



Test Report No.: W7L-P21120015RF04



# FCC TEST REPORT (Part 15, Subpart C)



Applicant:	Ingenious Technology LLC
Address:	111 Deerwood Road, Suite 200, San Ramon, Ca, 94583

Manufacturer or Supplier:	Shenzhen Hoverstar Innovations Technology Co.,Ltd.
Address:	5F ,block B,Aerospace Micro-motor Building,No. 25 North 2nd Road of Science and technology,Nanshan
Product:	Osprey Electronics Hotspot G1
Brand Name:	Osprey Electronics
Model Name:	Hotspot G1
FCC ID:	2A3TX-HG1V1
Date of tests:	Dec. 01, 2021 ~ Mar. 03, 2022

The tests have been carried out according to the requirements of the following standard:

- FCC Part 15, Subpart C, Section 15.247
- ANSI C63.10-2013

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Mar. 03, 2022	 Date: Mar. 03, 2022

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-P21120015RF04	Original release	Mar. 03, 2022



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## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C		
STANDARD	TEST TYPE AND LIMIT	RESULT
§15.207	AC Power Conducted Emission	Compliance
§15.247(f)	Number of Hopping Frequency Used	Compliance
§15.247(f)	Dwell Time on Each Channel	Compliance
§15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Compliance
§15.247(b)	Maximum Peak Output Power	Compliance
§15.247(f)	Power Spectral Density	Compliance
§15.247(d)& §15.209	Transmitter Radiated Emissions	Compliance
§15.247(d)	Out of band Measurement	Compliance
§15.203	Antenna Requirement	Compliance

### NOTE:

1. Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
2. The hopping function must be a true frequency hopping system, as described in Section 15.247(a)(1). The specific requirements in Section 15.247(a)(1) are:
  - a) a minimum channel separation;
  - b) pseudo-random hop sequence;
  - c) equal use of each frequency; and
  - d) receiver matching bandwidth and synchronization

### Test Lab Information Reference:

BV 7Layers Communications Technology (Shenzhen) Co. Ltd

#### Lab Address:

No.B102, Dazu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, China

**Accredited Test Lab Cert 3939.01**



## 1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	UNCERTAINTY
AC Power Conducted emissions	±2.70dB
Radiated emissions (30MHz~1GMHz)	±4.98dB
Radiated emissions (1GMHz ~6GMHz)	±4.70dB
Radiated emissions (6GMHz ~18GMHz)	±4.60dB
Conducted emissions	±4.01dB
Occupied Channel Bandwidth	±43.58KHz
Conducted Output power	±2.06dB
Power Spectral Density	±0.85 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.





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## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Osprey Electronics Hotspot G1
<b>BRAND NAME</b>	Osprey Electronics
<b>MODEL NAME</b>	Hotspot G1
<b>NOMINAL VOLTAGE</b>	5.0Vdc(adapter)
<b>MODULATION TECHNOLOGY</b>	Hybrid ( FHSS&DTS )
<b>MODULATION TYPE</b>	FSK
<b>OPERATING FREQUENCY</b>	903.9MHz~905.3MHz
<b>NUMBER OF CHANNEL</b>	8
<b>MAX. OUTPUT POWER</b>	17.91mW (Max. Measured)
<b>ANTENNA TYPE</b>	External Antenna with 3dBi gain
<b>HW VERSION</b>	G1
<b>SW VERSION</b>	G1
<b>I/O PORTS</b>	Refer to user's manual
<b>CABLE SUPPLIED</b>	USB cable : unshielded without ferrite, 0.3 meter

#### NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. CMD command was used for the testing.

#### List of Accessory:

ACCESSORIES	BRAND	MODEL	SPECIFICATION
AC Adapter	Sunshiny	XSD-0503000NEUD	I/P: 100-240Vac, 0.5A, O/P: 5.0Vdc, 3.0A
USB Cable	HCTL	AM TO TYPE-C-0.3M	Signal Line, 0.3meter



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## 2.2 DESCRIPTION OF TEST MODES

8 channels are provided to Hybrid Mode (125 kHz Bandwidth Lora) of this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	903.9	3	904.3	5	904.7	7	905.1
2	904.1	4	904.5	6	904.9	8	905.3



## 2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photograph of the test configuration for reference.

## 2.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports.

The worst case was found when positioned on X axis for radiated emission.

Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	√	√	-

Where **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission

**RE≥1G**: Radiated Emission above 1GHz  
**APCM**: Antenna Port Conducted Measurement

### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
-	1 to 8	1,4, 8	Hybrid	FSK

### RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
-	1 to 8	1,4, 8	Hybrid	FSK



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**POWER LINE CONDUCTED EMISSION TEST:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
-	1 to 8	1,4, 8	Hybrid	FSK

**ANTENNA PORT CONDUCTED MEASUREMENT:**

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1 to 8	1,4, 8	Hybrid	FSK

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	23deg. C, 70%RH	DC 5V By Adapter	Jace Hu
RE≥1G	23deg. C, 70%RH	DC5V By Adapter	Jace Hu
PLC	25deg. C, 52%RH	DC5V By Adapter	James Fu
APCM	25deg. C, 60%RH	DC5V By Adapter	James Fu



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## 2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

### FCC Part 15, Subpart C. Section 15.247 ANSI C63.10-2013

- NOTE:**
1. All test items have been performed and recorded as per the above standards.
  2. The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

## 2.4 DESCRIPTION OF SUPPORT UNITS

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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Desktop	Lenovo	M73 SFF	PC04GRQV	N/A
2	Desktop	Lenovo	M73 SFF	PC06CS27	N/A
3	Laptop	Lenovo	Thnikpad L440	R90FTFKN	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.5m
2	AC Line: Unshielded, Detachable 1.5m
3	AC Line: Unshielded, Detachable 1.5m



### 3 TEST TYPES AND RESULTS

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

##### 3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Mar. 03,21	Mar. 02,22
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Feb. 25,21	Feb. 24,22
LISN network	Rohde&Schwarz	ENV216	101922	Feb. 25,22	Feb. 24,23

- NOTE:**
1. The test was performed in CE shielded room.
  2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

##### 3.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.



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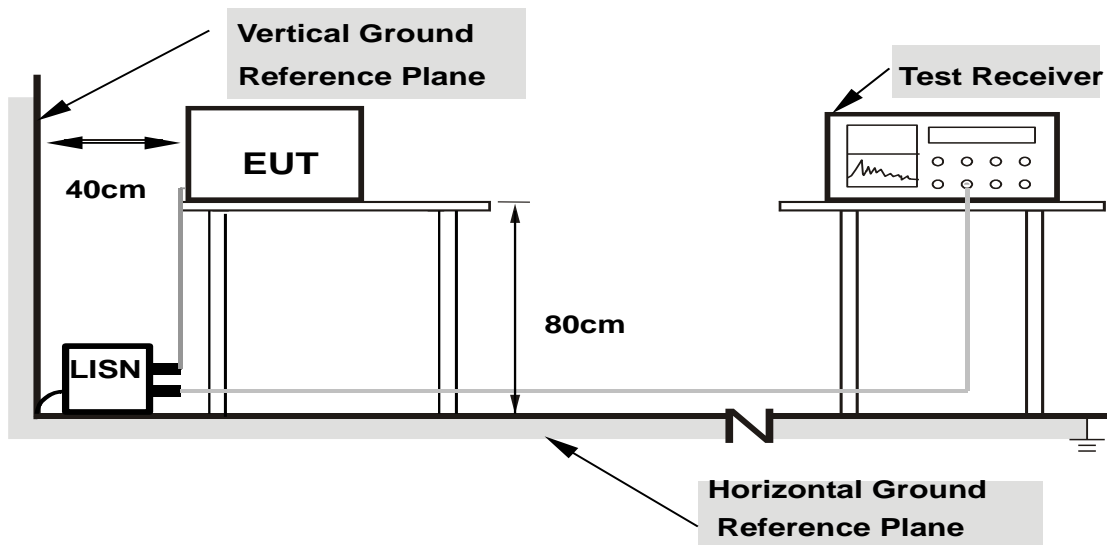
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**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

### 3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

### 3.1.5 TEST SETUP



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 3.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



### 3.1.7 TEST RESULTS

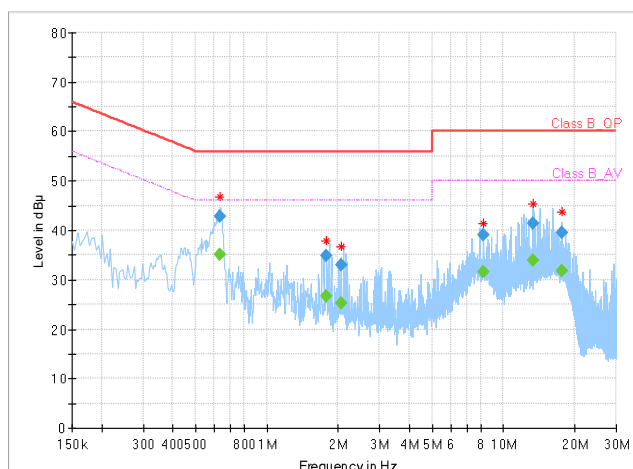
#### CONDUCTED WORST-CASE DATA:

Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26deg. C, 51%RH
Tested By	Carl xie		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.632000	---	35.16	46.00	10.84	L1	ON	9.7
0.632000	42.92	---	56.00	13.08	L1	ON	9.7
1.788000	---	26.62	46.00	19.38	L1	ON	9.7
1.788000	34.92	---	56.00	21.08	L1	ON	9.7
2.056000	---	25.18	46.00	20.82	L1	ON	9.7
2.056000	32.98	---	56.00	23.02	L1	ON	9.7
8.208000	---	31.59	50.00	18.41	L1	ON	9.7
8.208000	39.17	---	60.00	20.83	L1	ON	9.7
13.420000	---	33.99	50.00	16.01	L1	ON	9.8
13.420000	41.46	---	60.00	18.54	L1	ON	9.8
17.692000	---	31.74	50.00	18.26	L1	ON	9.8
17.692000	39.45	---	60.00	20.55	L1	ON	9.8

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Limit value - Emission level
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.

