



FCC LISTED, REGISTRATION
NUMBER: 720267

Informe de ensayo nº:
Test report No:

ISED LISTED REGISTRATION
NUMBER 4621A-3

NIE: 55553RRF.002

Test report

REFERENCE STANDARD:

USA FCC Part 15.225 and Part 15.209 & CANADA RSS-210

Identificación del objeto ensayado.....: Identification of item tested	Electro-mechanic lock
Marca Trademark	Ojmar
Modelo y/o referencia tipo Model and /or type reference	NEXO NLX1
Other identification of the product	FCC ID: 2ANY7OJM002
Final HW version	Main board: Hw2.0 Antenna: Hw1.8
Final SW version	Not provided data
Características Features	Technologies: -RFID : From reader to card the modulation in the reader is 100% ASK and the encryption is Miller modified. From card to the reader the modulation is made with sub-carrier load with Manchester encryption for 106kBd and BPSK for 212 and 424kBd. -NFC: (Just maintenance) NFC communication depends on the speed. For 106kbits/s Mifare schema for higher speeds than Felica is used. For both active and passive communications: For 106 kbit/s 100% ASK modulation is used with Miller modified encryption.
Solicitante Applicant	OJMAR S.A. Polígono Industrial de Lerun s/n 20870, Elgoibar, Gipuzkoa, SPAIN
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.225 (10–1–17 Edition): Operation within the band 13.110 -14.010. USA FCC Part 15.209 (10–1–17 Edition). Radiated emission limits, general requirements. CANADA RSS-210 Issue 9 (August 2016). 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	2018-02-15
Date of issue	
Formato de informe No.	FDT08_20
Report template No	

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Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification 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.

DEKRA Testing and Certification 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: ISED 4621A-3.

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

DEKRA Testing and Certification 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 DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification 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.

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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 DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Usage of samples

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

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
55553/021	Electro-mechanic lock	NEXO NLX1	---	2017-12-11

Sample S/01 is composed of the following auxiliary elements:

Control N°	Description	Model	Serial N°	Date of reception
55553/016	NLX1	PP NFC	---	2017-12-11

1. Sample S/01 has undergone following test(s).

All tests indicated in appendix A for NFC.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
55553/019	Electro-mechanic lock	NEXO NLX1	---	2017-12-11

Sample S/02 is composed of the following auxiliary elements:

Control N°	Description	Model	Serial N°	Date of reception
55553/006	RFID Tag	---	---	2017-12-11

1. Sample S/02 has undergone following test(s).

All tests indicated in appendix A for RFID.

Test sample description

RFID “locker lock” device @ 13,56 MHz power supplied by 4 AA alkaline non-rechargeable batteries. Includes NFC communication for maintenance purposes. Devices also includes a WiFi antenna @ 2.4GHz in order to communicate with an already certified router

Operation modes:

- On line: lock communicates with a card (RFID communication). After that Reading, lock communicates via WiFi with the server. This server is the one that grants or denies the card permissions and sends back an order to the lock in order to open/close/reject operation
- Off line: Lock Works as a regular RFID lock. Once card is approached lock will perform the operation (No WiFi communication is made)

In both cases, NFC communication is made for maintenance purposes.

Identification of the client

OJMAR S.A

Polígono Industrial de Lerun s/n

20870, Elgoibar, Gipuzkoa, SPAIN

Testing period

The performed test started on 2017-12-11 and finished on 2017-12-14.

The tests have been performed at DEKRA Testing and Certification.

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 1 Ω

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 1 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. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 1 Ω

Remarks and comments

1: Tests have been performed by the technical personnel: Carolina Postigo.

2: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Signal and spectrum analyzer R&S FSV40	2017/07	2019/07
2.	Climatic chamber HERAEUS VM 04/35	2016/03	2018/03
3.	DC power supply Keysight Technologies U8002A	N.A.	N.A.
4.	Digital Multimeter Fluke 179	2017/05	2018/05

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber Frankonia SAC-3	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2017/09	2020/09
3.	Multi Device Controller FRANKONIA FC-06	N.A.	N.A.
4.	EMI Test Receiver R&S ESR7	2017/08	2019/08
5.	RF pre-amplifier 10 MHz-6 GHz Bonn Elektronik BLNA 0160-01N	2017/09	2018/09
6.	Loop antenna HP 1196 A.	2016/05	2018/05

Testing verdicts

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

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

Appendix A – Test result

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TEST CONDITIONS

Power supply (V):

$$V_{\text{nom}} = 6.0 \text{ Vdc}$$

$$V_{\text{max}} = 6.9 \text{ Vdc}$$

$$V_{\text{min}} = 5.1 \text{ Vdc}$$

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC voltage from alkaline batteries.

Type of antenna = Integral antenna

Operating Temperature Range (°C):

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

TEST FREQUENCIES:

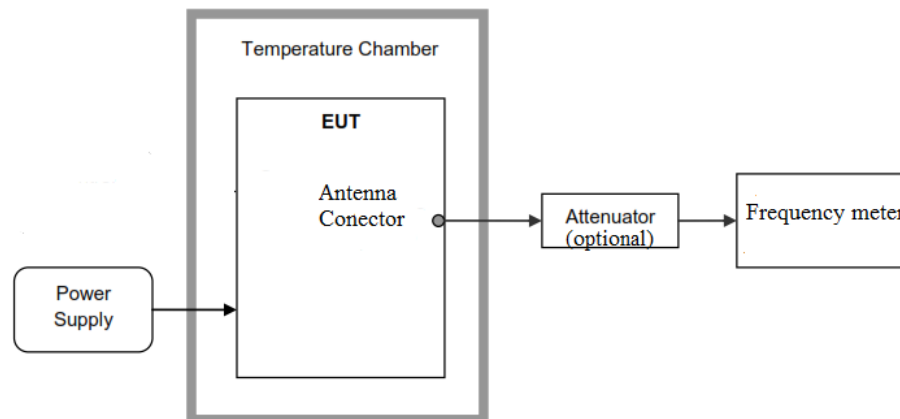
Nominal Operating frequency: 13.56 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer through a coupling device.



For frequency stability test the EUT was placed inside a climatic chamber and connected to a frequency meter using a low loss cable. An external DC power supply was connected to the EUT for voltage variation test.



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.

