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# Dormakaba USA Inc. TEST REPORT

**SCOPE OF WORK**  
EMC TESTING – WDC

**REPORT NUMBER**  
104352999LEX-001

<b>ISSUE DATE</b>	<b>REVISED DATE</b>
6/22/2020	8/13/2020

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Non-Specific EMC Report Shell Rev. December 2017  
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**EMC TEST REPORT**  
(FULL COMPLIANCE)

**Report Number:** 104352999LEX-001.1

**Project Number:** G104352999

**Report Issue Date:** 8/13/2020

**Model(s) Tested:** WDC

**Standards:** FCC Part 15B  
ICES-003 Issue 6  
FCC Part 15C  
(Limited to Radiated Spurious Emissions)

Tested by:  
Intertek Testing Services NA, Inc.  
731 Enterprise Dr.  
Lexington, KY 40510  
USA

Client:  
Dormakaba USA Inc.  
6161 E. 75th Street  
Indianapolis, IN 46250  
USA

Report prepared by



Brandon Norris,  
Engineer

Report reviewed by



Bryan Taylor,  
Team Leader

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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	Radiated Emissions (Transmitters Idle) (ANSI C63.4:2014)	Pass
6	Radiated Spurious Emissions (Transmitters Active) (ANSI C63.10:2013)	Pass
7	Conducted Emissions (ANSI C63.4:2014)	N/A <sup>1</sup>

<sup>1</sup> The device was battery powered.



### 3 Client Information

This product was tested at the request of the following:

Client Information	
<b>Client Name:</b>	Dormakaba USA Inc.
<b>Address:</b>	6161 E. 75th Street Indianapolis, IN 46250 USA
<b>Contact:</b>	Robert Strong
<b>Telephone:</b>	317-806-3288
<b>Email:</b>	Bob.strong@dormakaba.com
Manufacturer Information	
<b>Manufacturer Name:</b>	Dormakaba USA Inc.
<b>Manufacturer Address:</b>	6161 E. 75th Street Indianapolis, IN 46250 USA



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

Equipment Under Test	
Product Name	WDC
Model Number	WDC
Receive Date	6/8/2020
Test Start Date	6/8/2020
Test End Date	6/11/2020
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	6VDC
Description of Equipment Under Test (provided by client)	
The WDC is a door lock that can be unlocked using RFID and Bluetooth technology.	

Radios in the EUT			
Manufacturer	FCCID	TX Band	Transmission Type
HID	JQ6-SE3210	125kHz	RFID Module
HID	JQ6-SE3210	13.56MHz	RFID Module
HID	JQ6-XTENDER	2402-2480MHz	Bluetooth Module
Dormakaba	WEF-WDC	2405-2475MHz	Wireless door controller (Non-modular 'zigbee like')

##### 4.1 Variant Models:

There were no variant models covered by this evaluation.



## 5 System Setup and Method

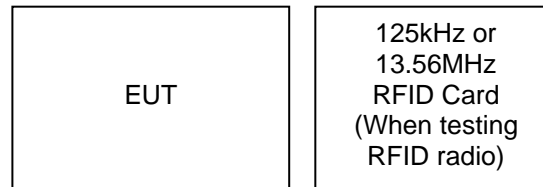
### 5.1 Method:

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

No.	Descriptions of EUT Exercising
1	Device on and in idle mode
2	Device on and actively transmitting 125kHz RFID, 13.56MHz RFID, Bluetooth, and 'zigbee like'

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination

### 5.2 EUT Block Diagram:





**5.3 EUT Photo (Front):**







**5.4 EUT Photo (Back):**





## 6 Radiated Emissions

### 6.1 Method

Tests are performed in accordance with ANSI C63.4:2014 and ANSI C63.10:2013.

**TEST SITE:** 10m ALSE

**Site Designation:** 10m Chamber

#### Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U <sub>CISPR</sub>
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.



## 6.2 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 dB $\mu$ V  
AF = 7.4 dB/m  
CF = 1.6 dB  
AG = 29.0 dB  
FS = 32 dB $\mu$ 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:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$
$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$



### 6.3 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
Horn Antenna	3780	ETS Lindgren	4001	1/16/2020	1/16/2021
Loop Antenna	2366	ETS	6502	6/11/2019	6/11/2020
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
3m Cable Antenna→Preamp	3074			12/4/2019	12/4/2020
3m Cable Preamplifier	3918	Rohde & Schwarz	TS-PR18	12/4/2019	12/4/2020
3m Cable Preamp→Chamber	2588			12/4/2019	12/4/2020
3m Cable Chamber→Control Room	2593			12/4/2019	12/4/2020
3m Cable Control Room→Receiver	2592			12/4/2019	12/4/2020

