



# FCC RADIO TEST REPORT

**FCC ID** : ZAT-1312PSIP-3  
**Equipment** : CC1312PSIP  
**Brand Name** : Texas Instruments  
**Model Name** : CC1312PSIPMOT3  
**Applicant** : Texas Instruments Incorporated  
12500 TI BLVD., Dallas, Texas, 75243  
**Manufacturer** : Texas Instruments Incorporated  
12500 TI BLVD., Dallas, Texas, 75243  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Oct. 27, 2023 and testing was performed from Nov. 01, 2023 to Dec. 21, 2023. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**Sporton International Inc. Wensan Laboratory**

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



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### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Reporting only	-
3.5	15.247(b)(2)	Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	0.10 dB under the limit at 864.75 MHz
3.9	15.207	AC Conducted Emission	Pass	4.62 dB under the limit at 0.15 MHz
3.10	15.203 15.247(b)	Antenna Requirement	Pass	-

**Note:** After assessing, since the HW of the module is the same but SW adds other RF technical specifications, the FR341305-02E report reuses test data from the report FR341305-01C.

**Conformity Assessment Condition:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

**Disclaimer:**

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: Danny Lee**  
**Report Producer: Clio Lo**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
<b>General Specs</b>	
PowerG PHY, 50 kbps, GFSK, 25 kHz Deviation	

Antenna Information				
	Brand	Antenna Type	Model	915MHz Gain
1	TI	Integrated PCB antenna	LP-EM-CC1312PSIP antenna	+2.69 dBi
2	Kaadas	Flexi PCB antenna	K1	-5.82 dBi
3	Leederson	Integrated PCB antenna	L1	-4.51 dBi
4	Leederson	Integrated PCB antenna	L2	-1.83 dBi
5	Leederson	Stanced antenna	L3	-9.48 dBi
6	Leederson	Stanced antenna	L4	+0.37 dBi
7	Leederson	Integrated PCB antenna	L5	-1.74 dBi
8	Pulse	External whip antenna	W5017	+0.90 dBi
9	Johanson Technology	Chip antenna	0900AT43A0070	-0.50 dBi
10	Johanson Technology	Chip antenna	0915AT43A0026	+1.0 dBi
11	Pulse	Wire antenna	W3113	+0.80 dBi

**Remark:**

1. The EUT uses the Integrated PCB antenna from Texas Instruments (Antenna #1)
2. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.



### 1.3 Testing Location

<b>Test Site</b>	Sporton International Inc. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> CO05-HY (TAF Code: 1190)
<b>Remark</b>	The AC Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory.

**Note:** The test site complies with ANSI C63.4 2014 requirement.

<b>Test Site</b>	Sporton International Inc. Wensan Laboratory
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No.</b> TH05-HY, 03CH11-HY, 03CH13-HY

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

### 1.4 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

### 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
902-928 MHz	1	912.75	28	916.26
	2	912.88	29	916.39
	3	913.01	30	916.52
	4	913.14	31	916.65
	5	913.27	32	916.78
	6	913.4	33	916.91
	7	913.53	34	917.04
	8	913.66	35	917.17
	9	913.79	36	917.3
	10	913.92	37	917.43
	11	914.05	38	917.56
	12	914.18	39	917.69
	13	914.31	40	917.82
	14	914.44	41	917.95
	15	914.57	42	918.08
	16	914.7	43	918.21
	17	914.83	44	918.34
	18	914.96	45	918.47
	19	915.09	46	918.6
	20	915.22	47	918.73
	21	915.35	48	918.86
	22	915.48	49	918.99
	23	915.61	50	919.12
	24	915.74		
	25	915.87		
	26	916		
	27	916.13		



## 2.2 Test Mode

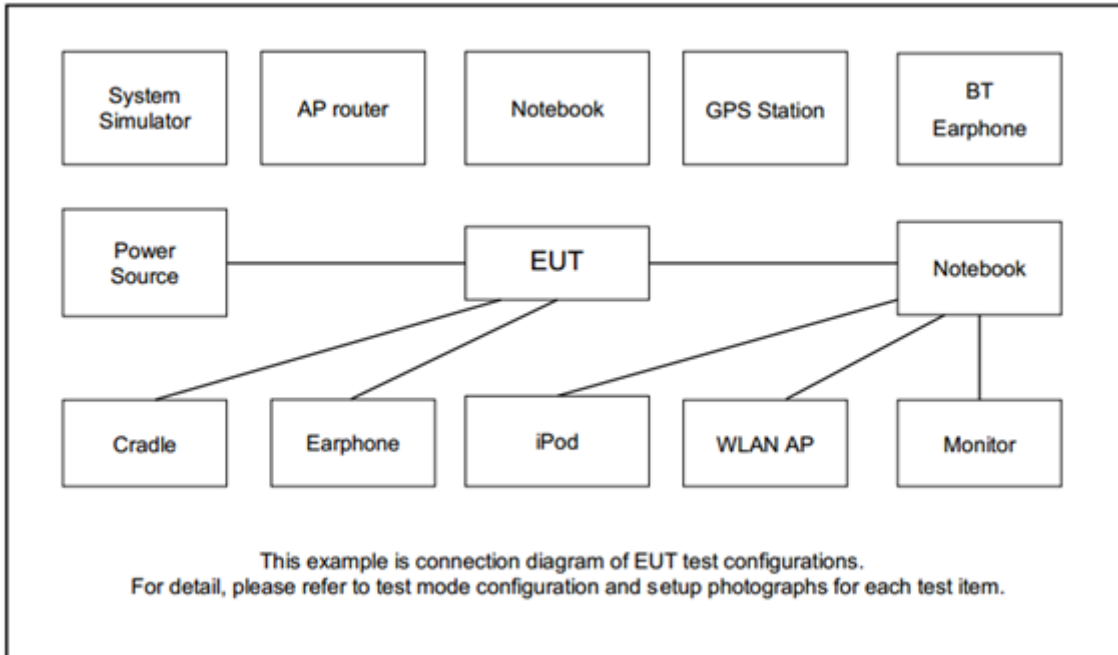
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	50 kbps / GFSK
<b>Conducted Test Cases</b>	Mode 1: CH01 Tx_912.75 MHz Mode 2: CH50 Tx_919.12 MHz
<b>Radiated Test Cases</b>	Mode 1: CH01 Tx_912.75 MHz Mode 2: CH50 Tx_919.12 MHz
<b>AC Conducted Emission</b>	Mode 1: PowerG PHY 912.75 MHz (Ch01) TX + USB Cable (Charging from Notebook)
<b>Remark:</b> 1. The test mode is configured by test software with the following configurations: <b>For the 14 dBm port:</b> <ul style="list-style-type: none"> <li>♦ Max power 12.5 dBm without duty cycling (with 100% duty cycle), and tested with antenna gain 2.0 dBi.</li> <li>♦ Max power 12.0 dBm without duty cycling (with 100% duty cycle), and tested with antenna gain 2.69 dBi.</li> <li>♦ Max power 14.0 dBm with duty cycling of 60ms_max (with 60% duty cycle), and tested with antenna gain 2.69 dBi.</li> <li>♦ Max power 14.0 dBm without duty cycling (with 100% duty cycle), and tested with antenna gain 2.69 dBi.</li> </ul> <b>For the 20 dBm port:</b> <ul style="list-style-type: none"> <li>♦ Max power 19.0 dBm without duty cycling (with 100% duty cycle), and tested with antenna gain 2.69 dBi.</li> <li>♦ Max power 20.0 dBm with duty cycling of 60ms_max (with 60% duty cycle), and tested with antenna gain 2.69 dBi.</li> </ul> 2. For the CSE and RSE measurement of 14 dBm port, the worst case data 14.0 dBm without duty cycling (with 100% duty cycle) is recorded in this report. 3. For the RSE measurement of 20 dBm port, 19.0 dBm without duty cycling (with 100% duty cycle), and 20.0 dBm with duty cycling of 60ms_max (with 60% duty cycle) are recorded in this report.	



### 2.3 Connection Diagram of Test System



### 2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude 3420	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	Acer	N18Q13	PD9AX201NG	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	Lenovo	Ideapad Gaming 3 15IHU6	PD9AX201NG	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
6.	Fixture 1	Texas Instruments	LP-XDS110	N/A	N/A	N/A
7.	Fixture 2	Texas Instruments	LP-EM-CC1312PSIP	N/A	N/A	N/A

### 2.5 EUT Operation Test Setup

The RF test items, utility “SmartRF\_Studio\_7 v2.29.4” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.



## 2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 Number of Channel Measurement

##### 3.1.1 Limits of Number of Hopping Frequency

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.

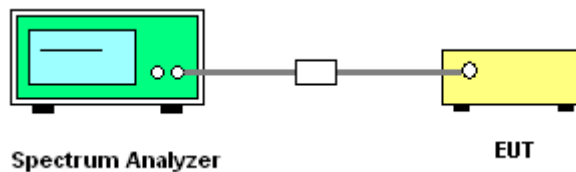
##### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

##### 3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation;  
RBW = 30kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.  
The number of hopping frequency used is defined as the number of total channel.
6. Record the measurement data derived from spectrum analyzer.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

## 3.2 Hopping Channel Separation Measurement

### 3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 902 – 928 MHz band 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.

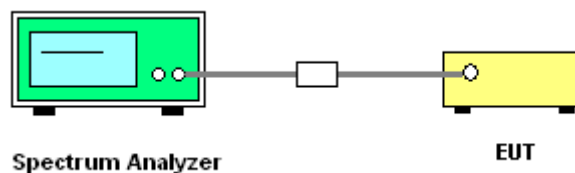
### 3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:  
Span = wide enough to capture the peaks of two adjacent channels;  
RBW = 30kHz for; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.  
Measure and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

### 3.3 Dwell Time Measurement

#### 3.3.1 Limit of Dwell Time

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

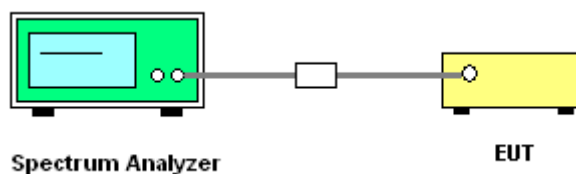
#### 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 100 kHz; VBW  $\geq$  RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

## 3.4 20dB and 99% Bandwidth Measurement

### 3.4.1 Limit of 20dB and 99% Bandwidth

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

99% Bandwidth is reporting only.

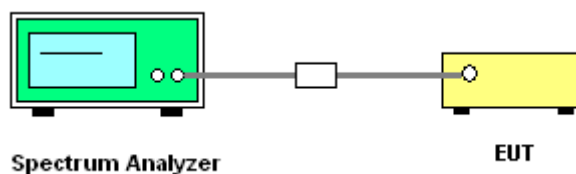
### 3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.  
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;  
RBW  $\geq$  1% of the 20 dB bandwidth; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak;  
Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.  
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;  
RBW  $\geq$  1-5% of the 99% bandwidth; VBW  $\geq$  3 \* RBW; Sweep = auto; Detector function = peak;  
Trace = max hold.
6. Measure and record the results in the test report.

### 3.4.4 Test Setup



### 3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

### 3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

## 3.5 Output Power Measurement

### 3.5.1 Limit of Output Power

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.

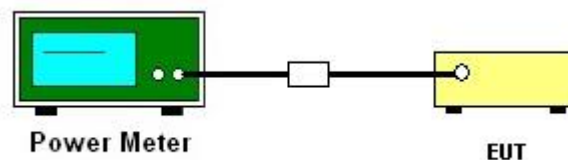
### 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

### 3.5.4 Test Setup



### 3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

### 3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

## 3.6 Conducted Band Edges Measurement

### 3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

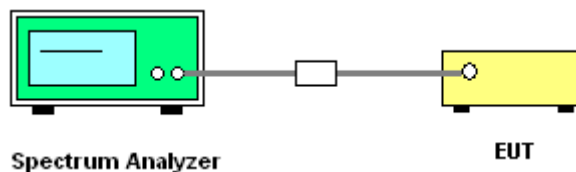
### 3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2 and 3.
5. Measure and record the results in the test report.

### 3.6.4 Test Setup



### 3.6.5 Test Result of Conducted Band Edges

Please refer to Appendix A.

### 3.6.6 Test Result of Conducted Hopping Mode Band Edges

Please refer to Appendix A.



## 3.7 Conducted Spurious Emission Measurement

### 3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

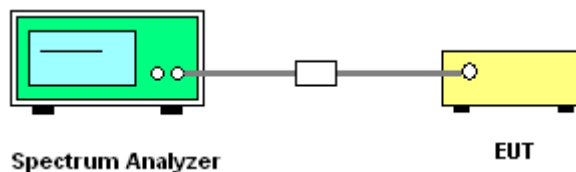
### 3.7.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.7.4 Test Setup



### 3.7.5 Test Result of Conducted Spurious Emission

Please refer to Appendix A.



### 3.8 Radiated Band Edges and Spurious Emission Measurement

#### 3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics / spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (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

#### 3.8.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.



### 3.8.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.2 Antenna-port conducted measurements.
2. Measure the conducted output power (in dBm) using the peak detector.
3. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP.
4. Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies  $\leq$  30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies  $>$  1000 MHz).
5. Convert the resultant EIRP to an equivalent electric field strength using the following relationship:  
$$E = \text{EIRP} - 20 \log d + 104.8,$$
where  
E is the electric field strength in dB $\mu$ V/m  
EIRP is the equivalent isotropically radiated power in dBm  
d is the specified measurement distance in 3m
6. Compare the resultant electric field strength level with the applicable regulatory limit.
7. Corrected Reading for conducted spurious emission: Antenna Factor + Cable Loss + Read Level = Level
8. Perform the cabinet radiated spurious emission test.
9. The EUT is 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.
10. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
11. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
12. Corrected Reading for cabinet radiated spurious emission: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
13. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.
14. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as “-“.

15. Use the following spectrum analyzer settings:

- (1) Span shall wide enough to fully capture the emission being measured;
- (2) Set RBW = 100 kHz for  $f < 1$  GHz;  $VBW \geq RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold;
- (3) Set RBW = 1 MHz, VBW = 3 MHz for  $f \geq 1$  GHz for peak measurement.
- (4) For RMS average measurement when 60 ms max TX\_on time duty cycling mode:

use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

On time =  $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$

Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

RMS Average Emission Level = Average Emission Level (reduced VBW) + 20\*log (Duty cycle)

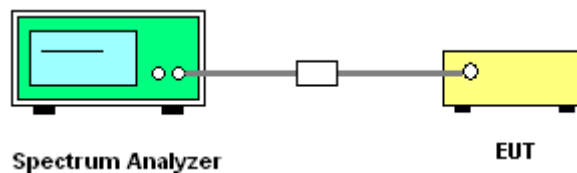
The maximum on time is 60 ms in the 100 ms period please refer to manufacture's Operational Description.

The RMS average levels are calculated from the average level (reduced VBW) corrected with duty cycle correction factor (-4.44 dB) derived from  $20\log(\text{dwell time}/100\text{ms})$ . This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

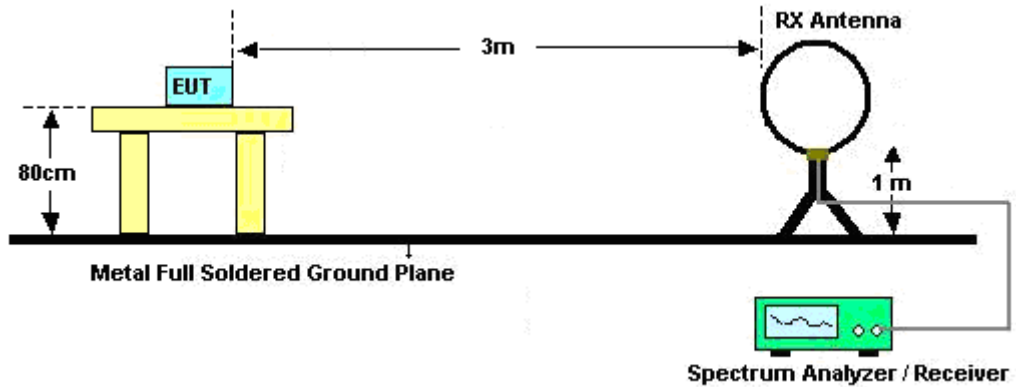
- (5) For average measurement when no duty cycling mode:
  - $VBW = 10$  Hz, when duty cycle is no less than 98 percent.
  - $VBW \geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.8.4 Test Setup

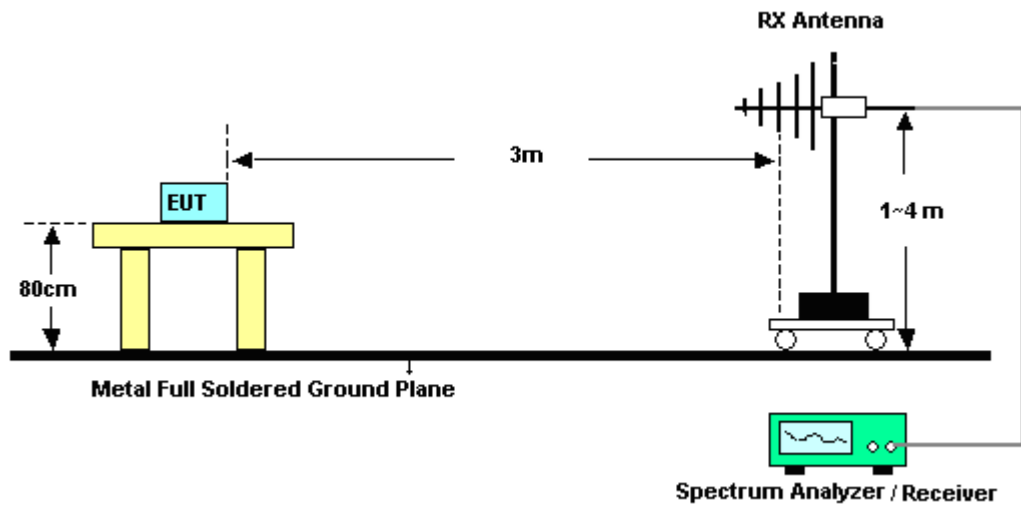
For antenna-port conducted measurement setup:



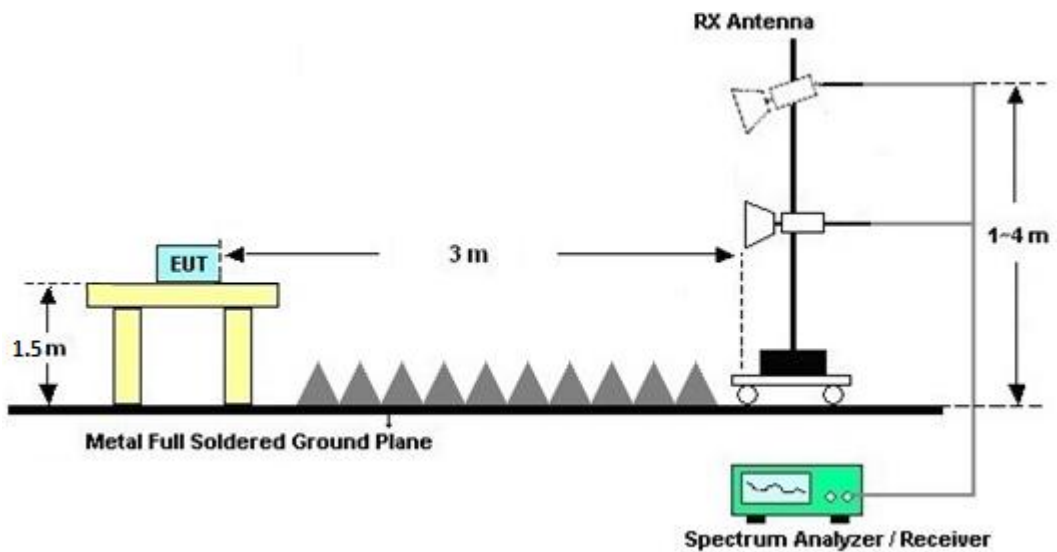
For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz





### **3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

### **3.8.6 Test Result of Conduced Spurious Emission in the Restricted Band (30 MHz ~ 10th Harmonic)**

Please refer to Appendix C and D.

