



Report No.: FR422010C

FCC RADIO TEST REPORT

FCC ID : 2AEM4-5170111 Equipment : Wireless Router

Brand Name : eero

Model Name : SN10001 Applicant : eero LLC

660 3rd Street, 4th Floor, San Francisco, CA, USA

Manufacturer : eero LLC

660 3rd Street, 4th Floor, San Francisco, CA, USA

Standard : FCC Part 15 Subpart C §15.247

The product was received on Apr. 29, 2024 and testing was performed from May 07, 2024 to Jun. 06, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Approved by: Louis Wu

TEL: 886-3-327-0868

Louis Wu

Sporton International Inc. Wensan Laboratory

Page Number

: 1 of 23

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

FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024 Report Template No.: BU5-FR15CBT4.0 Version 2.4 Report Version : 02

Table of Contents

Report No.: FR422010C

His	tory o	f this test report	3
Sur	nmary	of Test Result	4
1	Gene	ral Description	5
	1.1	Product Feature of Equipment Under Test	5
	1.2	Modification of EUT	5
	1.3	Testing Location	6
	1.4	Applicable Standards	6
2	Test	Configuration of Equipment Under Test	7
	2.1	Carrier Frequency Channel	7
	2.2	Test Mode	8
	2.3	Connection Diagram of Test System	9
	2.4	Support Unit used in Test Configuration and System	9
	2.5	EUT Operation Test Setup	10
	2.6	Measurement Results Explanation Example	10
3	Test	Result	.11
	3.1	6dB and 99% Bandwidth Measurement	11
	3.2	Output Power Measurement	12
	3.3	Power Spectral Density Measurement	13
	3.4	Conducted Band Edges and Spurious Emission Measurement	14
	3.5	Radiated Band Edges and Spurious Emission Measurement	15
	3.6	AC Conducted Emission Measurement	19
	3.7	Antenna Requirements	21
4	List c	of Measuring Equipment	22
5	Meas	urement Uncertainty	23
App	endix	A. Conducted Test Results	
App	endix	B. AC Conducted Emission Test Result	
App	endix	C. Radiated Spurious Emission Test Data	
App	endix	D. Duty Cycle Plots	

TEL: 886-3-327-0868 Page Number : 2 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

History of this test report

Report No.: FR422010C

Report No.	Version	Description	Issue Date
FR422010C	01	Initial issue of report	Jun. 21, 2024
FR422010C	02	Revise Equipment This report is an updated version, replacing the report issued on Jun. 21, 2024.	Aug. 21, 2024

TEL: 886-3-327-0868 Page Number : 3 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

Summary of Test Result

Report No.: FR422010C

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)(3) 15.247(b)(4)	Output Power	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	1.78 dB under the limit at 4810.00 MHz
3.6	15.207	AC Conducted Emission	Pass	12.41 dB under the limit at 0.80 MHz 12.41 dB under the limit at 0.81 MHz
3.7	15.203	Antenna Requirement	Pass	-

Conformity Assessment Condition:

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

Disclaimer:

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

Reviewed by: Yun Huang Report Producer: Mila Chen

TEL: 886-3-327-0868 Page Number : 4 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature

Report No.: FR422010C

General Specs

Bluetooth-LE, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax/be, Wi-Fi 5GHz 802.11a/n/ac/ax/be, and IEEE 802.15.4.

Antenna Type

WLAN:

<5G_Ant. 0>: Dipole Antenna

<2.4G_Ant. 0 and 5G_Ant. 1>: Dipole Antenna

<2.4G_Ant. 1 >: Dipole Antenna Bluetooth-LE: Dipole Antenna IEEE 802.15.4: Dipole Antenna

Antenna information					
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	1.81			

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.2 Modification of EUT

No modifications made to the EUT during the testing.

TEL: 886-3-327-0868 Page Number : 5 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

1.3 Testing Location

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

Report No.: FR422010C

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

Test Site	Sporton International Inc. Wensan Laboratory
	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,
Took Cita Lagation	Taoyuan City 333010, Taiwan (R.O.C.)
Test Site Location	TEL: +886-3-327-0868
	FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
rest site NO.	TH05-HY, 03CH23-HY

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

FCC designation No.: TW1190 and TW3786

1.4 Applicable Standards

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

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

Remark:

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

TEL: 886-3-327-0868 Page Number : 6 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	11	2405	19	2445
	12	2410	20	2450
	13	2415	21	2455
2400-2483.5 MHz	14	2420	22	2460
2400-2463.5 NITZ	15	2425	23	2465
	16	2430	24	2470
	17	2435	25	2475
	18	2440	26	2480

Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : 7 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Report No.: FR422010C

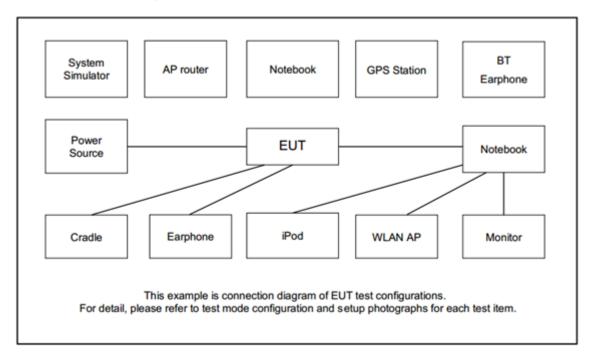
b. AC power line Conducted Emission was tested under maximum output power.

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

	Summary table of Test Cases					
Test Item	Data Rate / Modulation					
	Bluetooth – LE / GFSK					
Conducted	Mode 1: ZigBee Tx CH11_2405 MHz					
	Mode 2: ZigBee Tx CH17_2435 MHz					
Test Cases	Mode 3: ZigBee Tx CH25_2475 MHz					
	Mode 4: ZigBee Tx CH26_2480 MHz					
	Mode 1: ZigBee Tx CH11_2405 MHz					
Radiated	Mode 2: ZigBee Tx CH17_2435 MHz					
Test Cases	Mode 3: ZigBee Tx CH25_2475 MHz					
	Mode 1: ZigBee Tx CH26_2480 MHz					
AC Conducted	Made 4. ZigBoo Link + DoE Dower Injector (CE40044)					
Emission	Mode 1: ZigBee Link + PoE Power Injector (C510011)					
	Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.					

TEL: 886-3-327-0868 Page Number : 8 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

2.3 Connection Diagram of Test System



Report No.: FR422010C

2.4 Support Unit used in Test Configuration and System

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord	
1.	Notebook	Lenovo	IdeaPad Gaming 3 15IHU6	PD9AX201NG	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m	
2.	Notebook	DELL	Latitude 3420	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m	
3.	Button	SmartThings	IM6001-BTP01	2AF4S-IM6001-BTP01	N/A	N/A	
4.	Mobile Phone	Apple	A1586	BCG-E2816A	N/A	N/A	
5.	PoE INJECTOR	eero	POE-PTTI-3055NDN	FCC DOC	N/A	N/A	

TEL: 886-3-327-0868 Page Number : 9 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

2.5 EUT Operation Test Setup

The RF test items, utility "Radio Control Console version 4.0.0.0" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

Report No.: FR422010C

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

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

Offset(dB) = RF cable loss(dB) + attenuator factor(dB). = 4.2 + 10 = 14.2 (dB)

TEL: 886-3-327-0868 Page Number : 10 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

3.1.2 Measuring Instruments

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

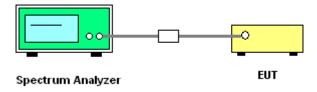
3.1.3 Test Procedures

- 1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.

Report No.: FR422010C

- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.
- For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set
 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
- 6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

TEL: 886-3-327-0868 Page Number : 11 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Report No.: FR422010C

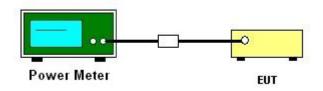
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

- 1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
- 2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
- 3. The path loss is compensated to the results for each measurement.
- 4. Set the maximum power setting and enable the EUT to transmit continuously.
- 5. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

TEL: 886-3-327-0868 Page Number : 12 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

Report No.: FR422010C

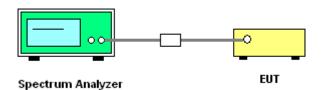
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

- 1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz.
 Video bandwidth (VBW) = 10 kHz. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6 dB BW)
- 5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- 6. Measure and record the results in the test report.
- 7. The Measured power density (dBm)/ 100 kHz is a reference level and is used as 20 dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

TEL: 886-3-327-0868 Page Number : 13 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 30 dB down from the highest emission level within the authorized band.

Report No.: FR422010C

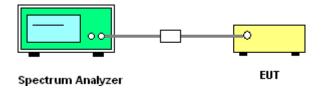
3.4.2 Measuring Instruments

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

3.4.3 Test Procedure

- 1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- 4. Set RBW = 100 kHz, VBW = 300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges Plots

Please refer to Appendix A.