Full Spectrum







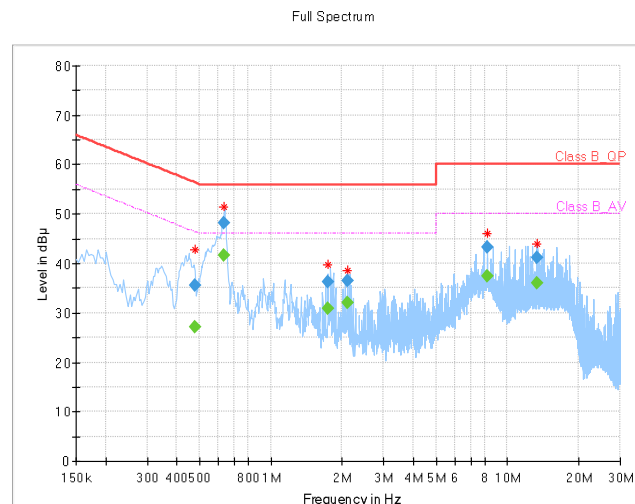
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Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26deg. C, 51%RH
Tested By	Carl xie		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.480000	---	27.18	46.34	19.16	N	ON	9.7
0.480000	35.46	---	56.34	20.88	N	ON	9.7
0.632000	---	41.54	46.00	4.46	N	ON	9.7
0.632000	48.12	---	56.00	7.88	N	ON	9.7
1.744000	---	30.92	46.00	15.08	N	ON	9.8
1.744000	36.16	---	56.00	19.84	N	ON	9.8
2.100000	---	31.94	46.00	14.06	N	ON	9.8
2.100000	36.51	---	56.00	19.49	N	ON	9.8
8.200000	---	37.53	50.00	12.47	N	ON	9.8
8.200000	43.38	---	60.00	16.62	N	ON	9.8
13.420000	---	36.07	50.00	13.93	N	ON	9.8
13.420000	41.16	---	60.00	18.84	N	ON	9.8

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Limit value - Emission level
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.





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### 3.2 RADIATED EMISSION AND BANDEGE MEASUREMENT

#### 3.2.1 LIMITS OF RADIATED EMISSION AND BANDEGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



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### 3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May. 19,20	May. 18,23
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Mar. 05,21	Mar. 04,22
Horn Antenna	ETS-LINDGREN	3117	00168728	Apr. 02, 21	Apr. 01, 22
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Aug. 25, 21	Aug. 24, 22
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jun. 03,21	Jun. 02,22
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Apr. 27,21	Apr. 26,22
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jun. 02,21	Jun. 01,22
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jun. 02,21	Jun. 01,22
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Apr. 30,21	Apr. 29,22
DC Source	Kikusui/JP	PMX18-5A	0000001	Aug. 25,21	Aug. 24,22
Power Meter	Anritsu	ML2495A	1506002	Feb. 25,21	Feb. 24,22
Power Meter	Anritsu	ML2495A	1506002	Feb. 25,22	Feb. 24,23
Power Sensor	Anritsu	MA2411B	1339352	Feb. 25,21	Feb. 24,22
Power Sensor	Anritsu	MA2411B	1339352	Feb. 25,22	Feb. 24,23
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-051	Feb 14,20	Feb. 13,23

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
  2. The test was performed in 3m Chamber.
  3. The FCC Site Registration No. is 525120; The Designation No. is CN1171.



### 3.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

#### NOTE:

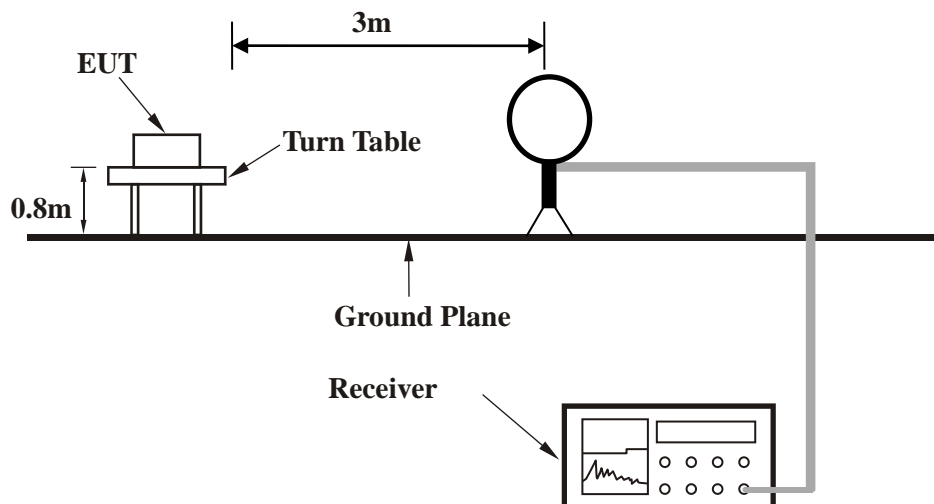
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 3.2.4 DEVIATION FROM TEST STANDARD

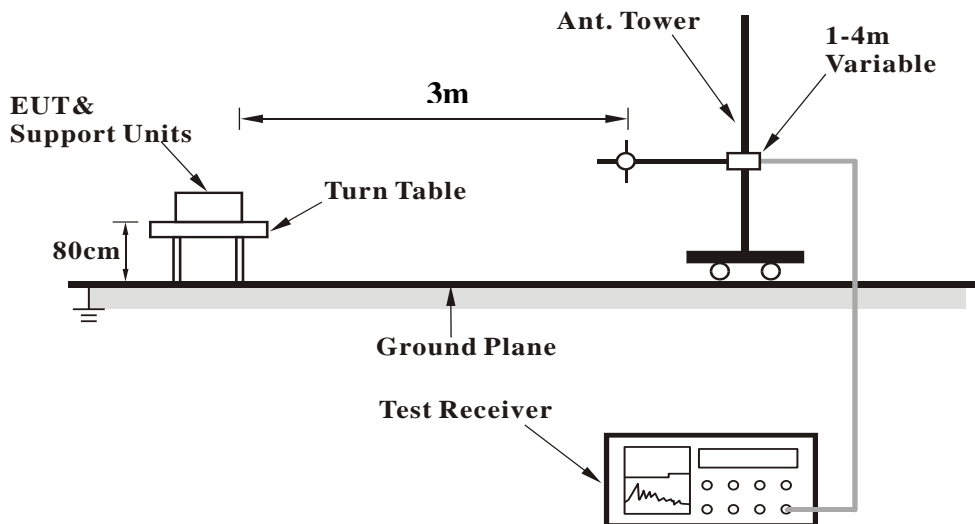
No deviation.

### 3.2.5 TEST SETUP

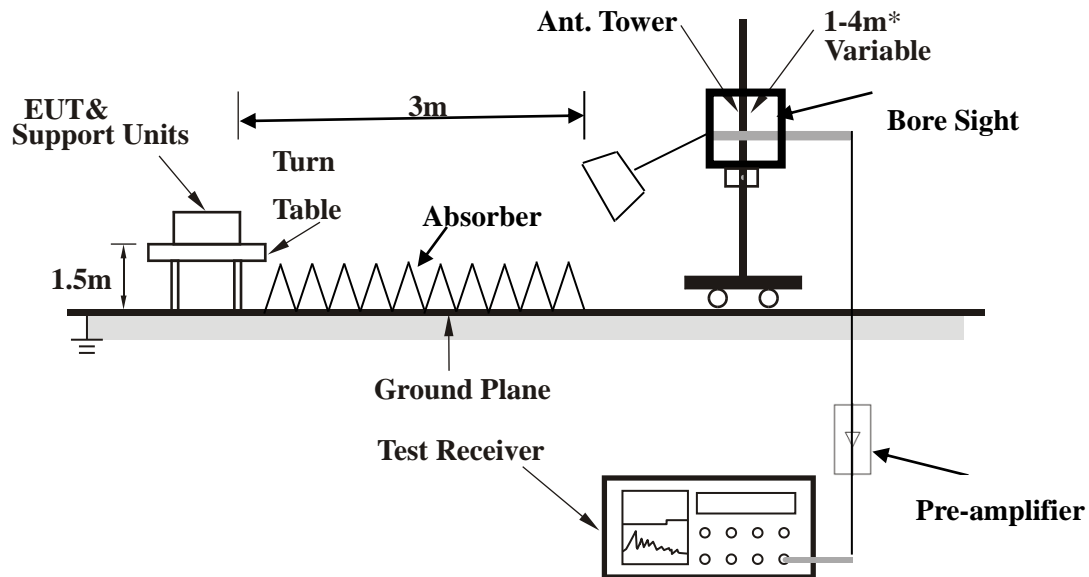
#### < Frequency Range 9KHz~30MHz >



#### < Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



**Note:** Above 1G is a directional antenna

Depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 3.2.6 EUT OPERATING CONDITIONS

- a. Set the EUT under full load condition and placed them on a testing table.
- b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the EUT in full functions.



