MEASUREMENT REPORT
FCC PART 15.247 Zigbee

Report No.: S20240701315601
Issue Date: 08-07-2024

Applicant:	Jiangsu Shushi Technology Co., Ltd.
Address:	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu, China
FCC ID:	2BAGQ-TRZB13
Product:	IOT Module
Model No.:	TRZB13; 3RCB01057Z
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:	Jul. 03, 2024
Test Date:	Jul. 10~ Jul. 26, 2024

Compiled By: Chuang Li
(Chuang Li)
Senior Test Engineer

Approved By: Line Chen
(Line Chen)
Engineer Manager

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.

Revision History

Report No.	Version	Description	Issue Date
S20240701315601	Rev. 01	/	08-07-2024

CONTENTS

§2.1033 General Information

Applicant:	Jiangsu Shushi Technology Co., Ltd.
Applicant Address:	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
Manufacturer:	Jiangsu Shushi Technology Co., Ltd.
Manufacturer Address:	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
Factory:	Shushi (Zhenjiang) Intelligent Technology Co., Ltd.
Factory Address:	NO.9 Nanxu Road,RunZhou District,Zhenjiang,Jiangsu,China
Test Site:	Fangguang Inspection & Testing Co., Ltd.
LAB ID:	CN5037
Test Site Address:	G9 Building, China Sensor Network International Innovation Park No.200, Linghu Avenue Wuxi, Jiangsu 214000 China
FCC Rule Part(s):	Part 15 Subpart C (15.247)
FCC ID:	2BAGQ-TRZB13
Test Device Serial No.:	S/N.: / ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	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. Fangguang Test Location

These measurement tests were performed at the Fangguang 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:	IOT Module
Main Test Model:	TRZB13
Additional Model:	3RCB01057Z
Model Description:	Model “TRZB13” and “3RCB01057Z” only differ in name.
Trade Mark:	ThirdReality
Input Voltage Range:	DC 3.3V
Zigbee Version:	3.0
Software Version:	V0.0.30
Hardware Version:	V0.5

2.2. Product Specification Subjective to this Report

Frequency Range	2405-2480 MHz
Number of Channels	Zigbee: 16
Channel Spacing	Zigbee: 5MHz
Antenna Type:	PCB antenna
Antenna Gain	2.0dBi
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 94.69%.

2.5. Description of Test Software

The test utility software used during testing was “BLDevCube.exe”, Power Parameter Value:

Test Mode	ANT1
Zigbee	Default

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 (dBμV) = Reading Level (dBμV) + Factor (dB)

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

For Radiated Emissions Below 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

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

For Radiated Emissions Above 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + 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	2025/04/28
Thermohygrometer	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	2025/07/07
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	2025/05/31
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	2025/05/19
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2025/02/25

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

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.05dB
Radiated Emission Measurement（below 1GHz）
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.06dB
Radiated Emission Measurement（above 1GHz）
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 4.13dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 30MHz-1GHz: 1.00 dB 1GHz-12.75GHz: 1.30 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.60dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.80dB
Occupied Bandwidth
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	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 30dBm		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm/3kHz		Pass	Section 7.4
15.247(d)	Band Edge	≥ 20dBc		Pass	Section 7.5
15.247(d)	Out-of-Band Emissions	≥ 20dBc		Pass	Section 7.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS GEN [8.9])	Radiated	Pass	Section 7.6&7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits (RSS GEN [8.8])	Line Conducted	Pass	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

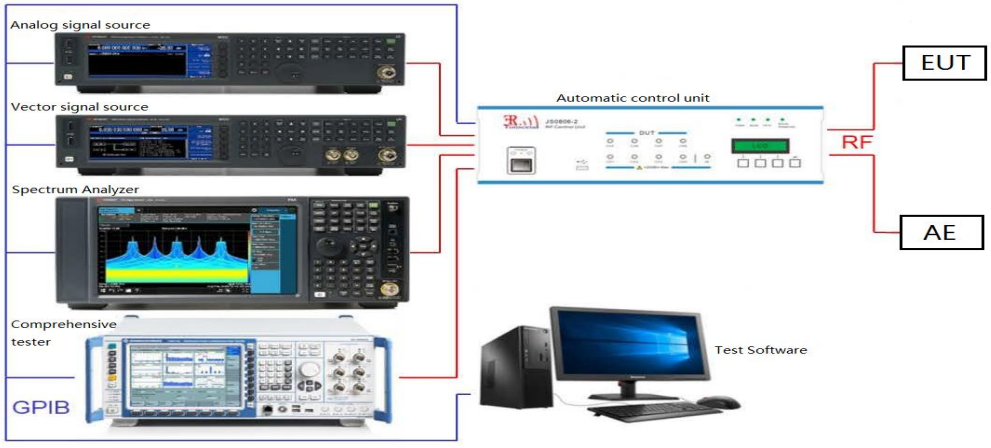
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

7.2.3. Test Setting

1. Set RBW = 100 kHz
2. VBW ≥ 3 × 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	1.540	2404.070	2405.610	≥0.5	2.2298	PASS
		2440	1.520	2439.080	2440.600	≥0.5	2.2039	PASS
		2480	1.350	2479.130	2480.480	≥0.5	2.2342	PASS

Test Graphs of 6dB Bandwidth

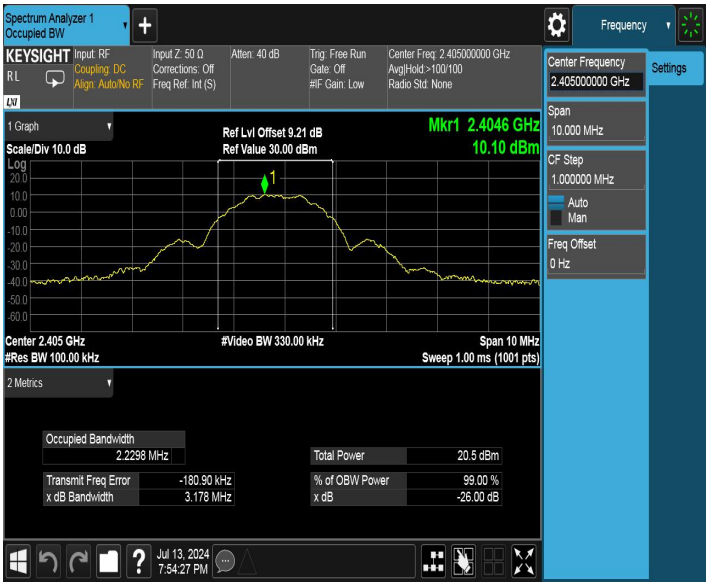
ZIGB_Ant1_2405

ZIGB_Ant1_2440

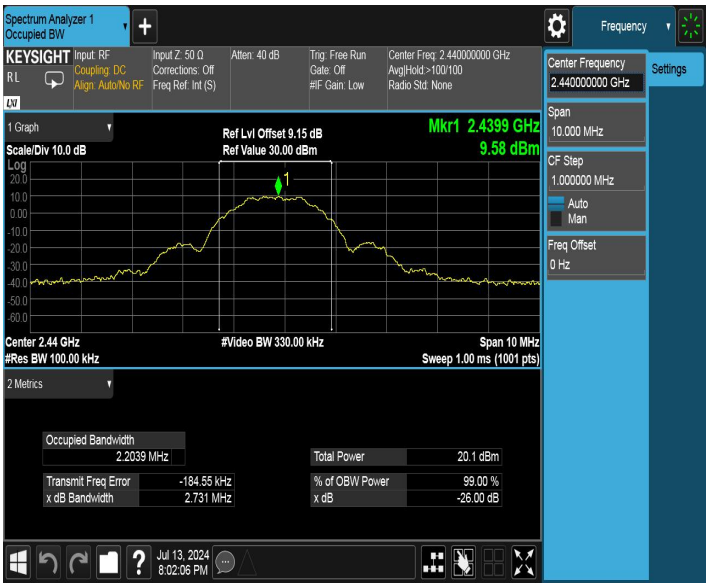
ZIGB_Ant1_2480

Test Graphs of Occupied Channel Bandwidth

ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


Spectrum Analyzer 1
Occupied BW
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
Atten: 40 dB
Trig: Free Run
Gate: Off
#IF Gain: Low
Center Freq: 2.480000000 GHz
Avg|Hold:>100/100
Radio Std: None
Frequency
Center Frequency
2.480000000 GHz
Settings
Span
10.000 MHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
1 Graph
Ref Lvl Offset 9.65 dB
Ref Value 30.00 dBm
Mkr1 2.4799 GHz
4.26 dBm
Scale/Div 10.0 dB
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 2.48 GHz
#Res BW 100.00 kHz
#Video BW 330.00 kHz
Span 10 MHz
Sweep 1.00 ms (1001 pts)
2 Metrics
Occupied Bandwidth
2.2342 MHz
Total Power
14.5 dBm
Transmit Freq Error
-181.92 kHz
% of OBW Power
99.00 %
x dB Bandwidth
2.721 MHz
x dB
-26.00 dB
Jul 26, 2024
11:44:37 AM

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 ≥ DTS bandwidth.

2.Set the VBW ≥ [3 × RBW].

3.Set the span ≥[3 × RBW].

4.Detector = peak.

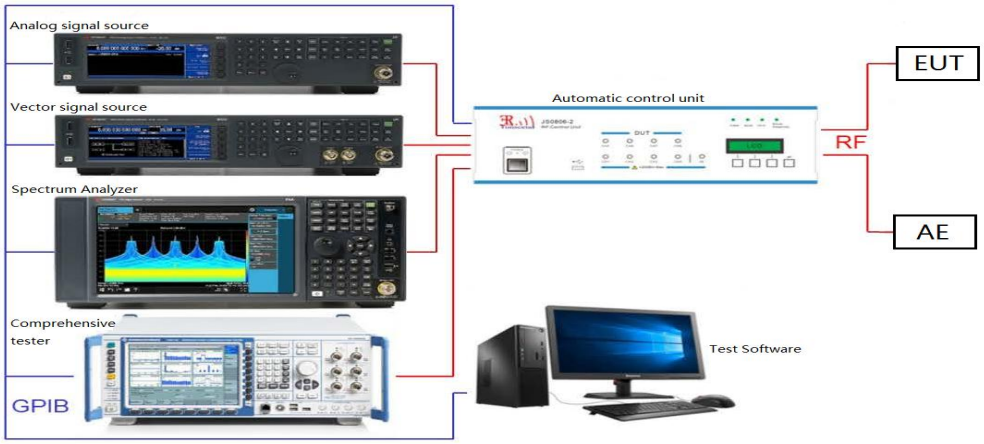
5.Sweep time = auto couple.

