DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 68382RRF.001

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

(*) Identification of item tested	General purpose IVD reagent dilution instrument
(*) Trademark	RPI
(*) Model and /or type reference	RPI-ECO21
Other identification of the product	HW version: A0016871 SW version: 2.13 FCC ID: 2A3GORPIA0016871 IC: N/A
(*) Features	RFID
Manufacturer	RR Mechatronics Manufacturer B.V. De Corantijn 13, 1689 AN Zwaag The Netherlands
Test method requested, standard	USA FCC Part 15.225 (10-1-20 Edition): Operation within the band 13.110 - 14.010. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-210 Issue 10 (December 2019). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager 2021.11.12 13:10:41 +01'00'
Date of issue	2021-11-12
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Competences and guarantees 3
General conditions 3
Uncertainty 3
Data provided by the client 3
Usage of samples 4
Test sample description 4
Identification of the client 5
Testing period and place 5
Document history 5
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Test results 9

Competences and guarantees

DEKRA Testing and Certification S.A.U. 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 FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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

DEKRA Testing and Certification S.A.U. 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 S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. 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.

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.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample of the model RPI-ECO21 is a general purpose instrument intended to dilute a concentrated reagent to a usable fluid for in vitro laboratory testing.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: the client.

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

Control Nº	Description	Model	Serial Nº	Reception
68382/004	NFC reader (conducted)	--	--	2021/10/01

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Reception
68382/006	USB cable	--	--	2021/10/01

Sample S/01 has undergone the test(s): All CONDUCTED tests indicated in Appendix A except "Frequency Stability over Voltage Variations."

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

Control Nº	Description	Model	Serial Nº	Reception
68382/001	RPI Complete Instrument	RPI-ECO21	A0016871	2021/10/01
68382/002	Power cable	--	--	2021/10/01

Sample S/02 has undergone the test(s): All RADIATED tests indicated in Appendix A and the CONDUCTED test "Frequency Stability over Voltage Variations."

Test sample description

Ports…… :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)		
	LAN	5	☐	☒	☐		
	RS232	3	☐	☐	☐		
	USB	5	☐	☒	☐		
	Water		☒	☐	☐		
	Drain		☒	☐	☐		
	--		☐	☐	☐		
Supplementary information to the ports…… :	Input water connection (1-6 bar): 1x John Guest PM Acetal fitting 8mm Waste (W1 + W2): JG PM Acetal fitting 6 mm OD (W1), JG PM Acetal fitting 10mm OD (W2)						
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 110-230	☒	☐	☐	☒	☒
	☐	DC:					

Rated Power .....:	600 VA			
Clock frequencies.....:	2.5 GHz highest internal frequency			
Other parameters .....:	50-60 Hz mains			
Software version .....:	2.13			
Hardware version .....:	A0016871			
Dimensions in cm (W x H x D) ....:	62 x 75 x 77.5 cm			
Mounting position .....:	☐	Table top equipment		
	☐	Wall/Ceiling mounted equipment		
	☒	Floor standing equipment		
	☐	Hand-held equipment		
	☐	Other:		
Modules/parts.....:	Module/parts of test item		Type	Manufacturer
	NFC reader		Chilli-USB B1	Eccel Technologies
Accessories (not part of the test item) .....:	Description		Type	Manufacturer
Documents as provided by the applicant.....:	Description		File name	Issue date
	Installation manual			
	User manual			

(3) Only for Medical Equipment

Identification of the client

RR Mechatronics Manufacturer B.V.
De Corantijn 13, 1689 AN Zwaag
The Netherlands

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-10-14
Date (finish)	2021-10-29

Document history

Report number	Date	Description
68382RRF.001	2021-11-12	First release

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Miguel Manuel López, Pablo Redondo and Nicolás Salguero.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz ROHDE AND SCHWARZ FSV40	2020/03	2022/03
2.	TEMPERATURE CHAMBER BINDER MK 56	2021/03	2022/03
3.	AC POWER SUPPLY 135/270V 5/10/20/40A ELGAR CS-AC35(351SL)	2019/09	2022/09
4.	DC POWER SUPPLY 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
5.	Digital multimeter FLUKE 179	2020/11	2021/11

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	Shielded Room ETS LINDGREN S101	N.A.	N.A.
3.	Active Loop Antenna HEWLETT PACKARD 11966A	2020/07	2022/07
4.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
5.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
6.	Preamplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK BLNA 0160-01N	2021/03	2022/03
7.	AC POWER SUPPLY 135/270V 5/10/20/40A ELGAR CS-AC35(351SL)	2019/09	2022/09

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-210 Requirement – Test case		Verdict	Remark
FCC 15.225 (a) / RSS-210 B.6 (a)(i)	Field strength of emissions within the band 13.553 MHz – 13.567 MHz	P	
FCC 15.225 (b) / RSS-210 B.6 (a)(ii)	Field strength of emissions within the band 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	P	
FCC 15.225 (c) / RSS-210 B.6 (a)(iii)	Field strength of emissions within the band 13.110 – 13.410 MHz and 13.710 – 14.010 MHz	P	
FCC 15.225 (d) / RSS-210 B.6 (a)(iv)	Field strength of emissions outside of the band 13.110 MHz -14.010 MHz	P	
FCC 15.225 (e) / RSS-210 B.6 (b)	Frequency tolerance of the carrier signal	P	
Supplementary information and remarks: None.			