**BUREAU  
VERITAS**

**Test Report No.: W7L-P21120015RF04**

### 3.2.7 TEST RESULTS

#### BELOW 1GHz WORST-CASE DATA:

**Note:** For frequency below 30MHz, the emission was tested 20db below the limit, so the data not recorded in the sheet.

#### 30 MHz – 1GHz data:

<b>CHANNEL</b>	Low (903.9MHz)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
125.06	39.31	68.1	43.5	-4.19	7.65	0.6	37.04	100	360	QP
*174.53	31.73	57.3	86.68	-54.95	10.39	0.7	36.66	100	360	QP
*624.61	46.41	61.24	86.68	-40.27	21.19	1.39	37.41	100	360	QP
*672.14	36.65	50.56	86.68	-50.03	22.14	1.44	37.49	100	360	QP
*778.84	45.69	58.55	86.68	-40.99	23.25	1.56	37.67	100	205	QP
*902	49.09	61.82	86.68	-37.59	23.32	1.7	37.75	100	140	QP
903.9	106.68	119.38	/	/	23.35	1.7	37.75	100	360	Peak
*915.61	53.96	66.5	86.68	-32.72	23.49	1.71	37.74	100	360	QP

#### REMARKS:

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 903.9MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.



Test Report No.: W7L-P21120015RF04

<b>CHANNEL</b>	Low (903.9MHz)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
125.06	40.39	68.93	43.5	-3.11	7.9	0.6	37.04	300	0	QP
*294.81	39.04	60	86.98	-47.94	14.88	0.9	36.74	300	0	QP
*594.54	39.82	55.02	86.98	-47.16	20.8	1.35	37.35	300	0	QP
*892.33	45.72	57.94	86.98	-41.26	23.84	1.69	37.75	300	0	QP
*902.03	44.13	56.28	86.98	-42.85	23.9	1.7	37.75	100	312	QP
903.9	106.98	119.13	/	/	23.9	1.7	37.75	300	0	Peak
*928.22	48.9	61	86.98	-38.08	23.9	1.73	37.73	300	0	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 903.9MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.





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<b>CHANNEL</b>	Mid ( 904.5MHz )	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
*35.82	36.5	55.85	86.66	-50.16	17.9	0.34	37.59	300	0	QP
125.06	40.12	68.91	43.5	-3.38	7.65	0.6	37.04	300	0	QP
*624.61	45.33	60.16	86.66	-41.33	21.19	1.39	37.41	115	0	QP
*779.81	44.69	57.54	86.66	-41.97	23.26	1.56	37.67	100	0	QP
*892.33	54.51	67.26	86.66	-32.15	23.31	1.69	37.75	300	0	QP
904.5	106.66	119.35	/	/	23.36	1.7	37.75	300	0	Peak
*928.22	52.83	65.19	86.66	-33.83	23.64	1.73	37.73	300	0	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 904.5MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.



Test Report No.: W7L-P21120015RF04

<b>CHANNEL</b>	Mid ( 904.5MHz )	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
* 48.43	30.44	57.9	87.17	-56.73	9.5	0.39	37.35	300	0	QP
125.06	40.05	68.59	43.5	-3.45	7.9	0.6	37.04	300	0	QP
* 616.85	42.14	57.02	87.17	-45.03	21.14	1.38	37.4	300	0	QP
* 779.81	42.82	55.99	87.17	-44.35	22.94	1.56	37.67	300	0	QP
* 880.69	45.17	57.49	87.17	-42	23.75	1.67	37.74	300	0	QP
904.5	107.17	119.32	/	/	23.9	1.7	37.75	300	0	Peak
* 928.22	47.37	59.47	87.17	-39.8	23.9	1.73	37.73	300	0	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 904.5MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.



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<b>CHANNEL</b>	High ( 905.3MHz )	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
* 69.77	34.51	63.67	86.65	-52.14	7.7	0.47	37.33	300	0	QP
125.06	39.7	68.49	43.5	-3.8	7.65	0.6	37.04	300	0	QP
* 624.61	45.35	60.18	86.65	-41.3	21.19	1.39	37.41	100	0	QP
* 780.78	44.98	57.83	86.65	-41.67	23.27	1.56	37.68	100	0	QP
* 893.30	55.06	67.81	86.65	-31.59	23.31	1.69	37.75	300	0	QP
905.3	106.65	119.34	/	/	23.36	1.7	37.75	300	0	Peak
* 929.19	49.48	61.83	86.65	-37.17	23.65	1.73	37.73	100	135	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 905.3MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.



Test Report No.: W7L-P21120015RF04

<b>CHANNEL</b>	High ( 905.3MHz )	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
*47.46	30.9	58.07	87.14	-56.24	9.81	0.39	37.37	300	0	QP
125.06	38.62	67.16	43.5	-4.88	7.9	0.6	37.04	300	0	QP
*615.88	40.43	55.33	87.14	-46.71	21.12	1.38	37.4	300	0	QP
*780.78	38.54	51.71	87.14	-48.6	22.95	1.56	37.68	300	0	QP
*893.3	48.58	60.79	87.14	-38.56	23.85	1.69	37.75	300	0	QP
905.3	107.14	119.29	/	/	23.9	1.7	37.75	300	0	Peak
*929.19	46.34	58.44	87.14	-40.8	23.9	1.73	37.73	100	0	QP

**REMARKS:**

1. Emission Level(dBuV/m) = Read Level(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. 905.3MHz: Fundamental frequency.
6. \* Represents that the point not falls in the restricted bands.



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**ABOVE 1GHz WORST-CASE DATA:**

**Note:** For higher frequency, the emission is too low to be detected.

1GHz – 10GHz:

<b>CHANNEL</b>	Low (903.9MHz)	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz – 10GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1807.8	43.25	55.08	74	-30.75	29.54	5.09	46.46	300	0	Peak
1807.8	33	44.83	54	-21	29.54	5.09	46.46	300	0	Average
2711.7	45.12	52.48	74	-28.88	32.35	6.29	46	120	0	Peak
2711.7	41.01	48.37	54	-12.99	32.35	6.29	46	120	0	Average

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1807.8	43.11	54.63	74	-30.89	29.85	5.09	46.46	100	0	Peak
1807.8	34.41	45.93	54	-19.59	29.85	5.09	46.46	100	0	Average
2711.7	44.78	51.84	74	-29.22	32.65	6.29	46	100	0	Peak
2711.7	36.19	43.25	54	-17.81	32.65	6.29	46	100	0	Average

**REMARKS:**

- Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.



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<b>CHANNEL</b>	Mid ( 904.5MHz )	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz – 10GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1809	42.07	53.89	74	-31.93	29.55	5.09	46.46	100	0	Peak
1809	33.99	45.81	54	-20.01	29.55	5.09	46.46	100	0	Average
2713.5	44.98	52.32	74	-29.02	32.36	6.3	46	100	0	Peak
2713.5	37.48	44.82	54	-16.52	32.36	6.3	46	100	0	Average

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1809	43.87	55.38	74	-30.13	29.86	5.09	46.46	200	0	Peak
1809	35.32	46.83	54	-18.68	29.86	5.09	46.46	200	0	Average
2713.5	44.68	51.72	74	-29.32	32.66	6.3	46	200	0	Peak
2713.5	36.37	43.41	54	-17.63	32.66	6.3	46	200	0	Average

**REMARKS:**

- Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.



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<b>CHANNEL</b>	High ( 905.3MHz )	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz – 10GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1810.6	42.48	54.29	74	-31.52	29.55	5.09	46.45	100	0	Peak
1810.6	35	46.81	54	-19	29.55	5.09	46.45	100	0	Average
2715.9	46.18	53.51	74	-27.82	32.36	6.3	45.99	100	0	Peak
2715.9	38.23	45.56	54	-15.77	32.36	6.3	45.99	100	0	Average

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1810.6	42.56	54.05	74	-31.44	29.87	5.09	46.45	100	0	Peak
1810.6	35.7	47.19	54	-18.3	29.87	5.09	46.45	100	0	Average
2715.9	46.07	53.1	74	-27.93	32.66	6.3	45.99	100	0	Peak
2715.9	49.18	56.21	54	-4.82	32.66	6.3	45.99	100	0	Average

**REMARKS:**

- Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor  
Margin value = Emission level – Limit value.

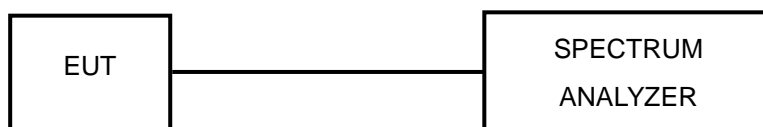


### 3.3 NUMBER OF HOPPING FREQUENCY USED

#### 3.3.1 LIMIT OF HOPPING FREQUENCY USED

There is no minimum number of hopping channels associated with this type of hybrid system. While there is not a specific minimum limit, the hop sequence is required to appear as pseudorandom per Section 15.247(a)(1).

#### 3.3.2 TEST SETUP



#### 3.3.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Meter	ANRITSU	ML2495A	1506002	Feb. 25,21	Feb. 24,22
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510322	Apr. 26,21	Apr. 25,22
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Feb. 25,21	Feb. 24,22
Power Sensor	ANRITSU	MA2411B	1339352	Feb. 25,21	Feb. 24,22

**NOTE:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.





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### 3.3.4 TEST PROCEDURES

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement 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.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were completed.

### 3.3.5 DEVIATION FROM TEST STANDARD

No deviation.

