Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
Canadian CAB Identifier: FR0003

RADIO TEST REPORT

FCC 47 CFR PART 15: June 2023
RSS-210, Issue 10: December 2019 / AMD: April 2020

Company	**STMICROELECTRONICS (Rousset) SAS**
Address	190 AVENUE CELESTIN COQ 13106 ROUSSET FRANCE

Test item description	**NFC card reader evaluation board**
Trade Mark	STMICROELECTRONICS
Manufacturer	STMICROELECTRONICS
Model/Type reference	X-NUCLEO-NFC09A1
FCC ID	YCPNFC09A1
IC	8976A-NFC09A1
Ratings	5 Vdc

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

Report Reference No	**RR-EVE-23E875-2A**
Test procedure	FCC IC Certification
Diffusion	Mr BATISTA
Applicant's name	STMICROELECTRONICS
Date of issue	September 18, 2024
Total number of pages	36
Revision	0
Compiled by	Morgan PATEY
Approved by (+ signature)	Olivier AELBRECHT (Technical Manager)

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REPORT INDEX:

REVISION HISTORY:

Revision	Date	Modified pages	Modifications
0	September 18, 2024	/	Creation

1. GENERAL INFORMATIONS

This document submits the results of Radio tests performed on the equipment **X-NUCLEO-NFC09A1** (denominated hereafter E.U.T.: equipment under test) according to document(s) listed in §2 of this test report.

TESTING PROCEDURE AND TESTING LOCATION:

Testing Location	**EMITECH MONTPELLIER laboratory & Open Area Test Site in SALINELLES (30)**
Address	145 rue de Massacan 34740 VENDARGUES FRANCE
Test procedure.	FCC IC Certification
Tested by	Morgan PATEY
Test supervisor	None
Date of receipt of test item	N/A
Date (s) of performance of tests	From August 28th to September 01st of 2023

APPLICANT'S GENERAL INFORMATIONS:

Company name	STMICROELECTRONICS (Rousset) SAS
Company address.	190 AVENUE CELESTIN COQ 13106 ROUSSET FRANCE
Person(s) present during the tests.	No representative for company attended the tests.
Responsible.	Mr BATISTA

GENERAL REMARKS:

The information in italics is declared by the manufacturer and is under his responsibility
The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report the decimal separator is point.

POSSIBLE TEST CASE VERDICTS:

Test case does not apply to the test object.	N/A
Test case not performed	N/P
Test object does meet the requirement.	P (Pass)
Test object does not meet the requirement.	F (Fail)

DEFINITIONS AND ABBREVIATIONS:

E.U.T.	Equipment Under Test	AE	Ancillary Equipment	Pk	Peak detector
RBW	Resolution BandWidth	VBW	Video BandWidth	QP	Quasi-peak detector
OATS	Open Area Test Site	FAR	Full Anechoic Room	Av	Average detector
VP	Vertical Polarization	HP	Horizontal Polarization	RMS	Root Mean Square
RF	Radio Frequency	N.T.R	Nothing To Report	N/C	Not Communicated

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:
The following referenced documents are necessary for the application of the present test report. **FCC 47 CFR PART 15: June 2023** Code of federal regulations – Title 47 telecommunication - Part 15 - Radio frequency devices **FCC Part 15.225** Operation within the bands 13.553-13.567MHz **RSS-210, Issue 10: December 2019 / AMD: April 2020** Licence-Exempt Radio Apparatus: Category I Equipment **RSS-GEN, Issue 5: April 2018 / AMD 1: 2019 / AMD 2: 2021** General Requirements for Compliance of Radio Apparatus **ANSI C 63.10: 2013** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices Although the product standard uses obsolete technical standards, the latest versions of standards achievable by the laboratory will be used for testing.
INFORMATIVE REFERENCES:
The following referenced documents are not necessary for the application of the present test report but they assist the user with regard to a particular subject area.

3. EQUIPMENT TECHNICAL DESCRIPTION

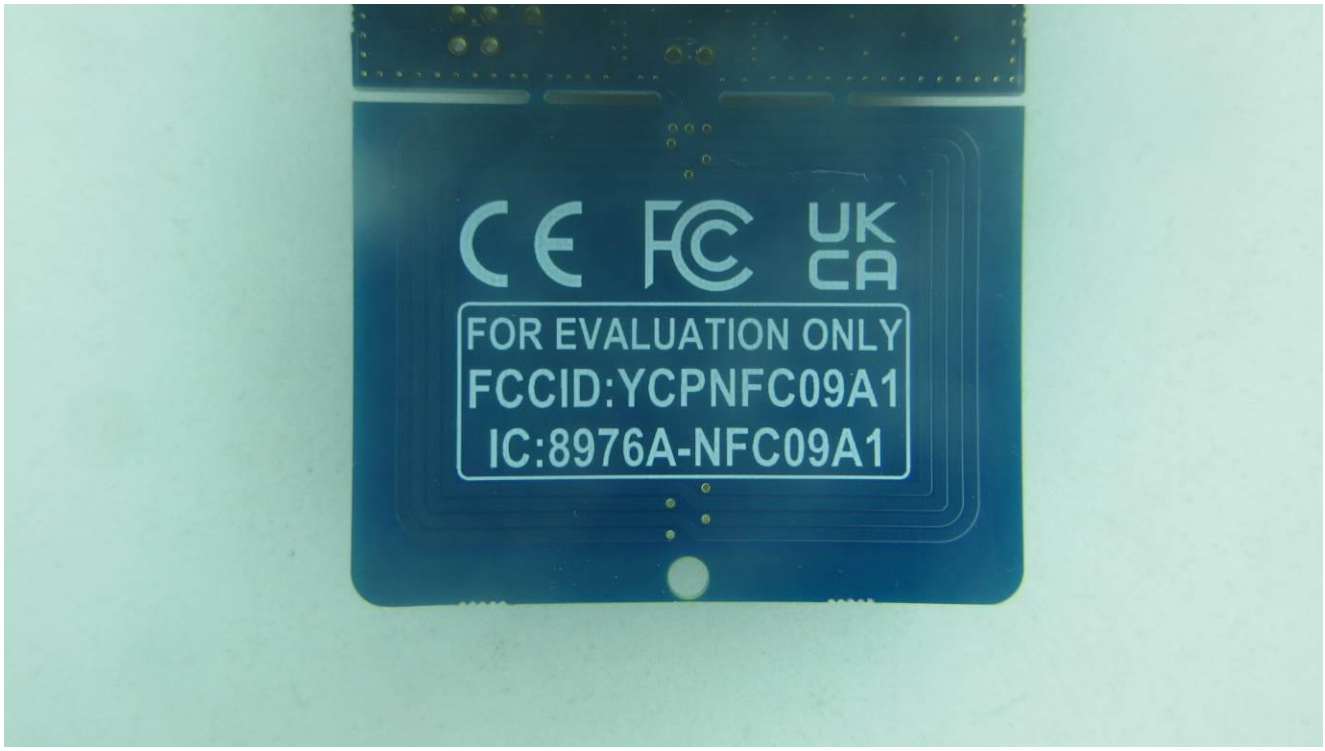
3.1. Test Conditions

Test item description.	:	NFC card reader evaluation board
Model/Type reference.	:	X-NUCLEO-NFC09A1
Trade Mark.	:	STMICROELECTRONICS
Serial number (S/N).	:	Not communicated
Part number (P/N).	:	Not communicated
Software version.	:	*Not communicated*
Firmware version.	:	*Not communicated*
Type of sample.	:	Pre-serial
Function(s).	:	NFC demo board
Manufacturer name.	:	STMICROELECTRONICS
Address.	:	776 RUE ALBERT CAQUOT SKY SOPHIA BATIMENT B 06410 BIOT FRANCE

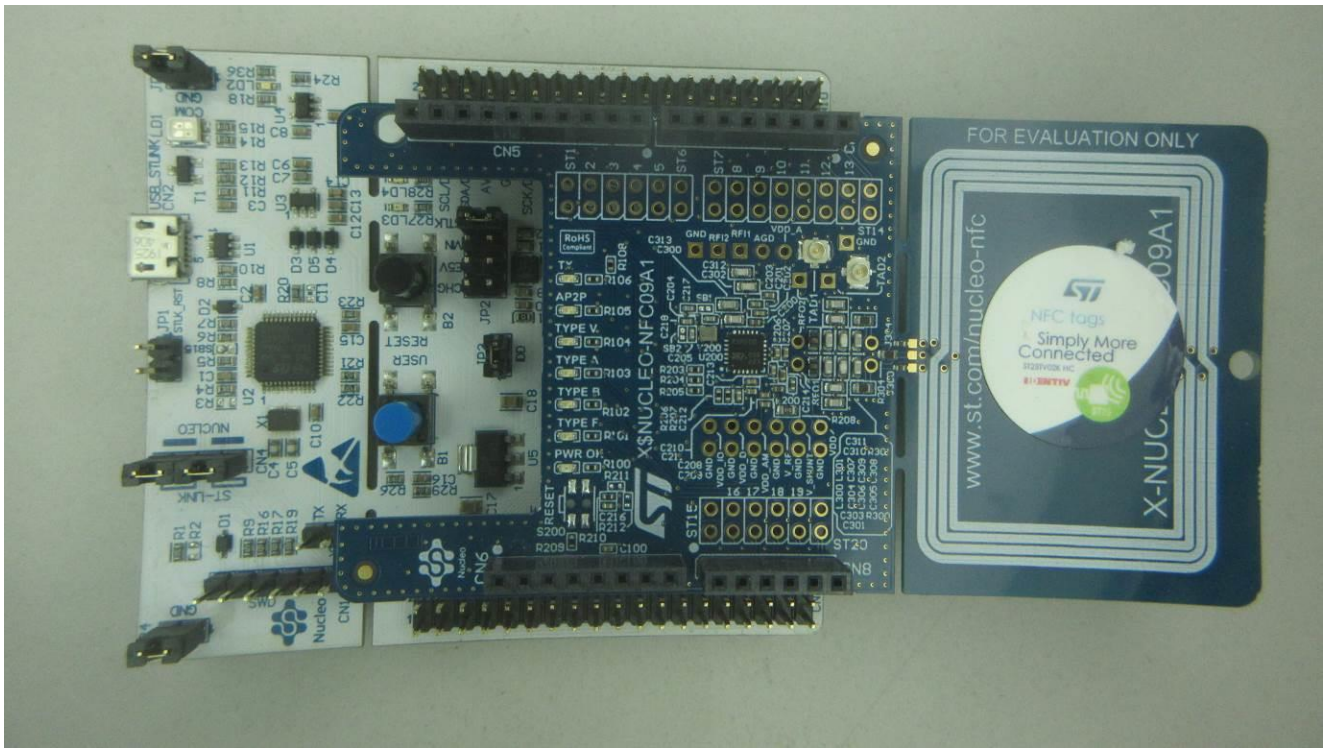
General product information:

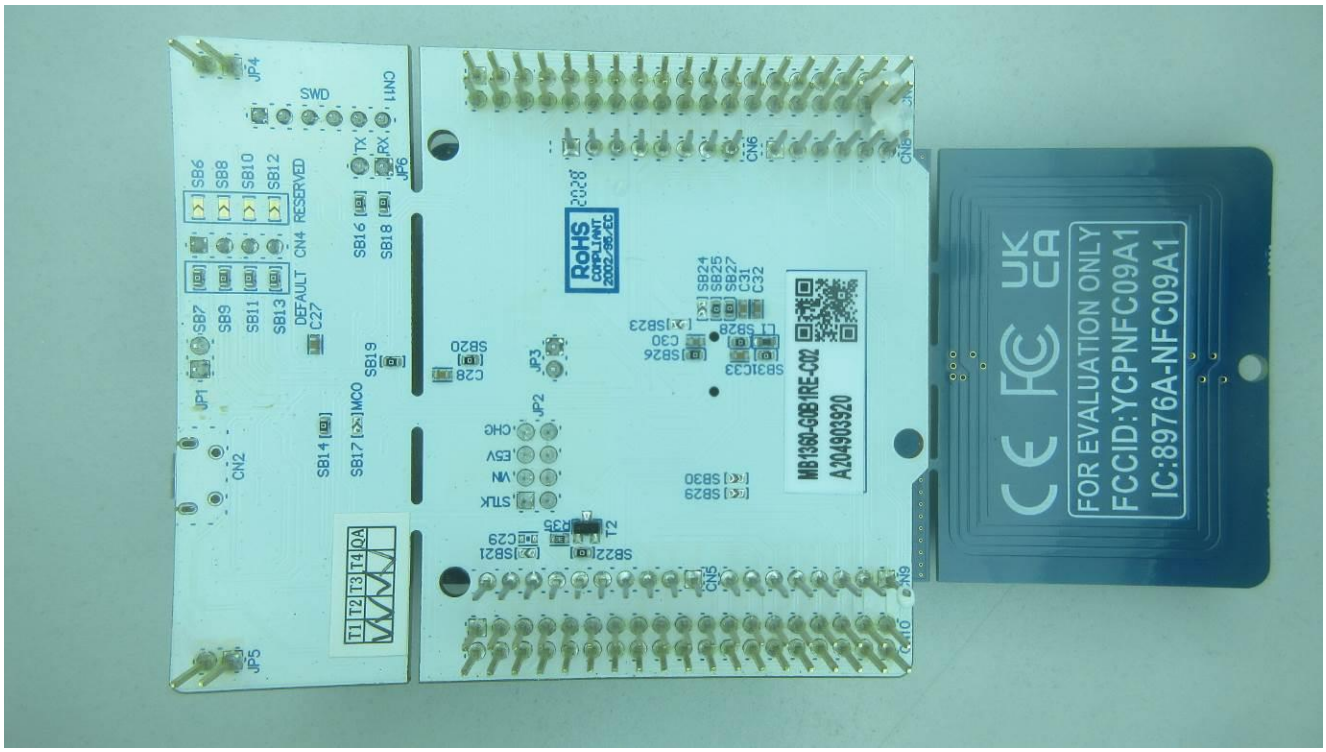
N/A

3.2. EUT Marking plate



3.3. EUT General view



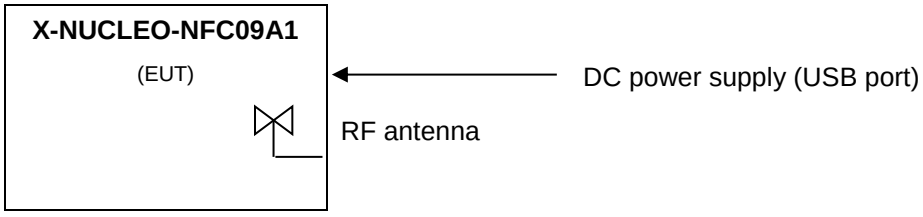


3.4. EUT Mechanical and Electrical Design

Power supply. ..... : *5 Vdc*
Power supply range. ..... : *5 Vdc*
Power type. ..... : *USB*
Power (W). ..... : *1.7*
Nominal current (A). ..... : *Not communicated*
Dimensions (L x W x H) (m). ..... : *0.104 x 0.054 x 0.007*
Weight (kg). ..... : *0.01*
Temperature range (°C). ..... : *0 to +60*
Ground bounding strap. ..... : *No*

Comments:
N/A

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



PORT	NAME	TYPE	LENGTH	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	PCB	N/A
1	DC power source	DC	N/A	N/A	5Vdc
2	RF antenna	RF	N/A	N/A	13.56 MHz PCB printed

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 .....: Direct current port
RF.....: Radio frequency port

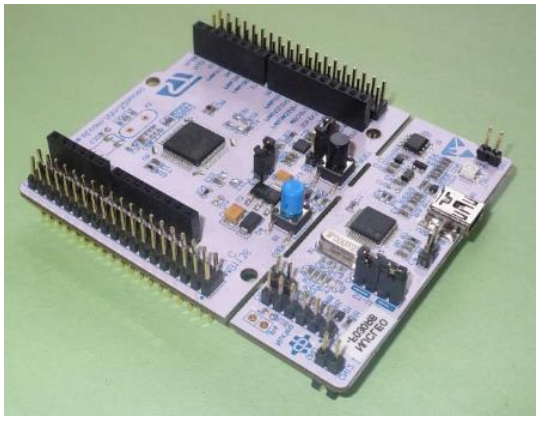
3.6. Supporting Equipment Used During Test

Sample subject to the tests was tested with following equipment.

PRODUCT TYPE	MANUFACTURER	MODEL	N°EMITECH / COMMENTS
NFC TAG	STMICROELECTRONICS	ST25TV02K HC	Used to initiate NFC communications.
Nucleo demo board	STMICROELECTRONICS	Not communicated	Used to powered the EUT and set it in test mode.
Power Bank	Xindao B.V.	P324.25	Used as EUT's power supply for OATS measurements
AC to 5Vdc USB converter	Pro-Power	MWUSB3U	Used as EUT's power supply.

NFC TAG (AE)

NUCLEO DEMO BOARD (AE)



POWER BANK (AE)

AC TO 5VDC USB CONVERTER (AE)


3.7. EUT Radio Specifications

a) GENERAL INFORMATIONS
According to manufacturer's declarations : EUT type..... : *Transceiver* Technology..... : *RFID* Environmental profile..... : *Data transmissions* Temperature range..... : *0°C to +60°C* Antenna type ..... : *PCB* Antenna Gain..... : *Not communicated* **Comments:** *N/A*
b) TRANSMITTER PARAMETERS (TX)
Frequency bands..... : *13.553 MHz to 13.567 MHz* RF Power..... : *1.7 W* Number of channels / Separation..... : *1* Modulation type ..... : *AM* Duty cycle ..... : *100%* Tested frequency..... : *13.56 MHz*
c) RECEIVER PARAMETERS (RX)
Frequency bands..... : *13.553 MHz to 13.567 MHz*

4. RESULT SUMMARY

TEST DESIGNATION	SEVERITY	VERDICT	COMMENTS
GENERAL			
Labeling requirements		N/P	15.19 / See certification documents
Information to user		N/P	15.21 / See certification documents
Home-built devices		N/A	15.23
Kits		N/A	15.25
Special Accessories		N/P	15.27 / See certification documents
Inspection by the Commission		N/A	15.29
Measurement standards		PASS	15.31
Test procedure for CPU boards and computer power supplies		N/A	15.32
Frequency range of radiated measurements		PASS	15.33
Measurement detector functions and bandwidths		PASS	15.35
Transition provisions for compliance with the rules		N/P	15.37 / See certification documents
UNINTENTIONAL RADIATORS			
Equipment authorization			15.101
- Verification		N/A	
- Declaration of Conformity		N/A	
CPU boards and power supplies used in personal computers		N/A	15.102
Exempted device		N/A	15.103
Information to the user		N/P	See certification documents
Conducted limits	Class B	PASS	15.107
Radiated emission limits	Class B	PASS	15.109
Antenna power conduction limits for receivers		N/A	15.111
Power line carrier systems		N/A	15.113
TV interface devices, including cable system terminal devices		N/A	15.115
TV broadcast receivers		N/A	15.117
Cable ready consumer electronics equipment		N/A	15.118
Program blocking technology requirements for TV receivers		N/A	15.120
Scanning receivers and frequency converters used with scanning receivers		N/A	15.121
Labeling of digital cable ready products		N/A	15.123
INTENTIONAL RADIATORS			

TEST DESIGNATION	SEVERITY	VERDICT	COMMENTS
Equipment authorization requirement		**PASS**	**15.201 / Transmitter part is subject to Certification procedure**
Certified operating frequency range		**N/A**	**15.202**
Antenna requirement		**PASS**	**15.203 / Dedicated integral antenna**
External radio frequency power amplifiers and antenna modifications		**N/A**	**15.204**
Restricted bands of operation		**PASS**	**15.205**
Conducted limits		**PASS**	**15.207**
Radiated emission limits; general requirements		**PASS**	**15.209**
Tunnel radio systems		**N/A**	**15.211**
Modular transmitters		**N/A**	**15.212**
Cable locating equipment		**N/A**	**15.213**
Cordless telephones		**N/A**	**15.214**
Additional provisions to the general radiated emission limits		**PASS**	**15.215**
Operation within the band 13.110-14.010 MHz.		**PASS**	**15.225**
- **Field strength in the band 13.553-13.567 MHz**		**PASS**	**(a)**
- **Field strength in the band 13.410-13.553 MHz and 13.567-13.710 MHz**		**PASS**	**(b)**
- **Field strength in the band 13.110-13.410 MHz and 13.710-14.010 MHz**		**PASS**	**(c)**
- **Field strength outside the band 13.110-14.010 MHz**		**PASS**	**(d)**
- **Frequency tolerance of the carrier signal**		**PASS**	**(e)**
- **Radio frequency powered tag**		**N/A**	**(f) EUT is an RFID reader**

Sample subject to the test complies with the requirements of the reference document(s) listed in §2 of this test report and, where applicable, with deviation(s) specified in this document.

