TEST REPORT

Applicant Name :	Dragino Technology Co., Limited.
Address :	Room 202,BaoChengTai industrial park,No.8 CaiYun, LongCheng Street, LongGang District,Shenzhen,China
Report Number :	SZ1210818-52990E-RF-00A
FCC ID:	ZHZLDS02

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	LoRaWAN Door Sensor
Model No.:	LDS02
Multiple Model(s) No.:	LWL02(model difference see product declaration letter of similarity)
Trade Mark:	Dragino
Date Received:	2021/08/18
Date of Test:	2021/12/23~2022/02/17
Report Date:	2022/02/18

Test Result:	Pass*

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

Prepared and Checked By:

Ting LV
EMC Engineer

Approved By:

Candy Li
EMC Engineer

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	903.9~905.3 MHz
Maximum Conducted Peak Output Power	1.48dBm
Technique	Hybrid System
Antenna Specification	2.0dBi
Voltage Range	DC3V From Battery
Sample serial number	SZ1210818-52990E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Line Conducted emission		2.72dB
Emissions, Radiated	30MHz – 1GHz	4.28dB
	1GHz – 18GHz	4.98dB
	18GHz – 26.5GHz	5.06dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

Channel list:

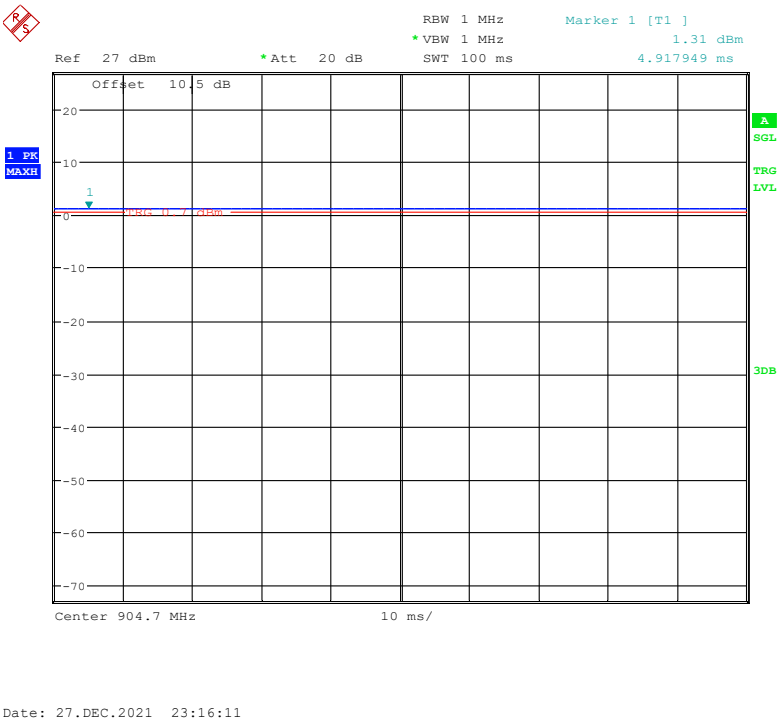
Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**903.9**	4	**904.7**
1	904.1	5	904.9
2	904.3	6	905.1
3	904.5	7	**905.3**

EUT was test with channel 0/4/7

EUT Exercise Software

“Friendly Serial Assistant”* software was used to the EUT tested and power level is default*. The software and power level was provided by the applicant.

Duty cycle



Mode	Ton (ms)	Ton+off (ms)	Duty Cycle (%)
Hybrid System	100	100	100

Equipment Modifications

No modification was made to the EUT tested.

Special Accessories

No special accessory.

Support Equipment List and Details

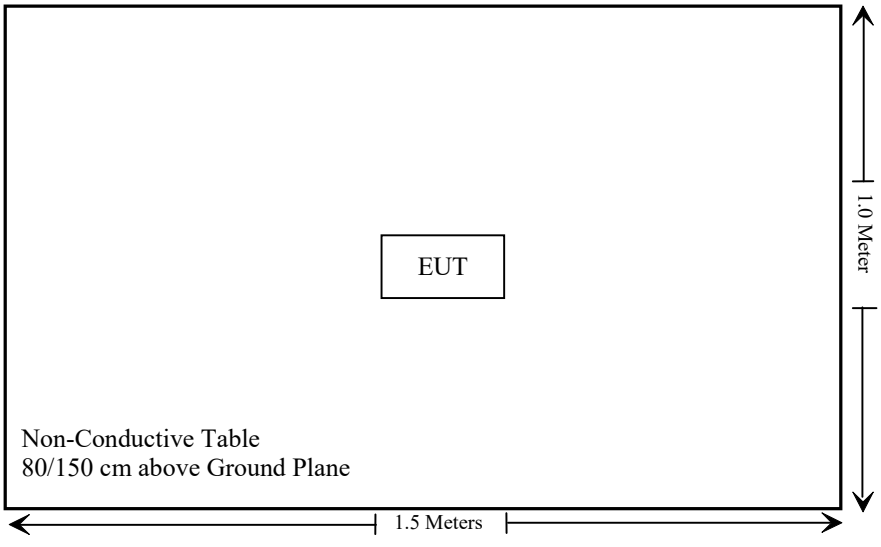
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
/	/	/	/

Block Diagram of Test Setup

For radiated emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	Maximum Permissible Exposure(MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth	Compliant
§15.247(a)(1)(i)	Channel Separation Test	Compliant
§15.247(f)	Time of Occupancy (Dwell Time)	Compliant
§15.247(b)(3)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant
§15.247(f)	Power Spectral Density	Compliant

Not Applicable: The EUT is powered by the battery.
Note: pre-scan two models, the worst case model LDS02 was selected to test.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
CD	High Pass Filter	HPM-1.2/18G-60	110	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
Radiated Emission Test Software: e3 19821b (V9)					
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200982	2021/07/06	2022/07/05
Rohde & Schwarz	Signal analyzer	FSV40	101605	2021/07/06	2022/07/05
WEINSCHEL	10dB Attenuator	5324	AU 3842	2021/12/14	2022/12/13
Unknown	RF Cable	Unknown	Unknown	Each time	/

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
a)

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
903.9-905.3	2.0	1.58	2.0	1.58	20	0.0005	0.603

