

FCC REPORT

(RFID)

Applicant: Shenzhen RodinBell Technology Co., Ltd.

Address of Applicant: 905#, Tower B, Xinghe WORLD, Wuhe Avenue, Longgang District, Shenzhen City, PRC

Equipment Under Test (EUT)

Product Name: M-500 Micro UHF RFID Module

Model No.: M-500

FCC ID: 2AKQD-M500

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 08 Jun., 2017

Date of Test: 08 Jun., to 10 Jul., 2017

Date of report issued: 10 Jul., 2017

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.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

Version No.	Date	Description
00	10 Jul., 2017	Original

Tested by:

Carrey Chen

Test Engineer

Date:

10 Jul., 2017

Reviewed by:

Ryan Lee

Project Engineer

Date:

10 Jul., 2017

3 Contents

Page

1	COVER PAGE.....	1
2	VERSION	2
3	CONTENTS	3
4	TEST SUMMARY.....	4
5	GENERAL INFORMATION.....	5
5.1	CLIENT INFORMATION	5
5.2	GENERAL DESCRIPTION OF E.U.T.	5
5.3	TEST MODE	6
5.4	MEASUREMENT UNCERTAINTY.....	6
5.5	LABORATORY FACILITY.....	6
5.6	LABORATORY LOCATION	6
5.7	TEST INSTRUMENTS LIST.....	7
6	TEST RESULTS AND MEASUREMENT DATA	8
6.1	ANTENNA REQUIREMENT	8
6.2	CONDUCTED EMISSIONS	9
6.3	CONDUCTED OUTPUT POWER.....	12
6.4	20dB OCCUPY BANDWIDTH.....	14
6.5	CARRIER FREQUENCIES SEPARATION.....	16
6.6	HOPPING CHANNEL NUMBER	18
6.7	DWELL TIME.....	20
6.8	PSEUDORANDOM FREQUENCY HOPPING SEQUENCE	22
6.9	BAND EDGE.....	23
6.9.1	Conducted Emission Method.....	23
6.9.2	Radiated Emission Method.....	25
6.10	SPURIOUS EMISSION	27
6.10.1	Conducted Emission Method.....	27
6.10.2	Radiated Emission Method	30
7	TEST SETUP PHOTO	35
8	EUT CONSTRUCTIONAL DETAILS.....	37

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Pass: The EUT complies with the essential requirements in the standard.

5 General Information

5.1 Client Information

Applicant:	Shenzhen RodinBell Technology Co., Ltd.
Address:	905#, Tower B, Xinghe WORLD, Wuhe Avenue, Longgang District, Shenzhen City, PRC
Manufacturer:	Shenzhen RodinBell Technology Co., Ltd.
Address:	905#, Tower B, Xinghe WORLD, Wuhe Avenue, Longgang District, Shenzhen City, PRC

5.2 General Description of E.U.T.

Product Name:	M-500 Micro UHF RFID Module
Model No.:	M-500
Operation Frequency:	902MHz~928MHz
Number of channel:	50
Modulation type:	GFSK
Modulation technology:	FHSS
Antenna Type:	Ceramic antenna
Antenna gain:	2.0dBi
Power supply:	AC 120V

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.5 MHz	13	908.61 MHz	26	914.72 MHz	39	921.3 MHz
1	902.97 MHz	14	909.08 MHz	27	915.19 MHz	40	921.77 MHz
2	903.44 MHz	15	909.55 MHz	28	915.66 MHz	41	922.24 MHz
3	903.91 MHz	16	910.02 MHz	29	916.13 MHz	42	922.71 MHz
4	904.38 MHz	17	910.49 MHz	30	916.6 MHz	43	923.18 MHz
5	904.85 MHz	18	910.96 MHz	31	917.07 MHz	44	923.65 MHz
6	905.32 MHz	19	911.43 MHz	32	917.54 MHz	45	924.12 MHz
7	905.79 MHz	20	911.9 MHz	33	918.01 MHz	46	924.59 MHz
8	906.26 MHz	21	912.37 MHz	34	918.48 MHz	47	925.06 MHz
9	906.73 MHz	22	912.84 MHz	35	918.95 MHz	48	925.53 MHz
10	907.2 MHz	23	913.31 MHz	36	919.42 MHz	49	926 MHz
11	907.67 MHz	24	913.78 MHz	37	919.89 MHz		
12	908.14 MHz	25	914.25 MHz	38	920.36 MHz		
Remark: Channel 0, 25 & 49 selected for tested.							

5.3 Test mode

Test mode 1 (TM 1):	Keep the EUT in continues transmitting mode with 100% duty cycle.
Test mode 2 (TM 2):	Keep the EUT in hopping mode.
The sample was investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position.	

5.4 Measurement Uncertainty

Items	Expanded Uncertainty (Confidence of 95%)
Conducted Emission (9kHz ~ 30MHz)	2.14 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	4.24 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	4.35 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	4.44 dB (k=2)
Radiated Emission (18GHz ~ 26.5GHz)	4.56 dB (k=2)

5.5 Laboratory Facility

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

● **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in out files. Registration 817957, February 27, 2012.

● **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.

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: www.ccis-cb.com

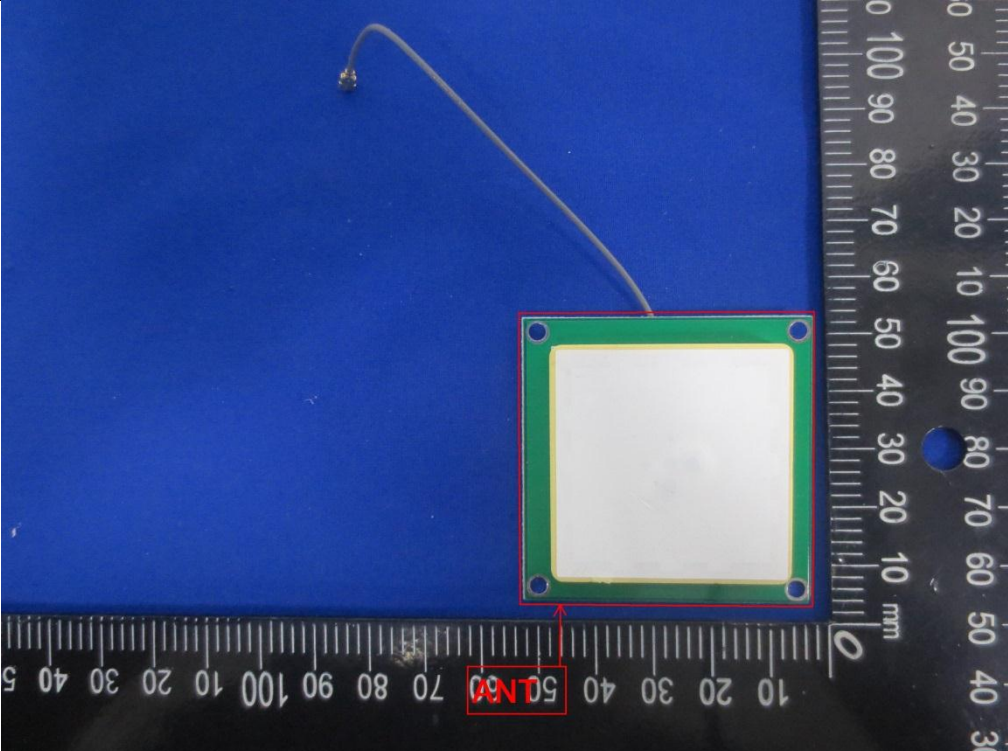
5.7 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	3m SAC	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	08-23-2014	08-22-2017
2	BiConiLog Antenna	SCHWARZBECK	VULB9163	CCIS0005	02-25-2017	02-24-2018
3	Horn Antenna	SCHWARZBECK	BBHA9120D	CCIS0006	02-25-2017	02-24-2018
4	Pre-amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	02-25-2017	02-24-2018
5	Pre-amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	02-25-2017	02-24-2018
6	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP30	CCIS0023	02-25-2017	02-24-2018
7	EMI Test Receiver	Rohde & Schwarz	ESRP7	CCIS0167	02-25-2017	02-24-2018
8	Loop antenna	Laplace instrument	RF300	EMC0701	02-25-2017	02-24-2018
9	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