### 6.4 Software Utilized:

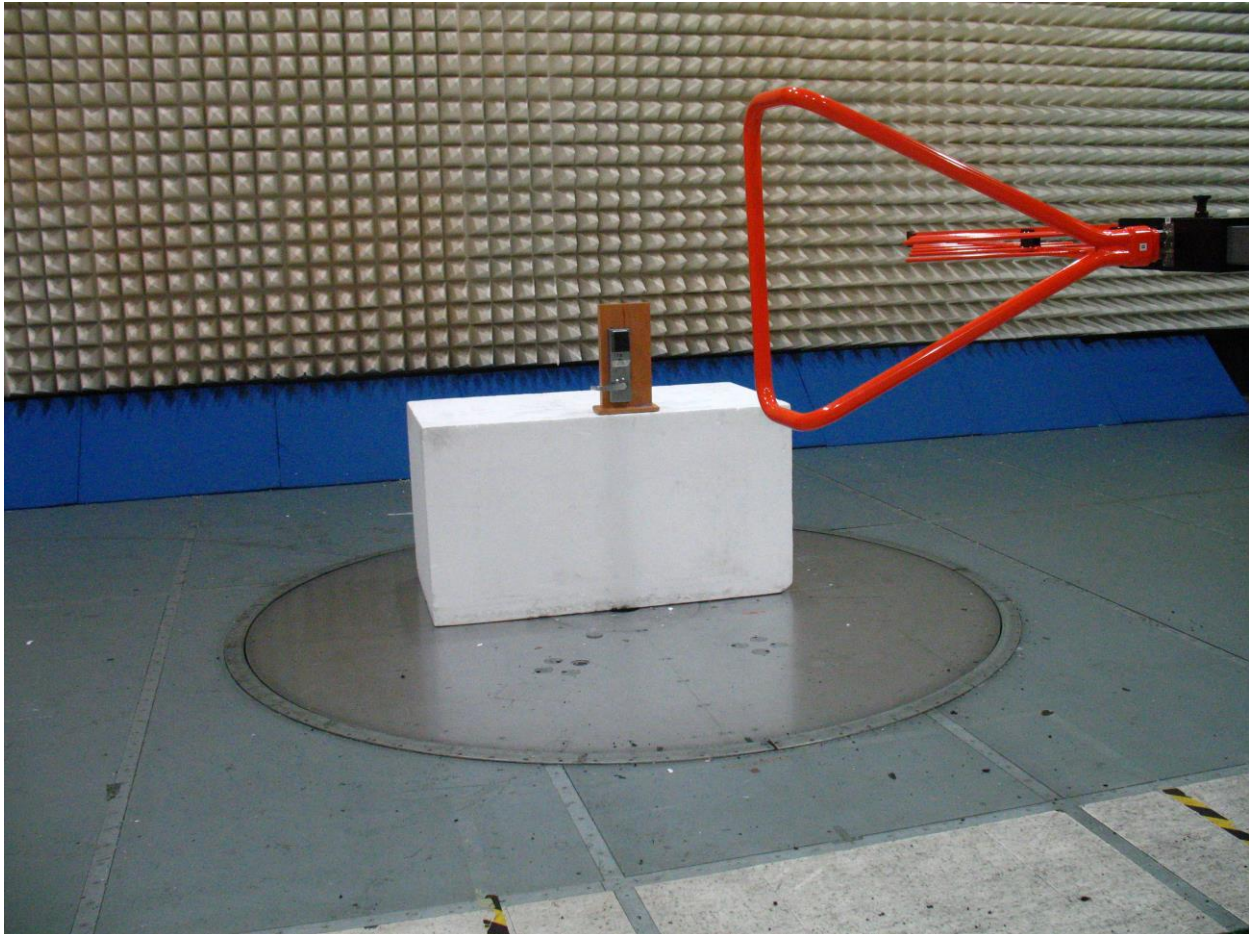
Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

### 6.5 Results:

The sample tested was found to Comply.