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, 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 shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

b. Antenna must be permanently attached to the unit.
c. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has an internal antenna which was permanently attached, the antenna gain is 2.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

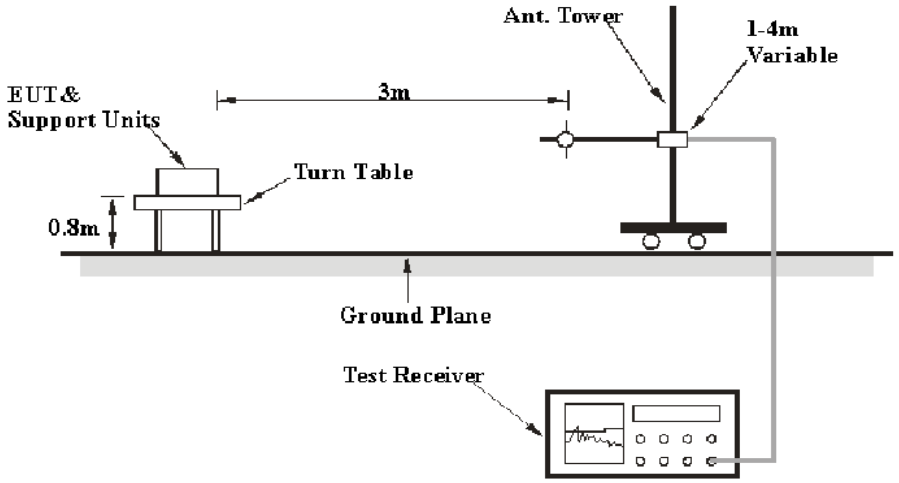
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

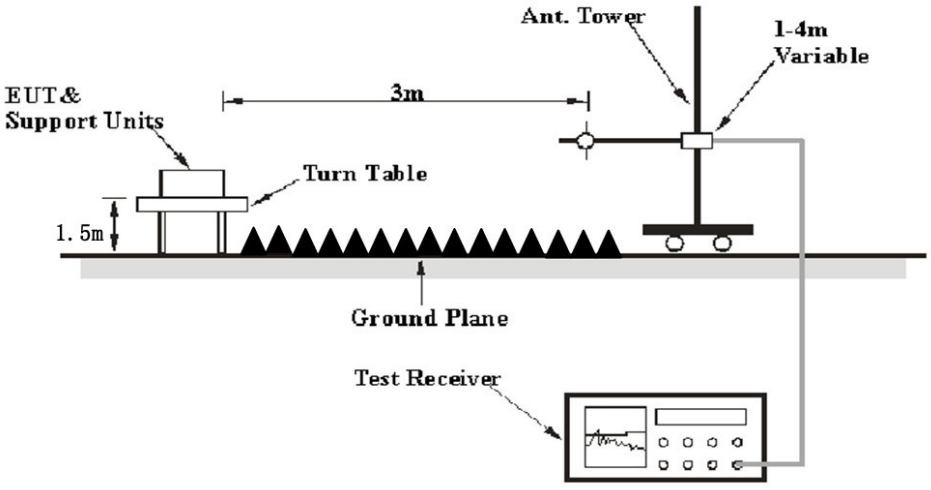
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 10 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurements
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Factor & Margin Calculation

The Corrected Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit or Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a over limit/margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Over Limit/Margin = Level/Corrected Amplitude – Limit
Level/Corrected Amplitude= Read Level + Corrected Factor

Test Data

Environmental Conditions

Temperature:	25~25.8 ℃
Relative Humidity:	51~64 %
ATM Pressure:	101.0 kPa

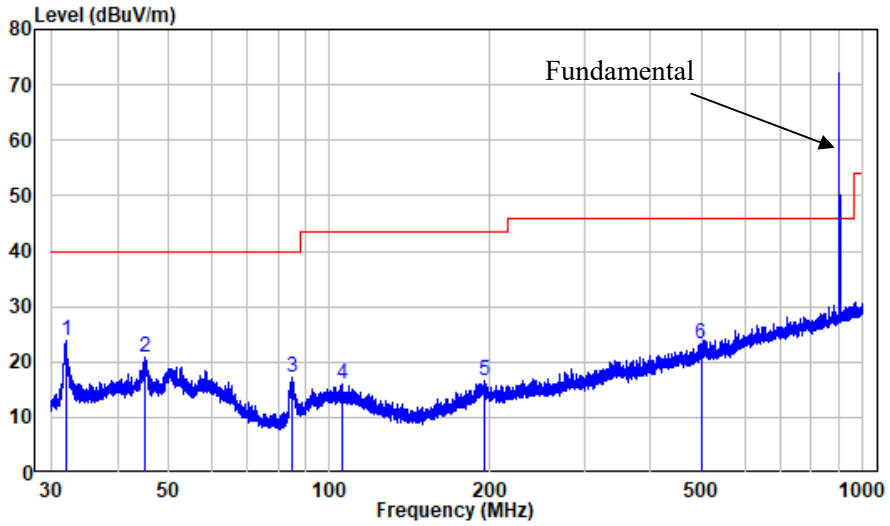
The testing was performed by Bin Deng on 2021-12-31 for below 1G and Caro Hu on 2021-12-23 for above 1G.

EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case of orientation was recorded)

30MHz - 1GHz: *(worst case is Middle channel)*

Horizontal

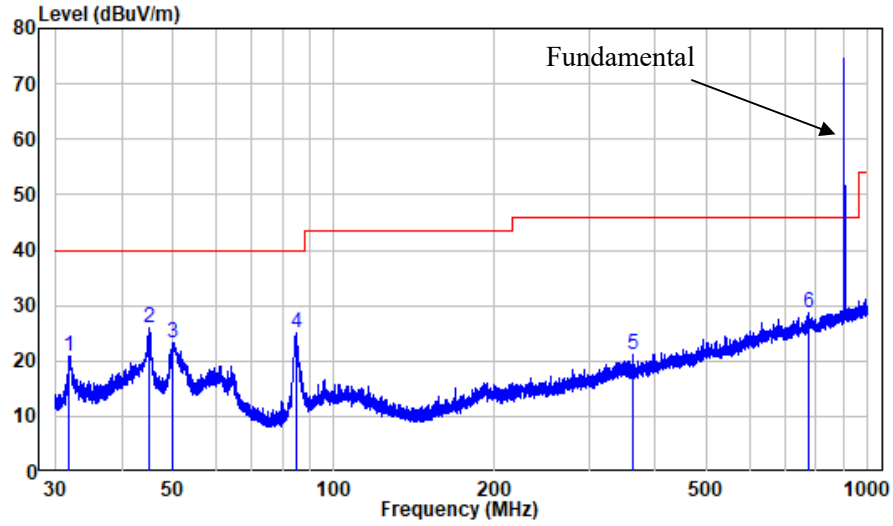
Fundamental



Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZ1210818-52990E-RF
Test Mode: Hybird

