



Test report issued under the responsibility of:
EMITECH MONTPELLIER laboratory
MRA US-EU Designation Number: FR0006
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RADIO TEST REPORT

FFC Part 15.225
RSS-210 Issue 10

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-NFC10A1
FCC ID..... : YCPNFC10A1
IC : 8976A-NFC10A1
Ratings..... : 5Vdc

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

Report Reference No..... : **RR-EVE-24D107-2A**
Test procedure : FCC IC Certification
Diffusion..... : Mr. DAVID DAUBOIS
Applicant's name : STMICROELECTRONICS
Date of issue..... : October 18, 2024
Total number of pages..... : 34
Revision : 0
Compiled by..... : Olivier AELBRECHT
Approved by (+ signature) : David MONTAULON (Technical Manager)

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REPORT INDEX:

1. GENERAL INFORMATIONS	3
2. REFERENCE DOCUMENT(S).....	4
3. EQUIPMENT TECHNICAL DESCRIPTION.....	5
3.1. TEST CONDITIONS	5
3.2. E.U.T. GENERAL VIEW	5
3.3. E.U.T. MARKING PLATE	6
3.4. E.U.T. MECHANICAL AND ELECTRICAL DESIGN.....	6
3.5. E.U.T. INPUT/OUTPUT PORTS.....	7
3.6. SUPPORTING EQUIPMENT USED DURING TEST.....	8
3.7. EUT RADIO SPECIFICATIONS.....	9
4. RESULT SUMMARY	10
5. MEASUREMENT UNCERTAINTY.....	11
6. TEST CONDITIONS AND RESULTS	12
6.1. AC POWER-LINE CONDUCTED EMISSIONS	12
6.2. OCCUPIED BANDWIDTH	15
6.3. FIELD STRENGTH IN THE BAND 13.553-13.567MHZ.....	17
6.4. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.010MHZ.....	19
6.5. TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ.....	23
6.6. TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ.....	29
6.7. MEASUREMENT OF FREQUENCY STABILITY.....	33

REVISION HISTORY:

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

1. GENERAL INFORMATIONS

This document submits the results of Radio tests performed on the equipment **NFC demo board X-NUCLEO-NFC10A1** (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				
Address.	145 rue de Massacan 34740 VENDARGUES FRANCE				
Test procedure.	FCC IC Certification				
Tested by	Olivier AELBRECHT				
Test supervisor	None				
Date of receipt of test item	N/A				
Date (s) of performance of tests	June the 7 th of 2024				
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. DAVID DAUBOIS				
GENERAL REMARKS:					
<p>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.</p> <p>"(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.</p>					
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
FSOATS	Free Space 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
SAC	Semi Anechoic Chamber				

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:

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

FFC 47 CFR PART 15: May 2024

Code of federal regulations. Title 47- Telecommunication Chapter 1- Federal Communication Commission. Part 15- Radio frequency devices

PART 15.225

Operation within the band 13.110-14.010 MHz.

RSS-210 Issue 10: December 2019 / AMD: April. 2020

Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen, Issue 5, April 2018 / AMD 1: March 2019 / AMD 2 : February 2021

General Requirements for Compliance of Radio Apparatus

ANSI C63.10 : 2103

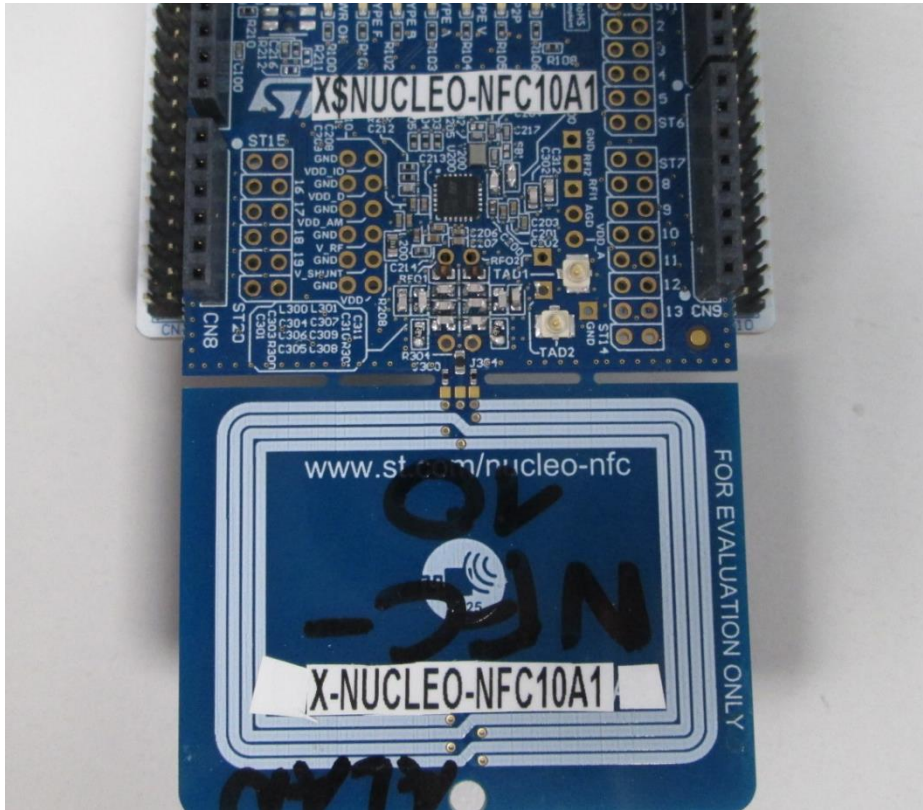
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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.

3.3.E.U.T. Marking plate



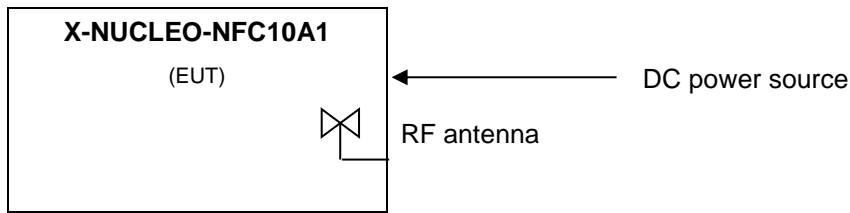
3.4.E.U.T. Mechanical and Electrical Design

Power supply.....	: 5Vdc
Power supply range.....	: 5Vdc
Power type.....	: USB
Power (W).....	: Not communicated
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	Plastic	N/A
1	DC power source	DC	N/A	N/A	5Vdc
2	RF antenna	RF	N/A	N/A	13.56MHz 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

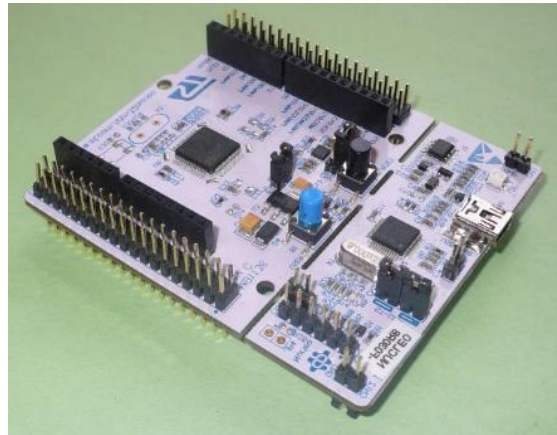
DC.....: Direct current port
 RF: Radio frequency port

3.6. Supporting Equipment Used During Test

Sample subject to the tests was tested with following equipment.

