

FCC REPORT

(WIFI)

Applicant: Chengdu Ebyte Electronic Technology Co., Ltd.

Address of Applicant: Innovation Center D347,4# XI-XIN road, High-tech district(west),
Chengdu, Sichuan, China

Equipment Under Test (EUT)

Product Name: Wireless transceiver module by ZigBee

Model No.: E18

Trade mark: EBYTE

FCC ID: 2ALPH-E18

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 19 Jan., 2018

Date of Test: 19 Jan., to 08 Mar., 2018

Date of report issued: 09 Mar., 2018

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2 Version

Version No.	Date	Description
00	09 Mar., 2018	Original

Tested by:

Mike.Ou

Date:

09 Mar., 2018

Test Engineer

Reviewed by:

Wimer Zhang

Date:

09 Mar., 2018

Project Engineer

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4 Test Summary

Test Items	Section in CFR 47	Result
Antenna requirement	15.203 & 15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(3)	Pass
6dB Emission Bandwidth 99% Occupied Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247 (d)	Pass
Spurious Emission	15.205 & 15.209	Pass
<i>Pass: The EUT complies with the essential requirements in the standard.</i> <i>N/A: N/A: Not Applicable.</i>		

5 General Information

5.1 Client Information

Applicant:	Chengdu Ebyte Electronic Technology Co., Ltd.
Address:	Innovation Center D347,4# XI-XIN road, High-tech district(west), Chengdu, Sichuan, China
Manufacturer/ Factory:	Chengdu Ebyte Electronic Technology Co., Ltd.
Address:	Innovation Center D347,4# XI-XIN road, High-tech district(west), Chengdu, Sichuan, China

5.2 General Description of E.U.T.

Product Name:	Wireless transceiver module by ZigBee
Model No.:	E18
Operation Frequency:	2405MHz~2480MHz (IEEE 802.15.4)
Channel numbers:	16 for (IEEE 802.15.4)
Channel separation:	5MHz
Modulation technology: (IEEE 802.15.4)	OQPSK
Data speed (IEEE 802.15.4):	250kbps
Antenna Type:	PCB Antenna
Antenna gain:	0 dBi
Power supply:	DC 3.3V

Operation Frequency each of channel for IEEE 802.15.4							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2405MHz	5	2425MHz	9	2445MHz	13	2465MHz
2	2410MHz	6	2430MHz	10	2450MHz	14	2470MHz
3	2415MHz	7	2435MHz	11	2455MHz	15	2475MHz
4	2420MHz	8	2440MHz	12	2460MHz	16	2480MHz
Note:							
1. Channel 1, 8 & 16 selected for IEEE 802.15.4 as Lowest, Middle and Highest channel.							

5.3 Test environment and test mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	

5.4 Description of Support Units

The EUT has been tested as an independent unit.

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	2.14 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	4.24 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	4.35 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	4.44 dB (k=2)
Radiated Emission (18GHz ~ 26.5GHz)	4.56 dB (k=2)

5.6 Laboratory Facility

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

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.7 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
 Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
 Bao'an District, Shenzhen, Guangdong, China
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

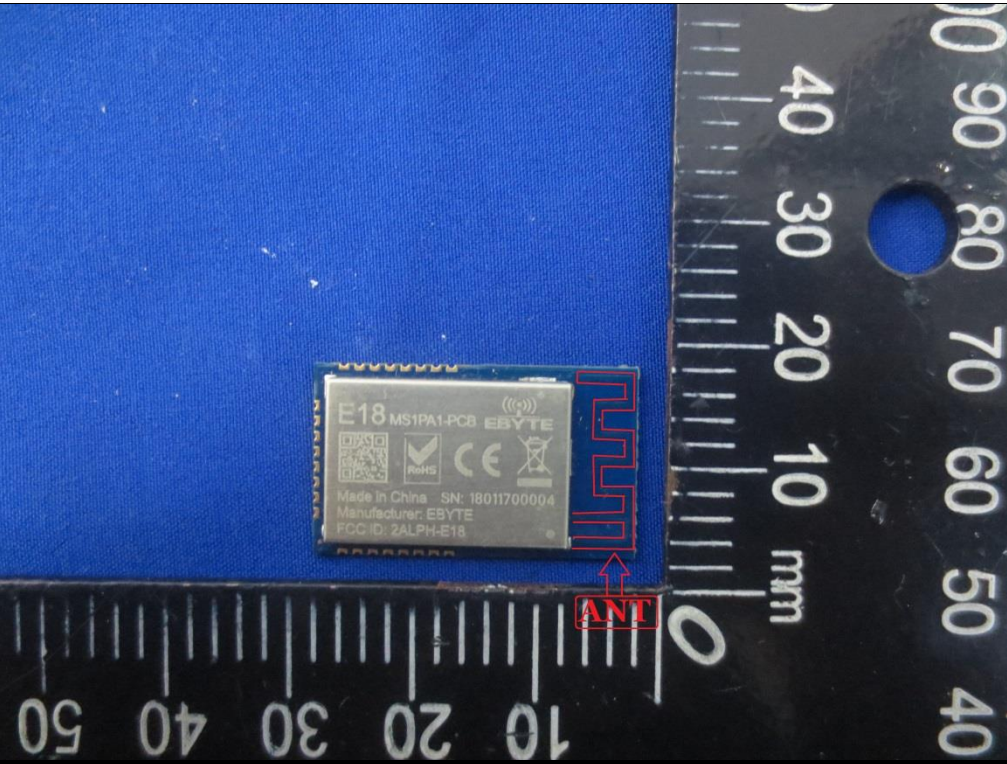
5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	12-28-2017	12-27-2018
Horn Antenna	SCHWARZBECK	BBHA9120D	916	12-28-2017	12-27-2018
EMI Test Software	AUDIX	E3	6.110919b	N/A	N/A
Pre-amplifier	HP	8447D	2944A09358	12-28-2017	12-27-2018
Pre-amplifier	CD	PAP-1G18	11804	12-28-2017	12-27-2018
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	12-28-2017	12-27-2018
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	12-28-2017	12-27-2018
Simulated Station	Anritsu	MT8820C	6201026545	12-28-2017	12-27-2018
Cable	ZDECL	Z108-NJ-NJ-81	1608458	12-28-2017	12-27-2018
Cable	MICRO-COAX	MFR64639	K10742-5	12-28-2017	12-27-2018
Cable	SUHNER	SUCOFLEX100	58193/4PE	12-28-2017	12-27-2018

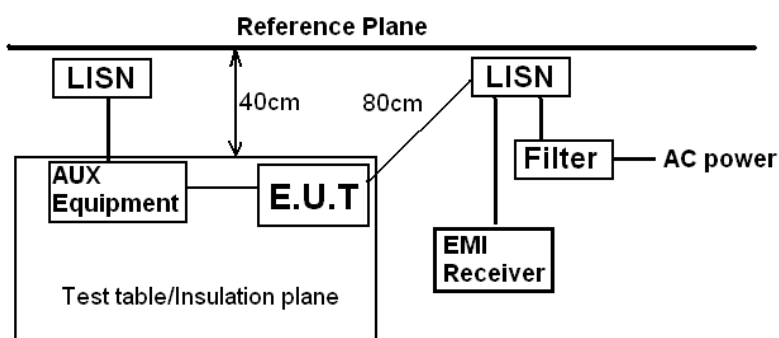
Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	12-28-2017	12-27-2018
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	12-28-2017	12-27-2018
LISN	CHASE	MN2050D	1447	12-28-2017	12-27-2018
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2017	07-20-2018
Cable	HP	10503A	N/A	12-28-2017	12-27-2018
EMI Test Software	AUDIX	E3	6.110919b	N/A	N/A

