TEST REPORT

Applicant:	Dragino Technology Co., Limited.
Address of Applicant:	Room 202,BaoChengTai industrial park,No.8 CaiYun LongCheng Street,LongGang District, Shenzhen 518116, China
Manufacturer/Factory :	Dragino Technology Co., Limited.
Address of Manufacturer/Factory :	Room 202,BaoChengTai industrial park,No.8 CaiYun LongCheng Street,LongGang District, Shenzhen 518116, China

Equipment Under Test (EUT)

Product Name:	LoRaWAN Gateway
Model No.:	DLOS8
Trade Mark:	Dragino
FCC ID:	ZHZDLOS8
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	Oct. 12, 2020
Date of Test:	Oct. 12 – Nov. 03, 2020
Date of report issued:	Nov. 04, 2020
Test Result :	PASS *

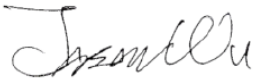
* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

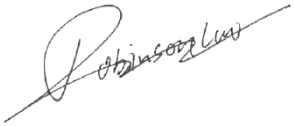
Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*Nov. 04, 2020*	*Original*

Prepared By:  ***Date:*** *Nov. 04, 2020*

Project Engineer

Check By:  ***Date:*** *Nov. 04, 2020*

Reviewer

3 Contents

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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
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass
Power Spectral Density	15.247 (e)	Pass

Remarks:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *Test according to ANSI C63.10:2013*

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	LoRaWAN Gateway
Model No.:	DLOS8
Test sample(s) ID:	GTSxxx
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	902MHz~928MHz
Channel numbers:	128 for 125KHz bandwidth 77 for 250KHz bandwidth 16 for 500KHz bandwidth
Channel separation:	200KHz for 125KHz bandwidth 330KHz for 250KHz bandwidth 1.6MHz for 500KHz bandwidth
Modulation type:	FSK
Antenna Type:	fibre-glass epoxy antenna
Antenna gain:	3dBi
Power supply:	Adapter Model:TP02-120100U Input: AC 100-240V,50/60Hz, 0.5A Output: DC 12V, 1.0A

125KHz for FHSS:

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.3	34	908.9	67	915.5	100	922.1
2	902.5	35	909.1	68	915.7	101	922.3
3	902.7	36	909.3	69	915.9	102	922.5
4	902.9	37	909.5	70	916.1	103	922.7
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.
30	908.1	63	914.7	96	921.3	128	927.7
31	908.3	64	914.9	97	921.5		
32	908.5	65	915.1	98	921.7		
33	908.7	66	915.3	99	921.9		

250KHz for FHSS:

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.40	21	909.00	41	915.60	61	922.20
2	902.73	22	909.33	42	915.93	62	922.53
3	903.06	23	909.66	43	916.26	63	922.86
4	903.39	24	909.99	44	916.59	64	923.19
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.
17	907.68	37	914.28	57	920.88	77	927.48
18	908.01	38	914.61	58	921.21		
19	908.34	39	914.94	59	921.54		
20	908.67	40	915.27	60	921.87		

500KHz for DTS:

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	903.00	5	909.40	9	915.80	13	922.20
2	904.60	6	911.00	10	917.40	14	923.80
3	906.20	7	912.60	11	919.00	15	925.40
4	907.80	8	914.20	12	920.60	16	927.00

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency(125KHz)	Frequency(250KHz)	Frequency(500KHz)
The lowest channel	902.30MHz	902.40MHz	903.00MHz
The middle channel	915.10MHz	914.94MHz	915.80MHz
The Highest channel	927.70MHz	927.48MHz	927.00MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383.

● **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

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 Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 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.

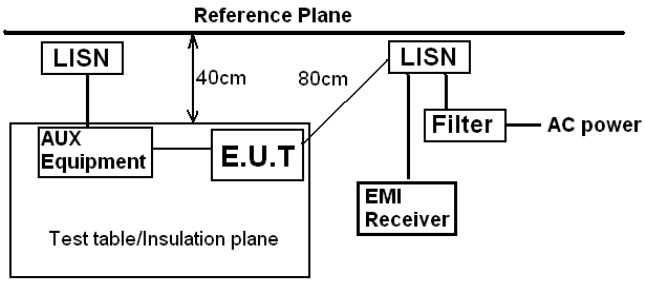
15.247(c) (1)(i) requirement:

(i) Systems operating in the 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 antenna is fibre-glass epoxy antenna*, the best case gain of the is 3dBi, reference to the appendix II for details.*

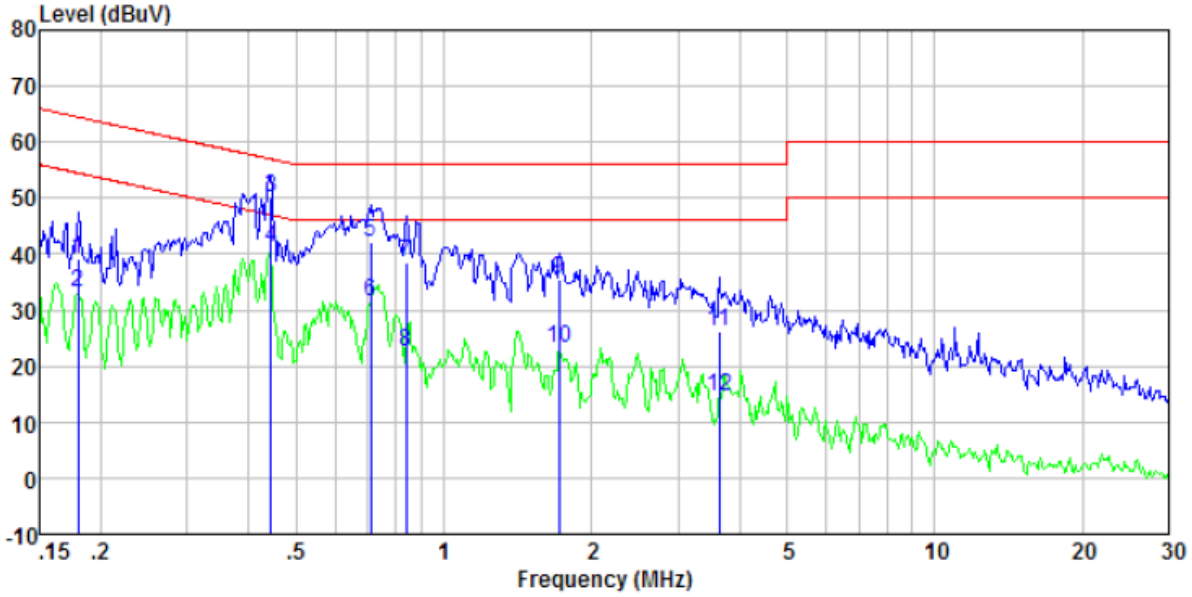
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, 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 C63.10:2013 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar
Test voltage:	AC 120V, 60Hz
Test results:	Pass

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

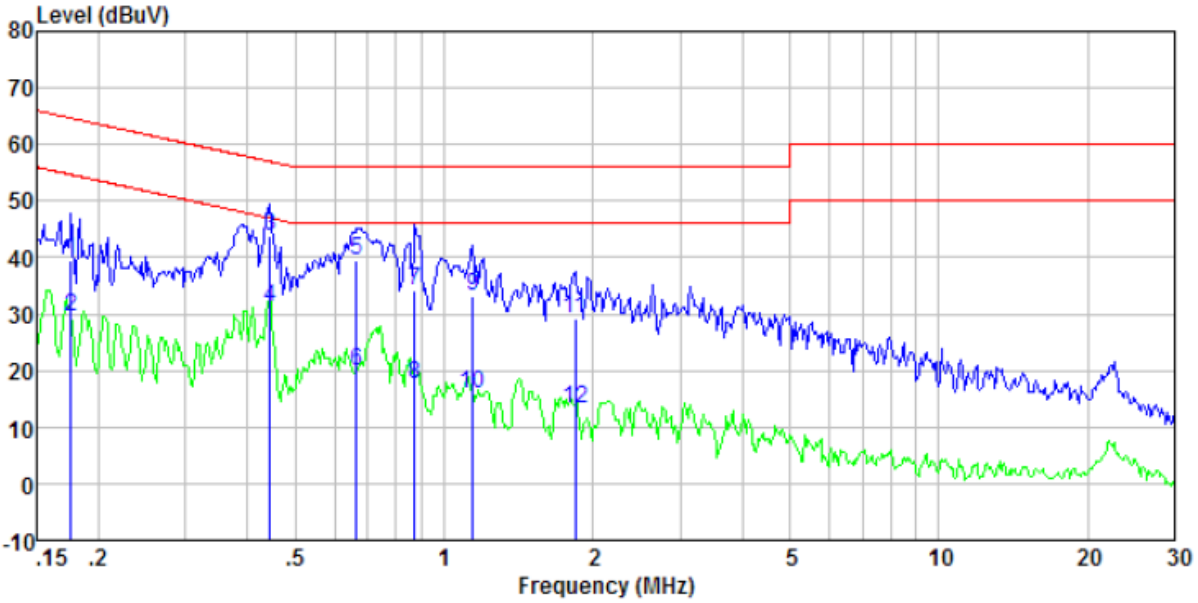
Measurement data:

Line:



Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.180	38.73	0.40	0.10	39.23	64.50	-25.27	QP
0.180	32.64	0.40	0.10	33.14	54.50	-21.36	Average
0.444	49.67	0.33	0.11	50.11	56.98	-6.87	QP
0.444	40.69	0.33	0.11	41.13	46.98	-5.85	Average
0.708	41.70	0.26	0.13	42.09	56.00	-13.91	QP
0.708	31.20	0.26	0.13	31.59	46.00	-14.41	Average
0.839	38.24	0.23	0.14	38.61	56.00	-17.39	QP
0.839	22.22	0.23	0.14	22.59	46.00	-23.41	Average
1.716	35.05	0.20	0.17	35.42	56.00	-20.58	QP
1.716	22.90	0.20	0.17	23.27	46.00	-22.73	Average
3.642	25.87	0.20	0.18	26.25	56.00	-29.75	QP
3.642	14.05	0.20	0.18	14.43	46.00	-31.57	Average

Neutral:



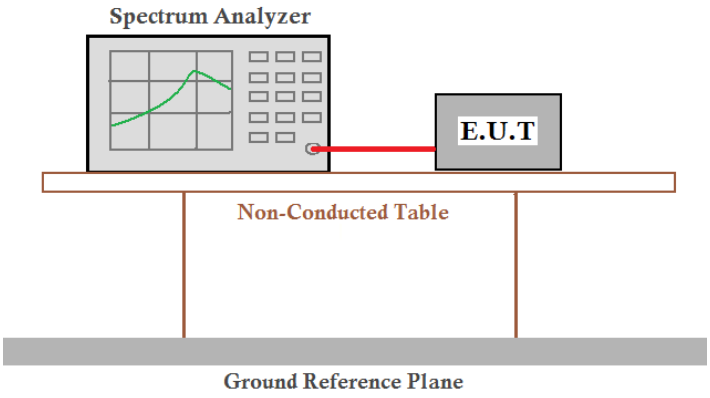
Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.176	39.16	0.40	0.09	39.65	64.68	-25.03	QP
0.176	29.15	0.40	0.09	29.64	54.68	-25.04	Average
0.444	43.49	0.33	0.11	43.93	56.98	-13.05	QP
0.444	30.75	0.33	0.11	31.19	46.98	-15.79	Average
0.665	39.19	0.27	0.13	39.59	56.00	-16.41	QP
0.665	19.42	0.27	0.13	19.82	46.00	-26.18	Average
0.871	33.87	0.22	0.14	34.23	56.00	-21.77	QP
0.871	17.07	0.22	0.14	17.43	46.00	-28.57	Average
1.141	32.88	0.20	0.15	33.23	56.00	-22.77	QP
1.141	15.60	0.20	0.15	15.95	46.00	-30.05	Average
1.839	28.76	0.20	0.17	29.13	56.00	-26.87	QP
1.839	13.00	0.20	0.17	13.37	46.00	-32.63	Average

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

8 Test Items for Hybrid

8.1 Conducted Peak Output Power

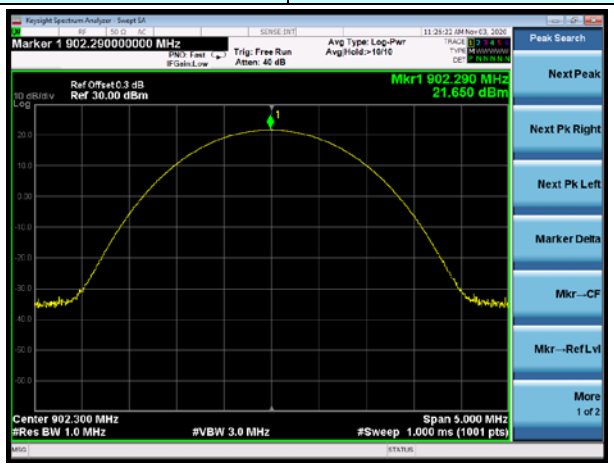
Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