PRODUCT TYPE	MANUFACTURER	MODEL	N°EMITECH / COMMENTS
Nucleo demo board	STMICROELECTRONICS	Not communicated	Used to powered the EUT and set it in test mode.
Power Bank	Xindao B.V.	P324.25	Provide the 5Vdc to the Nucleo demo board (AE) during radiated measurement.

NUCLEO DEMO BOARD (AE)



POWER BANK (AE)



3.7. EUT Radio Specifications

a) GENERAL INFORMATIONS	
According to manufacturer's declarations :	
EUT type.....	<i>Transceiver</i>
Technology	<i>RFID</i>
Environmental profile.....	<i>Data transmissions</i>
Temperature range.....	<i>0°C to +60°C</i>
Antenna type	<i>Integral</i>
Antenna Gain.....	<i>Not communicated</i>
Comments:	
<i>N/A</i>	
b) TRANSMITTER PARAMETERS (Tx)	
Frequency bands.....	<i>13.553MHz to 13.567MHz</i>
RF Power.....	<i>Not communicated</i>
Number of channels / Separation.....	<i>1 channel</i>
Modulation type	<i>AM</i>
Duty cycle	<i>Not communicated</i>
Tested frequency.....	<i>13.56MHz</i>
c) RECEIVER PARAMETERS (Rx)	
Frequency bands.....	<i>13.553MHz to 13.567MHz</i>
Category/Class	<i>Not communicated</i>
Bandwidth	<i>Not communicated</i>

4. RESULT SUMMARY

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
Conducted emission - 120Vac/60Hz	B	PASS	ANSI C63.10: 2013
Occupied bandwidth - 99% Bandwidth	<14kHz	PASS	ANSI C63.10: 2013
Field strength in the band 13.553-13.567MHz - X-NUCLEO-NFC10A1	Tx	PASS	ANSI C63.10: 2013
Field strength outside the band 13.110-14.010MHz - X-NUCLEO-NFC10A1	Tx	PASS	ANSI C63.10: 2013
Transmitter radiated spurious emissions at frequencies <30MHz - Tx mode / 0° / X-NUCLEO-NFC10A1 - Tx mode / 45° / X-NUCLEO-NFC10A1 - Tx mode / 90° / X-NUCLEO-NFC10A1	Tx Tx Tx	PASS PASS PASS	Fcc Part 15.209 RSS-Gen ANSI C63.10: 2013
Transmitter radiated spurious emissions at frequencies >30MHz - Tx mode / X-NUCLEO-NFC10A1		PASS	Fcc Part 15.209 RSS-Gen ANSI C63.10: 2013
Measurement of Frequency Stability - 13.56MHz	+/-0.01%	PASS	ANSI C63.10: 2013

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

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the results with the exception of emission tests based on CISPR standards.

TEST(S) PERFORMED	MODIFICATION(S)
Fcc Part 15.225 RSS-210 ANSI C63.10: 2013	N/A
Fcc Part 15.209 RSS-Gen ANSI C63.10: 2013	N/A

5. MEASUREMENT UNCERTAINTY

PARAMETER	MAXIMAL EMITECH UNCERTAINTY	MINIMAL STANDARD UNCERTAINTY
Radio frequency	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$
Occupied bandwidth		
RF power	$\pm 3.8 \%$	$\pm 5 \%$
Supply voltages	$\pm 3 \%$	$\pm 3 \%$
Temperature	$\pm 1 \text{ }^\circ\text{C}$	$\pm 1^\circ\text{C}$
Humidity	$\pm 5 \%$	$\pm 5 \%$
Time / Duty cycle	$\pm 4.4 \%$	$\pm 5 \%$
Adaptivity	$\pm 2.9 \text{ dB}$	/
Conducted emission (FCC) (Artificial Mains Network) 150kHz – 30MHz	$\pm 3.4 \text{ dB}$	$\pm 3.4 \text{ dB}$
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	$\pm 2.7 \text{ dB}$	/
30MHz – 1GHz	$\pm 5.0 \text{ dB}$	/
1GHz – 18GHz	$\pm 5.3 \text{ dB}$	/
18GHz – 40GHz	$\pm 6.1 \text{ dB}$	/
40GHz – 140GHz	$\pm 5.7 \text{ dB}$	/

For the 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 through a "standard power supply" which meets FCC and RSS requirements.		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
AC power source	KIKUSUI	PCR 4000L	15322	20/02/2024	20/04/2026
Cable	EMITECH	Current absorber sheath	18366	17/08/2023	17/10/2025
Cable	C&C	N-3m	16413	16/08/2023	16/10/2025
LISN	Rohde & Schwarz	ENV216	17925	06/12/2023	06/02/2026
Receiver	Rohde & Schwarz	ESI	9704	15/01/2024	15/03/2025
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024

