

FCC REPORT

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

Model No.: E90-DTU

Trade mark: EBYTE

FCC ID: 2ALPH-E90-DTU

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

Date of sample receipt: 30 May., 2018

Date of Test: 30 May., to 14 Jun., 2018

Date of report issued: 15 Jun., 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.

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2 Version

Version No.	Date	Description
00	15 Jun., 2018	Original

Tested by: Zora Lee **Date:** 15 Jun., 2018
Test Engineer

Reviewed by: Wimer Zhang **Date:** 15 Jun., 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. 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
Model No.:	E90-DTU
Operation Frequency:	907 MHz~922.5 MHz
Channel numbers:	31
Modulation technology:	FSK
Antenna Type:	External Antenna
Antenna gain:	2 dBi
Power supply:	DC 12V

Operation Frequency each of channel for FSK					
Channel	Frequency	Channel	Frequency	Channel	Frequency
0	907.0MHz	13	913.5MHz	26	920.0MHz
1	907.5MHz	14	914.0MHz	27	920.5MHz
2	908.0MHz	15	914.5MHz	28	921.0MHz
3	908.5MHz	16	915.0MHz	29	921.5MHz
4	909.0MHz	17	915.5MHz	30	922.0MHz
5	909.5MHz	18	916.0MHz	31	922.5MHz
6	910.0MHz	19	916.5MHz		
7	910.5MHz	20	917.0MHz		
8	911.0MHz	21	917.5MHz		
9	911.5MHz	22	918.0MHz		
10	912.0MHz	23	918.5MHz		
11	912.5MHz	24	919.0MHz		
12	913.0MHz	25	919.5MHz		
Remark: Channel 0, 16 & 31 selected for GFSK.					

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
<p>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. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.</p>	

5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
LENOVO	Laptop	SL510	2847A65	DoC
Sunshiny	Adapter	XS-1201000SCN	N/A	N/A

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 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