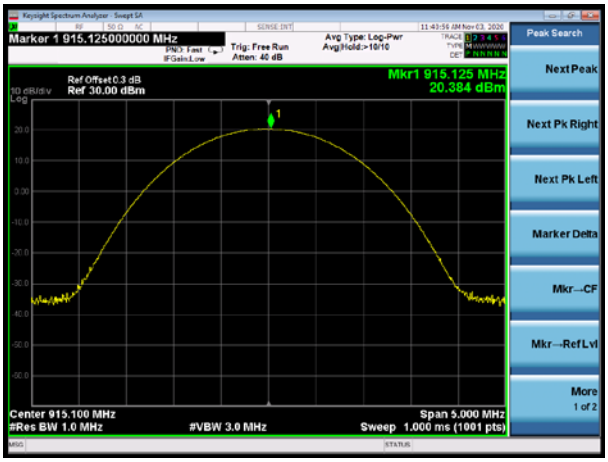
Mode	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
125KHz Bandwidth	Lowest	21.650	30.00	Pass
	Middle	20.384		
	Highest	19.085		
250KHz Bandwidth	Lowest	21.548	30.00	Pass
	Middle	20.366		
	Highest	17.076		

Test plot as follows:

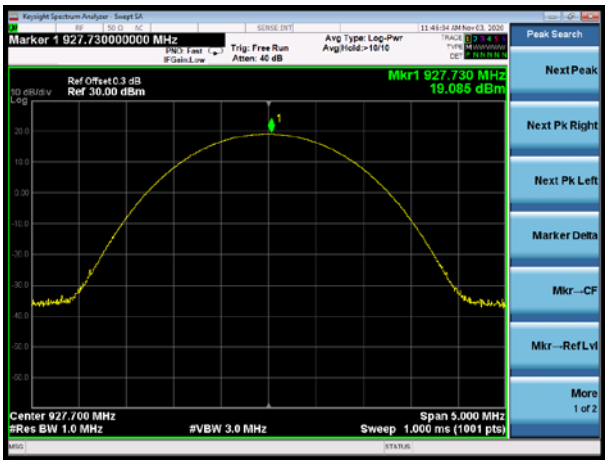
Test mode:	125KHz Bandwidth



Lowest channel

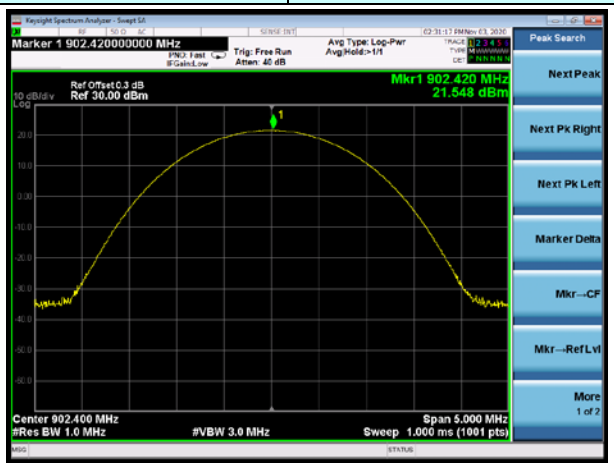


Middle channel

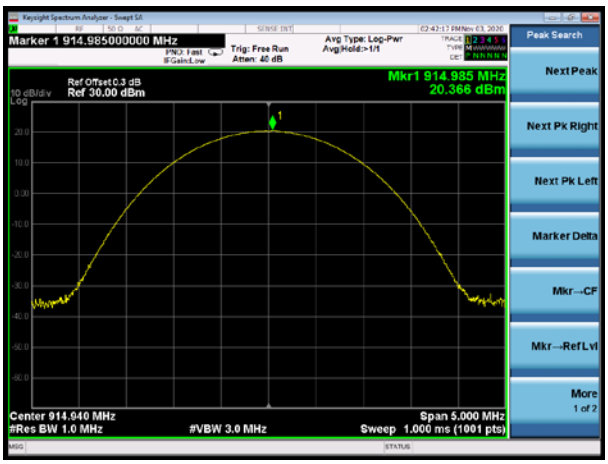


Highest channel

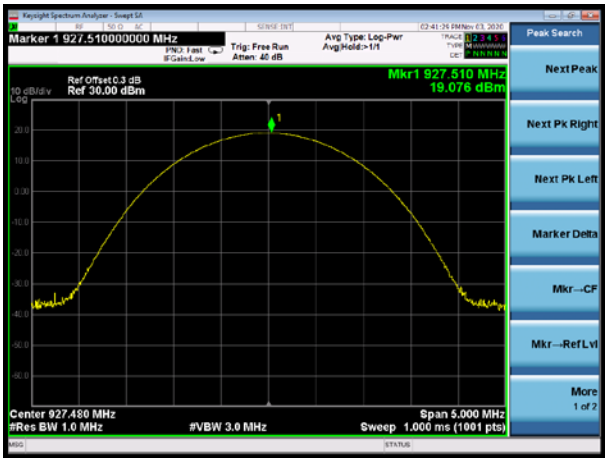
Test mode:	250KHz Bandwidth



Lowest channel

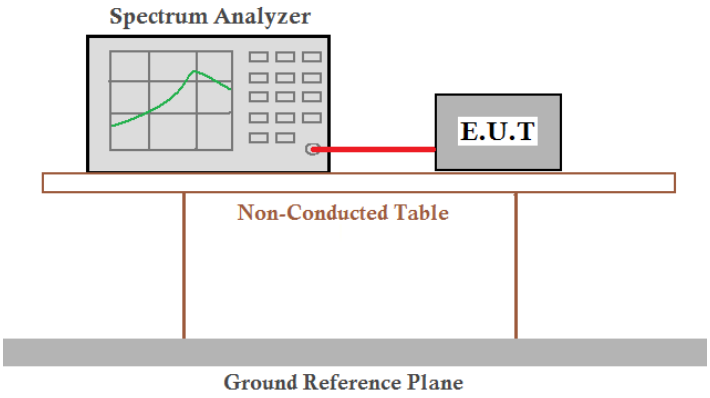


Middle channel



Highest channel

8.2 20dB Emission Bandwidth

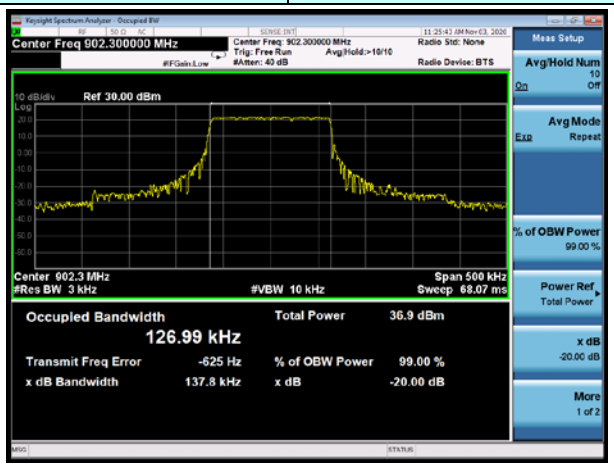
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

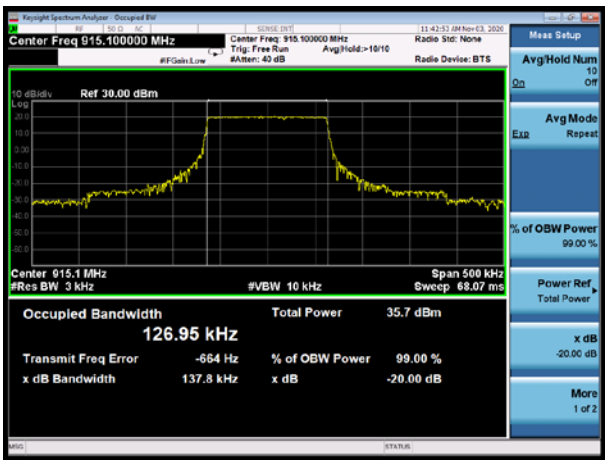
Mode	Test channel	20dB Emission Bandwidth (KHz)	Result
125KHz Bandwidth	Lowest	137.8	Pass
	Middle	137.8	
	Highest	138.2	
250KHz Bandwidth	Lowest	261.6	Pass
	Middle	262.1	
	Highest	262.7	

Test plot as follows:

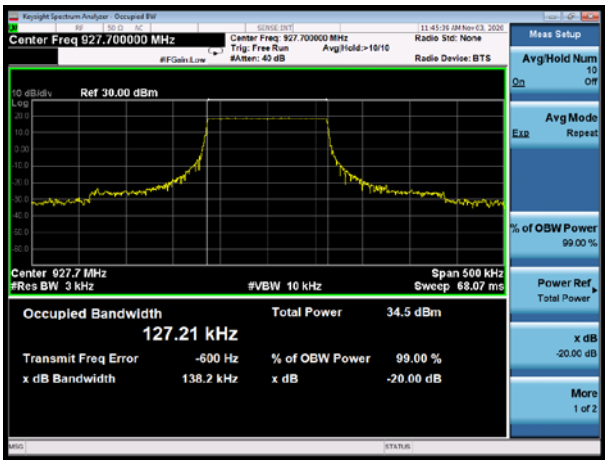
Test mode:	125KHz Bandwidth



Lowest channel

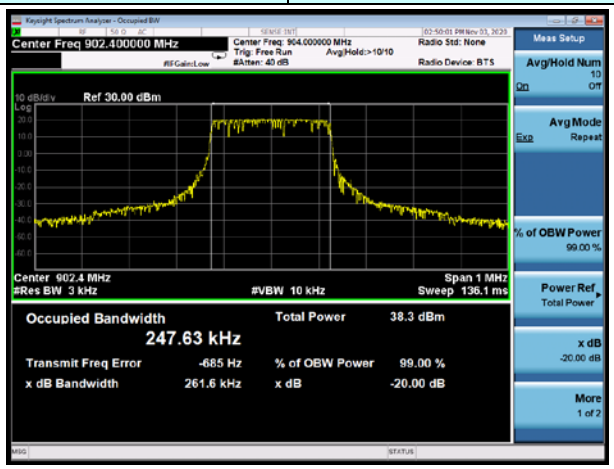


Middle channel

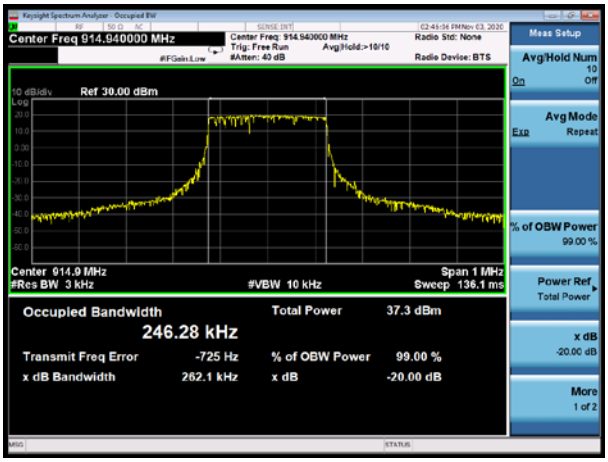


Highest channel

Test mode:	250KHz Bandwidth



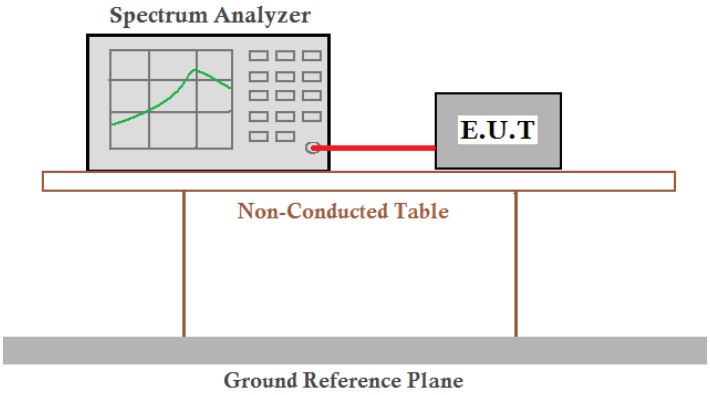
Lowest channel



Middle channel

Highest channel

8.3 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, 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
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Mode	Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
125KHz Bandwidth	Lowest	200.00	138.2	Pass
	Middle	200.00	138.2	Pass
	Highest	200.00	138.2	Pass
250KHz Bandwidth	Lowest	330.00	262.7	Pass
	Middle	330.00	262.7	Pass
	Highest	331.00	262.7	Pass