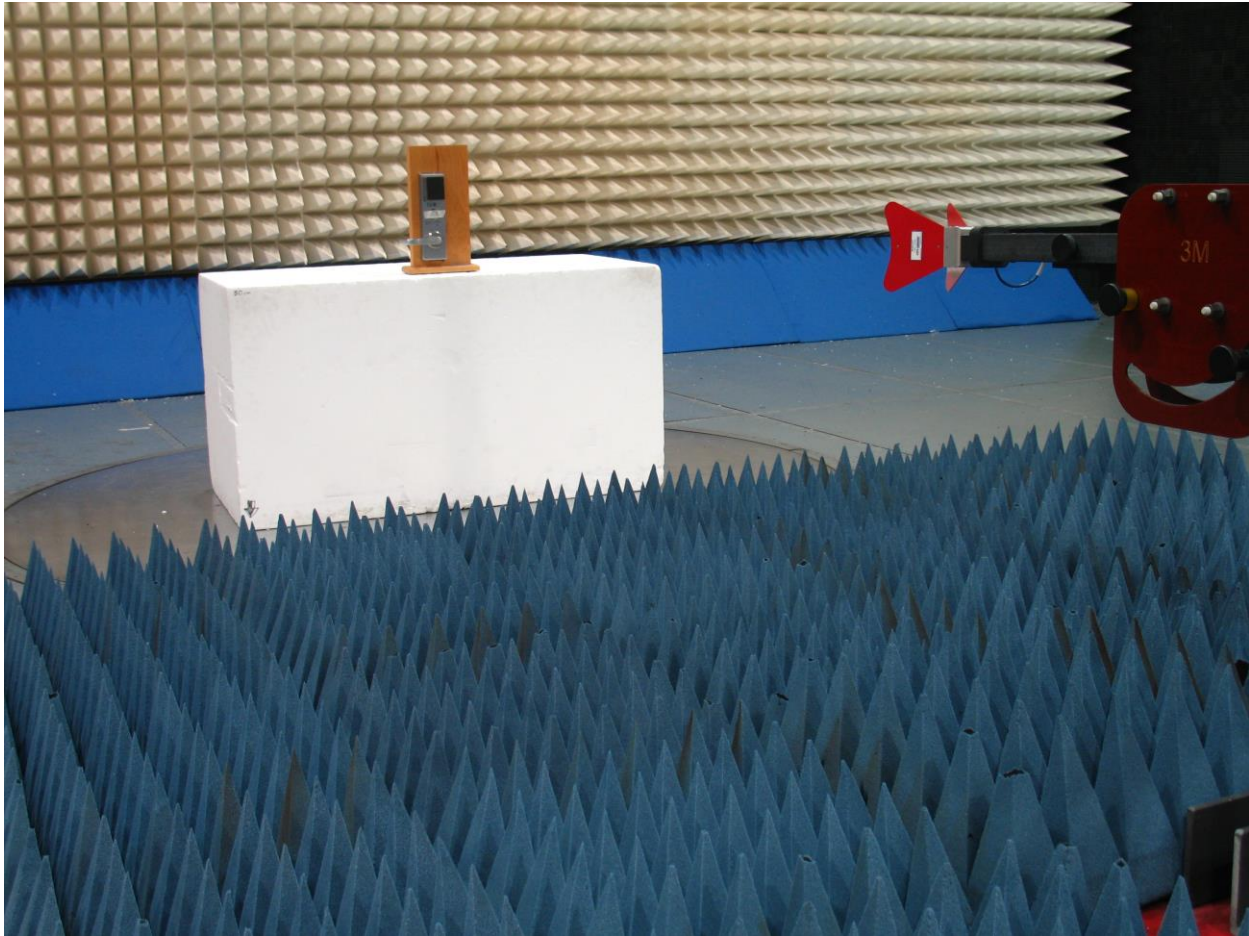


## 6.6 Setup Photographs: Radiated Emissions (FCC Part 15B/15C Below 1GHz)



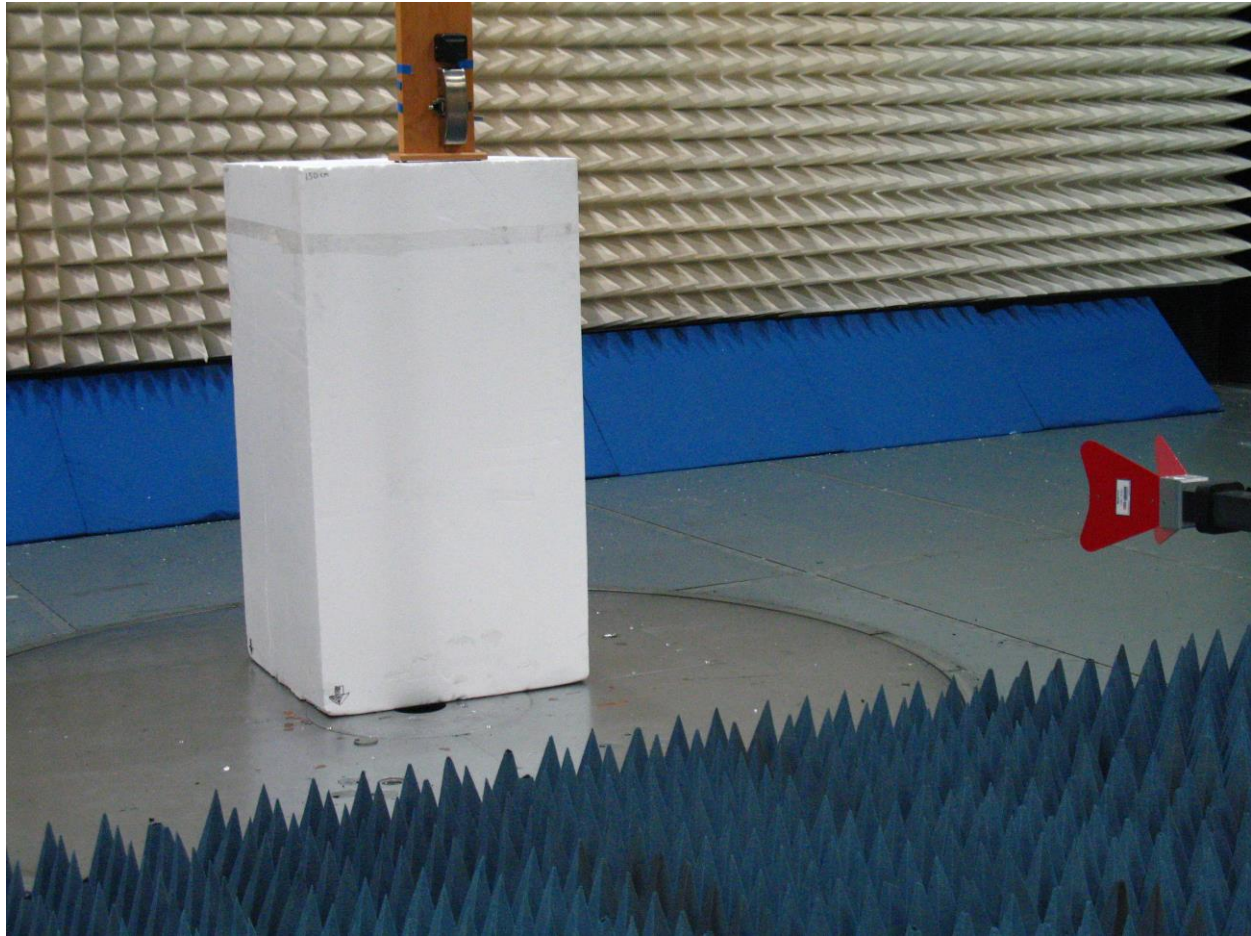


### 6.7 Setup Photographs: Radiated Emissions (FCC Part 15B Above 1GHz)



