

# GPS Industries, LLC TEST REPORT

## SCOPE OF WORK

EMC TESTING – V3-1005A

## REPORT NUMBER

104290673LEX-003.1

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## EMC TEST REPORT

(FULL COMPLIANCE)

**Report Number:** 104290673LEX-003.1

**Project Number:** G104290673

**Report Issue Date:** 2/2/2021

**Product Tested:** V3-1005A

**Model Number:** V3-1005A

**Standards:** FCC Title 47 CFR Part 15.225  
RSS-210 Issue 10  
RSS-Gen Issue 5

Tested by:  
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Client:  
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Report reviewed by



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## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

## 2 Test Summary

Section	Test full name	Result
6	Transmitter Fundamental and Spurious Emissions (ANSI C63.10: 2013, FCC Part 15.209, 15.225(a)-(d), RSS-210 Issue 10 § B.6(a)-(d), RSS-Gen Issue 5 § 8.9)	Pass
7	Frequency Stability (ANSI C63.10: 2013, FCC Part 15.225(e), RSS-210 Issue 10 § B.6)	Pass
8	Occupied Bandwidth (ANSI C63.10: 2013, RSS-Gen Issue 5 § 6.6, FCC Part 15.215c)	Pass
--	Conducted Emissions (ANSI C63.10: 2013)	NA <sup>1</sup>
9	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 8.3)	Pass

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<sup>1</sup> The EUT did not connect AC mains in normal usage. The EUT is battery powered and uses chargeable batteries. The EUT batteries are charged through Golf Card batteries in normal use.



### 3 Client Information

This product was tested at the request of the following:

Client Information	
<b>Client Name:</b>	GPS Industries, LLC
<b>Address:</b>	1074 N. Orange Ave. Sarasota, FL 34236 USA
<b>Contact:</b>	Karl Klinner
<b>Telephone:</b>	(941) 256-0572
<b>Email:</b>	Karl.klinner@irco.com
Manufacturer Information	
<b>Manufacturer Name:</b>	GPS Industries, LLC
<b>Manufacturer Address:</b>	1074 N. Orange Ave. Sarasota, FL 34236 USA



#### 4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	V3-1005A
Model Number	V3-1005A
Serial Number	G 20 12 1014
Receive Date	3/23/2020
Test Start Date	3/24/2020
Test End Date	3/27/2020
Device Received Condition	Good
Test Sample Type	Production
Input Rating	12VDC
Frequency Band(s)	RFID: 13.56MHz Bluetooth: 2402 – 2480MHz WiFi: 2412 – 2462MHz  Cellular: Band 4: 1710 – 1755MHz Band 13: 777 – 787MHz
Description of Equipment Under Test (provided by client)	
<p>The V3-1005A (Model V3-1005A) is a tracking device that installs on golf carts. It provides distances to holes, tracking capabilities for the golf carts, and has integrated Bluetooth, WiFi, Cellular, and RFID connectivity. The Bluetooth, WiFi, and Cellular radios onboard are certified transmitter modules as follows:</p> <p><b>Cellular:</b> UBLOX TOBY-L201 FCCID: XPYTOBYL201</p> <p><b>Bluetooth / WiFi:</b> Texas Instruments WL1831MODGBMOCT FCCID: Z64-WL18SBMOD</p>	

##### 4.1 Variant Models:

There were no variant models covered by this evaluation.



