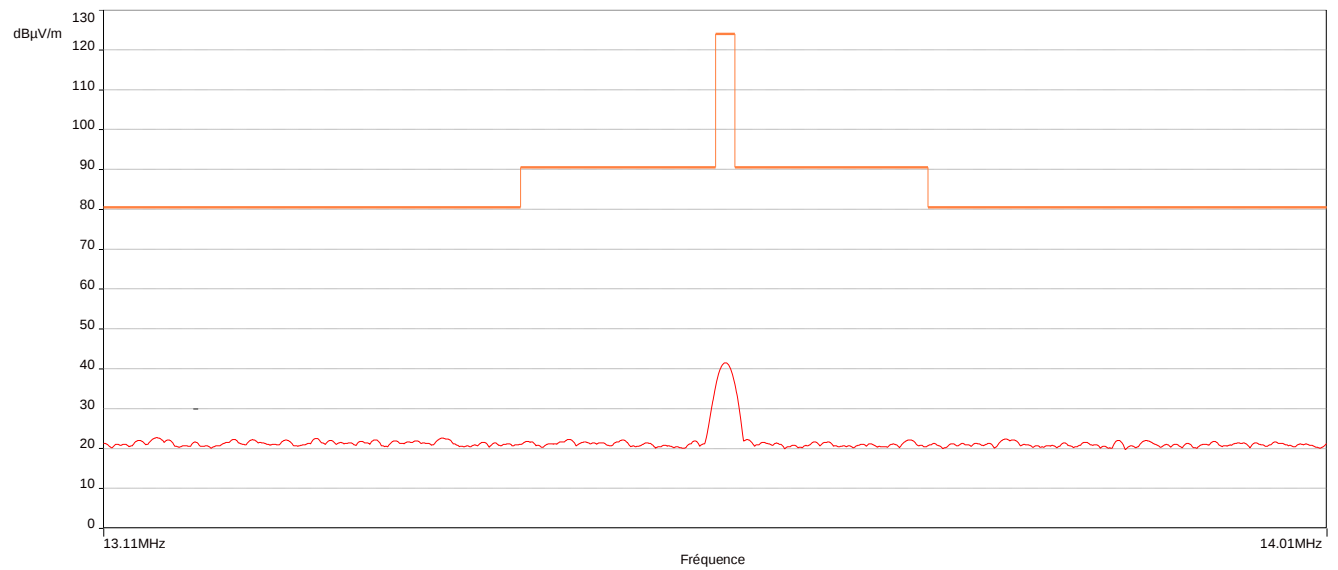


E.U.T. position	Frequency (MHz)	Electro-magnetic field (dBμV/m)	Limit (dBμV/m)
320°	13.56	+38.5 @ 3 m	+ 124 @ 3 m

