

**FCC LISTED, REGISTRATION
NUMBER: 720267**

Test report No:

**IC LISTED REGISTRATION
NUMBER IC 4621A-1**

NIE: 41945RRF.003

Test report USA FCC Part 15.225 and Part 15.209 CANADA RSS-210, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz,
and 5725 - 5850 MHz.

Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
General Requirements and Information for the Certification of Radio Apparatus.

Identificación del objeto ensayado.....: Identification of item tested	Reader for RFID/NFC tokens
Marca Trade	OKIDOKEYS
Modelo y/o referencia tipo Model and /or type reference	SMART READER
Other identification of the product	Commercial name: OKIDOKEYS FCC ID: 2AC8KSRUSV1 IC: 12350A-SRUSV1
Final HW version	---
Final SW version	---
IMEI TAC	---
Características Features	Bluetooth Low Energy 4.0, NFC
Peticionario Applicant	PRACTICAL HOUSE, INC. 1000 N West Street Suite 1200#1356. Wilmington DE 19801 USA. VAT: 46 4106343 Contact person: Aitor Agueda Telephone: +33 (0) 183 642 938 e-mail: aagueda@openways.com
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.225 (10–1–13 Edition): Operation within the band 13.110 -14.010. USA FCC Part 15.209 (10–1–13 Edition).: Radiated emission limits, general requirements CANADA RSS-210 Issue 8 (December 2010). CANADA RSS-Gen Issue 4 (November 2014). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Resultado.....: Summary	IN COMPLIANCE

Aprobado por (nombre / cargo y firma) Approved by (name / position & signature)	A. Llamas RF Lab. Manager
Fecha de realización Date of issue	2014-11-21
Formato de informe No. Report template No	FDT08_15

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Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
41945/014	Reader for RFID/NFC tokens with internal antenna	SMART READER	574883314DEF34645	2014-07-30

1. Sample M/01 has undergone the test(s).
All radiated tests indicated in appendix A.

Sample M/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
41945/020	Reader for RFID/NFC tokens with antenna connector	SMART READER	---	2014-08-20

1. Sample M/02 has undergone the test(s).
All conducted tests indicated in appendix A.

Test sample description

The test sample consists of a reader for RFID/NFC tokens and Acoustic devices (phones) for driving SMART LOCK with devices other than Bluetooth devices.

Test samples supplier

OPENWAYS SAS

56, Rue de FOURQUEUX – 78100 St Germain en Laye. FRANCE.

VAT: FR32514973718

Contact person: Aitor Agueda

Telephone: +33 (0) 183 642 938

e-mail: aagueda@openways.com

Testing period

The performed test started on 2014-08-04 and finished on 2014-08-29.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 20.0 °C Max. = 24.1 °C
Relative humidity	Min. = 33.1 % Max. = 39.2 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber the following limits were not exceeded during the test.

Temperature	Min. = 20.4 °C Max. = 20.9 °C
Relative humidity	Min. = 46.0 % Max. = 47.7 %
Air pressure	Min. = 1002 mbar Max. = 1009 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 25.5 °C Max. = 26.8 °C
Relative humidity	Min. = 37.7 % Max. = 41.6 %
Air pressure	Min. = 1002 mbar Max. = 1010 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Remarks and comments

1: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2014/05	2016/05
2.	Climatic chamber HERAEUS VM 07/100	2012/10	2015/10
4.	DC power supply R&S NGPE 40/40	2011/11	2014/11

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
4.	Antenna mast EM 1072 NMT	N.A.	N.A.
5.	Rotating table EM 1084-4. ON	N.A.	N.A.
6.	Loop antenna HP 1196 A.	2014/03	2016/03
7.	EMI Test Receiver R&S ESU 26	2013/08	2015/08
8.	Multi Device Controller EMCO 2090	N.A.	N.A.
9.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2014/02	2015/02
10.	Antenna tripod EMCO 11968C.	N.A.	N.A.

Testing verdicts

Not applicable	N/A
Pass	P
Fail	F
Not measured	N/M

FCC PART 15 PARAGRAPH	VERDICT			
	NA	P	F	NM
15.225 Subclause (a) / RSS-210 Clause A2.6 (a). Field strength of emissions within the band 13.553 MHz -13.567 MHz		P		
15.225 Subclause (b) / RSS-210 Clause A2.6 (b). Field strength of emissions within the band 13.410 - 13.553 MHz and 13.567 – 13.710 MHz		P		
15.225 Subclause (c) / RSS-210 Clause A2.6 (c). Field strength of emissions within the band 13.110 - 13.410 MHz and 13.710 – 14.010 MHz		P		
15.225 Subclause (d) / RSS-210 Clause A2.6 (d). Field strength of emissions outside of the band 13.110 MHz -14.010 MHz		P		
15.225 Subclause (e) / RSS-210 Clause A2.6. Frequency tolerance of the carrier signal		P		

Appendix A – Test result

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TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 4.5 \text{ Vdc}$$

Type of power supply = DC voltage from external power supply.

Type of antenna = Integral antenna

Operating Temperature Range (°C):

$$T_n = +15 \text{ to } +35$$

TEST FREQUENCIES:

Nominal Operating frequency: 13.56 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and inside a climatic chamber and it is connected to the spectrum analyser using a low loss cable.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the range between 9 kHz to 30 MHz and Bilog antenna for the range between 30 MHz to 200 MHz) is situated at a distance of 3 m.

For radiated emissions in the range 9 kHz to 30 MHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and in the range between 30 MHz and 200 MHz the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

In the range between 9 kHz and 30 MHz the measurements were made in the three different orientation planes of the loop antenna to determine the maximum received field.

In the range between 30 MHz and 200 MHz the measurements were made in both horizontal and vertical planes of polarization.

