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-VNT4
FCC ID:	2AOKM-VN2
IC :	24223-VN2
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C,15.231 RSS-Gen Issue 5 April 2018 RSS-210 Issue 9 August 2016,Annex A
Date of sample receipt:	25 Sep., 2018
Date of Test:	25 Sep., to 30 Sep., 2018
Date of report issue:	10 Oct., 2018
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	*10 Oct., 2018*	*Original*

Prepared By: Carey Chen ***Date:*** *10 Oct., 2018*

Test Engineer

Check By: Winner Zhang ***Date:*** *10 Oct., 2018*

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 and 99% Bandwidth	15.231 (c)	RSS-210 A.1.3 RSS-GEN 6.7	Pass
Duration time	15.231 (a1)	RSS-210 Annex A Section A.1.1 (a)	Pass
Frequency stability	/	RSS-GEN 6.11 8.11	Pass
Conducted Emission	15.207	RSS-GEN 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 of Applicant:	310 ALDER RD, DOVER DE 19904 USA
Manufacturer:	Remote Tech LLC
Address of Manufacturer:	310 ALDER RD, DOVER DE 19904 USA

5.2 General Description of E.U.T.

Product Name:	keyless transmitter
Model No.:	RT-VNT4
Operation Frequency:	315MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	PCB antenna
Antenna gain:	0 dBi
Power supply:	DC 3V (CR2032 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

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)	80.87	80.85	80.83
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)

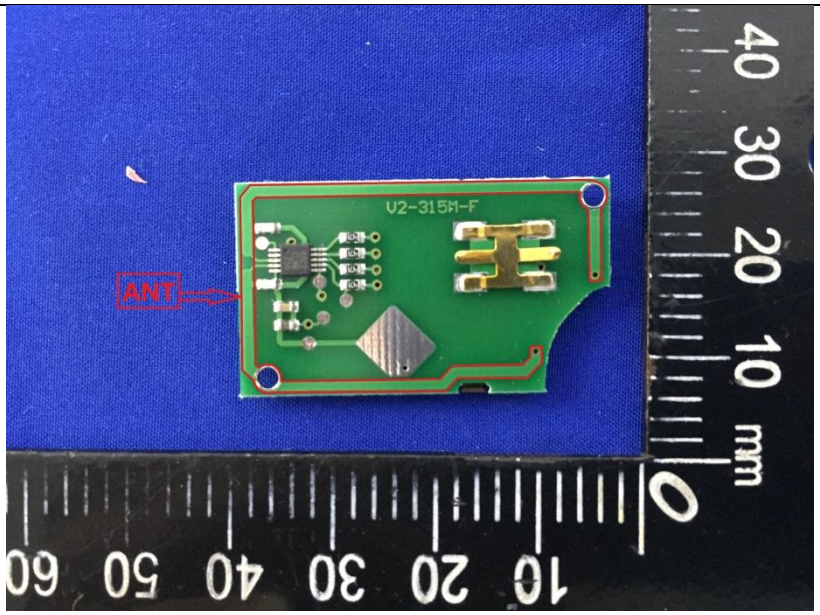
5.8 Test Instruments list

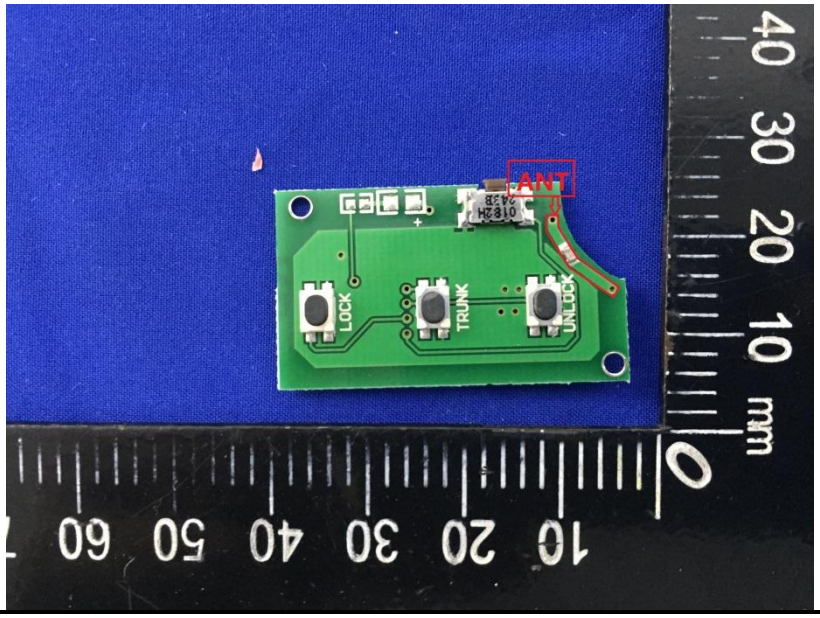
Radiated Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2017	11-20-2018
Loop Antenna	SCHWARZBECK	FMZB 1519 B	00044	04-28-2018	04-27-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2018	03-06-2019
Pre-amplifier	CD	PAP-1G18	11804	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2017	11-20-2018
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-07-2018	03-06-2019
Simulated Station	Anritsu	MT8820C	6201026545	03-07-2018	03-06-2019
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2018	03-06-2019
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2018	03-06-2019
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2018	03-06-2019
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	10-31-2017	10-30-2018
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)/15.209 RSS-210 Annex A Section A.1.2 (a)(b)
Test Method:	ANSI C63.10:2013
Test Frequency Range:	30MHz to 3500MHz
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