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.983	-12.17	36.06	23.89	40.00	-16.11	Peak
2	44.999	-9.94	30.75	20.81	40.00	-19.19	Peak
3	85.074	-15.60	32.80	17.20	40.00	-22.80	Peak
4	105.318	-11.86	27.97	16.11	43.50	-27.39	Peak
5	195.736	-11.54	28.00	16.46	43.50	-27.04	Peak
6	497.240	-4.36	27.60	23.24	46.00	-22.76	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : SZ1210818-52990E-RF
Test Mode: Hybird

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.899	-12.19	33.17	20.98	40.00	-19.02	Peak
2	45.157	-9.95	35.78	25.83	40.00	-14.17	Peak
3	49.903	-9.91	33.08	23.17	40.00	-16.83	Peak
4	85.111	-15.59	40.58	24.99	40.00	-15.01	Peak
5	362.031	-7.62	28.73	21.11	46.00	-24.89	Peak
6	774.158	0.01	28.63	28.64	46.00	-17.36	Peak

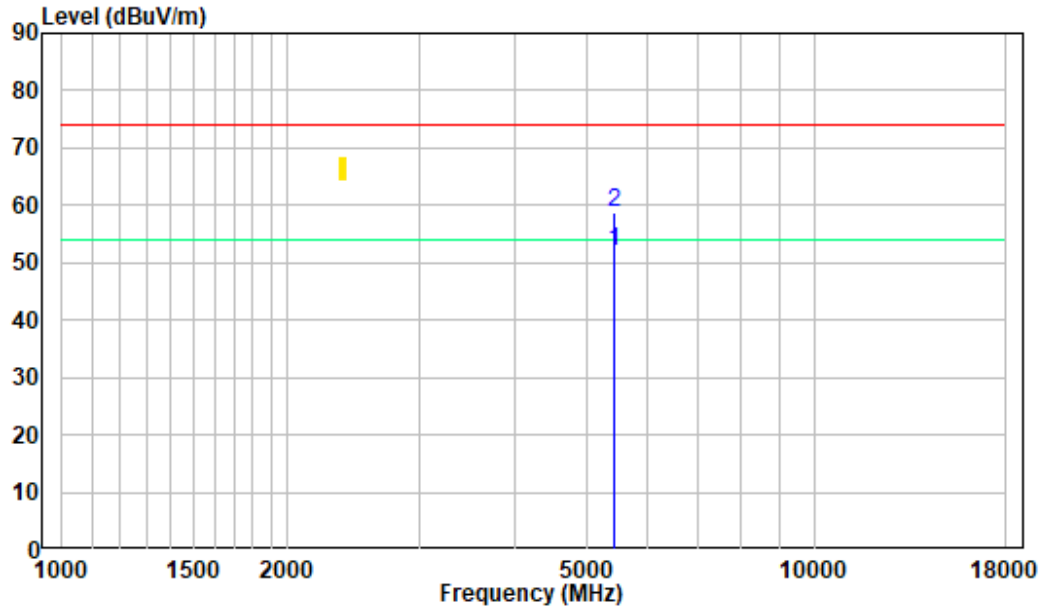
Above 1 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel(903.9MHz)									
5423.4	61.17	PK	42	2	H	-2.29	58.88	74	-15.12
5423.4	54.11	Ave.	42	2	H	-2.29	51.82	54	-2.18
5423.4	59.74	PK	355	2.1	H	-2.29	57.45	74	-16.55
5423.4	52.92	Ave.	355	2.1	H	-2.29	50.63	54	-3.37
Middle Channel(904.7MHz)									
5428.2	59.77	PK	146	1.6	H	-2.3	57.47	74	-16.53
5428.2	52.95	Ave.	146	1.6	H	-2.3	50.65	54	-3.35
5428.2	60.11	PK	280	1.6	V	-2.3	57.81	74	-16.19
5428.2	53.24	Ave.	280	1.6	V	-2.3	50.94	54	-3.06
High Channel(905.3 MHz)									
5431.8	59.81	PK	188	1.6	H	-2.3	57.51	74	-16.49
5431.8	52.92	Ave.	188	1.6	H	-2.3	50.62	54	-3.38
5431.8	61.06	PK	161	1.6	V	-2.3	58.76	74	-15.24
5431.8	53.99	Ave.	161	1.6	V	-2.3	51.69	54	-2.31

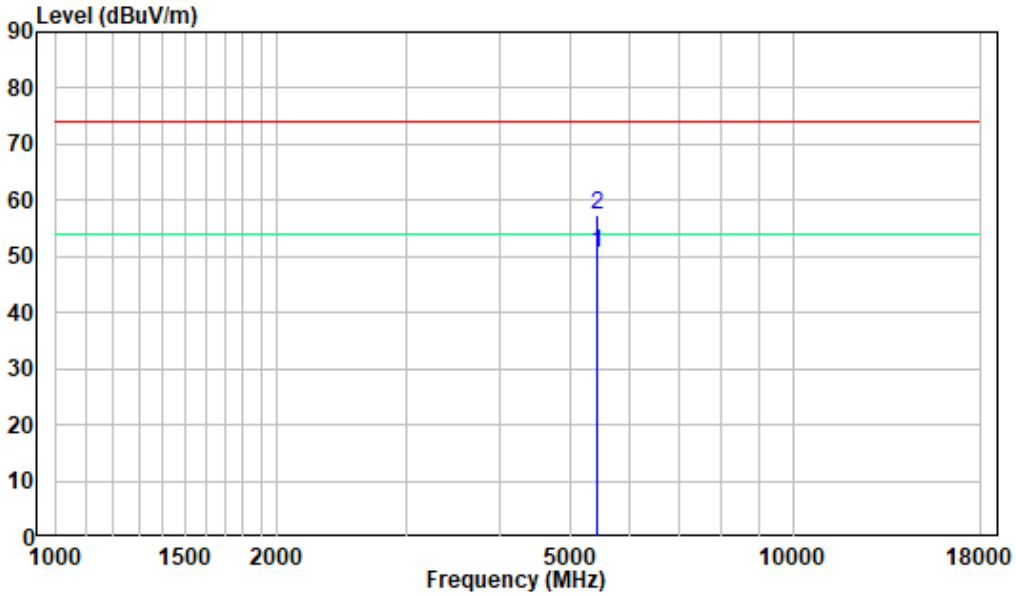
Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with Low channel

Horizontal



Vertical



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping 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.

