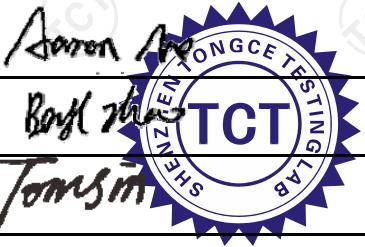


# TEST REPORT

<b>FCC ID.</b> .....	2AUCL-LD1001	
<b>Test Report No.</b> .....	TCT220207E906	
<b>Date of issue</b> .....	Feb. 09, 2022	
<b>Testing laboratory</b> .....	SHENZHEN TONGCE TESTING LAB	
<b>Testing location/ address:</b>	TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China	
<b>Applicant's name</b> .....	FX Technology Limited	
<b>Address</b> .....	2 Stone Buildings, Lincoln's Inn, London WC2A 3TH, United Kingdom	
<b>Manufacturer's name</b> ...	Shenzhen Eternity Technology Co., Ltd	
<b>Address</b> .....	Building A2, YingZhan Industrial Park, LongTian Street, PingShan, ShenZhen, China	
<b>Standard(s)</b> .....	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013	
<b>Test item description</b> .....	Linxdot Hotspot	
<b>Trade Mark</b> .....	Linxdot	
<b>Model/Type reference</b> .....	LD-1001	
<b>Rating(s)</b> .....	Adapter Information: Model: TPQ-228F120200UW01 Input: AC 100-240V, 50/60Hz, 0.8A Output: DC 12.0V, 2.0A	
<b>Date of receipt of test item</b> .....	Feb. 07, 2022	
<b>Date (s) of performance of test</b> .....	Feb. 07, 2022 - Feb. 09, 2022	
<b>Tested by (+signature)</b> ...	Aaron MO	
<b>Check by (+signature)</b> ....	Beryl ZHAO	
<b>Approved by (+signature):</b>	Tomsin	

**General disclaimer:**

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### Appendix A: Photographs of Test Setup

### Appendix B: Photographs of EUT

## 1. General Product Information

### 1.1. EUT description

Test item description .....	Linxdot Hotspot
Model/Type reference.....	LD-1001
Sample Number.....	TCT220207E904-0101
Operation Frequency .....	125KHz: 902.3MHz~914.9MHz
Number of Channel .....	64 for FHSS
Modulation Type .....	LoRa
Modulation Technology .....	Hybrid system
Antenna Type.....	External Antenna
Antenna Gain.....	2dBi
Rating(s) .....	Adapter Information: Model: TPQ-228F120200UW01 Input: AC 100-240V, 50/60Hz, 0.8A Output: DC 12.0V, 2.0A

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

### 1.2. Model(s) list

None.

### 1.3. Operation Frequency

125KHz for FHSS

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.3MHz	16	905.5MHz	32	908.7MHz	48	911.9MHz
1	902.5MHz	17	905.7MHz	33	908.9MHz	49	912.1MHz
2	902.7MHz	18	905.9MHz	34	909.1MHz	50	912.3MHz
3	902.9MHz	19	906.1MHz	35	909.3MHz	51	912.5MHz
4	903.1MHz	20	906.3MHz	36	909.5MHz	52	912.7MHz
5	903.3MHz	21	906.5MHz	37	909.7MHz	53	912.9MHz
6	903.5MHz	22	906.7MHz	38	909.9MHz	54	913.1MHz
7	903.7MHz	23	906.9MHz	39	910.1MHz	55	913.3MHz
8	903.9MHz	24	907.1MHz	40	910.3MHz	56	913.5MHz
9	904.1MHz	25	907.3MHz	41	910.5MHz	57	913.7MHz
10	904.3MHz	26	907.5MHz	42	910.7MHz	58	913.9MHz
11	904.5MHz	27	907.7MHz	43	910.9MHz	59	914.1MHz
12	904.7MHz	28	907.9MHz	44	911.1MHz	60	914.3MHz
13	904.9MHz	29	908.1MHz	45	911.3MHz	61	914.5MHz
14	905.1MHz	30	908.3MHz	46	911.5MHz	62	914.7MHz
15	905.3MHz	31	908.5MHz	47	911.7MHz	63	914.9MHz

Remark: Channel 0, 32 &63 have been tested

## 2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)	PASS
Occupied Bandwidth	§15.247 (a)	PASS
Carrier Frequencies Separation	§15.247 (a)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (f)	PASS
Radiated Emission	§15.205/§15.209	PASS
Band Edge	§15.247(d)	PASS

**Note:**

1. PASS: *Test item meets the requirement.*
2. Fail: *Test item does not meet the requirement.*
3. N/A: *Test case does not apply to the test object.*
4. *The test result judgment is decided by the limit of test standard.*

### 3. General Information

#### 3.1. Test environment and mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	24.6 °C	25.1 °C
Humidity:	49 % RH	52 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Mode:		
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations	
<p>The sample was placed 0.8m &amp; 1.5m for the measurement below &amp; above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y &amp; Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case( Z axis) are shown in Test Results of the following pages.</p>		

#### 3.2. 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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

##### Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

## 4. Facilities and Accreditations

### 4.1. Facilities

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

- FCC - Registration No.: 645098

SHENZHEN TONGCE TESTING LAB

Designation Number: CN1205

The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

SHENZHEN TONGCE TESTING LAB

CAB identifier: CN0031

The testing lab has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

### 4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

### 4.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended 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	MU
1	Conducted Emission	$\pm 3.10$ dB
2	RF power, conducted	$\pm 0.12$ dB
3	Spurious emissions, conducted	$\pm 0.11$ dB
4	All emissions, radiated(<1 GHz)	$\pm 4.56$ dB
5	All emissions, radiated(1 GHz - 18 GHz)	$\pm 4.22$ dB
6	All emissions, radiated(18 GHz- 40 GHz)	$\pm 4.36$ dB

## 5. Test Results and Measurement Data

### 5.1. Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p>	
<b>E.U.T Antenna:</b>	
<p>The antenna is external antenna which permanently attached, and the best case gain of the antenna is 2dBi.</p>	
	

## 5.2. Conducted Emission

### 5.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207														
<b>Test Method:</b>	ANSI C63.10:2013														
<b>Frequency Range:</b>	150 kHz to 30 MHz														
<b>Receiver setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
<b>Limits:</b>	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	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
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													
<b>Test Setup:</b>	<p>Reference Plane</p>  <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
<b>Test Mode:</b>	Refer to item 3.1														
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>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).</li> <li>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.</li> </ol>														
<b>Test Result:</b>	PASS														

