



TEST REPORT

FCC ID:ZHZHP0A

Report Number.....: ZKT-2203011237E

Date of Test.....: Mar. 01, 2022 to May. 28, 2022

Date of issue.....: May.28, 2022

Total number of pages.....: 42

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, Block B, BCT Incubation Bases, No.8 CaiYunRoad LongCheng Street, LongGang District ; Shenzhen 518116,China

Manufacturer's name.....: **Dragino Technology Co., Limited.**

Address.....: Room 202, Block B, BCT Incubation Bases, No.8 CaiYunRoad 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.

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Product name.....: **Outdoor LoRaWAN Gateway**

Trademark.....: DRAGINO

Model/Type reference.....: HP0A, DLOS8v2

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) : Jim Liu

Jim Liu

Reviewer (name + signature) : Tom Zou

Tom Zou

Approved (name + signature) : Lake Xie



**TABLE OF CONTENTS**

Page

1.VERSION	4
2. TEST SUMMARY	5
2.1 TEST FACILITY	6
2.2 MEASUREMENT UNCERTAINTY	6
3. GENERAL INFORMATION	7
3.1 GENERAL DESCRIPTION OF EUT	7
3.2 TEST MODE	9
3.3 TEST SETUP CONFIGURATION	9
3.4 SUPPORT EQUIPMENT	9
3.5 TEST INSTRUMENTS LIST	10
4. EMC EMISSION TEST	11
4.1 CONDUCTED EMISSIONS	11
4.2 CONDUCTED PEAK OUTPUT POWER	14
4.3 20dB EMISSION BANDWIDTH	17
4.4 CARRIER FREQUENCIES SEPARATION	20
4.5 HOPPING CHANNEL NUMBER	23
4.6 DWELL TIME	24
4.7 BAND EDGE	27
4.9 SPURIOUS EMISSION	30
4.10 RADIATED EMISSION METHOD	33
5. ANTENNA REQUIREMENT	41
6. TEST SETUP PHOTO	42
7. EUT CONSTRUCTIONAL DETAILS	42



1.Version

Report No.	Version	Description	Approved
ZKT-2203011237E	Rev.01	Initial issue of report	May. 28, 2022



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
Emissions in non-restricted frequency bands	15.247(b)(4)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	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(9KHz-30MHz)	U=4.5dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59℃



3. General Information

3.1 General Description of EUT

Product Name:	Outdoor LoRaWAN Gateway
Model No.:	HP0A, DLOS8v2
Test sample(s) ID:	ZKT-2203011237-1
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
Channel separation:	200KHz for 125KHz bandwidth 330KHz for 250KHz bandwidth
Modulation type:	LoRa
Antenna Type:	Fibre-glass epoxy antenna
Antenna gain:	0dBi
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		

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)
The lowest channel	902.30MHz	902.40MHz
The middle channel	915.10MHz	914.94MHz
The Highest channel	927.70MHz	927.48MHz

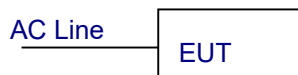


3.2 Test mode

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	Outdoor LoRaWAN Gateway	DRAGINO	HP0A, DLOS8v2	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)	SCHWARZBEC K	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)	SCHWARZBEC K	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