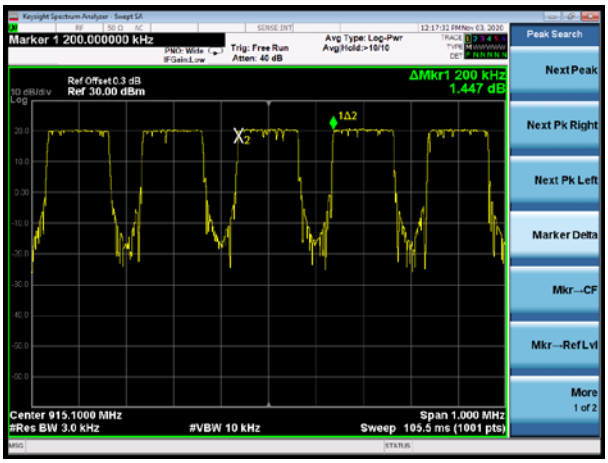
Note: According to section 8.2

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
125KHz Bandwidth	138.2	138.2
250KHz Bandwidth	262.7	262.7

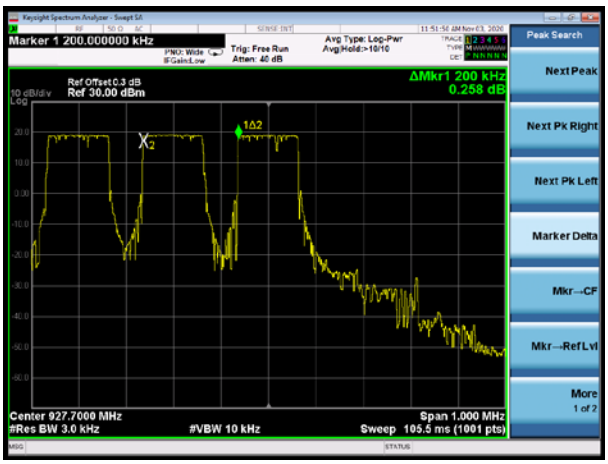
Test plot as follows:

Modulation mode:	125KHz Bandwidth

Lowest channel



Middle channel



Highest channel

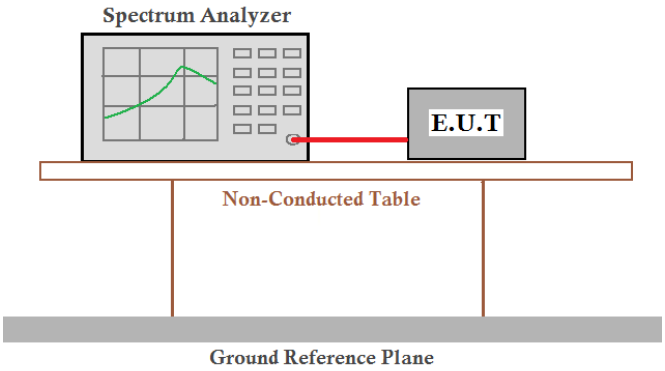
Test mode:	250KHz Bandwidth

Lowest channel

Middle channel

Highest channel

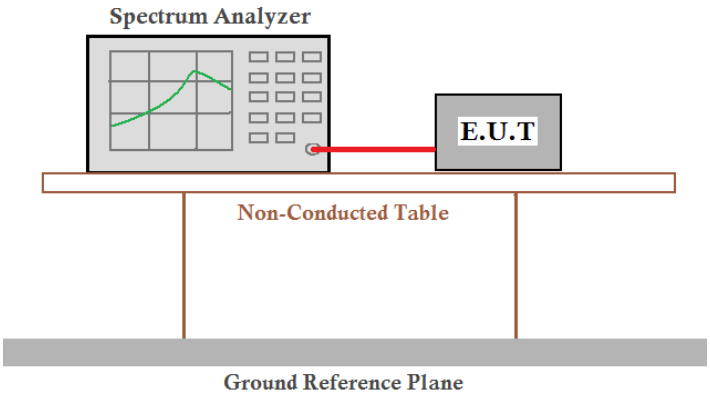
8.4 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

Mode	Hopping channel numbers	Limit	Result
125KHz Bandwidth	128	50	Pass
250KHz Bandwidth	77	25	Pass

8.5 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=10kHz, VBW=30KHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

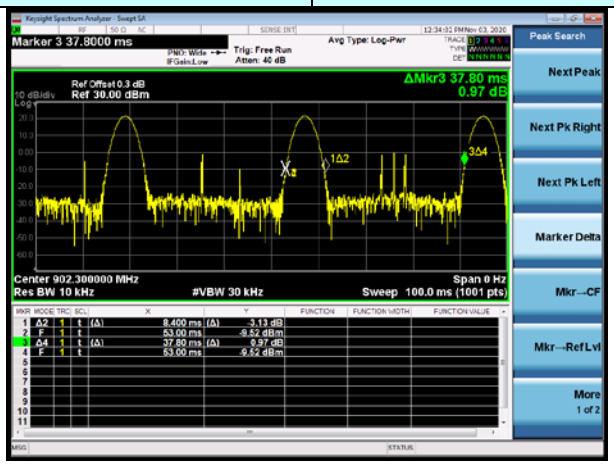
Mode	Ton(ms)	Tcycle(ms)	Dwell time(ms)	Limit(ms)	Result
125KHz Bandwidth	8.40	37.80	294.00	400	Pass
250KHz Bandwidth	2.30	19.75	75.90	400	Pass

Note: Transmit numbers= Continue TX Time/Tcycle

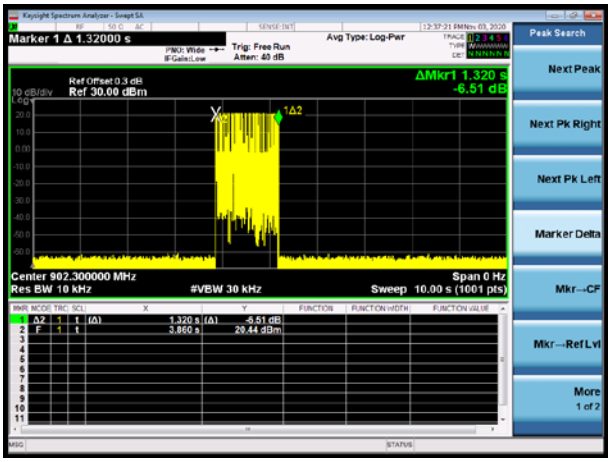
Dwell time=Transmit numbers*Ton

Test plot as follows:

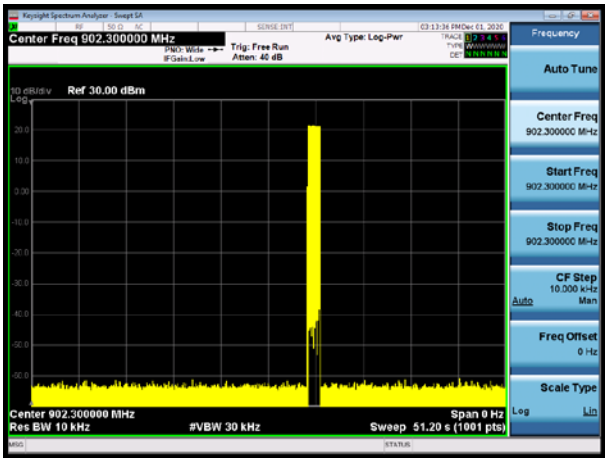
Test Mode:	125KHz Bandwidth



Ton&Tcycle

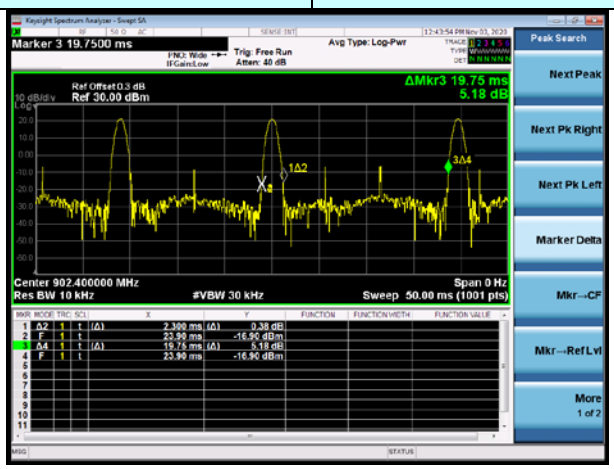


Continue TX Time

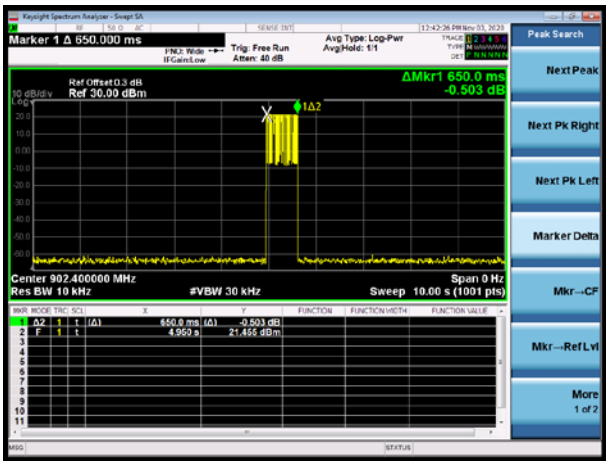


Tperiod

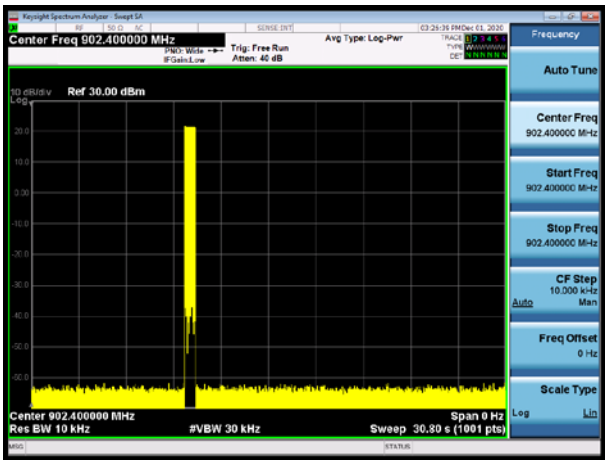
Test Mode:	250KHz Bandwidth



Ton&Tcycle



Continue TX Time



Tperiod

8.6 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)/g/h requirement:

a(1): 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.

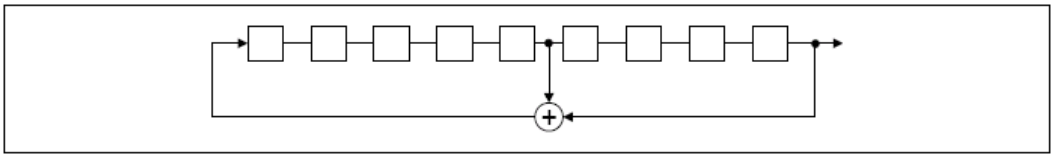
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudorandom Frequency Hopping Sequence

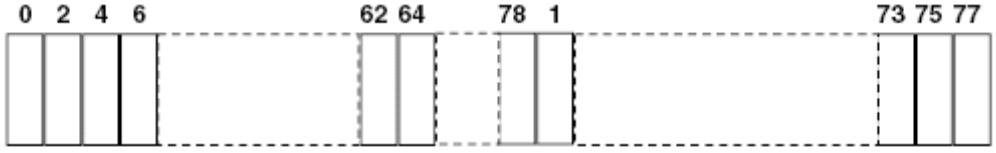
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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



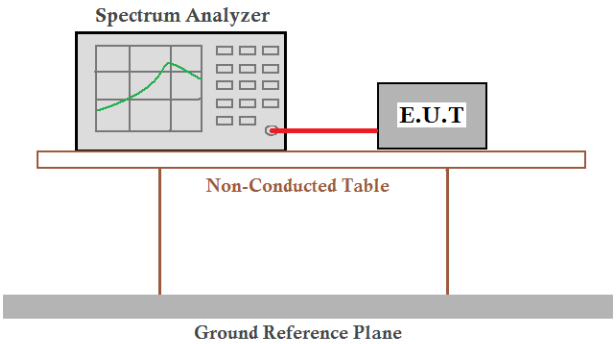
Each frequency used equally on the average by each transmitter.

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.

it permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted.