6 Test results and Measurement Data

6.1 Antenna requirement

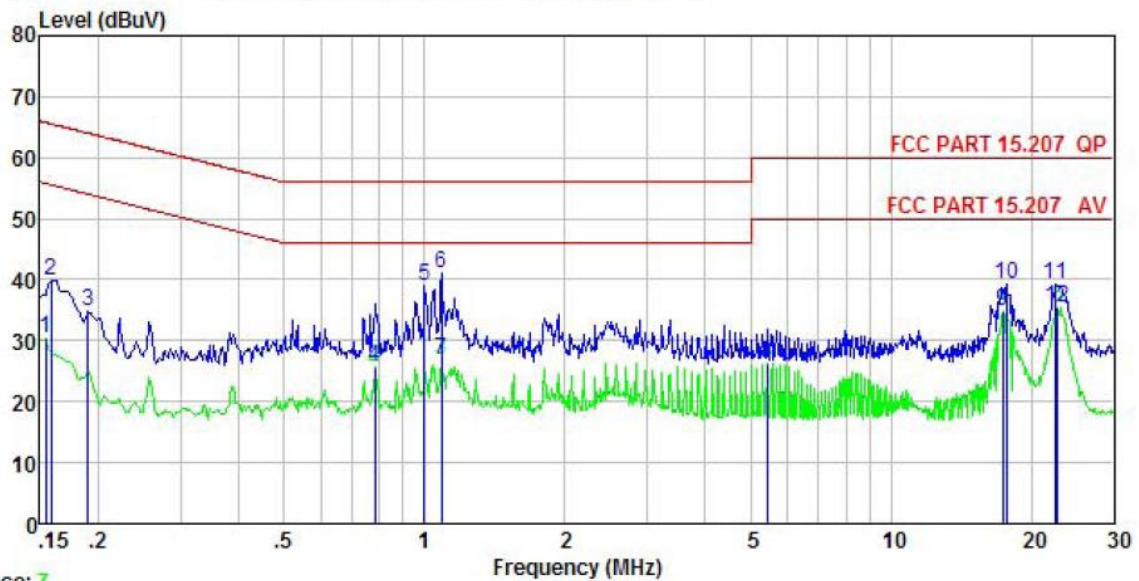
Standard requirement:	FCC Part 15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique 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. 15.247(c) (1)(i) requirement: (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.	
E.U.T Antenna:	
The Zigbee antenna is an PCB antenna which cannot replace by end-user, the best case gain of the antenna is 0dBi.	
	

6.2 Conducted Emission

Test Requirement:	FCC Part 15 C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9 kHz, VBW=30 kHz		
Limit:	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 procedure	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.		
Test setup:	 <i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m		
Test Instruments:	Refer to section 5.8 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

Measurement Data:

Test Phase: Neutral



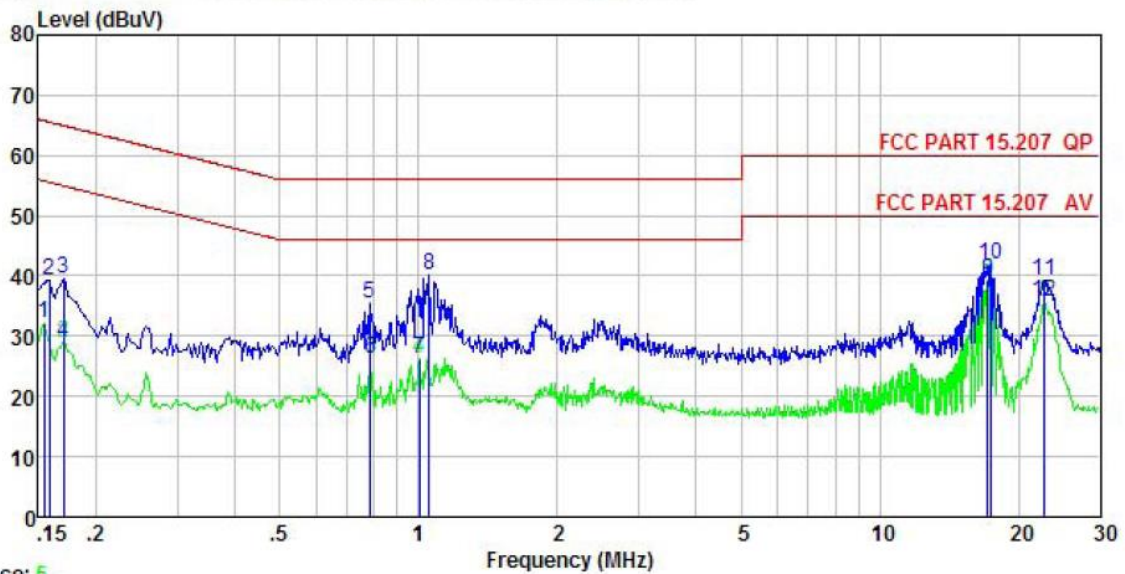
Site : CCIS Shielding Room
 Condition : FCC PART 15.207 QP LISN(RS) NEUTRAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test Mode : RFID mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Mike
 Remark :

	Read	LISN	Cable	Limit	Over	
Freq	Level	Factor	Loss	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB	dB	dBuV	dB	
1	0.154	18.79	0.70	10.78	30.27	55.78 -25.51 Average
2	0.158	28.44	0.70	10.77	39.91	65.56 -25.65 QP
3	0.190	23.35	0.66	10.76	34.77	64.02 -29.25 QP
4	0.783	14.24	0.65	10.81	25.70	46.00 -20.30 Average
5	1.000	27.35	0.67	10.87	38.89	56.00 -17.11 QP
6	1.088	29.47	0.67	10.88	41.02	56.00 -14.98 QP
7	1.088	15.27	0.67	10.88	26.82	46.00 -19.18 Average
8	5.419	14.88	0.70	10.84	26.42	50.00 -23.58 Average
9	17.383	23.21	0.69	10.92	34.82	50.00 -15.18 Average
10	17.661	27.63	0.69	10.92	39.24	60.00 -20.76 QP
11	22.535	27.62	0.69	10.90	39.21	60.00 -20.79 QP
12	22.775	23.78	0.69	10.90	35.37	50.00 -14.63 Average

Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

Test Phase: **Line**



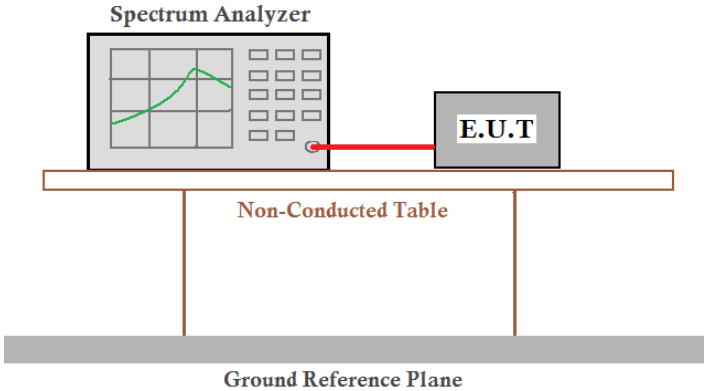
Site : CCIS Shielding Room
 Condition : FCC PART 15.207 QP LISN(RS) LINE
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test Mode : RFID mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Mike
 Remark :