3.4.6 Test Result of Conducted Spurious Emission Plots

Please refer to Appendix A.

TEL: 886-3-327-0868 Page Number : 14 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Report No.: FR422010C

Frequency	Field Strength	Measurement Distance		
(MHz)	(microvolts/meter)	(meters)		
0.009 - 0.490	2400/F(kHz)	300		
0.490 – 1.705	24000/F(kHz)	30		
1.705 – 30.0	30	30		
30 – 88	100	3		
88 – 216	150	3		
216 - 960	200	3		
Above 960	500	3		

3.5.2 Measuring Instruments

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

TEL: 886-3-327-0868 Page Number : 15 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.5.3 Test Procedures

- 1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
- 2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.

Report No.: FR422010C

- The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
- 4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
- 7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
- 8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW = 3 MHz for f ≥ 1 GHz for peak measurement.

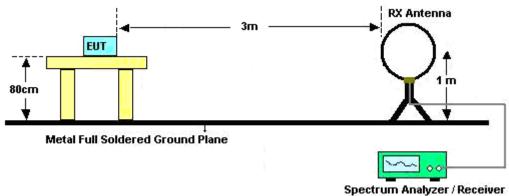
For average measurement:

- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

TEL: 886-3-327-0868 Page Number : 16 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.5.4 Test Setup

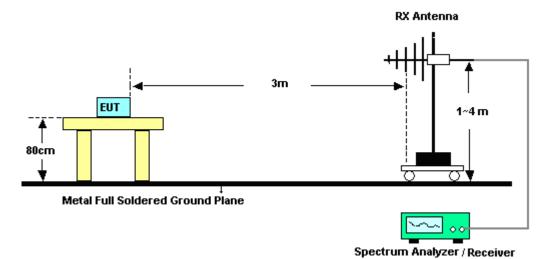
For radiated test below 30MHz



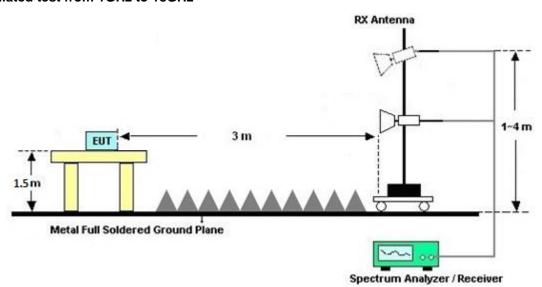
Report No.: FR422010C

Spectrum Analyzer / Receive

For radiated test from 30MHz to 1GHz

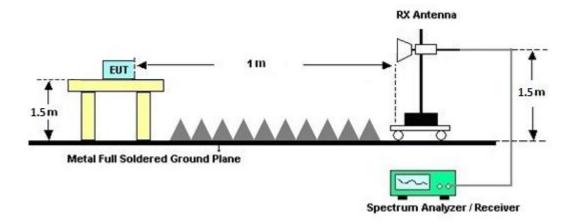


For radiated test from 1GHz to 18GHz



TEL: 886-3-327-0868 Page Number : 17 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

For radiated test above 18GHz



Report No.: FR422010C

3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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

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

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Duty Cycle

Please refer to Appendix D.

3.5.8 Test Result of Radiated Spurious Emission (30 MHz ~ 10th Harmonic)

Please refer to Appendix C.

TEL: 886-3-327-0868 Page Number : 18 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

Report No.: FR422010C

Eroquonov of omission (MHz)	Conducted limit (dBμV)				
Frequency of emission (MHz)	Quasi-peak	Average			
0.15-0.5	66 to 56*	56 to 46*			
0.5-5	56	46			
5-30	60	50			

^{*}Decreases with the logarithm of the frequency.

3.6.2 Measuring Instruments

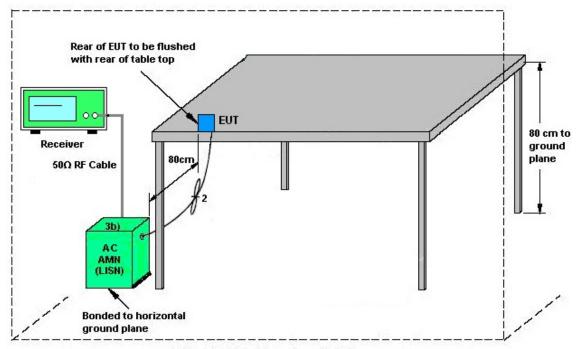
Please refer to the measuring equipment list in this test report.

3.6.3 Test Procedures

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

TEL: 886-3-327-0868 Page Number : 19 of 23
FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

3.6.4 Test Setup



Report No.: FR422010C

AMN = Artificial mains network (LISN)

AE = Associated equipment

EUT = Equipment under test

ISN = Impedance stabilization network

3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

TEL: 886-3-327-0868 Page Number : 20 of 23 FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024 : 02

3.7 Antenna Requirements

3.7.1 Standard Applicable

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

Report No.: FR422010C

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

TEL: 886-3-327-0868 Page Number : 21 of 23 FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	May 09, 2024	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 06, 2023	May 09, 2024	Dec. 05, 2024	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Oct. 26, 2023	May 09, 2024	Oct. 25, 2024	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 22, 2023	May 09, 2024	Nov. 21, 2024	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	May 09, 2024	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBE CK	VTSD 9561-F N	00691	N/A	Jul. 28, 2023	May 09, 2024	Jul. 27, 2024	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 28, 2023	May 09, 2024	Dec. 27, 2024	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 07, 2023	May 31, 2024~ Jun. 05, 2024	Nov. 06, 2024	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	17I00015SNO 35 (NO:109)	10MHz~6GHz	Jan. 15, 2024	May 31, 2024~ Jun. 05, 2024	Jan. 14, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 23, 2023	May 31, 2024~ Jun. 05, 2024	Aug. 22, 2024	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	May 07, 2024~ Jun. 06, 2024	Sep. 11, 2024	Radiation (03CH23-HY)
Bilog Antenna with 6dB pad	TESEQ & WOKEN	CBL 6111D & 00802N1D-06	62028 & 003	N/A	Oct. 15, 2023	May 07, 2024~ Jun. 06, 2024	Oct. 14, 2024	Radiation (03CH23-HY)
Amplifier	SONOMA	310N	421582	N/A	Jul. 15, 2023	May 07, 2024~ Jun. 06, 2024	Jul. 14, 2024	Radiation (03CH23-HY)
Double Ridged Guide Horn Antenna	RFSPIN	DRH18-E	LE2C05A18EN	1GHz~18GHz	Jul. 12, 2023	May 07, 2024~ Jun. 06, 2024	Jul. 11, 2024	Radiation (03CH23-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA9170	1223	18GHz-40GHz	Jul. 10, 2023	May 07, 2024~ Jun. 06, 2024	Jul. 09, 2024	Radiation (03CH23-HY)
Amplifier	EMEC	EM01G18GA	060878	N/A	Sep. 28, 2023	May 07, 2024~ Jun. 06, 2024	Sep. 27, 2024	Radiation (03CH23-HY)
Preamplifier	EMEC	EM18G40G	060871	18-40GHz	Sep. 06, 2023	May 07, 2024~ Jun. 06, 2024	Sep. 05, 2024	Radiation (03CH23-HY)
Signal Analyzer	Keysight	N9010B	MY62170337	N/A	Aug. 17, 2023	May 07, 2024~ Jun. 06, 2024	Aug. 16, 2024	Radiation (03CH23-HY)
Hygrometer	TECPEL	DTM-303B	TP211542	N/A	Oct. 30, 2023	May 07, 2024~ Jun. 06, 2024	Oct. 29, 2024	Radiation (03CH23-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	May 07, 2024~ Jun. 06, 2024	N/A	Radiation (03CH23-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	May 07, 2024~ Jun. 06, 2024	N/A	Radiation (03CH23-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	May 07, 2024~ Jun. 06, 2024	N/A	Radiation (03CH23-HY)
Software	Audix	E3 6.09824_20191 22	RK-002348	N/A	N/A	May 07, 2024~ Jun. 06, 2024	N/A	Radiation (03CH23-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9kHz~30MHz	Mar. 06, 2024	May 07, 2024~ Jun. 06, 2024	Mar. 05, 2025	Radiation (03CH23-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804395/2	N/A	Nov. 27, 2023	May 07, 2024~ Jun. 06, 2024	Nov. 26, 2024	Radiation (03CH23-HY)
RF Cable	EMC	EMC101Y	231115/231119 /231122	N/A	Nov. 27, 2023	May 07, 2024~ Jun. 06, 2024	Nov. 26, 2024	Radiation (03CH23-HY)

Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : 22 of 23 FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence	3.5 dB
of 95% (U = 2Uc(y))	3.5 dB