Blank cells = Permanent validity

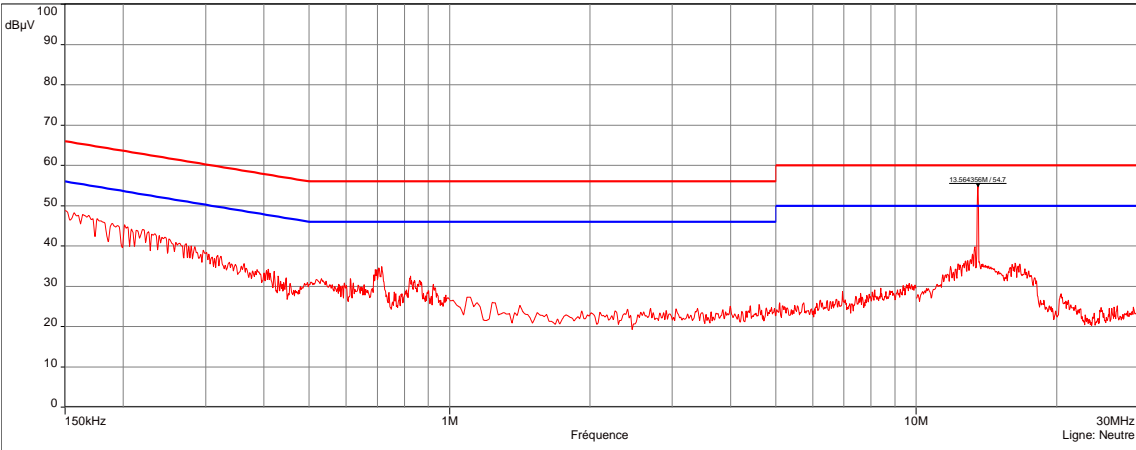
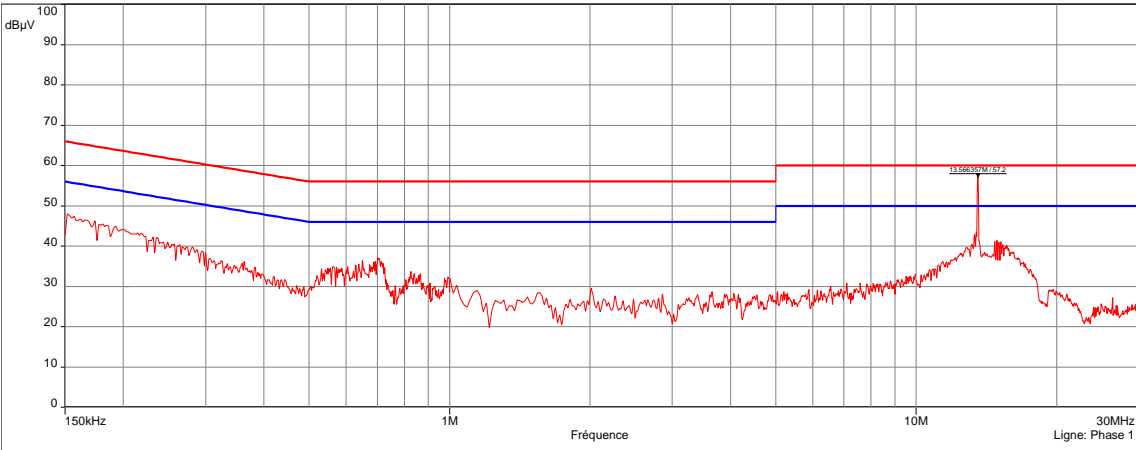
TEST SETUP PHOTO(S) – POWER SUPPLY USED FOR CONDUCTED MEASUREMENT



AC POWER-LINE CONDUCTED EMISSIONS - TABULATED RESULTS

120VAC / 60Hz							EMI4610	
FREQUENCY (MHz)	TERMINAL	PEAK LEVEL (dBµV)	QPEAK LEVEL (dBµV)	QPEAK LIMIT (dBµV)	QPEAK MARGIN (dBµV)	AVERAGE LEVEL (dBµV)	AVERAGE LIMIT (dBµV)	AVERAGE MARGIN (dBµV)
0.150	Neutral	48.80	N/P	56.00	N/P	N/P	46.00	N/P
0.176	Neutral	46.77	N/P	54.69	N/P	N/P	44.69	N/P
0.189	Neutral	45.62	N/P	54.07	N/P	N/P	44.07	N/P
0.201	Neutral	45.23	N/P	53.57	N/P	N/P	43.57	N/P
0.220	Neutral	44.08	N/P	52.82	N/P	N/P	42.82	N/P
0.227	Neutral	43.52	N/P	52.57	N/P	N/P	42.57	N/P
0.152	Line	47.92	N/P	55.91	N/P	N/P	45.91	N/P
0.181	Line	45.46	N/P	54.45	N/P	N/P	44.45	N/P
0.651	Line	36.52	N/P	46.00	N/P	N/P	36.00	N/P
0.688	Line	36.06	N/P	46.00	N/P	N/P	36.00	N/P
0.693	Line	36.12	N/P	46.00	N/P	N/P	36.00	N/P
0.702	Line	37.10	N/P	46.00	N/P	N/P	36.00	N/P

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:	05/09/2024		H (%):	45.4
Test Operator:	MPA		P (hPa):	1009
<div style="font-size: small;"> — FCC/15.207 - Classe:B - Moyenne/ — FCC/15.207 - Classe:B - QCrête/ — Mes. Peak (Neutre) </div>				
				
Conducted measurement / 120Vac/60Hz - 05/09/2024 12:47 - 4481 - 13.564356M, 54.7 dBµV : =9%ϕ				
<div style="font-size: small;"> — FCC/15.207 - Classe:B - Moyenne/ — FCC/15.207 - Classe:B - QCrête/ — Mes. Peak (Phase 1) </div>				
				
Conducted measurement / 120Vac/60Hz - 05/09/2024 12:47 - 4481 - 13.566357M, 57.2 dBµV : =9%ϕ				
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
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

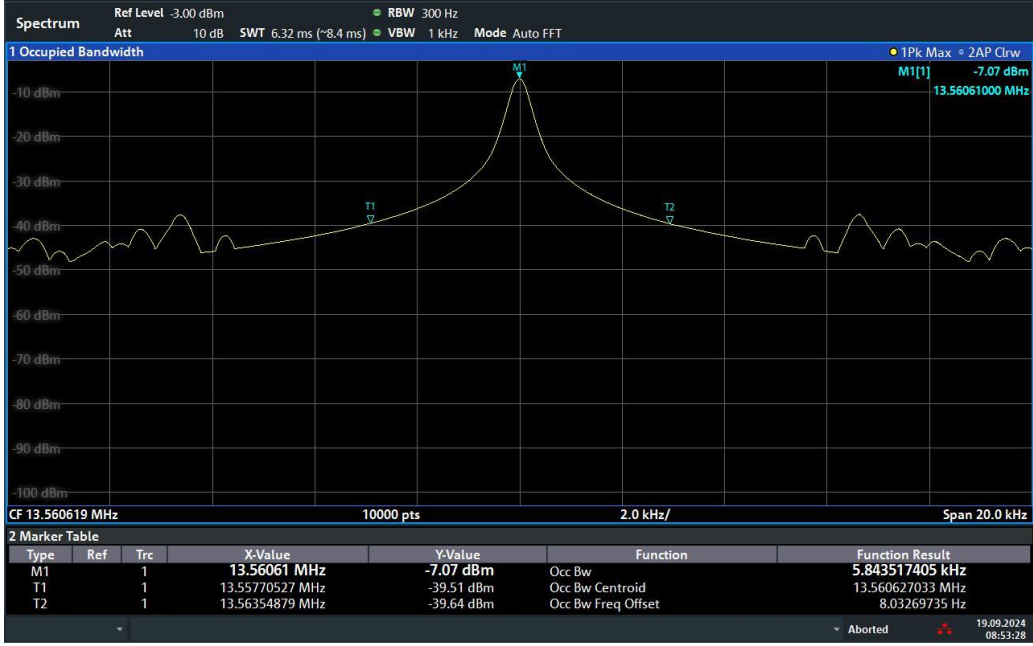
Reference standard:	FCC part 15 Radio part 15.215 RSS-Gen
Test method:	ANSI C63.10: 2013
<p>Test description: The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls. The residual part of the total power being denoted as β, which, in cases of symmetrical spectra, splits up into $\beta/2$ on each side of the spectrum. Unless otherwise specified, $\beta/2$ is taken as 0,5 %.</p> <p>The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions.</p> <p>Measurement is done using a near filed probe.</p>	