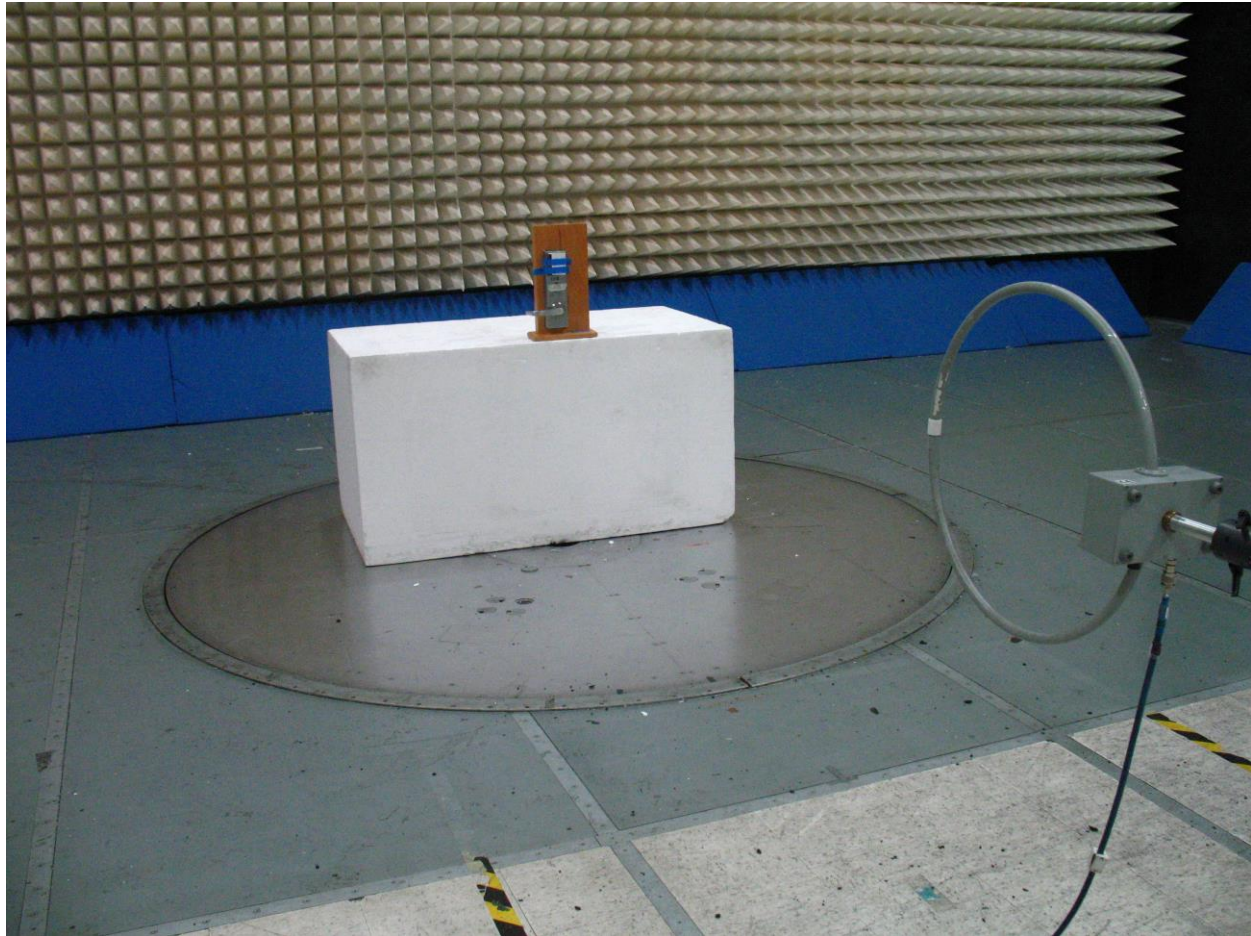


### 6.8 Setup Photographs: Radiated Emissions (FCC Part 15C Above 1GHz)





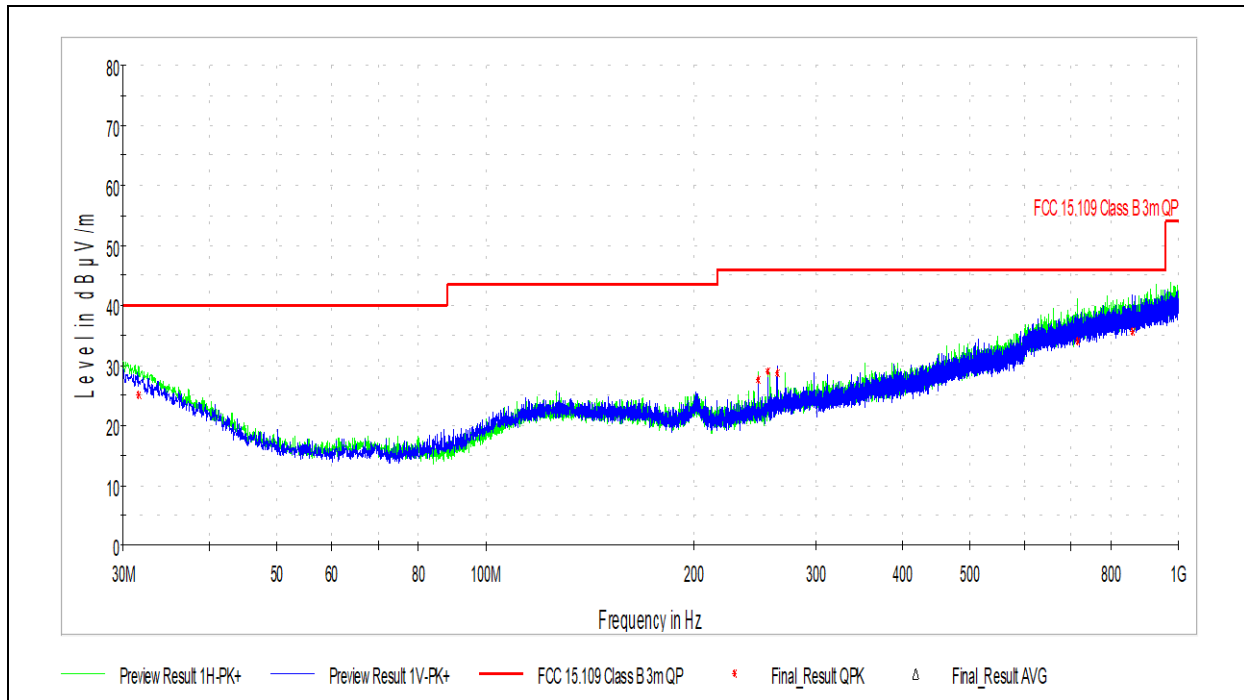
### 6.9 Setup Photographs: Radiated Emissions (FCC Part 15C 10kHz-30MHz)







