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-2900 UHF RFID 8-Port Module
Model No.:	M-2900
FCC ID:	2AKQD-M2900
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	06 Jun., 2017
Date of Test:	06 Jun., to 7 Jul., 2017
Date of report issued:	7 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	*7 Jul., 2017*	*Original*

Tested by: Mike.ou ***Date:*** *7 Jul., 2017*

Test Engineer

Reviewed by: RYan.Lee ***Date:*** *7 Jul., 2017*

Project Engineer

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 LABORATORY FACILITY 6
5.5 LABORATORY LOCATION 6
5.6 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 26
6.10.1 Conducted Emission Method 26
6.10.2 Radiated Emission Method 29
7 TEST SETUP PHOTO 34
8 EUT CONSTRUCTIONAL DETAILS 36

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

5.2 General Description of E.U.T.

Product Name:	M-2900 UHF RFID 8-Port Module
Model No.:	M-2900
Operation Frequency:	902MHz~928MHz
Number of channel:	50
Modulation type:	GFSK
Modulation technology:	FHSS
Antenna Type:	Ceramic antenna
Antenna gain:	2.0dBi
AC adapter:	Model: GP305C-120-300 Input: AC100-240V 50/60Hz 1.0A Output: DC 12V, 3.0A

Operation Frequency each of channel for GFSK							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.50MHz	13	909.00MHz	26	915.50MHz	39	922.00MHz
1	903.00MHz	14	909.50MHz	27	916.00MHz	40	922.50MHz
2	903.50MHz	15	910.00MHz	28	916.50MHz	41	923.00MHz
3	904.00MHz	16	910.50MHz	29	917.00MHz	42	923.50MHz
4	904.50MHz	17	911.00MHz	30	917.50MHz	43	924.00MHz
5	905.00MHz	18	911.50MHz	31	918.00MHz	44	924.50MHz
6	905.50MHz	19	912.00MHz	32	918.50MHz	45	925.50MHz
7	906.00MHz	20	912.50MHz	33	919.00MHz	46	926.00MHz
8	906.50MHz	21	913.00MHz	34	919.50MHz	47	926.50MHz
9	907.00MHz	22	913.50MHz	35	920.00MHz	48	927.00MHz
10	907.50MHz	23	914.00MHz	36	920.50MHz	49	927.50MHz
11	908.00MHz	24	914.50MHz	37	921.00MHz		
12	908.50MHz	25	915.00MHz	38	921.50MHz		
Remark: Channel 0, 25 & 49 selected for GFSK.							

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with worst case data rate.
The sample was placed 0.8m 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.	
The EUT has four TX ports with the identical configure, and only one port can transmit at the same time, so the worst case port was performed to test.	

5.4 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.

5.5 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

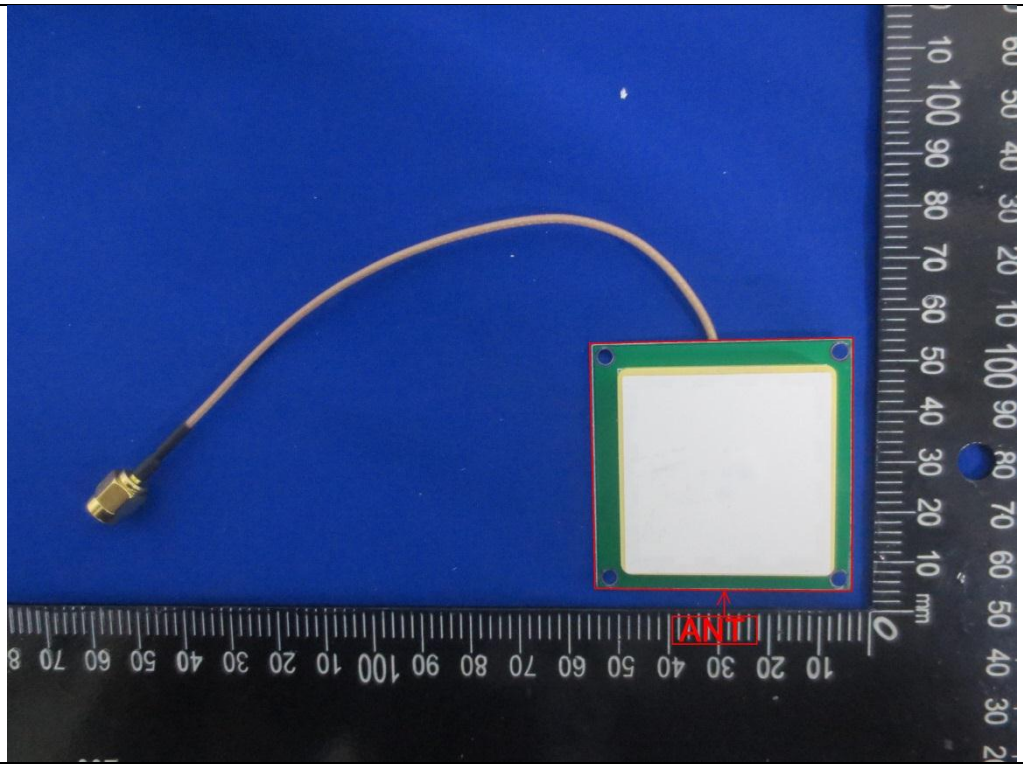
5.6 Test Instruments list

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	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	02-25-2017	02-24-2018
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	02-25-2017	02-24-2018
8	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP30	CCIS0023	02-25-2017	02-24-2018
9	EMI Test Receiver	Rohde & Schwarz	ESRP7	CCIS0167	02-25-2017	02-24-2018
10	Loop antenna	Laplace instrument	RF300	EMC0701	02-25-2017	02-24-2018
11	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)
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 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.*	
E.U.T Antenna:	
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.* All *the RF characteristics (such as power, bandwidth etc.) of the ports are identical, which can't launch at the same time, 8 ports is polling, eight antennas installation will not affect each other.*	
	

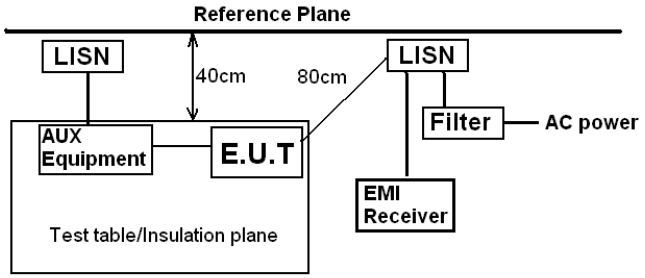
6.2 Conducted Emissions

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 Impedence Stabilization Network
Test table height=0.8m

