FCC&IC REPORT

Applicant:	Horizon Hobby, LLC
Address of Applicant:	4105 Fieldstone Rd.,Chanmpaign, IL 62822 USA
Equipment Under Test (EUT)	
Product Name:	MR210 Transmitter with Telemetry
Model No.:	MR210
Trade mark:	Dromida
FCC ID:	BRWMR210
Canada IC:	6157A-MR210
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 RSS-Gen Issue 5, April 2018 RSS-247 Issue 2, February 2017
Date of sample receipt:	31 Aug., 2018
Date of Test:	31 Aug., to 06 Sep., 2018
Date of report issued:	07 Sep., 2018
Test Result:	PASS *

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*07 Sep., 2018*	*Original*

Tested by: Carey Chen ***Date:*** *07 Sep., 2018*

Test Engineer

Reviewed by: Winner Zhang ***Date:*** *07 Sep., 2018*

Project Engineer

3 Contents

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4 Test Summary

Test Items	Section		Result
	FCC	IC	
Antenna Requirement	15.203	RSS-GEN 6.8	Pass
AC Power Line Conducted Emission	15.207	RSS-GEN Section 8.8	N/A
Conducted Peak Output Power	15.247 (b)(1)	RSS-247 Section 5.4 (b)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	RSS-247 Section 5.1 (a)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	RSS-247 Section 5.1 (b)	Pass
Hopping Channel Number	15.247 (a)(1)	RSS-247 Section 5.1 (d)	Pass
Dwell Time	15.247 (a)(1)(iii)	RSS-247 Section 5.1 (d)	Pass
Spurious Emission	15.205/15.209	RSS-GEN 8.9 8.10 RSS-247 Section 5.5	Pass
Band Edge	15.247(d)	RSS-GEN 8.9 8.10 RSS-247 Section 5.5	Pass
Frequency stability	/	RSS-GEN 6.11 8.11	Pass

Pass: The EUT complies with the essential requirements in the standard. N/A: Not Applicable.
Test according to ANSI C63.10-2013 ;KDB558074 D01 15.247 Meas Guidance v05

5 General Information

5.1 Client Information

Applicant:	Horizon Hobby, LLC
Address:	4105 Fieldstone Rd.,Chanmpaign, IL 62822 USA
Manufacturer:	Horizon Hobby, LLC
Address:	4105 Fieldstone Rd.,Chanmpaign, IL 62822 USA
Factory:	Shenzhen Yitianfu Electronics Technology Co., Ltd
Address:	3F, Bldg E, Jinchangda Technological Park, Zhangkengjin, Baoan District, Shenzhen 518110, China

5.2 General Description of E.U.T.

Product Name:	MR210 Transmitter with Telemetry
Model No.:	MR210
Operation Frequency:	2405MHz ~ 2475MHz
Transfer rate:	1Mbits/s
Number of channel:	71
Modulation type:	GFSK
Modulation technology:	FHSS
Antenna Type:	Internal Antenna
Antenna gain:	2.0dBi
Power supply:	DC6V (‘AAA’ * 4 battery)

Test channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
Lowest	2405MHz	Middle	2440MHz	Highest	2475MHz
Remark: According to the ID number of each remote controller, 15 frequency points are randomly generated in the frequency band of 2405 ~ 2475MHz.					

NOTE: The system works in the frequency range of 2405MHz to 2475MHz. This band has been divided to 71 independent channels. Each radio system uses 15 different channels; the minimum channel separation is >2MHz.

5.3 Test environment and test mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Modes: new battery is used during all test	
Non-hopping mode:	Keep the EUT in continuous transmitting mode with worst case data rate.
Hopping mode:	Keep the EUT in hopping mode.
The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working with a fresh battery, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

5.4 Description of Support Units

The EUT has been tested as an independent unit.

5.5 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)

5.6 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

5.7 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

5.8 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
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-16-2018	03-15-2019
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	BBHA 9170	BBHA9170582	11-21-2017	11-20-2018
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
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
RF Switch Unit	MWRFTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTEST	MTS8200	Version: 2.0.0.0		
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

Conducted Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-07-2018	03-06-2019
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-07-2018	03-06-2019
LISN	CHASE	MN2050D	1447	03-19-2018	03-18-2019
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2018	07-20-2019
Cable	HP	10503A	N/A	03-07-2018	03-06-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		

6 Test results and measurement data

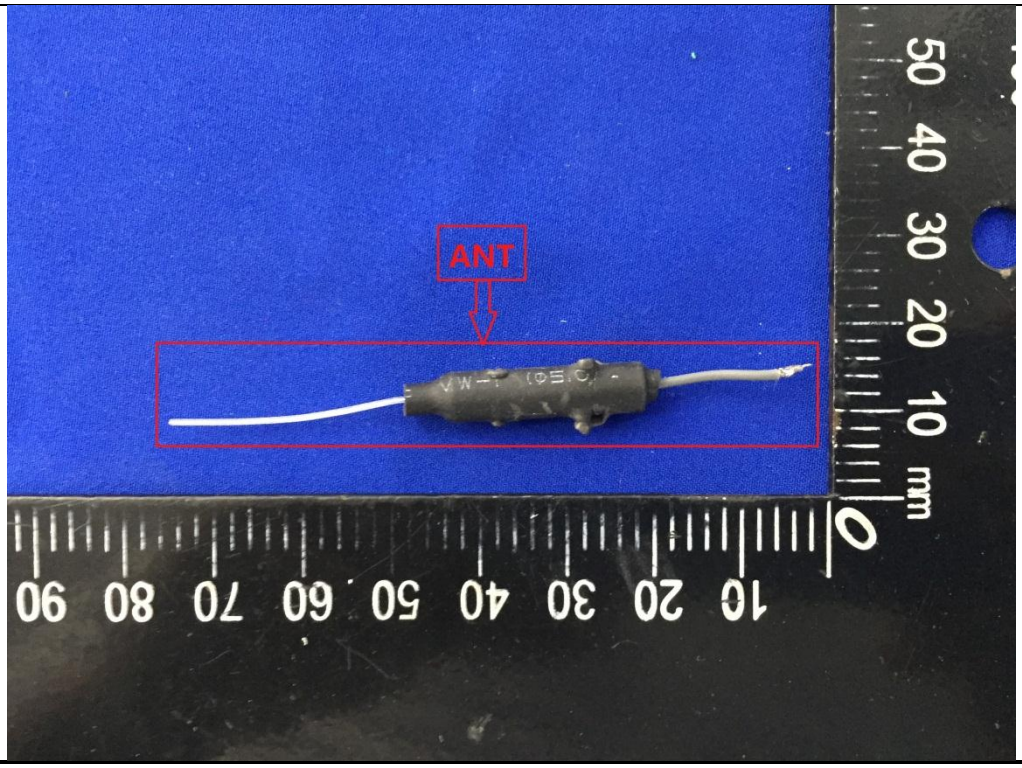
6.1 Antenna Requirement

Standard requirement:	FCC Part 15 C Section 15.203

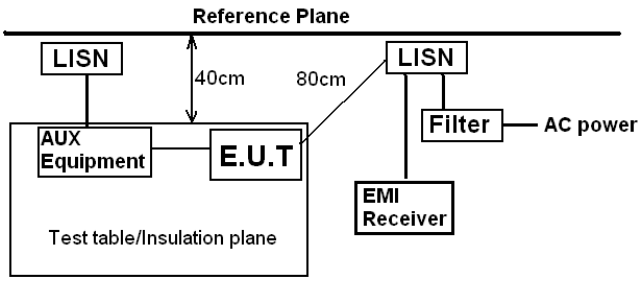
15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer 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.
15.247(c) (1)(i) requirement:
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:	

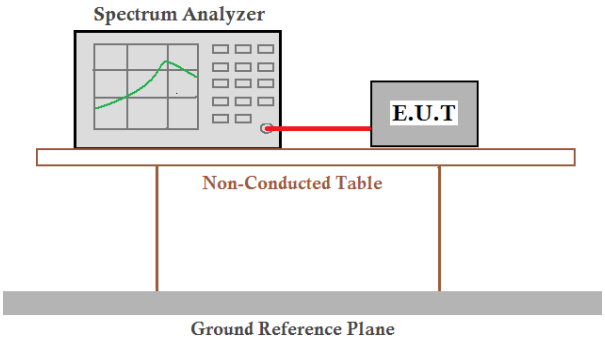
The EUT antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 2.0dBi.