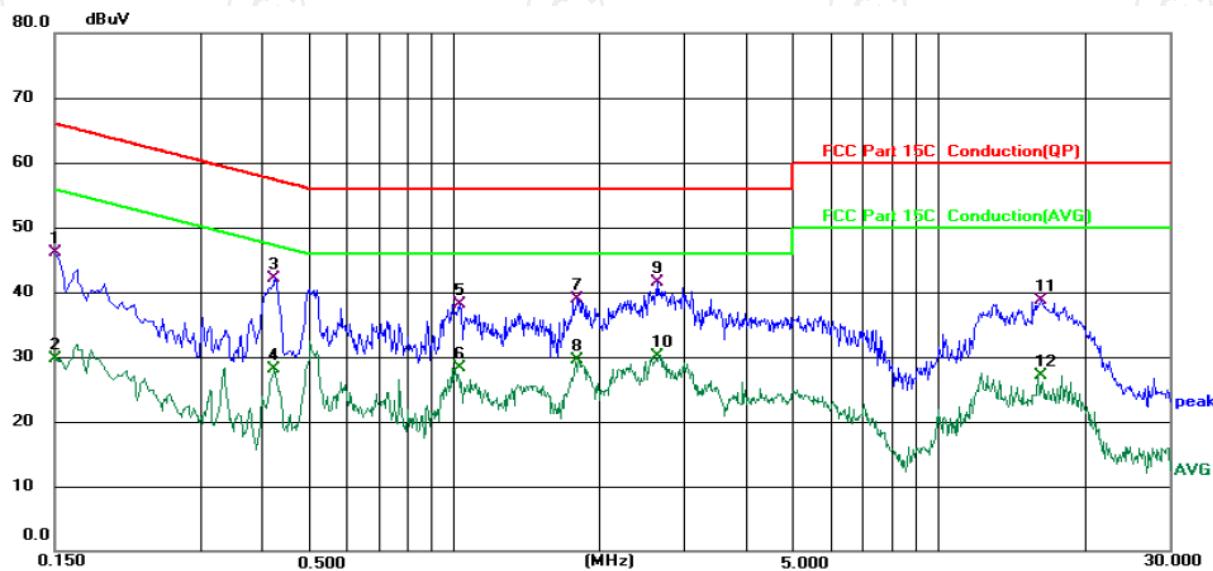
**5.2.2. Test Instruments**

Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI3	100898	Jul. 07, 2022
Line Impedance Stabilisation Newtork(LISN)	Schwarzbeck	NSLK 8126	8126453	Mar. 11, 2022
Line-5	TCT	CE-05	N/A	Jul. 07, 2022
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

### 5.2.3. Test data

Please refer to following diagram for individual

#### Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room

Phase: *L1*

Temperature: 24.6 (°C)

Humidity: 49 %

Limit: FCC Part 15C Conduction(QP)

Power: AC 120 V/60 Hz

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1500	36.45	9.61	46.06	66.00	-19.94	QP	
2	0.1500	20.13	9.61	29.74	56.00	-26.26	AVG	
3	0.4259	32.77	9.24	42.01	57.33	-15.32	QP	
4	0.4259	18.90	9.24	28.14	47.33	-19.19	AVG	
5	1.0300	28.84	9.31	38.15	56.00	-17.85	QP	
6	1.0300	18.93	9.31	28.24	46.00	-17.76	AVG	
7	1.8020	29.56	9.36	38.92	56.00	-17.08	QP	
8	1.8020	20.13	9.36	29.49	46.00	-16.51	AVG	
9 *	2.6419	32.08	9.41	41.49	56.00	-14.51	QP	
10	2.6419	20.74	9.41	30.15	46.00	-15.85	AVG	
11	16.3460	28.99	9.70	38.69	60.00	-21.31	QP	
12	16.3460	17.39	9.70	27.09	50.00	-22.91	AVG	

#### Note:

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

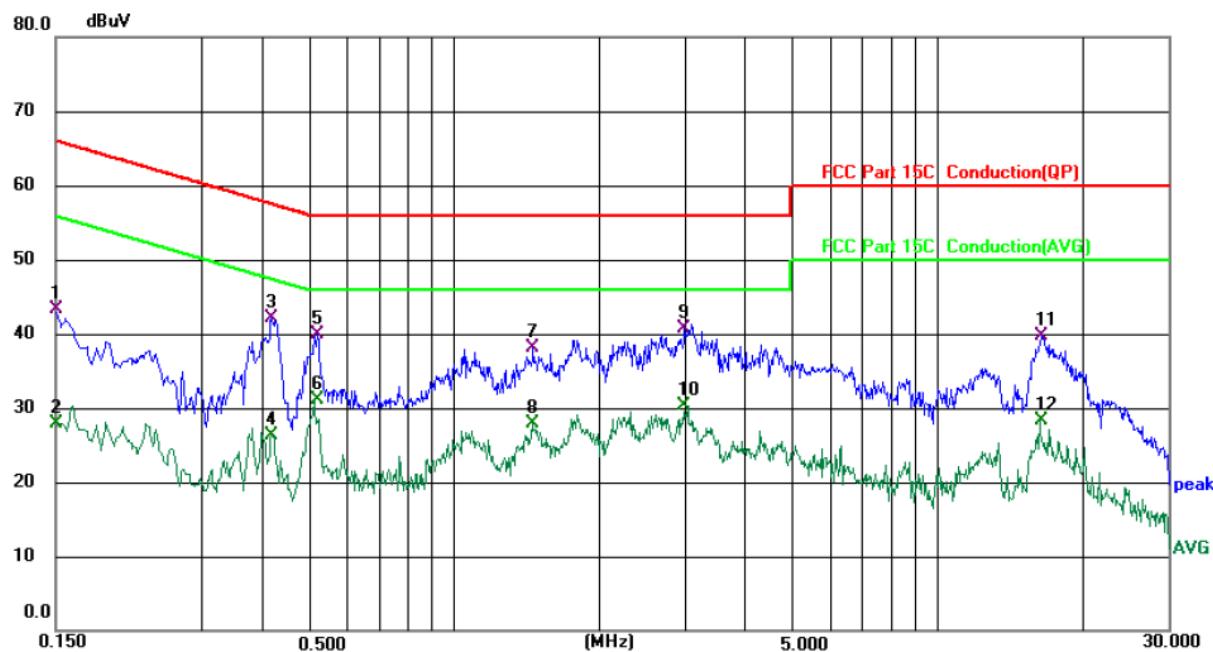
Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. = Quasi-Peak

AVG = average

\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

**Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)**



Site 844 Shielding Room

Phase: *N*

Temperature: 24.6 (°C)

Humidity: 49 %

Limit: FCC Part 15C Conduction(QP)

Power: AC 120 V/60 Hz

No.	Mk.	Freq. MHz	Reading Level dB $\mu$ V	Correct Factor dB	Measure- ment dB $\mu$ V	Limit dB $\mu$ V	Over	
							Detector	Comment
1		0.1500	33.69	9.61	43.30	66.00	-22.70	QP
2		0.1500	18.23	9.61	27.84	56.00	-28.16	AVG
3		0.4178	32.94	9.25	42.19	57.49	-15.30	QP
4		0.4178	17.03	9.25	26.28	47.49	-21.21	AVG
5		0.5220	30.66	9.22	39.88	56.00	-16.12	QP
6	*	0.5220	21.79	9.22	31.01	46.00	-14.99	AVG
7		1.4616	28.70	9.34	38.04	56.00	-17.96	QP
8		1.4616	18.53	9.34	27.87	46.00	-18.13	AVG
9		2.9940	31.27	9.42	40.69	56.00	-15.31	QP
10		2.9940	20.98	9.42	30.40	46.00	-15.60	AVG
11		16.4540	29.91	9.70	39.61	60.00	-20.39	QP
12		16.4540	18.70	9.70	28.40	50.00	-21.60	AVG

**Note1:**

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. = Quasi-Peak AVG = average

\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

**Note2:**

Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (Middle channel) was submitted only.

### 5.3. Conducted Output Power

### 5.3.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (b)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<p>Use the following spectrum analyzer settings:</p> <p>Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel</p> <p>RBW &gt; the 20 dB bandwidth of the emission being measured <math>VBW \geq RBW</math></p> <p>Sweep = auto</p> <p>Detector function = peak</p> <p>Trace = max hold</p> <p>Allow the trace to stabilize.</p> <p>Use the marker-to-peak function to set the marker to the peak of the emission.</p>
<b>Test Result:</b>	PASS

### 5.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

### 5.3.3. Test Data

For FHSS

125KHz

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	21.51	30.00	PASS
Middle	21.95	30.00	PASS
Highest	21.06	30.00	PASS