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

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

5. MEASUREMENT UNCERTAINTY

PARAMETER	MAXIMAL EMITECH UNCERTAINTY	MINIMAL STANDARD UNCERTAINTY
Radio frequency	± 1 x 10^{-7}	±1 x 10^{-7}
Occuped bandwidth		
RF power	± 3.8 %	± 5 %
Supply voltages	± 3 %	± 3 %
Temperature	± 1 °C	± 1°C
Humidity	± 5 %	± 5 %
Conducted emission (FCC)		
(Artificial Mains Network) 150kHz – 30MHz	± 3.4 dB	± 3.4 dB
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	± 2.7 dB	/
30MHz – 1GHz	± 5.0 dB	/
1GHz – 18GHz	± 5.3 dB	/
18GHz – 40GHz	± 6.1 dB	/
40GHz – 140GHz	± 5.7 dB	/

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

6. TEST CONDITIONS AND RESULTS

6.1. AC power-line conducted emissions

Reference standard:	FCC part 15.207 RSS-Gen
Test method:	ANSI C63.10: 2013
General test setup: EUT is set on an insulating support at 80cm above the horizontal ground reference plane, and at 40cm of the vertical ground reference plane. All power was connected to the system through Artificial Mains Network (AMN). The AMN is placed at 80cm from the boundary of the EUT and bonded to a ground reference plane.	

TESTED CABLE	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
120Vac / 60Hz	150kHz-30MHz	15.207	EMI4610	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	30 to 60 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
Test method deviation: N/A		
Supplementary information: EUT power supply is done trought a “standard power supply” wich meets FCC and RSS requirements.		

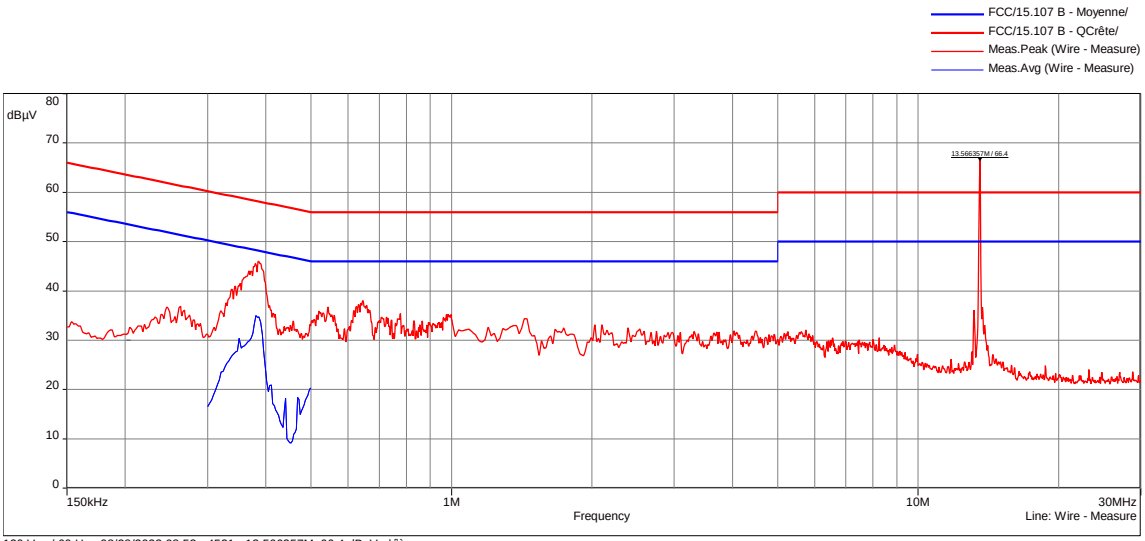
TEST EQUIPMENT USED					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
AC power source	GW Instek	APS-1102	17782	24/06/2023	24/08/2024
Cable	EMITECH	Current absorber sheath	18366	17/08/2023	17/10/2025
Cable	C&C	N-3m	14335	14/04/2023	14/06/2025
LISN	Rohde & Schwarz	ENV216	17925	24/09/2021	24/11/2023
Multimeter	FLUKE	8808A	10382	17/05/2023	17/07/2024
Receiver	Rohde & Schwarz	ESI	9704	18/11/2022	18/01/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H1	7561	19/06/2023	19/08/2024
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024

Blank cells = Permanent validity

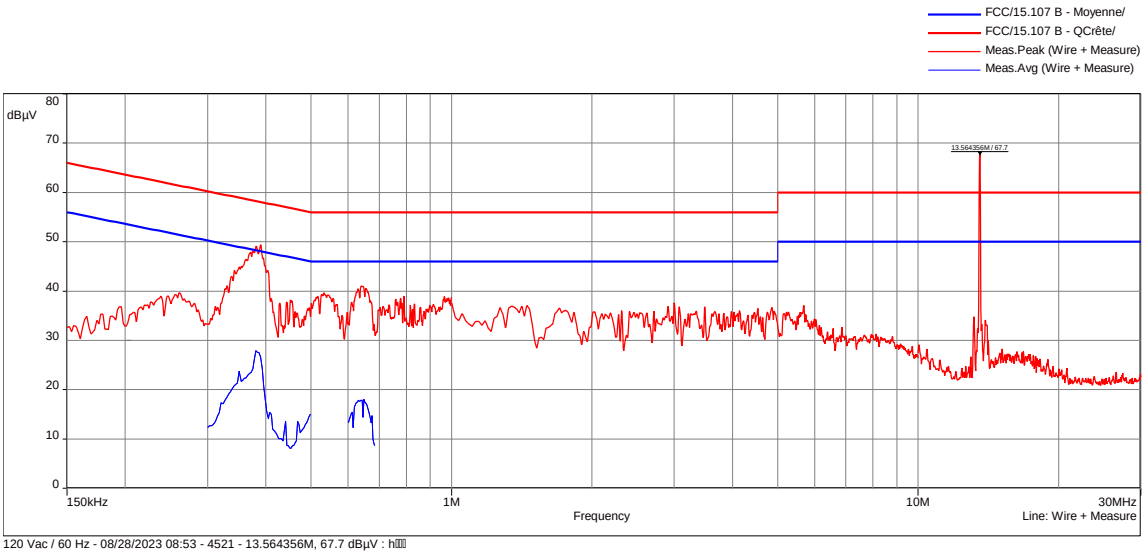
TEST SETUP PHOTO(S) – POWER SUPPLY USED FOR CONDUCTED MEASUREMENT


AC POWER-LINE CONDUCTED EMISSIONS - TABULATED RESULTS					
120VAC / 60HZ					EMI4610
TERMINAL	FREQUENCY (MHZ)	DETECTOR (PK/QP/AV)	LEVEL (dBµV)	LIMIT (dBµV)	MARGIN (dB)
0.262	Neutral	Pk	36.86	51.35	-14.49
0.385	Neutral	Av	34.99	48.17	-13.18
0.544	Neutral	Pk	36.73	46.00	-9.27
0.646	Neutral	Pk	38.02	46.00	-7.98
0.777	Neutral	Pk	35.41	46.00	-10.59
1.433	Neutral	Pk	34.36	46.00	-11.64
2.028	Neutral	Pk	33.17	46.00	-12.83
0.261	Line	Pk	39.66	51.41	-11.75
0.390	Line	AV	26.58	48.06	-21.48
0.428	Line	Pk	37.55	47.30	-9.75
0.452	Line	Pk	38.22	46.85	-8.63
0.533	Line	Pk	39.60	46.00	-6.4
0.649	Line	AV	18.03	46.00	-27.97
0.779	Line	Pk	38.46	46.00	-7.54
0.790	Line	Pk	39.02	46.00	-6.98
0.966	Line	Pk	38.91	46.00	-7.09
1.000	Line	Pk	37.59	46.00	-8.41
1.703	Line	Pk	36.52	46.00	-9.48
2.317	Line	Pk	36.05	46.00	-9.95
3.002	Line	Pk	37.56	46.00	-8.44
3.489	Line	Pk	36.80	46.00	-9.2
4.860	Line	Pk	36.64	46.00	-9.36
Supplementary information: When margin between peak measurements and Average/Qpeak limit(s) is > 6dB, no Average/Qpeak measurements were performed.					