### **3.8.7 Test Result of Cabinet Radiated Spurious Emission in the Restricted Band (30 MHz ~ 10th Harmonic)**

Please refer to Appendix E and F.

### **3.8.8 Duty Cycle**

Please refer to Appendix G.



### 3.9 AC Conducted Emission Measurement

#### 3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

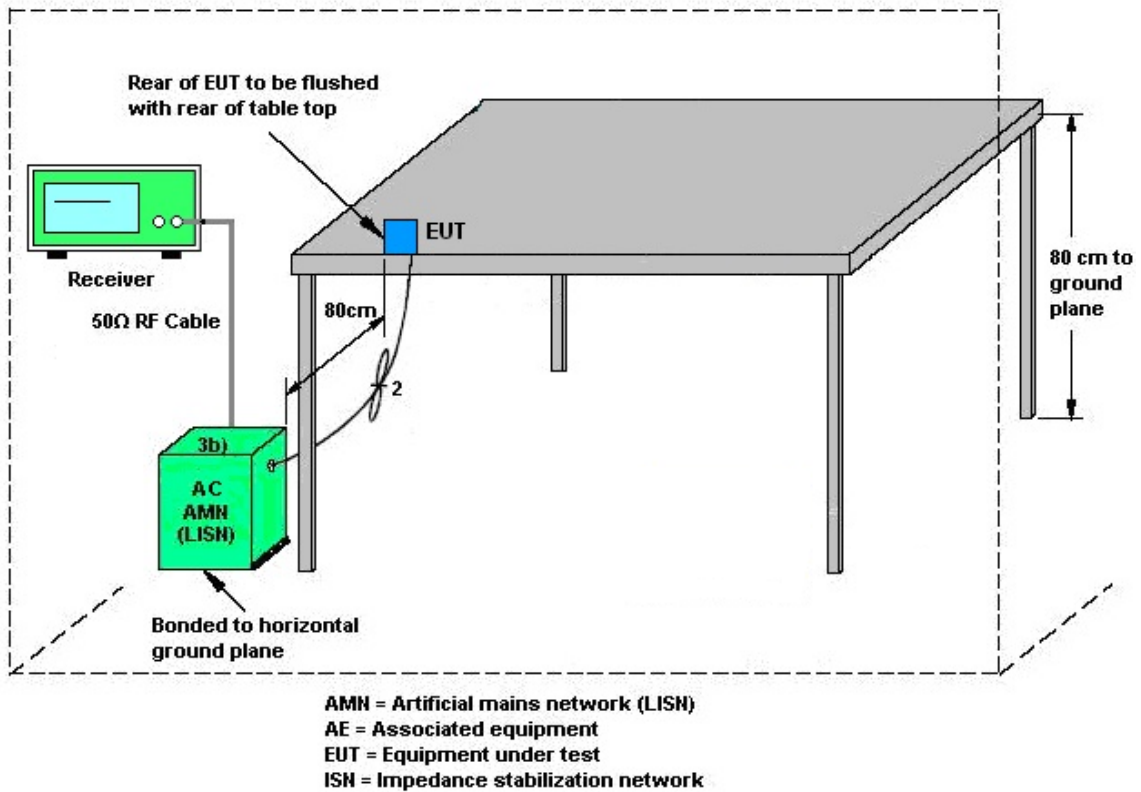
#### 3.9.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.9.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.9.4 Test Setup



### 3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.





## **3.10 Antenna Requirements**

### **3.10.1 Standard Applicable**

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

### **3.10.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.



## 4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Feb. 28, 2023	Nov. 02, 2023~ Nov. 07, 2023	Feb. 27, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9k~30M	Mar. 07, 2023	Nov. 02, 2023~ Nov. 07, 2023	Mar. 06, 2024	Radiation (03CH13-HY)
Amplifier	SONOMA	310N	187282	9kHz~1GHz	Dec. 14, 2022	Nov. 02, 2023~ Nov. 07, 2023	Dec. 13, 2023	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	40103 & 07	30MHz~1GHz	Apr. 23, 2023	Nov. 02, 2023~ Nov. 07, 2023	Apr. 22, 2024	Radiation (03CH13-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290045	20MHz~8.4GHz	Apr. 25, 2023	Nov. 02, 2023~ Nov. 07, 2023	Apr. 24, 2024	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz~18GHz	Aug. 17, 2023	Nov. 02, 2023~ Nov. 07, 2023	Aug. 16, 2024	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 16, 2023	Nov. 02, 2023~ Nov. 07, 2023	May 15, 2024	Radiation (03CH13-HY)
Preamplifier	EM Electronics	EM01G18G	060803	1GHz~18GHz	Jan. 10, 2023	Nov. 02, 2023~ Nov. 07, 2023	Jan. 09, 2024	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 23, 2023	Nov. 02, 2023~ Nov. 07, 2023	Mar. 22, 2024	Radiation (03CH13-HY)
Filter	Wainwright	WLK4-1000-15 30-8000-40SS	SN4	1.53GHz Low Pass Filter	Jun. 14, 2023	Nov. 02, 2023~ Nov. 07, 2023	Jun. 13, 2024	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12-935-1000-15000-40 ST	SN1	1GHz High Pass Filter	Apr. 27, 2023	Nov. 02, 2023~ Nov. 07, 2023	Apr. 26, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 08, 2023	Nov. 02, 2023~ Nov. 07, 2023	Feb. 07, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 08, 2023	Nov. 02, 2023~ Nov. 07, 2023	Feb. 07, 2024	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 08, 2023	Nov. 02, 2023~ Nov. 07, 2023	Feb. 07, 2024	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 02, 2023~ Nov. 07, 2023	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 02, 2023~ Nov. 07, 2023	N/A	Radiation (03CH13-HY)
Software	Audix	N/A	RK-001124	N/A	N/A	Nov. 02, 2023~ Nov. 07, 2023	N/A	Radiation (03CH13-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Dec. 21, 2023	Sep. 11, 2024	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 07, 2023	Dec. 21, 2023	Oct. 06, 2024	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Aug. 17, 2023	Dec. 21, 2023	Aug. 16, 2024	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 08, 2023	Dec. 21, 2023	Dec. 07, 2024	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055007	1GHz~18GHz	Jun. 14, 2023	Dec. 21, 2023	Jun. 13, 2024	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 05, 2023	Dec. 21, 2023	Oct. 04, 2024	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Oct. 06, 2023	Dec. 21, 2023	Oct. 05, 2024	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Dec. 21, 2023	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Dec. 21, 2023	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Dec. 21, 2023	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz~40GHz	Mar. 07, 2023	Dec. 21, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801595/2	30MHz~40GHz	Mar. 07, 2023	Dec. 21, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9K~30M	Mar. 07, 2023	Dec. 21, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	30M~40G	Mar. 07, 2023	Dec. 21, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN11	1.53G Low Pass	Sep. 11, 2023	Dec. 21, 2023	Sep. 10, 2024	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN12	1GHz High Pass Filter	Sep. 11, 2023	Dec. 21, 2023	Sep. 10, 2024	Radiation (03CH11-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1036004	N/A	Jul. 27, 2023	Nov. 01, 2023~ Dec. 19, 2023	Jul. 26, 2024	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz z	Jul. 27, 2023	Nov. 01, 2023~ Dec. 19, 2023	Jul. 26, 2024	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 23, 2023	Nov. 01, 2023~ Dec. 19, 2023	Aug. 22, 2024	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV3013	101549	10Hz~13.6GHz	Jan. 31, 2023	Nov. 01, 2023~ Dec. 19, 2023	Jan. 30, 2024	Conducted (TH05-HY)
Spectrum Analyzer	ROHDE & SCHWARZ	FSV40	101565	10Hz~40GHz	Dec. 26, 2022	Nov. 03, 2023~ Dec. 20, 2023	Dec. 25, 2023	CSE (TH05-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Feb. 08, 2023	Nov. 03, 2023~ Dec. 20, 2023	Feb. 07, 2024	CSE (TH05-HY)
Filter	Wainwright	WHKX12-1080-1200-15000-60ST	SN5	1.2GHz High Pass Filter	Jun. 14, 2023	Nov. 03, 2023	Jun. 13, 2024	CSE (TH05-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN12	1GHz High Pass Filter	Sep. 11, 2023	Dec. 20, 2023	Sep. 10, 2024	CSE (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 02, 2023	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Nov. 02, 2023	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Nov. 02, 2023	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2022	Nov. 02, 2023	Nov. 30, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Nov. 02, 2023	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Nov. 02, 2023	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	9kHz~200MHz	Jul. 28, 2023	Nov. 02, 2023	Jul. 27, 2024	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 29, 2022	Nov. 02, 2023	Dec. 28, 2023	Conduction (CO05-HY)



## 5 Measurement Uncertainty

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.5 dB
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<For 03CH13-HY>

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.5 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.2 dB
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### Uncertainty of Radiated Emission Measurement (6000 MHz ~ 180000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.6 dB
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<For 03CH11-HY>

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.1 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.3 dB
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### Uncertainty of Radiated Emission Measurement (6000 MHz ~ 180000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.3 dB
---	--------

**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Mina Liu	Temperature:	21~25	°C
Test Date:	2023/11/1~2023/12/19	Relative Humidity:	50-56	%

&lt;60 ms max Tx\_on time duty cycling, 20 dBm and antenna gain 2.69 dBi&gt;

**TEST RESULTS DATA**  
**20dB and 99% Occupied Bandwidth**

Operation Band	NTX	CH.	Freq. (MHz)	99% Bandwidth (kHz)	20dB BW (kHz)	20dB BW Limit (kHz)	Pass/Fail
902-928 MHz	1	1	912.75	96.803	104.630	< 500	Pass
902-928 MHz	1	50	919.12	98.901	103.760	< 500	Pass

**TEST RESULTS DATA**  
**Hopping Channel Separation**

Operation Band	NTX	CH.	Hopping Channel Separation (kHz)	Hopping Channel Separation Limit (kHz)	Pass/Fail
902-928 MHz	1	1~2	128.570	> 104.630	Pass
902-928 MHz	1	49~50	129.670	> 103.760	Pass

**TEST RESULTS DATA**  
**Dwell Time**

Operation Band	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Hopping	32.00	6.05	0.19	0.40	Pass

**TEST RESULTS DATA**  
**Peak Power Table**

Operation Band	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
902-928 MHz	1	1	912.75	19.63	30.00	2.69	22.32	36.00	Pass
902-928 MHz	1	50	919.12	19.65	30.00	2.69	22.34	36.00	Pass

**TEST RESULTS DATA**  
**Average Power Table**  
**(Reporting Only)**

Operation Band	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Duty Factor (dB)
902-928 MHz	1	1	912.75	19.51	0.00
902-928 MHz	1	50	919.12	19.53	0.00

**TEST RESULTS DATA**  
**Number of Hopping Frequency**

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
50	≥ 50	Pass

< No duty cycling, 19 dBm and antenna gain 2.69 dBi>

<b>TEST RESULTS DATA</b>										
<b>Peak Power Table</b>										
Operation Band	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	
902-928 MHz	1	1	912.75	18.73	30.00	2.69	21.42	36.00	Pass	
902-928 MHz	1	50	919.12	18.72	30.00	2.69	21.41	36.00	Pass	

<b>TEST RESULTS DATA</b>						
<b>Average Power Table</b>						
<b>(Reporting Only)</b>						
Operation Band	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Duty Factor (dB)	
902-928 MHz	1	1	912.75	18.60	0.00	
902-928 MHz	1	50	919.12	18.58	0.00	

&lt;60 ms max Tx\_on time duty cycling, 14 dBm and antenna gain 2.69 dBi&gt;

**TEST RESULTS DATA**  
**20dB and 99% Occupied Bandwidth**

Operation Band	NTX	CH.	Freq. (MHz)	99% Bandwidth (kHz)	20dB BW (kHz)	20dB BW Limit (kHz)	Pass/Fail
902-928 MHz	1	1	912.75	94.705	103.400	< 500	Pass
902-928 MHz	1	50	919.12	93.506	103.100	< 500	Pass

**TEST RESULTS DATA**  
**Hopping Channel Separation**

Operation Band	NTX	CH.	Hopping Channel Separation (kHz)	Hopping Channel Separation Limit (kHz)	Pass/Fail
902-928 MHz	1	1~2	130.220	> 103.400	Pass
902-928 MHz	1	49~50	130.220	> 103.100	Pass

**TEST RESULTS DATA**  
**Dwell Time**

Operation Band	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Hopping	43.00	5.23	0.22	0.40	Pass

**TEST RESULTS DATA**  
**Peak Power Table**

Operation Band	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
902-928 MHz	1	1	912.75	13.63	30.00	2.69	16.32	36.00	Pass
902-928 MHz	1	50	919.12	13.59	30.00	2.69	16.28	36.00	Pass

**TEST RESULTS DATA**  
**Average Power Table**  
**(Reporting Only)**

Operation Band	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Duty Factor (dB)
902-928 MHz	1	1	912.75	13.47	0.00
902-928 MHz	1	50	919.12	13.40	0.00

**TEST RESULTS DATA**  
**Number of Hopping Frequency**

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
50	≥ 50	Pass



&lt;No duty cycling, 12.5 dBm and antenna gain 2 dBi&gt;

**TEST RESULTS DATA****Peak Power Table**

Operation Band	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
902-928 MHz	1	1	912.75	<b>11.60</b>	30.00	2.00	13.60	36.00	Pass
902-928 MHz	1	50	919.12	11.55	30.00	2.00	13.55	36.00	Pass

**TEST RESULTS DATA****Average Power Table****(Reporting Only)**

Operation Band	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Duty Factor (dB)
902-928 MHz	1	1	912.75	<b>11.34</b>	0.00
902-928 MHz	1	50	919.12	11.26	0.00

&lt;No duty cycling, 12 dBm and antenna gain 2.69 dBi&gt;

**TEST RESULTS DATA****Peak Power Table**

Operation Band	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
902-928 MHz	1	1	912.75	<b>10.44</b>	30.00	2.69	13.13	36.00	Pass
902-928 MHz	1	50	919.12	10.39	30.00	2.69	13.08	36.00	Pass

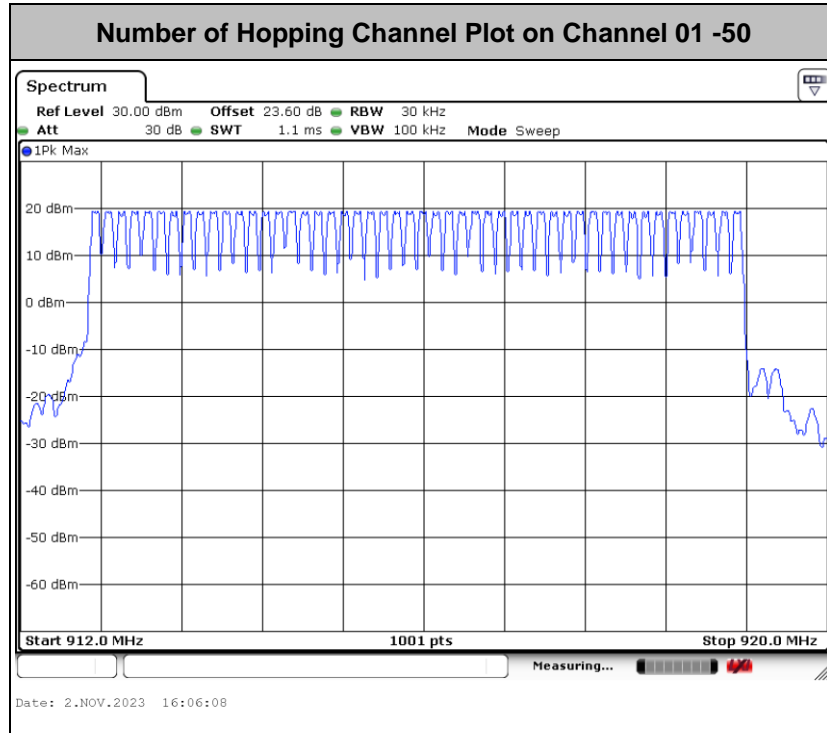
**TEST RESULTS DATA****Average Power Table****(Reporting Only)**

Operation Band	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Duty Factor (dB)
902-928 MHz	1	1	912.75	<b>10.08</b>	0.00
902-928 MHz	1	50	919.12	10.01	0.00



