

ISED CABid: ES1909

Test Report No:
NIE: 70499RRF.002A1

Test Report

USA FCC Part 15.225, 15.209

CANADA RSS-210, RSS-Gen

(*) Identification of item tested	Door Handle Sensor with NFC Reader
(*) Trademark	Vitesco
(*) Model and /or type reference	DHSEQ5NFC
Other identification of the product	
(*) Features	HW version: AAA2064150000 HVIN: AAA2064150000 SW version: X190 – AUN119__ FCC ID: 2A6TC-DHSEQ5NFC IC: 28616-DHSEQ5NFC Features: NFC
Applicant	Vitesco Technologies 44 Avenue du General de Croutte, Toulouse, France 31100
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)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2022-11-30
Report template No	FDT08_24 (*) "Data provided by the client"

Index

Competences and guarantees3

General conditions.....3

Uncertainty.....3

Data provided by the client3

Usage of samples4

Test sample description.....5

Identification of the client6

Testing period and place6

Document history.....6

Environmental conditions6

Remarks and comments.....7

Testing verdicts.....8

Summary8

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 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 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.
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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 DHSEQ5NFC consist of a door handle sensor is a standalone module with capacitive and NFC functions. This module is integrated into a door handle, and used in Keyless Entry System, enabling "key-free" Vehicle Unlocking and Locking.

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
70499/011	Door Handle Sensor with NFC Reader	DHSEQ5NFC	95169924366821	2022/06/09

Auxiliary elements used with the Sample S/02:

Control Nº	Description	Model	Serial Nº	Reception
70499/020	Connecting Cable	--	--	2022/07/05

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

Test sample description

Ports.....:	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	CAN H (blue)			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	CAN L (green)			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	GND (black)			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
VBATT (grey)			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports.....:	-						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/> AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> DC: 12 V							
Rated Power..... :	4mW mean						
Clock frequencies..... :	-						
Other parameters	-						
Software version..... :	X190 – AUN119__						
Hardware version	AAA2064150000 HVIN: AAA2064150000						
Dimensions in cm (W x H x D) ... :	15x4x2 cm						
Mounting position	<input checked="" type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other:					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	door handle sensor connected and powered						
Accessories (not part of the test item)	Description		Type		Manufacturer		
	test box						
Documents as provided by the applicant	Description		File name		Issue date		
	test box manual						

⁽³⁾ Only for Medical Equipment

Identification of the client

Vitesco Technologies
44 Avenue du General de Croutte, Toulouse, France 31100

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-07-27
Date (finish)	2022-08-23

Document history

Report number	Date	Description
70499RRF.002	2022-10-04	First release.
70499RRF.002A1	2022-11-24	Second release. It was corrected minor typos. This test report cancels and replaces the report: 70499RRF.002
70499RRF.002A2	2022-11-30	Third release. It was corrected minor typos. This test report cancels and replaces the report: 70499RRF.002A1

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 %

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 %

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 %

Remarks and comments

The tests have been performed by the technical personnel: Victoria Olmedo and Nicolás Salguero.

Used instrumentation:

Conducted Tests:

	Last Calibration	Due Calibration
1. SHIELDED ROOM SIEPEL	N/A	N/A
2. DC Power Supply 30V/3A 90W, GW INSTEK GPS-3030D	N/A	N/A
3. Digital Multimeter FLUKE 175	2021/11	2022/11
4. Signal and Spectrum Analyzer 2 Hz - 50 GHz ROHDE AND SCHWARZ FSW50	2021/07	2023/07
5. Temperature Chamber HERAEUS VMT 04/35	2022/07	2024/07

Radiated Tests:

	Last Calibration	Due Calibration
1. SEMIANECHOIC ABSORBER LINED CHAMBER VI ALBATROSS P29419	N/A	N/A
2. SHIELDED ROOM ALBATROSS PROJECTS GMBH P29419	N/A	N/A
3. Power supply DC 30 V / 3 A, ELC ALR3003	N/A	N/A
4. Digital Multimeter FLUKE 175	2021/11	2022/11
5. Active Loop Antenna 9kHz-30MHz SCHWARZBECK FMZB 1519B	2019/11	2022/11
6. Ultralog Antenna 30MHz-6GHz ROHDE AND SCHWARZ HL562E_UPG	2019/10	2022/10
7. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12

Testing verdicts

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

Summary

Type A: ISO 14443-A

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	
<u>Supplementary information and remarks:</u> None.			