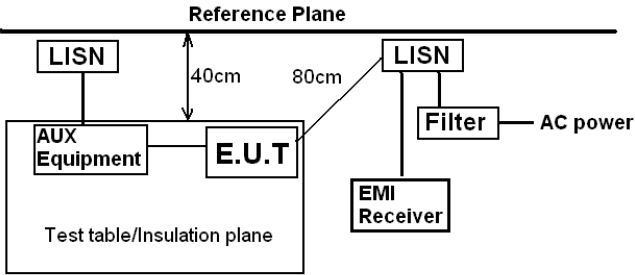
Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
1	Shielding Room	ZhongShuo Electron	11.0(L)x4.0(W)x3.0(H)	CCIS0061	08-23-2014	08-22-2017
2	EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	02-25-2017	02-24-2018
3	LISN	CHASE	MN2050D	CCIS0074	02-25-2017	02-24-2018
4	Coaxial Cable	CCIS	N/A	CCIS0086	02-25-2017	02-24-2018
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

6 Test results and Measurement Data

6.1 Antenna requirement

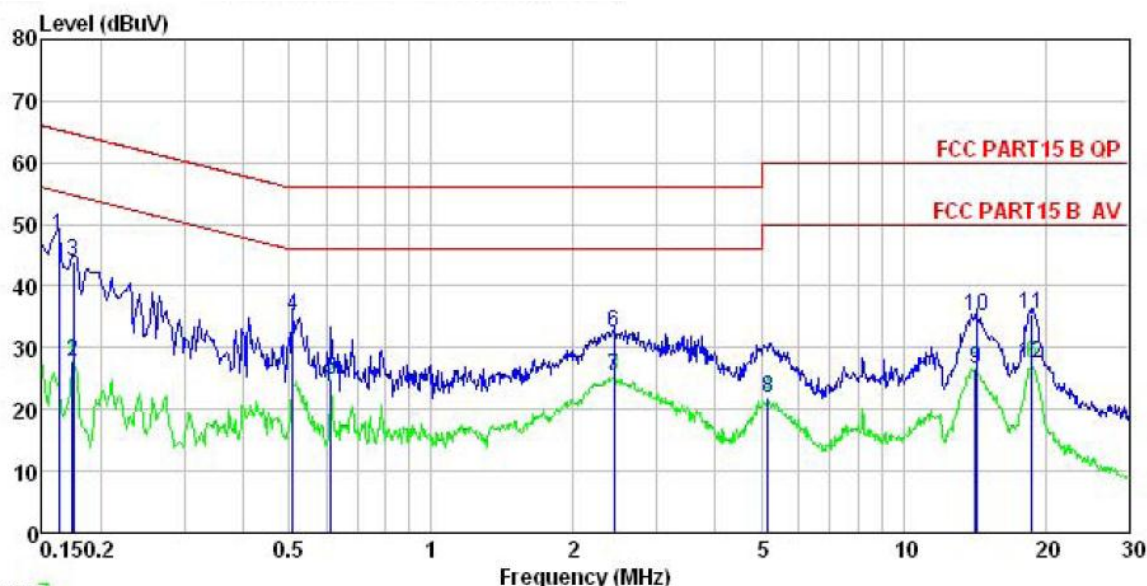
Standard requirement:	FCC Part 15 C Section 15.203 /247(c)
<i>15.203 requirement:</i> <i>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that 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.</i> <i>15.247(c) (1)(i) requirement:</i> <i>(i) Systems operating in the 902-928MHz 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.</i>	
E.U.T Antenna:	
<i>The antenna under test sample is a ceramic antenna as below, and the best case gain of the antenna is 2.0dBi. Device is equipped with unique non-standard antenna connector and the recommended specific antenna by the manufacture.</i>	
	

6.2 Conducted Emissions

Test Requirement:	FCC Part 15 C Section 15.207		
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 Impedance 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 C63.10: 2013 on conducted measurement.		
Test Instruments:	Refer to section 5.7 for details		
Test mode:	TM 2		
Test results:	Pass		

Measurement Data

Line:

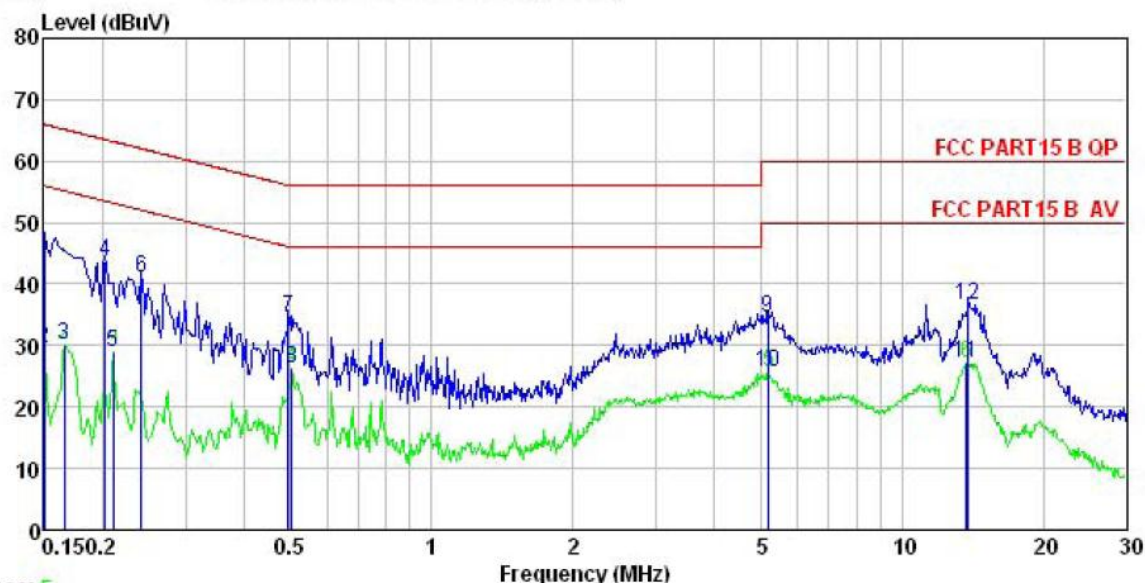


Trace: 7

Site : CCIS Shielding Room
 Condition : FCC PART15 B QP LISN LINE
 EUT : M-500 Micro UHF RFID Module)
 Model : M-500
 Test Mode : RFID Mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Carey
 Remark :