## 5 System Setup and Method

### 5.1 Method:

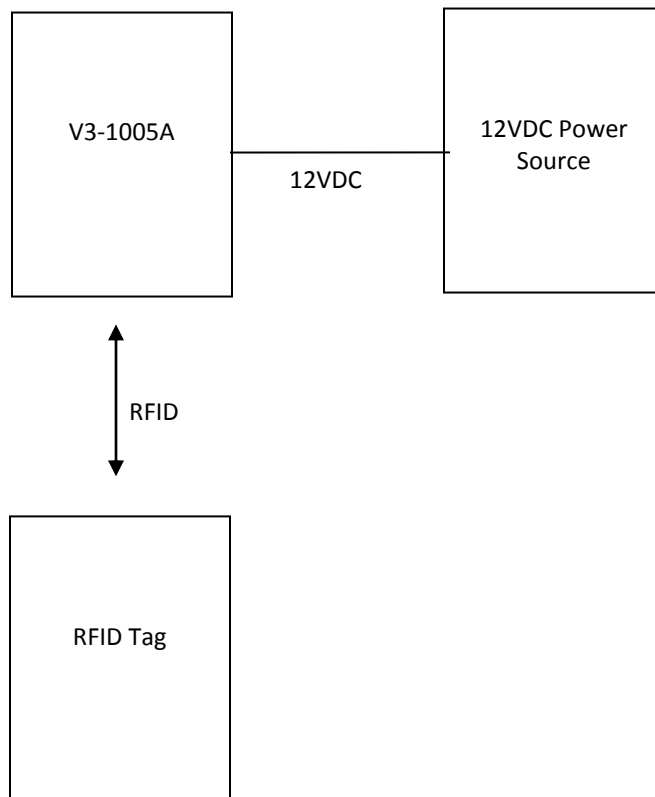
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013.

No.	Descriptions of EUT Exercising
1	Transmitting an RFID signal at 13.56MHz

Cables					
Qty	Description	Length (m)	Shielding	Ferrites	Termination
1	DC Input	2	No	No	12VDC Power Source



## 5.2 EUT Block Diagram:







## 6 Transmitter Fundamental and Spurious Emissions

### 6.1 Test Limits

#### FCC Part 15.225:

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) 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 at 30 meters.
- (c) 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 at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

#### FCC Part 15.209:

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

#### RSS-210 Issue 10 § B.6:

The field strength of any emission shall not exceed the following limits:

1. 15.848 mV/m (84 dBμV/m) at 30 m, within the band 13.553-13.567 MHz;
2. 334 μV/m (50.5 dBμV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
3. 106 μV/m (40.5 dBμV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and
4. RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

**RSS-Gen Issue 5 § 8.9:**

Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz	
Frequency (MHz)	Field Strength (µV/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

Table 5 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Below 30 MHz			
Frequency	Electric Field Strength (µV/m)	Magnetic Field Strength (H-Field) (µA/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1,705-30 MHz	30	N/A	30

**6.2 Test Method**

Tests are performed in accordance with ANSI C63.10:2013.

**TEST SITE:** 10m ALSE

**Site Designation:** 10m Chamber

**Measurement Uncertainty**

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	3.9dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.0dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7dB	5.5 dB

As shown in the table above our radiated emissions  $U_{lab}$  is less than the corresponding  $U_{CISPR}$  reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.



### 6.3 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB $\mu$ V to  $\mu$ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$
$$NF = \text{Net Reading in dB}\mu\text{V}$$

**Example:**

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$



#### 6.4 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	9/18/2019	9/18/2020
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	8/8/2019	8/8/2020
Magnetic Loop Antenna	2366	ETS	6502	6/11/2019	6/11/2020
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	2593			12/6/2019	12/6/2020
Coaxial Cable	2592			12/6/2019	12/6/2020
Coaxial Cable	3339			12/6/2019	12/6/2020