Appendix A: Test results

INDEX

TEST CONDITIONS11

Occupied Bandwidth14

15.225 (a) / RSS-210 B.6 (a)(i) Field strength of emissions within the band 13.553 MHz - 13.567 MHz15

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 MHz16

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 MHz18

15.225 (d) / RSS-210 B.6 (a)(iv) Field strength of emissions outside of the band 13.110 MHz - 14.010 MHz20

15.225 (e) / RSS-210 B.6 (b) Frequency tolerance of the carrier signal23

TEST CONDITIONS

POWER SUPPLY:

Vn: 12 Vdc (*)
Vmin: 10.8 Vdc (*)
Vmax: 15.6 Vdc (*)

Type of Power Supply: Battery.

The subscripts 'n', 'min' and 'max' mean nominal, minimum and maximum respectively.
(*): Declared by applicant.

ANTENNA:

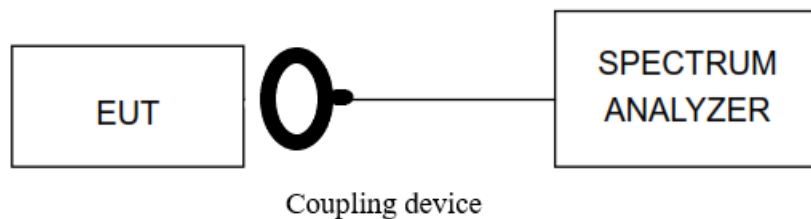
Type of Antenna: Internal (Coil antenna).
Maximum Declared Antenna Gain: Not Applicable.

TEST FREQUENCIES:

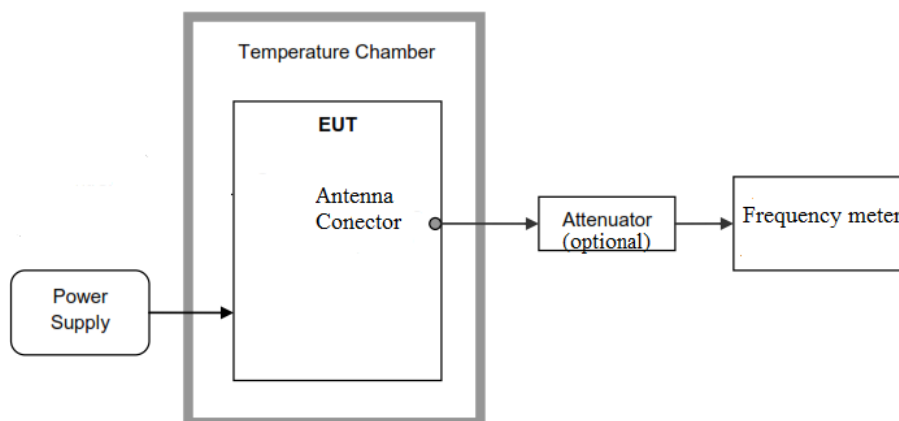
Nominal Operating Frequency: 13.56 MHz

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.