Test Procedure

d. Set the EUT in transmitting mode, maxhold the channel.
e. Set the adjacent channel of the EUT and maxhold another trace.
f. Measure the channel separation.

Test Data

Environmental Conditions

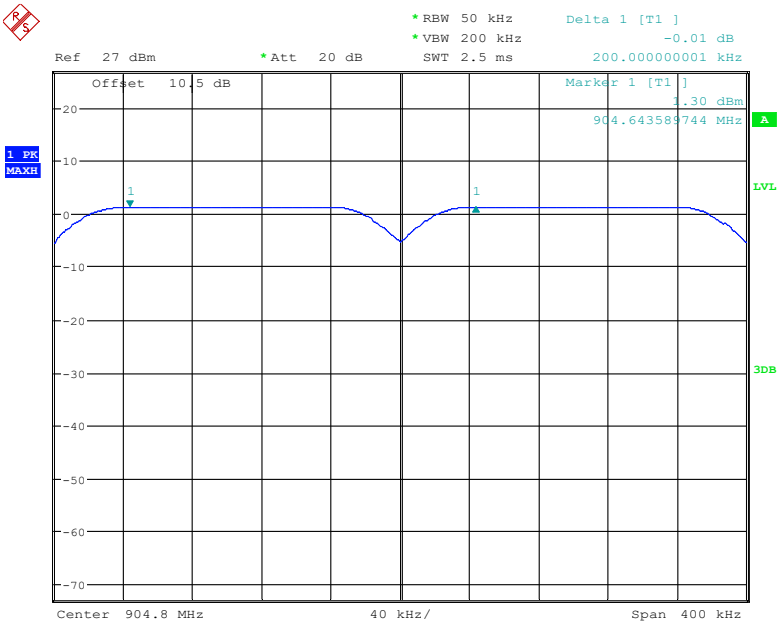
Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu on 2021-12-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots

Channel	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit
Hybrid System			
Middle	0.200	0.140	> the 20 dB bandwidth


RBW 50 kHz
VBW 200 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.01 dB
200.000000001 kHz
Ref 27 dBm
Att 20 dB
Offset 10.5 dB
Marker 1 [T1]
1.30 dBm
904.643589744 MHz
1 PK
MAXH
A
LVL
3DB
Center 904.8 MHz
40 kHz/
Span 400 kHz
Date: 27.DEC.2021 23:45:02

FCC §15.247(a) (1) (i)– 20 dB EMISSION BANDWIDTH

Applicable Standard

According to §15.247(a) (1) (i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

g. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
h. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
i. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
j. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

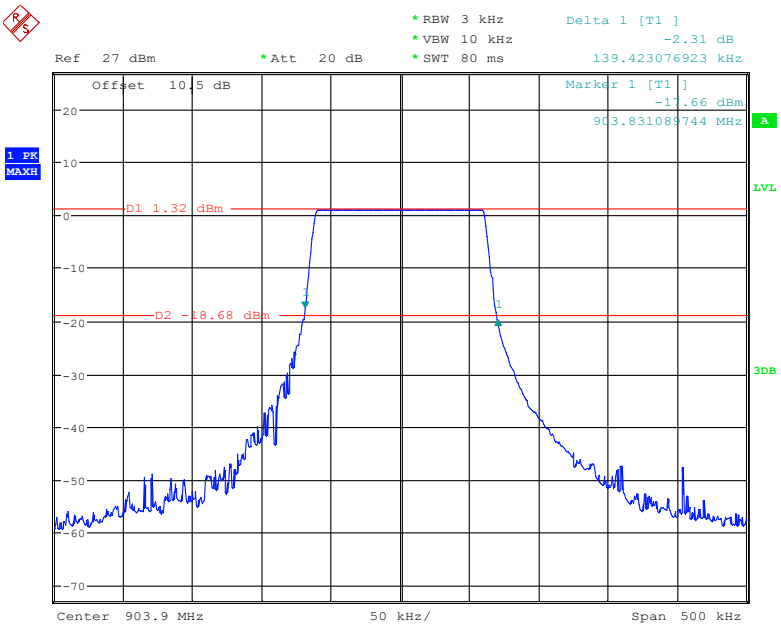
The testing was performed by Paul Liu on 2021-12-27.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots.

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
Hybrid System	Low	903.9	0.139
	Middle	904.7	0.140
	High	905.3	0.140

Low Channel



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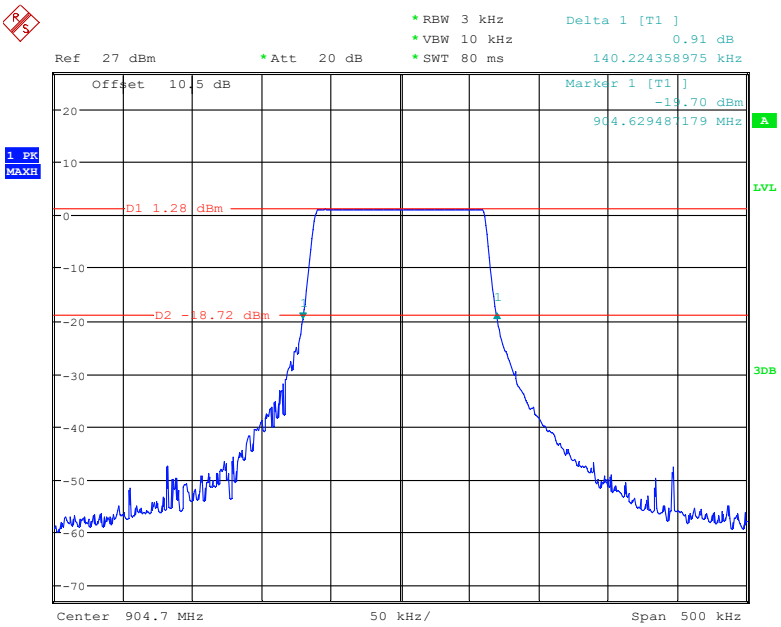
Middle Channel