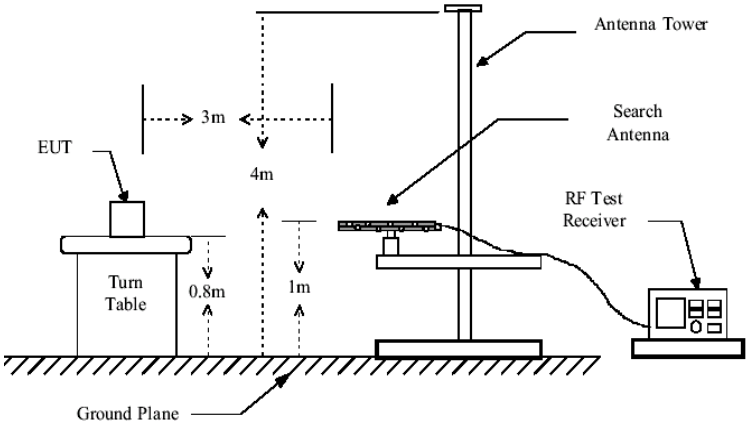
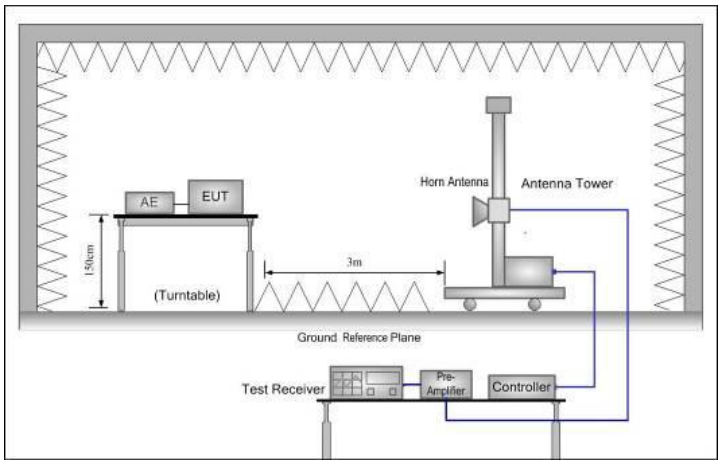
Limit:
(Spurious Emissions)

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

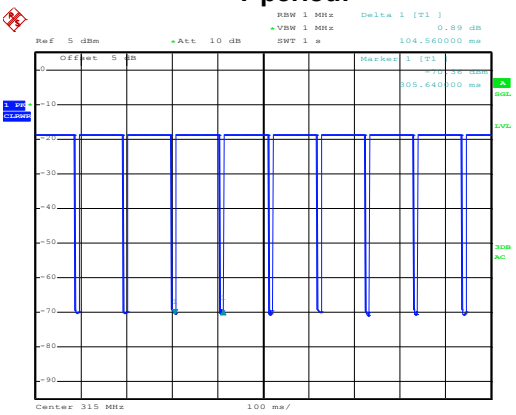
6.2.1 Field Strength Of The Fundamental Signal

Peak value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)		Polarization
315	49.59	13.92	2.99	0.00	66.5	95.62		Vertical
315	63.96	13.92	2.99	0.00	80.87	95.62		Horizontoal

Average value					
Frequency (MHz)	Level (dBuV/m)	Duty Cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Polarization
315	66.5	-5.80	60.7	75.62	Vertical
315	80.87	-5.80	75.07	75.62	Horizontoal

Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor = 20log(Duty cycle)
	Duty cycle = on time/100 milliseconds or period, whichever is less
Test data:	T on time =1.06X32+0.56X31=33.92+17.36=51.28(ms)
	T period =104.56(ms)>100(ms)
	Duty cycle =51.28%
	Duty cycle factor = 20log(Duty cycle) = -5.80

T period:



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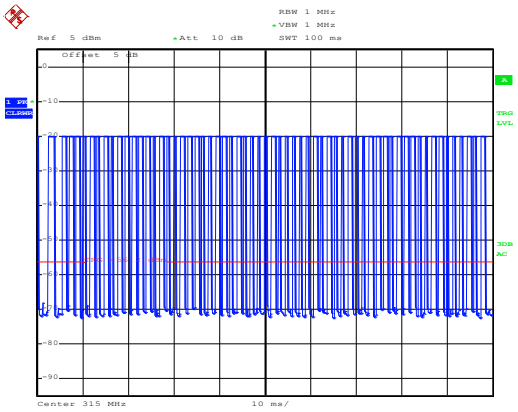
T 100ms:



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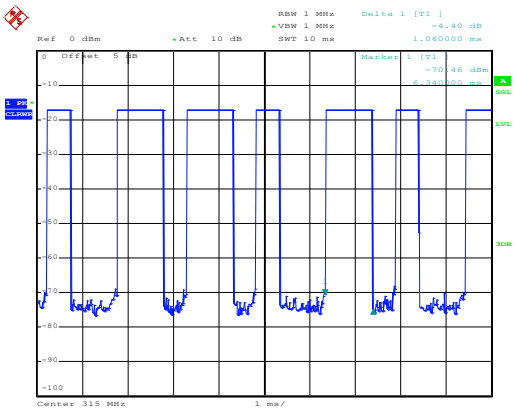
T on time slot-1:



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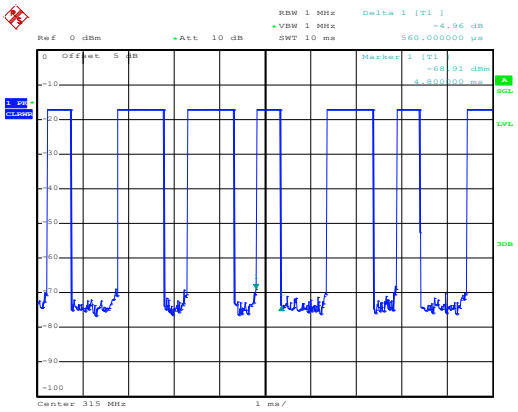
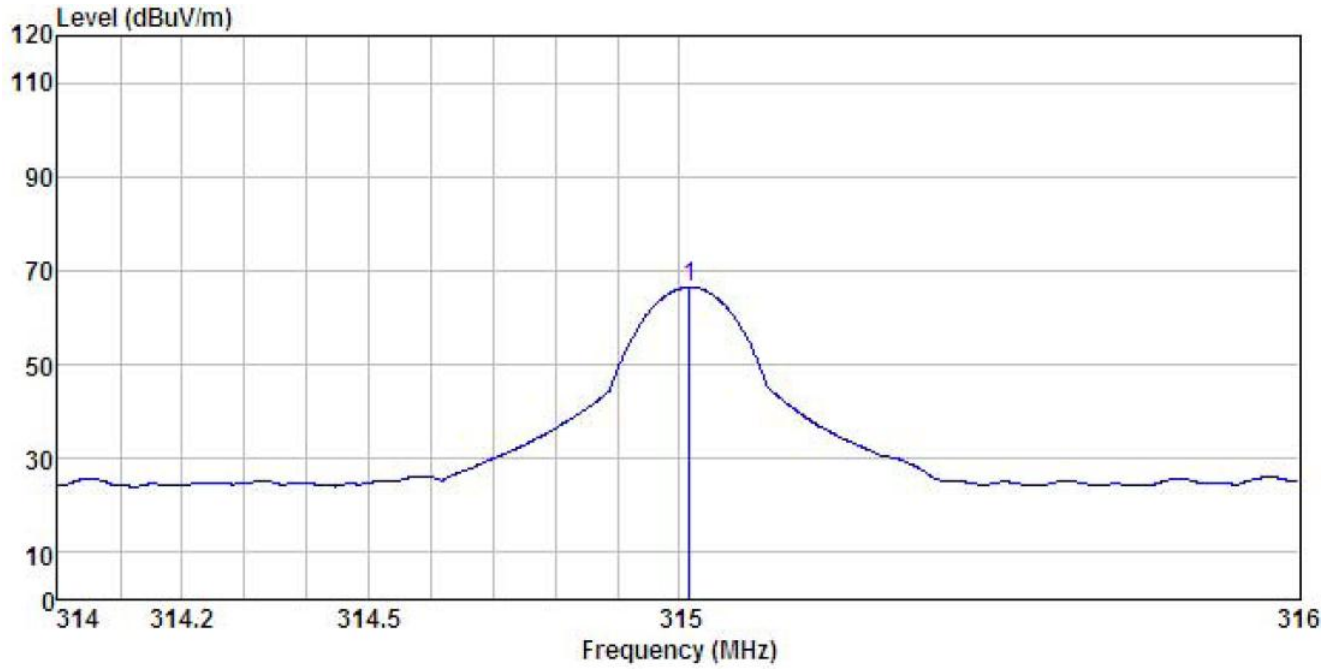
T on time slot-2:



Date: 29.SEP.2018 18:01:52

Test Plots:

Product Name:	keyless transmitter	**Product Model:**	RT-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	315 MHz	**Polarization:**	Vertical
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%

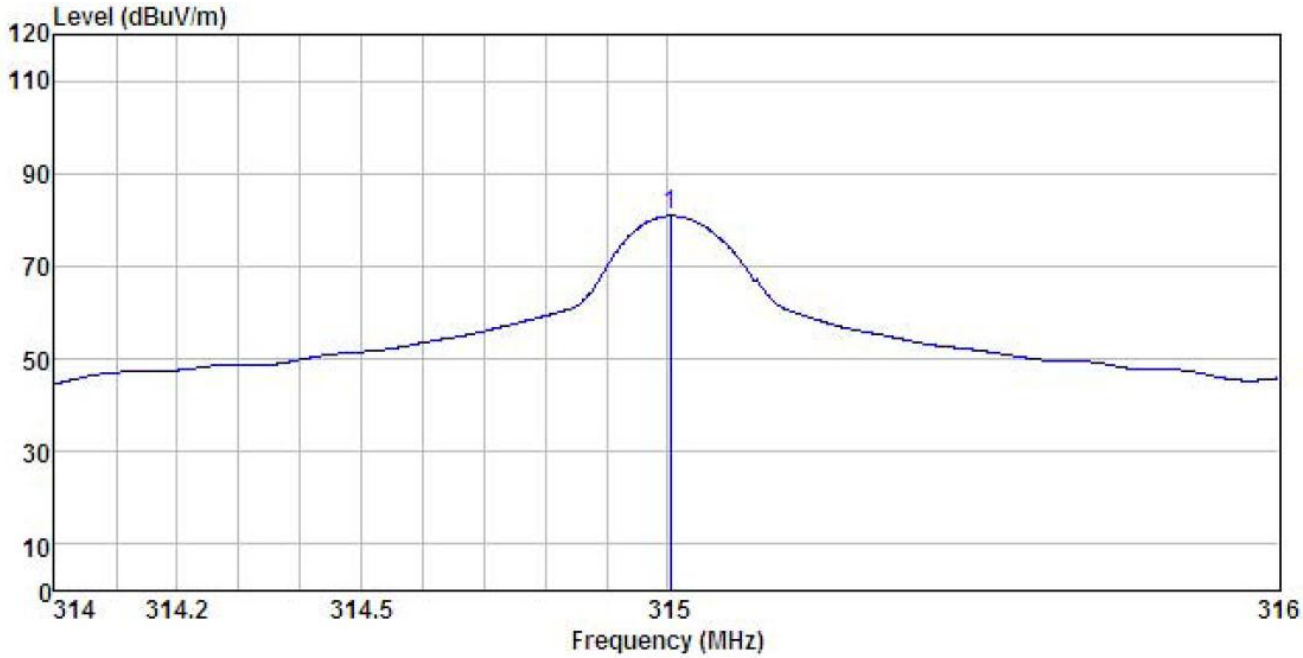


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	315.016	49.59	13.92	2.99	0.00	66.50	------	------	

Remark:

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

Product Name:	keyless transmitter	**Product Model:**	RT-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	315 MHz	**Polarization:**	Horizontal
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%



	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	315.004	63.96	13.92	2.99	0.00	80.87	------	------	