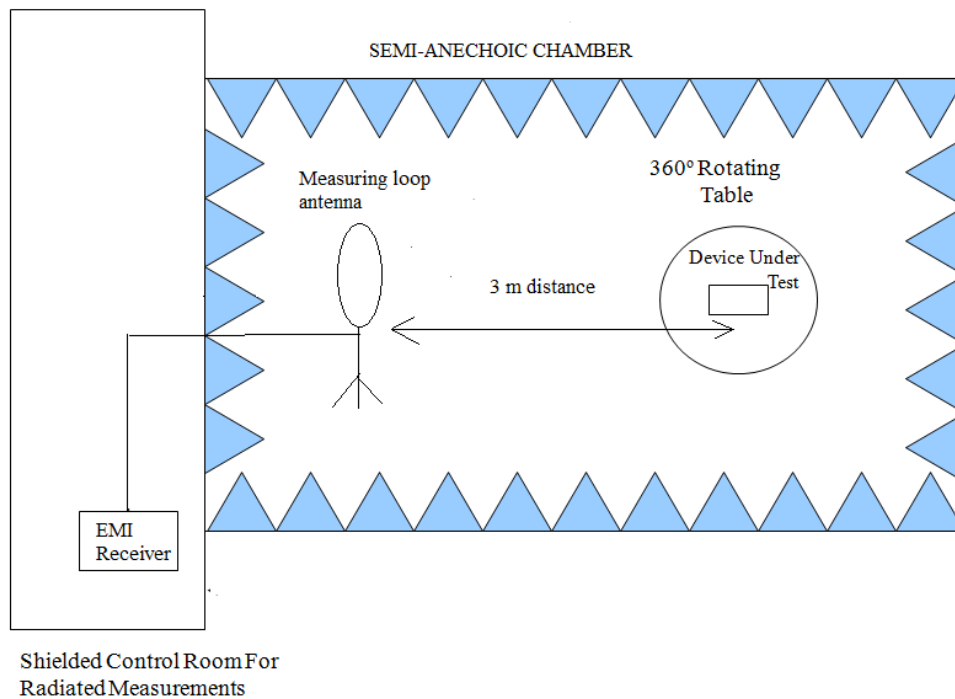
RADIATED MEASUREMENTS:

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.

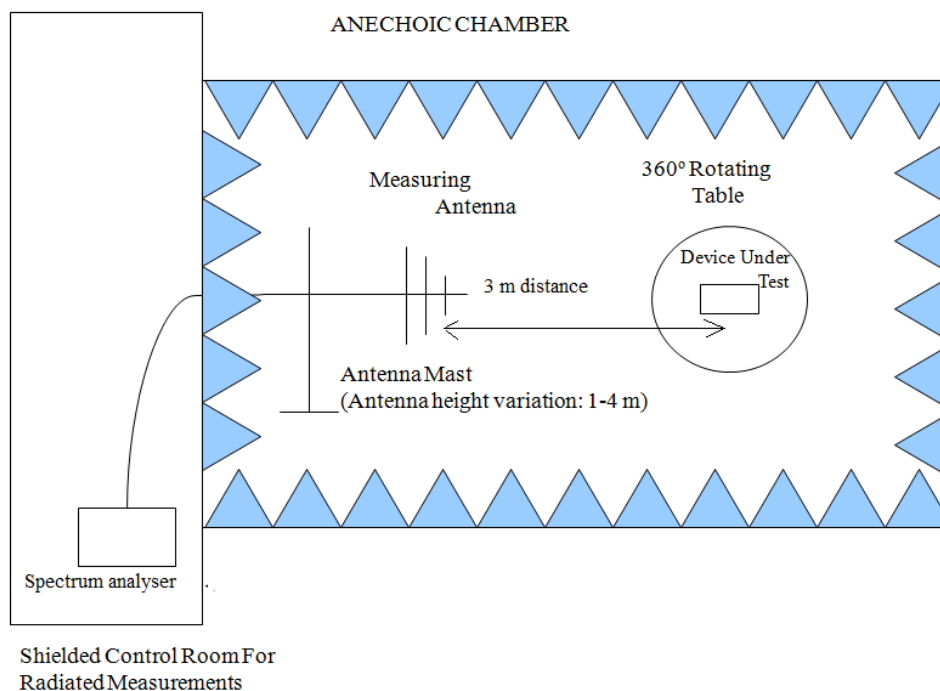
For radiated emissions in the range 9 kHz to 30 MHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