#### 6.5 Software Utilized

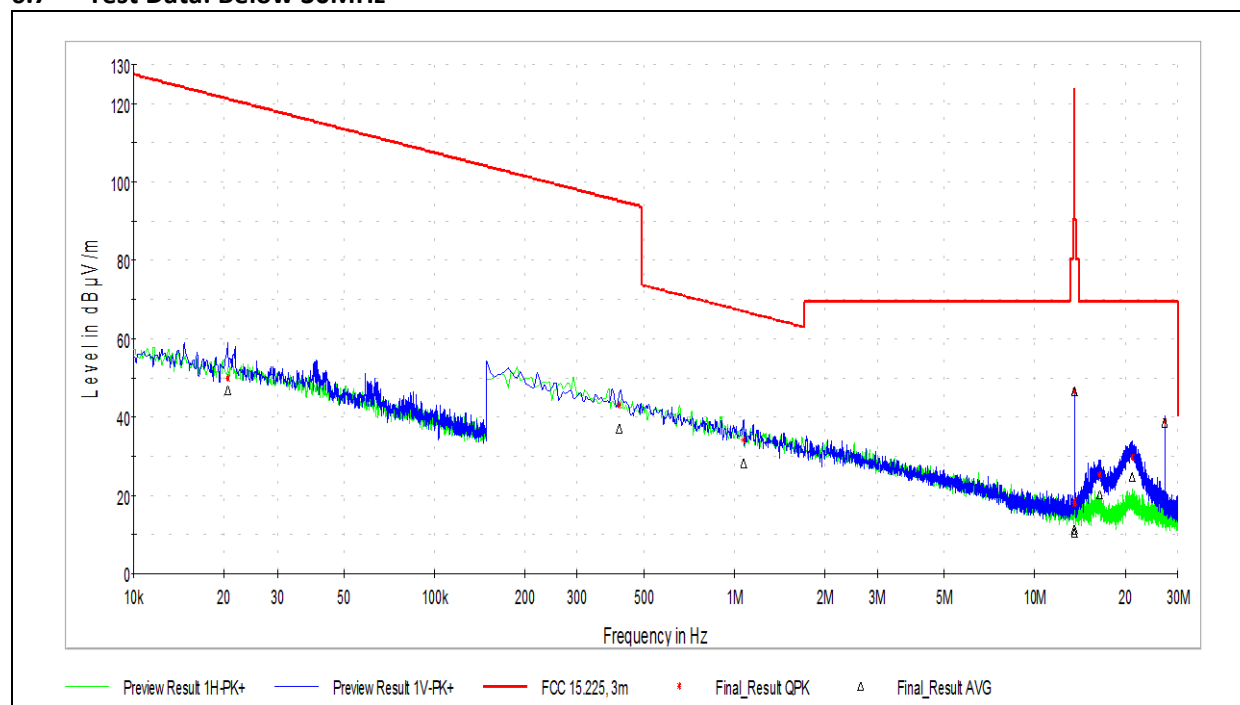
Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

#### 6.6 Test Results

The sample tested was found to be **compliant**.



## 6.7 Test Data: Below 30MHz



Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.020500	46.80	121.35	-74.55	0.200	78.0	16.2
0.413382	37.17	95.28	-58.11	9.000	75.0	12.6
1.071838	28.15	67.02	-38.87	9.000	89.0	12.8
13.547382	11.40	90.50	-79.10	9.000	40.0	11.6
13.560552 (fundamental)	46.48	124.00	-77.52	9.000	40.0	11.6
13.586890	10.48	90.50	-80.02	9.000	58.0	11.6
16.453368	20.11	69.50	-49.39	9.000	74.0	11.5
21.084507	24.69	69.50	-44.81	9.000	256.0	11.0
27.120353	38.60	69.50	-30.90	9.000	225.0	9.8

**Note:** Correlation measurements were performed below 30MHz between 10m ALSE and Open Field site according to FCC KDB 414788 D01 Radiated Test Site v01r01 section 2. All readings were within the acceptable tolerance.