6.2 Conducted Emissions

Test Requirement:	FCC Part 15 C Section 15.207, RSS-GEN Section 8.8		
Test Method:	ANSI C63.10:2013		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*		
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.		
Test Instruments:	Refer to section 5.8 for details		
Test mode:	N/A		
Test results:	N/A		

6.3 Conducted Output Power

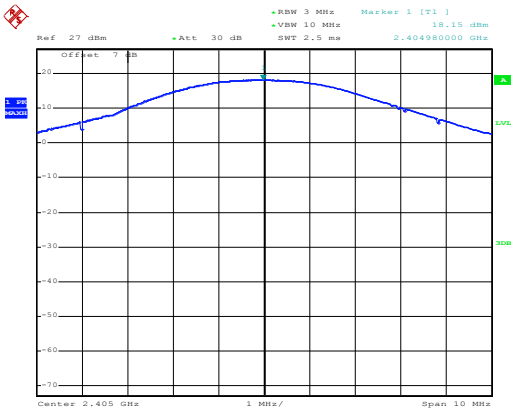
Test Requirement:	FCC Part 15 C Section 15.247 (b)(1), RSS-247 Section 5.4(b)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=3MHz, Detector=Peak (If 20dB BW ≤1 MHz) RBW=3MHz, VBW=10MHz, Detector=Peak (If 20dB BW > 1 MHz and < 3MHz)
Limit:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data:

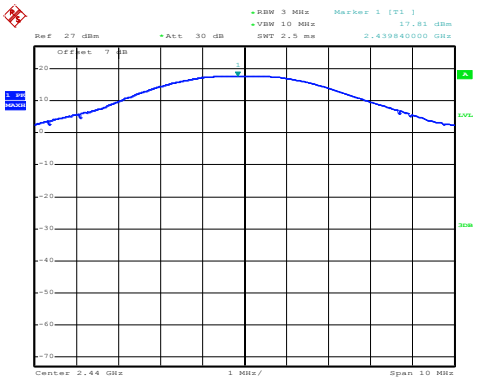
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	18.15	21.00	Pass
Middle	17.81	21.00	Pass
Highest	16.86	21.00	Pass

Max EIRP: 18.15dBm+2dBi=20.15dBm
10^2.015=0.1035W<4W

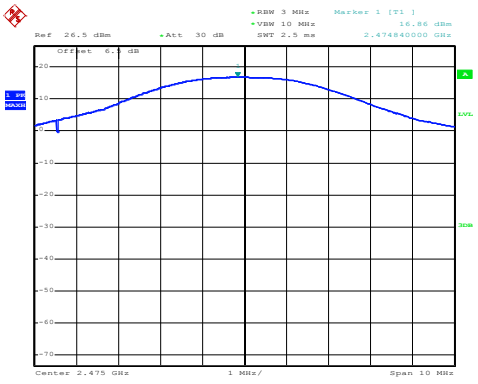
Test plot as follows:



Lowest channel

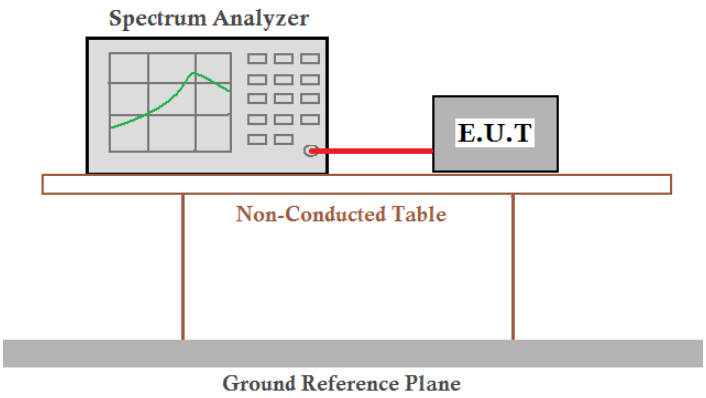


Middle channel



Highest channel

6.4 20dB and 99% Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1), RSS-247 Section 5.1(a)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=30 kHz, VBW=100 kHz, detector=Peak
Limit:	NA
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

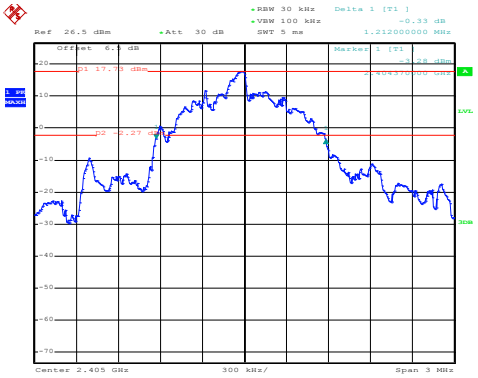
Measurement Data:

Test channel	20dB Occupy Bandwidth (kHz)	99% Occupy Bandwidth (kHz)
Lowest	1212	1296
Middle	1128	1128
Highest	1206	1182

Test plot as follows:

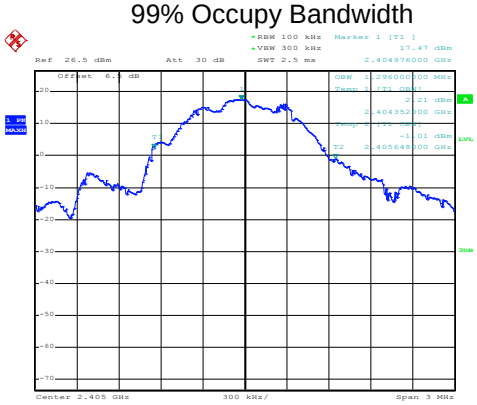
20dB BW:

Lowest channel



Date: 7.SEP.2018 02:19:51

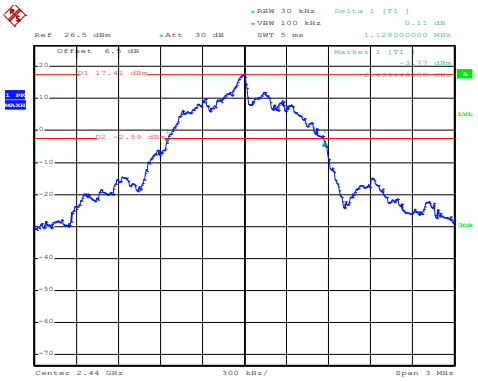
99% Occupy Bandwidth



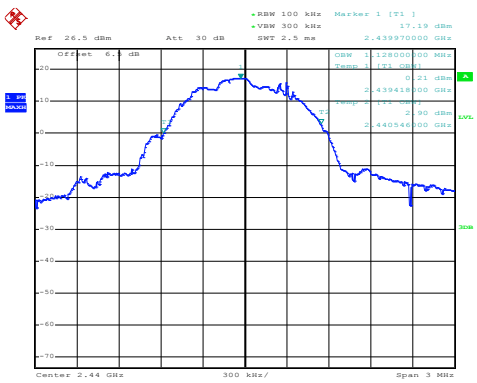
Date: 7.SEP.2018

Lowest channel

Middle channel



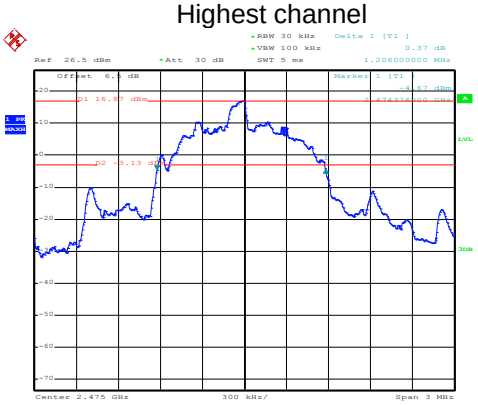
Date: 7.SEP.2018 02:18:17



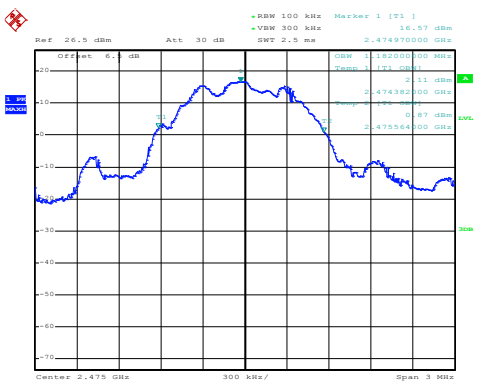
Date: 7.SEP.2018

Middle channel

Highest channel



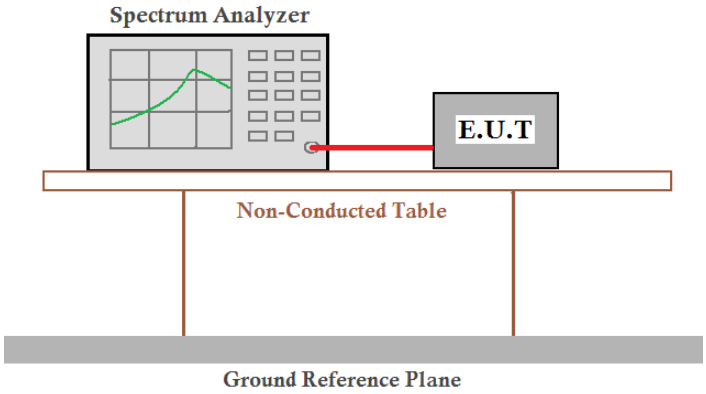
Date: 7.SEP.2018 02:19:05



Date: 7.SEP.2018

Highest channel

6.5 Carrier Frequencies Separation

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1), RSS-247 Section 5.1(b)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, detector=Peak
Limit:	a) 0.025MHz or the 20dB bandwidth (whichever is greater) b) 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data:

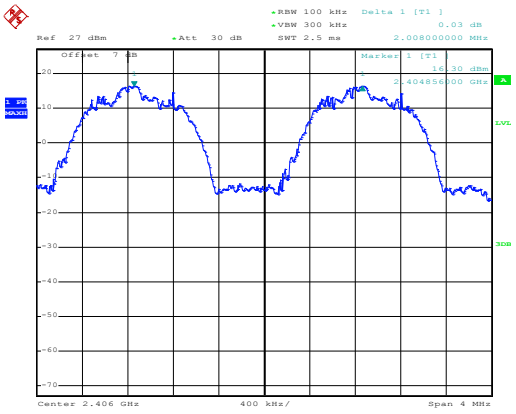
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	2008	808.00	Pass
Middle	7000	752.00	Pass
Highest	3002	804.00	Pass

Note: According to section 6.4

Test channel	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
Lowest	1212	808.00
Middle	1128	752.00
Highest	1206	804.00

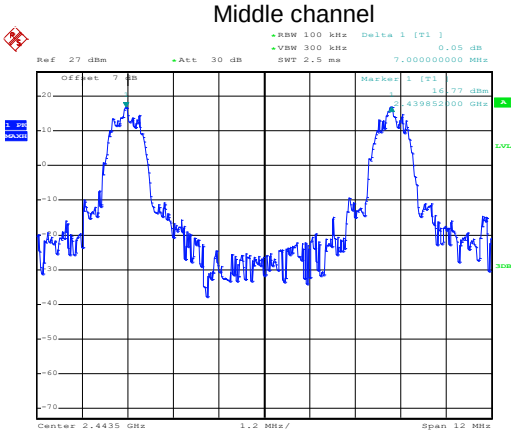
Test plot as follows:

Lowest channel



Date: 6.SEP.2018 17:03:16

Middle channel



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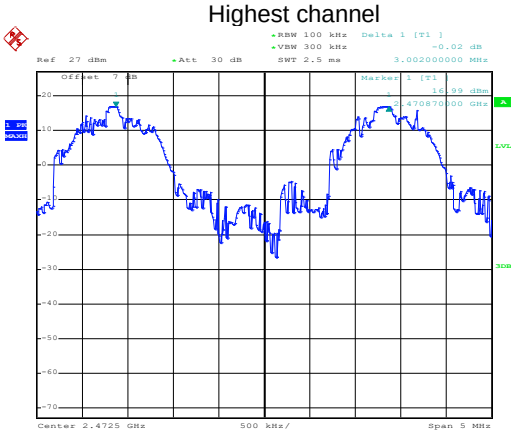
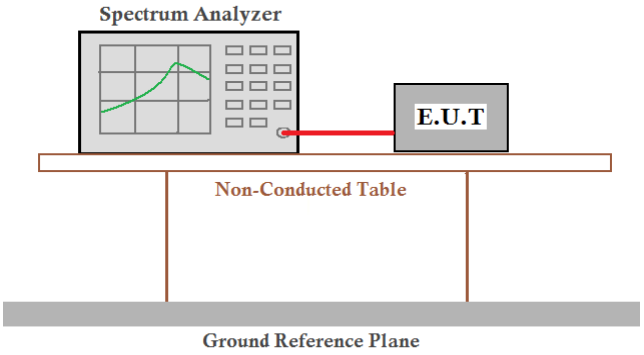
Highest channel



Date: 6.SEP.2018 17:24:37

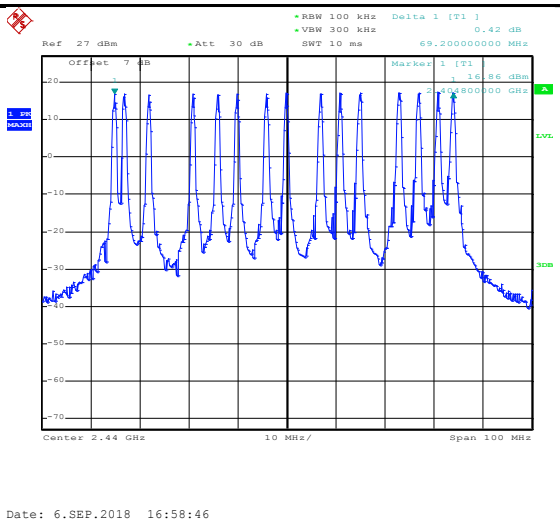
6.6 Hopping Channel Number

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)(iii), RSS-247 Section 5.1(d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data:

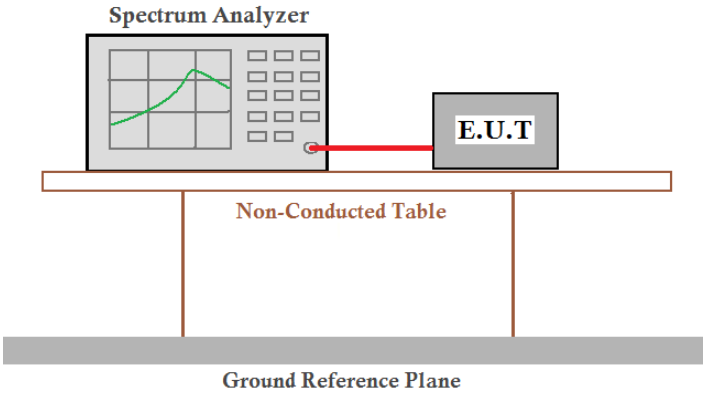
Mode	Hopping channel numbers	Limit	Result
GFSK	15	15	Pass

Test plot as follows:



Hopping

6.7 Dwell Time

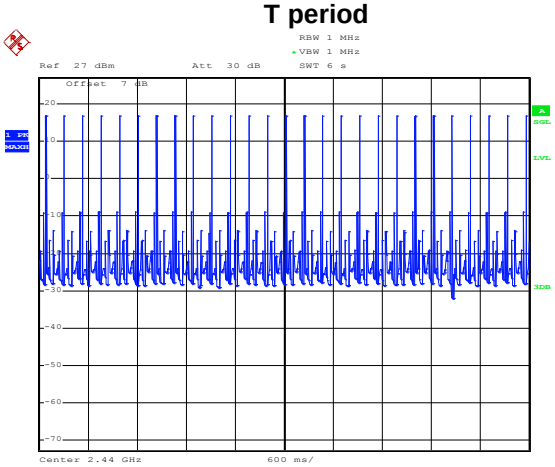
Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)(iii), RSS-247 Section 5.1(d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data (Worse case):

Test channel	Dwell time (second)	Limit (second)	Result
Middle channel	0.061344	0.4	Pass
Remark: Dwell time= per on time slot * Number of pulses in period= (0.568msX4)X27 =61.344(ms)			

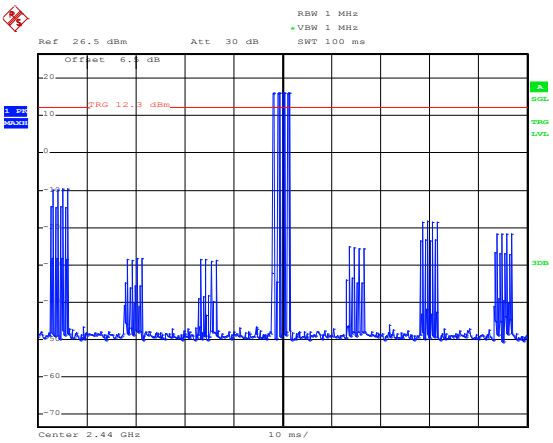
Test plot as follows:

T period



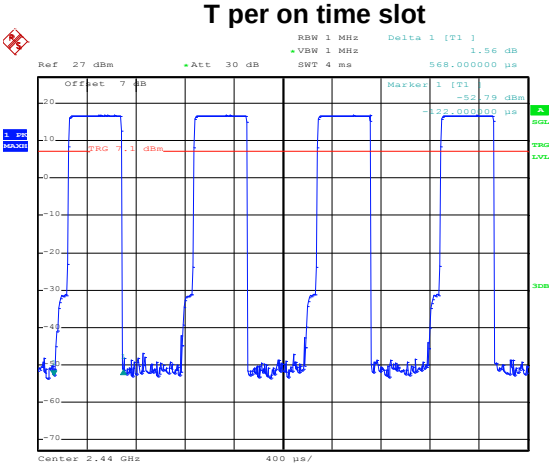
Date: 4.SEP.2018

T 100ms



Date: 7.SEP.2018

T per on time slot



Date: 4.SEP.2018 21:39:16

6.8 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1) requirement:

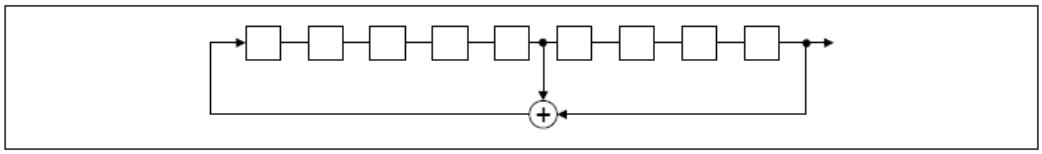
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

• Number of shift register stages: 9
• Length of pseudo-random sequence: 2^9 -1 = 511 bits
• Longest sequence of zeros: 8 (non-inverted signal)



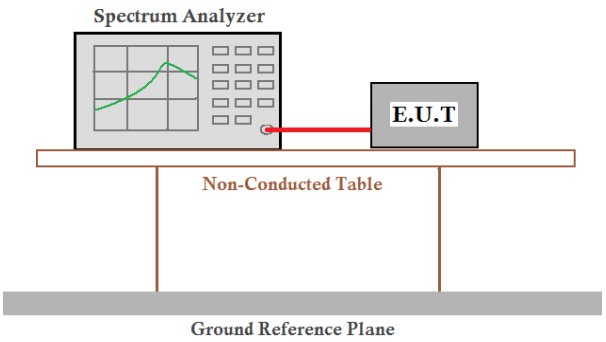
Linear Feedback Shift Register for Generation of the PRBS sequence

Each frequency used equally on the average by each transmitter.

