



# MEASUREMENT REPORT

## FCC PART 15.247 Zigbee

Report No.: S2024031461470104

Issue Date: 04-19-2024

**Applicant:** Jiangsu Shushi Technology Co., Ltd.

**Address:** NO.9 Nanxu Road,RunZhou District,Zhenjiang,  
Jiangsu,China

**FCC ID:** 2BAGQ-3RTHS0224Z

**Product:** Temperature and Humidity Sensor Lite

**Model No.:** 3RTHS0224Z

**FCC Classification:** Digital Transmission System (DTS)

**FCC Rule Part(s):** Part 15 Subpart C (15.247)

**Test Procedure(s):** ANSI C63.10-2013, KDB 558074 D01v05r02

**Result:** Pass

**Item Receipt Date:** Mar. 19, 2024

**Test Date:** Mar. 20 ~ Apr. 03, 2024

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The test results relate only to the samples tested.  
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. Test results reported herein relate only to the item(s) tested. The test report shall not be reproduced except in full without the written approval of Fangguang Inspection & Testing Co., Ltd. Wuxi Branch  
The test report must not be used by the client to claim product certifications, approval, or endorsement by NVLAP, NIST or any agency of U.S. Government.

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## Revision History

Report No.	Version	Description	Issue Date
S2024031461470104	Rev. 01	/	04-19-2024

# CONTENTS

Description	Page
<b>§2.1033 General Information</b> .....	<b>5</b>
<b>1. INTRODUCTION</b> .....	<b>6</b>
1.1. Scope .....	6
1.2. Fangguang Test Location .....	6
<b>2. PRODUCT INFORMATION</b> .....	<b>7</b>
2.1. Equipment Description .....	7
2.2. Product Specification Subjective to this Report .....	7
2.3. Operation Frequency / Channel List .....	8
2.4. Device Capabilities .....	8
2.5. Description of Test Software .....	8
2.6. Test Mode .....	8
2.7. Test Configuration .....	9
2.8. EMI Suppression Device(s)/Modifications .....	9
2.9. Labeling Requirements .....	9
2.10. Calculation with all conversion and correction factors used .....	9
<b>3. DESCRIPTION OF TEST</b> .....	<b>10</b>
3.1. Evaluation Procedure .....	10
3.2. AC Line Conducted Emissions .....	10
3.3. Radiated Emissions .....	11
<b>4. ANTENNA REQUIREMENTS</b> .....	<b>12</b>
<b>5. TEST EQUIPMENT CALIBRATION DATE</b> .....	<b>13</b>
<b>6. MEASUREMENT UNCERTAINTY</b> .....	<b>14</b>
<b>7. TEST RESULT</b> .....	<b>15</b>
7.1. Summary .....	15
7.2. 6dB Bandwidth Measurement .....	16
7.2.1. Test Limit .....	16
7.2.2. Test Procedure used .....	16
7.2.3. Test Setting .....	16
7.2.4. Test Setup .....	16
7.2.5. Test Result .....	17
7.3. Output Power Measurement .....	21
7.3.1. Test Limit .....	21

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7.3.2.	Test Procedure Used .....	21
7.3.3.	Test Setting .....	21
7.3.4.	Test Setup .....	22
7.3.5.	Test Result .....	22
7.4.	Power Spectral Density Measurement .....	25
7.4.1.	Test Limit .....	25
7.4.2.	Test Procedure Used .....	25
7.4.3.	Test Setting .....	25
7.4.4.	Test Setup .....	26
7.4.5.	Test Result .....	27
7.5.	Conducted Band Edge and Out-of-Band Emissions .....	29
7.5.1.	Test Limit .....	29
7.5.2.	Test Procedure Used .....	29
7.5.3.	Test Setting .....	29
7.5.4.	Test Setup .....	29
7.5.5.	Test Result .....	30
7.6.	Radiated Spurious Emission Measurement .....	37
7.6.1.	Test Limit .....	37
7.6.2.	Test Procedure Used .....	37
7.6.3.	Test Setting .....	37
7.6.4.	Test Setup .....	39
7.6.5.	Test Result .....	41
7.7.	Restricted Band Edge Measurement .....	50
7.7.1.	Test Limit .....	50
7.7.2.	Test Procedure Used .....	53
7.7.3.	Test Setting .....	53
7.7.4.	Test Setup .....	54
7.7.5.	Test Result .....	55
7.8.	AC Conducted Emissions Measurement .....	58
7.8.1.	Test Limit .....	58
7.8.2.	Test Setup .....	58
7.8.3.	Test Result .....	59
<b>8.</b>	<b>CONCLUSION .....</b>	<b>60</b>

## §2.1033 General Information

<b>Applicant:</b>	Jiangsu Shushi Technology Co., Ltd.
<b>Applicant Address:</b>	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
<b>Manufacturer:</b>	Jiangsu Shushi Technology Co., Ltd.
<b>Manufacturer Address:</b>	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
<b>Factory:</b>	Shushi (Zhenjiang) Intelligent Technology Co., Ltd.
<b>Factory Address:</b>	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
<b>Test Site:</b>	Fanguang Inspection & Testing Co., Ltd.
<b>LAB ID:</b>	CN5037
<b>Test Site Address:</b>	G9 Building,China Sensor Network International Innovation Park No.200,Linghu Avenue Wuxi,Jiangsu 214000 China
<b>FCC Rule Part(s):</b>	Part 15 Subpart C (15.247)
<b>FCC ID:</b>	2BAGQ-3RTHS0224Z
<b>Test Device Serial No.:</b>	S/N.: / <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
<b>FCC Classification:</b>	Digital Transmission System (DTS)

## **1. INTRODUCTION**

### **1.1. Scope**

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

### **1.2. Fanguang Test Location**

These measurement tests were performed at the Fanguang Inspection and testing Co.,LTD located at 200 Linghu Avenue, Xinwu District, Wuxi City. The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014.

## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

Product Name:	Temperature and Humidity Sensor Lite
Model Name:	3RTHS0224Z
Trade Mark:	ThirdReality
Input Voltage Range:	DC 3V(2*AAA 1.5V)
Zigbee Version:	3.0

### 2.2. Product Specification Subjective to this Report

Frequency Range	2405-2480 MHz
Number of Channels	16
Channel Spacing	5MHz
Antenna Type:	PCB Antenna
Antenna Gain	2.0 dBi
Type of Modulation	Zigbee: O-QPSK

### 2.3. Operation Frequency / Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405 MHz	12	2410 MHz	13	2415 MHz
14	2420 MHz	15	2425 MHz	16	2430 MHz
17	2435 MHz	18	2440 MHz	19	2445 MHz
20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz
26	2480 MHz				

### 2.4. Device Capabilities

This device contains the following capabilities: Zigbee (3.0)

**Note:** The maximum achievable duty cycle was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 8MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles of Zigbee are 91.45%.

### 2.5. Description of Test Software

The test utility software used during testing was "BouffaloLabDevCube-1.7.5",

Power Parameter Value:

Test Mode	ANT1
Zigbee	2405: 7
	2440: 7
	2480: 7

### 2.6. Test Mode

Test Mode
Mode 1: Transmit by Zigbee



## 2.7. Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

## 2.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 2.9. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase.

However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

## 2.10. Calculation with all conversion and correction factors used

For AC Line Conducted Emissions Test:

Measure Level (dB $\mu$ V) = Reading Level (dB $\mu$ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

For Radiated Emissions Below 1GHz Test:

Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

For Radiated Emissions Above 1GHz Test:

Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB).

### 3. DESCRIPTION OF TEST

#### 3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

**Deviation from measurement procedure.....None**

#### 3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

### 3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. The turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

## 4. ANTENNA REQUIREMENTS

### **Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- Use a unique coupling to the intentional radiator.

## 5. TEST EQUIPMENT CALIBRATION DATE

### Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	FWXGJC-2016-181	1 year	2025/03/07
Two-Line V-Network	R&S	ENV 216	FWXGJC-2016-182	1 year	2024/05/14
Thermohyrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2025/02/25

### Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Loop Antenna	Schwarzbeck	FMZB 1519B	FWXGJC-2018-015	3 year	2024/08/13
Bi-Log Antenna	R&S	HL562E	FWXGJC-2016-267-06	1 year	2025/03/02
Broadband Horn Antenna	R&S	HF907	FWXGJC-2016-267-07	1 year	2025/03/01
Broadband Horn Antenna	Schwarzbeck	BBHA9170	FWXGJC-2018-016	3 year	2024/06/04
EMI Receiver	R&S	ESR26	FWXGJC-2016-267-01	1 year	2024/11/05
Pre-Amplifier	R&S	SCU-18D	FWXGJC-2016-267-05	1 year	2024/11/05
Pre-Amplifier	R&S	EMC184055 SE	FWXGJC-2018-018	3 year	2025/04/13
Hygrothermograph	Mittel	HTC-1	FWXDA-2016-386	1 year	2024/11/03
Anechoic Chamber	Aimuke	EMCCT-3	FWXGJC-2016-270	3 year	2025/06/07

### Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Keysight	N9010B	FWXGJC-2018-010	1 year	2025/03/02
RF Control Unit	Toncend	JS0806-2	FWXGJC-2018-013	1 year	2024/05/14
Hygrothermograph	Mittel	HTC-1	FWXDA-2016-386	1 year	2024/11/03

Test Software	Manufacturer	Version	Asset No.	Function
EMI Test Software	Toncend	V2.5.2.4	FWXWA-2018-004	Emission Test
RF Test Software	Toncend	3.3.10	/	/

## 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

<b>AC Conducted Emission Measurement</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 2.05dB
<b>Radiated Emission Measurement ( below 1GHz )</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 3.06dB
<b>Radiated Emission Measurement ( above 1GHz )</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 4.13dB
<b>Spurious Emissions, Conducted</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 30MHz-1GHz: 1.00 dB 1GHz-12.75GHz: 1.30 dB
<b>Output Power</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.60dB
<b>Power Spectrum Density</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.80dB
<b>Occupied Bandwidth</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.20MHz

## 7. TEST RESULT

### 7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	$\leq 30\text{dBm}$		Pass	Section 7.3
15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$		Pass	Section 7.4
15.247(d)	Band Edge	$\geq 20\text{dBc}$		Pass	Section 7.5
15.247(d)	Out-of-Band Emissions	$\geq 20\text{dBc}$		Pass	Section 7.6
15.205	Restricted Bands	Emissions in restricted bands must meet the radiated limits detailed in 15.205		Pass	Section 7.7
15.209	General Field Strength Limits (Radiated Emission Limits)	Radiated Emission must meet the radiated limits detailed in 15.209 (RSS GEN [8.9])	Radiated	Pass	Section 7.6
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits ( RSS GEN [8.8])	Line Conducted	N/A	Section 7.8

#### Notes:

- 1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

## 7.2. 6dB Bandwidth Measurement

### 7.2.1. Test Limit

The minimum permissible 6dB bandwidth is 500 kHz.