	Freq	Read Level	LISN	Cable Loss	Level	Limit	Over Limit	Remark
	MHz	dBuV		dB	dBuV	dBuV	dB	
1	0.162	37.25	0.14	10.77	48.16	65.34	-17.18	QP
2	0.174	16.70	0.15	10.77	27.62	54.77	-27.15	Average
3	0.175	33.00	0.15	10.77	43.92	64.72	-20.80	QP
4	0.510	24.18	0.25	10.76	35.19	56.00	-20.81	QP
5	0.614	13.86	0.29	10.77	24.92	46.00	-21.08	Average
6	2.435	21.10	0.33	10.94	32.37	56.00	-23.63	QP
7	2.435	14.05	0.33	10.94	25.32	46.00	-20.68	Average
8	5.166	10.62	0.35	10.84	21.81	50.00	-28.19	Average
9	14.213	15.45	0.26	10.91	26.62	50.00	-23.38	Average
10	14.288	24.00	0.26	10.91	35.17	60.00	-24.83	QP
11	18.622	24.17	0.32	10.91	35.40	60.00	-24.60	QP
12	18.721	16.33	0.32	10.91	27.56	50.00	-22.44	Average

Neutral:



Trace: 5

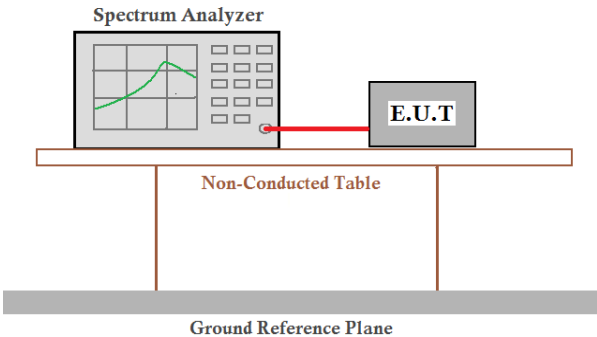
Site : CCIS Shielding Room
 Condition : FCC PART15 B QP LISN NEUTRAL
 EUT : M-500 Micro UHF RFID Module)
 Model : M-500
 Test Mode : RFID Mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Carey
 Remark :

	Freq	Read	LISN	Cable	Level	Limit	Over	
	MHz	Level		Loss	dBuV	Line	Limit	Remark
		dBuV		dB		dBuV	dB	
1	0.150	36.39	0.12	10.78	47.29	66.00	-18.71	QP
2	0.150	18.49	0.12	10.78	29.39	56.00	-26.61	Average
3	0.166	19.16	0.13	10.77	30.06	55.16	-25.10	Average
4	0.202	32.69	0.15	10.76	43.60	63.54	-19.94	QP
5	0.211	17.88	0.16	10.76	28.80	53.18	-24.38	Average
6	0.242	30.21	0.17	10.75	41.13	62.04	-20.91	QP
7	0.497	23.66	0.24	10.76	34.66	56.05	-21.39	QP
8	0.505	15.21	0.24	10.76	26.21	46.00	-19.79	Average
9	5.194	23.50	0.33	10.84	34.67	60.00	-25.33	QP
10	5.221	14.39	0.33	10.84	25.56	50.00	-24.44	Average
11	13.695	15.88	0.26	10.91	27.05	50.00	-22.95	Average
12	13.841	25.56	0.26	10.91	36.73	60.00	-23.27	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

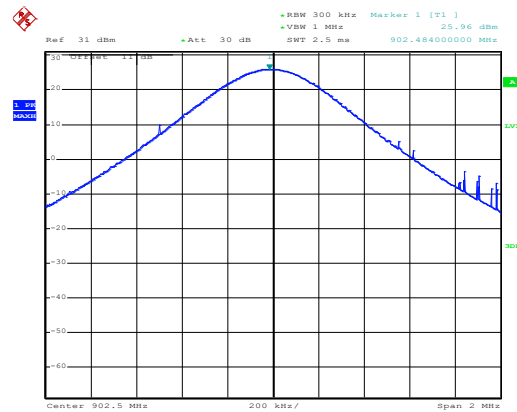
6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Receiver setup:	Set the RBW $\geq$ 20dB bandwidth, Set VBW $\geq$ 3 RBW, Set span $\geq$ 3 RBW Sweep time = auto couple. Detector = peak, Trace mode = max hold.
Limit:	1W(30 dBm)
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. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 5.7 for details
Test mode:	TM 1
Test results:	Pass

Measurement Data

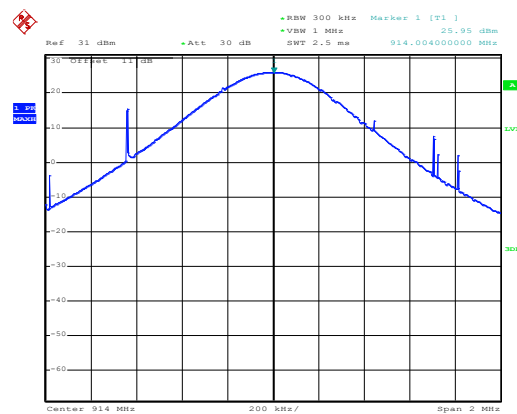
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	25.96	30.00	Pass
Middle	25.95	30.00	Pass
Highest	25.97	30.00	Pass

Test plot as follows:



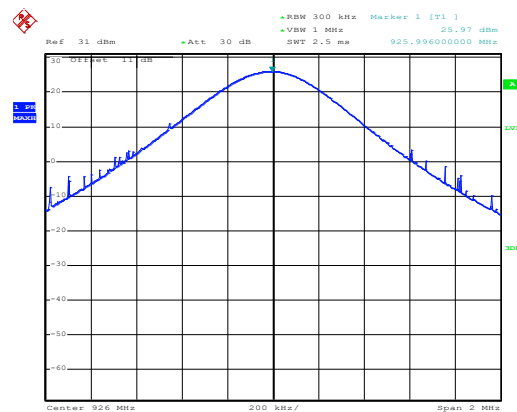
Date: 14.JUN.2017 15:01:15

Lowest channel



Date: 14.JUN.2017 14:56:35

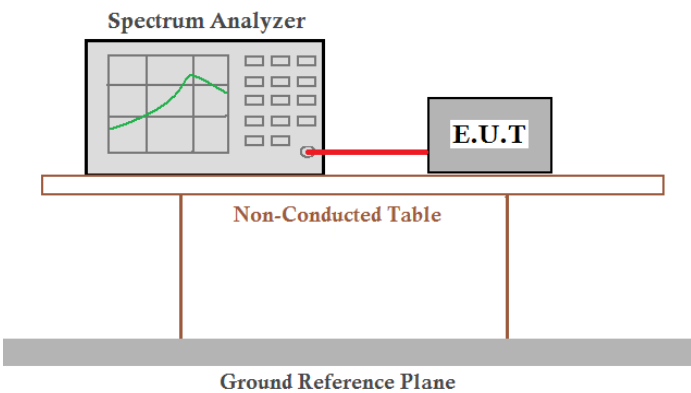
Middle channel



Date: 14.JUN.2017 15:01:49

Highest channel

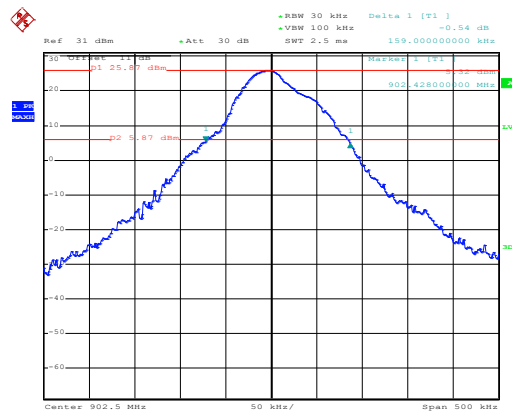
6.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=30 kHz, VBW=100 kHz, detector=Peak
Limit:	500kHz
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:	TM 1
Test results:	Pass