AC POWER-LINE CONDUCTED EMISSIONS - GRAPH			
120VAC / 60HZ		EMI4610	
EUT mode:	Tx mode	**T (°C):**	22.9
Test Date:	28/08/2023	**H (%):**	45.4
Test Operator:	MPA	**P (hPa):**	1009



120 Vac / 60 Hz - 08/28/2023 08:53 - 4521 - 13.566357M, 66.4 dBµV : ¦ù



120 Vac / 60 Hz - 08/28/2023 08:53 - 4521 - 13.564356M, 67.7 dBµV : hÌÌÌ

TERMINAL	FREQUENCIES	RBW	VBW	DETECTOR
Neutral	150kHz-1MHz	10kHz	30kHz	Peak
Neutral	1MHz-10MHz	10kHz	30kHz	Peak
Neutral	10MHz-30MHz	10kHz	30kHz	Peak
Line	150kHz-1MHz	10kHz	30kHz	Peak
Line	1MHz-10MHz	10kHz	30kHz	Peak
Line	10MHz-30MHz	10kHz	30kHz	Peak
Neutral	300kHz-500kHz	10kHz	30kHz	Average
Line	300kHz-500kHz	10kHz	30kHz	Average
Line	601kHz-684kHz	10kHz	30kHz	Average
Measure with:	A.M.N.			
Comments:	The 13.56MHz is the main carrier frequency of the EUT's radio signal.			
EUT modification(s): N/A				

6.2. Occupied Bandwidth

Reference standard:	FCC part 15 Radio part 15.215 RSS-Gen
Test method:	ANSI C63.10: 2013
Test description: The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls. The residual part of the total power being denoted as β, which, in cases of symmetrical spectra, splits up into β/2 on each side of the spectrum. Unless otherwise specified, β/2 is taken as 0,5 %. The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions. EUT is connected to the measuring receiver via 50Ω attenuator(s).	

TESTED CABLE	OBW	SEVERITY	RESULT TAB.	VERDICT
99% Bandwidth	4.520 kHz	<14kHz	EMI4470	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	22.6 °C
Relative Humidity	20 to 75 %	56.6 %
Atmospheric pressure	N/A	1017 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	EMITECH	3.5 cm	4653		
Attenuator	Radiall	R412720124	4391	30/09/2022	30/11/2025
Cable	MegaPhase	N-3m	14853	20/05/2022	20/07/2024
Receiver	Rohde & Schwarz	FPL1007	17908	02/11/2022	02/01/2024
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	09/06/2021	09/02/2024

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OCCUPIED BANDWIDTH - GRAPH		
99% BANDWIDTH		EMI4470
EUT mode:	Tx mode	
Test Date:	01/09/2023	
Test Operator:	MPA	

EUT modification(s): N/A

Results:	The system has an OBW of 4.520 kHz in the 13.553MHz to 13.567MHz band.

EUT modification(s): N/A

6.3. Radiated spurious emissions

Reference standard:	FCC Part 15.225, 15.209 RSS-210, RSS-Gen
Test method:	ANSI C63.10: 2013

General test setup: For f <30MHz, EUT is set on an insulating support at 80cmcm above the ground reference plane.

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter in a semi-anechoic chamber. The EUT was rotated 360°in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°).

Final measurements (quasi-peak) were then performed in a 10-meter Open Area Test Site that complies to CISPR 16 in the same measurement conditions.

For f > 30MHz, EUT is set on an insulating support at 80cm above the ground reference plane (150cm for f >1GHz).

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities.

Final measurements (quasi-peak or average) were then performed in a semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. The EUT was rotated 360° about its azimuth and adjusting the receive antenna height from 1 to 4 m.

All frequencies were investigated, where applicable.

For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Radiated measurement / 0° / All positions	9kHz-30MHz	15.209	EMI4615	**PASS**
Radiated measurement / 45° / All positions	9kHz-30MHz	15.209	EMI4616	**PASS**
Radiated measurement / 90° / All positions	9kHz-30MHz	15.209	EMI4617	**PASS**
Radiated measurement / Position 1	30MHz-1GHz	15.209	EMI4577	**PASS**
Radiated measurement / Position 2	30MHz-1GHz	15.209	EMI4580	**PASS**
Radiated measurement / Position 3	30MHz-1GHz	15.209	EMI4581	**PASS**

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

Test method deviation: N/A

Supplementary information:

From 9 kHz to 30MHz: limit indicated on the curves is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

From 30MHz to 1GHz Quasi peak limit provided is the limit given in §15.209.

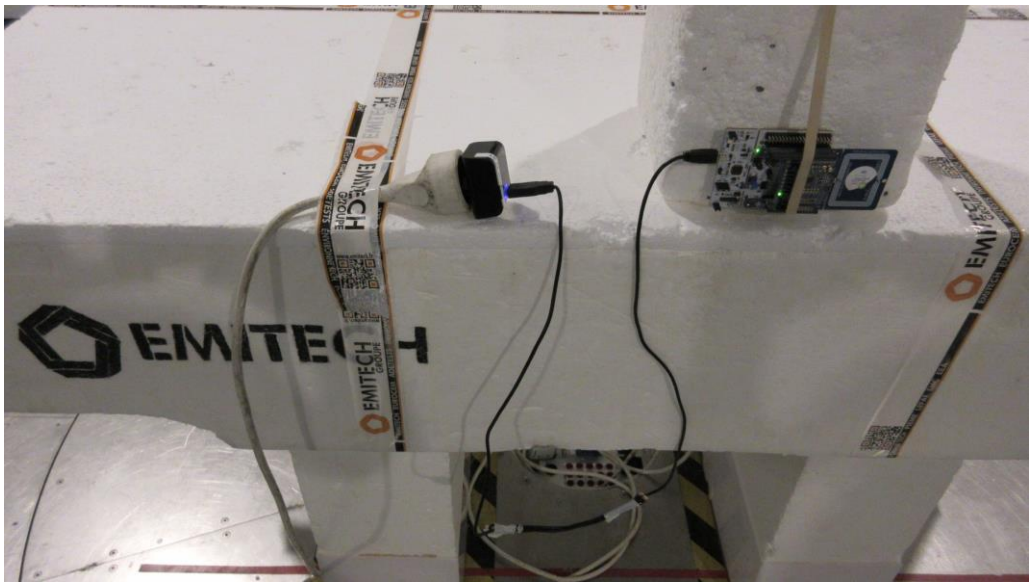
TEST EQUIPMENT USED – 9 KHZ TO 30 MHZ					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Antenna	Rohde & Schwarz	HFH2-Z2	5825	16/08/2022	16/10/2024
Cable	/	N-1m	3625	02/05/2023	02/07/2025
Cable	Techniwave	N-3.5m	18353	25/01/2022	25/03/2024
Cable	Techniwave	N-4m	18355	25/01/2022	25/03/2024
Receiver	Rohde & Schwarz	FSW43	14830	10/08/2022	10/10/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	09/06/2021	09/02/2024

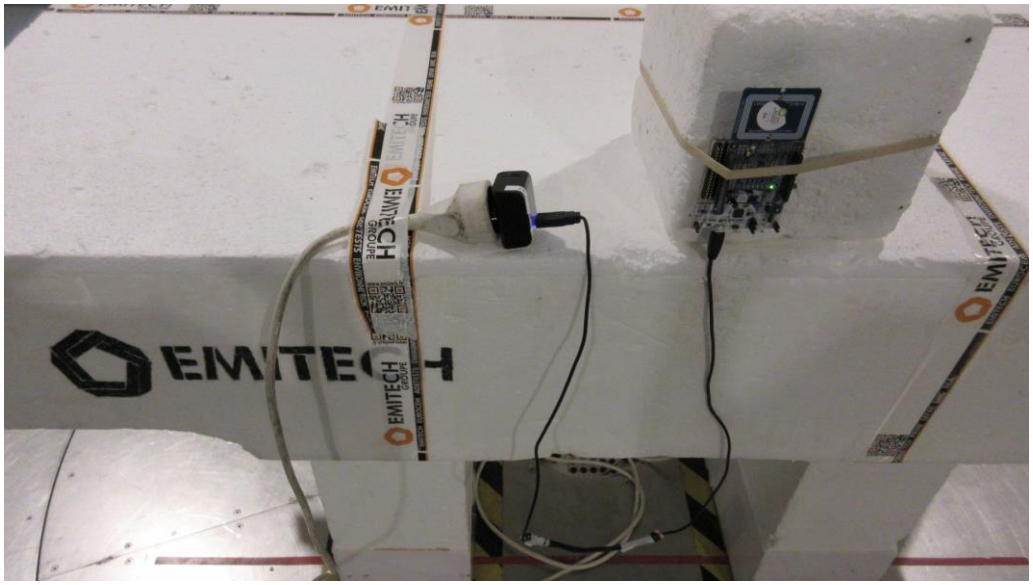
BAT-EMC software version: V3.18.0.26 Blank cells = Permanent validity

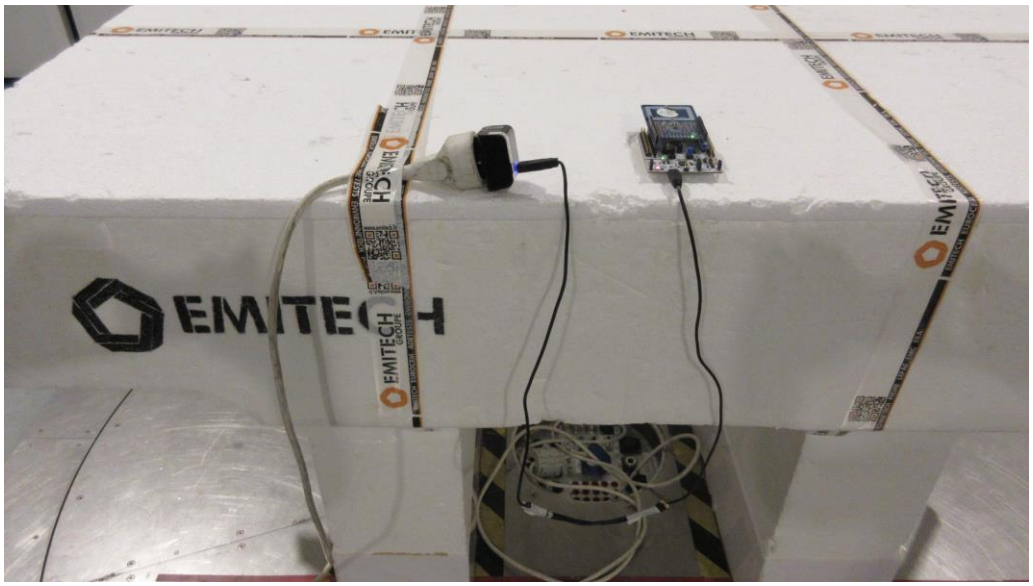
TEST EQUIPMENT USED – 30 MHZ TO 1 GHZ					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Antenna	ETS lindgren	3142E	14523	27/01/2022	27/03/2025
Cable	SUCOFLEX	N-3m	14378	17/08/2023	17/10/2025
Cable	SUCOFLEX	N-6,5m	14380	17/08/2023	17/10/2025
Cable	Techniwave	N-8m	18349	17/08/2023	17/10/2025
Receiver	Rohde & Schwarz	ESW26	17791	08/02/2023	08/04/2024
Shielded enclosure	COMTEST	FAR-3m	18014	17/08/2021	17/10/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024