TESTED CABLE	OBW	SEVERITY	RESULT TAB.	VERDICT
99% Bandwidth	5.843 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	R412710124	17328	17/08/2023	17/10/2026
Attenuator	Radiall	R412710124	4390	30/09/2022	30/11/2025
Spectrum analyzer	Rohde & Schwarz	FPL1007	17908	04/12/2023	04/02/2025
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024

Blank cells = Permanent validity

OCCUPIED BANDWIDTH - GRAPH																													
99% BANDWIDTH																													
EMI4470																													
EUT mode:	Tx mode																												
Test Date:	19/09/2023																												
Test Operator:	MPA																												
 <p>The spectrum graph displays a peak at 13.56061 MHz with a power level of -7.07 dBm. The graph includes a table with the following data:</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>13.56061 MHz</td> <td>-7.07 dBm</td> <td>Occ Bw</td> <td>5.843517405 kHz</td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>13.55770527 MHz</td> <td>-39.51 dBm</td> <td>Occ Bw Centroid</td> <td>13.560627033 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>13.56354879 MHz</td> <td>-39.64 dBm</td> <td>Occ Bw Freq Offset</td> <td>8.03269735 Hz</td> </tr> </tbody> </table>		Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		13.56061 MHz	-7.07 dBm	Occ Bw	5.843517405 kHz	T1	1		13.55770527 MHz	-39.51 dBm	Occ Bw Centroid	13.560627033 MHz	T2	1		13.56354879 MHz	-39.64 dBm	Occ Bw Freq Offset	8.03269735 Hz
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		13.56061 MHz	-7.07 dBm	Occ Bw	5.843517405 kHz																							
T1	1		13.55770527 MHz	-39.51 dBm	Occ Bw Centroid	13.560627033 MHz																							
T2	1		13.56354879 MHz	-39.64 dBm	Occ Bw Freq Offset	8.03269735 Hz																							
08:53:28 19.09.2024																													
EUT modification(s): N/A																													
Results:	The system has an OBW of 5.843 kHz in the 13.553 MHz to 13.567 MHz band.																												
EUT modification(s): N/A																													

6.3. Field strength in the band 13.553-13.567MHz

Reference standard:	FCC part 15 Radio part 15.225 a) RSS-210
Test method:	ANSI C63.10: 2013
<p>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.</p> <p>The EUT was rotated 360° in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°).</p> <p>For portable equipments a research of maximum level is done on the 3 axes. Only the highest levels are recorded.</p>	

TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
0° / X-NUCLEO-NFC10A1	Permanent emission mode	15848µV/m at 30m	EMI4605	PASS
45° / X-NUCLEO-NFC10A1	Permanent emission mode	15848µV/m at 30m	EMI4604	PASS
90° / X-NUCLEO-NFC10A1	Permanent emission mode	15848µV/m at 30m	EMI4603	PASS

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

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-20m	8385	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	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

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TEST SETUP PHOTO(S)



FIELD STRENGTH - TABULATED RESULTS

TEST CONDITION	FREQUENCIES	LEVEL AT 10m (dB μ A/m)	LIMIT AT 10m (dB μ A/m)	LIMIT AT 30m (μ V/m)	RESULT TAB.
0° / X-NUCLEO-NFC10A1	13.56MHz	3.16	51.58	15848	EMI4605
45° / X-NUCLEO-NFC10A1	13.56MHz	1.86	51.58	15848	EMI4604
90° / X-NUCLEO-NFC10A1	13.56MHz	0.36	51.58	15848	EMI4603

EUT MODIFICATIONS	OPERATOR	TEST DATE
N/A	OAT	07/10/2024

Maximun level at 10m for X-NUCLEO-NFC010A1 is 3.16 μ A/m for a limit at 51.58dB μ A/m.

Using an extrapolation factor of 40dB/dec and a conversion factor of -51.5dB, level at 30m is: 35.58dB μ V/m for X-NUCLEO-NFC010A1 for a limit at 84dB μ V/m.

6.4. Field strength outside the band 13.110-14.010MHz

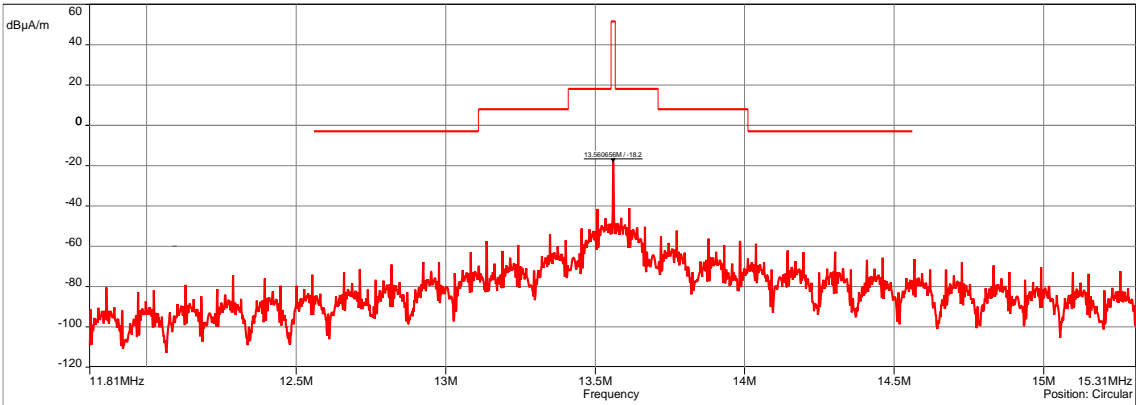
Reference standard:	FCC Part 15.225 b) c) & d) RSS-210
Test method:	ANSI C63.10: 2013
General test setup: EUT is set inside the climatic enclosure. Carrier level are correlated with the maximum carrier level measured in normal conditions.	

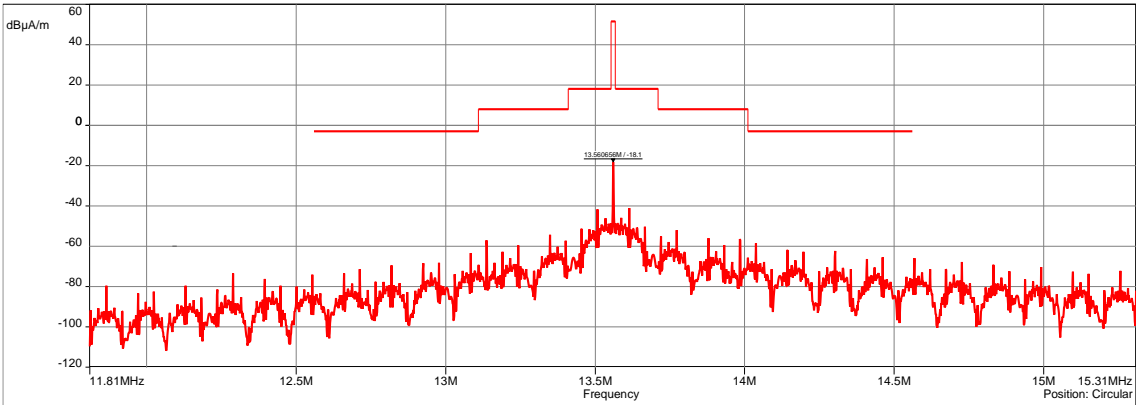
FREQUENCY BAND	SEVERITY	RESULT TAB.	VERDICT
13.110-13.410MHz	106 μ V/m at 30m	See graphic	PASS
13.410-13.553MHz	334 μ V/m at 30m	See graphic	PASS
13.553-13.567MHz	15,848 μ V/m at 30m	See graphic & §6.4 of this report	PASS
13.567-13.710MHz	334 μ V/m at 30m	See graphic	PASS
13.710-14.010MHz	106 μ V/m at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

