

Project No: TM-2305000465P  
Report No.: TMWK2305001704KR

FCC ID: 2AGBW9290035625X

Page: 1 / 47  
Rev.: 03

# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

<b>Test Standard</b>	<b>FCC Part 15.247</b>
<b>Product name</b>	<b>Digital Device</b>
<b>Brand Name</b>	<b>Philips</b>
<b>Model</b>	<b>9290035625, 9290035626</b>
<b>Test Result</b>	<b>Pass</b>
<b>Statements of Conformity</b>	<b>Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.</b>

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:



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Shawn Wu  
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.  
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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## Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	August 2, 2023	Initial Issue	ALL	Doris Chu
01	August 14, 2023	See the following Note Rev. (01)	P.5, P.8, P.17-18, P.12, P.4	Doris Chu
02	August 17, 2023	See the following Note Rev. (02)	P.4	Doris Chu
03	August 18, 2023	See the following Note Rev. (03)	P.4	Doris Chu

Rev. (01)

1. Modify antenna type to Monopole in section 1.3.
2. Modify 966D Equipment to EXA Signal Analyzer in section 1.6.
3. Add 240V Conduction data in section 4.1.4.
4. Modify test mode in section 3.2.
5. Add Serial Number and modify Model Discrepancy in section 1.1.

Rev. (02)

1. Modify Serial Number in section 1.1.

Rev. (03)

1. Remove HW Version in section 1.1.

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# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

Applicant	Signify (China) Investment Co., Ltd. Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai, 200233, China	
Manufacturer	Signify (China) Investment Co., Ltd. Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai, 200233, China	
Equipment	Digital Device	
Model No.	9290035625, 9290035626	
Model Discrepancy	<b>Model</b>	<b>Difference</b>
	9290035625	1.without Battery components 2. without level shift IC 3. Zigbee Antenna model: RFFPA203007IMAB402 WiFi Antenna model: RFFPA203006IMLB403
	9290035626	1. with Battery components 2.with level shift IC 3. Zigbee Antenna model: RFFPA203007IMAB401 WiFi Antenna model: RFFPA203006IMLB402
Trade Name	Philips	
Received Date	June 2, 2023	
Date of Test	June 12 ~ August 8, 2023	
Power Supply	1. Power from Power Adapter. I/P: 100-240VAC, 0.6A, 50-60Hz O/P: 12.0VDC, 2.0A, 24.0W 2. Power from Battery. (DC 3.7V) (for 9290035626)	
SW Version	V1.0.02R25	
Serial Number	Radiated: 9290035625: E53080 9290035626: 0DF5C2 Conducted 9290035625: FB2287 Conduction 9290035626: 74F6BF	

**Remark:**

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. Disclaimer: The variant model numbers / trademarks are assessed as identical in hardware and software to each other, hence all variants are fully covered by the test results in this test report without further verification test.

## 1.2 EUT CHANNEL INFORMATION

Frequency Range	Zigbee: 2405~2480MHz
Modulation Type	Zigbee: OQPSK (Offset Quadrature Phase Shift Keyed)
Number of channels	Zigbee: 16 Channels

**Remark:**

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
<input type="checkbox"/> 1 MHz or less	1	Middle
<input type="checkbox"/> 1 MHz to 10 MHz	2	1 near top and 1 near bottom
<input checked="" type="checkbox"/> More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

## 1.3 ANTENNA INFORMATION

Antenna Type	<input checked="" type="checkbox"/> Monopole <input type="checkbox"/> PCB <input type="checkbox"/> Dipole <input type="checkbox"/> Coils
Antenna Gain	9290035625: Gain: 1.3 dBi 9290035626: Gain: 1.1 dBi
Antenna connector	I-PEX

**Notes:**

1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.

## 1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
RF output power (Power Meter + Power sensor)	± 0.243 dB
Power Spectral density	± 2.739 dB
Conducted Bandedge	± 2.739 dB
Conducted Spurious Emission	± 2.742 dB
Radiated Emission_9kHz-30MHz	± 3.115 dB
Radiated Emission_30MHz-200MHz	± 4.071 dB
Radiated Emission_200MHz-1GHz	± 4.419 dB
Radiated Emission_1GHz-6GHz	± 5.023 dB
Radiated Emission_6GHz-18GHz	± 5.068 dB
Radiated Emission_18GHz-26GHz	± 3.349 dB
Radiated Emission_26GHz-40GHz	± 3.229 dB

**Remark:**

- 1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

## 1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

AC Powerline Conducted Emission and Conducted:

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

Radiated emission 9kHz to 40GHz:

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Tony Chao	-
Radiation	Czerny Lin	-
RF Conducted	Allen Shen	-

**Remark:** The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC public Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

## 1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Sensor	Anritsu	MA2411B	1911386	2022-08-08	2023-08-07
Power Sensor	Anritsu	MA2411B	1911387	2022-08-08	2023-08-07
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2022-10-13	2023-10-12
Power Meter	Anritsu	ML2496A	2136002	2022-11-24	2023-11-23
Software	Radio Test Software Ver. 21 & E3-Ver: 6.11-20180413 LTE Measurement_Power-Ver.21				

Wugu 966 Chamber D					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Antenna	SHWARZBECK	VULB 9168	1277	2023-01-13	2024-01-12
Pre-Amplifier	EMCI	EMC118A4 5SE	980820	2022-12-23	2023-12-22
Pre-Amplifier	EMCI	EMC330N	980853	2022-12-23	2023-12-22
Coaxial Cable	EMC	EMC101G- KM-KM-900 0	220407+21122 8+230205	2023-03-21	2024-03-20
EXA Signal Analyzer	Agilent	N9010A	MY52220817	2023-03-09	2024-03-08
Coaxial Cable	EMC	EMCCFD4 00	211212+211222 +211020	2023-03-21	2024-03-20
High Pass Filter	TITAN	T04H30001 800070S01	211215-7-1	2023-02-02	2024-02-01
Thermo-Hygro Meter	EDSDS	EDS-A49	966D1	2023-05-11	2024-05-10
Pre-Amplifier	EMCI	EMC18404 5SE	980872	2023-01-03	2024-01-02
Horn Antenna	RF SPIN	DRH18-E	210301A18ES	2023-02-03	2024-02-02
Horn Antenna	SHWARZBECK	BBHA 9170	1134	2022-12-30	2023-12-29
Loop Antenna	SCHWARZBEC K	FMZB 1513-60	1513-60-028	2022-12-27	2023-12-26
Software	e3 V9-210616c				

AC Conducted Emissions Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
EMI Test Receiver	R&S	ESCI	100064	2023-06-07	2024-06-06
LISN	TESEQ	LN2-16N	22012	2023-03-08	2024-03-07
Cable	EMCI	CFD300-NL	CERF	2022-06-27	2023-06-26
				2023-06-27	2024-06-26
Software	EZ-EMC(CCS-3A1-CE-WUGU)				

**Remark:**

1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.



## 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(E)	Lenovo	T460	N/A	N/A

## 1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247.

## 2. TEST SUMMERY

<b>FCC Standard Section</b>	<b>Chapter</b>	<b>Test Item</b>	<b>Result</b>
15.203	1.3	Antenna Requirement	Pass
15.207	4.1	AC Conducted Emission	Pass
15.247(a)(2)	4.2	6 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)	4.3	Output Power Measurement	Pass
15.247(e)	4.4	Power Spectral Density	Pass
15.247(d)	4.5	Conducted Band Edge	Pass
15.247(d)	4.5	Conducted Emission	Pass
15.247(d)	4.6	Radiation Band Edge	Pass
15.247(d)	4.6	Radiation Spurious Emission	Pass

### 3. DESCRIPTION OF TEST MODES

#### 3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	Zigbee
Test Channel Frequencies	<b>Zigbee:</b> 1. Lowest Channel : 2405MHz 2. Middle Channel : 2440MHz 3. Highest Channel : 2480MHz

### 3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT (Model: 9290035626) Power by Adapter-1.5m(S024CSM1200200) Mode 2: EUT (Model: 9290035625) Power by Adapter-1.5m(S024CSM1200200)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT (Model: 9290035626) Power by Adapter-1.5m(S024CSM1200200) Mode 2: EUT (Model: 9290035625) Power by Adapter-1.5m(S024CSM1200200)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst Position	<input type="checkbox"/> Placed in fixed position. <input checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> Placed in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT (Model: 9290035626) Power by Adapter-1.5m(S024CSM1200200) Mode 2: EUT (Model: 9290035625) Power by Adapter-1.5m(S024CSM1200200)
Worst Mode	<input type="checkbox"/> Mode 1 <input checked="" type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

*Remark:*

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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### 3.3 EUT DUTY CYCLE

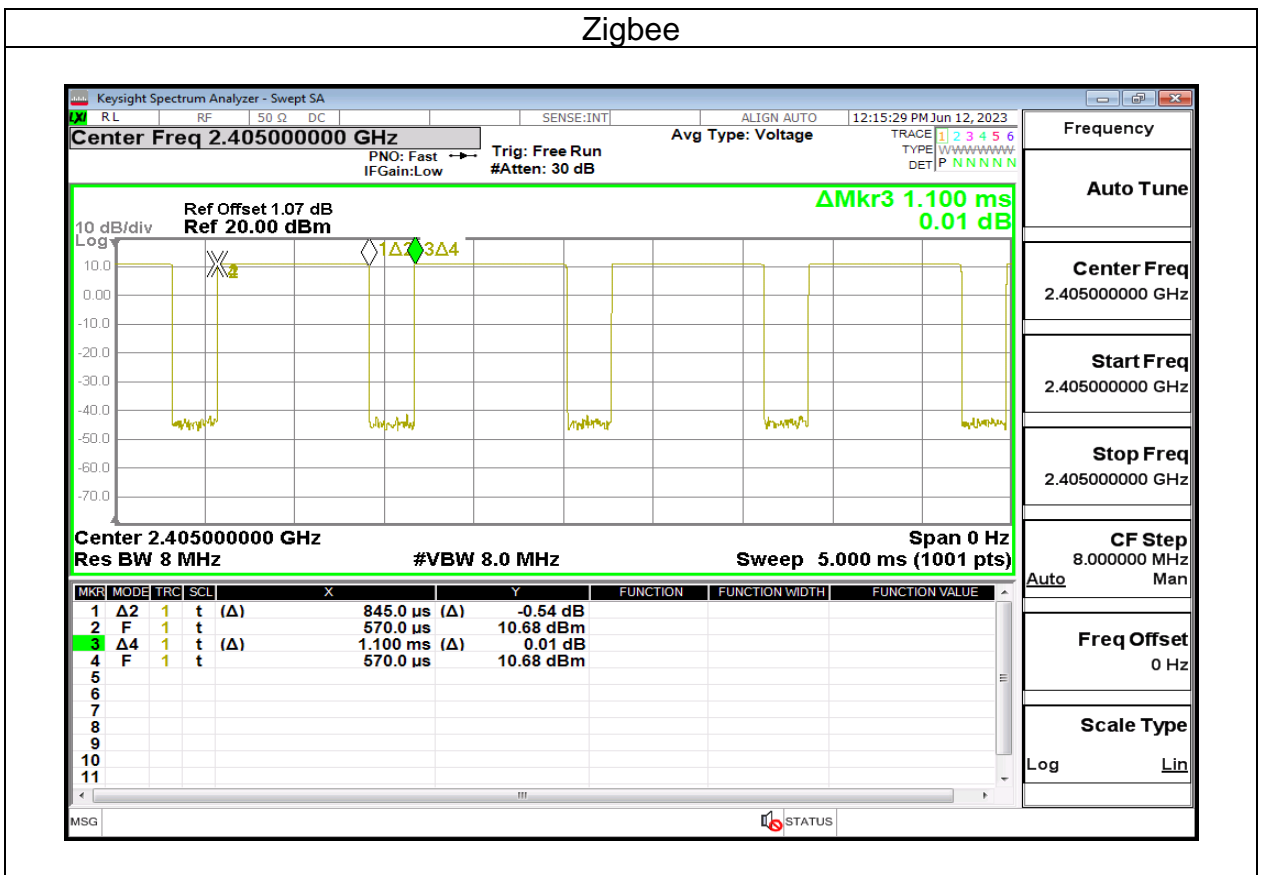
Temperature: 23.2 ~ 25.4°C

Test date: June 12 ~ 15, 2023

Humidity: 57 ~ 60% RH

Tested by: Allen Shen

Duty Cycle				
Configuration	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
Zigbee	76.82	1.15	1.18	2.00