<60 ms max Tx\_on time duty cycling, 20 dBm and antenna gain 2.69 dBi>

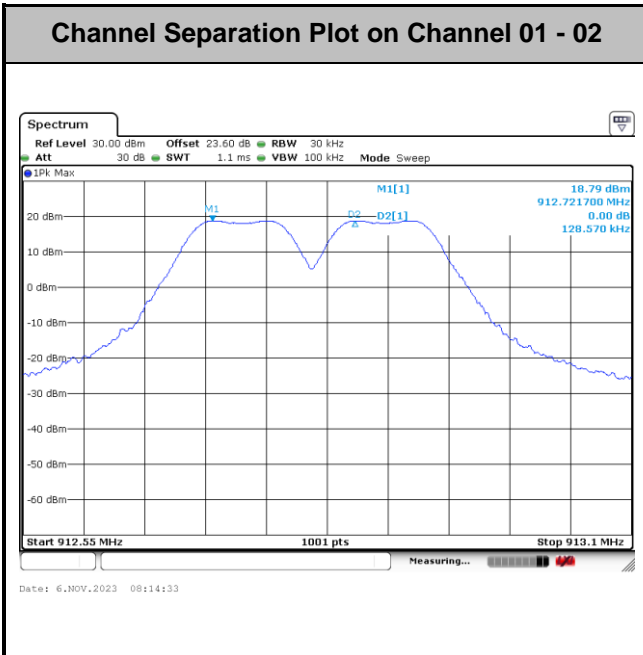
### Number of Hopping Frequency



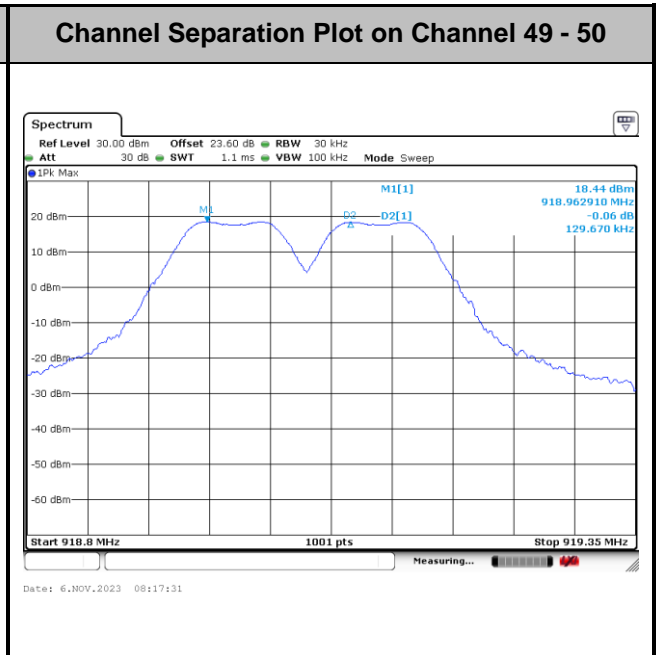


# Hopping Channel Separation

Channel Separation Plot on Channel 01 - 02

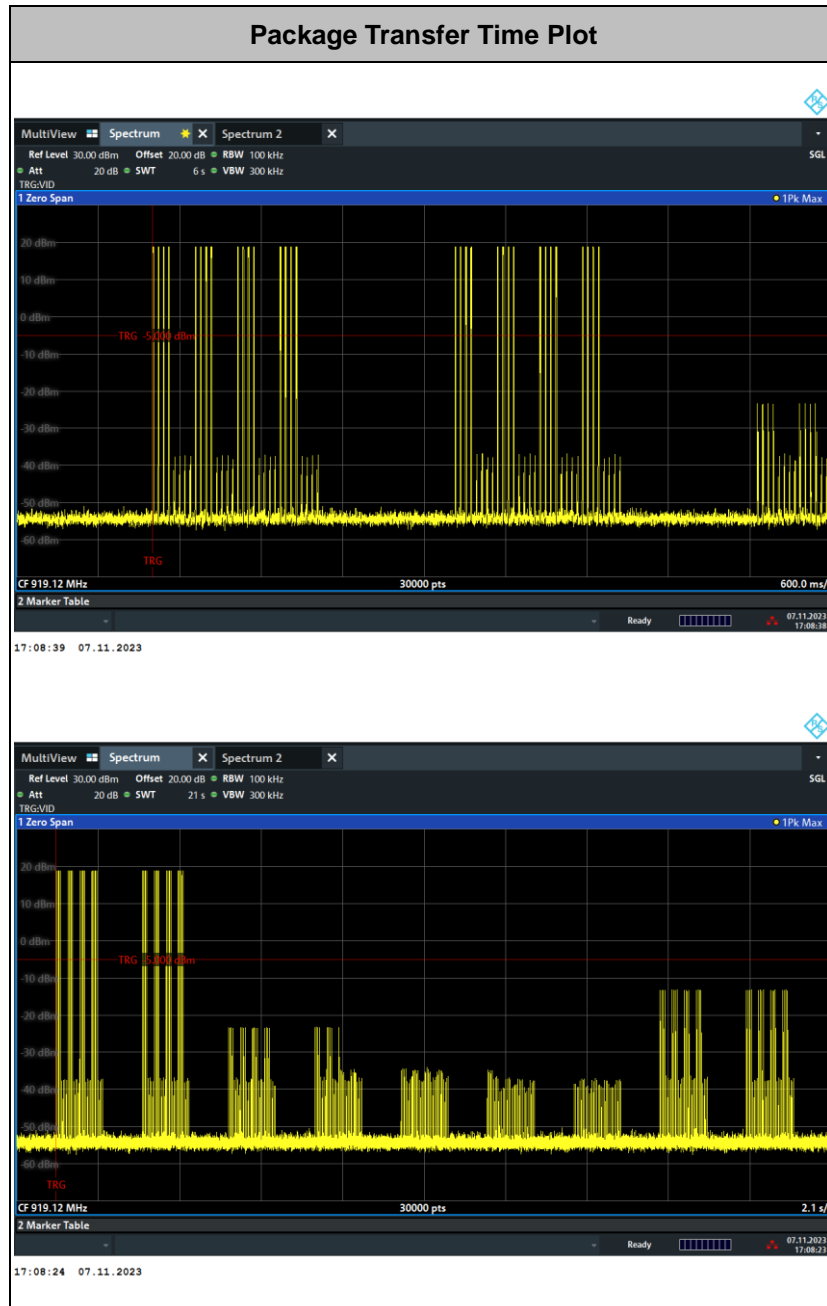


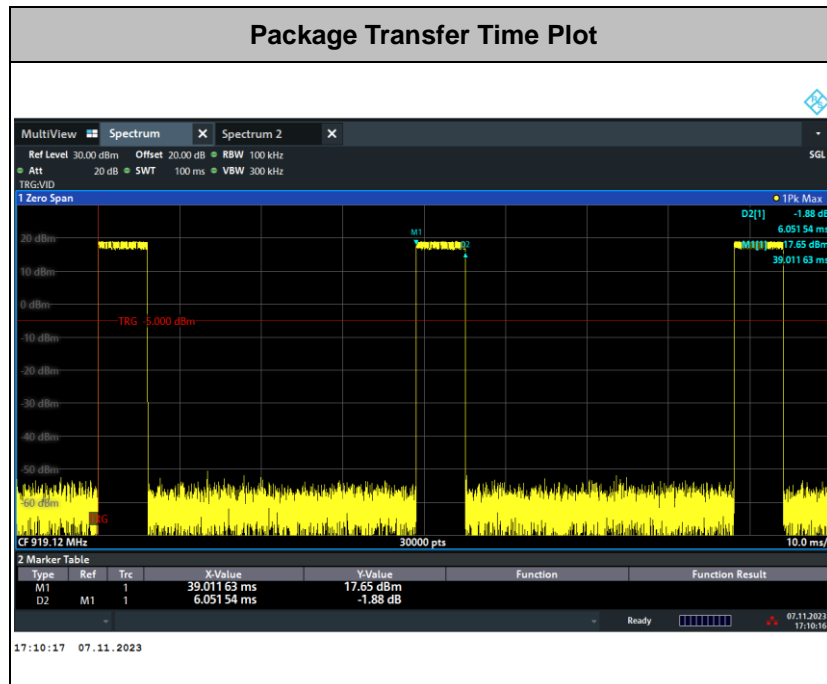
Channel Separation Plot on Channel 49 - 50