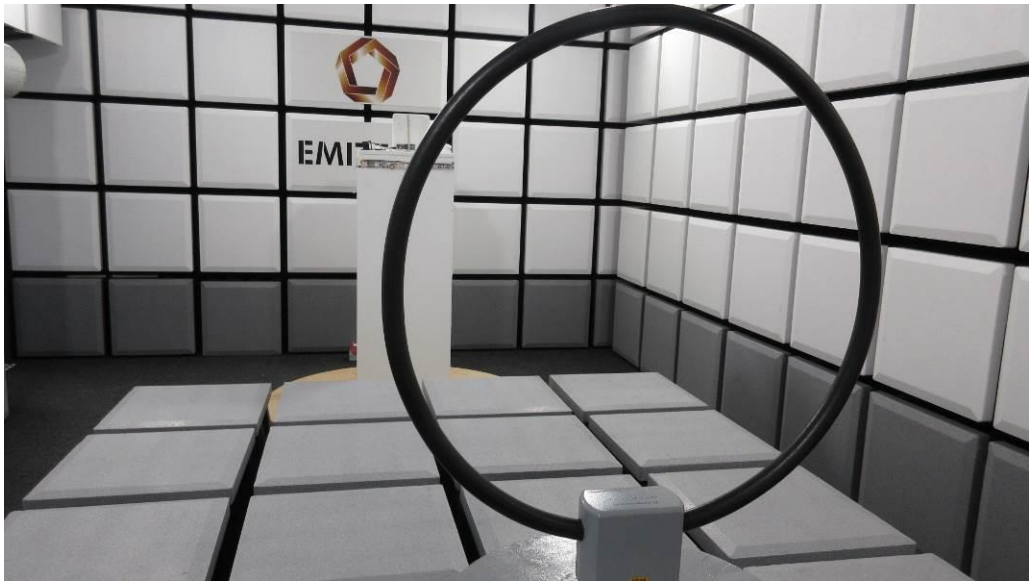
BAT-EMC software version: V3.18.0.26 Blank cells = Permanent validity

TEST SETUP PHOTO(S) EUT POSITION 1



TEST SETUP PHOTO(S) EUT POSITION 2


TEST SETUP PHOTO(S) EUT POSITION 3


TEST SETUP PHOTO(S) RADIATED EMISSIONS (9KHZ TO 30MHZ)


TEST SETUP PHOTO(S) RADIATED EMISSIONS (30 MHZ TO 1 GHZ)


RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / 0° / ALL POSITIONS					EMI4615
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµA/m)	AVERAGE/QPEAK LEVEL (dBµA/m)	AVERAGE/ QPEAK LIMIT (dBµA/m)	MARGING (dB)
N/A	N/A	N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.					

RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / 45° / ALL POSITIONS					EMI4616
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµA/m)	AVERAGE/QPEAK LEVEL (dBµA/m)	AVERAGE/ QPEAK LIMIT (dBµA/m)	MARGING (dB)
N/A	N/A	N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.					

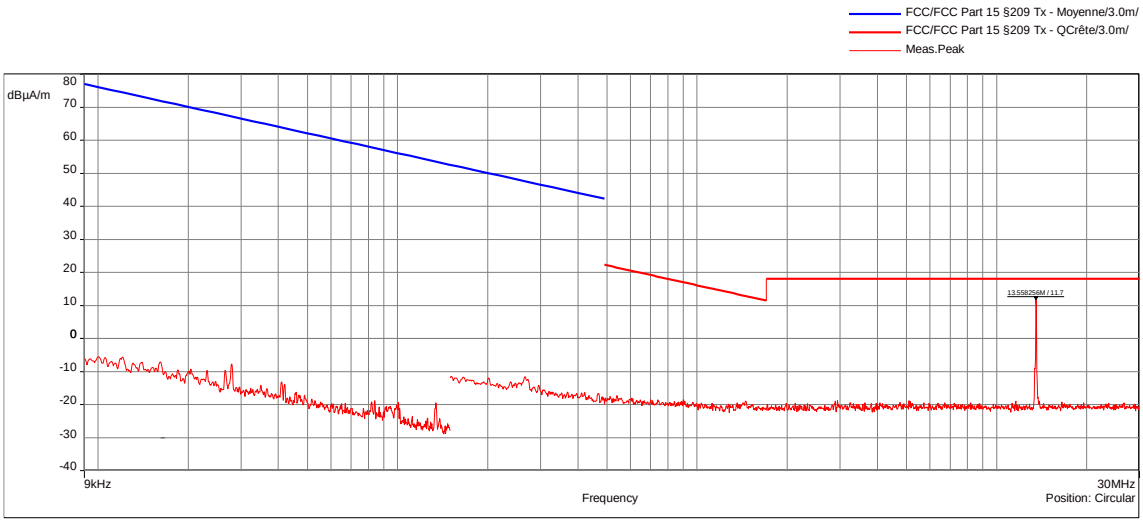
RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / 90° / ALL POSITIONS					EMI4617
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµA/m)	AVERAGE/QPEAK LEVEL (dBµA/m)	AVERAGE/ QPEAK LIMIT (dBµA/m)	MARGING (dB)
N/A	N/A	N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.					

RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / POSITION 1					EMI4577
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµV/m)	QPEAK LEVEL (dBµV/m)	QPEAK LIMIT (dBµV/m)	MARGING (dB)
36.338	Vertical	33.92	N/P	40.00	-6.08
38.795	Vertical	33.13	N/P	40.00	-6.87
77.726	Vertical	29.94	N/P	40.00	-10.06
94.927	Vertical	26.42	N/P	43.50	-17.08
143.979	Vertical	29.69	N/P	43.50	-13.81
176.281	Vertical	26.22	N/P	43.50	-17.28
180.323	Vertical	26.11	N/P	43.50	-17.39
182.715	Vertical	25.46	N/P	43.50	-18.04
184.300	Vertical	26.56	N/P	43.50	-16.94
32.328	Horizontal	23.53	N/P	40.00	-16.47
76.917	Horizontal	25.41	N/P	40.00	-14.59
94.927	Horizontal	19.08	N/P	43.50	-24.42
149.152	Horizontal	22.16	N/P	43.50	-21.34
176.281	Horizontal	26.59	N/P	43.50	-16.91
182.554	Horizontal	22.19	N/P	43.50	-21.31
203.409	Horizontal	25.63	N/P	43.50	-17.87
287.996	Horizontal	25.91	N/P	46.00	-20.09
Supplementary information: when margin between peak measurements and quasi-peak limit(s) is > 6dB, no quasi-peak measurements were performed					

RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / POSITION 2					EMI4580
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµV/m)	QPEAK LEVEL (dBµV/m)	QPEAK LIMIT (dBµV/m)	MARGING (dB)
35.432	Vertical	31.25	N/P	40.00	-8.75
40.670	Vertical	30.16	N/P	40.00	-9.84
77.241	Vertical	27.47	N/P	40.00	-12.53
143.979	Vertical	29.68	N/P	43.50	-13.82
144.852	Vertical	28.89	N/P	43.50	-14.61
168.391	Vertical	25.66	N/P	43.50	-17.84
172.918	Vertical	24.77	N/P	43.50	-18.73
176.281	Vertical	27.52	N/P	43.50	-15.98
203.409	Vertical	24.58	N/P	43.50	-18.92
881.462	Vertical	35.28	N/P	46.00	-10.72
33.557	Horizontal	23.91	N/P	40.00	-16.09
77.079	Horizontal	22.71	N/P	40.00	-17.29
144.011	Horizontal	21.76	N/P	43.50	-21.74
287.996	Horizontal	25.64	N/P	46.00	-20.36
325.440	Horizontal	26.32	N/P	46.00	-19.68
339.020	Horizontal	28.13	N/P	46.00	-17.87
Supplementary information: when margin between peak measurements and quasi-peak limit(s) is > 6dB, no quasi-peak measurements were performed					

RADIATED SPURIOUS EMISSIONS – TABULATED RESULTS					
RADIATED MEASUREMENT / POSITION 3					EMI4581
FREQUENCY (MHz)	POLARIZATION	PEAK LEVEL (dBµV/m)	QPEAK LEVEL (dBµV/m)	QPEAK LIMIT (dBµV/m)	MARGING (dB)
36.273	Vertical	31.95	N/P	40.00	-8.05
76.917	Vertical	28.63	N/P	40.00	-11.37
133.405	Vertical	28.30	N/P	43.50	-15.20
143.979	Vertical	28.88	N/P	43.50	-14.62
168.553	Vertical	22.89	N/P	43.50	-20.61
172.368	Vertical	23.94	N/P	43.50	-19.56
176.281	Vertical	27.65	N/P	43.50	-15.85
179.514	Vertical	23.19	N/P	43.50	-20.31
180.484	Vertical	24.90	N/P	43.50	-18.60
33.072	Horizontal	23.22	N/P	40.00	-16.78
77.338	Horizontal	23.46	N/P	40.00	-16.54
143.979	Horizontal	20.86	N/P	43.50	-22.64
287.996	Horizontal	26.62	N/P	46.00	-19.38
325.440	Horizontal	26.00	N/P	46.00	-20.00
Supplementary information: when margin between peak measurements and quasi-peak limit(s) is > 6dB, no quasi-peak measurements were performed					