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## 4. TEST RESULT

### 4.1 AC POWER LINE CONDUCTED EMISSION

#### 4.1.1 Test Limit

According to §15.207(a)(2),

Frequency Range (MHz)	Limits(dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

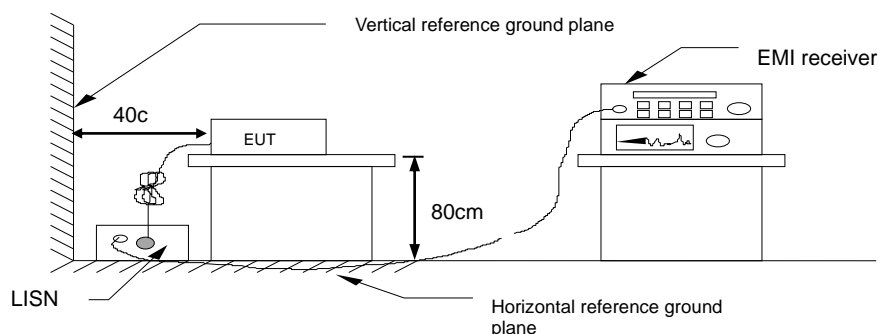
\* Decreases with the logarithm of the frequency.

#### 4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

#### 4.1.3 Test Setup



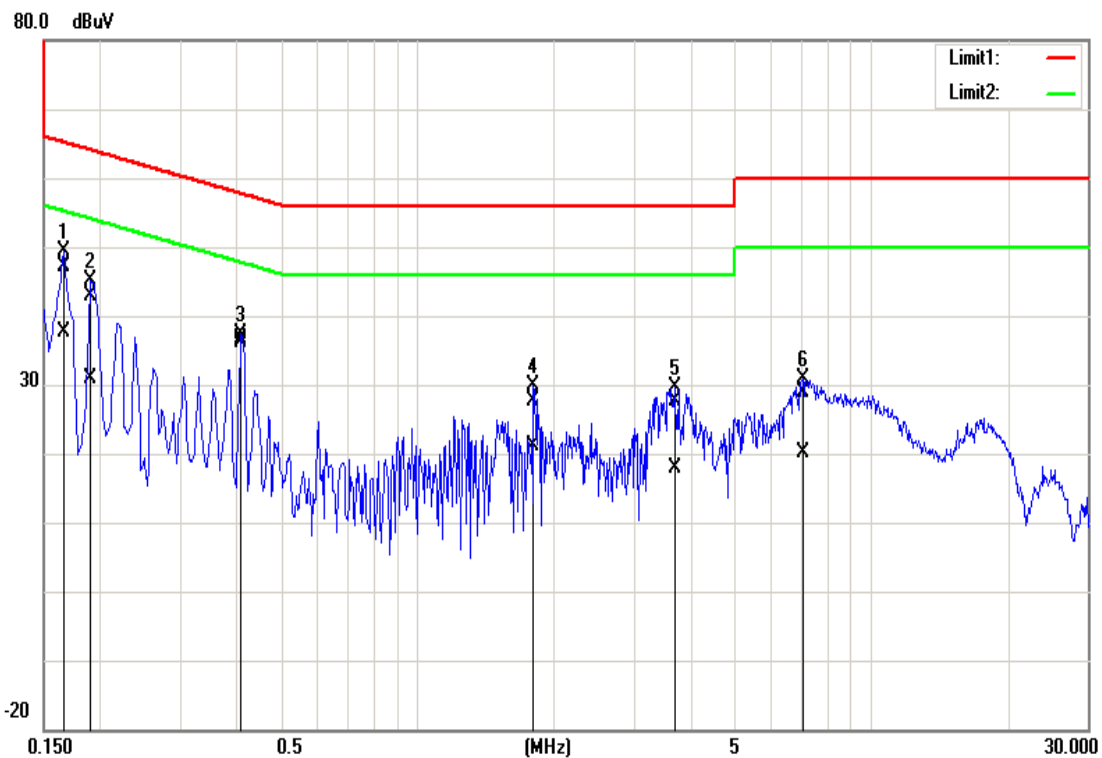
#### 4.1.4 Test Result

**Pass.**

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## Test Data

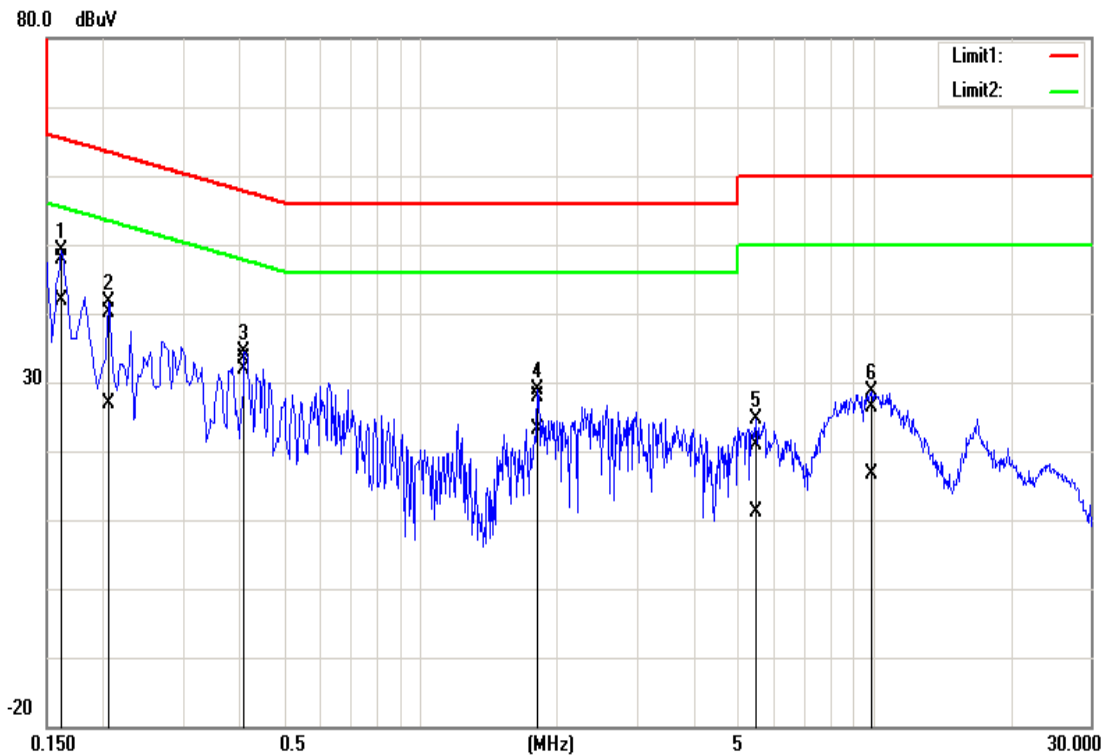
Test Mode:	Mode 1	Temp/Hum	24.8(°C)/ 57%RH
Phase:	Line	Test Date	June 19, 2023
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (d uV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1660	46.98	37.38	0.15	47.13	37.53	65.16	55.16	-18.03	-17.63	Pass
0.1900	42.80	30.74	0.15	42.95	30.89	64.04	54.04	-21.09	-23.15	Pass
0.4100	36.53	35.94	0.15	36.68	36.09	57.65	47.65	-20.97	-11.56	Pass
1.8060	27.31	20.86	0.20	27.51	21.06	56.00	46.00	-28.49	-24.94	Pass
3.6820	27.46	17.74	0.25	27.71	17.99	56.00	46.00	-28.29	-28.01	Pass
7.0860	28.64	19.71	0.31	28.95	20.02	60.00	50.00	-31.05	-29.98	Pass

**Note:** 1. Correction factor = LISN loss + Cable loss.

Test Mode:	Mode 1	Temp/Hum	24.8(°C)/ 57%RH
Phase:	Neutral	Test Date	June 19, 2023
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao

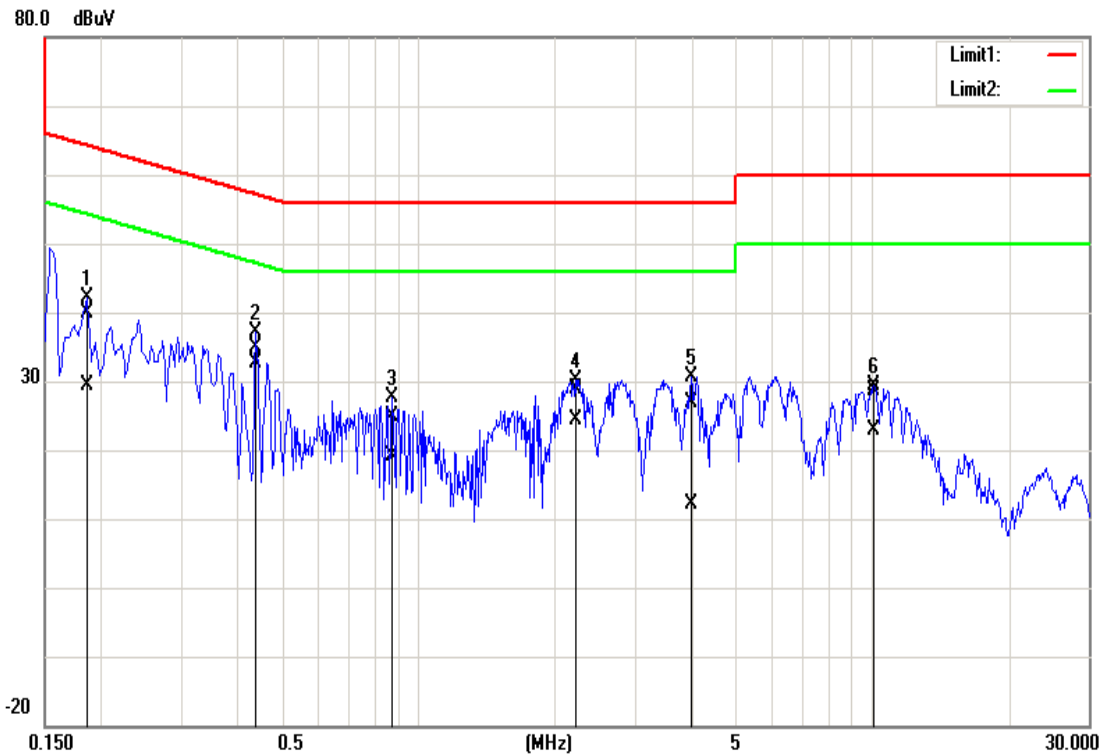


Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1620	47.67	41.68	0.20	47.87	41.88	65.36	55.36	-17.49	-13.48	Pass
0.2060	40.06	26.76	0.19	40.25	26.95	63.37	53.37	-23.12	-26.42	Pass
0.4100	33.31	31.61	0.19	33.50	31.80	57.65	47.65	-24.15	-15.85	Pass
1.8180	27.76	22.97	0.24	28.00	23.21	56.00	46.00	-28.00	-22.79	Pass
5.4780	20.67	10.88	0.32	20.99	11.20	60.00	50.00	-39.01	-38.80	Pass
9.8780	25.93	16.31	0.38	26.31	16.69	60.00	50.00	-33.69	-33.31	Pass