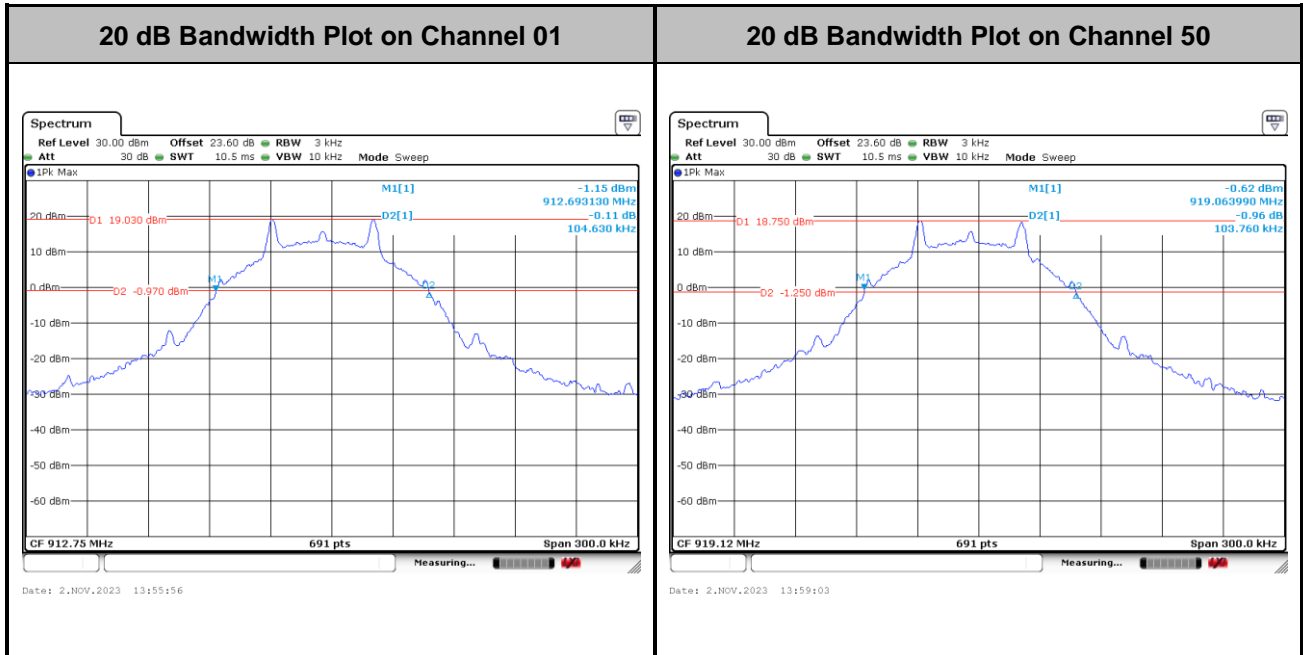
# Dwell Time





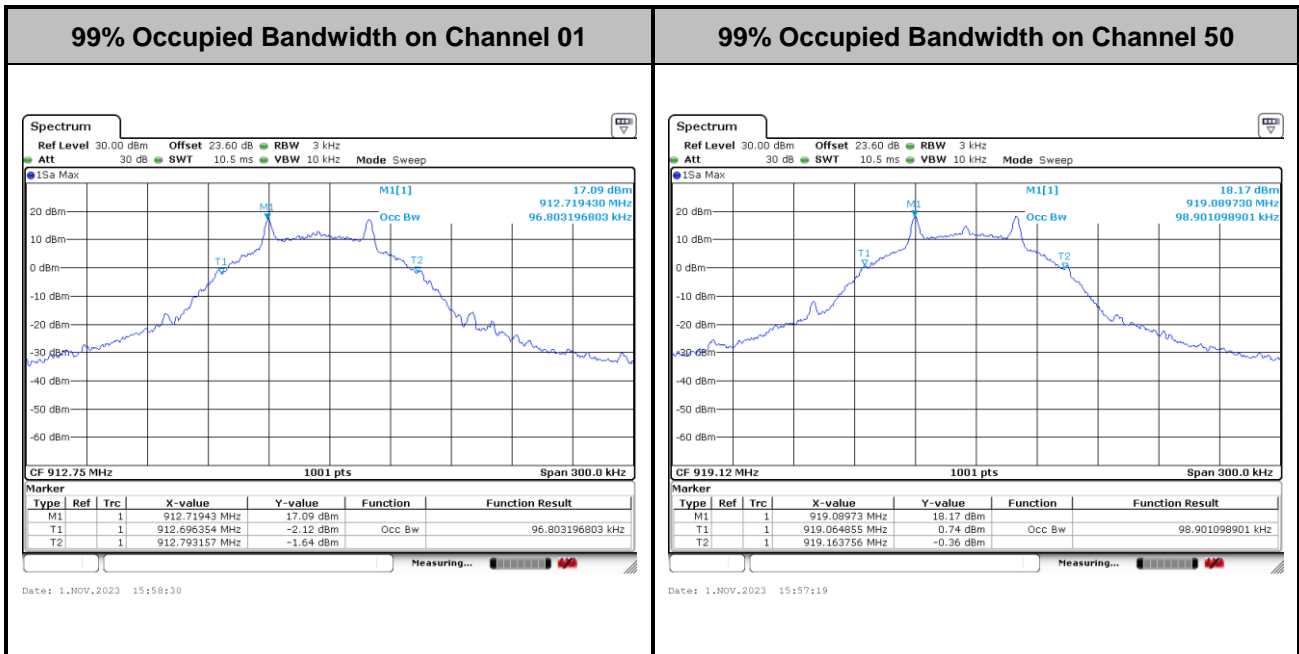


### 20dB Bandwidth





# 99% Occupied Bandwidth

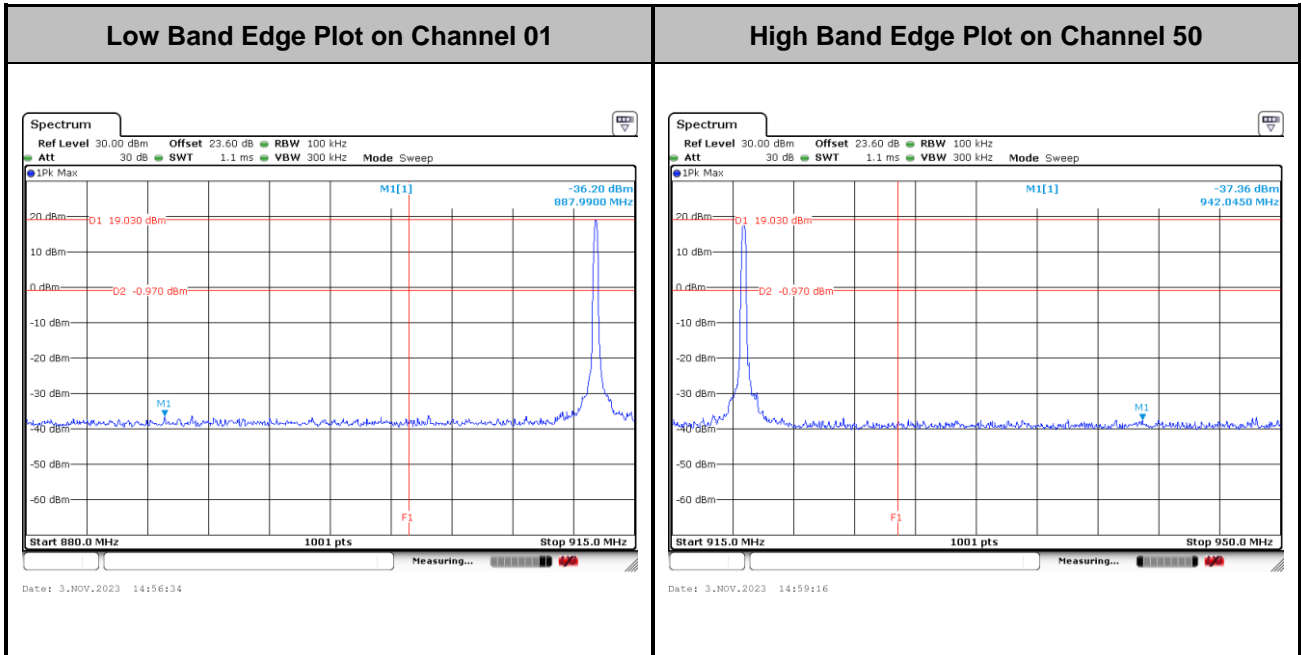


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

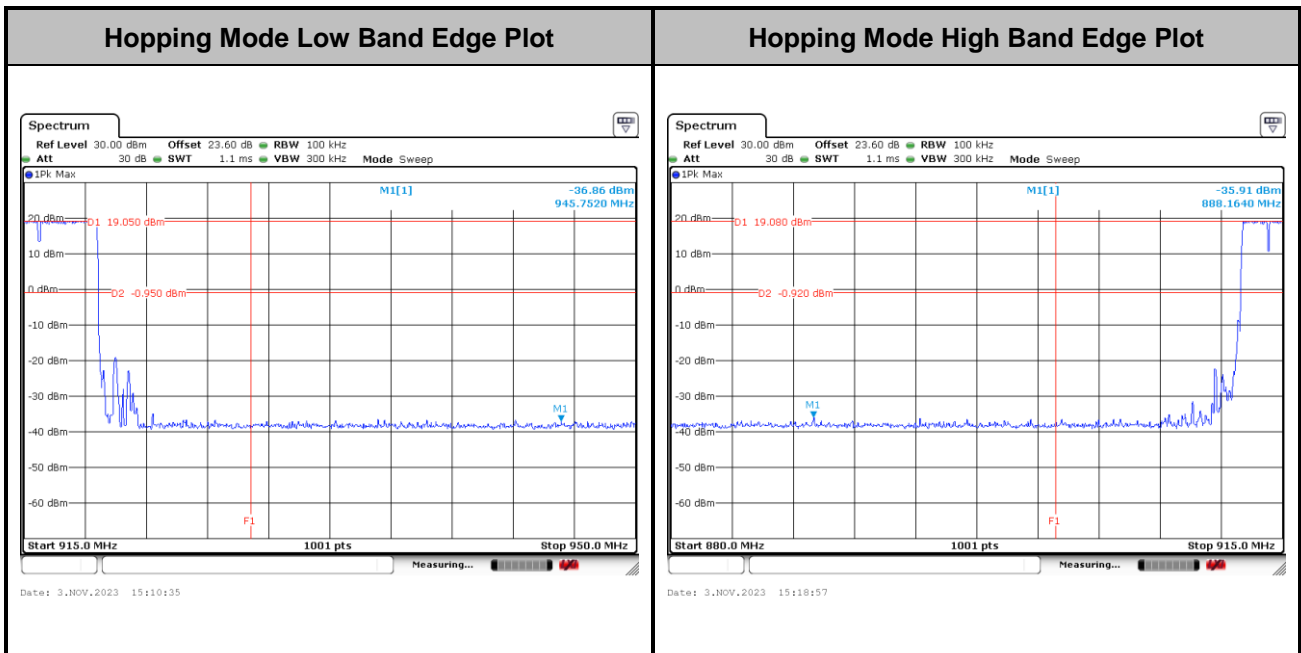




### Band Edges



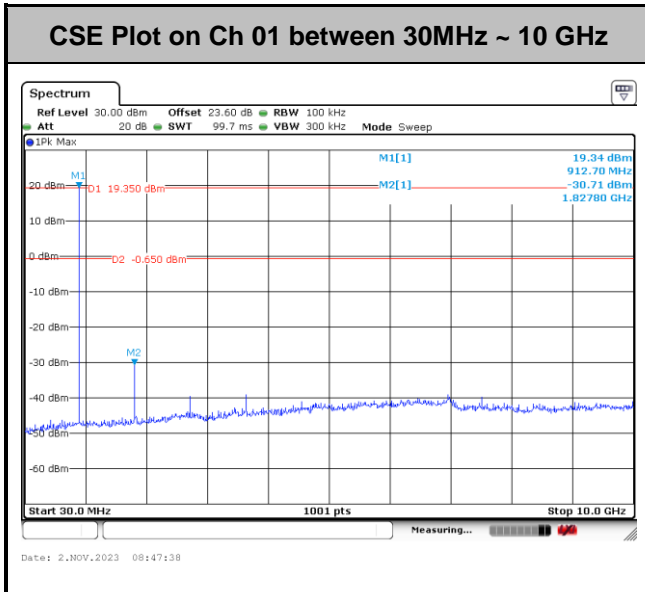
### Hopping Mode Band Edges



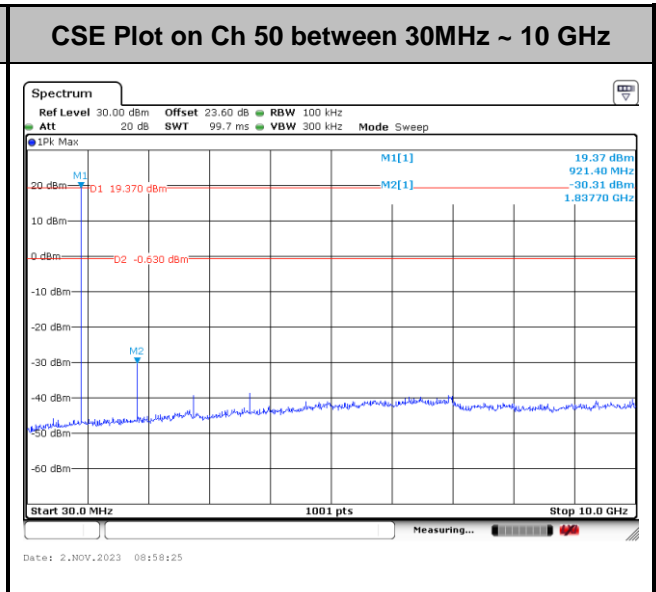


# Spurious Emission

CSE Plot on Ch 01 between 30MHz ~ 10 GHz



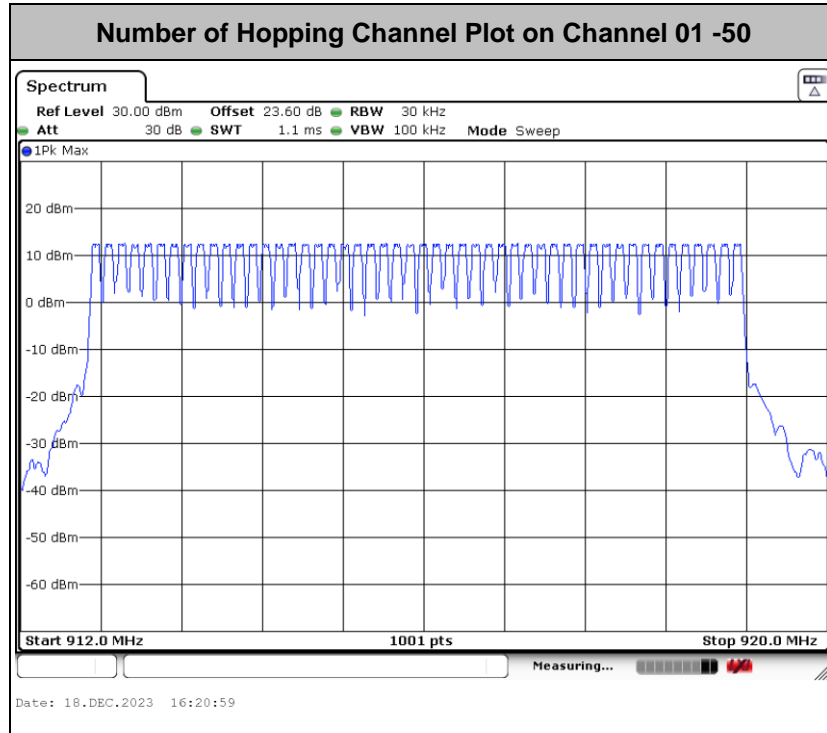
CSE Plot on Ch 50 between 30MHz ~ 10 GHz





<60 ms max Tx\_on time duty cycling, 14 dBm and antenna gain 2.69 dBi>

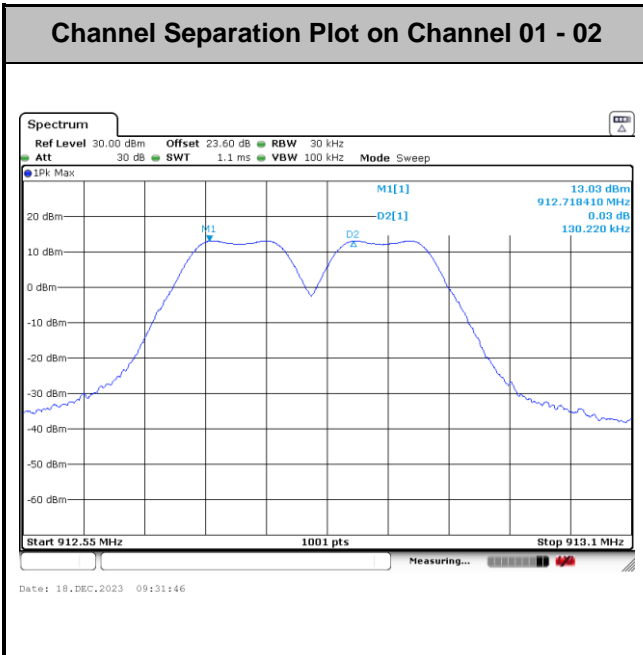
### Number of Hopping Frequency



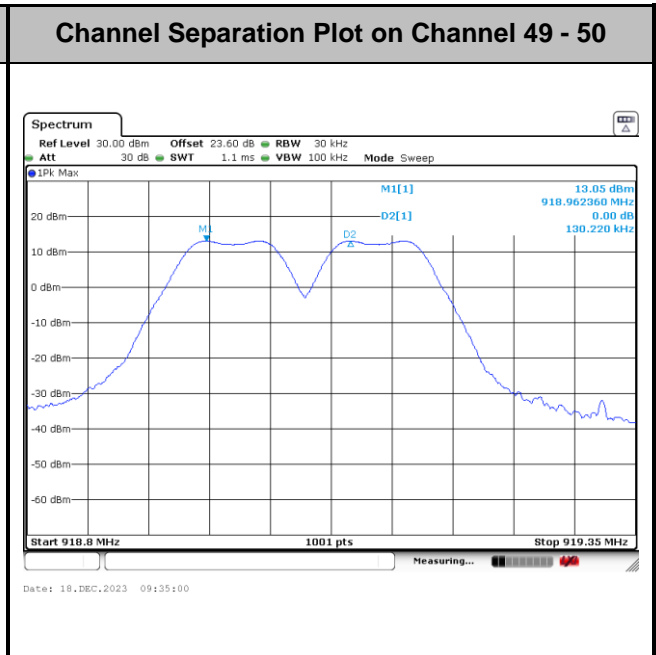


# Hopping Channel Separation

Channel Separation Plot on Channel 01 - 02

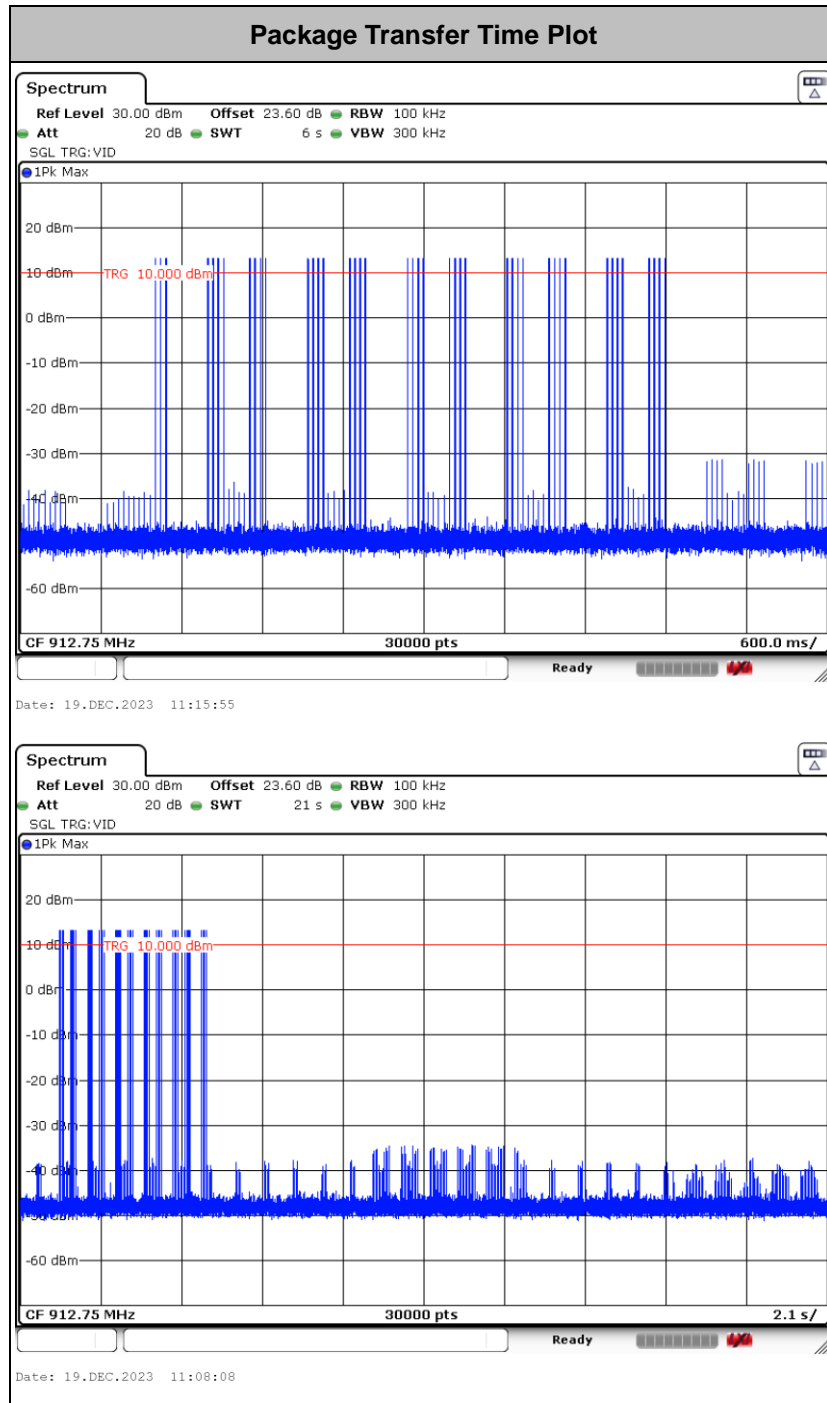


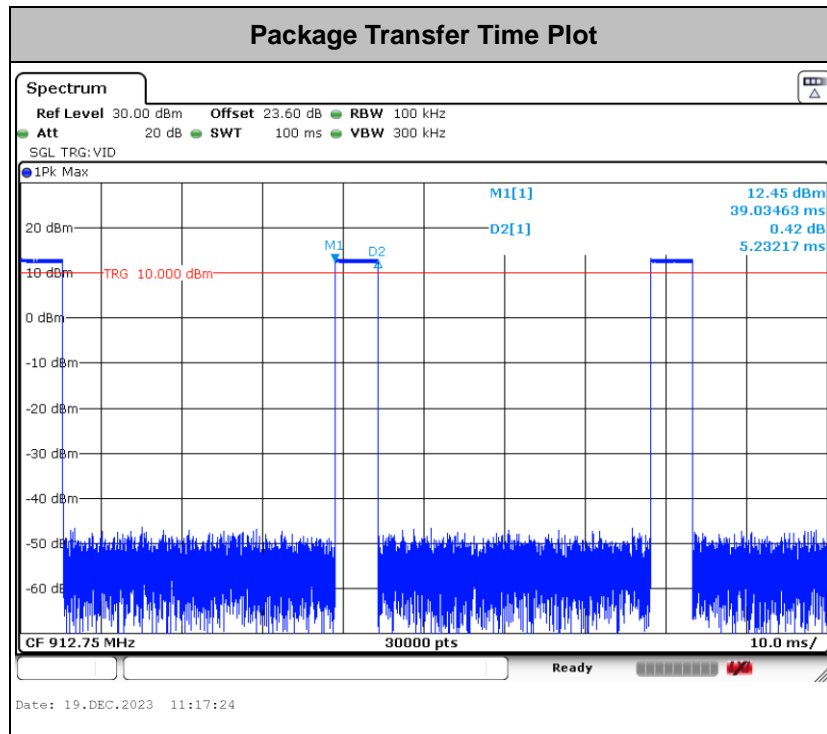
Channel Separation Plot on Channel 49 - 50