### 7.2.2. Test Procedure used

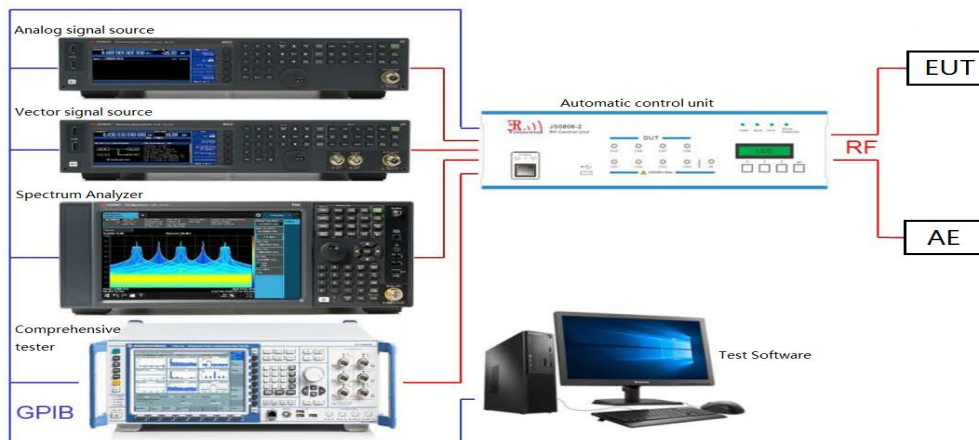
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

### 7.2.3. Test Setting

1. Set RBW = 100 kHz
2. VBW  $\geq 3 \times$  RBW
3. Detector = peak
4. Trace mode = max hold
5. Sweep = auto couple
6. Allow the trace was allowed to stabilize
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.2.4. Test Setup

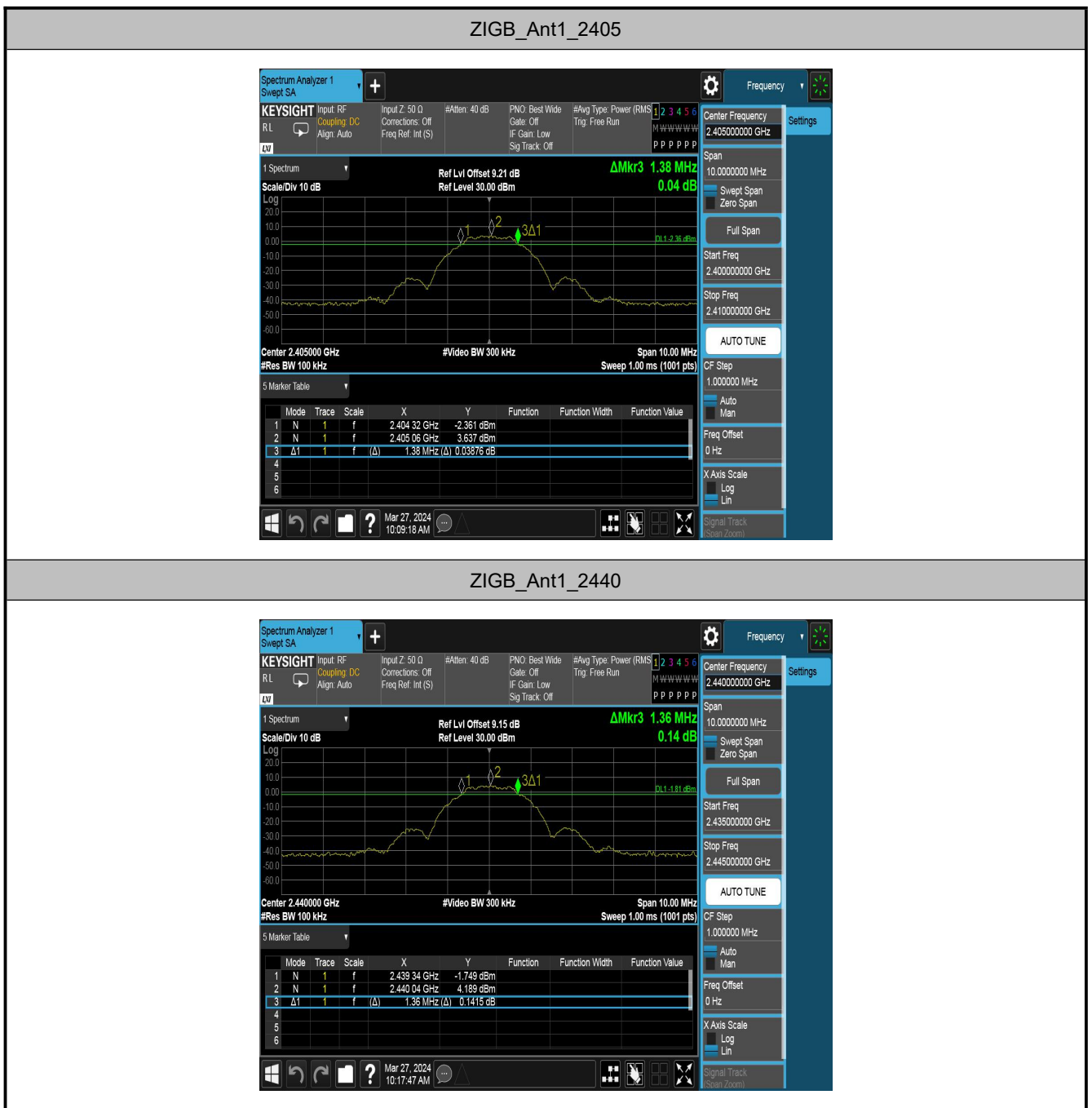




### 7.2.5. Test Result

Test Mode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	99% BW[MHz]	Verdict
Zigbee	Ant1	2405	1.380	2404.320	2405.700	≥0.5	2.1354	PASS
		2440	1.360	2439.340	2440.700	≥0.5	2.1346	PASS
		2480	1.430	2479.320	2480.750	≥0.5	2.1330	PASS

### Test Graphs of 6dB Bandwidth



ZIGB\_Ant1\_2480



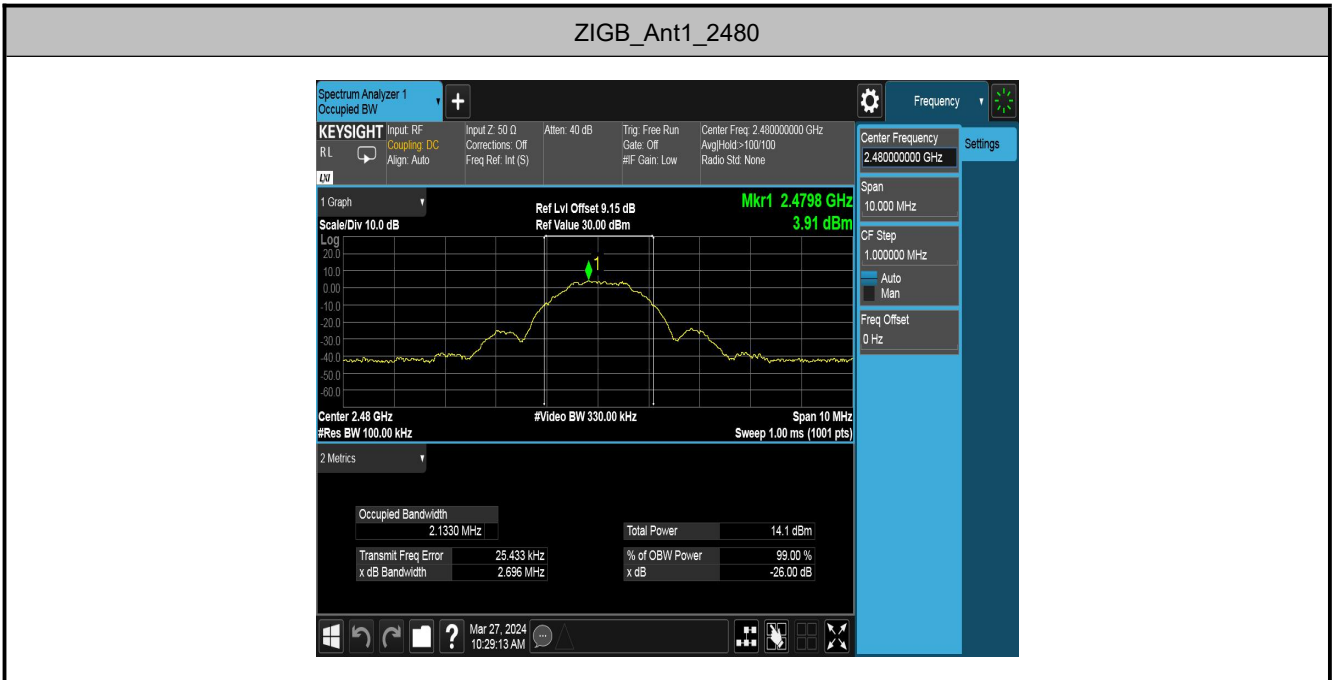
### Test Graphs of Occupied Channel Bandwidth