Measurement Data

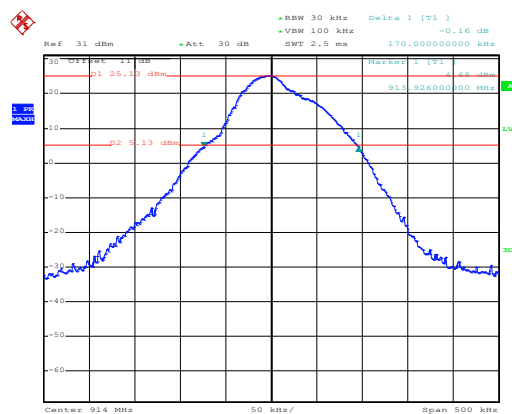
Test channel	20dB Occupy Bandwidth (kHz)	Limit (kHz)
Lowest	159	--
Middle	170	--
Highest	158	--

Test plot as follows:



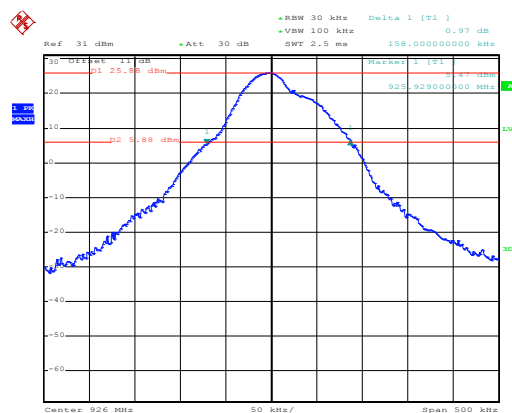
Date: 14.JUN.2017 15:05:23

Lowest channel



Date: 14.JUN.2017 15:06:11

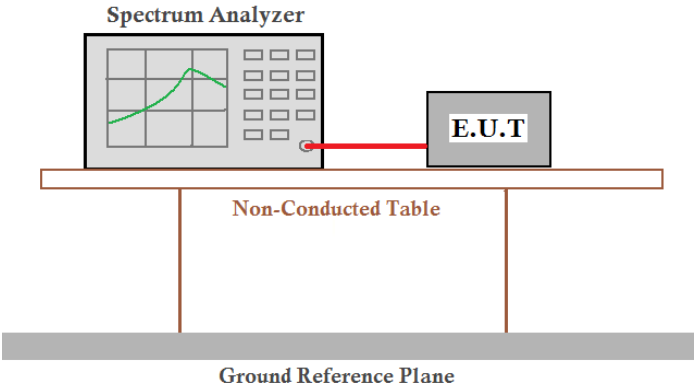
Middle channel



Date: 14.JUN.2017 15:06:54

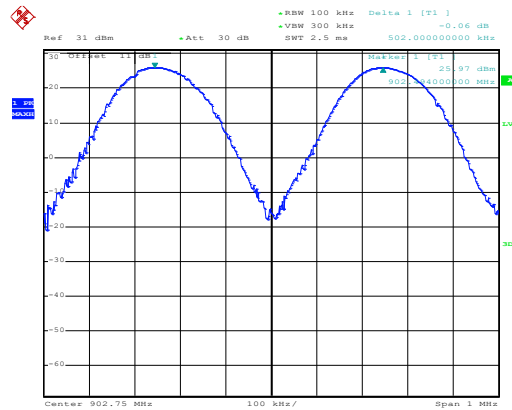
Highest channel

6.5 Carrier Frequencies Separation

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, detector=Peak
Limit:	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.
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 5.7 for details
Test mode:	TM 2
Test results:	Pass

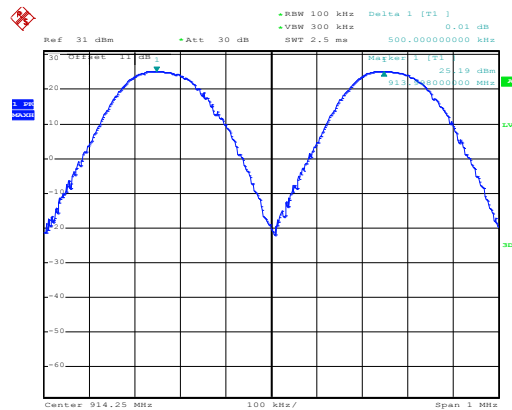
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)
Lowest	502	137
Middle	500	136
Highest	500	141



