

FCC/ IC REPORT

Applicant: Remote Tech LLC

Address of Applicant: 310 ALDER RD, DOVER DE 19904 USA

Equipment Under Test (EUT)

Product Name: keyless transmitter

Model No.: RT-HK4

FCC ID: 2AOKM-HK4

Canada IC: 24223-HK4

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231
RSS-210 Issue 9 August 2016 Annex A Section A.1.1
RSS-Gen Issue 5 April 2018

Date of sample receipt: 24 Apr., 2019

Date of Test: 24 Apr., to 05 May., 2019

Date of report issue: 06 May., 2019

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2 Version

Version No.	Date	Description
00	06 May., 2019	Original

Prepared By:

Carey Chen

Date:

06 May., 2019

Test Engineer

Check By:

Wimer Zhang

Date:

06 May., 2019

Project Engineer

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4 Test Summary

Test Item	Section in CFR 47		Result
	FCC	IC	
Antenna requirement	15.203	RSS-GEN 6.8	Pass
Field strength of the fundamental signal	15.231 (b)	RSS-210 Annex A Section A.1.2 (a)	Pass
Spurious emissions	15.231 (b)/15.209	RSS-210 Annex A Section A.1.2 (b)	Pass
20dB Bandwidth	15.231 (c)	RSS-210 Annex A Section A.1.3	Pass
Dwell time	15.231 (a)(1)	RSS-210 Annex A Section A.1.1 (a)	N/A
Frequency stability	/	RSS-GEN Section 8.11	Pass
Conducted Emission	15.207	RSS-GEN Section 8.8	N/A
Remarks: N/A: The EUT not applicable of the test item. Pass: The EUT complies with the essential requirements in the standard. TEST ACCORDING TO ANSI C63.4:2014 AND ANSI C63.10:2013.			

5 General Information

5.1 Client Information

Applicant:	Remote Tech LLC
Address:	310 ALDER RD, DOVER DE 19904 USA
Manufacturer:	Remote Tech LLC
Address:	310 ALDER RD, DOVER DE 19904 USA

5.2 General Description of E.U.T.

Product Name:	keyless transmitter
Model No.:	RT-HK4
Operation Frequency:	315MHz
Channel numbers:	1
Modulation type:	FSK
Antenna Type:	PCB antenna
Antenna gain:	0 dBi
Power supply:	DC 3V (CR2032 battery)

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation（new battery used）		
Pre-Test Mode:			
CCIS has verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:			
Axis	X	Y	Z
Field Strength(dBuV/m)	83.18	81.22	79.74
Final Test Mode:			
According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”: X axis (see the test setup photo)			

5.4 Description of Support Units

N/A

5.5 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.6 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.

Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

5.7 Measurement Uncertainty

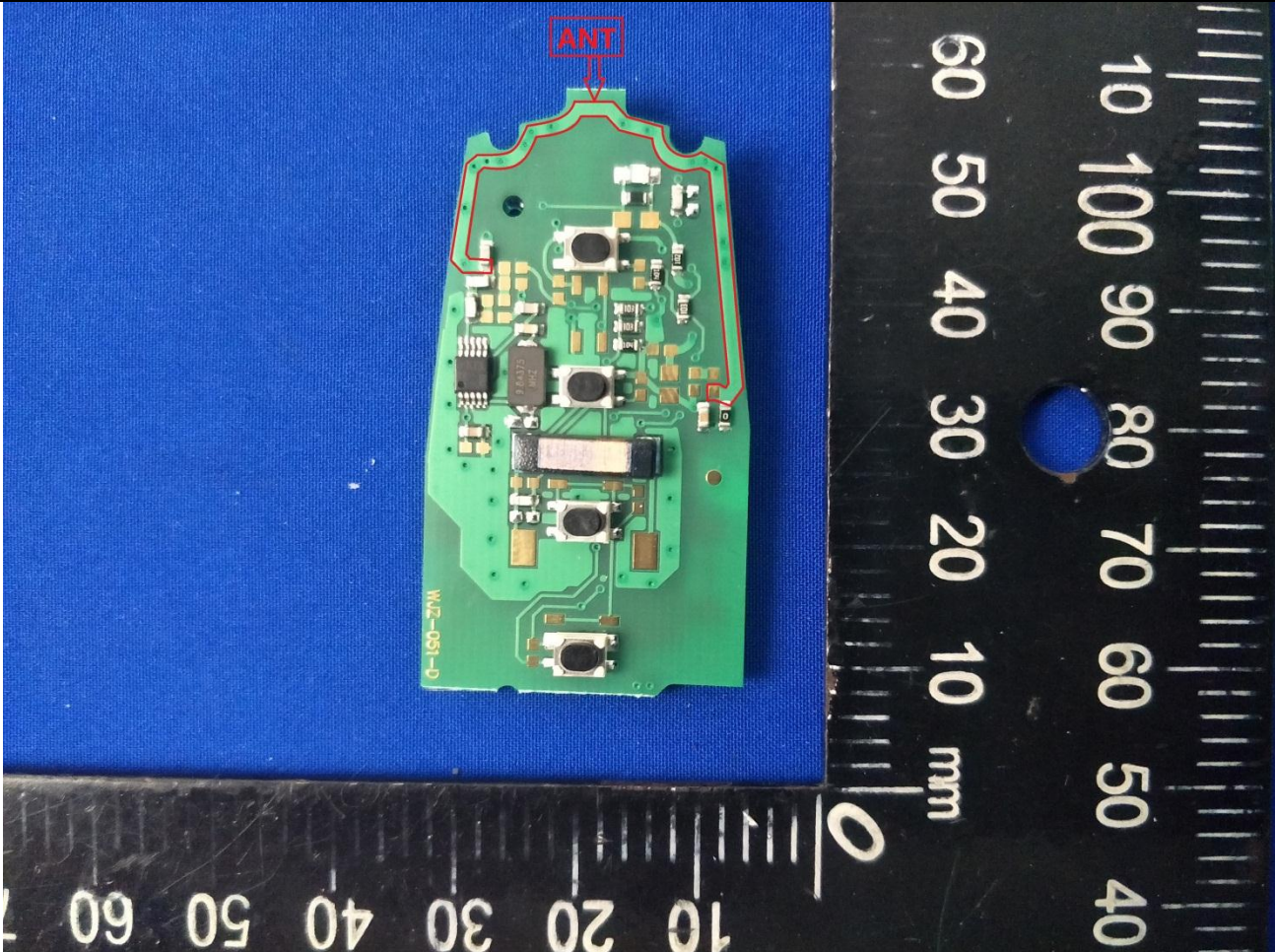
Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 dB (k=2)