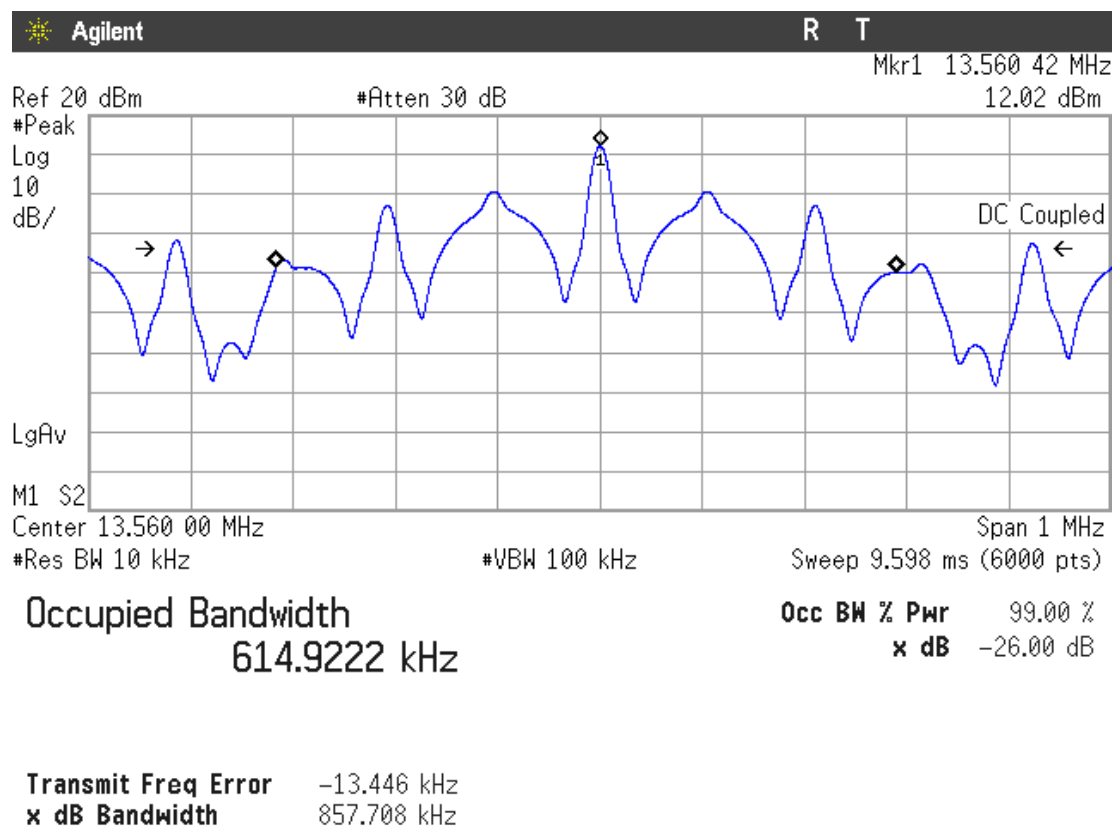
Occupied Bandwidth

RESULTS

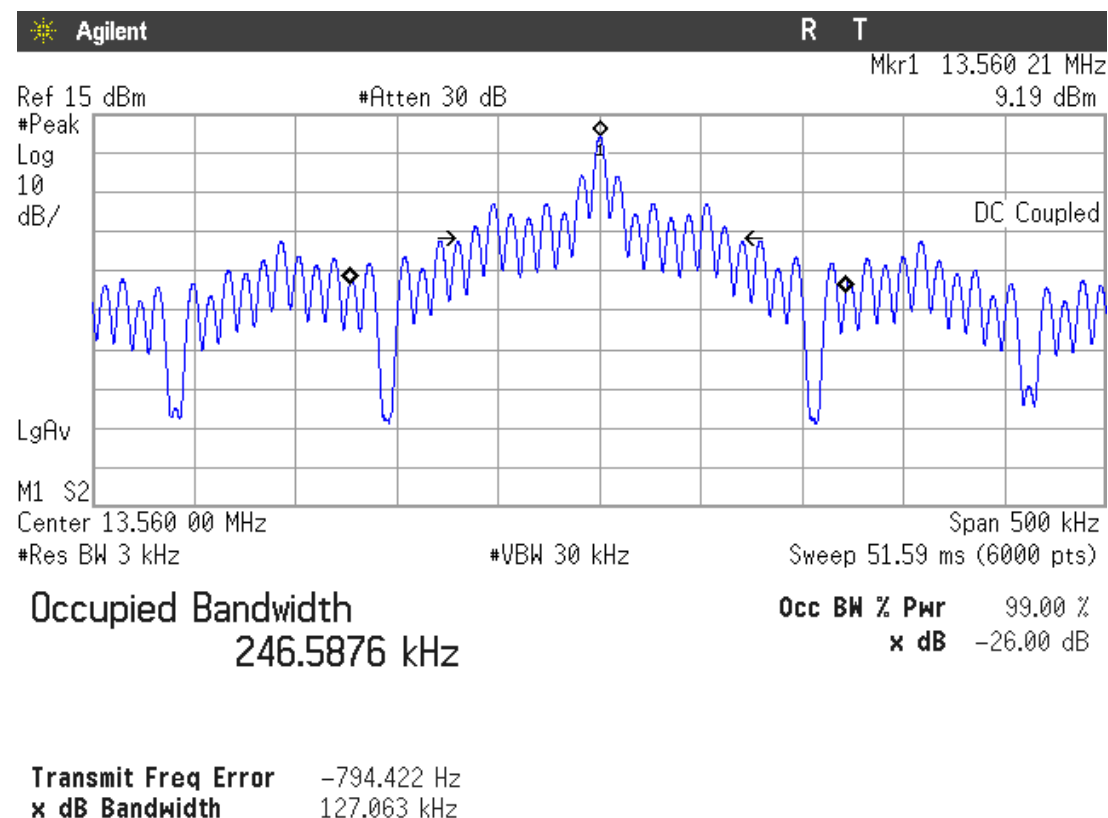
99 % Occupied Bandwidth (see next plots).

Operation mode	99% occupied bandwith (kHz)
NFC-A at 106 kbps	614.922
NFC-B at 106 kbps	246.589
NFC-F at 212 kbps	426.098
Measurement uncertainty (Hz)	±16

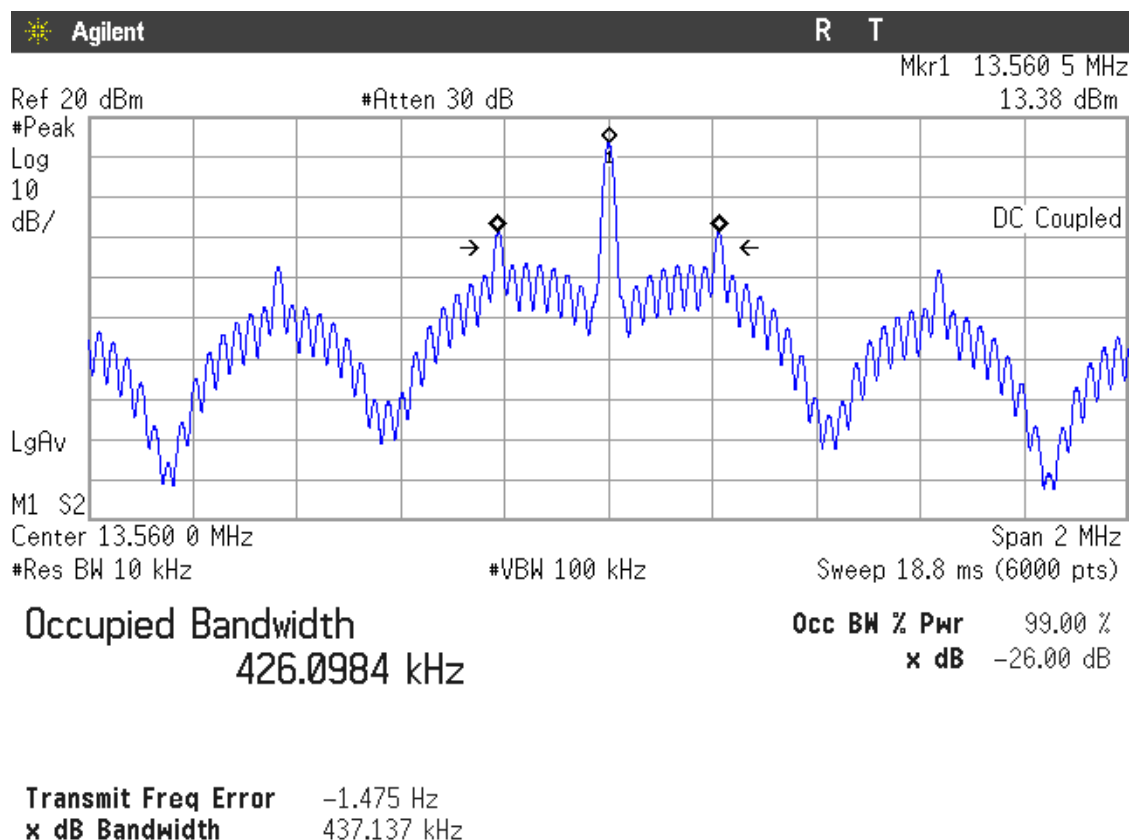
Operation mode: NFC-A at 106 kbps



Operation mode: NFC-B at 106 kbps



Operation mode: NFC-F at 212 kbps



Section 15.225 Subclause (a) / RSS-210 Clause A2.6 (a). Field strength of emissions within the band 13.553 MHz -13.567 MHz

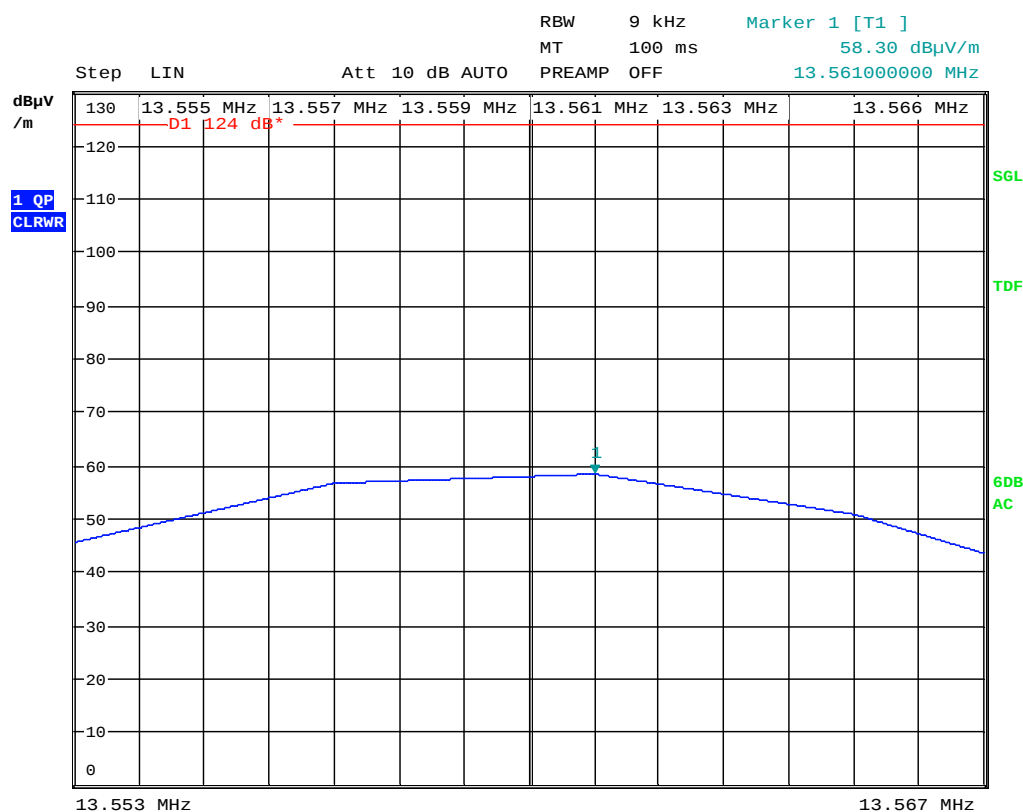
SPECIFICATION

The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts/meter (84 dB μ V/m) at 30 meters.