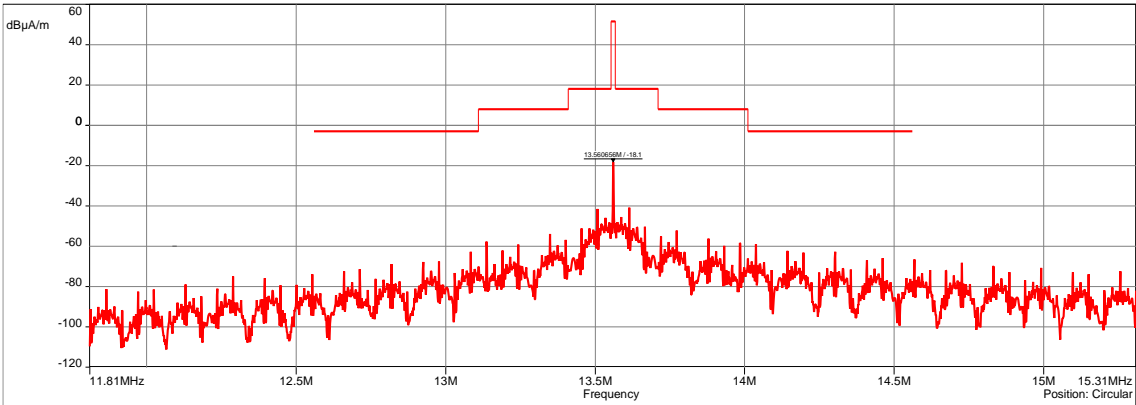
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(es)
Relative Humidity	20 to 75 %	See Graph(es)
Atmospheric pressure	N/A	See Graph(es)
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	EMITECH	3.5 cm	4653		
Climatic enclosure	CLIMATS	EXCAL 7714-HA	14261	26/03/2024	26/05/2025
Receiver	Rohde & Schwarz	FPL1007	17908	04/12/2023	04/02/2025
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024

Blank cells = Permanent validity

TRANSMITTER SPECTRUM MASK - GRAPH					
RFID MASK / 25°C / 5Vdc				EMI4513	
EUT mode:	Tx mode			T (°C):	22.7
Test Date:	05/09/2024			H (%):	60.3
Test Operator:	MPA			P (hPa):	1005
<p>Sub-range 1 Frequencies: 11.81 MHz - 15.31 MHz (Analyser mode) 8000 Points Settings: RBW: 300Hz, VBW: 1kHz, Auto, Attenuation: Auto, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: Off Position: Circular Distance: 10 m</p> <p style="text-align: right;"> — FCC/15.225 Tx - QCrête/10.0m/ — Meas.Peak </p>  <p style="font-size: small;">RFID Mask / 25°C / 5Vdc - 4513</p>					
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. No spurious emissions were detected.				
<i>EUT modification(s): N/A</i>					

TRANSMITTER SPECTRUM MASK - GRAPH					
RFID MASK / -20°C / 5Vdc				EMI4515	
EUT mode:	Tx mode			T (°C):	22.7
Test Date:	05/09/2024			H (%):	60.3
Test Operator:	MPA			P (hPa):	1005
<p>Sub-range 1 Frequencies: 11.81 MHz - 15.31 MHz (Analyser mode) 8000 Points Settings: RBW: 300Hz, VBW: 1kHz, Auto, Attenuation: Auto, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: Off Position: Circular Distance: 10 m</p> <p style="text-align: right;"> — FCC/15.225 Tx - QCrête/10.0m/ — Meas.Peak </p>  <p style="text-align: center;">RFID Mask / -20°C / 5Vdc - 4515</p>					
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. No spurious emissions were detected.				
<i>EUT modification(s): N/A</i>					

TRANSMITTER SPECTRUM MASK - GRAPH					
RFID MASK / 50°C / 5Vdc				EMI4514	
EUT mode:	Tx mode			T (°C):	22.7
Test Date:	05/09/2024			H (%):	60.3
Test Operator:	MPA			P (hPa):	1005
<p>Sub-range 1 Frequencies: 11.81 MHz - 15.31 MHz (Analyser mode) 8000 Points Settings: RBW: 300Hz, VBW: 1kHz, Auto, Attenuation: Auto, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: Off Position: Circular Distance: 10 m</p> <p style="text-align: right;"> — FCC/15.225 Tx - QCrête/10.0m/ — Meas.Peak </p>  <p style="font-size: small;">RFID Mask / 50°C / 5Vdc - 4514</p>					
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. No spurious emissions were detected.				
<i>EUT modification(s): N/A</i>					

6.5. Transmitter radiated spurious emissions at frequencies <30MHz

Reference standard:	Fcc Part 15.209 RSS-Gen
Test method:	ANSI C63.10: 2013
<p>Test description: : Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation.</p> <p>EUT is set on an insulating support at 80cm above the ground reference plane.</p> <p>Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter in a anechoic chamber. The EUT was rotated 360°in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°).</p> <p>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.</p> <p>All frequencies were investigated, where applicable.</p>	

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Tx mode / 0° / X-NUCLEO-NFC10A1	9kHz-30MHz	Part 15.209	EMI4538	PASS
Tx mode / 45° / X-NUCLEO-NFC10A1	9kHz-30MHz	Part 15.209	EMI4539	PASS
Tx mode / 90° / X-NUCLEO-NFC10A1	9kHz-30MHz	Part 15.209	EMI4540	PASS