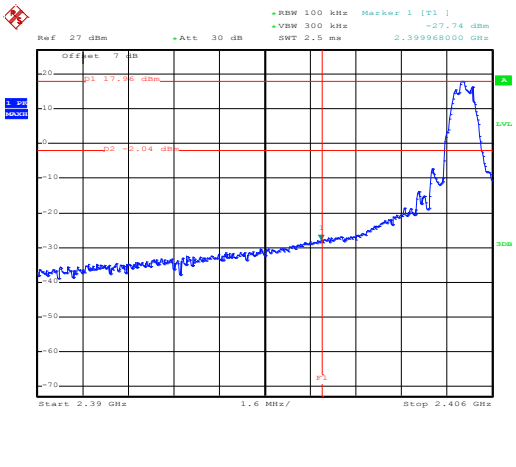
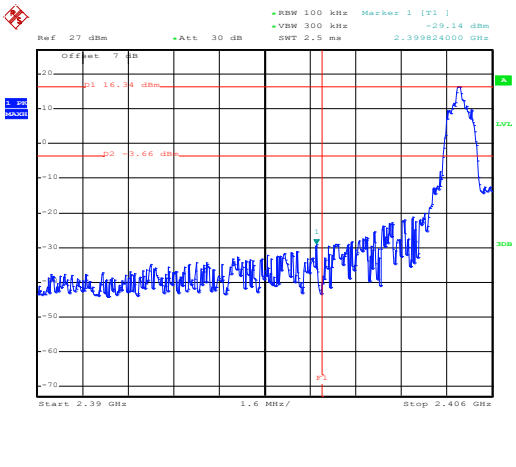
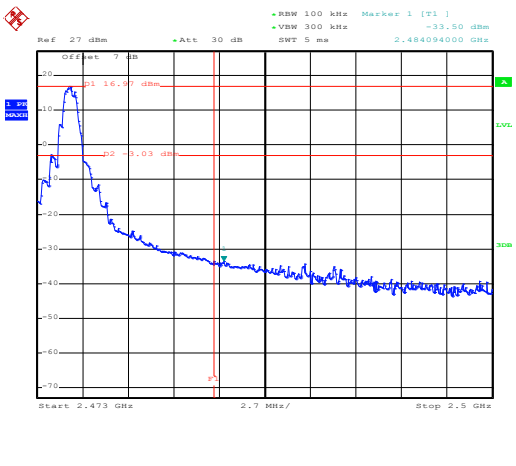
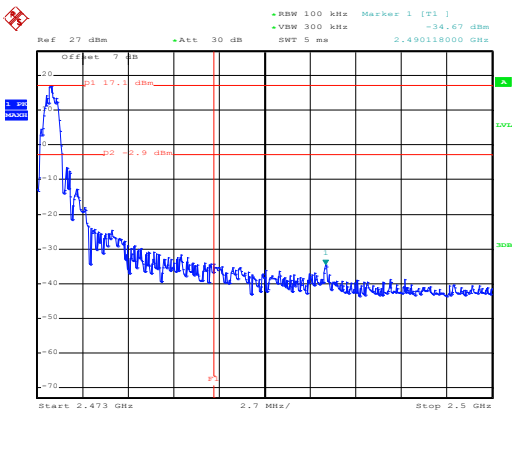
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

6.9 Band Edge

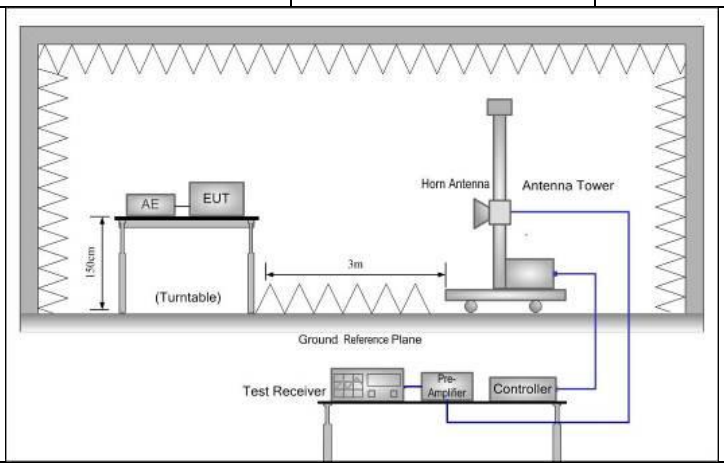
6.9.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d), RSS-GEN Section 8.9 8.10 ,RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode and hopping mode
Test results:	Pass

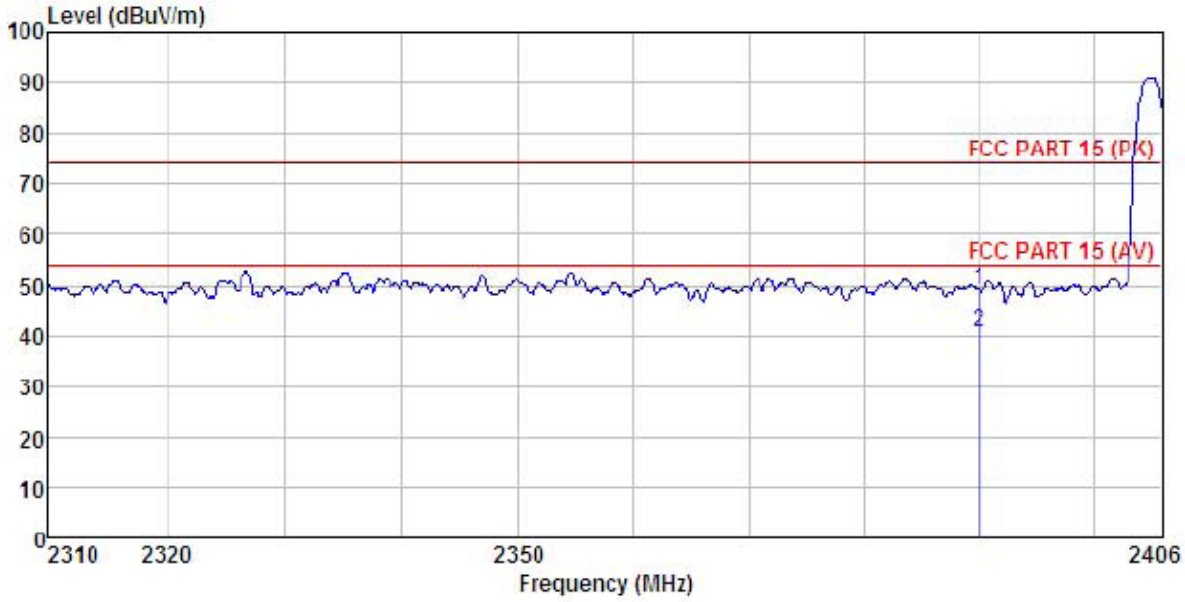
Test plot as follows:

Lowest Channel	
	
No-hopping mode	Hopping mode
Highest Channel	
	
No-hopping mode	Hopping mode

6.9.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205, RSS-GEN Section 8.9 8.10 ,RSS-247 Section 5.5				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	2.3GHz to 2.5GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00		Average Value	
		74.00		Peak Value	
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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 Instruments:	Refer to section 5.8 for details				
Test mode:	Non-hopping mode				
Test results:	Passed				

Product Name:	MR210 Transmitter with Telemetry	Product Model:	MR210
Test By:	Carey	Test mode:	2405 MHz
Test Channel:	Lowest channel	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