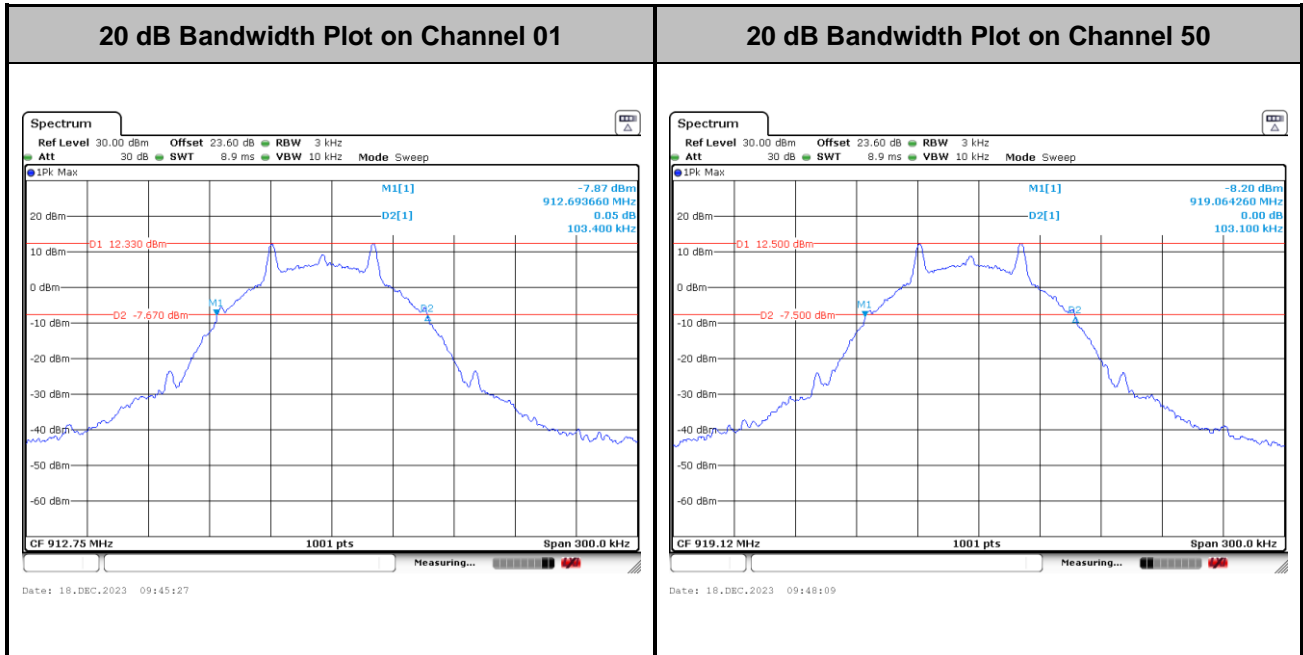
# Dwell Time





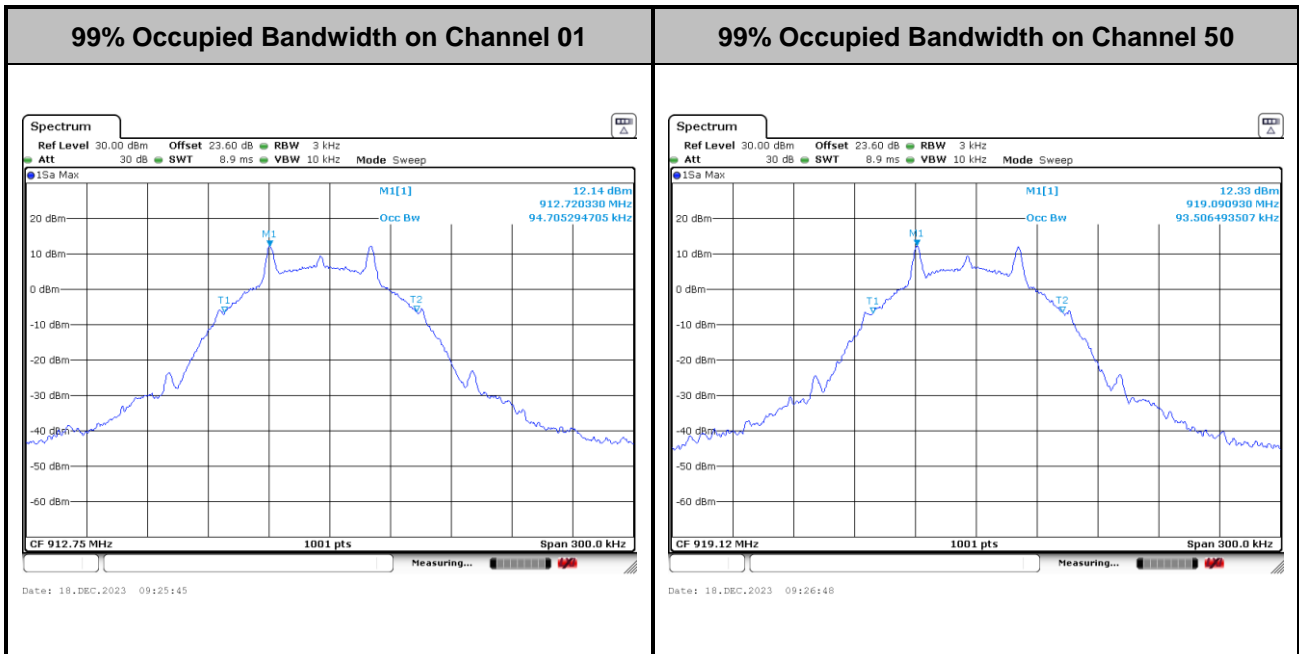


### 20dB Bandwidth





# 99% Occupied Bandwidth

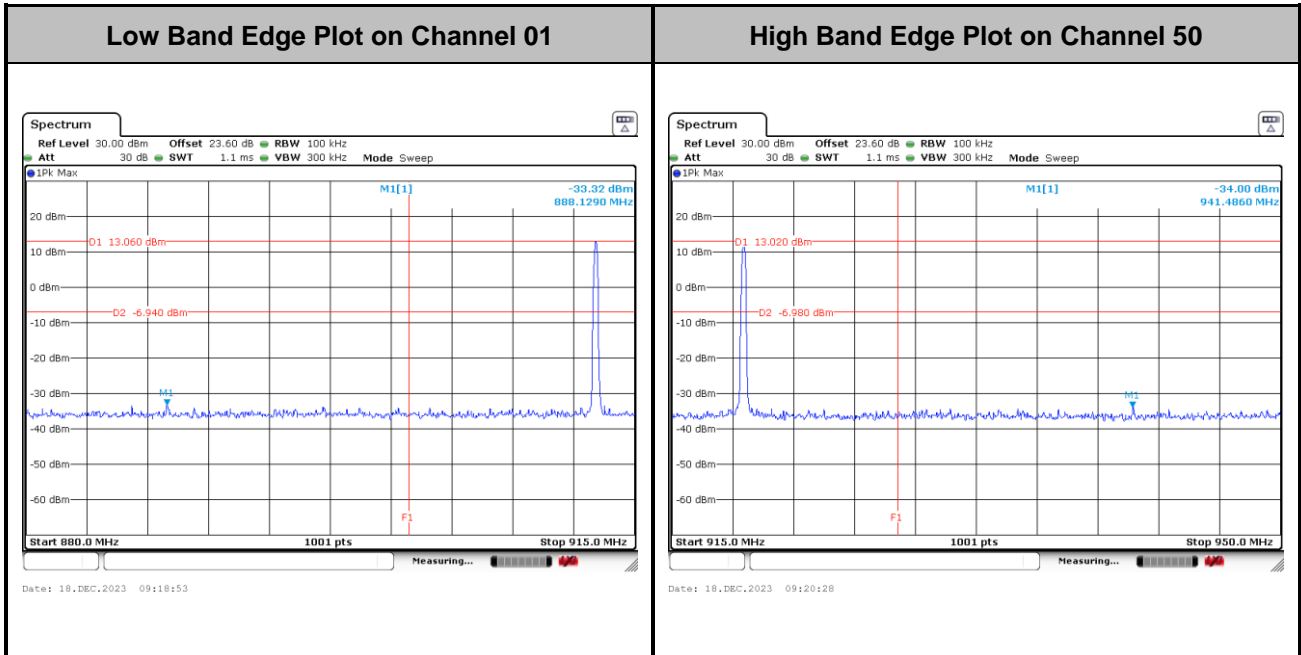


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

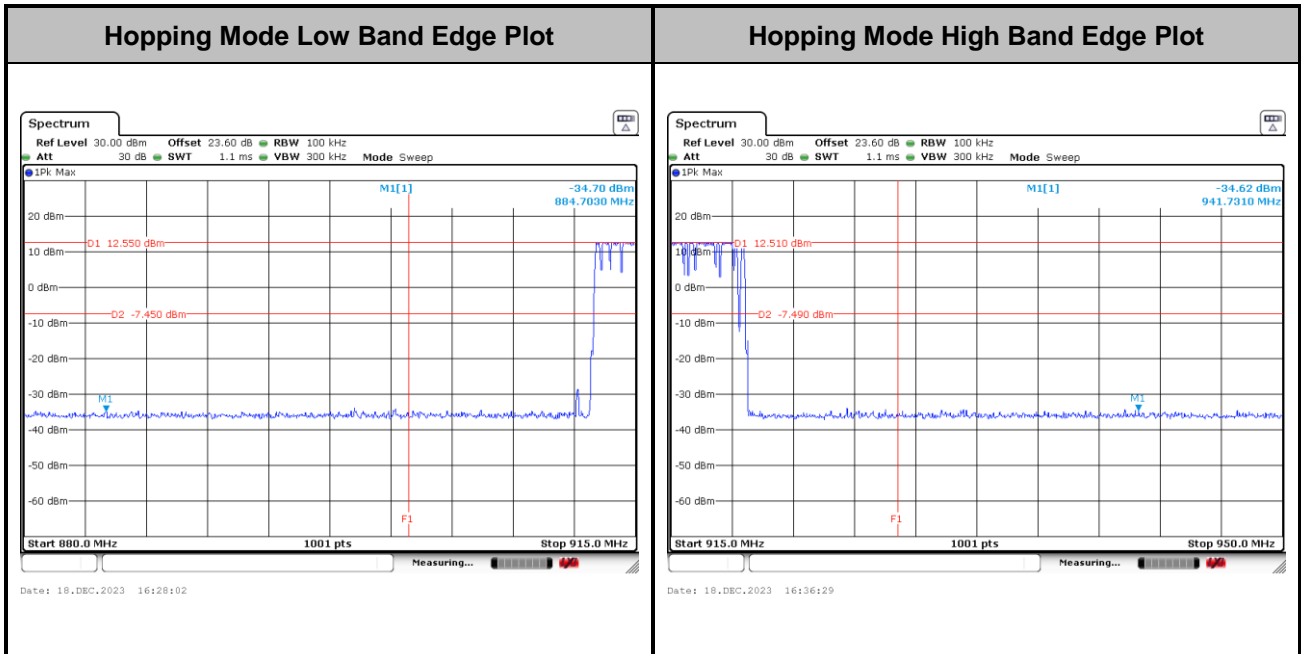




# Band Edges



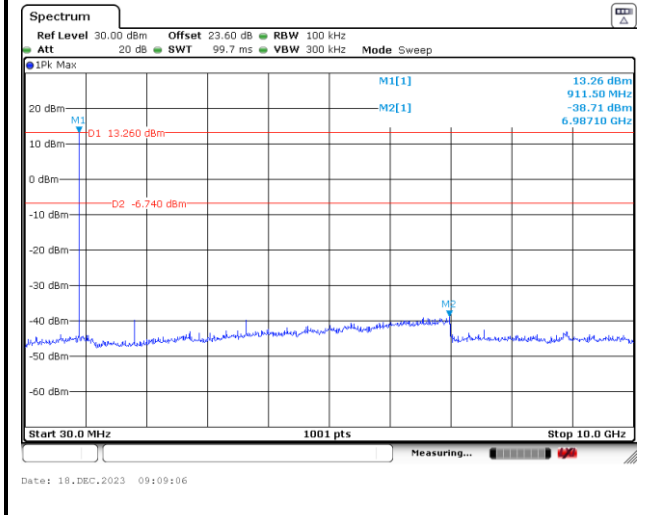
# Hopping Mode Band Edges



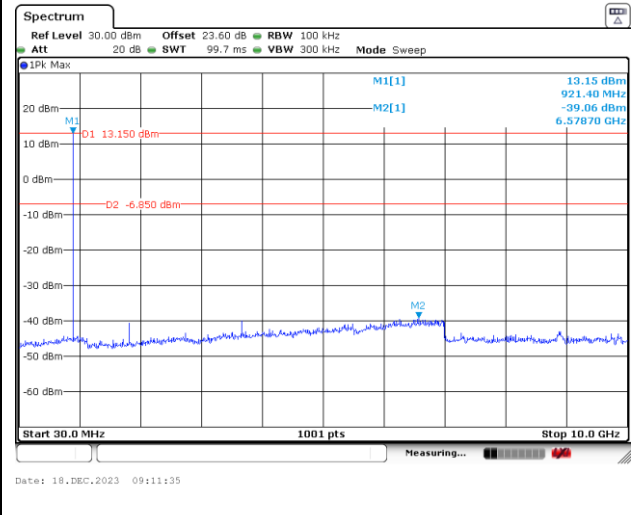


# Spurious Emission

CSE Plot on Ch 01 between 30MHz ~ 10 GHz



CSE Plot on Ch 50 between 30MHz ~ 10 GHz





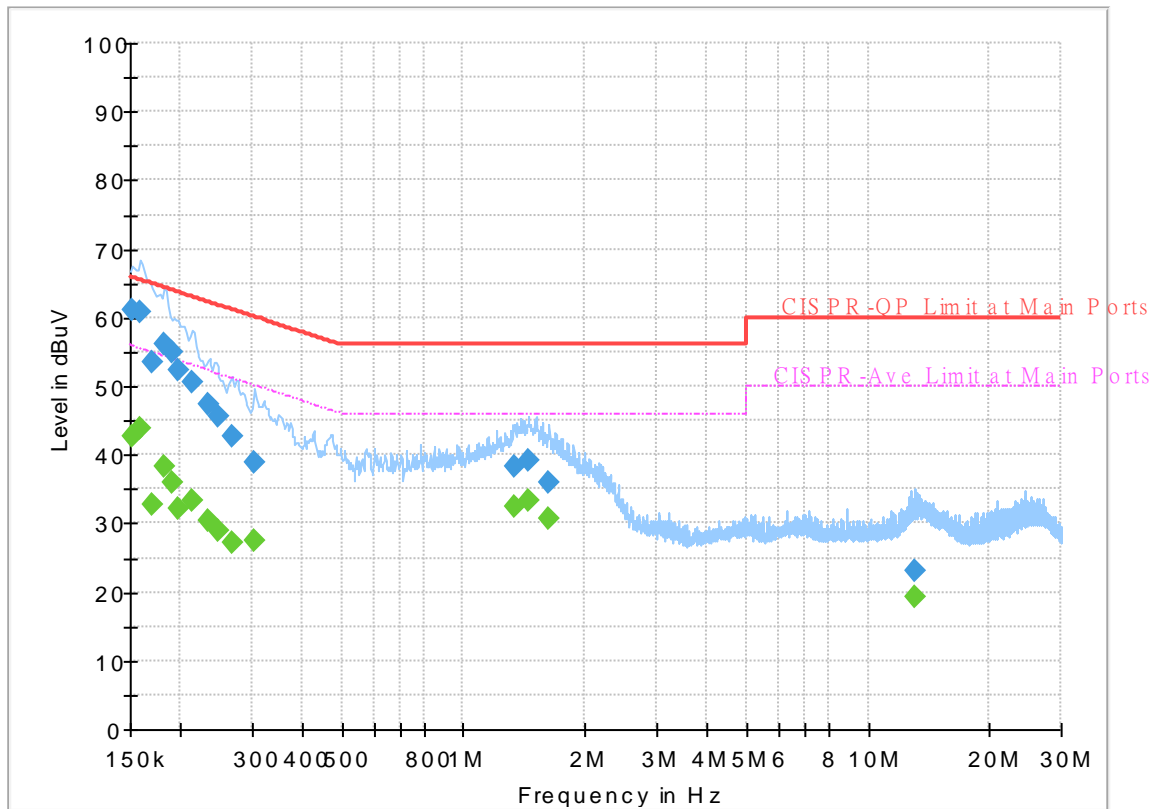
## Appendix B. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	Temperature :	23~26°C
		Relative Humidity :	45~55%

# EUT Information

Test Mode : Mode 1  
 Test Voltage : Power From System  
 Phase : Line

Full Spectrum



## Final\_Result

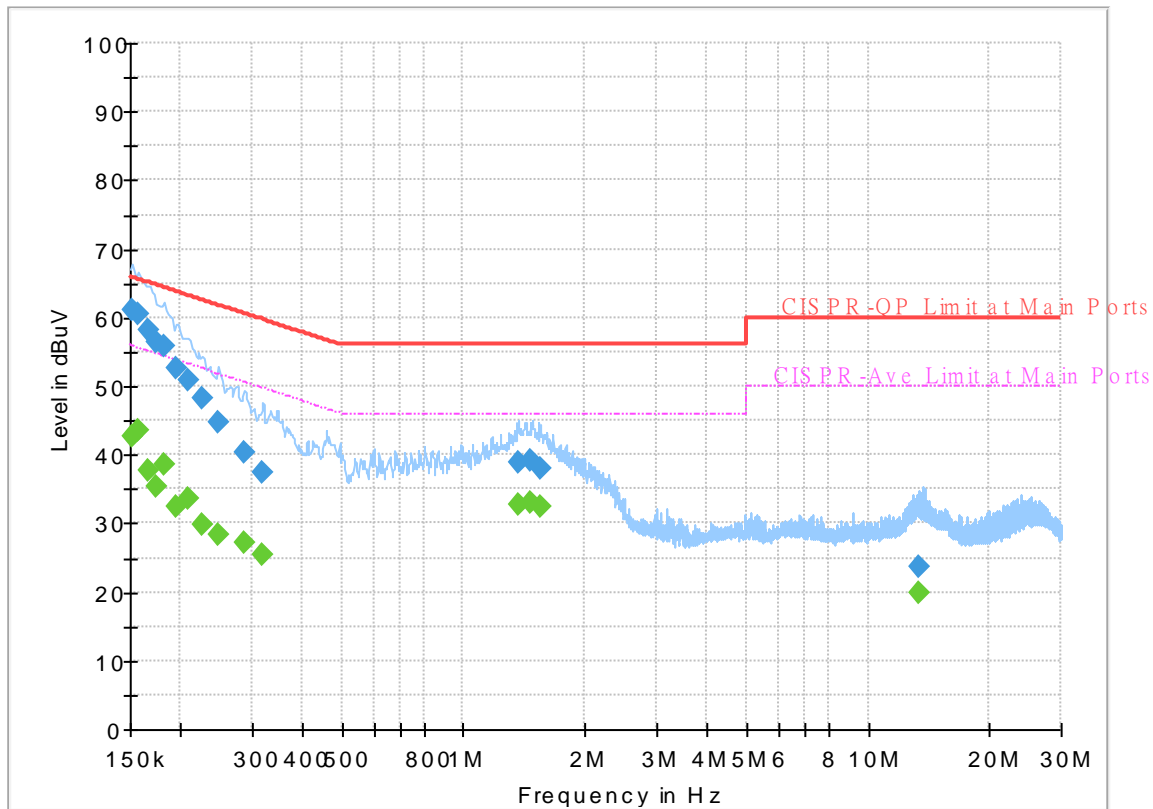
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	42.77	55.88	13.11	L1	OFF	19.8
0.152250	61.24	---	65.88	4.64	L1	OFF	19.8
0.159000	---	43.80	55.52	11.72	L1	OFF	19.8
0.159000	60.74	---	65.52	4.78	L1	OFF	19.8
0.170250	---	32.61	54.95	22.34	L1	OFF	19.8
0.170250	53.50	---	64.95	11.45	L1	OFF	19.8
0.181500	---	38.38	54.42	16.04	L1	OFF	19.8
0.181500	56.00	---	64.42	8.42	L1	OFF	19.8
0.190500	---	35.98	54.02	18.04	L1	OFF	19.8
0.190500	55.07	---	64.02	8.95	L1	OFF	19.8
0.197250	---	32.23	53.73	21.50	L1	OFF	19.8
0.197250	52.34	---	63.73	11.39	L1	OFF	19.8
0.213000	---	33.47	53.09	19.62	L1	OFF	19.8
0.213000	50.61	---	63.09	12.48	L1	OFF	19.8
0.233250	---	30.34	52.33	21.99	L1	OFF	19.8
0.233250	47.28	---	62.33	15.05	L1	OFF	19.8
0.246750	---	28.86	51.87	23.01	L1	OFF	19.8
0.246750	45.51	---	61.87	16.36	L1	OFF	19.8
0.267000	---	27.20	51.21	24.01	L1	OFF	19.8
0.267000	42.83	---	61.21	18.38	L1	OFF	19.8
0.305250	---	27.36	50.10	22.74	L1	OFF	19.8

0.305250	38.86	---	60.10	21.24	L1	OFF	19.8
1.342500	---	32.54	46.00	13.46	L1	OFF	19.8
1.342500	38.45	---	56.00	17.55	L1	OFF	19.8
1.443750	---	33.44	46.00	12.56	L1	OFF	19.8
1.443750	39.28	---	56.00	16.72	L1	OFF	19.8
1.630500	---	30.69	46.00	15.31	L1	OFF	19.9
1.630500	35.87	---	56.00	20.13	L1	OFF	19.9
13.110000	---	19.33	50.00	30.67	L1	OFF	19.9
13.110000	23.11	---	60.00	36.89	L1	OFF	19.9

# EUT Information

Test Mode : Mode 1  
 Test Voltage : Power From System  
 Phase : Neutral

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	42.72	55.88	13.16	N	OFF	19.8
0.152250	61.09	---	65.88	4.79	N	OFF	19.8
0.156750	---	43.57	55.63	12.06	N	OFF	19.8
0.156750	60.56	---	65.63	5.07	N	OFF	19.8
0.165750	---	37.80	55.17	17.37	N	OFF	19.8
0.165750	58.25	---	65.17	6.92	N	OFF	19.8
0.174750	---	35.48	54.73	19.25	N	OFF	19.8
0.174750	56.57	---	64.73	8.16	N	OFF	19.8
0.181500	---	38.58	54.42	15.84	N	OFF	19.8
0.181500	55.71	---	64.42	8.71	N	OFF	19.8
0.195000	---	32.37	53.82	21.45	N	OFF	19.8
0.195000	52.60	---	63.82	11.22	N	OFF	19.8
0.208500	---	33.58	53.27	19.69	N	OFF	19.8
0.208500	50.94	---	63.27	12.33	N	OFF	19.8
0.226500	---	29.81	52.58	22.77	N	OFF	19.8
0.226500	48.38	---	62.58	14.20	N	OFF	19.8
0.249000	---	28.27	51.79	23.52	N	OFF	19.8
0.249000	44.76	---	61.79	17.03	N	OFF	19.8
0.287250	---	27.28	50.60	23.32	N	OFF	19.8
0.287250	40.39	---	60.60	20.21	N	OFF	19.8
0.318750	---	25.42	49.74	24.32	N	OFF	19.8

0.318750	37.35	---	59.74	22.39	N	OFF	19.8
1.365000	---	32.88	46.00	13.12	N	OFF	19.8
1.365000	38.82	---	56.00	17.18	N	OFF	19.8
1.468500	---	33.18	46.00	12.82	N	OFF	19.8
1.468500	39.12	---	56.00	16.88	N	OFF	19.8
1.545000	---	32.42	46.00	13.58	N	OFF	19.8
1.545000	37.88	---	56.00	18.12	N	OFF	19.8
13.377750	---	19.87	50.00	30.13	N	OFF	20.0
13.377750	23.63	---	60.00	36.37	N	OFF	20.0



### Appendix C. Conducted Spurious Emission

Test Engineer :	Ken Wu and Kai Liao	Temperature :	20.1~24.5°C
		Relative Humidity :	54.3~66.1%

<60 ms max Tx\_on time duty cycling, 20 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 01 912.75 MHz	#	456.375	-44.6	-	-	-52.51	2.69	0.52	0	4.7	P
		720.7	-56.31	-7.11	-49.2	-64.39	2.69	0.69	0	4.7	P
		733.3	-53.54	-4.34	-49.2	-61.62	2.69	0.69	0	4.7	P
		770.4	-49.75	-0.55	-49.2	-57.92	2.69	0.78	0	4.7	P
		816.6	-56.05	-6.85	-49.2	-64.19	2.69	0.75	0	4.7	P
		864.75	-49.3	-0.1	-49.2	-57.5	2.69	0.81	0	4.7	Q
	*	912.75	27.13	-	-	18.85	2.69	0.89	0	4.7	P
		960.8	-45.85	-4.65	-41.2	-54.18	2.69	0.94	0	4.7	P
CH 50 919.12 MHz	#	459.56	-46.08	-	-	-53.98	2.69	0.51	0	4.7	P
		727	-56.99	-7.79	-49.2	-65.07	2.69	0.69	0	4.7	P
		739.6	-52.74	-3.54	-49.2	-60.8	2.69	0.67	0	4.7	P
		775.5	-54.58	-5.38	-49.2	-62.75	2.69	0.78	0	4.7	Q
		823.6	-54.6	-5.4	-49.2	-62.75	2.69	0.76	0	4.7	P
		871.12	-52.18	-2.98	-49.2	-60.38	2.69	0.81	0	4.7	Q
	*	919.12	27.15	-	-	18.82	2.69	0.94	0	4.7	P
		967.1	-46.55	-5.35	-41.2	-54.88	2.69	0.94	0	4.7	P
Remark	1. No other spurious found. 2. All results are PASS against limit line.										