RESULTS

Measurement distance: 3 meters

1. Operation mode: NFC-A at 106 kbps bit rate.

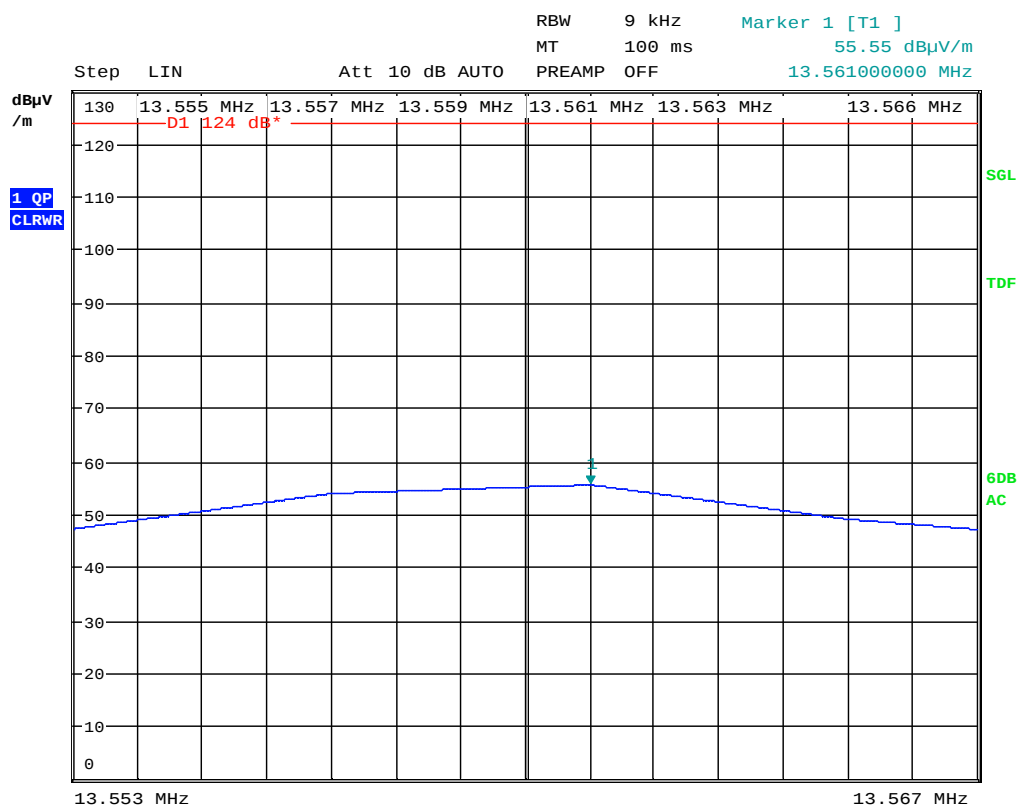


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dB μ V/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dB μ V/m) extrapolated to 30 m (40 dB/decade)
13.561	58.30	18.30
Measurement uncertainty (dB)	± 3.2	

Verdict: PASS

2. Operation mode: NFC-B at 106 kbps bit rate.

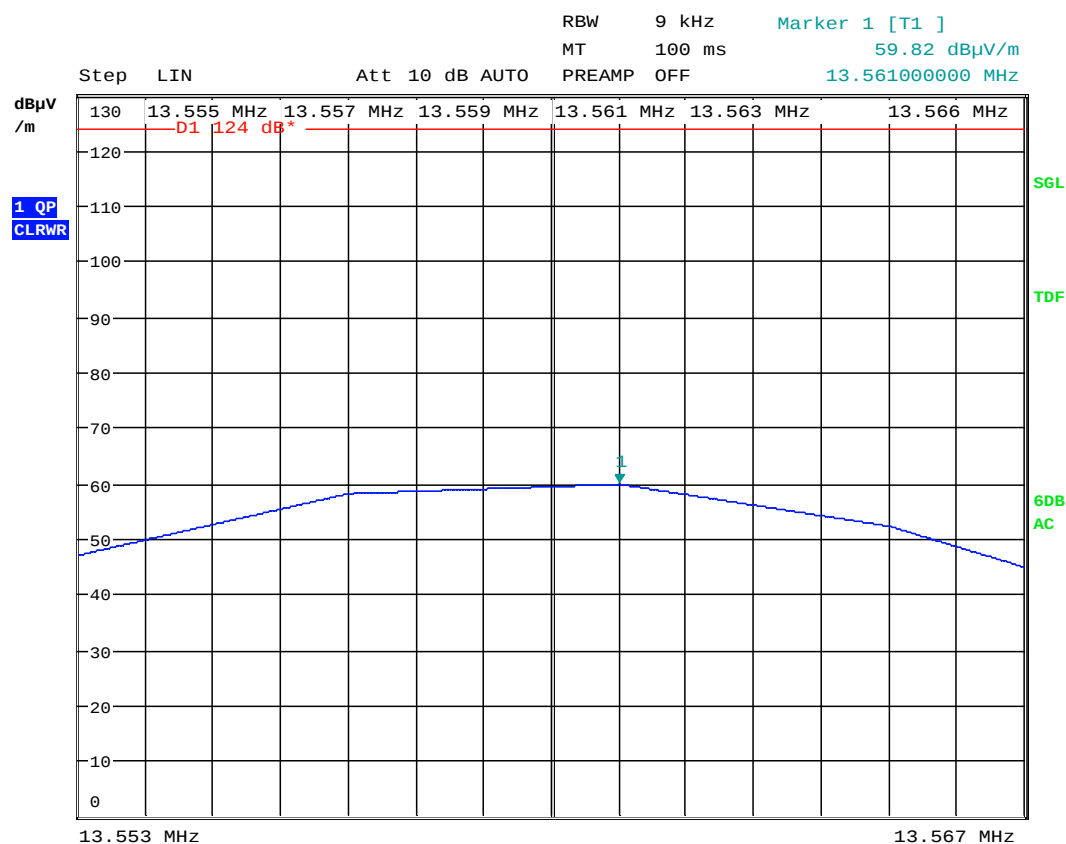


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.561	55.55	15.55
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

3. Operation mode: NFC-F at 212 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.561	59.82	19.82
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

Section 15.225 Subclause (b) / RSS-210 Clause A2.6 (b). Field strength of emissions within the band 13.410 MHz -13.553 MHz and 13.567 MHz -13.710 MHz

SPECIFICATION

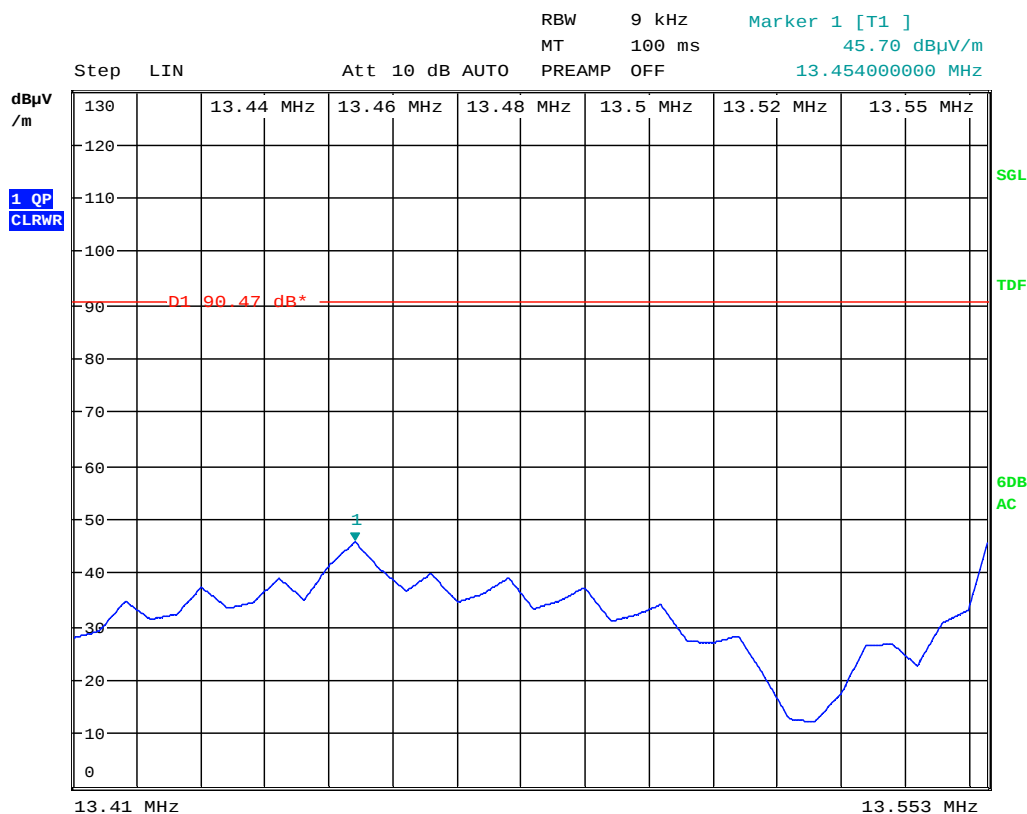
Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (50.47 dBμV/m) at 30 meters.