Appendix A: Test results

INDEX

TEST CONDITIONS 11

Occupied Bandwidth 14

15.225 (a) / RSS-210 B.6 (a)(i) Field Strength of Emissions within the band 13.553 MHz – 13.567 MHz 15

15.225 (b) / RSS-210 B.6 (a)(ii) Field Strength of Emissions within the band 13.410 MHz – 13.553 MHz and 13.567 MHz – 13.710 MHz 16

15.225 (c) / RSS-210 B.6 (a)(iii) Field Strength of Emissions within the band 13.110 MHz – 13.410 MHz and 13.710 MHz – 14.010 MHz 18

15.225 (d) / RSS-210 B.6 (a)(iv) Field Strength of Emissions outside of the band 13.110 MHz – 14.010 MHz 20

15.225 (e) / RSS-210 B.6 (b) Frequency Tolerance of the Carrier Signal 23

TEST CONDITIONS

POWER SUPPLY (*):

Vnominal:	120 Vac
Type of Power Supply:	AC external mains

ANTENNA (*):

Type of Antenna:	Inductive loop on PCB.
Maximum Declared Antenna Gain:	0 dBi

TEST FREQUENCIES (*):

Nominal Operating Frequency:	13.56 MHz

(*) Declared by applicant.

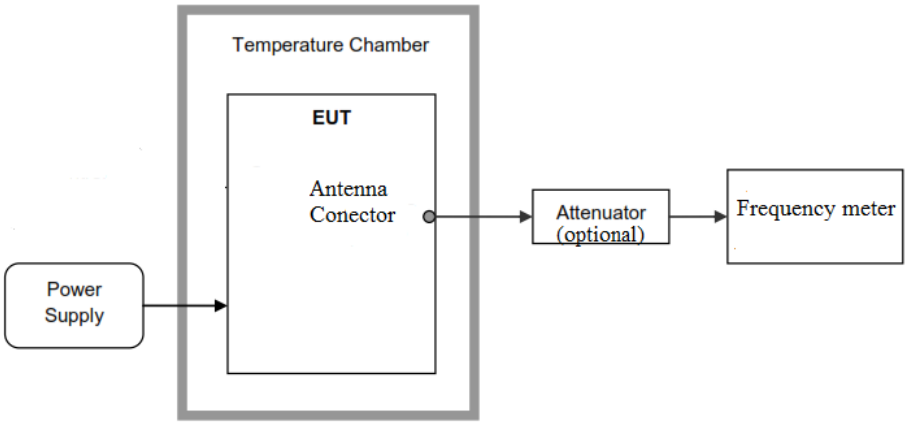
Testing radiated performed with the tree NFC readers working simultaneously.

Testing conducted performed with only one NFC reader (three NFC readers are the same model).

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and directly connected to the spectrum analyzer.

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



RADIATED MEASUREMENTS:

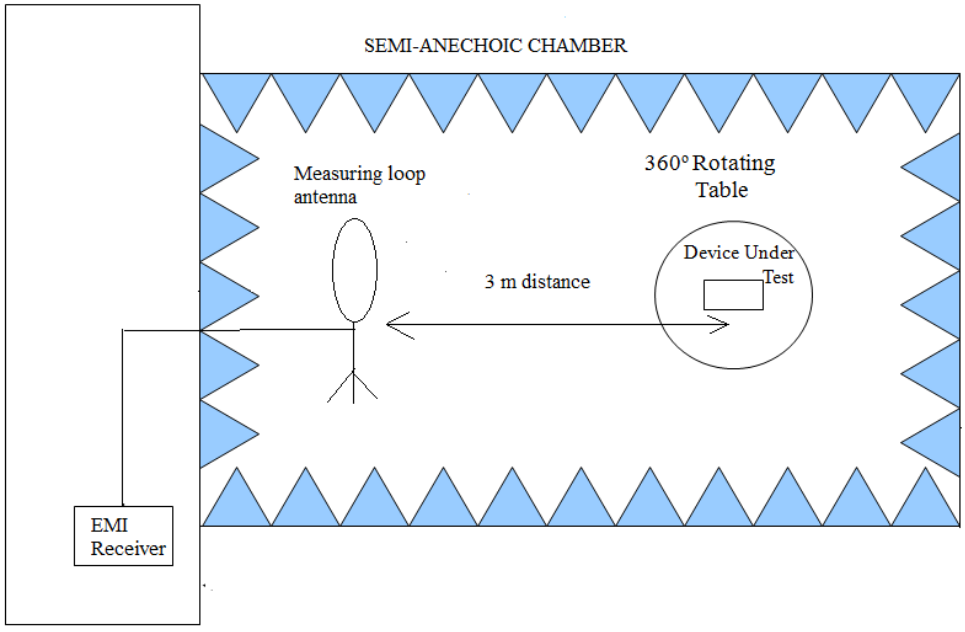
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the range from 9 kHz to 30 MHz and Bilog antenna for the range from 30 MHz to 200 MHz) is situated at a distance of 3 m.

For radiated emissions tests in the range 9 kHz to 30 MHz performed at a distance closer than the distance specified in standard, 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 360º 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.

