



## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

Report Reference No.....: HTT202507080F01

FCC ID.....: 2A87N-MG-SJ100

Compiled by

( position+printed name+signature)...: File administrators

Supervised by

( position+printed name+signature)...: Project Engineer

Approved by

( position+printed name+signature)...: RF Manager

Date of issue.....: Jul. 08, 2025

Testing Laboratory Name .....: Shenzhen HTT Technology Co.,Ltd.

Address.....: 1F, Building B, Huafeng International Robotics Industrial Park,  
Hangcheng Road, Nanchang Community, Xixiang Street, Bao'an  
District, Shenzhen, Guangdong, China

Applicant's name.....: Shen Zhen Simaru Tec Co.,Ltd

Address .....: 208, Building C, No.129, Pingxin North Road, Shangmugu  
Community, Pinghu Street, Longgang District, Shenzhen, Guangdong,  
China

Test specification .....

Standard .....: FCC Part 15.247

**Shenzhen HTT Technology Co.,Ltd. All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HTT Technology Co.,Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HTT Technology Co.,Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Equipment description.....: Zigbee Rainwater Leakage Detection

Trade Mark .....: N/A

Manufacturer .....: Shen Zhen Simaru Tec Co.,Ltd

Model/Type reference.....: MG-SJ100-W-ZIG

Listed Models .....: SMR-MG-SJ100-W-ZIG

Modulation .....: OQPSK

Frequency.....: 2405-2480MHz

Ratings .....: DC 3.0V From Battery

Result.....: **PASS**

Heber He  
Bruce Zhu  
Kevin Yang



## TEST REPORT

Equipment under Test : Zigbee Rainwater Leakage Detection

Model /Type : MG-SJ100-W-ZIG

Listed Models : SMR-MG-SJ100-W-ZIG

Model Declaration : PCB board, structure and internal of these model(s) are the same,  
So no additional models were tested.

Applicant : **Shen Zhen Simaru Tec Co.,Ltd**

Address : 208, Building C, No.129, Pingxin North Road, Shangmugu Community,  
Pinghu Street,Longgang District, Shenzhen, Guangdong, China

Manufacturer : **Shen Zhen Simaru Tec Co.,Ltd**

Address : 208, Building C, No.129, Pingxin North Road, Shangmugu Community,  
Pinghu Street,Longgang District, Shenzhen, Guangdong, China

<b>Test Result:</b>	<b>PASS</b>
---------------------	-------------

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Contents

<u>1</u>	<u>TEST STANDARDS .....</u>	<u>4</u>
<u>2</u>	<u>SUMMARY .....</u>	<u>5</u>
2.1	General Remarks	5
2.2	Product Description*	5
2.3	Equipment Under Test	5
2.4	Short description of the Equipment under Test (EUT)	5
2.5	EUT operation mode	6
2.6	Block Diagram of Test Setup	6
2.7	Related Submittal(s) / Grant (s)	6
2.8	Modifications	6
<u>3</u>	<u>TEST ENVIRONMENT .....</u>	<u>7</u>
3.1	Address of the test laboratory	7
3.2	Test Facility	7
3.3	Environmental conditions	7
3.4	Summary of measurement results	8
3.5	Statement of the measurement uncertainty	8
3.6	Equipments Used during the Test	9
<u>4</u>	<u>TEST CONDITIONS AND RESULTS .....</u>	<u>11</u>
4.1	AC Power Conducted Emission	11
4.2	Radiated Emissions and Band Edge	12
4.3	Maximum Peak Output Power	19
4.4	Power Spectral Density	20
4.5	6dB Bandwidth	21
4.6	Out-of-band Emissions	22
4.7	Antenna Requirement	24
	<u>TEST SETUP PHOTOS OF THE EUT .....</u>	<u>25</u>
<u>5</u>	<u>PHOTOS OF THE EUT .....</u>	<u>25</u>

## 1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 V05r02](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

## 2 SUMMARY

### 2.1 General Remarks

Date of receipt of test sample	:	Jul. 01, 2025
Testing commenced on	:	Jul. 01, 2025
Testing concluded on	:	Jul. 08, 2025