ZIGB\_Ant1\_2405



ZIGB\_Ant1\_2440





### **7.3. Output Power Measurement**

#### **7.3.1. Test Limit**

The maximum permissible conducted output power is 1 Watt (30dBm). And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **7.3.2. Test Procedure Used**

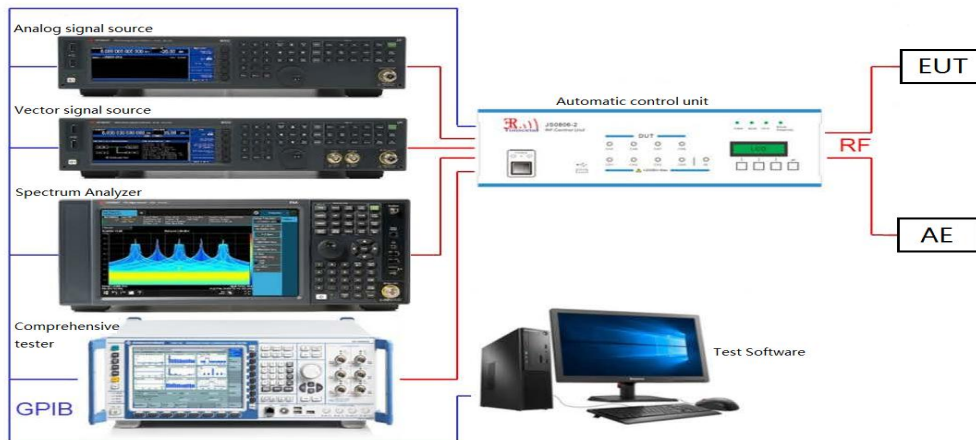
ANSI C63.10-2013 – Section 11.9.1.1

KDB 558074 D01 v05r02 – Section 8.3.1.2

#### **7.3.3. Test Setting**

- 1.Set the RBW  $\geq$  DTS bandwidth.
- 2.Set the VBW  $\geq$  [3  $\times$  RBW].
- 3.Set the span  $\geq$ [3  $\times$  RBW].
- 4.Detector = peak.
- 5.Sweep time = auto couple.
- 6.Trace mode = max hold.
- 7.Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

### 7.3.4. Test Setup



### 7.3.5. Test Result

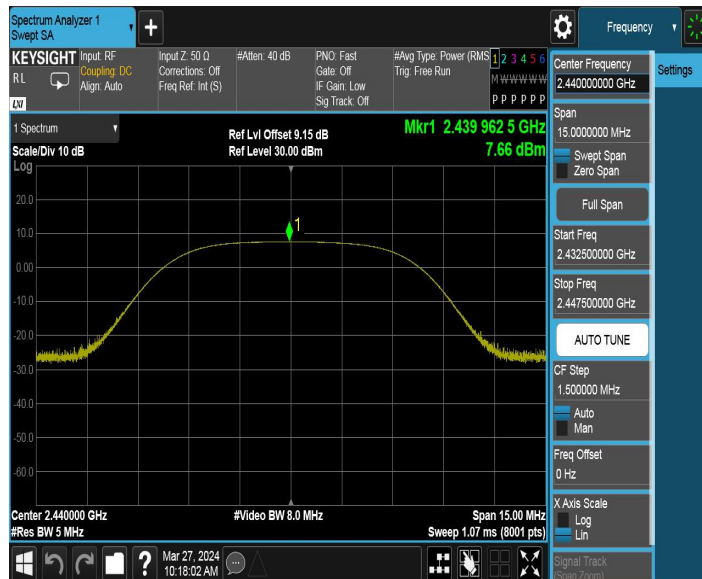
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	7.09	≤30	PASS
		2440	7.66	≤30	PASS
		2480	7.48	≤30	PASS

### Test Graphs

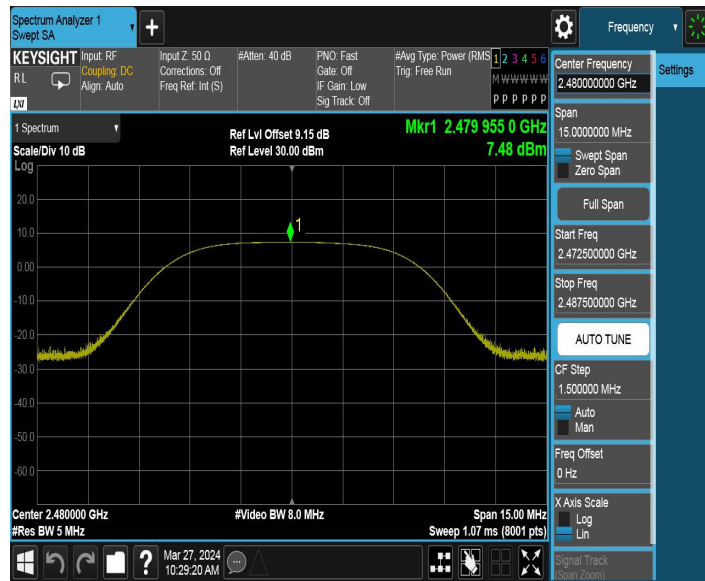
ZIGB\_Ant1\_2405



ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480





## **7.4. Power Spectral Density Measurement**

### **7.4.1. Test Limit**

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **7.4.2. Test Procedure Used**

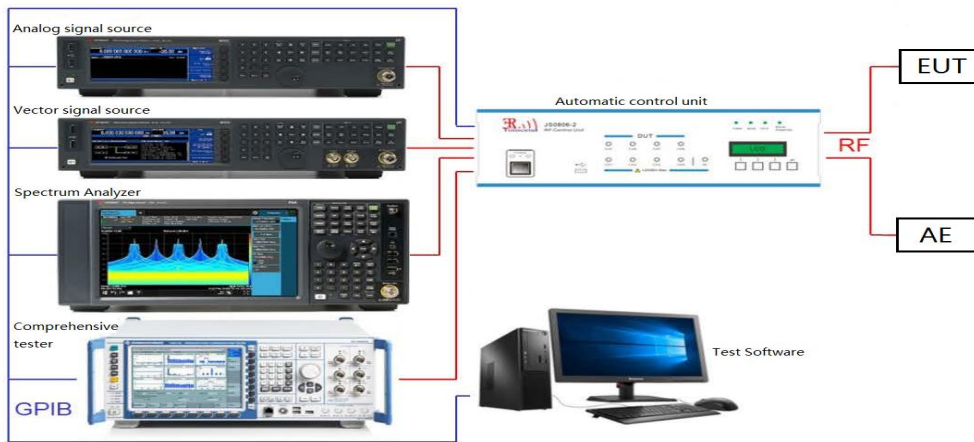
KDB 558074 D01 v05r02 - Section 8.4

ANSI C63.10 – Section 11.10.2

### **7.4.3. Test Setting**

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq [3 \times \text{RBW}]$ .
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

### 7.4.4. Test Setup

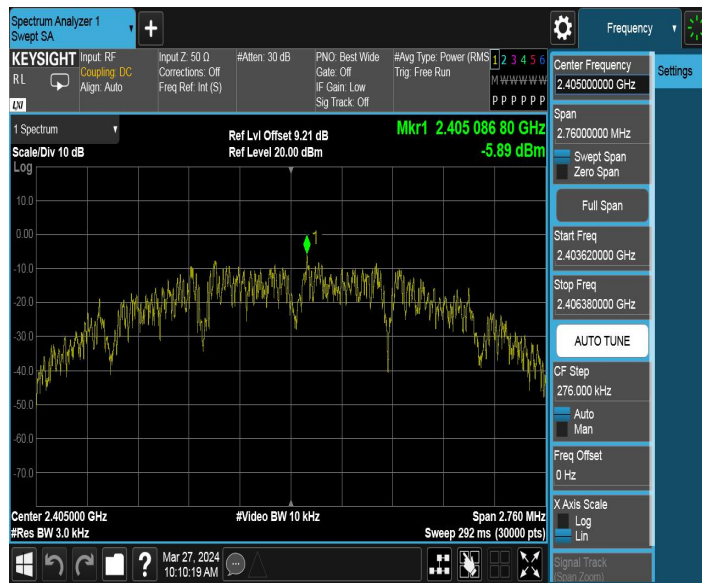


### 7.4.5. Test Result

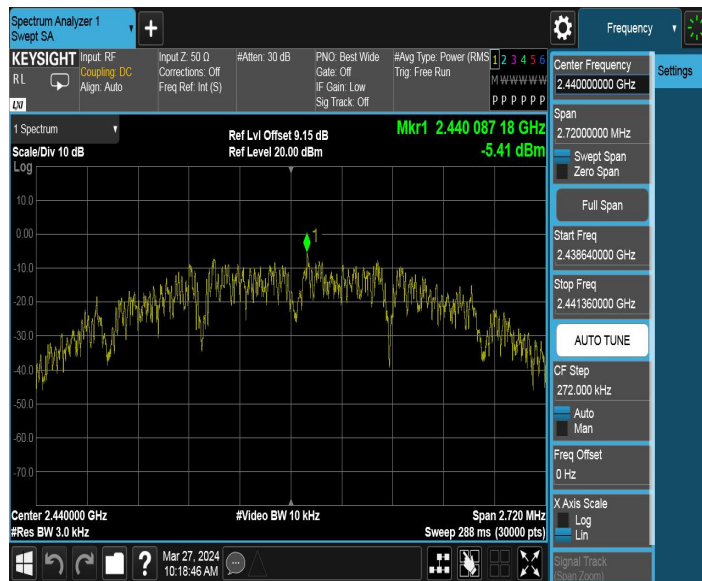
Test Mode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	-5.89	≤8.00	PASS
		2440	-5.41	≤8.00	PASS
		2480	-5.89	≤8.00	PASS