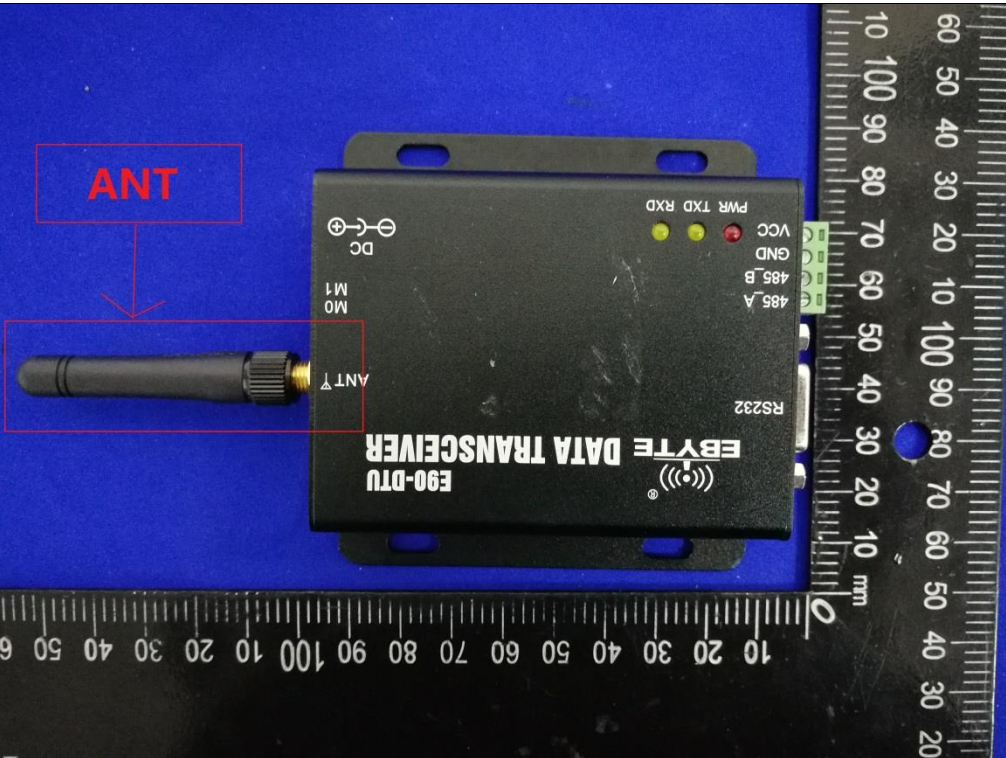
5.8 Test Instruments list

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	02-25-2018	02-24-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	916	02-25-2018	02-24-2019
EMI Test Software	AUDIX	E3	6.110919b	N/A	N/A
Pre-amplifier	HP	8447D	2944A09358	03-07-2018	03-06-2019
Pre-amplifier	CD	PAP-1G18	11804	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-07-2018	03-06-2019
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-07-2018	03-06-2019
Simulated Station	Anritsu	MT8820C	6201026545	03-07-2018	03-06-2019
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2018	03-06-2019
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2018	03-06-2019
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2018	03-06-2019

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	03-07-2018	03-06-2019
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-07-2018	03-06-2019
LISN	CHASE	MN2050D	1447	02-25-2018	02-24-2019
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2017	07-20-2018
ISN	Schwarzbeck	CAT3 8158	CCIS0185	02-25-2018	02-24-2019
ISN	Schwarzbeck	CAT5 8158	CCIS0186	02-25-2018	02-24-2019
ISN	Schwarzbeck	NTFM 8158	CCIS0187	02-25-2018	02-24-2019
Cable	HP	10503A	N/A	03-07-2018	03-06-2019
EMI Test Software	AUDIX	E3	6.110919b	N/A	N/A

6 Test results and Measurement Data

6.1 Antenna requirement:

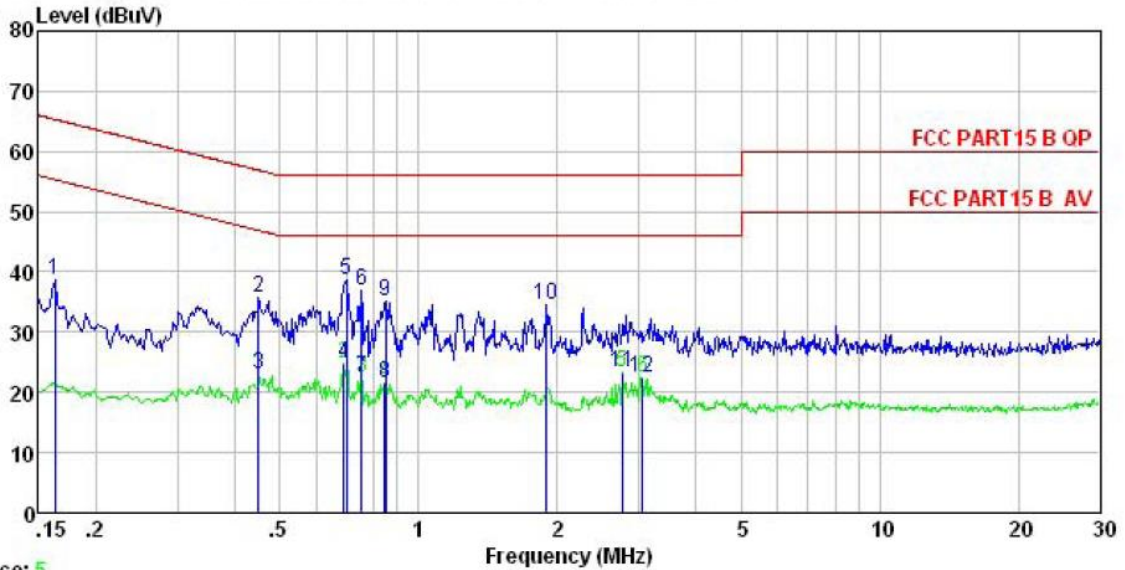
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p><i>15.203 requirement:</i> <i>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that 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.</i></p>	
E.U.T Antenna:	
<p><i>The antenna is an external antenna which cannot replace by end-user, the best case gain of the antenna is 2.0 dBi.</i></p>	
	