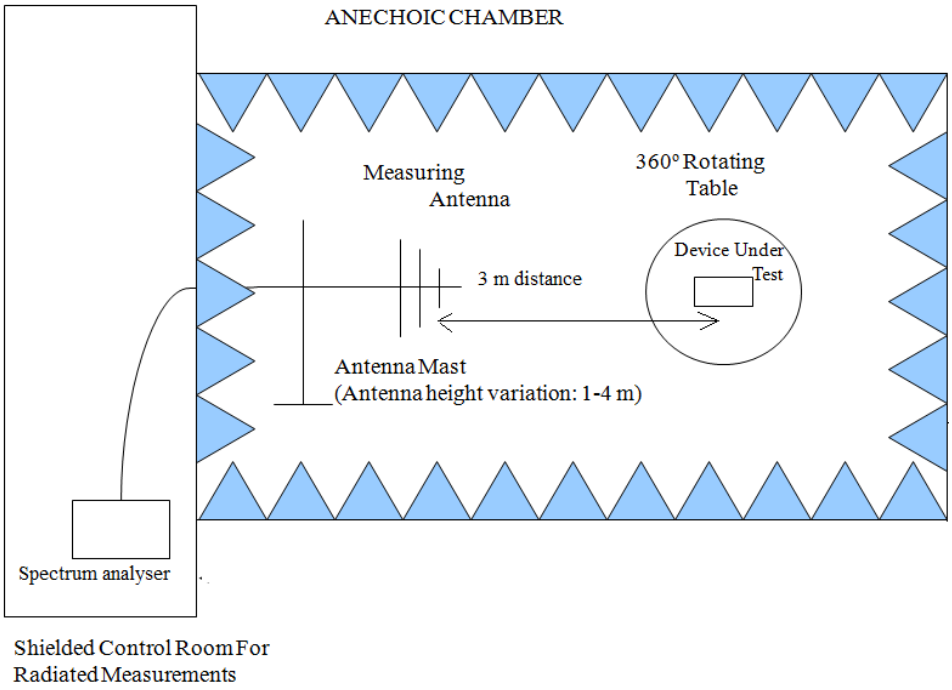
Radiated tests were performed with the three NFC interfaces of the EUT transmitting simultaneously.

Radiated measurements setup 9 kHz to 30 MHz:



Shielded Control Room For Radiated Measurements

Radiated measurements setup 30 MHz to 200 MHz:

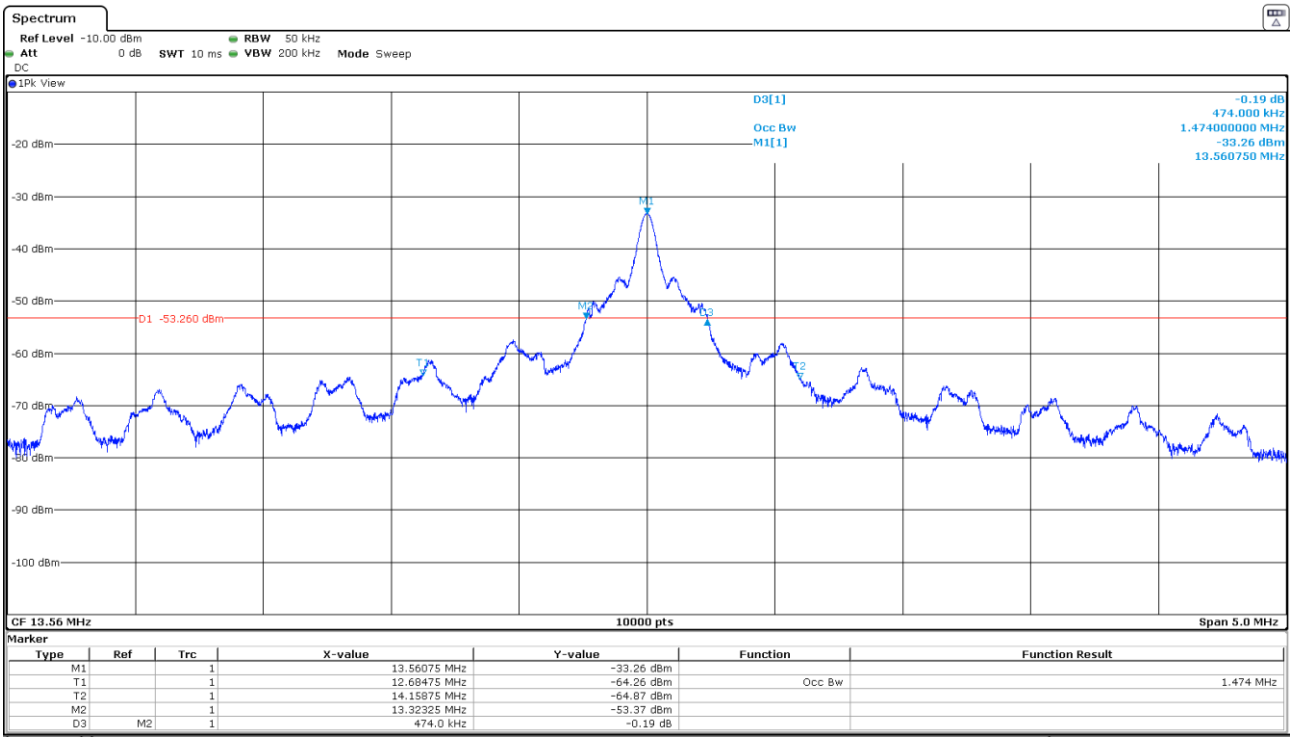


Occupied Bandwidth

RESULTS:

99 % Occupied Bandwidth and 20 dB Bandwidth.

Operation mode	99% Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)
NFC	1474	474
Measurement uncertainty (kHz)	< ±1.42	