	Freq	Read	LISN	Cable	Level	Limit	Over	
	MHz	dBuV	Factor	Loss	dBuV	dBuV	Limit	Remark
			dB	dB			dB	
1	0.154	20.80	0.71	10.78	32.29	55.78	-23.49	Average
2	0.158	27.87	0.71	10.77	39.35	65.56	-26.21	QP
3	0.170	28.05	0.71	10.77	39.53	64.94	-25.41	QP
4	0.170	17.52	0.71	10.77	29.00	54.94	-25.94	Average
5	0.783	23.88	0.77	10.81	35.46	56.00	-20.54	QP
6	0.788	14.79	0.77	10.81	26.37	46.00	-19.63	Average
7	1.005	14.66	0.78	10.87	26.31	46.00	-19.69	Average
8	1.054	28.54	0.78	10.88	40.20	56.00	-15.80	QP
9	17.109	27.59	0.70	10.91	39.20	50.00	-10.80	Average
10	17.383	30.44	0.70	10.92	42.06	60.00	-17.94	QP
11	22.775	27.80	0.70	10.90	39.40	60.00	-20.60	QP
12	22.775	24.17	0.70	10.90	35.77	50.00	-14.23	Average

Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

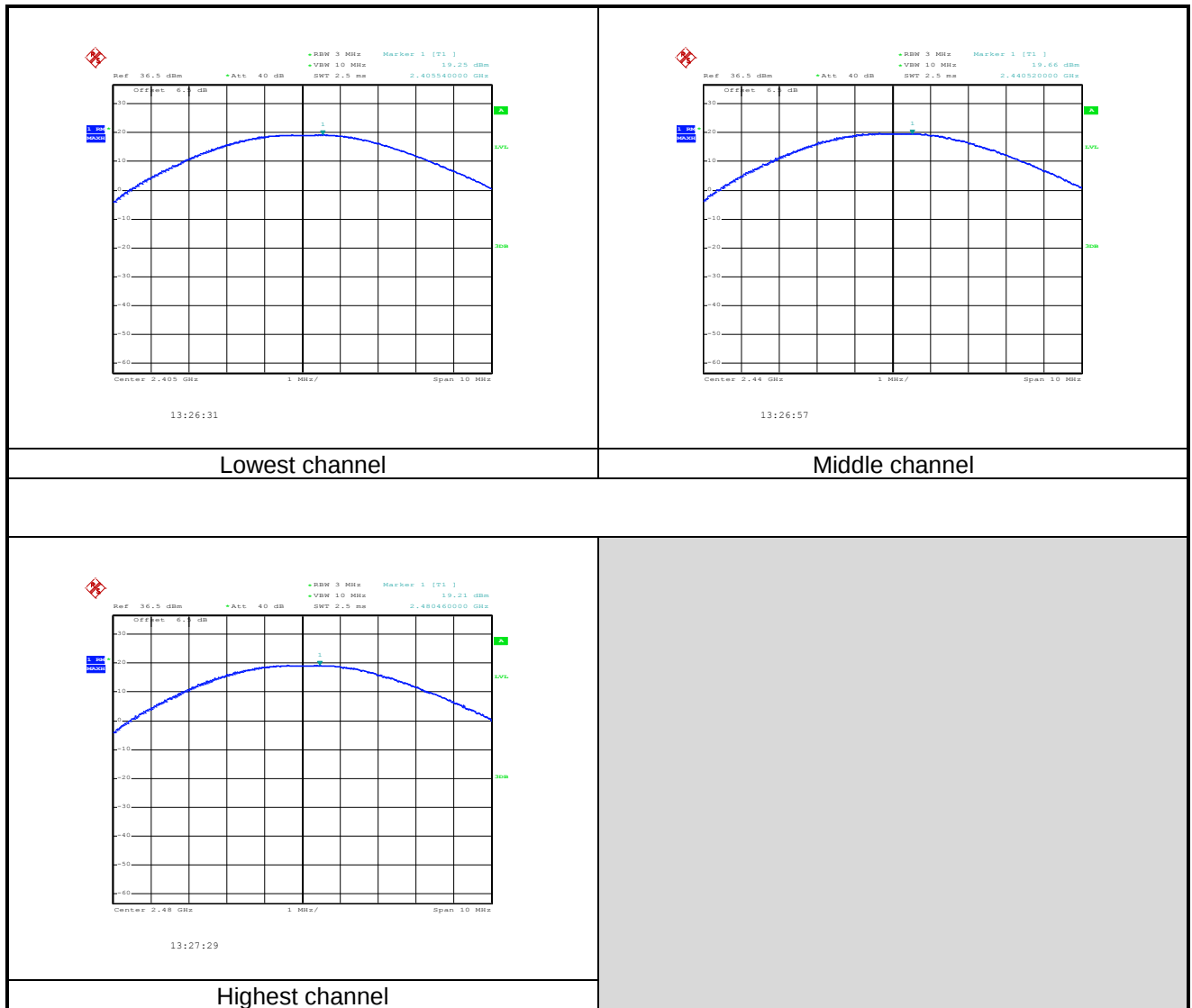
6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	30dBm
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

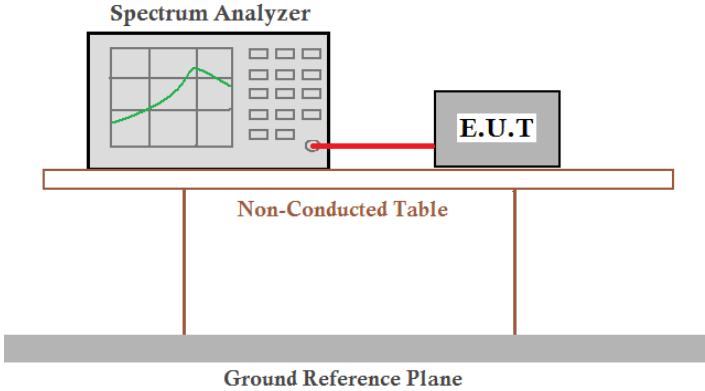
Measurement Data:

Test CH	Maximum Conducted Output Power (dBm)	Limit(dBm)	Result
Lowest	19.25	30.00	Pass
Middle	19.66		
Highest	19.21		

Test plot as follows:



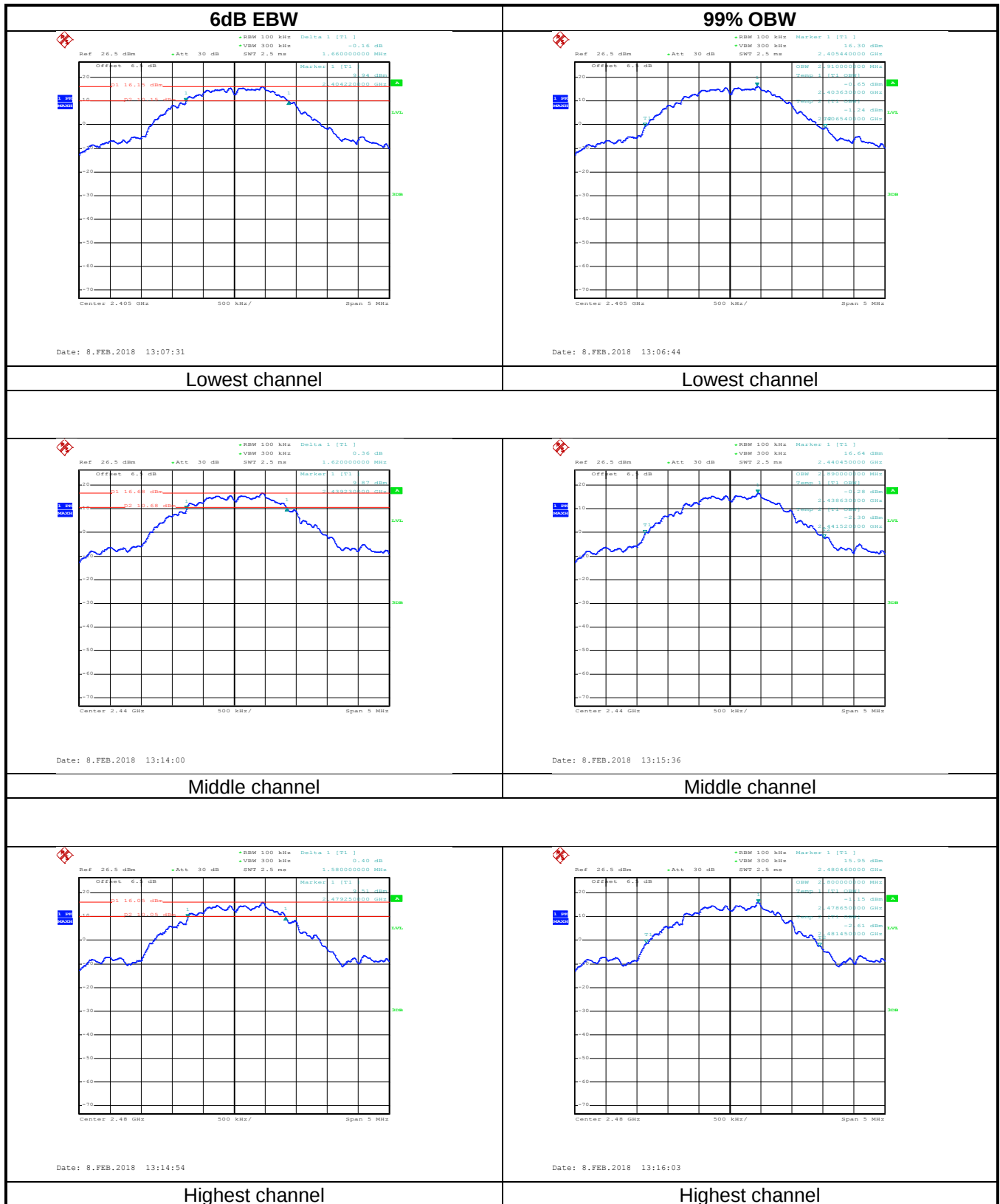
6.4 Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	>500kHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

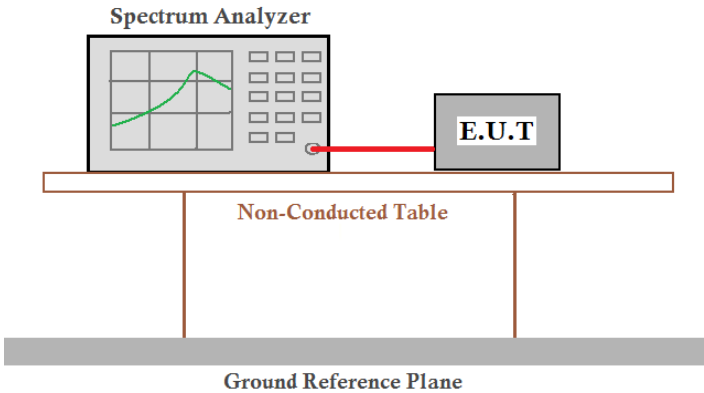
Measurement Data:

Test CH	6dB Emission Bandwidth (MHz)	Limit(kHz)	Result
Lowest	1.66	>500	Pass
Middle	1.62		
Highest	1.58		
Test CH	99% Occupy Bandwidth (MHz)	Limit(kHz)	Result
Lowest	2.91	N/A	N/A
Middle	2.89		
Highest	2.80		

Test plot as follows:



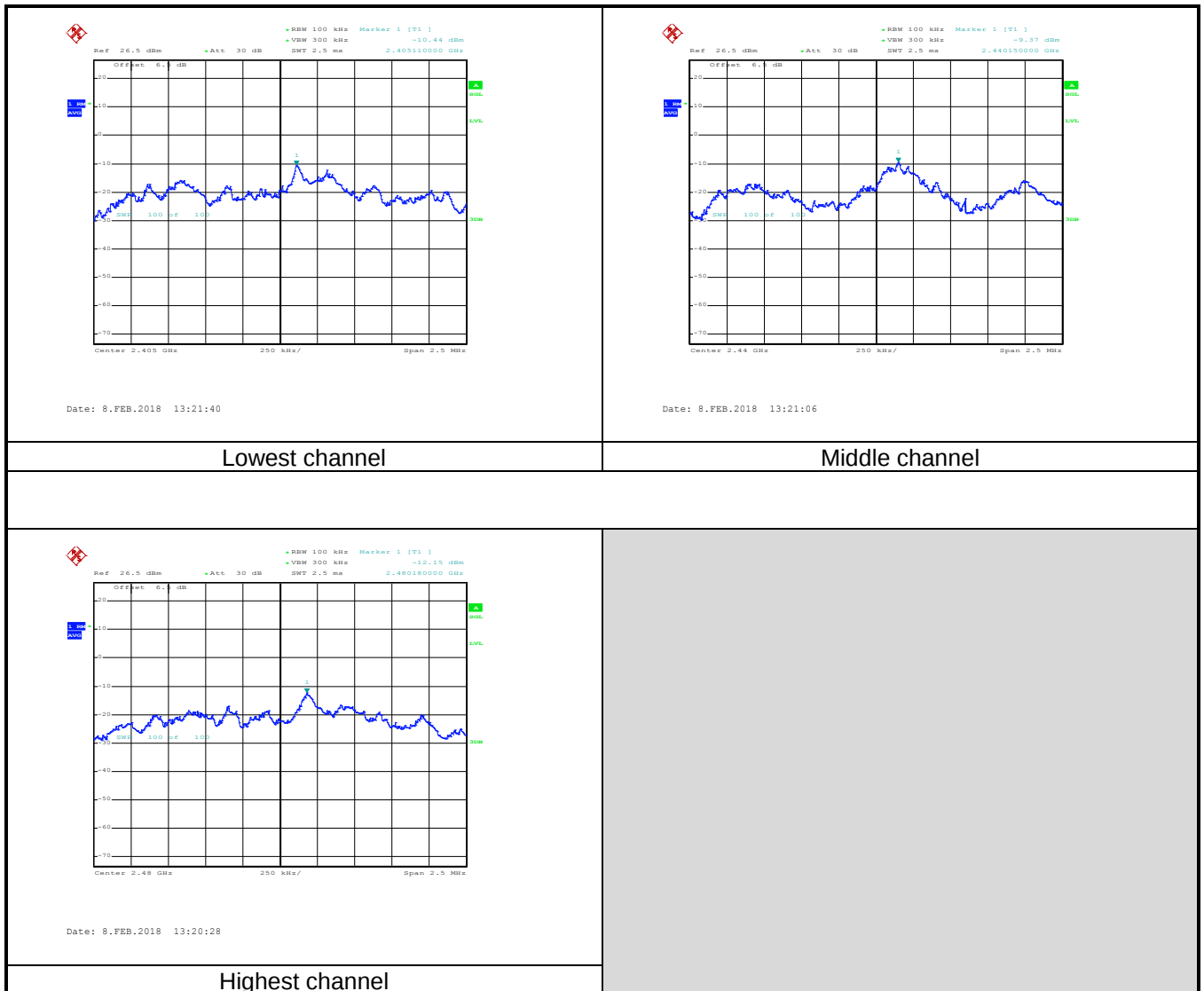
6.5 Power Spectral Density

Test Requirement:	FCC Part 15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	8dBm
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