### 2.2 Product Description\*

Name of EUT	Zigbee Rainwater Leakage Detection
Model Number	MG-SJ100-W-ZIG
Power Rating	DC 3.0V From Battery
Sample ID:	HTT202507080-1# (Engineer sample) HTT202507080-2# (Normal sample)
Operation frequency	2405-2480MHz
Modulation	OQPSK
Antenna Type	PCB antenna
Antenna Gain	1.08 dBi

### 2.3 Equipment Under Test

#### Power supply system utilised

Power supply voltage	:	<input type="radio"/>	230V / 50 Hz	<input type="radio"/>	120V / 60Hz
		<input type="radio"/>	12 V DC	<input type="radio"/>	24 V DC
		<input checked="" type="radio"/>	Other (specified in blank below)		

DC 3.0V From Battery

### 2.4 Short description of the Equipment under Test (EUT)

This is a Zigbee Rainwater Leakage Detection.

For more details, refer to the user's manual of the EUT.

## 2.5 EUT operation mode

The Applicant use Key to control the EUT for staying in continuous transmitting and receiving mode for testing .There is 16 channels provided to the EUT. Channel Low, Mid and High was selected to test.

### Operation Frequency:

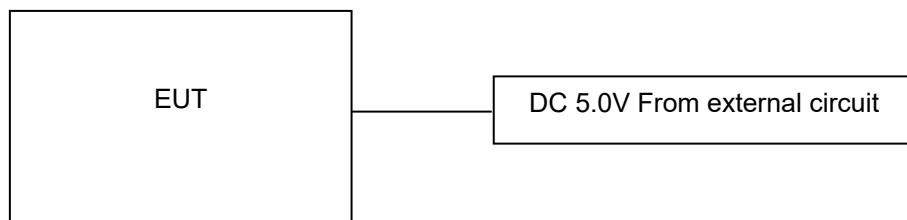
Channel	Frequency(MHz)	Channel	Frequency(MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

Test frequency:

Channel	Frequency (MHz)
Low	2405
Mid	2440
High	2480

Test Software Version	EMI_Test_v1.8		
Frequency	2405 MHz	2440MHz	2480 MHz
OQPSK	10.5	10.5	10.5

## 2.6 Block Diagram of Test Setup



## 2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8 Modifications

No modifications were implemented to meet testing criteria.

### **3 TEST ENVIRONMENT**

#### **3.1 Address of the test laboratory**

##### **Shenzhen HTT Technology Co.,Ltd.**

1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road, Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

#### **3.2 Test Facility**

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

##### **FCC-Registration No.: 779513 Designation Number: CN1319**

Shenzhen HTT Technology Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

##### **A2LA-Lab Cert. No.: 6435.01**

Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

#### **3.3 Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Radiated Emission:

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

### 3.4 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(e)	Power spectral density	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	complies
§15.247(b)(3)	Maximum output Peak power	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	complies
§15.247(d)	Band edge compliance conducted	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	complies
§15.205	Band edge compliance radiated	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	complies
§15.247(d)	TX spurious emissions conducted	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	complies
§15.247(d)	TX spurious emissions radiated	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Zigbee	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	complies
§15.209(a)	TX spurious Emissions radiated Below 1GHz	Zigbee	-/-	Zigbee	-/-	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	Zigbee	-/-	Zigbee	-/-	complies

Remark:

1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

### 3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen HTT Technology Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen HTT Technology Co.,Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.12 dB	(1)
Radiated Emission	30~1000MHz	4.37 dB	(1)
Radiated Emission	1~18GHz	5.40 dB	(1)
Radiated Emission	18-40GHz	5.45 dB	(1)
Conducted Disturbance	0.15~30MHz	2.68 dB	(1)
Output Peak power	30MHz~18GHz	0.57 dB	(1)
Power spectral density	/	0.54 dB	(1)
Spectrum bandwidth	/	1.2%	(1)
Time	/	±10%	(1)
Radiated spurious emission (30MHz-1GHz)	30~1000MHz	4.25 dB	(1)
Radiated spurious emission (1GHz-18GHz)	1~18GHz	4.15 dB	(1)
Radiated spurious emission (18GHz-40GHz)	18-40GHz	5.35 dB	(1)

Spurious RF Conducted Emission	9KHz~40GHz	1.20 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.20 dB	(1)
Occupied Bandwidth	9KHz~40GHz	-	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3.6 Equipments Used during the Test