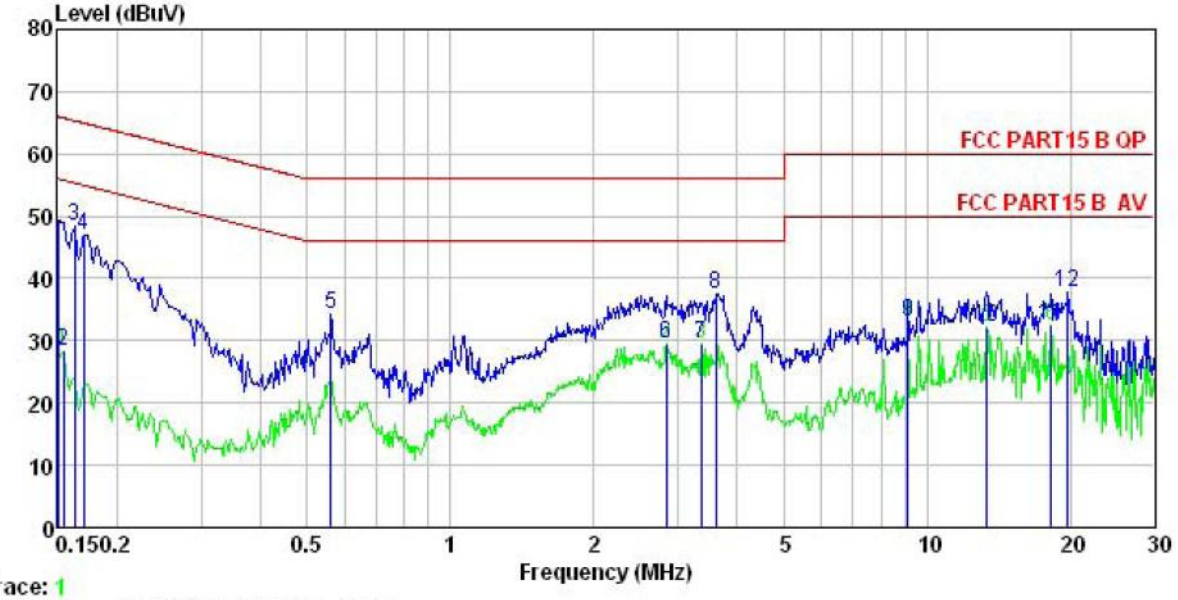
Test procedure:

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: 2009 on conducted measurement.

Test Uncertainty:	±3.28 dB
Test Instruments:	Refer to section 5.7 for details
Test mode:	Bluetooth (Continuous transmitting) mode
Test results:	Pass

Measurement Data

Line:

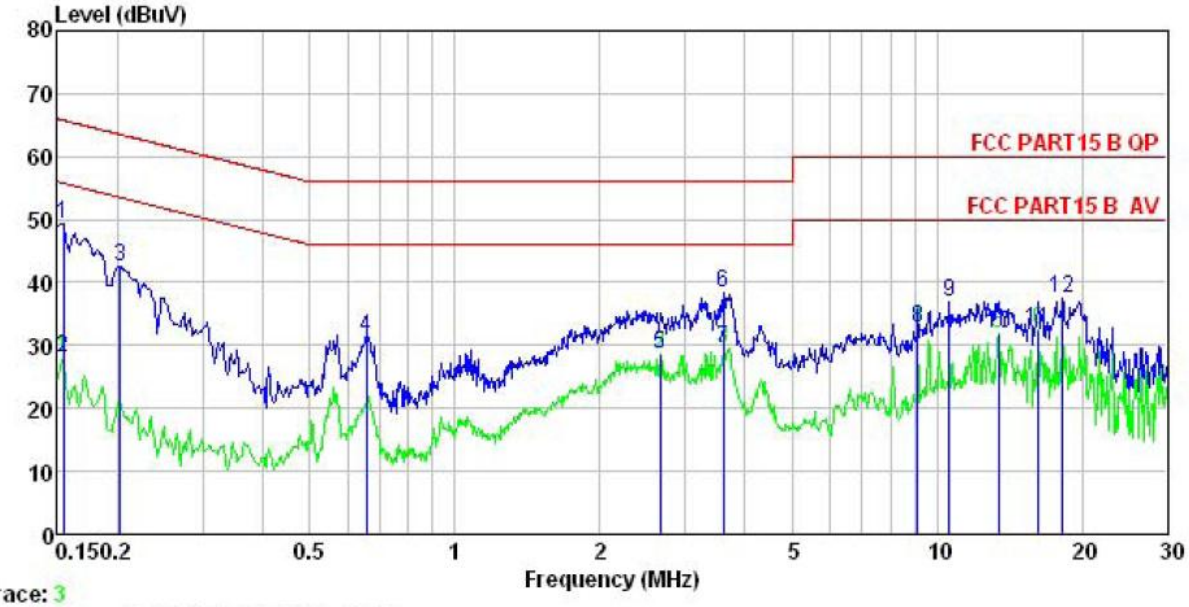


Trace: 1

Site : CCIS Shielding Room
Condition : FCC PART15 B QP LISN LINE
EUT : M-2900 UHF RFID 8-Port Module
Model : M-2900
Test Mode : TX Mode
Power Rating : AC 120V/60Hz
Environment : Temp: 23 ℃ Huni:56% Atmos:101KPa
Test Engineer: Mike
Remark :

	Freq	Read Level	ISN	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV		dB	dBuV	dBuV	dB	
1	0.150	38.42	0.14	10.78	49.34	66.00	-16.66	QP
2	0.154	17.50	0.14	10.78	28.42	55.78	-27.36	Average
3	0.162	37.38	0.14	10.77	48.29	65.34	-17.05	QP
4	0.170	36.12	0.14	10.77	47.03	64.94	-17.91	QP
5	0.561	23.15	0.27	10.77	34.19	56.00	-21.81	QP
6	2.839	18.22	0.33	10.93	29.48	46.00	-16.52	Average
7	3.364	18.14	0.33	10.91	29.38	46.00	-16.62	Average
8	3.603	26.25	0.34	10.90	37.49	56.00	-18.51	QP
9	9.107	21.80	0.32	10.90	33.02	50.00	-16.98	Average
10	13.337	20.90	0.26	10.91	32.07	50.00	-17.93	Average
11	18.232	21.19	0.31	10.91	32.41	50.00	-17.59	Average
12	19.740	26.67	0.33	10.93	37.93	60.00	-22.07	QP

Neutral:



Trace: 3

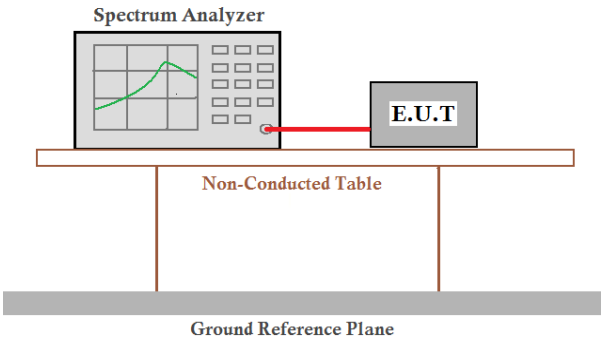
Site : CCIS Shielding Room
Condition : FCC PART15 B QP LISN NEUTRAL
EUT : M-2900 UHF RFID 8-Port Module
Model : M-2900
Test Mode : TX Mode
Power Rating : AC 120V/60Hz
Environment : Temp: 23 ℃ Huni:56% Atmos:101KPa
Test Engineer: Mike
Remark :

	Freq	Read Level	ISN	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV		dB	dBuV	dBuV	dB	
1	0.154	38.42	0.12	10.78	49.32	65.78	-16.46	QP
2	0.154	17.14	0.12	10.78	28.04	55.78	-27.74	Average
3	0.202	31.66	0.15	10.76	42.57	63.54	-20.97	QP
4	0.654	20.15	0.31	10.77	31.23	56.00	-24.77	QP
5	2.664	17.44	0.29	10.93	28.66	46.00	-17.34	Average
6	3.603	27.04	0.33	10.90	38.27	56.00	-17.73	QP
7	3.603	18.40	0.33	10.90	29.63	46.00	-16.37	Average
8	9.107	21.62	0.26	10.90	32.78	50.00	-17.22	Average
9	10.620	25.78	0.24	10.93	36.95	60.00	-23.05	QP
10	13.408	20.85	0.25	10.91	32.01	50.00	-17.99	Average
11	16.226	21.23	0.27	10.91	32.41	50.00	-17.59	Average
12	18.232	26.29	0.27	10.91	37.47	60.00	-22.53	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

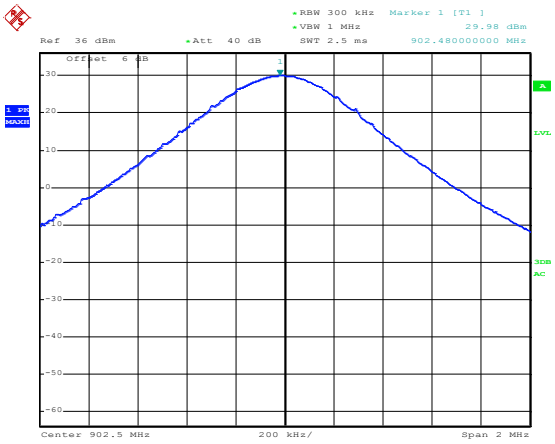
6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074v03r03 section 9.2.2
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:	1W(30 dBm)
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data

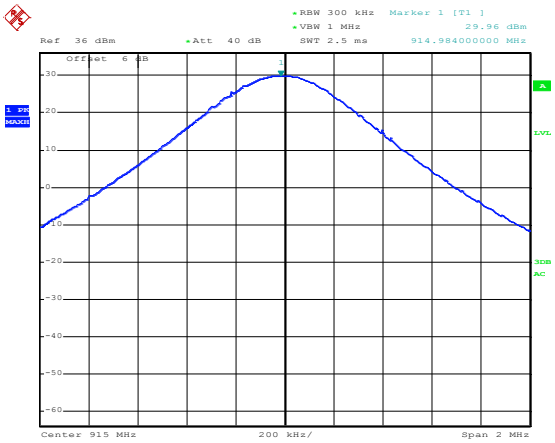
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	29.98	30.00	Pass
Middle	29.96	30.00	Pass
Highest	29.99	30.00	Pass

Test plot as follows:



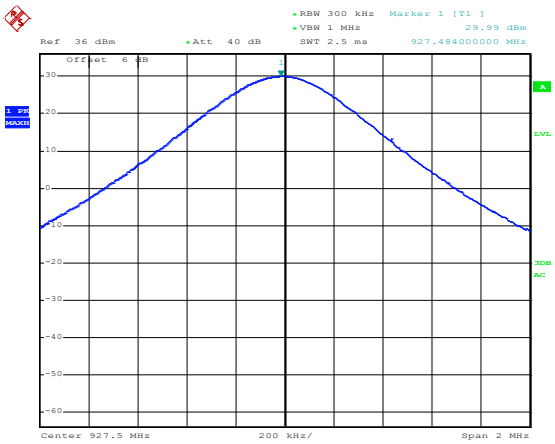
Date: 11.JUN.2017 10:36:09

Lowest channel



Date: 11.JUN.2017 10:38:32

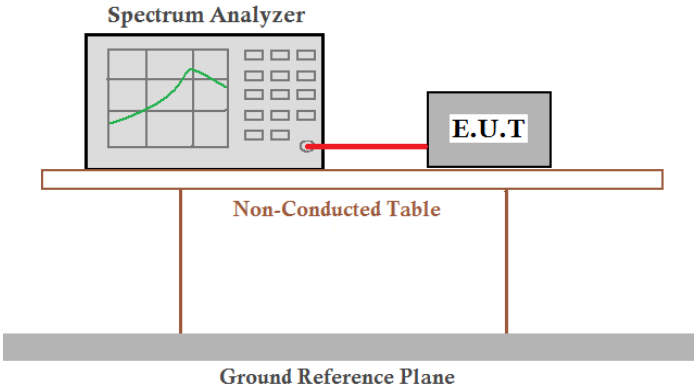
Middle channel



Date: 11.JUN.2017 10:40:09

Highest channel

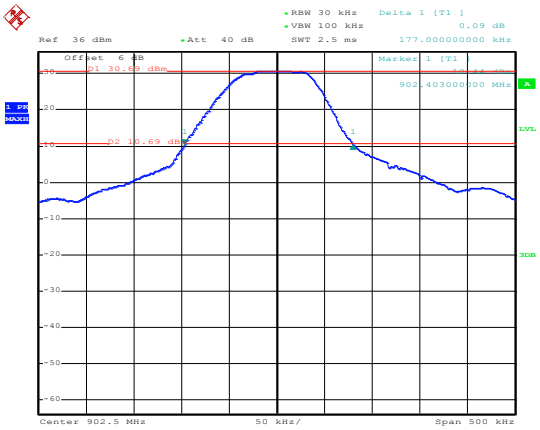
6.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and KDB558074v03r03 section 8.1
Receiver setup:	RBW=30 kHz, VBW=100 kHz, detector=Peak
Limit:	500kHz
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data