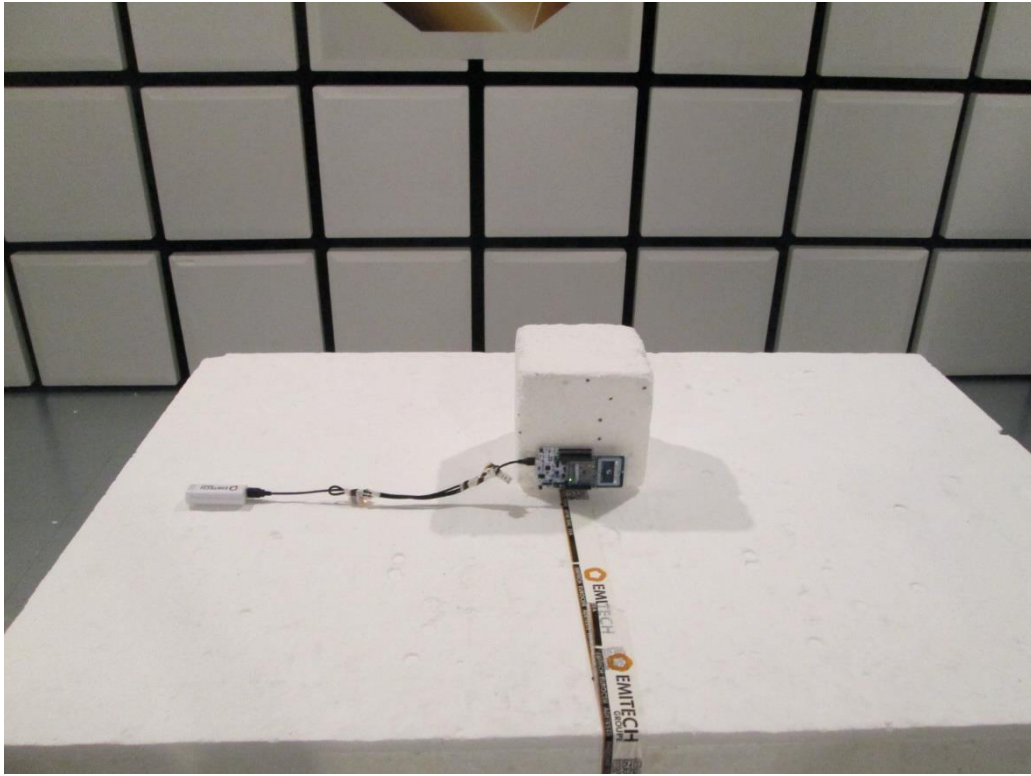
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	See Graph(s)
Relative Humidity	20 to 75 %	See Graph(s)
Atmospheric pressure	N/A	See Graph(s)
Test method deviation: N/A		
Supplementary information: Limit indicated on the curves is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	Rohde & Schwarz	HFH2-Z2	5825	16/08/2022	16/10/2024
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	14/02/2023	14/04/2025
Shielded enclosure	COMTEST	SAC 3m	14494	08/08/2023	08/10/2026
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

TEST SETUP PHOTO(S) – EUT POSITION



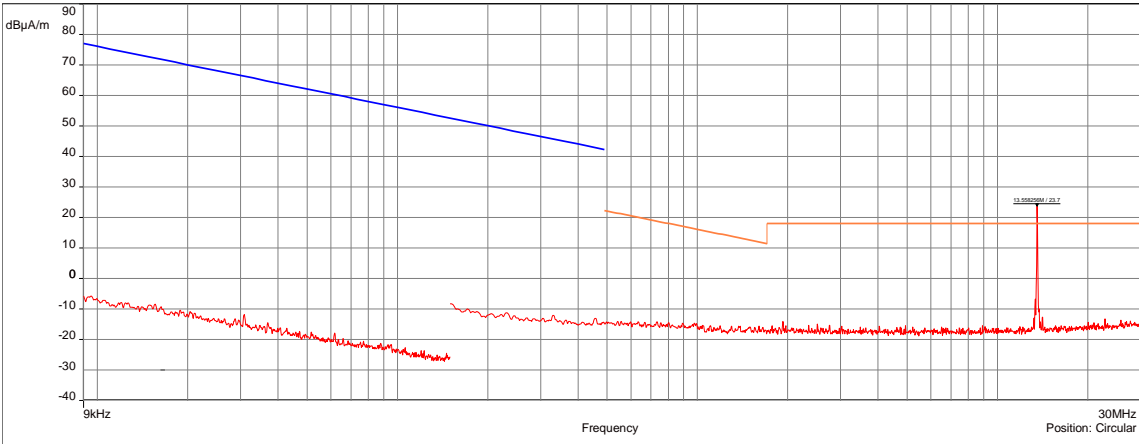
TEST SETUP PHOTO(S)