### 3.3.6 TEST RESULTS

There are 8 hopping frequencies in the hopping mode. Please refer to Appendix for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

Please Refer to Appendix Of this test report.

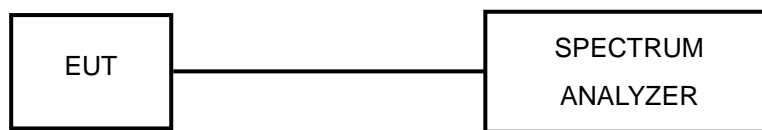


### 3.4 DWELL TIME ON EACH CHANNEL

#### 3.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

#### 3.4.2 TEST SETUP



#### 3.4.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

#### 3.4.4 TEST PROCEDURES

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement 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.
- c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.



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### 3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

### 3.4.6 TEST RESULTS

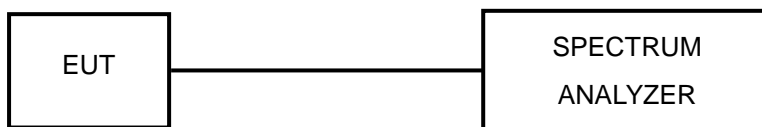
Please Refer to Appendix Of this test report

### 3.5 CHANNEL BANDWIDTH

#### 3.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 902-928MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

#### 3.5.2 TEST SETUP



#### 3.5.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

#### 3.5.4 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. 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.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

#### 3.5.5 DEVIATION FROM TEST STANDARD

No deviation.



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### 3.5.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 3.5.7 TEST RESULTS

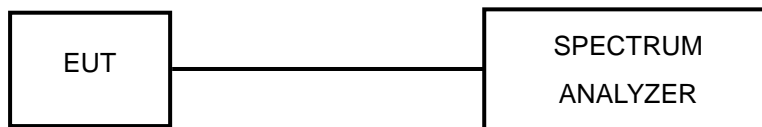
Please Refer to Appendix Of this test report.

### 3.6 HOPPING CHANNEL SEPARATION

#### 3.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

For frequency hopping system operating in the 902-928MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

#### 3.6.2 TEST SETUP



#### 3.6.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

#### 3.6.4 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

#### 3.6.5 DEVIATION FROM TEST STANDARD

No deviation.

### 3.6.6 TEST RESULTS

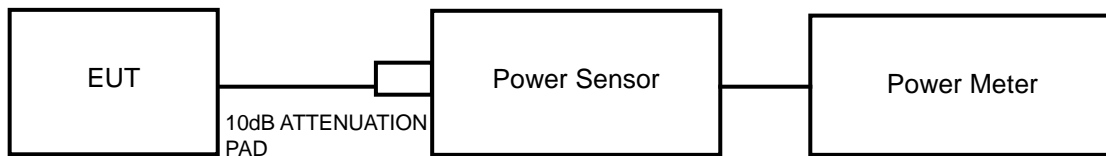
Please Refer to Appendix Of this test report.

## 3.7 MAXIMUM OUTPUT POWER

### 3.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 1W.

### 3.7.2 TEST SETUP



### 3.7.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

### 3.7.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.



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### 3.7.5 DEVIATION FROM TEST STANDARD

No deviation.

### 3.7.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.





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### 3.7.7 TEST RESULTS

#### 3.7.7.1 MAXIMUM PEAK OUTPUT POWER

Please Refer to Appendix Of this test report.



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### 3.7.7.2 Average Output Power (FOR REFERENCE)

The average power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

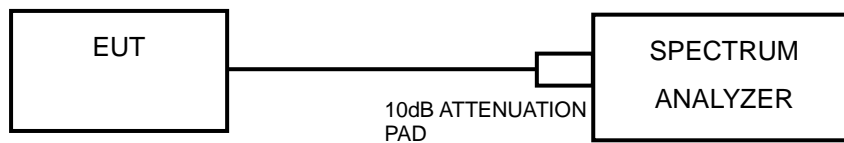
Please Refer to Appendix Of this test report.

### 3.8 POWER SPECTRAL DENSITY MEASUREMENT

#### 3.8.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

#### 3.8.2 TEST SETUP



#### 3.8.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

#### 3.8.4 TEST PROCEDURE

1. Set the span >1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW  $\geq 3 \times$  RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

#### 3.8.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 3.8.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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### 3.8.7 TEST RESULTS

Please Refer to Appendix Of this test report.



### 3.9 OUT OF BAND MEASUREMENT

#### 3.9.1 LIMITS OF OUT OF BAND MEASUREMENT

Below  $-20\text{dB}$  of the highest emission level of operating band (in 100KHz RBW).

#### 3.9.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

#### 3.9.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Spectrum Analyzer was set RBW to 100 kHz and VBW to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. The band edges was measured and recorded.

#### 3.9.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 3.9.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 3.9.6 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.

Please Refer to Appendix Of this test report.



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## 4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



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## **5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.



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## 6 APPENDIX

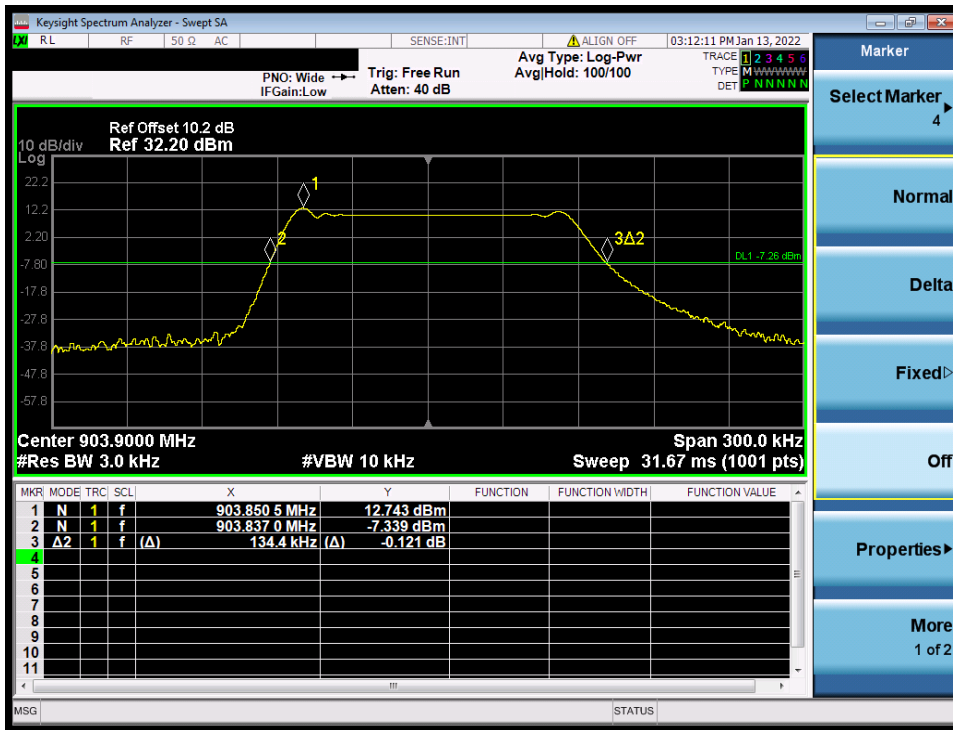
### 20DB EMISSION BANDWIDTH

#### TEST RESULT

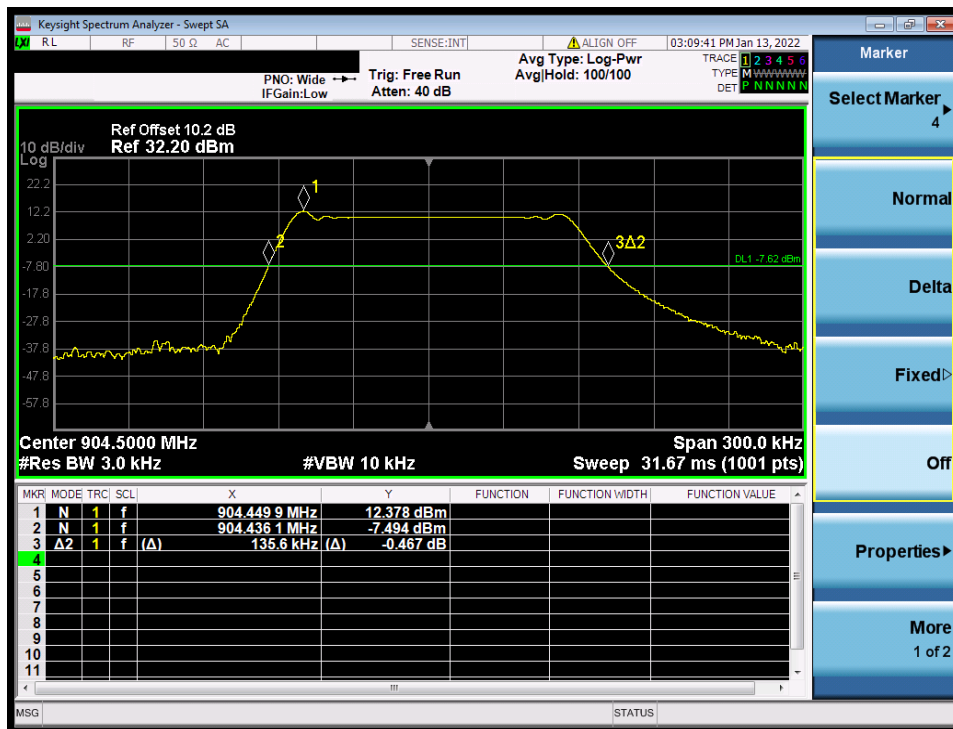
TestMode	Channel	20db EBW[KHz]	FL[MHz]	FH[MHz]	Verdict
Hybrid-Lora	903.9	134.4	903.8370	903.9714	PASS
	904.5	135.6	904.4361	904.5717	PASS
	905.3	135.0	905.2364	905.3714	PASS