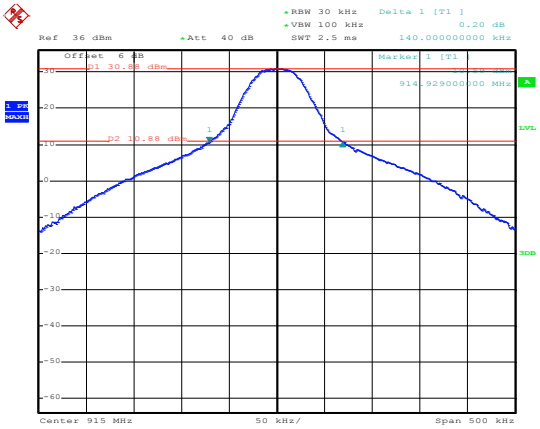
Test channel	20dB Occupy Bandwidth (kHz)	Limit (kHz)
Lowest	177	500
Middle	140	500
Highest	141	500

Test plot as follows:



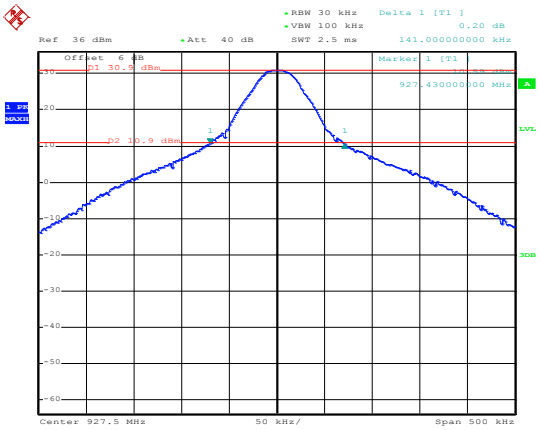
Date: 11.JUN.2017 16:51:21

Lowest channel



Date: 11.JUN.2017 16:40:47

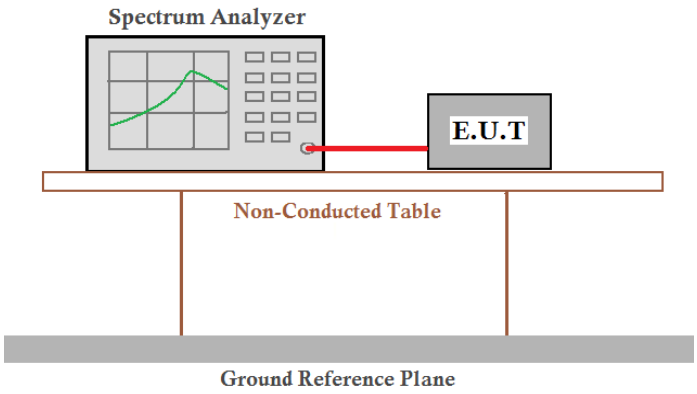
Middle channel



Date: 11.JUN.2017 16:29:35

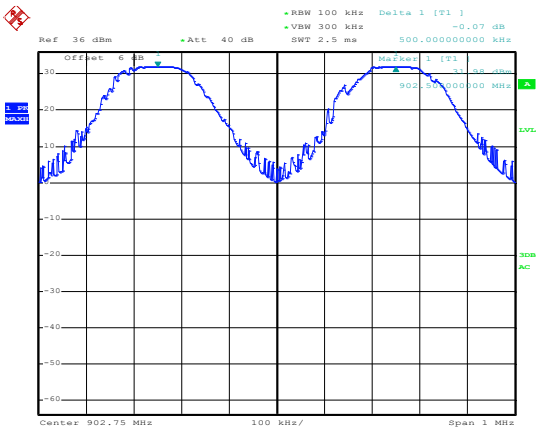
Highest channel

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:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

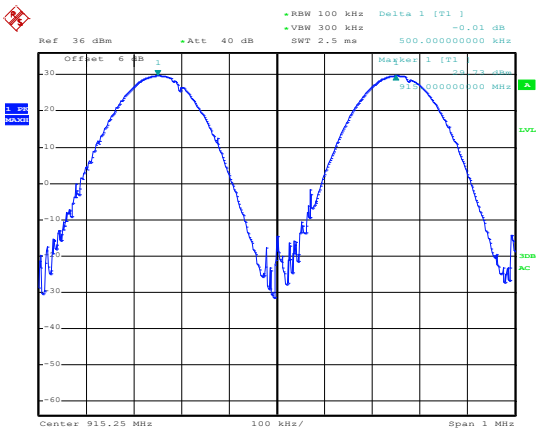
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)
Lowest	500	137
Middle	500	136
Highest	504	141



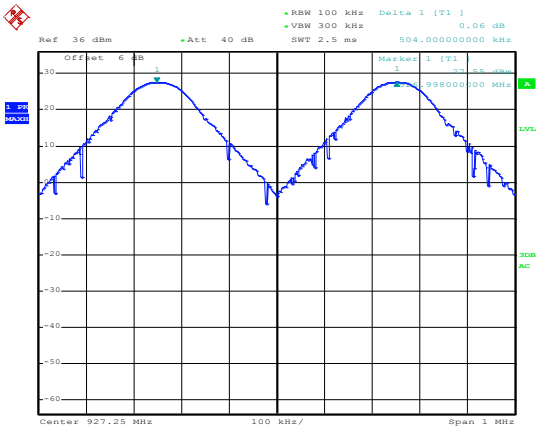
Date: 11.JUN.2017 10:47:57

Lowest channel



Date: 8.JUN.2017 17:01:23

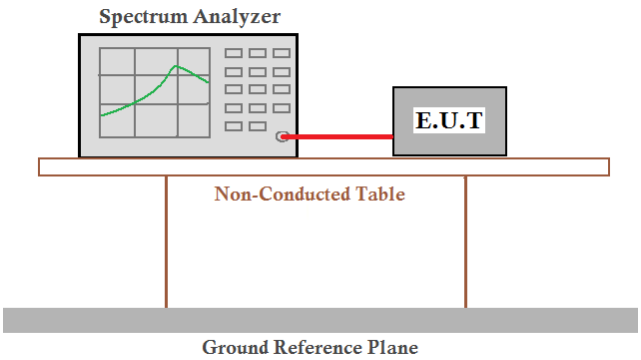
Middle channel



Date: 8.JUN.2017 16:59:46

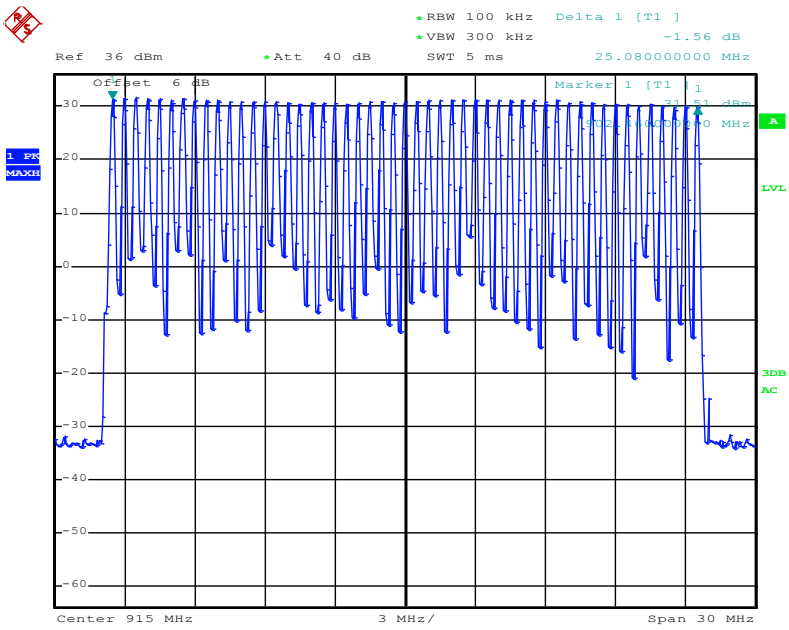
Highest channel

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:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

