DEKRA Testing and Certification, S.A.U.
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C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 68042RRF.004

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

(*) Identification of item tested	Battery control unit
(*) Trademark	Inuheat
(*) Model and /or type reference	PP3/3000
Other identification of the product	HW version: 3.1 SW version: 3.3 FCC ID: 2A2NC-1100047 IC ID: 27559-1100047
(*) Features	BLE, NFC
Applicant	Inuheat Group AB Hedtångsvägen 6 436 53 Hovås, Sweden
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 (March 2019). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Jose Manuel Gómez Industrial & Automotive EMC Lab Manager Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456) Fecha: 2021.08.26 13:22:37 +02'00'
Date of issue	2021-08-25
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 5
Identification of the client 6
Testing period and place 6
Document history 6
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Test results 9

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 S.A.U. is an FCC-recognized accredited testing laboratory with the appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. 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 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.

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 PP3/3000 is a unit for supplying energy to heated garments as well as communication with an App in phones.

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	Date of reception
68042B/095	Battery control unit	PP3/3000	40226	2021/05/13

Sample S/01 has undergone the test(s): All Radiated tests indicated in Appendix A.

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

Control Nº	Description	Model	Serial Nº	Date of reception
68042B/097	Battery control unit	PP3/3000	40227	2021/05/13

Sample S/02 has undergone the test(s): All Conducted tests indicated in Appendix A.

Test sample description

Ports…… :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient[3]
	Terminal 1	NA	☐	☐	☐
	Terminal 2	NA	☐	☐	☐
	--		☐	☐	☐
Supplementary information to the ports…… :	Outputs alternating (plus/minus) square pulse power to garments when garment is recognized and a resistance is measured.				
Rated power supply .....:	Voltage and Frequency	Reference poles			
		L1	L2	L3	N	PE
	☒	AC: (-16Vac) - 16 Vac 1Hz (Output voltage to garment)				
	☒	DC: 4Vdc (Internal Battery)				
	☒	DC: 5Vdc (Charging voltage)				
Rated Power .....:	max 6.5W					
Clock frequencies .....:	1Hz square pulse					
Other parameters.....:	--					
Software version .....:	3.3					
Hardware version.....:	3.1					
Dimensions in cm (W x H x D)....:	4.8 x 8.0 x 1.7					
Mounting position.....:	☐	Table top equipment				
	☐	Wall/Ceiling mounted equipment				
	☐	Floor standing equipment				
	☐	Hand-held equipment				
	☒	Other: On garment				
Modules/parts .....:	Module/parts of test item		Type	Manufacturer		
	--					
Accessories (not part of the test item) .....:	Description		Type	Manufacturer		
	--					
Documents as provided by the applicant.....:	Description		File name	Issue date		
	--					

[3] Only for Medical Equipment

Identification of the client

Inuheat Group AB

Hedtångsvägen 6

436 53 Hovås, Sweden

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-05-24
Date (finish)	2021-06-24

Document history

Report number	Date	Description
68042RRF.004	2021-08-25	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: Pablo Reyes.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	Shielded Room ETS LINDGREN S101	N/A	N/A
2.	Climatic Chamber BINDER MK 56	2021/03	2022/03
3.	Signal and Spectrum analyzer 10Hz-40GHz ROHDE AND SCHWARZ FSV40	2021/02	2023/02
4.	DC Power Supply 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N/A	N/A
5.	Multimeter FLUKE 175	2020/10	2021/10

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 9kHz-7GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
5.	Hibrid Bilog 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

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-247 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 13

15.225 (a) / RSS-210 B.6 (a)(i) Field strength of emissions within the band 13.553 MHz - 13.567 MHz 14

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 15

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 17

15.225 (d) / RSS-210 B.6 (a)(iv) Field strength of emissions outside of the band 13.110 MHz - 14.010 MHz 19

15.225 (e) / RSS-210 B.6 (b) Frequency tolerance of the carrier signal 22

TEST CONDITIONS

POWER SUPPLY:

Vn:	4 Vdc
Vmin:	3.4 Vdc
Vmax:	4.6 Vdc

The subscripts 'n', 'min' and 'max' mean normal, minimum and maximum respectively.

Type of Power Supply: Battery.

ANTENNA:

Type of Antenna: Integral.

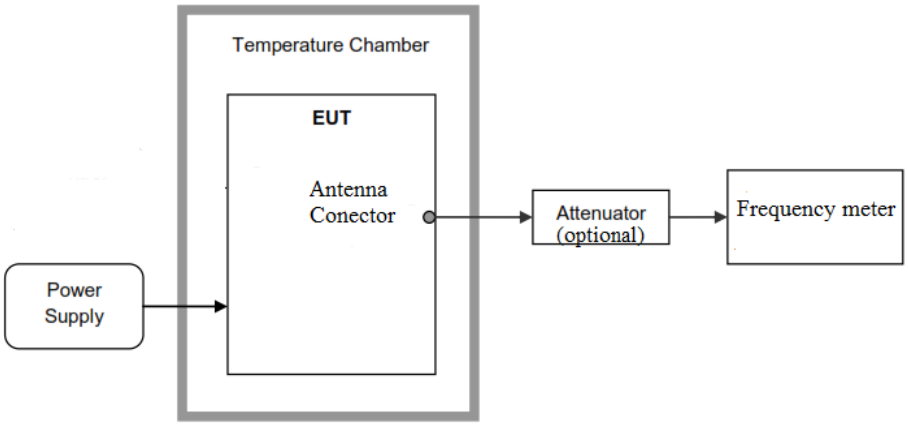
TEST FREQUENCIES:

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.