8.7 Band Edge

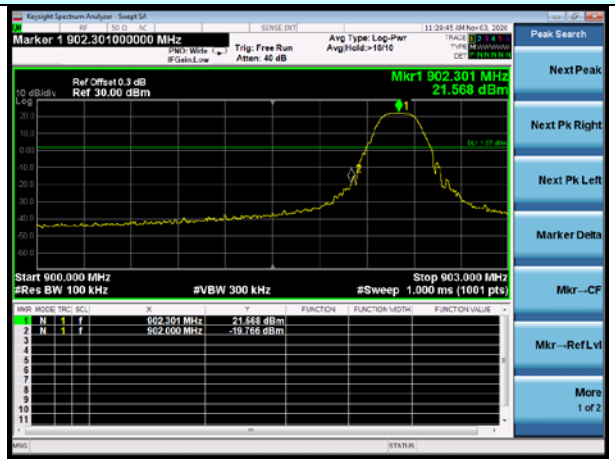
8.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, 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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

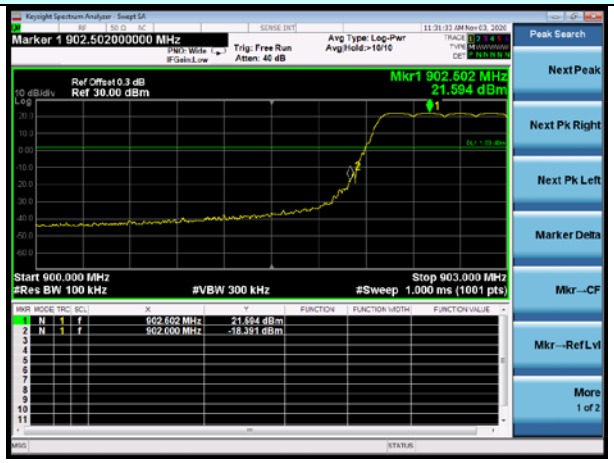
Test plot as follows:

125KHz Bandwidth:

Test channel:	Lowest channel

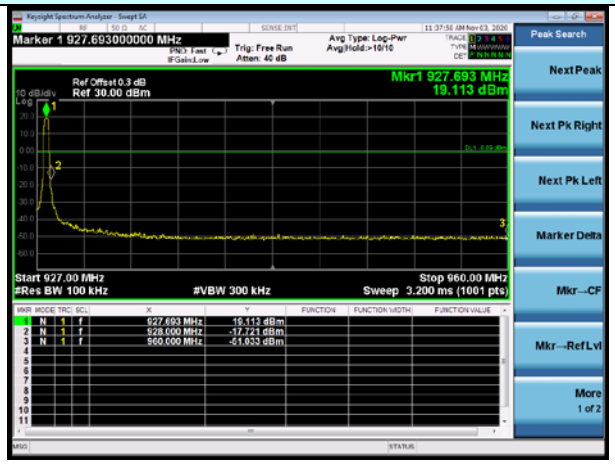


No-hopping mode

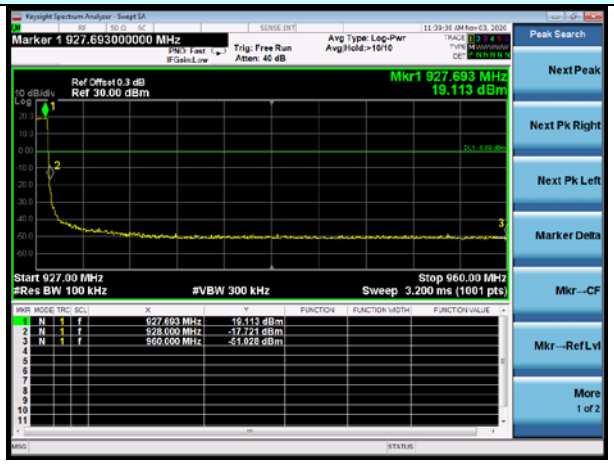


Hopping mode

Test channel:	Highest channel



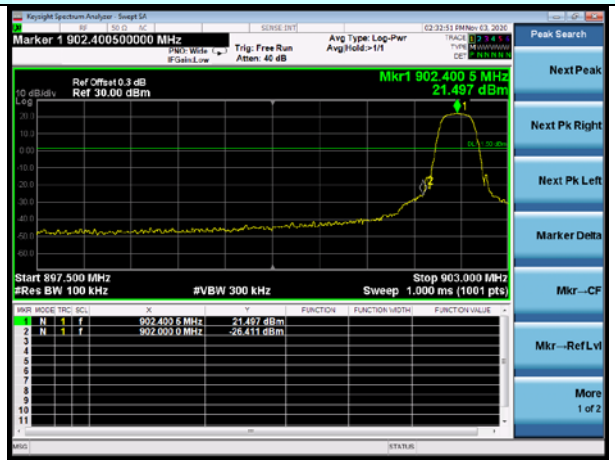
No-hopping mode



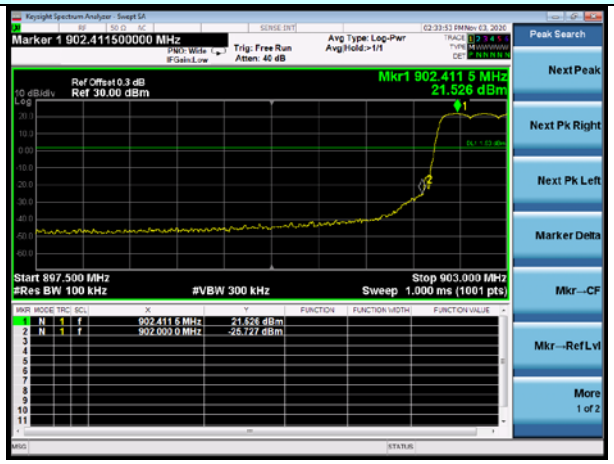
Hopping mode

250KHz Bandwidth:

Test channel:	Lowest channel

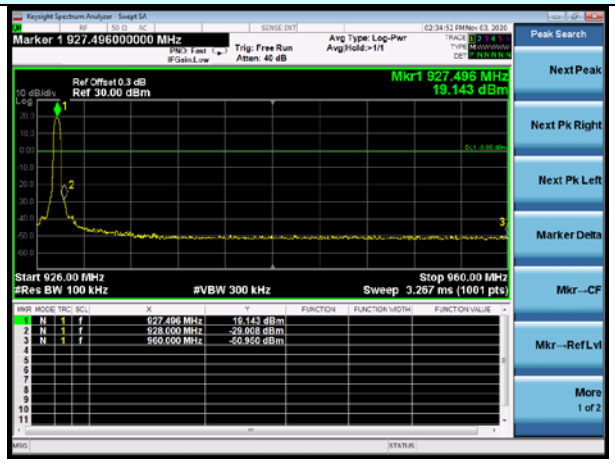


No-hopping mode

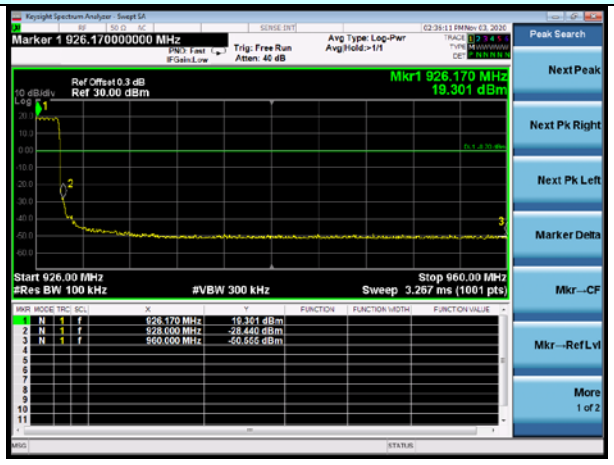


Hopping mode

Test channel:	Highest channel

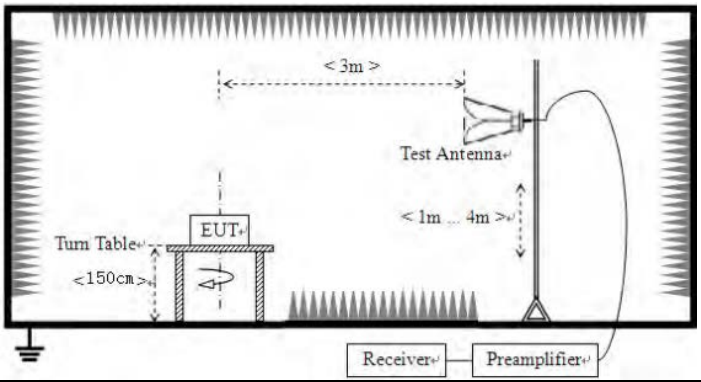


No-hopping mode



Hopping mode

8.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10:2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m
Receiver setup:	Frequency / Detector / RBW / VBW / Remark Above 1GHz / Peak / 1MHz / 3MHz / Peak Value Above 1GHz / Peak / 1MHz / 10Hz / Average Value
Limit:	Frequency / Limit (dBuV/m @3m) / Remark Above 1GHz / 54.00 / Average Value Above 1GHz / 74.00 / Peak Value
Test setup:	
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test channel:	Lowest channel

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
902.00	36.77	22.30	4.87	37.60	26.34	74.00	-47.66	Horizontal
902.00	39.49	22.30	4.87	37.60	29.06	74.00	-44.94	Vertical

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
902.00	33.93	22.30	4.87	37.60	23.50	54.00	-30.50	Horizontal
902.00	30.41	22.30	4.87	37.60	19.98	54.00	-34.02	Vertical

Test channel:	Highest channel

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
928.00	34.00	22.41	4.96	37.57	21.81	74.00	-32.19	Horizontal
928.00	32.00	22.41	4.96	37.57	17.54	74.00	-36.46	Vertical

Average value:

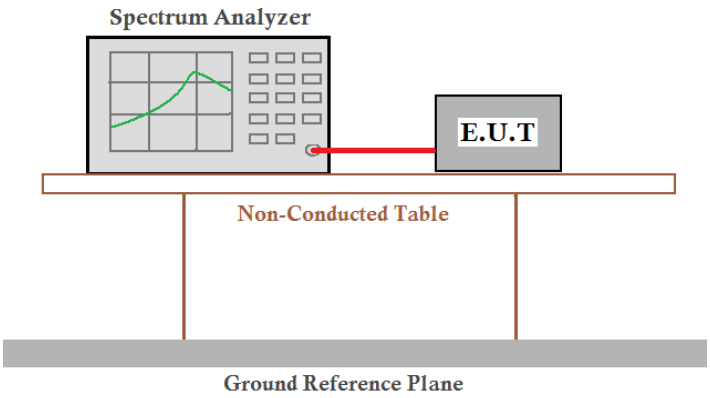
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
928.00	32.01	22.41	4.96	37.57	21.81	54.00	-32.19	Horizontal
928.00	30.74	22.41	4.96	37.57	20.54	54.00	-33.46	Vertical

Remarks:

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.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *During the test, pre-scan the 125KHz bandwidth and 250KHz bandwidth mode, and found the 125KHz bandwidth which it is worse case.*

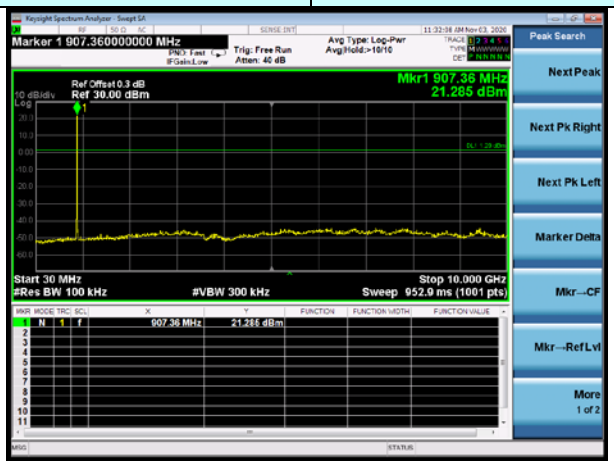
8.8 Spurious Emission

8.8.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

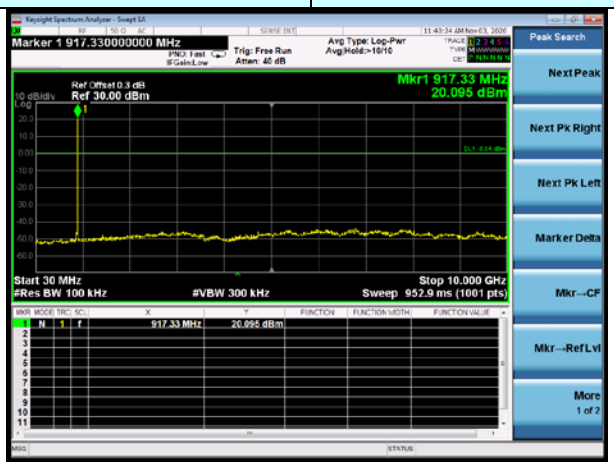
125KHz Bandwidth:

Test channel:	Lowest channel



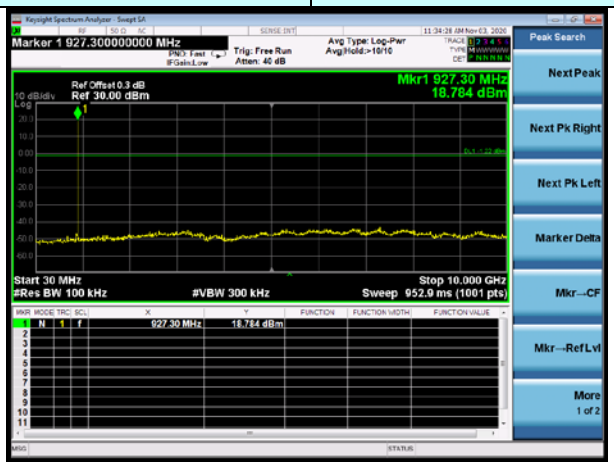
30MHz~10GHz

Test channel:	Middle channel



30MHz~10GHz

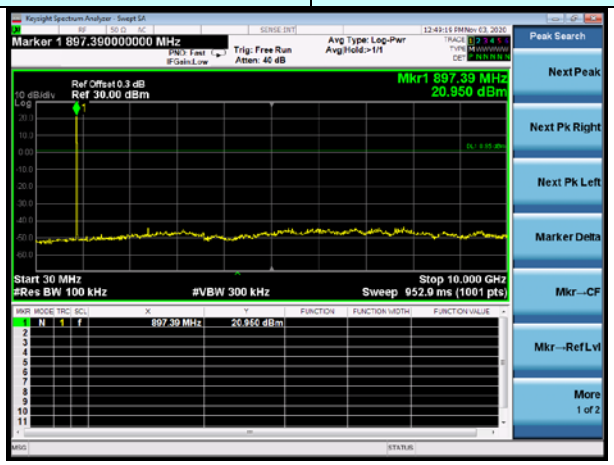
Test channel:	Highest channel



30MHz~10GHz

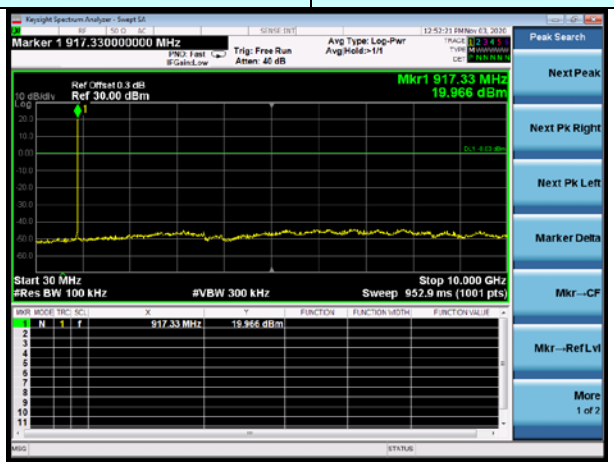
250KHz Bandwidth:

Test channel:	Lowest channel



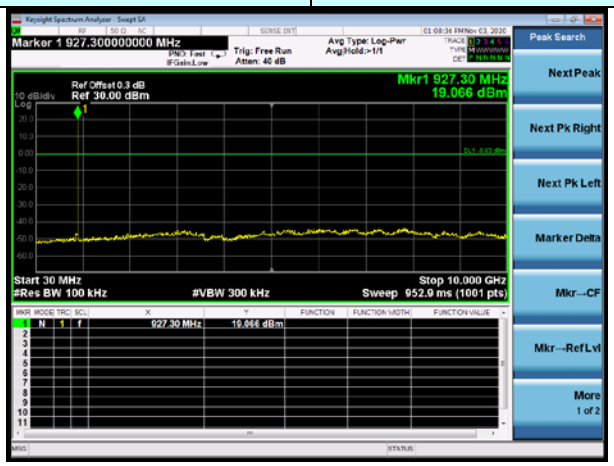
30MHz~10GHz

Test channel:	Middle channel



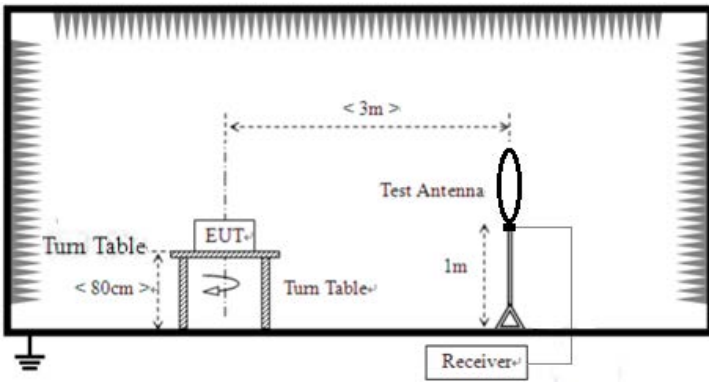
30MHz~10GHz

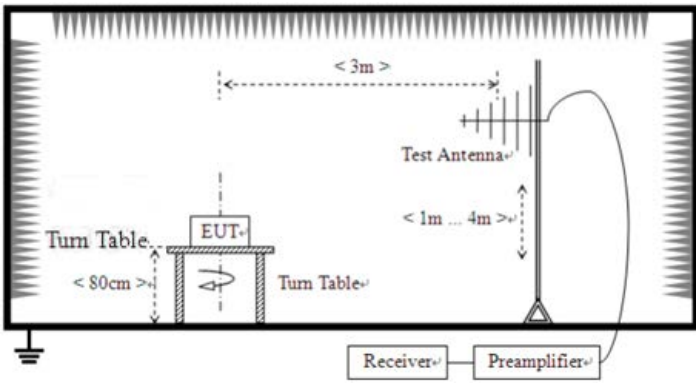
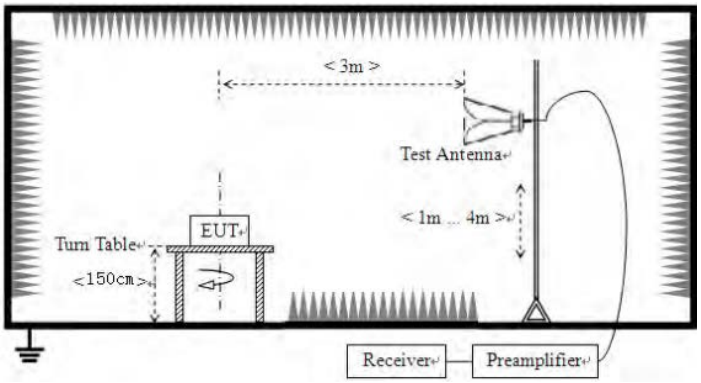
Test channel:	Highest channel



30MHz~10GHz

8.8.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>9KHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>600Hz</td><td>Quasi-peak</td></tr>
<tr><td>150KHz-30MHz</td><td>Quasi-peak</td><td>9KHz</td><td>30KHz</td><td>Quasi-peak</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>30m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="7">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz
 
</td></tr>
</table>

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) 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 6.0 for details
Test mode:	Refer to section 5.2 for details

Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remarks:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

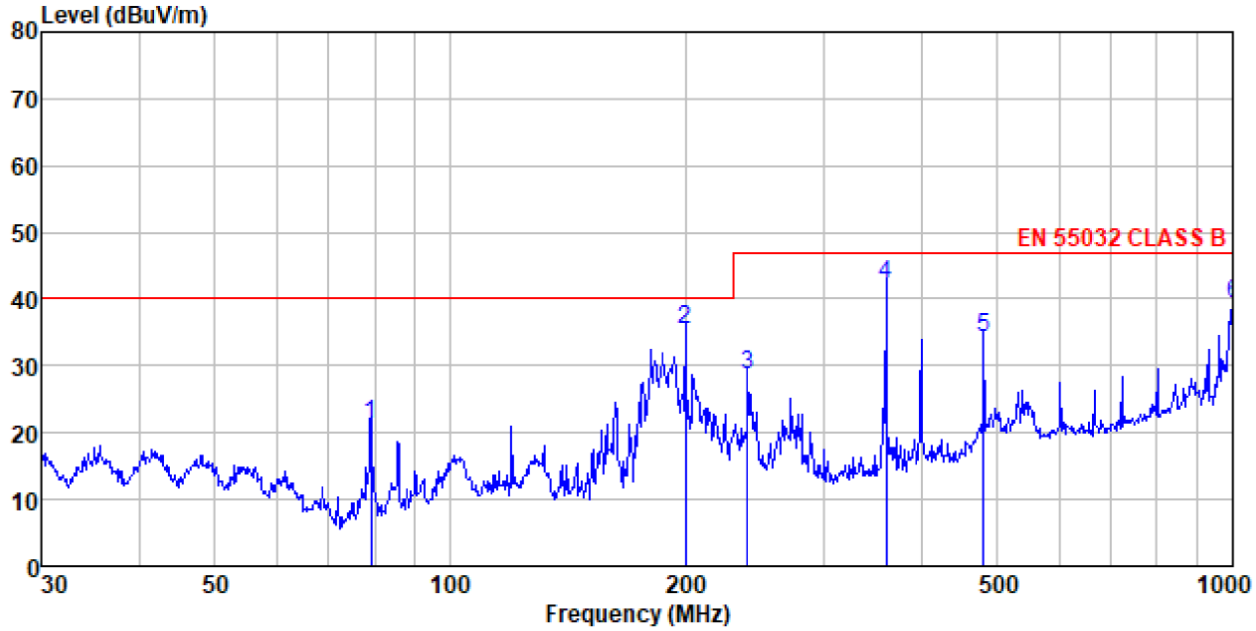
■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ **Below 1GHz**

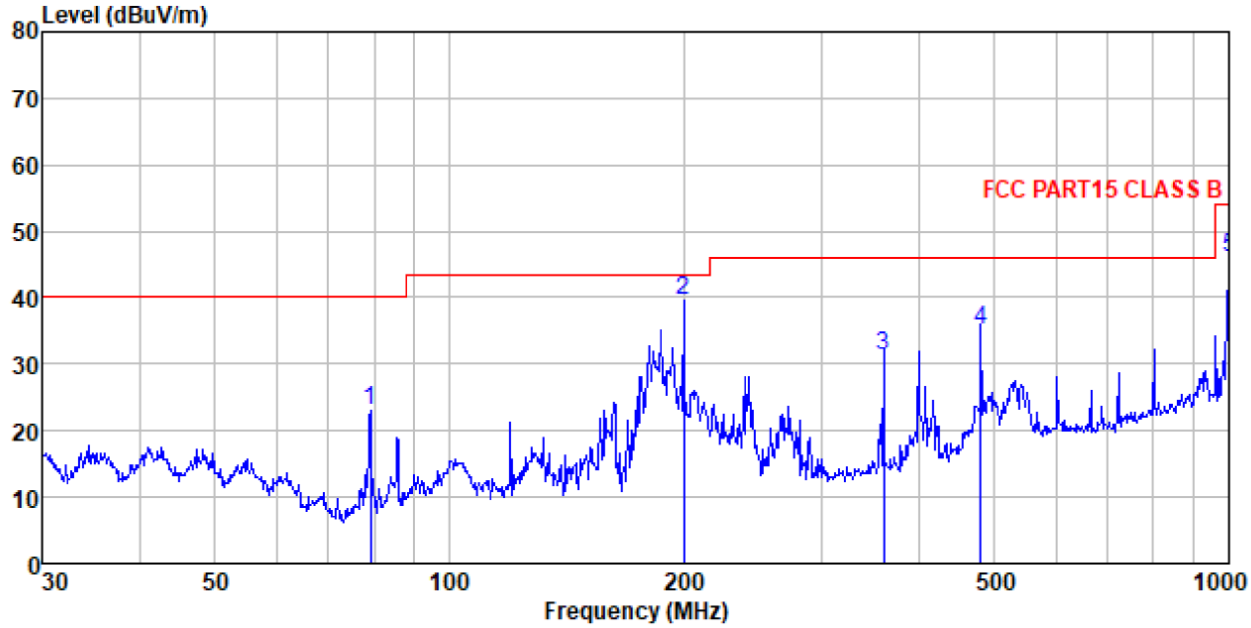
Pre-scan all test modes, found worst case at lowest channel of 125KHz bandwidth, so only show the worst case on the report.