5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2018	11-20-2019
Loop Antenna	SCHWARZBECK	FMZB 1519 B	00044	03-18-2019	03-17-2020
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-18-2019	03-17-2020
Pre-amplifier	CD	PAP-1G18	11804	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2018	11-20-2019
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-18-2019	03-17-2020
Simulated Station	Anritsu	MT8820C	6201026545	03-18-2019	03-17-2020
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-18-2019	03-17-2020
Cable	MICRO-COAX	MFR64639	K10742-5	03-18-2019	03-17-2020
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-18-2019	03-17-2020
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	10-31-2018	10-30-2019
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	09-24-2017	09-23-2018
				09-24-2018	09-23-2019

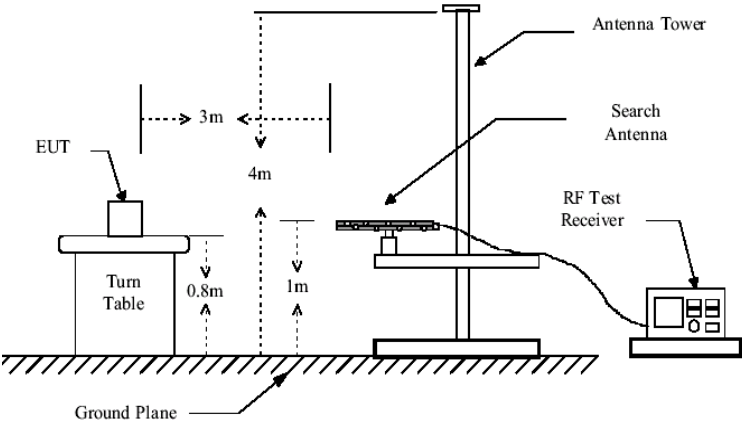
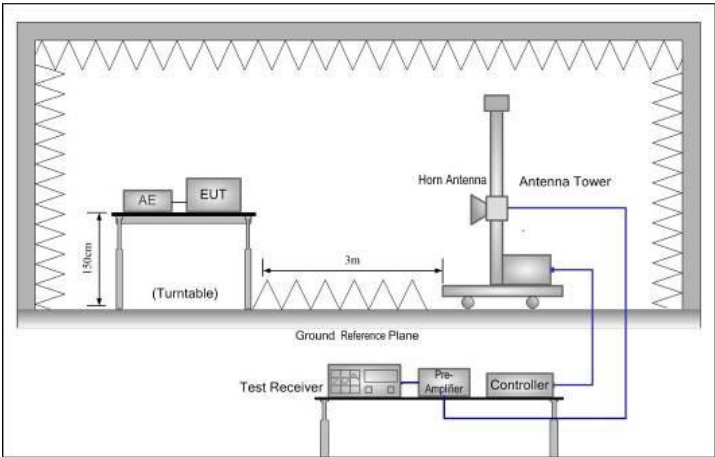
6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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, 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.	
E.U.T Antenna:	
The EUT make use of an PCB antenna, The typical gain of the antenna is 0 dBi.	
	

6.2 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.231(b) and 15.209 RSS-210 Annex A Section A.1.2				
Test Method:	ANSI C63.4:2014				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	315MHz		75.62		Average Value
			95.62		Peak Value
Limit: (Spurious Emissions)	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
			74.0		Peak Value
	Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.				
Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.				
	b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.				
	c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.				
	d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.				
	e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.				
	f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				