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=9kHz, VBW=30kHz		
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	<ol style="list-style-type: none"> 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:	<p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>		
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



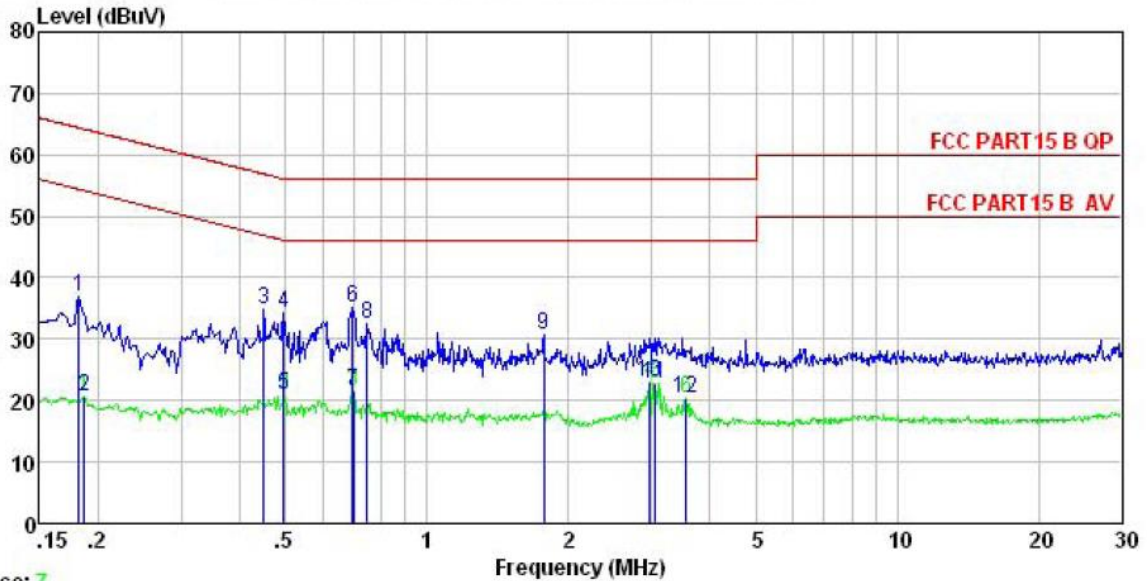
Trace: 5
 Site : CCIS Shielding Room
 Condition : FCC PART15 B QP LISN NEUTRAL
 EUT : Wireless trans ceiver module
 Model : E90-DTU
 Test Mode : TX mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Zora
 Remark :

	Read Freq	Level	LISN Factor	Cable Loss	Level	Limit	Over	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.162	26.88	0.97	10.77	38.62	65.34	-26.72	QP
2	0.449	24.06	0.97	10.74	35.77	56.89	-21.12	QP
3	0.449	11.29	0.97	10.74	23.00	46.89	-23.89	Average
4	0.690	13.16	0.97	10.77	24.90	46.00	-21.10	Average
5	0.697	26.94	0.97	10.77	38.68	56.00	-17.32	QP
6	0.751	25.00	0.97	10.79	36.76	56.00	-19.24	QP
7	0.751	10.77	0.97	10.79	22.53	46.00	-23.47	Average
8	0.844	9.87	0.97	10.82	21.66	46.00	-24.34	Average
9	0.848	23.22	0.97	10.82	35.01	56.00	-20.99	QP
10	1.898	22.59	0.98	10.95	34.52	56.00	-21.48	QP
11	2.765	11.28	0.99	10.93	23.20	46.00	-22.80	Average
12	3.058	10.44	0.99	10.92	22.35	46.00	-23.65	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