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 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:



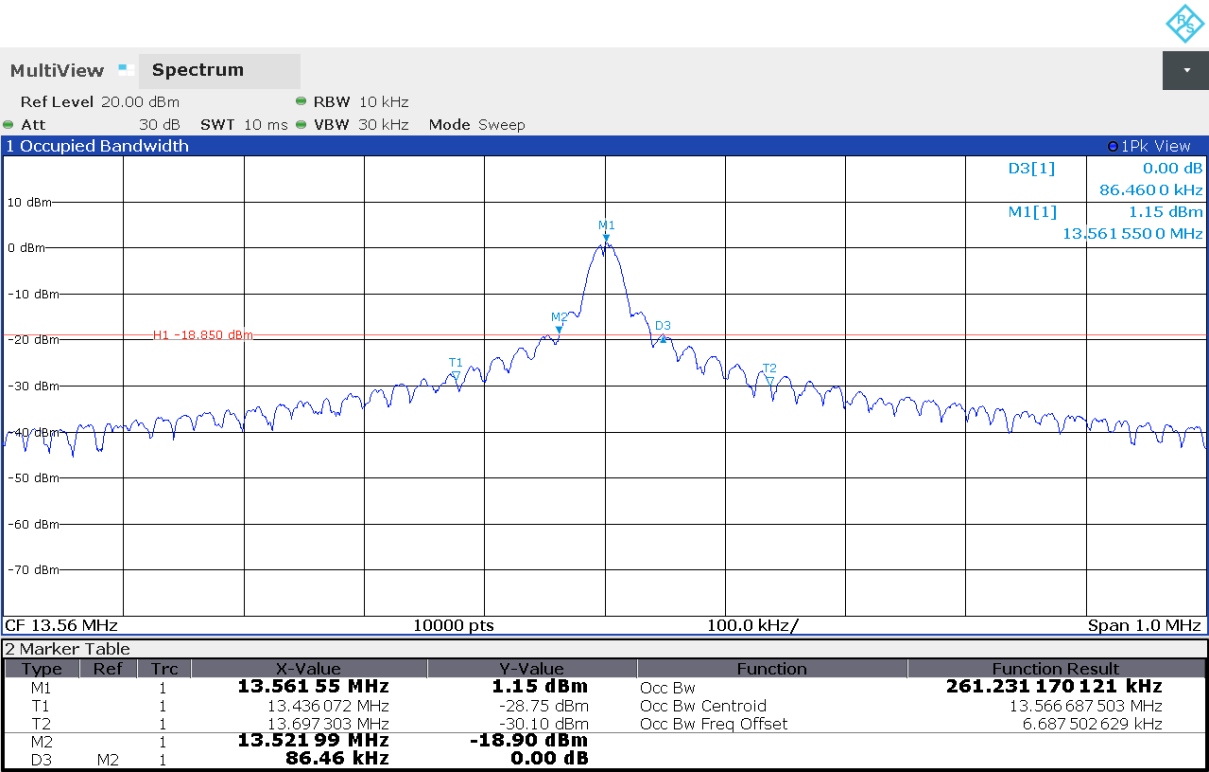
Occupied Bandwidth

RESULTS:

99 % Occupied Bandwidth and 20 dB Bandwidth.