**6.10 Plots/Data: Radiated Emissions, 30MHz – 1GHz (Digital Device)**



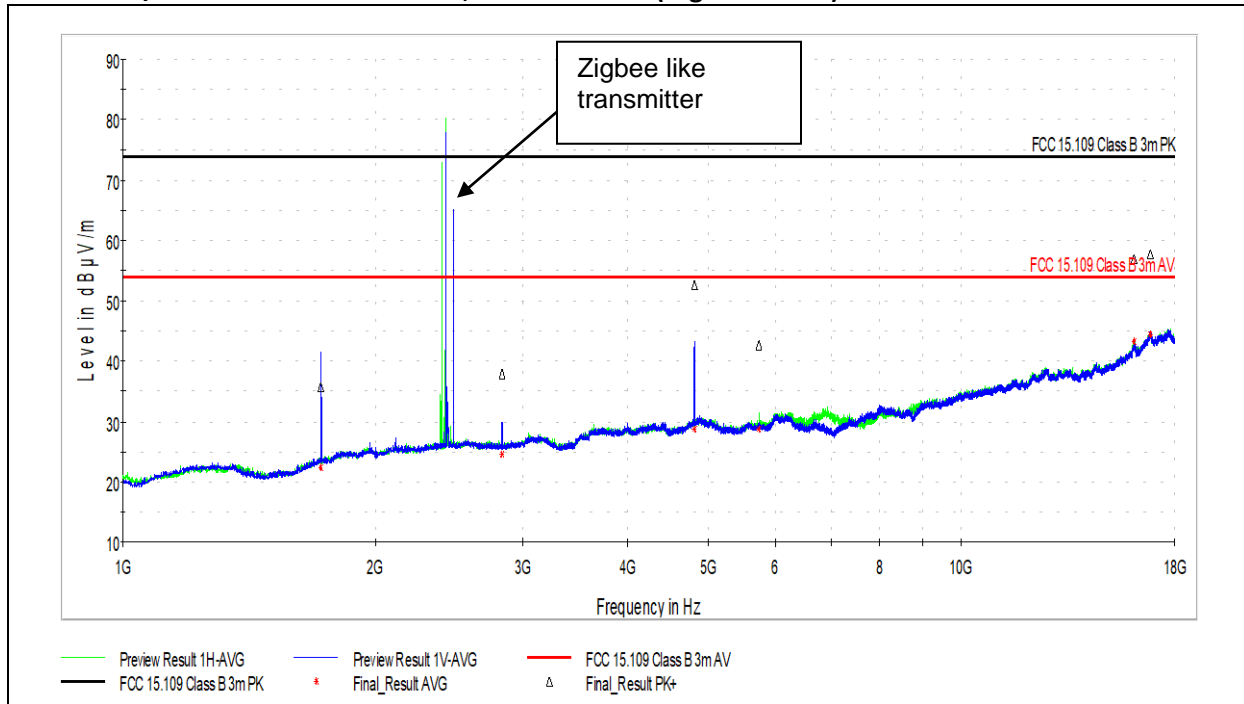
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.616667	25.07	40.00	14.93	120.000	284.8	H	248.0	27.6
247.495556	27.62	46.02	18.40	120.000	105.4	H	266.0	21.7
255.471111	28.92	46.02	17.10	120.000	104.5	H	263.0	21.9
263.446667	28.72	46.02	17.30	120.000	154.1	V	0.0	23.0
716.275000	34.11	46.02	11.91	120.000	166.2	H	94.0	34.3
858.433889	35.53	46.02	10.49	120.000	400.0	V	0.0	35.8

Test Personnel:	<u>Brandon Norris</u>	Test Date:	<u>6/8/2020</u>
Supervising/Reviewing Engineer:	<u>N/A</u>	Limit Applied:	<u>Class B</u>
(Where Applicable)	<u>FCC Part 15B</u>	Ambient Temperature:	<u>24.2 °C</u>
Product Standard:	<u>ICES-003 Issue 6</u>	Relative Humidity:	<u>46.5 %</u>
Input Voltage:	<u>6V DC</u>	Atmospheric Pressure:	<u>984.5 mbar</u>
Pretest Verification w / Ambient Signals or BB Source:	<u>Yes</u>		

Deviations, Additions, or Exclusions: None



**6.11 Plots/Data: Radiated Emissions, 1GHz – 18GHz (Digital Device)**



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1722.000000	35.69	73.98	38.29	1000.000	100.0	V	347.0	0.4
2836.000000	37.80	73.98	36.18	1000.000	100.0	V	250.0	4.5
4803.500000	52.56	73.98	21.42	1000.000	100.0	V	341.0	8.2
5741.000000	42.65	73.98	31.33	1000.000	117.0	H	182.0	9.6
16087.500000	56.87	73.98	17.11	1000.000	152.0	V	188.0	26.0
16827.000000	57.74	73.98	16.24	1000.000	100.0	H	37.0	26.2