### Test Graphs

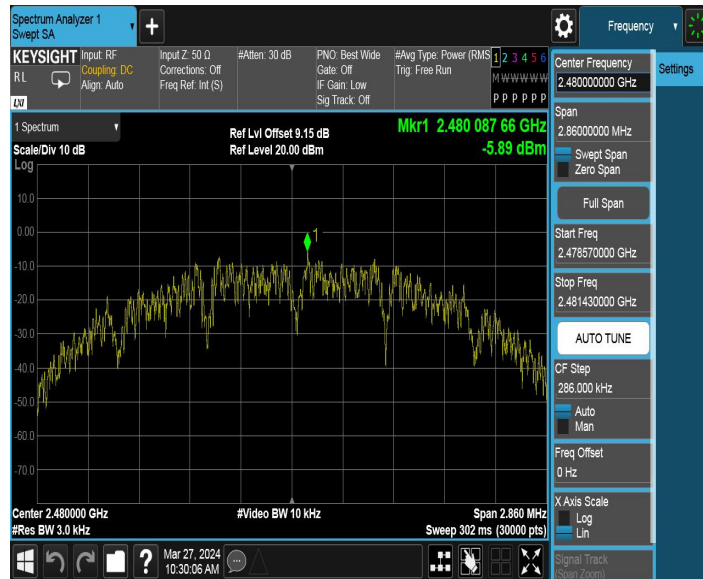
ZIGB\_Ant1\_2405



ZIGB\_Ant1\_2440



ZIGB\_Ant1\_2480



## 7.5. Conducted Band Edge and Out-of-Band Emissions

### 7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

### 7.5.2. Test Procedure Used

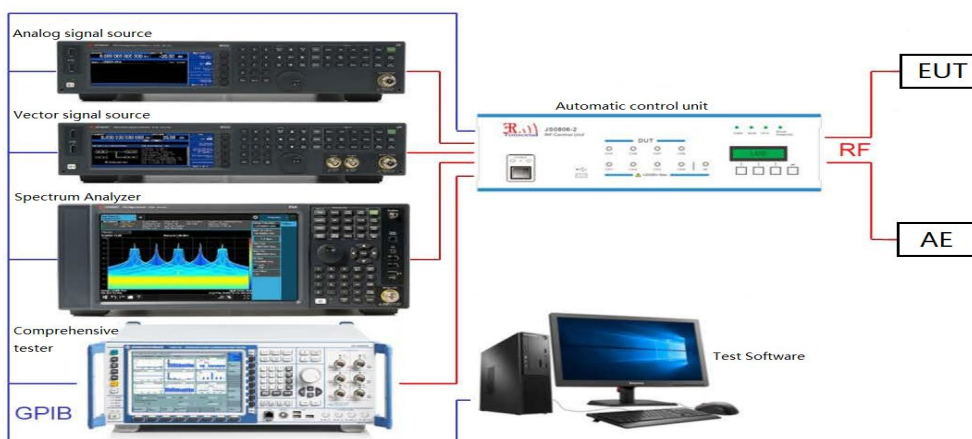
KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

### 7.5.3. Test Setting

- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = Peak
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

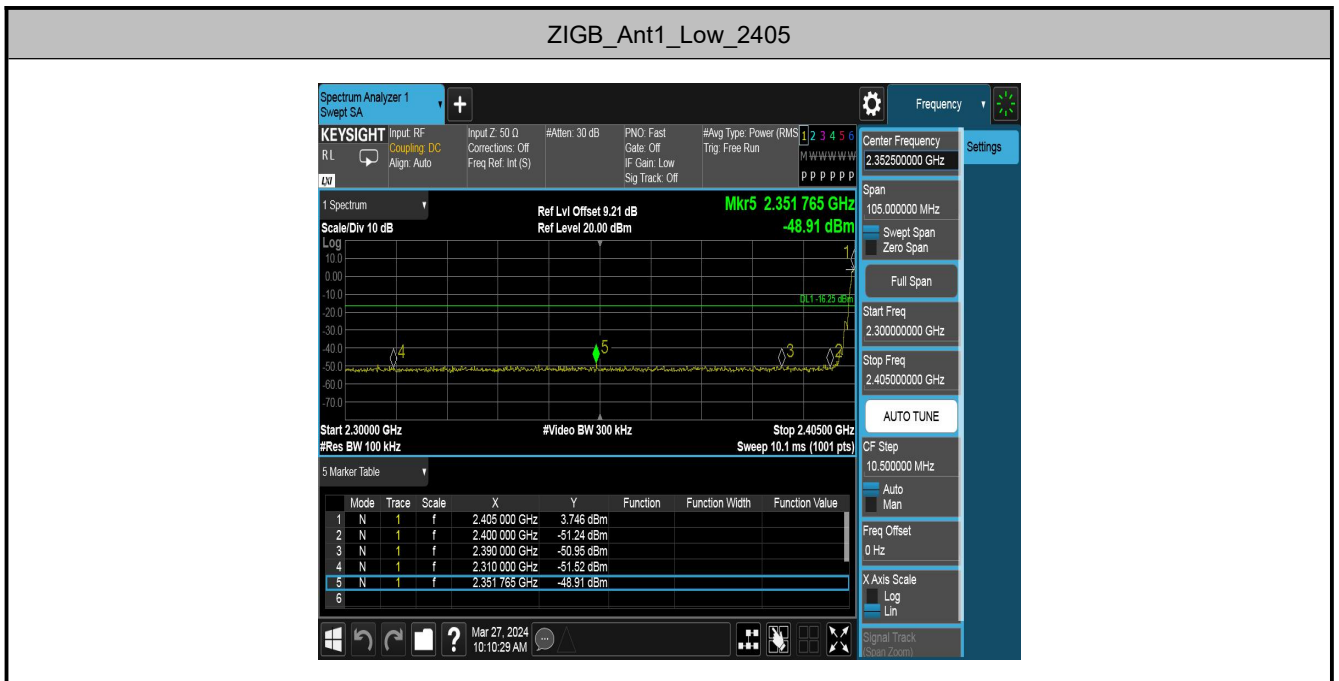
### 7.5.4. Test Setup



### 7.5.5. Test Result

Test Mode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	Reference	3.44	3.44	---	PASS
			30~1000	3.44	-61.15	≤-16.56	PASS
			1000~26500	3.44	-52.18	≤-16.56	PASS
		2440	Reference	4.03	4.03	---	PASS
			30~1000	4.03	-60.98	≤-15.97	PASS
			1000~26500	4.03	-52.21	≤-15.97	PASS
		2480	Reference	3.76	3.76	---	PASS
			30~1000	3.76	-61.4	≤-16.24	PASS
			1000~26500	3.76	-50.64	≤-16.24	PASS