- Modulation type 14443A (ISO A):

Operation mode	99% Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)
NFC	261.23	86.46
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

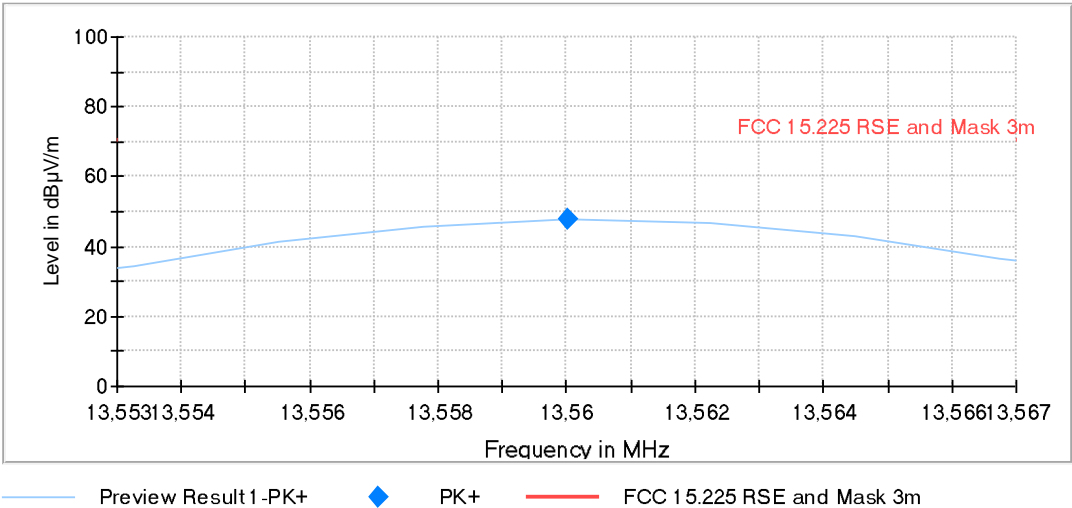
SPECIFICATION:

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.

- Modulation type 14443A (ISO A):



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

Resolution bandwidth: 9KHz
Detector: QPK

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)
13.560	47.68	7.68
Measurement uncertainty (dB)	<±3.08	

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:

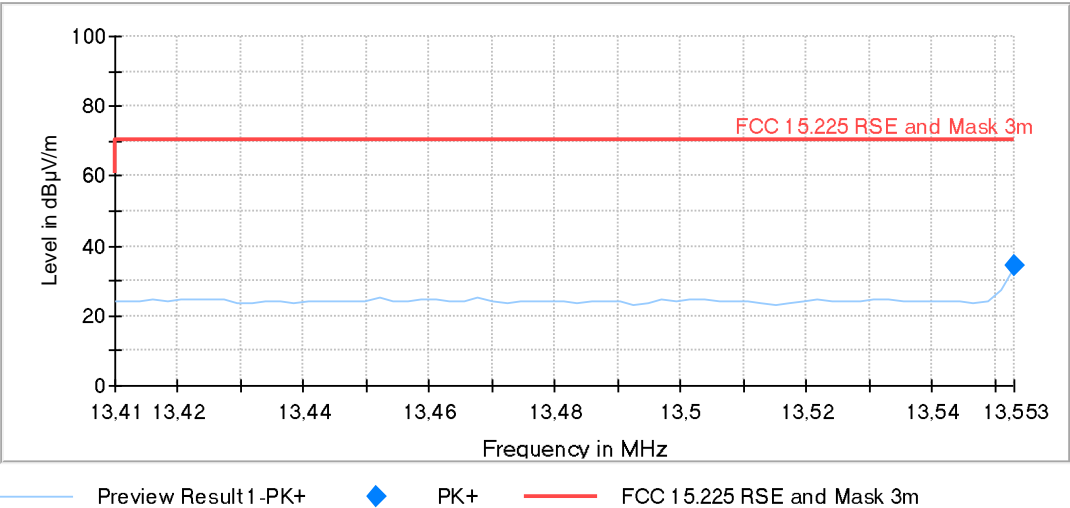
Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (50.47 dBµV/m) at 30 meters.

RESULTS:

Measurement distance: 3 meters.