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

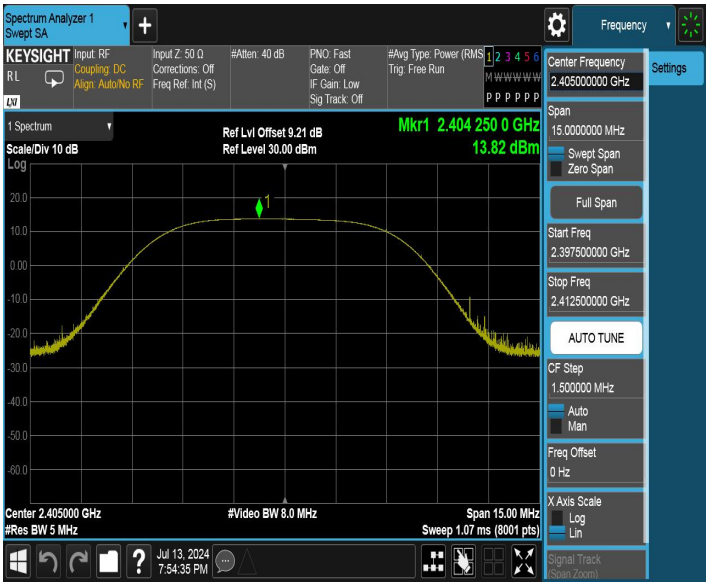


7.3.5. Test Result

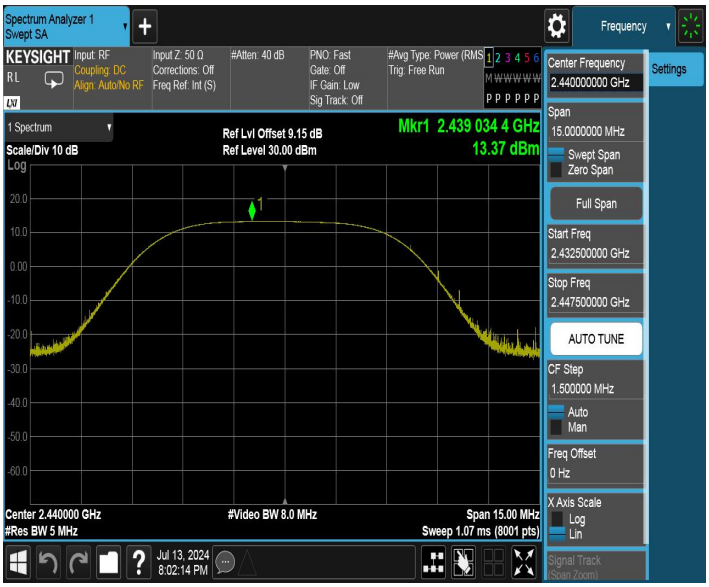
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	13.82	≤30	PASS
		2440	13.37	≤30	PASS
		2480	7.80	≤30	PASS

Test Graphs

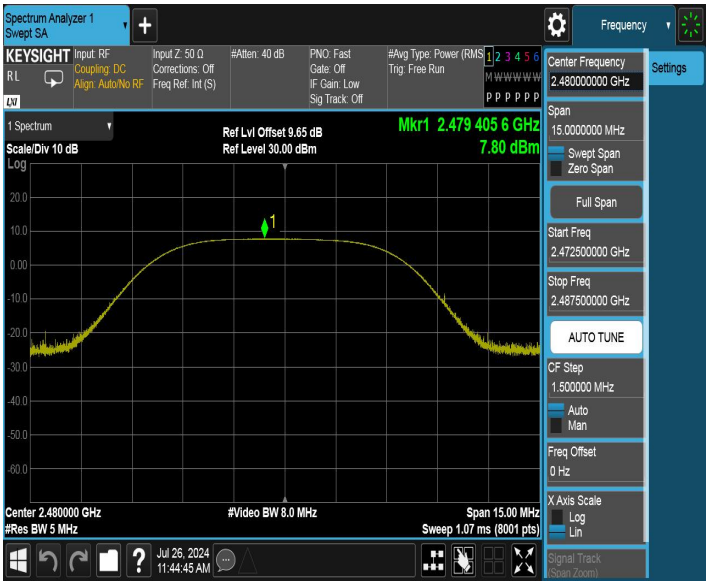
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 40 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
15.0000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.472500000 GHz
Stop Freq
2.487500000 GHz
AUTO TUNE
CF Step
1.500000 MHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 9.65 dB
Ref Level 30.00 dBm
Mkr1 2.479 405 6 GHz
7.80 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 2.480000 GHz
#Res BW 5 MHz
#Video BW 8.0 MHz
Span 15.00 MHz
Sweep 1.07 ms (8001 pts)
Jul 26, 2024
11:44:45 AM

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

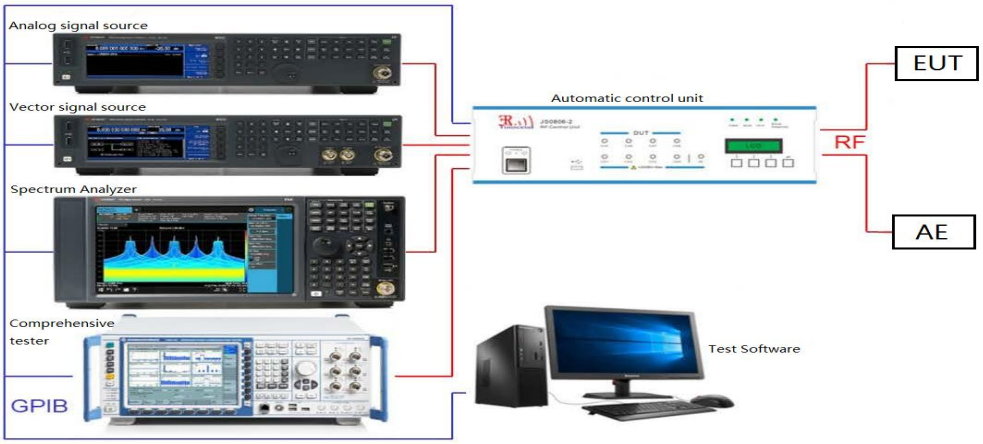
KDB 558074 D01 v05r02 - Section 8.4

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 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × 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

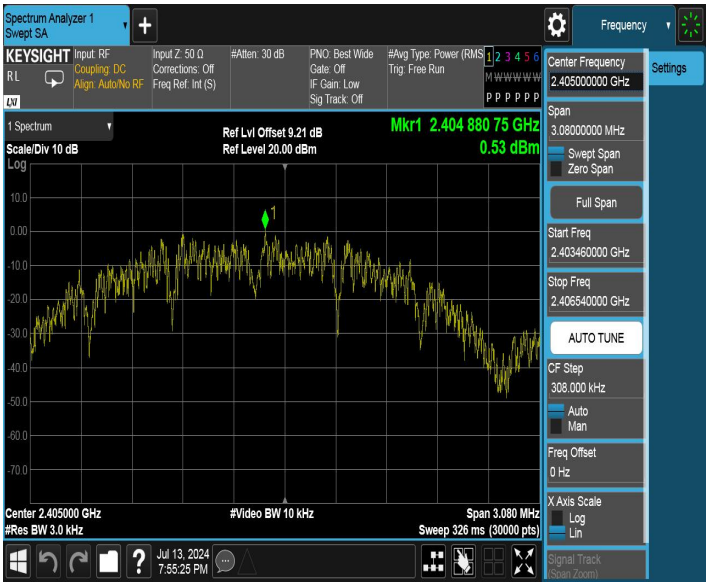


7.4.5. Test Result

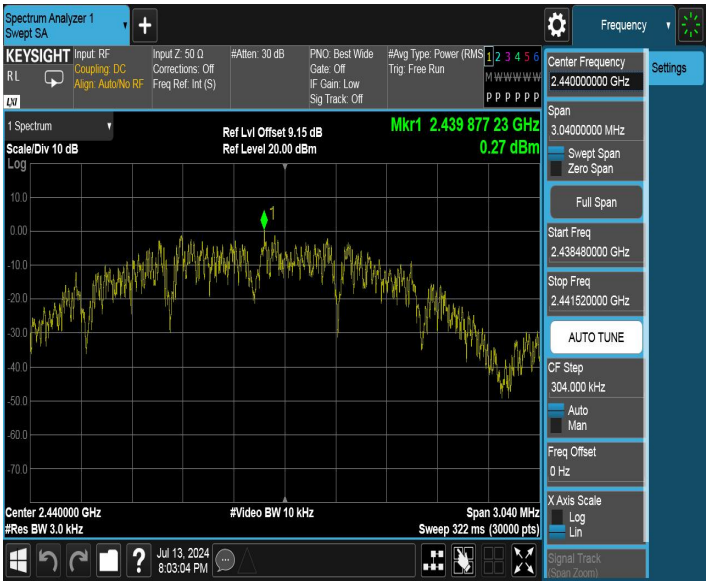
Test Mode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	0.53	≤8.00	PASS
		2440	0.27	≤8.00	PASS
		2480	-5.33	≤8.00	PASS