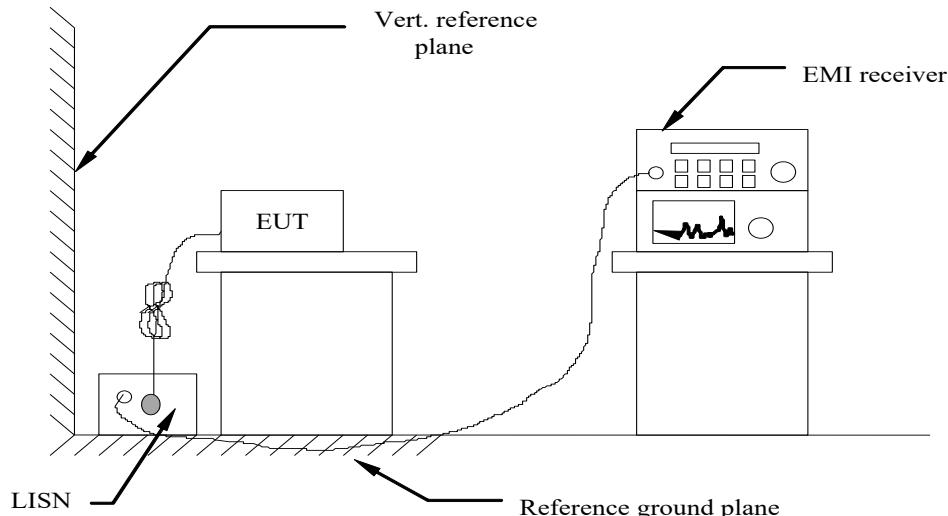
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2024	Aug. 09 2027
2	Control Room	Shenzhen C.R.T technology co., LTD	4.8*3.5*3.0	HTT-E030	Aug. 10 2024	Aug. 09 2027
3	EMI Test Receiver	Rohde&Schwarz	ESCI7	HTT-E022	Apr. 22 2025	Apr. 21 2026
4	Spectrum Analyzer	ROHDE&SCHWARZ	FSV40-N	HTT-E050	Jun. 04 2025	Jun. 03 2026
5	Coaxial Cable	ZDecl	ZT26-NJ-NJ-0.6M	HTT-E018	Apr. 22 2025	Apr. 21 2026
6	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-2M	HTT-E019	Apr. 22 2025	Apr. 21 2026
7	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-0.6M	HTT-E020	Apr. 22 2025	Apr. 21 2026
8	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-8.5M	HTT-E021	Apr. 22 2025	Apr. 21 2026
9	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	Apr. 19 2025	Apr. 18 2026
10	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	Apr. 19 2025	Apr. 18 2026
11	Loop Antenna	Zhinan	ZN30900C	HTT-E039	Apr. 19 2025	Apr. 18 2026
12	Horn Antenna	A.H. Systems, inc.	SAS-574	HTT-E040	Jun. 04 2025	Jun. 03 2026
13	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	Apr. 22 2025	Apr. 21 2026
14	high-frequency Amplifier	HP	8449B	HTT-E014	Apr. 22 2025	Apr. 21 2026
15	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	Apr. 22 2025	Apr. 21 2026
16	EMI Test Receiver	Rohde & Schwarz	ESCI3	HTT-E043	Apr. 22 2025	Apr. 21 2026
17	Artificial Mains	Rohde & Schwarz	ESH3-Z5	HTT-E006	Apr. 22 2025	Apr. 21 2026
18	Artificial Mains	Rohde & Schwarz	ENV-216	HTT-E038	Apr. 22 2025	Apr. 21 2026
19	Cable Line	Robinson	Z302S-NJ-BNCJ-1.5M	HTT-E001	Apr. 22 2025	Apr. 21 2026
20	Filter	ROHDE&SCHWARZ	ESH3-Z2	HTT-E045	Sep. 20 2024	Sep. 19 2025
21	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650 (5KVA)	HTT-E032	Apr. 22 2025	Apr. 21 2026
22	Control Room	Shenzhen C.R.T technology co., LTD	8*4*3.5	HTT-E029	Aug. 10 2024	Aug. 09 2027
23	DC power supply	Agilent	E3632A	HTT-E023	Apr. 22 2025	Apr. 21 2026
24	EMI Test Receiver	Agilent	N9020A	HTT-E024	Apr. 22 2025	Apr. 21 2026
25	Analog signal generator	Agilent	N5181A	HTT-E025	Apr. 22 2025	Apr. 21 2026
26	Vector signal generator	Agilent	N5182A	HTT-E026	Apr. 22 2025	Apr. 21 2026
27	RF Switch box	Keysight	Switchbox	HTT-E047	May. 19 2025	May. 18 2026
28	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-074	Apr. 21 2025	Apr. 20 2026
29	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
30	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
31	RF Test Software	panshanrf	TST	N/A	N/A	N/A
32	WIDEBAND RADIO COMMUNICATION TESTER	ROHDE&SCHWARZ	CMW 500	HTT-E036	May. 19 2025	May. 18 2026