Horizontal:



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	79.243	49.50	7.41	36.54	1.02	21.39	40.00	-18.61	QP
2	199.986	60.50	10.40	37.33	1.84	35.41	40.00	-4.59	QP
3	239.987	52.19	11.85	37.37	2.07	28.74	47.00	-18.26	QP
4	360.448	62.19	14.70	37.48	2.67	42.08	47.00	-4.92	QP
5	480.528	51.74	16.93	37.51	3.22	34.38	47.00	-12.62	QP
6	1000.000	48.85	22.70	37.51	5.22	39.26	47.00	-7.74	QP

Vertical:



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	79.243	51.01	7.41	36.54	1.02	22.90	40.00	-17.10	QP
2	199.986	64.60	10.40	37.33	1.84	39.51	43.50	-3.99	QP
3	360.448	51.43	14.70	37.48	2.67	31.32	46.00	-14.68	QP
4	480.528	52.45	16.93	37.51	3.22	35.09	46.00	-10.91	QP
5	1000.000	55.69	22.70	37.51	5.22	46.10	54.00	-7.90	QP

■ **Above 1GHz**

Test channel:	Lowest channel

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
1804.60	41.19	25.35	4.67	34.04	37.17	74.00	-36.83	Vertical
2706.90	34.94	28.26	5.43	33.25	35.38	74.00	-38.62	Vertical
3609.20	33.71	29.18	7.11	37.34	32.66	74.00	-41.34	Vertical
4511.50	*					74.00		Vertical
5413.80	*					74.00		Vertical
6316.10	*					74.00		Vertical
1804.60	39.78	25.35	4.67	34.04	35.76	74.00	-38.24	Horizontal
2706.90	34.99	28.26	5.43	33.25	35.43	74.00	-38.57	Horizontal
3609.20	32.67	29.18	7.11	37.34	31.62	74.00	-42.38	Horizontal
4511.50	*					74.00		Horizontal
5413.80	*					74.00		Horizontal
6316.10	*					74.00		Horizontal

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
1804.60	30.27	25.35	4.67	34.04	26.25	54.00	-27.75	Vertical
2706.90	23.81	28.26	5.43	33.25	24.25	54.00	-29.75	Vertical
3609.20	24.06	29.18	7.11	37.34	23.01	54.00	-30.99	Vertical
4511.50	*					54.00		Vertical
5413.80	*					54.00		Vertical
6316.10	*					54.00		Vertical
1804.60	29.31	25.35	4.67	34.04	25.29	54.00	-28.71	Horizontal
2706.90	23.57	28.26	5.43	33.25	24.01	54.00	-29.99	Horizontal
3609.20	22.42	29.18	7.11	37.34	21.37	54.00	-32.63	Horizontal
4511.50	*					54.00		Horizontal
5413.80	*					54.00		Horizontal
6316.10	*					54.00		Horizontal

Test channel:	Middle channel

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
1830.20	40.23	25.43	4.89	34.12	36.43	74.00	-37.57	Vertical
2745.30	35.00	28.34	5.68	33.57	35.45	74.00	-38.55	Vertical
3660.40	34.73	29.42	7.29	37.66	33.78	74.00	-40.22	Vertical
4575.50	*					74.00		Vertical
5490.60	*					74.00		Vertical
6405.70	*					74.00		Vertical
1830.20	40.63	25.43	4.89	34.12	36.83	74.00	-37.17	Horizontal
2745.30	33.95	28.34	5.68	33.57	34.40	74.00	-39.60	Horizontal
3660.40	33.99	29.42	7.29	37.66	33.04	74.00	-40.96	Horizontal
4575.50	*					74.00		Horizontal
5490.60	*					74.00		Horizontal
6405.70	*					74.00		Horizontal

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
1830.20	31.08	25.43	4.89	34.12	27.28	54.00	-26.72	Vertical
2745.30	23.32	28.34	5.68	33.57	23.77	54.00	-30.23	Vertical
3660.40	23.98	29.42	7.29	37.66	23.03	54.00	-30.97	Vertical
4575.50	*					54.00		Vertical
5490.60	*					54.00		Vertical
6405.70	*					54.00		Vertical
1830.20	30.74	25.43	4.89	34.12	26.94	54.00	-27.06	Horizontal
2745.30	23.04	28.34	5.68	33.57	23.49	54.00	-30.51	Horizontal
3660.40	23.71	29.42	7.29	37.66	22.76	54.00	-31.24	Horizontal
4575.50	*					54.00		Horizontal
5490.60	*					54.00		Horizontal
6405.70	*					54.00		Horizontal

Test channel:	Highest channel

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
1855.40	45.80	25.64	4.75	34.67	41.52	74.00	-32.48	Vertical
2783.10	35.70	28.46	5.87	33.83	36.20	74.00	-37.80	Vertical
3710.80	38.04	29.75	7.59	37.76	37.62	74.00	-36.38	Vertical
4638.50	*					74.00		Vertical
5566.20	*					74.00		Vertical
6493.90	*					74.00		Vertical
1855.40	45.02	25.64	4.75	34.67	40.74	74.00	-33.26	Horizontal
2783.10	34.91	28.46	5.87	33.83	35.41	74.00	-38.59	Horizontal
3710.80	33.59	29.75	7.59	37.76	33.17	74.00	-40.83	Horizontal
4638.50	*					74.00		Horizontal
5566.20	*					74.00		Horizontal
6493.90	*					74.00		Horizontal

Average value:

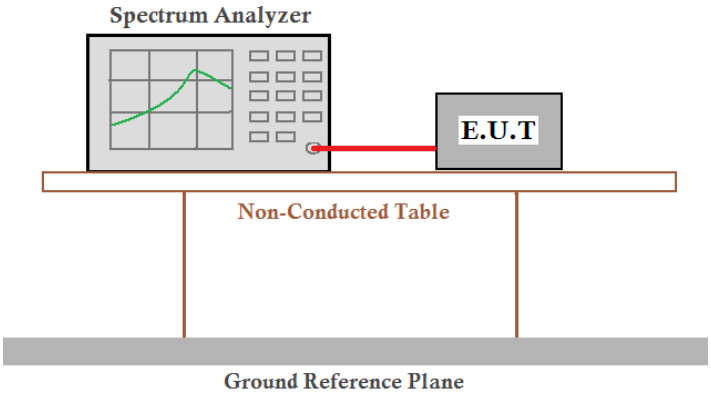
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1855.40	36.71	25.64	4.75	34.67	32.43	54.00	-21.57	Vertical
2783.10	25.62	28.46	5.87	33.83	26.12	54.00	-27.88	Vertical
3710.80	26.54	29.75	7.59	37.76	26.12	54.00	-27.88	Vertical
4638.50	*					54.00		Vertical
5566.20	*					54.00		Vertical
6493.90	*					54.00		Vertical
1855.40	35.38	25.64	4.75	34.67	31.10	54.00	-22.90	Horizontal
2783.10	24.29	28.46	5.87	33.83	24.79	54.00	-29.21	Horizontal
3710.80	22.85	29.75	7.59	37.76	22.43	54.00	-31.57	Horizontal
4638.50	*					54.00		Horizontal
5566.20	*					54.00		Horizontal
6493.90	*					54.00		Horizontal

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *The test data shows only the worst case 125KHz bandwidth mode.*

9 Test Items for DTS

9.1 Conducted Peak Output Power

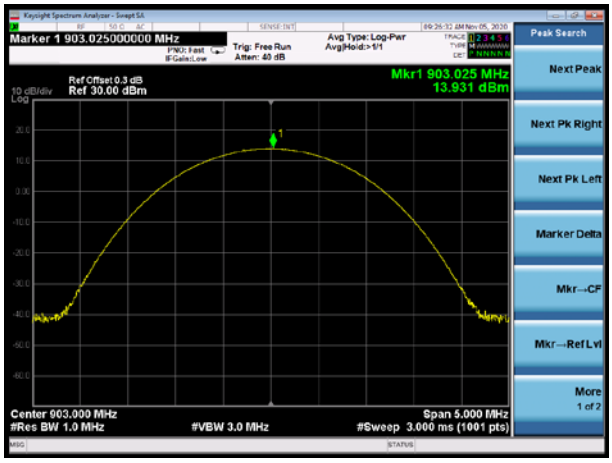
Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

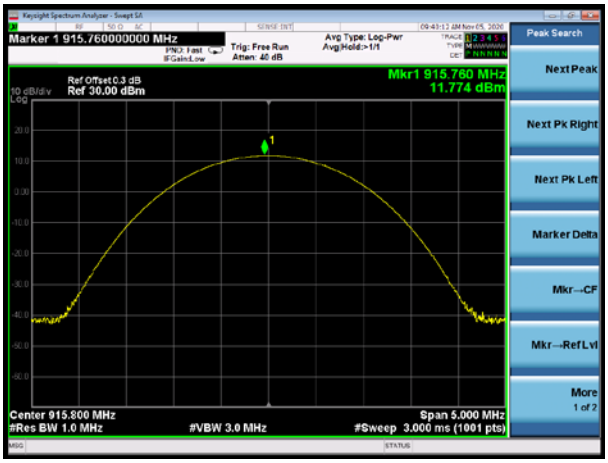
500KHz Bandwidth:

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	13.931	30.00	Pass
Middle	11.774		
Highest	10.221		

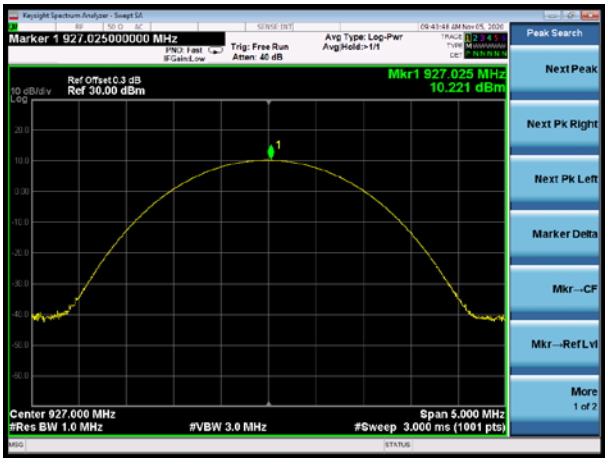
Test plot as follows:



Lowest channel

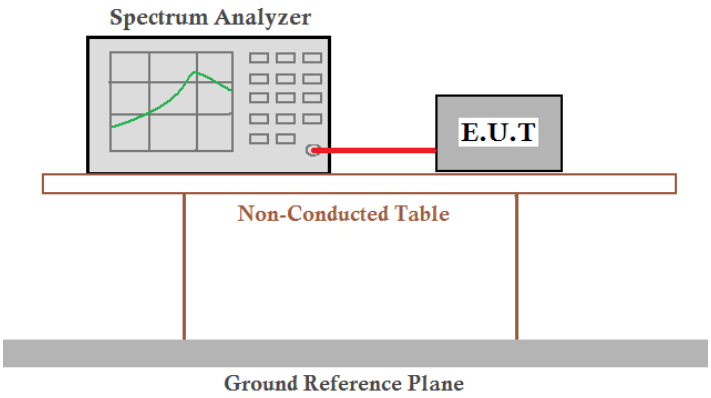


Middle channel



Highest channel

9.2 Channel Bandwidth

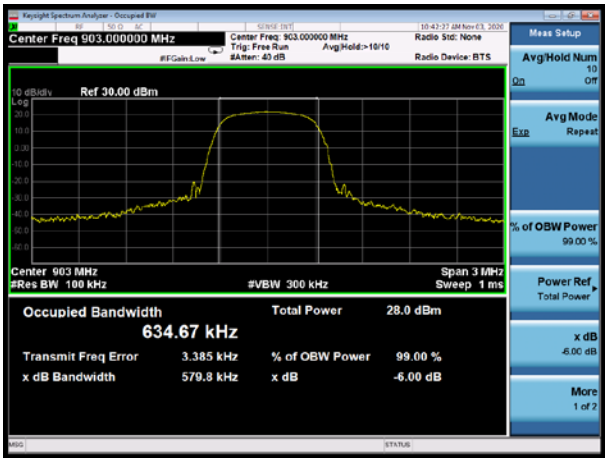
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

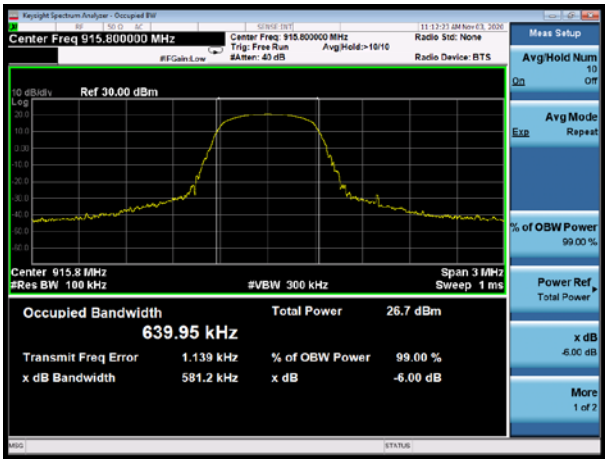
500KHz Bandwidth:

Test channel	Channel Bandwidth (KHz)	Limit(KHz)	Result
Lowest	579.8	>500	Pass
Middle	581.2		
Highest	579.4		