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / 0° / ALL POSITIONS		EMI4615	
EUT mode:	D-M2	**T (°C):**	24
Test Date:	29/08/2023	**H (%):**	44.2
Test Operator:	MPA	**P (hPa):**	1010

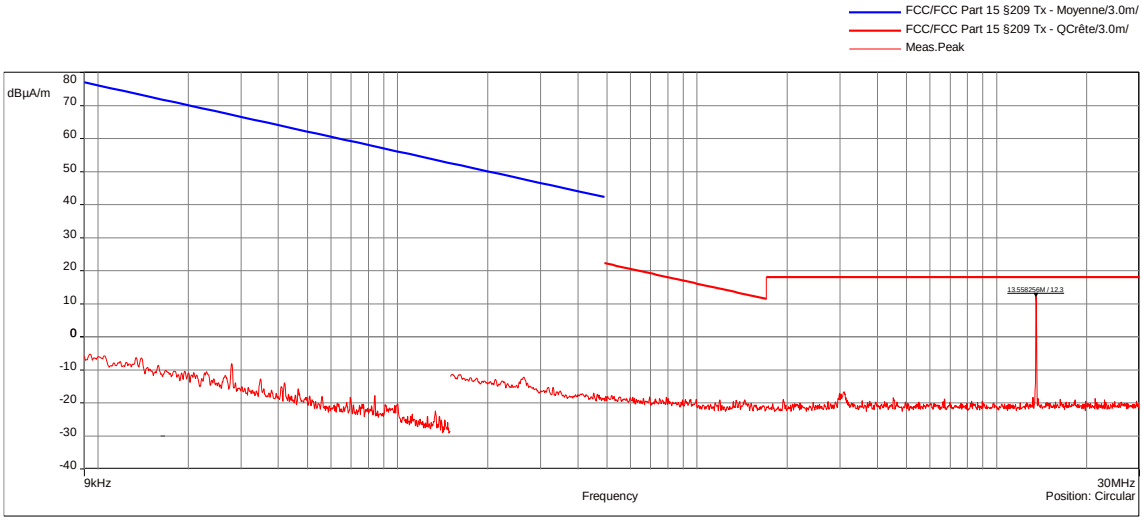


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak

Configuration:	N/A
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor. The 13.56MHz is the main carrier frequency of the EUT's radio signal.

EUT modification(s): N/A

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / 45° / ALL POSITIONS		EMI4616	
EUT mode:	D-M2	**T (°C):**	24
Test Date:	29/08/2023	**H (%):**	44.2
Test Operator:	MPA	**P (hPa):**	1010

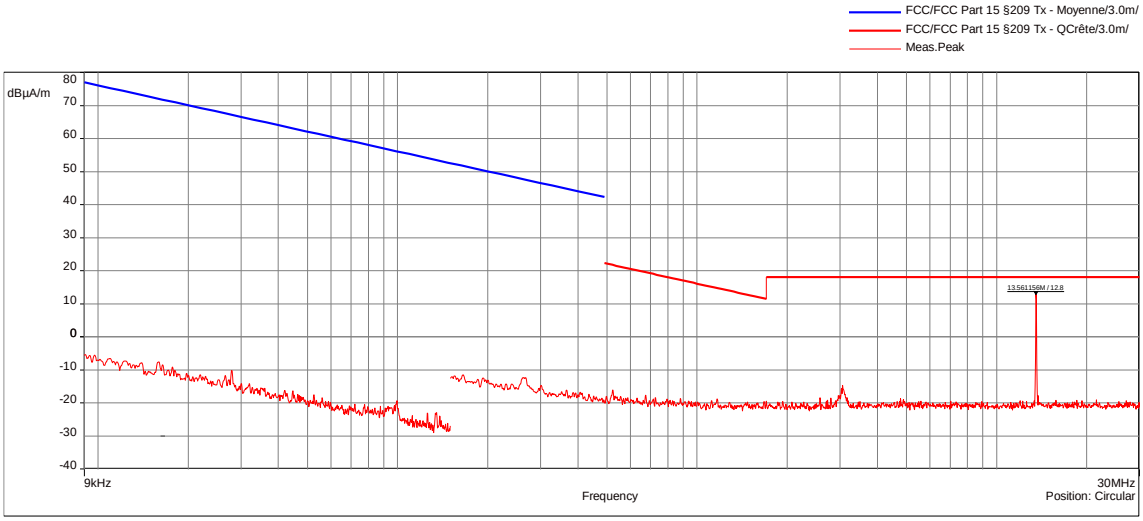


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak

Configuration:	N/A
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor. The 13.56MHz is the main carrier frequency of the EUT's radio signal.

EUT modification(s): N/A

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / 90° / ALL POSITIONS		EMI4617	
EUT mode:	D-M2	**T (°C):**	24
Test Date:	29/08/2023	**H (%):**	44.2
Test Operator:	MPA	**P (hPa):**	1010

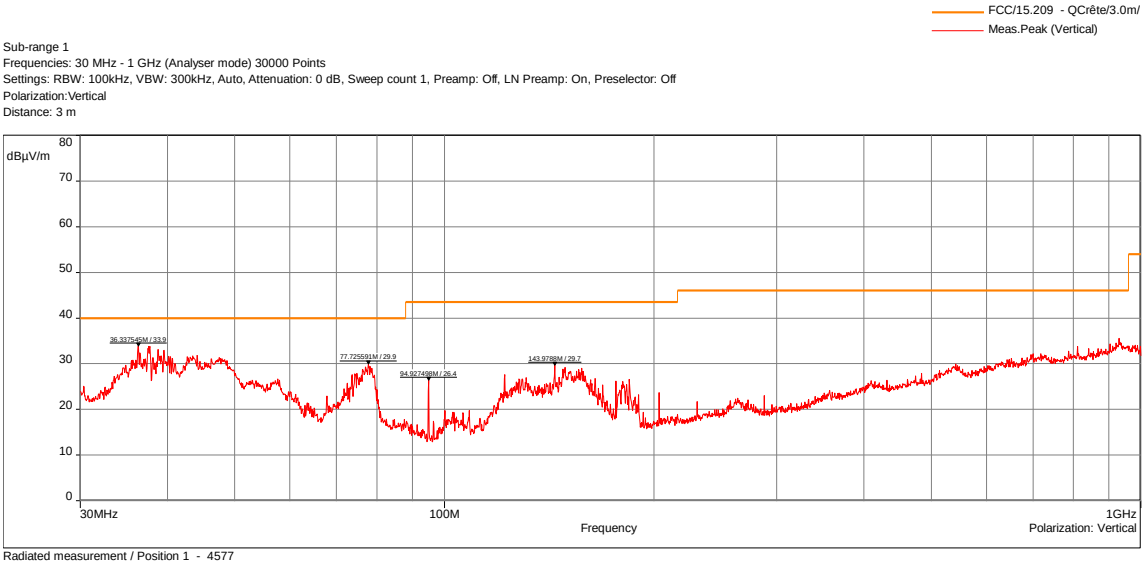


POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	9kHz-150kHz	300Hz	1kHz	Peak
Circular	150kHz-1MHz	10kHz	30kHz	Peak
Circular	1MHz-30MHz	10kHz	30kHz	Peak

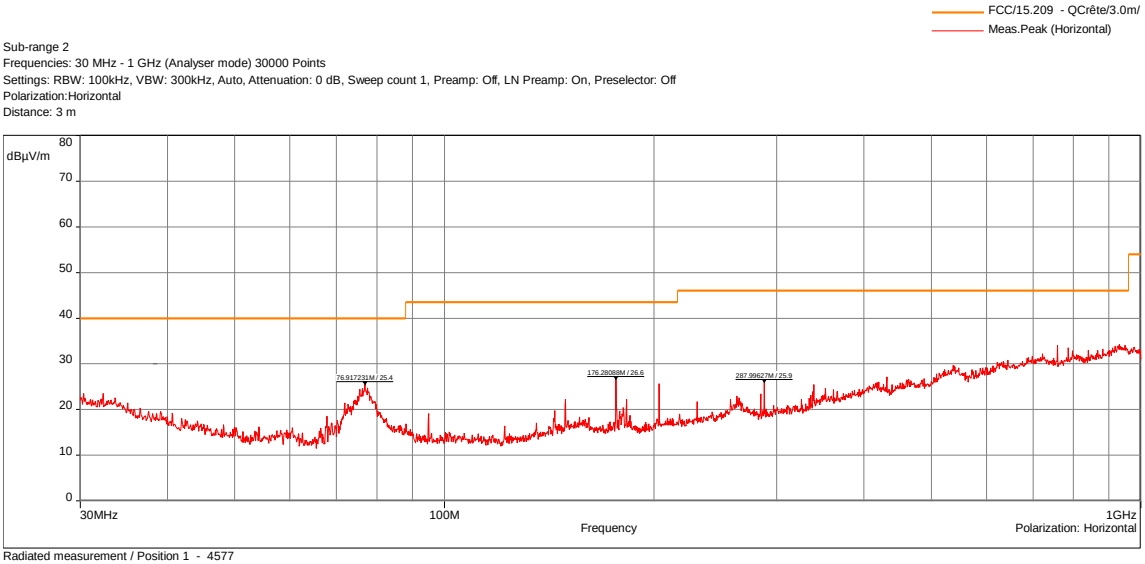
Configuration:	N/A
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor. The 13.56MHz is the main carrier frequency of the EUT's radio signal.