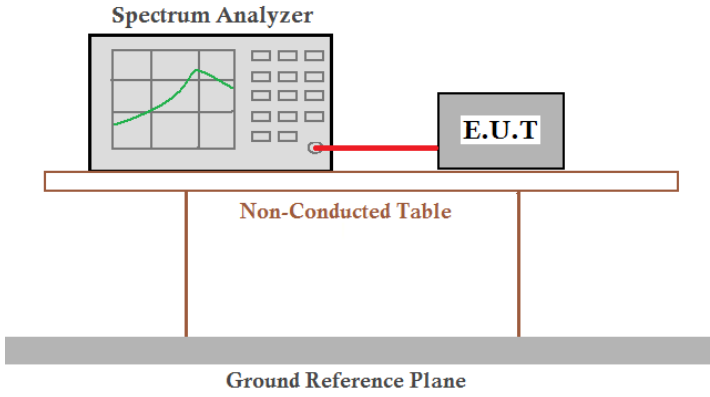
Trace: 7
 Site : CCIS Shielding Room
 Condition : FCC PART15 B QP LISN LINE
 EUT : Wireless trans ceiver module
 Model : E90-DTU
 Test Mode : TX mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Zora
 Remark :

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.182	25.91	0.16	10.77	36.84	64.42	-27.58	QP
2	0.186	9.72	0.16	10.76	20.64	54.20	-33.56	Average
3	0.449	23.99	0.12	10.74	34.85	56.89	-22.04	QP
4	0.497	23.44	0.12	10.76	34.32	56.05	-21.73	QP
5	0.497	10.17	0.12	10.76	21.05	46.05	-25.00	Average
6	0.694	24.26	0.13	10.77	35.16	56.00	-20.84	QP
7	0.697	10.61	0.13	10.77	21.51	46.00	-24.49	Average
8	0.747	21.44	0.13	10.79	32.36	56.00	-23.64	QP
9	1.772	19.59	0.14	10.94	30.67	56.00	-25.33	QP
10	2.978	11.89	0.16	10.92	22.97	46.00	-23.03	Average
11	3.058	11.69	0.16	10.92	22.77	46.00	-23.23	Average
12	3.565	9.22	0.17	10.90	20.29	46.00	-25.71	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.

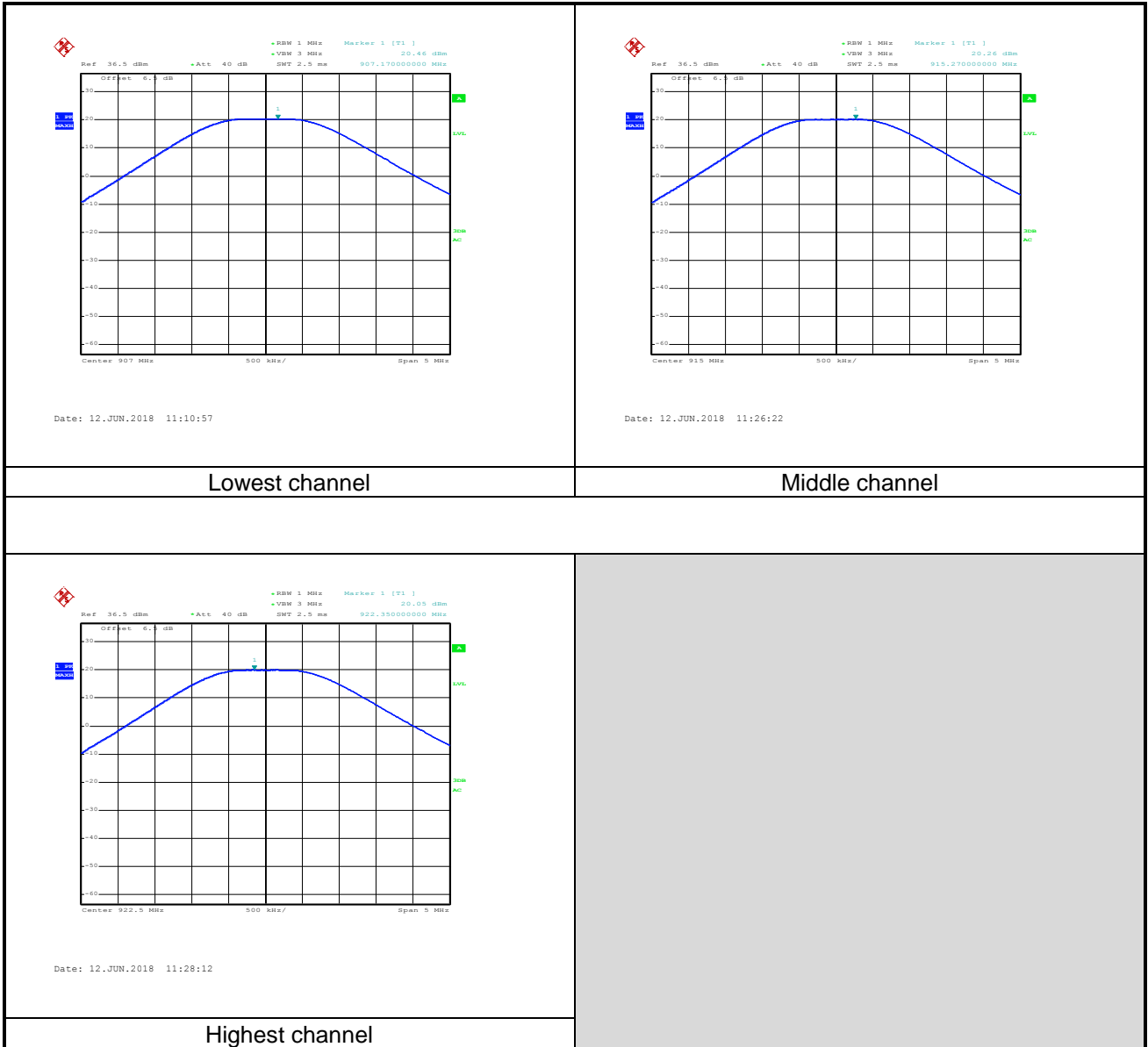
6.3 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	30dBm
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is positioned above a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