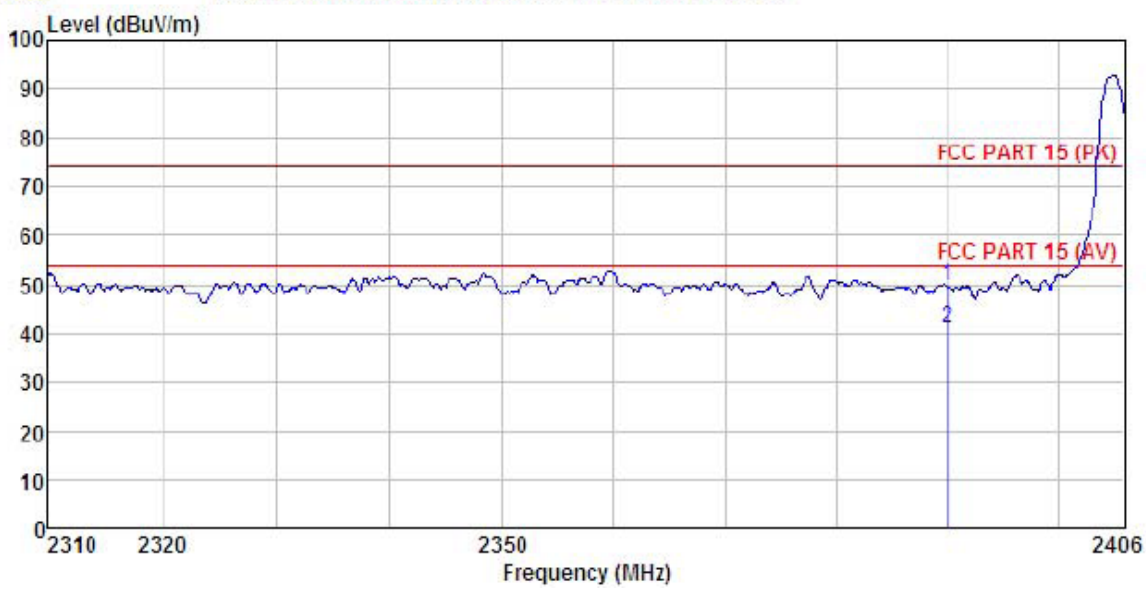


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	17.15	27.37	4.69	0.00	49.21	74.00	-24.79	Peak
2	2390.000	8.45	27.37	4.69	0.00	40.51	54.00	-13.49	Average

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:	MR210 Transmitter with Telemetry	Product Model:	MR210
Test By:	Carey	Test mode:	2405 MHz
Test Channel:	Lowest channel	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

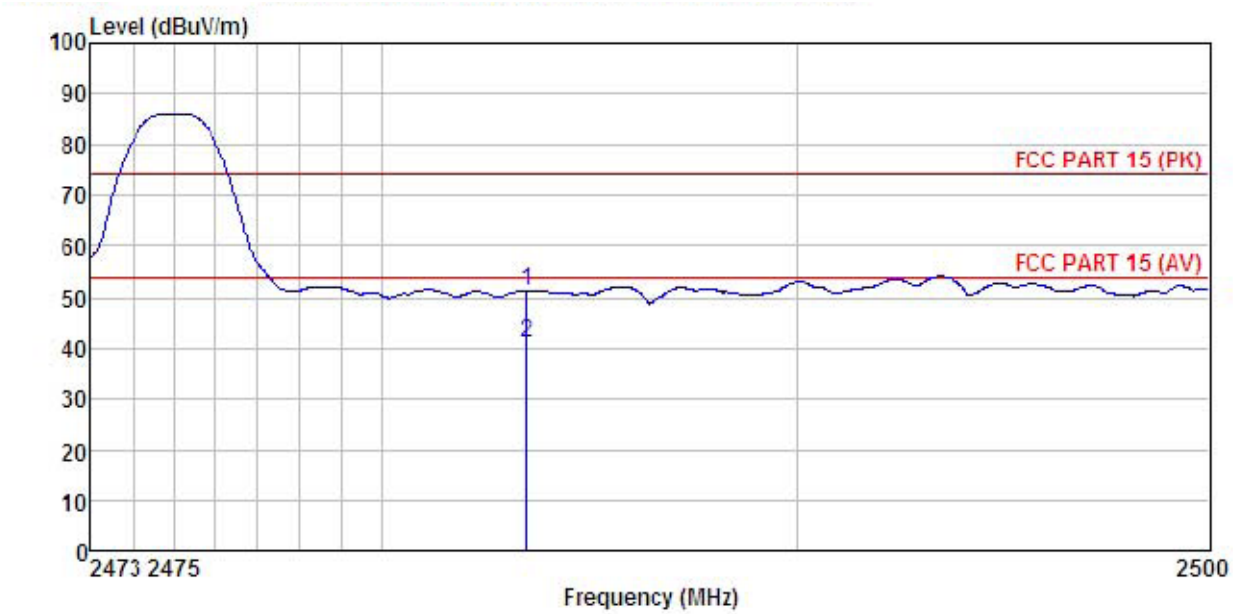


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	17.58	27.37	4.69	0.00	49.64	74.00	-24.36	Peak
2	2390.000	8.78	27.37	4.69	0.00	40.84	54.00	-13.16	Average

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:	MR210 Transmitter with Telemetry	Product Model:	MR210
Test By:	Carey	Test mode:	2475 MHz
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%

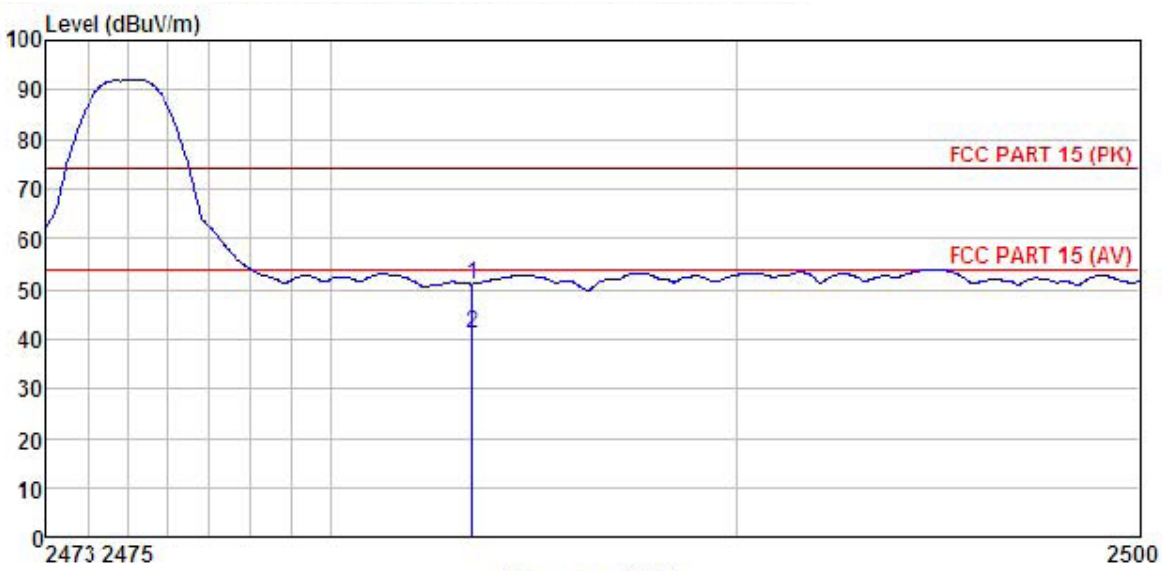


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	18.92	27.57	4.81	0.00	51.30	74.00	-22.70	Peak
2	2483.500	8.72	27.57	4.81	0.00	41.10	54.00	-12.90	Average

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:	MR210 Transmitter with Telemetry	Product Model:	MR210
Test By:	Carey	Test mode:	2475 MHz
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Huni: 57%



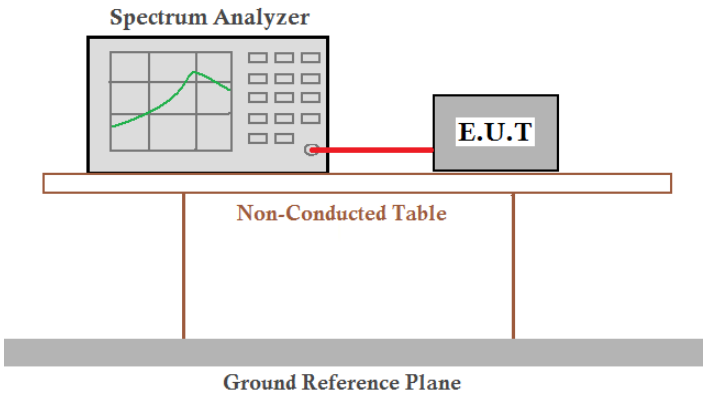
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	18.73	27.57	4.81	0.00	51.11	74.00	-22.89	Peak
2	2483.500	8.55	27.57	4.81	0.00	40.93	54.00	-13.07	Average