**Note:** 1. Correction factor = LISN loss + Cable loss.



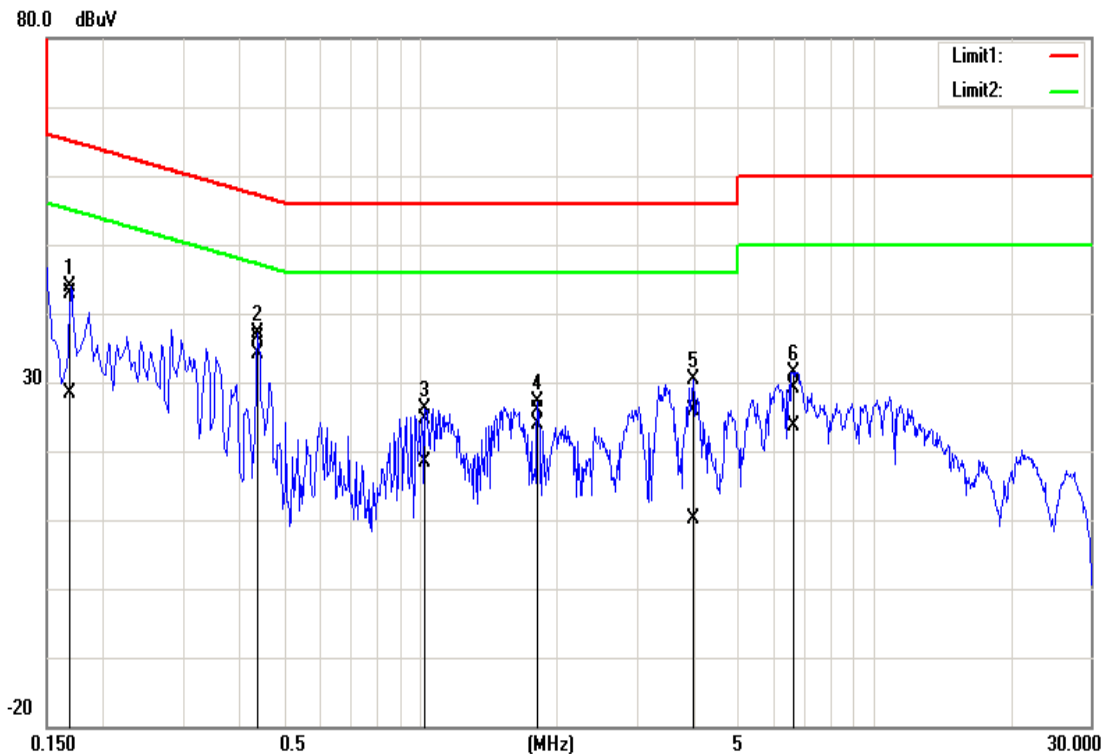
Test Mode:	Mode 1	Temp/Hum	24.3(°C)/ 52%RH
Phase:	Line	Test Date	August 8, 2023
Test Voltage:	240Vac, 50Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (d uV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1860	39.76	29.32	0.15	39.91	29.47	64.21	54.21	-24.30	-24.74	Pass
0.4380	34.72	32.36	0.15	34.87	32.51	57.10	47.10	-22.23	-14.59	Pass
0.8740	24.62	19.00	0.16	24.78	19.16	56.00	46.00	-31.22	-26.84	Pass
2.2180	28.61	24.07	0.22	28.83	24.29	56.00	46.00	-27.17	-21.71	Pass
3.9940	26.59	11.76	0.26	26.85	12.02	56.00	46.00	-29.15	-33.98	Pass
10.1060	28.27	22.56	0.36	28.63	22.92	60.00	50.00	-31.37	-27.08	Pass

**Note:** 1. Correction factor = LISN loss + Cable loss.

Test Mode:	Mode 1	Temp/Hum	24.3(°C)/ 52%RH
Phase:	Neutral	Test Date	August 8, 2023
Test Voltage:	240Vac, 50Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1700	42.81	28.27	0.19	43.00	28.46	64.96	54.96	-21.96	-26.50	Pass
0.4380	36.22	33.98	0.19	36.41	34.17	57.10	47.10	-20.69	-12.93	Pass
1.0260	24.47	18.06	0.21	24.68	18.27	56.00	46.00	-31.32	-27.73	Pass
1.8100	25.54	23.52	0.25	25.79	23.77	56.00	46.00	-30.21	-22.23	Pass
3.9900	25.49	9.85	0.31	25.80	10.16	56.00	46.00	-30.20	-35.84	Pass
6.6340	28.88	23.38	0.34	29.22	23.72	60.00	50.00	-30.78	-26.28	Pass

**Note:** 1. Correction factor = LISN loss + Cable loss.

## 4.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

### 4.2.1 Test Limit

According to §15.247(a)(2)

#### **6 dB Bandwidth** :

Limit	Shall be at least 500kHz
-------	--------------------------

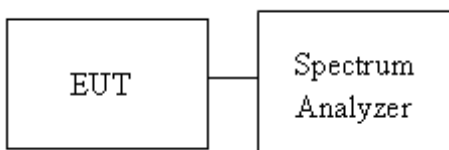
**Occupied Bandwidth(99%)** : For reporting purposes only.

### 4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth in the test report.

### 4.2.3 Test Setup



#### 4.2.4 Test Result

**Temperature:** 23.2 ~ 25.4°C

**Test date:** June 12 ~ 15, 2023

**Humidity:** 57 ~ 60% RH

**Tested by:** Allen Shen

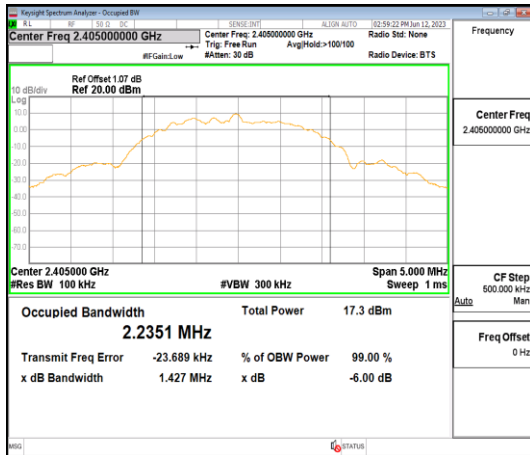
Test mode: Zigbee / 2405-2480 MHz				
Channel	Frequency (MHz)	OBW (99%) (MHz)	6dB BW (MHz)	6dB limit (kHz)
Low	2405	2.2217	1.427	≥500
Mid	2440	2.2230	1.423	
High	2480	2.2267	1.336	