Test Graphs

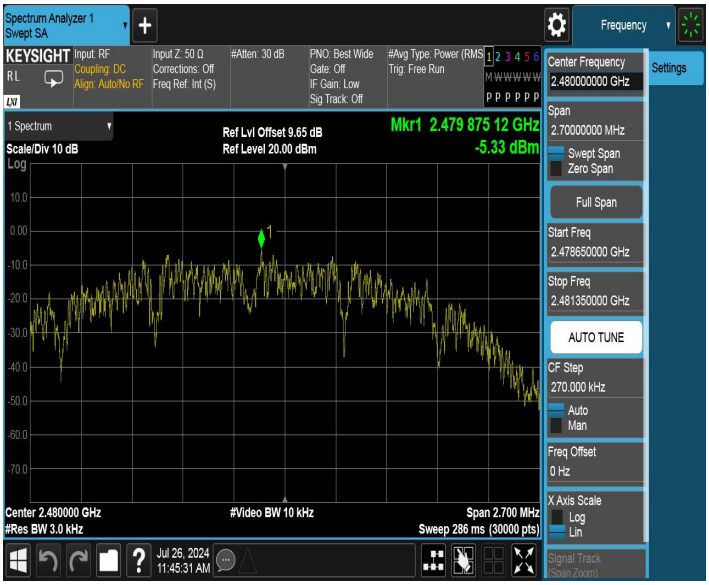
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 30 dB
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
2.70000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.478650000 GHz
Stop Freq
2.481350000 GHz
AUTO TUNE
CF Step
270.000 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 9.65 dB
Ref Level 20.00 dBm
Mkr1 2.479 875 12 GHz
-5.33 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.480000 GHz
#Res BW 3.0 kHz
#Video BW 10 kHz
Span 2.700 MHz
Sweep 286 ms (30000 pts)
Jul 26, 2024
11:45:31 AM

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 Settitng

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

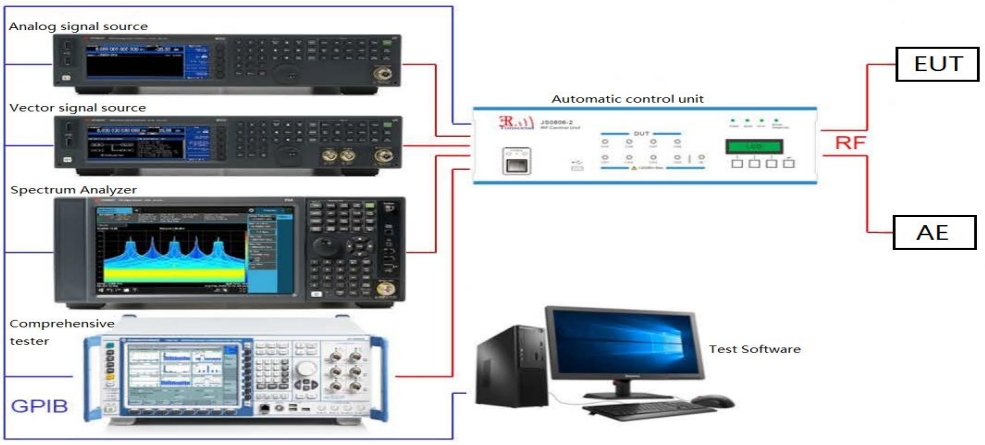
(d) Detector = Peak

(e) Trace mode = max hold

(f) Sweep time = auto couple

(g) The trace was allowed to stabilize

7.5.4. Test Setup

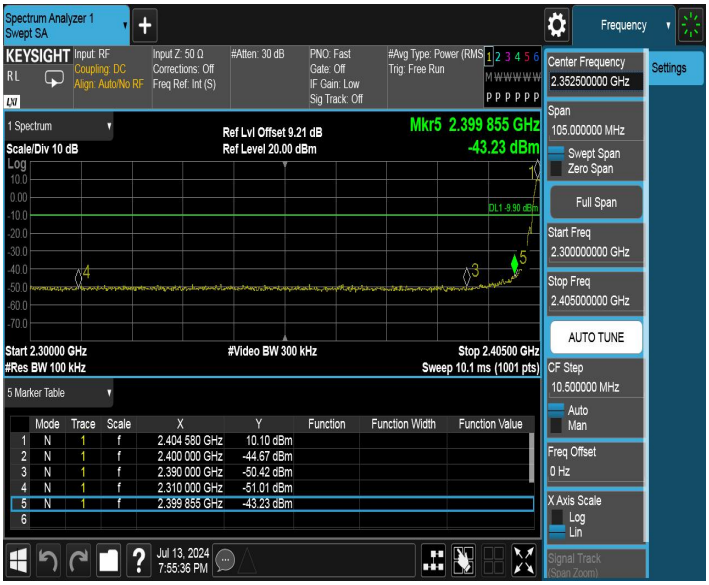


7.5.5. Test Result

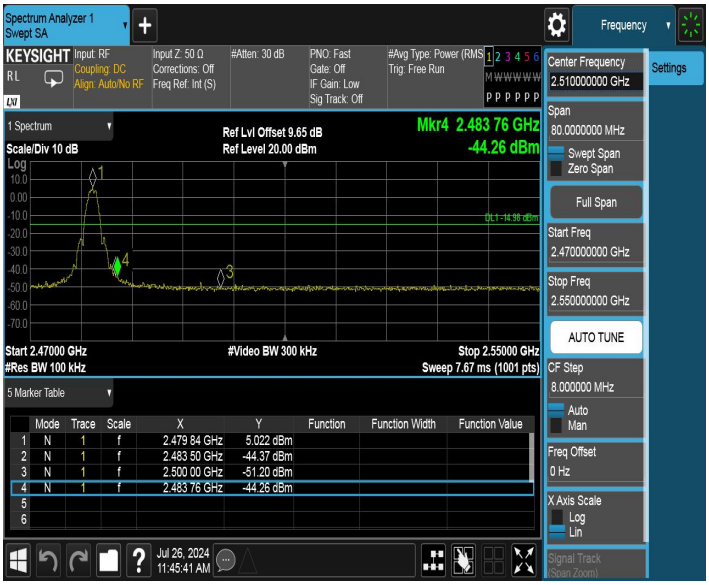
Test Mode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	Reference	9.76	9.76	---	PASS
			30~1000	9.76	-60.72	≤-10.24	PASS
			1000~26500	9.76	-44.67	≤-10.24	PASS
		2440	Reference	9.47	9.47	---	PASS
			30~1000	9.47	-60.78	≤-10.53	PASS
			1000~26500	9.47	-45.86	≤-10.53	PASS
		2480	Reference	4.68	4.68	---	PASS
			30~1000	4.68	-60.25	≤-15.32	PASS
			1000~26500	4.68	-48.83	≤-15.32	PASS

Test Graphs of Band Edge

ZIGB_Ant1_Low_2405

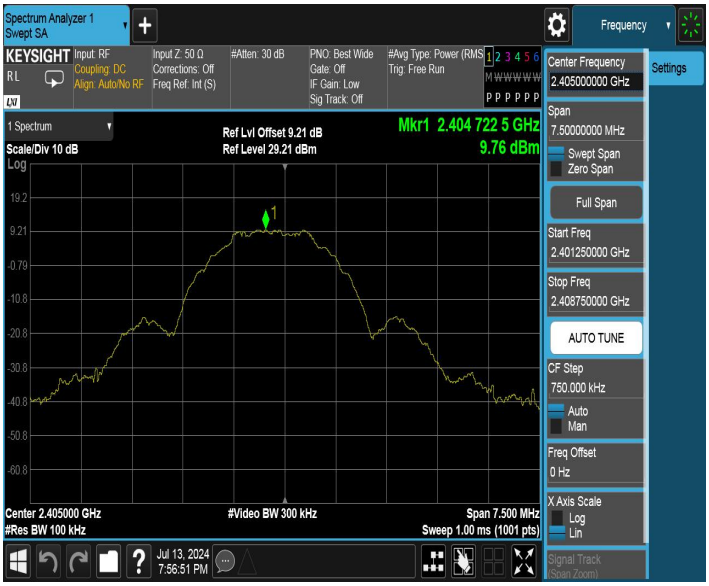


ZIGB_Ant1_High_2480

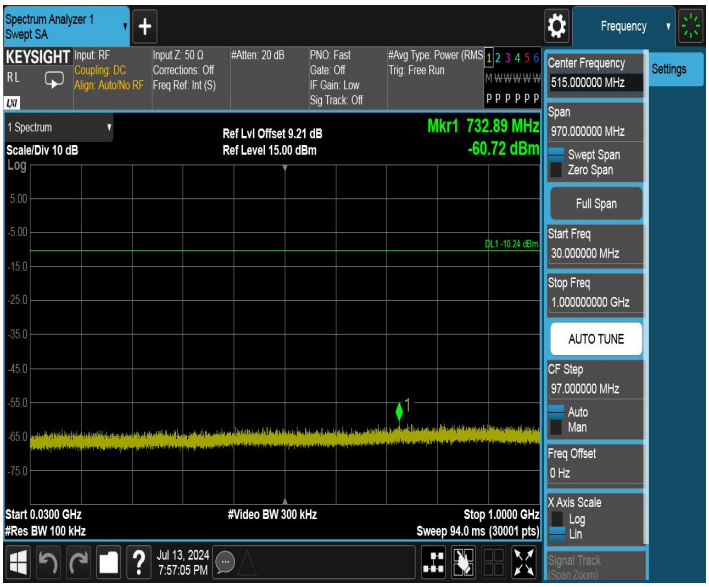

Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 30 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
Frequency
Settings
Center Frequency
2.510000000 GHz
Span
80.0000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.470000000 GHz
Stop Freq
2.550000000 GHz
AUTO TUNE
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 9.65 dB
Ref Level 20.00 dBm
Mkr4 2.483 76 GHz
-44.26 dBm
Start 2.47000 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Stop 2.55000 GHz
Sweep 7.67 ms (1001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 2.479 84 GHz 5.022 dBm
2 N 1 f 2.483 50 GHz -44.37 dBm
3 N 1 f 2.500 00 GHz -51.20 dBm
4 N 1 f 2.483 76 GHz -44.26 dBm
5
6
Jul 26, 2024
11:45:41 AM