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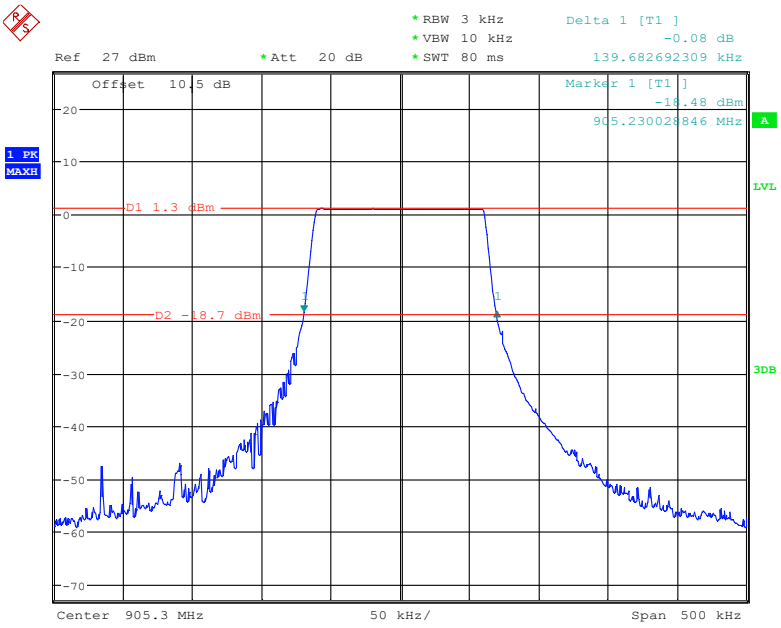
High Channel



Date: 27.DEC.2021 23:27:17

FCC §15.247(f) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =
(number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

Test Data

Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

The testing was performed by Paul Liu on 2021-12-27 and 2022-02-17.

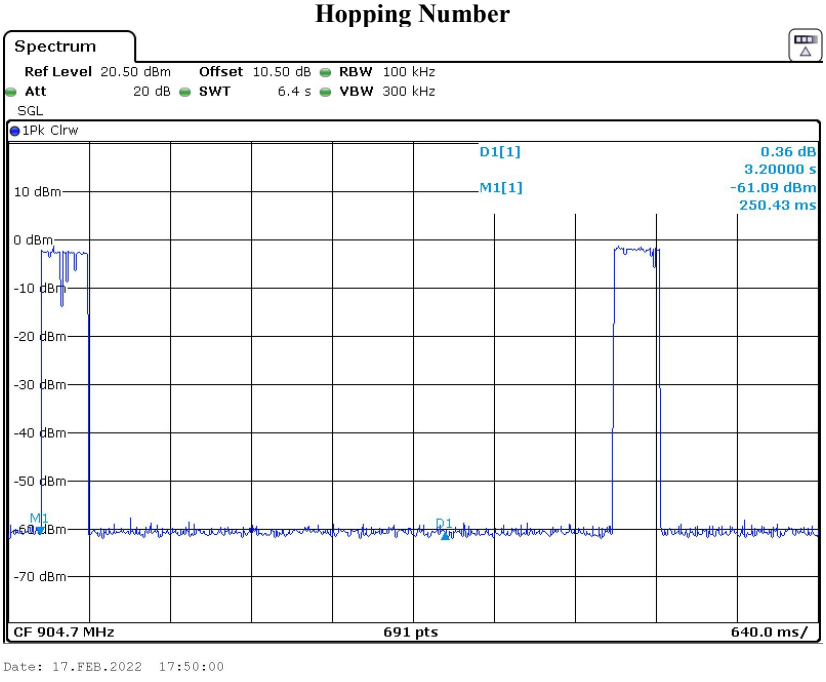
EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots.

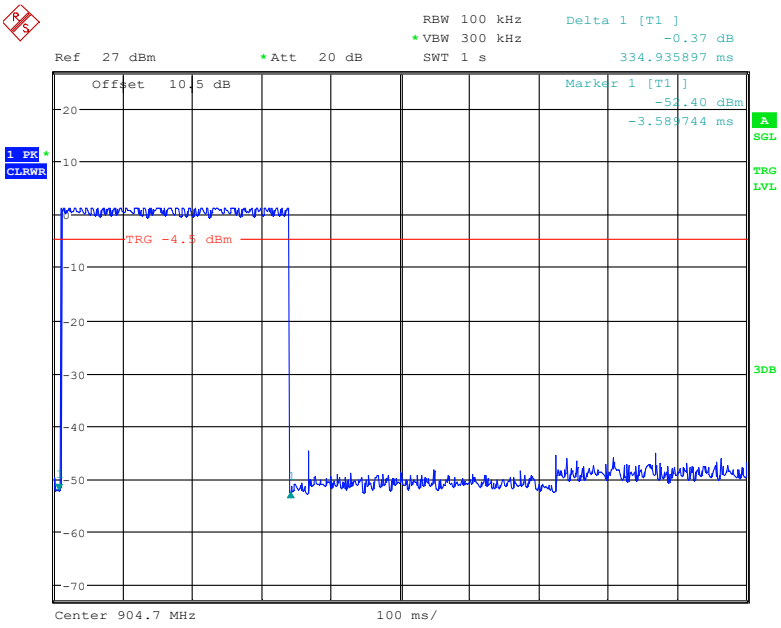
Frequency (MHz)	Observe time (s)	Pulse width (ms)	Total Hops	Dwell time (s)	Limit (s)
904.7	3.2	334.94	1	0.335	0.4

Note: Observe time=0.4s*channel number=0.4s*8=3.2s (plot sweep time(6.4s) was set to two times observe time, from the plot, in any 3.2s, the maximum hopping number is 1)
Dwell time= Pulse width*Total hops
Second high signals were other channel

Hopping Number



Pulse Time



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FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