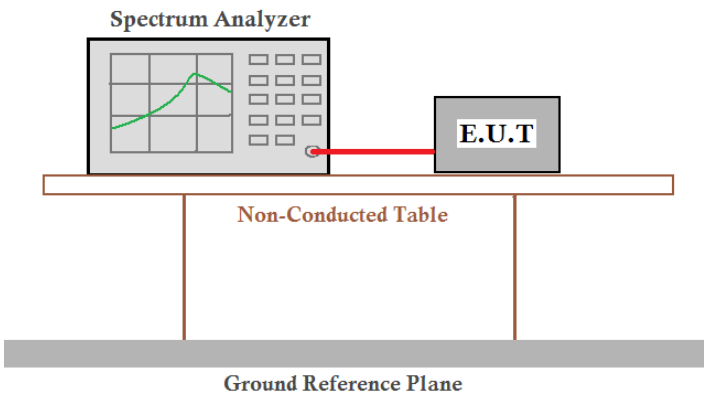
Test CH	Power Spectral Density (dBm)	Limit(dBm)	Result
Lowest	-10.44	8.00	Pass
Middle	-9.37		
Highest	-12.15		

Test plot as follows:

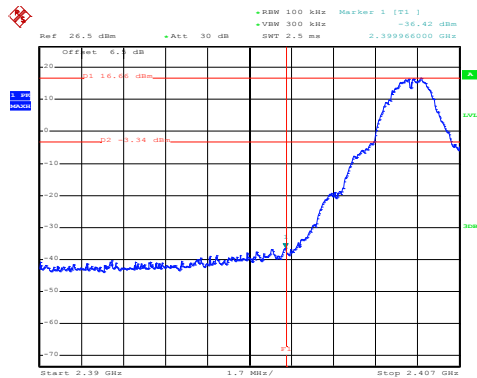


6.6 Band Edge

6.6.1 Conducted Emission Method

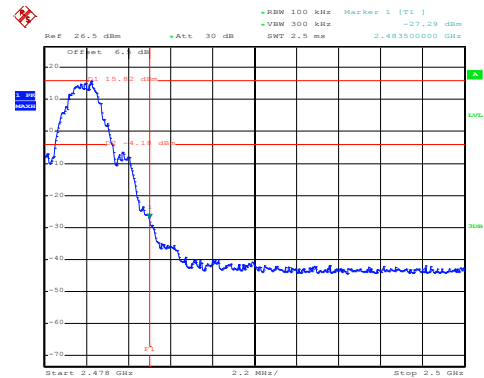
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 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.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer, shown with a grid and a green curve, is connected by a red cable to a box labeled 'E.U.T'. Both the Spectrum Analyzer and the E.U.T are positioned on a 'Non-Conducted Table'. This table is supported by two vertical legs and sits on a 'Ground Reference Plane', which is represented by a thick grey horizontal bar at the bottom.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plot as follows:



Date: 8.FEB.2018 13:35:52

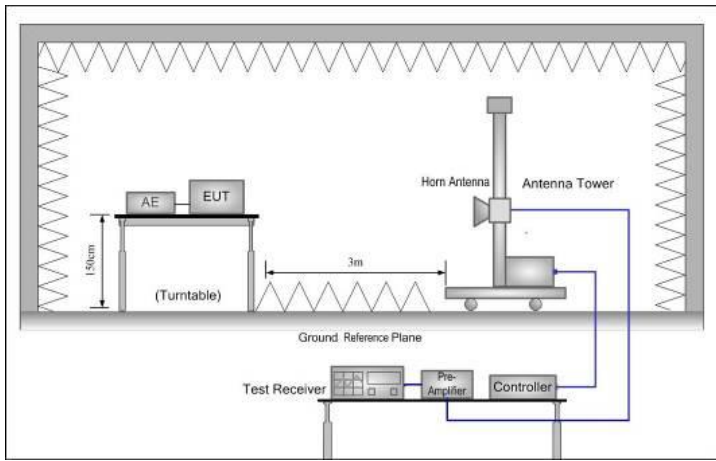
Lowest channel



Date: 8.FEB.2018 13:37:39

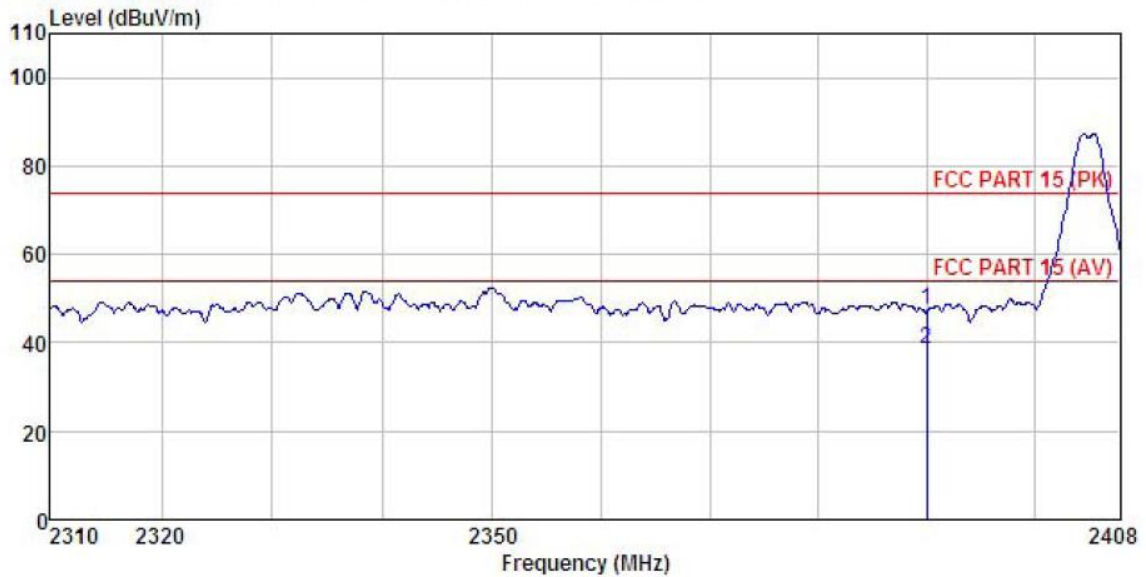
Highest channel

6.6.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013 and KDB 558074				
Test Frequency Range:	2.3GHz to 2.5GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00		Average Value	
		74.00		Peak Value	
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
Test setup:					
Test Instruments:	Refer to section 5.8 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Passed				