Remark:

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

6.2.2 Spurious Emissions

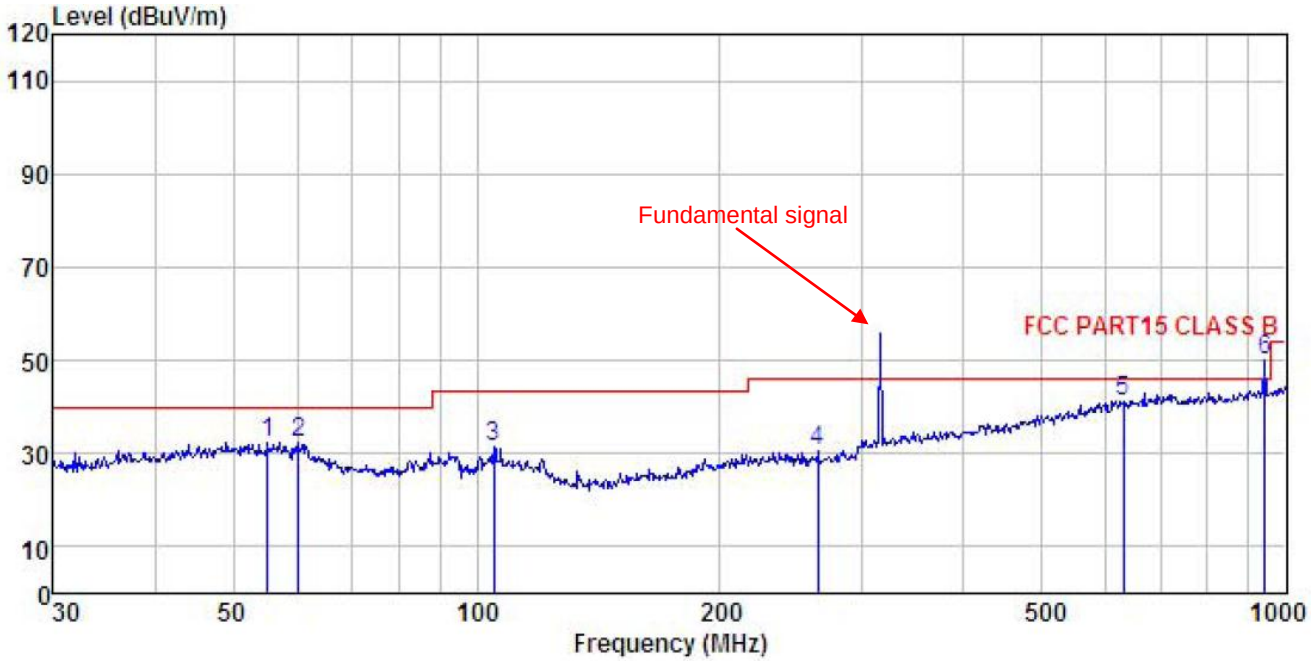
Below 1GHz (30MHz-1000MHz)								
Peak value								
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
629.477	17.55	19.56	3.89	0.00	41.00	75.62	-34.62	Vertical
942.131	23.66	22.38	4.13	0.00	50.17	75.62	-25.45	Vertical
629.477	16.89	19.56	3.89	0.00	40.34	75.62	-35.28	Horizontoal
942.131	20.09	22.38	4.13	0.00	46.60	75.62	-29.02	Horizontoal

Average value						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
629.477	41.00	-5.80	35.2	55.62	-20.42	Vertical
942.131	50.17	-5.80	44.37	55.62	-11.25	Vertical
629.477	40.34	-5.80	34.54	55.62	-21.08	Horizontoal
942.131	46.60	-5.80	40.8	55.62	-14.82	Horizontoal

Remark: Average value=Peak value + Duty Cycle Factor.

Test Plots:

Product Name:	keyless transmitter	**Product Model:**	RT-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%