33	Amplifier(18-40G)	/	LNA-18004000-50G35	HTT-E053	Jun. 03 2025	Jun. 02 2026
34	Power Meter	R&S	NRVS	HTT-E057	Apr. 22 2025	Apr. 21 2026

## 4 TEST CONDITIONS AND RESULTS

### 4.1 AC Power Conducted Emission

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

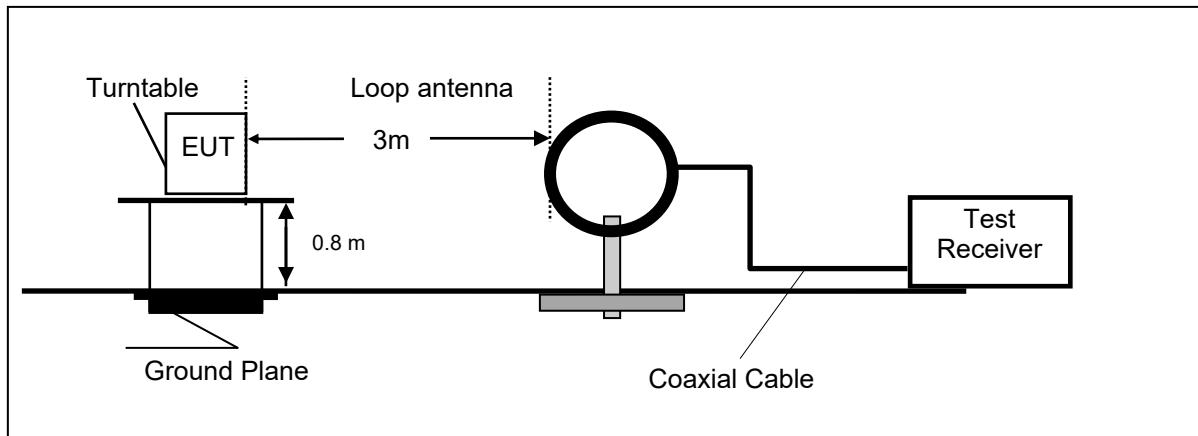
#### TEST RESULTS

N/A

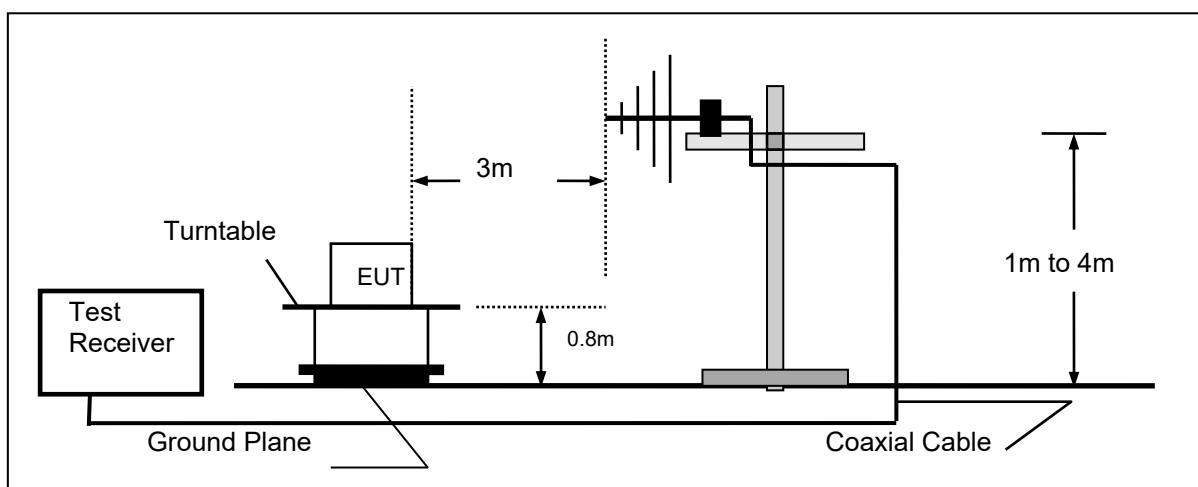