902 MHz ~ 928 MHz

(1 GHz ~ 10 GHz)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
CH 01 912.75 MHz		1369.125	-61.85	-40.65	-21.2	-66.23	2.69	1.69	0	0	P
	#	1825.5	-18.91	-	-	-22.77	2.69	1.17	0	0	P
		2738.25	-41	-19.8	-21.2	-44.83	2.69	1.14	0	0	P
		2738.25	-45.87	-4.67	-41.2	-49.7	2.69	1.14	0	0	A
		3651	-42.07	-20.87	-21.2	-45.99	2.69	1.23	0	0	P
		3651	-46.84	-5.64	-41.2	-50.76	2.69	1.23	0	0	A
		4563.75	-40.9	-19.7	-21.2	-44.69	2.69	1.1	0	0	P
		4563.75	-45.81	-4.61	-41.2	-49.6	2.69	1.1	0	0	A
		7302	-64.59	-43.39	-21.2	-68.68	2.69	1.4	0	0	P
		8214.75	-54.18	-32.98	-21.2	-58.43	2.69	1.56	0	0	P
CH 50 919.12 MHz		1378.68	-51.35	-30.15	-21.2	-55.67	2.69	1.63	0	0	P
	#	1838.24	-19.03	-	-	-22.89	2.69	1.17	0	0	P
		2757.36	-39.86	-18.66	-21.2	-43.68	2.69	1.13	0	0	P
		2757.36	-45.12	-3.92	-41.2	-48.94	2.69	1.13	0	0	A
		3676.48	-39.9	-18.7	-21.2	-44.46	2.69	1.87	0	0	P
		3676.48	-44.78	-3.58	-41.2	-48.94	2.69	1.13	0	0	A
		4595.6	-41.12	-19.92	-21.2	-45.06	2.69	1.25	0	0	P
		4595.6	-46.09	-4.89	-41.2	-50.03	2.69	1.25	0	0	A
		7352.96	-58.48	-37.28	-21.2	-62.96	2.69	1.79	0	0	P
		8272.08	-52.04	-30.84	-21.2	-56.52	2.69	1.79	0	0	P
	9191.2	-53.88	-32.68	-21.2	-58.22	2.69	1.65	0	0	P	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.										



<No duty cycling, 19 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 50 919.12 MHz	#	459.56	-47.2	-	-	-55.1	2.69	0.51	0	4.7	P
		727	-57.23	-8.03	-49.2	-65.31	2.69	0.69	0	4.7	P
		739.6	-54.18	-4.98	-49.2	-62.24	2.69	0.67	0	4.7	P
		775.5	-54.78	-5.58	-49.2	-62.95	2.69	0.78	0	4.7	Q
		823.6	-55.49	-6.29	-49.2	-63.64	2.69	0.76	0	4.7	P
		871.12	-51.27	-2.07	-49.2	-59.47	2.69	0.81	0	4.7	Q
	*	919.12	27.06	-	-	18.73	2.69	0.94	0	4.7	P
		967.8	-46.66	-5.46	-41.2	-54.99	2.69	0.94	0	4.7	P
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.										



902 MHz ~ 928 MHz

(1 GHz ~ 10 GHz)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
CH 50 919.12 MHz		1378.68	-51.97	-30.77	-21.2	-56.29	2.69	1.63	0	0	P
	#	1838.24	-20.69	-	-	-24.55	2.69	1.17	0	0	P
		2757.36	-46.75	-25.55	-21.2	-50.57	2.69	1.13	0	0	P
		3676.48	-44.37	-23.17	-21.2	-48.93	2.69	1.87	0	0	P
		3676.48	-45.26	-4.06	-41.2	-49.82	2.69	1.87	0	0	A
		4595.6	-41.71	-20.51	-21.2	-45.65	2.69	1.25	0	0	P
		4595.6	-42.13	-0.93	-41.2	-46.07	2.69	1.25	0	0	A
		7352.96	-63.77	-42.57	-21.2	-68.25	2.69	1.79	0	0	P
		8272.08	-57.32	-36.12	-21.2	-61.8	2.69	1.79	0	0	P
		9191.2	-56.56	-35.36	-21.2	-60.9	2.69	1.65	0	0	P
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.										



<60 ms max Tx\_on time duty cycling, 14 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 01 912.75 MHz		32.97	-69.39	-14.19	-55.2	-76.93	2.69	0.15	0	4.7	P
		193.08	-70.38	-18.68	-51.7	-78.06	2.69	0.29	0	4.7	P
		294.87	-69.73	-20.53	-49.2	-77.53	2.69	0.41	0	4.7	P
	#	456.375	-50.35	-	-	-58.26	2.69	0.52	0	4.7	P
		720.7	-61.56	-12.36	-49.2	-69.64	2.69	0.69	0	4.7	P
		770.4	-55.39	-6.19	-49.2	-63.56	2.69	0.78	0	4.7	P
		864.9	-53.29	-4.09	-49.2	-61.49	2.69	0.81	0	4.7	P
	*	912.75	20.8	-	-	12.52	2.69	0.89	0	4.7	P
		960.8	-52.42	-11.22	-41.2	-60.75	2.69	0.94	0	4.7	P
Remark	1. No other spurious found. 2. All results are PASS against limit line.										



902 MHz ~ 928 MHz

(1 GHz ~ 10 GHz)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
CH 01 912.75 MHz		1369	-57.58	-36.38	-21.2	-61.57	2.69	1.3	0	0	P
	#	1825.5	-39.7	-	-	-43.44	2.69	1.05	0	0	P
		2738.25	-49.5	-28.3	-21.2	-53.25	2.69	1.06	0	0	P
		3651	-33.11	-11.91	-21.2	-36.96	2.69	1.16	0	0	P
		3651	-41.83	-0.63	-41.2	-49.69	2.69	1.17	0	0	A
		4564	-53.06	-31.86	-21.2	-56.98	2.69	1.23	0	0	P
		5482	-62.09	-40.89	-21.2	-66.32	2.69	1.54	0	0	P
		7309	-59.72	-38.52	-21.2	-64.09	2.69	1.68	0	0	P
		9127.5	-65.78	-44.58	-21.2	-70.32	2.69	1.85	0	0	P
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.										



<No duty cycling, 14 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 50 919.12 MHz		32.97	-69.91	-14.71	-55.2	-77.45	2.69	0.15	0	4.7	P
		209.28	-70.42	-18.72	-51.7	-78.18	2.69	0.37	0	4.7	P
		269.22	-69.58	-20.38	-49.2	-77.32	2.69	0.35	0	4.7	P
	#	459.56	-50.24	-	-	-58.14	2.69	0.51	0	4.7	P
		775.3	-55.76	-6.56	-49.2	-63.93	2.69	0.78	0	4.7	P
		871.2	-53.19	-3.99	-49.2	-61.39	2.69	0.81	0	4.7	P
		906.9	-51.38	-2.18	-49.2	-59.66	2.69	0.89	0	4.7	P
	*	919.12	20.83	-	-	12.5	2.69	0.94	0	4.7	P
		967.8	-52.18	-10.98	-41.2	-60.51	2.69	0.94	0	4.7	P
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.										



902 MHz ~ 928 MHz

(1 GHz ~ 10 GHz)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
CH 50 919.12 MHz		1378	-54.65	-33.45	-21.2	-58.64	2.69	1.3	0	0	P
	#	1837	-41.35	-	-	-45.09	2.69	1.05	0	0	P
		2764	-47.04	-25.84	-21.2	-50.82	2.69	1.09	0	0	P
		3682	-39.52	-18.32	-21.2	-43.38	2.69	1.17	0	0	P
		3682	-43.82	-2.62	-41.2	-47.68	2.69	1.17	0	0	A
		4600	-51.93	-30.73	-21.2	-55.82	2.69	1.2	0	0	P
		5518	-63.21	-42.01	-21.2	-67.36	2.69	1.46	0	0	P
		6436	-63.34	-42.14	-21.2	-67.3	2.69	1.27	0	0	P
		8272	-68.46	-47.26	-21.2	-72.79	2.69	1.64	0	0	P
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.										



<No duty cycling, 12 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 01 912.75 MHz		32.97	-69.26	-14.06	-55.2	-76.8	2.69	0.15	0	4.7	P
		186.33	-70.98	-19.28	-51.7	-78.66	2.69	0.29	0	4.7	P
		221.97	-70.29	-21.09	-49.2	-78.03	2.69	0.35	0	4.7	P
	#	456.375	-49.4	-	-	-57.31	2.69	0.52	0	4.7	P
		720.7	-62.6	-13.4	-49.2	-70.68	2.69	0.69	0	4.7	P
		770.4	-55.91	-6.71	-49.2	-64.08	2.69	0.78	0	4.7	P
		864.9	-54.98	-5.78	-49.2	-63.18	2.69	0.81	0	4.7	P
	*	912.75	18.98	-	-	10.7	2.69	0.89	0	4.7	P
		960.8	-53.44	-12.24	-41.2	-61.77	2.69	0.94	0	4.7	P
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.										





**902 MHz ~ 928 MHz**

**(1 GHz ~ 10 GHz)**

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
<b>CH 01</b> <b>912.75 MHz</b>		1369	-62.06	-40.86	-21.2	-66.05	2.69	1.3	0	0	P
	#	1828	-42.57	-	-	-46.31	2.69	1.05	0	0	P
		2746	-55.61	-34.41	-21.2	-59.36	2.69	1.06	0	0	P
		3655	-41.68	-22.38	-21.2	-45.54	2.69	1.17	0	0	P
		3655	-44.58	-3.38	-41.2	-48.44	2.69	1.17	0	0	A
		4564	-62.69	-41.49	-21.2	-66.61	2.69	1.23	0	0	P
		7309	-62.15	-40.95	-21.2	-66.52	2.69	1.68	0	0	P
		8218	-68.88	-47.68	-21.2	-73.18	2.69	1.61	0	0	P
		9127	-67.33	-46.13	-21.2	-71.87	2.69	1.85	0	0	P
<b>Remark</b>	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.										



<No duty cycling, 12.5 dBm and antenna gain 2 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

Mode	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	MIMO Factor	Grounding Factor	Peak QP.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/Q)
CH 01 912.75 MHz		33.24	-70.51	-15.31	-55.2	-77.36	2	0.15	0	4.7	P
		199.56	-71.41	-19.71	-51.7	-78.4	2	0.29	0	4.7	P
		238.17	-69.92	-20.72	-49.2	-76.97	2	0.35	0	4.7	P
	#	456.375	-50.92	-	-	-58.14	2	0.52	0	4.7	P
		720.7	-64.83	-15.63	-49.2	-72.22	2	0.69	0	4.7	P
		770.4	-57.15	-7.95	-49.2	-64.63	2	0.78	0	4.7	P
		864.9	-55.83	-6.63	-49.2	-63.34	2	0.81	0	4.7	P
	*	912.75	18.7	-	-	11.11	2	0.89	0	4.7	P
		960.8	-55.01	-13.81	-41.2	-62.65	2	0.94	0	4.7	P
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.										



**902 MHz ~ 928 MHz**

**(1 GHz ~ 10 GHz)**

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
					Line	Level	Gain	Loss	Factor	Factor	Avg.
		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
<b>CH 01</b> <b>912.75 MHz</b>		1369	-61.75	-40.55	-21.2	-65.05	2	1.3	0	0	P
	#	1828	-42.79	-	-	-45.84	2	1.05	0	0	P
		2746	-54.39	-33.19	-21.2	-57.45	2	1.06	0	0	P
		3655	-38.97	-17.77	-21.2	-42.14	2	1.17	0	0	P
		3655	-41.79	-0.59	-41.2	-44.96	2	1.17	0	0	A
		4564	-71.26	-50.06	-21.2	-74.49	2	1.23	0	0	P
		7309	-61.61	-40.41	-21.2	-65.29	2	1.68	0	0	P
		8218	-70.63	-49.43	-21.2	-74.24	2	1.61	0	0	P
		9127	-67.8	-46.6	-21.2	-71.65	2	1.85	0	0	P
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.										



Note symbol

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
#	The unwanted signal can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).
!	Test result is <b>Margin</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for conducted spurious emission is shown as below:

	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
		( MHz )	( dBm )	( dB )	( dBm )	( dBm )	( dBi )	( dB )	( dB )	( dB )	( P/A )
CH 01		1825.5	-38.76	-17.56	-21.2	-42.5	2.69	1.05	0	0	P
912.75 MHz		1825.5	-42.33	-1.13	-41.2	-46.07	2.69	1.05	0	0	A

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBm) =  
Antenna Factor(dBi) + Path Loss(dB) + Read Level(dBm)
3. Margin(dB) = Level(dBm) – Limit Line(dBm)

**For Peak Limit @ 1825.5 MHz:**

1. Level(dBm)  
= Antenna Factor(dBi) + Path Loss(dB) + Read Level(dBm)  
= 2.69(dBi) + 1.05(dB) – 42.5(dBm)  
= -38.76 (dBm)
2. Margin(dB)  
= Level(dBm) – Limit Line(dBm)  
= -38.76(dBm) +21.2(dBm)  
= -17.56(dB)

**For Average Limit @ 1825.5MHz:**

1. Level(dBm)  
= Antenna Factor(dBi) + Path Loss(dB) + Read Level(dBm)  
= 2.69(dBi) + 1.05(dB) – 46.07(dBm)  
= -42.33 (dBm)
2. Margin(dB)  
= Level(dBm) – Limit Line(dBm)  
= -42.33(dBm) + 41.2(dBm)  
= -1.13(dB)

**Both peak and average measured complies with the limit line, so test result is “PASS”.**

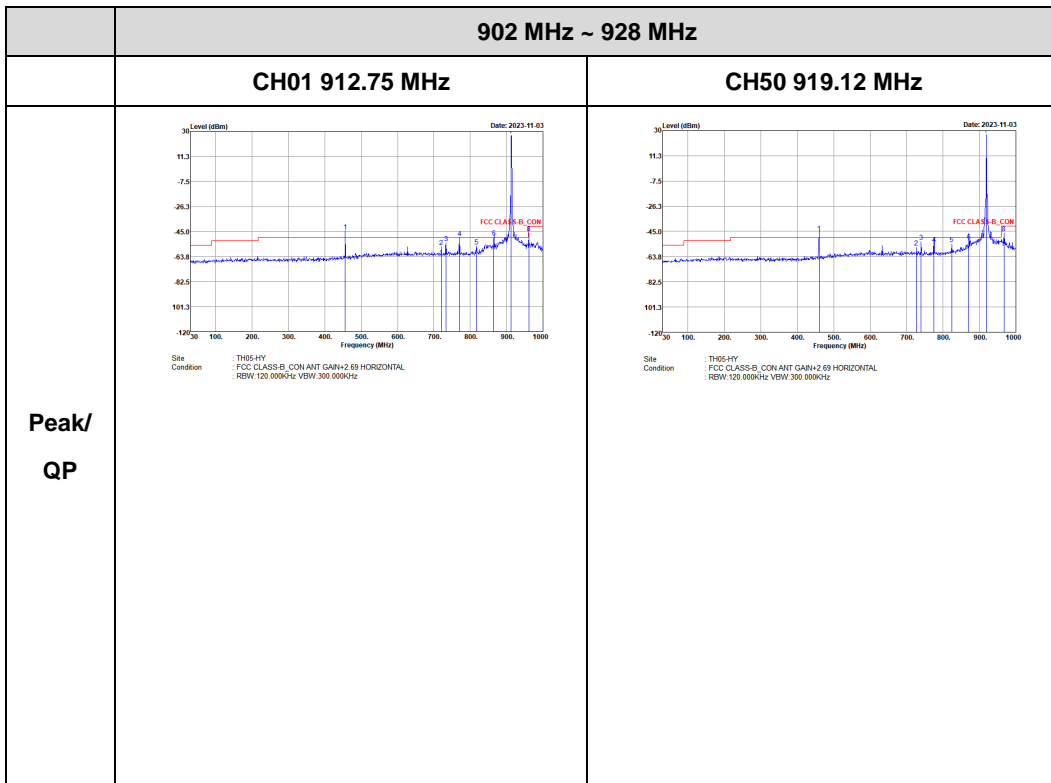


### Appendix D. Conducted Spurious Emission Plots

Test Engineer :	Ken Wu and Kai Liao	Temperature :	20.1~24.5°C
		Relative Humidity :	54.3~66.1%

<60 ms max Tx\_on time duty cycling, 20 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz  
(30 MHz ~ 1 GHz)



**Remark:** The unwanted signal #1 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz		
	CH01 912.75 MHz	CH50 919.12 MHz
Peak Avg.	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN+2.69 HORIZONTAL REW:1000.000kHz VIEW:3000.000kHz</p>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN+2.69 HORIZONTAL REW:1000.000kHz VIEW:3000.000kHz</p>

**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



<No duty cycling, 19 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)

902 MHz ~ 928 MHz	
	<b>CH50 919.12 MHz</b>
<b>Peak/ QP</b>	<p>Site: TH55-HY Condition: FCC CLASS B_CON ANT GAIN=2.69 HORIZONTAL RBW: 120.000kHz VBW: 300.000kHz</p>

**Remark:** The unwanted signal #1 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).





902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz	
	<b>CH50 919.12 MHz</b>
<b>Peak Avg.</b>	<p>Left Blank</p>