### Test Graphs of Band Edge



ZIGB\_Ant1\_High\_2480

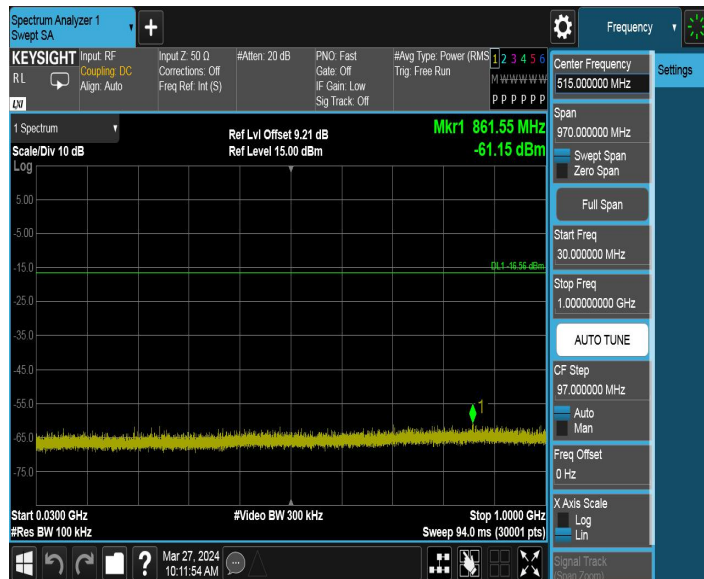


### Test Graphs of Out-of-Band Emissions

ZIGB\_Ant1\_2405\_0~Reference

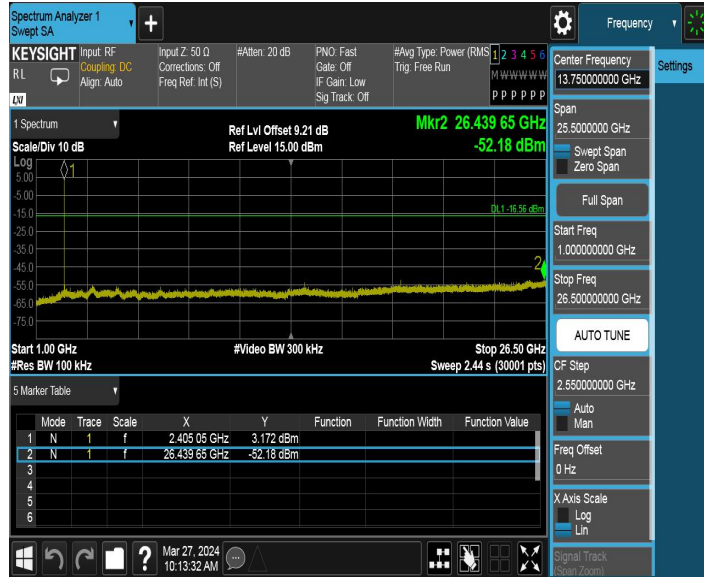


ZIGB\_Ant1\_2405\_30~1000





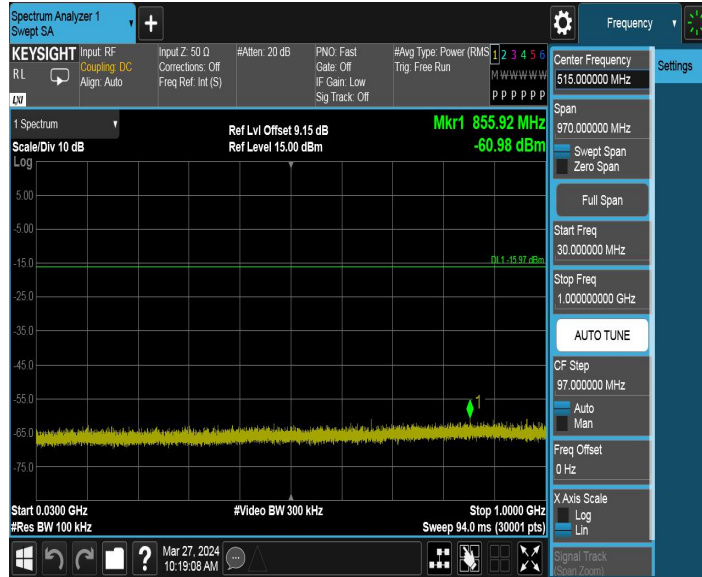
ZIGB\_Ant1\_2405\_1000~26500



ZIGB\_Ant1\_2440\_0~Reference



ZIGB\_Ant1\_2440\_30~1000



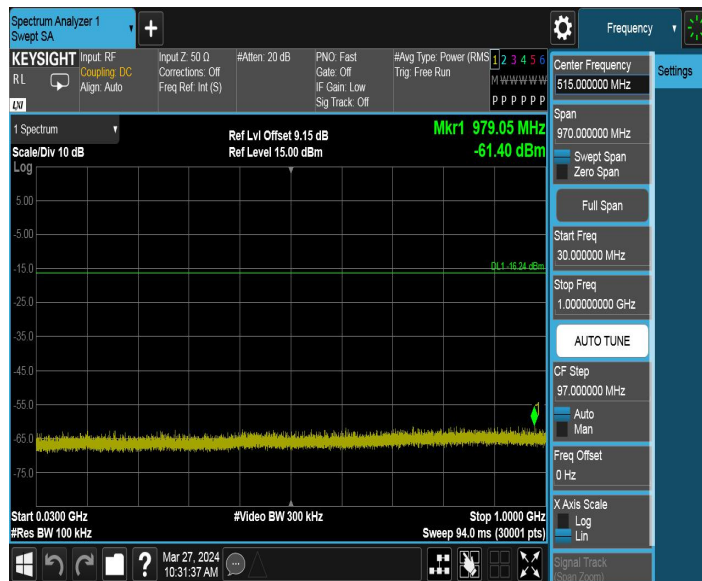
ZIGB\_Ant1\_2440\_1000~26500



ZIGB\_Ant1\_2480\_0~Reference



ZIGB\_Ant1\_2480\_30~1000



ZIGB\_Ant1\_2480\_1000~26500



## 7.6. Radiated Spurious Emission Measurement

### 7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 7.6.2. Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

### 7.6.3. Test Setting

#### Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

- Trace was allowed to stabilize

**Table 1 - RBW as a function of frequency**

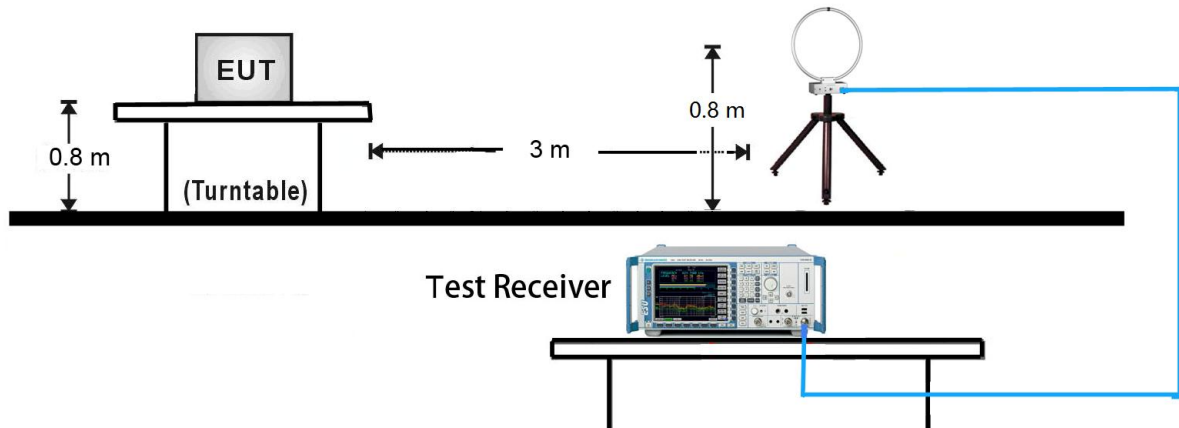
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

### **Average Field Strength Measurements**

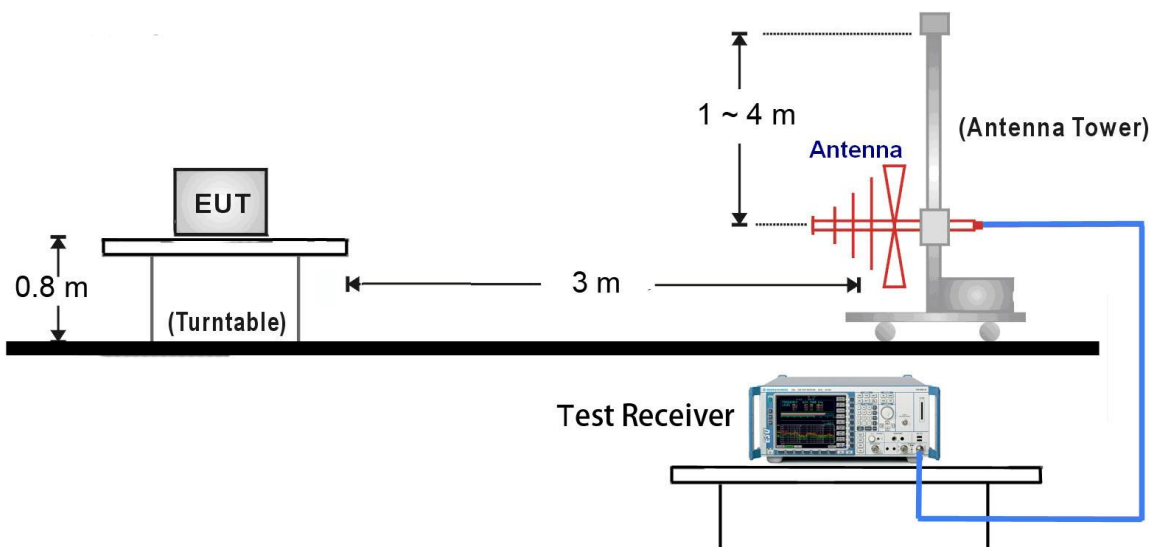
- Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- RBW = 1MHz
- VBW = 3MHz
- Detector = Power Average (RMS)
- Number of sweep point = 2001 (Number of sweep points must be  $\geq 2 \times \text{span} / \text{RBW}$ )
- Sweep time = auto
- Trace (RMS) averaging was performed over at least 100 traces.

#### 7.6.4. Test Setup

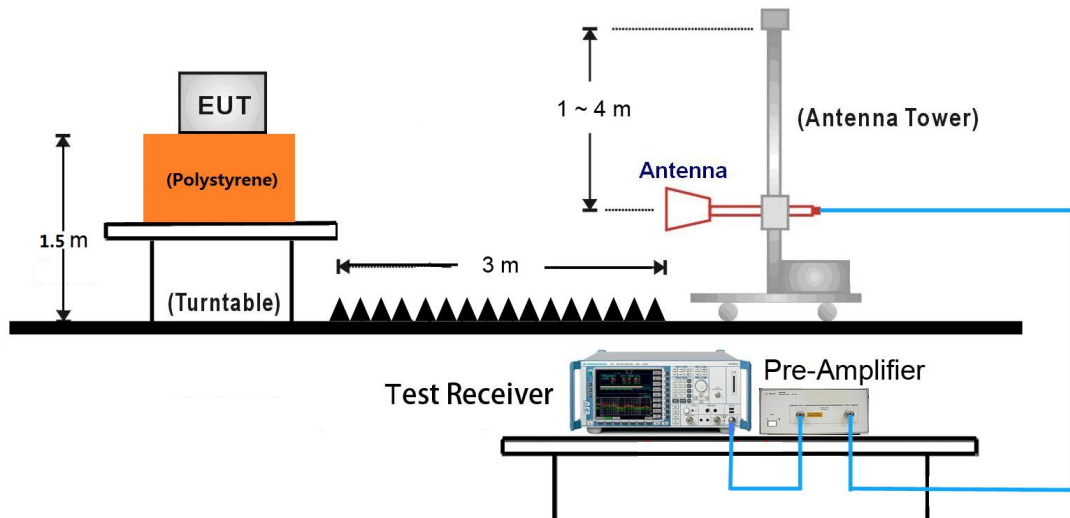
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 26.5GHz Test Setup:





### 7.6.5. Test Result

Test Mode:	Zigbee	Test Date:	2024.04.03
Test Channel:	11	Test Engineer:	Chuang Li
Remark:	Average measurement was not performed if peak level lower than average limit. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Frequency (MHz)	Level (dB $\mu$ V/m)	Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
4807.5000	46.16	-3.10	74.00	27.84	Peak	Horizontal
7215.0000	47.99	3.05	74.00	26.01	Peak	Horizontal
9615.0000	50.11	7.22	74.00	23.89	Peak	Horizontal
4807.5000	43.76	-3.10	74.00	30.24	Peak	Vertical
7215.0000	45.09	3.05	74.00	28.91	Peak	Vertical
9622.5000	47.70	7.23	74.00	26.30	Peak	Vertical

Test Mode:	Zigbee	Test Date:	2024.04.03
Test Channel:	18	Test Engineer:	Chuang Li
Remark:	Average measurement was not performed if peak level lower than average limit. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Frequency (MHz)	Level (dB $\mu$ V/m)	Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
4875.0000	44.39	-3.02	74.00	29.61	Peak	Horizontal
7320.0000	45.68	3.19	74.00	28.32	Peak	Horizontal
9765.0000	51.41	7.19	74.00	22.59	Peak	Horizontal
4875.0000	46.10	-3.02	74.00	27.90	Peak	Vertical
7320.0000	52.01	3.19	74.00	21.99	Peak	Vertical
9765.0000	46.58	7.19	74.00	27.42	Peak	Vertical

Test Mode:	Zigbee	Test Date:	2024.04.03
Test Channel:	26	Test Engineer:	Chuang Li
Remark:	Average measurement was not performed if peak level lower than average limit. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

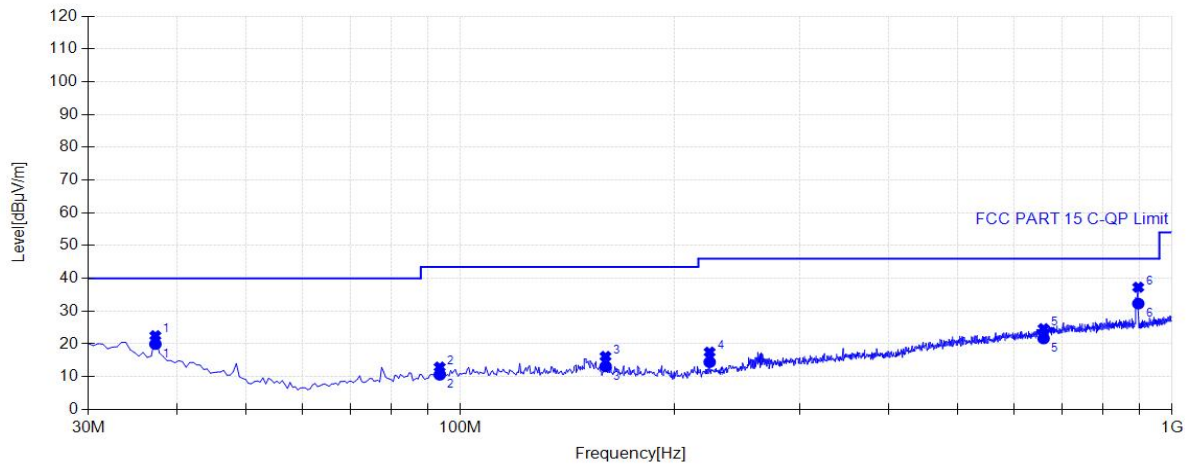
Frequency (MHz)	Level (dB $\mu$ V/m)	Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
4957.5000	46.24	-2.89	74.00	27.76	Peak	Horizontal
7440.0000	46.71	3.34	74.00	27.29	Peak	Horizontal
9922.5000	47.08	7.82	74.00	26.92	Peak	Horizontal
4957.5000	45.91	-2.89	74.00	28.09	Peak	Vertical
7440.0000	50.70	3.34	74.00	23.30	Peak	Vertical
9922.5000	49.89	7.82	74.00	24.11	Peak	Vertical

## The worst case of Radiated Emission below 1GHz:

### 30MHz – 1GHz Test Data

EUT:	Temperature and Humidity Sensor Lite	Polarity:	Horizontal
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

### Test Graph



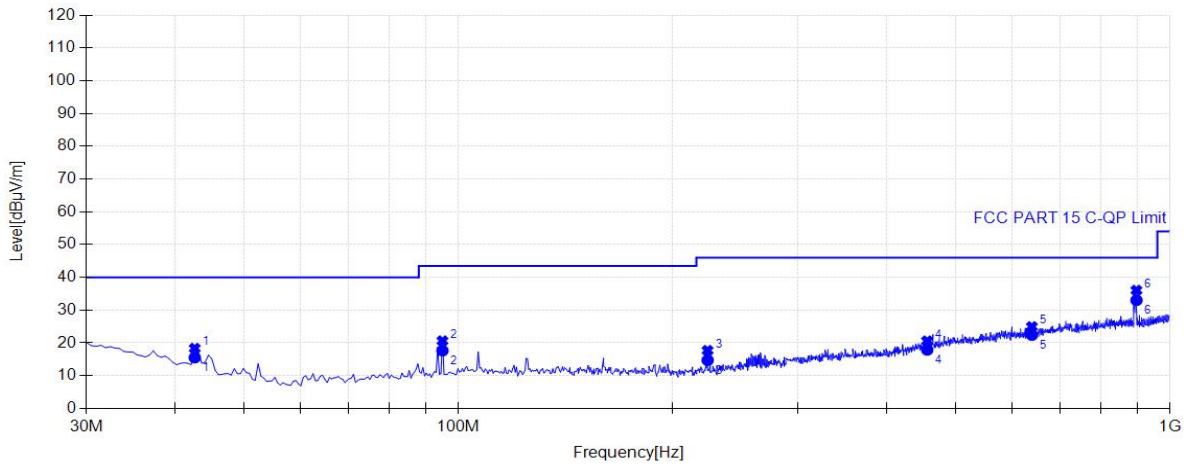
### Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	37.2750	15.79	19.94	40.00	20.06	155	358	Horizontal
2	93.5350	10.40	10.58	43.50	32.92	155	119	Horizontal
3	159.980	10.31	13.16	43.50	30.34	155	112	Horizontal
4	224.000	10.59	14.45	46.00	31.55	155	37	Horizontal
5	660.015	21.24	21.66	46.00	24.34	155	284	Horizontal
6	896.695	23.98	32.30	46.00	13.70	155	106	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

EUT:	Temperature and Humidity	Polarity:	Vertical
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

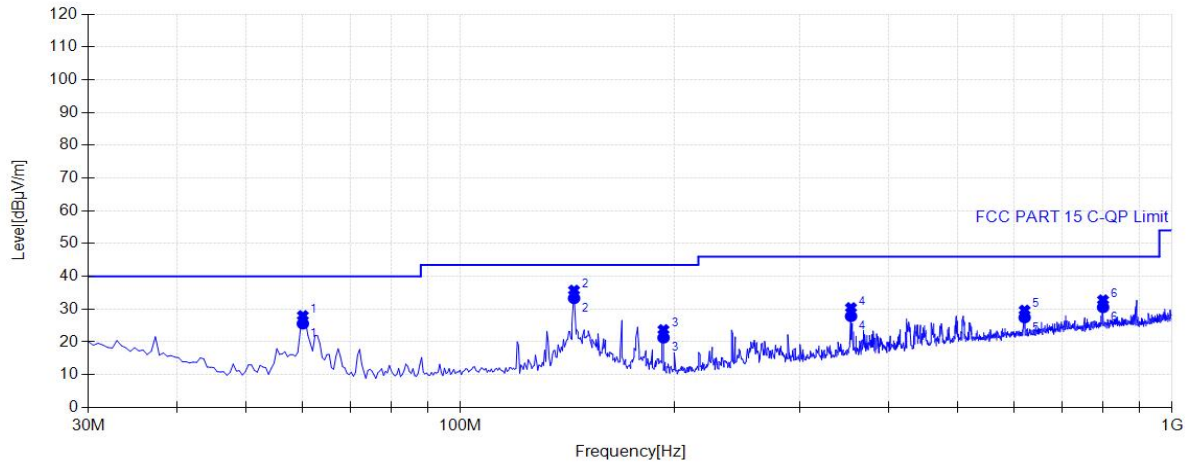
**Test Graph**



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	42.6100	13.07	15.52	40.00	24.48	155	192	Vertical
2	94.9900	10.58	17.64	43.50	25.86	155	336	Vertical
3	224.000	10.59	14.71	46.00	31.29	155	187	Vertical
4	455.830	17.76	17.86	46.00	28.14	155	276	Vertical
5	639.645	20.95	22.40	46.00	23.60	155	104	Vertical
6	897.180	23.98	33.03	46.00	12.97	155	309	Vertical

EUT:	Temperature and Humidity Sensor Lite	Polarity:	Horizontal
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