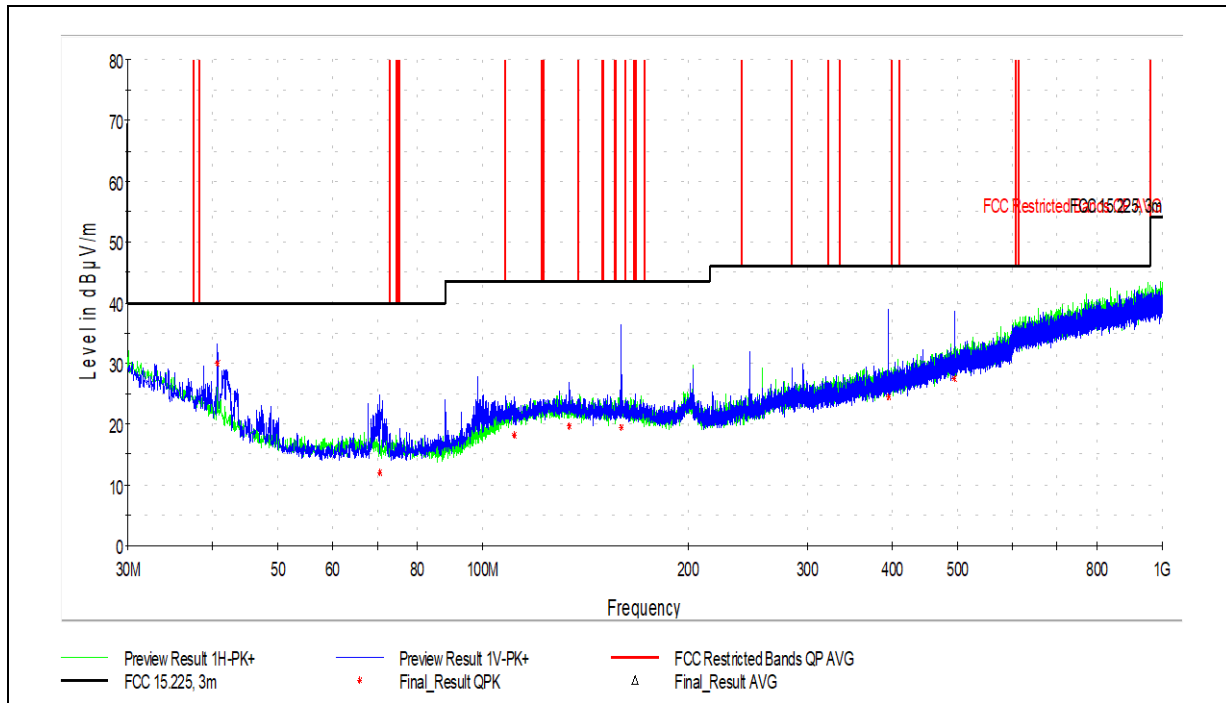
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1722.000000	22.29	53.98	31.69	1000.000	100.0	V	347.0	0.4
2836.000000	24.50	53.98	29.48	1000.000	100.0	V	250.0	4.5
4803.500000	28.62	53.98	25.36	1000.000	100.0	V	341.0	8.2
5741.000000	28.75	53.98	25.23	1000.000	117.0	H	182.0	9.6
16087.500000	43.25	53.98	10.73	1000.000	152.0	V	188.0	26.0
16827.000000	44.35	53.98	9.63	1000.000	100.0	H	37.0	26.2

Test Personnel:	<u>Brandon Norris</u>	Test Date:	<u>6/8/2020</u>
Supervising/Reviewing Engineer:	<u>N/A</u>	Limit Applied:	<u>Class B</u>
(Where Applicable)	<u>FCC Part 15B</u>	Ambient Temperature:	<u>24.2 °C</u>
Product Standard:	<u>ICES-003 Issue 6</u>	Relative Humidity:	<u>46.5 %</u>
Input Voltage:	<u>6V DC</u>	Atmospheric Pressure:	<u>984.5 mbar</u>
Pretest Verification w / Ambient Signals or BB Source:	<u>Yes</u>		

Deviations, Additions, or Exclusions: None



**6.12 Radiated Spurious Emissions (Bluetooth, Zigbee, 13.56MHz RFID 30MHz – 1 GHz)**



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.670000	29.90	40.00	10.10	120.000	105.0	V	240.0	20.3
70.470556	12.10	40.00	27.90	120.000	142.3	V	163.0	15.0
111.048889	18.11	43.52	25.41	120.000	105.3	V	126.0	21.1
134.167222	19.58	43.52	23.94	120.000	129.9	V	173.0	22.4
159.980000	19.52	43.52	24.00	120.000	105.1	V	0.0	21.8
395.582222	24.40	46.02	21.62	120.000	154.3	V	17.0	26.6
494.468333	27.55	46.02	18.47	120.000	141.8	V	73.0	29.2

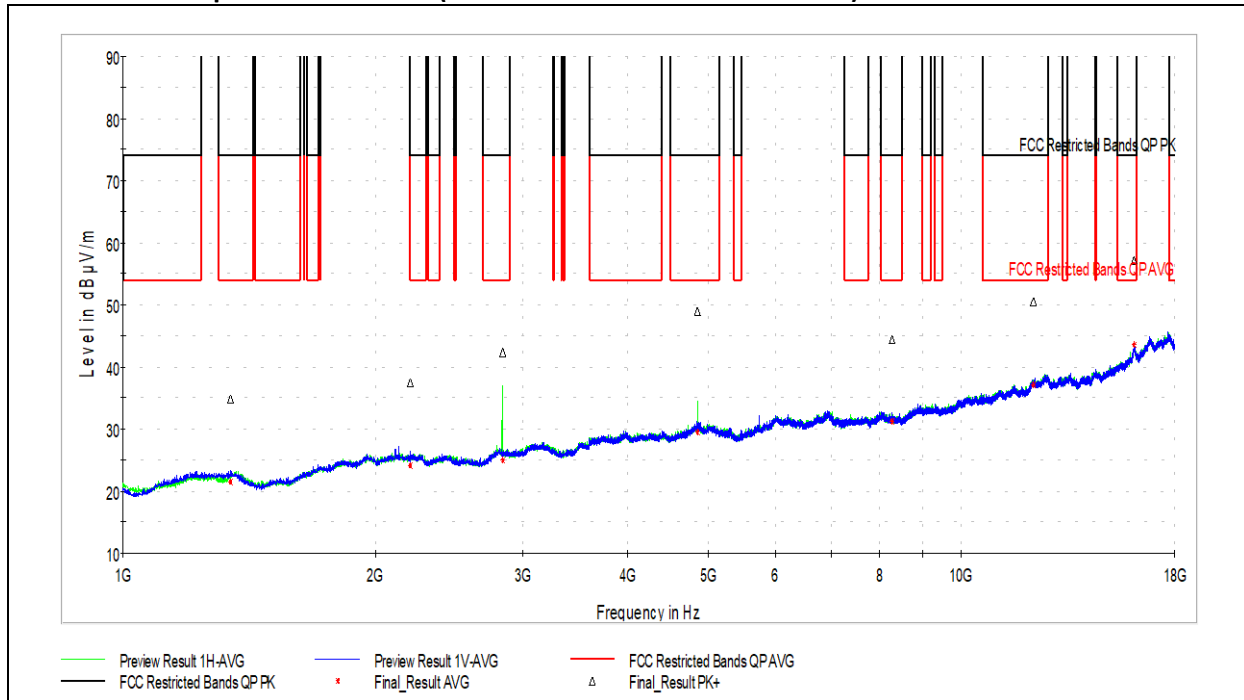
Test Personnel: Brandon Norris  
 Supervising/Reviewing Engineer: \_\_\_\_\_  
 (Where Applicable) N/A  
 Product Standard: FCC Part 15C  
 Input Voltage: 6V DC  
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/11/2020  
 Limit Applied: 15.209  
 Ambient Temperature: 24.1 °C  
 Relative Humidity: 49.1 %  
 Atmospheric Pressure: 989.5 mbar