RESULTS

Band 13.410-13.553 MHz

Measurement distance: 3 meters

1. Operation mode: NFC-A at 106 kbps bit rate.

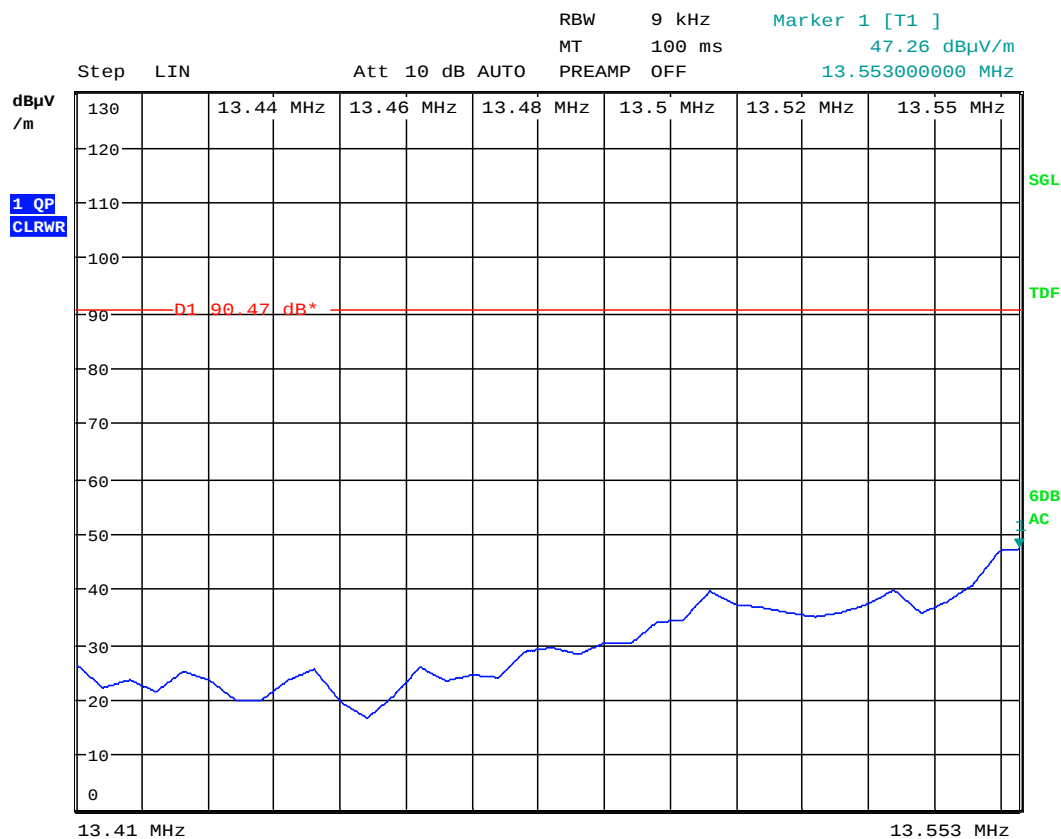


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.454	45.70	5.70
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

2. Operation mode: NFC-B at 106 kbps bit rate.

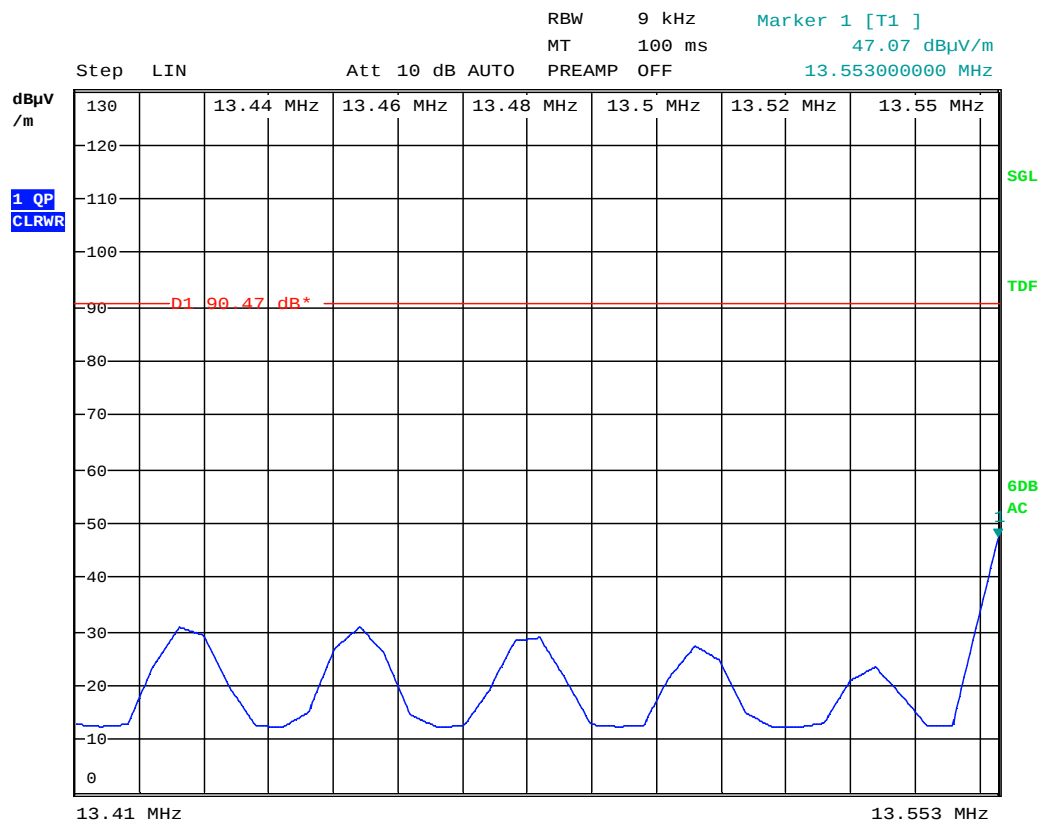


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.553	47.26	7.26
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

3. Operation mode: NFC-F at 212 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

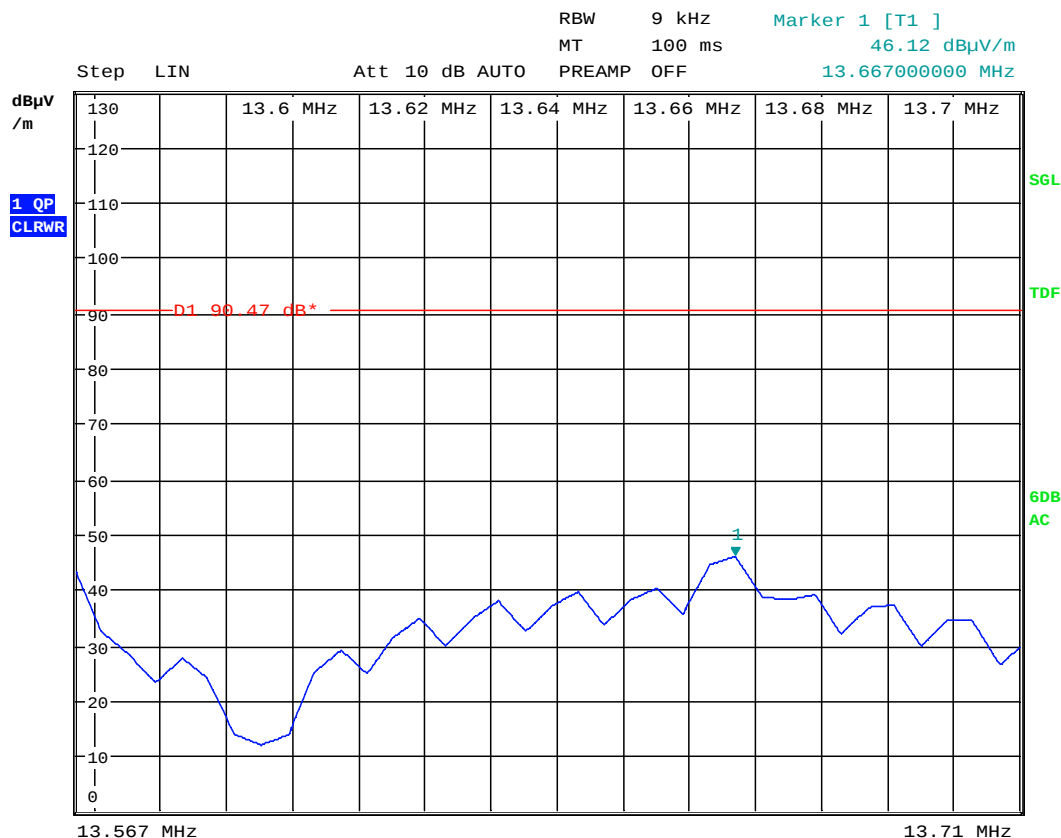
Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.553	47.07	7.07
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

Band 13.567-13.710 MHz

Measurement distance: 3 meters

1. Operation mode: NFC-A at 106 kbps bit rate.

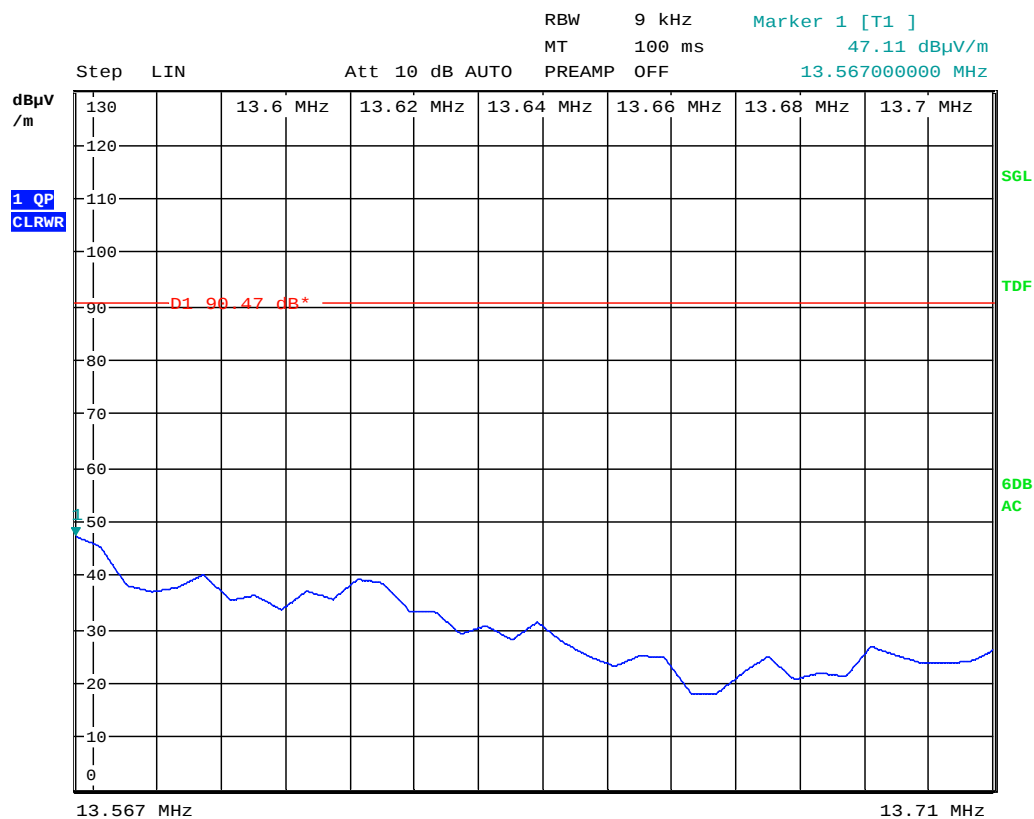


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.667	46.12	6.12
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