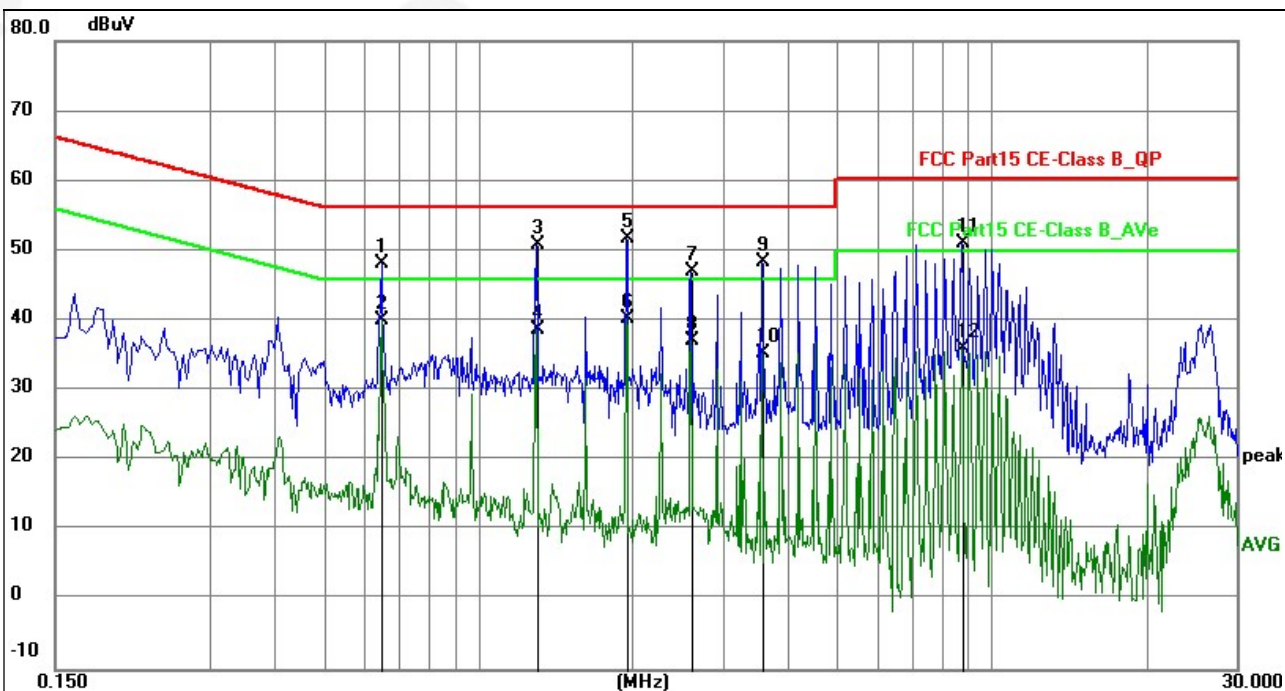
Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	150KHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)		Limit (dBuV)			
			Quasi-peak		Average	
	0.15-0.5		66 to 56*		56 to 46*	
	0.5-5		56		46	
	5-30		60		50	
* Decreases with the logarithm of the frequency.						
Test setup:	Reference Plane Test table/Insulation plane <i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m					
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.					
Test Instruments:	Refer to section 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℃	Relative Humidity:	63%
Pressure:	101kPa	Phase :	L
Test Voltage :	AC120/60Hz		



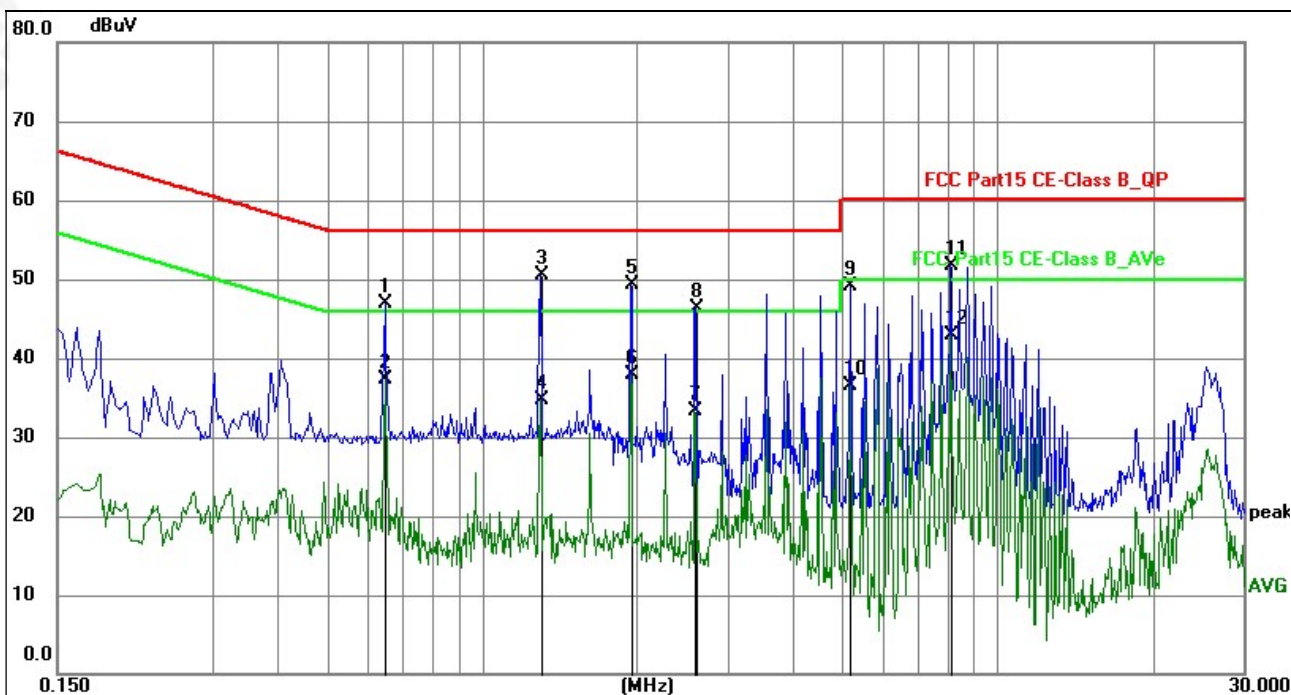
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.6493	37.62	10.48	48.10	56.00	-7.90	QP	P	
2	0.6493	29.62	10.48	40.10	46.00	-5.90	AVG	P	
3	1.2974	40.59	10.34	50.93	56.00	-5.07	QP	P	
4	1.2974	28.47	10.34	38.81	46.00	-7.19	AVG	P	
5	1.9454	41.49	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℃	Relative Humidity:	63%
Pressure:	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