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:

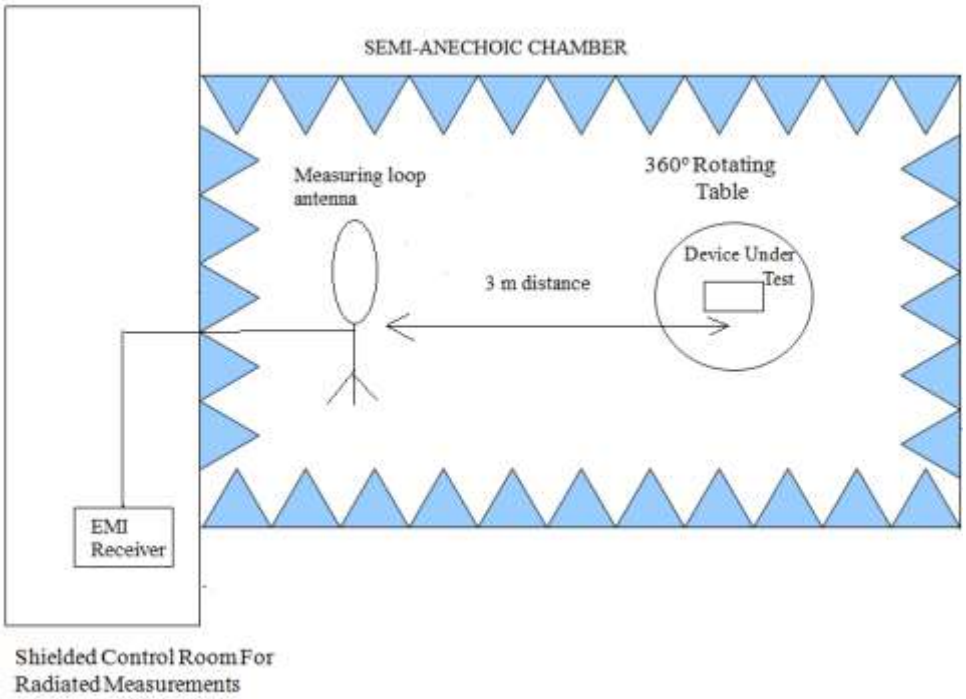
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the range between 9 kHz to 30 MHz and Bilog antenna for the range between 30 MHz to 200 MHz) is situated at a distance of 3 m.

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.

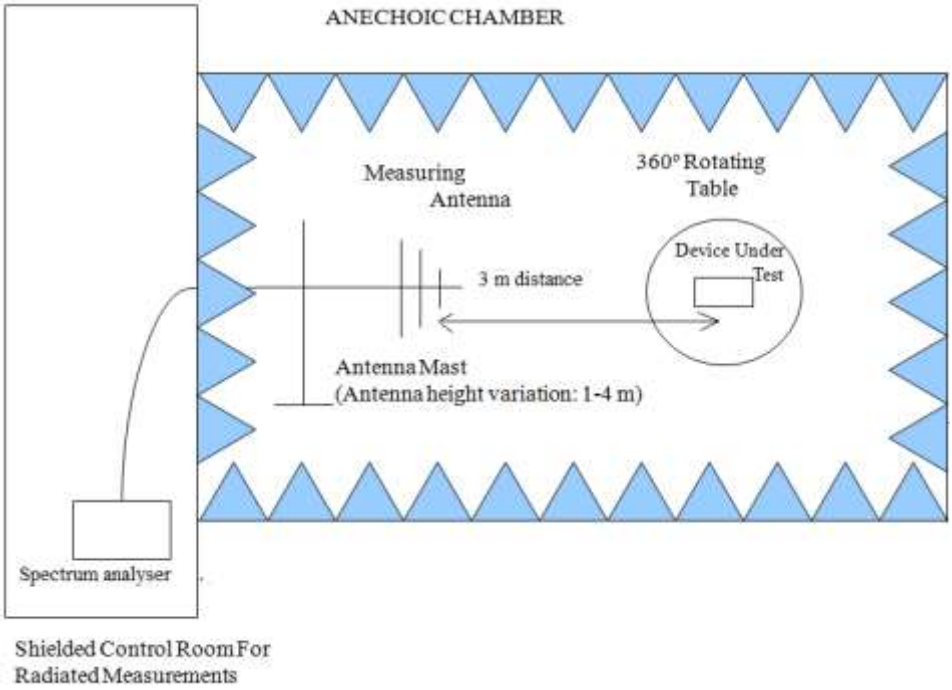
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and in the range between 30 MHz and 200 MHz the antenna height was varied from 1 to 4 meters to find the 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 measurements setup 9 kHz to 30 MHz:



Radiated measurements setup 30 MHz to 200 MHz:

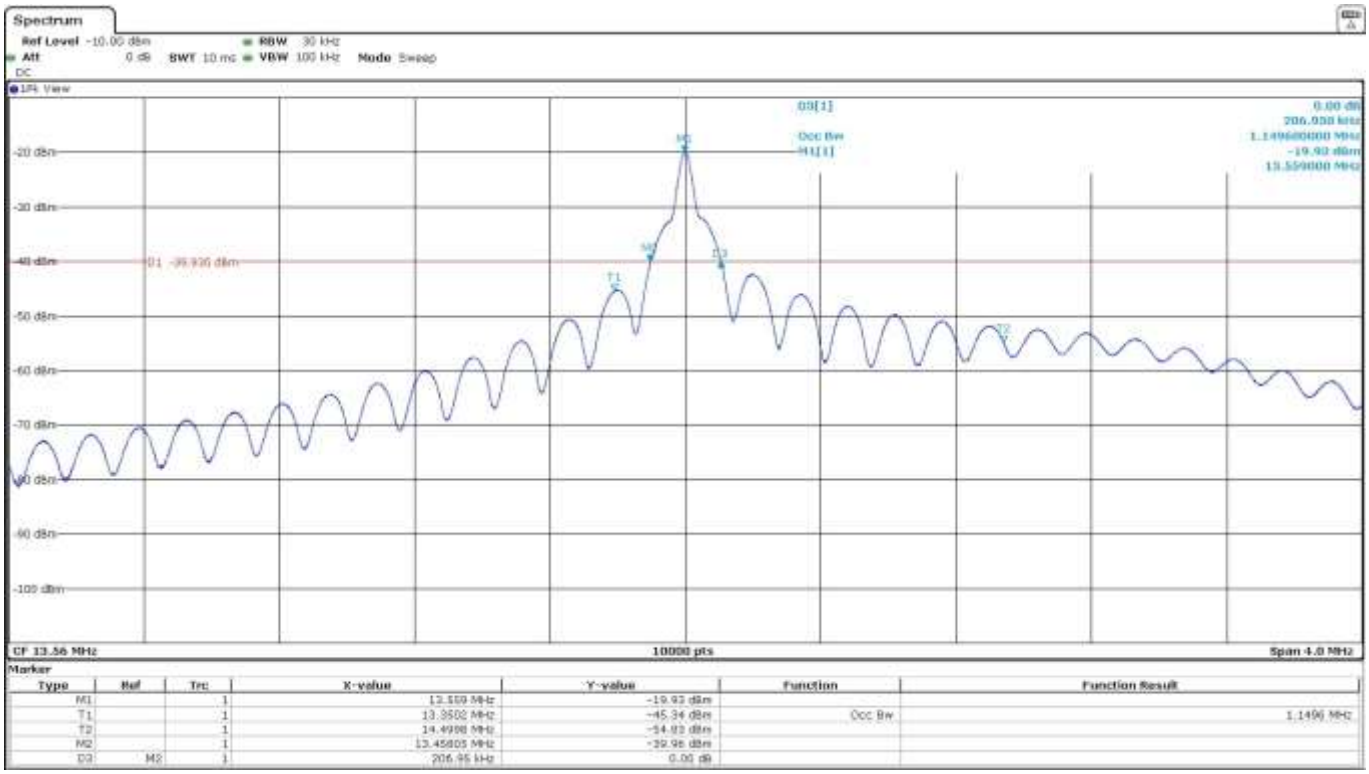


Occupied Bandwidth

RESULTS:

99 % Occupied Bandwidth and 20 dB Bandwidth.

Operation mode	99% Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)
NFC	1149.60	206.95
Measurement uncertainty (kHz)	<±1.20	