### Test Graph

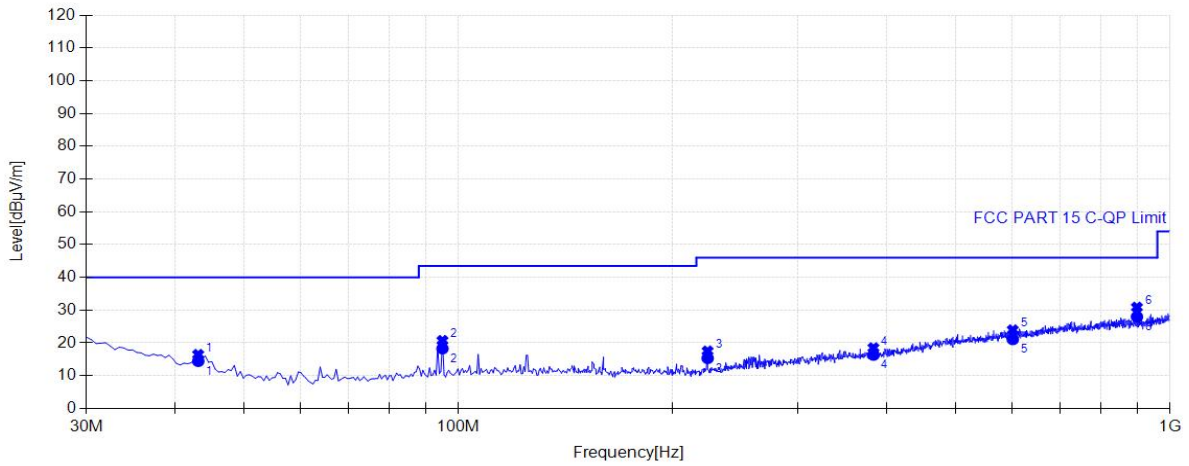


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	60.0700	6.63	25.57	40.00	14.43	155	44	Horizontal
2	144.460	11.08	33.32	43.50	10.18	155	119	Horizontal
3	192.960	10.04	21.28	43.50	22.22	155	100	Horizontal
4	353.980	14.98	27.83	46.00	18.17	155	359	Horizontal
5	620.730	20.67	27.43	46.00	18.57	155	359	Horizontal
6	800.180	23.63	30.56	46.00	15.44	155	92	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

EUT:	Temperature and Humidity	Polarity:	Vertical
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

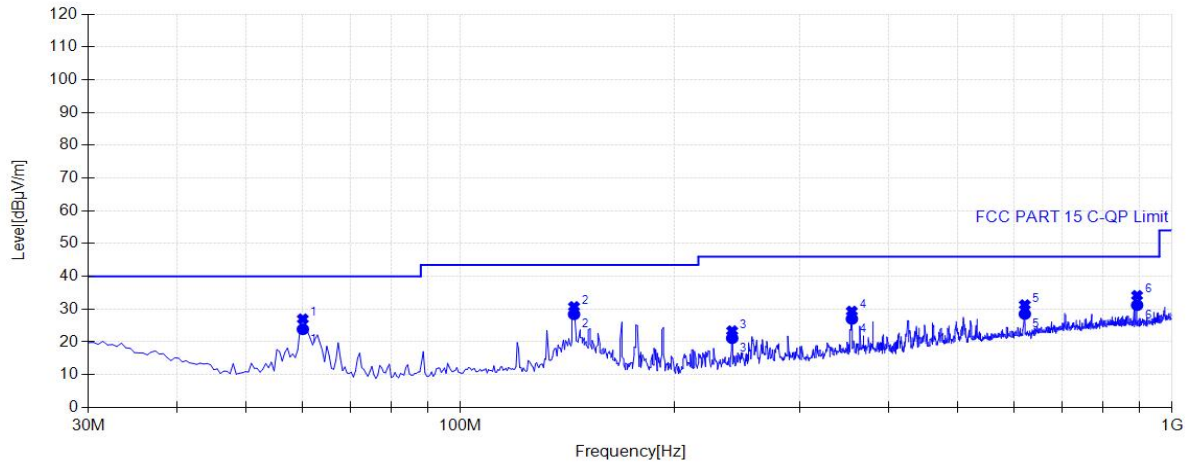
**Test Graph**



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	43.0950	12.83	14.42	40.00	25.58	155	134	Vertical
2	94.9900	10.58	18.26	43.50	25.24	155	358	Vertical
3	224.000	10.59	15.31	46.00	30.69	155	107	Vertical
4	383.080	15.48	16.31	46.00	29.69	155	230	Vertical
5	601.330	20.39	21.08	46.00	24.92	155	278	Vertical
6	898.635	23.99	28.00	46.00	18.00	155	168	Vertical

EUT:	Temperature and Humidity Sensor Lite	Polarity:	Horizontal
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

### Test Graph



### Final Data List

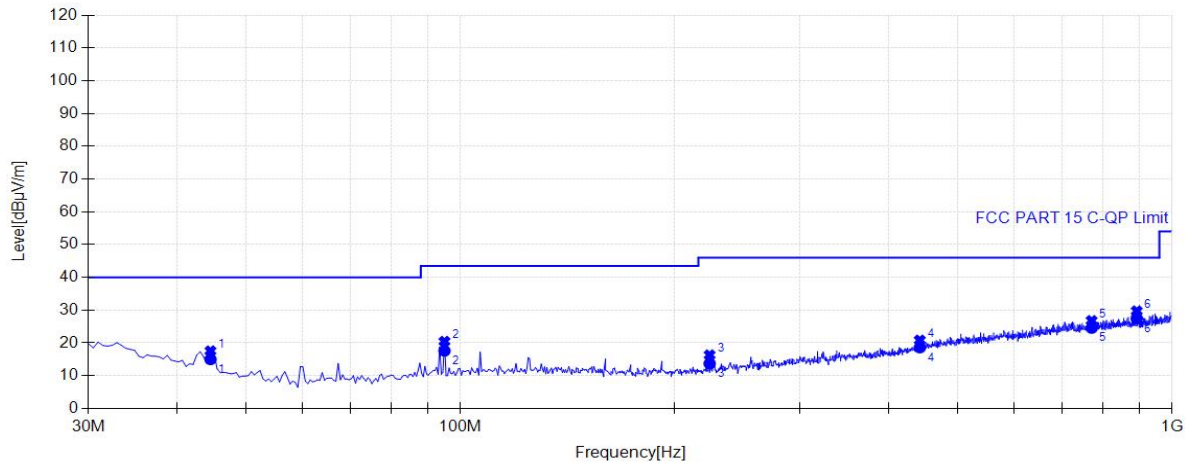
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	60.0700	6.63	23.86	40.00	16.14	155	357	Horizontal
2	144.460	11.08	28.42	43.50	15.08	155	119	Horizontal
3	240.975	11.24	21.13	46.00	24.87	155	31	Horizontal
4	354.950	15.00	27.02	46.00	18.98	155	93	Horizontal
5	621.215	20.68	28.52	46.00	17.48	155	357	Horizontal
6	893.300	23.97	31.21	46.00	14.79	155	65	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.



EUT:	Temperature and Humidity	Polarity:	Vertical
Model:	3RTHS0224Z	SN:	N/A
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 3V(2*AAA 1.5V)
Environment:	Temp: 22°C; Humi:52%	Engineer:	Chuang Li

### Test Graph



### Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	44.5500	12.09	14.98	40.00	25.02	155	50	Vertical
2	94.9900	10.58	17.59	43.50	25.91	155	17	Vertical
3	224.000	10.59	13.70	46.00	32.30	155	180	Vertical
4	442.250	17.33	18.57	46.00	27.43	155	276	Vertical
5	771.080	23.10	24.54	46.00	21.46	155	194	Vertical
6	892.330	23.97	27.45	46.00	18.55	155	180	Vertical

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 26.5GHz), therefore no data appear in the report.

## 7.7. Restricted Band Edge Measurement

### 7.7.1. Test Limit

#### **For 15.205 requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.25 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52480 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

<b>FCC Part 15 Subpart C Paragraph 15.209</b>		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

**For RSS-Gen Section 8.10 requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.009 - 0.110	240 - 285	9.0 - 9.2
2.1735 - 2.1905	322 - 335.4	9.3 - 9.5
3.020 - 3.026	399.9 - 410	10.6 - 12.7
4.125 - 4.128	608 - 614	13.25 - 13.4
4.17725 - 4.17775	960 - 1427	14.47 - 14.5
4.20725 - 4.20775	1435 - 1626.5	15.35 - 16.2
5.677 - 5.683	1645.5 - 1646.5	17.7 - 21.4
6.215 - 6.218	1660 - 1710	22.01 - 23.12
6.26775 - 6.26825	1718.8 - 1722.2	23.6 - 24.0
6.31175 - 6.31225	2200 - 2300	31.2 - 31.8
8.291 - 8.294	2310 - 2390	36.43 - 36.5
8.362 - 8.366	2655 - 2900	Above 38.6
8.37625 - 8.38675	3260 - 3267	--
8.41425 - 8.41475	3332 - 3339	
12.29 - 12.293	334.5 - 3358	
12.51975 - 12.52025	3500 - 4400	
12.57675 - 12.57725	4500 - 5150	
13.36 - 13.41	5350 - 5460	
16.42 - 16.423	7250 - 7750	
16.69475 - 16.69525	8025 - 8500	
16.80425 - 16.80475	--	
25.5 - 25.67		
37.5 - 38.25		
73 - 74.6		
74.8 - 75.2		
108 - 138		
156.52480 - 156.525225		
156.7 - 156.9		

All out of band emissions appearing in a restricted band as specified in Section 8.10 of the RSS-Gen

must not exceed the limits shown in Table per Section 8.9.