Test Graphs of Out-of-Band Emissions

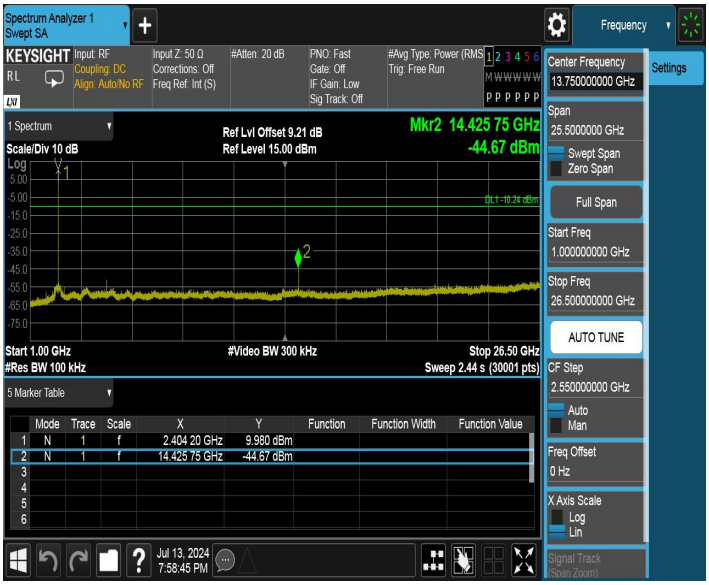
ZIGB_Ant1_2405_0~Reference



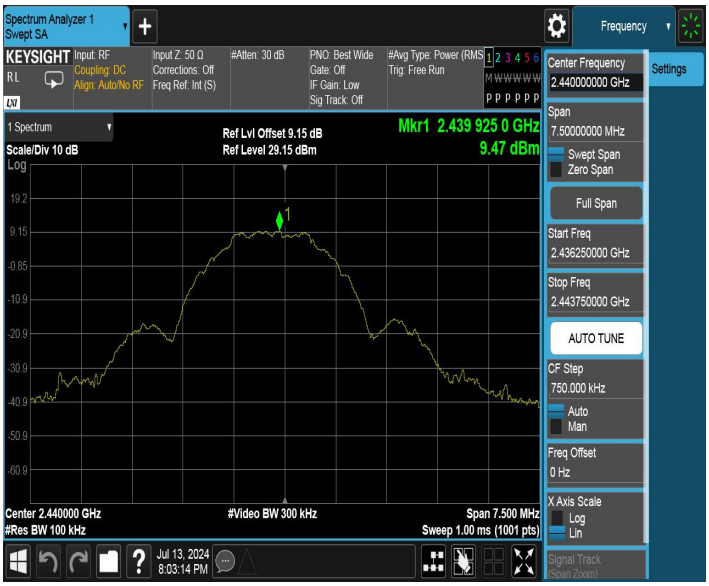
ZIGB_Ant1_2405_30~1000



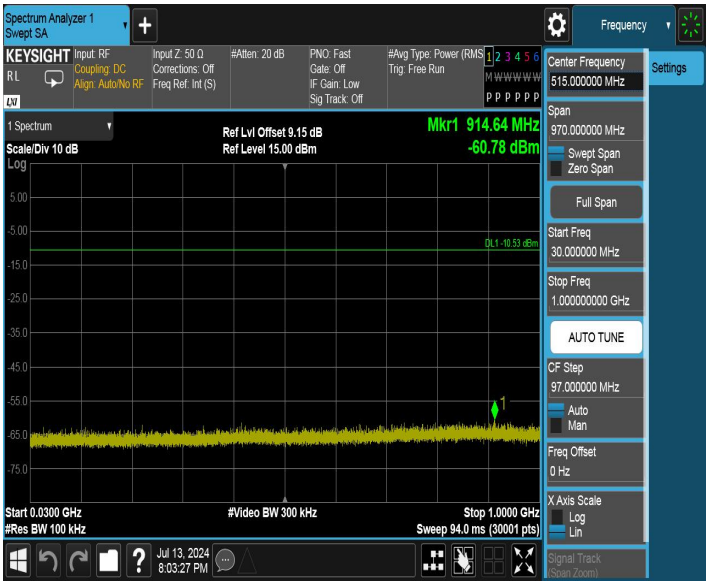
ZIGB_Ant1_2405_1000~26500



ZIGB_Ant1_2440_0~Reference



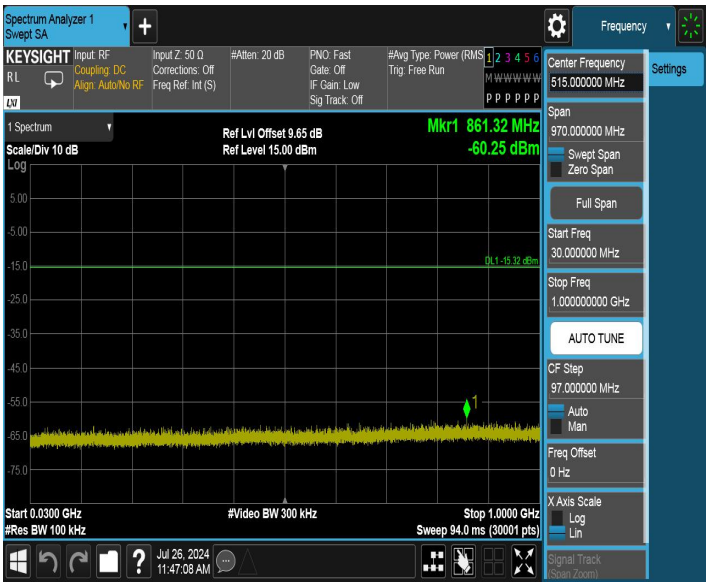
ZIGB_Ant1_2440_30~1000



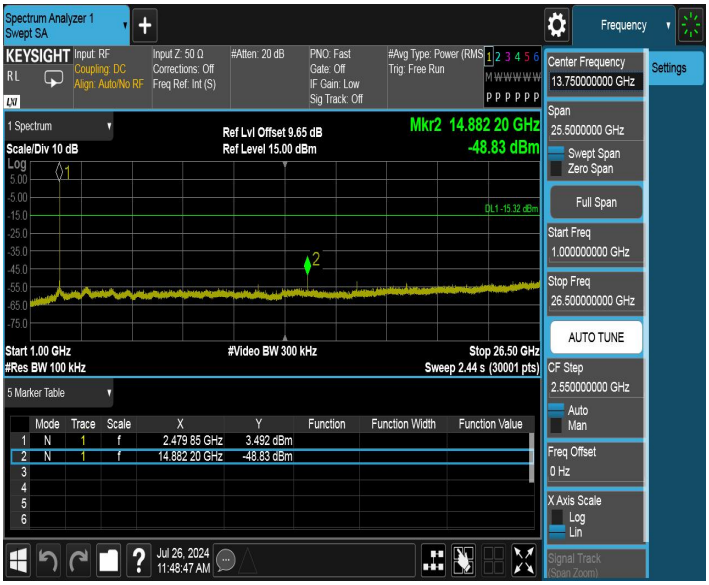
ZIGB_Ant1_2440_1000~26500

ZIGB_Ant1_2480_0~Reference

ZIGB_Ant1_2480_30~1000



ZIGB_Ant1_2480_1000~26500


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 20 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
Frequency
Settings
Center Frequency
13.750000000 GHz
Span
25.5000000 GHz
Swept Span
Zero Span
Full Span
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
AUTO TUNE
CF Step
2.550000000 GHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 9.65 dB
Ref Level 15.00 dBm
Mkr2 14.882 20 GHz
-48.83 dBm
Start 1.00 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Stop 26.50 GHz
Sweep 2.44 s (30001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 2.479 85 GHz 3.492 dBm
2 N 1 f 14.882 20 GHz -48.83 dBm
Jul 26, 2024
11:48:47 AM

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

7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

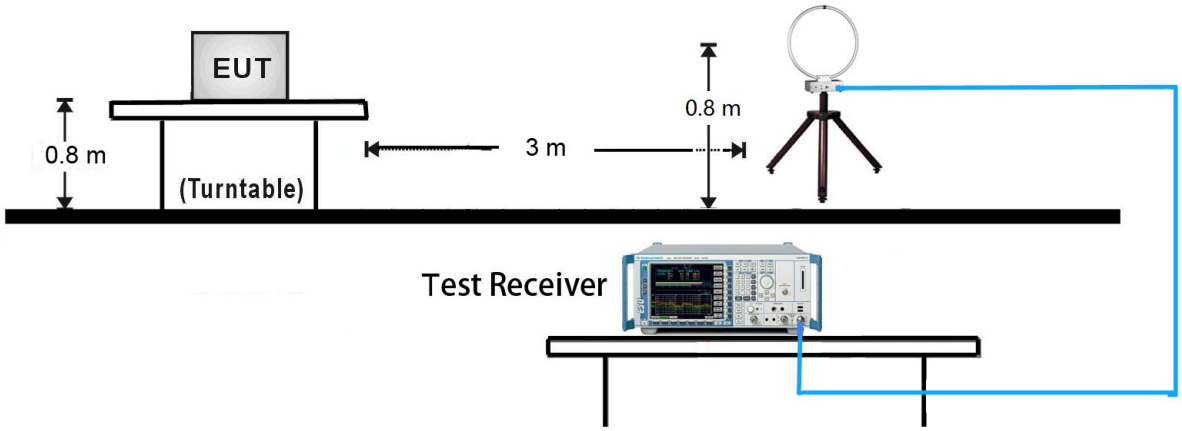
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

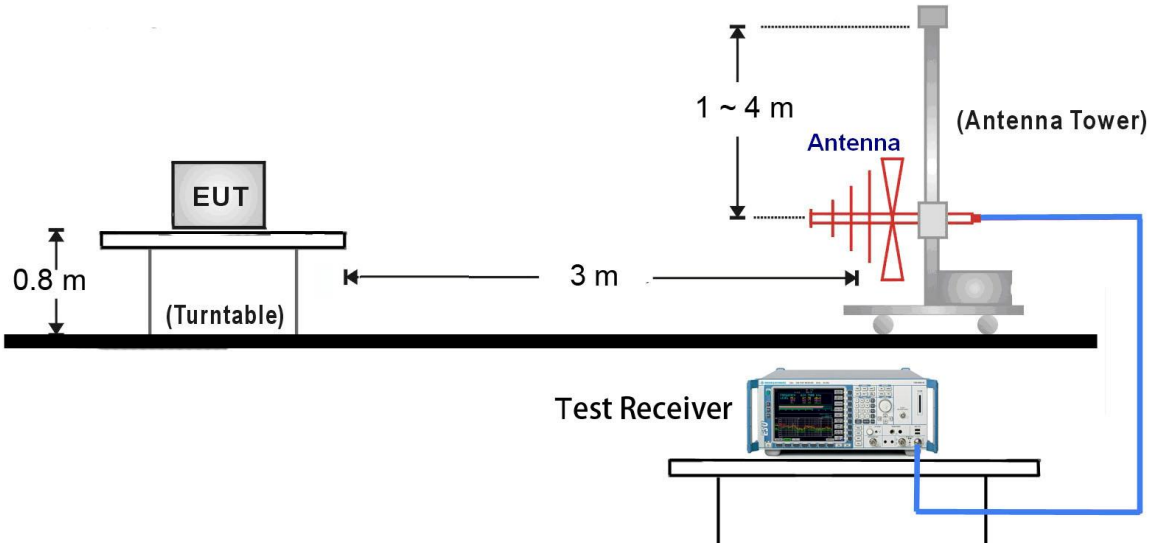
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed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