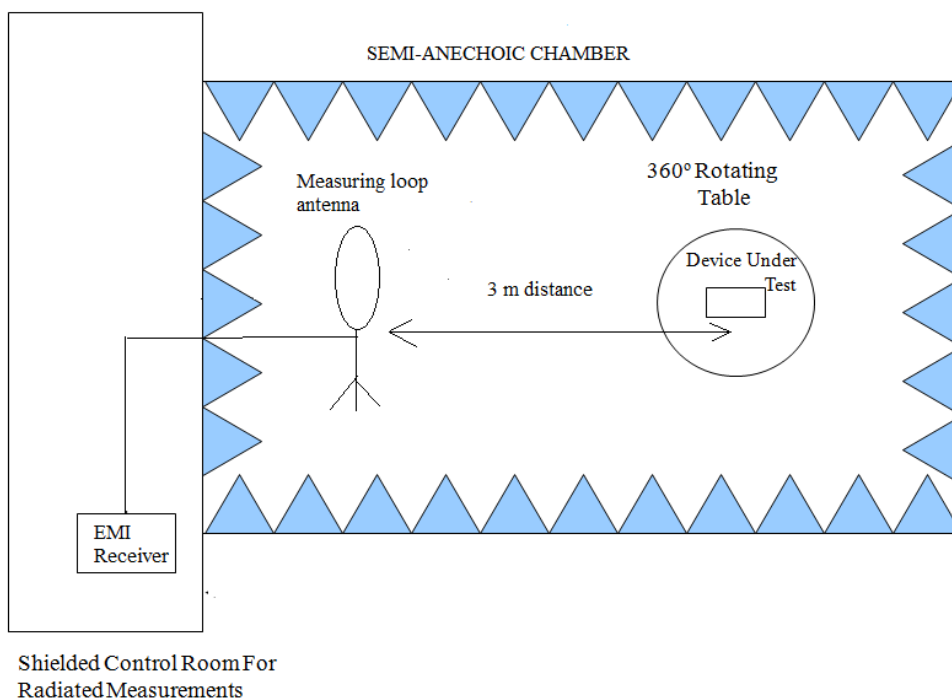
For radiated emissions in the range 9 kHz to 30 MHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform 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.

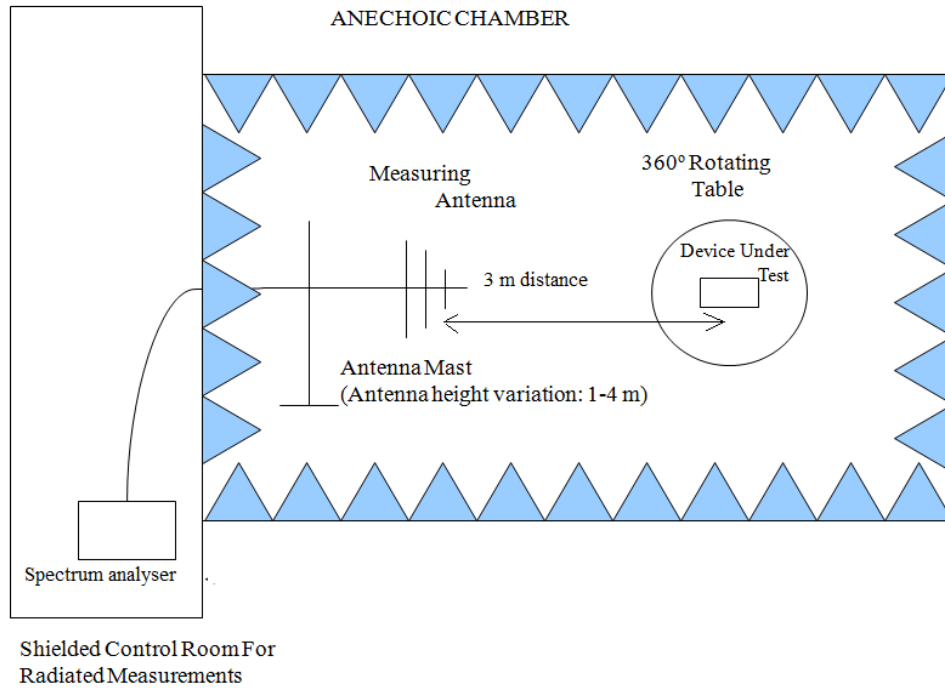
In the range between 9 kHz and 30 MHz the measurements were made in the three different orientation planes of the loop antenna to determine the maximum received field.

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

Radiated measurements setup 9 kHz to 30 MHz.



Radiated measurements setup 30 MHz to 200 MHz.



Occupied Bandwidth

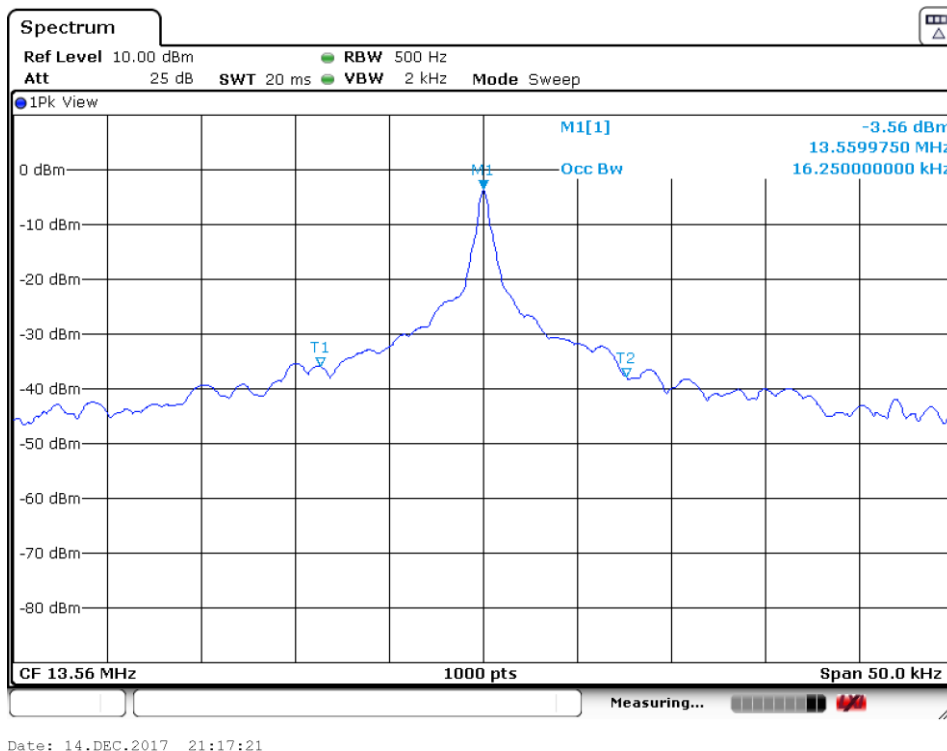
RESULTS

99 % Occupied Bandwidth (see next plots).