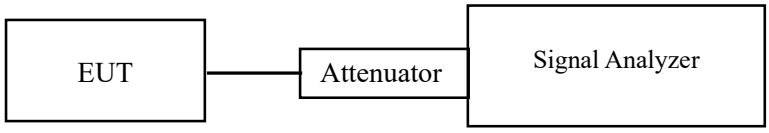
(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

Test Procedure

k. Place the EUT on a bench and set it in transmitting mode.

l. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.

m. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

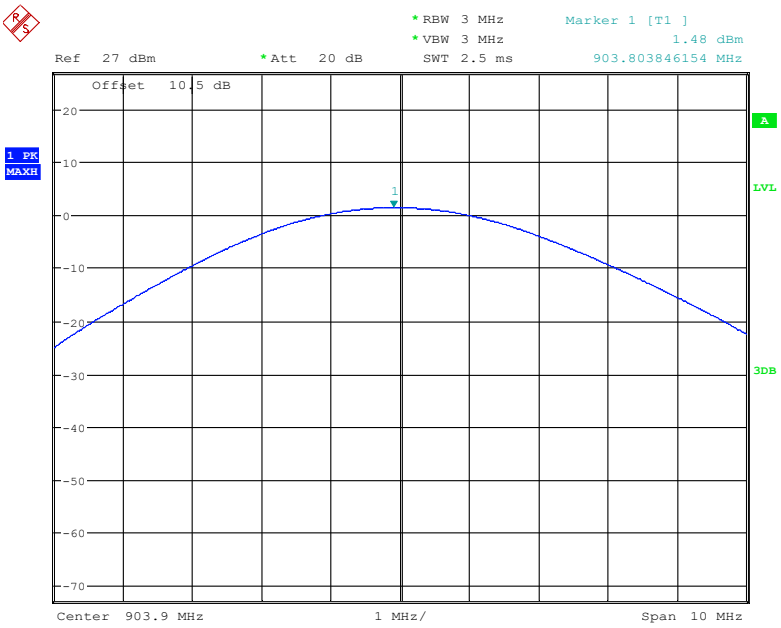
The testing was performed by Paul Liu on 2021-12-27.

Test Result: Compliance. Please refer to following table and plots.

EUT operation mode: Transmitting

Test Mode	Frequency (MHZ)	Max Peak Output Power (dBm)	Limit[dBm]	Verdict
Hybrid System	903.9	1.48	<=30	PASS
	904.7	1.32		PASS
	905.3	1.31		PASS

Low Channel



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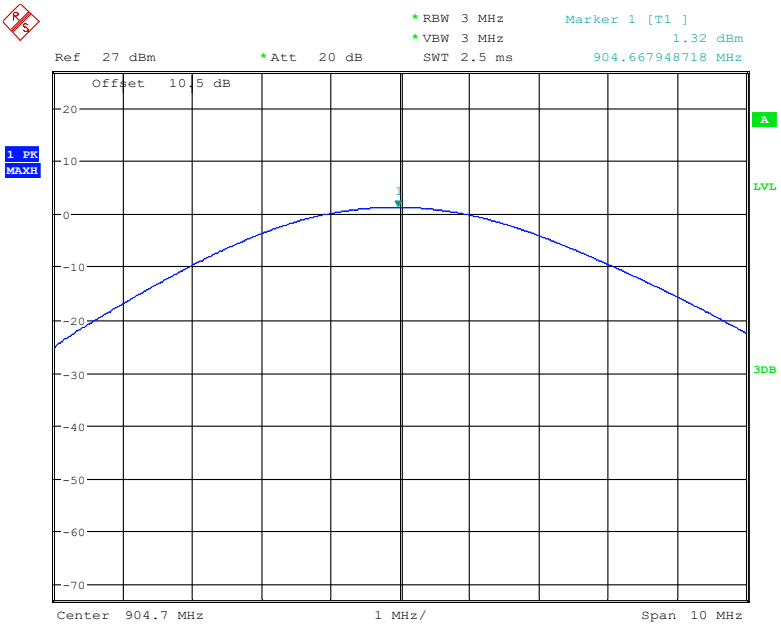
Middle Channel



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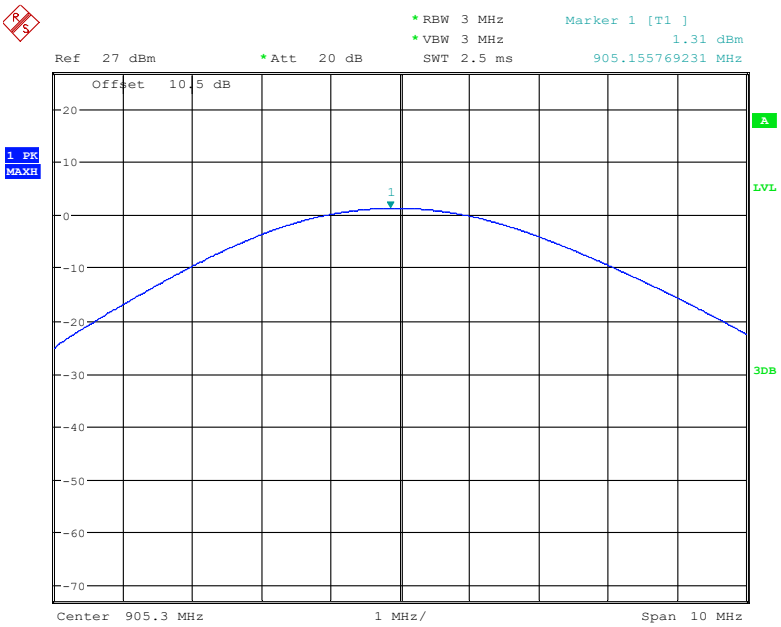
High Channel



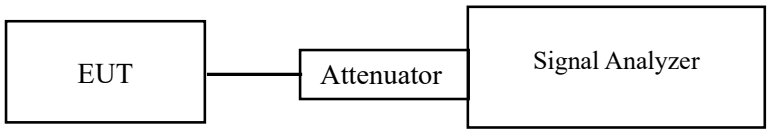
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

n. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
o. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
p. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
q. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
r. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