7.6.4. Test Setup

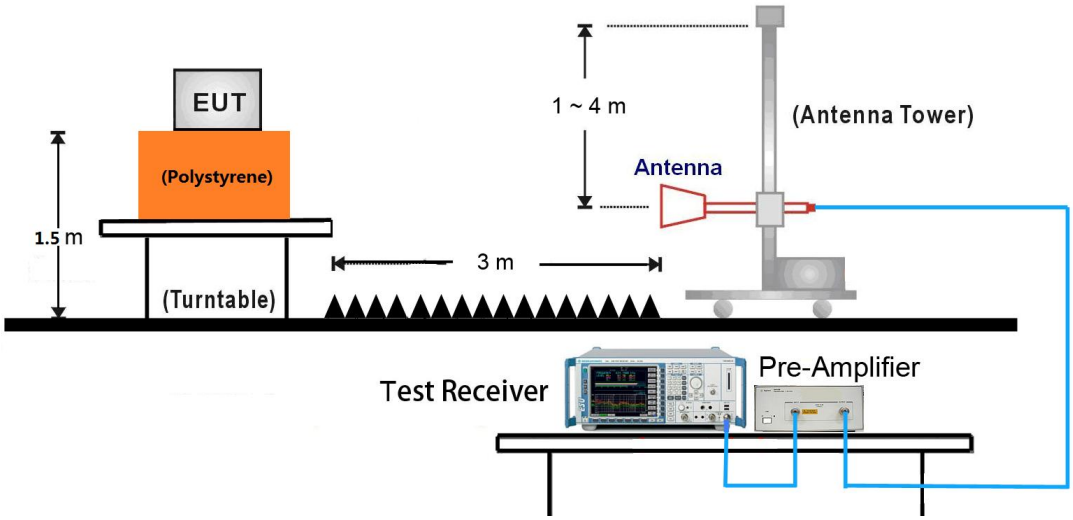
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 26.5GHz Test Setup:



7.6.5. Test Result

Test Mode:	Zigbee	Test Date:	2024-07-20
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 (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1065.7143	44.32	-19.34	74.00	29.68	Peak	Horizontal
1594.2857	39.76	-16.11	74.00	34.24	Peak	Horizontal
3615.0000	43.21	-6.20	74.00	30.79	Peak	Horizontal
4805.0000	48.75	-2.04	74.00	25.25	Peak	Horizontal
1151.4286	45.78	-17.74	74.00	28.22	Peak	Vertical
1632.8571	37.96	-15.05	74.00	36.04	Peak	Vertical
3255.0000	42.26	-7.09	74.00	31.74	Peak	Vertical
4810.0000	47.39	-2.54	74.00	26.61	Peak	Vertical

Test Mode:	Zigbee	Test Date:	2024-07-20
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 (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1151.4286	42.48	-18.82	74.00	31.52	Peak	Horizontal
1688.5714	42.90	-15.37	74.00	31.10	Peak	Horizontal
3435.0000	42.94	-6.91	74.00	31.06	Peak	Horizontal
4880.0000	46.78	-1.69	74.00	27.22	Peak	Horizontal
1062.8571	42.72	-18.21	74.00	31.28	Peak	Vertical
1682.8571	43.72	-14.69	74.00	30.28	Peak	Vertical
3560.0000	43.83	-6.08	74.00	30.17	Peak	Vertical
4880.0000	46.33	-2.27	74.00	27.67	Peak	Vertical

Test Mode:	Zigbee	Test Date:	2024-07-20
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.		

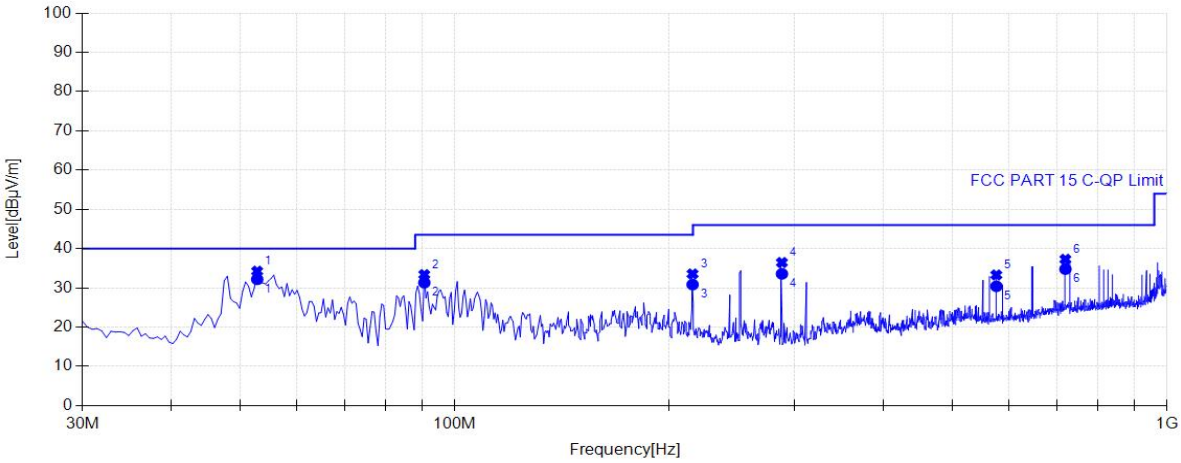
Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1151.4286	44.53	-18.82	74.00	29.47	Peak	Horizontal
1687.1429	42.91	-15.38	74.00	31.09	Peak	Horizontal
3895.0000	43.45	-5.06	74.00	30.55	Peak	Horizontal
4955.0000	48.41	-1.34	74.00	25.59	Peak	Horizontal
1152.8571	43.57	-17.73	74.00	30.43	Peak	Vertical
1684.2857	41.23	-14.68	74.00	32.77	Peak	Vertical
3620.0000	43.69	-5.81	74.00	30.31	Peak	Vertical
5000.0000	45.17	-1.57	74.00	28.83	Peak	Vertical

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	IOT Module	Polarity:	Horizontal
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3.3V
Environment:	Temp: 24℃; Humi:52%	Engineer:	Chuang Li

Test Graph

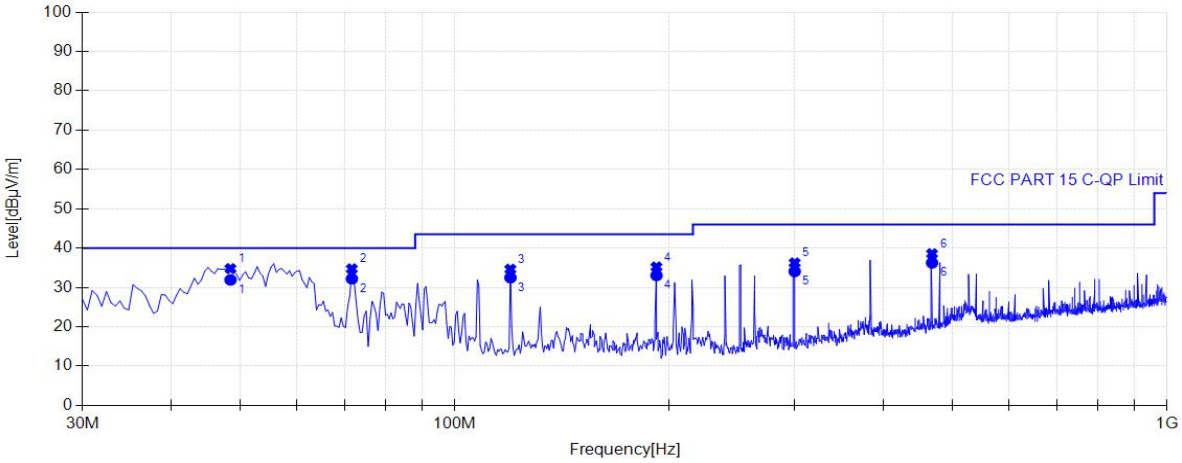


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.7950	9.32	32.18	40.00	7.82	100	174	Horizonta
2	90.6250	10.41	31.32	43.50	12.18	100	359	Horizonta
3	215.755	10.63	30.84	43.50	12.66	100	285	Horizonta
4	288.020	12.61	33.58	46.00	12.42	100	285	Horizonta
5	576.110	19.37	30.41	46.00	15.59	100	340	Horizonta
6	720.155	21.83	34.78	46.00	11.22	100	359	Horizonta

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:	IOT Module	Polarity:	Vertical
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3.3V
Environment:	Temp: 24℃; Humi:52%	Engineer:	Chuang Li