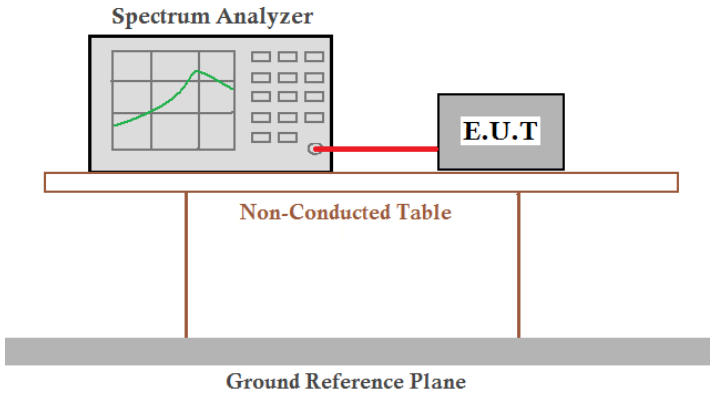
Measurement Data:

Test CH	Maximum Conducted Output Power (dBm)	Limit(dBm)	Result
Lowest	20.46	30.00	Pass
Middle	20.26		
Highest	20.05		

Test plot as follows:



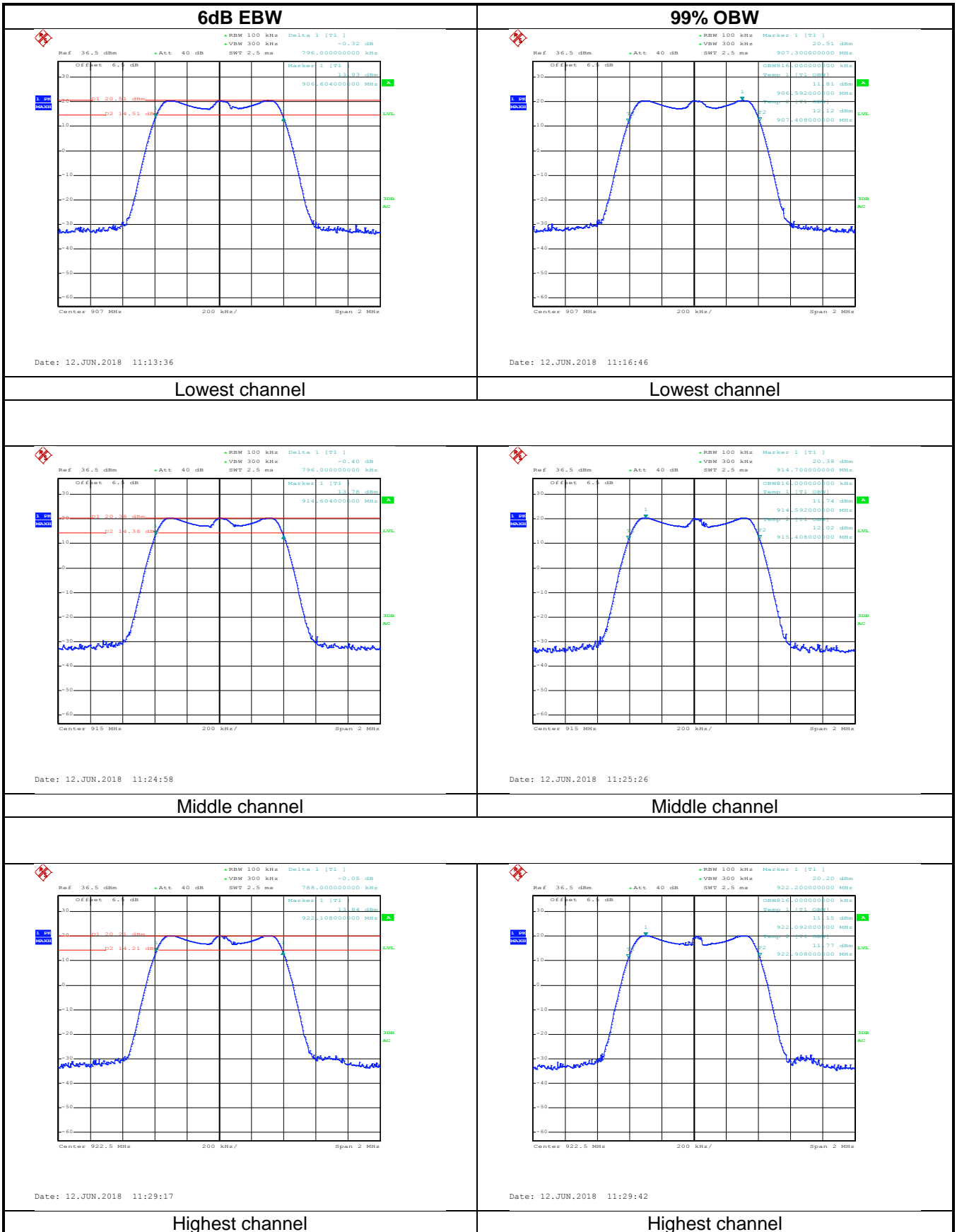
6.4 Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	>500kHz