### TEST GRAPHS



Hybrid\_Low

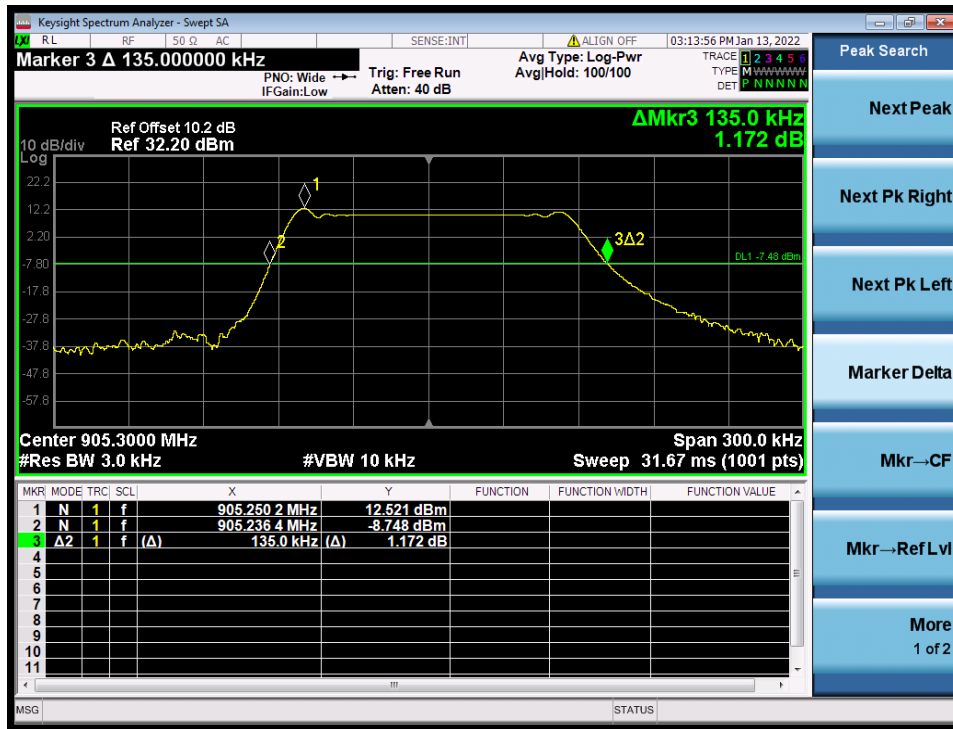




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Hybrid\_Mid



Hybrid\_Hidh



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## OCCUPIED CHANNEL BANDWIDTH TEST RESULT

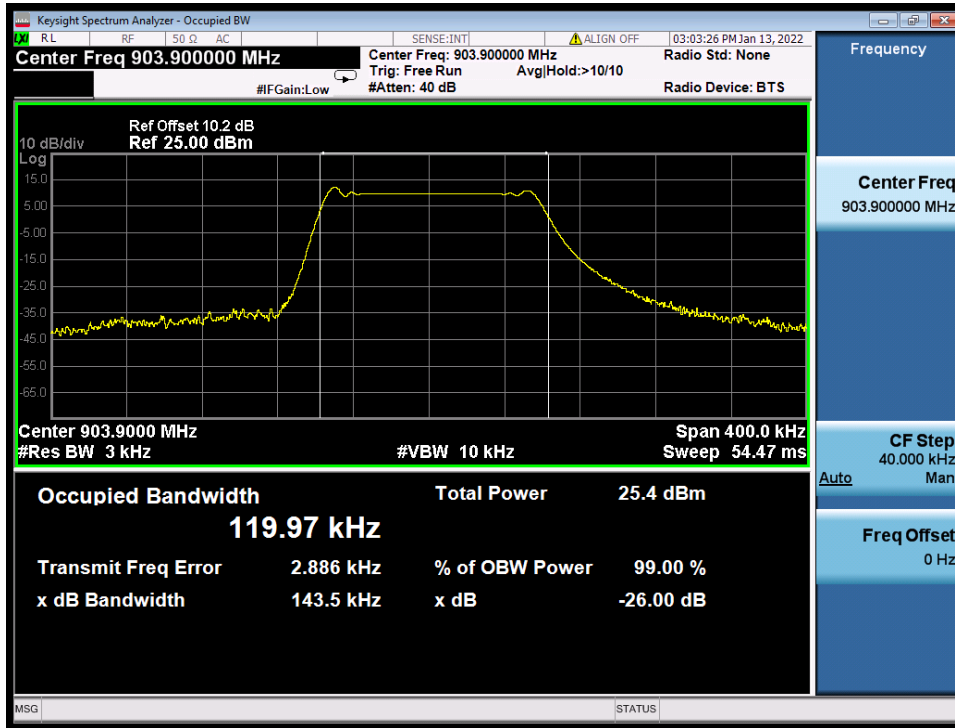
TestMode	Channel	OCB [KHz]	Limit[MHz]	Verdict
Hybrid-Lora	903.9	119.97	---	PASS
	904.5	120.65	---	PASS
	905.3	120.00	---	PASS



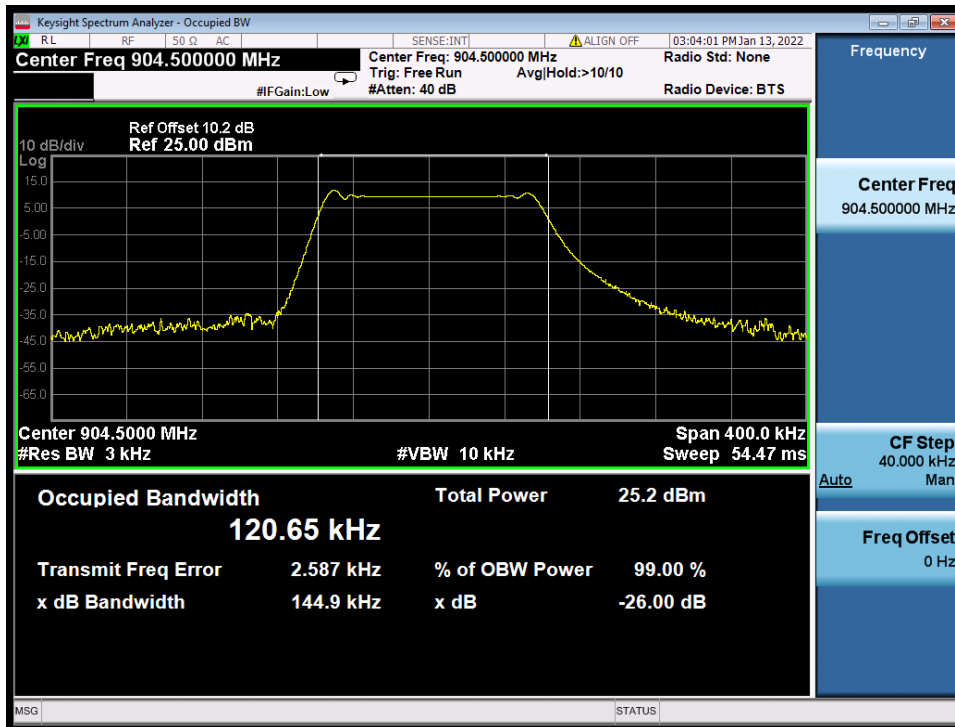
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### TEST GRAPHS



Hybrid\_Low

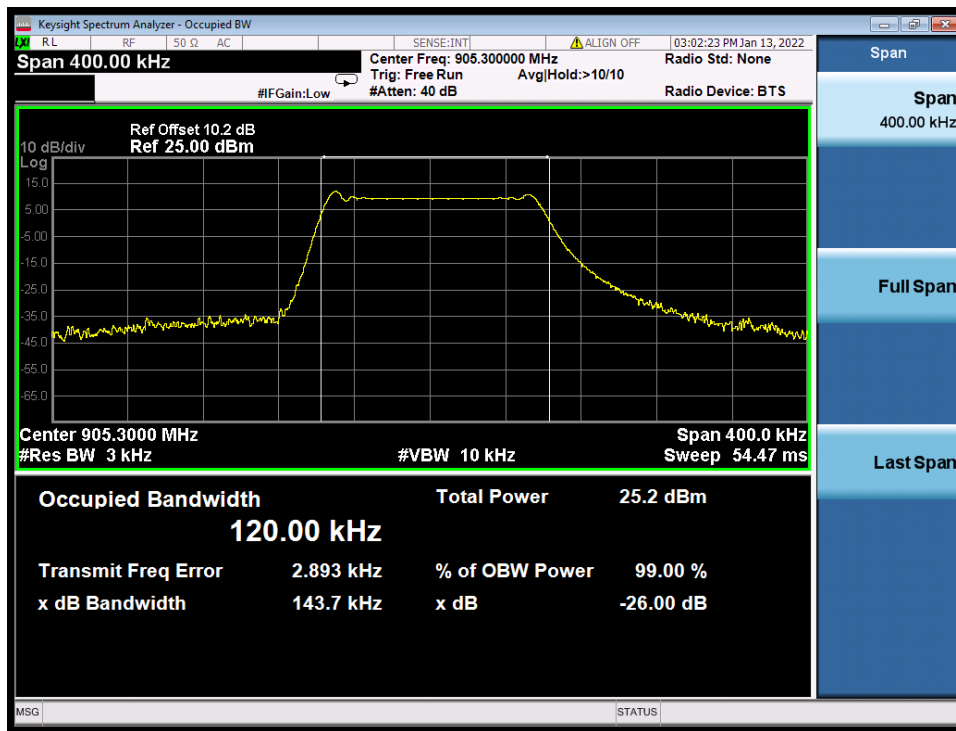




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Hybrid\_Mid



Hybrid\_High



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## MAXIMUM CONDUCTED OUTPUT POWER TEST RESULT PEAK

Test Mode	Channel	Peak Power[dBm]	Peak Power[mw]	Power Limit (dBm)	Verdict	Power setting
Hybrid-Lora	<b>903.9</b>	12.52	17.86	30.00	PASS	17
	<b>904.5</b>	12.38	17.30	30.00	PASS	17
	<b>905.3</b>	12.53	17.91	30.00	PASS	17