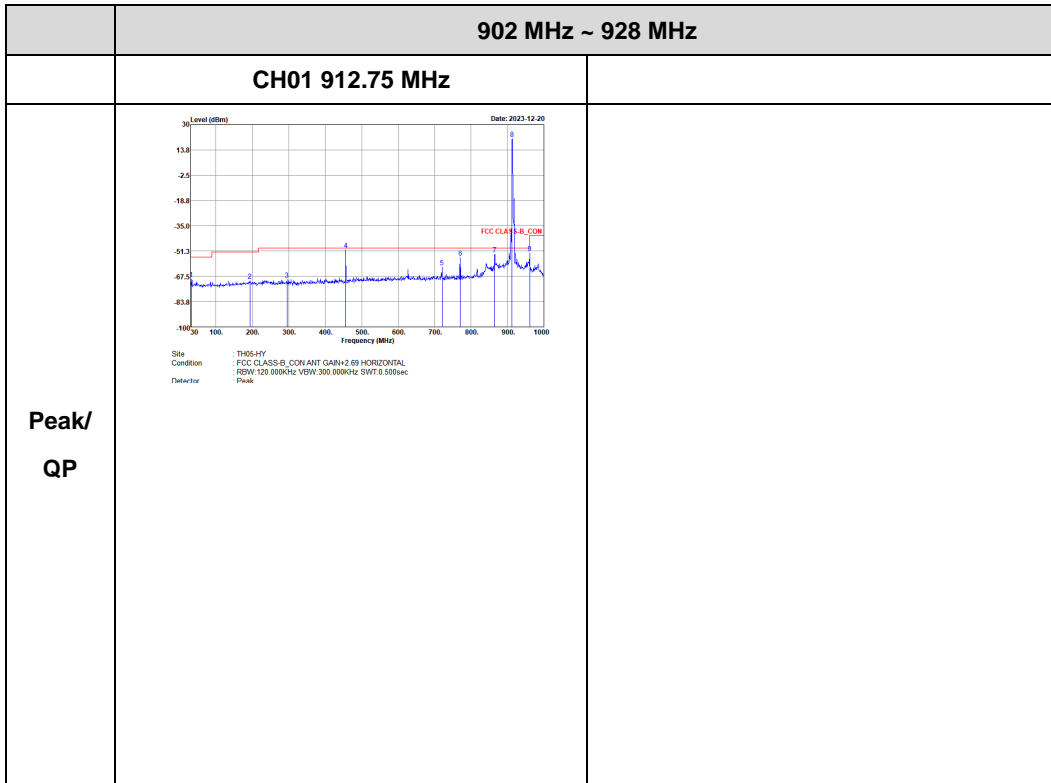
**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



<60 ms max Tx\_on time duty cycling, 14 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)



**Remark:** The unwanted signal #4 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz	
	<b>CH01 912.75 MHz</b>
<b>Peak Avg.</b>	<p>The spectrum plot displays the signal level in dBm across a frequency range from 1000 to 10000 MHz. Two horizontal red lines indicate the FCC Class B limits: FCC CLASS B_CON at -26.3 dBm and FCC CLASS B(AVG)_CON at -45.0 dBm. The signal level is generally below -60 dBm, with a notable peak labeled #2 at approximately 1500 MHz. Other peaks are labeled 1, 3, 4, 5, 7, 8, 9, and 10.</p> <p>Site : THOS-HY Condition : FCC CLASS-B_CON ANT GAIN+2 89 HORIZONTAL Reference : RBW 1000 000KHz VBW 3000 000KHz SWT Auto Detector : Peak</p>

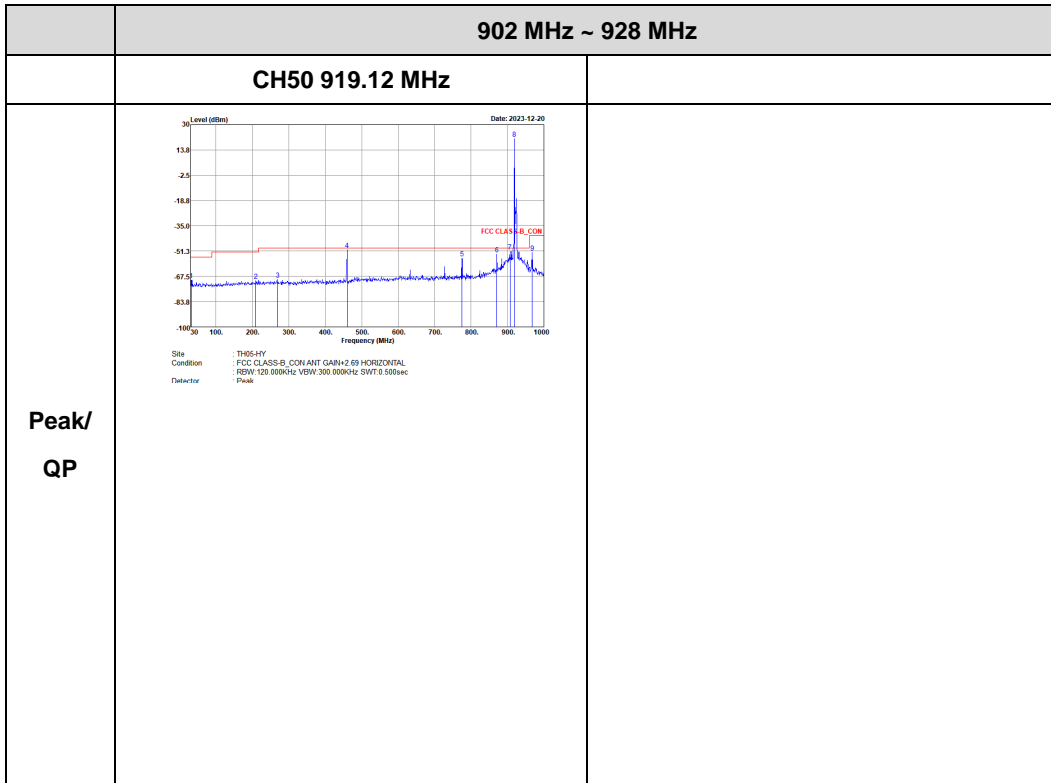
**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



<No duty cycling, 14 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)



**Remark:** The unwanted signal #4 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz	
	<b>CH50 919.12 MHz</b>
<b>Peak Avg.</b>	<p>The spectrum plot displays the signal level in dBm across a frequency range from 1000 MHz to 10000 MHz. Two horizontal red lines indicate the FCC Class B limit at -26.3 dBm and the FCC Class B/A/B/D limit at -45.0 dBm. A blue signal trace shows several peaks, with peak #2 being the most prominent at approximately 1500 MHz. The signal level for peak #2 is approximately -20 dBm, which is above the FCC Class B limit. Other peaks are labeled 1 through 9.</p> <p>Site : THOS-HY Condition : FCC CLASS-B_CON ANT GAIN+2 89 HORIZONTAL Reference : RBW 1000 000KHz VBW 3000 000KHz SWT Auto Detector : Peak</p>

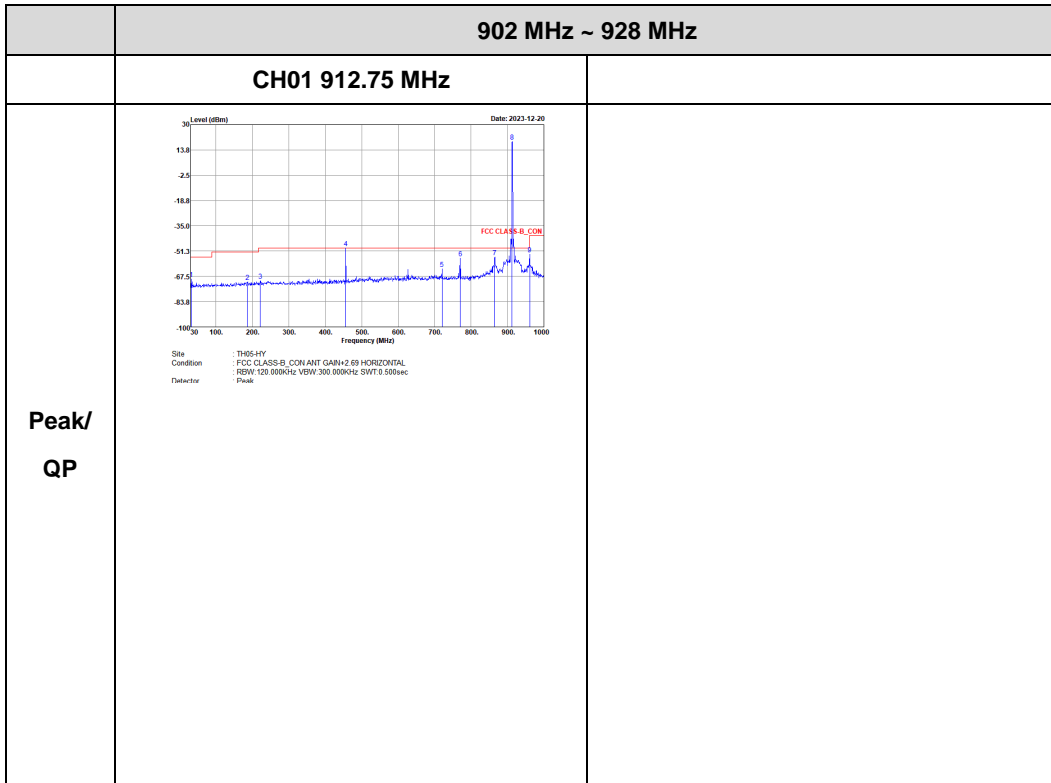
**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



<No duty cycling, 12 dBm and antenna gain 2.69 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)



**Remark:** The unwanted signal #4 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz	
	<b>CH01 912.75 MHz</b>
<b>Peak Avg.</b>	<p>The spectrum plot displays the signal level in dBm across a frequency range from 1000 to 10000 MHz. Two horizontal red lines indicate the FCC Class B limits: -26.3 dBm (FCC CLASS B_CON) and -45.0 dBm (FCC CLASS B_AVG_CON). Several peaks are identified with numbers 1 through 8. Peak #2 is notably higher than the others, reaching approximately -26.3 dBm. The plot also includes technical details: Site: THOS-HY, Condition: FCC CLASS B_CON ANT GAIN+2 89 HORIZONTAL, Reflector: Peak, and Date: 2023.12.20.</p>

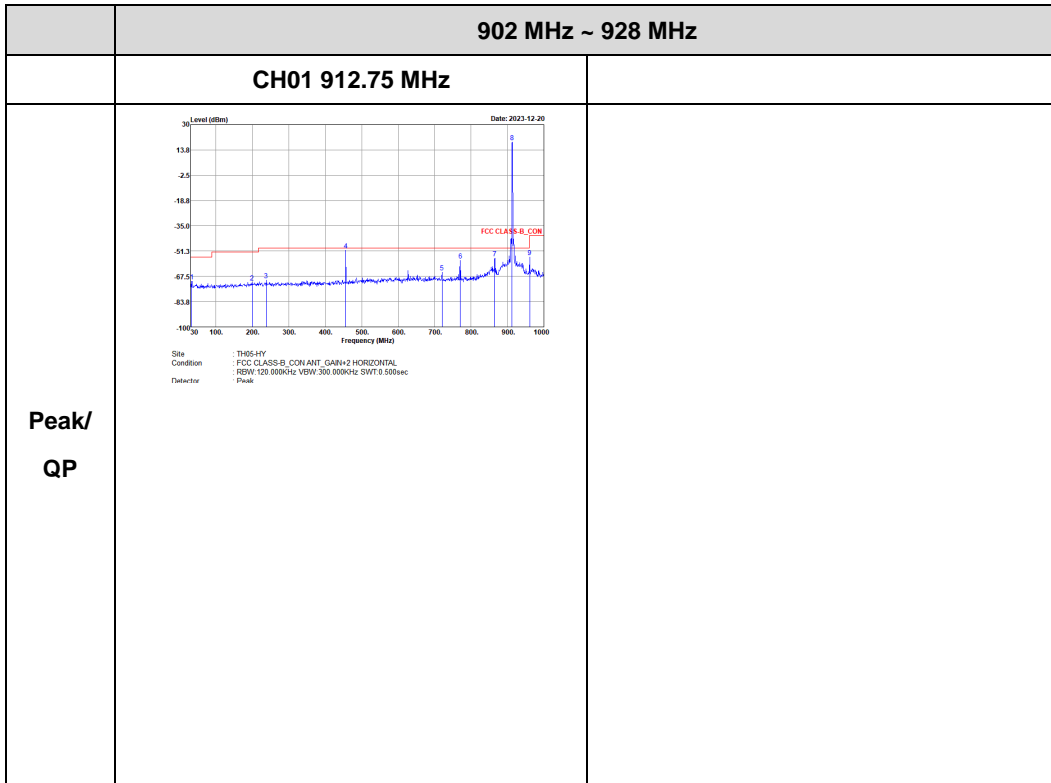
**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



<No duty cycling, 12.5 dBm and antenna gain 2 dBi>

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz)



**Remark:** The unwanted signal #4 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).





902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz)

902 MHz ~ 928 MHz	
	<b>CH01 912.75 MHz</b>
<b>Peak Avg.</b>	<p>The spectrum plot displays the signal level in dBm across a frequency range from 1000 to 10000 MHz. Two horizontal red lines indicate the FCC Class B limits: -26.3 dBm (labeled 'FCC CLASS B_CON') and -45.0 dBm (labeled 'FCC CLASS B_AVG'). The signal level is generally below -60 dBm, with several peaks labeled 1 through 8. Peak #2 is an unwanted signal within the non-restricted band.</p> <p>Site : THOS-HY Condition : FCC CLASS B_CON ANT_GAIN+2 HORIZONTAL Reference : RBW 1000 000KHz VBW 3000 000KHz SWT Auto Detector : Peak</p>

**Remark:** The unwanted signal #2 can be ignored since it falls within the non-restricted band and meet the requirements of 15.247 (d).



## Appendix E. Cabinet Radiated Spurious Emission

Test Engineer :	Jacky Hung	Temperature :	20~26°C
		Relative Humidity :	40~65%

<60 ms max Tx\_on time duty cycling, 20 dBm >

902 MHz ~ 928 MHz

(30 MHz ~ 1 GHz @ 3m)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
CH01 912.75MHz		31.89	22.68	-17.32	40	29.96	24.03	0.85	32.16	-	-	P	H	
		241.95	21.76	-24.24	46	34.58	17.56	1.68	32.06	-	-	P	H	
		264.09	24.22	-21.78	46	34.16	20.37	1.75	32.06	-	-	P	H	
		419.7	33.81	-12.19	46	40.8	22.83	2.09	31.91	-	-	P	H	
		600.3	36.36	-9.64	46	40.39	25.88	2.02	31.93	-	-	P	H	
		713.7	33.77	-12.23	46	36.33	26.85	2.67	32.08	-	-	P	H	
	*	912.75	72.43	-	-	71.5	29.17	3.04	31.28	100	57	P	H	
														H
														H
			32.97	22.74	-17.26	40	30.42	23.62	0.87	32.17	-	-	P	V
			110.46	18.94	-24.56	43.5	32.69	17.15	1.25	32.15	-	-	P	V
			264.09	20.45	-25.55	46	30.39	20.37	1.75	32.06	-	-	P	V
			713.7	33.45	-12.55	46	36.01	26.85	2.67	32.08	-	-	P	V
			830.6	32.12	-13.88	46	32.58	28.33	2.89	31.68	-	-	P	V
	*		912.75	66.67	-	-	65.74	29.17	3.04	31.28	100	97	P	V
			970.6	33.61	-20.39	54	30.18	31.07	3.12	30.76	-	-	P	V
													V	
													V	



<b>CH50</b> <b>919.12MHz</b>		31.62	22.68	-17.32	40	29.79	24.21	0.84	32.16	-	-	P	H
		244.38	22.83	-23.17	46	35.34	17.86	1.69	32.06	-	-	P	H
		264.09	25.4	-20.6	46	35.34	20.37	1.75	32.06	-	-	P	H
		419.7	34.41	-11.59	46	41.4	22.83	2.09	31.91	-	-	P	H
		552	36.4	-9.6	46	40.49	25.66	2.35	32.1	-	-	P	H
		600.3	35.95	-10.05	46	39.98	25.88	2.02	31.93	-	-	P	H
	*	919.12	73.11	-	-	72.03	29.26	3.04	31.22	102	55	P	H
													H
													H
		30.27	23.79	-16.21	40	30.28	24.85	0.82	32.16	-	-	P	V
		127.47	16.98	-26.52	43.5	30.06	17.75	1.3	32.13	-	-	P	V
		264.09	21.74	-24.26	46	31.68	20.37	1.75	32.06	-	-	P	V
		552	29.77	-16.23	46	33.86	25.66	2.35	32.1	-	-	P	V
		717.2	34.63	-11.37	46	37.02	27.02	2.67	32.08	-	-	P	V
		736.1	34.42	-11.58	46	35.84	27.9	2.72	32.04	-	-	P	V
	*	919.12	68.03	-	-	66.95	29.26	3.04	31.22	100	88	P	V
													V
													V
<b>Remark</b>	<ol style="list-style-type: none"> <li>1. No other spurious found.</li> <li>2. All results are PASS against limit line.</li> <li>3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.</li> </ol>												



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

Mode	Note	Frequency ( MHz )	Level ( dBμV/m )	Margin ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
CH01 912.75MHz		2738.25	51.46	-22.54	74	75.29	28.12	5.47	57.42	100	130	P	H	
		2738.25	45.61	-8.39	54	69.44	28.12	5.47	57.42	100	130	A	H	
		3651	54.35	-19.65	74	76.56	29.7	6.39	58.3	301	60	P	H	
		3651	48.49	-5.51	54	70.70	29.7	6.39	58.3	301	60	A	H	
		4563.75	48.98	-25.02	74	68.21	31.73	7.13	58.09	381	296	P	H	
		4563.75	41.38	-12.62	54	60.61	31.73	7.13	58.09	381	296	A	H	
		7302	45.13	-28.87	74	56.21	36.99	8.74	56.81	-	-	P	H	
		8214.75	45.35	-28.65	74	55.31	37	9.5	56.46	-	-	P	H	
		9127.5	46.57	-27.43	74	55.59	38.01	9.76	56.79	-	-	P	H	
			2738.25	49.5	-24.5	74	73.33	28.12	5.47	57.42	400	86	P	V
			2738.25	42.70	-11.30	54	66.53	28.12	5.47	57.42	400	86	A	V
			3651	58.42	-15.58	74	80.63	29.7	6.39	58.3	309	178	P	V
			3651	48.77	-5.23	54	70.98	29.7	6.39	58.3	309	178	A	V
			4563.75	50.62	-23.38	74	69.85	31.73	7.13	58.09	307	329	P	V
			4563.75	43.76	-10.24	54	62.99	31.73	7.13	58.09	307	329	A	V
			7302	44.94	-29.06	74	56.02	36.99	8.74	56.81	-	-	P	V
			8214.75	44.45	-29.55	74	54.41	37	9.5	56.46	-	-	P	V
			9127.5	52.77	-21.23	74	61.79	38.01	9.76	56.79	302	6	P	V
		9127.5	43.18	-10.82	54	52.20	38.01	9.76	56.79	302	6	A	V	