EUT modification(s): N/A

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / POSITION 1		EMI4577	
EUT mode:	Tx mode	**T (°C):**	22.9
Test Date:	28/08/2023	**H (%):**	45.4
Test Operator:	MPA	**P (hPa):**	1009



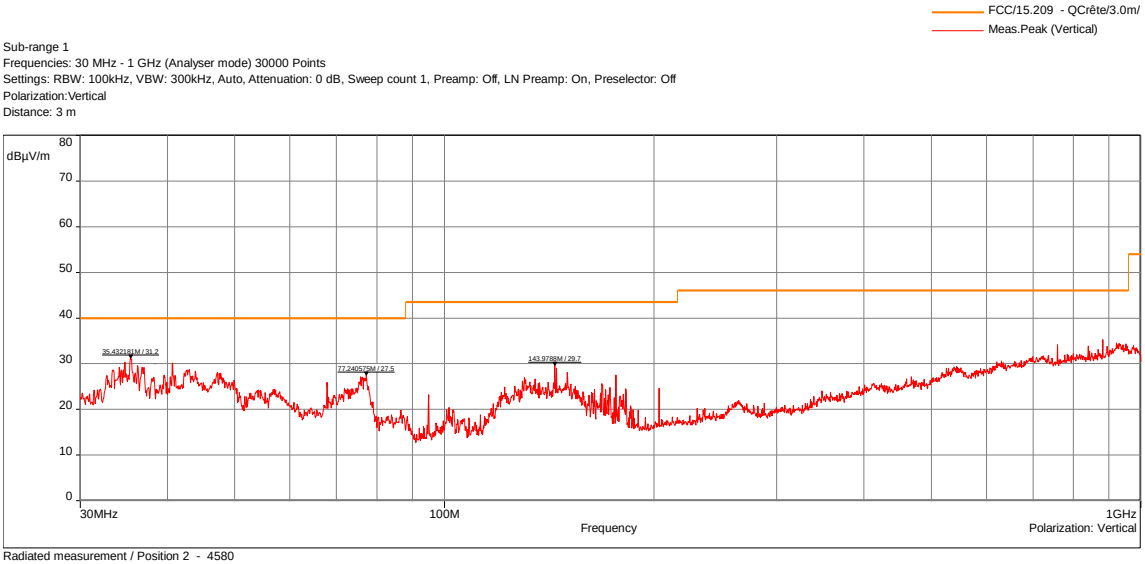
Radiated measurement / Position 1 - 4577



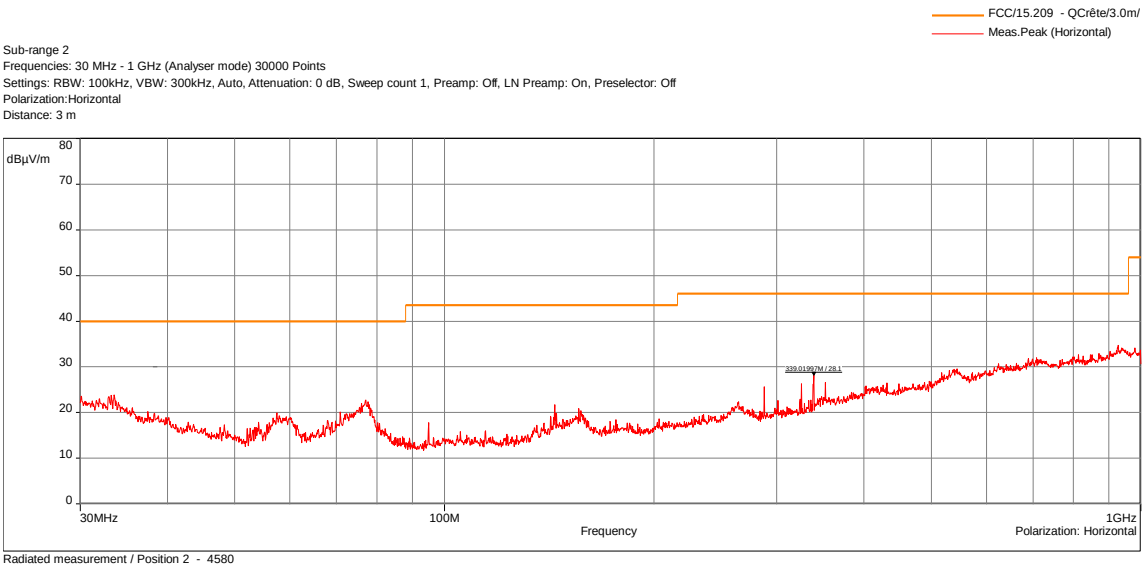
Radiated measurement / Position 1 - 4577

POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-1GHz	100kHz	300kHz	Peak
Horizontal	30MHz-1GHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / POSITION 2		EMI4580	
EUT mode:	Tx mode	**T (°C):**	22.9
Test Date:	28/08/2023	**H (%):**	45.4
Test Operator:	MPA	**P (hPa):**	1009



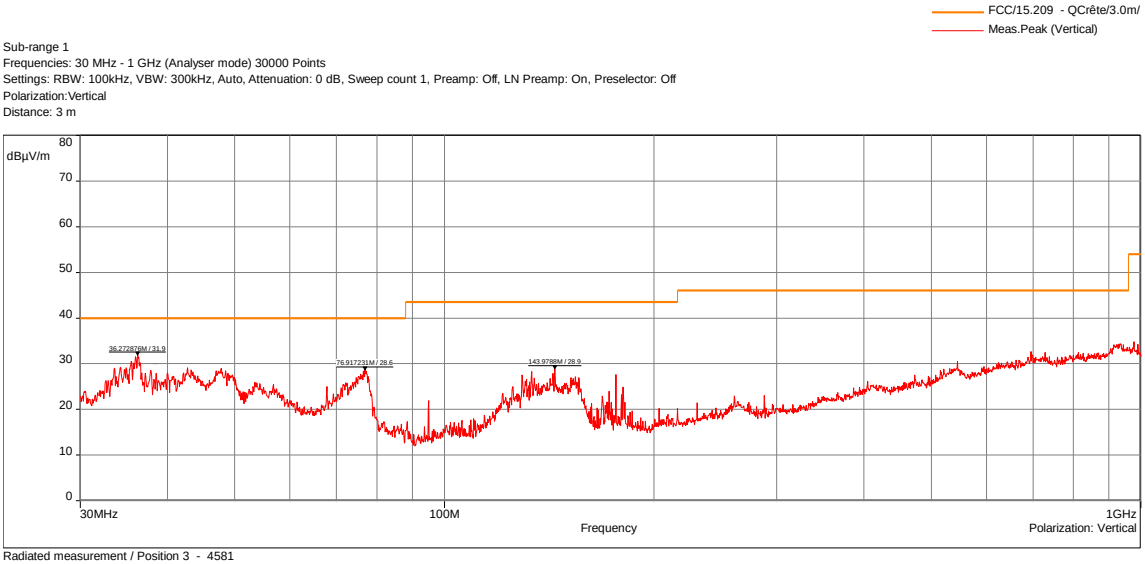
Radiated measurement / Position 2 - 4580



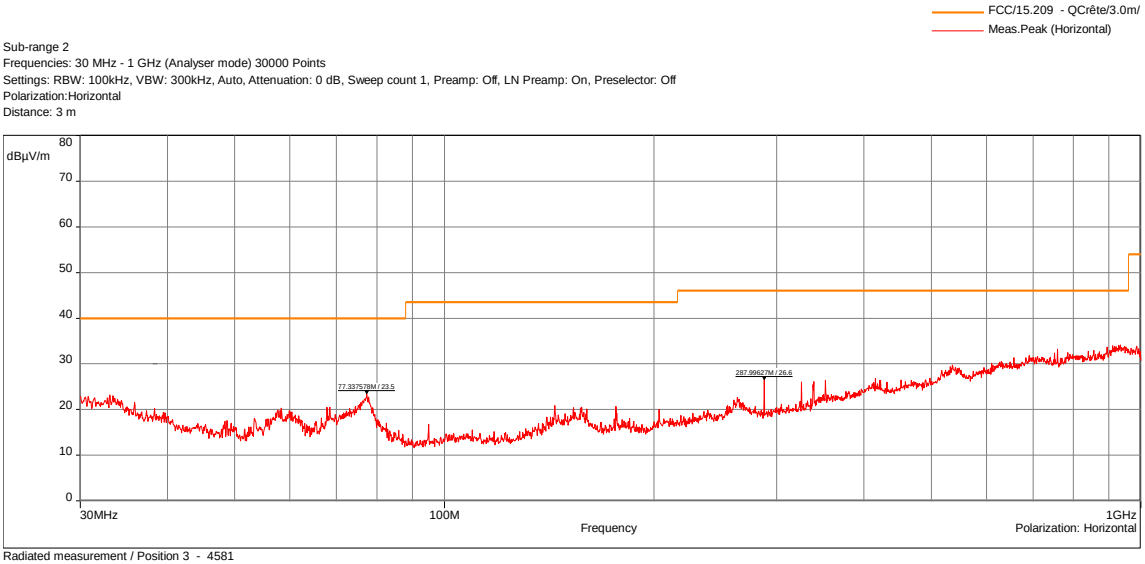
Radiated measurement / Position 2 - 4580

POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-1GHz	100kHz	300kHz	Peak
Horizontal	30MHz-1GHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

RADIATED SPURIOUS EMISSIONS - GRAPH			
RADIATED MEASUREMENT / POSITION 3		EMI4581	
EUT mode:	Tx mode	**T (°C):**	22.9
Test Date:	28/08/2023	**H (%):**	45.4
Test Operator:	MPA	**P (hPa):**	1009



Radiated measurement / Position 3 - 4581



Radiated measurement / Position 3 - 4581

POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-1GHz	100kHz	300kHz	Peak
Horizontal	30MHz-1GHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	N/A			
EUT modification(s): N/A				

6.4. Field strength in the band 13.553-13.567MHz

Reference standard:	FCC Part 15.225 a) RSS-210
Test method:	ANSI C63.10: 2013
General test setup: EUT is set on an insulating support at 80cm. Measurements were then performed in a 10-meter Open Area Test Site that complies to CISPR 16. The EUT was rotated 360° in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°). For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.	