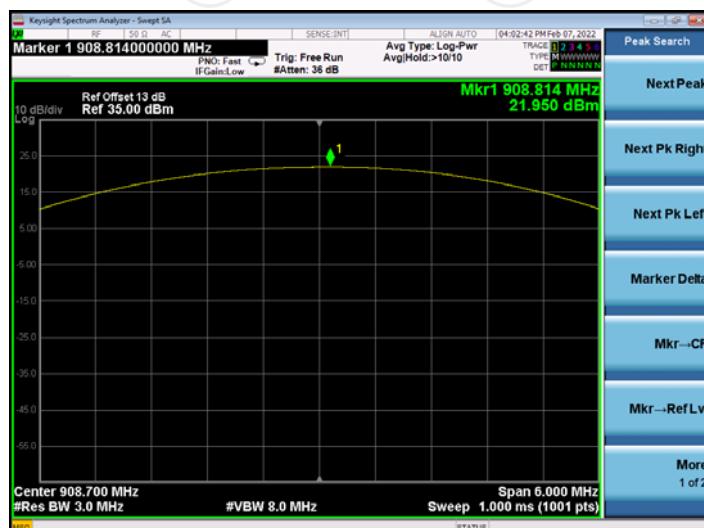
Test plots as follows:

125KHz

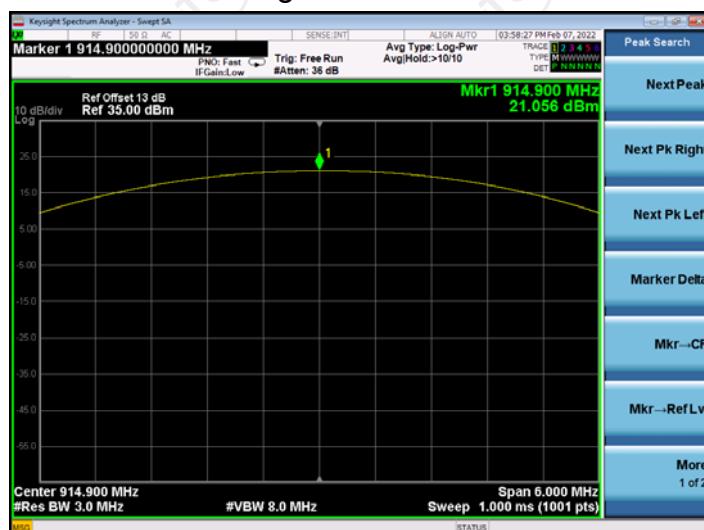
### Lowest channel



### Middle channel

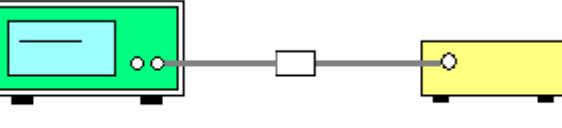


### Highest channel



## 5.4. 20dB Occupy Bandwidth

### 5.4.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	For frequency hopping systems operating in the 902-928 MHz band: The maximum allowed 20 dB bandwidth of the hopping channel is 250 kHz
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.            Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel; <math>1\% \leq RBW \leq 5\%</math> of the 20 dB bandwidth; <math>VBW \geq 3RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

## 5.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

### 5.4.3. Test data

For FHSS:

Test channel	20dB Occupy Bandwidth (kHz)		
	125KHz	Limit	Conclusion
Lowest	135.3	≤250k	PASS
Middle	135.2	≤250k	PASS
Highest	136.0	≤250k	PASS

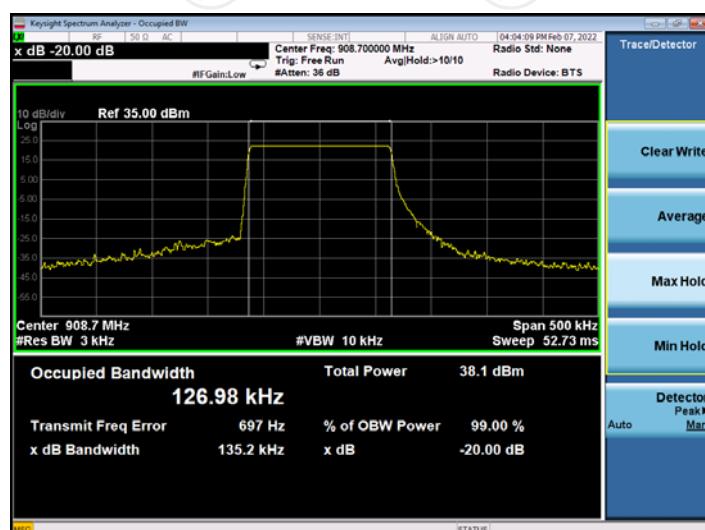
Test plots as follows:

125KHz

### Lowest channel



### Middle channel



### Highest channel



## 5.5. Carrier Frequencies Separation

### 5.5.1. Test Specification

## 5.5.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

**5.5.3. Test data**

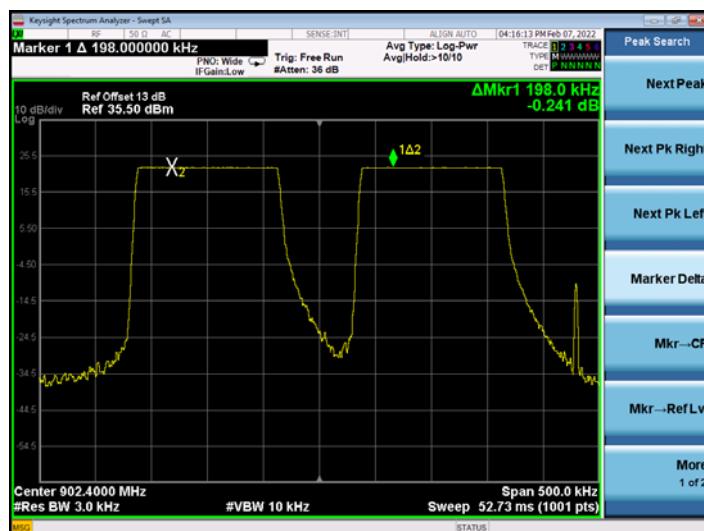
For FHSS:

125KHz			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	198.0	135.3	PASS
Middle	201.0	135.2	PASS
Highest	204.5	136.0	PASS

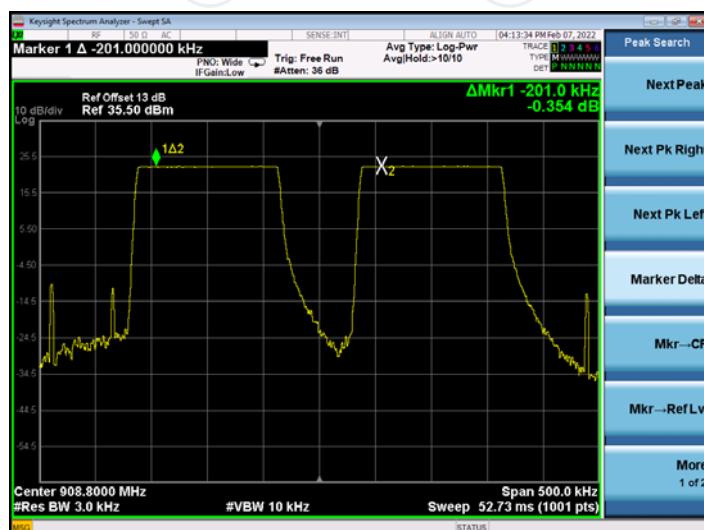
**Test plots as follows:**

125KHz

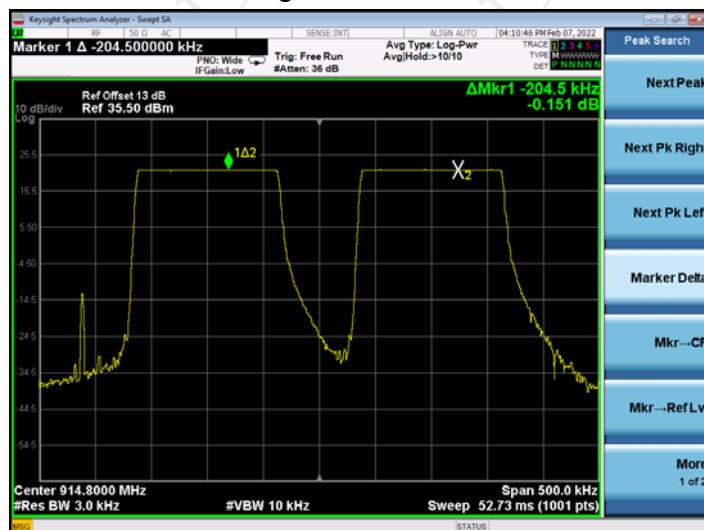
### Lowest channel



### Middle channel

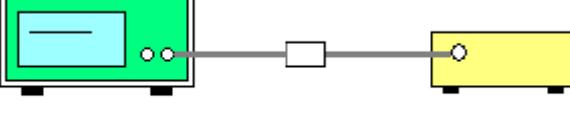


### Highest channel



## 5.6. Hopping Channel Number

### 5.6.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Hopping mode
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Enable the EUT hopping function.</li> <li>4. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>5. The number of hopping frequency used is defined as the number of total channel.</li> <li>6. Record the measurement data in report.</li> </ol>
<b>Test Result:</b>	PASS