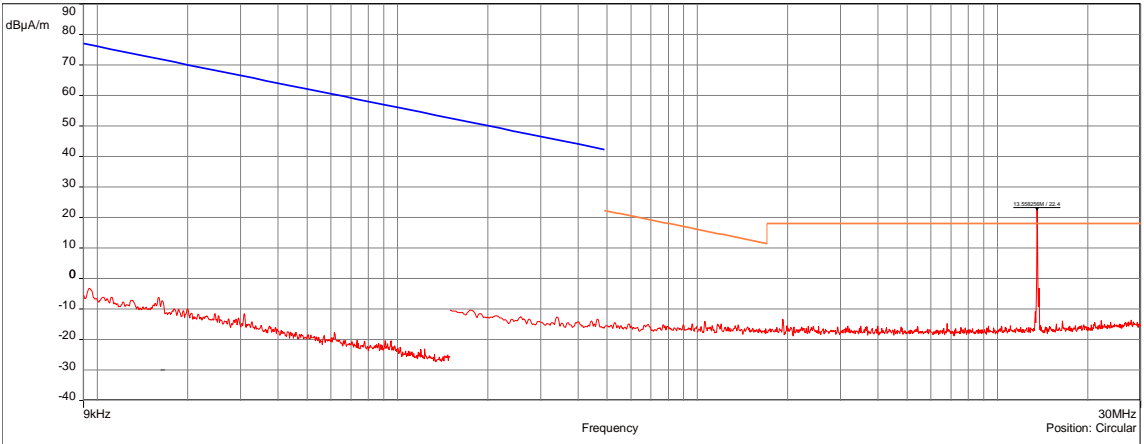


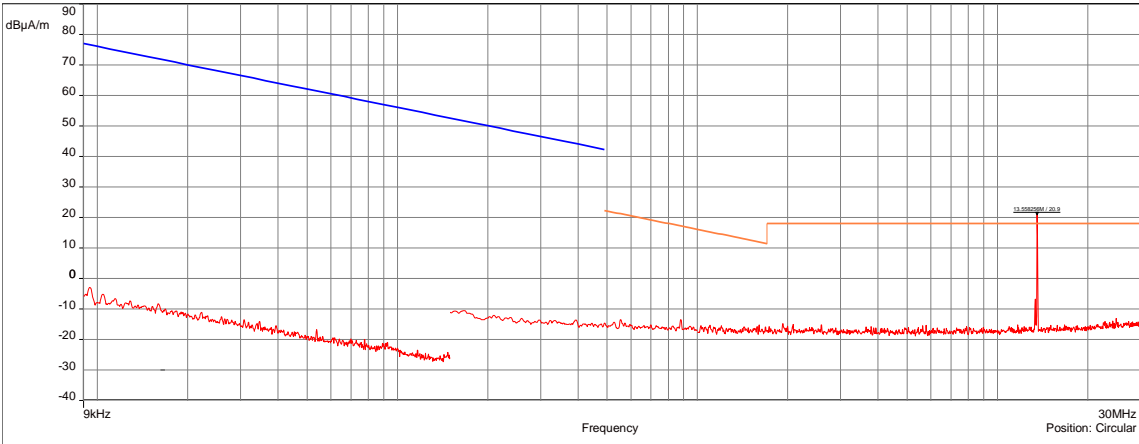
TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - TABULATED RESULTS			
TX MODE / 0° / X-NUCLEO-NFC10A1			EMI4538
Frequency (MHz)	Antenna Position	Level (dBμA/m)	Limit (dBμA/m)
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - TABULATED RESULTS			
TX MODE / 45° / X-NUCLEO-NFC10A1			EMI4539
Frequency (MHz)	Antenna Position	Level (dBμA/m)	Limit (dBμA/m)
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - TABULATED RESULTS			
TX MODE / 90° / X-NUCLEO-NFC10A1			EMI4540
Frequency (MHz)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)
N/A	N/A	N/A	N/A
Supplementary information: No spurious emissions were detected.			

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - GRAPH				
Tx MODE / 0° / X-NUCLEO-NFC10A1			EMI4538	
EUT mode:	D-M2		T (°C):	22.5
Test Date:	07/06/2024		H (%):	63.9
Test Operator:	OAT		P (hPa):	1008
<div style="text-align: right; font-size: small;"> — FCC/FCC Part 15 §209 Tx - Moyenne/3.0m/ — FCC/FCC Part 15 §209 Tx - QCrête/3.0m/ — Meas.Peak </div> 				
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:	The 13.56MHz is the main carrier frequency of the EUT radio signal. Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			
EUT modification(s): N/A				

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHZ - GRAPH				
TX MODE / 45° / X-NUCLEO-NFC10A1				EMI4539
EUT mode:	D-M2			T (°C): 22.5
Test Date:	07/06/2024			H (%): 63.9
Test Operator:	OAT			P (hPa): 1008
				
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:	The 13.56MHz is the main carrier frequency of the EUT radio signal. Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.			
EUT modification(s): N/A				

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES <30MHz - GRAPH					
TX MODE / 90° / X-NUCLEO-NFC10A1				EMI4540	
EUT mode:	D-M2			T (°C):	22.5
Test Date:	07/06/2024			H (%):	63.9
Test Operator:	OAT			P (hPa):	1008
<div style="text-align: right; font-size: small;"> — FCC/FCC Part 15 §209 Tx - Moyenne/3.0m/ — FCC/FCC Part 15 §209 Tx - QCrête/3.0m/ — Meas.Peak </div> 					
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:	The 13.56MHz is the main carrier frequency of the EUT radio signal. 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. Transmitter radiated spurious emissions at frequencies >30MHz

Reference standard:	Fcc Part 15.209 RSS-Gen
Test method:	ANSI C63.10: 2013
<p>General test setup: EUT is set on an insulating support at 80cm above the ground reference plane. Measurement are done on a normalized test site by the substitution method.</p> <p>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.</p> <p>For portable equipments a research of maximum level is done on the 3 axes. Only the highest levels are recorded.</p>	

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Tx mode / X-NUCLEO-NFC10A1	30MHz-1GHz	Part 15.209	EMI4548	PASS

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

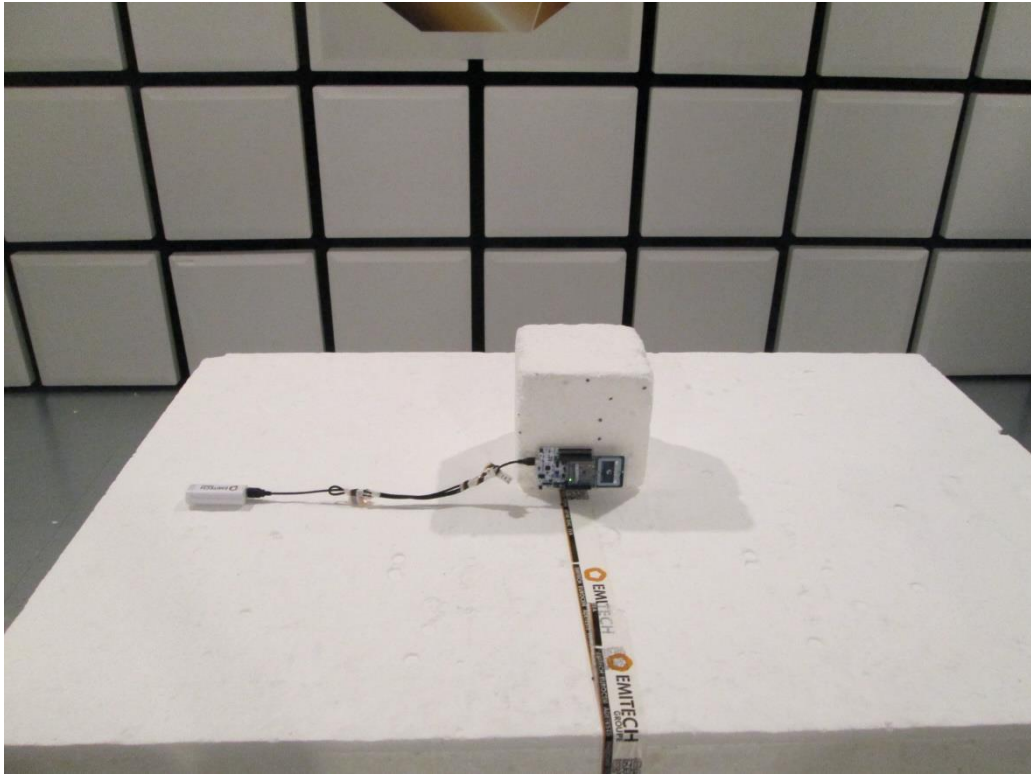
TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Antenna	ETS lindgren	3142E	14523	27/01/2022	27/03/2025
Cable	SUCOFLEX	N-3m	14378	17/08/2023	17/10/2025
Cable	SUCOFLEX	N-6,5m	14380	17/08/2023	17/10/2025
Cable	Techniwave	N-8m	18349	17/08/2023	17/10/2025
Receiver	Rohde & Schwarz	ESW26	17791	14/02/2023	14/04/2025
Shielded enclosure	COMTEST	SAC 3m	14494	08/08/2023	08/10/2026
Software	Nexio	BAT EMC	0000		
Thermohygrometer	Testo	608-H2	12269	07/06/2022	07/08/2024
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025