Report No.: FR422010C

<u>Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)</u>

Measuring Uncertainty for a Level of Confidence	6.5 dB
of 95% (U = 2Uc(y))	0.5 UB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence	4.6 dB
of 95% (U = 2Uc(y))	4.0 UB

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	
of 95% (U = 2Uc(y))	4.6 dB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence	5.3 dB
of 95% (U = 2Uc(y))	J.3 UB

TEL: 886-3-327-0868 Page Number : 23 of 23 FAX: 886-3-327-0855 Issue Date : Aug. 21, 2024

Report Number : FR422010C

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Eason Huang	Temperature:	21~25	°C
Test Date:	2024/05/31~2024/06/05	Relative Humidity:	51~54	%

TEST RESULTS DATA 6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
ZigBee	250K	1	11	2405	2.218	1.558	0.50	Pass
ZigBee	250K	1	17	2435	2.213	1.560	0.50	Pass
ZigBee	250K	1	25	2475	2.208	1.562	0.50	Pass
ZigBee	250K	1	26	2480	2.218	1.561	0.50	Pass

TEST RESULTS DATA Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
ZigBee	250K	1	11	2405	19.40	30.00	1.81	21.21	36.00	Pass
ZigBee	250K	1	17	2435	20.40	30.00	1.81	22.21	36.00	Pass
ZigBee	250K	1	25	2475	20.10	30.00	1.81	21.91	36.00	Pass
ZigBee	250K	1	26	2480	3.80	30.00	1.81	5.61	36.00	Pass

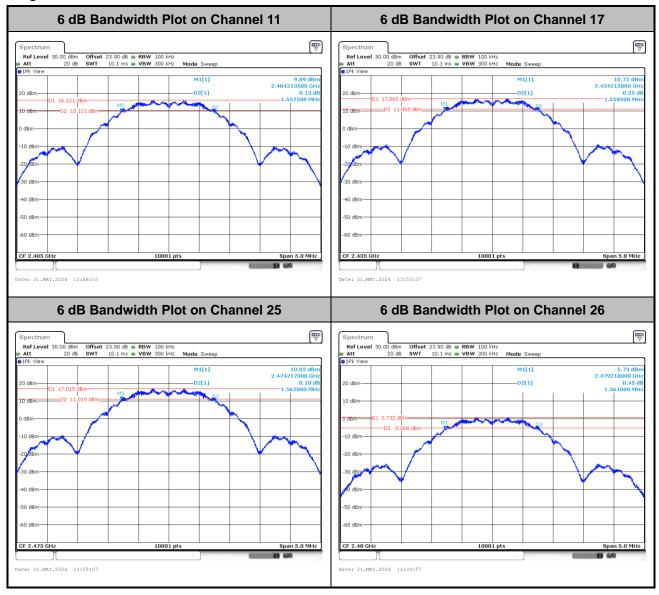
TEST RESULTS DATA Peak Power Density

Mod.	Data Rate	N⊤x	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
ZigBee	250K	1	11	2405	16.23	4.63	1.81	8.00	Pass
ZigBee	250K	1	17	2435	17.09	5.67	1.81	8.00	Pass
ZigBee	250K	1	25	2475	16.97	5.38	1.81	8.00	Pass
ZigBee	250K	1	26	2480	0.72	-10.58	1.81	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

6dB Bandwidth

<ZigBee>

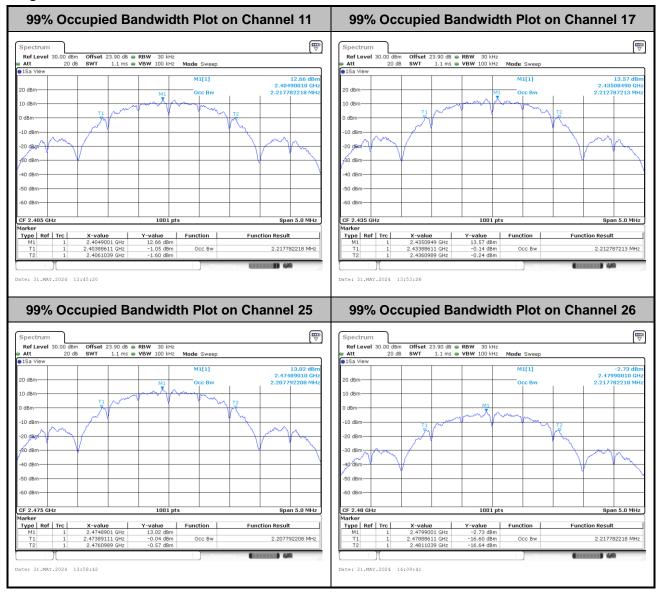


Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-1 of 7

99% Occupied Bandwidth

<ZigBee>

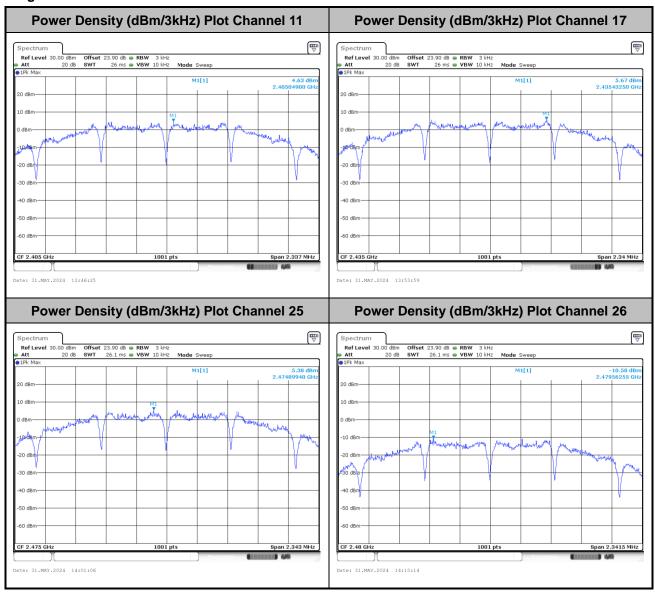


Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-2 of 7

Power Spectral Density (dBm/3kHz)

<ZigBee>

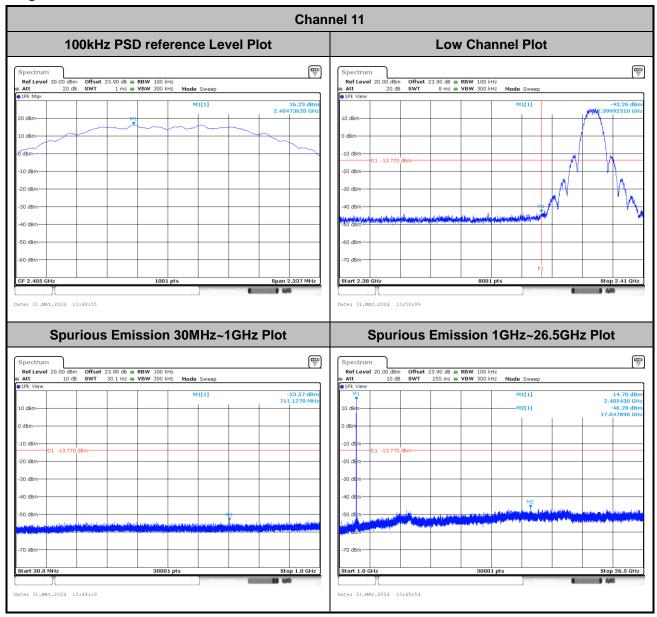


Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-3 of 7

Band Edge and Conducted Spurious Emission

<ZigBee>



Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-4 of 7

Channel 17 100kHz PSD reference Level Plot **Mid Channel Plot**
 Ref Level
 30.00 dBm
 Offset
 23.90 dB
 RBW
 100 kHz

 Att
 20 dB
 SWT
 1 ms
 VBW
 300 kHz
 Mode
 Sweep
 Spurious Emission 30MHz~1GHz Plot Spurious Emission 1GHz~26.5GHz Plot M2[1]

Date: 31.MAY.2024 13:56:55

Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-5 of 7

FAX: 886-3-327-0855

Date: 31.MAY.2024 13:56:14

Channel 25 100kHz PSD reference Level Plot **High Channel Plot** Ref Level 20.00 dBm Att 20 dB Ref Level 30.00 dBm Att 20 dB
 Offset
 23.90 dB
 ■ RBW
 100 kHz

 SWT
 1 ms
 ■ VBW
 300 kHz
 Mode
 Sweep
 Offset 23.90 dB ● RBW 100 kHz SWT 8 ms ● VBW 300 kHz Mode Sweep Date: 31.MAY.2024 14:02:55 Spurious Emission 30MHz~1GHz Plot Spurious Emission 1GHz~26.5GHz Plot M2[1]

Date: 31.MAY.2024 14:02:38

Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-6 of 7

FAX: 886-3-327-0855

Date: 31.MAY.2024 14:02:08

Channel 26 100kHz PSD reference Level Plot **Low Channel Plot** Offset 23.90 dB ● RBW 100 kHz SWT 1 ms ● VBW 300 kHz Mode Sweep Ref Level 20.00 dBm Att 20 dB Ref Level 30.00 dBm Att 20 dB Offset 23.90 dB ● RBW 100 kHz SWT 8 ms ● VBW 300 kHz Mode Sweep M1[1] -10 dBm Date: 31.MAY.2024 14:12:03 Spurious Emission 30MHz~1GHz Plot Spurious Emission 1GHz~26.5GHz Plot M2[1] -46.09 dB 785650 GI

Date: 31.MAY.2024 14:11:41

Report No.: FR422010C

TEL: 886-3-327-0868 Page Number : A2-7 of 7

FAX: 886-3-327-0855

Date: 31.MAY.2024 14:11:15

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Calvin Wong	Tem	nperature :	23~26°C
	Calvin Wang	Rela	ative Humidity :	45~55%

Report No. : FR422010C

TEL: 886-3-327-0868 Page Number : B1 of B3

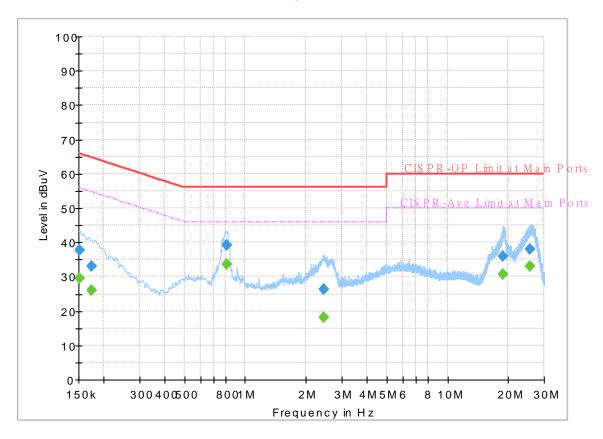
EUT Information

Report NO: 422010

Test Voltage: 120Vac/60Hz

Phase: Line

FullSpectrum



Final Result

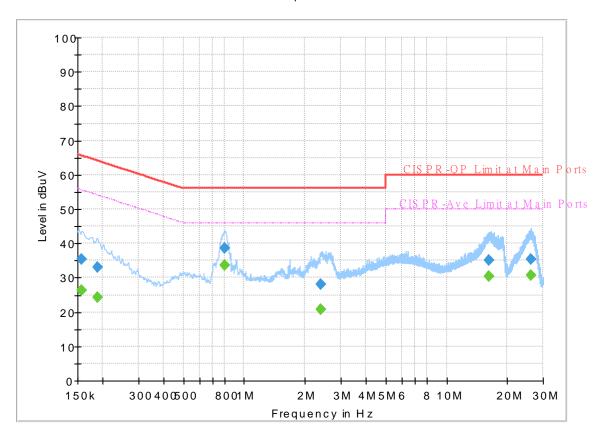
Frequency	QuasiPeak	CAverage	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBuV)	(dBuV)	(dBuV)	(dB)			(dB)
0.152250		29.63	55.88	26.25	L1	OFF	19.8
0.152250	37.61		65.88	28.27	L1	OFF	19.8
0.174750		26.16	54.73	28.57	L1	OFF	19.8
0.174750	33.08	-	64.73	31.65	L1	OFF	19.8
0.807000		33.59	46.00	12.41	L1	OFF	19.8
0.807000	39.17		56.00	16.83	L1	OFF	19.8
2.433750		18.20	46.00	27.80	L1	OFF	19.8
2.433750	26.35	-	56.00	29.65	L1	OFF	19.8
18.838500		30.66	50.00	19.34	L1	OFF	19.9
18.838500	35.95	-	60.00	24.05	L1	OFF	19.9
25.687500		32.98	50.00	17.02	L1	OFF	20.0
25.687500	37.91		60.00	22.09	L1	OFF	20.0

EUT Information

Report NO: 422010

Test Voltage : 120Vac/60Hz Phase : Neutral

FullSpectrum



Final_Result

Frequency	QuasiPeak	CAverage	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBuV)	(dBuV)	(dBuV)	(dB)			(dB)
0.156750		26.21	55.63	29.42	N	OFF	19.8
0.156750	35.51		65.63	30.12	N	OFF	19.8
0.188250		24.38	54.11	29.73	N	OFF	19.8
0.188250	32.97	-	64.11	31.14	N	OFF	19.8
0.798000		33.59	46.00	12.41	N	OFF	19.8
0.798000	38.67		56.00	17.33	N	OFF	19.8
2.393250		20.72	46.00	25.28	N	OFF	19.8
2.393250	28.09		56.00	27.91	N	OFF	19.8
16.203750		30.42	50.00	19.58	N	OFF	20.0
16.203750	35.09	-	60.00	24.91	N	OFF	20.0
26.308500		30.60	50.00	19.40	N	OFF	20.2
26.308500	35.35		60.00	24.65	N	OFF	20.2

Appendix C. Radiated Spurious Emission Test Data

Test Engineer :	Leo Li and Lucifer Jiang	Temperature :	21.7~22.5°C	
		Relative Humidity :	51~57%	

Report No. :FR422010C

C1. Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 8	2400-2483.5	IoT Ant 0	ZigBee	11	2405	250kbps	-	-
Mode 9	2400-2483.5	IoT Ant 0	ZigBee	ee 17 2435		250kbps	-	-
Mode 10	2400-2483.5	IoT Ant 0	ZigBee	25	2475	250kbps	-	-
Mode 11	2400-2483.5	IoT Ant 0	ZigBee	26	2480	250kbps	-	-
Mode 12	2400-2483.5	IoT Ant 0	ZigBee	11	2405	250kbps	-	LF
	2400-2483.5	IoT Ant 0	ZigBee	11	2405	250kbps	-	SHF

TEL: 886-3-327-0868 Page Number : C1 of C23

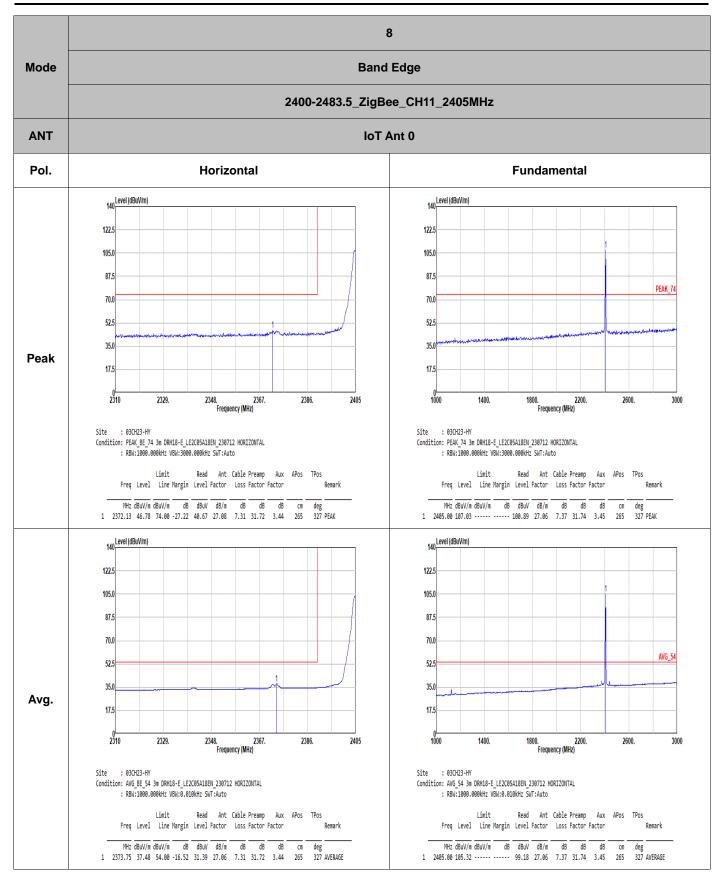


CC RADIO TEST REPORT Report No. :FR422010C

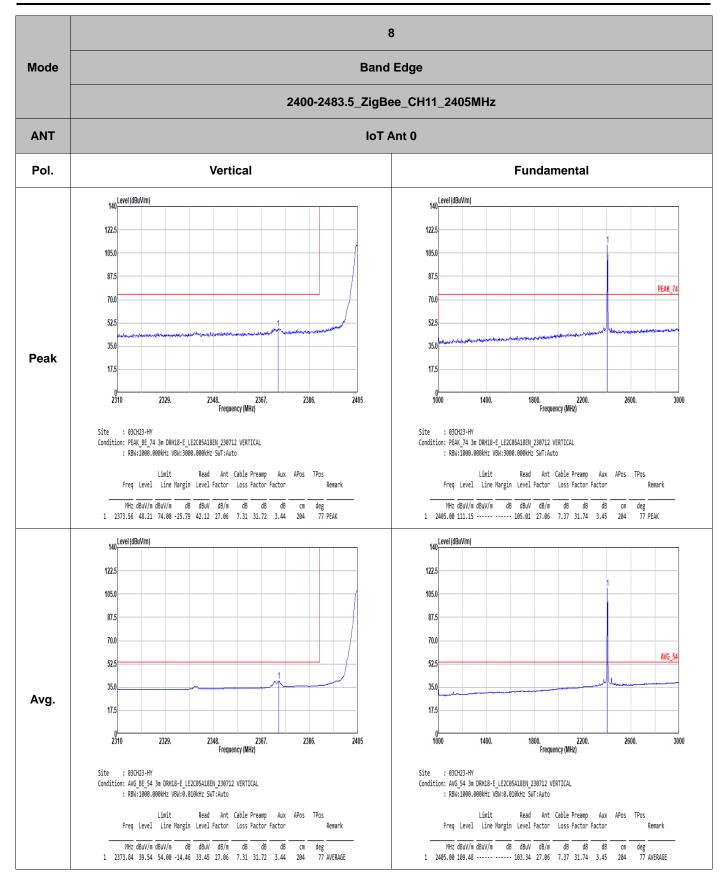
C2. Summary of each worse mode

Mode	Modulation	Ch.	Freq.	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	RU	Remark
8	ZigBee	11	2373.84	39.54	54.00	-14.46	V	Avg.	Pass	-	Band Edge
	ZigBee	11	4810.00	52.22	54.00	-1.78	٧	Avg.	Pass	-	Harmonic
9	ZigBee	17	2498.90	35.69	54.00	-18.31	٧	Avg.	Pass	-	Band Edge
	ZigBee	17	4870.00	50.46	54.00	-3.54	Н	Avg.	Pass	-	Harmonic
10	ZigBee	25	2483.53	45.06	54.00	-8.94	٧	Avg.	Pass	-	Band Edge
	ZigBee	25	12375.00	49.30	54.00	-4.70	٧	Avg.	Pass	-	Harmonic
11	ZigBee	26	2483.52	52.01	54.00	-1.99	٧	Avg.	Pass	-	Band Edge
	ZigBee	26	7440.00	40.07	54.00	-13.93	Н	Avg.	Pass	-	Harmonic
12	LF	11	450.98	39.63	46.00	-6.37	٧	Peak	Pass	-	LF
	SHF	11	24754.00	42.09	74.00	-31.91	V	Peak	Pass	-	SHF

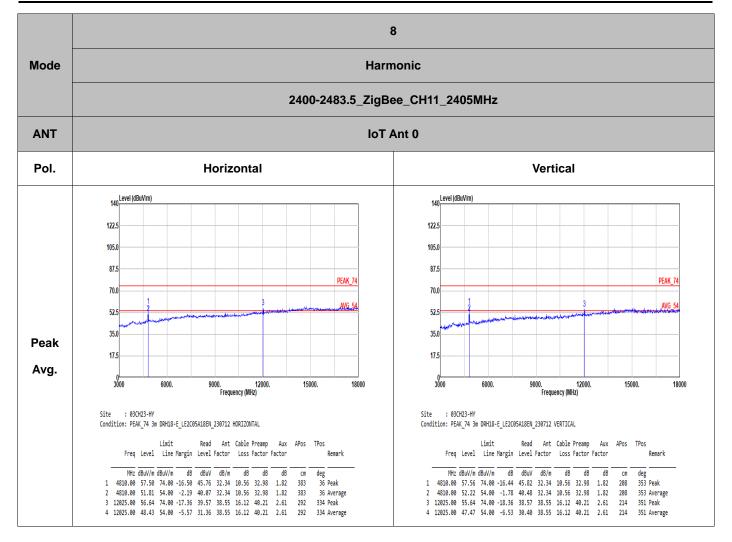
TEL: 886-3-327-0868 Page Number : C2 of C23



TEL: 886-3-327-0868 Page Number : C3 of C23

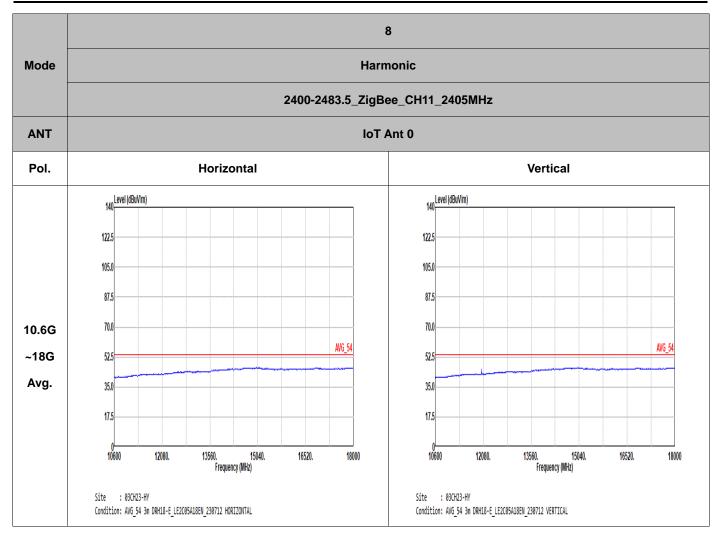


TEL: 886-3-327-0868 Page Number : C4 of C23

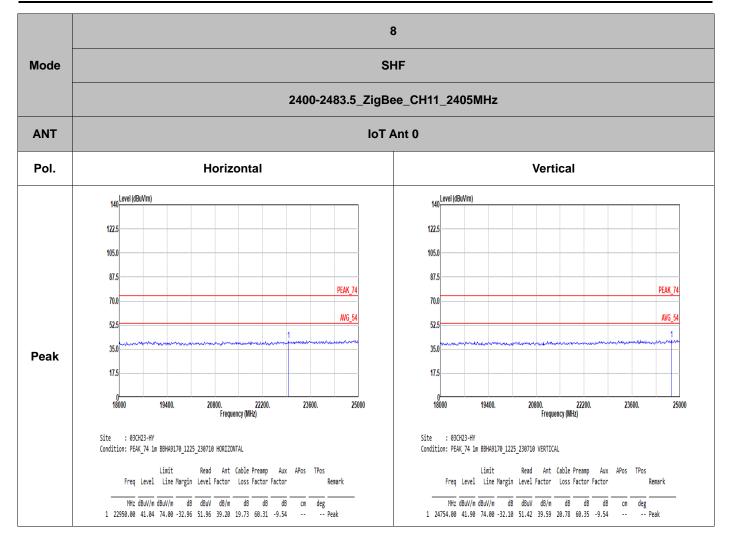


TEL: 886-3-327-0868 Page Number : C5 of C23

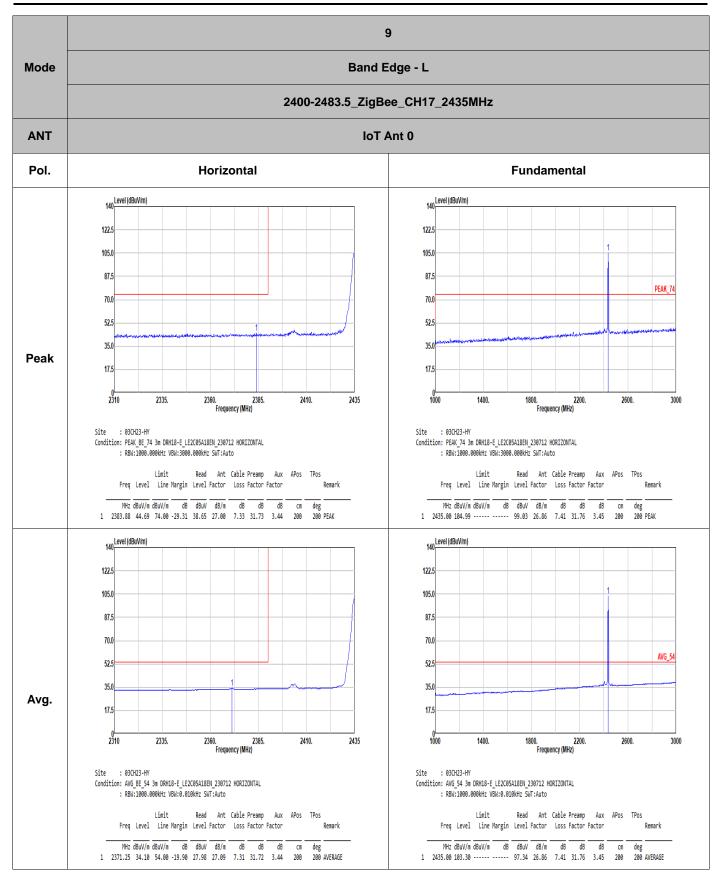
EPORT Report No. :FR422010C



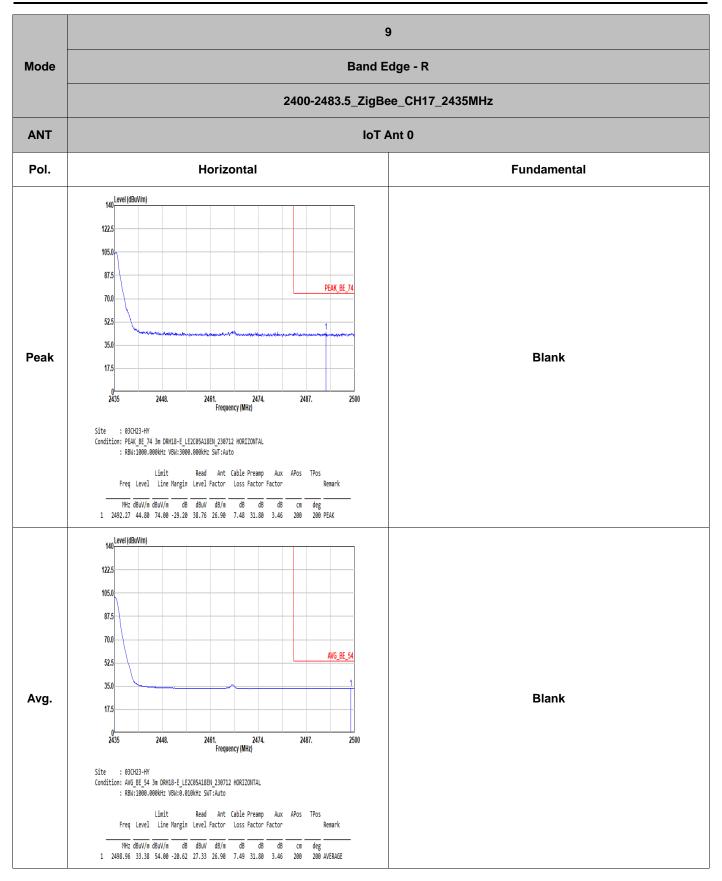
TEL: 886-3-327-0868 Page Number : C6 of C23



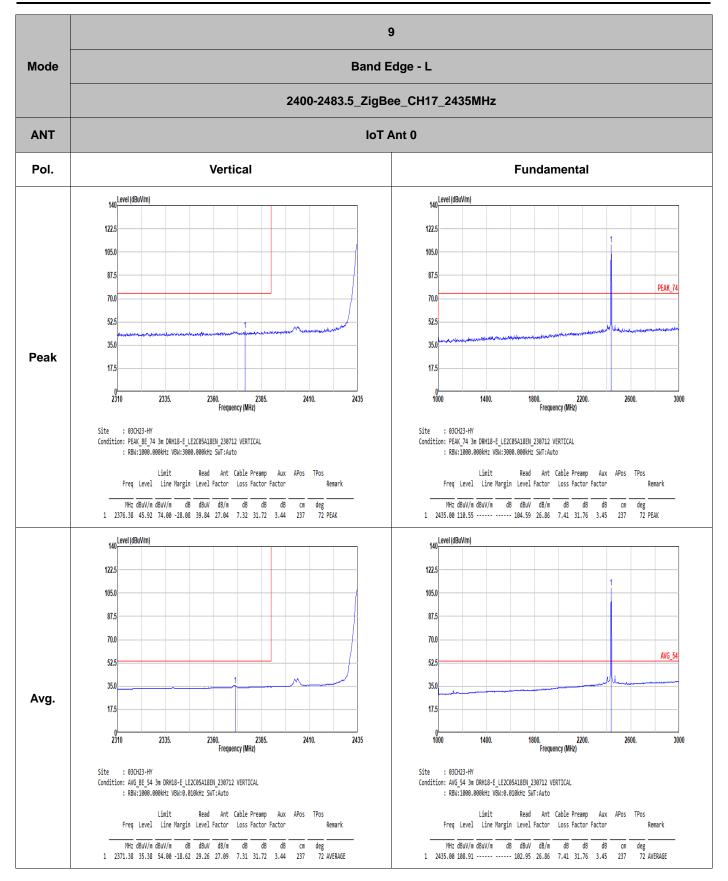
TEL: 886-3-327-0868 Page Number : C7 of C23



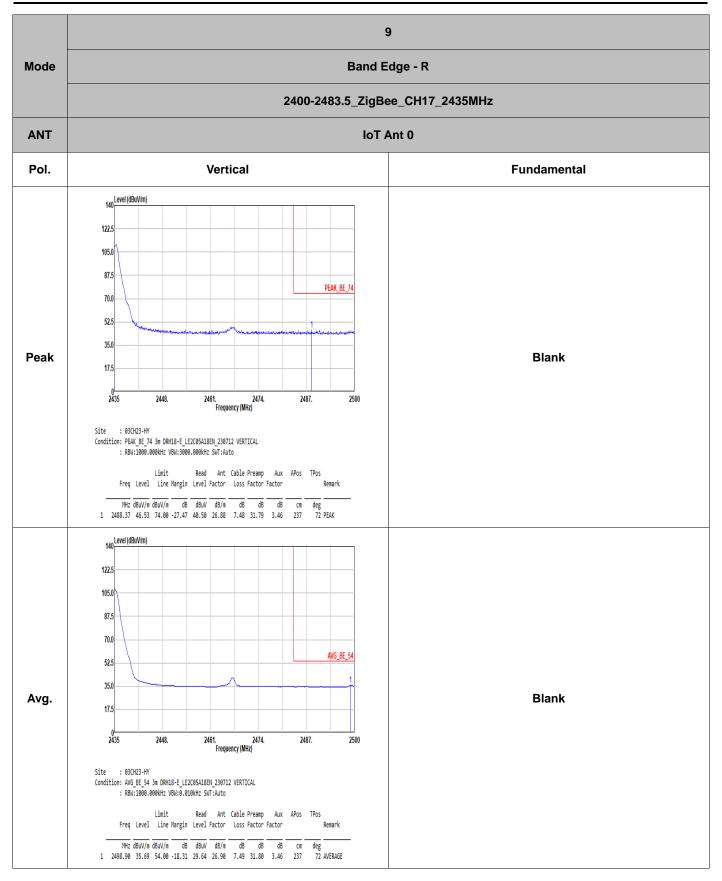
TEL: 886-3-327-0868 Page Number : C8 of C23



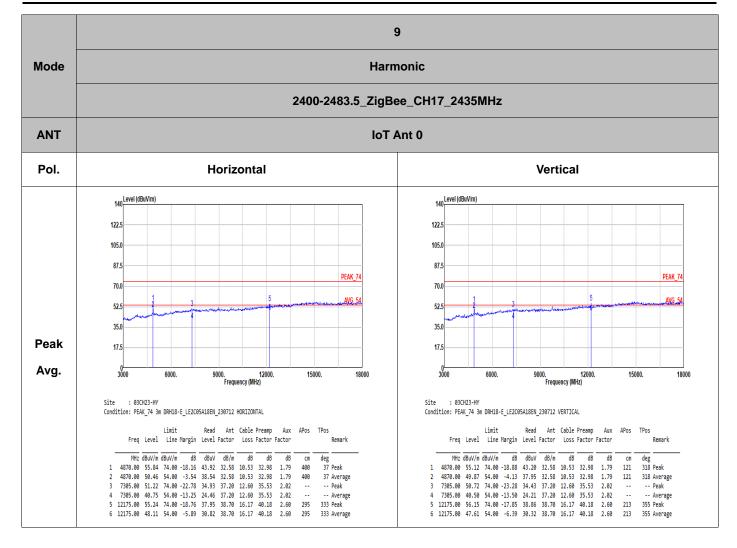
TEL: 886-3-327-0868 Page Number : C9 of C23



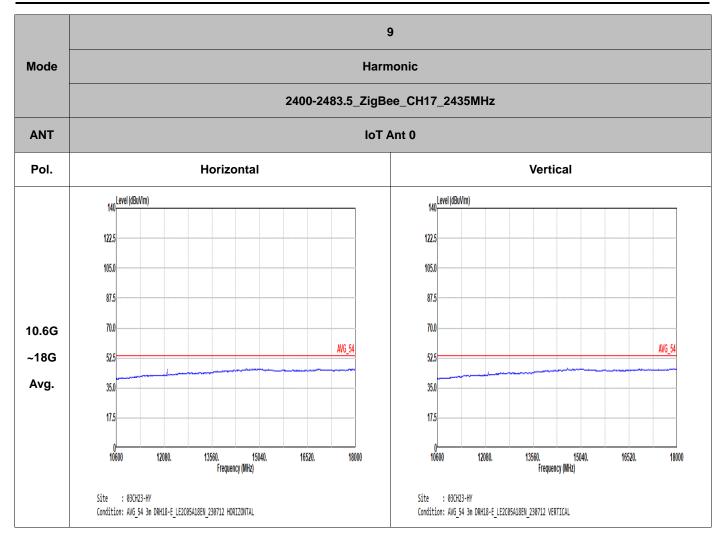
TEL: 886-3-327-0868 Page Number : C10 of C23



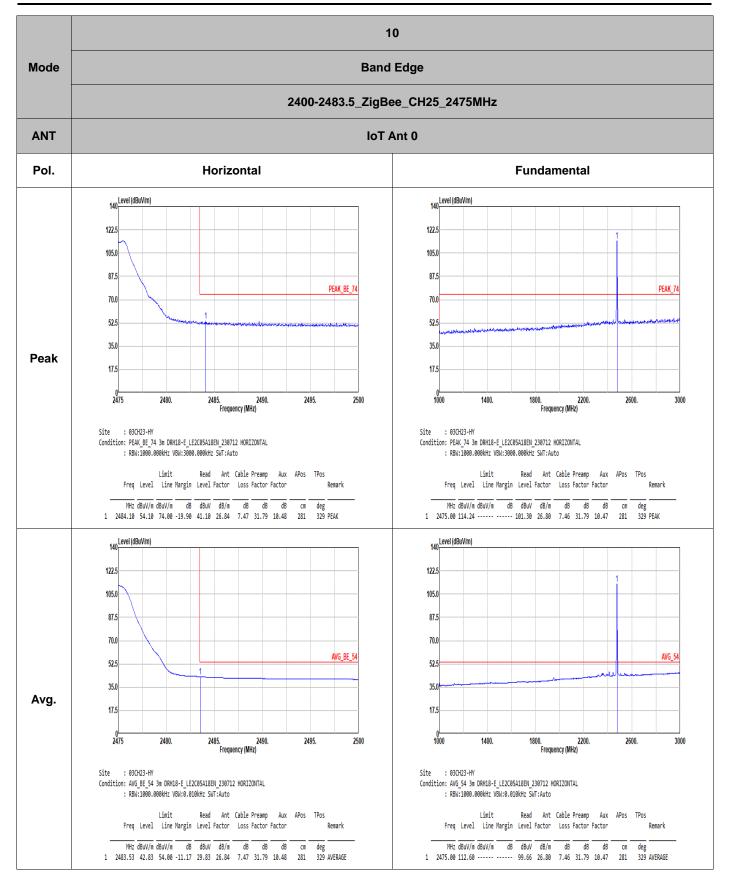
TEL: 886-3-327-0868 Page Number : C11 of C23



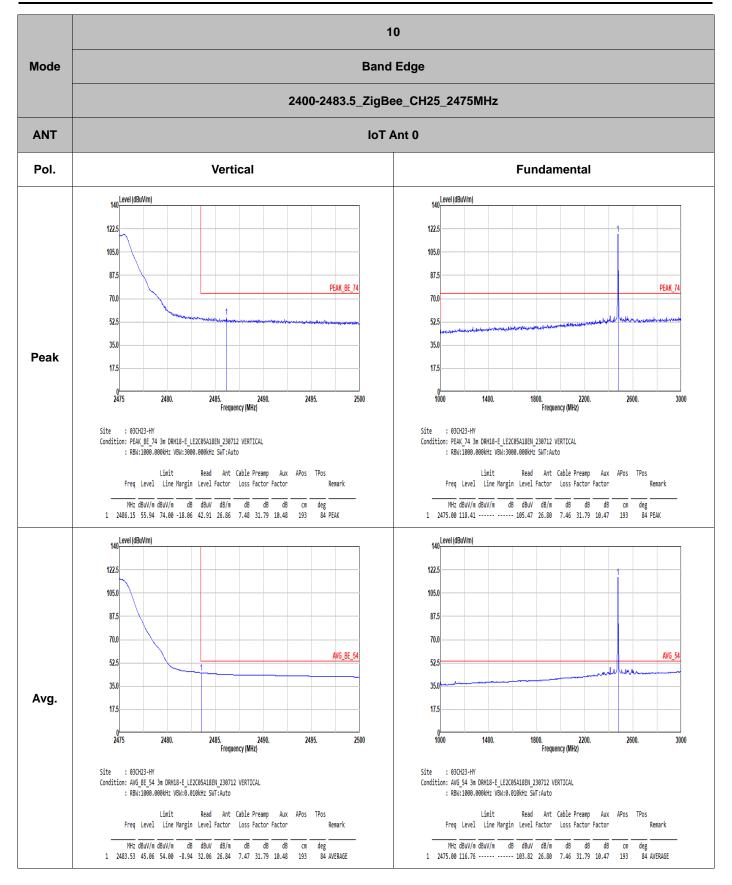
TEL: 886-3-327-0868 Page Number : C12 of C23



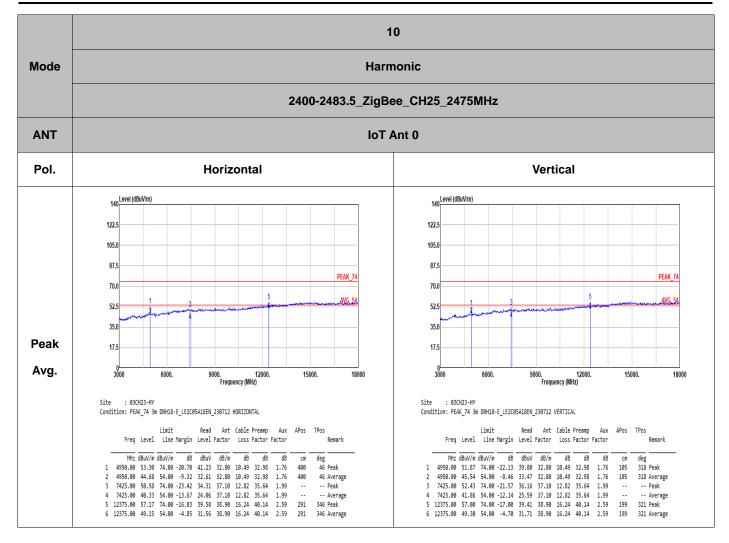
TEL: 886-3-327-0868 Page Number : C13 of C23



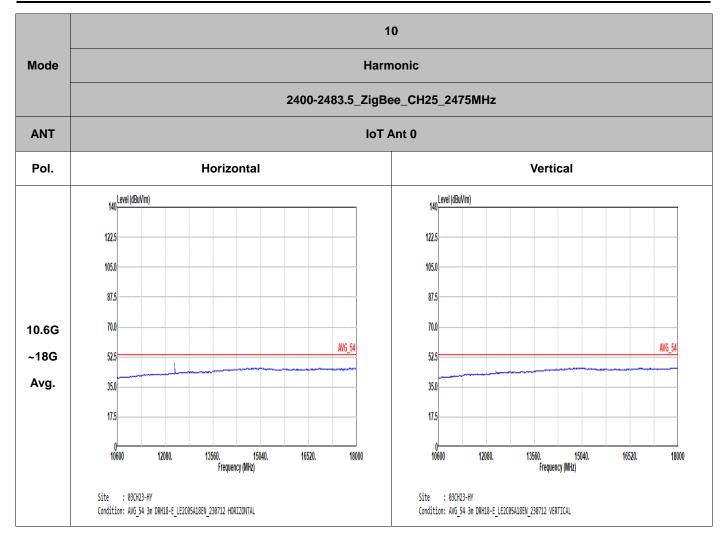
TEL: 886-3-327-0868 Page Number : C14 of C23



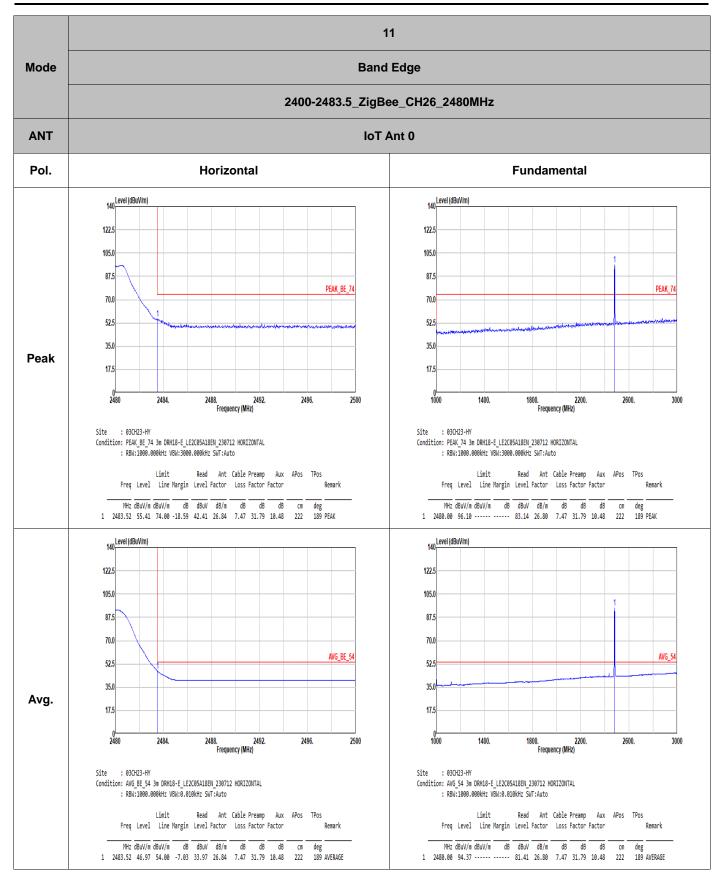
TEL: 886-3-327-0868 Page Number : C15 of C23



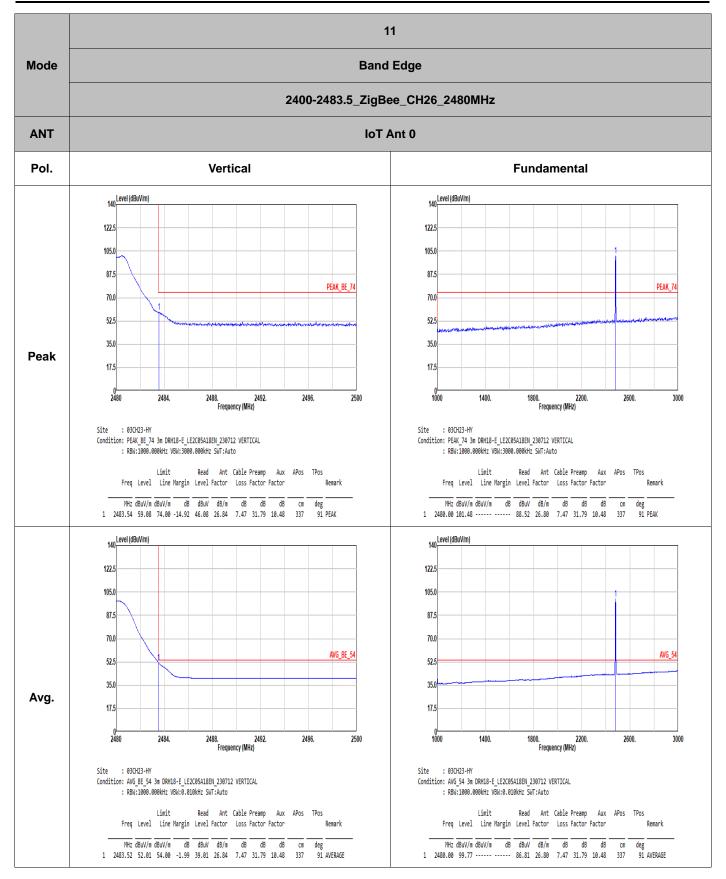
TEL: 886-3-327-0868 Page Number : C16 of C23



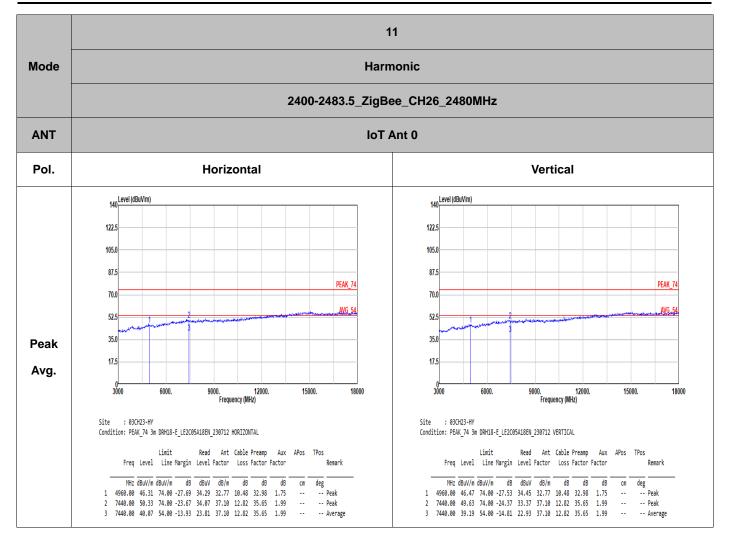
TEL: 886-3-327-0868 Page Number : C17 of C23



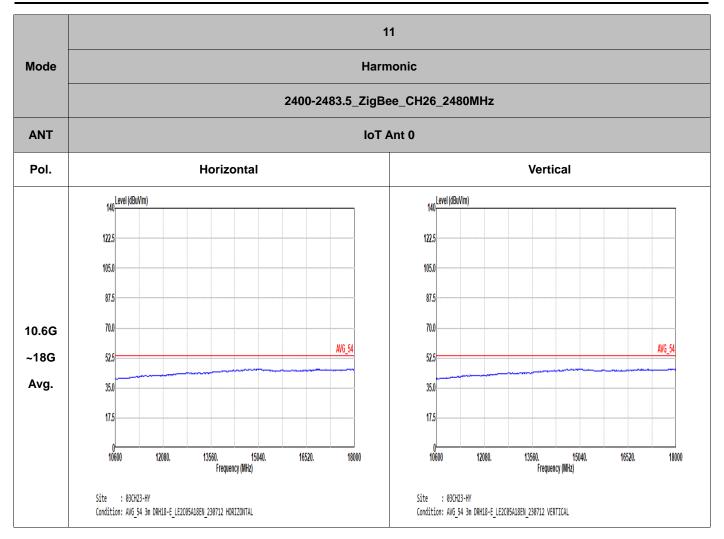
TEL: 886-3-327-0868 Page Number : C18 of C23



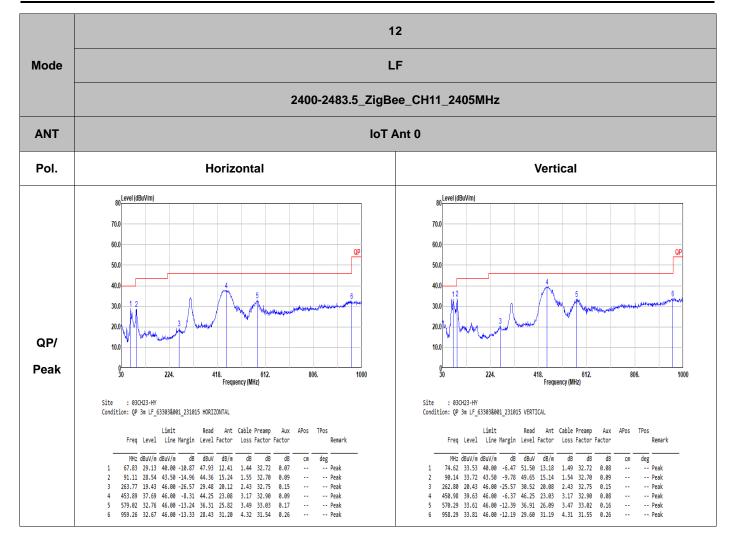
TEL: 886-3-327-0868 Page Number : C19 of C23



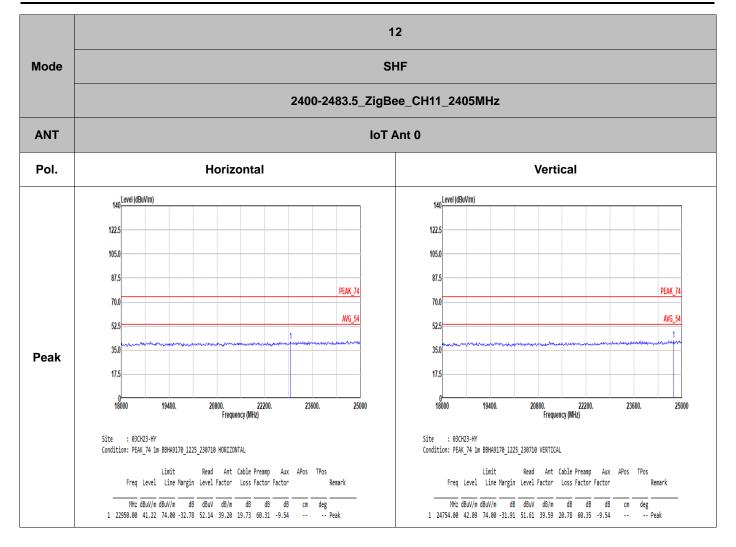
TEL: 886-3-327-0868 Page Number : C20 of C23



TEL: 886-3-327-0868 Page Number : C21 of C23



TEL: 886-3-327-0868 Page Number : C22 of C23



TEL: 886-3-327-0868 Page Number : C23 of C23

Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
ZigBee for 250kbps	100.00	-	-	10Hz

Report No. : FR422010C





TEL: 886-3-327-0868 Page Number : D1 of D1