Test setup:	Below 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

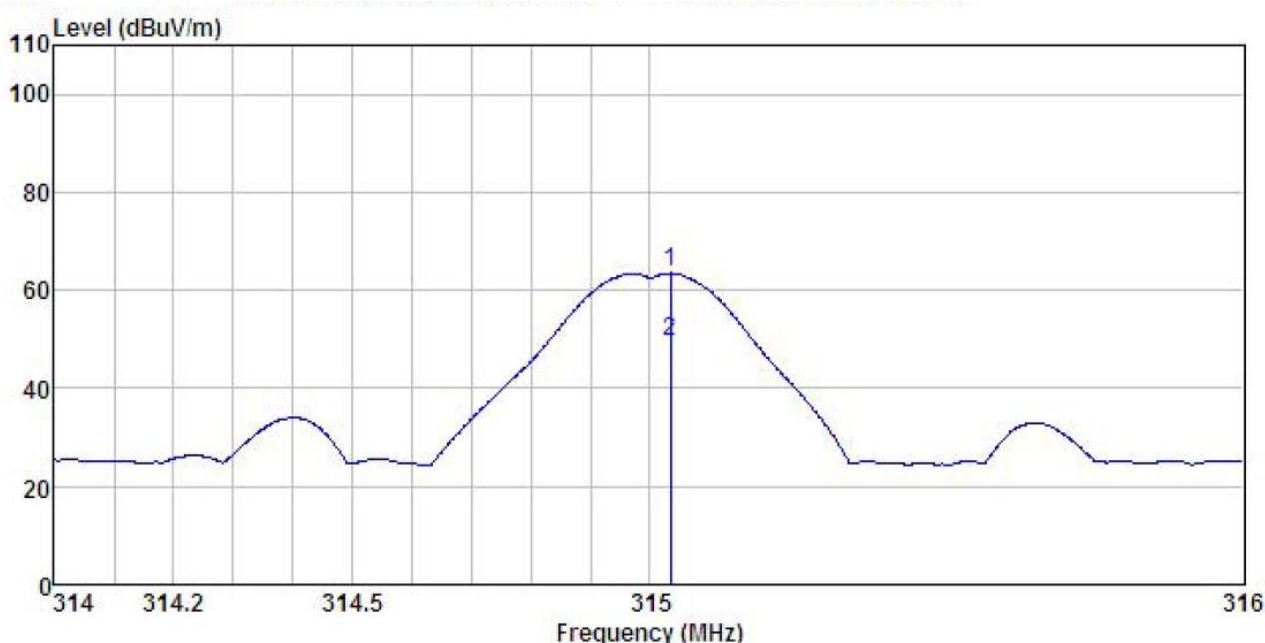
6.2.1 Field Strength Of The Fundamental Signal

Peak value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
315	46.61	13.92	2.99	0.00	63.52	95.62	-32.10	Vertical
315	66.27	13.92	2.99	0.00	83.18	95.62	-12.44	Horizontoal
Average value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
315	32.57	13.92	2.99	0.00	49.48	75.62	-26.14	Vertical
315	51.45	13.92	2.99	0.00	68.36	75.62	-7.26	Horizontoal

Note:dutycycle=100%

Test Plots:

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	315 MHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Humi: 57%

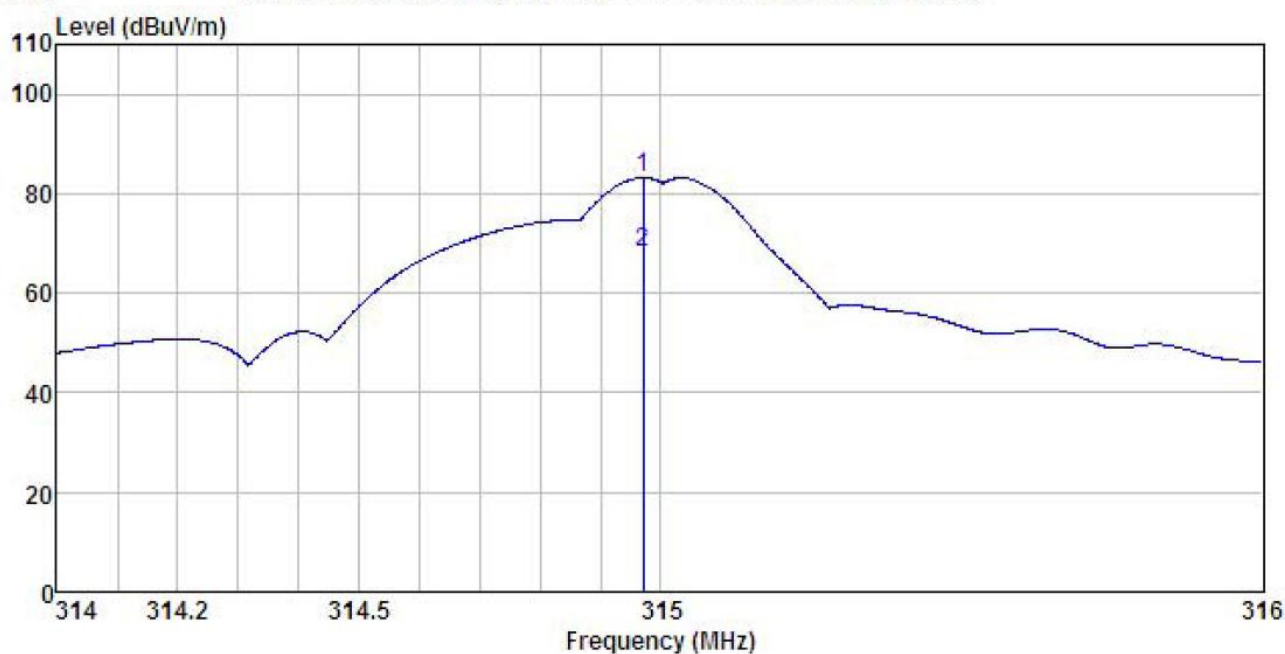


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	315.034	46.61	13.92	2.99	0.00	63.52	-----	-----	Peak
2	315.034	32.57	13.92	2.99	0.00	49.48	-----	-----	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	315 MHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	314.970	66.27	13.92	2.99	0.00	83.18	-----	-----	Peak
2	314.970	51.45	13.92	2.99	0.00	68.36	-----	-----	Average