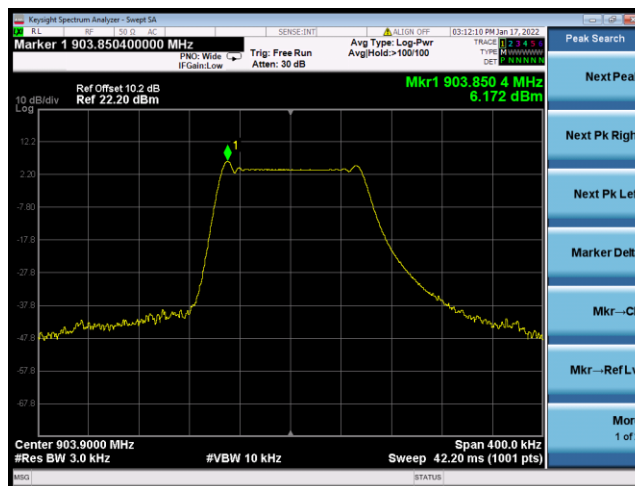
## TEST RESULT AVERAGE

Test Mode	Channel	Average Power[dBm]	Conducted Limit[dBm]	Verdict	Power setting
Hybrid-Lora	<b>903.9</b>	12.46	/	PASS	17
	<b>904.5</b>	12.32	/	PASS	17
	<b>905.3</b>	12.47	/	PASS	17

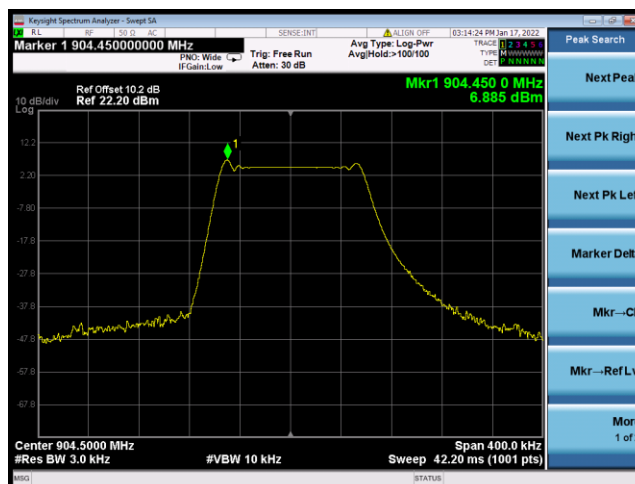
## MAXIMUM POWER SPECTRAL DENSITY TEST RESULT

TestMode	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
Hybrid Lora	903.9	6.172	≤8	PASS
	904.5	6.885	≤8	PASS
	905.3	7.197	≤8	PASS

## TEST GRAPHS



Hybrid\_903.9MHz

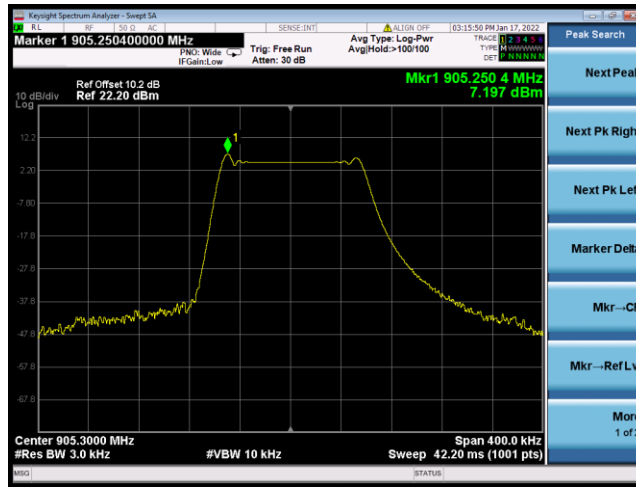


Hybrid\_904.5MHz



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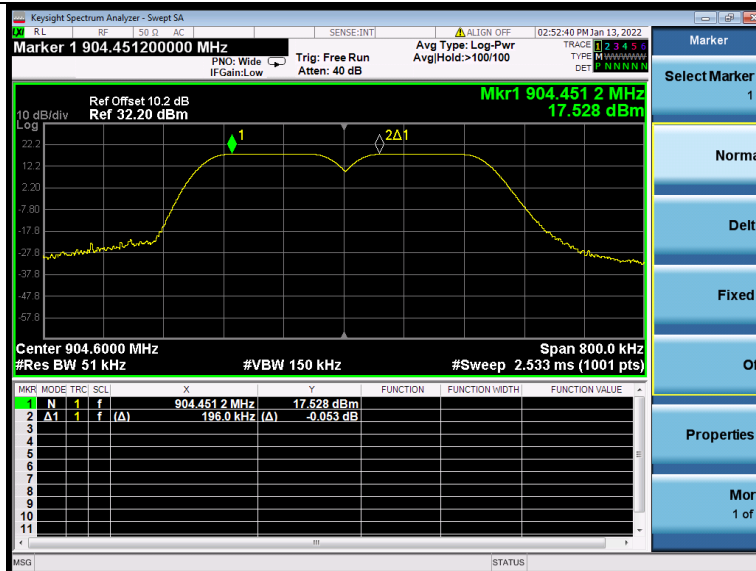
Hybrid\_905.3MHz

## CARRIER FREQUENCY SEPARATION

### TEST RESULT

TestMode	Channel	Result[MHz]	Limit[MHz]	Verdict
Hybrid-Lora	Hop	0.196	≥0.136	PASS

### TEST GRAPHS



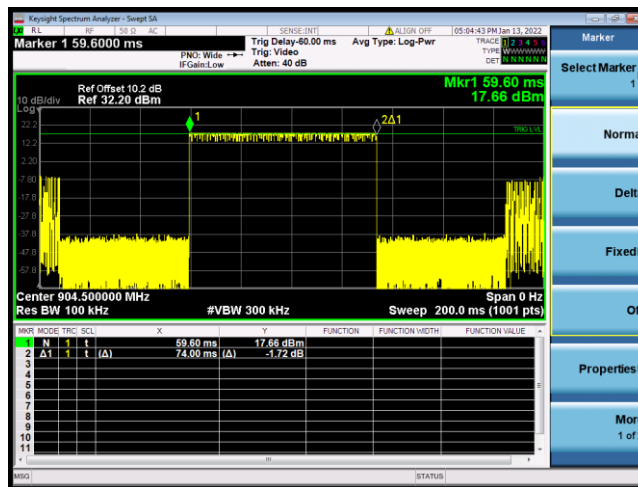
Hybrid\_Hop



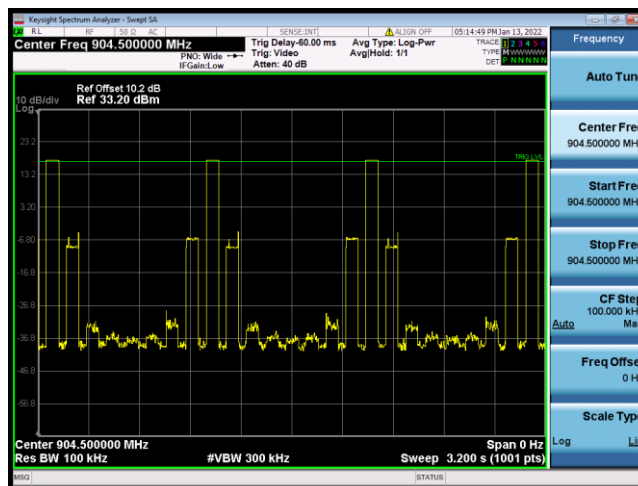
## TIME OF OCCUPANCY TEST RESULT

TestMode	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
Hybrid-Lora	Hop	0.074	4	0.296	≤0.4	PASS