## 5.6.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

**5.6.3. Test data**

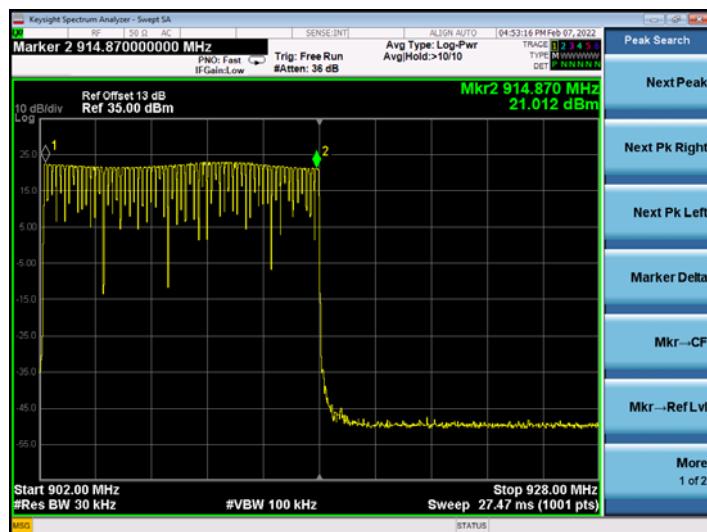
For FHSS:

Mode	Hopping channel numbers	Limit	Result
125KHz	64	50	PASS

Test plots as follows:

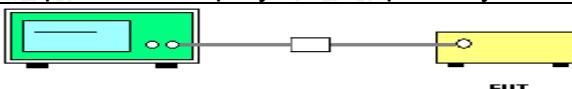


125KHz



## 5.7. Dwell Time

### 5.7.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (f)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	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.
<b>Test Setup:</b>	 <p><b>Spectrum Analyzer</b></p> <p><b>EUT</b></p>
<b>Test Mode:</b>	Hopping mode
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Enable the EUT hopping function.</li> <li>4. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be <math>\leq</math> channel spacing and where possible RBW should be set <math>&gt;&gt; 1 / T</math>, where T is the expected dwell time per channel; VBW<math>\geq</math>RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.</li> <li>5. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

## 5.7.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

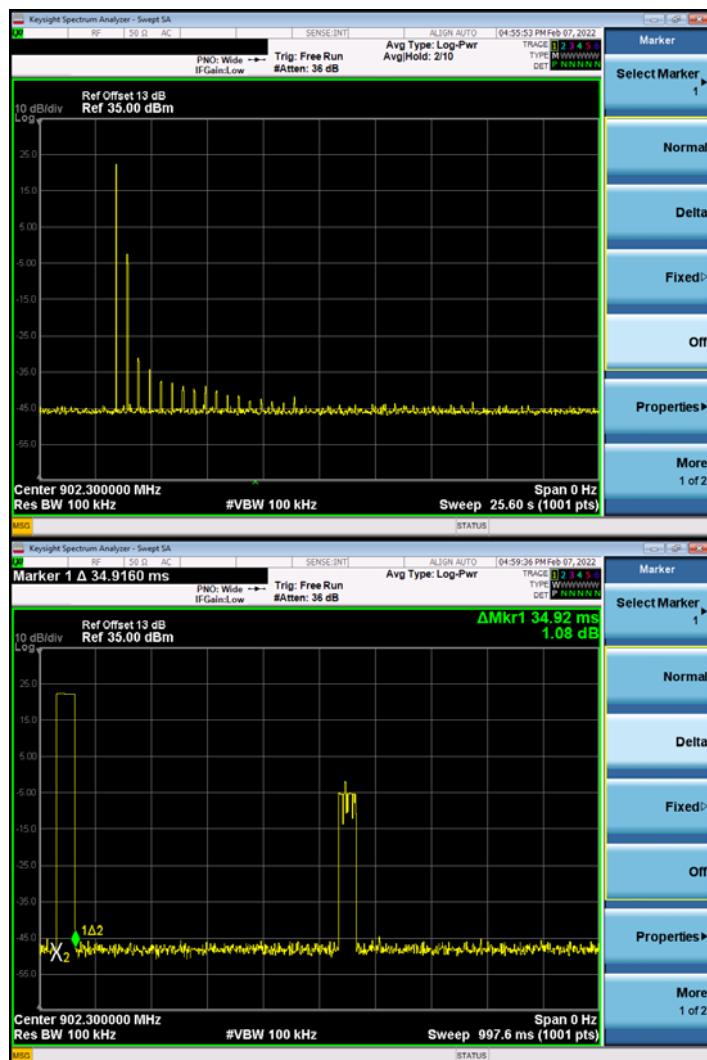
**5.7.3. Test Data**

For FHSS:

Mode	Dwell time (ms)	Limit (second)	Result
125KHz	34.92	0.4	PASS

**Test plots as follows:**

125KHz



## 5.8. Pseudorandom Frequency Hopping Sequence

### Test Requirement: FCC Part15 C Section 15.247 (a)(1) requirement:

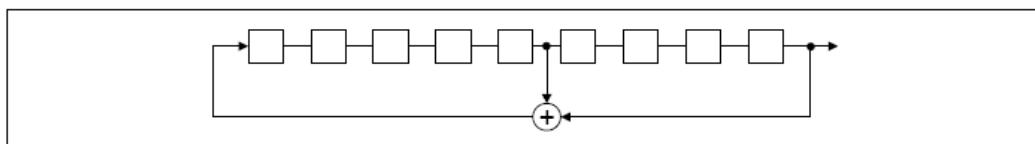
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### EUT Pseudorandom Frequency Hopping Sequence

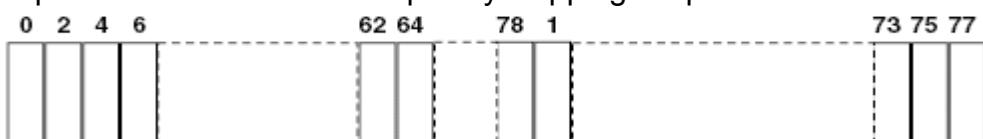
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized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

- Number of shift register stages: 9
- Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits
- Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

## 5.9. Conducted Band Edge Measurement

### 5.9.1. Test Specification

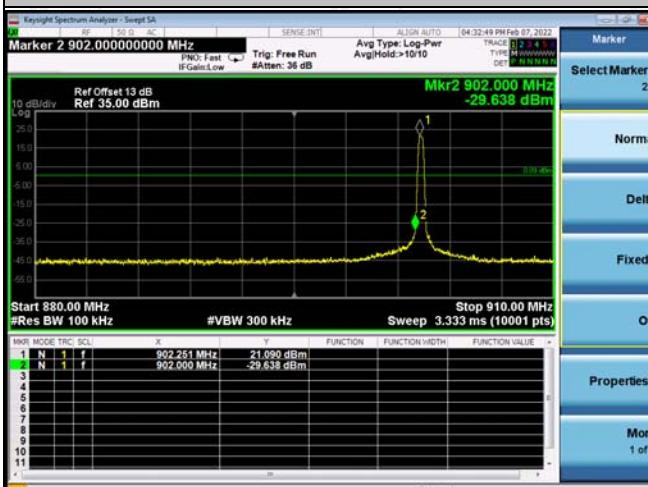
## 5.9.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