Remark:

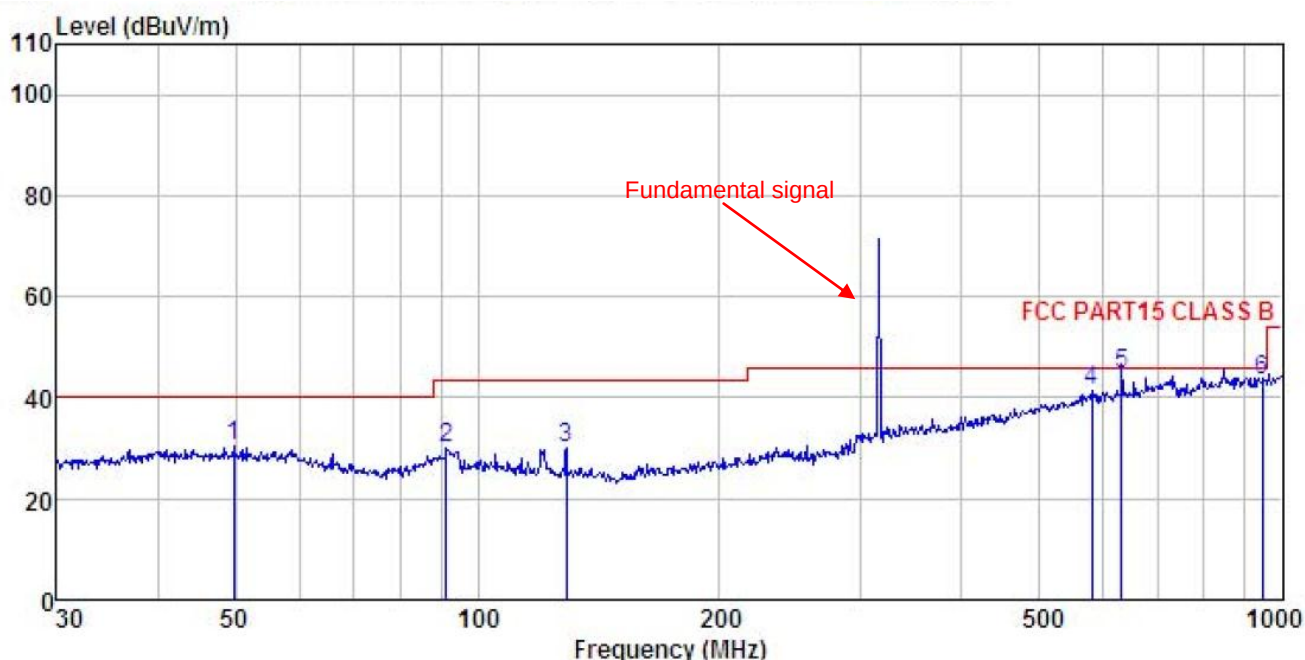
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

6.2.2 Spurious Emissions

Below 1GHz (30MHz-1000MHz)								
Quasi-peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
630.00	21.16	19.64	3.89	0.00	44.69	55.62	-10.93	Vertical
945.00	16.67	22.68	4.16	0.00	43.51	55.62	-12.11	Vertical
630.00	18.53	19.64	3.89	0.00	42.06	55.62	-13.56	Horizontal
945.00	16.55	22.68	4.16	0.00	43.39	55.62	-12.23	Horizontal

Test Plots:

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%

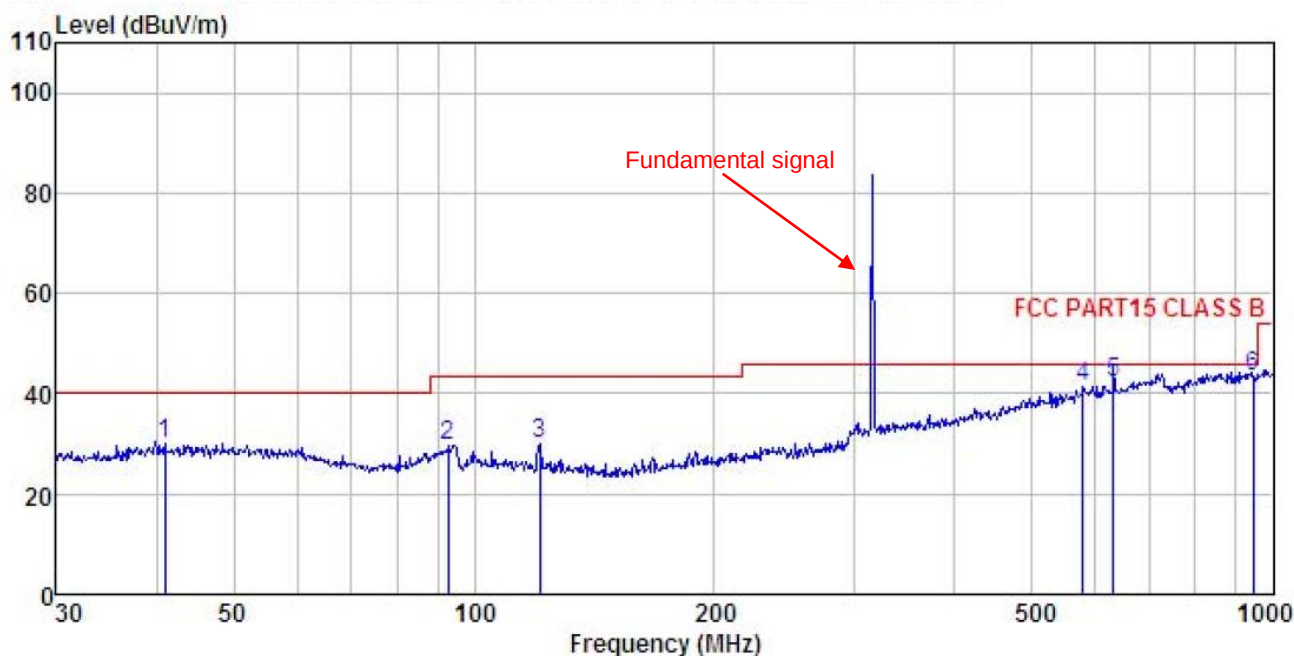


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	49.707	17.01	12.12	1.26	0.00	30.39	40.00	-9.61	QP
2	91.495	17.39	10.43	2.03	0.00	29.85	43.50	-13.65	QP
3	129.015	17.45	10.25	2.27	0.00	29.97	43.50	-13.53	QP
4	580.703	18.20	19.11	3.92	0.00	41.23	46.00	-4.77	QP
5	631.688	21.16	19.64	3.89	0.00	44.69	46.00	-1.31	QP
6	945.440	16.67	22.68	4.16	0.00	43.51	46.00	-2.49	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%

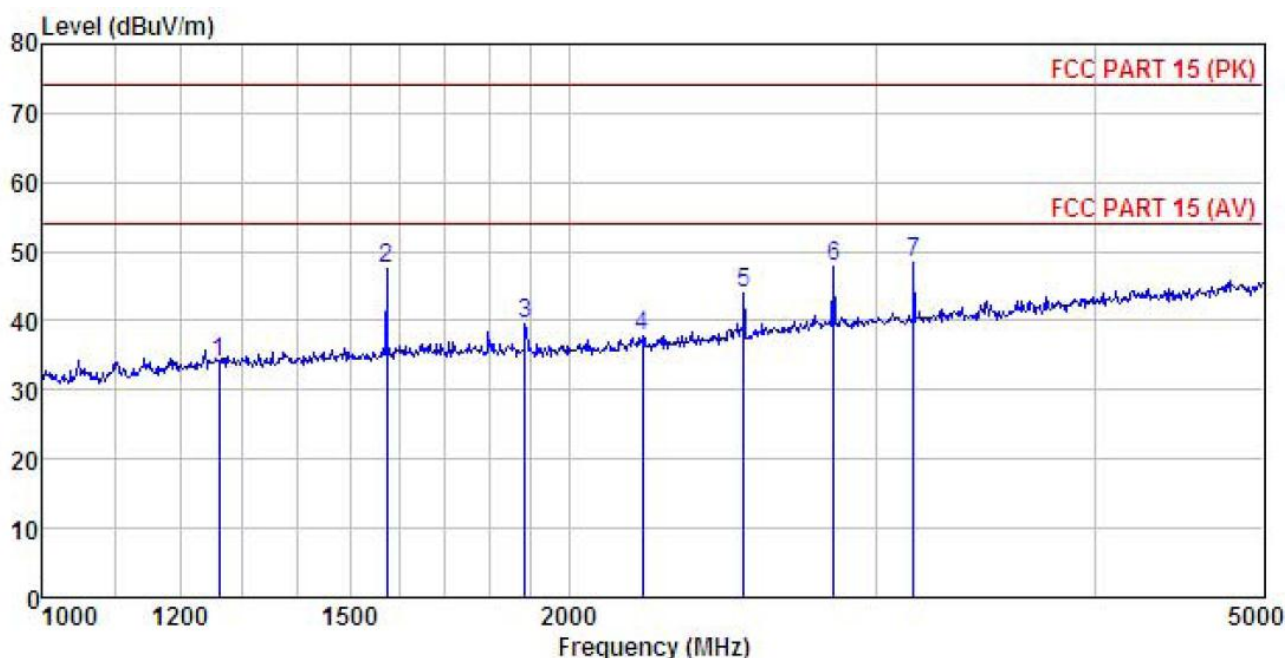


	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	40.988	16.44	12.38	1.22	0.00	30.04	40.00	-9.96	QP
2	92.787	16.75	10.76	2.03	0.00	29.54	43.50	-13.96	QP
3	120.699	17.09	10.85	2.18	0.00	30.12	43.50	-13.38	QP
4	578.670	18.62	19.06	3.92	0.00	41.60	46.00	-4.40	QP
5	631.688	18.53	19.64	3.89	0.00	42.06	46.00	-3.94	QP
6	945.440	16.55	22.68	4.16	0.00	43.39	46.00	-2.61	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Vertical
Test Voltage:	DC 3V	Environment:	Temp: 24°C Humi: 57%