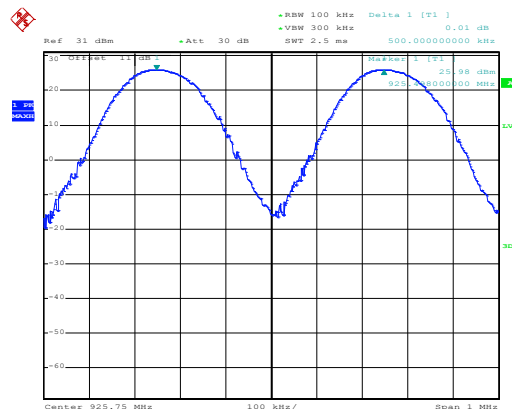
Date: 14.JUN.2017 15:13:12

Lowest channel



Date: 14.JUN.2017 15:13:59

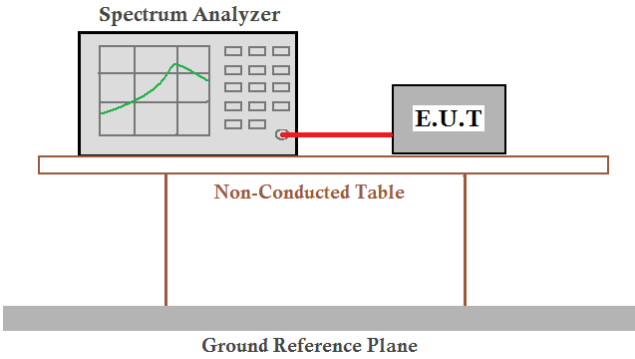
Middle channel



Date: 14.JUN.2017 15:14:50

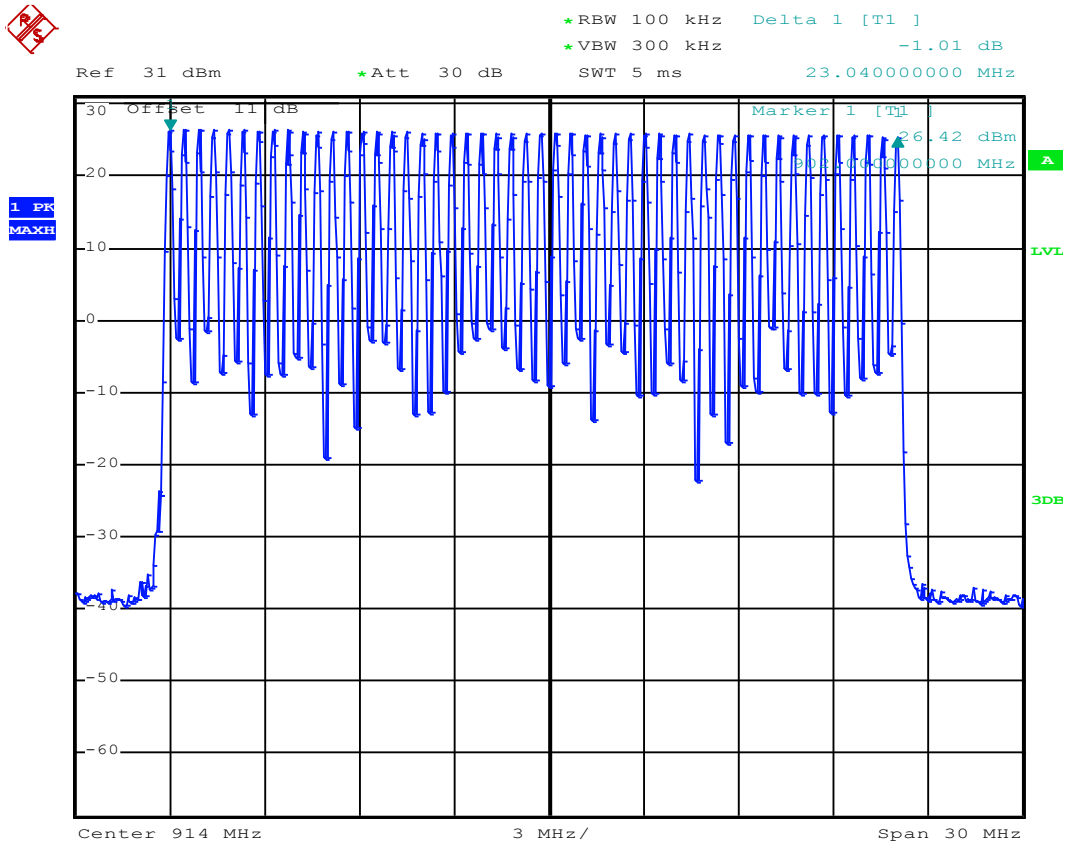
Highest channel

6.6 Hopping Channel Number

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.
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 5.7 for details
Test mode:	TM 2
Test results:	Pass

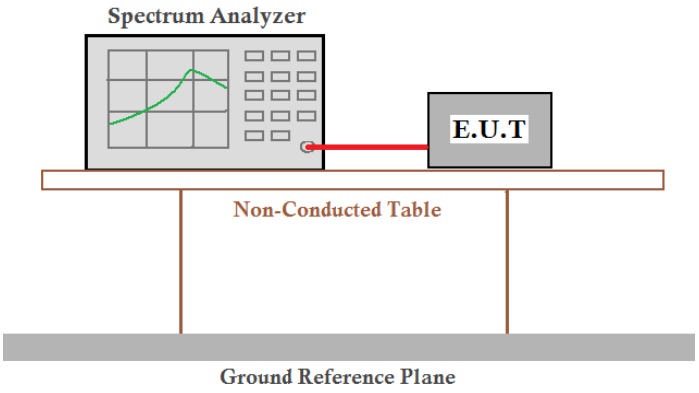
Measurement Data:

Hopping channel numbers	Limit	Result
50	50	Pass



Date: 14.JUN.2017 17:29:29

6.7 Dwell Time

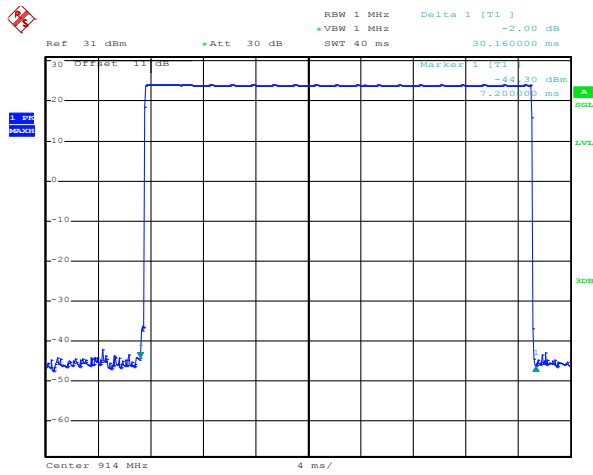
Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Detector=Peak
Limit:	0.4 seconds within a 20 second period
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 5.7 for details
Test mode:	TM 2
Test results:	Pass

Measurement Data

Dwell time per hop (Second)	Hopping numbers	Dwell time in one period (Second)	Limit (Second)	Result
0.03016	11	0.332	0.4	Pass

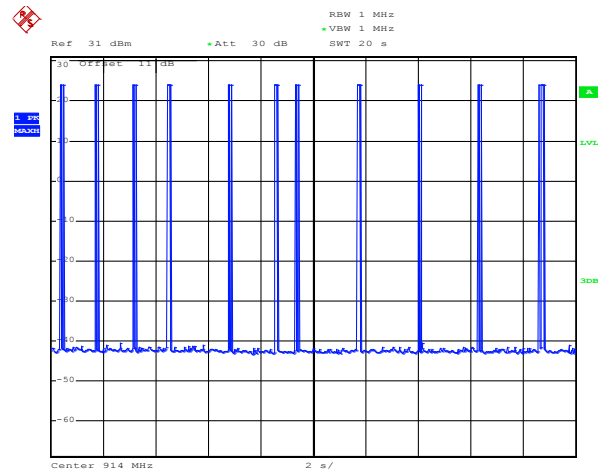
Remark:

The test period: T= 20s



Date: 14.JUN.2017 14:25:39

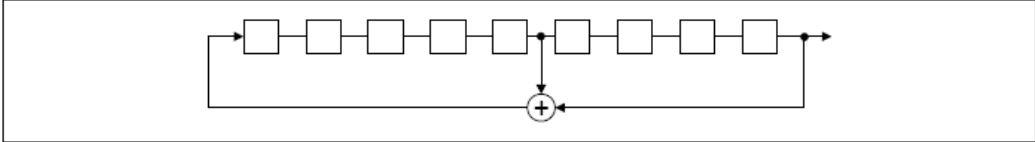
Duration time



Date: 14.JUN.2017 14:26:46

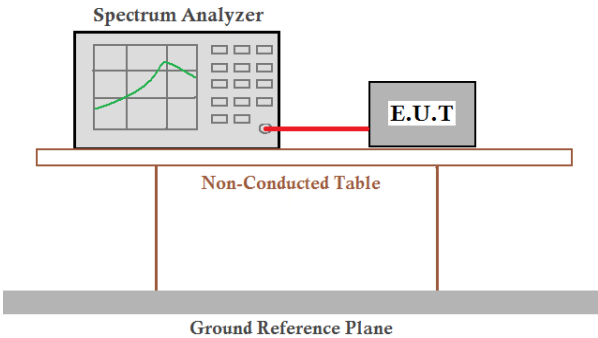
Hopping number

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)  <i>Linear Feedback Shift Register for Generation of the PRBS sequence</i> 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.	