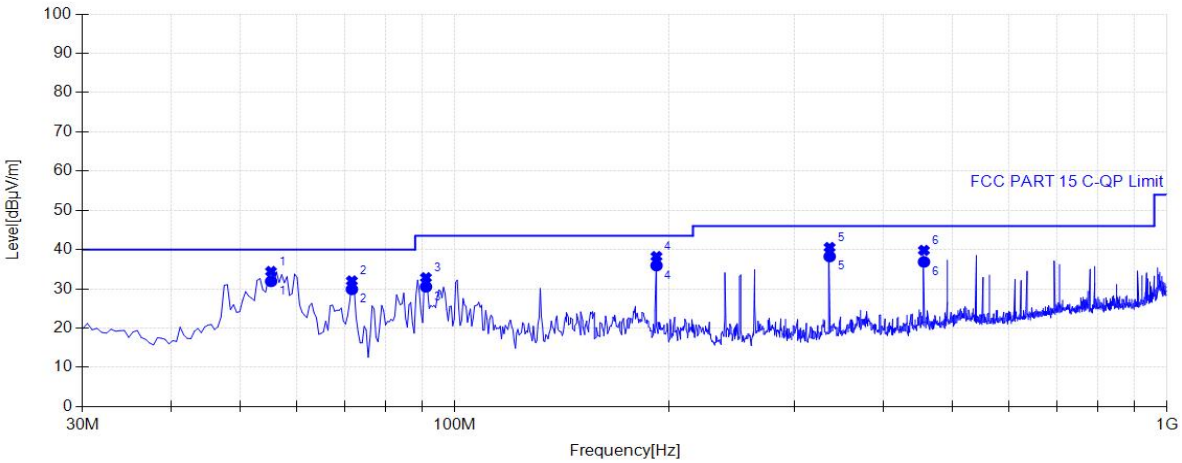
Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.4300	10.16	31.92	40.00	8.08	100	103	Vertical
2	71.7100	7.94	32.22	40.00	7.78	100	350	Vertical
3	119.725	11.74	32.49	43.50	11.01	100	295	Vertical
4	191.990	10.25	33.06	43.50	10.44	100	267	Vertical
5	300.145	11.95	34.09	46.00	11.91	100	322	Vertical
6	467.955	16.93	36.27	46.00	9.73	100	240	Vertical

EUT:	IOT Module	Polarity:	Horizontal
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 3.3V
Environment:	Temp: 24℃; Humi:52%	Engineer:	Chuang Li

Test Graph

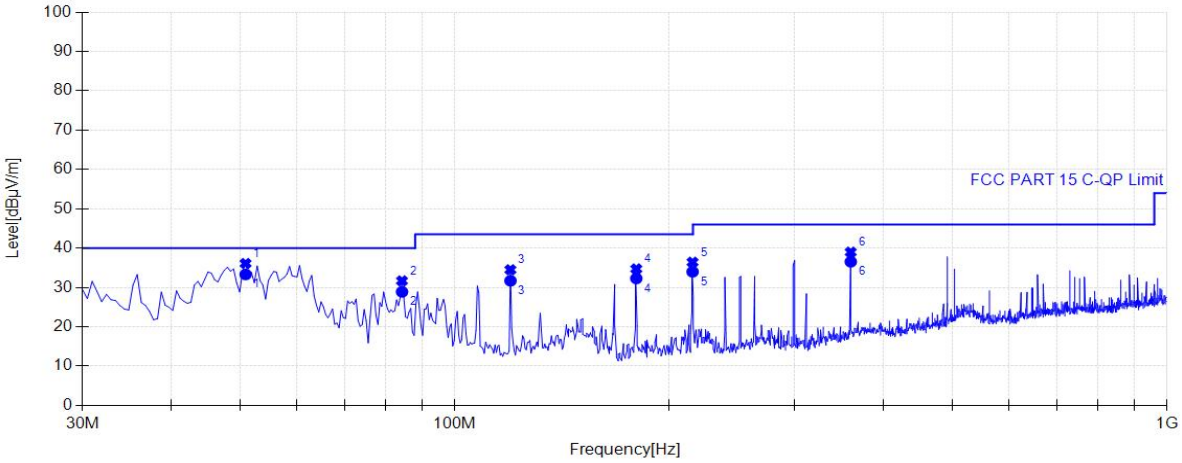


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	55.2200	8.71	31.93	40.00	8.07	100	9	Horizonta
2	71.7100	8.30	29.88	40.00	10.12	100	310	Horizonta
3	91.1100	10.45	30.54	43.50	12.96	100	359	Horizonta
4	191.990	10.57	35.94	43.50	7.56	100	228	Horizonta
5	336.035	13.85	38.25	46.00	7.75	100	9	Horizonta
6	455.830	16.94	36.87	46.00	9.13	100	255	Horizonta

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:	IOT Module	Polarity:	Vertical
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 18	Voltage:	DC 3.3V
Environment:	Temp: 24℃; Humi:52%	Engineer:	Chuang Li

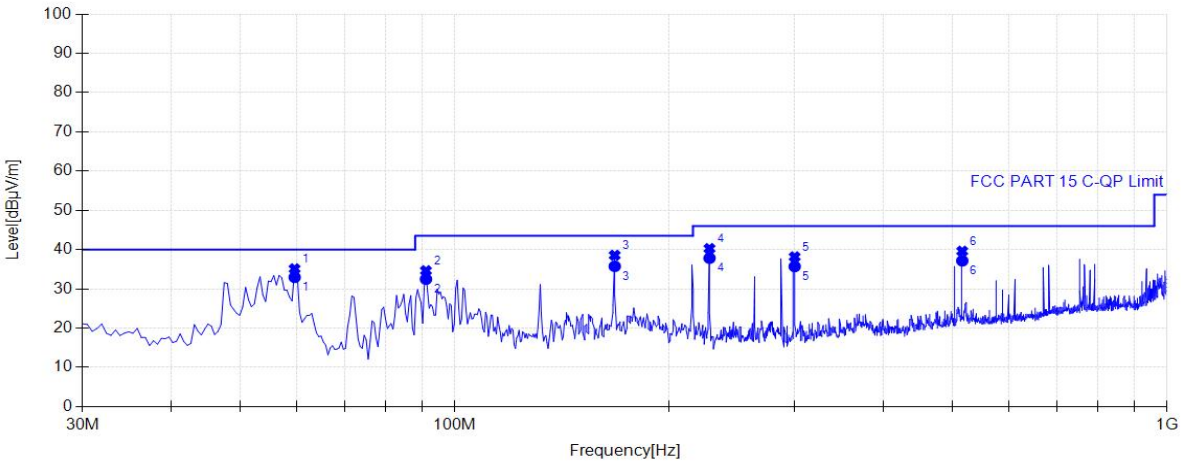
Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	50.8550	9.24	33.31	40.00	6.69	100	77	Vertical
2	84.3200	9.37	28.89	40.00	11.11	100	1	Vertical
3	119.725	11.74	31.71	43.50	11.79	100	323	Vertical
4	179.865	10.02	32.29	43.50	11.21	100	268	Vertical
5	215.755	10.14	33.99	43.50	9.51	100	297	Vertical
6	359.800	13.93	36.55	46.00	9.45	100	323	Vertical

EUT:	IOT Module	Polarity:	Horizontal
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 3.3V
Environment:	Temp: 24℃; Humi:52%	Engineer:	Chuang Li

Test Graph

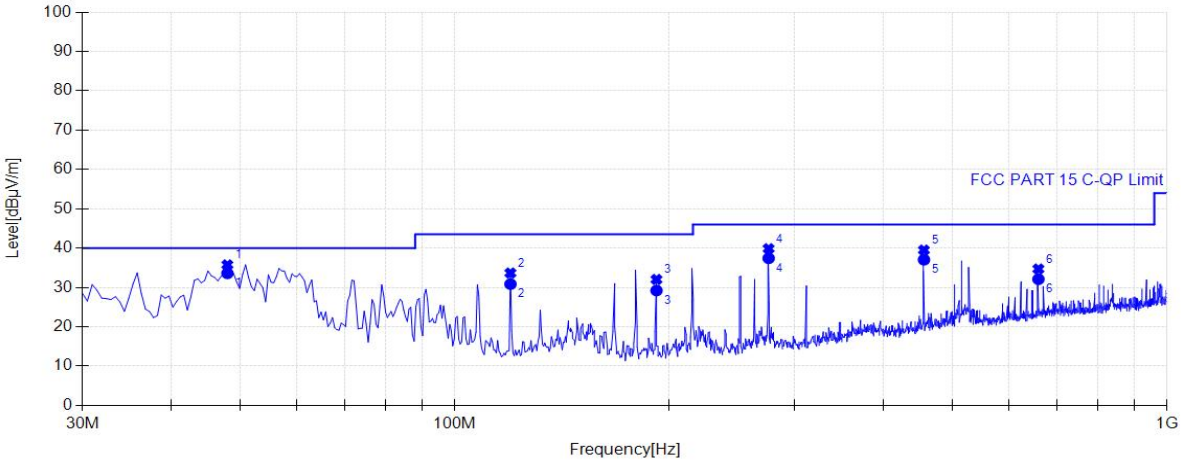


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	59.5850	7.61	32.96	40.00	7.04	100	10	Horizonta
2	91.1100	10.45	32.48	43.50	11.02	100	10	Horizonta
3	167.740	9.99	35.76	43.50	7.74	100	203	Horizonta
4	227.880	10.96	37.83	46.00	8.17	100	148	Horizonta
5	300.145	12.95	35.71	46.00	10.29	100	175	Horizonta
6	515.970	18.37	37.16	46.00	8.84	100	284	Horizonta

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:	IOT Module	Polarity:	Vertical
Model:	TRZB13	SN:	N/A
Mode:	Transmit at Zigbee Channel 26	Voltage:	DC 3.3V
Environment:	Temp: 24℃; 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	47.9450	10.39	33.59	40.00	6.41	100	76	Vertical
2	119.725	11.74	30.86	43.50	12.64	100	322	Vertical
3	191.990	10.25	29.23	43.50	14.27	100	295	Vertical
4	275.895	11.42	37.42	46.00	8.58	100	159	Vertical
5	455.830	16.63	37.06	46.00	8.94	100	240	Vertical
6	660.015	20.29	32.10	46.00	13.90	100	350	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. Radiated 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
[1] 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	([2])
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.