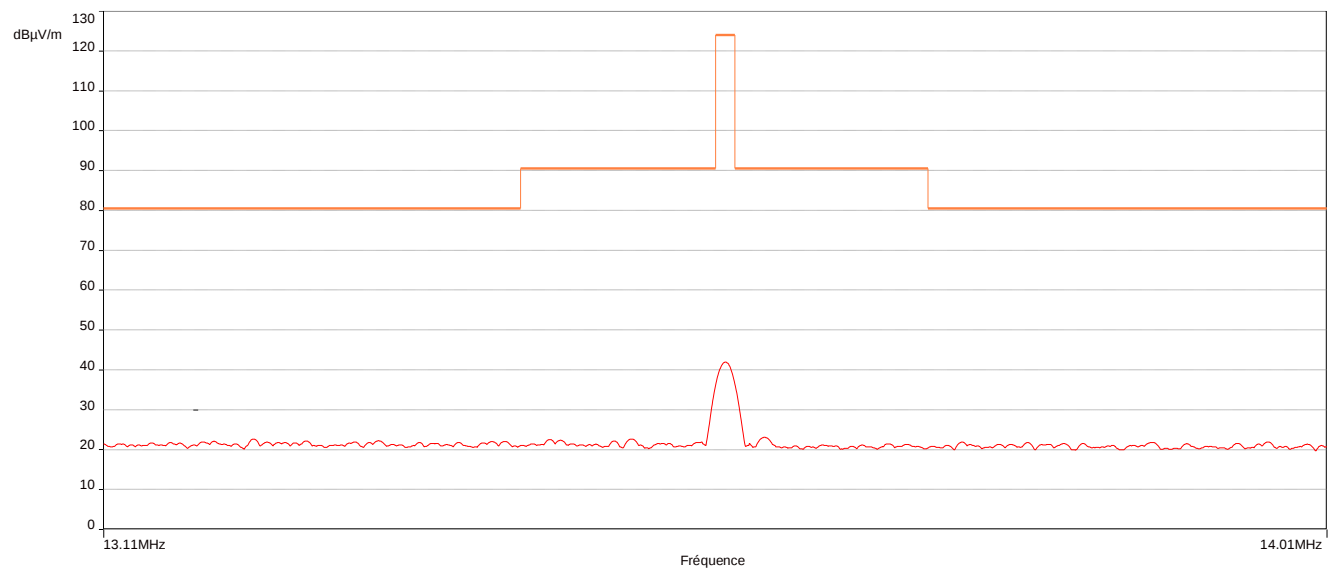
Antenna 0° position



Antenna 45° position



Antenna 90° position



6.4. 20dB bandwidth and 99% Occupied bandwidth

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10 : 2019
Test method:	ANSI C63.10 : 2013
General test setup: E.U.T. is set on an insulating support at 80 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	20°C
Relative Humidity	10 to 90 %	40 %
Atmospheric pressure	N/A	N/A
Test method deviation: No		
Supplementary information: -		

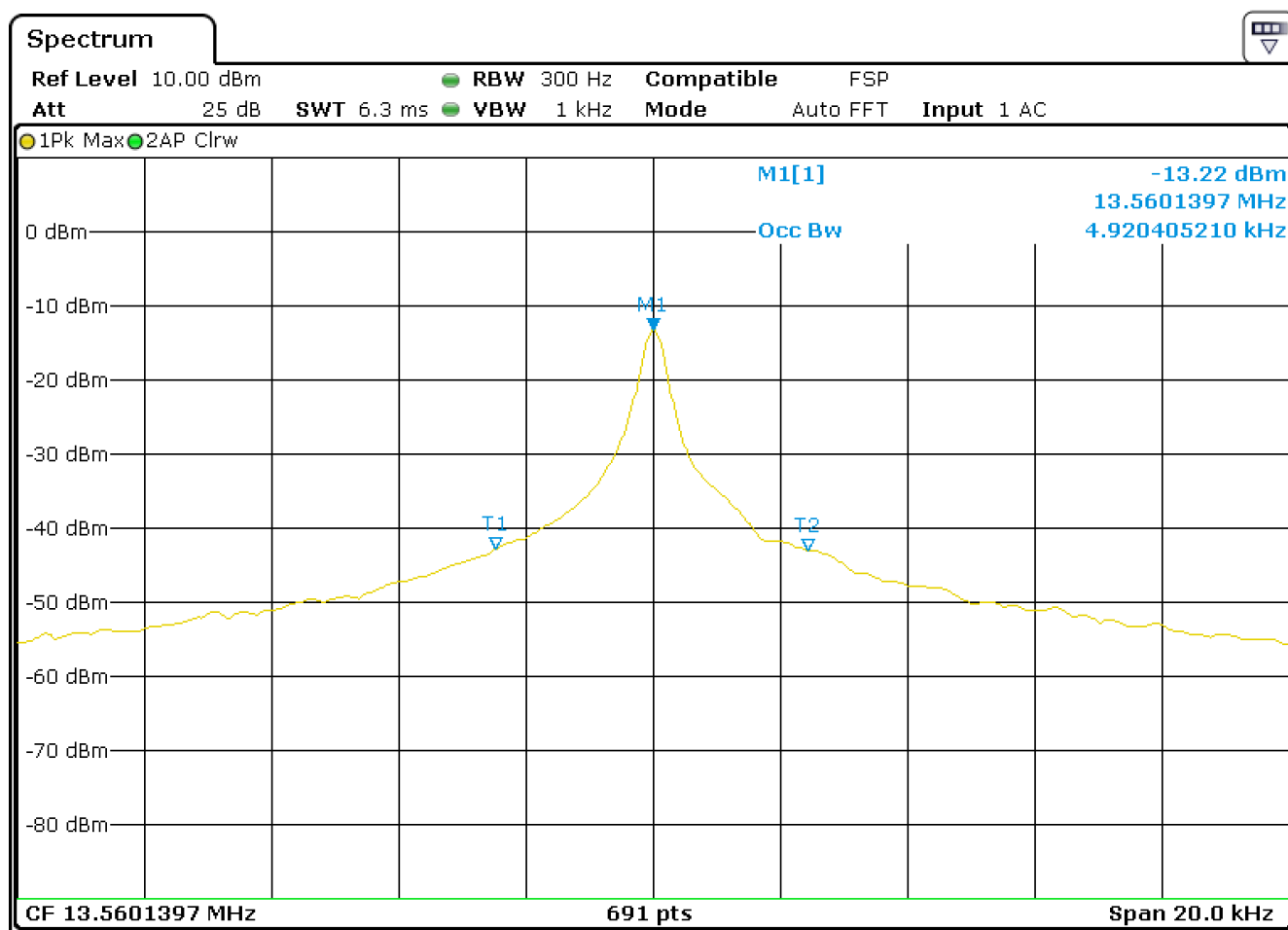
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Emco	6502	9579	16/08/2021	16/10/2023
Cable	Huber + Suhner	N-6m	17270	10/06/2022	10/08/2024
Cable	C&C	N-4m	14228	10/06/2022	10/08/2024
Cable	Huber + Suhner	N-10m	17265	10/06/2022	10/08/2024
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Shielded enclosure	Comtest	SAC 3m	14803		