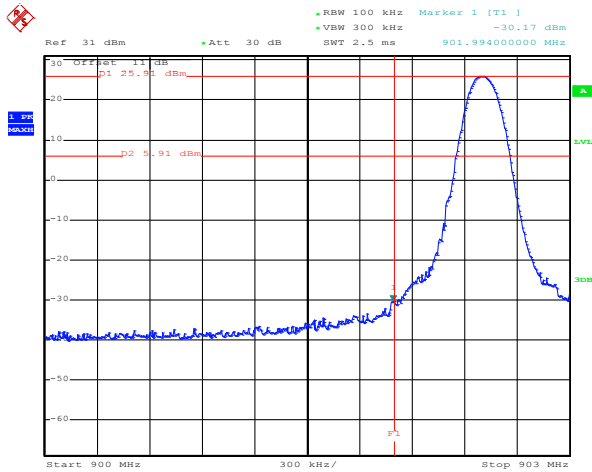
6.9 Band Edge

6.9.1 Conducted Emission Method

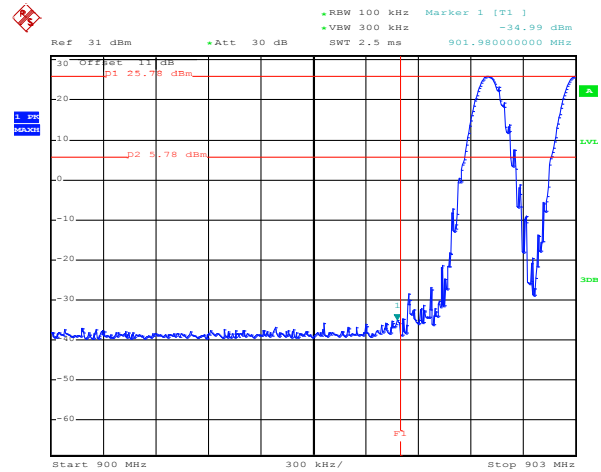
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100 kHz, VBW=300 kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced 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:	 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. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 5.7 for details
Test mode:	TM 1 & TM 2
Test results:	Pass

Test plot as follows:

Lowest Channel



Date: 14.JUN.2017 15:12:16

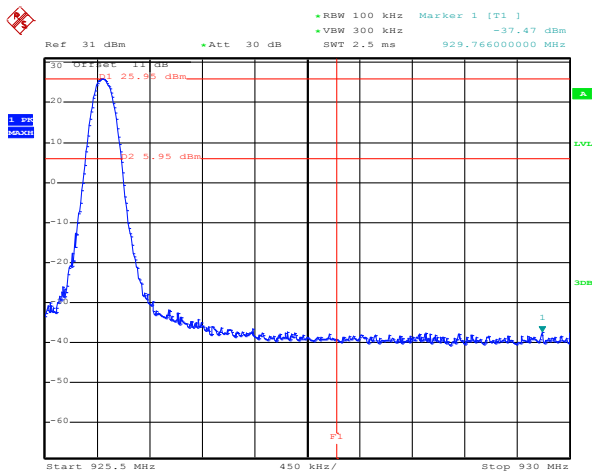


Date: 14.JUN.2017 15:11:15

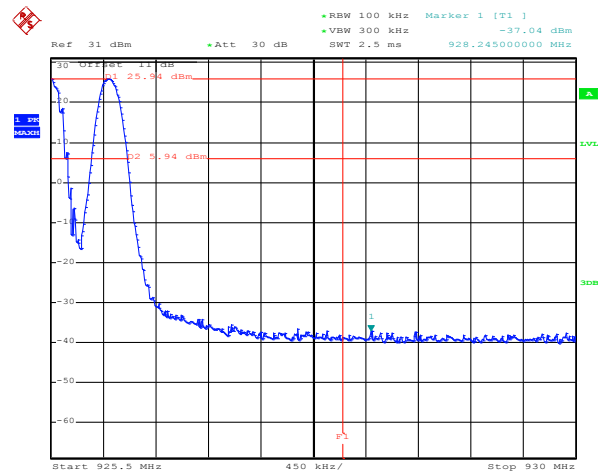
Non-hopping

Hopping

Highest Channel



Date: 14.JUN.2017 15:07:58

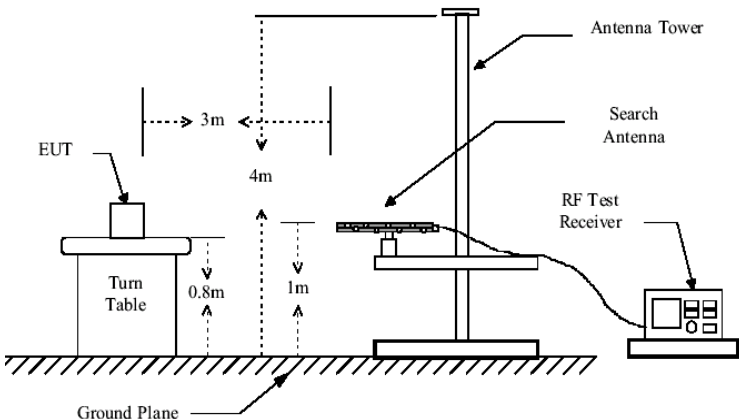
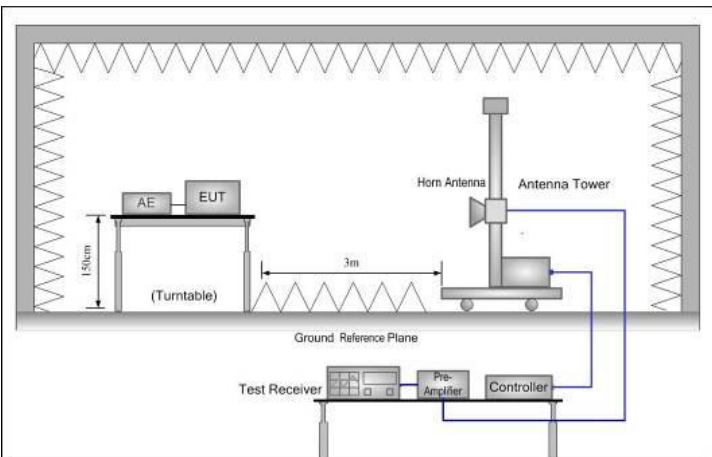


Date: 14.JUN.2017 15:08:58

Non-hopping

Hopping

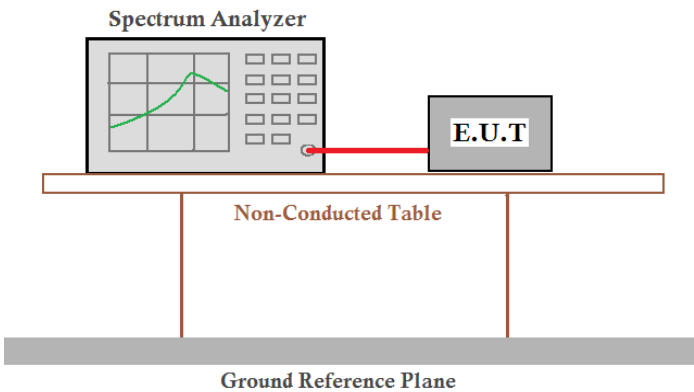
6.9.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	960MHz to 1.240GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	960MHz-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
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:	Below 1GHz				
					
Test setup:	Above 1GHz				
					
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters 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				

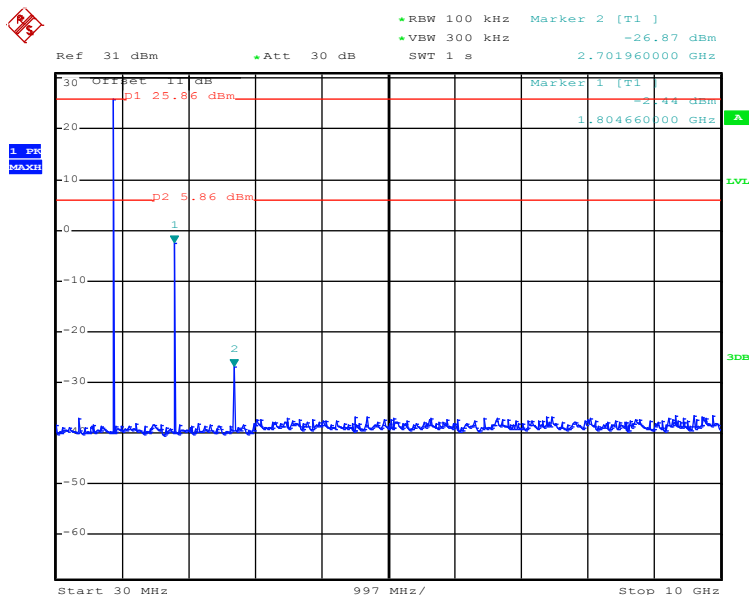
	antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. 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 5.7 for details
Test mode:	TM 1
Test results:	Pass
Remark	All the reading values were the noise floor and not recorded.