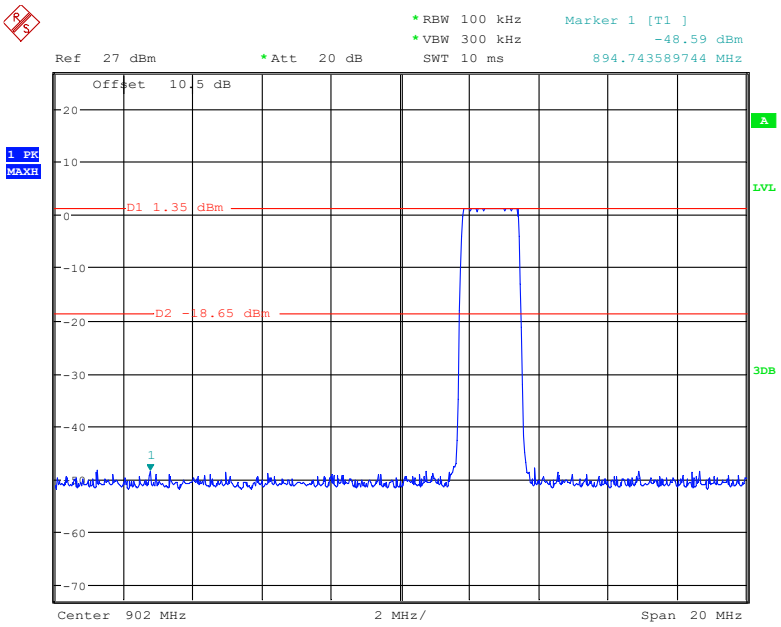
The testing was performed by Paul Liu on 2021-12-27.

Test Result: Compliance. Please refer to following plots.

EUT operation mode: Transmitting

Left side

Hopping



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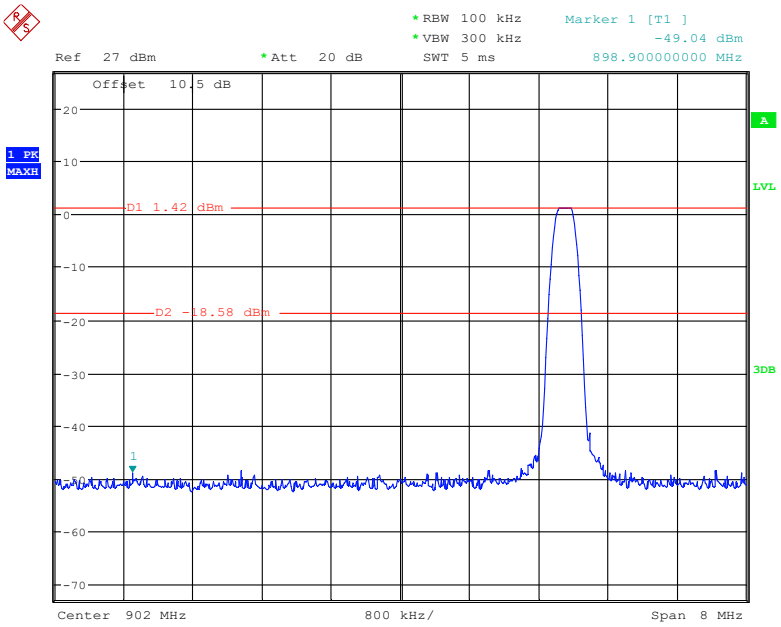
Single



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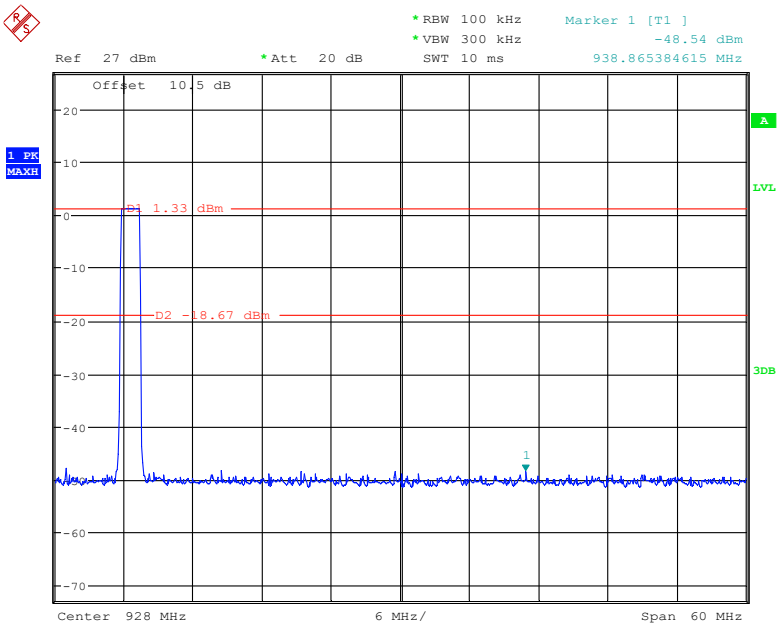
Right side

Hopping



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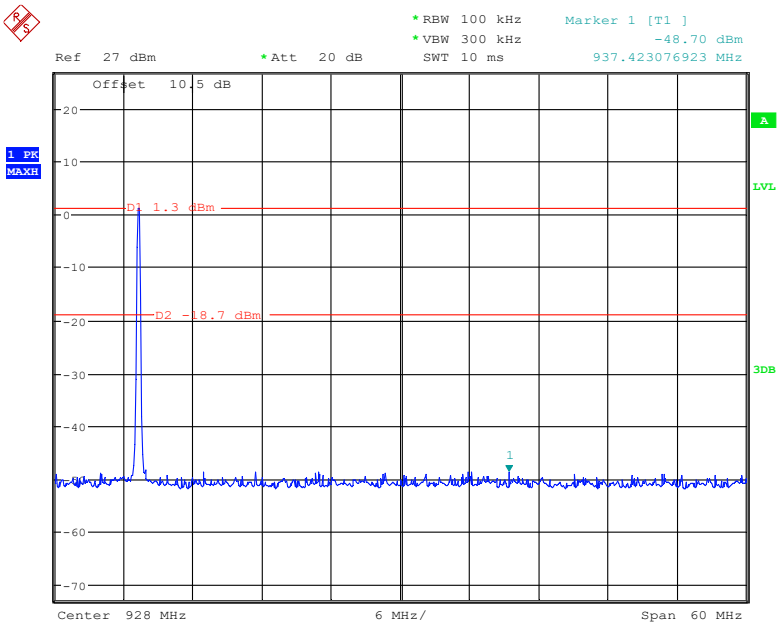
Single