### 5.9.3. Test Data

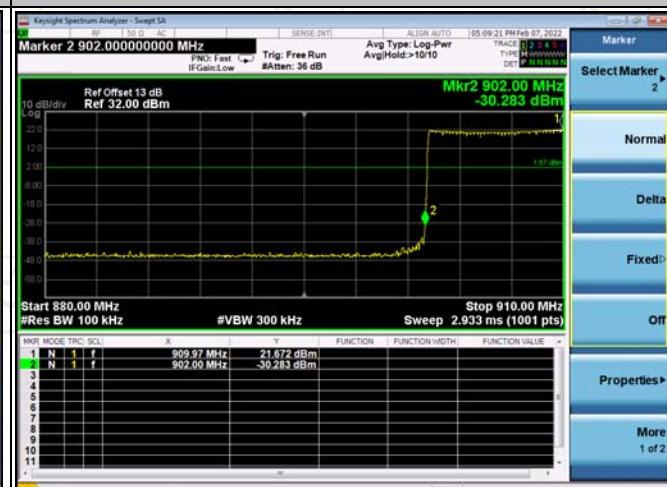
#### 125KHz

##### Test channel:



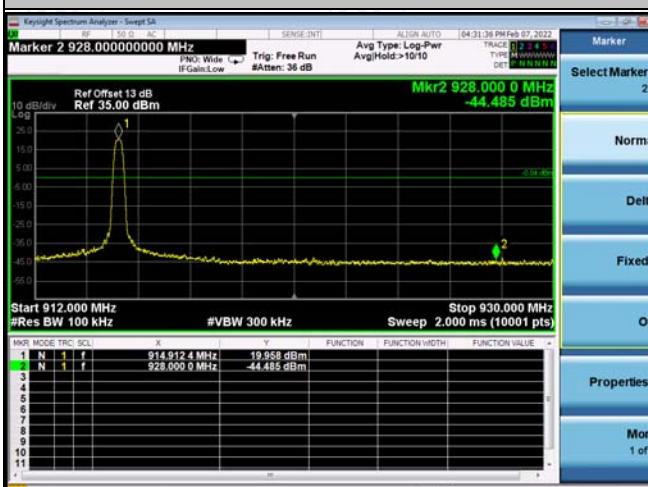
No-hopping mode

##### Lowest channel



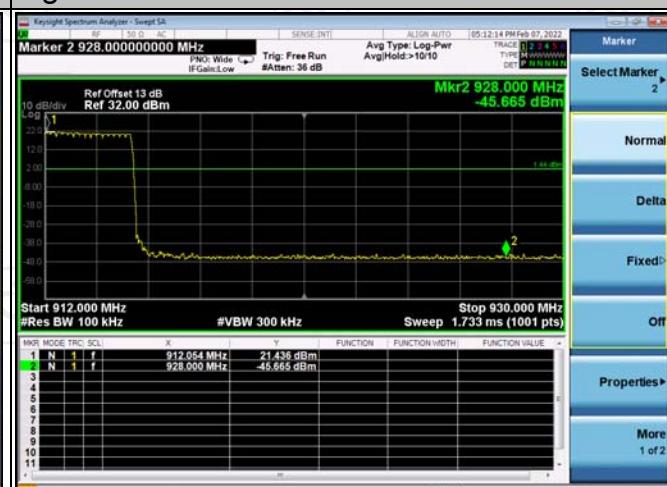
Hopping mode

##### Test channel:



No-hopping mode

##### Highest channel



Hopping mode

## 5.10. Conducted Spurious Emission Measurement

### 5.10.1. Test Specification

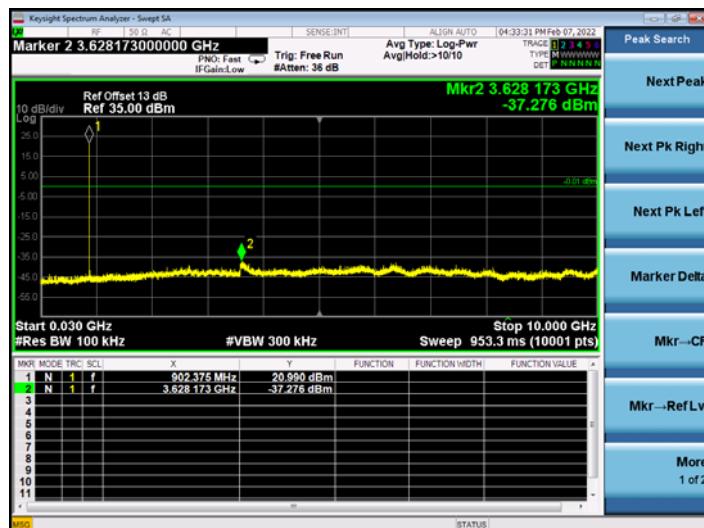
## 5.10.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-01	N/A	Jul. 18, 2022