E.U.T. position:



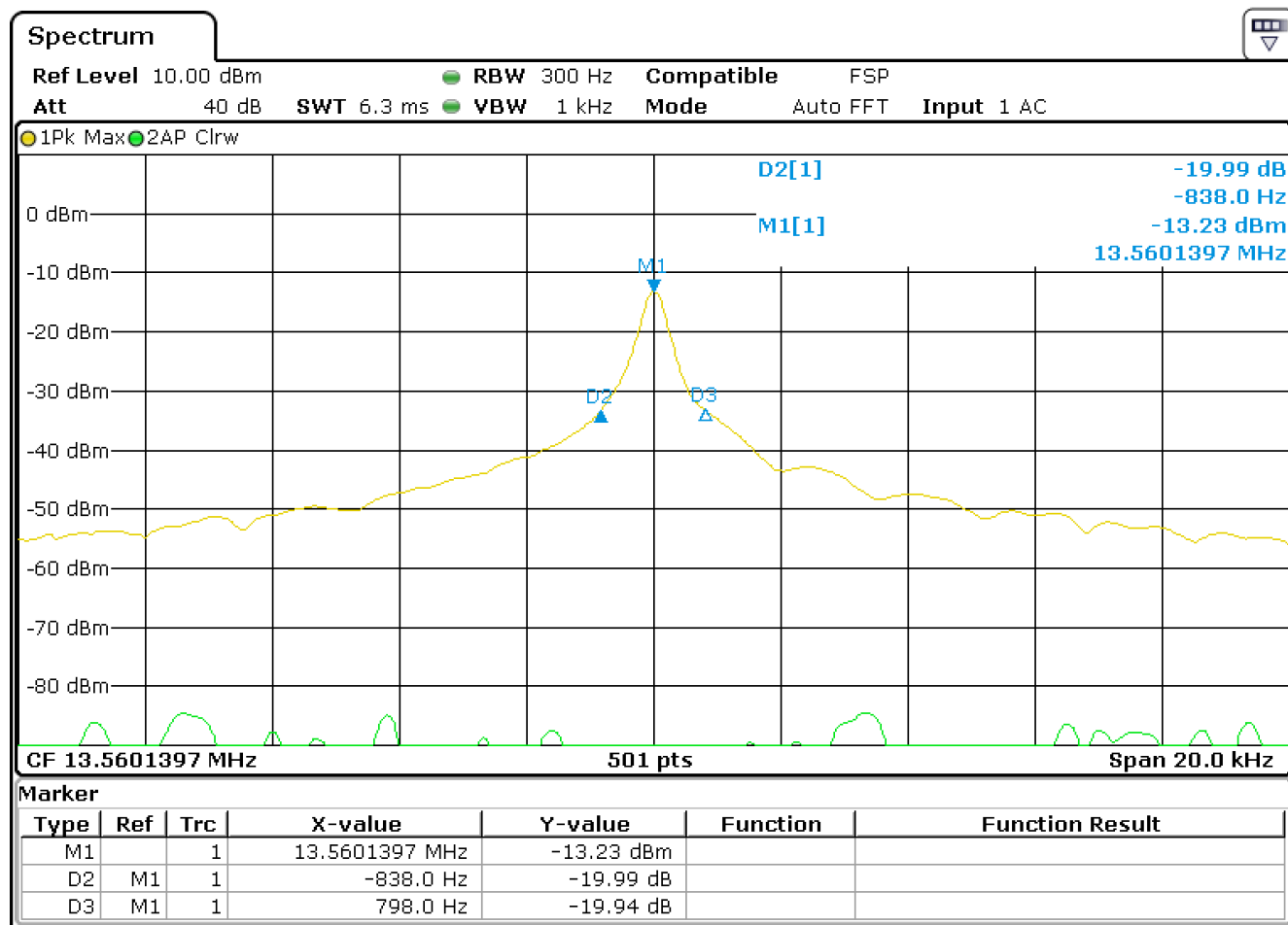
99% Bandwidth

E.U.T.	Antenna type	Frequency	Results (kHz)	Limit (kHz)
HMI	internal	13.56 MHz	4.92	-