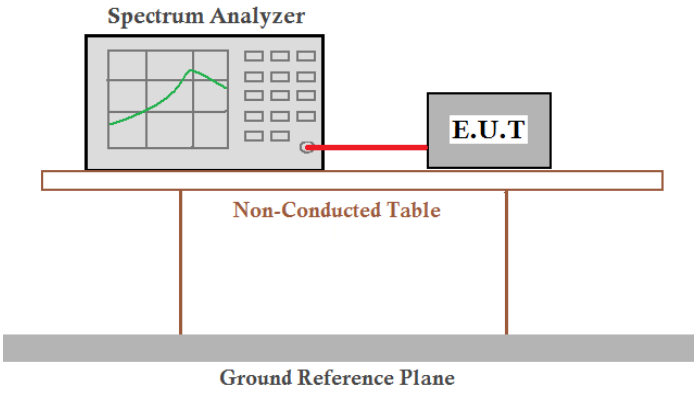
Measurement Data:

Hopping channel numbers	Limit	Result
50	50	Pass



Date: 11.JUN.2017 10:55:35

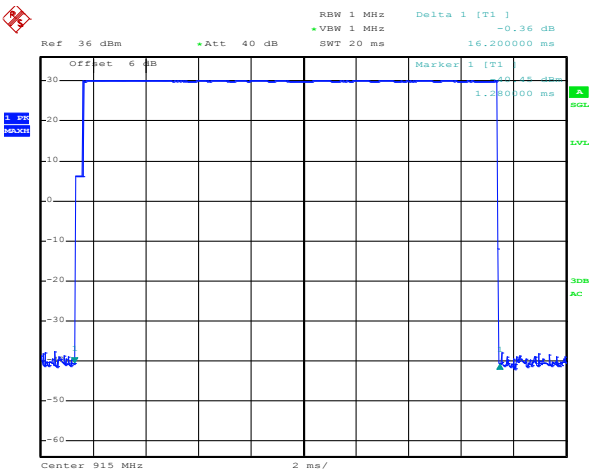
6.7 Dwell Time

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:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

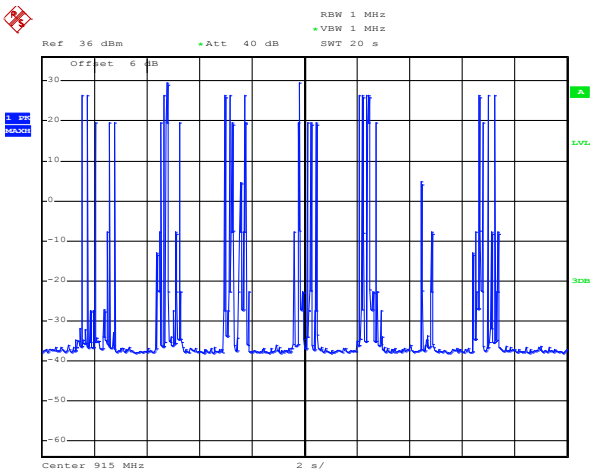
Measurement Data

Dwell time per hop (Second)	Hopping numbers	Dwell time in one period (Second)	Limit (Second)	Result
0.01620	15	0.243	0.4	Pass

Remark:
The test period: T= 20s



Date: 11.JUN.2017 10:57:07



Date: 4.JUL.2017 19:06:26

6.8 Pseudorandom Frequency Hopping Sequence

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

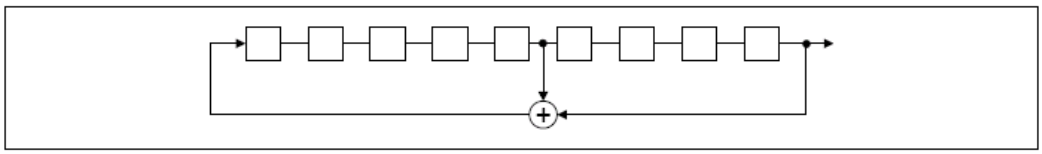
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

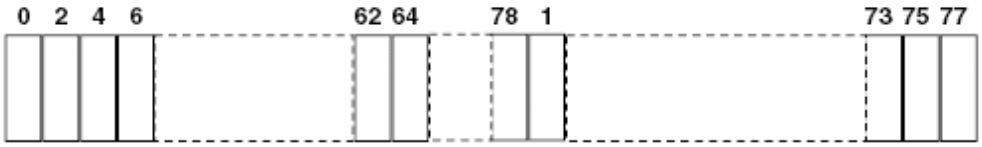
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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

An example of Pseudorandom Frequency Hopping Sequence as follow:

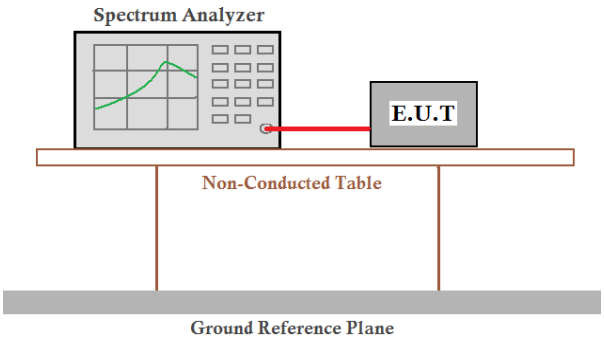


Each frequency used equally on the average by each transmitter.

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.