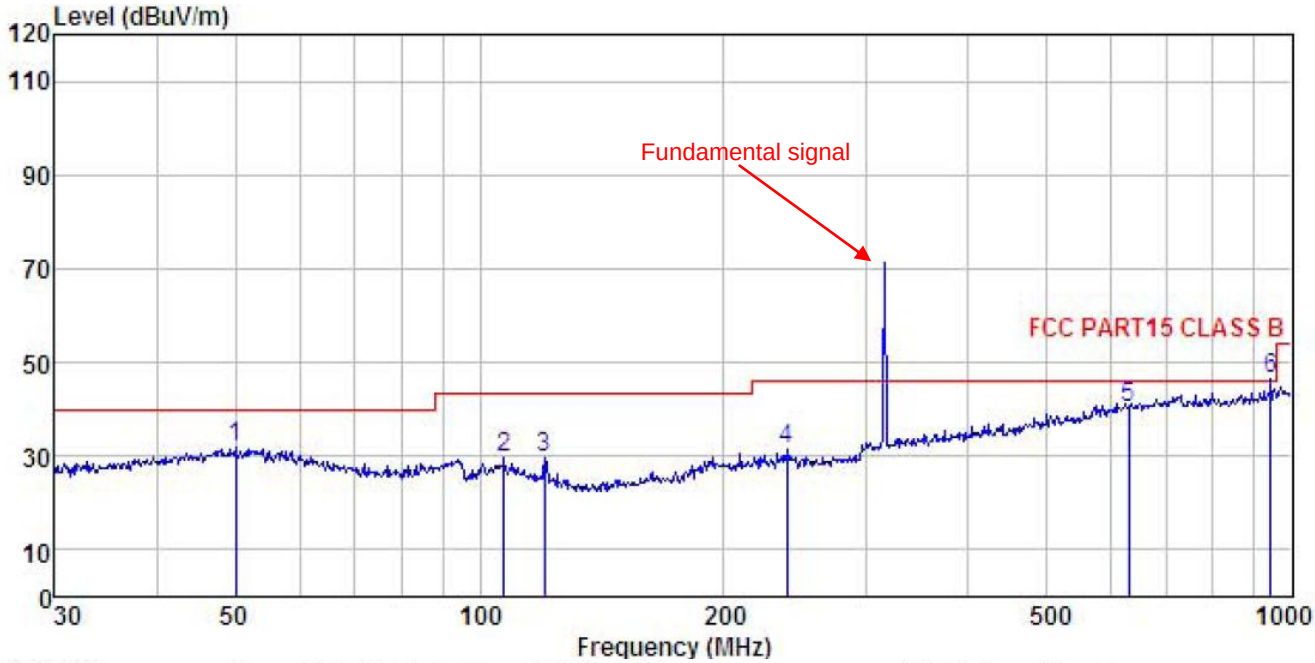


		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		55.221	17.94	13.17	1.36	0.00	32.47	40.00	-7.53	QP
2		60.280	18.73	12.30	1.38	0.00	32.41	40.00	-7.59	QP
3		104.903	17.62	12.00	2.00	0.00	31.62	43.50	-11.88	QP
4		263.819	14.36	13.39	2.85	0.00	30.60	46.00	-15.40	QP
5		629.477	17.55	19.56	3.89	0.00	41.00			Peak
6	*	942.131	23.66	22.38	4.13	0.00	50.17			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-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Horizontal
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%

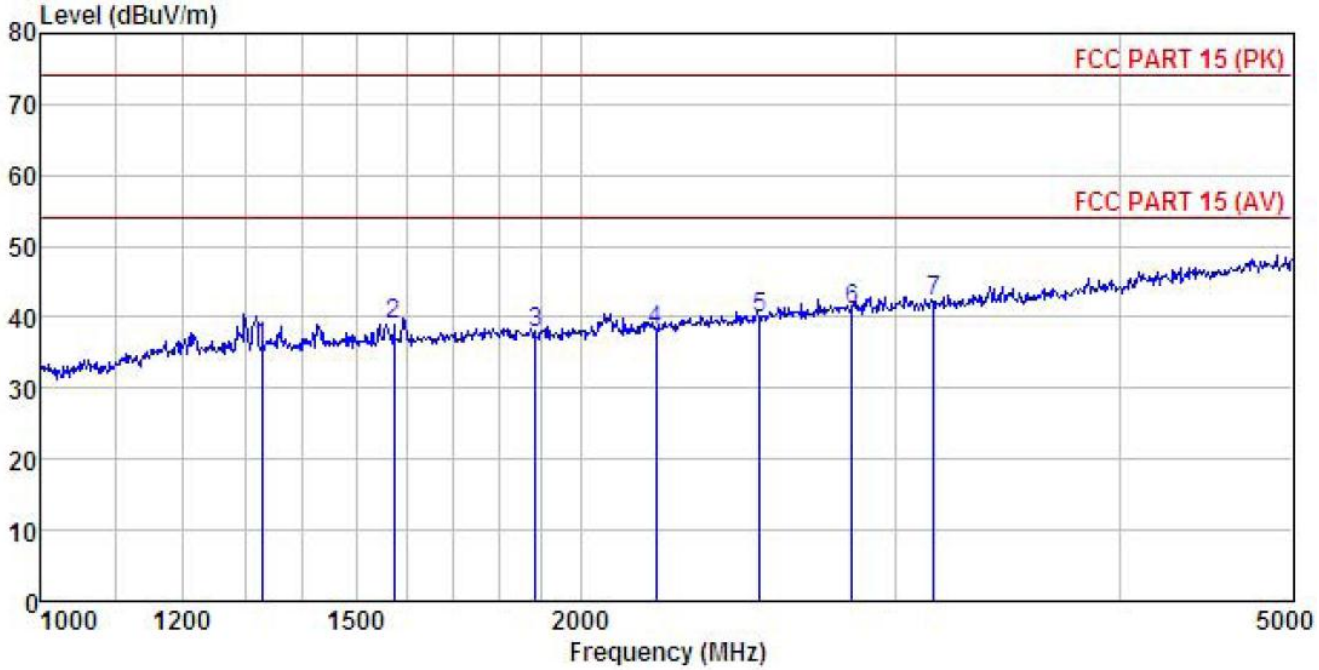


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	50.057	16.33	14.09	1.25	0.00	31.67	40.00	-8.33	QP
2	107.134	15.39	12.13	2.02	0.00	29.54	43.50	-13.96	QP
3	120.277	17.30	10.16	2.17	0.00	29.63	43.50	-13.87	QP
4	239.147	15.74	12.94	2.82	0.00	31.50	46.00	-14.50	QP
5	629.477	16.89	19.56	3.89	0.00	40.34			Peak
6 *	942.131	20.09	22.38	4.13	0.00	46.60			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-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	**Polarization:**	Vertical
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%