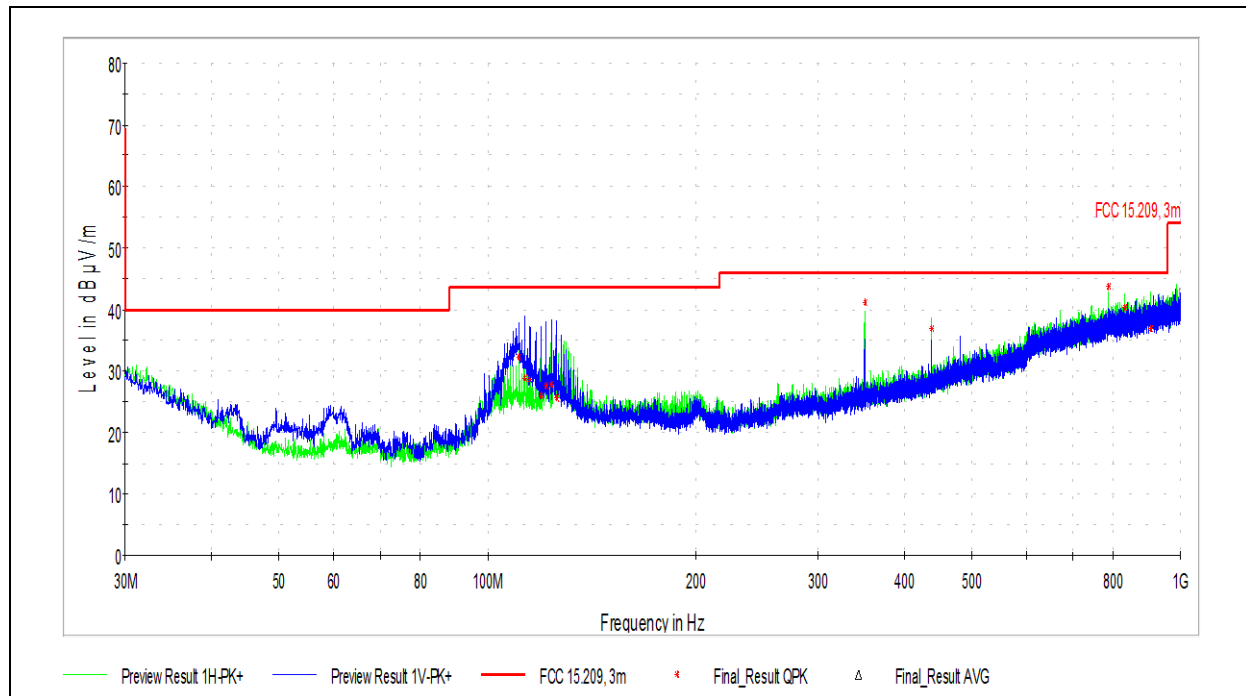


Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.020500	49.98	121.35	-71.37	0.200	78.0	16.2
0.413382	42.98	95.28	-52.30	9.000	75.0	12.6
1.071838	34.00	67.02	-33.02	9.000	89.0	12.8
13.547382	17.82	90.50	-72.68	9.000	40.0	11.6
13.560552 (Fundamental)	46.48	124.00	-77.52	9.000	40.0	11.6
13.586890	18.39	90.50	-72.11	9.000	58.0	11.6
16.453368	25.15	69.50	-44.35	9.000	74.0	11.5
21.084507	29.63	69.50	-39.87	9.000	256.0	11.0
27.120353	38.78	69.50	-30.72	9.000	225.0	9.8

Test Personnel:	Brandon Norris	Test Date:	3/27/2020
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Limit Applied:	See Above
	FCC Part 15.225		
Product Standard:	RSS-210 Issue 10	Ambient Temperature:	21.4C
Input Voltage:	12VDC	Relative Humidity:	41.3%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	976.9mbar

Deviations, Additions, or Exclusions: Limits were adjusted for testing at 3m by 40dB/decade per FCC Part 15.31(f)(2). The field strength of the fundamental and all spurious emissions was below the limits in FCC Part 15.209.

Data presented represents the worst case from positioning the device in 3 orthogonal planes.