6.10 Spurious Emission

6.10.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074v01r04 section 11
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:	 The diagram illustrates the test setup for conducted emission measurement. 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, which sits on a Ground Reference Plane.
Test Instruments:	Refer to section 5.7 for details
Test mode:	TM 1
Test results:	Pass

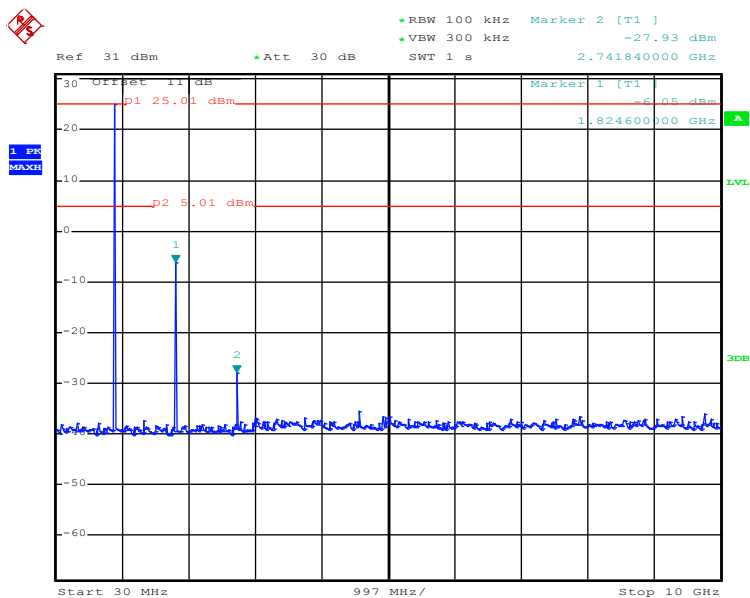
Lowest channel



Date: 14.JUN.2017 15:17:04

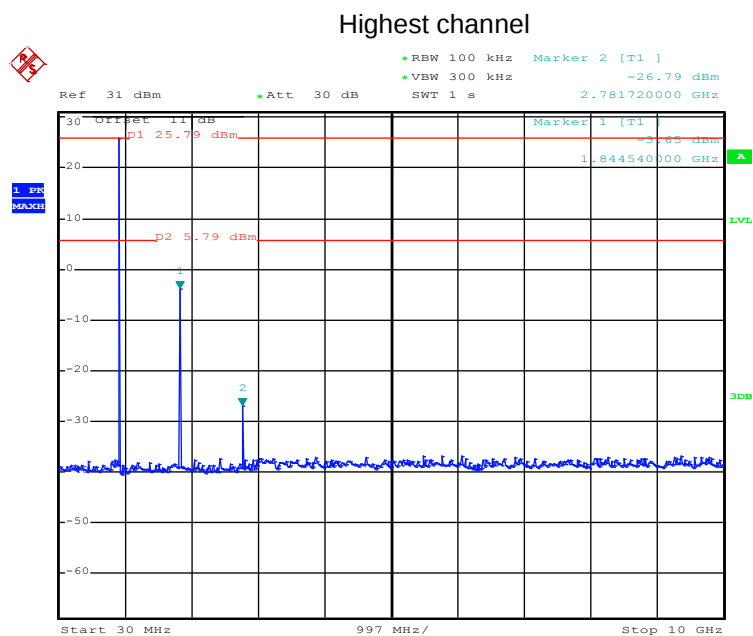
30MHz~10GHz

Middle channel



Date: 14.JUN.2017 15:16:27

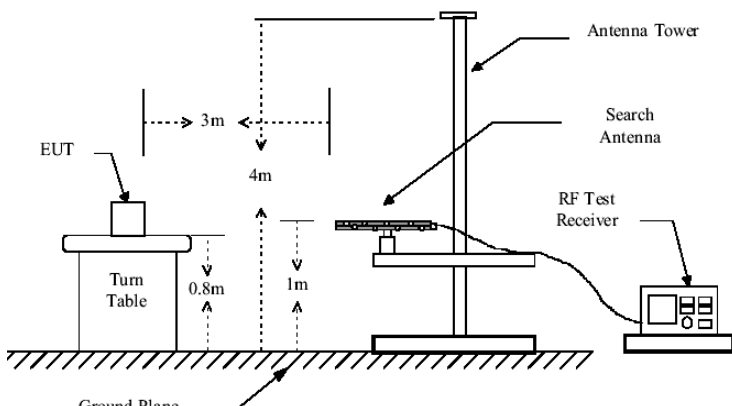
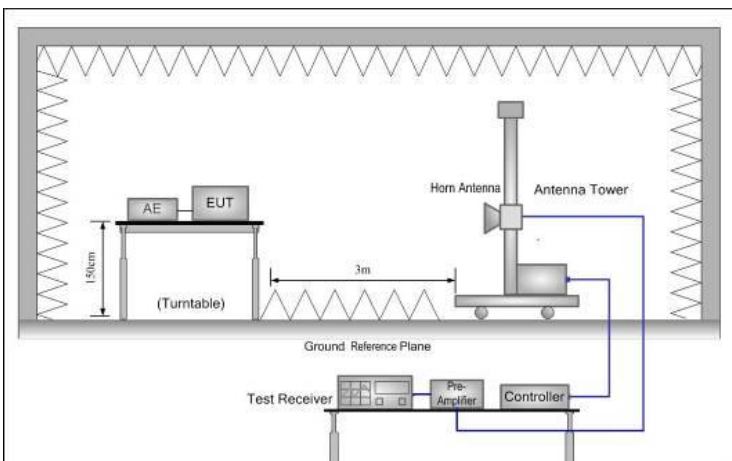
30MHz~10GHz



Date: 14.JUN.2017 15:15:39

30MHz~10GHz

6.10.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209																								
Test Method:	ANSI C63.10:2013																								
Test Frequency Range:	9 kHz to 10 GHz																								
Test site:	Measurement Distance: 3m																								
Receiver setup:	<table><tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr><tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr><tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr></table>					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	
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:	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr><tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr><tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr><tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr><tr><td>74.0</td><td>Peak Value</td></tr></table>					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
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 0.8 meters 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 5.7 for details
Test mode:	TM 1
Test results:	Pass