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

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

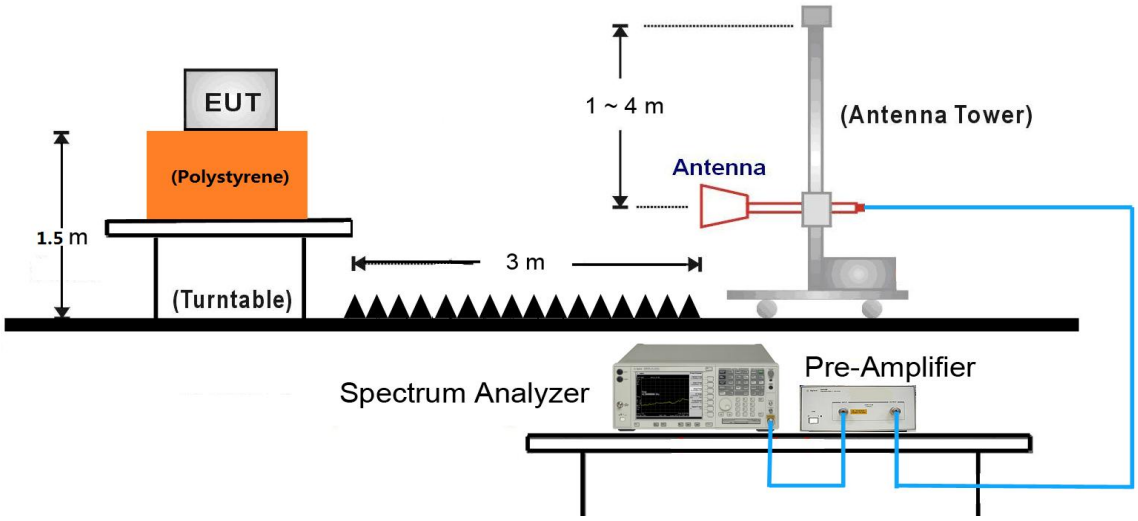
Peak Field Strength Measurements

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 ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.7.4. Test Setup

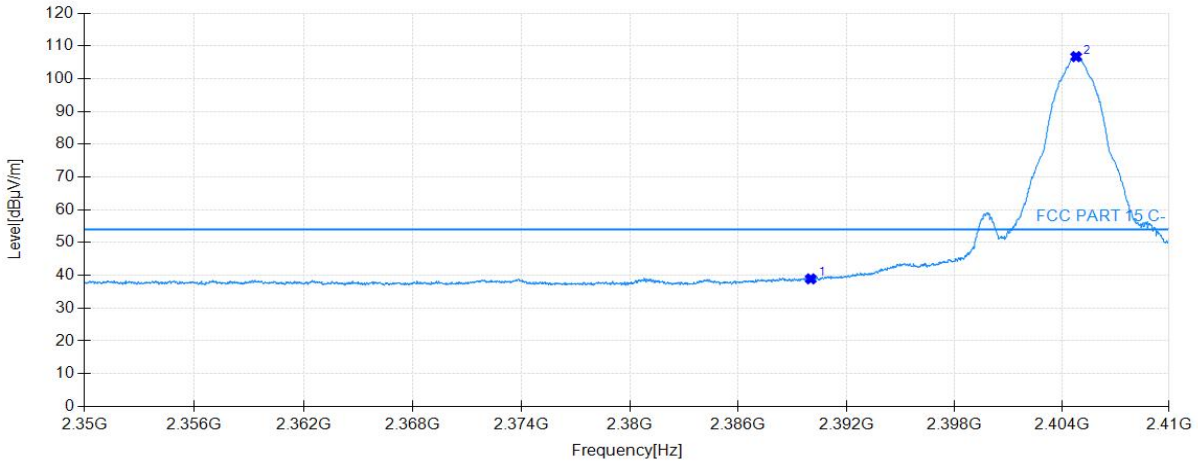


Note: This item was performed with the WIFI antenna connected.

7.7.5. Test Result

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2405	Test Engineer:	Chuang Li
Remark:	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.		

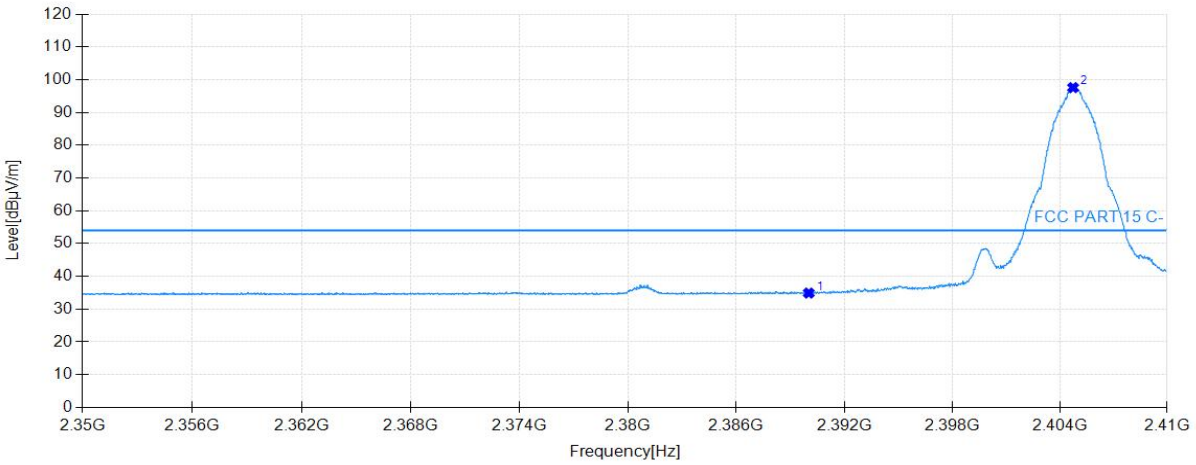
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2390.02	38.93	33.21	54.00	15.07	160	92	Average	Horizontal
2404.81	106.72	33.25	54.00	-52.72	160	92	Average	Horizontal

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2405	Test Engineer:	Chuang Li
Remark:	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.		

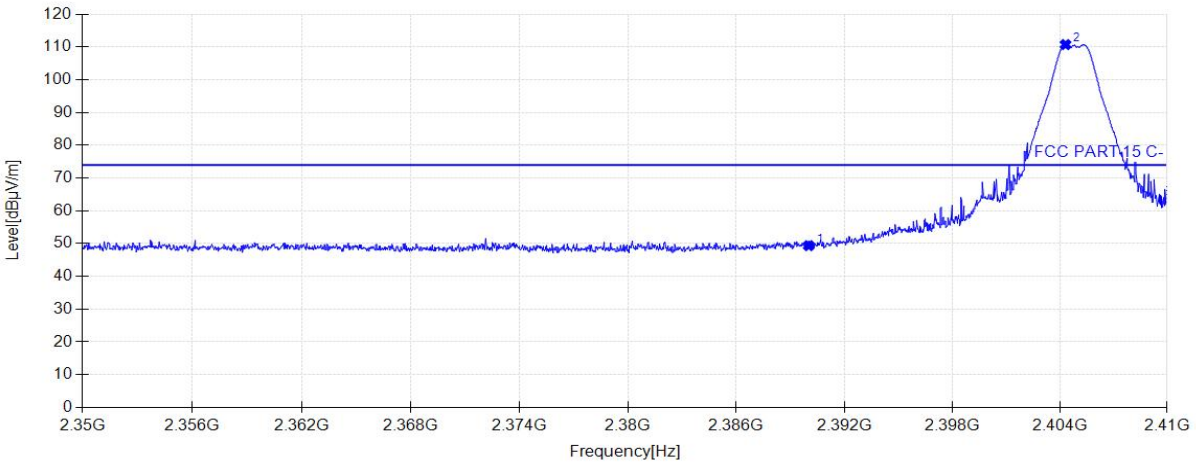
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2390.02	34.90	33.10	54.00	19.10	160	6	Average	Vertical
2404.75	97.58	33.12	54.00	-43.58	160	6	Average	Vertical

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2405	Test Engineer:	Chuang Li
Remark:	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.		

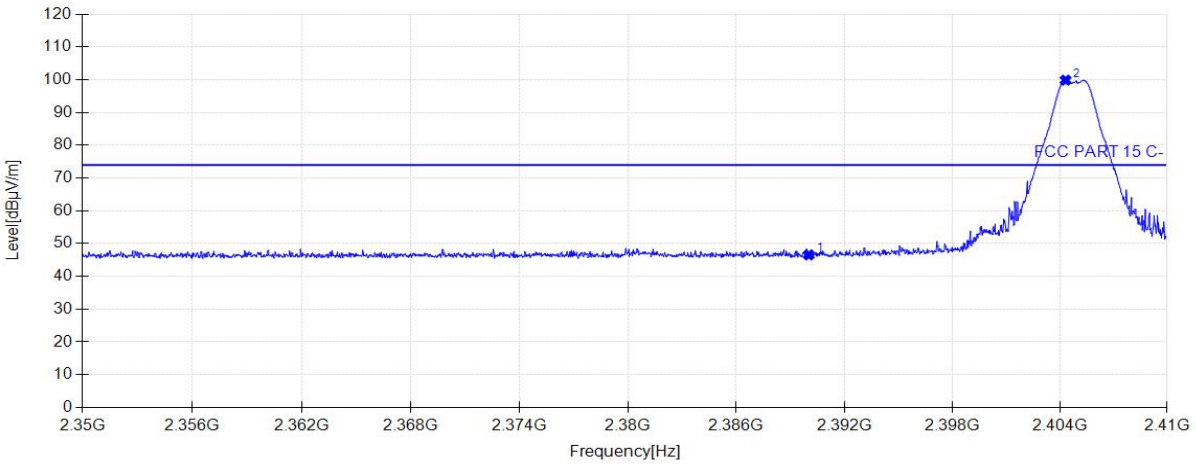
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2390.02	49.36	33.21	74.00	24.64	150	93	Peak	Horizontal
2404.33	110.71	33.25	74.00	-36.71	150	93	Peak	Horizontal

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2405	Test Engineer:	Chuang Li
Remark:	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.		