Verdict: PASS

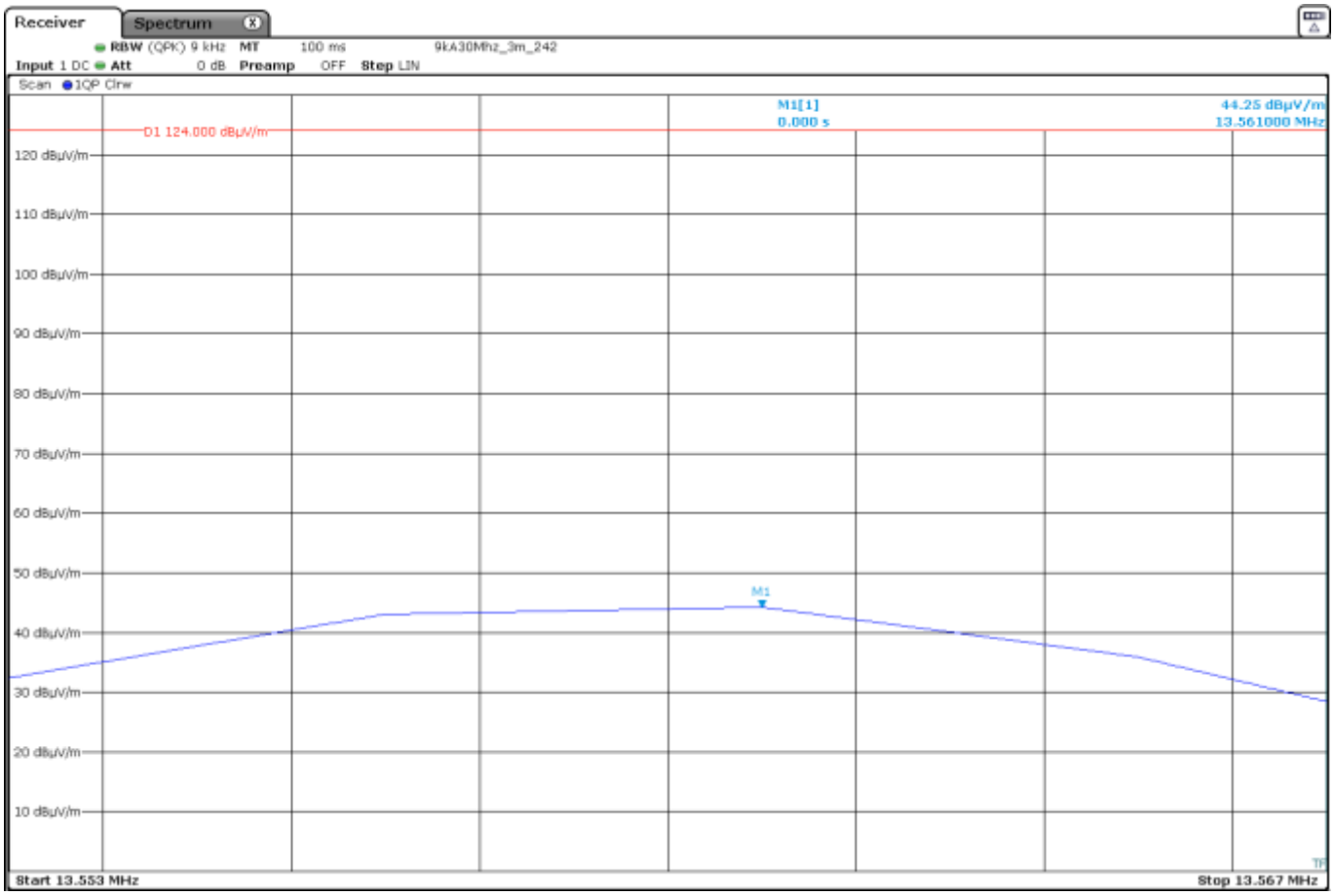
15.225 (a) / RSS-210 B.6 (a)(i) Field Strength of Emissions within the band 13.553 MHz - 13.567 MHz

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	44.25	4.25
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

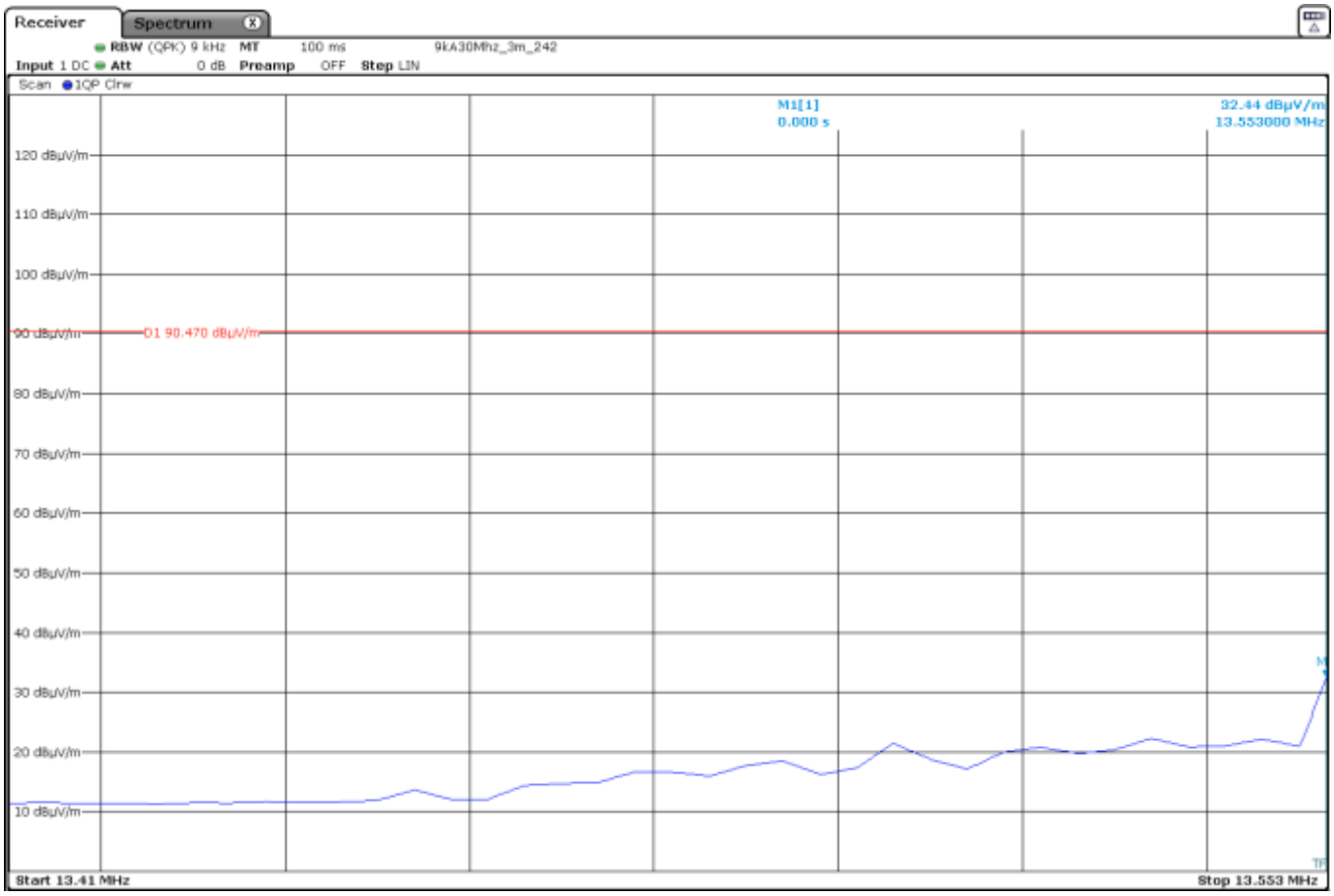
SPECIFICATION:

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:**

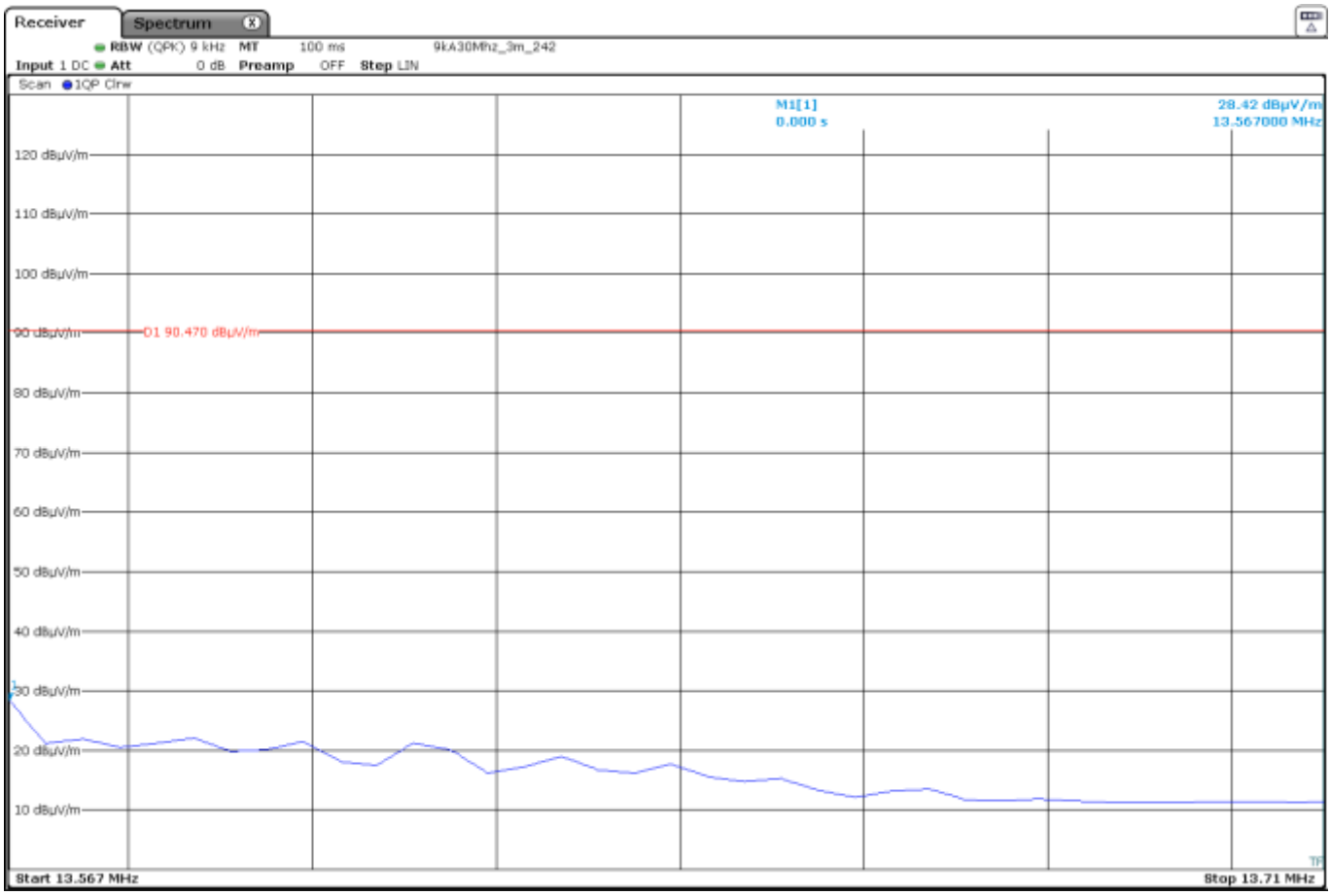


The limit shown in the above plot is extrapolated to 3 meters.