2. Operation mode: NFC-B at 106 kbps bit rate.

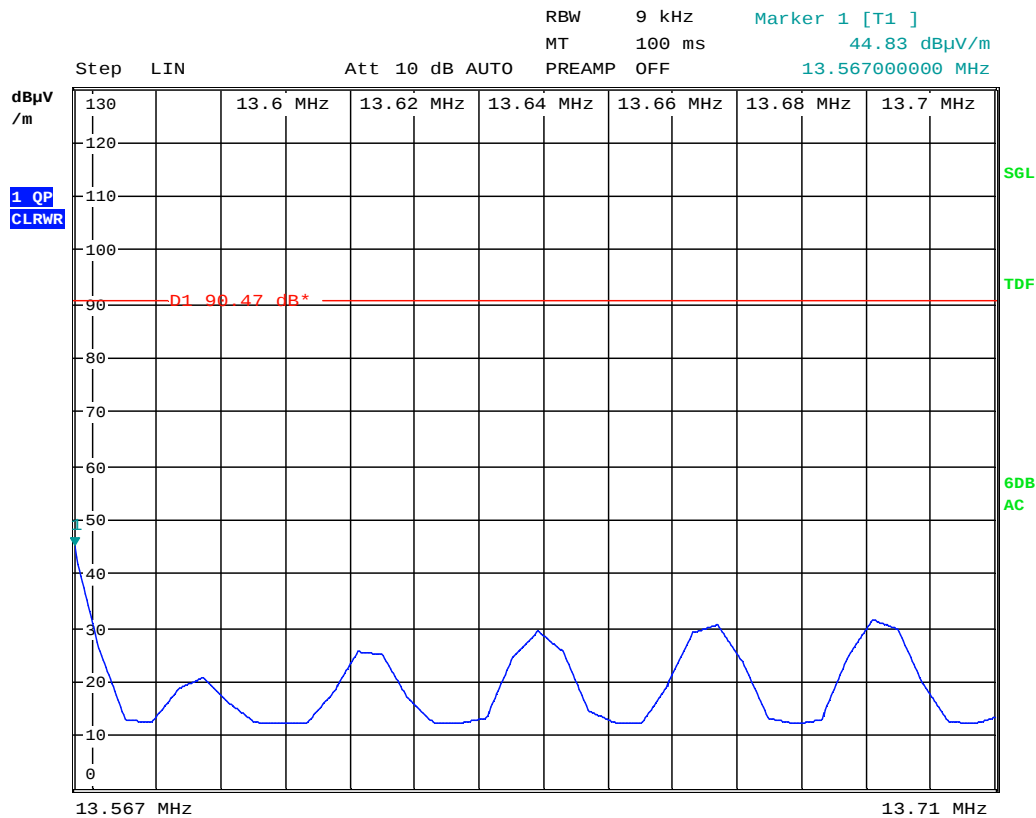


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.567	47.11	7.11
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

3. Operation mode: NFC-F at 212 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.567	44.83	4.83
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

Section 15.225 Subclause (c) / RSS-210 Clause A2.6 (c). Field strength of emissions within the band 13.110 MHz -13.410 MHz and 13.710 MHz -14.010 MHz

SPECIFICATION

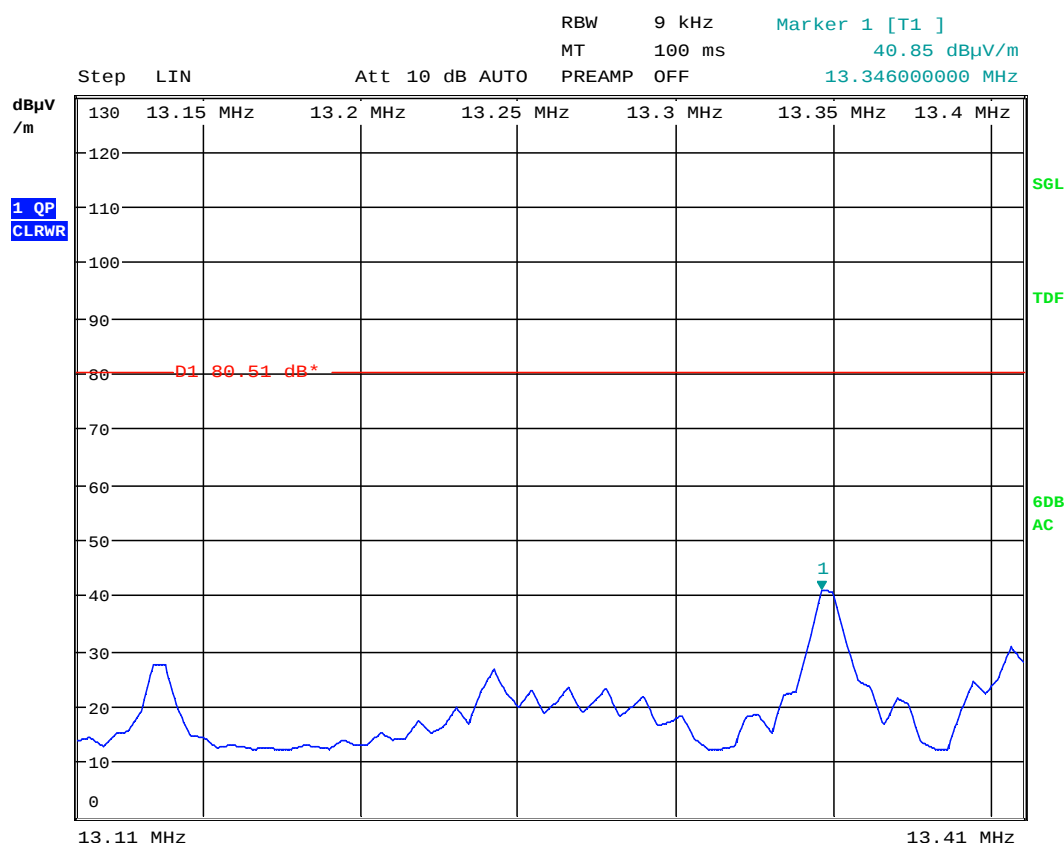
Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter (40.51 dB μ V/m) at 30 meters.

RESULTS

Band 13.110-13.410 MHz

Measurement distance: 3 meters

1. Operation mode: NFC-A at 106 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dB μ V/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dB μ V/m) extrapolated to 30 m (40 dB/decade)
13.346	40.85	0.85
Measurement uncertainty (dB)	± 3.2	

Verdict: PASS

2. Operation mode: NFC-B at 106 kbps bit rate.

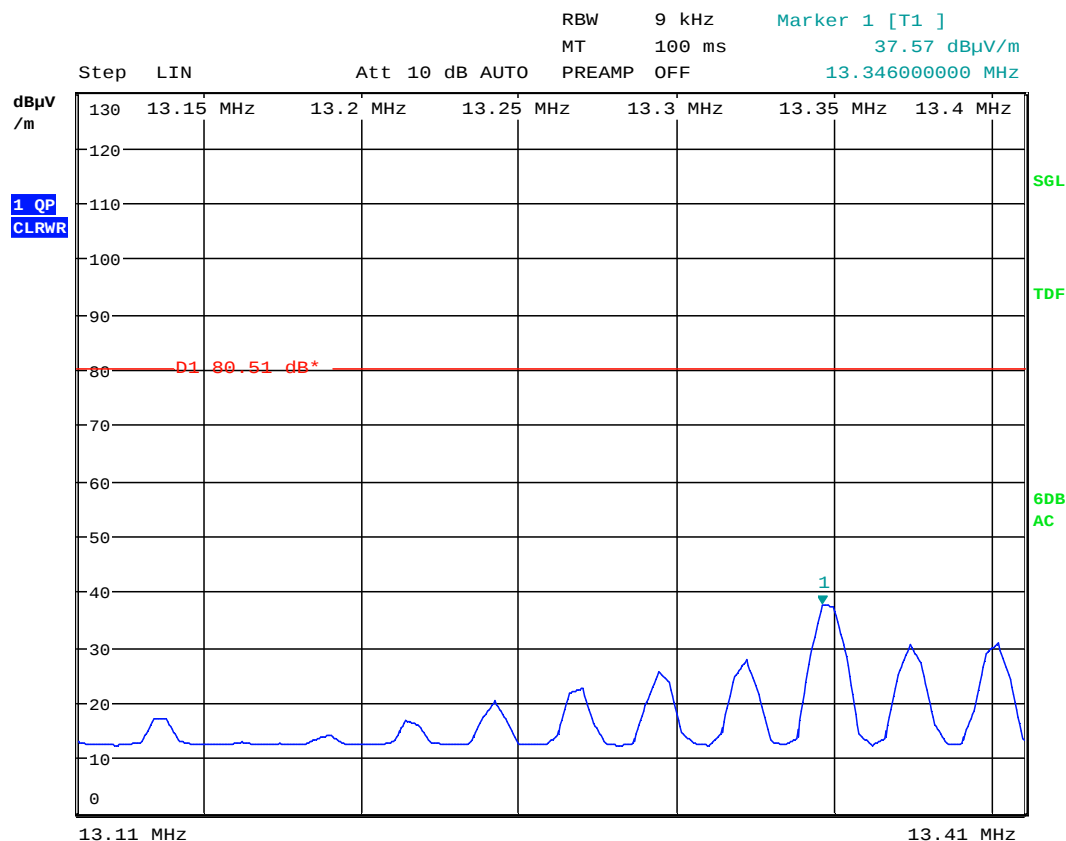


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.402	28.75	-11.25
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