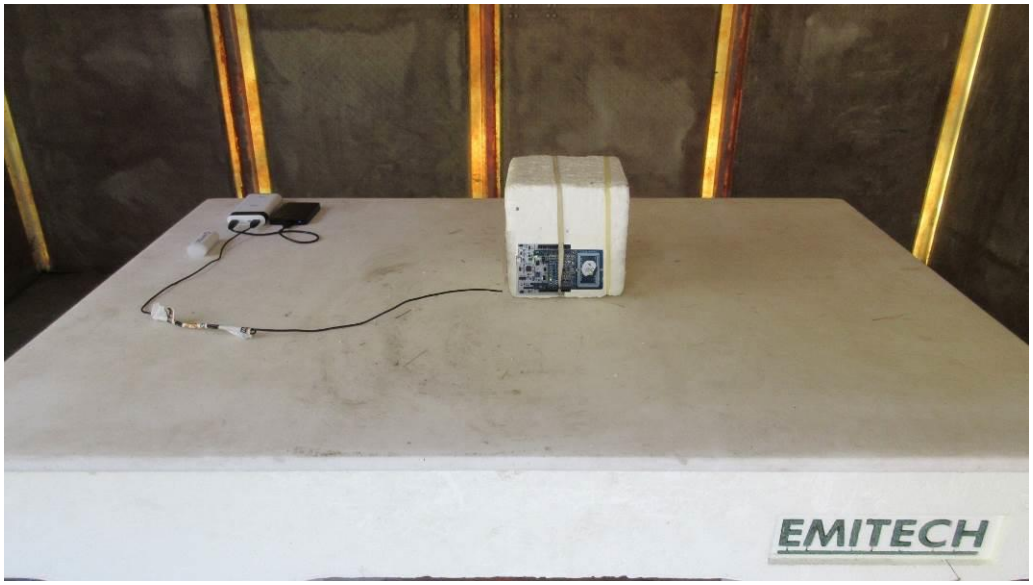
TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
Field strength	Tx mode	15848µV/m at 30m	EMI4400	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	22.6 °C
Relative Humidity	20 to 75 %	56.6 %
Atmospheric pressure	N/A	1017 hPa
Test method deviation: N/A		
Supplementary information: Only maximum level is recorded		

TEST EQUIPMENT USED

CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HFH2-Z2	5825	16/08/2022	16/10/2024
Cable	Huber + Suhner	N-10m	8472	16/08/2023	16/10/2025
Open area test site	EMITECH	Salinelles	3482	21/08/2021	21/10/2024
Receiver	Rohde & Schwarz	ESHS10	3371	04/05/2023	04/07/2024
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	09/06/2021	09/02/2024

Blank cells = Permanent validity

TEST SETUP PHOTO(S)


TEST SETUP PHOTO(S)


FIELD STRENGTH - TABULATED RESULTS				EMI4400
Frequency (MHz)	**Polarization (°)**	**Level at 10m (dBµA/m)**	**Limit at 10m (dBµA/m)**	**Limit at 30m (µV/m)**
13.56	0	-1.44	51.58	15848
13.56	45	0.36	51.58	15848
13.56	90	3.16	51.58	15848
Comments:	Maximun level at 10 m is 3.16 dBµA/m for a limit at 51.58 dBµA/m. Using an extrapolation factor of 40 dB/dec and a conversion factor of -51.5 dB, level at 30m is 35.58 dBµV/m for a limit at 84 dBµV/m.			

EUT MODIFICATIONS	OPERATOR	TEST DATE	RESULT TAB.
N/A	MPA	31/08/2023	EMI4400

6.5. Field strength outside the band 13.110-14.010MHz

Reference standard:	FCC Part 15.225 b) c) & d) RSS-210
Test method:	ANSI C63.10: 2013
General test setup: EUT is set inside the climatic enclosure. Carrier level are correlated with the maximum carrier level measured in normal conditions.	

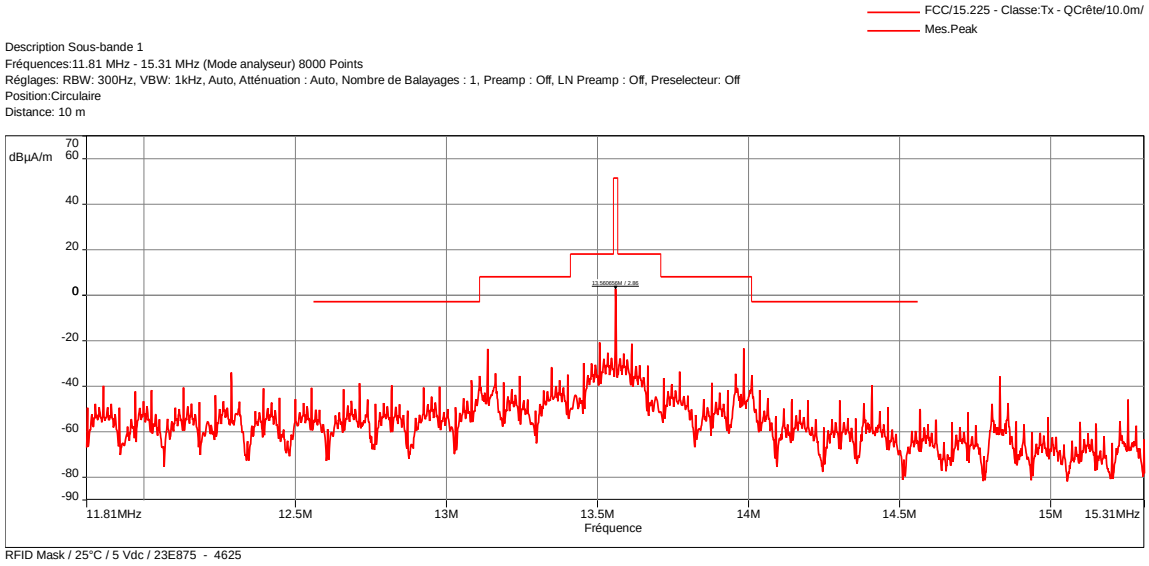
FREQUENCY BAND	SEVERITY	RESULT TAB.	VERDICT
13.110-13.410MHz	106µV/m at 30m	See graphic	**PASS**
13.410-13.553MHz	334µV/m at 30m	See graphic	**PASS**
13.553-13.567MHz	15,848µV/m at 30m	See graphic & §6.4 of this report	**PASS**
13.567-13.710MHz	334µV/m at 30m	See graphic	**PASS**
13.710-14.010MHz	106µV/m at 30m	See graphic	**PASS**
Above 14.010MHz	§15.209	See graphic & §6.3 of this report	**PASS**
Below 13.110MHz	§15.209	See graphic & §6.3 of this report	**PASS**

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

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	EMITECH	3.5 cm	4653		
Attenuator	Radiall	R412720124	4391	30/09/2022	30/11/2025
Cable	MegaPhase	N-3m	14853	20/05/2022	20/07/2024
Receiver	Rohde & Schwarz	FPL1007	17908	02/11/2022	02/01/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	09/06/2021	09/02/2024

Blank cells = Permanent validity

FIELD STRENGTH IN THE BAND 13.110-14.010MHZ AND OUTSIDE – GRAPH			
FIELD STRENGTH IN THE BAND 13.110-14.010MHZ AND OUTSIDE		**EMI4581**	
EUT mode:	Tx mode	**T (°C):**	22.6
Test Date:	01/09/2023	**H (%):**	56.6
Test Operator:	MPA	**P (hPa):**	1017



POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Circular	11.81MHz-15.31MHz	300Hz	1kHz	Peak
Configuration:	N/A			
Comments:	Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			

EUT modification(s): N/A

6.6. Measurement of Frequency Stability

Reference standard:	FCC 47 CRF Part 15.225 e) RSS-210
Test method :	ANSI C63.10: 2013
General test setup: The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees 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 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery. EUT is set inside the climatic enclosure. Carrier level are correlated with the maximum carrier level measured in normal conditions.	

TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
Frequency stability	Tx mode	+/-0.01%	EMI4500	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	22.6 °C
Relative Humidity	20 to 75 %	56.6 %
Atmospheric pressure	N/A	1017 hPa
Test method deviation: Due to EUT's operating temperature range, measurement was performed at 0°C and +60°C.		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Antenna	EMITECH	3.5 cm	4653		
Attenuator	Radiall	R412720124	4391	30/09/2022	30/11/2025
Cable	MegaPhase	N-3m	14853	20/05/2022	20/07/2024
Climatic enclosure	CLIMATS	EXCAL 7714-HA	14261	01/09/2022	01/11/2023
Receiver	Rohde & Schwarz	FPL1007	17908	02/11/2022	02/01/2024
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	09/06/2021	09/02/2024

Blank cells = Permanent validity

TEST SETUP PHOTO(S)


FREQUENCY STABILITY / CARD - TABULATED RESULTS					EMI4500
Test Case	**Temperature (°C)**	**Power supply (Vdc)**	**Frequency (MHz)**	**Frequency error (%)**	**Limit (%)**
Normal conditions	+25	5	13.5606154	-	+/- 0.01%
Extremes conditions	0	5	13.5606454	+0.00022	
	+60	5	13.5605475	-0.00050	

EUT MODIFICATIONS	OPERATOR	TEST DATE	RESULT TAB.
N/A	MPA	01/09/2023	EMI4500

End of test report