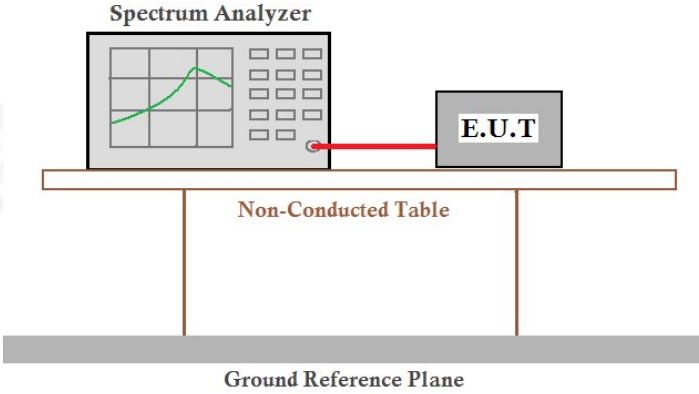
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.6493	36.39	10.48	46.87	56.00	-9.13	QP	P	
2	0.6493	26.90	10.48	37.38	46.00	-8.62	AVG	P	
3	1.2974	40.21	10.34	50.55	56.00	-5.45	QP	P	
4	1.2974	24.40	10.34	34.74	46.00	-11.26	AVG	P	
5	1.9454	39.12	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:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

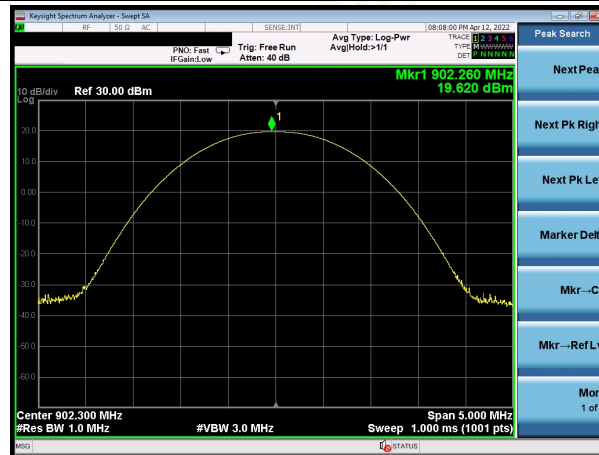
Mode	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
125KHz Bandwidth	Lowest	19.620	30.00	Pass
	Middle	21.112		
	Highest	20.804		
250KHz Bandwidth	Lowest	19.629	30.00	Pass
	Middle	21.185		
	Highest	20.780		