Report No.: TMWK2305001704KR

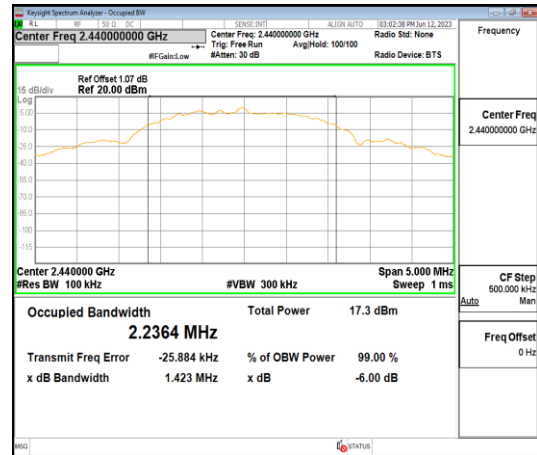
## Test Data 6dB BANDWIDTH

### Zigbee

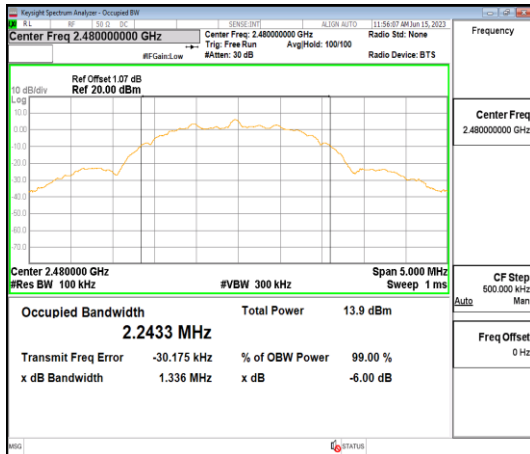
#### Low CH



#### Mid CH

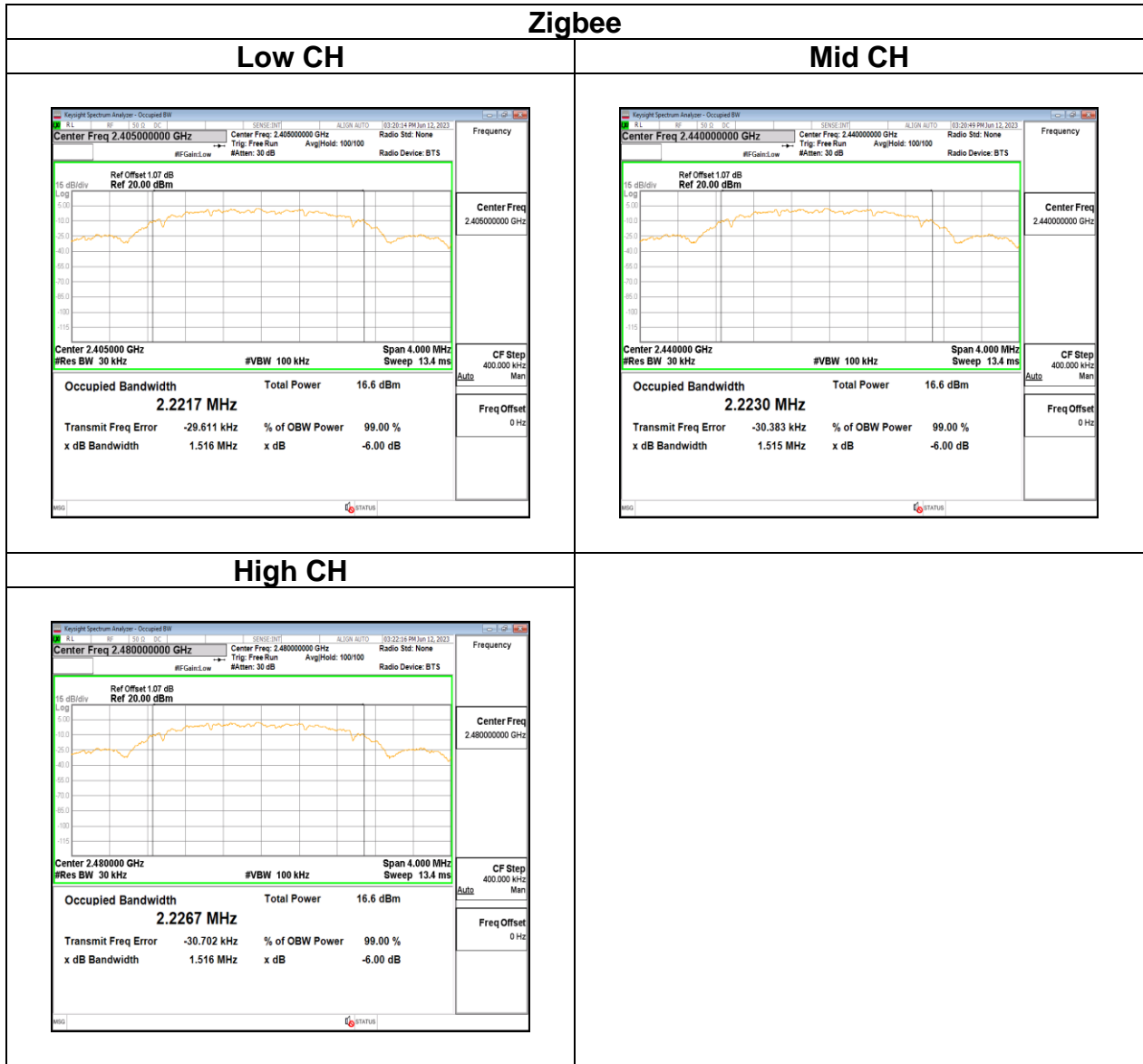


#### High CH



Report No.: TMWK2305001704KR

## Test Data BANDWIDTH (99%)



## 4.3 OUTPUT POWER MEASUREMENT

### 4.3.1 Test Limit

According to §15.247(b),

#### Peak output power :

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 30dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : [Limit = 30 – (DG – 6)] <input type="checkbox"/> Point-to-point operation :
-------	---

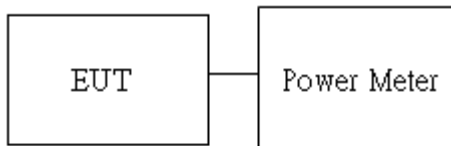
Average output power : For reporting purposes only.

### 4.3.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power in the test report.

### 4.3.3 Test Setup



### 4.3.4 Test Result

**Temperature:** 23.2 ~ 25.4°C

**Test date:** June 12 ~ 15, 2023

**Humidity:** 57 ~ 60% RH

**Tested by:** Allen Shen

**Peak output power :**

Zigbee mode:

CH	Frequency (MHz)	Power set	Peak Output Power (dBm)	Required Limit (dBm)
Low	2405	10	10.21	30
Mid	2440	10	<b>10.51</b>	30
High	2480	8	7.09	30

**Average output power :**

Zigbee mode:

CH	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Required Limit (dBm)
Low	2405	10	10.20	30
Mid	2440	10	10.50	30
High	2480	8	7.02	30



## 4.4 POWER SPECTRAL DENSITY

### 4.4.1 Test Limit

According to §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

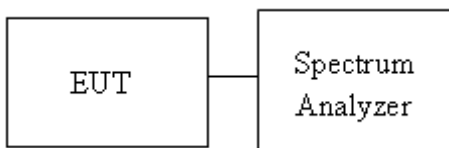
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 8dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi [ Limit = 8 – (DG – 6)] <input type="checkbox"/> Point-to-point operation :
-------	--

### 4.4.2 Test Procedure

Test method Refer as ANSI C63.10:2013

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

### 4.4.3 Test Setup



#### 4.4.4 Test Result

**Temperature:** 23.2 ~ 25.4°C

**Test date:** June 12 ~ 15, 2023

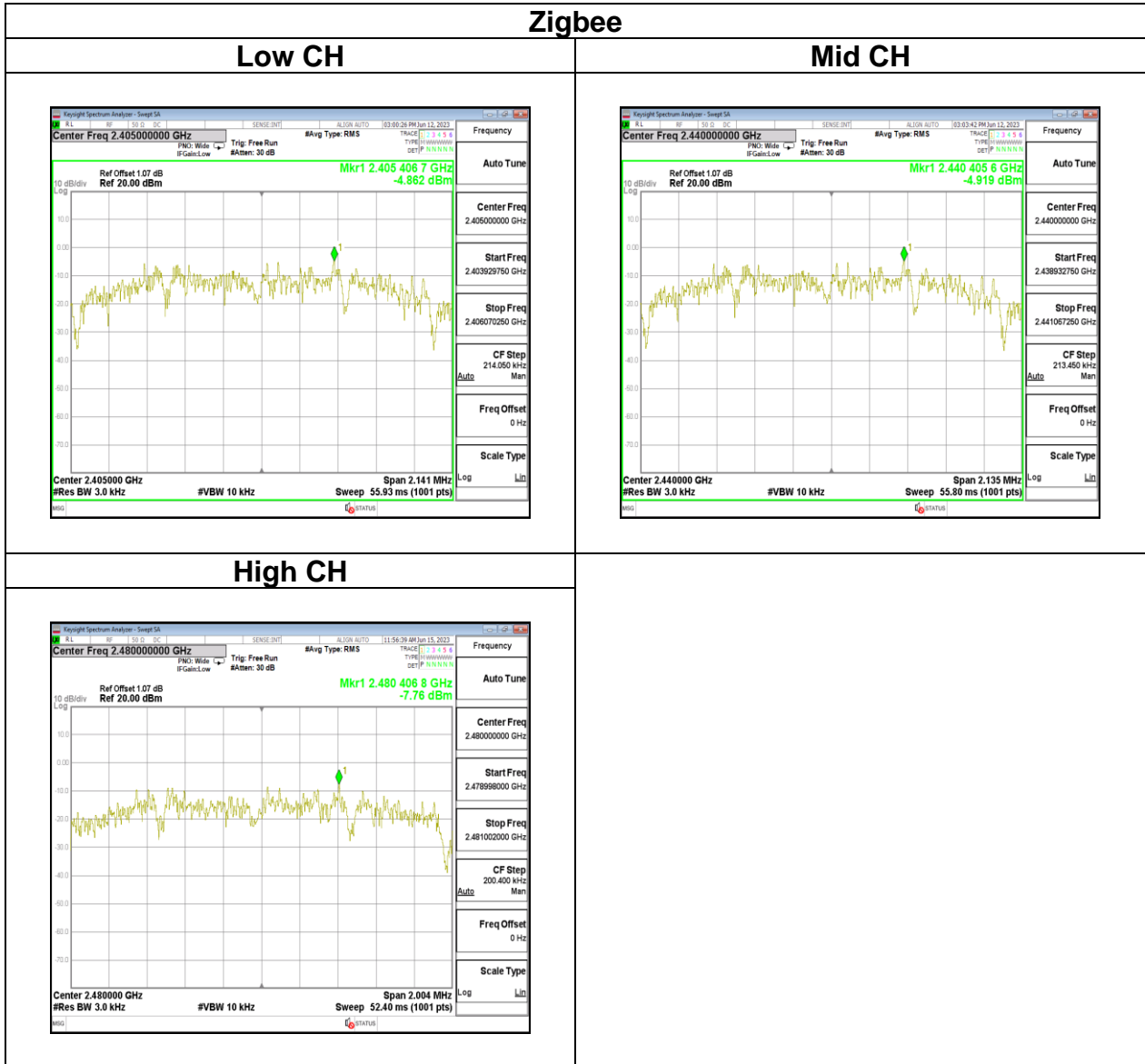
**Humidity:** 57 ~ 60% RH

**Tested by:** Allen Shen

Test mode: Zigbee			
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)
Low	2405	-4.862	8
Mid	2440	-4.919	
High	2480	-7.760	

Report No.: TMWK2305001704KR

## Test Data



## 4.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

### 4.5.1 Test Limit

According to §15.247(d),

In any 100 kHz bandwidth outside the authorized frequency band,

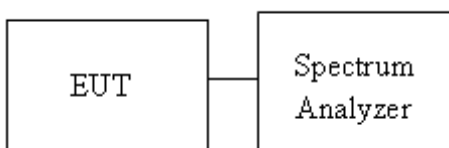
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 4.5.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 4.5.3 Test Setup