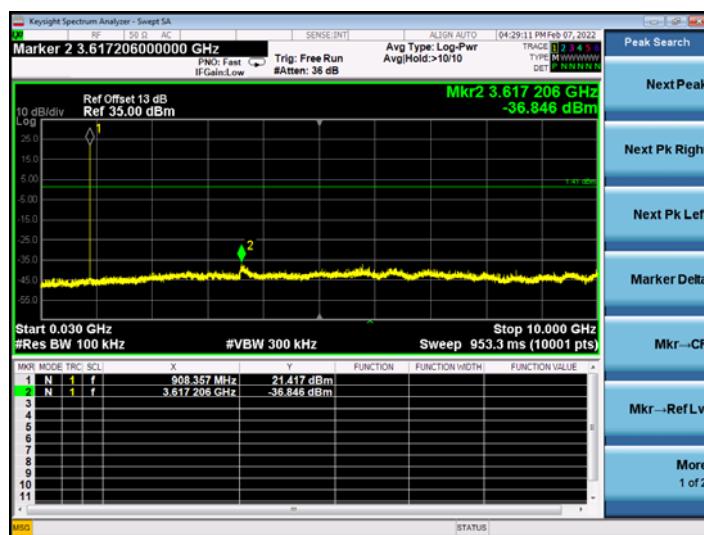
### 5.10.3. Test Data

125KHz

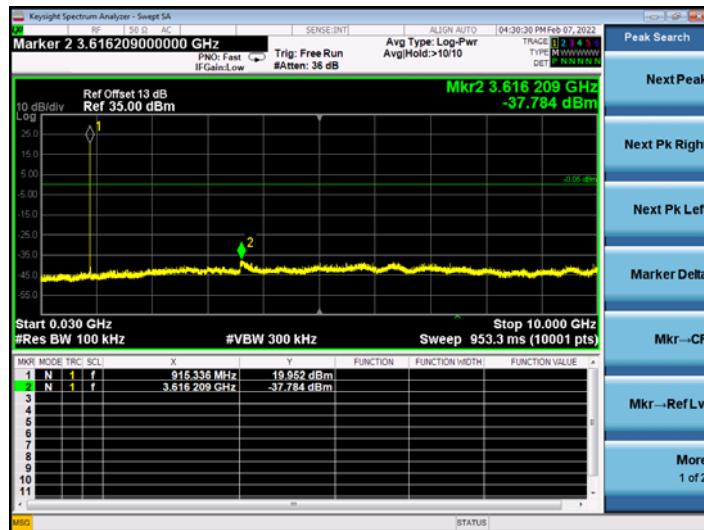
Lowest Channel



Middle Channel



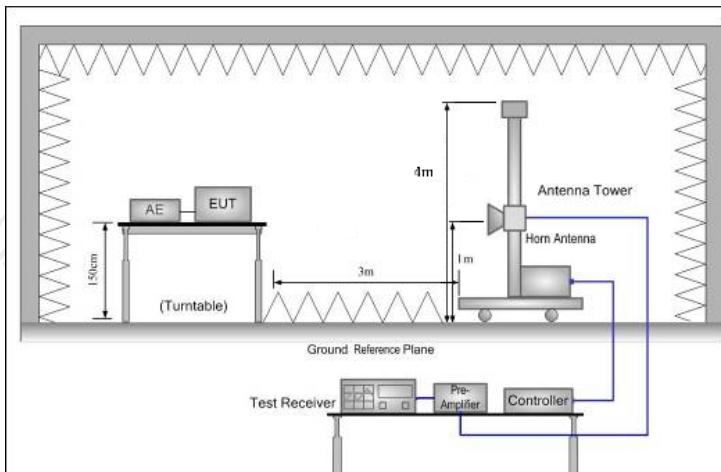
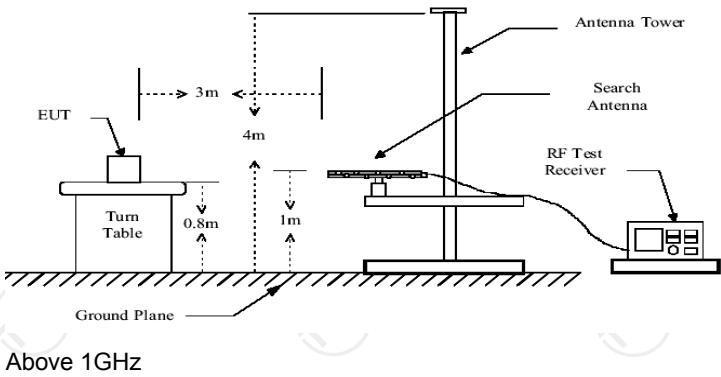
Highest Channel



## 5.11. Radiated Spurious Emission Measurement

### 5.11.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.209																																							
<b>Test Method:</b>	ANSI C63.10:2013																																							
<b>Frequency Range:</b>	9 kHz to 25 GHz																																							
<b>Measurement Distance:</b>	3 m																																							
<b>Antenna Polarization:</b>	Horizontal & Vertical																																							
<b>Receiver Setup:</b>	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Detector</th> <th>RBW</th> <th>VBW</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>9kHz- 150kHz</td> <td>Quasi-peak</td> <td>200Hz</td> <td>1kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>150kHz- 30MHz</td> <td>Quasi-peak</td> <td>9kHz</td> <td>30kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>30MHz-1GHz</td> <td>Quasi-peak</td> <td>120KHz</td> <td>300KHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td rowspan="2">Above 1GHz</td><td>Peak</td> <td>1MHz</td> <td>3MHz</td> <td>Peak Value</td> </tr> <tr> <td>Peak</td> <td>1MHz</td> <td>10Hz</td> <td>Average Value</td> </tr> </tbody> </table>					Frequency	Detector	RBW	VBW	Remark	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value						
Frequency	Detector	RBW	VBW	Remark																																				
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value																																				
150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value																																				
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value																																				
Above 1GHz	Peak	1MHz	3MHz	Peak Value																																				
	Peak	1MHz	10Hz	Average Value																																				
<b>Limit:</b>	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (microvolts/meter)</th> <th>Measurement Distance (meters)</th> </tr> </thead> <tbody> <tr> <td>0.009-0.490</td> <td>2400/F(KHz)</td> <td>300</td> </tr> <tr> <td>0.490-1.705</td> <td>24000/F(KHz)</td> <td>30</td> </tr> <tr> <td>1.705-30</td> <td>30</td> <td>30</td> </tr> <tr> <td>30-88</td> <td>100</td> <td>3</td> </tr> <tr> <td>88-216</td> <td>150</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>3</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (microvolts/meter)</th> <th>Measurement Distance (meters)</th> <th>Detector</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Above 1GHz</td><td>500</td> <td>3</td> <td>Average</td> </tr> <tr> <td>5000</td> <td>3</td> <td>Peak</td> </tr> </tbody> </table>					Frequency	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	30	30	30-88	100	3	88-216	150	3	216-960	200	3	Above 960	500	3	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector	Above 1GHz	500	3	Average	5000	3	Peak
Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)																																						
0.009-0.490	2400/F(KHz)	300																																						
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1.705-30	30	30																																						
30-88	100	3																																						
88-216	150	3																																						
216-960	200	3																																						
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Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector																																					
Above 1GHz	500	3	Average																																					
	5000	3	Peak																																					
<b>Test setup:</b>	<p>For radiated emissions below 30MHz</p> <p>Distance = 3m</p> <p>0.8m</p> <p>1m</p> <p>30MHz to 1GHz</p>																																							



<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<p>1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10:2013 Measurement Guidelines.</p> <p>2. For the radiated emission test below 1GHz:          The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.</p> <p>For the radiated emission test above 1GHz:          Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission</p>

	<p>and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <ol style="list-style-type: none"> <li>3. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>4. Use the following spectrum analyzer settings:             <ol style="list-style-type: none"> <li>(1) Span shall wide enough to fully capture the emission being measured;</li> <li>(2) Set RBW=120 kHz for <math>f &lt; 1</math> GHz, RBW=1MHz for <math>f &gt; 1</math> GHz ; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold for peak</li> <li>(3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = <math>N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n</math> Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + <math>20 \cdot \log(\text{Duty cycle})</math> Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</li> </ol> </li> </ol>
<b>Test results:</b>	PASS

5.11.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESIB7	100197	Jul. 07, 2022
Spectrum Analyzer	R&S	FSQ40	200061	Jul. 07, 2022
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012 102	Mar. 11, 2022
Pre-amplifier	SKET	LNPA_1840G-50	SK2021092 03500	Apr. 08, 2022
Pre-amplifier	HP	8447D	2727A05017	Jul. 07, 2022
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 05, 2022
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Apr. 10, 2023
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coaxial cable	SKET	RC_DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC40G-N	N/A	Jul. 07, 2022
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

### 5.11.3. Test Data

Please refer to following diagram for individual



Site #1 3m Anechoic Chamber

Polarization: **Horizontal**

Temperature: 25.1(C)