Verdict: PASS

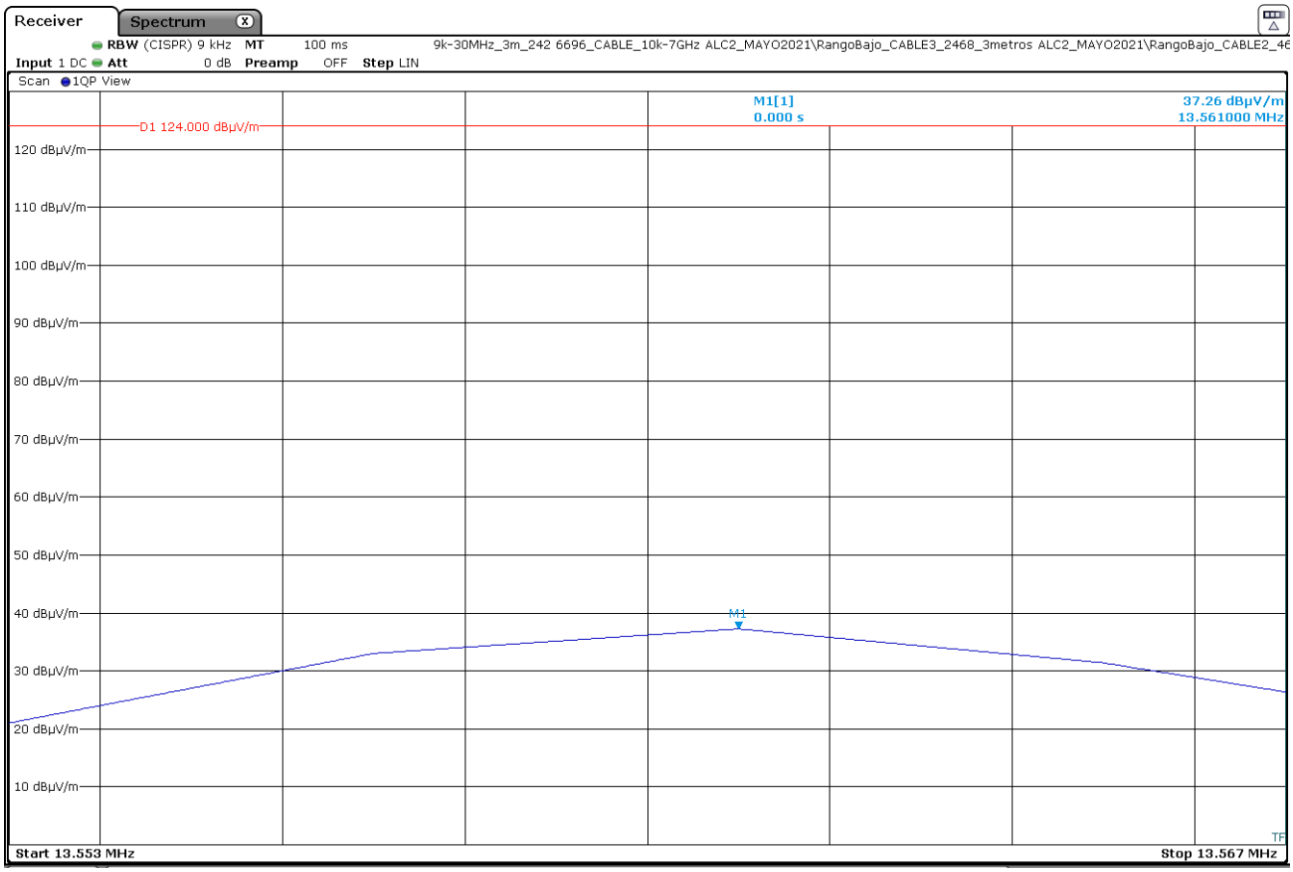
15.225 (a) / RSS-210 B.6 (a)(i) Field Strength of Emissions within the band 13.553 MHz – 13.567 MHz

SPECIFICATION:

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

RESULTS:

Measurement distance: 3 meters.



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	37.26	-2.74
Measurement uncertainty (dB)	< ±3.04	

Verdict: PASS

15.225 (b) / RSS-210 B.6 (a)(ii) Field Strength of Emissions within the band 13.410 MHz – 13.553 MHz and 13.567 MHz – 13.710 MHz

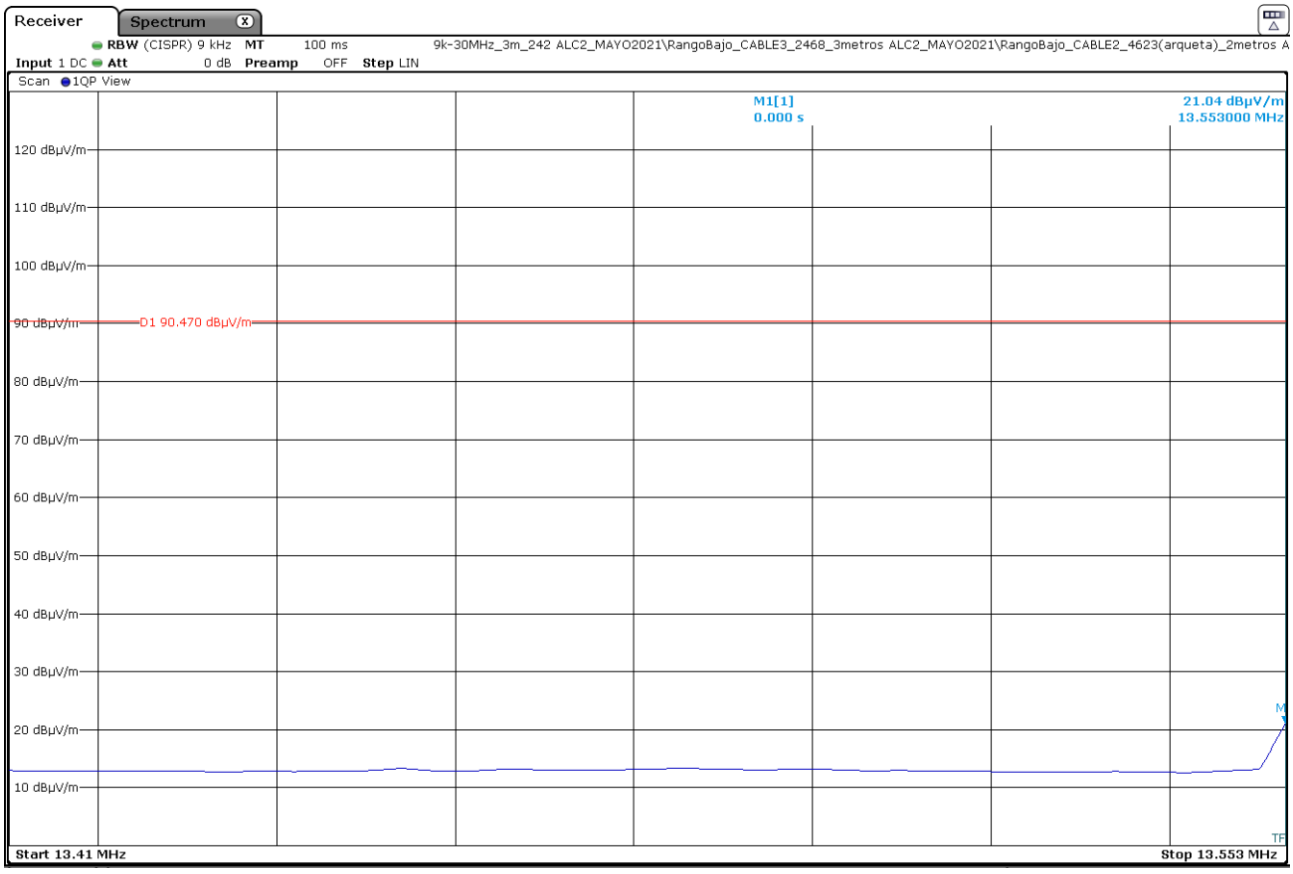
SPECIFICATION:

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:

Measurement distance: 3 meters.

- **Band 13.410 – 13.553 MHz:**

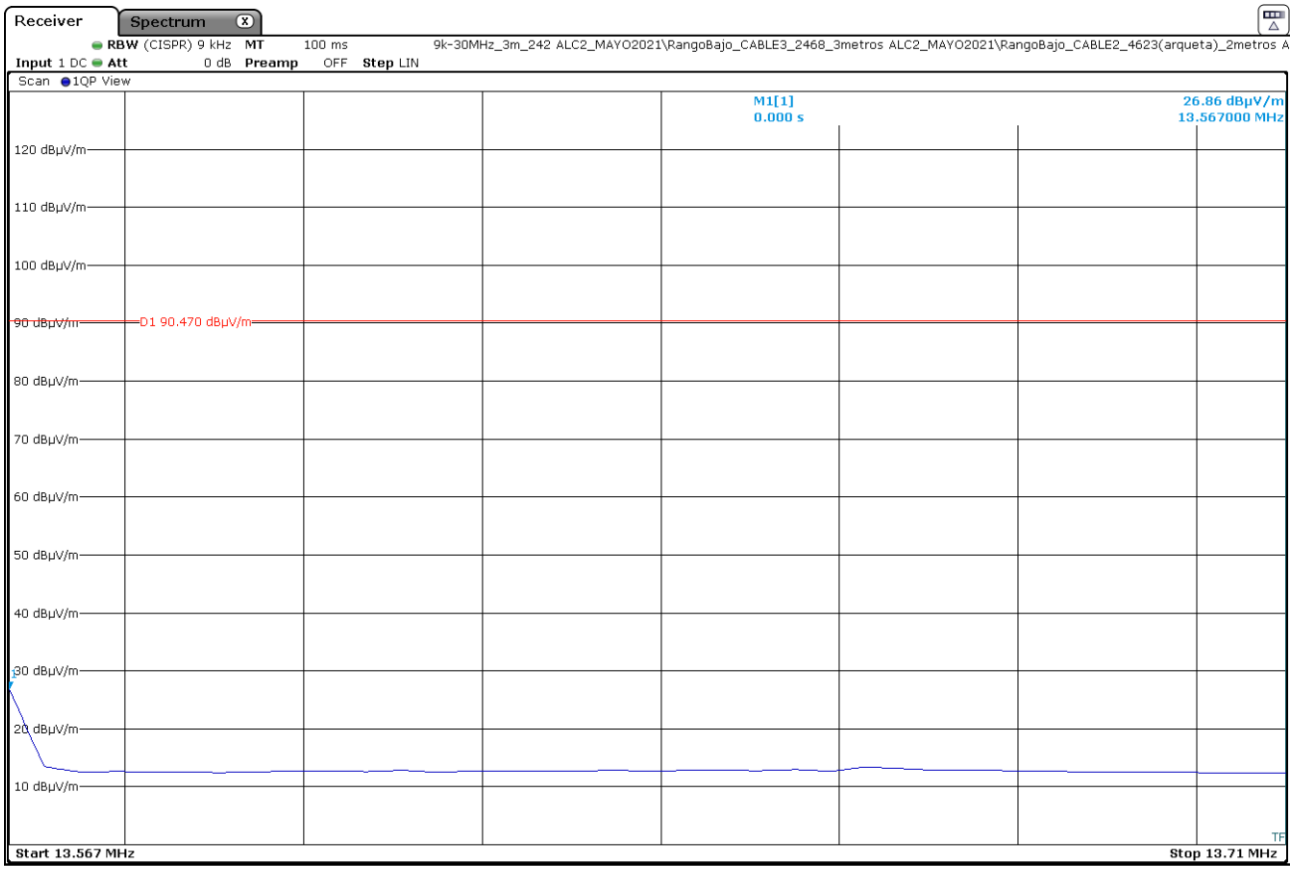


The limit shown in the above plot is extrapolated to 3 meters.