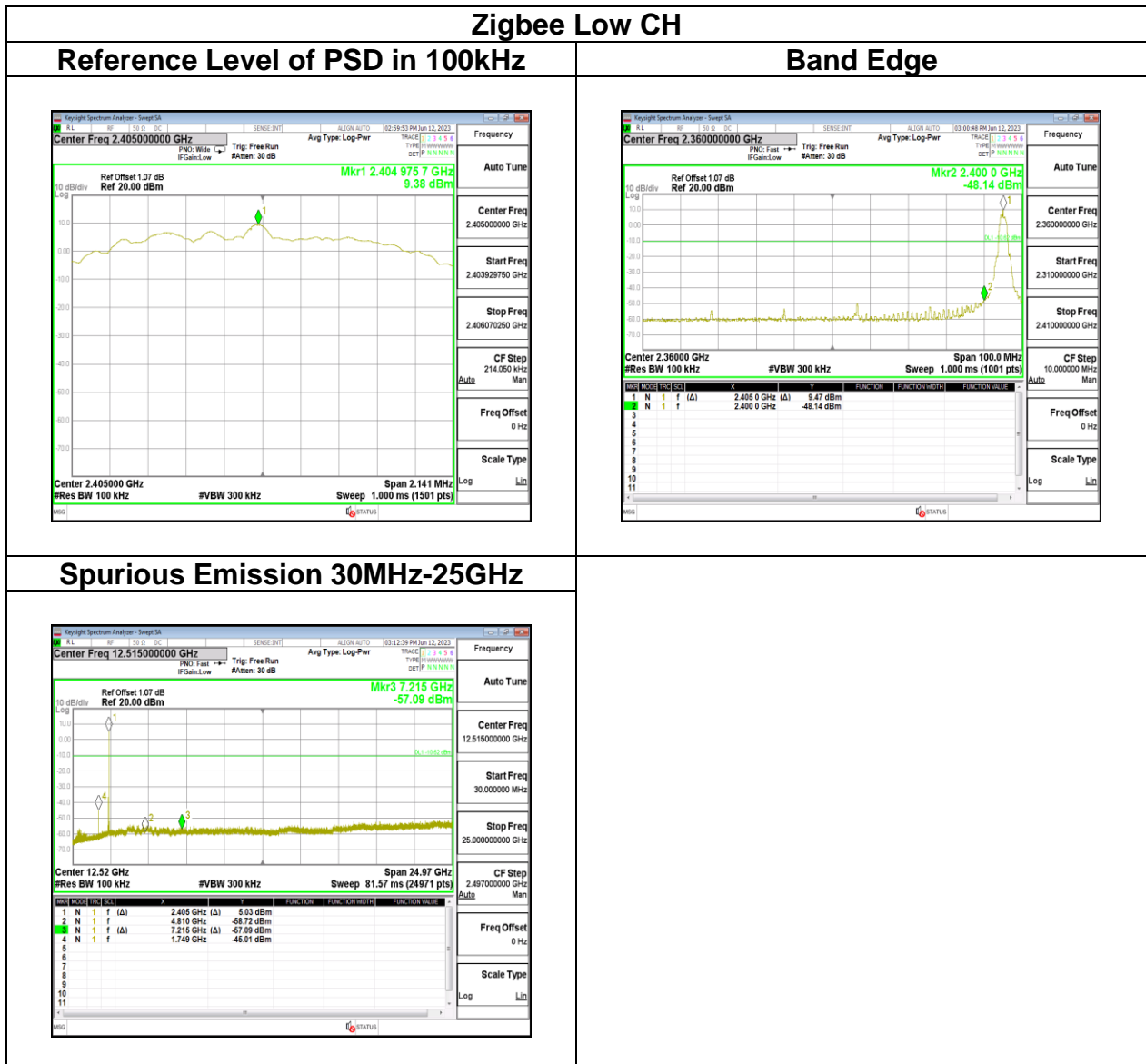
Report No.: TMWK2305001704KR

## 4.5.4 Test Result

Temperature: 23.2 ~ 25.4°C  
Humidity: 57 ~ 60% RH

Test date: June 12 ~ 15, 2023  
Tested by: Allen Shen

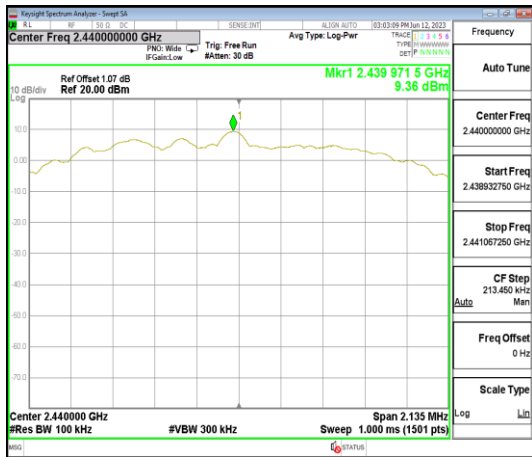
## Test Data



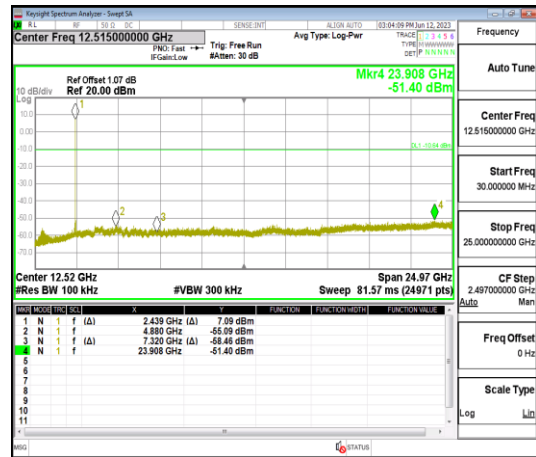
Report No.: TMWK2305001704KR

## Zigbee Mid CH

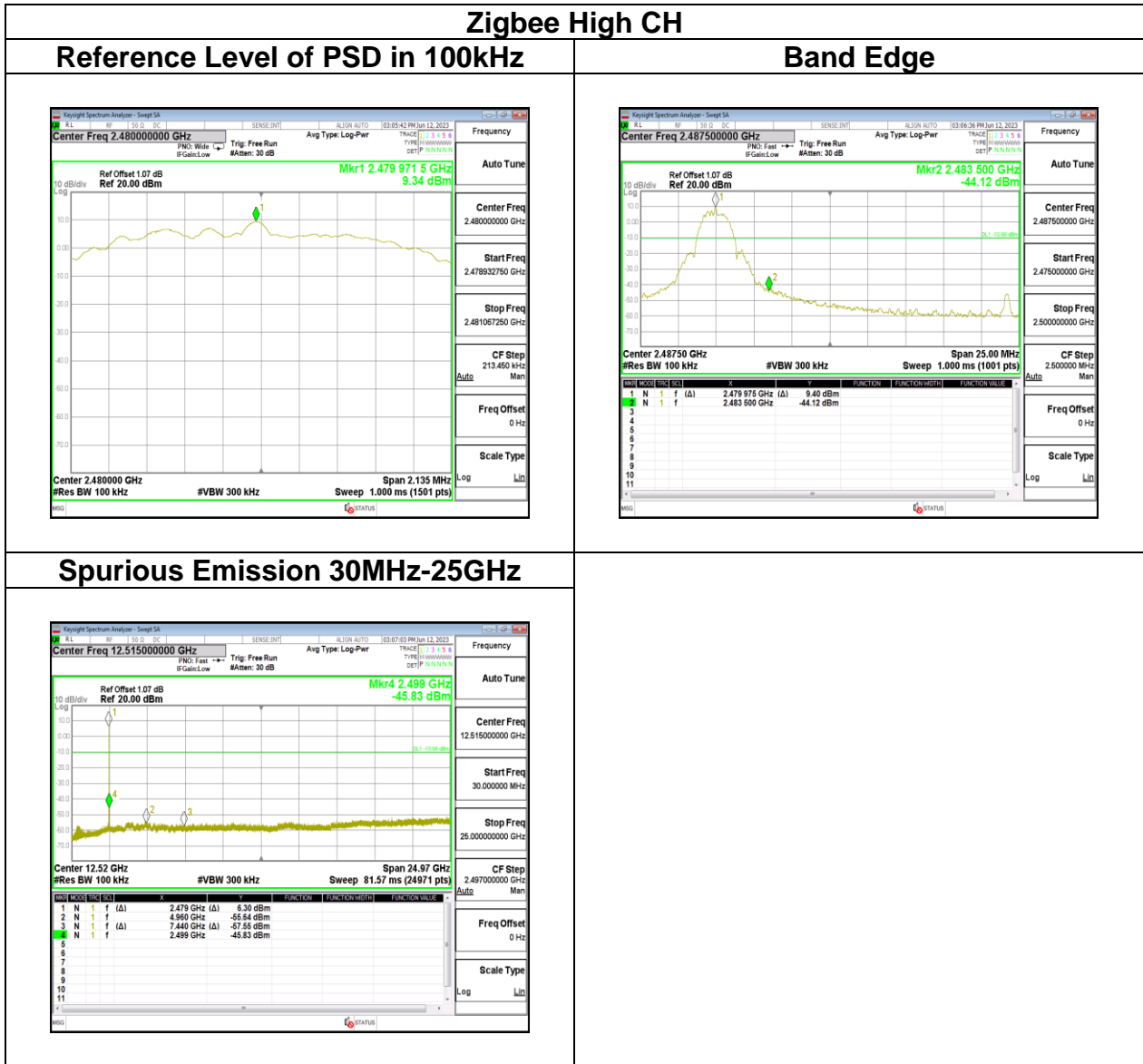
### Reference Level of PSD in 100kHz



### Spurious Emission 30MHz-25GHz



Report No.: TMWK2305001704KR



Report No.: TMWK2305001704KR

## 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

### 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

#### Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

#### Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field.



Report No.: TMWK2305001704KR

## 4.6.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:

1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

4. The SA setting following :

(1) Below 1G : RBW = 100kHz, VBW  $\geq$  3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G :

(2.1) For Peak measurement : RBW = 1MHz, VBW  $\geq$  3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

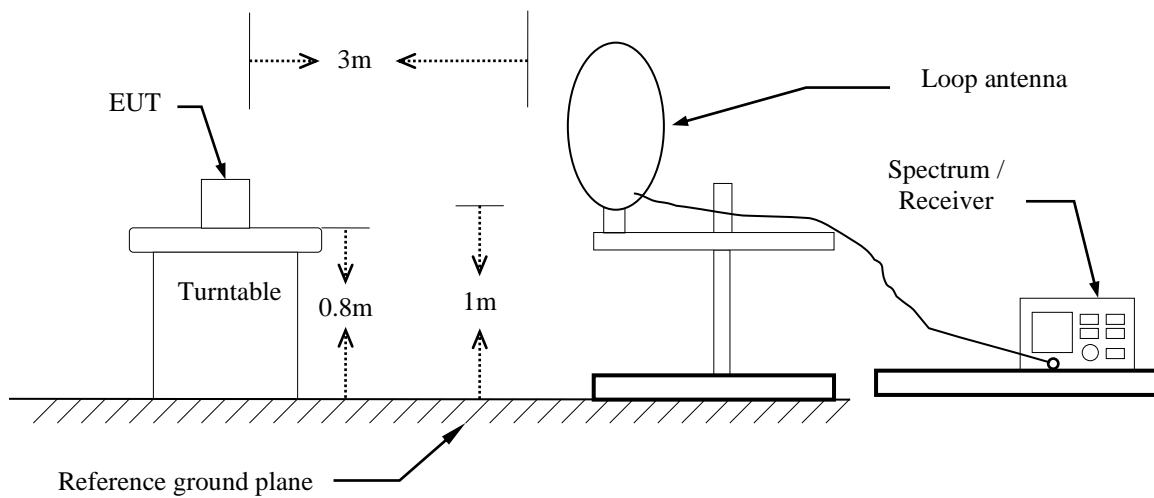
(2.2) For Average measurement : RBW = 1MHz, VBW

·If Duty Cycle  $\geq$  98%, VBW=10Hz.

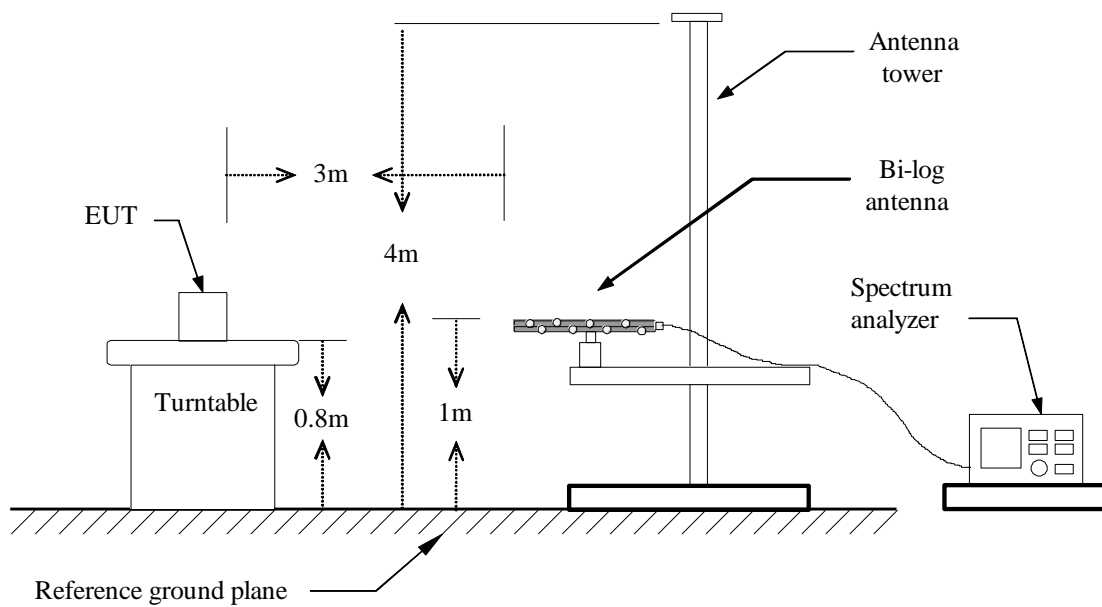
·If Duty Cycle < 98%, VBW $\geq$ 1/T.