## TEST GRAPHS



Hybrid\_Hop



Hybrid\_Hop

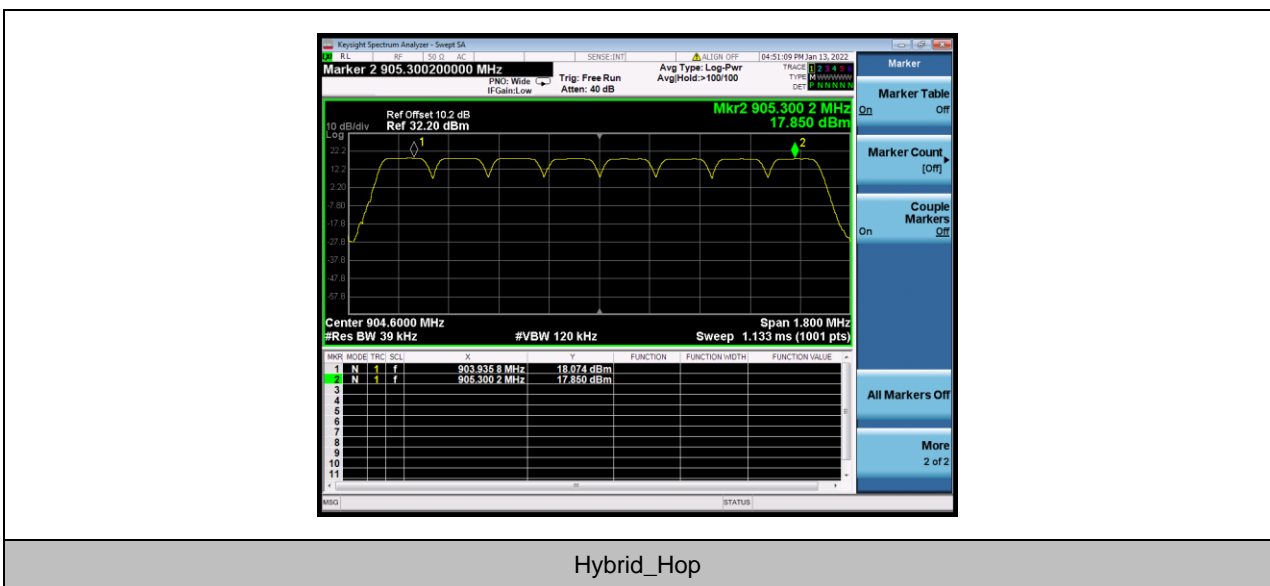
## NUMBER OF HOPPING CHANNELS

### TEST RESULT

TestMode	Channel	Result[Num]	Limit[Num]	Verdict
Hybrid-Lora	Hop	8	NA	PASS

**Note:** There is no minimum number of hopping channels associated with hybrid system.

### TEST GRAPHS

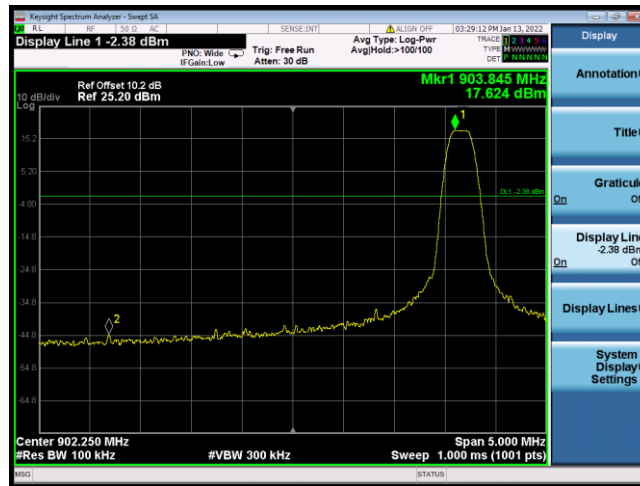


## BAND EDGE MEASUREMENTS

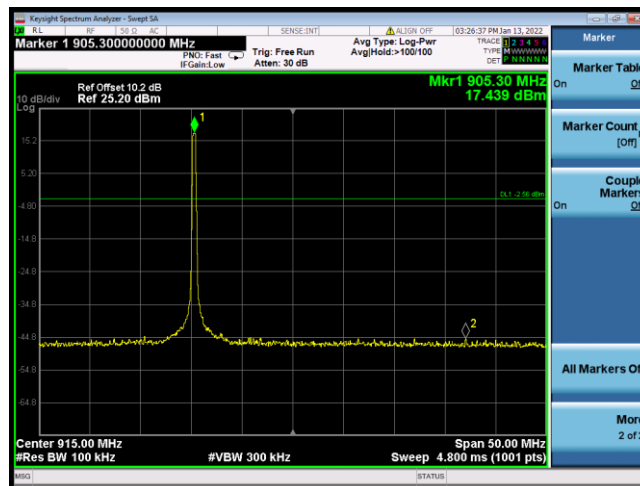
### TEST RESULT

TestMode	ChName	Verdict
Hybrid Lora	Low	PASS
	High	PASS
	Hop_Low	PASS
	Hop_High	PASS

### TEST GRAPHS



Low

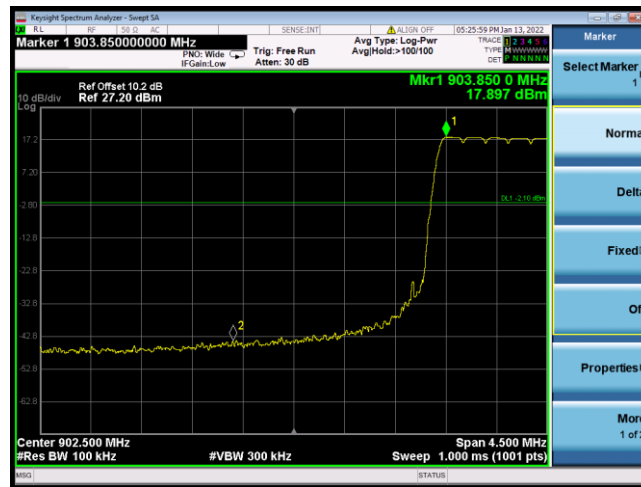


High

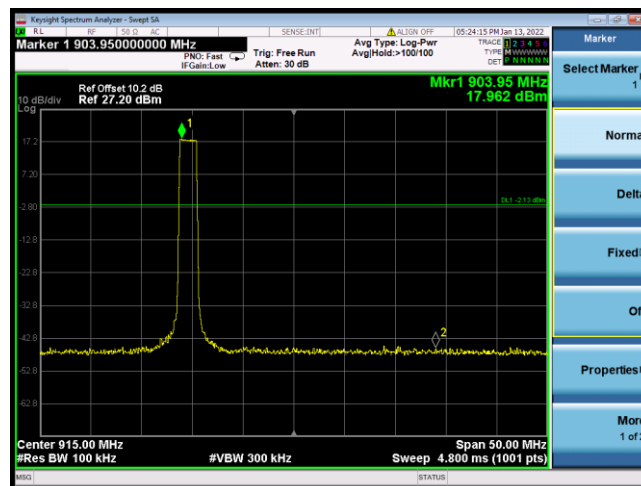


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Low\_Hop



High\_Hop



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## CONDUCTED SPURIOUS EMISSION TEST RESULT

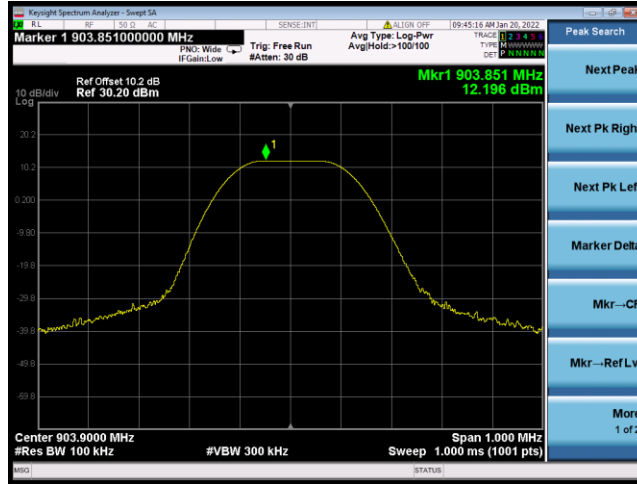
TestMode	Channel/Frequency	FreqRange [MHz]	RefLevel [dBm]	Limit [dBm]	Verdict
Hybrid Lora	903.9	Reference	12.196	---	PASS
		30~1000	12.196	≤-7.804	PASS
		1000~10000	12.196	≤-7.804	PASS
	904.5	Reference	12.051	---	PASS
		30~1000	12.051	≤-7.949	PASS
		1000~10000	12.051	≤-7.949	PASS
	905.3	Reference	12.186	---	PASS
		30~1000	12.186	≤-7.814	PASS
		1000~10000	12.186	≤-7.814	PASS



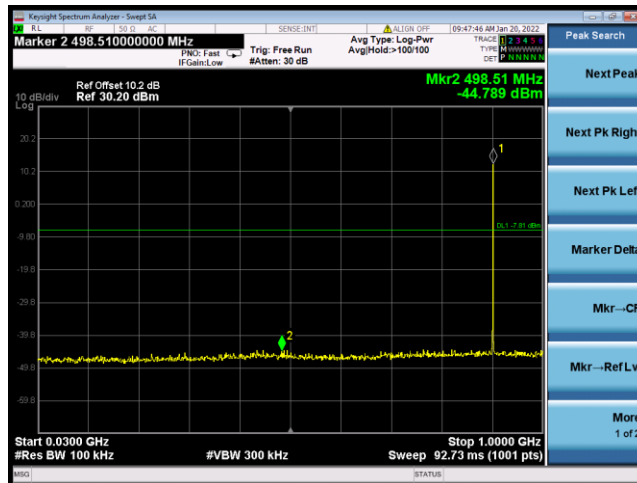
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### TEST GRAPHS