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	32.44	-7.56
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	28.42	-11.58
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

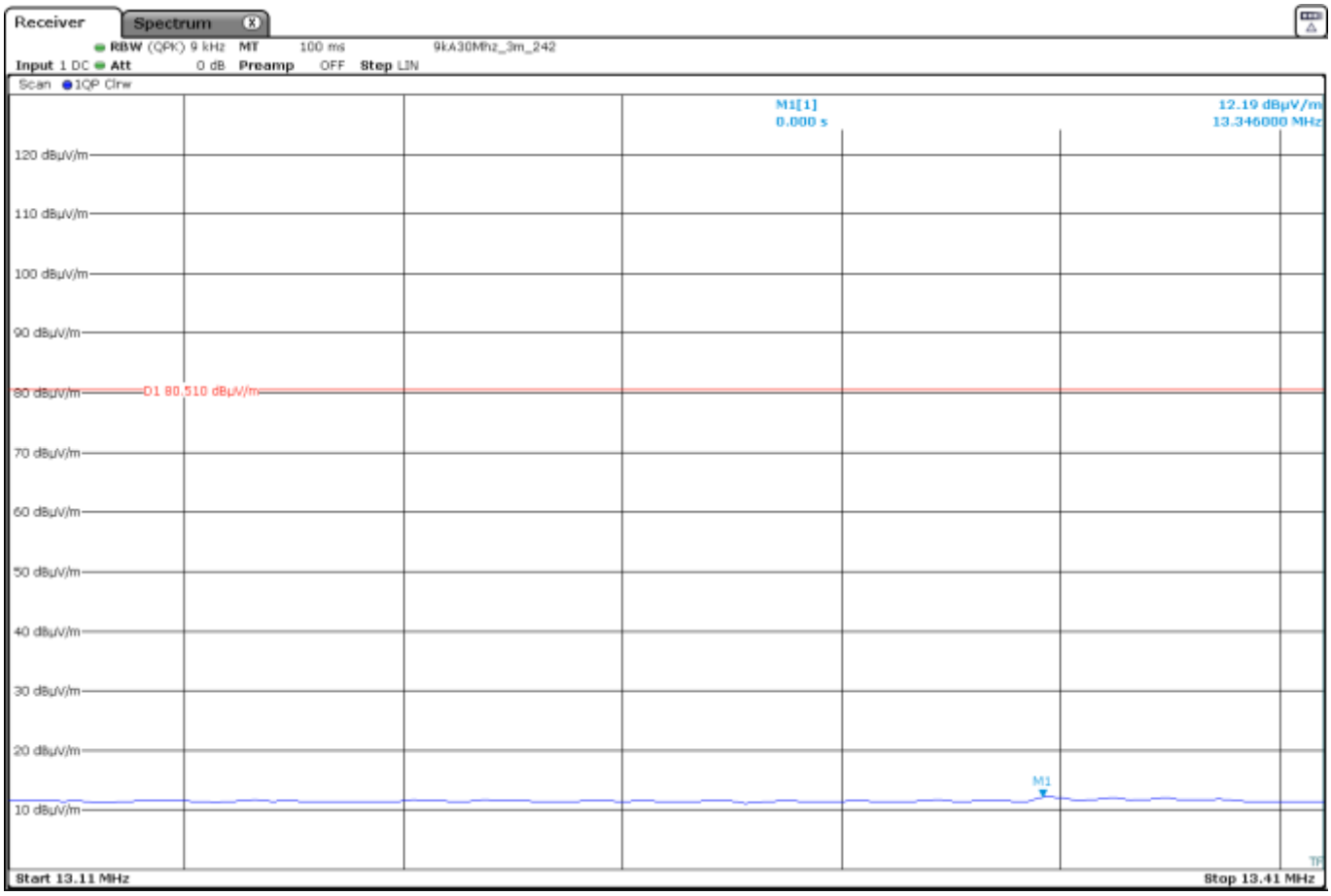
SPECIFICATION:

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:**

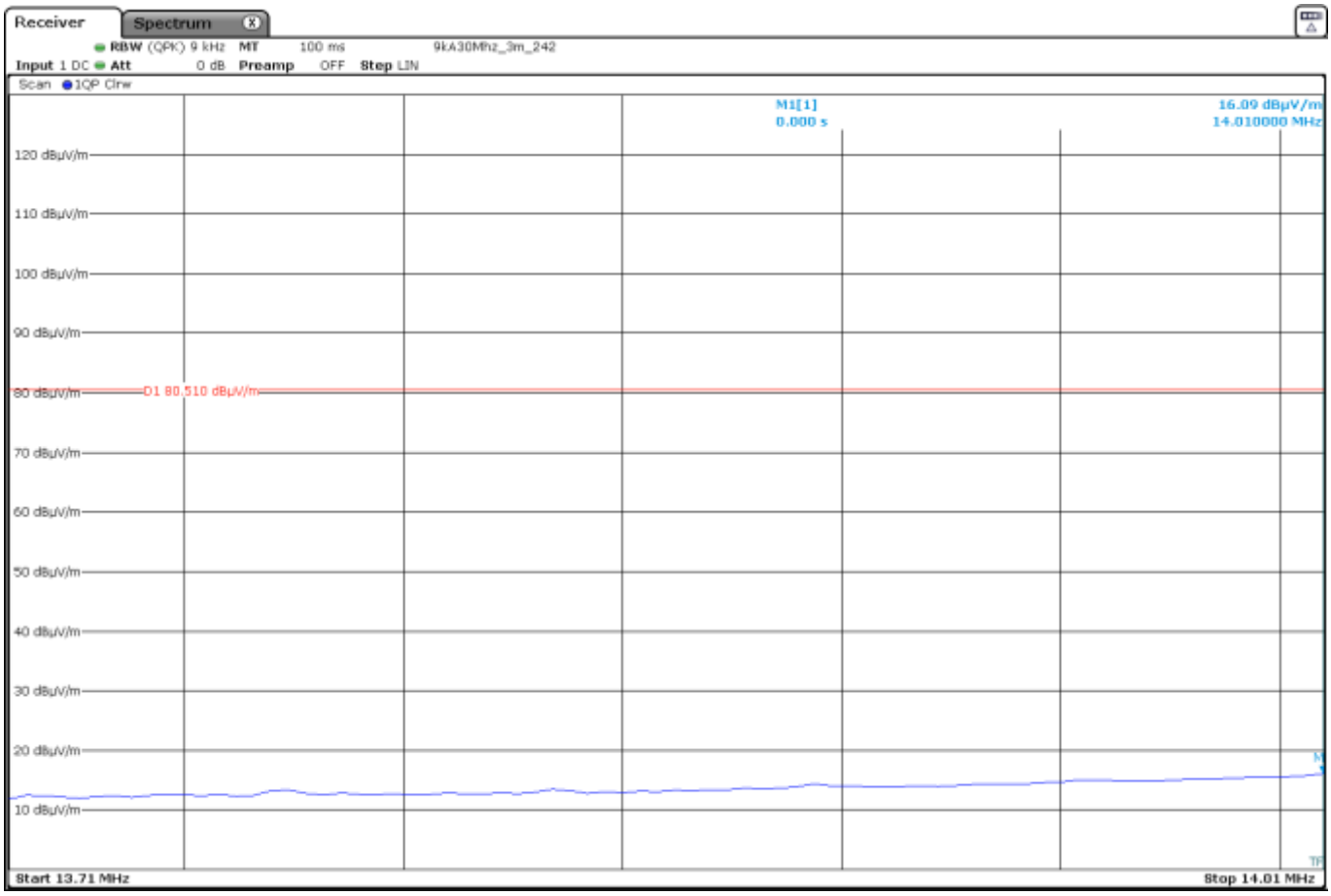


The limit shown in the above plot is extrapolated to 3 meters.

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)
13.402	12.19	-27.81
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)
13.718	16.09	-23.91
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:

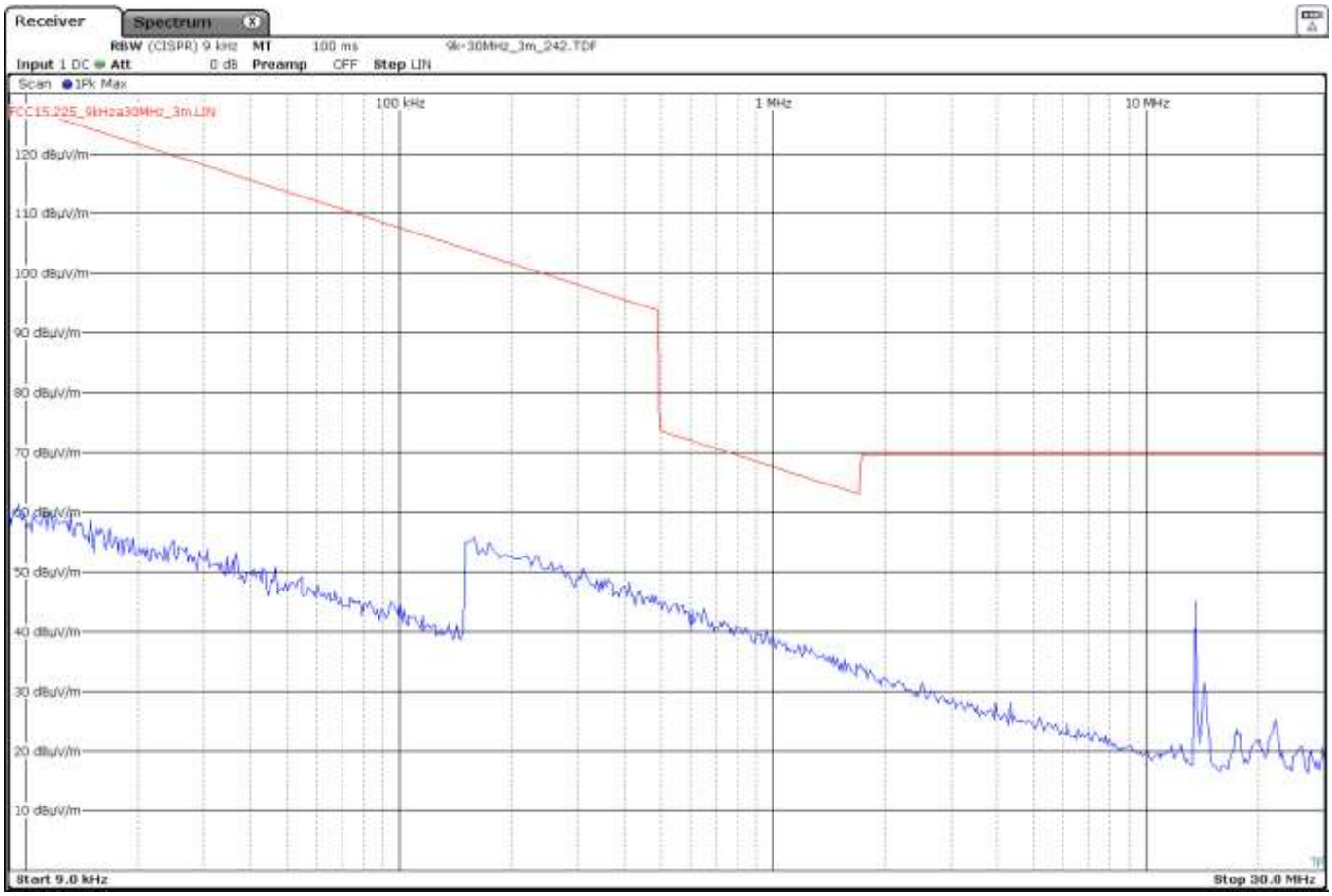
All tests were performed in a semi-anechoic chamber at a distance of 3 m.