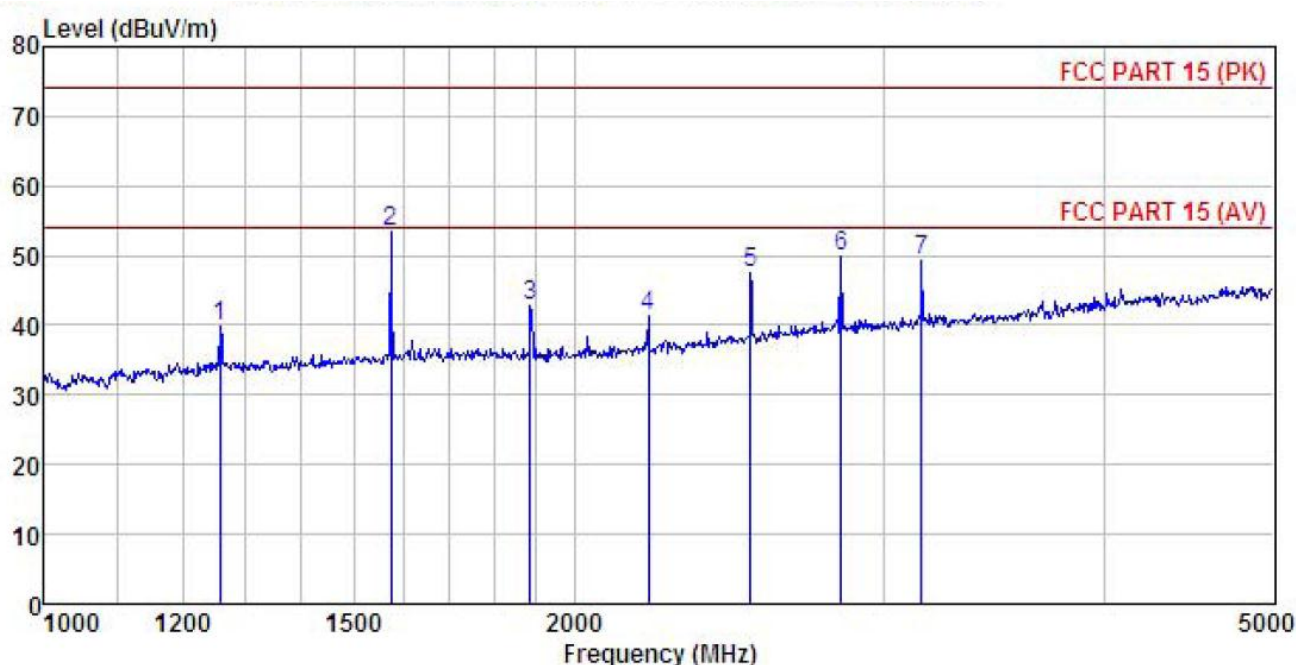


	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1260.816	45.71	24.66	3.41	41.05	33.97	74.00	-40.03	Peak
2	1574.380	58.07	25.32	3.82	41.03	47.57	74.00	-26.43	Peak
3	1888.396	49.55	25.69	4.22	41.41	39.60	74.00	-34.40	Peak
4	2203.912	46.98	26.49	4.50	41.68	37.93	74.00	-36.07	Peak
5	2518.887	51.77	27.45	4.85	41.90	43.88	74.00	-30.12	Peak
6	2837.478	54.30	28.17	5.18	41.63	47.86	74.00	-26.14	Peak
7	3150.399	53.86	28.53	5.40	41.43	48.34	74.00	-25.66	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Keyless transmitter	Product Model:	RT-HK4
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Horizontal
Test Voltage:	DC 3V	Environment:	Temp: 24℃ Humi: 57%

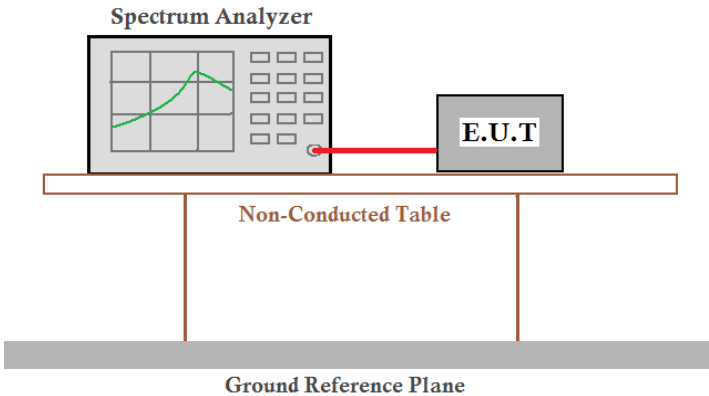


	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1258.788	51.60	24.66	3.41	41.05	39.85	74.00	-34.15	Peak
2	1574.380	63.87	25.33	3.82	41.03	53.38	74.00	-20.62	Peak
3	1888.396	52.77	25.69	4.22	41.41	42.82	74.00	-31.18	Peak
4	2203.912	50.43	26.50	4.50	41.68	41.39	74.00	-32.61	Peak
5	2518.887	55.45	27.45	4.85	41.90	47.56	74.00	-26.44	Peak
6	2837.478	56.25	28.16	5.18	41.63	49.80	74.00	-24.20	Peak
7	3150.399	54.91	28.53	5.40	41.43	49.39	74.00	-24.61	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.3 20dB Bandwidth