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	21.04	-18.96
Measurement uncertainty (dB)	< ±3.04	

Verdict: PASS

- **Band 13.567 – 13.710 MHz:**



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	26.86	-13.14
Measurement uncertainty (dB)	< ±3.04	

Verdict: PASS

15.225 (c) / RSS-210 B.6 (a)(iii) Field Strength of Emissions within the band 13.110 MHz – 13.410 MHz and 13.710 MHz – 14.010 MHz

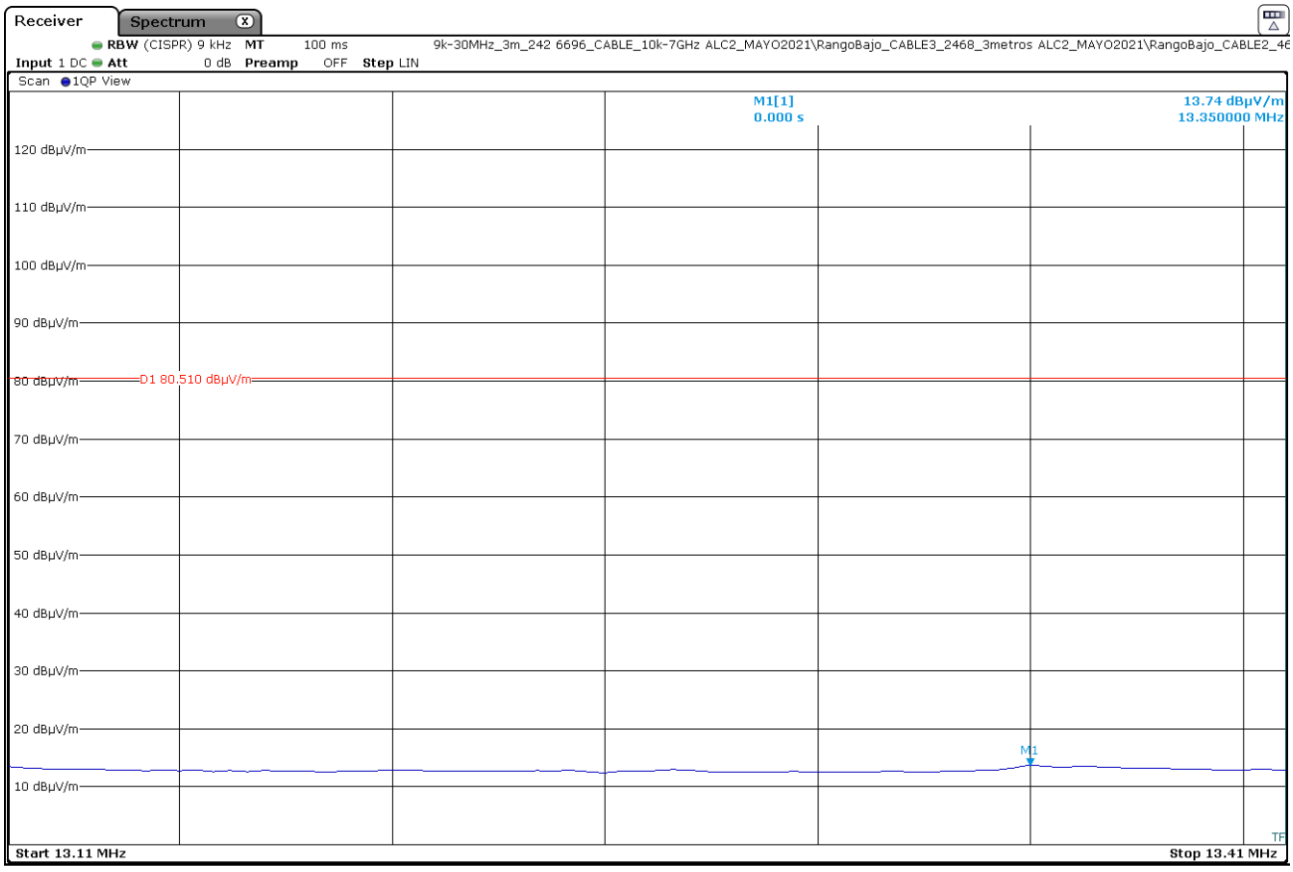
SPECIFICATION:

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:

Measurement distance: 3 meters.