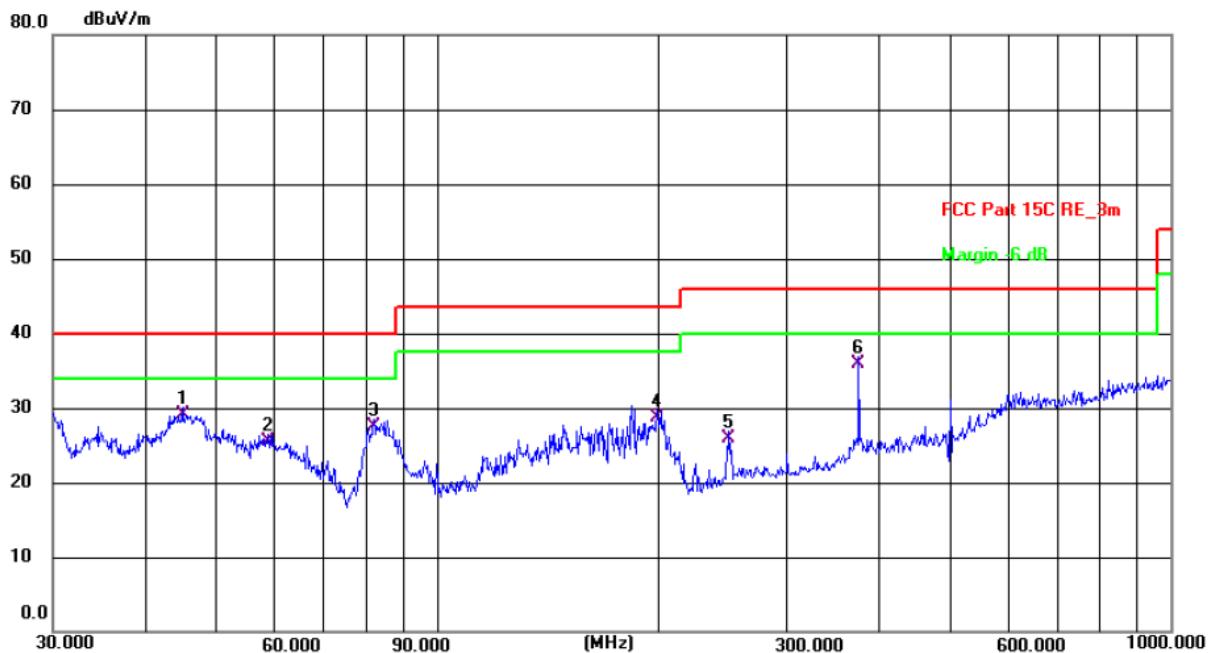
Humidity: 52 %

Limit: FCC Part 15C RE\_3m

Power: AC 120 V/60 Hz

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	45.0583	7.20	13.88	21.08	40.00	-18.92	QP	P	
2	81.2116	10.23	9.23	19.46	40.00	-20.54	QP	P	
3	194.4533	18.22	11.01	29.23	43.50	-14.27	QP	P	
4	250.3009	16.81	12.79	29.60	46.00	-16.40	QP	P	
5 *	375.9384	23.04	15.95	38.99	46.00	-7.01	QP	P	
6	501.1788	14.89	19.06	33.95	46.00	-12.05	QP	P	

Vertical:



Site #1 3m Anechoic Chamber

 Polarization: **Vertical**

Temperature: 25.1(C) Humidity: 52 %

Limit: FCC Part 15C RE\_3m

Power: AC 120 V/60 Hz

No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	P/F	Remark
1	45.0583	15.25	13.88	29.13	40.00	-10.87	QP	P	
2	59.0251	12.78	12.65	25.43	40.00	-14.57	QP	P	
3	82.0704	18.35	9.22	27.57	40.00	-12.43	QP	P	
4	199.2855	17.95	10.71	28.66	43.50	-14.84	QP	P	
5	250.3009	13.18	12.79	25.97	46.00	-20.03	QP	P	
6 *	375.9384	19.89	15.95	35.84	46.00	-10.16	QP	P	

**Note:** 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (Middle channel) was submitted only.

3. Freq. = Emission frequency in MHz

Measurement (dB $\mu$ V/m) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

Limit (dB $\mu$ V/m) = Limit stated in standard

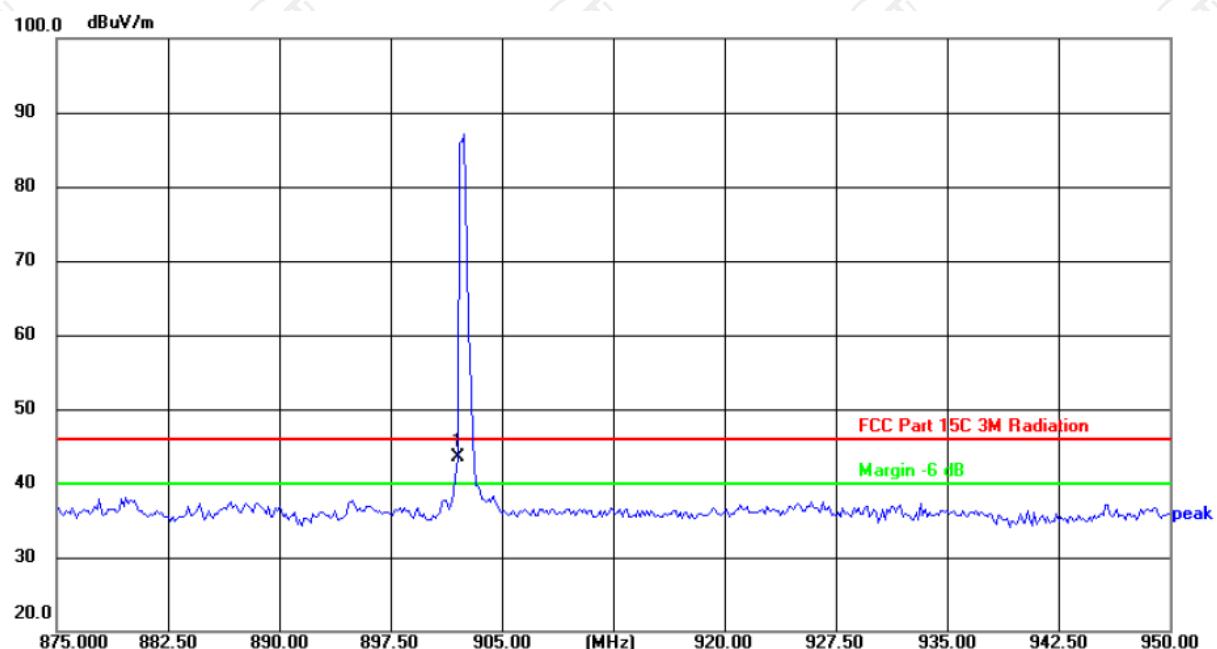
Margin (dB) = Measurement (dB $\mu$ V/m) – Limits (dB $\mu$ V/m)

\* is meaning the worst frequency has been tested in the test frequency range

Test Result of Radiated Spurious at Band edges

Lowest channel 902.3:

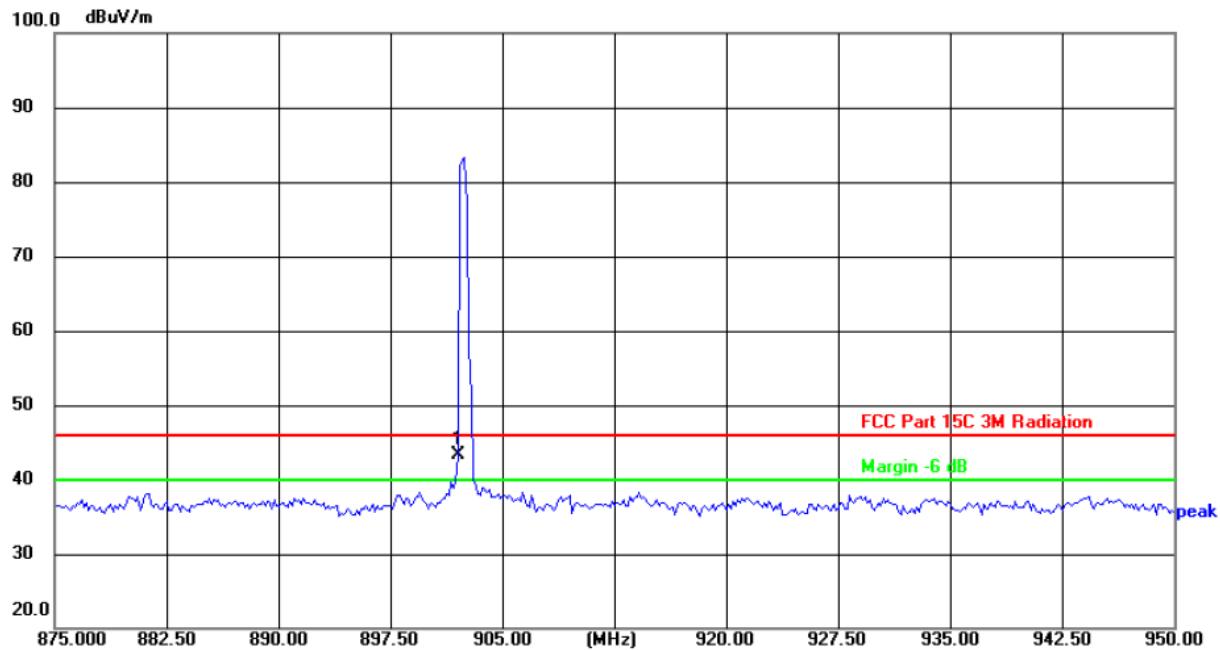
Horizontal:



Site Polarization: **Horizontal** Temperature: 25(°C)  
Limit: FCC Part 15C 3M Radiation Power: Humidity: 55 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	902.0000	41.68	1.86	43.54	46.00	-2.46	peak

Vertical:



Site

 Polarization: **Vertical**

Temperature: 25(°C)

Limit: FCC Part 15C 3M Radiation

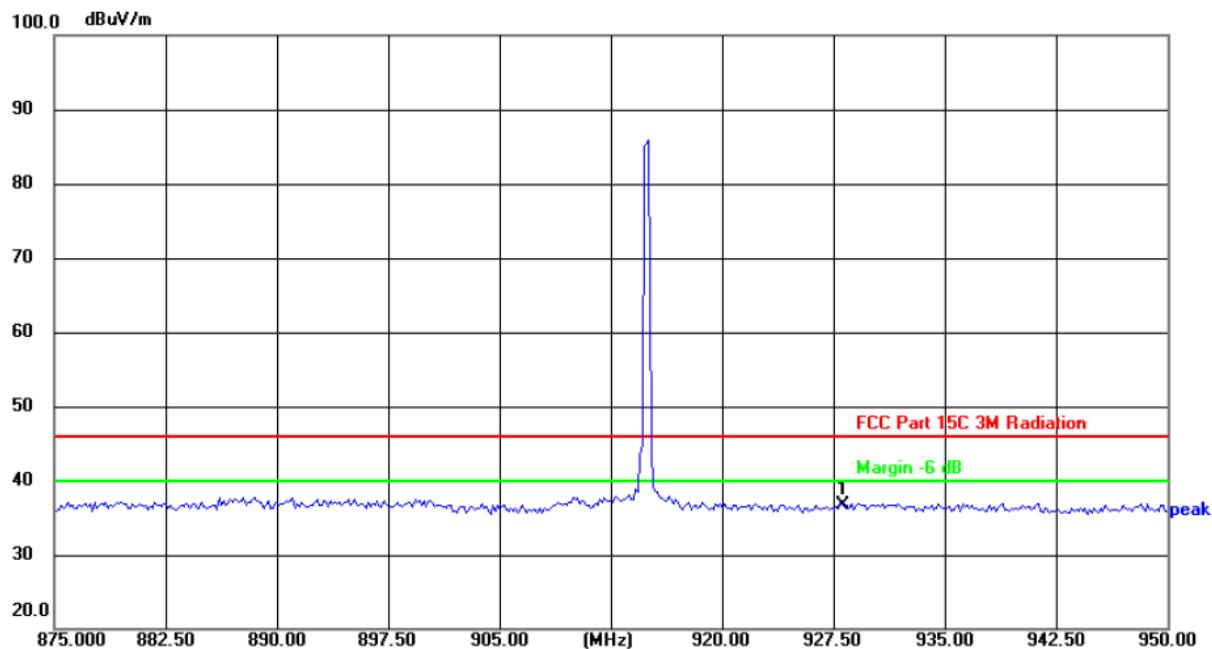
Power:

Humidity: 55 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	902.0000	41.36	1.86	43.22	46.00	-2.78	peak

Highest channel 914.9:

Horizontal:



Site

Polarization: **Horizontal**

Temperature: 25(°C)

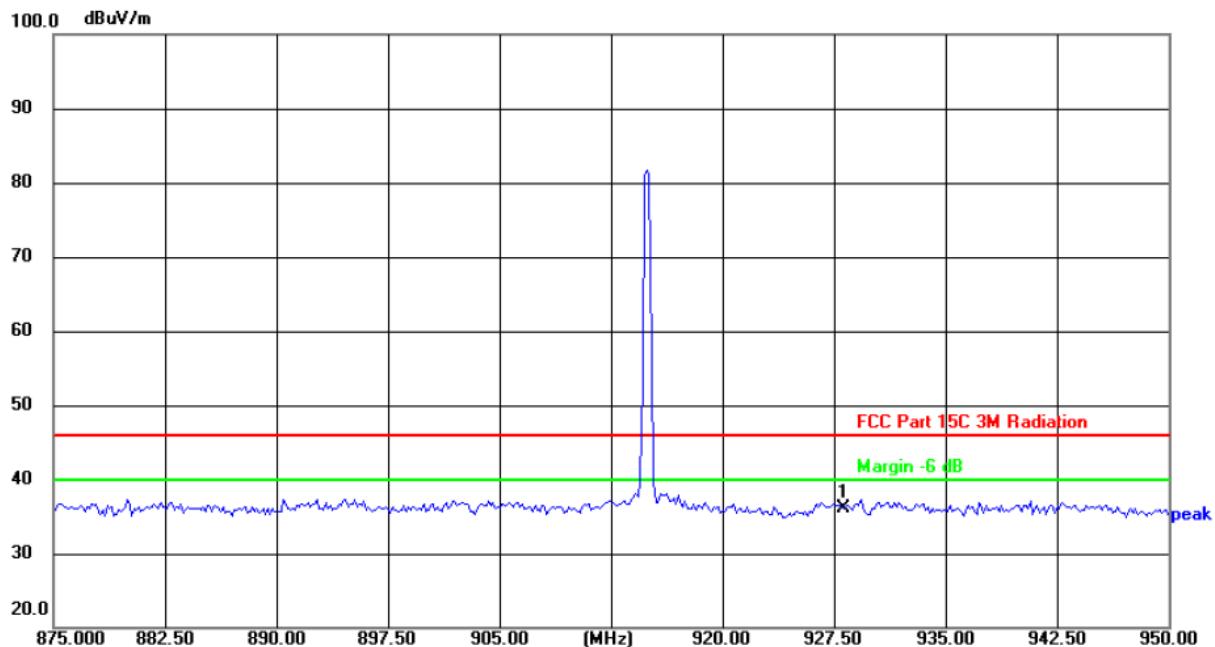
Limit: FCC Part 15C 3M Radiation

Power:

Humidity: 55 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	928.0000	34.79	1.88	36.67	46.00	-9.33	peak

Vertical:



Site

 Polarization: **Vertical**

Temperature: 25(°C)

Limit: FCC Part 15C 3M Radiation

Power:

Humidity: 55 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	928.0000	34.15	1.88	36.03	46.00	-9.97	peak

**Above 1GHz**

125KHz									
Low channel: 902.3 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1804.6	H	48.30	---	0.66	48.96	---	74	54	-5.04
2706.9	H	38.19	---	9.50	47.69	---	74	54	-6.31
---	H	---	---	---	---	---	---	---	---
1804.6	V	47.38	---	0.66	48.04	---	74	54	-5.96
2706.9	V	37.17	---	9.50	46.67	---	74	54	-7.33
---	V	---	---	---	---	---	---	---	---

Middle channel: 908.7 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1817.4	H	46.47	---	0.99	47.46	---	74	54	-6.54
2726.1	H	35.86	---	9.87	45.73	---	74	54	-8.27
---	H	---	---	---	---	---	---	---	---
1817.4	V	47.52	---	0.99	48.51	---	74	54	-5.49
2726.1	V	36.38	---	9.87	46.25	---	74	54	-7.75
---	V	---	---	---	---	---	---	---	---

High channel: 914.9 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1829.8	H	48.61	---	1.33	49.94	---	74	54	-4.06
2744.7	H	36.57	---	10.22	46.79	---	74	54	-7.21
---	H	---	---	---	---	---	---	---	---
1829.8	V	45.44	---	1.33	46.77	---	74	54	-7.23
2744.7	V	34.06	---	10.22	44.28	---	74	54	-9.72
---	V	---	---	---	---	---	---	---	---

**Note:**

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB $\mu$ V/m)-Average limit (dB $\mu$ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---” in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
6. All the restriction bands are compliance with the limit of 15.209.

## Appendix A: Photographs of Test Setup

Refer to the Appendix

## Appendix B: Photographs of EUT

Refer to the Appendix

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