BAT-EMC software version: V3.18.0.26

Blank cells = Permanent validity

TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHz - TABULATED RESULTS				
TX MODE / X-NUCLEO-NFC10A1				EMI4548
Frequency (MHz)	Polarization	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
198.021	Vertical	27.99	43.50	-15.51
357.311	Vertical	31.44	46.00	-14.56
362.743	Vertical	30.97	46.00	-15.03
365.945	Vertical	30.56	46.00	-15.44
700.822	Vertical	35.35	46.00	-10.65
936.944	Vertical	33.23	46.00	-12.77
196.760	Horizontal	36.94	43.50	-6.56
197.924	Horizontal	37.85	43.50	-5.65
199.864	Horizontal	37.37	43.50	-6.13
202.192	Horizontal	36.97	43.50	-6.53
207.528	Horizontal	37.19	43.50	-6.31
691.800	Horizontal	40.72	46.00	-5.88

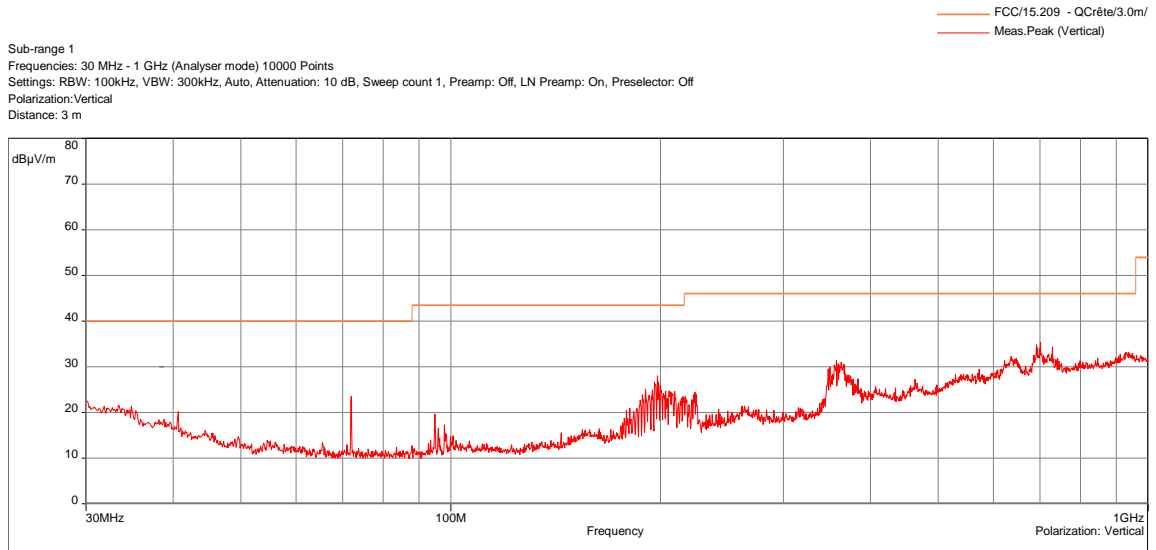
TEST SETUP PHOTO(S) – EUT POSITION



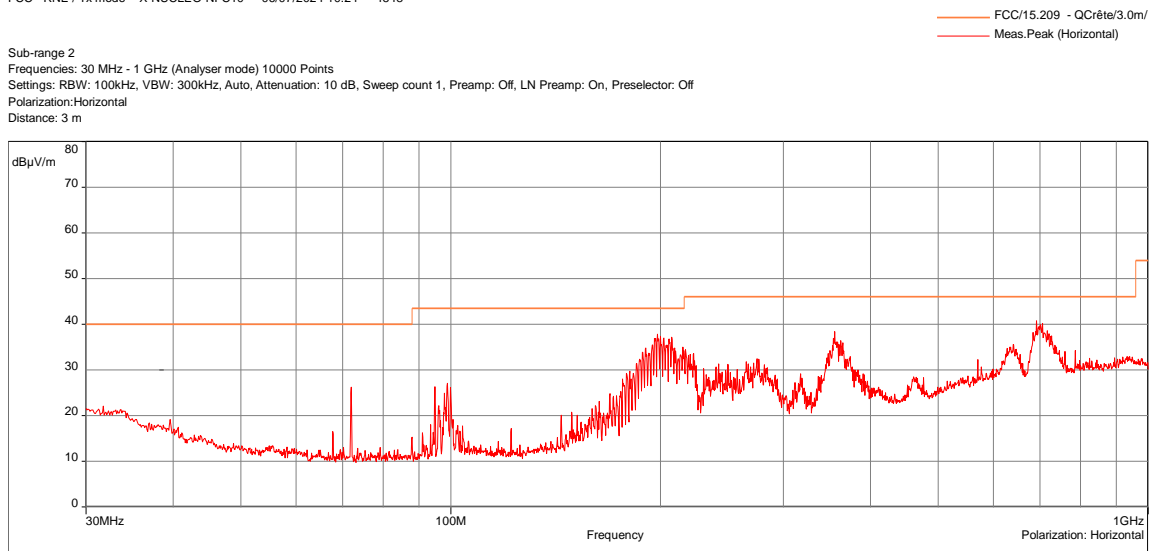
TEST SETUP PHOTO(S)



TRANSMITTER RADIATED SPURIOUS EMISSIONS AT FREQUENCIES >30MHZ - GRAPH			
Tx MODE / X-NUCLEO-NFC10A1			EMI4548
EUT mode:	D-M2	T (°C):	22.5
Test Date:	07/06/2024	H (%):	63.9
Test Operator:	OAT	P (hPa):	1008



FCC - RNE / Tx mode - X-NUCLEO-NFC10 - 06/07/2024 10:24 - 4548



FCC - RNE / Tx mode - X-NUCLEO-NFC10 - 06/07/2024 10:24 - 4548

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

6.7. Measurement of Frequency Stability

Reference standard:	FCC 47 CRF Part 15.225 e) RSS-210
Test method :	ANSI C63.10: 2013
<p>General test setup: The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.</p> <p>EUT is set inside the climatic enclosure. Carrier level are correlated with the maximum carrier level measured in normal conditions.</p>	

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
<p>Test method deviation: Due to EUT's operating temperature range, measurement was performed at 0°C and +60°C.</p>		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Attenuator	Radiall	R412710124	17328	17/08/2023	17/10/2026
Attenuator	Radiall	R412710124	4390	30/09/2022	30/11/2025
Climatic enclosure	CLIMATS	EXCAL 7714-HA	14261		
Spectrum analyzer	Rohde & Schwarz	FPL1007	17908	04/12/2023	04/02/2025
Thermohygrometer	Bioblock Scientific	Météostar	0963	25/09/2023	25/11/2025
Thermohygrometer	Testo	608-H2	12268	24/10/2022	24/12/2024
Thermometer contactless	GHM Greisinger	GMH 3710	12968	28/02/2023	28/04/2025

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	13.560602	-	+/- 0.01%
Extremes conditions	-20	5	13.560554	-0.00036	
	+50	5	13.560559	-0.00032	
EUT MODIFICATIONS		OPERATOR	TEST DATE		RESULT TAB.
N/A		MPA	05/09/2024		EMI4500

○○○ End of test report ○○○