- Modulation type 14443A (ISO A):

Band 13.410 - 13.553 MHz:



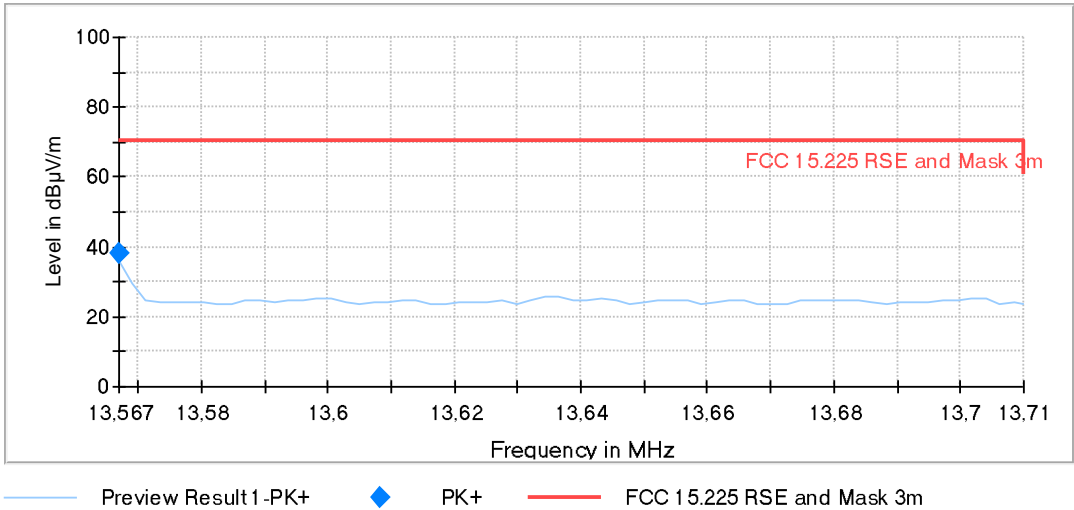
The limit shown in the above plot is extrapolated to 3 meters.

Resolution bandwidth: 9KHz
Detector: QPK

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	34.47	-5.3
Measurement uncertainty (dB)	<±3.08	

Verdict: PASS

Band 13.567 - 13.710 MHz:



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

Resolution bandwidth: 9KHz
Detector: QPK

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	38.20	-1.20
Measurement uncertainty (dB)	<±3.08	

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:

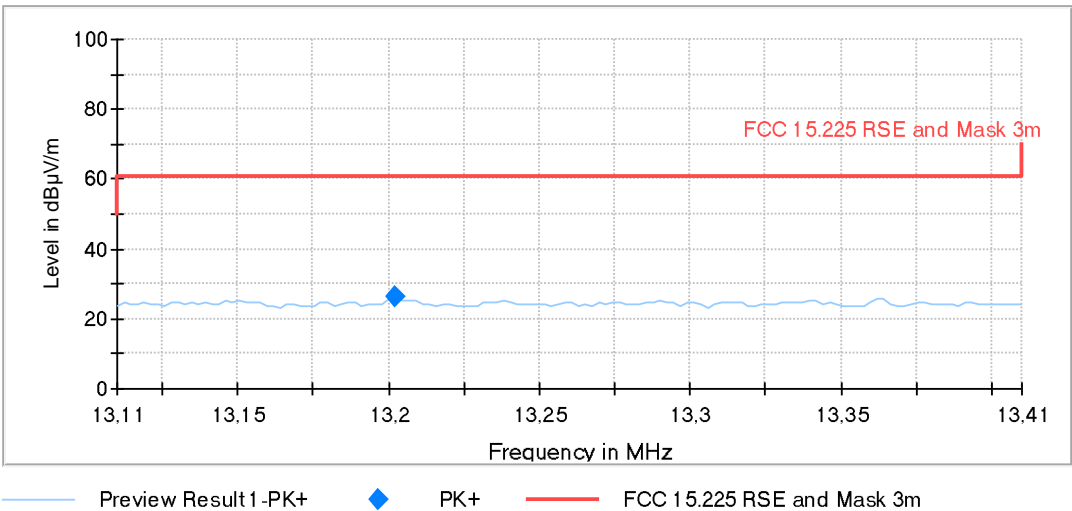
Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter (40.51 dBµV/m) at 30 meters.