## 4.2 Radiated Emissions and Band Edge

### TEST CONFIGURATION

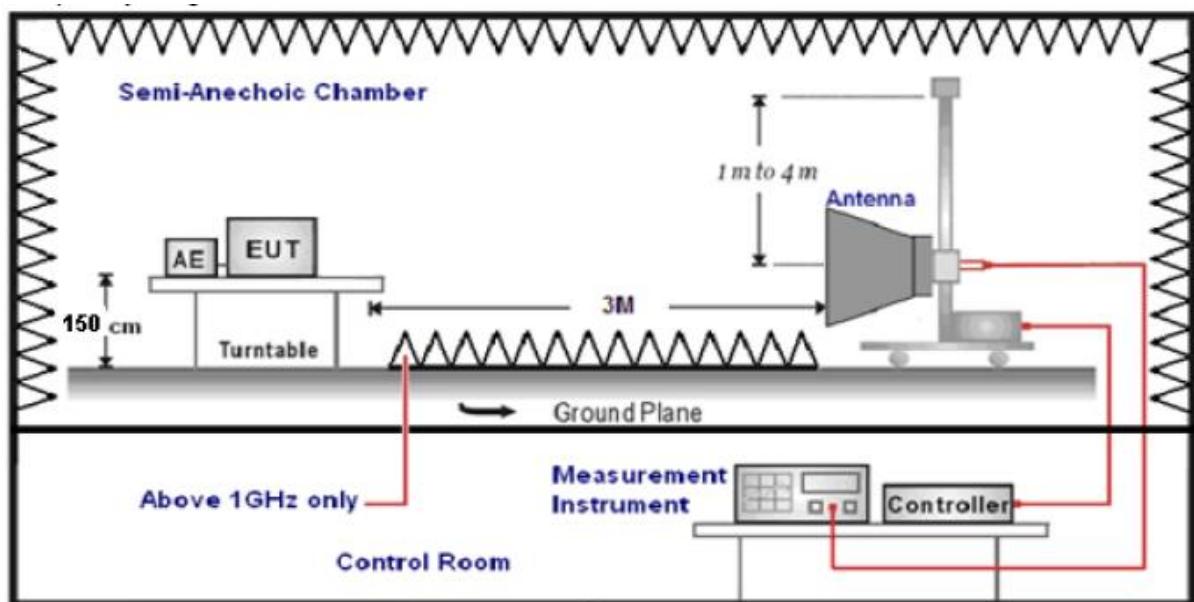
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



**TEST PROCEDURE**

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz; the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz. so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