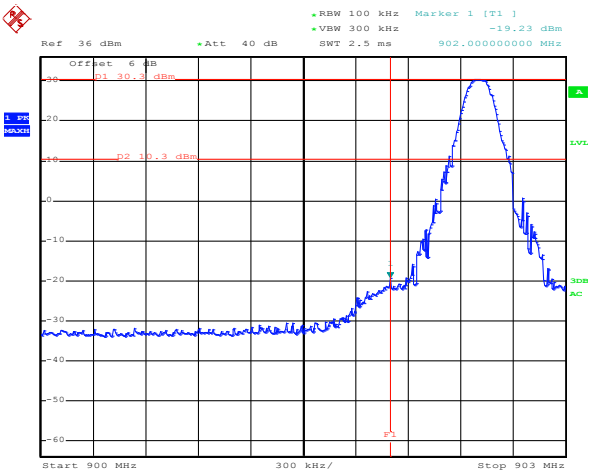
6.9 Band Edge

6.9.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074v03r03 section 13
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 5.7 for details
Test mode:	Non-hopping mode and hopping mode
Test results:	Pass

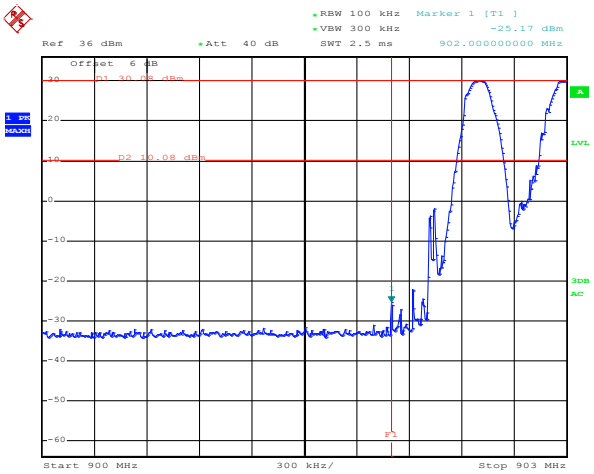
Test plot as follows:

Lowest Channel



Date: 8.JUN.2017 16:41:28

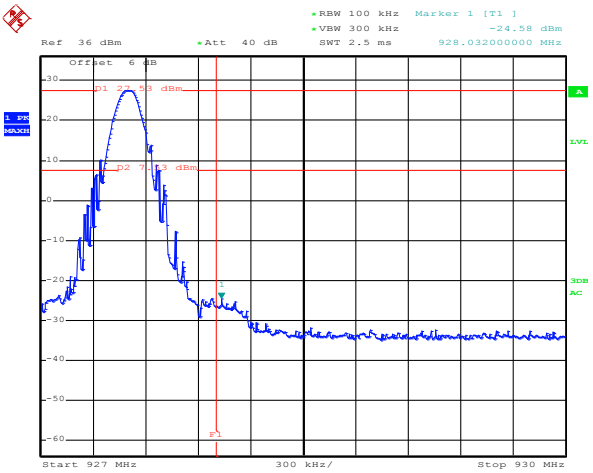
Non-hopping



Date: 8.JUN.2017 16:46:22

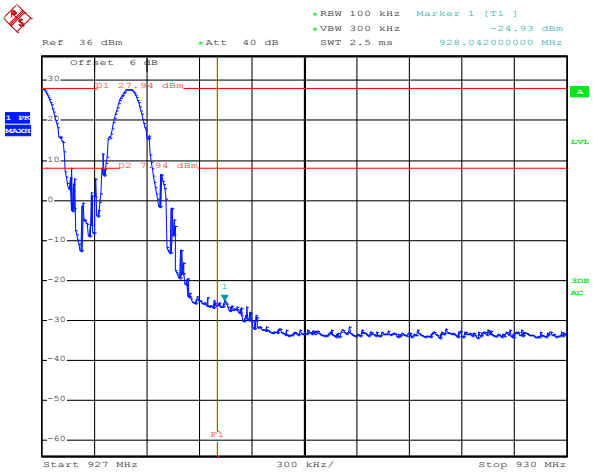
Hopping

Highest Channel



Date: 8.JUN.2017 16:51:24

Non-hopping



Date: 8.JUN.2017 16:49:46

Hopping

6.9.2 Radiated Emission Method

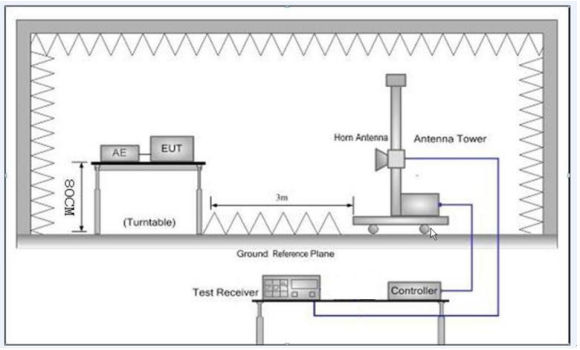
Test Requirement:	FCC Part 15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013and KDB 558074v03r03 section 12.1
Test Frequency Range:	902MHz~928MHz
Test site:	Measurement Distance: 3m
Receiver setup:	

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:



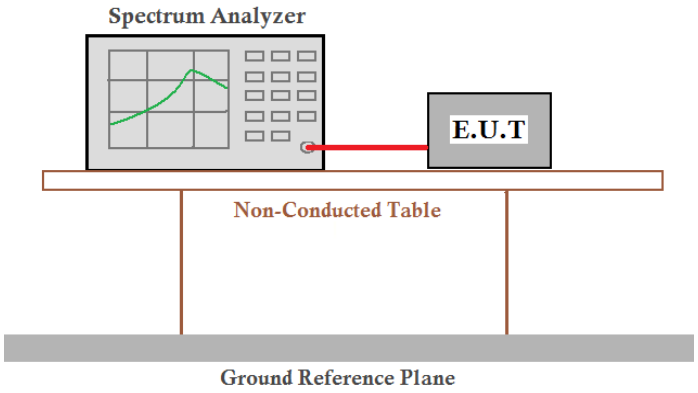
Test Procedure:

1. The EUT was placed on the top of a rotating table 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.

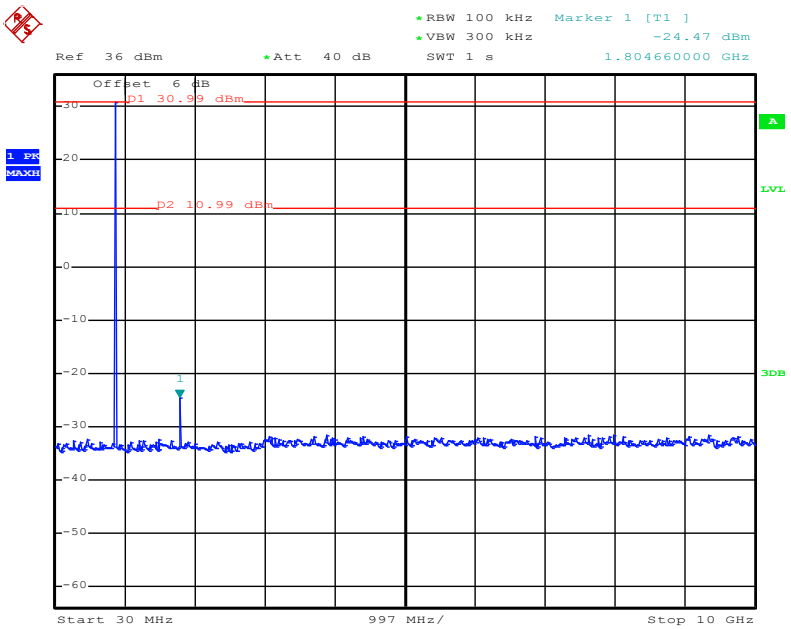
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Not applicable