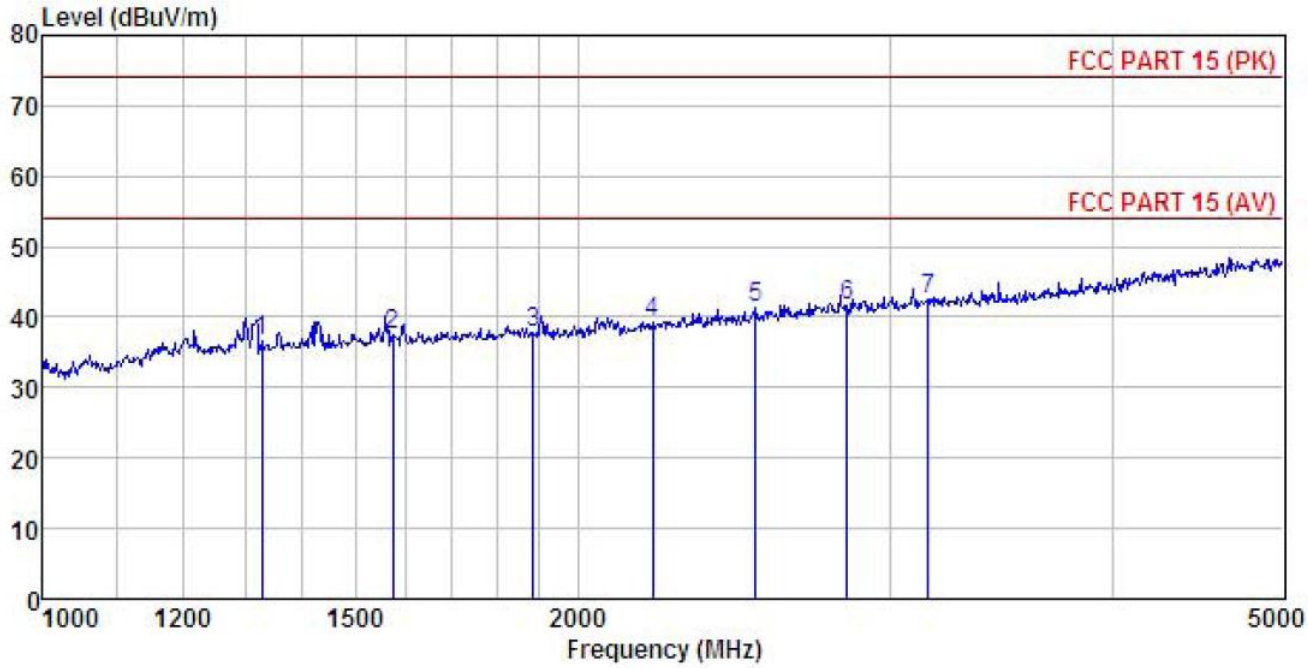


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1327.452	46.16	24.72	3.51	41.04	35.75	74.00	-38.25	Peak
2	1574.380	48.65	25.40	3.82	41.03	39.06	74.00	-34.94	Peak
3	1888.396	46.32	26.16	4.22	41.41	37.75	74.00	-36.25	Peak
4	2203.912	45.51	26.93	4.50	41.68	37.96	74.00	-36.04	Peak
5	2518.887	46.42	27.65	4.85	41.90	39.87	74.00	-34.13	Peak
6	2837.478	46.22	28.30	5.18	41.63	40.96	74.00	-33.04	Peak
7	3150.399	46.60	28.70	5.40	41.43	42.19	74.00	-31.81	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-VNT4
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	**Polarization:**	Horizontal
Test Voltage:	DC 3V	**Environment:**	Temp: 24℃ Huni: 57%

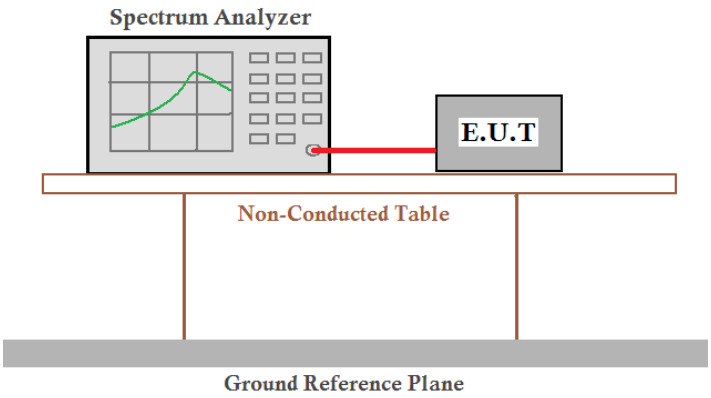


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1327.452	46.96	24.72	3.51	41.04	36.55	74.00	-37.45	Peak
2	1574.380	47.02	25.40	3.82	41.03	37.43	74.00	-36.57	Peak
3	1888.396	46.40	26.16	4.22	41.41	37.83	74.00	-36.17	Peak
4	2203.912	46.88	26.93	4.50	41.68	39.33	74.00	-34.67	Peak
5	2518.887	48.01	27.65	4.85	41.90	41.46	74.00	-32.54	Peak
6	2837.478	46.94	28.30	5.18	41.63	41.68	74.00	-32.32	Peak
7	3150.399	47.06	28.70	5.40	41.43	42.65	74.00	-31.35	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 C63.10:2013
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:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

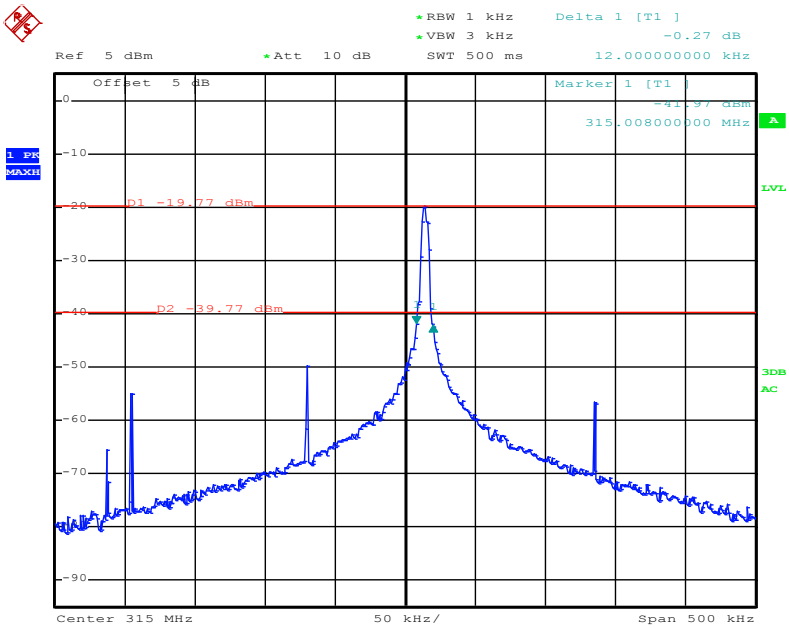
Measurement Data:

20dB bandwidth (MHz)	Limit (MHz)	99% Occupy Bandwidth (MHz)	Results
0.012	0.7875	0.012	Passed

Note: 20dB bandwidth Limit= Fundamental frequency×0.25%=315×0.25%=0.7875MHz

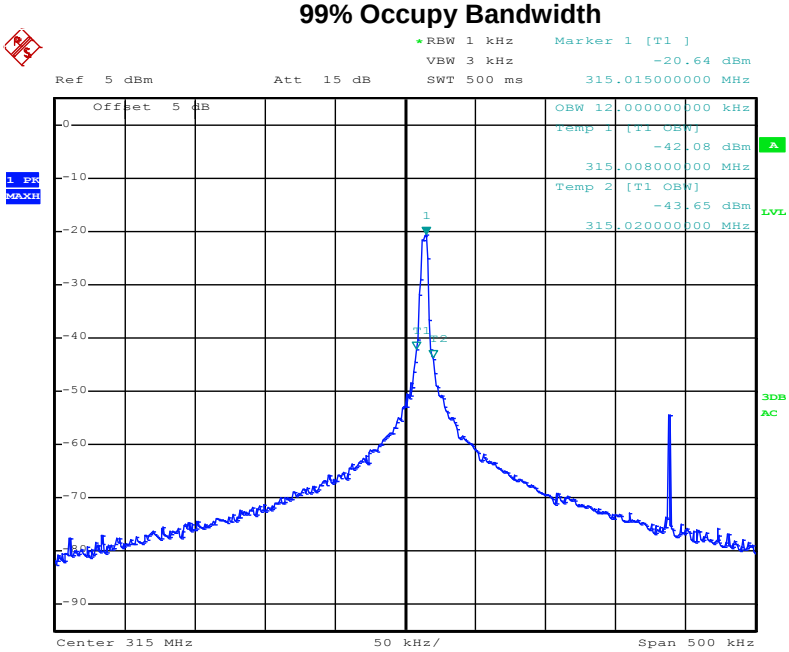
Test plot as follows:

20dB Bandwidth



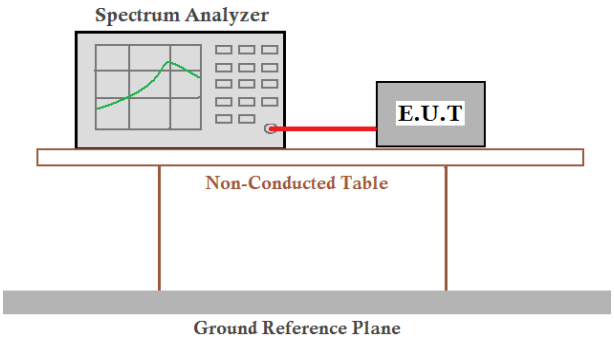
Date: 27.SEP.2018 23:39:43

99% Occupy Bandwidth



Date: 30.SEP.2018 21:05:35

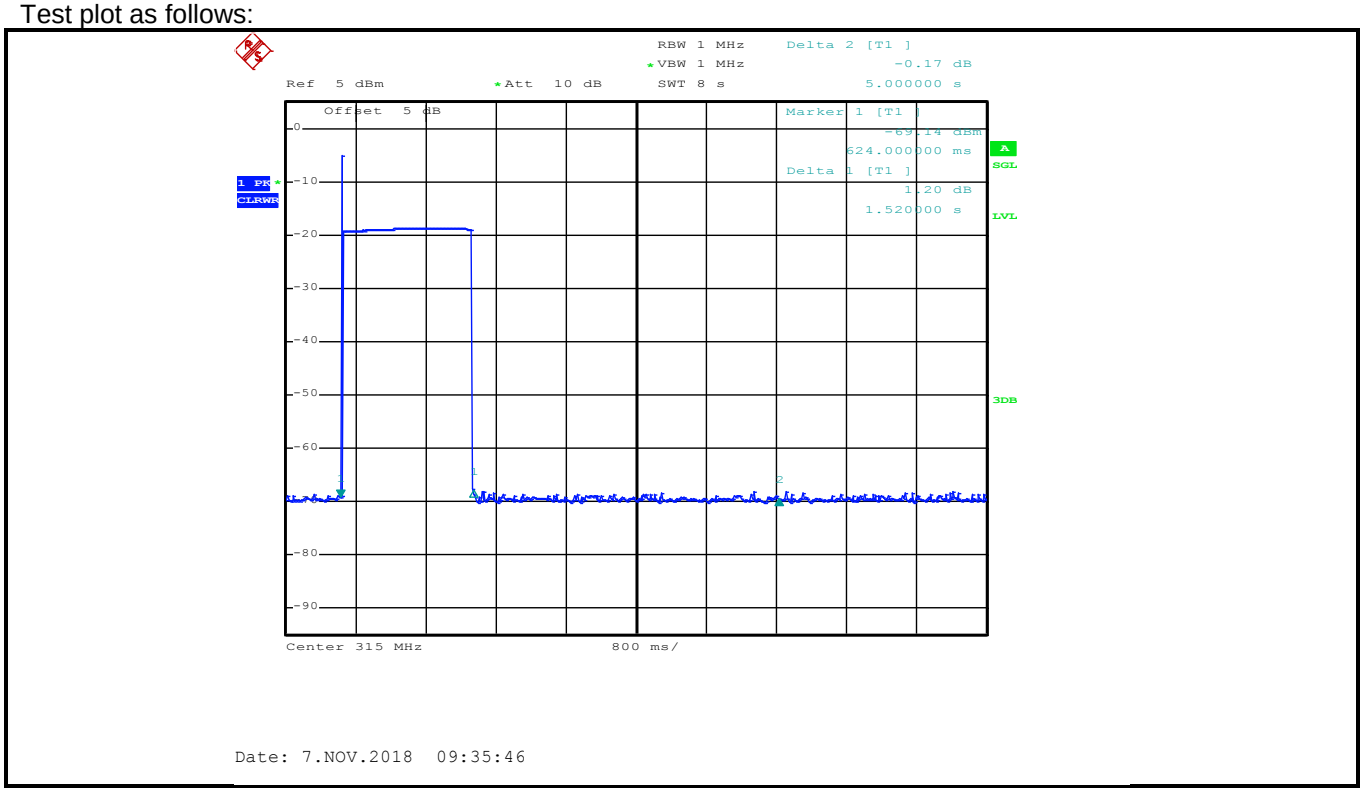
6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a1) RSS-210 Annex A Section A.1.1 (a)
Test Method:	ANSI C63.10: 2013
Receiver setup:	RBW=1MHz, VBW=1MHz, 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:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