<b>CH50 919.12MHz</b>		2757.36	50.71	-23.29	74	74.51	28.17	5.48	57.45	100	129	P	H
		2757.36	44.78	-9.22	54	68.58	28.17	5.48	57.45	100	129	A	H
		3676.48	54.09	-19.91	74	76.21	29.81	6.4	58.33	391	297	P	H
		3676.48	43.67	-10.33	54	65.79	29.81	6.4	58.33	391	297	A	H
		4595.6	49.19	-24.81	74	68.23	31.79	7.17	58	400	294	P	H
		4595.6	41.57	-12.43	54	60.61	31.79	7.17	58	400	294	A	H
		7352.96	44.12	-29.88	74	55.47	36.78	8.77	56.9	-	-	P	H
		8272.08	44.17	-29.83	74	54.14	37	9.48	56.45	-	-	P	H
		9191.2	45.22	-28.78	74	54	38.18	9.76	56.72	-	-	P	H
		2757.36	49.03	-24.97	74	72.83	28.17	5.48	57.45	400	82	P	V
		2757.36	42.33	-11.67	54	66.13	28.17	5.48	57.45	400	82	A	V
		3676.48	57.85	-16.15	74	79.97	29.81	6.4	58.33	306	177	P	V
		3676.48	52.61	-1.39	54	74.73	29.81	6.4	58.33	306	177	A	V
		4595.6	52.34	-21.66	74	71.38	31.79	7.17	58	400	336	P	V
		4595.6	45.59	-8.41	54	64.63	31.79	7.17	58	400	336	A	V
		7352.96	44.12	-29.88	74	55.47	36.78	8.77	56.9	-	-	P	V
		8272.08	44.33	-29.67	74	54.3	37	9.48	56.45	-	-	P	V
		9191.2	51.3	-22.7	74	60.08	38.18	9.76	56.72	314	10	P	V
	9191.2	41.37	-12.63	54	50.15	38.18	9.76	56.72	314	10	A	V	
<b>Remark</b>	<ol style="list-style-type: none"> <li>1. No other spurious found.</li> <li>2. All results are PASS against Peak and Average limit line.</li> <li>3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.</li> </ol>												



<No duty cycling, 19 dBm>

902 MHz ~ 928 MHz  
(30 MHz ~ 1 GHz @ 3m)

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
CH50 919.12MHz		31.35	22.79	-17.21	40	29.71	24.4	0.84	32.16	-	-	P	H	
		100.74	19.77	-23.73	43.5	34.27	16.43	1.21	32.14	-	-	P	H	
		294.87	19.93	-26.07	46	30.87	19.28	1.84	32.06	-	-	P	H	
		300	31.85	-14.15	46	42.7	19.36	1.85	32.06	-	-	P	H	
		419.7	34.28	-11.72	46	41.27	22.83	2.09	31.91	-	-	P	H	
		717.2	36.92	-9.08	46	39.31	27.02	2.67	32.08	-	-	P	H	
	*	919.12	69.64	-	-	68.56	29.26	3.04	31.22	102	55	P	H	
														H
														H
			32.16	22.09	-17.91	40	29.5	23.9	0.85	32.16	-	-	P	V
			113.16	20.68	-22.82	43.5	34.3	17.27	1.26	32.15	-	-	P	V
			264.09	20.61	-25.39	46	30.55	20.37	1.75	32.06	-	-	P	V
			419.7	28.69	-17.31	46	35.68	22.83	2.09	31.91	-	-	P	V
			552	29.17	-16.83	46	33.26	25.66	2.35	32.1	-	-	P	V
			892.9	31.86	-14.14	46	31.38	28.9	3	31.42	-	-	P	V
	*		919.12	67.79	-	-	66.71	29.26	3.04	31.22	100	88	P	V
														V
														V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against limit line.</li> <li>The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.</li> </ol>													



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

Mode	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
CH50 919.12MHz		2757.36	50.6	-23.4	74	74.4	28.17	5.48	57.45	100	127	P	H	
		2757.36	48.47	-5.53	54	72.27	28.17	5.48	57.45	100	127	A	H	
		3676.48	49.73	-24.27	74	71.85	29.81	6.4	58.33	393	298	P	H	
		3676.48	47.22	-6.78	54	69.34	29.81	6.4	58.33	393	298	A	H	
		4595.6	43.04	-30.96	74	62.08	31.79	7.17	58	400	305	P	H	
		7352.96	43.91	-30.09	74	55.26	36.78	8.77	56.9	-	-	P	H	
		8272.08	44.75	-29.25	74	54.72	37	9.48	56.45	-	-	P	H	
		9191.2	44.81	-29.19	74	53.59	38.18	9.76	56.72	-	-	P	H	
			2757.36	49.17	-24.83	74	72.97	28.17	5.48	57.45	400	81	P	V
			2757.36	46.79	-7.21	54	70.59	28.17	5.48	57.45	400	81	A	V
			3676.48	53	-21	74	75.12	29.81	6.4	58.33	306	177	P	V
			3676.48	51.59	-2.41	54	73.71	29.81	6.4	58.33	306	177	A	V
			4595.6	48.12	-25.88	74	67.16	31.79	7.17	58	308	43	P	V
			4595.6	43.8	-10.2	54	62.84	31.79	7.17	58	308	43	A	V
			7352.96	44.16	-29.84	74	55.51	36.78	8.77	56.9	-	-	P	V
			8272.08	44.54	-29.46	74	54.51	37	9.48	56.45	-	-	P	V
			9191.2	46.83	-27.17	74	55.61	38.18	9.76	56.72	-	-	P	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> <li>The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.</li> </ol>													



Test Engineer :	Troye Hsieh	Temperature :	19.2~20.2°C
		Relative Humidity :	53.1~64.9%

<No duty cycling, 14 dBm >

**902 MHz ~ 928 MHz**  
**(30 MHz ~ 1 GHz @ 3m)**

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
		( MHz )	( dBμV/m )	( dB )	Line ( dBμV/m )	Level ( dBμV )	Factor ( dB/m )	Loss ( dB )	Factor ( dB )	Pos ( cm )	Pos ( deg )	Avg. ( P/A )	( H/V )	
CH01 912.75MHz		30.81	23.59	-16.41	40	31.33	23.56	0.86	32.16	-	-	P	H	
		96.42	25.28	-18.22	43.5	40.44	15.41	1.56	32.13	-	-	P	H	
		120.45	25.44	-18.06	43.5	38.52	17.28	1.8	32.16	-	-	P	H	
		750.1	30.51	-15.49	46	30.47	27.67	4.19	31.82	-	-	P	H	
		862.8	31.93	-14.07	46	30.37	28.69	4.38	31.51	-	-	P	H	
	*	912.75	66.89	-	-	64.95	28.61	4.46	31.13	150	165	P	H	
		973.4	34.5	-19.5	54	29.79	30.54	4.73	30.56	-	-	P	H	
													P	H
			31.08	33.62	-6.38	40	41.49	23.43	0.86	32.16	-	-	P	V
			35.94	28.93	-11.07	40	38.9	21.28	0.95	32.2	-	-	P	V
			96.15	21.29	-22.21	43.5	36.5	15.36	1.56	32.13	-	-	P	V
			769	30.56	-15.44	46	30.42	27.74	4.25	31.85	-	-	P	V
			827.1	31.28	-14.72	46	30.77	27.87	4.37	31.73	-	-	P	V
	*		912.75	62.06	-	-	60.12	28.61	4.46	31.13	150	104	P	V
			967.8	34.93	-19.07	54	30.31	30.53	4.71	30.62	-	-	P	V
												P	V	





Mode	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
<b>CH50</b> <b>919.12MHz</b>		30	22.47	-17.53	40	29.86	23.92	0.84	32.15	-	-	P	H	
		96.42	25.74	-17.76	43.5	40.9	15.41	1.56	32.13	-	-	P	H	
		289.2	28.62	-17.38	46	39.15	18.89	2.59	32.01	-	-	P	H	
		850.9	32.5	-13.5	46	31	28.71	4.38	31.59	-	-	P	H	
		882.4	32.67	-13.33	46	31.14	28.51	4.39	31.37	-	-	P	H	
	*	919.12	67	-	-	64.88	28.7	4.49	31.07	150	166	P	H	
		981.1	34.49	-19.51	54	29.94	30.29	4.74	30.48	-	-	P	H	
													P	H
			31.89	24.54	-15.46	40	32.84	23	0.87	32.17	200	12	QP	V
			35.94	30.57	-9.43	40	40.54	21.28	0.95	32.2	-	-	P	V
			162.03	21.91	-21.59	43.5	35.97	16	2.03	32.09	-	-	P	V
			774.6	31.62	-14.38	46	31.47	27.74	4.26	31.85	-	-	P	V
			867	32.11	-13.89	46	30.48	28.72	4.39	31.48	-	-	P	V
		*	919.12	61.44	-	-	59.32	28.7	4.49	31.07	150	93	P	V
			969.9	34.32	-19.68	54	29.65	30.55	4.72	30.6	-	-	P	V
												P	V	
<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> <li>The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.</li> </ol>													



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

Mode	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
CH01 912.75MHz		2738.25	38.19	-35.81	74	61.65	28.14	8.63	60.23	-	-	P	H	
		3651	39.24	-34.76	74	57.89	29.7	10.16	58.51	-	-	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
			2738.25	37.71	-36.29	74	61.17	28.14	8.63	60.23	-	-	P	V
			3651	38.79	-35.21	74	57.44	29.7	10.16	58.51	-	-	P	V
														V
														V
														V
														V
														V



Mode	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
CH50 919.12MHz		2757.36	37.92	-36.08	74	61.3	28.17	8.66	60.21	-	-	P	H	
		3676.48	38.24	-35.76	74	56.86	29.65	10.17	58.44	-	-	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
			2757.36	37.48	-36.52	74	60.86	28.17	8.66	60.21	-	-	P	V
			3676.48	37.9	-36.1	74	56.52	29.65	10.17	58.44	-	-	P	V
													V	
													V	
													V	
													V	
													V	
	<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> <li>The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.</li> </ol>												



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>Margin</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for radiated spurious emission is shown as below:

Mode	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
CH 01		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
2402MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Margin(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
2. Margin(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
2. Margin(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

**Both peak and average measured complies with the limit line, so test result is “PASS”.**

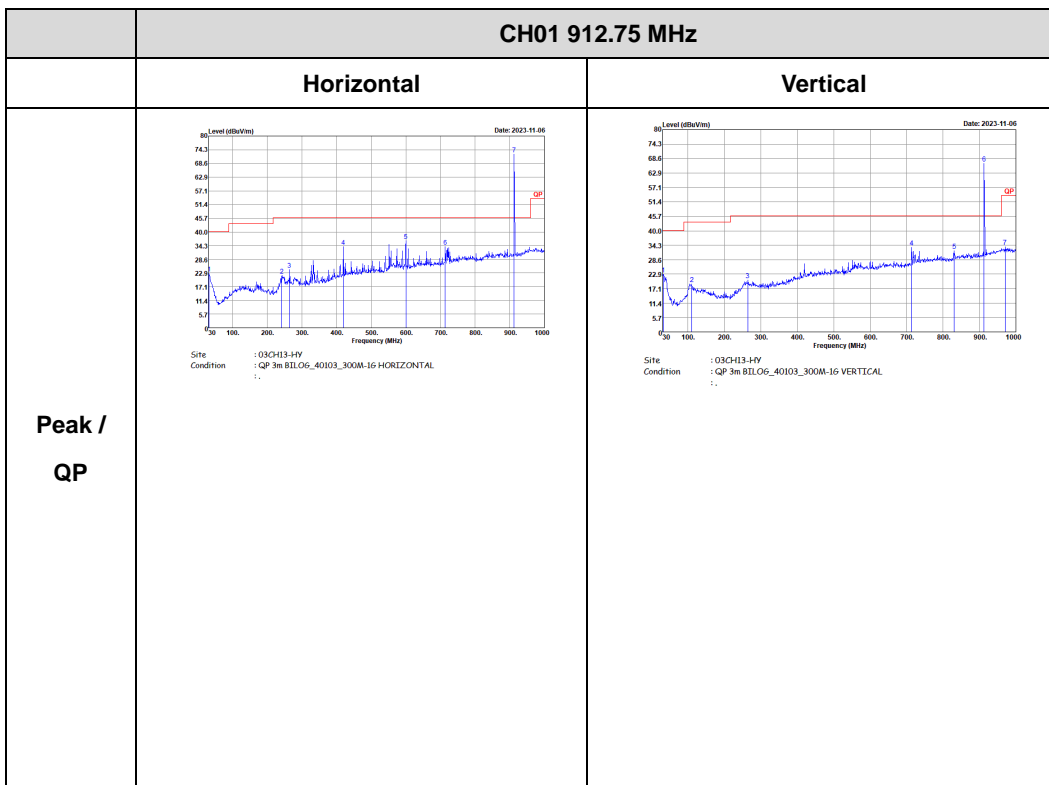


# Appendix F. Cabinet Radiated Spurious Emission Plots

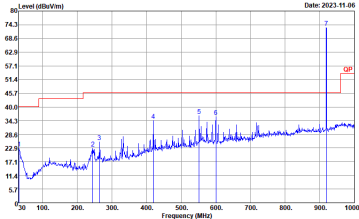
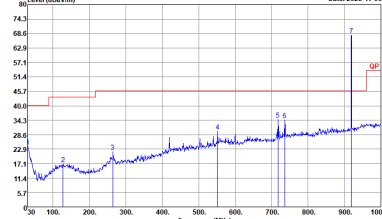
Test Engineer :	Jacky Hung	Temperature :	20~26°C
		Relative Humidity :	40~65%

<60 ms max Tx\_on time duty cycling, 20 dBm>

902 MHz ~ 928 MHz  
(30 MHz ~ 1 GHz @ 3m)





		CH50 919.12 MHz	
		Horizontal	Vertical
Peak / QP	 <p>Date: 2023-11-06</p> <p>Site : 03CH13-HY Condition : QP 3m BIL06_40103_300M-16 HORIZONTAL</p>	 <p>Date: 2023-11-06</p> <p>Site : 03CH13-HY Condition : QP 3m BIL06_40103_300M-16 VERTICAL</p>	



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

CH01 912.75 MHz		
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 HORIZONTAL</p>	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 VERTICAL</p>

**Remark:** The unwanted signal of 2nd Harmonic in plot falls within the non-restricted band and meet the requirements of 15.247 (d).





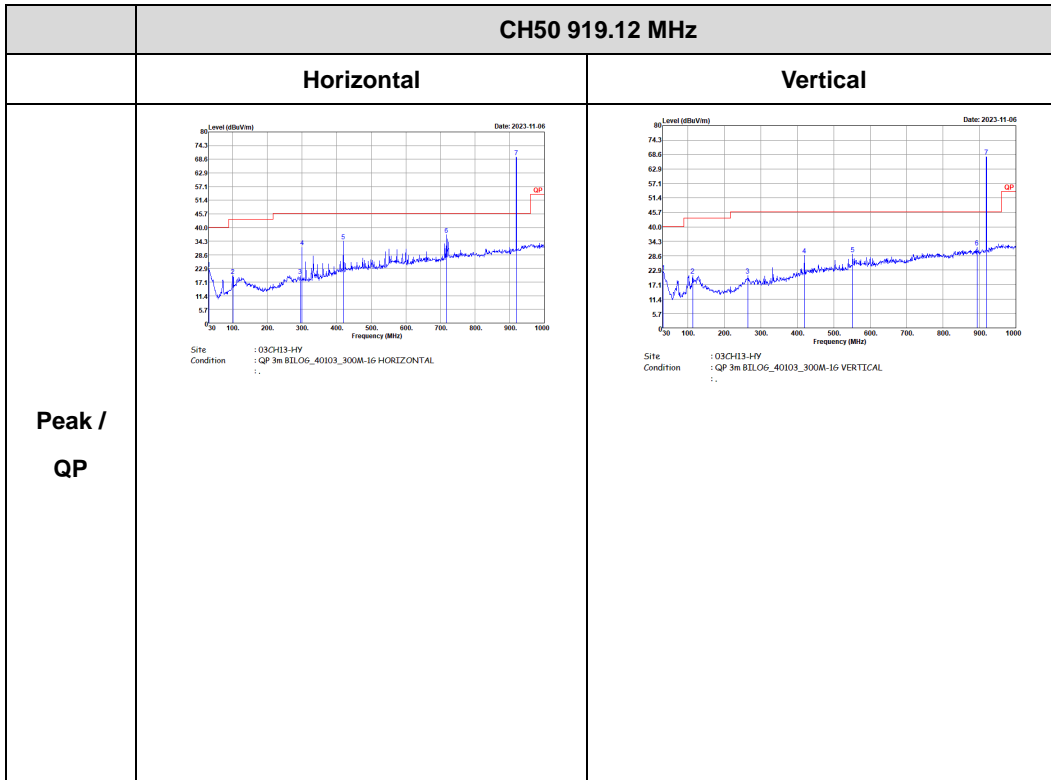
CH50 919.12 MHz		
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 HORIZONTAL</p>	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 VERTICAL</p>

**Remark:** The unwanted signal of 2nd Harmonic in plot falls within the non-restricted band and meet the requirements of 15.247 (d).



<No duty cycling, 19 dBm>

902 MHz ~ 928 MHz  
(30 MHz ~ 1 GHz @ 3m)





902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

CH50 919.12 MHz		
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 HORIZONTAL</p>	<p>Site : 03CH13-HY Condition : PEAK_74 3m HORN_91200_1326 VERTICAL</p>

**Remark:** The unwanted signal of 2nd Harmonic in plot falls within the non-restricted band and meet the requirements of 15.247 (d).



Test Engineer :	Troye Hsieh	Temperature :	19.2~20.2°C
		Relative Humidity :	53.1~64.9%

<No duty cycling, 14 dBm >

902 MHz ~ 928 MHz  
(30 MHz ~ 1 GHz @ 3m)

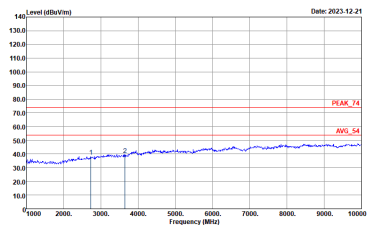
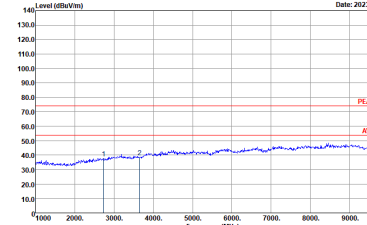
CH01 912.75 MHz		
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH11-HY Condition : QP 3m 2_BIL06_35414_221008 HORIZONTAL</p>	<p>Site : 03CH11-HY Condition : QP 3m 2_BIL06_35414_221008 VERTICAL</p>



		CH50 919.12 MHz	
		Horizontal	Vertical
Peak Avg.			



902 MHz ~ 928 MHz  
(1 GHz ~ 10 GHz @ 3m)

		CH01 912.75 MHz	
		Horizontal	Vertical
Peak Avg.			
	Site : 03CH11-HY Condition : PEAK_74 3m 91200_01620_230817 HORIZONTAL :	Site : 03CH11-HY Condition : PEAK_74 3m 91200_01620_230817 VERTICAL :	



CH50 919.12 MHz		
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH11-HY Condition : PEAK_74 3m 91200_01620_230817 HORIZONTAL</p>	<p>Site : 03CH11-HY Condition : PEAK_74 3m 91200_01620_230817 VERTICAL</p>



### Appendix G. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
PowerG PHY	100.00	-	-	10Hz