Test channel: Lowest channel

Test Polarization: Horizontal



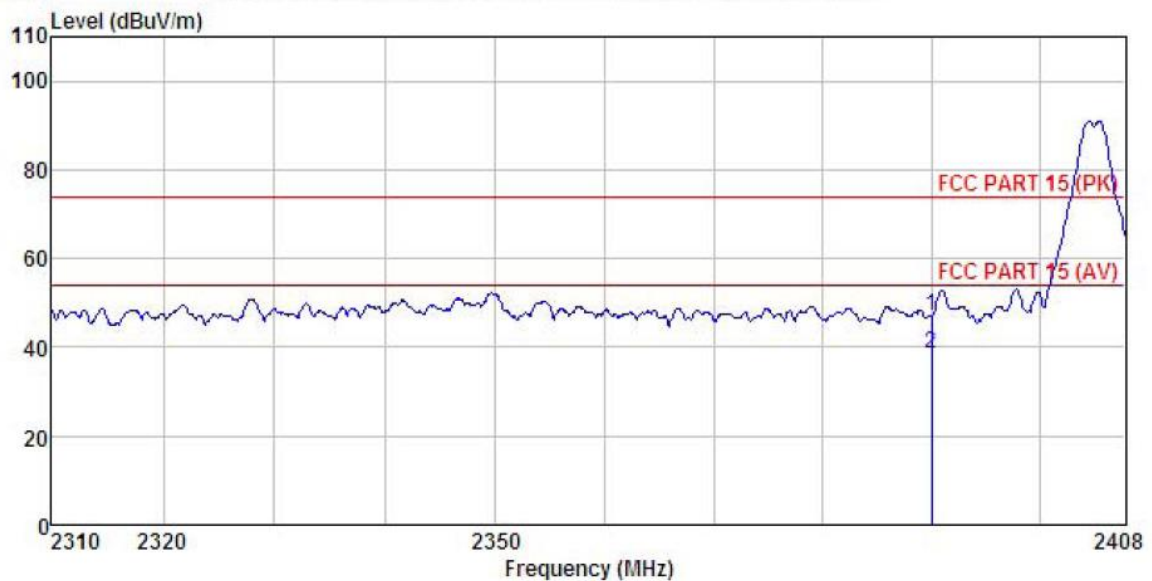
Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) HORIZONTAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : L mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	2390.000	17.23	25.45	4.69	0.00	47.37	74.00
2	2390.000	8.24	25.45	4.69	0.00	38.38	54.00

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test Polarization: Vertical



Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : L mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

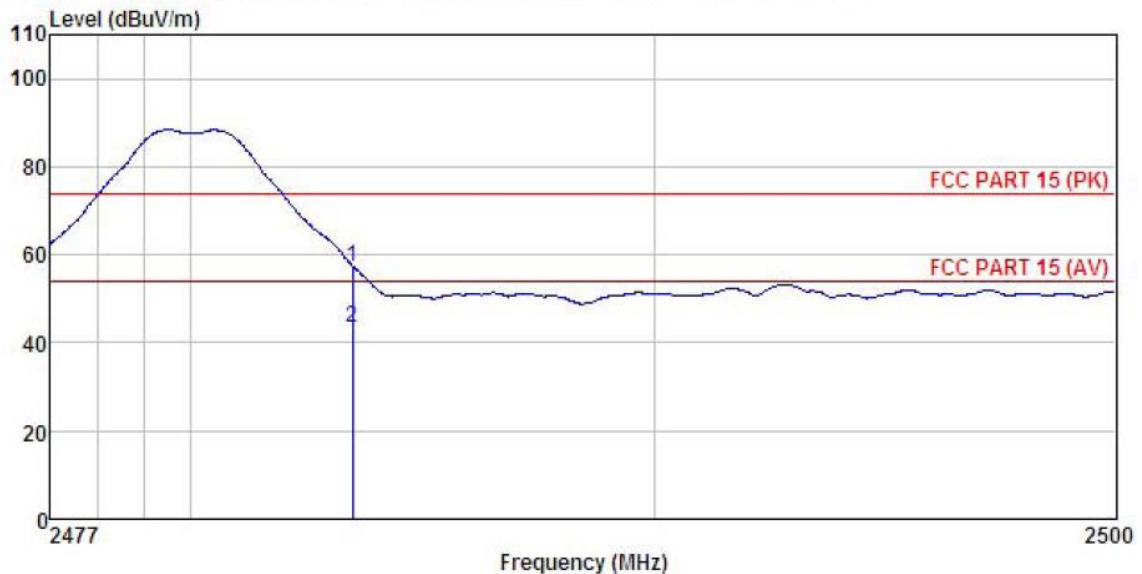
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2390.000	16.96	25.45	4.69	0.00	47.10	74.00	-26.90 Peak
2	2390.000	8.59	25.45	4.69	0.00	38.73	54.00	-15.27 Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel: Highest channel

Test Polarization: Horizontal



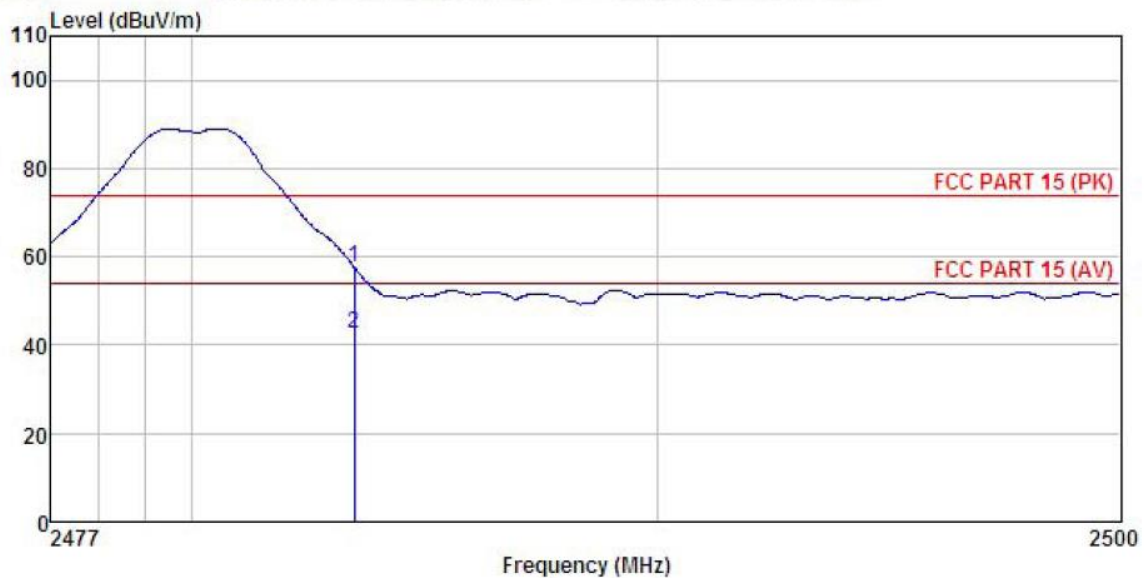
Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) HORIZONTAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : H mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2483.500	26.93	25.66	4.81	0.00	57.40	74.00	-16.60 Peak
2	2483.500	12.78	25.66	4.81	0.00	43.25	54.00	-10.75 Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test Polarization: Vertical



Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : H mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

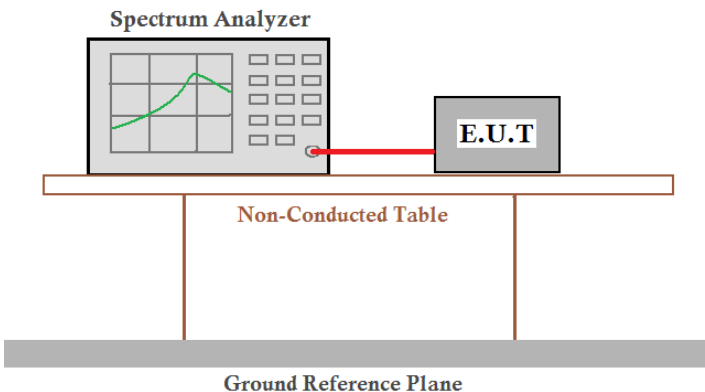
	Freq	ReadAntenna	Cable Preamp	Limit	Over	
		Level	Loss Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m
1	2483.500	27.02	25.66	4.81	0.00	57.49 74.00 -16.51 Peak
2	2483.500	12.27	25.66	4.81	0.00	42.74 54.00 -11.26 Average

Remark:

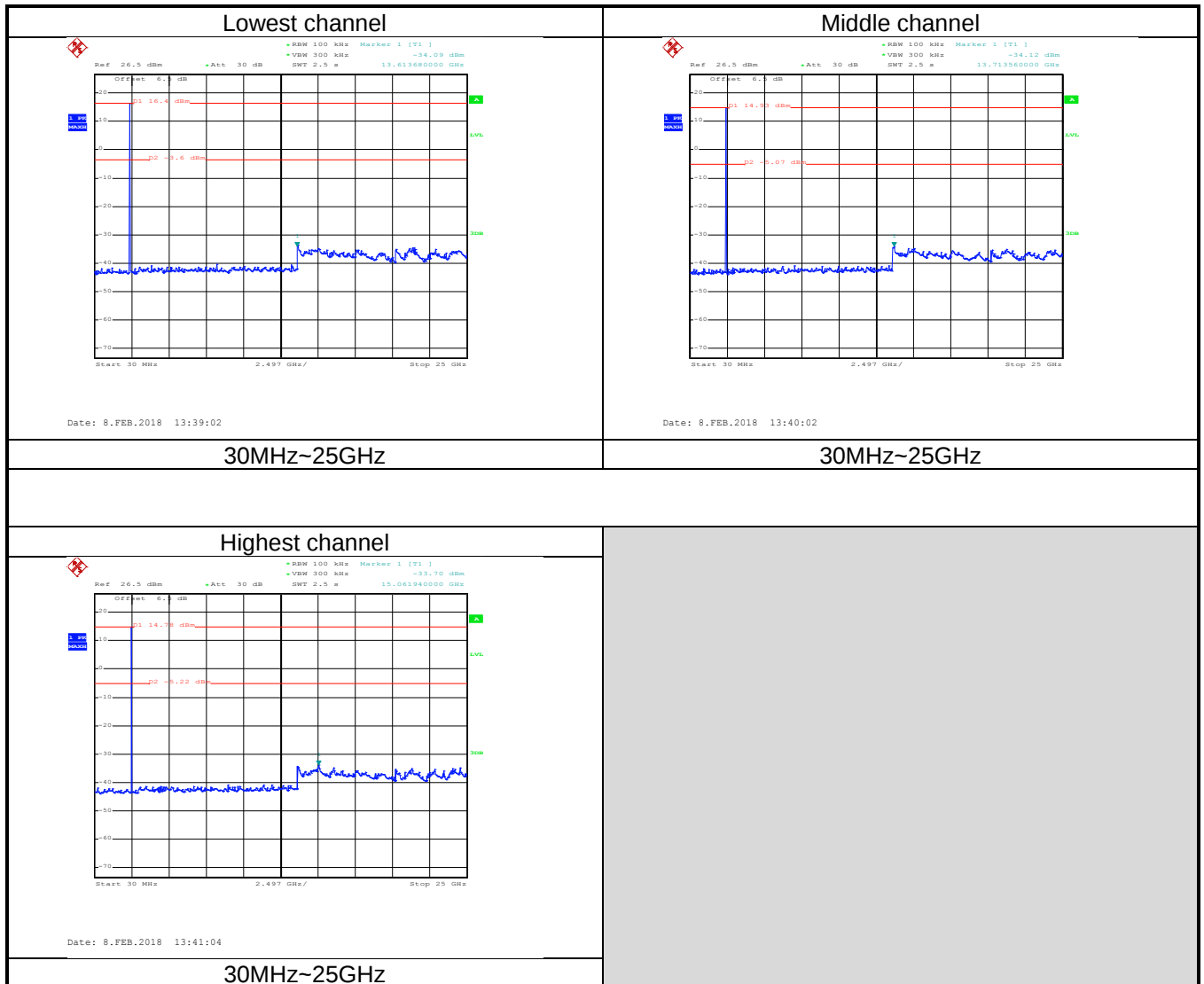
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.7 Spurious Emission

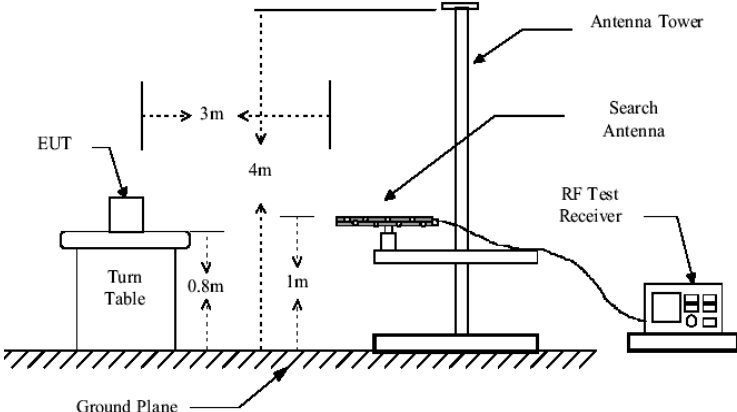
6.7.1 Conducted Emission Method

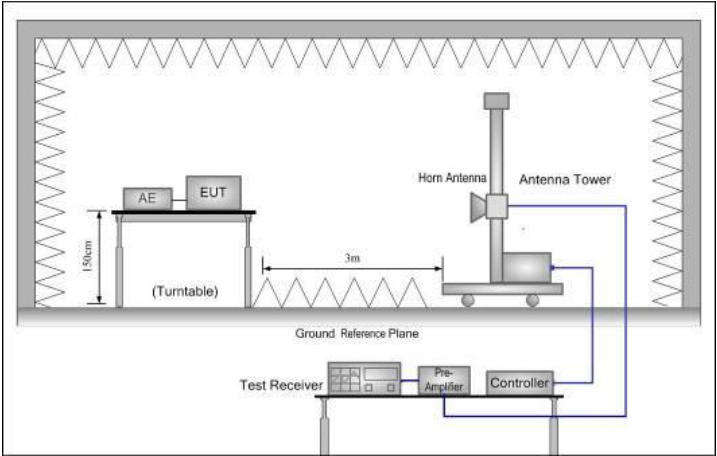
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at 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. 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.
Test setup:	 The diagram illustrates the test setup for conducted emission testing. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plot as follows:



6.7.2 Radiated Emission Method

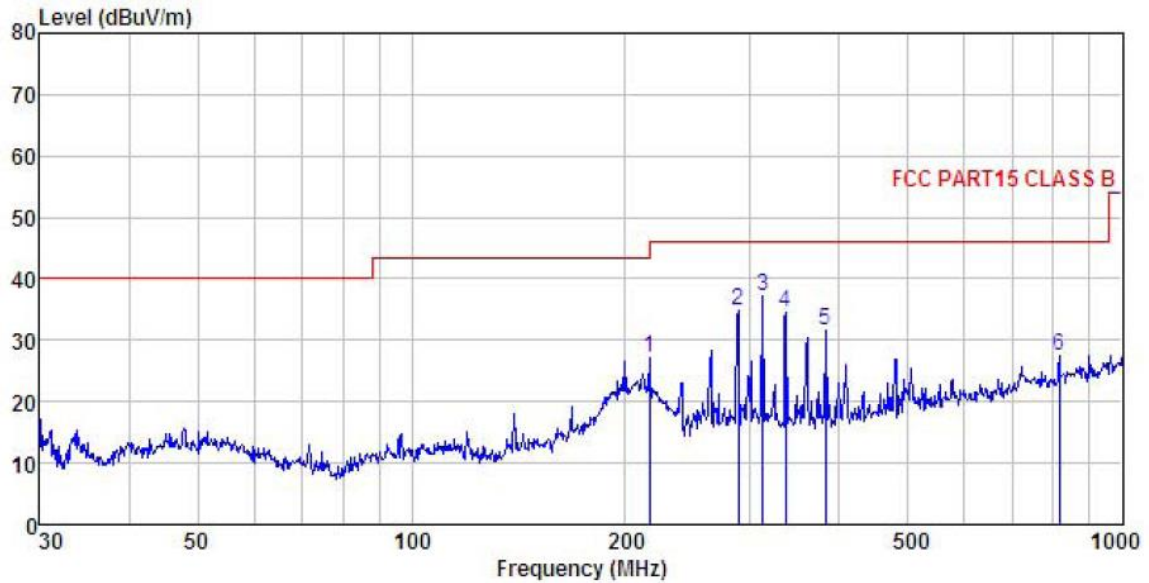
Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	960MHz-1GHz	54.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
74.0		Peak Value			
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
Test setup:	Below 1GHz 				

	Above 1GHz 
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):

Below 1GHz:

Test Polarization: Horizontal



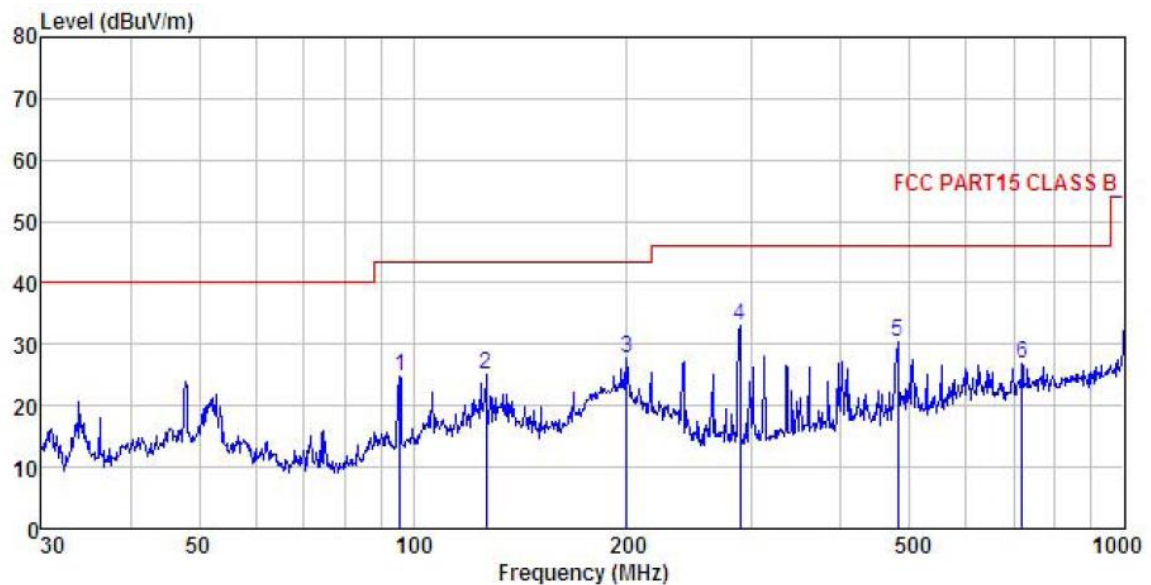
Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) HORIZONTAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : RFID mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

	Freq	Read	Antenna	Cable	Preamp	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	216.024	41.84	11.30	2.85	28.73	27.26	46.00	-18.74 QP
2	287.990	47.27	13.03	2.91	28.47	34.74	46.00	-11.26 QP
3	312.179	49.25	13.49	2.98	28.48	37.24	46.00	-8.76 QP
4	336.035	45.87	14.10	3.05	28.53	34.49	46.00	-11.51 QP
5	382.588	42.68	14.62	3.09	28.70	31.69	46.00	-14.31 QP
6	815.968	31.17	19.99	4.30	28.13	27.33	46.00	-18.67 QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test Polarization: Vertical



Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) VERTICAL
 EUT : Wireless transceiver module by ZigBee
 Model : E18
 Test mode : RFID mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: MIKE
 REMARK :

	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	95.762	40.94	11.40	2.01	29.55	24.80	43.50
2	126.772	42.86	9.28	2.25	29.35	25.04	43.50
3	199.986	42.51	11.30	2.87	28.83	27.85	43.50
4	287.990	45.67	13.03	2.91	28.47	33.14	46.00
5	480.528	40.22	15.78	3.46	28.92	30.54	46.00
6	719.200	31.82	19.52	4.25	28.59	27.00	46.00

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz

Test channel: Lowest channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4824.00	47.82	30.85	6.80	41.81	43.66	74.00	-30.34	Vertical
4824.00	47.40	30.85	6.80	41.81	43.24	74.00	-30.76	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4824.00	41.60	30.85	6.80	41.81	37.44	54.00	-16.56	Vertical
4824.00	38.23	30.85	6.80	41.81	34.07	54.00	-19.93	Horizontal
Test channel: Middle channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4874.00	47.79	31.20	6.86	41.84	44.01	74.00	-29.99	Vertical
4874.00	49.61	31.20	6.86	41.84	45.83	74.00	-28.17	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4874.00	42.63	31.20	6.86	41.84	38.85	54.00	-15.15	Vertical
4874.00	43.61	31.20	6.86	41.84	39.83	54.00	-14.17	Horizontal
Test channel: Highest channel								
Detector: Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4924.00	47.34	31.63	6.91	41.87	44.01	74.00	-29.99	Vertical
4924.00	49.57	31.63	6.91	41.87	46.24	74.00	-27.76	Horizontal
Detector: Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4924.00	41.67	31.63	6.91	41.87	38.34	54.00	-15.66	Vertical
4924.00	44.56	31.63	6.91	41.87	41.23	54.00	-12.77	Horizontal
Remark:								
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.								
2. The emission levels of other frequencies are very lower than the limit and not show in test report.								