3. Operation mode: NFC-F at 212 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

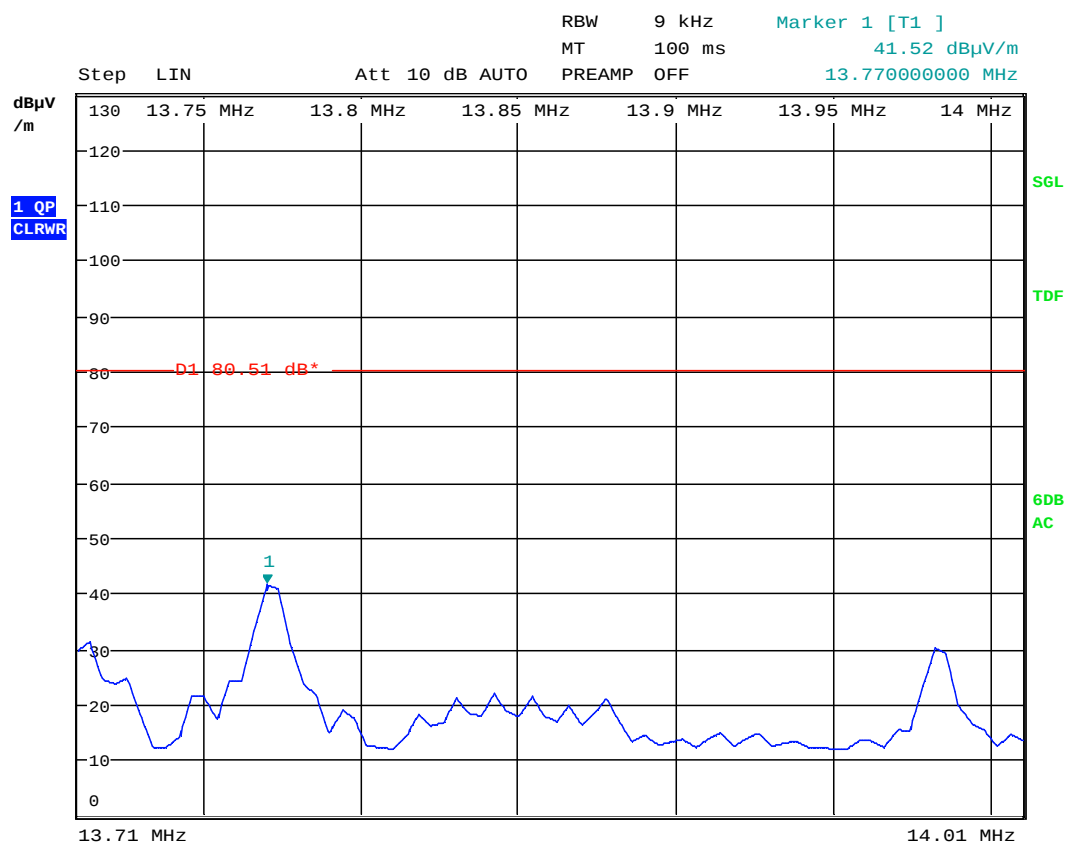
Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.346	37.57	-2.43
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

Band 13.710-14.010 MHz

Measurement distance: 3 meters

1. Operation mode: NFC-A at 106 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.770	41.52	1.52
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

2. Operation mode: NFC-B at 106 kbps bit rate.

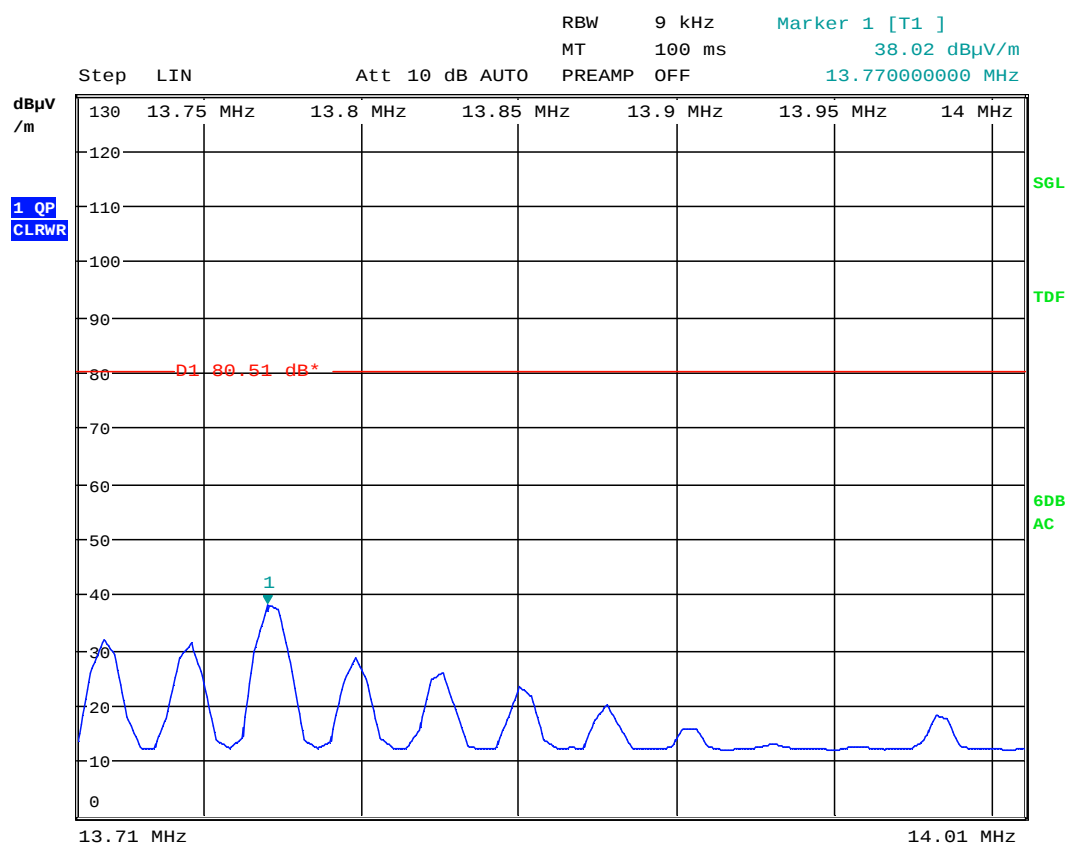


Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dB μ V/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dB μ V/m) extrapolated to 30 m (40 dB/decade)
13.710	25.95	-14.05
Measurement uncertainty (dB)	± 3.2	

Verdict: PASS

3. Operation mode: NFC-F at 212 kbps bit rate.



Note: The limit shown in the above plot is extrapolated to 3 meters

Frequency (MHz)	Maximum field strength (dBμV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBμV/m) extrapolated to 30 m (40 dB/decade)
13.770	38.02	-1.98
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

Section 15.225 Subclause (d) / RSS-210 Clause A2.6 (d). Field strength of emissions outside of the band 13.110 MHz -14.010 MHz

SPECIFICATION

FCC 15.225

The field strength of any emissions appearing outside of the band 13.110 MHz - 14.010 MHz band shall not exceed the general radiated emission limits in 15.209:

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	29.54	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

RSS-210

The field strength of any emissions appearing outside of the band 13.110 MHz - 14.010 MHz band shall not exceed 30 microvolts/meter (29.5 $\text{dB}\mu\text{V/m}$) at 30 meters.

RESULTS:

All tests were performed in a semi-anechoic chamber at a distance of 3 m.

The spectrum was inspected from 9 kHz to 200 MHz searching for spurious signals.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifier gain.

Frequency range 9 kHz-30 MHz.

No spurious signals were found for all NFC-A, NFC-B and NFC-F operation modes.

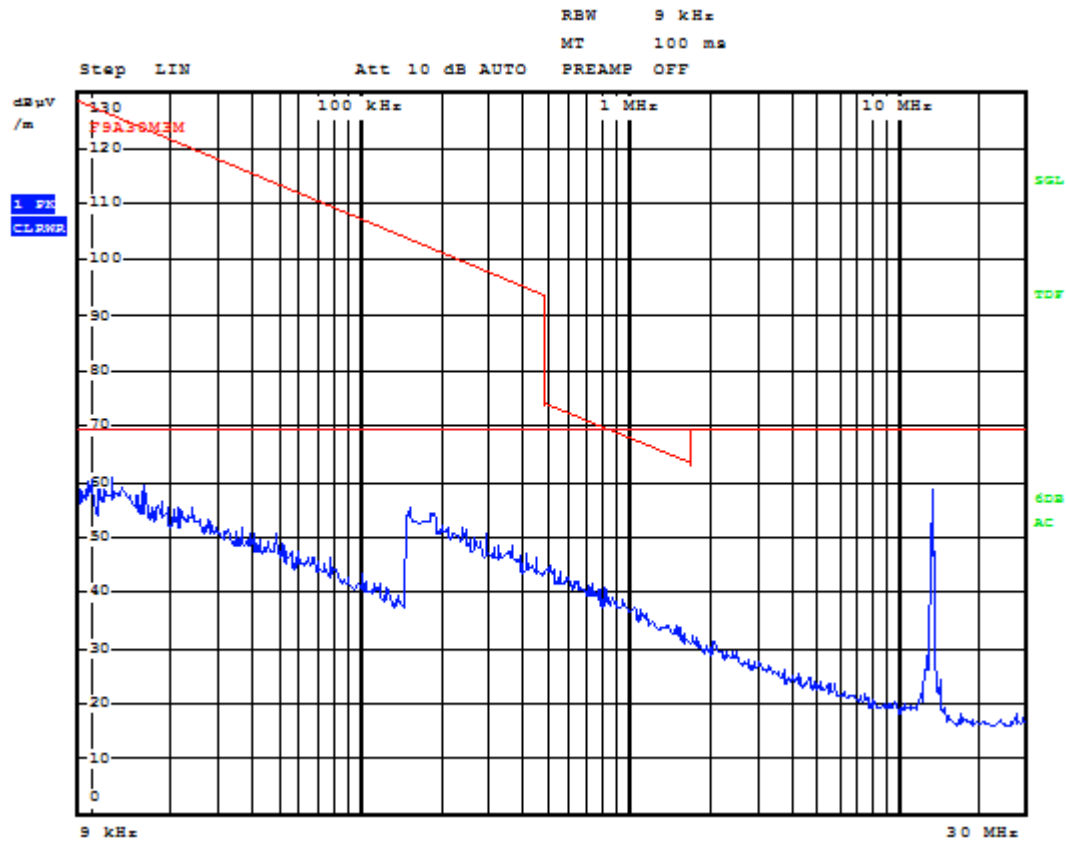
Frequency range 30 MHz-200 MHz

No spurious signals were found for all NFC-A, NFC-B and NFC-F operation modes at less than 20 dB below the limit.

Verdict: PASS

FREQUENCY RANGE 9 kHz-30 MHz.

1. Operation mode: NFC-A at 106 kbps.



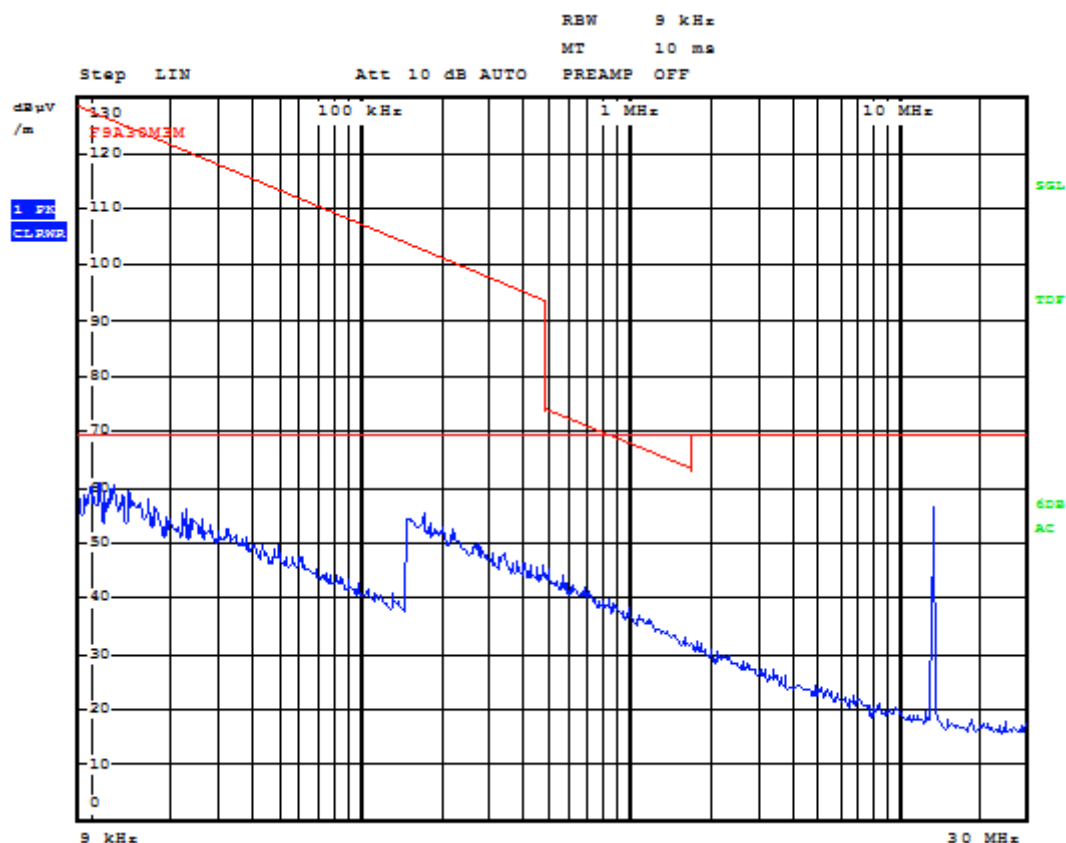
Resolution bandwidth:

200 Hz for $9 \text{ kHz} \leq f \leq 150 \text{ kHz}$

9 kHz for $150 \text{ kHz} \leq f \leq 30 \text{ MHz}$

Note: The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

2. Operation mode: NFC-B at 106 kbps.



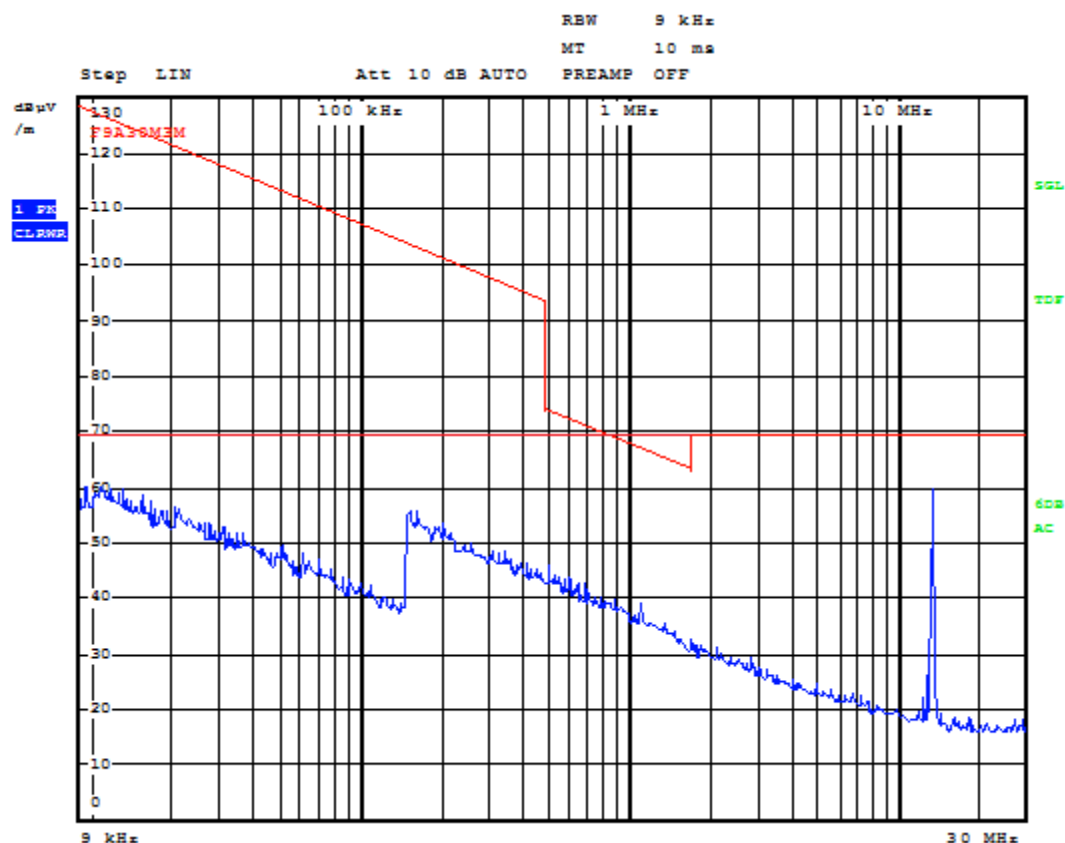
Resolution bandwidth:

200 Hz for $9 \text{ kHz} \leq f \leq 150 \text{ kHz}$

9 kHz for $150 \text{ kHz} \leq f \leq 30 \text{ MHz}$

Note: The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

3. Operation mode: NFC-F at 212 kbps.

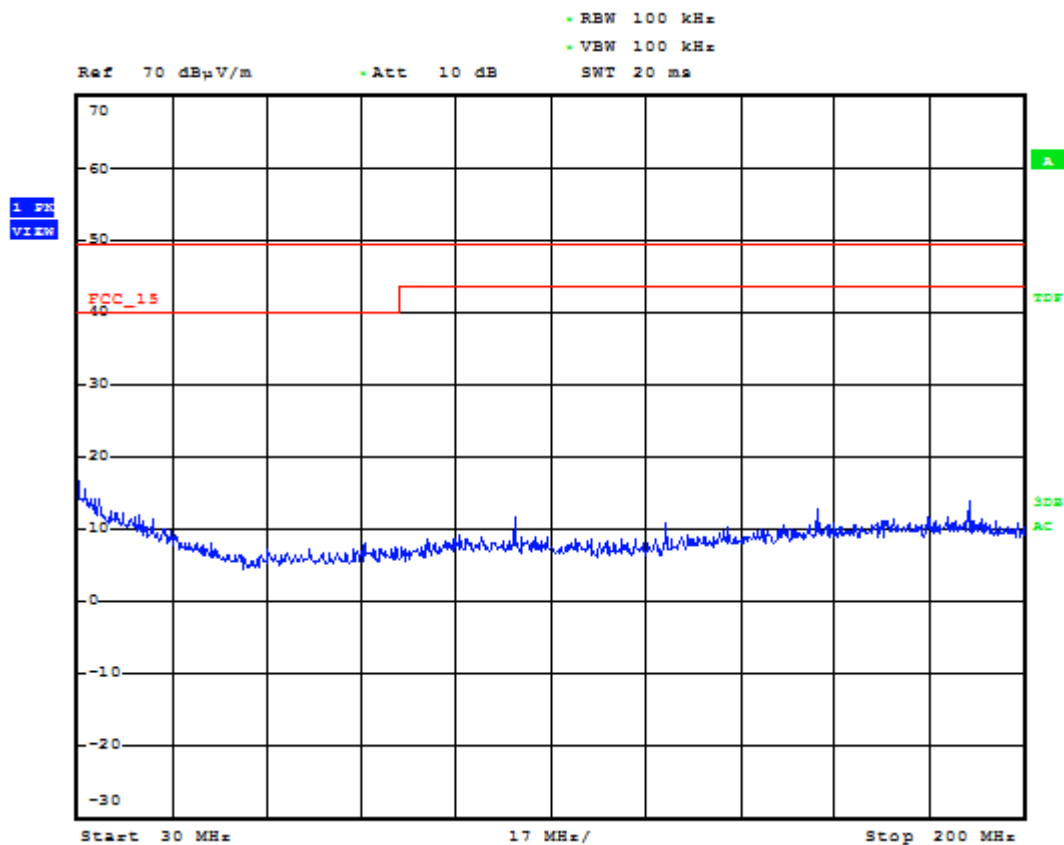


Resolution bandwidth:
 200 Hz for $9 \text{ kHz} \leq f \leq 150 \text{ kHz}$
 9 kHz for $150 \text{ kHz} \leq f \leq 30 \text{ MHz}$

Note: The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

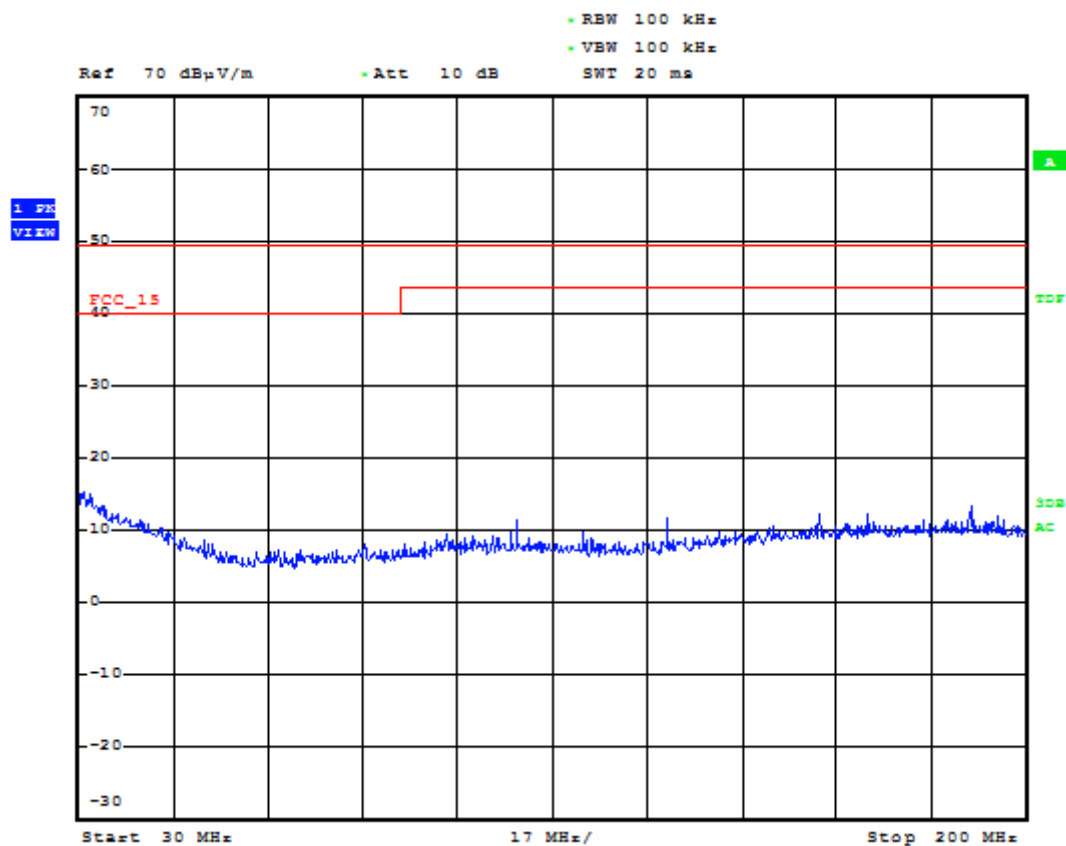
FREQUENCY RANGE 30 MHz to 200 MHz.

1. Operation mode: NFC-A 106 kbps.



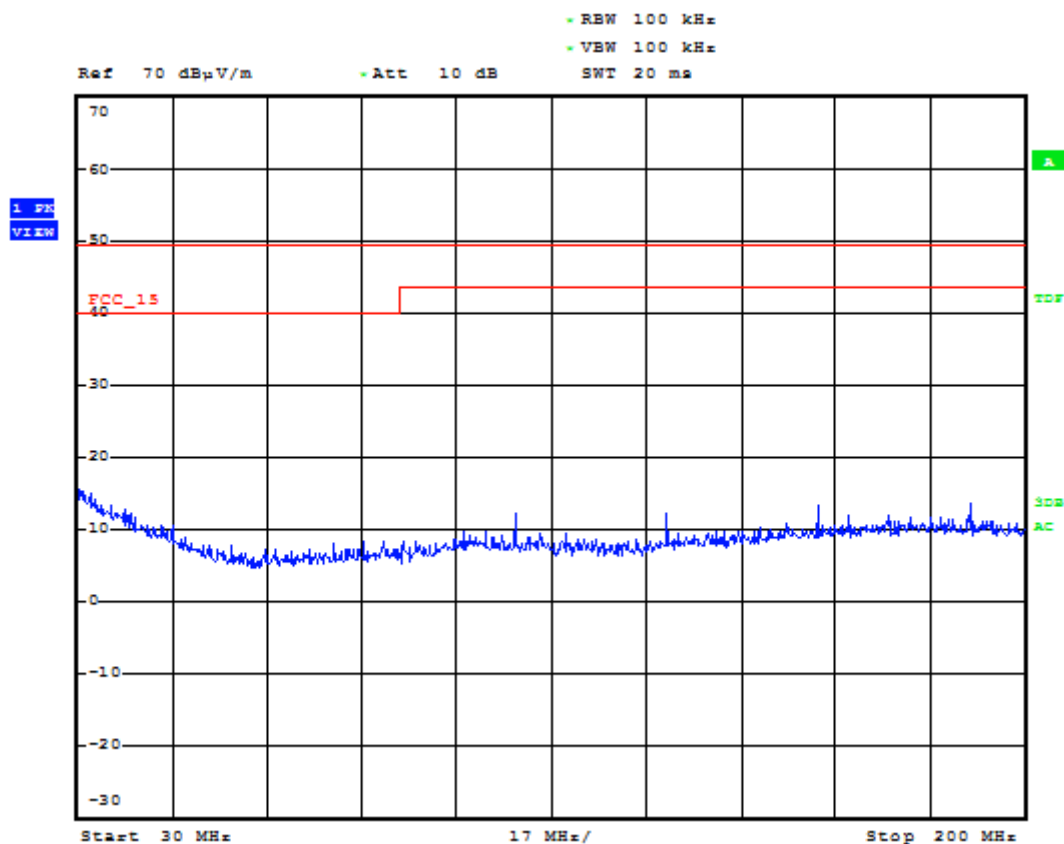
Note: The above plot shows the results of the scan using peak detector. The highest peaks are maximized and re-measured using a quasi-peak detector.
 The limit shown in the above plot for RSS-210 is extrapolated to 3 meters.

2. Operation mode: NFC-B 106 kbps.



Note: The above plot shows the results of the scan using peak detector. The highest peaks are maximized and re-measured using a quasi-peak detector.
 The limit shown in the above plot for RSS-210 is extrapolated to 3 meters.

3. Operation mode: NFC-F 212 kbps.



Note: The above plot shows the results of the scan using peak detector. The highest peaks are maximized and re-measured using a quasi-peak detector.

The limit shown in the above plot for RSS-210 is extrapolated to 3 meters.

Section 15.225 Subclause (e). Frequency tolerance of the carrier signal

SPECIFICATION

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.

RESULTS

Nominal operating frequency: 13.56 MHz

Frequency stability over temperature variations.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
+50	85.69	0.0006319
+40	109.29	0.0008060
+30	137.78	0.0010161
+20	150.08	0.0011068
+10	191.80	0.0014144
0	201.63	0.0014869
-10	189.42	0.0013969
-20	146.11	0.0010775

Frequency stability over voltage variations.

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (%)
Vmax	3.825	149.45	0.0011021
Vmin	5.175	149.13	0.0010998

Verdict: PASS