RESULTS:

Measurement distance: 3 meters.

- Modulation type 14443A (ISO A):

Band 13.110 - 13.410 MHz:



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

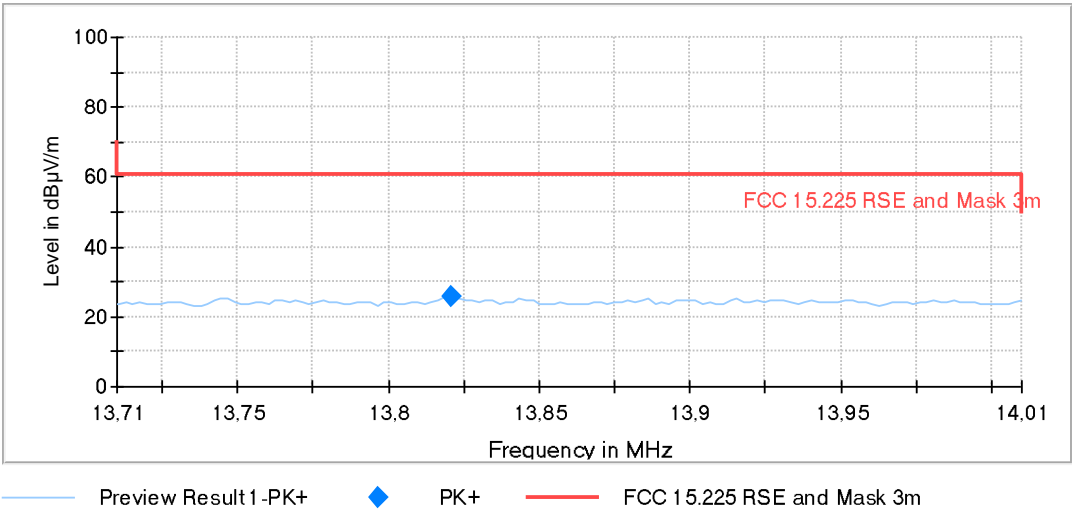
Resolution bandwidth: 9KHz

Detector: QPK

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)
13.202	26.09	-13.91
Measurement uncertainty (dB)	<±3.08	

Verdict: PASS

Band 13.710 - 14.010 MHz:



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

Resolution bandwidth: 9KHz
Detector: QPK

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)
13.821	25.94	-14.06
Measurement uncertainty (dB)	±3.08	

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 ($\mu\text{V/m}$)	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)	-	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.

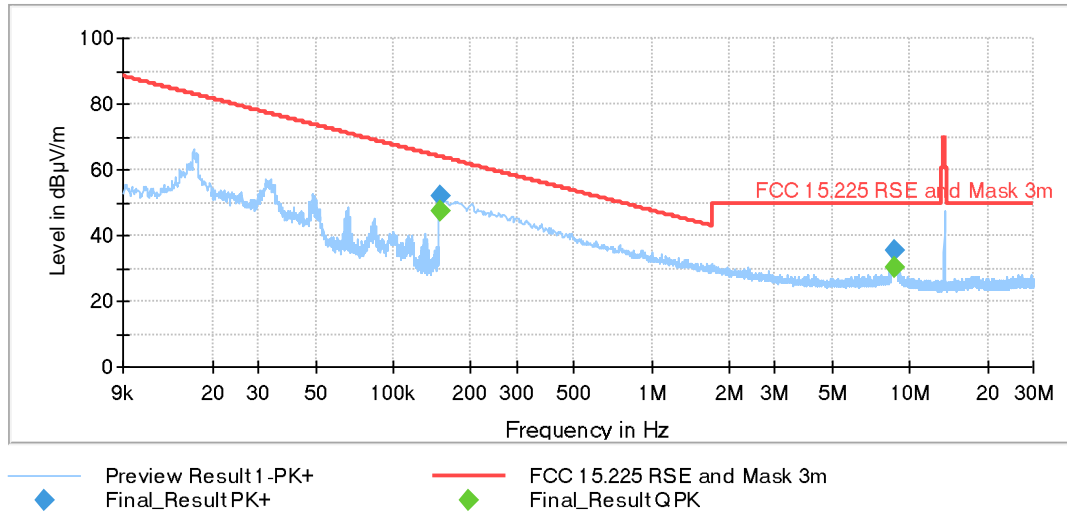
The spectrum was inspected from 9 kHz to 200 MHz searching for spurious signals.