- **Band 13.110 – 13.410 MHz:**

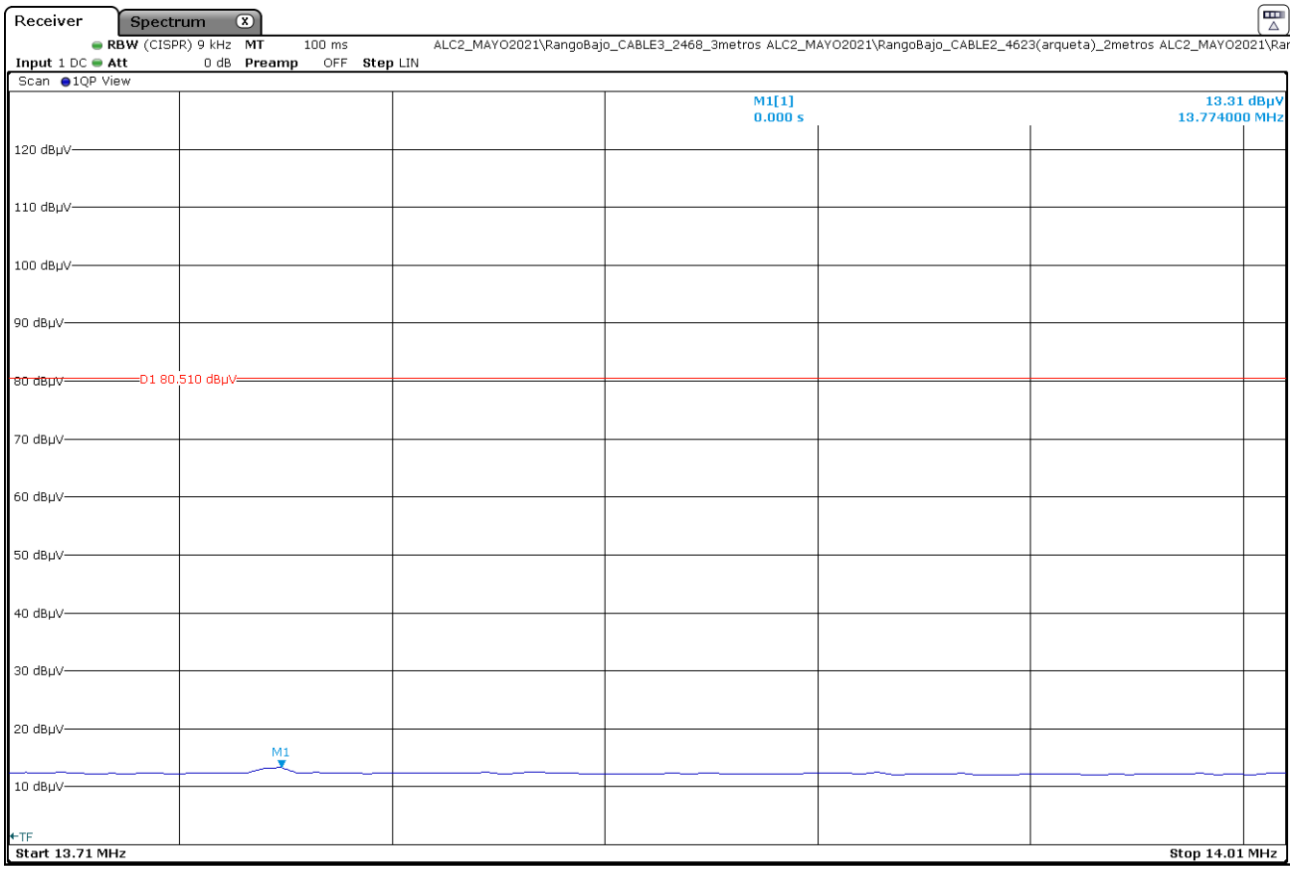


The limit shown in the above plot is extrapolated to 3 meters.

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)
13.350	13.74	-26.26
Measurement uncertainty (dB)	< ±3.04	

Verdict: PASS

- **Band 13.710 – 14.010 MHz:**



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)
13.774	13.31	-26.69
Measurement uncertainty (dB)	< ±3.04	

Verdict: PASS

15.225 (d) / RSS-210 B.6 (a)(iv) 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 (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
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:

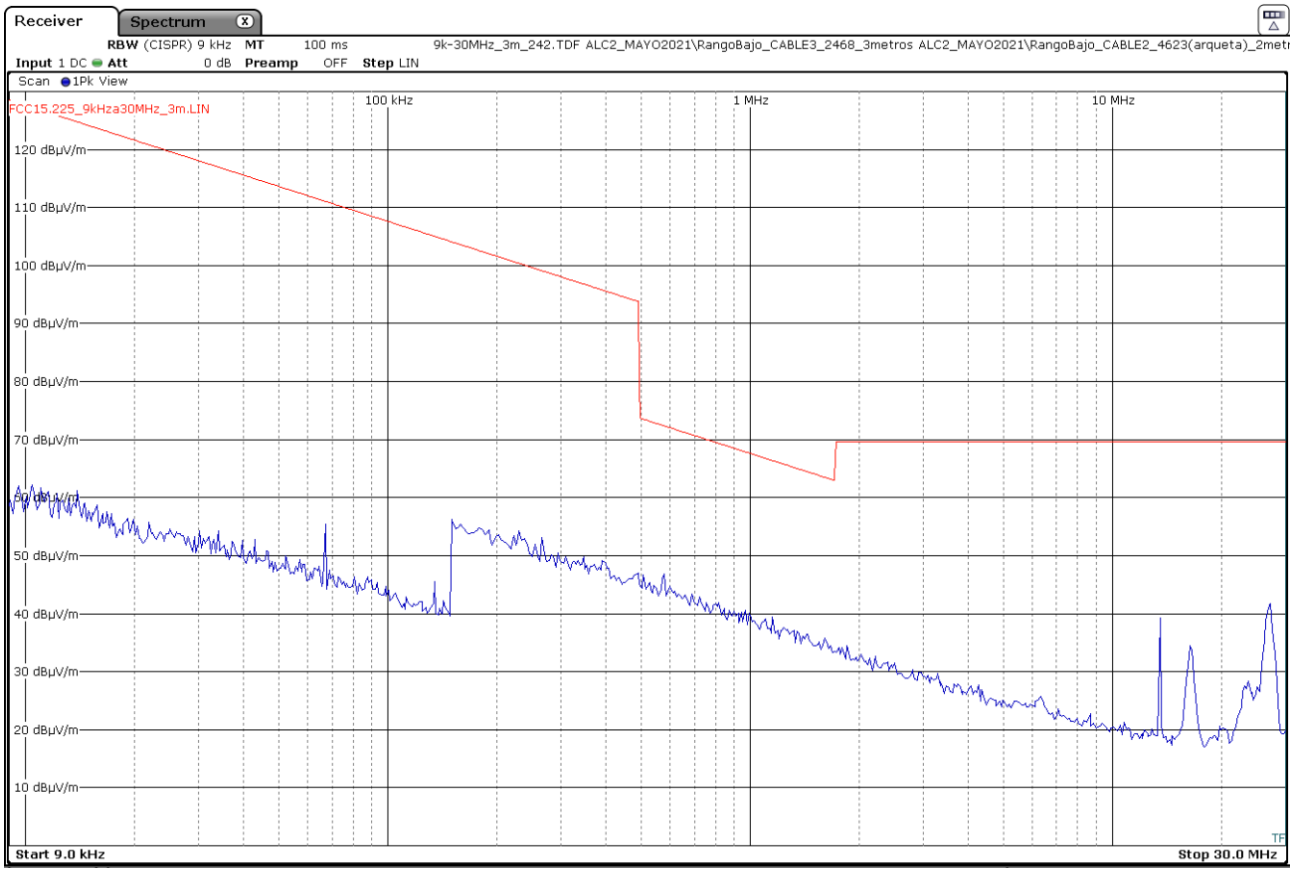
All tests were performed in a semi-anechoic chamber at a distance of 3 m.