## 4.6.3 Test Setup

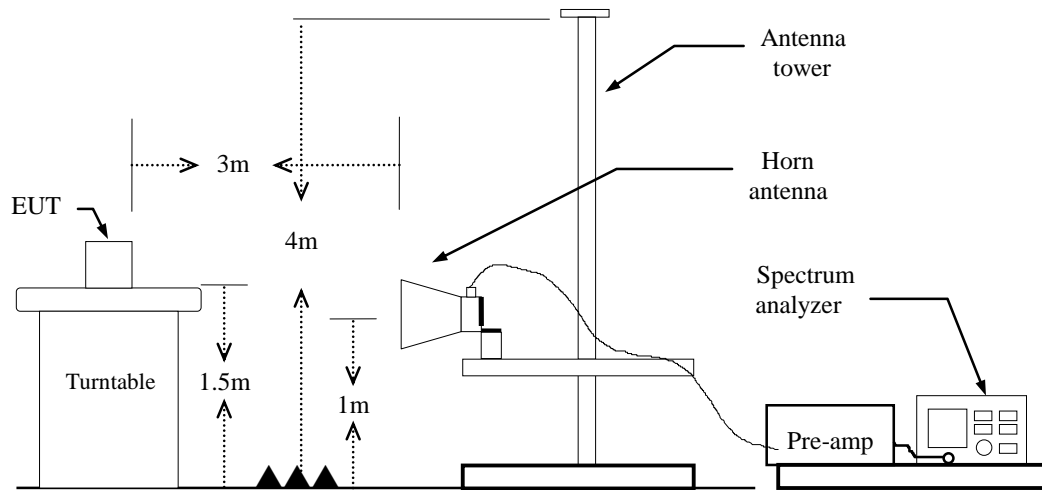
### 9kHz ~ 30MHz



### 30MHz ~ 1GHz



## Above 1 GHz

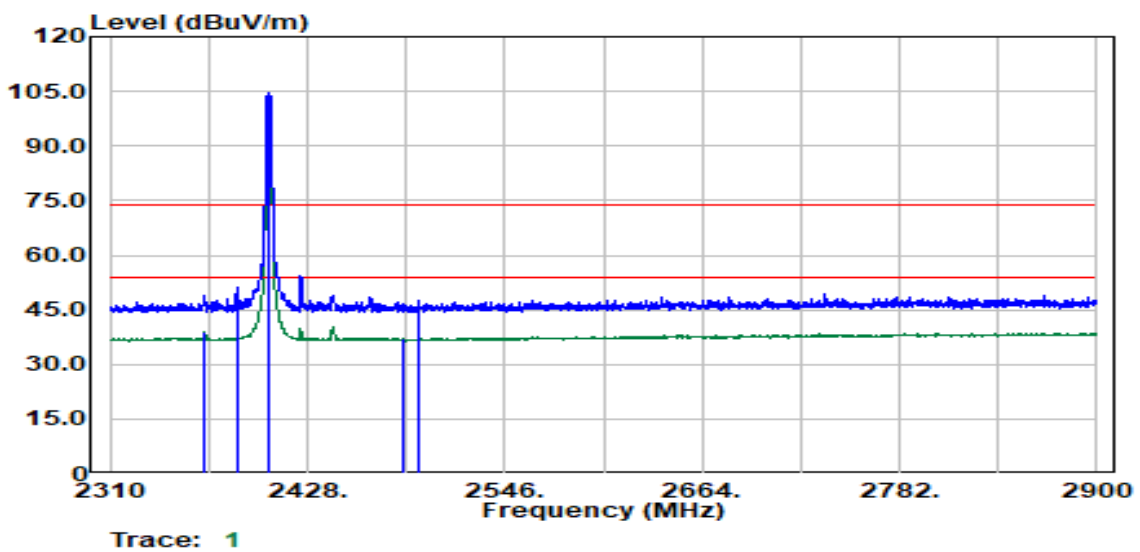


Report No.: TMWK2305001704KR

### 4.6.4 Test Result

#### Band Edge Test Data

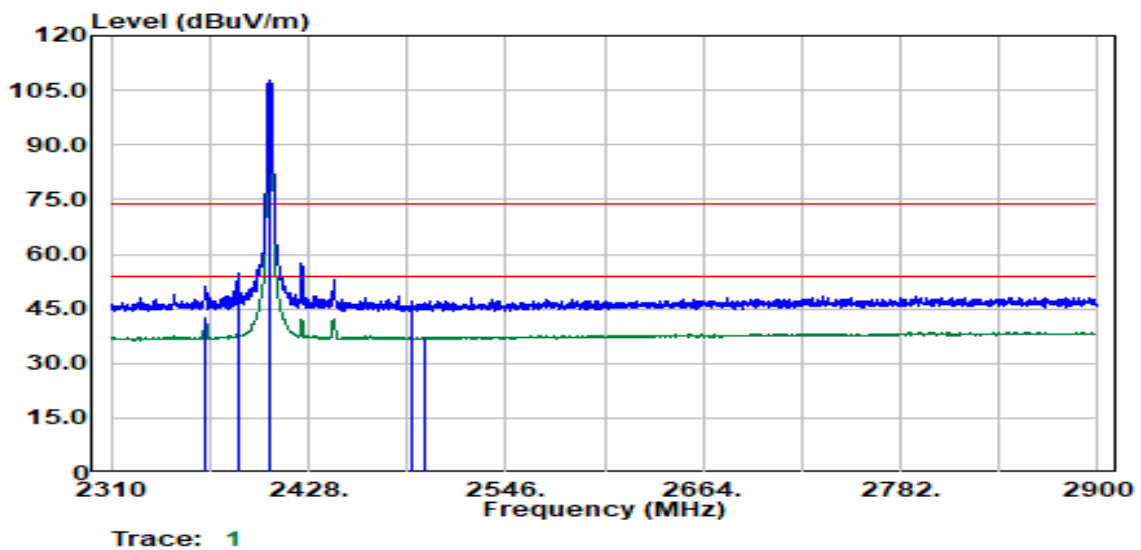
Test Mode	Zigbee Low CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Band Edge	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dB $\mu$ V)	Factor (dB)	Actual FS (dB $\mu$ V/m)	Limit @3m (dB $\mu$ V/m)	Margin (dB)
2366.52	Average	34.40	4.72	39.13	54.00	-14.87
2386.03	Peak	46.35	4.80	51.15	74.00	-22.85
2405.00	Peak	99.89	4.51	104.41	--	--
2405.00	Average	96.72	4.51	101.23	--	--
2485.07	Average	32.38	4.60	36.97	54.00	-17.03
2494.33	Peak	43.07	4.59	47.67	74.00	-26.33

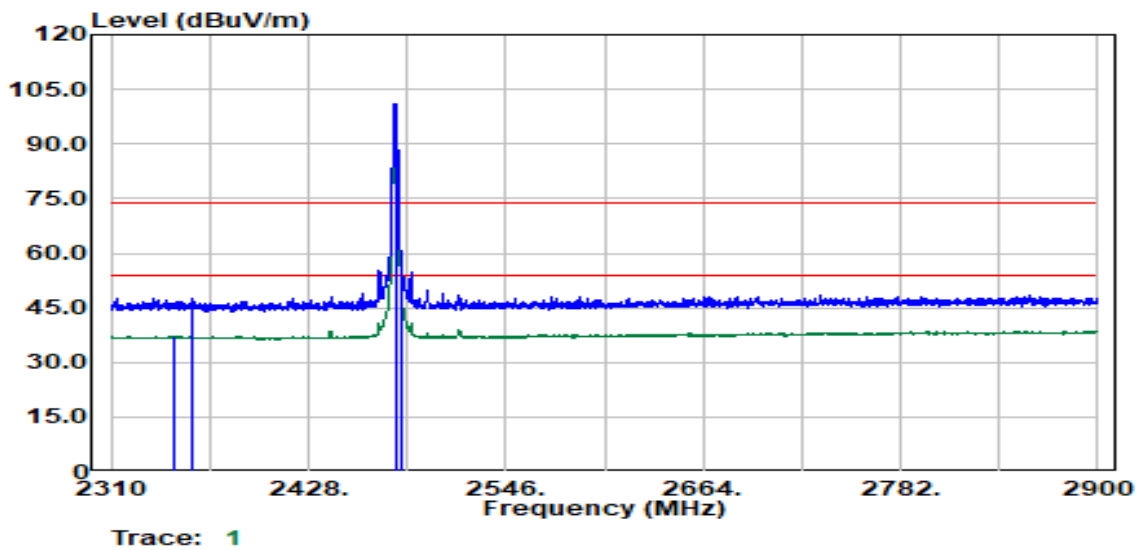
Report No.: TMWK2305001704KR

Test Mode	Zigbee Low CH	Temperature:	25.8(°C)/ 62%RH
Test Item	Band Edge	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2366.27	Average	37.71	4.73	42.44	54.00	-11.56
2385.78	Peak	49.84	4.80	54.64	74.00	-19.36
2405.00	Peak	103.16	4.51	107.68	--	--
2405.00	Average	100.08	4.51	104.59	--	--
2490.58	Peak	42.62	4.55	47.17	74.00	-26.83
2497.83	Average	32.65	4.63	37.28	54.00	-16.72