RSS-Gen Section 8.9		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 7.7.2. Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

### 7.7.3. Test Setting

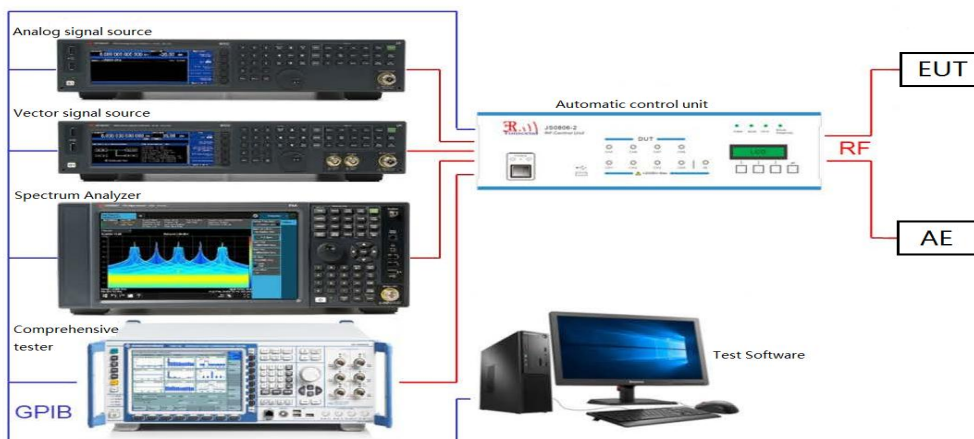
#### Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

### Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be  $\geq 2 \times \text{span} / \text{RBW}$ )
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

#### 7.7.4. Test Setup



### 7.7.5. Test Result

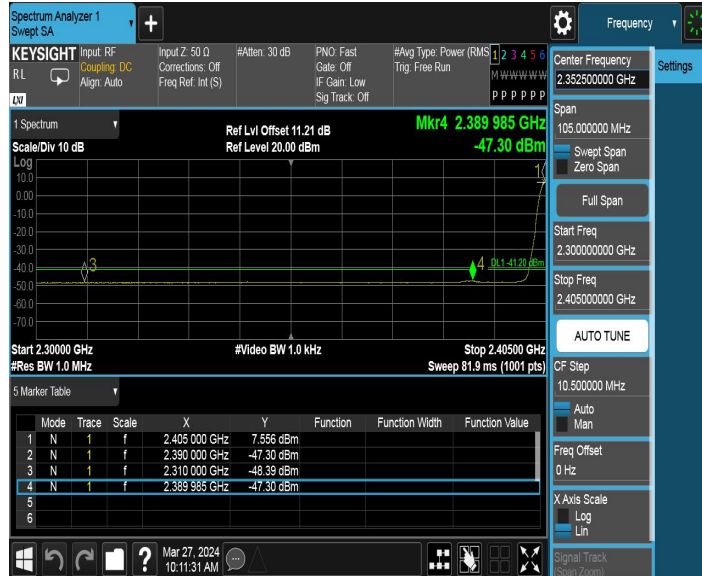
Test Mode	Antenna	Channel	Detector	Freq [MHz]	Result [dBm]	Limit [dBm]	Verdict
Zigbee	Ant1	2402	AV	2310.000	-48.39	≤-41.20	PASS
			AV	2389.985	-47.3	≤-41.20	PASS
			AV	2390.000	-47.3	≤-41.20	PASS
			Peak	2310.000	-39.16	≤-21.20	PASS
			Peak	2340.215	-37.08	≤-21.20	PASS
			Peak	2390.000	-38.52	≤-21.20	PASS
		2480	AV	2483.500	-42.02	≤-41.20	PASS
			AV	2483.520	-42.02	≤-41.20	PASS
			AV	2500.000	-48.37	≤-41.20	PASS
			Peak	2483.500	-35.71	≤-21.20	PASS
			Peak	2483.520	-35.71	≤-21.20	PASS
			Peak	2500.000	-38.05	≤-21.20	PASS

Note :

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a).  
The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

### Test Graphs

ZIGB\_Ant1\_Low\_2405\_AV

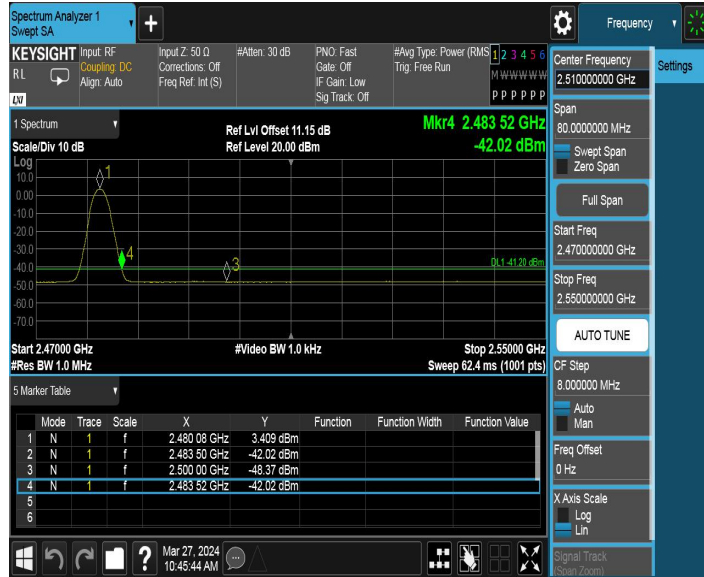


ZIGB\_Ant1\_Low\_2405\_Peak

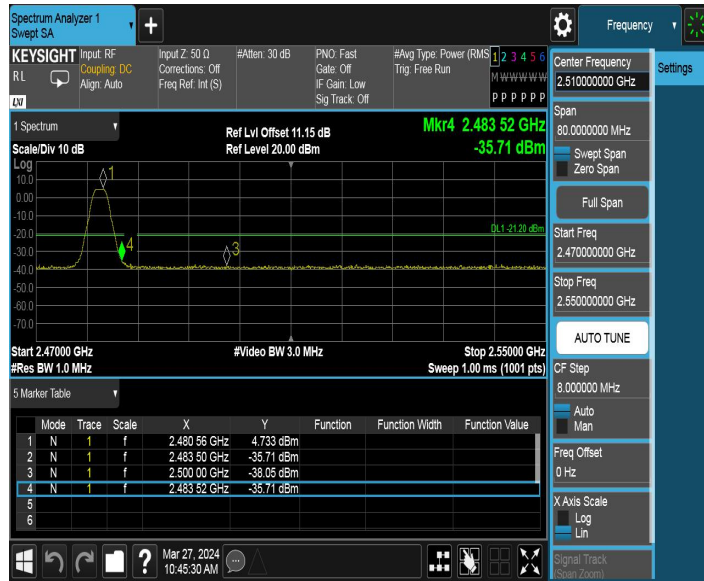




ZIGB\_Ant1\_High\_2480\_AV



ZIGB\_Ant1\_High\_2480\_Peak



## 7.8. AC Conducted Emissions Measurement

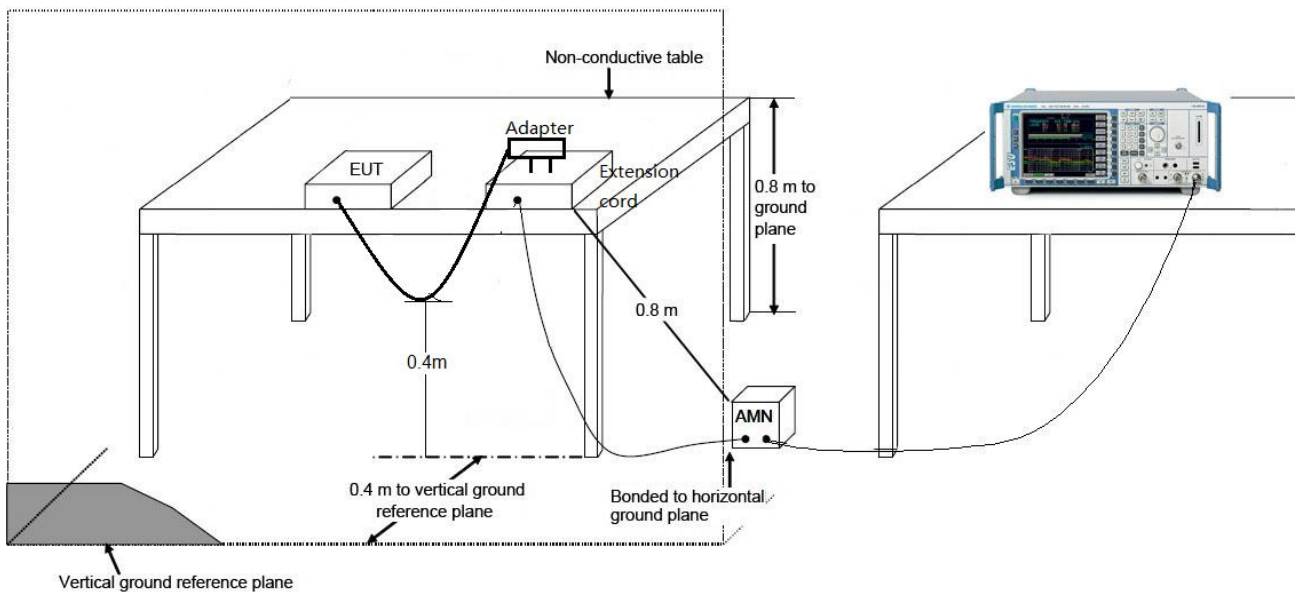
### 7.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

### 7.8.2. Test Setup



### 7.8.3. Test Result

Not Applicable . The device is only powered by dry batteries(2\*AAA 1.5V).

## 8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Temperature and Humidity Sensor Lite** is in compliance with Part 15C of the FCC Rules.

\_\_\_\_\_ The End \_\_\_\_\_