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

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

Frequency range 9 kHz – 30 MHz:

No spurious frequencies detected at less than 20 dB below the limit.



The limits shown in this plot are extrapolated to 3 m.

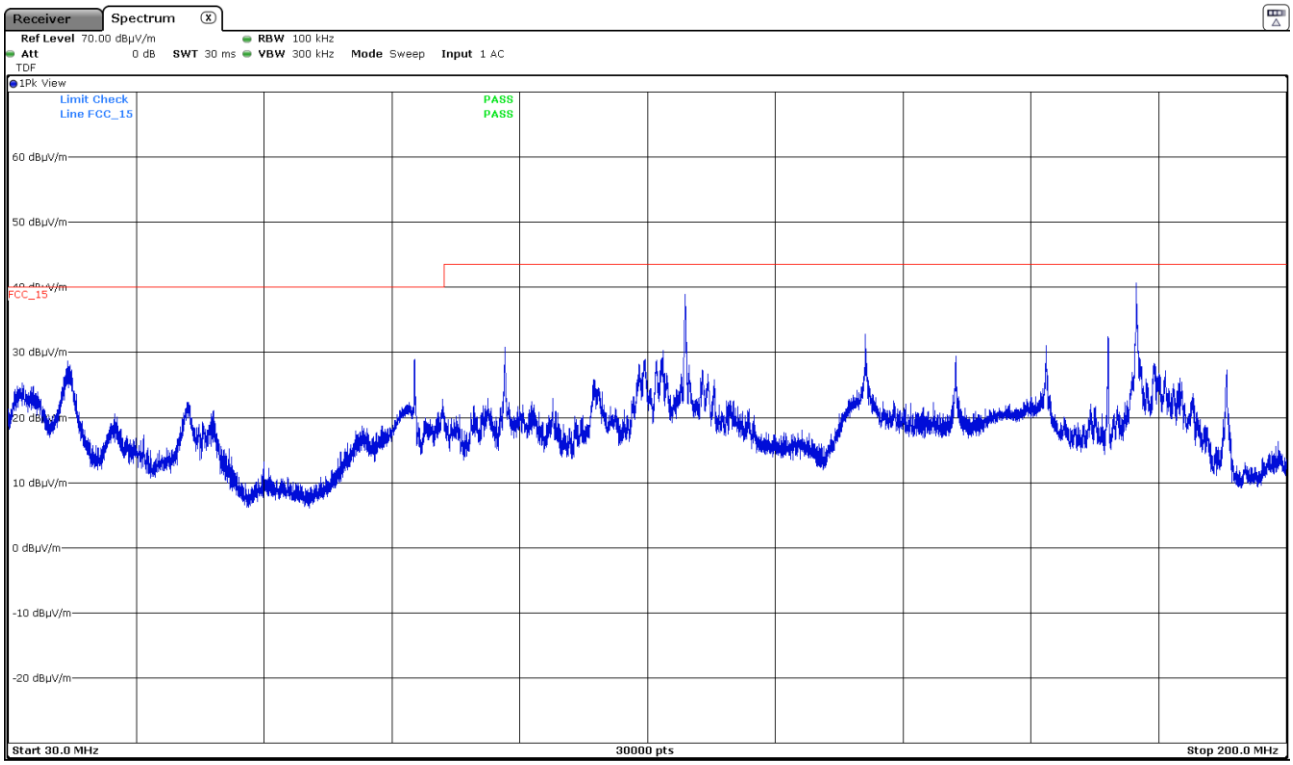
Resolution bandwidth:

200 Hz for 9 kHz ≤ f ≤ 150 kHz
9 kHz for 150 kHz ≤ f ≤ 30 MHz

Frequency range 30 – 200 MHz:

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Detector	Polarization	Measurement Uncertainty (dB)
37.8568	24.8	Quasi Peak	V	< ±5.01
84.0345	22.1	Quasi Peak	V	
96.0535	25.4	Quasi Peak	V	
120.0405	33.7	Quasi Peak	V	
144.0105	26.1	Quasi Peak	V	
168.0372	26.7	Quasi Peak	V	
176.2878	31.6	Quasi Peak	V	
180.0392	33.9	Quasi Peak	V	



This plot shows the pre-scan results using peak detector.

Verdict: PASS

15.225 (e) / RSS-210 B.6 (b) 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.

- **Frequency Stability over Temperature Variations**:

Temperature (ºC)	Frequency Error (kHz)	Frequency Error (%)
+50	0.606000	0.004469
+40	0.618000	0.004558
+30	0.658500	0.004856
+20	0.696000	0.005133
+10	0.729000	0.005376
0	0.747000	0.005509
-10	0.744000	0.005487
-20	0.721500	0.005321

- **Frequency Stability over Voltage Variations**:

AC Voltage	Voltage (V)	Temperature (ºC)	Frequency Error (kHz)	Frequency Error (%)
Vmax	126.5	+20	0.696000	0.005133
Vmin	93.5	+20	0.690000	0.005088

Verdict: PASS