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

The field strength is calculated by adding 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. The highest peak is the carrier frequency.

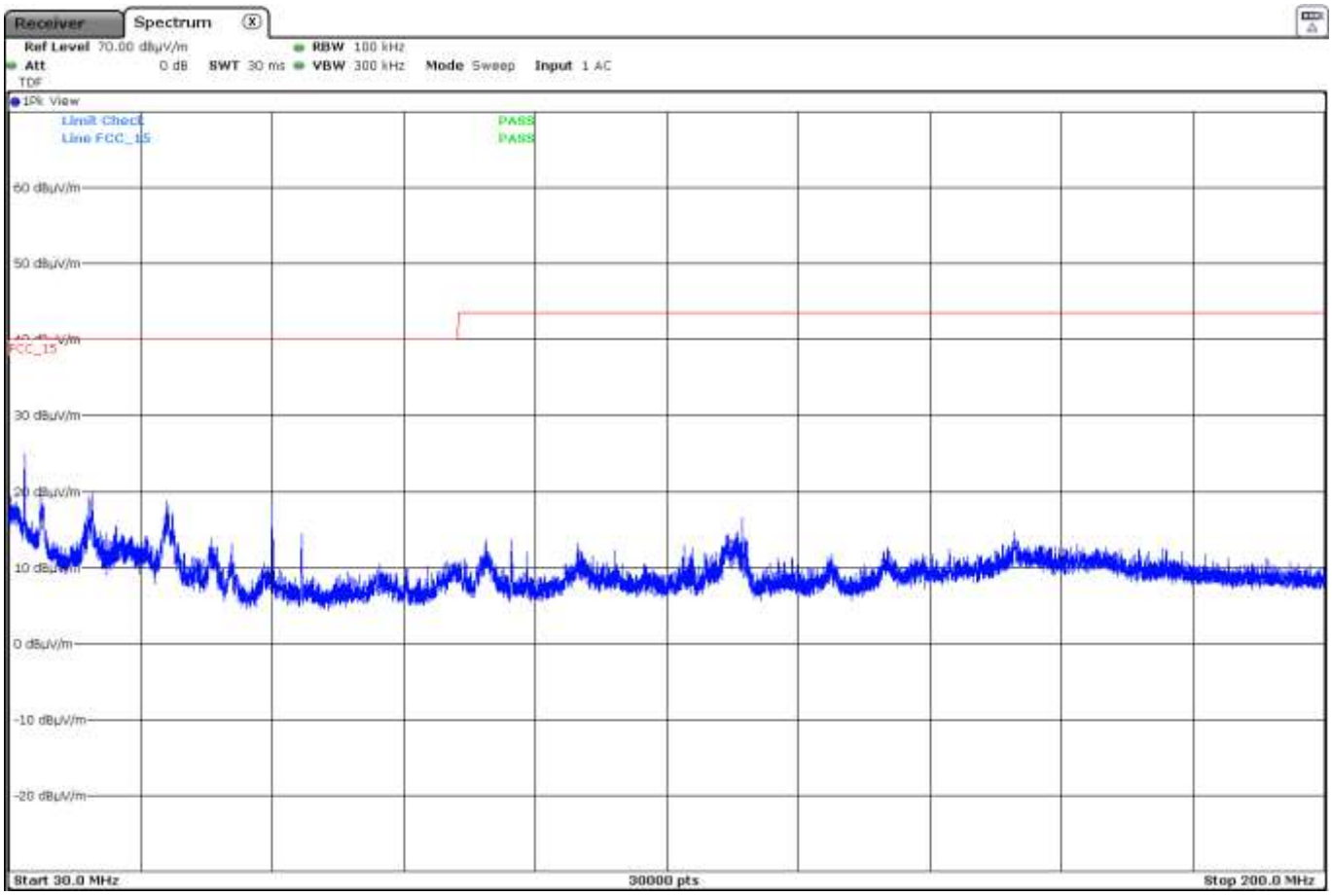
Measurement Uncertainty (dB) <± 3.04

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	Loop Position	Measurement Uncertainty (dB)
32.0088	23.0	Quasi Peak	V	<± 5.07
40.6675	18.8	Quasi Peak	V	<± 5.07



This plot shows the results of the scan 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	0.622500	0.004591
+40	0.624000	0.004602
+30	0.622500	0.004591
+20	0.618000	0.004558
+10	0.607450	0.004480
0	0.606000	0.004469
-10	0.598500	0.004414
-20	0.591000	0.004358

- **Frequency Stability over Voltage Variations**:

DC Voltage	Voltage (V)	Temperature (ºC)	Frequency Error (kHz)	Frequency Error (%)
Vmax	4.6	+20	0.616500	0.004546
Vmin	3.4	+20	0.615000	0.004535

Verdict: PASS