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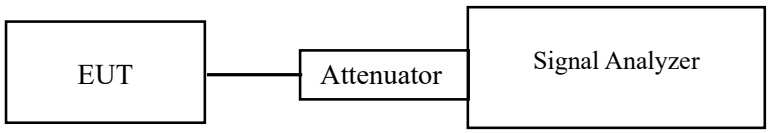
FCC §15.247(f) - POWER SPECTRAL DENSITY

Applicable Standard

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

s. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
t. Set the RBW to: 3kHz≤ RBW≤100 kHz.
u. Set the VBW ≥ 3×RBW.
v. Set the span to 1.5 times the DTS bandwidth.
w. Detector = peak.
x. Sweep time = auto couple.
y. Trace mode = max hold.
z. Allow trace to fully stabilize.
aa. Use the peak marker function to determine the maximum amplitude level within the RBW.
bb. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

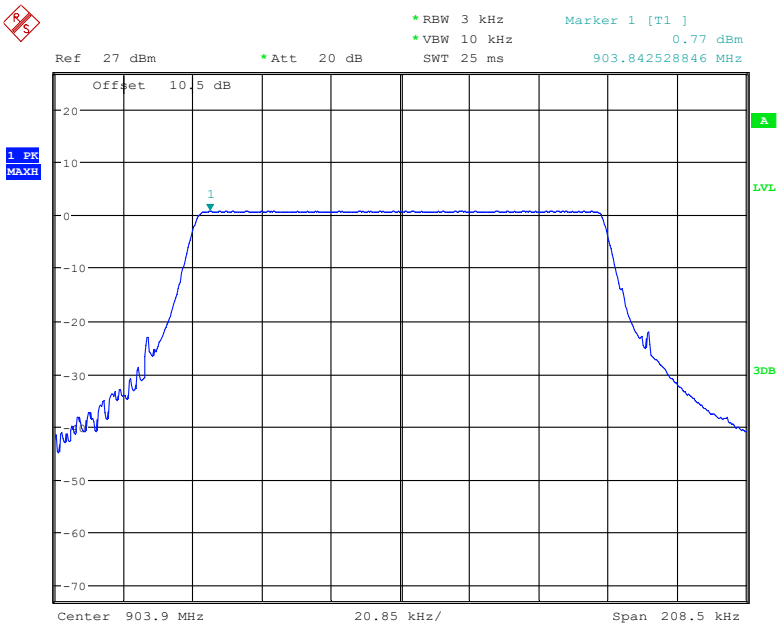
The testing was performed by Paul Liu on 2021-12-27.

EUT operation mode: Transmitting

Test Result: Pass

Test Mode	Frequency (MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
Hybrid System	903.9	0.77	<=8	PASS
	904.7	0.59		PASS
	905.3	0.44		PASS

Power Spectral Density, Low Channel



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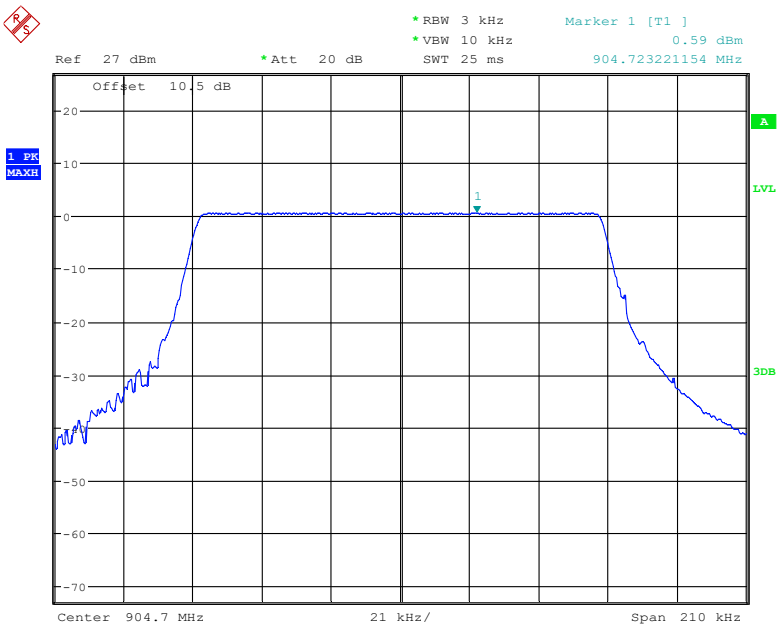
Power Spectral Density, Middle Channel



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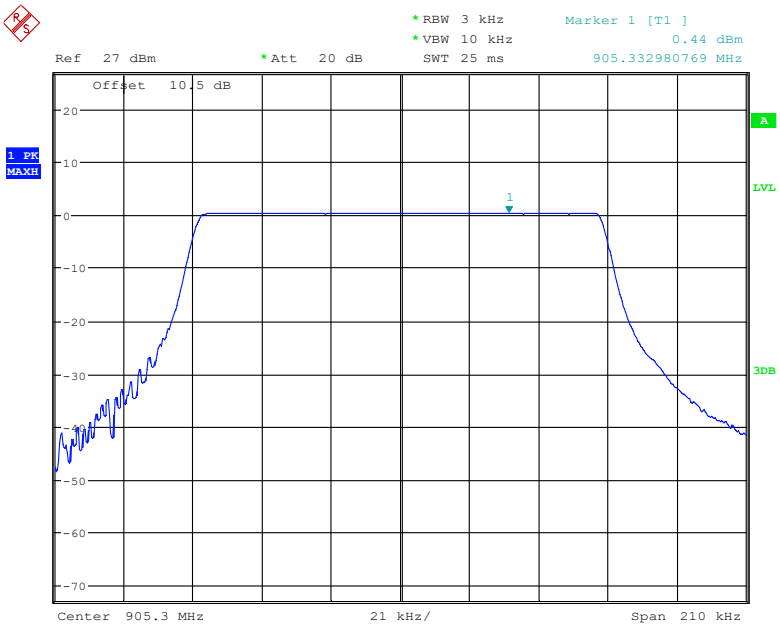
Power Spectral Density, High Channel



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