Deviations, Additions, or Exclusions: The 10<sup>th</sup> harmonic of 125kHz is 1.25MHz therefore that transmitter does not need to be tested in this frequency range.



### 6.13 Radiated Spurious Emissions (Bluetooth 802.11b 1GHz – 18GHz)



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1343.000000	34.81	73.98	39.17	1000.000	100.0	V	190.0	-0.3
2201.500000	37.56	73.98	36.42	1000.000	100.0	V	326.0	3.0
2836.500000	42.36	73.98	31.62	1000.000	100.0	H	273.0	4.5
4851.500000	48.96	73.98	25.02	1000.000	100.0	H	309.0	8.3
8277.500000	44.43	73.98	29.55	1000.000	100.0	V	249.0	12.5
12214.000000	50.46	73.98	23.52	1000.000	100.0	H	275.0	18.5
16093.500000	57.05	73.98	16.93	1000.000	109.0	H	113.0	26.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1343.000000	21.40	53.98	32.58	1000.000	100.0	V	190.0	-0.3
2201.500000	24.03	53.98	29.95	1000.000	100.0	V	326.0	3.0
2836.500000	24.87	53.98	29.11	1000.000	100.0	H	273.0	4.5
4851.500000	29.42	53.98	24.56	1000.000	100.0	H	309.0	8.3
8277.500000	31.27	53.98	22.71	1000.000	100.0	V	249.0	12.5
12214.000000	37.06	53.98	16.92	1000.000	100.0	H	275.0	18.5
16093.500000	43.64	53.98	10.34	1000.000	109.0	H	113.0	26.1

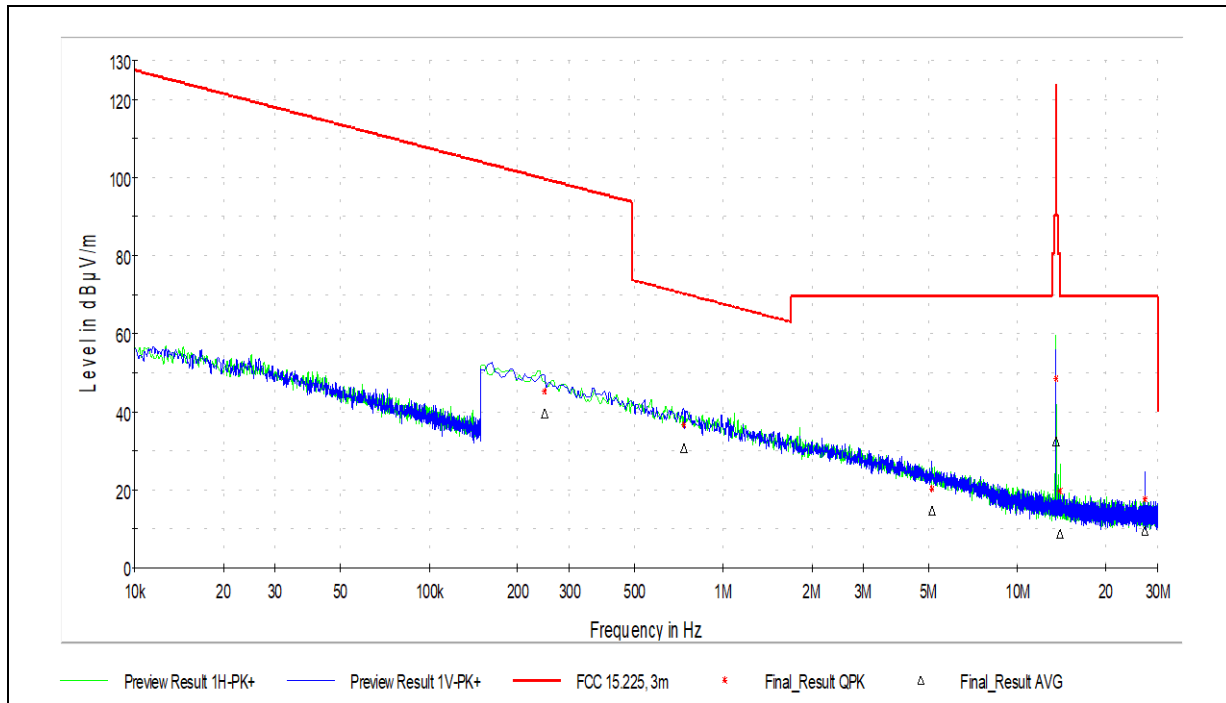
Test Personnel: Brandon Norris  
 Supervising/Reviewing Engineer: \_\_\_\_\_  
 (Where Applicable) N/A  
 Product Standard: FCC Part 15C  
 Input Voltage: 6V DC  
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/11/2020  
 Limit Applied: 15.205 Restricted Bands  
 Ambient Temperature: 24.1 °C  
 Relative Humidity: 49.1 %  
 Atmospheric Pressure: 989.5 mbar