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.

- **Modulation type 14443A (ISO A):**

Frequency range 9 kHz - 30 MHz:

No spurious signal found.



The highest peak is the carrier frequency.

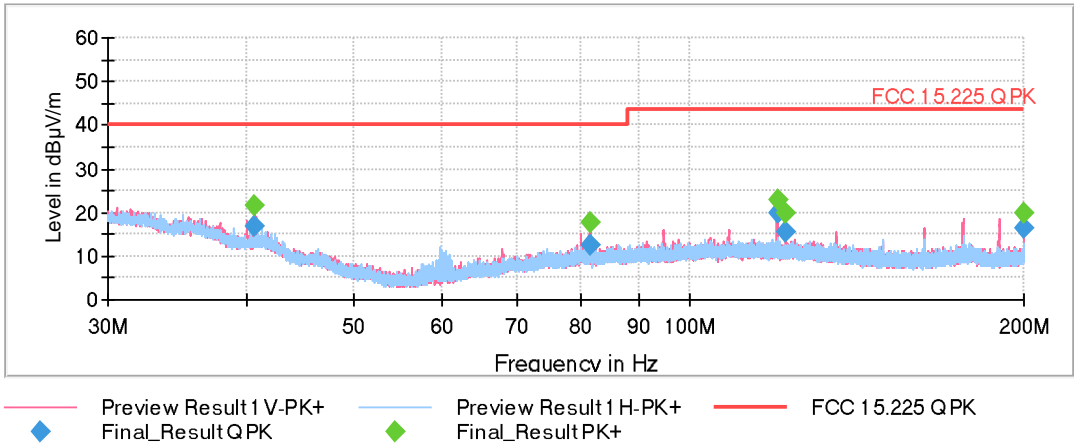
Resolution bandwidth:

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

Measurement Uncertainty (dB) $< \pm 3.08$

Frequency range 30 - 200 MHz:

No spurious signal found.



This plot shows the results of the scan using peak detector.

Measurement Uncertainty (dB) $<\pm 4.94$

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7] 30 MHz - 200 MHz	8,5 kHz	PK+	100 kHz	1 s	20 dB

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.

- **Modulation type 14443A (ISO A):**
 - **Frequency Stability over Temperature Variations:**

Temperature (°C)	Frequency Error (kHz)	Frequency Error (%)
+50	-0.173	-0.001276
+40	-0.143	-0.001055
+30	-0.188	-0.001386
+20	-0.298	-0.002198
+10	-0.288	-0.002124
0	-0.383	-0.002824
-10	-0.443	-0.003267
-20	-0.423	-0.003119

- **Frequency Stability over Voltage Variations:**

DC Voltage	Voltage (V)	Temperature (°C)	Frequency Error (kHz)	Frequency Error (%)
Vmax	15.6	+20	-0.253	-0.001866
Vmin	10.8	+20	-0.328	-0.002419

Verdict: PASS