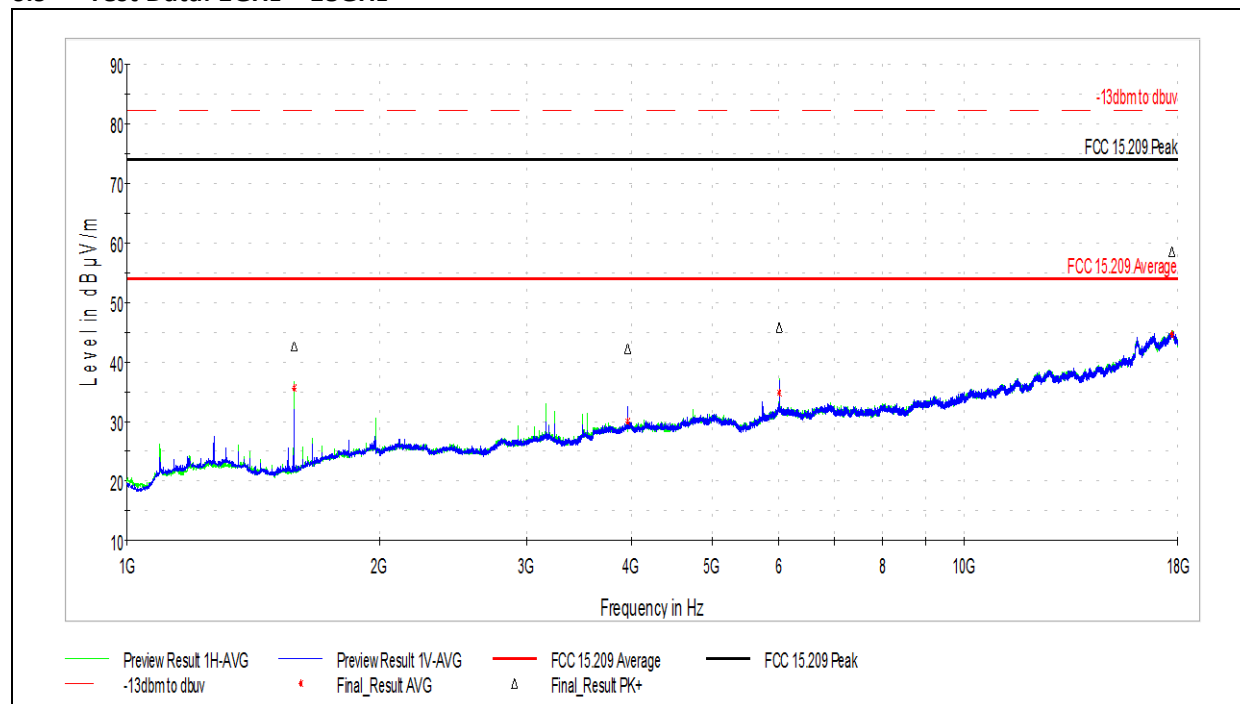
**6.8 Test Data: 30MHz – 1GHz**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
111.048889	32.21	43.50	-11.29	120.000	104.9	V	0.0	21.1
113.150556	28.89	43.50	-14.61	120.000	109.9	V	0.0	21.3
115.252222	28.60	43.50	-14.90	120.000	99.8	V	19.0	21.5
119.455556	26.08	43.50	-17.42	120.000	105.2	V	0.0	22.0
121.557222	27.63	43.50	-15.87	120.000	100.0	V	0.0	22.3
123.605000	27.90	43.50	-15.60	120.000	105.5	V	8.0	22.4
125.760556	25.57	43.50	-17.93	120.000	104.9	V	350.0	22.4
350.369445	41.11	46.00	-4.89	120.000	99.8	H	8.0	25.6
437.992778	36.87	46.00	-9.13	120.000	177.8	H	119.0	28.0
788.378333	43.80	46.00	-2.20	120.000	105.0	H	284.0	35.7
832.190000	40.21	46.00	-5.79	120.000	105.2	H	340.0	36.1
905.802222	36.78	46.00	-9.22	120.000	100.1	H	120.0	37.0

Test Personnel: Michael Carlson  
 Supervising/Reviewing Engineer: (Where Applicable) NA  
 Product Standard: FCC Part 15.225  
 Input Voltage: RSS-210 Issue 10  
 Pretest Verification w / Ambient Signals or BB Source: 12VDC  
 Yes

Test Date: 3/26/2020  
 Limit Applied: See Above  
 Ambient Temperature: 22.3C  
 Relative Humidity: 40.4%  
 Atmospheric Pressure: 982.4mbar

Deviations, Additions, or Exclusions: Data presented represents the worst case from positioning the device in 3 orthogonal planes.

**6.9 Test Data: 1GHz – 18GHz**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1584.000000	42.77	74.00	-31.23	1000.000	100.0	H	132.0	-1.4
3960.000000	42.37	74.00	-31.63	1000.000	232.0	V	326.0	7.1
6008.000000	45.83	74.00	-28.17	1000.000	207.0	H	168.0	10.3
17717.500000	58.58	74.00	-15.42	1000.000	109.0	V	0.0	26.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1584.000000	35.71	54.00	-18.29	1000.000	100.0	H	132.0	-1.4
3960.000000	29.94	54.00	-24.06	1000.000	232.0	V	326.0	7.1
6008.000000	34.74	54.00	-19.26	1000.000	207.0	H	168.0	10.3
17717.500000	44.55	54.00	-9.45	1000.000	109.0	V	0.0	26.0

Test Personnel: Michael Carlson  
Supervising/Reviewing Engineer: (Where Applicable) N/A  
Product Standard: FCC Part 15C, FCC Part 27  
Input Voltage: 120VAC / 60Hz  
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 3/24/2020  
Limit Applied: See Table Above  
Ambient Temperature: 22.5°C  
Relative Humidity: 39.1 %  
Atmospheric Pressure: 988.4 mbar

Deviations, Additions, or Exclusions: The -13dBm limit for the cellular radio onboard is also shown on the plot. This radio was active at the same time as the RFID radio which operates at 13.56MHz





## 7 Frequency Stability

### 7.1 Test Limits

#### FCC Part 15.225:

(e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  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 battery operated equipment, the equipment tests shall be performed using a new battery.