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 KDB558074 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:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

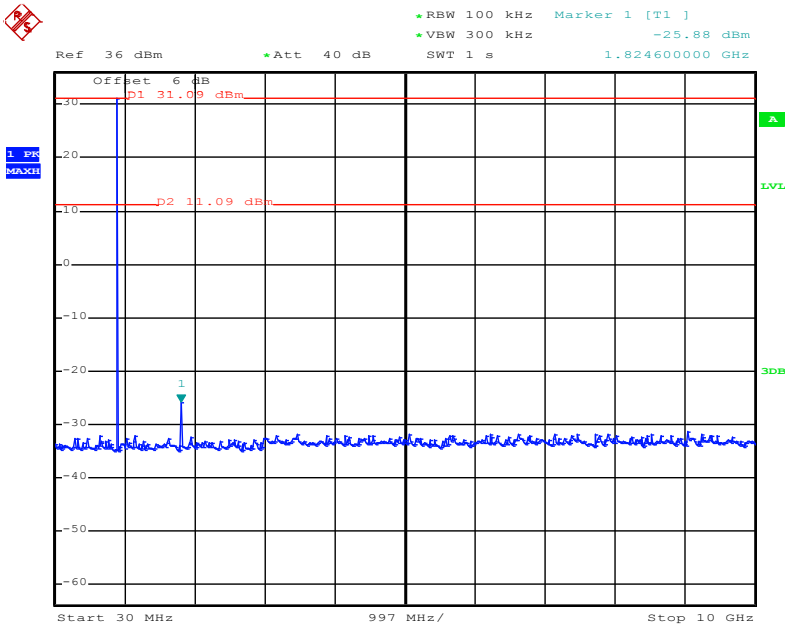
Lowest channel



Date: 11.JUN.2017 16:20:06

30MHz~10GHz

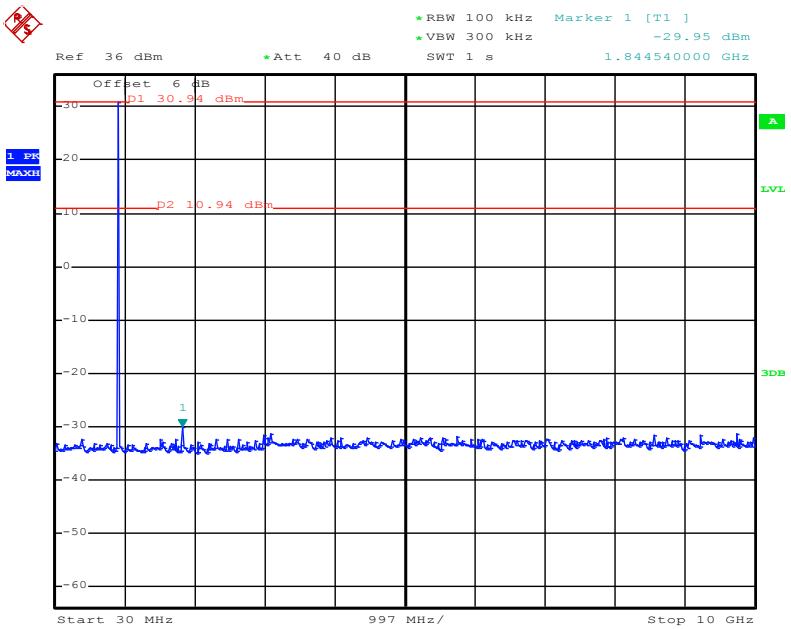
Middle channel



Date: 11.JUN.2017 16:21:06

30MHz~10GHz

Highest channel



Date: 11.JUN.2017 16:22:09

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:

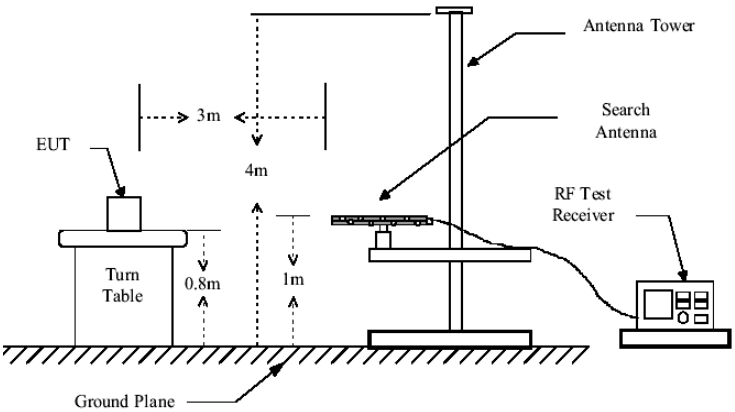
Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	RMS	1MHz	3MHz	Average Value

Limit:

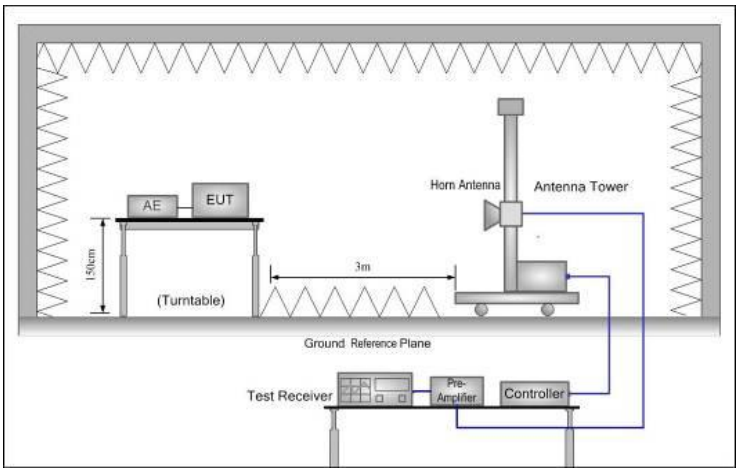
Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 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 Uncertainty:	±4.88 dB
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