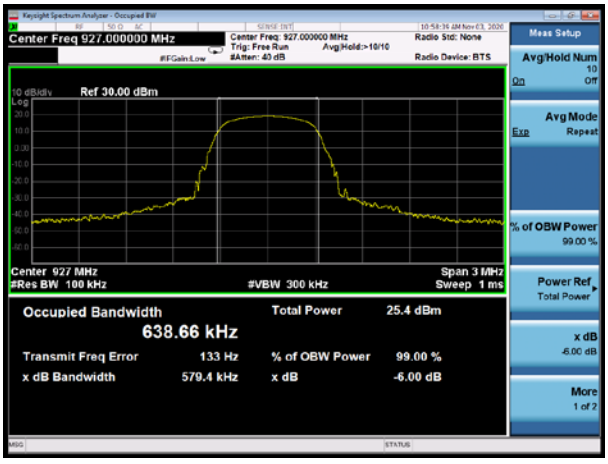
Test plot as follows:



Lowest channel

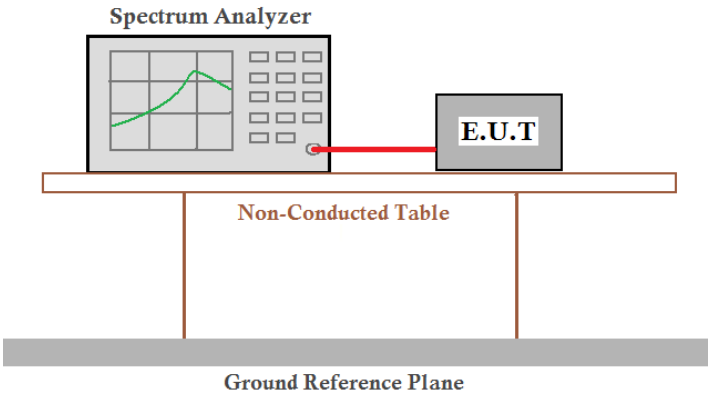


Middle channel



Highest channel

9.3 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test channel	Power Spectral Density (dBm/3kHz)	Limit(dBm/3kHz)	Result
Lowest	4.741	8.00	Pass
Middle	2.702		
Highest	1.024		

Test plot as follows:

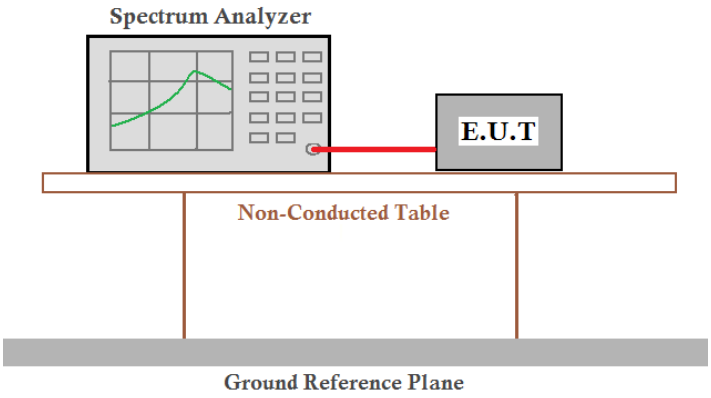
Lowest channel

Middle channel

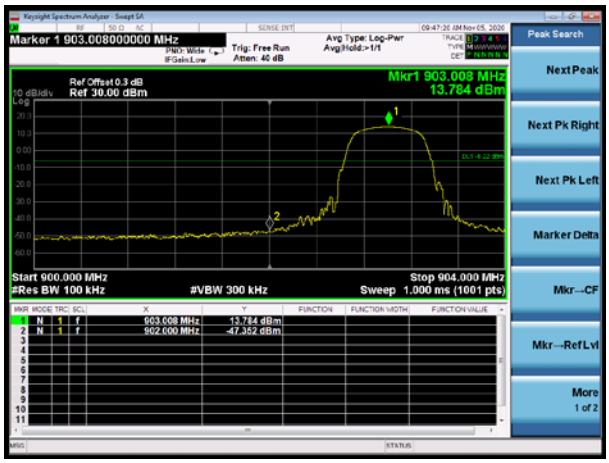
Highest channel

9.4 Band edges

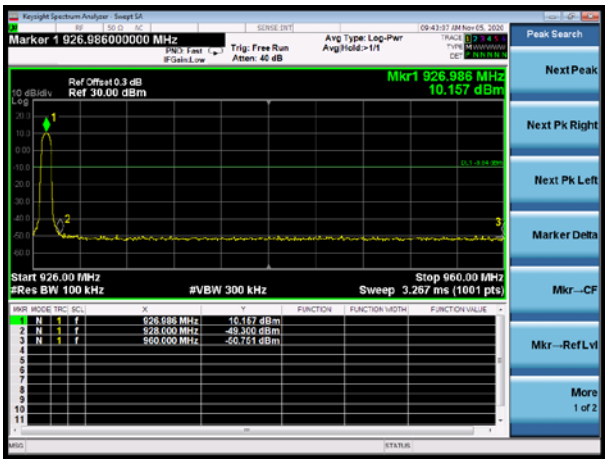
9.4.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

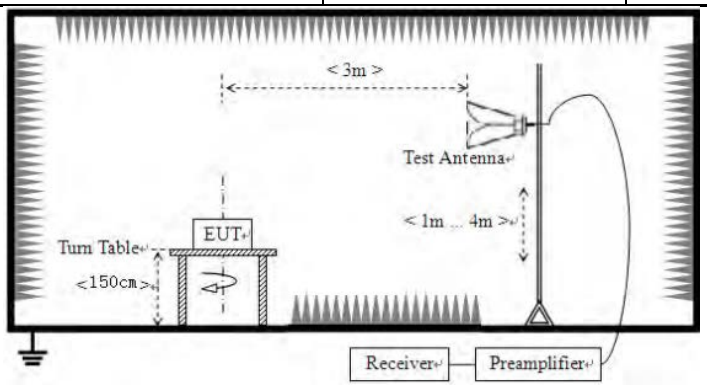


Lowest Channel



Highest Channel

9.4.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average</td></tr>
<tr><td>74.00</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test Procedure:</td><td>1. The EUT was placed on the top of a rotating table 1.5 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.</td></tr>
</table>

	7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test channel:	Lowest channel

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
902.00	35.76	22.30	4.87	37.60	21.81	74.00	-32.19	Horizontal
902.00	33.27	22.30	4.87	37.60	17.54	74.00	-36.46	Vertical

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
902.00	29.89	22.30	4.87	37.60	19.46	54.00	-34.54	Horizontal
902.00	28.64	22.30	4.87	37.60	18.21	54.00	-35.79	Vertical

Test channel:	Highest channel

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
928.00	36.45	22.41	4.96	37.57	21.81	74.00	-32.19	Horizontal
928.00	39.35	22.41	4.96	37.57	17.54	74.00	-36.46	Vertical

Average value:

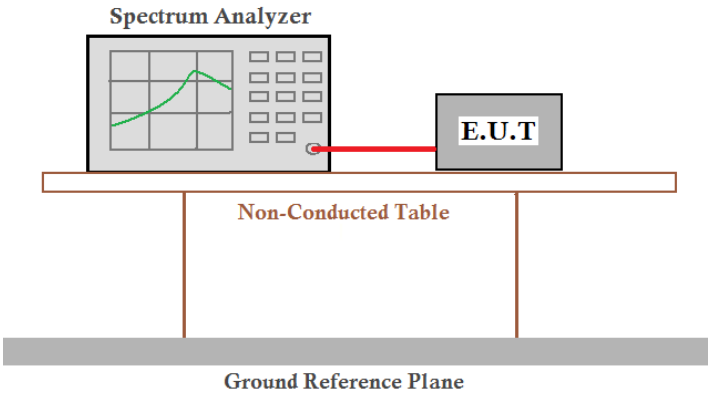
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
928.00	31.55	22.41	4.96	37.57	21.35	54.00	-32.65	Horizontal
928.00	30.24	22.41	4.96	37.57	20.04	54.00	-33.96	Vertical

Remarks:

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.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*

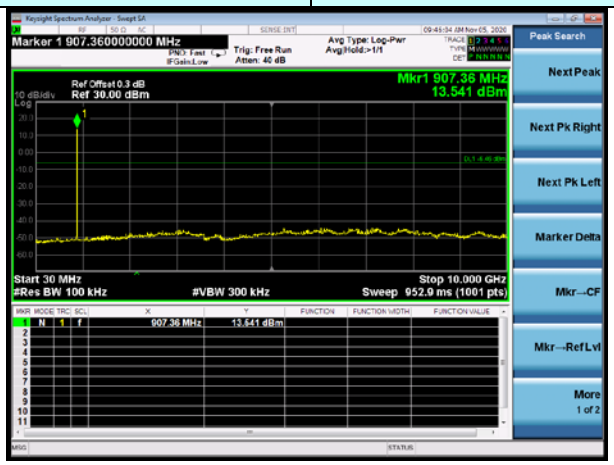
9.5 Spurious Emission

9.5.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
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 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

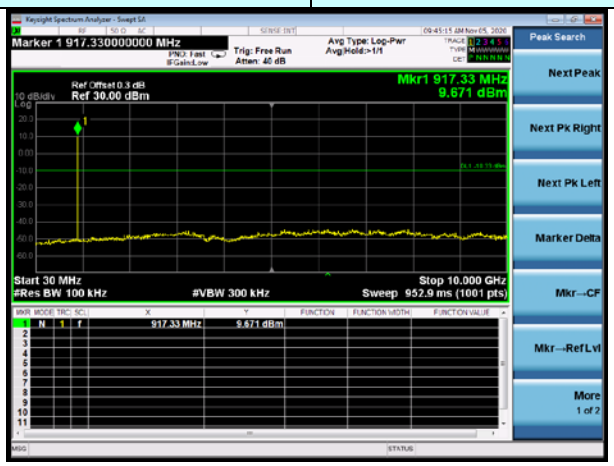
Test plot as follows:

Test channel:	Lowest channel



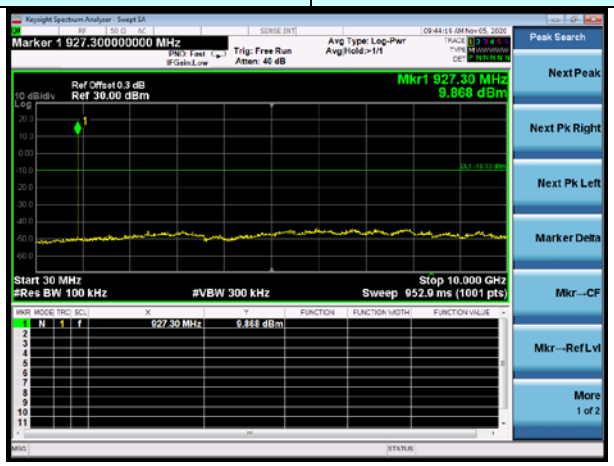
30MHz~10GHz

Test channel:	Middle channel



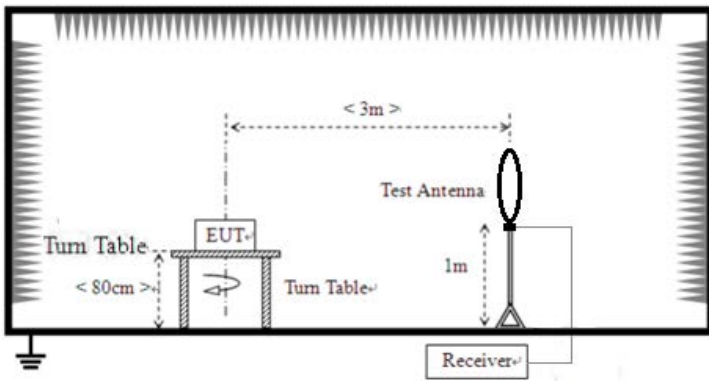
30MHz~10GHz

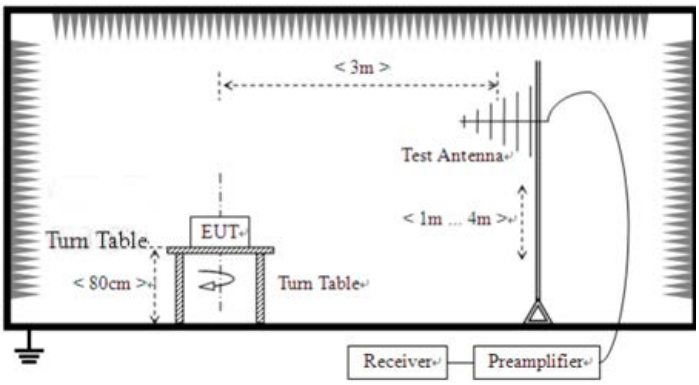
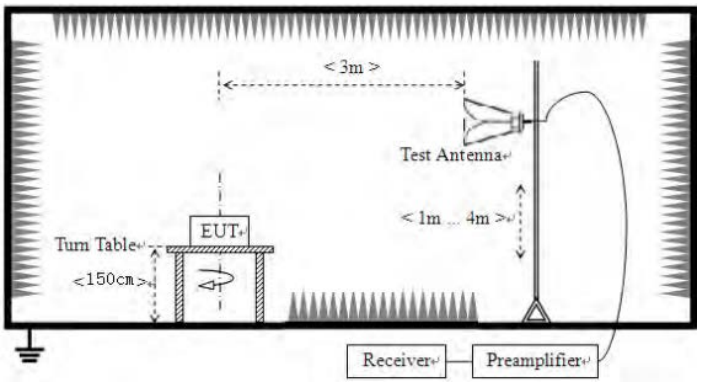
Test channel:	Highest channel