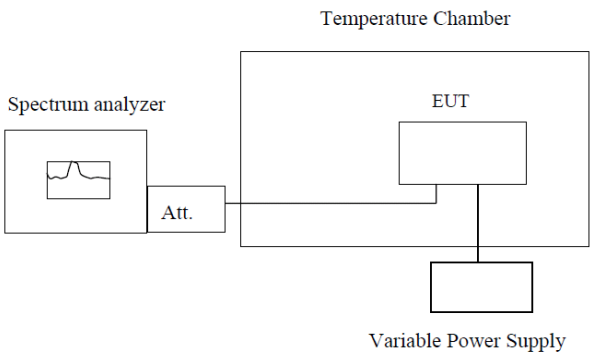
Measurement Data

Duration time (second)	Limit (second)	Result
1.52	<5.0	Pass

Test plot as follows:



6.5 Frequency Stability

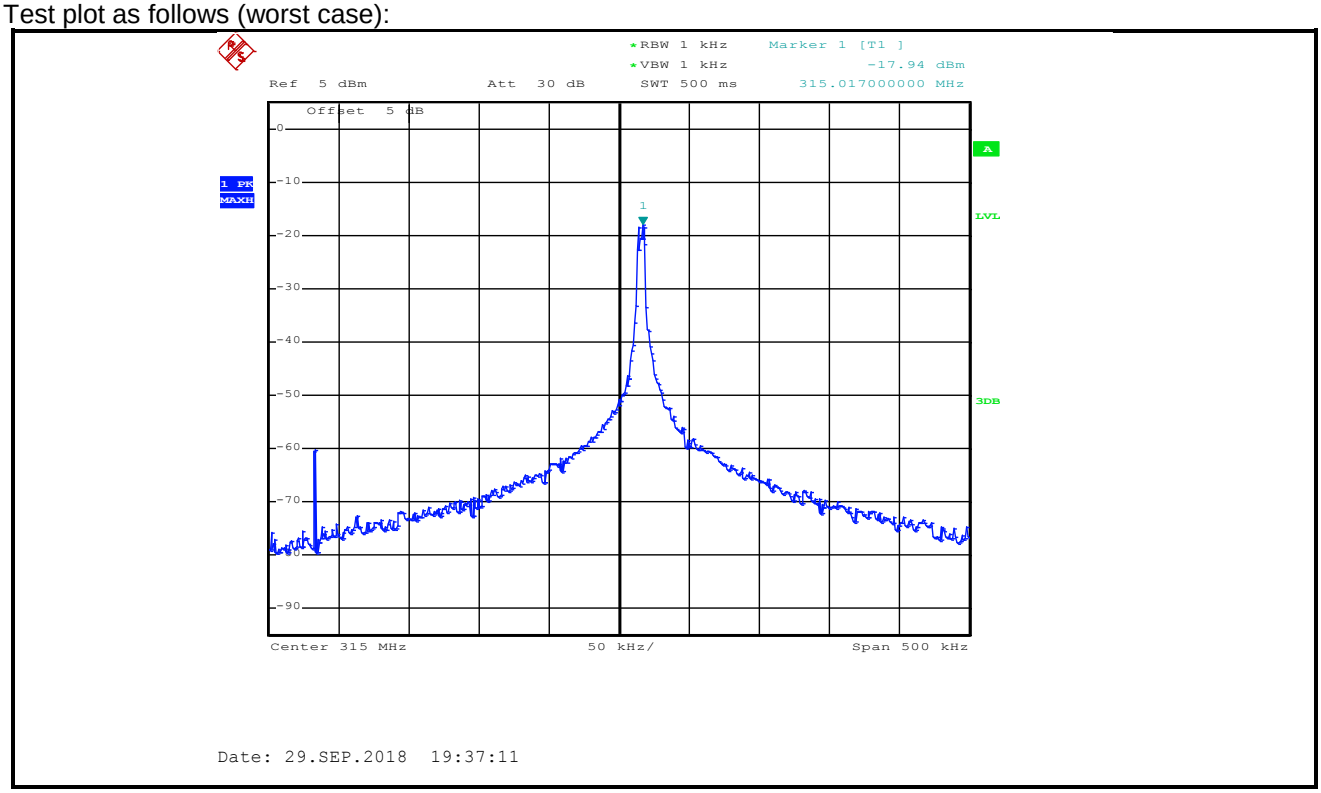
Test Requirement:	RSS-GEN Section 8.11
Test Method:	RSS-GEN Section 6.11
Limit:	kept within at least the central 80% of its permitted operating frequency band.
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. The EUT is installed in an environment test chamber 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:	Unmodulated carrier is not available, test at modulated carrier mode.
Test results:	Passed

Measurement Data:

Voltage vs. Frequency Stability

Test conditions		Measurement Frequency (MHz)	Limit (MHz)
Temp(℃)	Voltage(ac)		
20	3.2V	315.017	281 ~ 449
	3.0V	315.016	
	2.5V	315.015	
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(℃)		
3.0V	-20	315.017	281 ~ 449
	20	315.016	
	50	315.011	

Test plot as follows (worst case):