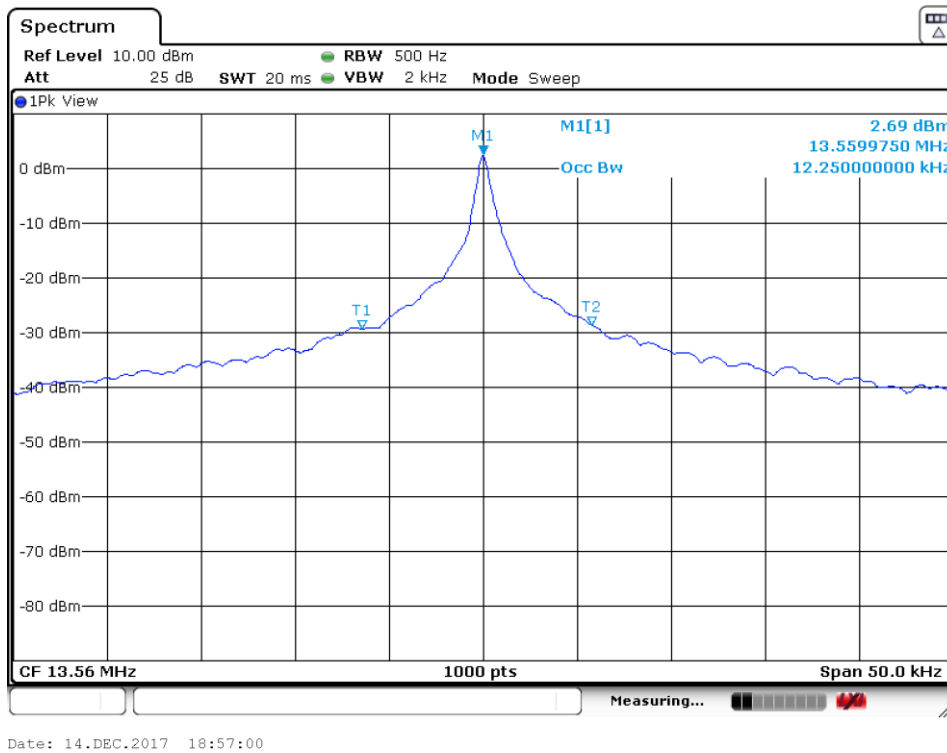
Operation mode	99% occupied bandwidth (kHz)
RFID	16.25
NFC	12.25
Measurement uncertainty (kHz)	<±0.03

Verdict: PASS

Operation mode: RFID



Operation mode: NFC



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

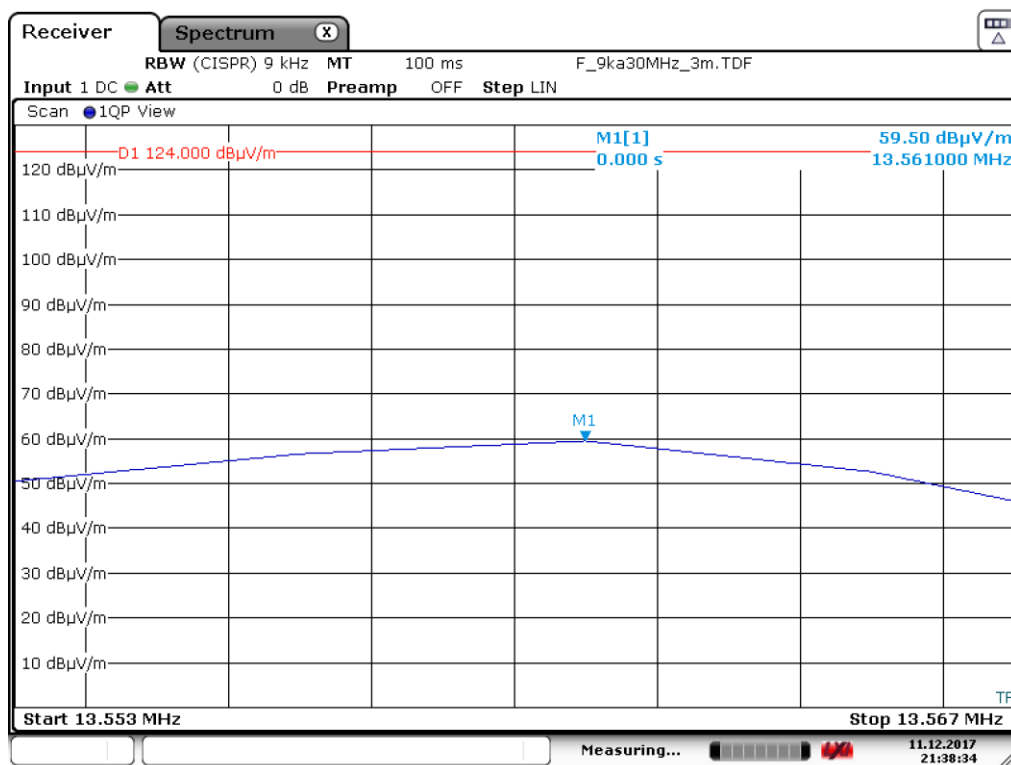
SPECIFICATION

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: RFID



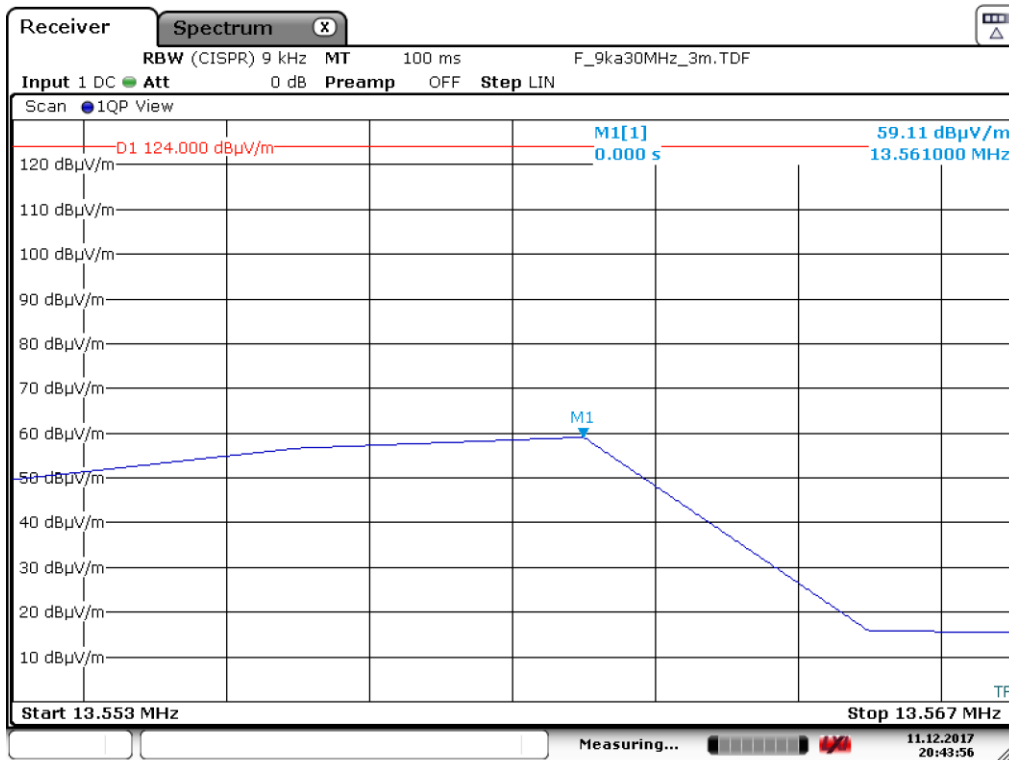
Date: 11.DEC.2017 21:38:35

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	59.50	19.50
Measurement uncertainty (dB)	< \pm 3.2	

Verdict: PASS

2. Operation mode: NFC



Date: 11.DEC.2017 20:43:57

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	59.11	19.11
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

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

SPECIFICATION

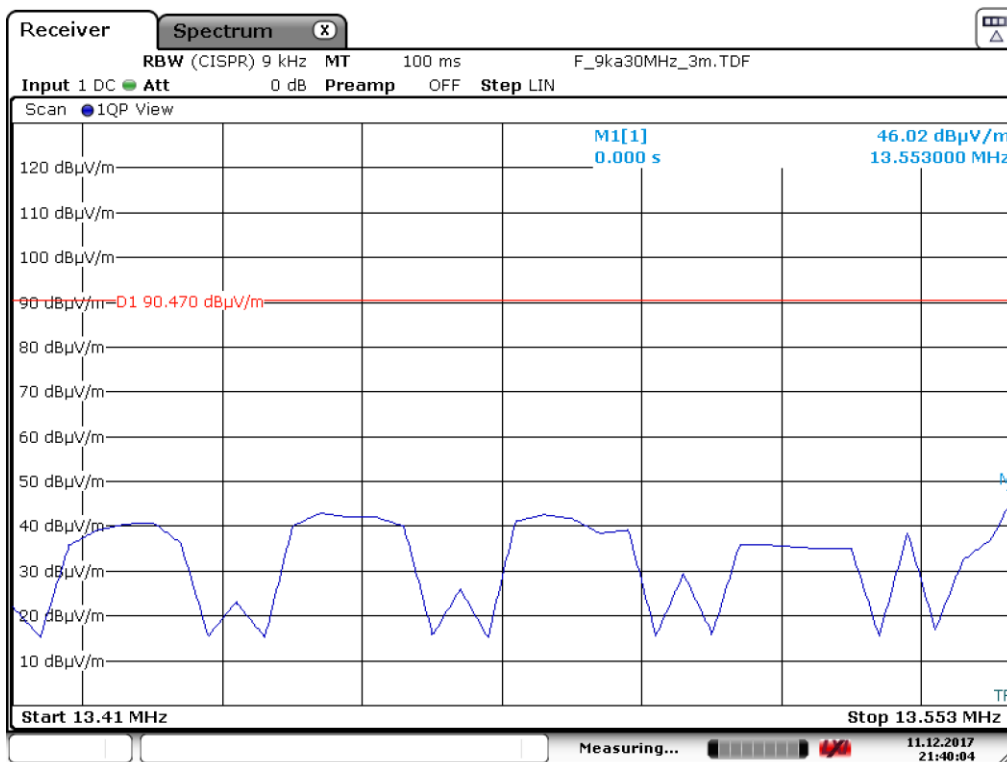
Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (50.47 dBµV/m) at 30 meters.

RESULTS

Band 13.410-13.553 MHz

Measurement distance: 3 meters.

1. Operation mode: RFID



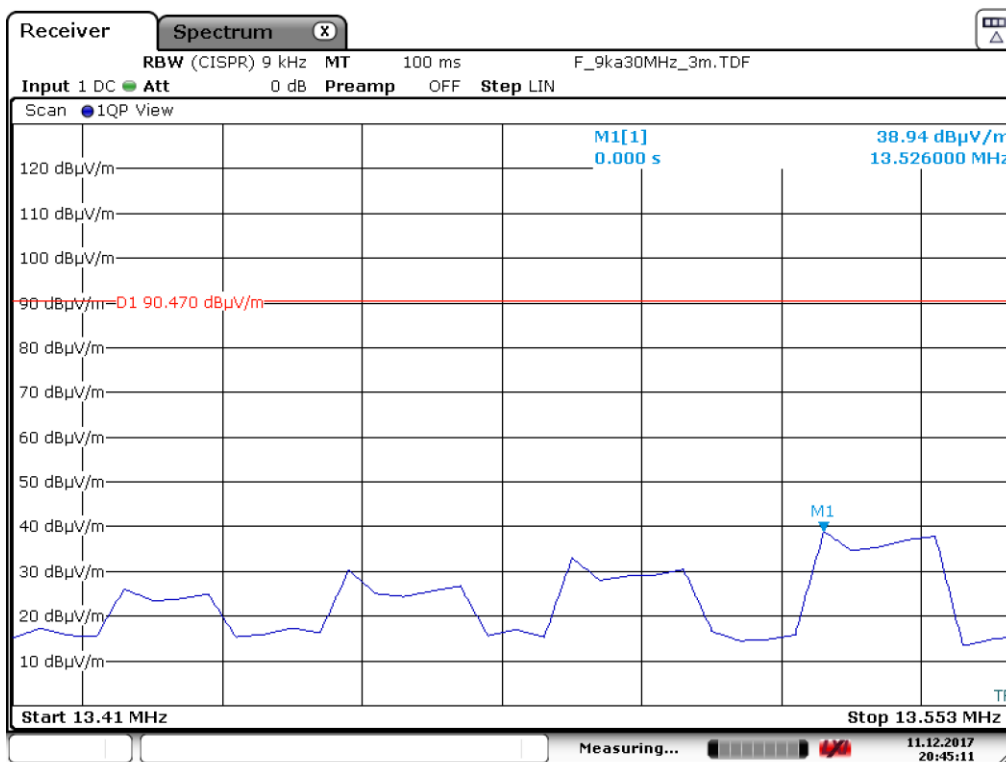
Date: 11.DEC.2017 21:40:05

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	46.02	6.02
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

2. Operation mode: NFC



Date: 11.DEC.2017 20:45:11

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

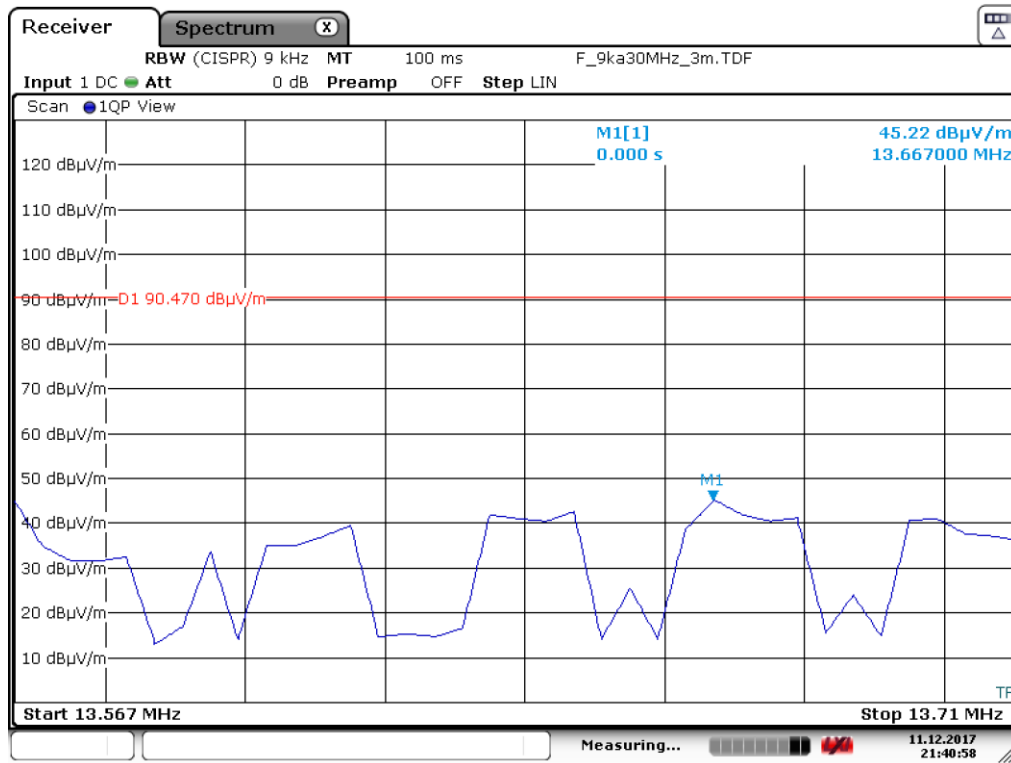
Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.526	38.94	-1.06
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

Band 13.567-13.710 MHz

Measurement distance: 3 meters.

1. Operation mode: RFID



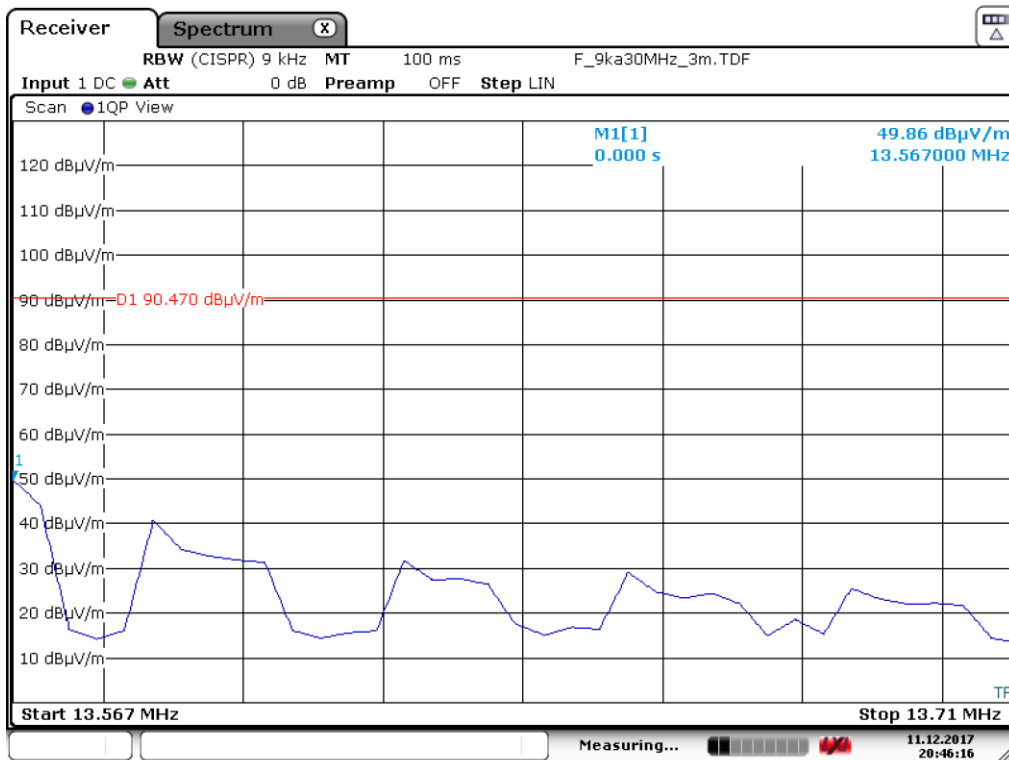
Date: 11.DEC.2017 21:40:58

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	45.22	5.22
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

2. Operation mode: NFC



Date: 11.DEC.2017 20:46:16

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	49.86	9.86
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

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

SPECIFICATION

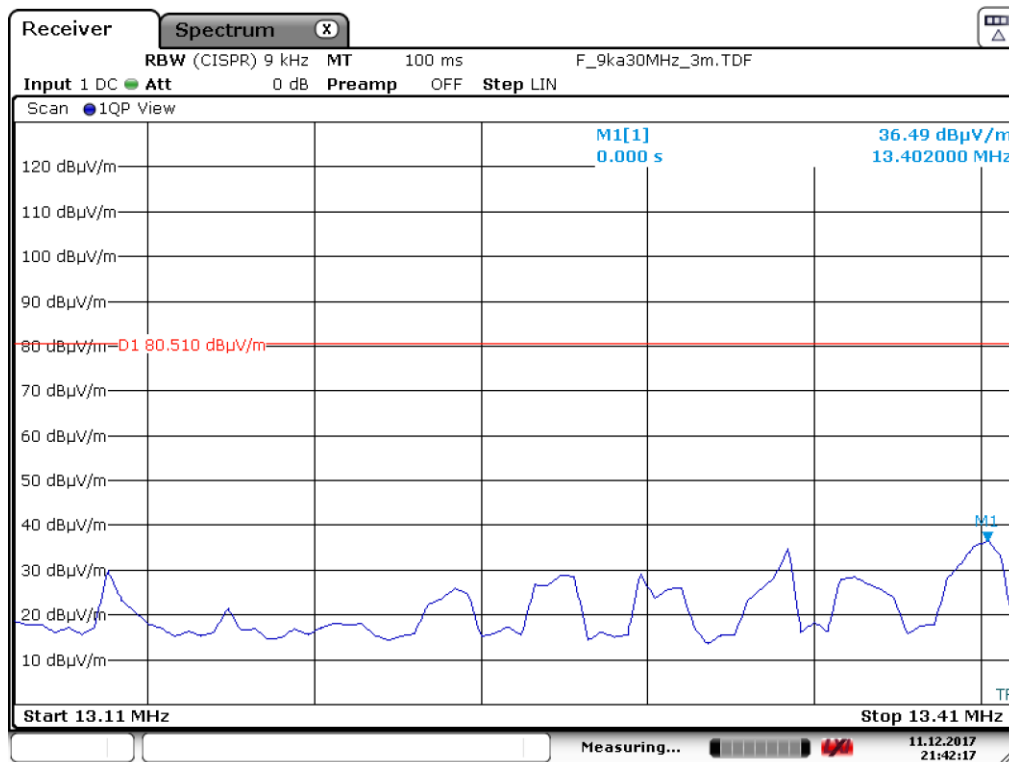
Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter (40.51 dBµV/m) at 30 meters.

RESULTS

Band 13.110-13.410 MHz

Measurement distance: 3 meters.

1. Operation mode: RFID



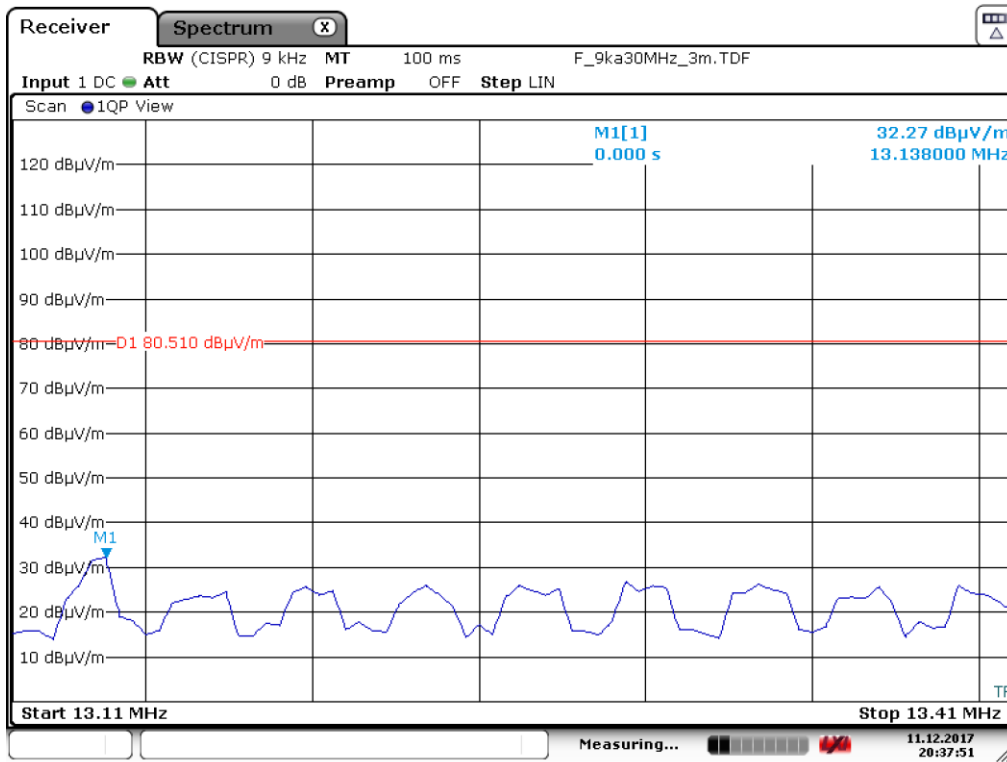
Date: 11.DEC.2017 21:42:17

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	36.49	-3.51
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

2. Operation mode: NFC



Date: 11.DEC.2017 20:37:51

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

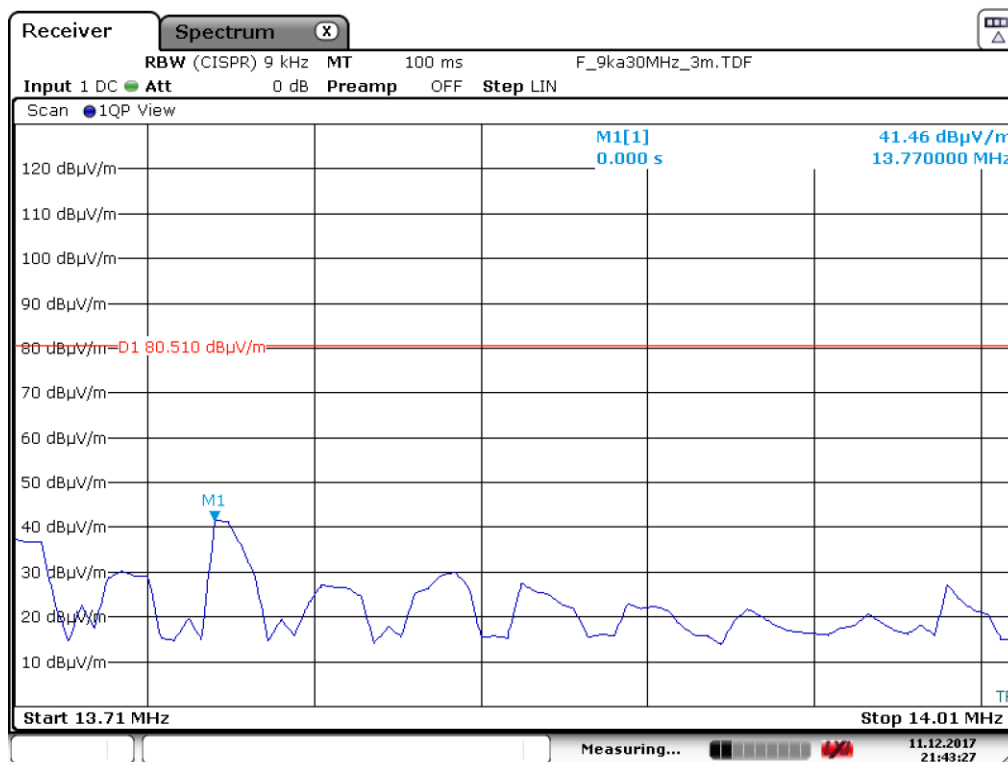
Frequency (MHz)	Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector)	Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade)
13.138	32.27	-7.73
Measurement uncertainty (dB)	<±3.2	

Verdict: PASS

Band 13.710-14.010 MHz

Measurement distance: 3 meters.

1. Operation mode: RFID



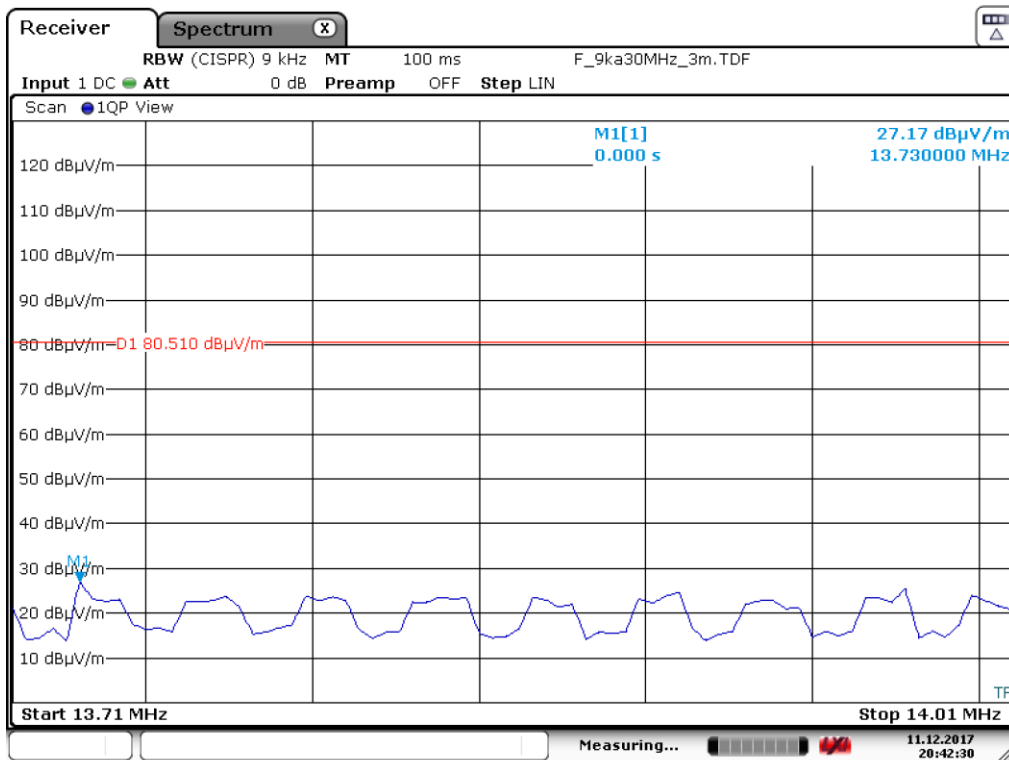
Date: 11.DEC.2017 21:43:28

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	41.46	1.46
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

2. Operation mode: NFC



Date: 11.DEC.2017 20:42:30

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)
13.730	27.17	-12.83
Measurement uncertainty (dB)	±3.2	

Verdict: PASS

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

SPECIFICATION

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/RSS-Gen:

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

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 analyzer. This correction factor includes antenna factor, cable loss and pre-amplifier gain.

1. Operation mode: RFID

Frequency range 9 kHz-30 MHz.

No spurious signals were found at less than 20 dB below the limit.

Frequency range 30 MHz-200 MHz.

No spurious signals were found at less than 20 dB below the limit.

Verdict: PASS

2. Operation mode: NFC

Frequency range 9 kHz-30 MHz.

No spurious signals were found at less than 20 dB below the limit.

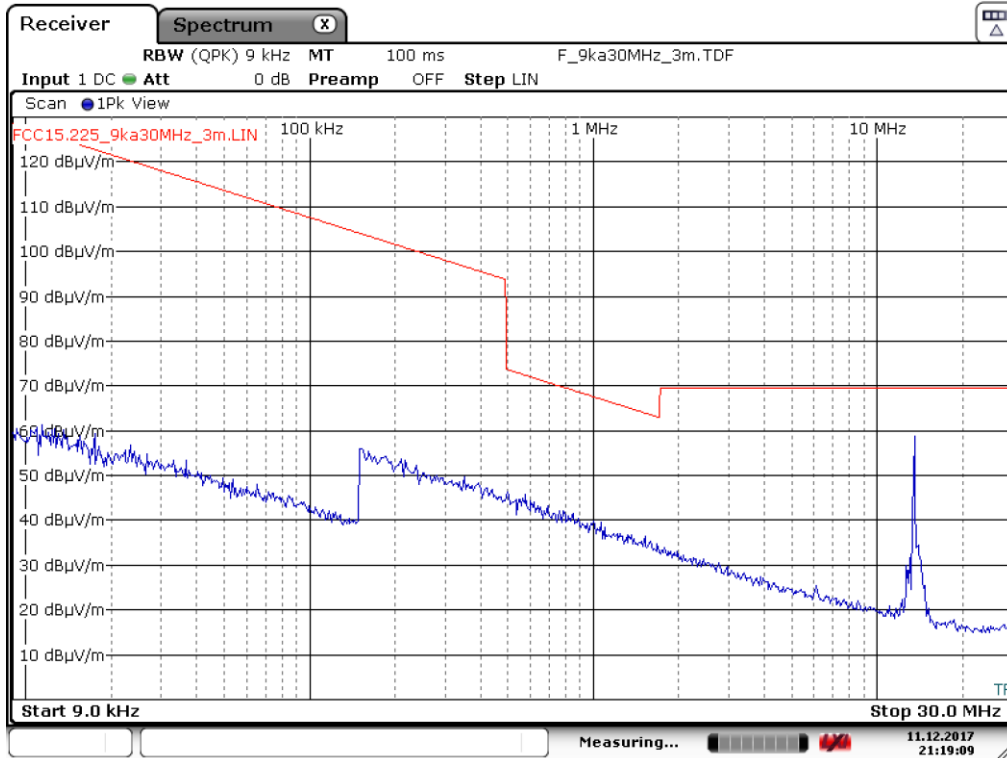
Frequency range 30 MHz-200 MHz.

No spurious signals were found at less than 20 dB below the limit.

Verdict: PASS

FREQUENCY RANGE 9 kHz-30 MHz.

1. Operation mode: RFID



Date: 11.DEC.2017 21:19:09

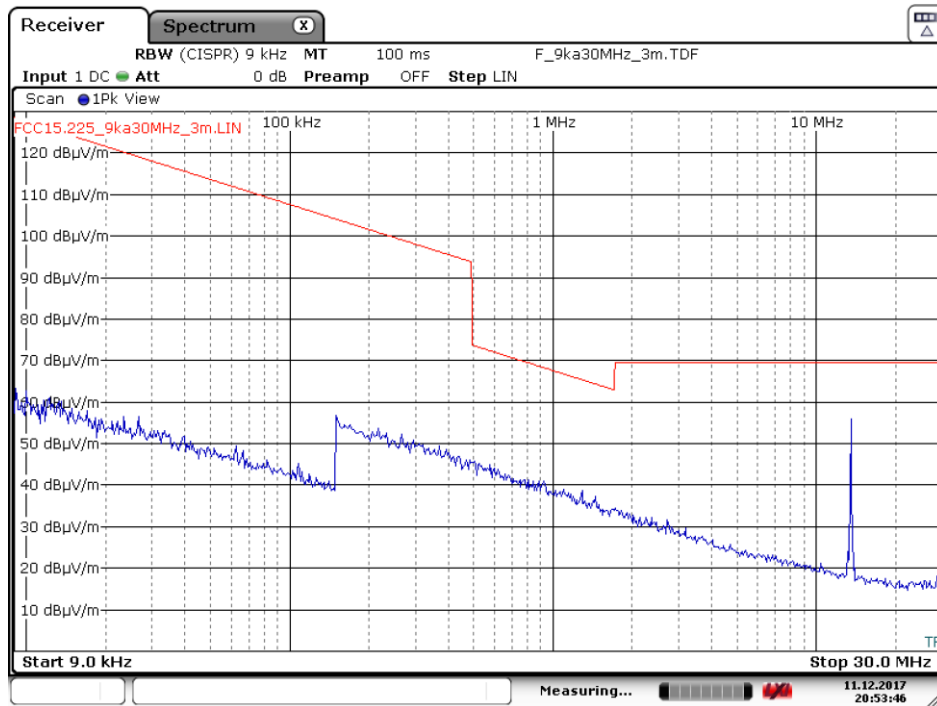
Note: The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

Resolution bandwidth:

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

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

2. Operation mode: NFC



Date: 11.DEC.2017 20:53:46

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

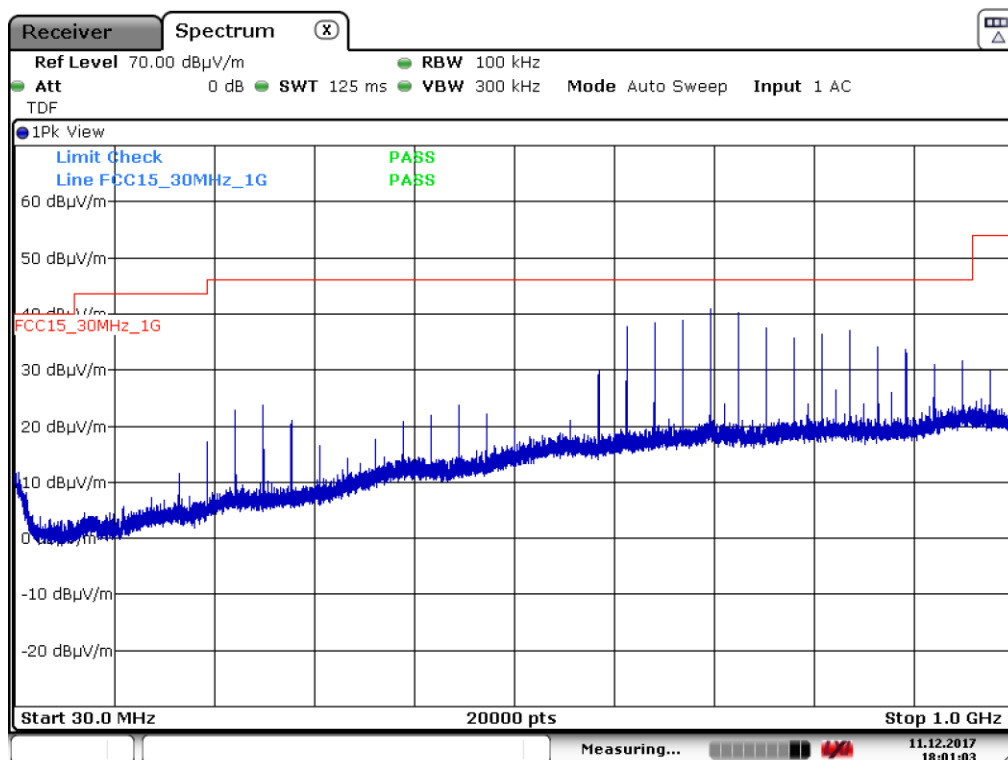
Resolution bandwidth:

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

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

FREQUENCY RANGE 30 MHz to 1000 MHz.

1. Operation mode: RFID

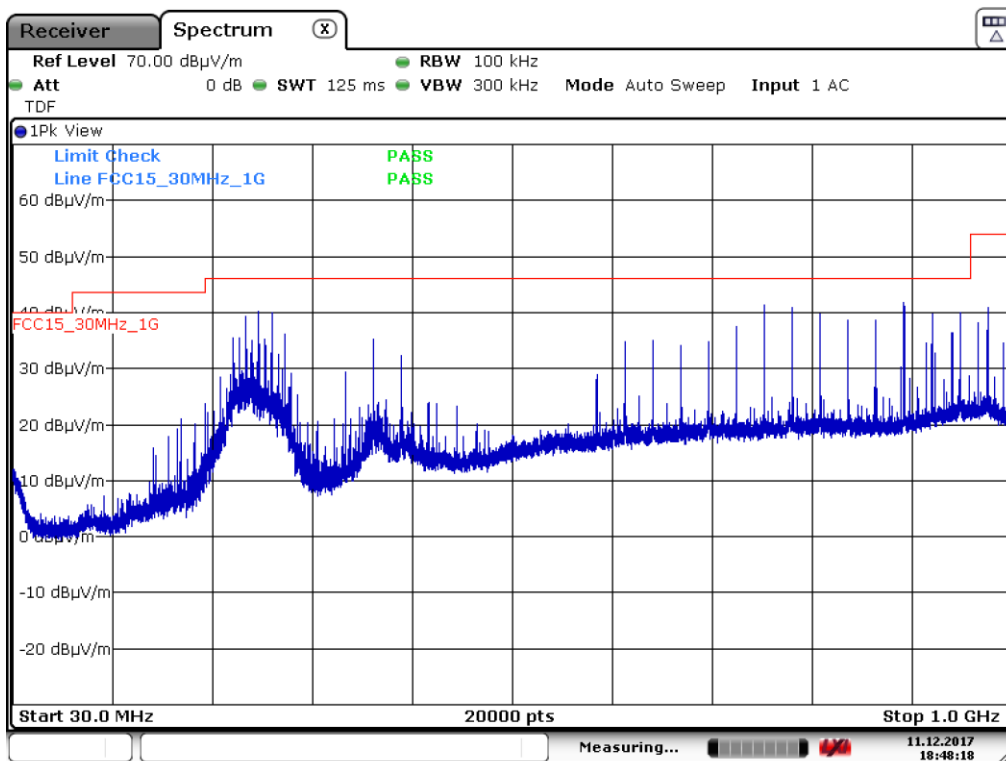


Date: 11.DEC.2017 18:01:04

Note1: The above plot shows the results of the scan using peak detector.

Note2: No spurious signals were found at less than 20 dB below the limit in the frequency range below 10th transmission harmonic with quasi-peak detector.

2. Operation mode: NFC



Date: 11.DEC.2017 18:48:18

Note1: The above plot shows the results of the scan using peak detector.

Note2: No spurious signals were found at less than 20 dB below the limit in the frequency range below 10th transmission harmonic with quasi-peak detector.

Section 15.225 Subclause (e) / RSS-210 Clause B.6. 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. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

RESULTS

Nominal operating frequency: 13.56 MHz

1. Operation mode: RFID

Frequency stability over temperature variations.

Temperature (°C)	Frequency Error (kHz)	Frequency Error (%)
+50	0.008417	0.000062
+40	-0.005830	-0.000043
+30	0.031951	0.000452
+20	-0.061234	-0.000452
+10	-0.044052	-0.000325
0	-0.069253	-0.000511
-10	-0.106443	-0.000785
-20	-0.120318	-0.000887

Frequency stability over voltage variations.

DC Supply voltage	Voltage (V)	Frequency Error (kHz)	Frequency Error (%)
V _{max}	6.9	0.024550	0.000151
V _{min}	5.1	0.044881	0.000331

2. Operation mode: NFC

Frequency stability over temperature variations.

Temperature (°C)	Frequency Error (kHz)	Frequency Error (%)
+50	-0.162048	-0.001195
+40	-0.161894	-0.001194
+30	-0.058585	-0.000432
+20	-0.044774	-0.000330
+10	-0.045823	-0.000338
0	-0.091682	-0.000679
-10	-0.091682	-0.000679
-20	-0.088779	-0.000655

Frequency stability over voltage variations.

DC Supply voltage	Voltage (V)	Frequency Error (kHz)	Frequency Error (%)
V _{max}	6.9	-0.224651	-0.001657
V _{min}	5.1	-0.226434	-0.001670

Verdict: PASS