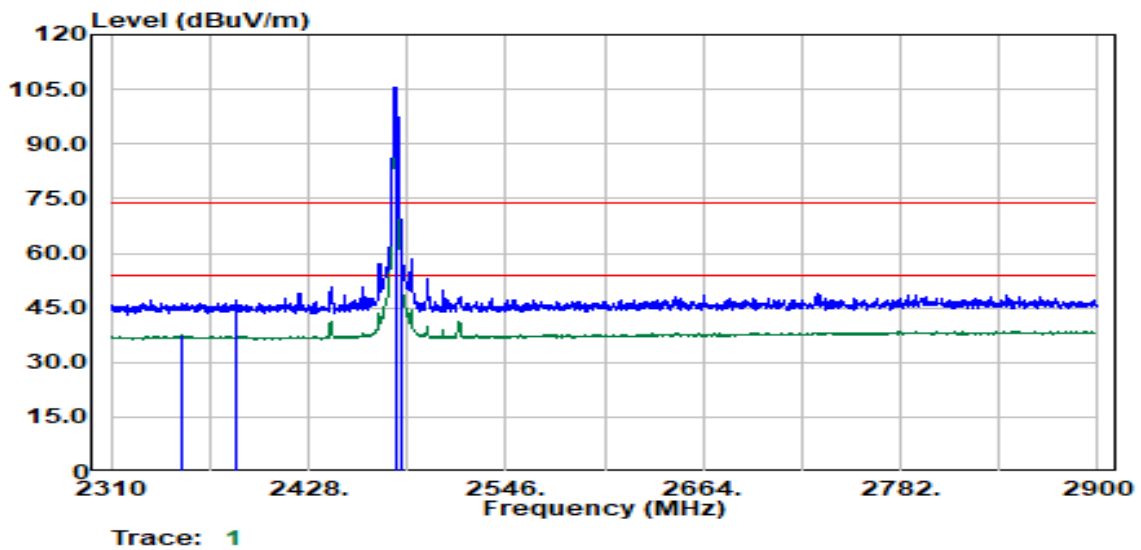
Test Mode	Zigbee High CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Band Edge	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
2347.52	Average	32.38	4.85	37.24	54.00	-16.76
2358.27	Peak	42.57	4.80	47.37	74.00	-26.63
2480.00	Peak	96.49	4.65	101.14	--	--
2480.00	Average	93.38	4.65	98.03	--	--
2483.57	Peak	52.80	4.61	57.41	74.00	-16.59
2483.57	Average	43.54	4.61	48.15	54.00	-5.85

Report No.: TMWK2305001704KR

Test Mode	Zigbee High CH	Temperature:	25.8(°C)/ 62%RH
Test Item	Band Edge	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		

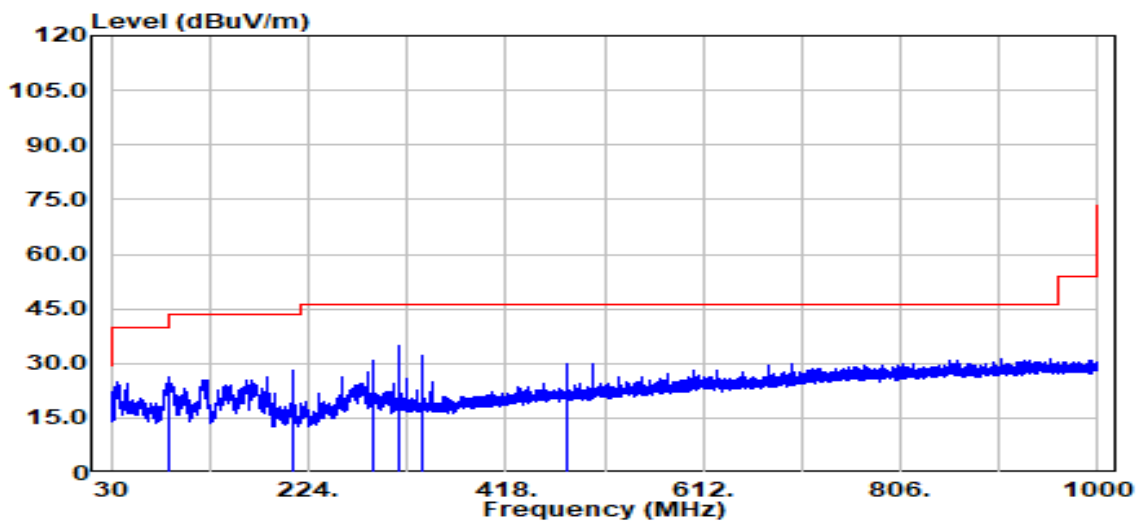


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dB $\mu$ V)	Factor (dB)	Actual FS (dB $\mu$ V/m)	Limit @3m (dB $\mu$ V/m)	Margin (dB)
2352.02	Average	32.56	4.86	37.42	54.00	-16.58
2385.28	Peak	42.76	4.80	47.56	74.00	-26.44
2480.00	Peak	100.73	4.65	105.38	--	--
2480.00	Average	97.60	4.65	102.25	--	--
2483.57	Peak	56.09	4.61	60.70	74.00	-13.30
2483.57	Average	47.99	4.61	52.60	54.00	-1.40

Report No.: TMWK2305001704KR

### **Below 1GHz**

Test Mode	Mode 2	Temp/Hum	24.5(°C)/ 61%RH
Test Item	30MHz-1GHz	Test Date	June 17, 2023
Polarize	Vertical	Test Engineer	Czerny Lin
Detector	Peak		



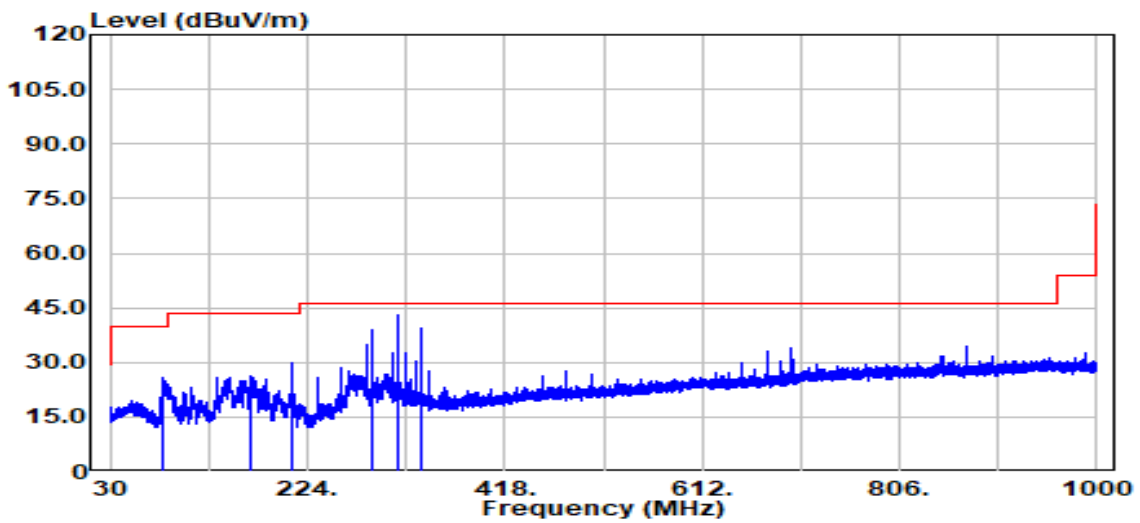
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dB $\mu$ V)	Factor (dB)	Actual FS (dB $\mu$ V/m)	Limit @3m (dB $\mu$ V/m)	Margin (dB)
86.94	Peak	44.99	-18.85	26.15	40.00	-13.85
208.87	Peak	44.11	-16.07	28.04	43.50	-15.46
288.02	Peak	43.54	-12.54	31.01	46.00	-14.99
311.98	Peak	46.81	-11.92	34.89	46.00	-11.11
336.04	Peak	43.56	-11.23	32.34	46.00	-13.66
479.30	Peak	37.90	-7.84	30.06	46.00	-15.94

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).



Report No.: TMWK2305001704KR

Test Mode	Mode 2	Temp/Hum	24.5(°C)/ 61%RH
Test Item	30MHz-1GHz	Test Date	June 17, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak		

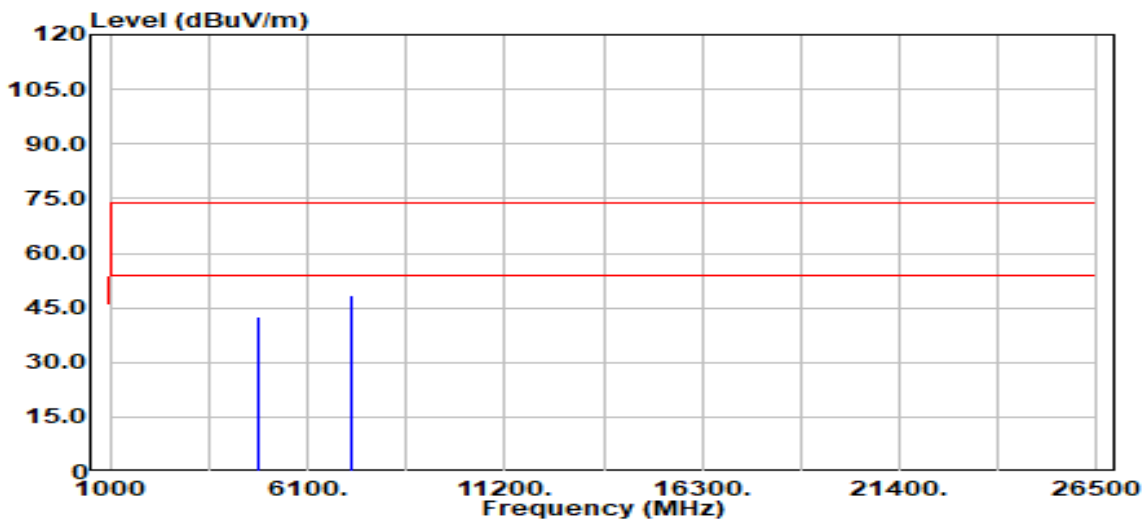


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dB $\mu$ V)	Factor (dB)	Actual FS (dB $\mu$ V/m)	Limit @3m (dB $\mu$ V/m)	Margin (dB)
82.38	Peak	44.20	-18.23	25.96	40.00	-14.04
168.90	Peak	39.76	-13.40	26.36	43.50	-17.14
208.87	Peak	46.14	-16.07	30.06	43.50	-13.44
288.02	Peak	51.69	-12.54	39.16	46.00	-6.84
311.98	Peak	54.86	-11.92	42.94	46.00	-3.06
336.04	Peak	50.45	-11.23	39.22	46.00	-6.78

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

**Above 1 GHz**

Test Mode	Zigbee Low CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		

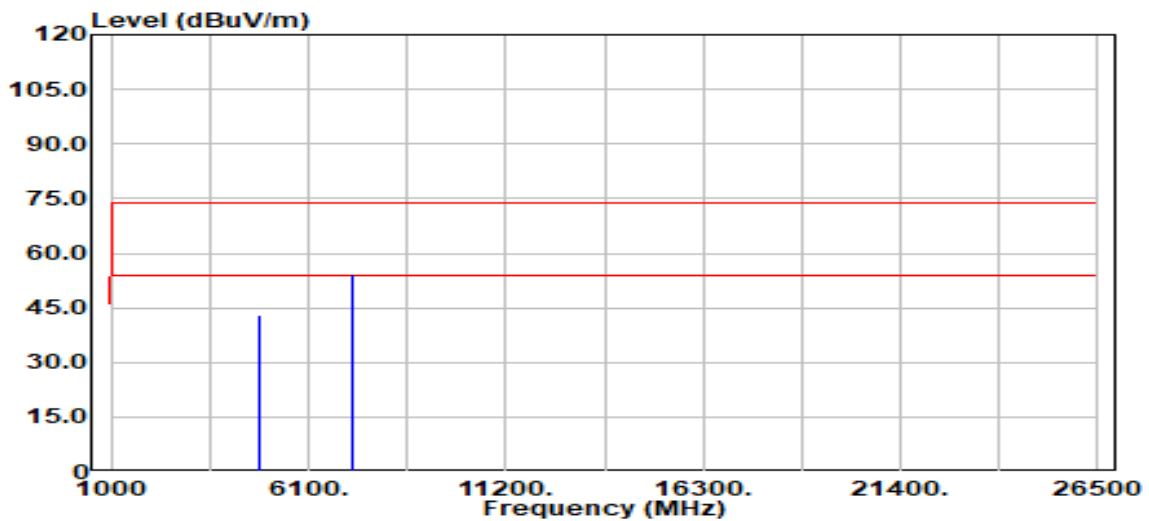


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
4810.00	Peak	42.35	0.39	42.74	74.00	-31.26
4810.00	Average	34.75	0.39	35.14	54.00	-18.86
7215.00	Peak	42.99	5.34	48.33	74.00	-25.67
7215.00	Average	36.23	5.34	41.57	54.00	-12.43
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	Zigbee Low CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Vertical	Test Engineer	Czerny Lin
Detector	Peak / Average		