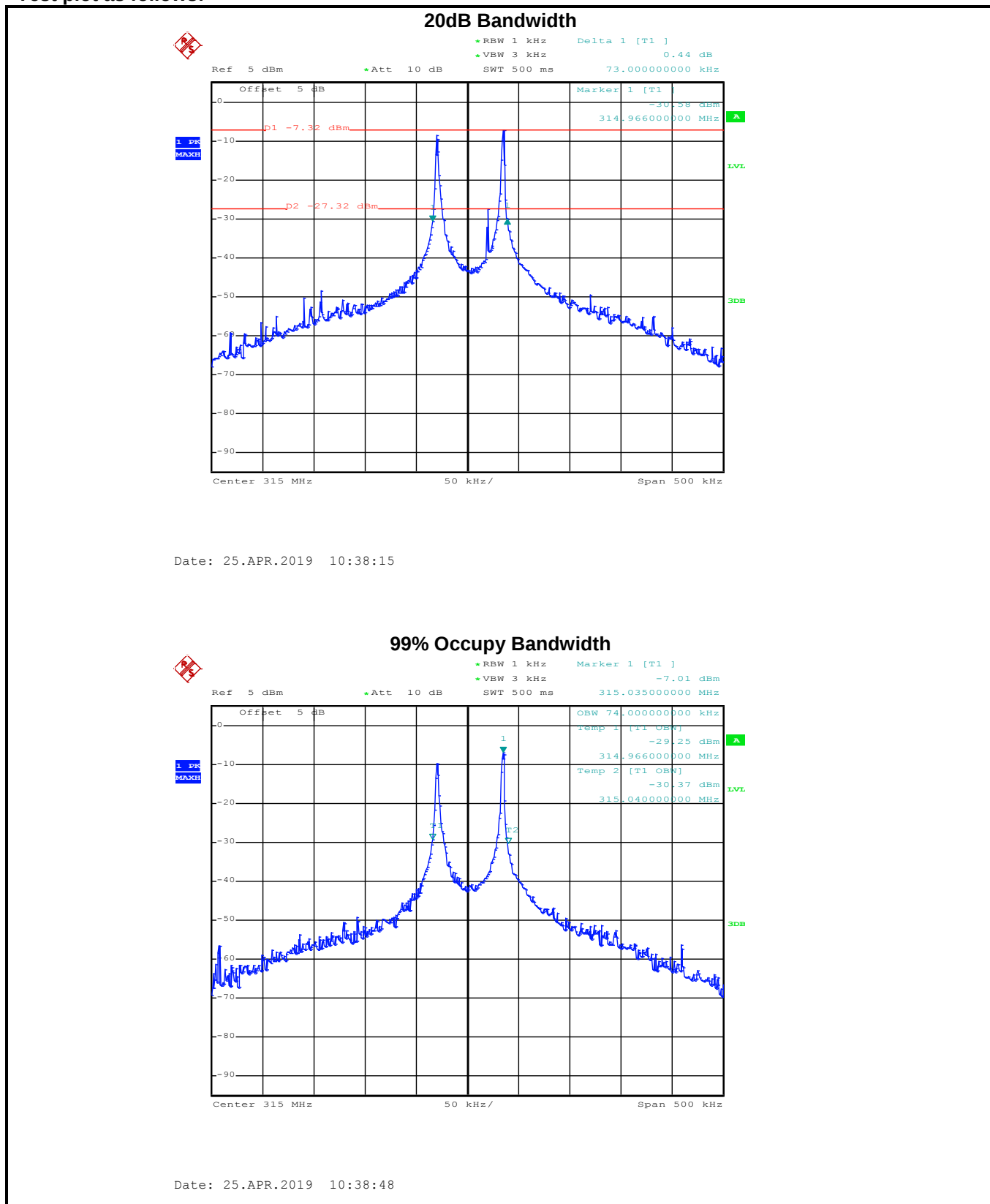
Test Requirement:	FCC Part15 C Section 15.231 (c) RSS-210 Annex A Section A.1.3
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

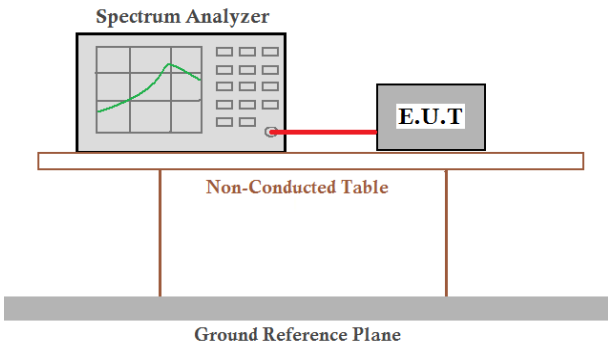
20dB bandwidth (MHz)	Limit (MHz)	99% Occupy Bandwidth (MHz)	Results
0.073	0.7875	0.074	Passed

Note: Limit= Fundamental frequency×0.25%=315×0.25%=0.7875MHz

Test plot as follows:



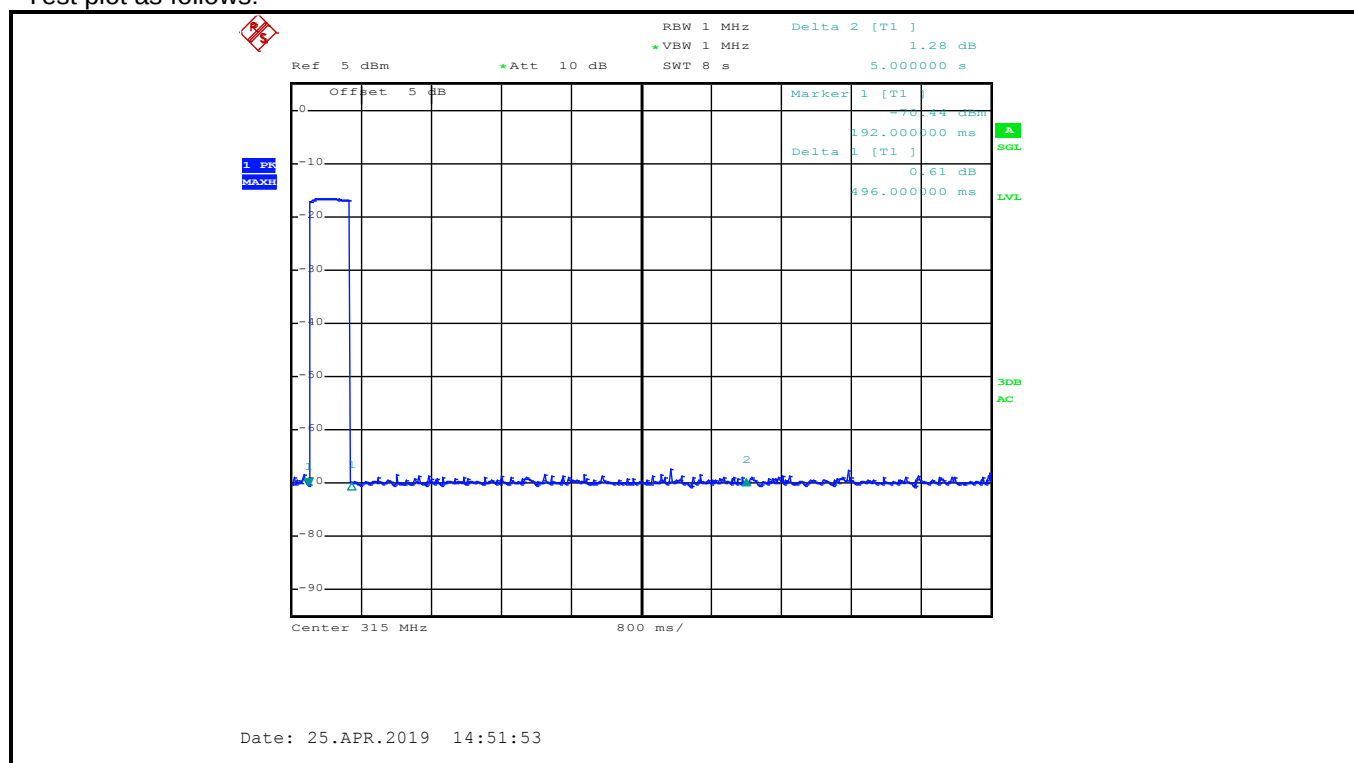
6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a) (1) RSS-210 Annex A Section A.1.1 (a)
Test Method:	ANSI C63.10: 2013
Receiver setup:	RBW=100kHz, VBW=300kHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmission, and read the transmission time.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

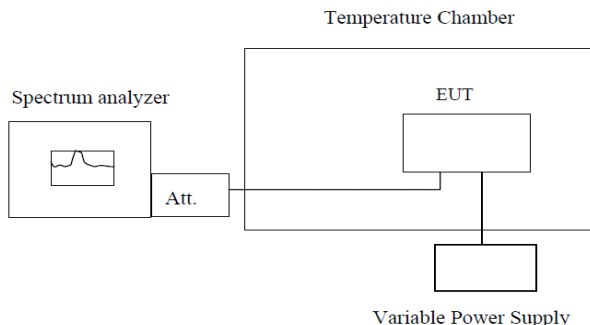
Measurement Data

Duration time (second)	Limit (second)	Result
0.496	<5.0	Pass

Test plot as follows:



6.5 Frequency stability

Test Requirement:	RSS-GEN Section 8.11
Test Method:	RSS-GEN Section 6.11
Limit:	kept within at least the central 80% of its permitted operating frequency band.
Test setup:	 Note : Measurement setup for testing on Antenna connector
Test procedure:	1. The EUT is installed in an environment test chamber with external power source. 2. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT. 3. A sufficient stabilization period at each temperature is used prior to each frequency measurement. 4. When temperature is stabled, measure the frequency stability. 5. The test shall be performed under -20 to 50 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data (worst case):

Voltage vs. Frequency Stability

Test conditions		Measurement Frequency (MHz)	Limit (MHz)
Temp(°C)	Voltage(dc)		
20	3.2V	315.0358	281 ~ 449
	3.0V	315.0350	
	2.5V	315.0342	

Note: EUT stops working when the supply voltage is lower than DC 2.5V.

Temperature vs. Frequency Stability

Test conditions		Frequency(MHz)	Limit (MHz)
Voltage(dc)	Temp(°C)		
3 V	-20	315.0342	281 ~ 449
	-10	315.0343	
	0	315.0345	
	10	315.0350	
	20	315.0350	
	30	315.0351	
	40	315.0352	
	50	315.0358	

Test plot as follows:

