



TEST REPORT

FCC ID:ZHHP0D

Report Number : ZKT-2111266451E	
Date of Test Nov. 25, 2021 to Dec. 06, 2021	
Date of issue..... : Dec. 06, 2021	
Total number of pages 66	
Test Result : PASS	
Testing Laboratory : Shenzhen ZKT Technology Co., Ltd.	
Address : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China	
Applicant's name : Dragino Technology Co., Limited.	
Address : Room 202,BaoChengTai industrial park,No.8 CaiYun LongCheng Street, LongGang District, Shenzhen 518116, China	
Manufacturer's name : Dragino Technology Co., Limited.	
Address : Room 202,BaoChengTai industrial park,No.8 CaiYun LongCheng Street, LongGang District, Shenzhen 518116, China	
Test specification:	
Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247	
Test procedure : /	
Non-standard test method : N/A	
Test Report Form No. : TRF-EL-110_V0	
Test Report Form(s) Originator : ZKT Testing	
Master TRF : Dated: 2020-01-06	
This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report. This report shall not be reproduced except in full, without the written approval of ZKT, this document may be altered or revised by ZKT, personal only, and shall be noted in the revision of the document.	
Product name : LoRaWAN Gateway	
Trademark : DRAGINO	
Model/Type reference : HP0D	
Ratings : Input: DC 12V From AC Adapter	



Testing procedure and testing location:

Testing Laboratory: **Shenzhen ZKT Technology Co., Ltd.**

Address.....: 1/F, No. 101, Building B, No. 6, Tangwei Community
Industrial Avenue, Fuhai Street, Bao'an District,
Shenzhen, China

Tested by (name + signature).....: Alen He

Reviewer (name + signature): Joe Liu

Approved (name + signature): Lake Xie





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1.Version

Report No.	Version	Description	Approved
ZKT-2111266451E	Rev.01	Initial issue of report	Dec. 06, 2021



2. 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

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report



2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.

Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street,
Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225

Designation Number: CN1299

IC Registered No.: 27033

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59℃
9	Radiated disturbance(30MHz-1000MHz)	U=4.8dB
10	Radiated disturbance(1GHz-6GHz)	U=4.9dB
11	Radiated disturbance(1GHz-18GHz)	U=5.0dB



3. General Information

3.1 General Description of EUT

Product Name:	LoRaWAN Gateway
Model No.:	HP0D
Test sample(s) ID:	ZKT-2111266451-1
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 9 for 500KHz bandwidth
Channel separation:	200KHz for 125KHz bandwidth 330KHz for 250KHz bandwidth 500KHz for 500KHz bandwidth
Modulation type:	FSK
Antenna Type:	fibre-glass epoxy antenna
Antenna gain:	3dBi
Power supply:	DC 12V From AC Adapter



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)
1	923.50	4	925.00	7	926.50
2	924.00	5	925.50	8	927.00
3	924.50	6	926.00	9	927.50



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	923.50MHz
The middle channel	915.10MHz	914.94MHz	-
The Highest channel	927.70MHz	927.48MHz	927.50MHz

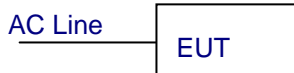


3.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>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.</i>	

3.3 Test Setup Configuration

Conducted Emission



Radiated Emission



Conducted Spurious



3.4 Support Equipment

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	LoRaWAN Gateway	DRAGINO	HP0D	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



3.5 Test Instruments list

Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY45109572	Sep. 22, 2021	Sep. 21, 2022
2	Spectrum Analyzer (1GHz-40GHz)	Agilent	E4446A	100363	Sep. 22, 2021	Sep. 21, 2022
3	Test Receiver (9kHz-7GHz)	R&S	ESCI7	101169	Sep. 22, 2021	Sep. 21, 2022
4	Bilog Antenna (30MHz-1400MHz)	Schwarzbeck	VULB9168	00877	Sep. 22, 2021	Sep. 21, 2022
5	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	Sep. 22, 2021	Sep. 21, 2022
6	Horn Antenna (18GHz-40GHz)	A.H. System	SAS-574	588	Sep. 22, 2021	Sep. 21, 2022
7	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	N/A	Sep. 22, 2021	Sep. 21, 2022
8	Amplifier (1GHz-40GHz)	全聚达	DLE-161	097	Sep. 22, 2021	Sep. 21, 2022
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Sep. 22, 2021	Sep. 21, 2022
10	RF cables1 (9kHz-30MHz)	N/A	9kHz-30MHz	N/A	Sep. 22, 2021	Sep. 21, 2022
11	RF cables2 (30MHz-1GHz)	N/A	30MHz-1GHz	N/A	Sep. 22, 2021	Sep. 21, 2022
12	RF cables3 (1GHz-40GHz)	N/A	1GHz-40GHz	N/A	Sep. 22, 2021	Sep. 21, 2022
13	CMW500 Test	R&S	CMW500	106504	Sep. 22, 2021	Sep. 21, 2022
14	ESG Signal Generator	Agilent	E4421B	GB40051203	Sep. 22, 2021	Sep. 21, 2022
15	Signal Generator	Agilent	N5182A	MY47420215	Sep. 22, 2021	Sep. 21, 2022
16	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
17	Software	Frad	EZ-EMC	FA-03A2 RE	\	\

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	Sep. 22, 2021	Sep. 21, 2022
2	LISN	CYBERTEK	EM5040A	E1850400149	Sep. 22, 2021	Sep. 21, 2022
3	Test Cable	N/A	C01	N/A	Sep. 22, 2021	Sep. 21, 2022
4	Test Cable	N/A	C02	N/A	Sep. 22, 2021	Sep. 21, 2022
5	EMI Test Receiver	R&S	ESRP3	101946	Sep. 22, 2021	Sep. 21, 2022
6	Absorbing Clamp	DZ	ZN23201	N/A	Sep. 22, 2021	Sep. 21, 2022



4. EMC EMISSION TEST

4.1 Conducted Emissions

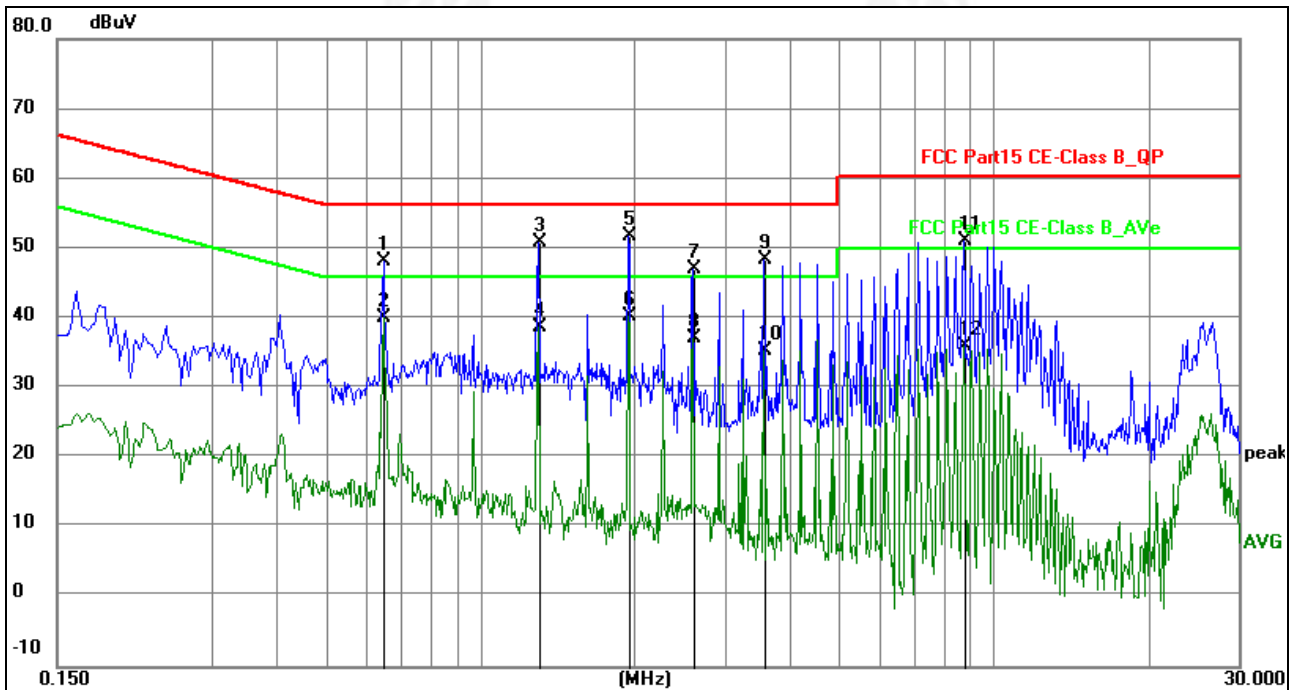
Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	150KHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)	Limit (dBuV)				
		Quasi-peak	Average			
	0.15-0.5	66 to 56*	56 to 46*			
	0.5-5	56	46			
	5-30	60	50			
* Decreases with the logarithm of the frequency.						
Test setup:	<p style="text-align: center;">Reference Plane</p> <p>The diagram shows a Reference Plane at the top. Below it, on the left, is a box containing 'AUX Equipment' and 'E.U.T' (Equipment Under Test). A vertical double-headed arrow indicates a distance of 40cm between the Reference Plane and the top of the equipment box. To the right of the equipment box, a diagonal line indicates a distance of 80cm to another LISN. This LISN is connected to a 'Filter' and 'AC power'. Below the equipment box is a 'Test table/Insulation plane'. An 'EMI Receiver' is connected to the LISN on the right.</p>					
	<p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>					
Test procedure:	<ol style="list-style-type: none"> 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					

We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.



Test Result:

Temperature:	26.8°C	Relative Humidity:	63%
Pressure:	101kPa	Phase :	L
Test Voltage :	AC120/60Hz		



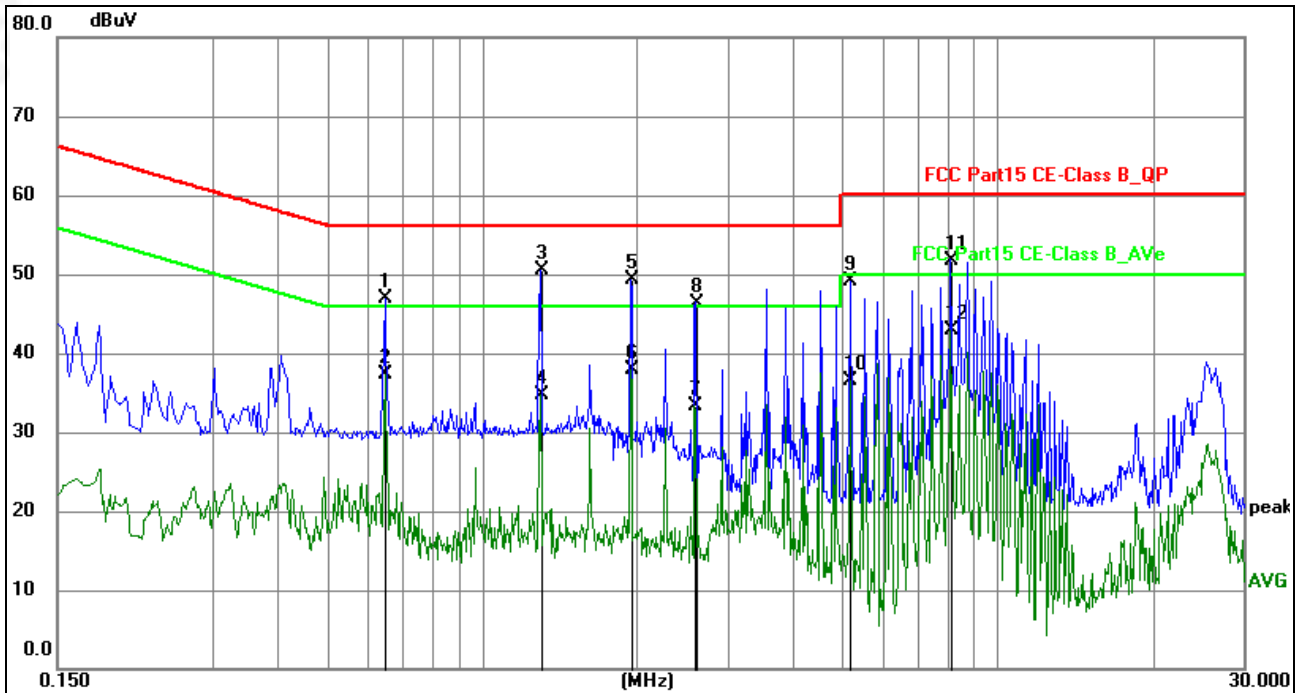
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.6493	37.62	10.48	48.10	56.00	-7.90	QP	P	
2	0.6493	29.62	10.48	40.10	46.00	-5.90	AVG	P	
3	1.2974	40.59	10.34	50.93	56.00	-5.07	QP	P	
4	1.2974	28.47	10.34	38.81	46.00	-7.19	AVG	P	
5	1.9454	41.49	10.17	51.66	56.00	-4.34	QP	P	
6	1.9454	30.02	10.17	40.19	46.00	-5.81	AVG	P	
7	2.5979	37.08	10.01	47.09	56.00	-8.91	QP	P	
8	2.5979	27.03	10.01	37.04	46.00	-8.96	AVG	P	
9	3.5700	38.84	9.55	48.39	56.00	-7.61	QP	P	
10	3.5700	25.71	9.55	35.26	46.00	-10.74	AVG	P	
11	8.7629	42.72	8.47	51.19	60.00	-8.81	QP	P	
12	8.7629	27.45	8.47	35.92	50.00	-14.08	AVG	P	

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. Measurement Level = Reading level + Correct Factor



Temperature:	26.8°C	Relative Humidity:	63%
Pressure:	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.6493	36.39	10.48	46.87	56.00	-9.13	QP	P	
2	0.6493	26.90	10.48	37.38	46.00	-8.62	AVG	P	
3	1.2974	40.21	10.34	50.55	56.00	-5.45	QP	P	
4	1.2974	24.40	10.34	34.74	46.00	-11.26	AVG	P	
5	1.9454	39.12	10.17	49.29	56.00	-6.71	QP	P	
6	1.9454	27.74	10.17	37.91	46.00	-8.09	AVG	P	
7	2.5935	23.32	10.01	33.33	46.00	-12.67	AVG	P	
8	2.5979	36.39	10.01	46.40	56.00	-9.60	QP	P	
9	5.1900	40.42	8.61	49.03	60.00	-10.97	QP	P	
10	5.1900	27.91	8.61	36.52	50.00	-13.48	AVG	P	
11	8.1105	43.30	8.50	51.80	60.00	-8.20	QP	P	
12	8.1105	34.46	8.50	42.96	50.00	-7.04	AVG	P	

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.Measurement Level = Reading level + Correct Factor



4.2 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Limit:	30dBm
Test setup:	<p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
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	20.277	30.00	Pass
	Middle	19.825		
	Highest	19.525		
250KHz Bandwidth	Lowest	20.226	30.00	Pass
	Middle	19.880		
	Highest	19.427		



Test plot as follows:

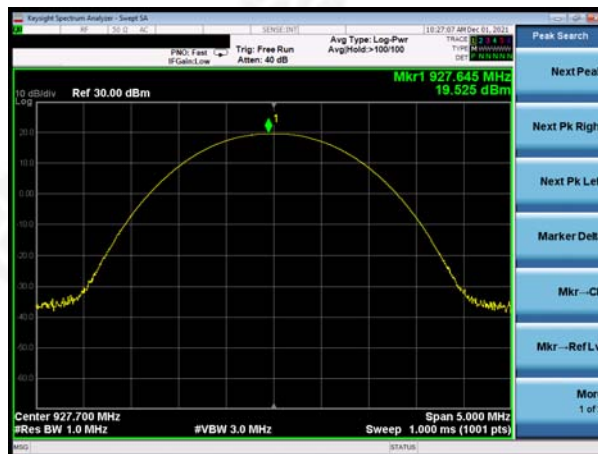
Test mode:	125KHz Bandwidth
------------	------------------



Lowest channel



Middle channel

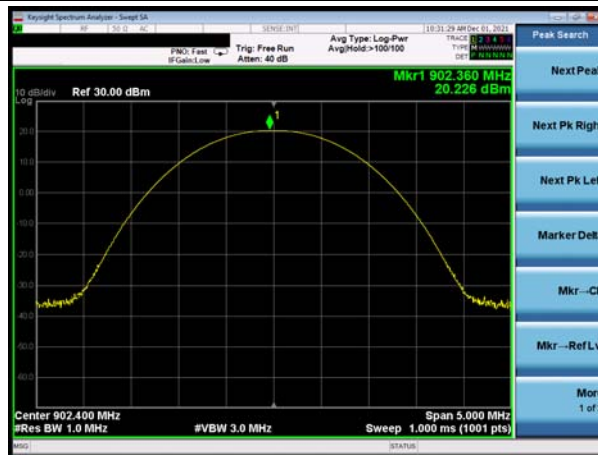


Highest channel



Test mode:

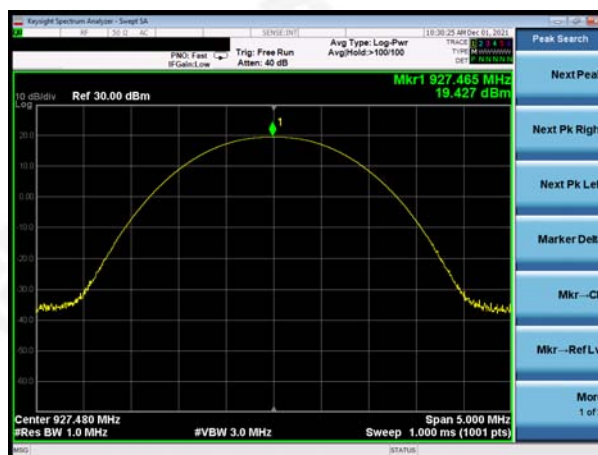
250KHz Bandwidth



Lowest channel



Middle channel



Highest channel



4.3 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	<p>The diagram shows a Spectrum Analyzer on the left and an E.U.T. on the right, connected by a red cable. They are placed on a brown table labeled 'Non-Conducted Table'. Below the table is a grey bar labeled 'Ground Reference Plane'.</p>
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	132.8	Pass
	Middle	132.8	
	Highest	134.3	
250KHz Bandwidth	Lowest	261.2	Pass
	Middle	258.4	
	Highest	260.5	

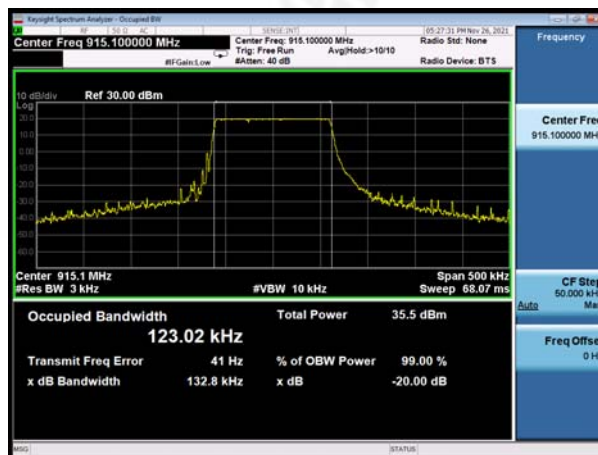


Test plot as follows:

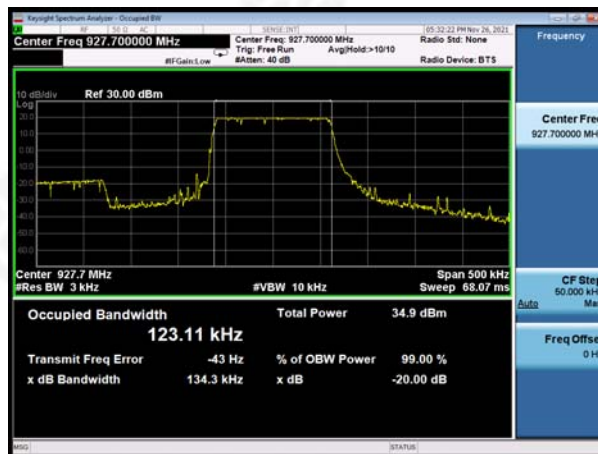
Test mode:	125KHz Bandwidth
------------	------------------



Lowest channel



Middle channel

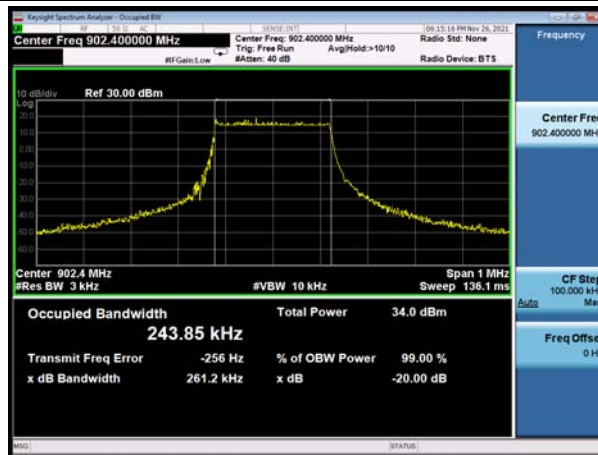


Highest channel



Test mode:

250KHz Bandwidth



Lowest channel



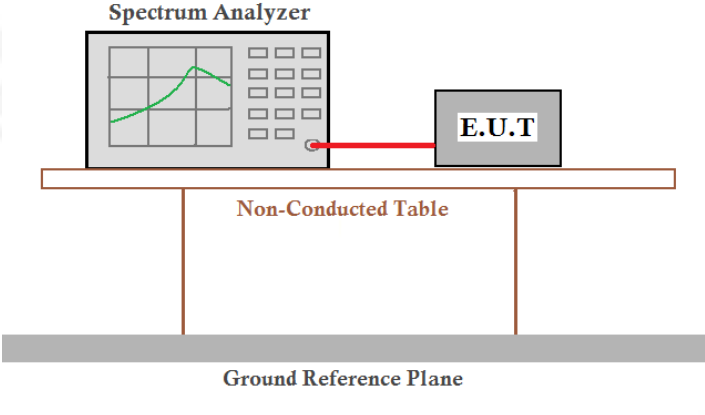
Middle channel



Highest channel



4.4 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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. This table is supported by a Ground Reference Plane.</p>
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	134.3	Pass
	Middle	200.00	134.3	Pass
	Highest	200.00	134.3	Pass
250KHz Bandwidth	Lowest	330.00	261.2	Pass
	Middle	330.00	261.2	Pass
	Highest	330.00	261.2	Pass

Note: According to section 8.2

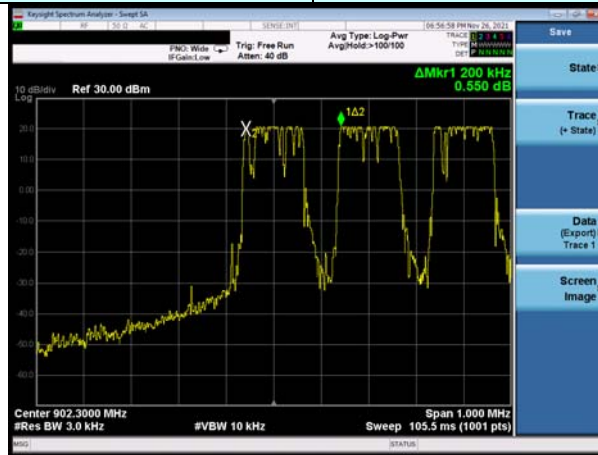
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
125KHz Bandwidth	134.3	134.3
250KHz Bandwidth	261.2	261.2



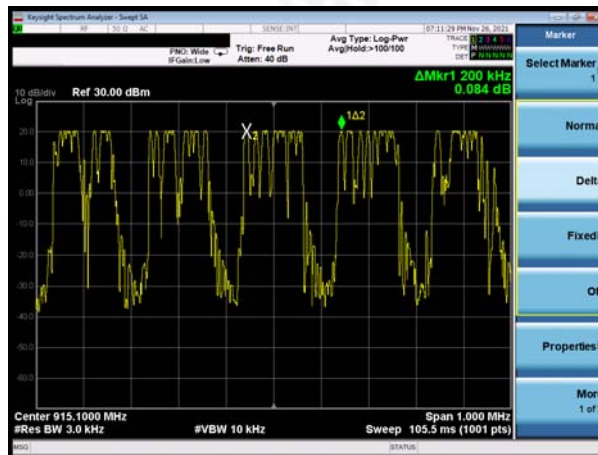
Test plot as follows:

Modulation mode:

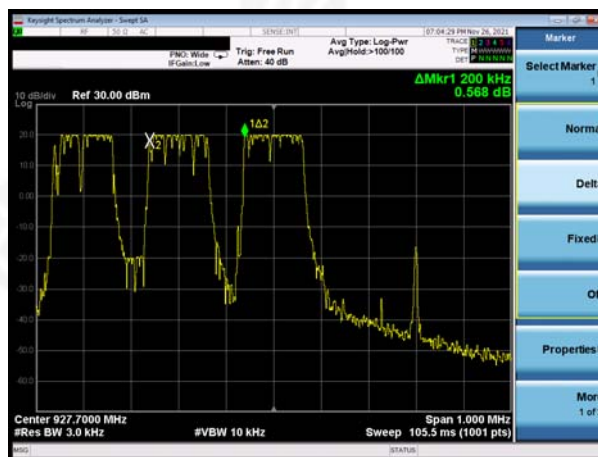
125KHz Bandwidth



Lowest channel



Middle channel



Highest channel



Test mode:

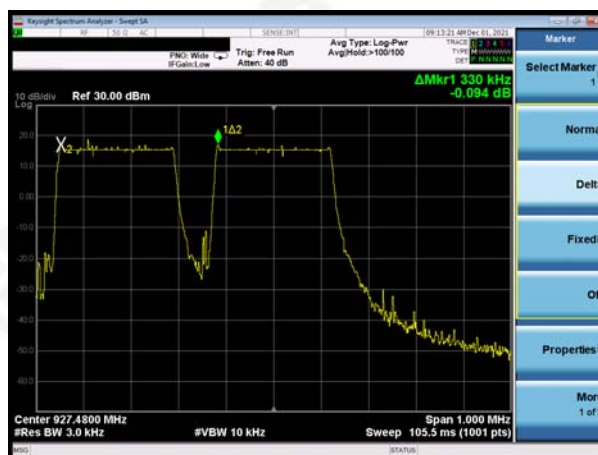
250KHz Bandwidth



Lowest channel



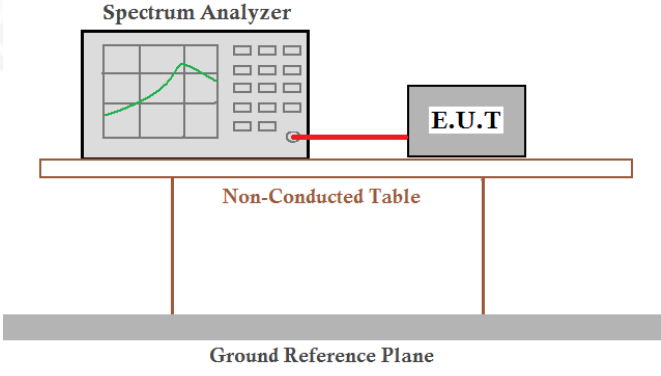
Middle channel



Highest channel



4.5 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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
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



4.6 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:	<p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



Measurement Data

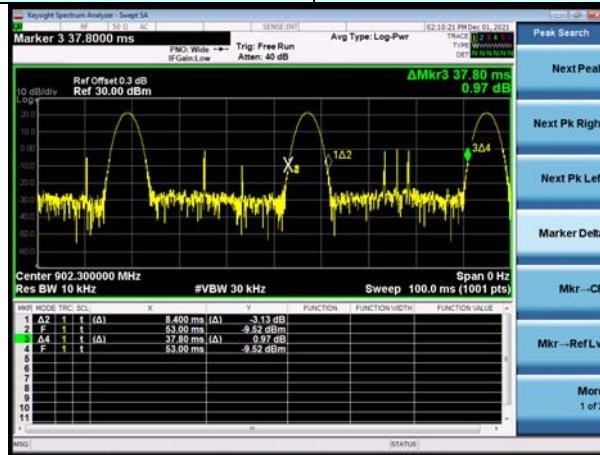
Mode	Ton(ms)	Tcycle(ms)	Dwell time(ms)	Limit(ms)	Result
125KHz Bandwidth	8.40	37.80	294.00	400	Pass
250KHz Bandwidth	2.30	19.75	75.90	400	Pass

Note: Transmit numbers= Continue TX Time/Tcycle
Dwell time=Transmit numbers*Ton

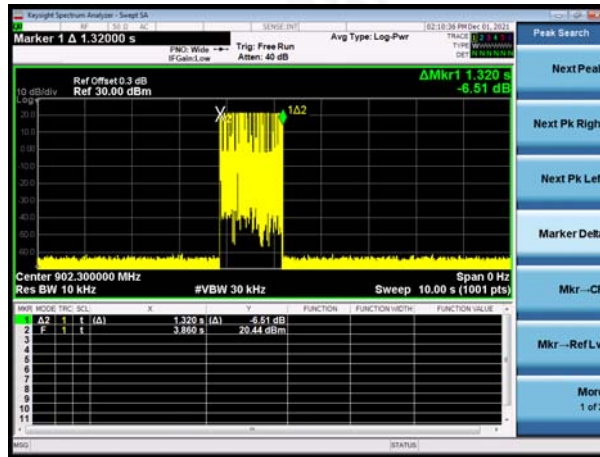


Test plot as follows:

Test Mode:	125KHz Bandwidth
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Ton&Tcycle

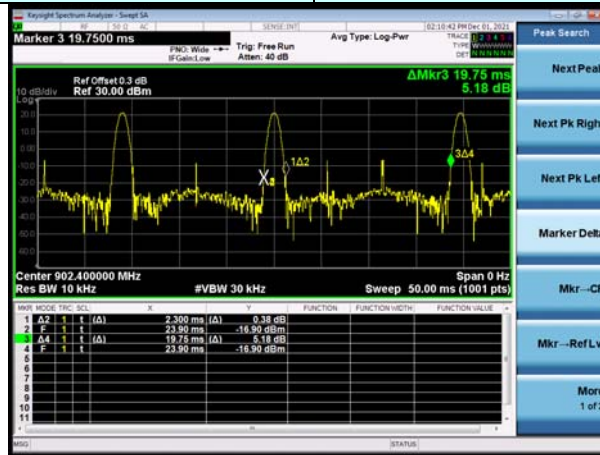


Continue TX Time

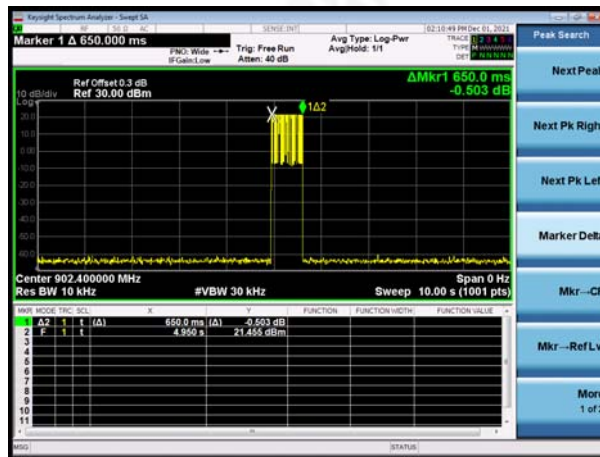


Test Mode:

250KHz Bandwidth



Ton&Tcycle

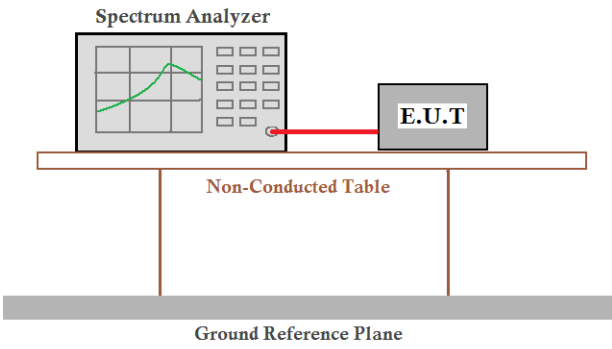


Continue TX Time



4.7 Band Edge

Conducted Emission Method

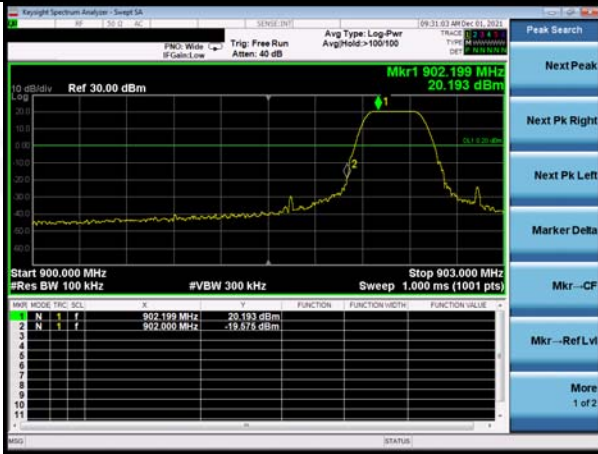
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



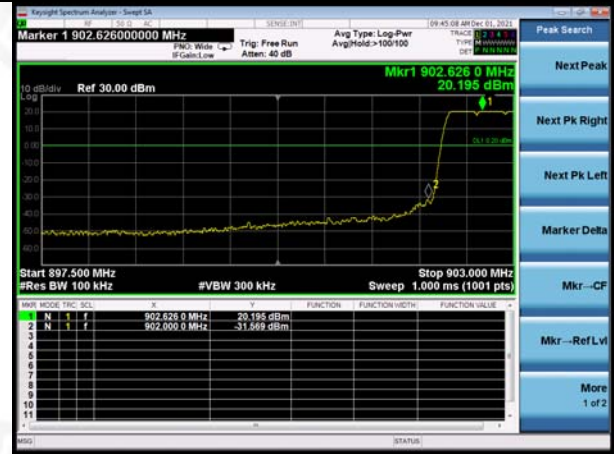
250KHz Bandwidth:

Test channel:

Lowest channel



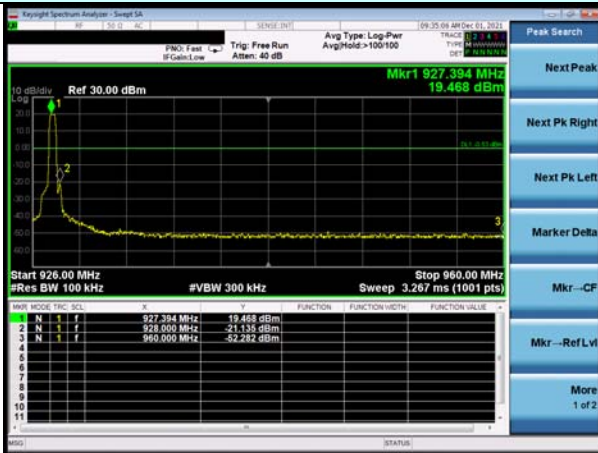
No-hopping mode



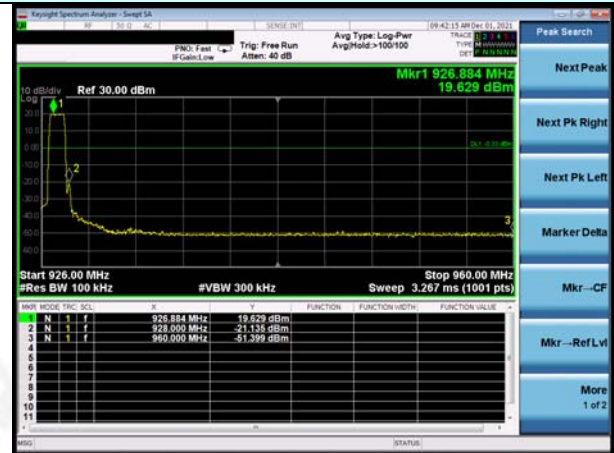
Hopping mode

Test channel:

Highest channel



No-hopping mode



Hopping mode



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 (902MHz to 928MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00		Average Value	
Test setup:			74.00	Peak Value	
Test Procedure:	<ol style="list-style-type: none"> 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
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QP 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	46.00	-19.66	Horizontal
902.00	39.49	22.30	4.87	37.60	29.06	46.00	-16.94	Vertical

Test channel:	Highest channel
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QP 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	23.80	46.00	-22.20	Horizontal
928.00	32.00	22.41	4.96	37.57	21.80	46.00	-24.20	Vertical

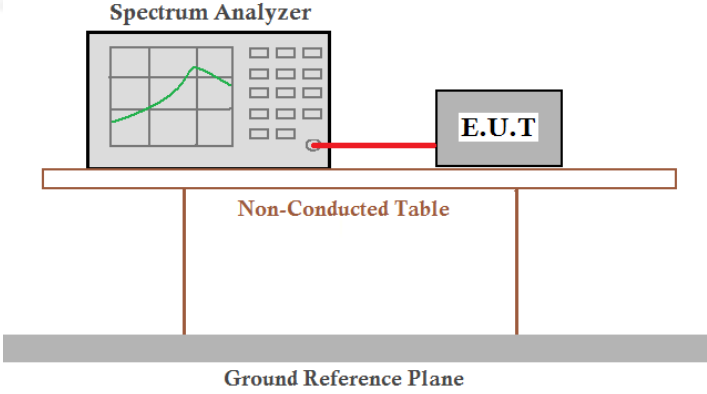
Remarks:

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.*



4.8 Spurious Emission

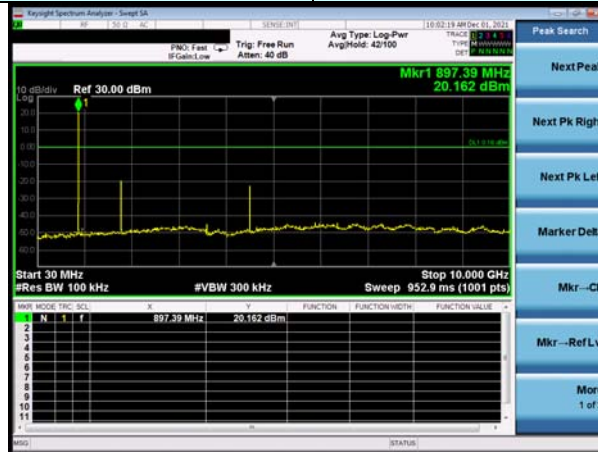
Conducted Emission Method

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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



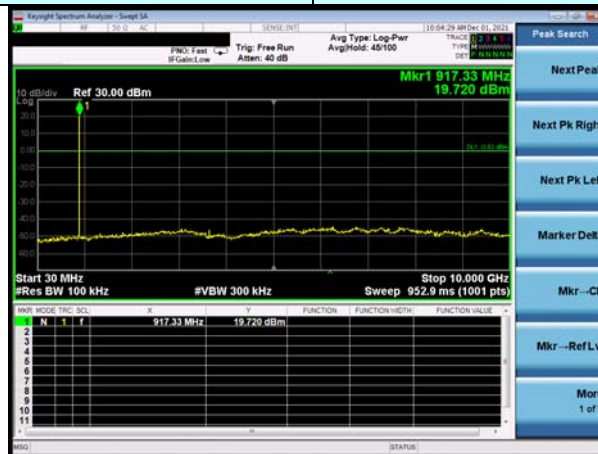
125KHz Bandwidth:

Test channel: Lowest channel



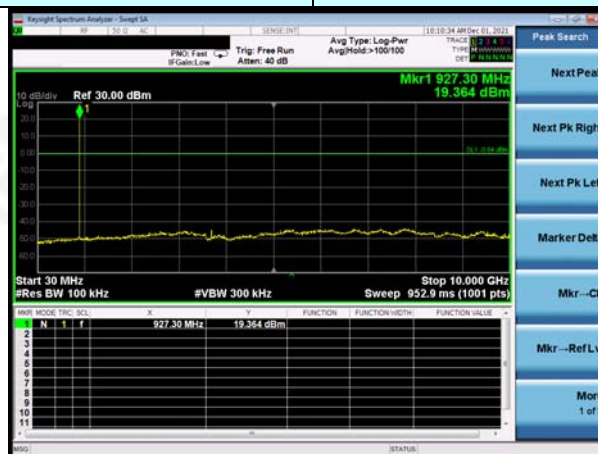
30MHz~10GHz

Test channel: Middle channel



30MHz~10GHz

Test channel: Highest channel

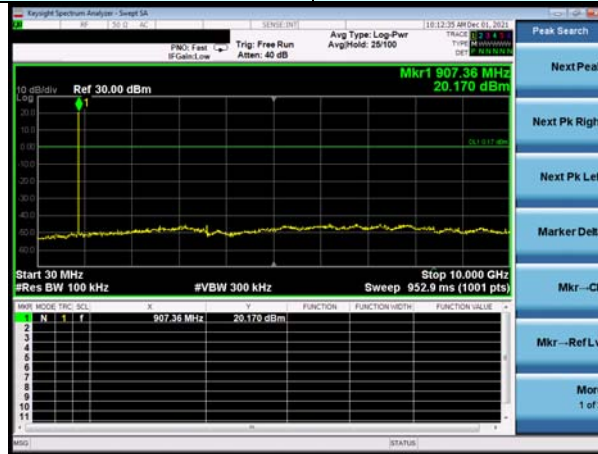


30MHz~10GHz



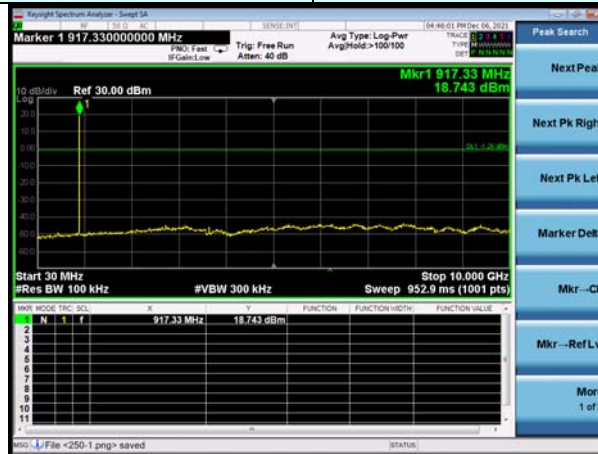
250KHz Bandwidth:

Test channel: Lowest channel



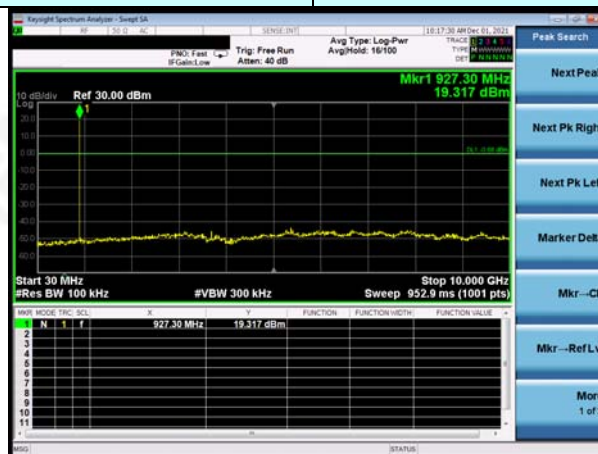
30MHz~10GHz

Test channel: Middle channel



30MHz~10GHz

Test channel: Highest channel



30MHz~10GHz

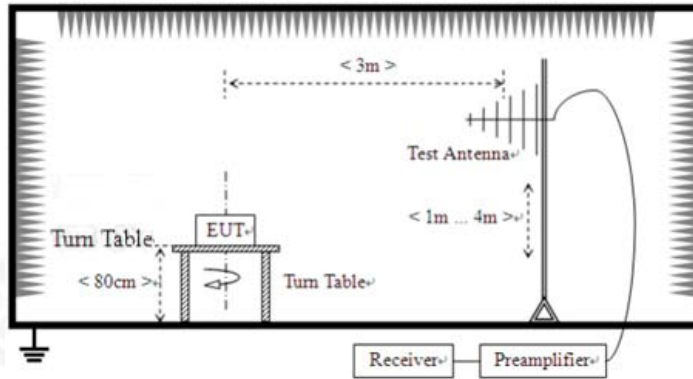


Radiated Emission Method

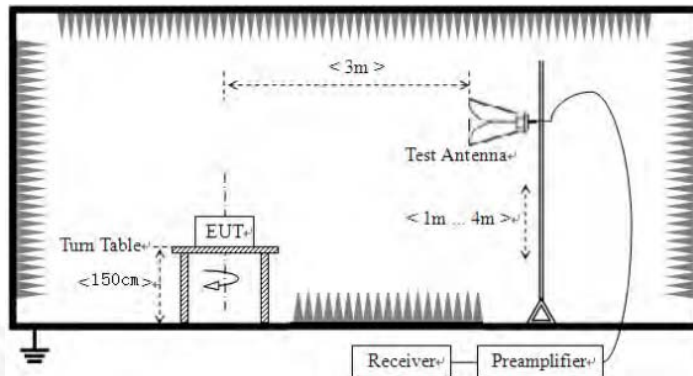
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak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



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
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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**

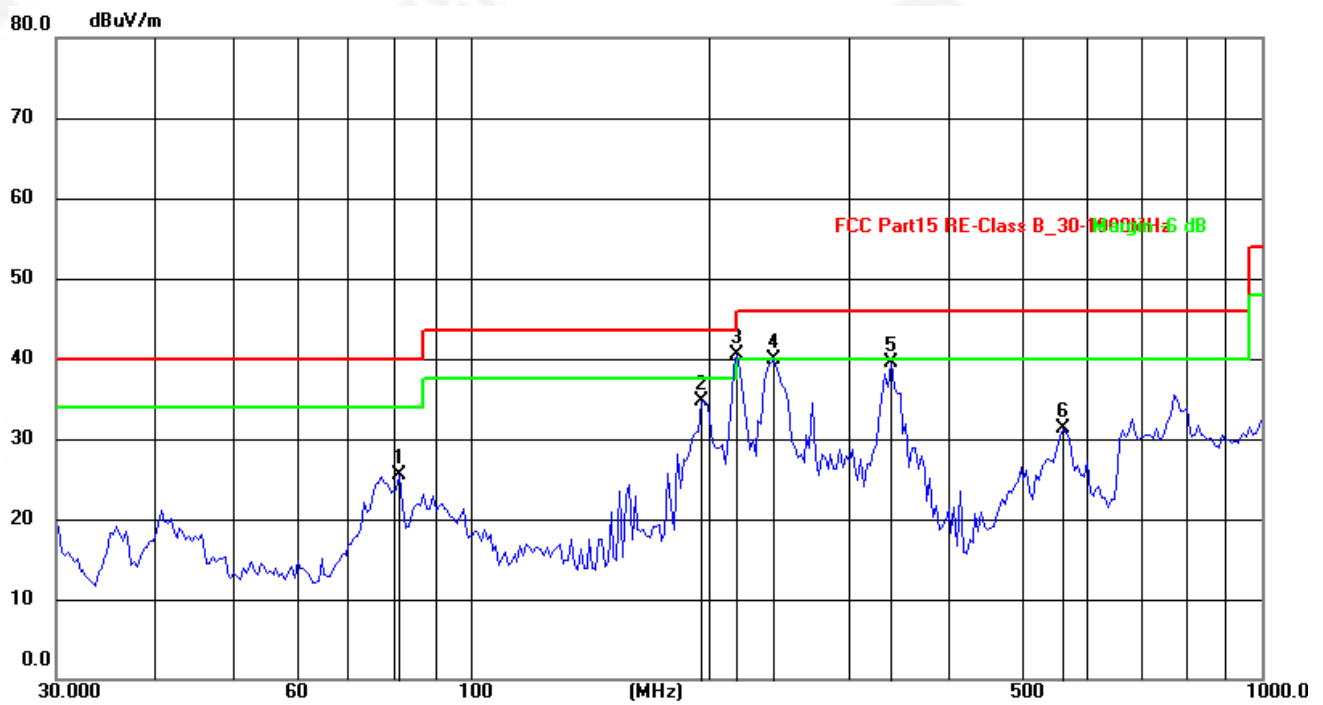
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.



■ 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:

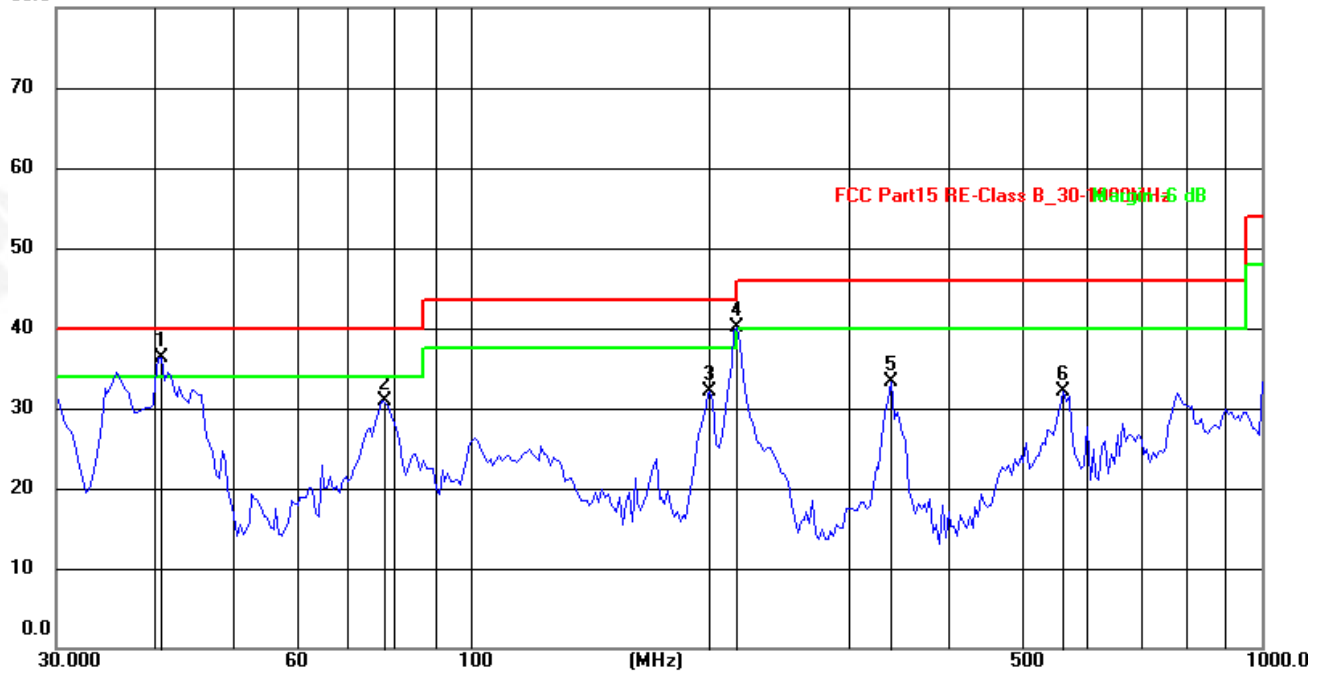


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	81.4970	45.08	-19.58	25.50	40.00	-14.50	QP
2	195.8219	54.36	-19.57	34.79	43.50	-8.71	QP
3	217.5443	59.63	-19.09	40.54	46.00	-5.46	QP
4	241.6763	57.62	-17.63	39.99	46.00	-6.01	QP
5	340.1847	58.26	-18.82	39.44	46.00	-6.56	QP
6	560.6928	43.21	-11.93	31.28	46.00	-14.72	QP



Vertical:

80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.4172	53.21	-16.88	36.33	40.00	-3.67	QP
2	77.3212	52.18	-21.19	30.99	40.00	-9.01	QP
3	201.0402	53.73	-21.69	32.04	43.50	-11.46	QP
4	217.5443	61.73	-21.60	40.13	46.00	-5.87	QP
5	340.1847	52.25	-19.00	33.25	46.00	-12.75	QP
6	560.6928	43.46	-11.27	32.19	46.00	-13.81	QP



■ Above 1GHz

Test channel:	Lowest channel
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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
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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
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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.



Test Items for DTS

4.9 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:	<p>The diagram shows a Spectrum Analyzer on the left, connected by a red cable to an E.U.T. (Equipment Under Test) on the right. Both are placed on a brown 'Non-Conducted Table'. Below the table is a grey 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

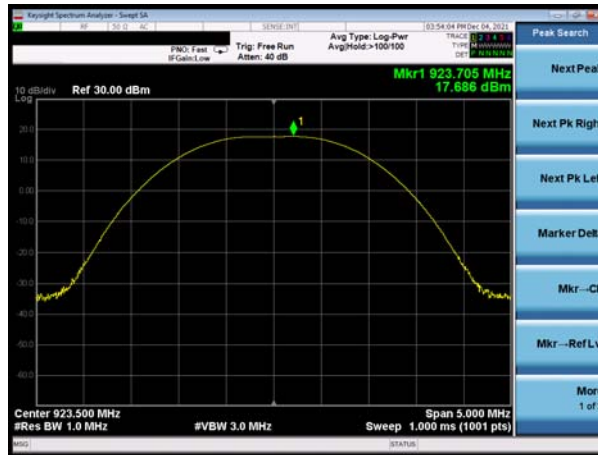
Measurement Data

500KHz Bandwidth:

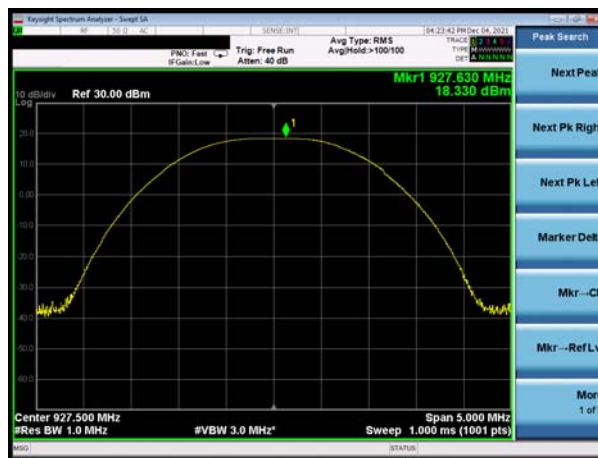
Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	17.686	30.00	Pass
Highest	18.330		



Test plot as follows:



Lowest channel



Highest channel



4.10 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:	<p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

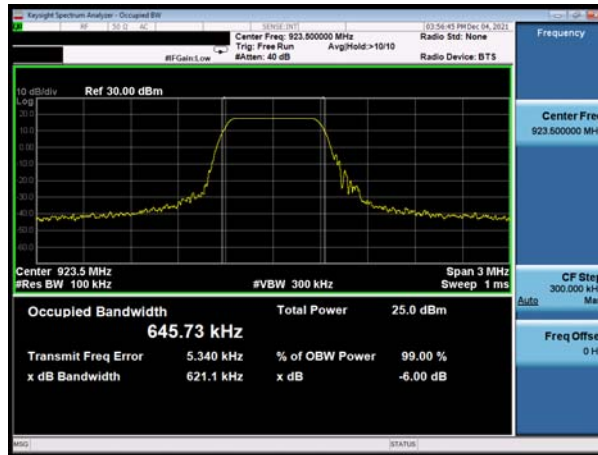
Measurement Data

500KHz Bandwidth:

Test channel	Channel Bandwidth (KHz)	Limit(KHz)	Result
Lowest	621.1	>500	Pass
Highest	628.1		



Test plot as follows:



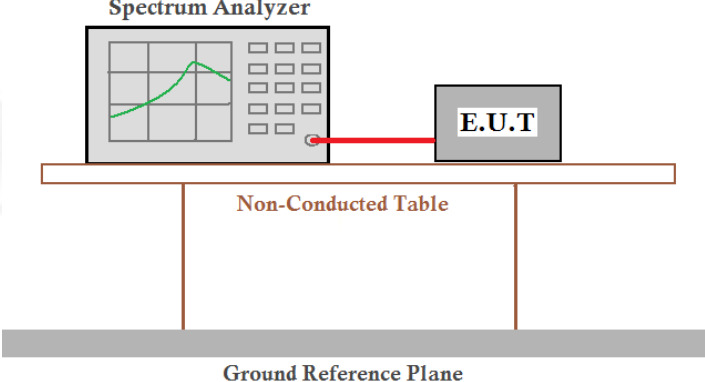
Lowest channel



Highest channel



4.11 Power Spectral Density

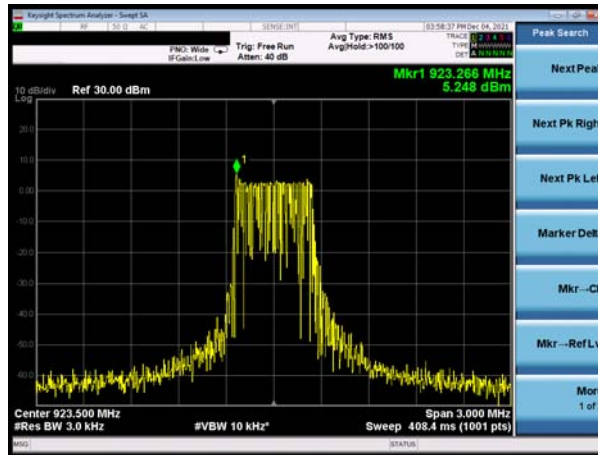
Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

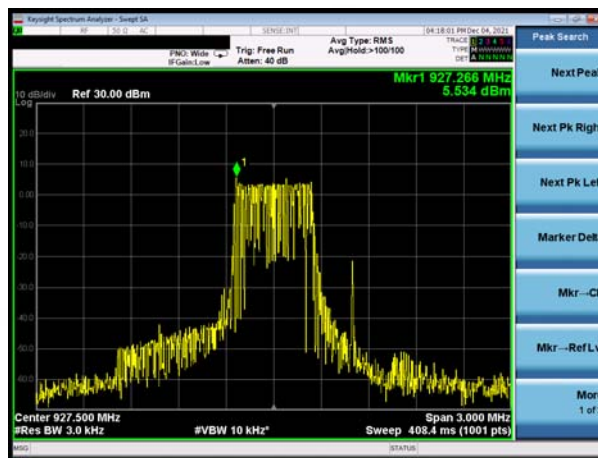
Test channel	Power Spectral Density (dBm/3kHz)	Limit(dBm/3kHz)	Result
Lowest	5.248	8.00	Pass
Highest	5.534		



Test plot as follows:



Lowest channel

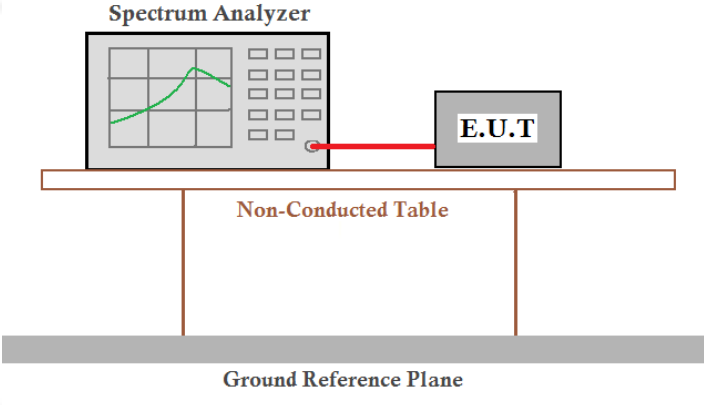


Highest channel

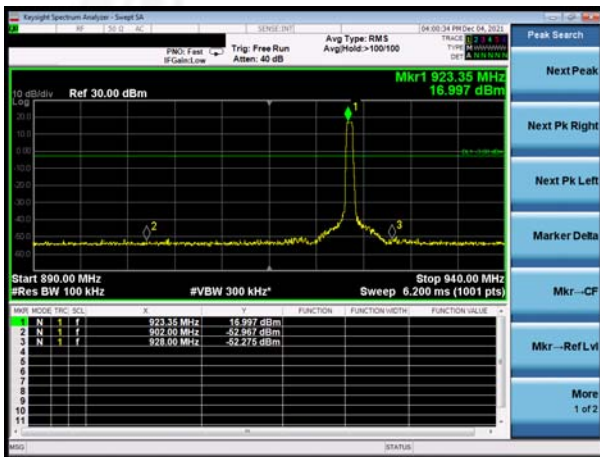


4.12 Band edges

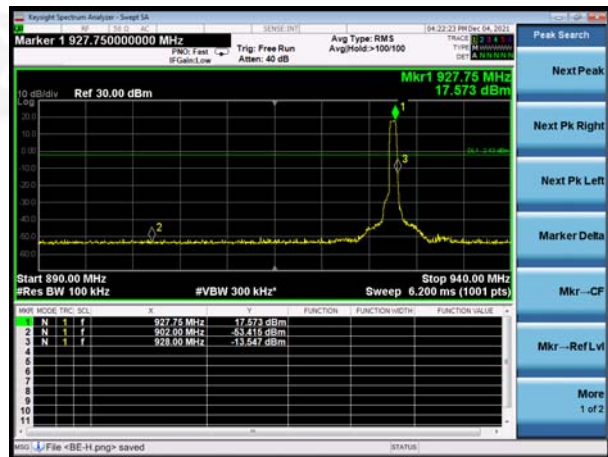
Conducted Emission Method

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



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 (902MHz to 928MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		RMS	1MHz	3MHz	Average
Limit:	Frequency		Limit (dBuV/m @3m)		Value
	Above 1GHz		54.00		Average
			74.00		Peak
Test setup:					
Test Procedure:	<ol style="list-style-type: none"> 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. 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
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QP 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	25.33	46.00	-20.67	Horizontal
902.00	33.27	22.30	4.87	37.60	22.84	46.00	-23.16	Vertical

Test channel:	Highest channel
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QP 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	26.25	46.00	-19.75	Horizontal
928.00	39.35	22.41	4.96	37.57	29.15	46.00	-16.85	Vertical

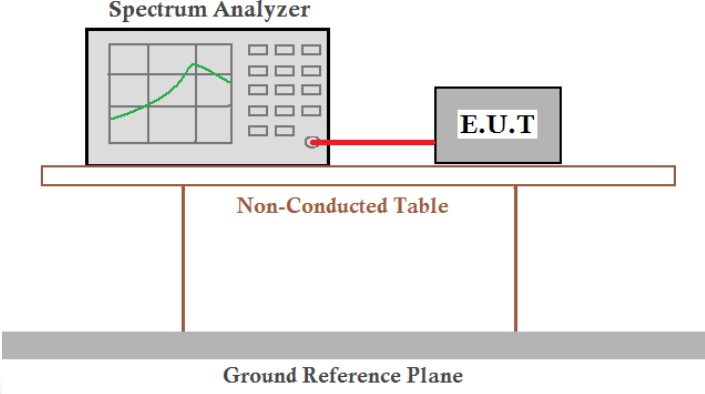
Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier 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.



4.13 Spurious Emission

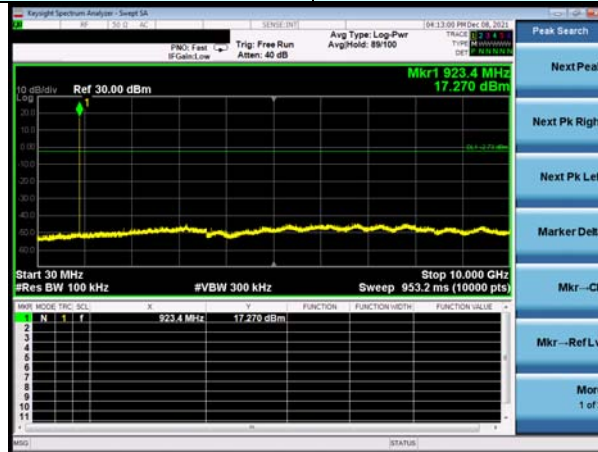
Conducted Emission Method

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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



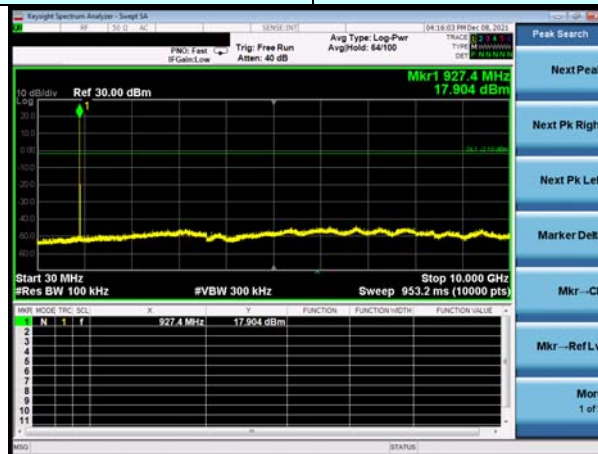
Test plot as follows:

Test channel: Lowest channel



30MHz~10GHz

Test channel: Highest channel



30MHz~10GHz

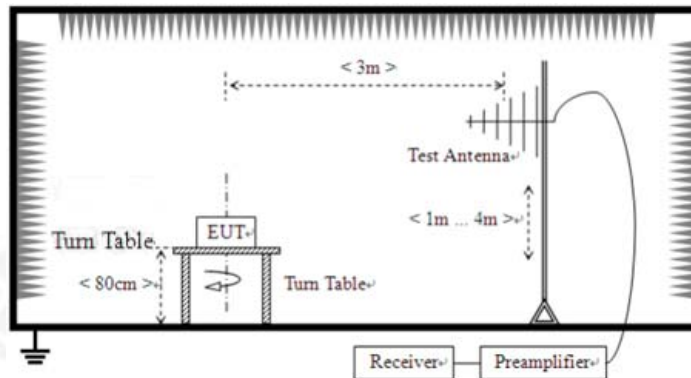


Radiated Emission Method

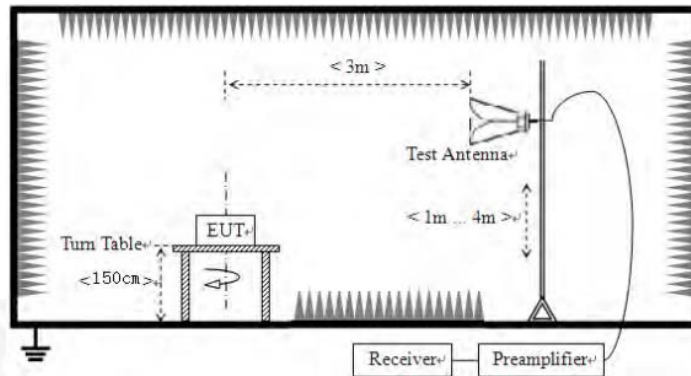
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz	Average	
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
5000		Peak			
Test setup:	For radiated emissions from 9kHz to 30MHz				
<p>The diagram illustrates the test setup for radiated emissions. It shows a Turn Table with a diameter of less than 80cm. On the turn table, an EUT (Equipment Under Test) is placed. A Test Antenna is positioned at a distance of less than 3m from the EUT. The Test Antenna is mounted on a stand that is 1m high. A Receiver is connected to the Test Antenna. The entire setup is enclosed in a shielded chamber, indicated by the vertical lines on the sides.</p>					



For radiated emissions from 30MHz to 1GHz



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
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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.

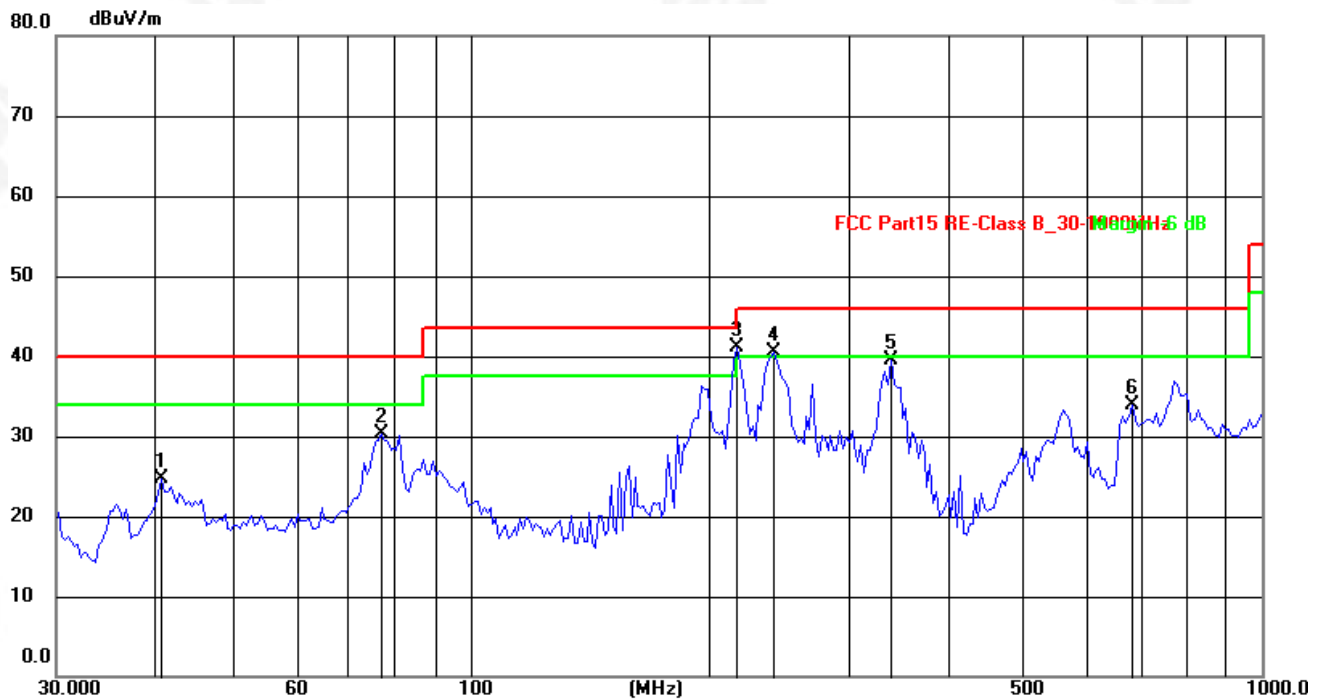
■ **9kHz~30MHz**

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

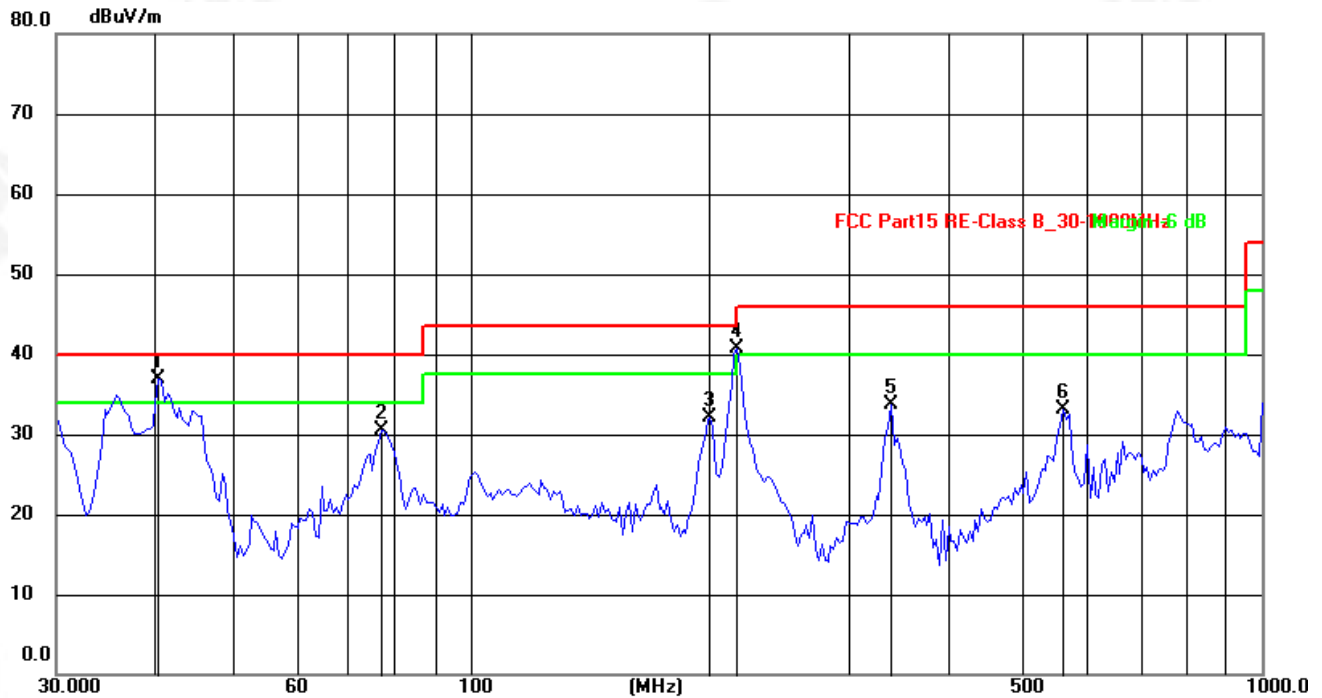
Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.7730	38.81	-14.13	24.68	40.00	-15.32	QP
2	77.3210	48.99	-18.78	30.21	40.00	-9.79	QP
3	217.5442	60.13	-19.09	41.04	46.00	-4.96	QP
4	241.6762	58.12	-17.63	40.49	46.00	-5.51	QP
5	340.1847	58.26	-18.82	39.44	46.00	-6.56	QP
6	685.9469	42.92	-9.01	33.91	46.00	-12.09	QP



Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	40.4170	53.71	-16.88	36.83	40.00	-3.17	QP
2	77.3210	51.68	-21.19	30.49	40.00	-9.51	QP
3	201.0401	53.73	-21.69	32.04	43.50	-11.46	QP
4	217.5442	62.23	-21.60	40.63	46.00	-5.37	QP
5	340.1847	52.75	-19.00	33.75	46.00	-12.25	QP
6	560.6928	44.46	-11.27	33.19	46.00	-12.81	QP



■ Above 1GHz

Test channel:	Lowest channel
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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:	Highest
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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
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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.



5. 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.	
EUT Antenna:	
The antenna is fibre-glass epoxy antenna, the best case gain of the antennas is 3dBi, reference to the appendix II for details	



6. Test Setup Photo

Reference to the appendix I for details.

7. EUT Constructional Details

Reference to the appendix II for details.

***** END OF REPORT *****