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.*

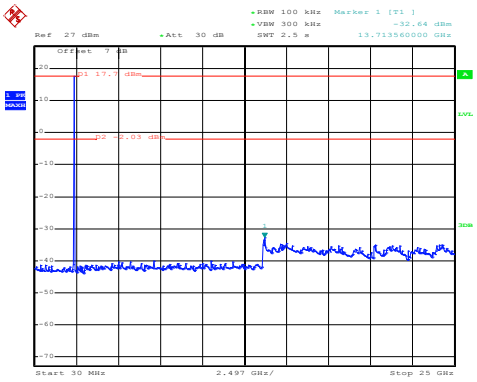
6.10 Spurious Emission

6.10.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d), RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass

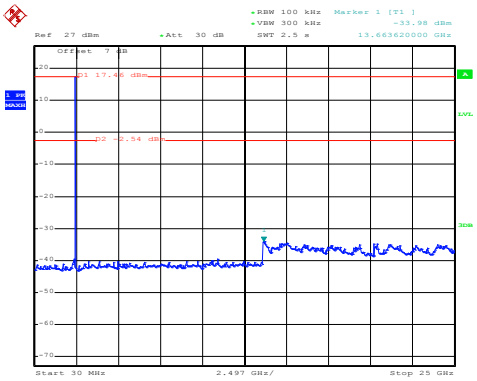
Test plot as follows:

Lowest channel



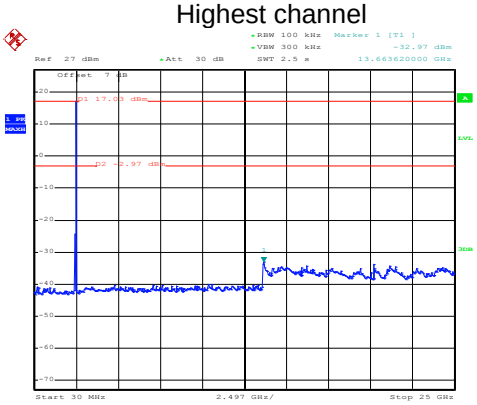
Date: 6.SEP.2018 16:42:09

Middle channel



Date: 6.SEP.2018 16:44:19

Highest channel



Date: 6.SEP.2018 16:41:24

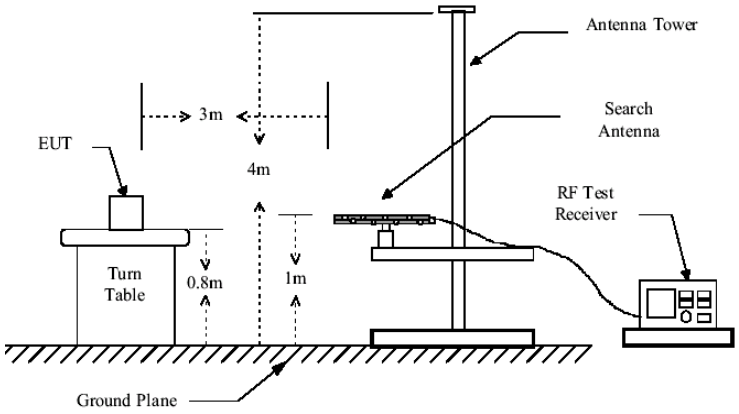
6.10.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209, RSS-GEN Section 8.9 8.10 ,RSS-247 Section 5.5				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	9 kHz to 25 GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

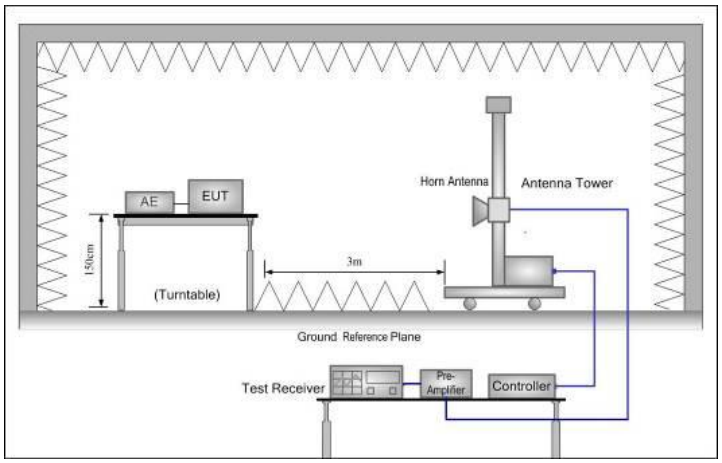
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz



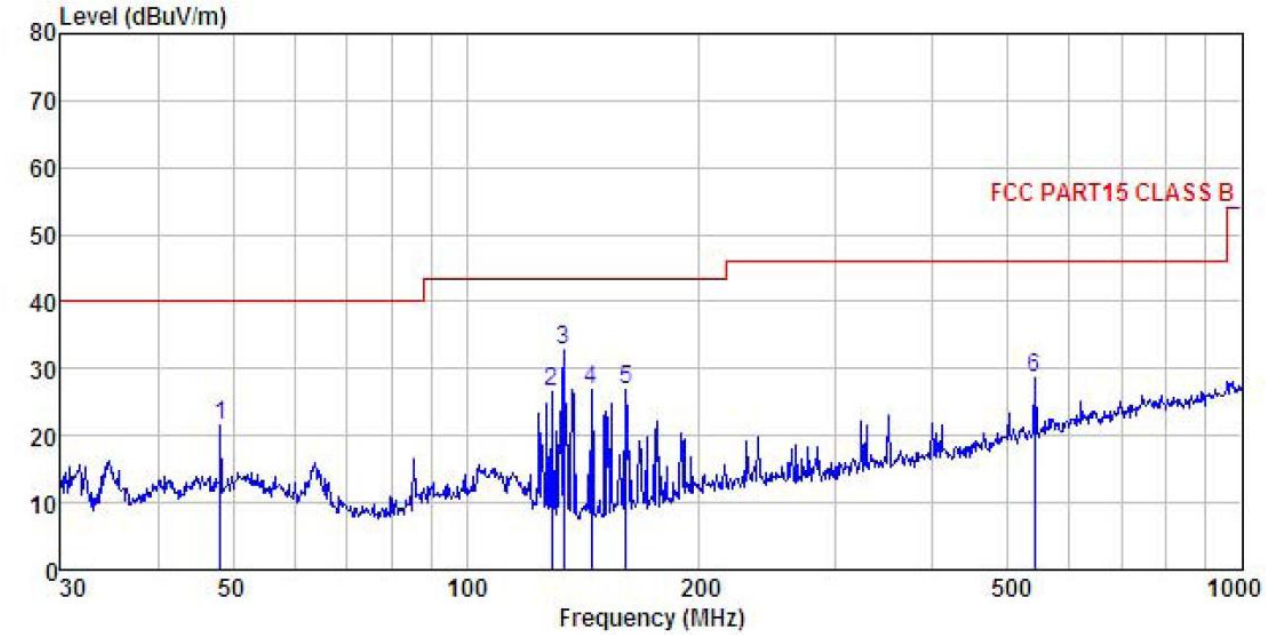
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)