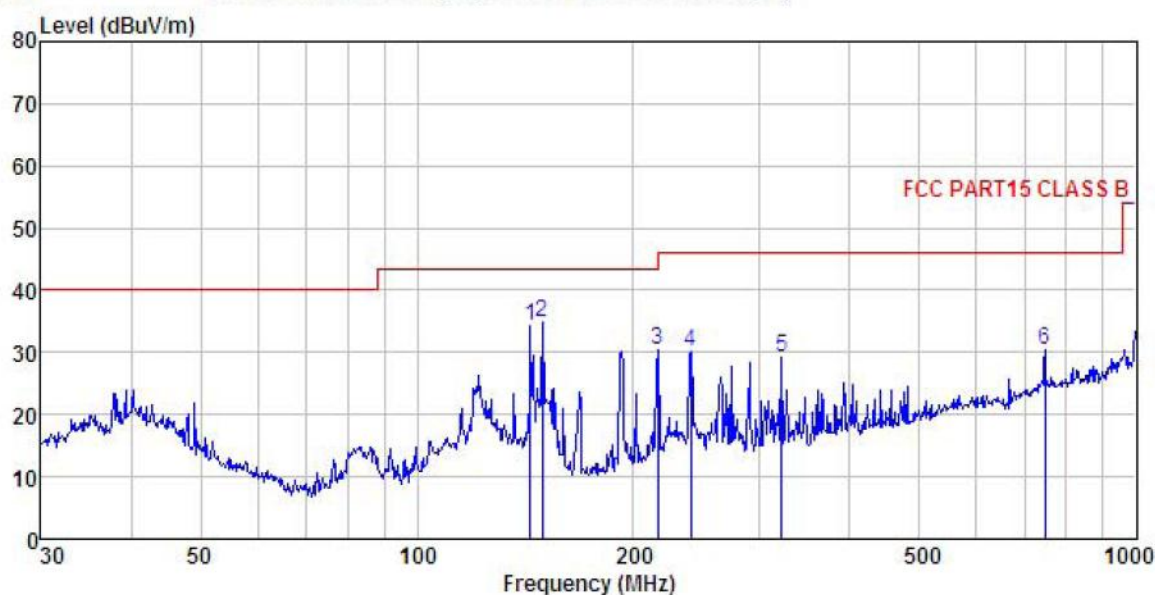
Remark:

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.
3. Low, mid and high 3 channels all have been tested for 30MHz to 1GHz, only report worst case.

Measurement data:

Below 1GHz

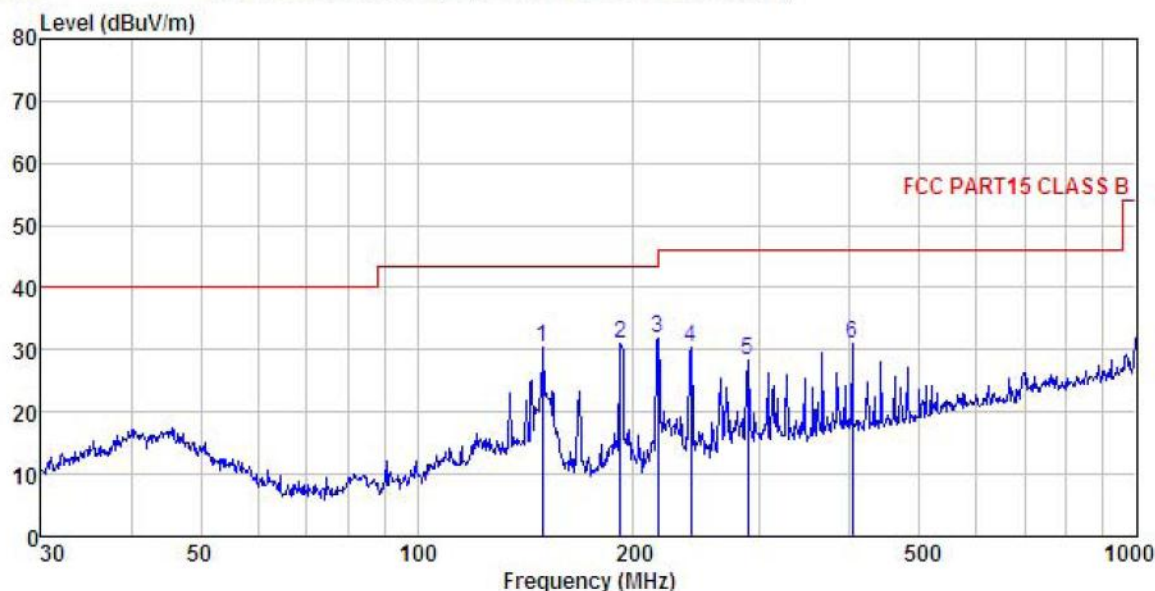
Vertical:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) VERTICAL
EUT : M-500 Micro UHF RFID Module)
Model : M-500
Test mode : ON mode
Power Rating : AC 120V/60Hz
Environment : Temp:25.5°C Humi:55%
Test Engineer: Carey
REMARK :

	Freq	ReadAntenna	Cable Preamp		Limit	Over	
		Level Factor	Loss Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB
1	143.830	49.72	11.34	2.44	29.25	34.25	43.50 -9.25 QP
2	149.486	50.82	10.70	2.51	29.22	34.81	43.50 -8.69 QP
3	216.024	45.13	11.18	2.85	28.73	30.43	46.00 -15.57 QP
4	239.987	44.21	11.80	2.82	28.59	30.24	46.00 -15.76 QP
5	321.061	41.42	13.34	3.01	28.50	29.27	46.00 -16.73 QP
6	747.483	34.14	20.32	4.35	28.49	30.32	46.00 -15.68 QP

Horizontal:



Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) HORIZONTAL
 EUT : M-500 Micro UHF RFID Module)
 Model : M-500
 Test mode : ON mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Carey
 REMARK :

	Freq	ReadAntenna	Cable Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Line	Limit	Remark
		dBuV	dB/m	dB	dB	dBuV/m	dB
1	149.486	46.29	10.70	2.51	29.22	30.28	43.50 -13.22 QP
2	191.745	47.23	9.79	2.81	28.89	30.94	43.50 -12.56 QP
3	216.024	46.49	11.18	2.85	28.73	31.79	46.00 -14.21 QP
4	239.987	44.30	11.80	2.82	28.59	30.33	46.00 -15.67 QP
5	287.990	41.74	12.27	2.91	28.47	28.45	46.00 -17.55 QP
6	403.250	40.74	15.92	3.09	28.79	30.96	46.00 -15.04 QP

Above 1GHz:

Test channel:			Lowest		Level:		Peak	
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
1805.00	64.98	23.10	4.12	41.21	50.99	74.00	-23.01	Vertical
1805.00	59.61	23.10	4.12	41.21	45.62	74.00	-28.38	Horizontal
Test channel:			Lowest		Level:		Average	
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
1805.00	54.37	23.10	4.12	41.21	40.38	54	-13.62	Vertical
1805.00	49.10	23.10	4.12	41.21	35.11	54	-18.89	Horizontal

Test channel:			Middle		Level:		Peak	
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
1830.00	63.66	23.17	4.15	41.27	49.71	74.00	-24.29	Vertical
1830.00	59.05	23.17	4.15	41.27	45.10	74.00	-28.90	Horizontal
Test channel:			Middle		Level:		Average	
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
1830.00	53.66	23.17	4.15	41.27	39.71	54.00	-14.29	Vertical
1830.00	49.87	23.17	4.15	41.27	35.92	54.00	-18.08	Horizontal

Test channel:			Highest		Level:		Peak	
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
1855.00	63.33	23.22	4.17	41.32	49.40	74.00	-24.60	Vertical
1855.00	56.06	23.22	4.17	41.32	42.13	74.00	-31.87	Horizontal
Test channel:			Highest		Level:		Average	
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
1855.00	53.67	23.22	4.17	41.32	39.74	54.00	-14.26	Vertical
1855.00	46.56	23.22	4.17	41.32	32.63	54.00	-21.37	Horizontal

Remark:

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