$$Transd=AF + CL - AG$$

**RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

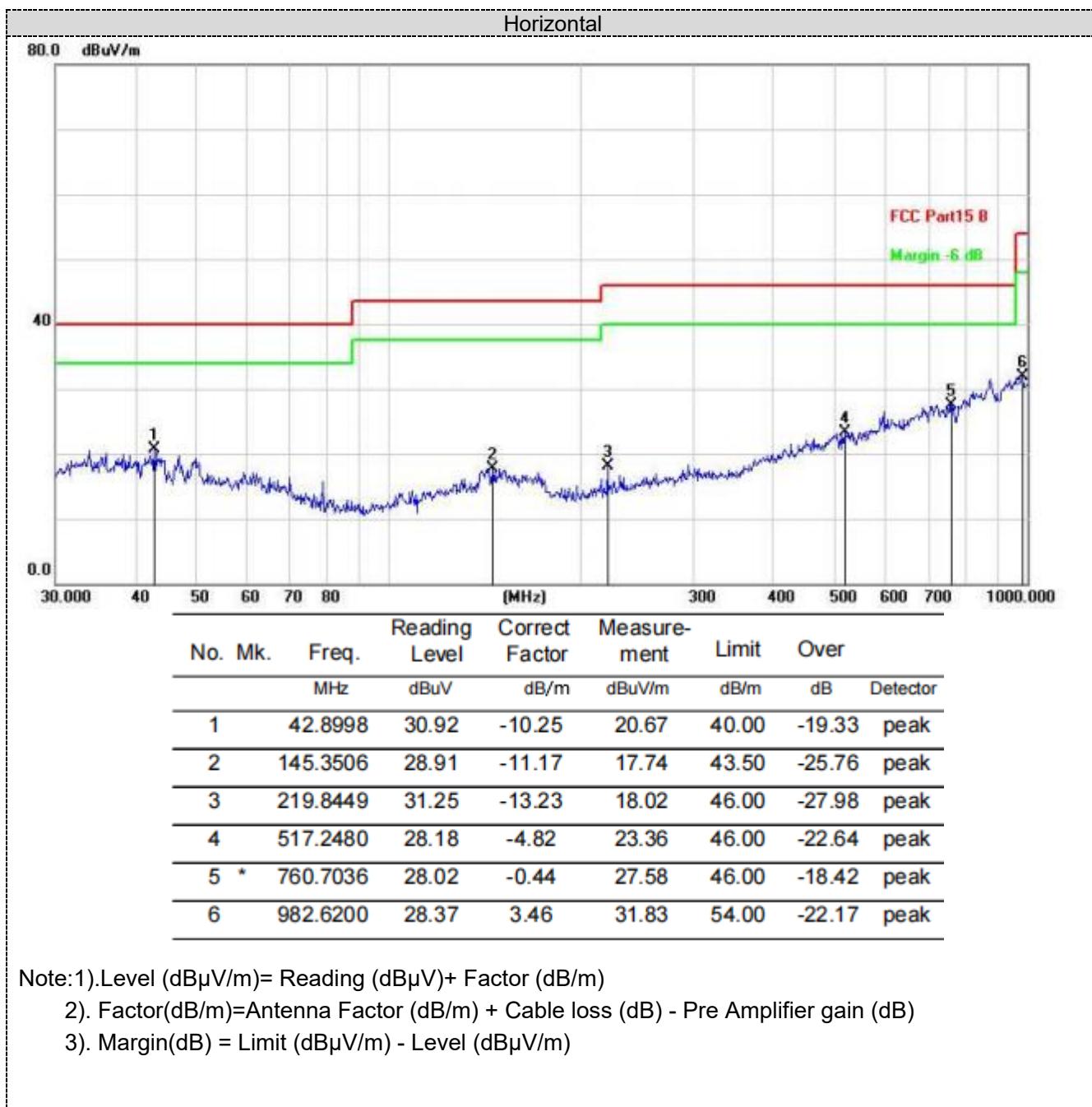
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

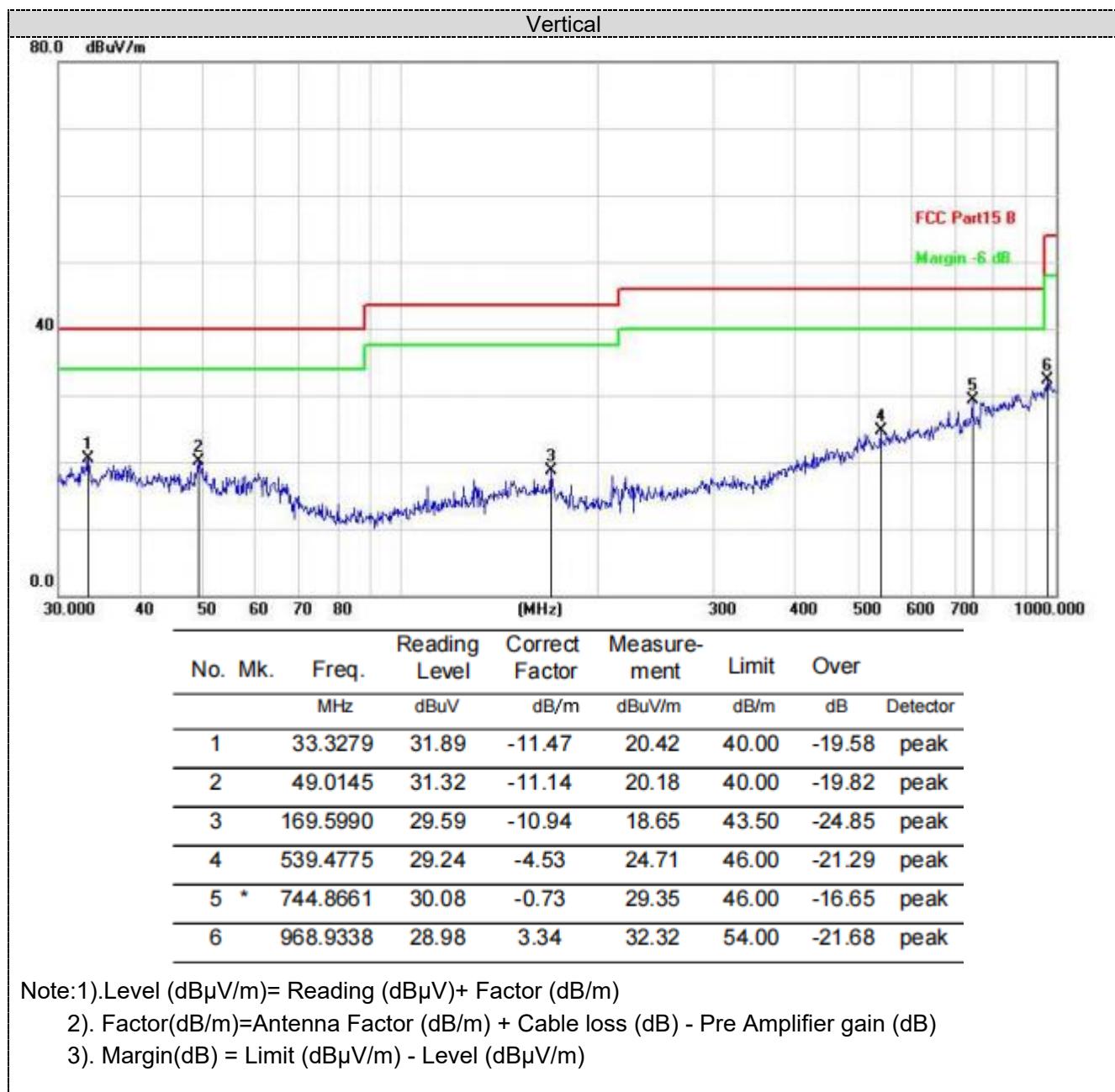
**TEST RESULTS**

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. Zigbee were tested at Low, Middle, and High channel and recorded worst mode at Zigbee.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

**For 30MHz-1GHz**





## For 1GHz to 25GHz

## OQPSK (above 1GHz)

Frequency(MHz):		2405		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4810.00	59.46	PK	74	14.54	53.39	31.3	6.52	31.75
4810.00	44.15	AV	54	9.85	38.08	31.3	6.52	31.75
7215.00	54.91	PK	74	19.09	42.03	36.2	8.17	31.49
7215.00	43.78	AV	54	10.22	30.90	36.2	8.17	31.49

Frequency(MHz):		2405		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4810.00	59.25	PK	74	14.75	53.18	31.3	6.52	31.75
4810.00	44.95	AV	54	9.05	38.88	31.3	6.52	31.75
7215.00	53.37	PK	74	20.63	40.49	36.2	8.17	31.49
7215.00	43.78	AV	54	10.22	30.90	36.2	8.17	31.49

Frequency(MHz):		2440		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	60.02	PK	74	13.98	53.86	31.2	6.61	31.65
4880.00	44.06	AV	54	9.94	37.90	31.2	6.61	31.65
7320.00	53.39	PK	74	20.61	40.44	36.2	8.23	31.48
7320.00	44.12	AV	54	9.88	31.17	36.2	8.23	31.48

Frequency(MHz):		2440		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	62.15	PK	74	11.85	55.99	31.2	6.61	31.65
4880.00	43.60	AV	54	10.40	37.44	31.2	6.61	31.65
7320.00	54.16	PK	74	19.84	41.21	36.2	8.23	31.48
7320.00	44.55	AV	54	9.45	31.60	36.2	8.23	31.48

Frequency(MHz):		2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	62.70	PK	74	11.30	56.04	31.4	6.76	31.5
4960.00	42.70	AV	54	11.30	36.04	31.4	6.76	31.5
7440.00	53.42	PK	74	20.58	40.12	36.4	8.35	31.45
7440.00	45.59	AV	54	8.41	32.29	36.4	8.35	31.45

Frequency(MHz):		2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	63.95	PK	74	10.05	57.29	31.4	6.76	31.5
4960.00	43.69	AV	54	10.31	37.03	31.4	6.76	31.5
7440.00	55.17	PK	74	18.83	41.87	36.4	8.35	31.45
7440.00	44.87	AV	54	9.13	31.57	36.4	8.35	31.45

## REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier

3. Margin value = Limit value- Emission level.  
 4. -- Mean the PK detector measured value is below average limit.  
 5. The other emission levels were very low against the limit.

**Results of Band Edges Test (Radiated)**

**OQPSK**

Frequency(MHz):		2405		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	61.16	PK	74	12.84	62.55	27.2	4.31	32.9
2390.00	45.87	AV	54	8.13	47.26	27.2	4.31	32.9
Frequency(MHz):		2405		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	58.67	PK	74	15.33	60.06	27.2	4.31	32.9
2390.00	45.74	AV	54	8.26	47.13	27.2	4.31	32.9
Frequency(MHz):		2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	57.16	PK	74	16.84	58.09	27.4	4.47	32.8
2483.50	45.65	AV	54	8.35	46.58	27.4	4.47	32.8
Frequency(MHz):		2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	54.72	PK	74	19.28	55.65	27.4	4.47	32.8
2483.50	43.90	AV	54	10.10	44.83	27.4	4.47	32.8

**REMARKS:**

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

### 4.3 Maximum Peak Output Power

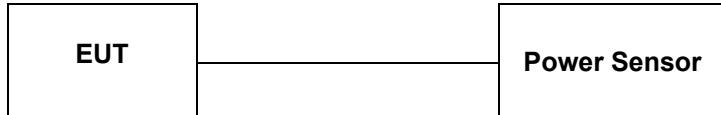
#### Limit

The Maximum Peak Output Power Measurement is 30dBm.

#### Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

#### Test Configuration



#### Test Results

Please refer to Appendix RF Test Data for ZIGBEE.

## 4.4 Power Spectral Density

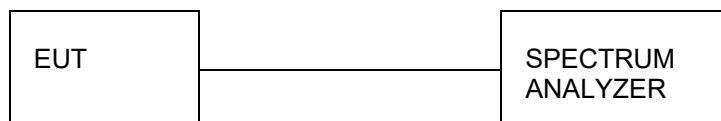
### Limit

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

### Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW  $\geq$  3 kHz.
3. Set the VBW  $\geq 3 \times$  RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

### Test Configuration



### Test Results

Please refer to Appendix RF Test Data for ZIGBEE.

## 4.5 6dB Bandwidth

### Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

### Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

### Test Configuration



### Test Results

Please refer to Appendix RF Test Data for ZIGBEE.

## 4.6 Out-of-band Emissions

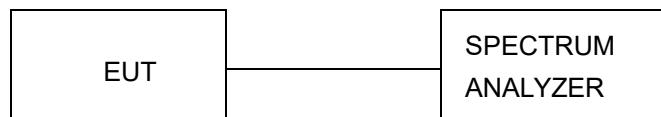
### Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

### Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

### Test Configuration



### Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

**Please refer to Appendix RF Test Data for ZIGBEE.**

**Band-edge Measurements for RF Conducted Emissions:**

**Please refer to Appendix RF Test Data for ZIGBEE.**

## 4.7 Antenna Requirement

### Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### Antenna Connected Construction

The gain of antenna was 1.08 dBi.

Remark: The antenna gain is provided by the customer, if the data provided by the customer is not accurate, Shenzhen HTT Technology Co.,Ltd. does not assume any responsibility.

## **5 Test Setup Photos of the EUT**

Reference to the **appendix I** for details

## **6 Photos of the EUT**

Reference to the **appendix II** for details.

\*\*\*\*\* End of Report \*\*\*\*\*