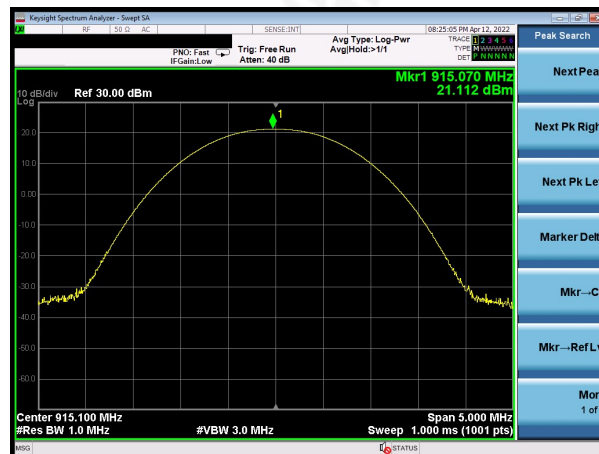
Test plot as follows:

Test mode:

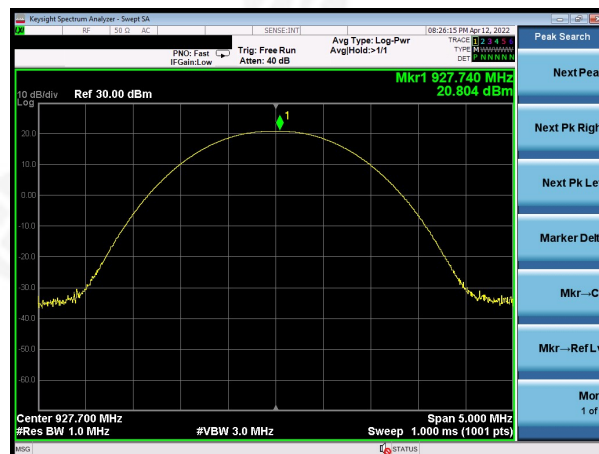
125KHz Bandwidth



Lowest channel



Middle channel

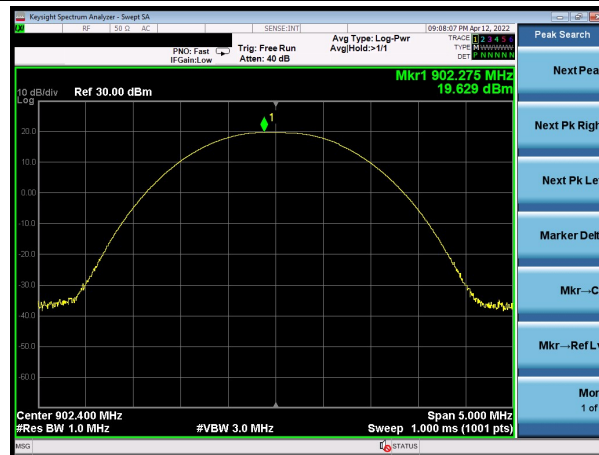


Highest channel

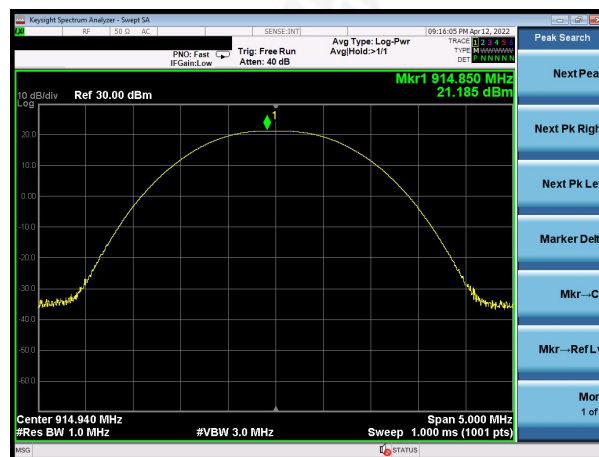


Test mode:

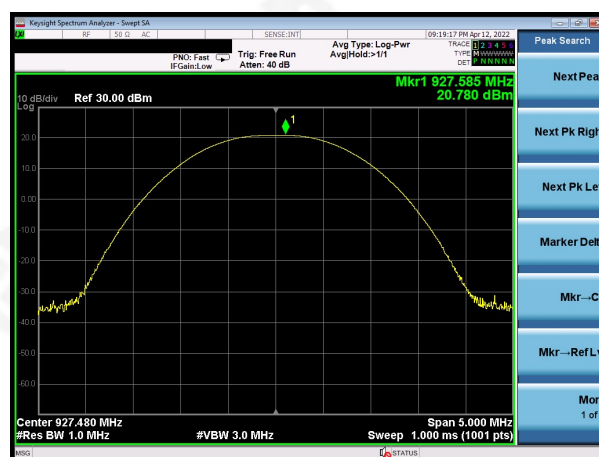
250KHz Bandwidth



Lowest channel



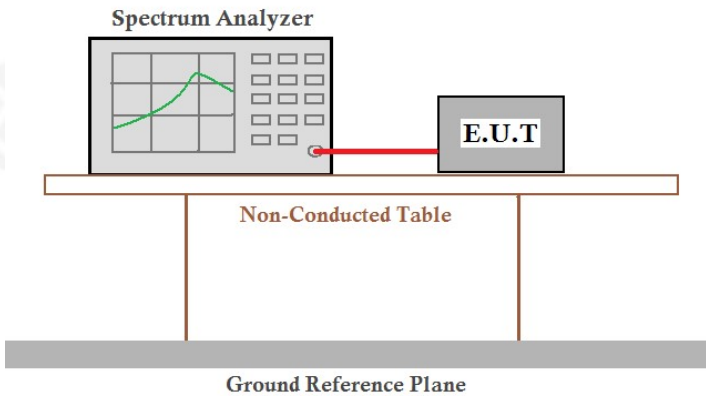
Middle channel



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:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

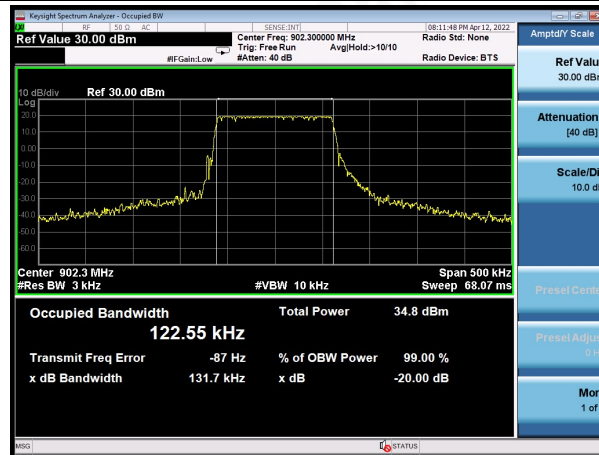
Mode	Test channel	20dB Emission Bandwidth (KHz)	Result
125KHz Bandwidth	Lowest	131.7	Pass
	Middle	133.4	
	Highest	132.9	
250KHz Bandwidth	Lowest	258.2	Pass
	Middle	259.5	
	Highest	262.4	



Test plot as follows:

Test mode:

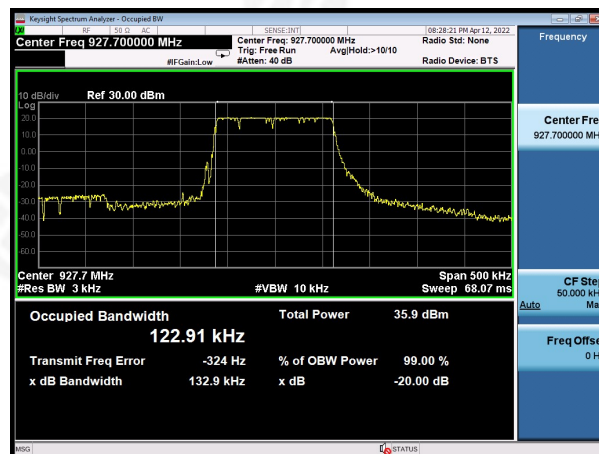
125KHz Bandwidth



Lowest channel



Middle channel

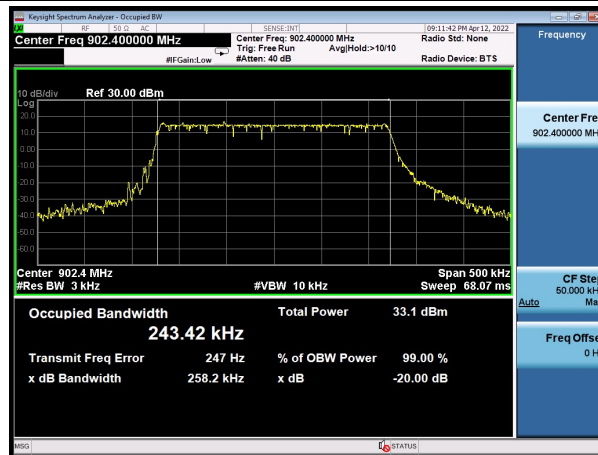


Highest channel

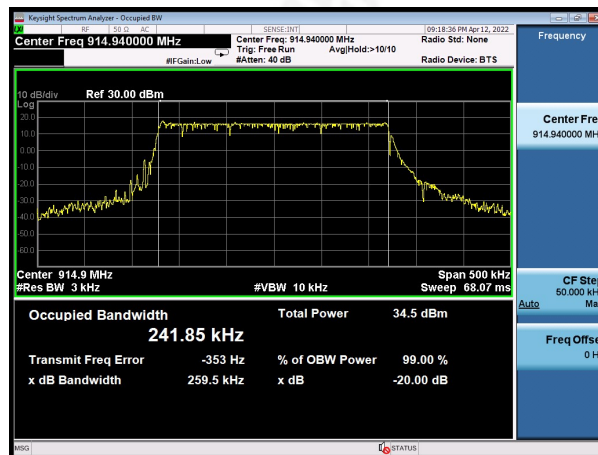


Test mode:

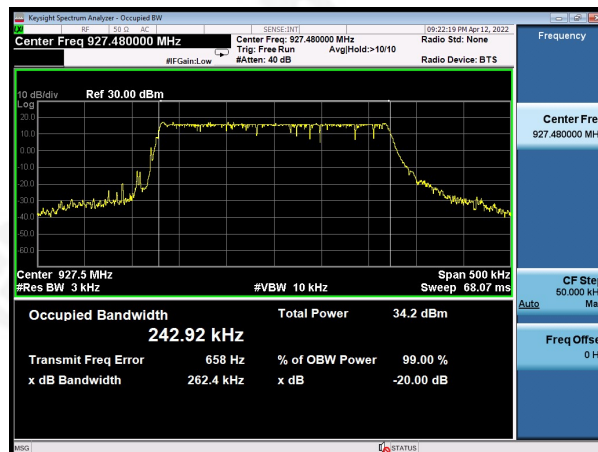
250KHz Bandwidth



Lowest channel



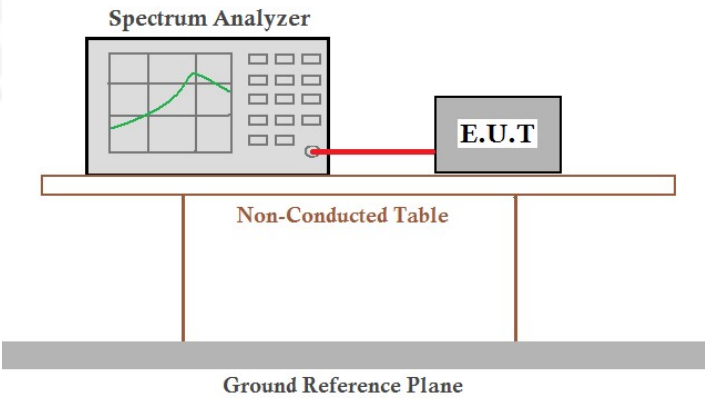
Middle channel



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:	
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	25KHz or 20dB Bandwidth	Pass
	Middle	200.00		Pass
	Highest	200.00		Pass
250KHz Bandwidth	Lowest	330.00	25KHz or 20dB Bandwidth	Pass
	Middle	330.00		Pass
	Highest	330.00		Pass