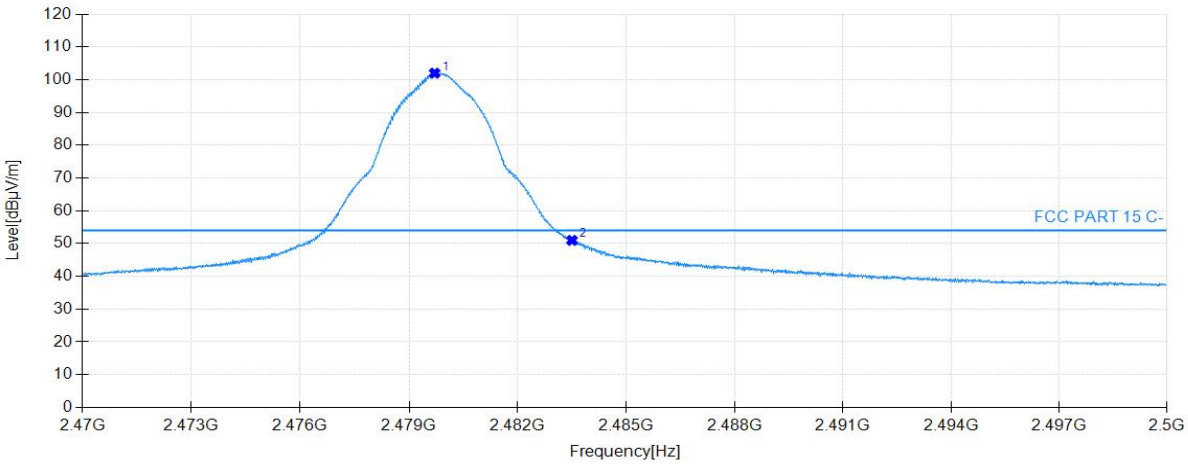
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2390.02	46.55	33.10	74.00	27.45	150	296	Peak	Vertical
2404.33	99.85	33.12	74.00	-25.85	150	20	Peak	Vertical

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2480	Test Engineer:	Chuang Li
Remark:	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.		

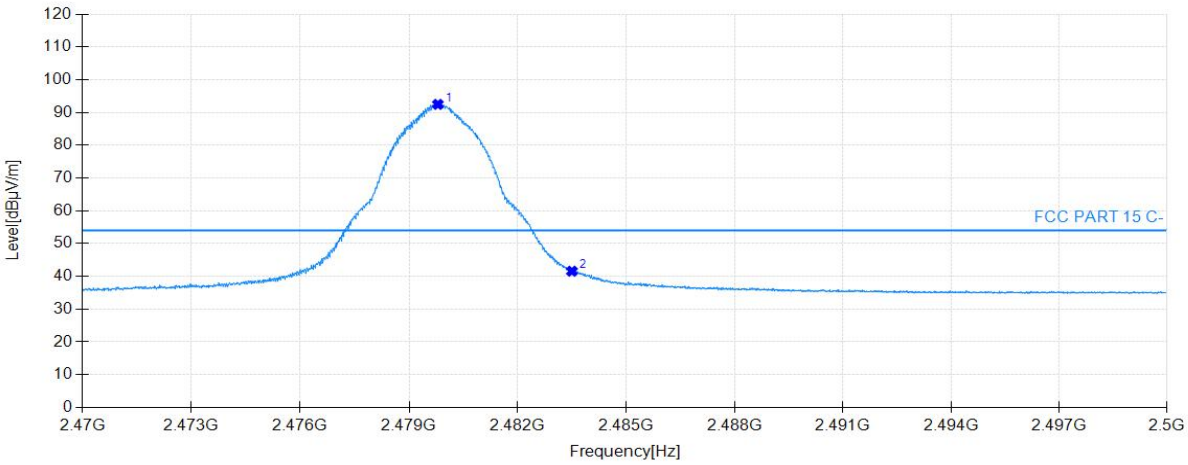
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2479.70	101.98	33.46	54.00	-47.98	160	92	Average	Horizontal
2483.50	50.98	33.47	54.00	3.02	160	92	Average	Horizontal

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2480	Test Engineer:	Chuang Li
Remark:	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.		

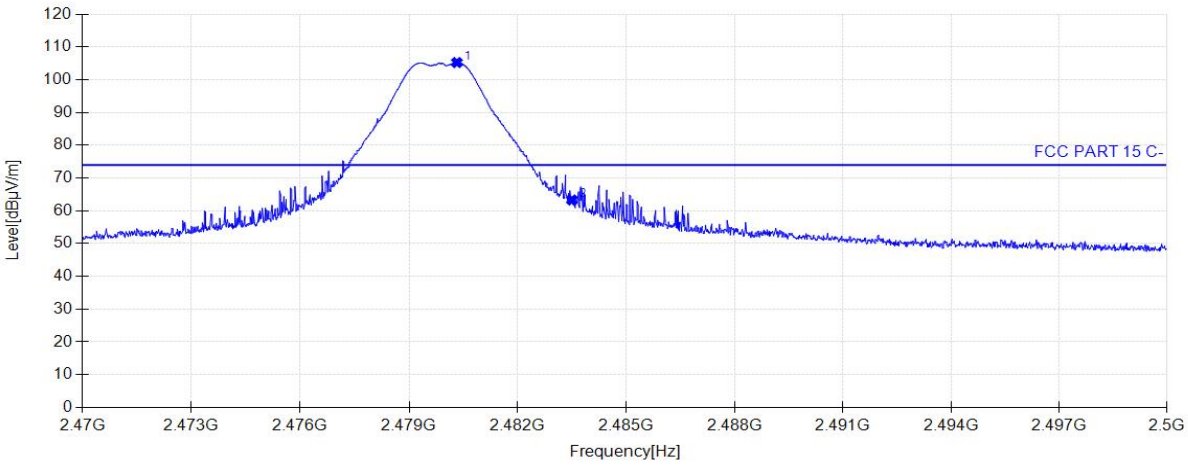
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2479.79	92.47	33.20	54.00	-38.47	160	21	Average	Vertical
2483.50	41.57	33.20	54.00	12.43	160	322	Average	Vertical

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2480	Test Engineer:	Chuang Li
Remark:	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.		

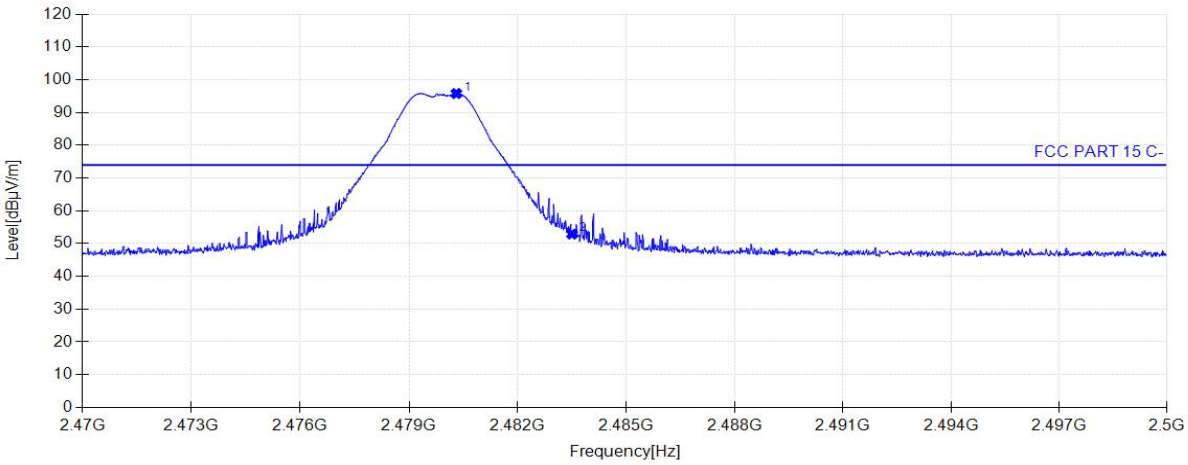
Test Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2480.32	105.23	33.46	74.00	-31.23	160	93	Peak	Horizontal
2483.50	63.30	33.47	74.00	10.70	160	359	Peak	Horizontal

Test Mode:	Zigbee	Test Date:	2024-07-20
Test Channel:	2480	Test Engineer:	Chuang Li
Remark:	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 Graph



Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
2480.30	95.78	33.20	74.00	-21.78	160	20	Peak	Vertical
2483.50	52.89	33.20	74.00	21.11	160	20	Peak	Vertical

7.8. AC Conducted Emissions Measurement

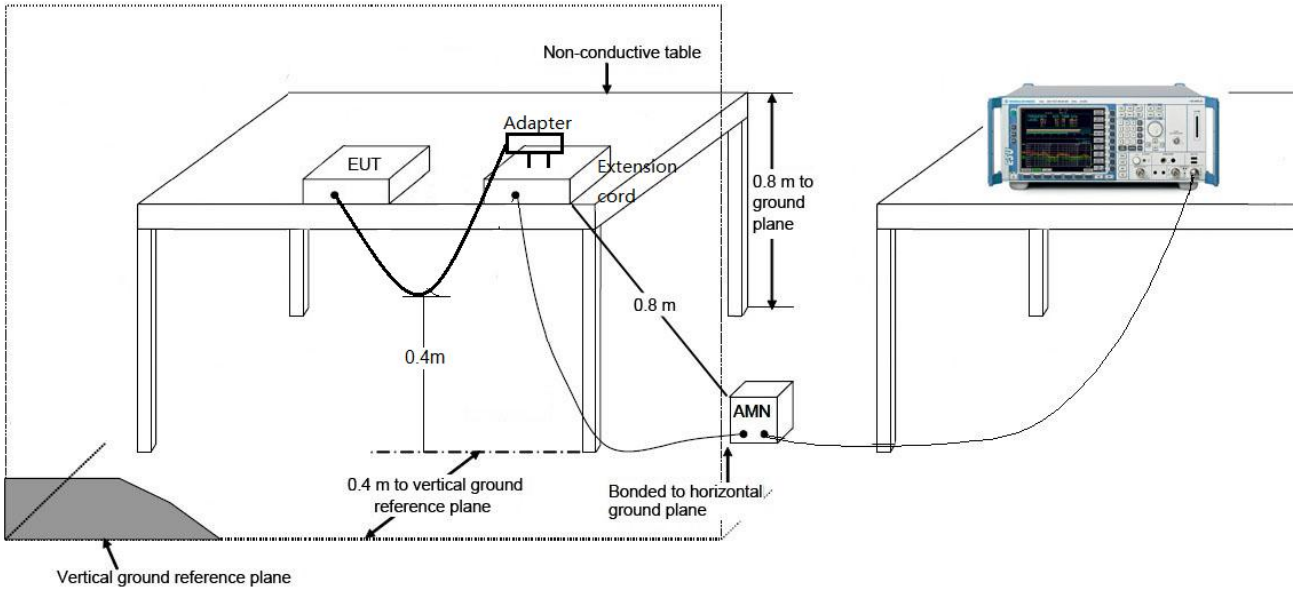
7.8.1. Test Limit

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 DC 3.3V.

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **IOT Module (Model: TRZB13)** is in compliance with Part 15C of the FCC Rules.

The End