	/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. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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 Instruments:	Refer to section 5.8 for details
Test mode:	Non-hopping mode
Test results:	Pass
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30 MHz is noise floor, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):

Below 1GHz:

Product Name:	MR210 Transmitter with Telemetry	**Product Model:**	MR210
Test By:	Carey	**Test mode:**	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	**Polarization:**	Vertical
Test Voltage:	AC 120/60Hz	**Environment:**	Temp: 24℃ Huni: 57%

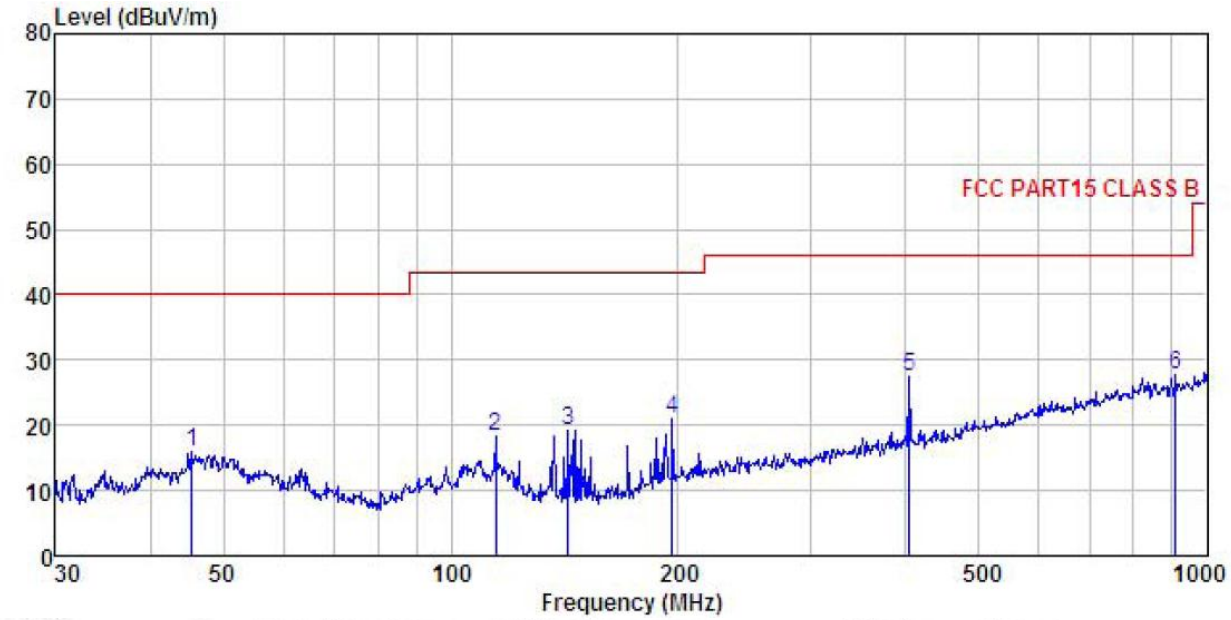


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	48.163	36.27	13.96	1.27	29.83	21.67	40.00	-18.33	QP
2	129.015	44.75	8.84	2.27	29.33	26.53	43.50	-16.97	QP
3	133.619	51.40	8.48	2.33	29.31	32.90	43.50	-10.60	QP
4	144.842	45.37	8.35	2.45	29.25	26.92	43.50	-16.58	QP
5	160.909	44.30	9.13	2.60	29.12	26.91	43.50	-16.59	QP
6	541.373	35.82	17.92	3.84	29.07	28.51	46.00	-17.49	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:	MR210 Transmitter with Telemetry	Product Model:	MR210
Test By:	Carey	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	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	45.375	30.90	13.73	1.29	29.86	16.06	40.00	-23.94	QP
2	114.515	34.45	11.33	2.10	29.43	18.45	43.50	-25.05	QP
3	142.824	37.67	8.24	2.43	29.26	19.08	43.50	-24.42	QP
4	196.510	35.60	11.40	2.84	28.85	20.99	43.50	-22.51	QP
5	404.667	37.65	15.56	3.09	28.79	27.51	46.00	-18.49	QP
6	909.667	29.58	22.32	3.81	27.85	27.86	46.00	-18.14	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.*

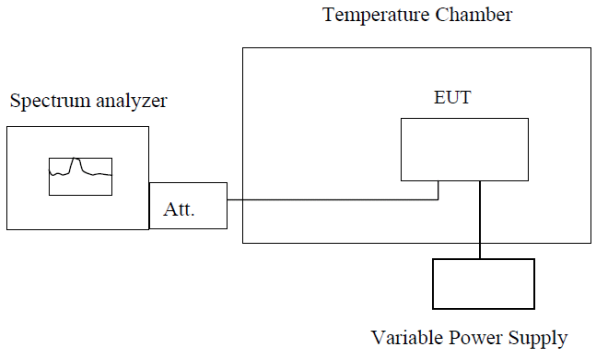
Above 1GHz:

Test channel: Lowest channel								
Detector: 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
4810.00	49.49	31.61	6.80	41.81	46.09	74.00	-27.91	Vertical
4810.00	50.28	31.61	6.80	41.81	46.88	74.00	-27.12	Horizontal
Detector: 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
4810.00	41.62	31.61	6.80	41.81	38.22	54.00	-15.78	Vertical
4810.00	42.10	31.61	6.80	41.81	38.70	54.00	-15.30	Horizontal
Test channel: Middle channel								
Detector: 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
4880.00	51.93	31.72	6.85	41.84	48.66	74.00	-25.34	Vertical
4880.00	50.42	31.72	6.85	41.84	47.15	74.00	-26.85	Horizontal
Detector: 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
4880.00	42.81	31.72	6.85	41.84	39.54	54.00	-14.46	Vertical
4880.00	41.91	31.72	6.85	41.84	38.64	54.00	-15.36	Horizontal
Test channel: Highest channel								
Detector: 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
4950.00	51.54	31.82	6.90	41.86	48.40	74.00	-25.60	Vertical
4950.00	48.69	31.82	6.90	41.86	45.55	74.00	-28.45	Horizontal
Detector: 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
4950.00	42.34	31.82	6.90	41.86	39.20	54.00	-14.80	Vertical
4950.00	40.39	31.82	6.90	41.86	37.25	54.00	-16.75	Horizontal

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.*

6.11 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:

2405MHz mode

Voltage vs. Frequency Stability

Test Frequency = 2405MHz			
Test conditions		Measurement Frequency (MHz)	Limit (MHz)
Temp(℃)	Voltage(ac)		
20	6.2V	2404.985	2400 ~ 2483.5
	6.0V	2404.987	
	5.5V	2404.991	
Note: 1. EUT stops working when the supply voltage DC 5.5V. *2. The test is performed in modulation mode.*			

Temperature vs. Frequency Stability

Test Frequency = 2405MHz			
Test conditions		Frequency(MHz)	Limit (MHz)
Voltage(dc)	Temp(℃)		
6.0V	-20	2404.988	2400 ~ 2483.5
	-10	2404.990	
	0	2404.993	
	10	2404.989	
	20	2404.992	
	30	2402.990	
	40	2404.987	
	50	2404.988	
Note: The test is performed in modulation mode.			