Deviations, Additions, or Exclusions: : The 10<sup>th</sup> harmonic of 125kHz is 1.25MHz and the 10<sup>th</sup> harmonic of 13.56MHz is 135.6MHz therefore those transmitters do not need to be tested in this frequency range



### 6.14 Radiated Spurious Emissions (RFID (13.56MHz) 10kHz – 30 MHz)



Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.246574	39.57	99.76	60.19	9.000	226.0	12.8
0.733831	30.74	70.30	39.56	9.000	127.0	12.6
5.127927	14.68	69.50	54.82	9.000	241.0	12.1
13.556162	32.43	124.00	91.57	9.000	174.0	11.6
13.981963	8.57	80.50	71.93	9.000	178.0	11.6
27.120353	9.56	69.50	59.94	9.000	238.0	9.8

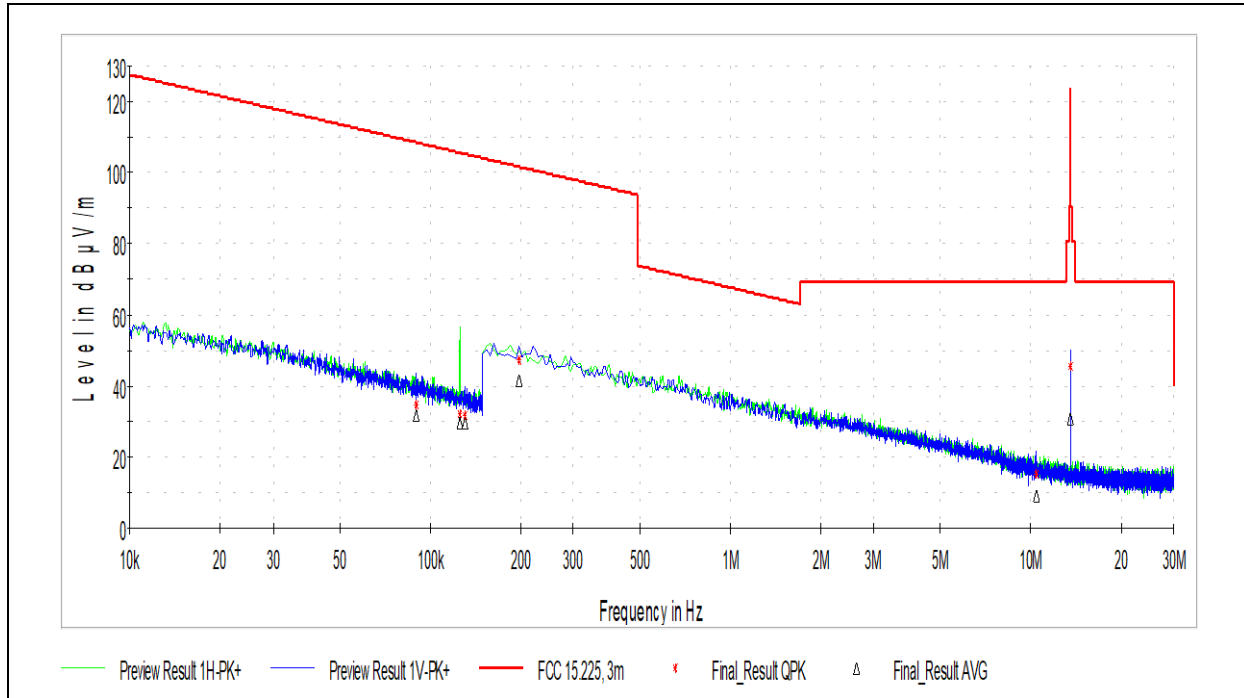
Test Personnel: Brandon Norris  
 Supervising/Reviewing Engineer: \_\_\_\_\_  
 (Where Applicable) N/A  
 Product Standard: FCC Part 15C  
 Input Voltage: 6V DC  
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/11/2020  
 Limit Applied: 15.209  
 Ambient Temperature: 24.1°C  
 Relative Humidity: 49.1 %  
 Atmospheric Pressure: 989.5 mbar

Deviations, Additions, or Exclusions: None



### 6.15 Radiated Spurious Emissions (RFID (125kHz) 10kHz – 30 MHz)



Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.089800	31.84	108.53	76.69	0.200	348.0	13.4
0.125700	29.32	105.61	76.29	0.200	104.0	13.0
0.130400	29.33	105.29	75.96	0.200	108.0	13.0
0.198287	41.65	101.65	60.00	9.000	292.0	12.9
10.439471	9.30	69.50	60.20	9.000	42.0	11.8
13.560552	30.60	124.00	93.40	9.000	58.0	11.6

Test Personnel: Brandon Norris  
 Supervising/Reviewing Engineer: \_\_\_\_\_  
 (Where Applicable) N/A  
 Product Standard: FCC Part 15C  
 Input Voltage: 6V DC  
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 6/11/2020  
 Limit Applied: 15.209  
 Ambient Temperature: 24.1°C  
 Relative Humidity: 49.1%  
 Atmospheric Pressure: 989.5 mbar

Deviations, Additions, or Exclusions: None



### 7 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	8/13/2020	104352999LEX-001	BN	BCT	Original Issue
1	8/13/2020	104352999LEX-001.1	BN	BCT	Fixed incorrect margins in section 6.12