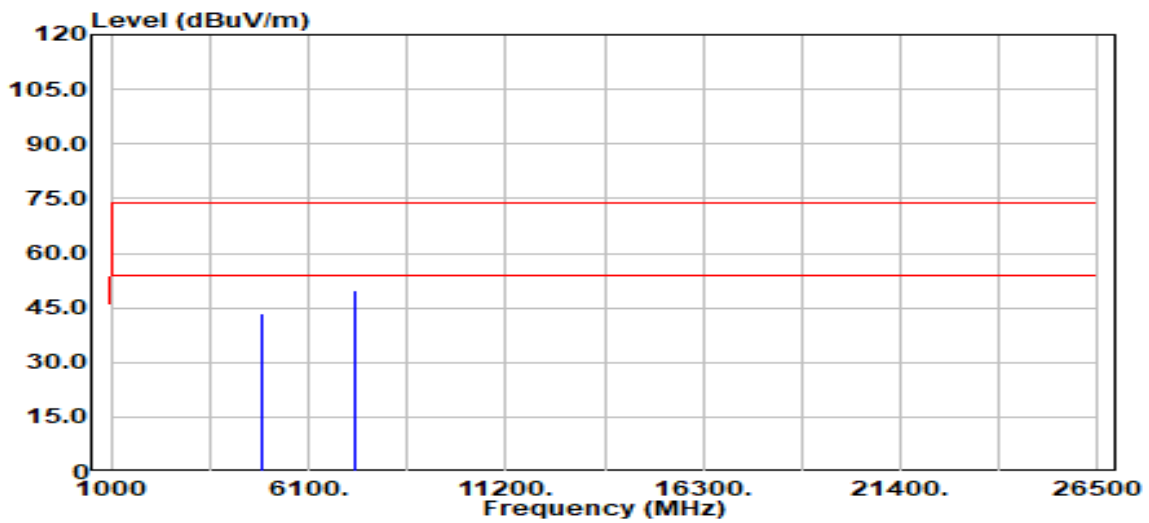


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dB $\mu$ V)	Factor (dB)	Actual FS (dB $\mu$ V/m)	Limit @3m (dB $\mu$ V/m)	Margin (dB)
4810.00	Peak	42.48	0.39	42.87	74.00	-31.13
4810.00	Average	34.67	0.39	35.06	54.00	-18.94
7215.00	Peak	49.01	5.34	54.34	74.00	-19.66
7215.00	Average	40.60	5.34	45.94	54.00	-8.06
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	Zigbee Mid CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		

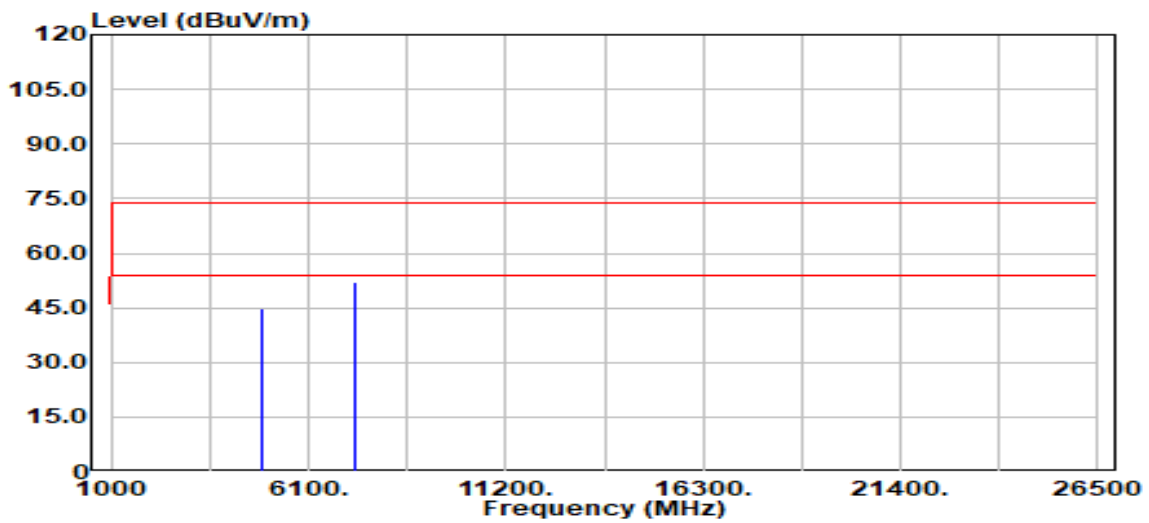


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
4880.00	Peak	42.82	0.48	43.30	74.00	-30.70
4880.00	Average	33.40	0.48	33.89	54.00	-20.11
7320.00	Peak	44.40	5.48	49.88	74.00	-24.12
7320.00	Average	35.36	5.48	40.84	54.00	-13.16
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	Zigbee Mid CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Vertical	Test Engineer	Czerny Lin
Detector	Peak / Average		

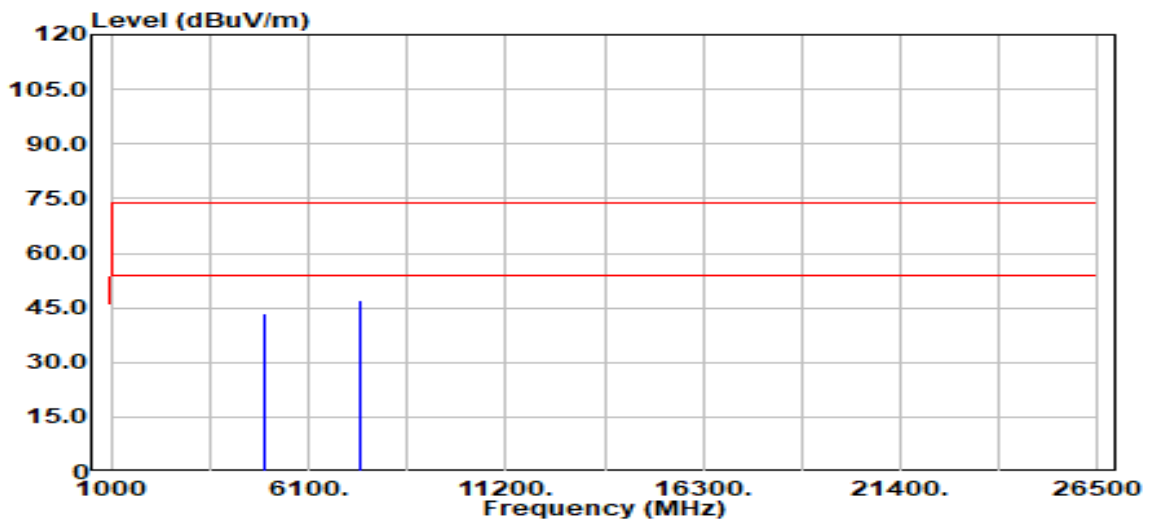


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4880.00	Peak	44.33	0.48	44.81	74.00	-29.19
4880.00	Average	35.69	0.48	36.17	54.00	-17.83
7320.00	Peak	46.58	5.48	52.06	74.00	-21.94
7320.00	Average	37.04	5.48	42.52	54.00	-11.48
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	Zigbee High CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Horizontal	Test Engineer	Czerny Lin
Detector	Peak / Average		

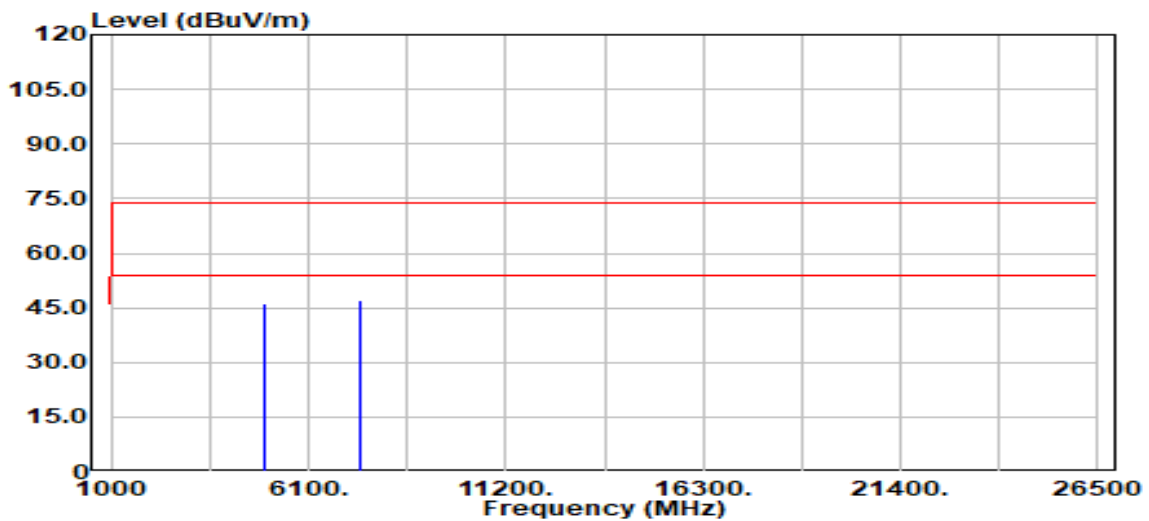


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
4960.00	Peak	42.68	0.65	43.33	74.00	-30.67
4960.00	Average	32.86	0.65	33.50	54.00	-20.50
7440.00	Peak	41.53	5.56	47.09	74.00	-26.91
7440.00	Average	31.37	5.56	36.93	54.00	-17.07
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	Zigbee High CH	Temp/Hum	25.8(°C)/ 62%RH
Test Item	Harmonic	Test Date	June 13, 2023
Polarize	Vertical	Test Engineer	Czerny Lin
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
4960.00	Peak	45.56	0.65	46.21	74.00	-27.80
4960.00	Average	37.37	0.65	38.02	54.00	-15.99
7440.00	Peak	41.54	5.56	47.10	74.00	-26.90
7440.00	Average	32.26	5.56	37.82	54.00	-16.18
N/A						

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

**--End of Test Report--**