#### RSS-210 Issue 10 § B.6:

Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

### 7.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 and RSS-GEN Section 6.11.

### 7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	3065	Rhode & Schwarz	FSP	9/18/2019	9/19/2020
Environmental Chamber	7077	CSZ	ZP-32	2/27/2020	2/27/2021
Multimeter	1294	Fluke	23	2/27/2020	2/27/2021

### 7.4 Test Results

The sample tested was found to be **compliant**.

**7.5 Test Data**

**Operating Frequency:** 13,559,495 Hz  
**Reference Voltage:** 12vdc VDC  
**Deviation Limit:** 0.01 %

Voltage %	Voltage (VDC)	Temp (°C)	Measured Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	Limit (%)
100%	12	-30	13,559,410	-85	-0.0006	0.01
100%	12	-20	13,559,410	-85	-0.0006	0.01
100%	12	-10	13,559,410	-85	-0.0006	0.01
100%	12	0	13,559,356	-139	-0.0010	0.01
100%	12	10	13,559,384	-111	-0.0008	0.01
100%	12	20	13,559,330	-165	-0.0012	0.01
100%	12	30	13,559,240	-255	-0.0019	0.01
100%	12	40	13,559,240	-255	-0.0019	0.01
100%	12	50	13,559,240	-255	-0.0019	0.01
100%	12	60	13,559,240	-255	-0.0019	0.01
115%	13.8	20	13,559,303	-192	-0.0014	0.01
85%	10.2	20	13,559,330	-165	-0.0012	0.01

Test Personnel: Carmen Davis  
 Supervising/Reviewing Engineer: NA  
 (Where Applicable) FCC Part 15.225  
 Product Standard: RSS-210 Issue 10  
 Input Voltage: 12VDC  
 Pretest Verification w / Ambient  
 Signals or BB Source: Yes

Test Date: 3/23/2020  
 Limit Applied: See Above  
 Ambient Temperature: 23.1C  
 Relative Humidity: 40.3%  
 Atmospheric Pressure: 987.9mbar

Deviations, Additions, or Exclusions: None



## 8 Occupied Bandwidth

### 8.1 Test Method

Tests are performed in accordance with ANSI C63.10:2013.

### 8.2 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	2327	Rohde & Schwarz	ESI26	9/30/2019	9/30/2020

### 8.3 Test Conditions

Test Personnel:	Bryan Taylor	Test Date:	3/23/2020
Supervising/Reviewing Engineer:		Limit Applied:	15.215c
(Where Applicable)	NA		
	FCC Part 15.225		
	FCC Part 15.215c		
Product Standard:	RSS-210 Issue 10	Ambient Temperature:	22.2C
Input Voltage:	12VDC	Relative Humidity:	34.6%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	993.1mbar

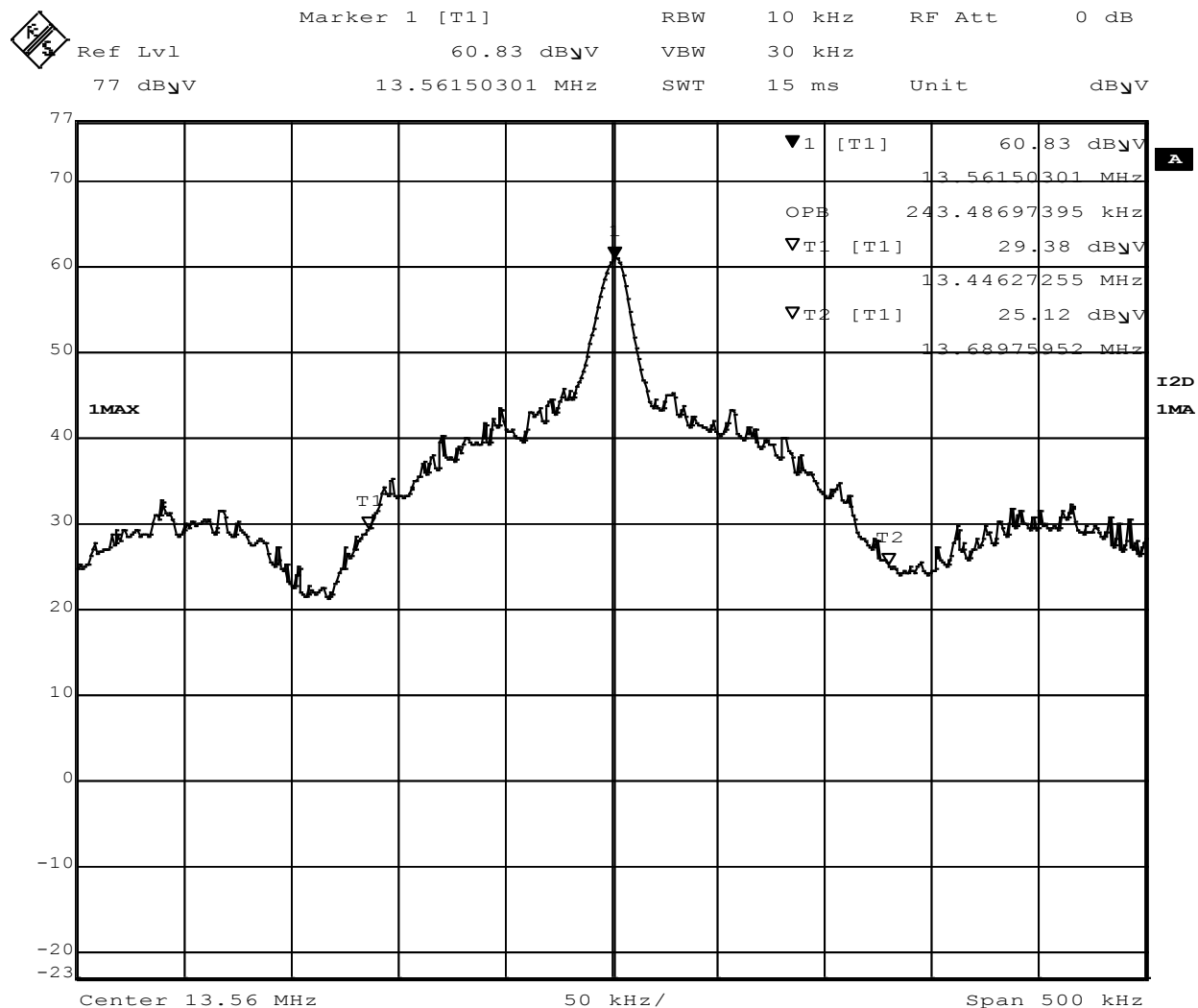


## 8.4 Test Results

The sample tested was found to be **compliant**. The 99% power bandwidth was measured as was the 20dB down bandwidth. The 20dB bandwidth was entirely within the transmit band 13.11MHz – 14.01MHz as required by FCC Part 15.215c.

## 8.5 Test Data

RBW	VBW	99% BW
10 kHz	30 kHz	243.48 kHz



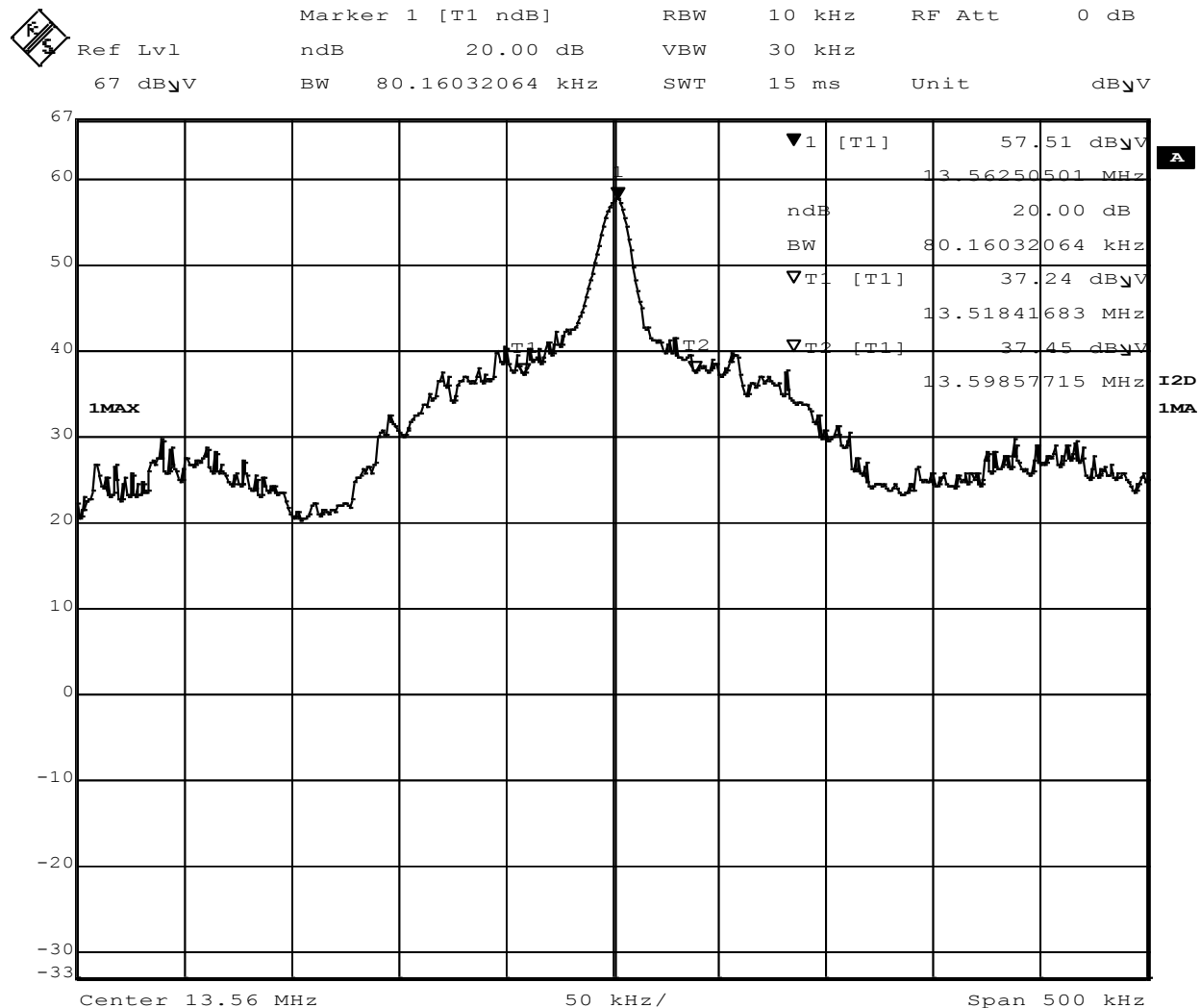
Date: 23.MAR.2020 13:40:42

99% Occupied Bandwidth

Deviations, Additions, or Exclusions: None



RBW	VBW	20dB BW
10 kHz	30 kHz	80.16 kHz



Date: 23.MAR.2020 13:53:18

**20dB Occupied Bandwidth<sup>2</sup>**

2 Note, it was not possible to get the resolution bandwidth setting to meet the 1% to 5% of the measured band width requirement from ANSI C63.5. This was due to the strong CW like signal present in the center of the transmission. It is clear from the 99% bandwidth that the entire signal lies within the 13.11MHz – 14.01MHz band as required by FCC Part 15.215c.



## 9 Antenna Requirement

### 9.1 Test Limits

#### FCC Part 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### RSS-Gen Issue 5 § 8.3:

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

*This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

### 9.2 Test Results

The device was found to be **compliant**. The device has an internal antenna with a unique connector.

**10 Revision History**

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	4/10/2020	104290673LEX-003	BCT	BZ	Original Issue
1	1/28/2021	104290673LEX-003.1	BCT	BZ	Fixed typo on module info