30MHz~10GHz

9.5.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>9KHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>600Hz</td><td>Quasi-peak</td></tr>
<tr><td>150KHz-30MHz</td><td>Quasi-peak</td><td>9KHz</td><td>30KHz</td><td>Quasi-peak</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>30m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="6">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz
 
</td></tr>
</table>

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 
Test Procedure:	7. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 8. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 1. 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. 2. 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. 3. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 4. 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 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remark:

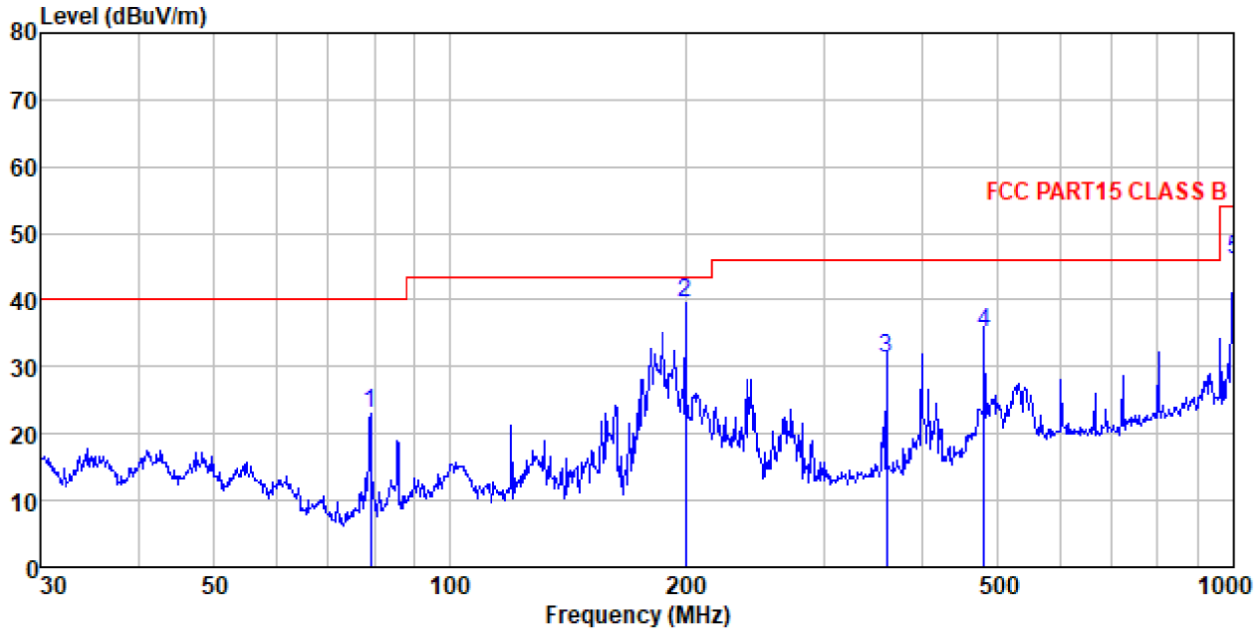
Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

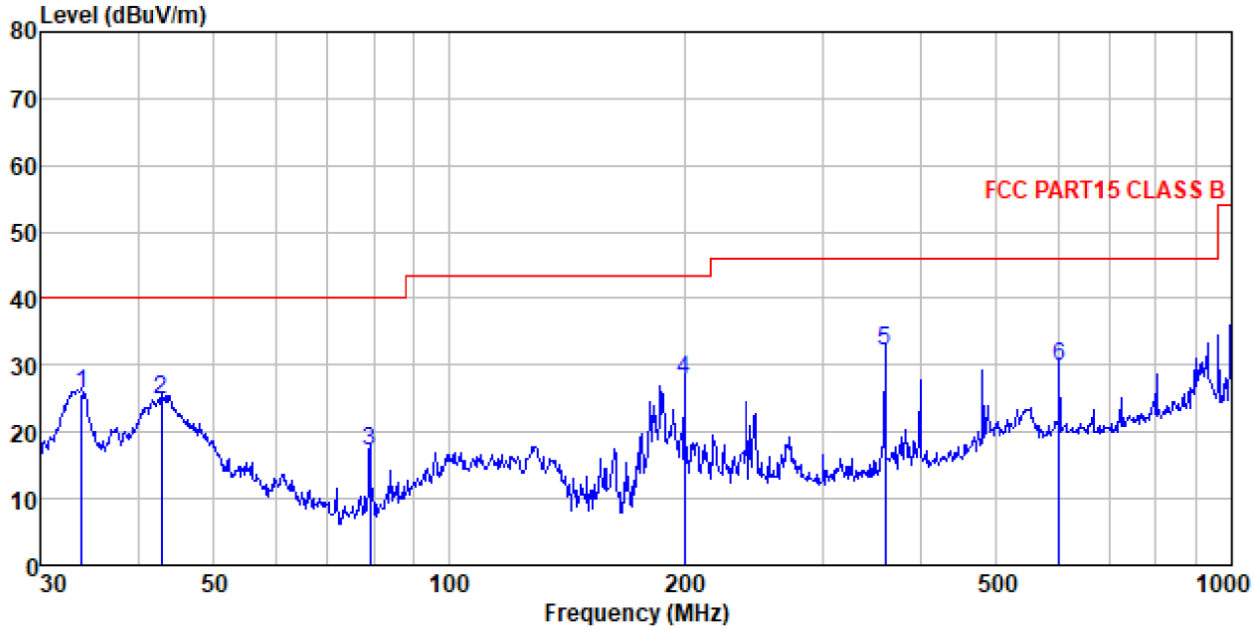
■ **Below 1GHz**

Horizontal:



	Freq	ReadLevel	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	79.243	51.01	7.41	36.54	1.02	22.90	40.00	-17.10	QP
2	199.986	64.60	10.40	37.33	1.84	39.51	43.50	-3.99	QP
3	360.448	51.43	14.70	37.48	2.67	31.32	46.00	-14.68	QP
4	480.528	52.45	16.93	37.51	3.22	35.09	46.00	-10.91	QP
5	1000.000	55.69	22.70	37.51	5.22	46.10	54.00	-7.90	QP

Vertical:



	Freq	ReadAntenna Level	Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	33.917	49.04	11.28	35.28	0.60	25.64	40.00	-14.36	QP
2	42.900	47.74	12.23	35.83	0.69	24.83	40.00	-15.17	QP
3	79.243	45.15	7.41	36.54	1.02	17.04	40.00	-22.96	QP
4	199.986	52.75	10.40	37.33	1.84	27.66	43.50	-15.84	QP
5	360.448	52.38	14.70	37.48	2.67	32.27	46.00	-13.73	QP
6	601.427	44.14	19.50	37.54	3.73	29.83	46.00	-16.17	QP

■ **Above 1GHz**

Test channel:	Lowest channel

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
1806.00	41.35	25.25	4.85	34.08	37.37	74.00	-36.63	Vertical
2709.00	35.00	28.12	5.66	33.68	35.10	74.00	-38.90	Vertical
3612.00	33.64	29.19	7.25	37.37	32.71	74.00	-41.29	Vertical
4515.00	*					74.00		Vertical
5418.00	*					74.00		Vertical
6321.00	*					74.00		Vertical
1806.00	39.90	25.25	4.85	34.08	35.92	74.00	-38.08	Horizontal
2709.00	34.95	28.12	5.66	33.68	35.05	74.00	-38.95	Horizontal
3612.00	32.74	29.19	7.25	37.37	31.81	74.00	-42.19	Horizontal
4515.00	*					74.00		Horizontal
5418.00	*					74.00		Horizontal
6321.00	*					74.00		Horizontal

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
1806.00	30.40	25.25	4.85	34.08	26.42	54.00	-27.58	Vertical
2709.00	23.86	28.12	5.66	33.68	23.96	54.00	-30.04	Vertical
3612.00	23.98	29.19	7.25	37.37	23.05	54.00	-30.95	Vertical
4515.00	*					54.00		Vertical
5418.00	*					54.00		Vertical
6321.00	*					54.00		Vertical
1806.00	29.41	25.25	4.85	34.08	25.43	54.00	-28.57	Horizontal
2709.00	23.52	28.12	5.66	33.68	23.62	54.00	-30.38	Horizontal
3612.00	22.48	29.19	7.25	37.37	21.55	54.00	-32.45	Horizontal
4515.00	*					54.00		Horizontal
5418.00	*					54.00		Horizontal
6321.00	*					54.00		Horizontal

Remarks:

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.*
3. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	Middle

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
1831.60	40.33	25.43	4.89	34.12	36.53	74.00	-37.47	Vertical
2747.40	35.03	28.34	5.68	33.57	35.48	74.00	-38.52	Vertical
3663.20	34.62	29.42	7.29	37.66	33.67	74.00	-40.33	Vertical
4579.00	*					74.00		Vertical
5494.80	*					74.00		Vertical
6410.60	*					74.00		Vertical
1831.60	40.70	25.43	4.89	34.12	36.90	74.00	-37.10	Horizontal
2747.40	33.87	28.34	5.68	33.57	34.32	74.00	-39.68	Horizontal
3663.20	34.04	29.42	7.29	37.66	33.09	74.00	-40.91	Horizontal
4579.00	*					74.00		Horizontal
5494.80	*					74.00		Horizontal
6410.60	*					74.00		Horizontal

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
1831.60	31.15	25.43	4.89	34.12	27.35	54.00	-26.65	Vertical
2747.40	23.33	28.34	5.68	33.57	23.78	54.00	-30.22	Vertical
3663.20	23.87	29.42	7.29	37.66	22.92	54.00	-31.08	Vertical
4579.00	*					54.00		Vertical
5494.80	*					54.00		Vertical
6410.60	*					54.00		Vertical
1831.60	30.80	25.43	4.89	34.12	27.00	54.00	-27.00	Horizontal
2747.40	22.95	28.34	5.68	33.57	23.40	54.00	-30.60	Horizontal
3663.20	23.75	29.42	7.29	37.66	22.80	54.00	-31.20	Horizontal
4579.00	*					54.00		Horizontal
5494.80	*					54.00		Horizontal
6410.60	*					54.00		Horizontal

Remarks:

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.*
3. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	Highest

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
1854.00	46.12	25.56	4.89	34.23	42.34	74.00	-31.66	Vertical
2781.00	35.87	28.23	5.7	33.63	36.17	74.00	-37.83	Vertical
3708.00	38.04	29.25	7.34	37.37	37.26	74.00	-36.74	Vertical
4635.00	*					74.00		Vertical
5562.00	*					74.00		Vertical
6489.00	*					74.00		Vertical
1854.00	45.28	25.56	4.89	34.23	41.50	74.00	-32.50	Horizontal
2781.00	34.95	28.23	5.7	33.63	35.25	74.00	-38.75	Horizontal
3708.00	33.73	29.25	7.34	37.37	32.95	74.00	-41.05	Horizontal
4635.00	*					74.00		Horizontal
5562.00	*					74.00		Horizontal
6489.00	*					74.00		Horizontal

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
1854.00	36.98	25.56	4.89	34.23	33.20	54.00	-20.80	Vertical
2781.00	25.77	28.23	5.7	33.63	26.07	54.00	-27.93	Vertical
3708.00	26.53	29.25	7.34	37.37	25.75	54.00	-28.25	Vertical
4635.00	*					54.00		Vertical
5562.00	*					54.00		Vertical
6489.00	*					54.00		Vertical
1854.00	35.61	25.56	4.89	34.23	31.83	54.00	-22.17	Horizontal
2781.00	24.33	28.23	5.7	33.63	24.63	54.00	-29.37	Horizontal
3708.00	22.98	29.25	7.34	37.37	22.20	54.00	-31.80	Horizontal
4635.00	*					54.00		Horizontal
5562.00	*					54.00		Horizontal
6489.00	*					54.00		Horizontal

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

10 Test Setup Photo

Reference to the **appendix I** for details.

11 EUT Constructional Details

Reference to the **appendix II** for details.

------End------