20dB Bandwidth

E.U.T.	Antenna type	Frequency	Results (kHz)	Limit (KHz)
HMI	internal	13.56MHz	1.63	-



6.5. Frequency Tolerance of the carrier signal

Reference standard:	FCC 47 CFR PART 15 : 2022 RSS-210 Issue 10 : 2019
Test method:	ANSI C63.10 : 2013
General test setup: E.U.T. is set on an insulating support at 5 cm above the ground on the climatic chamber. The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C . For battery operated equipment, the equipment tests shall be performed using a new battery.	

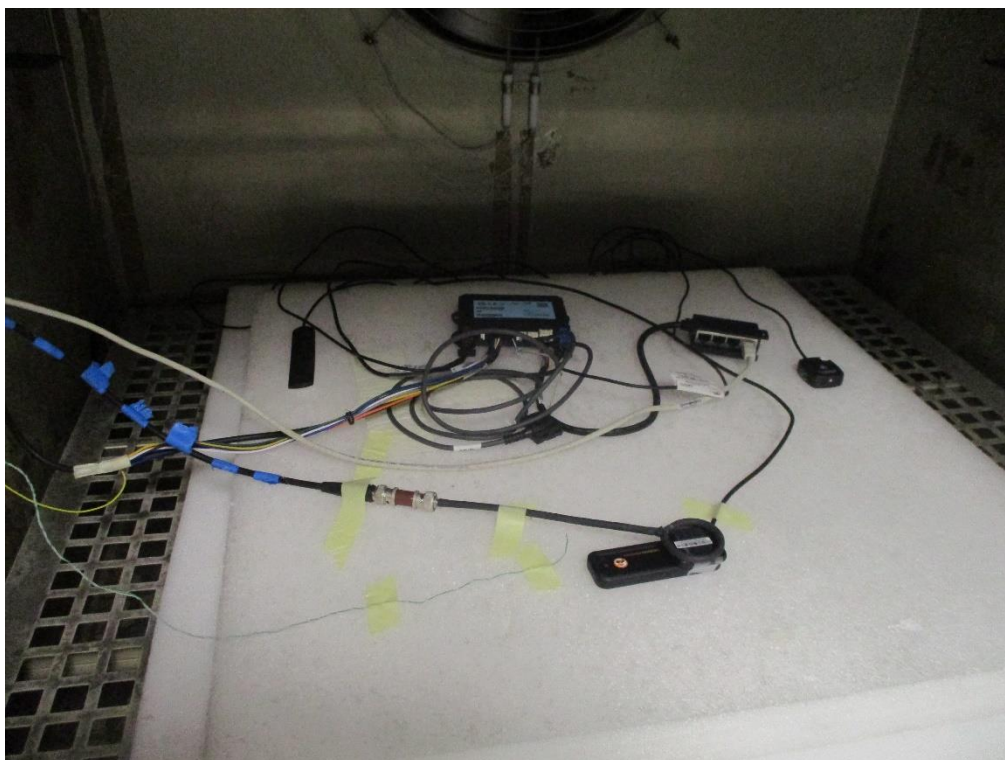
TESTED CONFIGURATION	VERDICT
RFID 13.56MHz	PASS

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	10 to 40°C	20°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
Climatic chamber	Sapratin	Phoenix 800I	0118	29/04/2022	29/06/2024
Data Acquisition Switch Unit	YCT	YC-747UD	8332	22/02/2022	22/04/2023
Multimeter	Fluke	8840A	1330	13/11/2020	13/01/2023
Power supply	Voltcraft	LPS1305	14586		
Receiver	Rohde & Schwarz	ESW44	17058	28/03/2022	28/05/2023
Test enclosure	Emitech	HC4	14878		
Thermocoupler	Emitech	Type k	12427	22/02/2022	22/04/2023

Blank cells = Permanent validity

TEST SETUP PHOTO



			Center frequency (MHz)
Normal conditions	Temperature (°C): 20	Nominal power source (V) : 13.5Vac	13.560127
		Minimal power source (V) : 11.5Vac	13.560147
		Maximal power source (V) : 15.5Vac	13.560352
Extrem conditions	Minimal temperature (°C) : -20	Nominal power source (V) : 13.5Vdc	13.560047
	Maximal temperature (°C) : +50	Nominal power source (V) : 13.5Vdc	13.560197
Limit of the frequency tolerance (MHz)			13.558644 to 13.561356

●●● End of test report ●●●