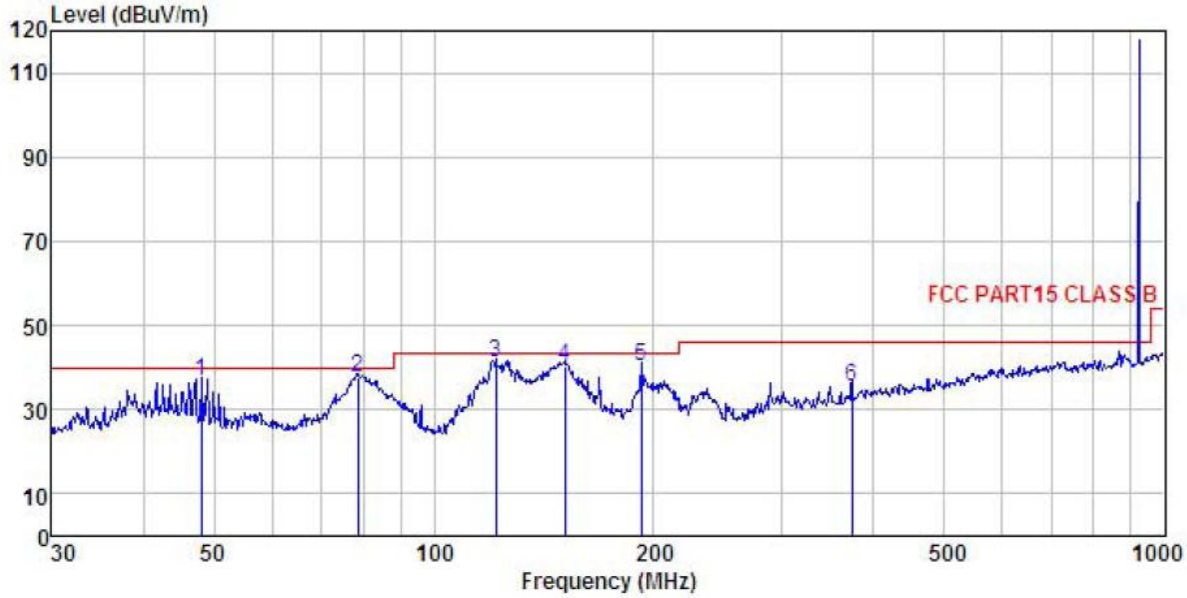
Remark:

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

Measurement data:

Below 1GHz

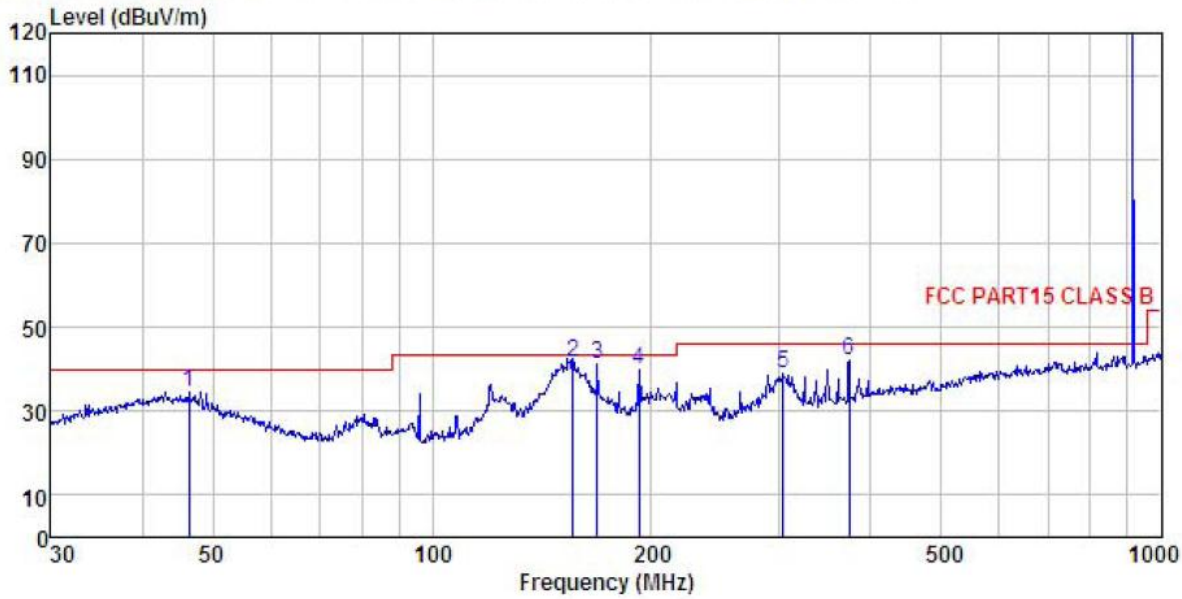
Vertical:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) VERTICAL
EUT : M-2900 UHF RFID 8-Port Module
Model : M-2900
Test mode : TX Mode
Power Rating : AC 120V/60Hz
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Mike
REMARK :

	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	47.994	19.49	16.10	1.27	0.00	36.86	40.00	-3.14	QP
2	78.689	29.49	6.44	1.65	0.00	37.58	40.00	-2.42	QP
3	121.549	26.97	11.89	2.19	0.00	41.05	43.50	-2.45	QP
4	151.067	27.31	10.59	2.53	0.00	40.43	43.50	-3.07	QP
5	192.419	27.50	9.84	2.82	0.00	40.16	43.50	-3.34	QP
6	373.311	17.55	14.97	3.09	0.00	35.61	46.00	-10.39	QP

Horizontal:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) HORIZONTAL
EUT : M-2900 UHF RFID 8-Port Module
Model : M-2900
Test mode : TX Mode
Power Rating : AC 120V/60Hz
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Mike
REMARK :

	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	46.340	16.12	17.08	1.28	0.00	34.48	40.00	-5.52	QP
2	155.910	28.87	10.19	2.56	0.00	41.62	43.50	-1.88	QP
3	168.414	28.85	9.81	2.64	0.00	41.30	43.50	-2.20	QP
4	192.419	27.14	9.84	2.82	0.00	39.80	43.50	-3.70	QP
5	303.544	23.36	12.83	2.95	0.00	39.14	46.00	-6.86	QP
6	373.311	23.95	14.97	3.09	0.00	42.01	46.00	-3.99	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	78.83	23.10	4.12	41.21	64.84	74.00	-9.16	Vertical
1805.00	75.66	23.10	4.12	41.21	61.67	74.00	-12.33	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	49.26	23.10	4.12	41.21	35.27	54.00	-18.73	Vertical
1805.00	49.94	23.10	4.12	41.21	35.95	54.00	-18.05	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	79.49	23.17	4.15	41.27	65.54	74.00	-8.46	Vertical
1830.00	76.50	23.17	4.15	41.27	62.55	74.00	-11.45	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	44.61	23.17	4.15	41.27	30.66	54.00	-23.34	Vertical
1830.00	51.23	23.17	4.15	41.27	37.28	54.00	-16.72	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	80.01	23.22	4.17	41.32	66.08	74.00	-7.92	Vertical
1855.00	77.21	23.22	4.17	41.32	63.28	74.00	-10.72	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	55.59	23.22	4.17	41.32	41.66	54.00	-12.34	Vertical
1855.00	53.66	23.22	4.17	41.32	39.73	54.00	-14.27	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.*