Low~Reference

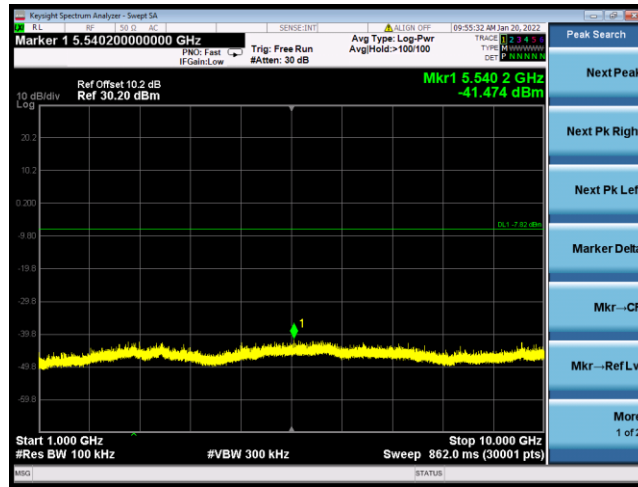


Low\_30~1000

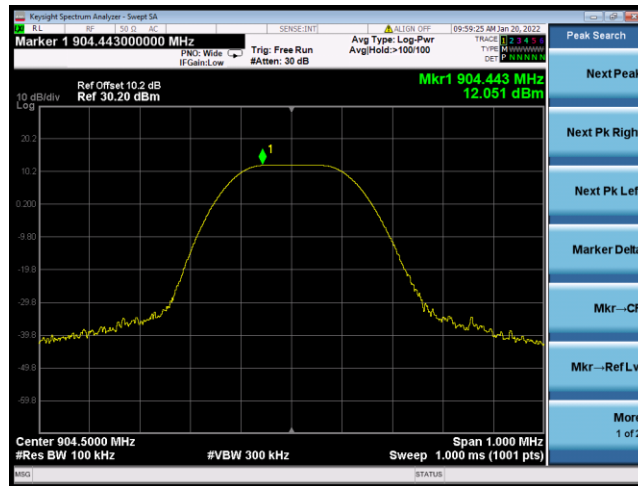


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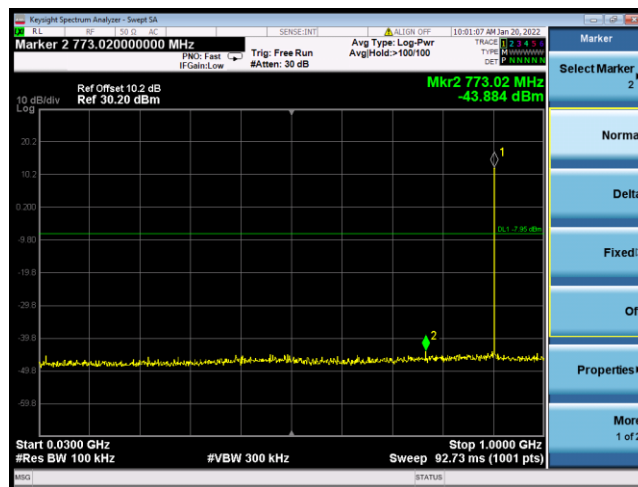
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Low\_1000~10000



Mid\_0~Reference

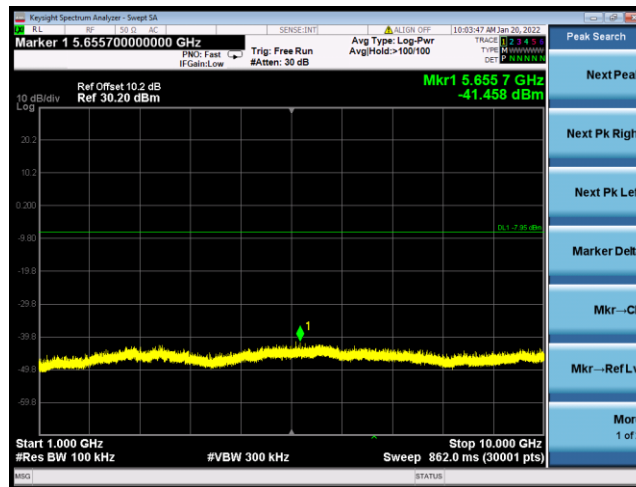




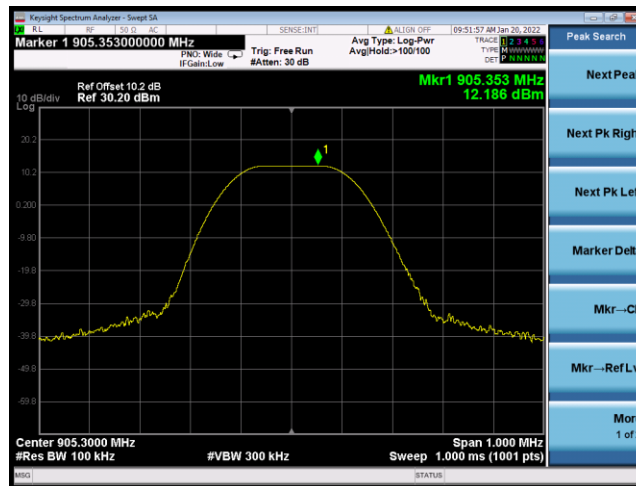
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## Mid\_30~1000



## Mid\_1000~10000



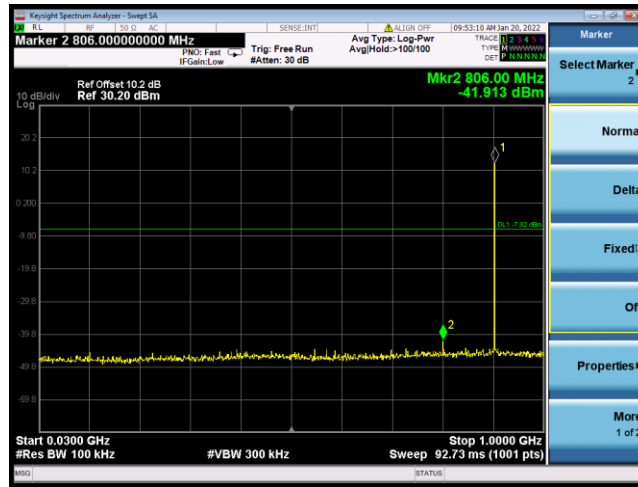
## High~Reference



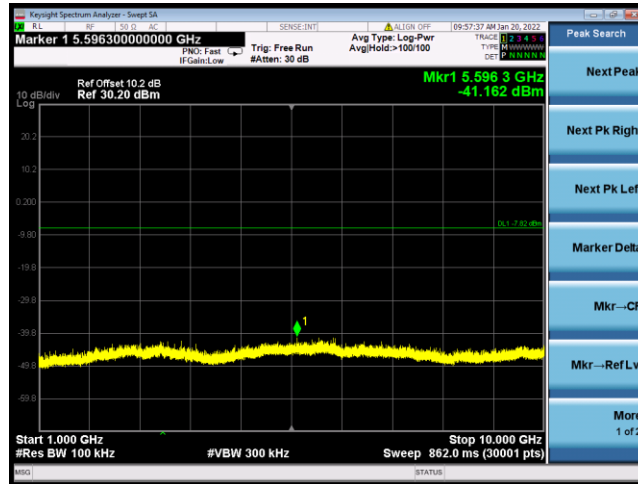


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High\_30~1000



High\_1000~10000



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## DUTY CYCLE

## TEST RESULT

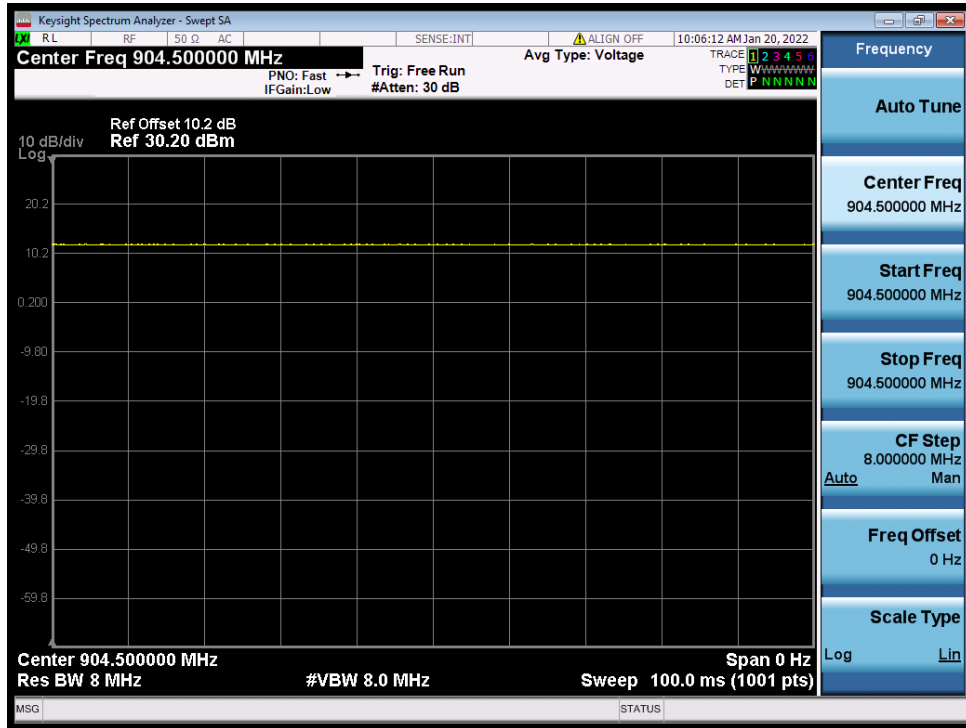
Test sMode	Channel	DC [%]	Limit	Verdict
Hybrid Lora	904.5	100	---	PASS



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### TEST GRAPHS



904.5MHz