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

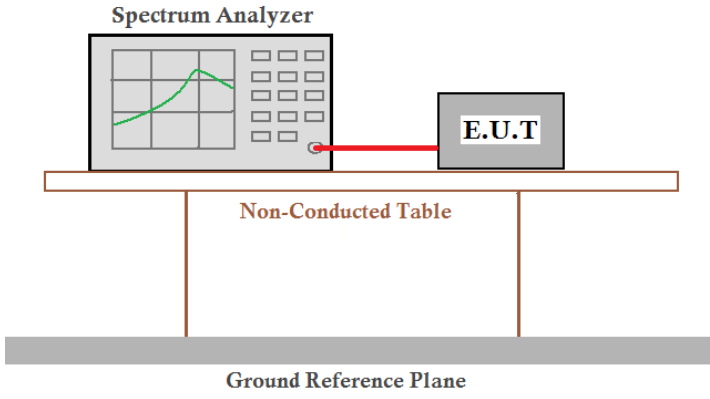
Measurement Data:

Test CH	6dB Emission Bandwidth (MHz)	Limit(kHz)	Result
Lowest	0.796	>500	Pass
Middle	0.796		
Highest	0.788		
Test CH	99% Occupy Bandwidth (MHz)	Limit(kHz)	Result
Lowest	0.816	N/A	N/A
Middle	0.816		
Highest	0.816		

Test plot as follows:



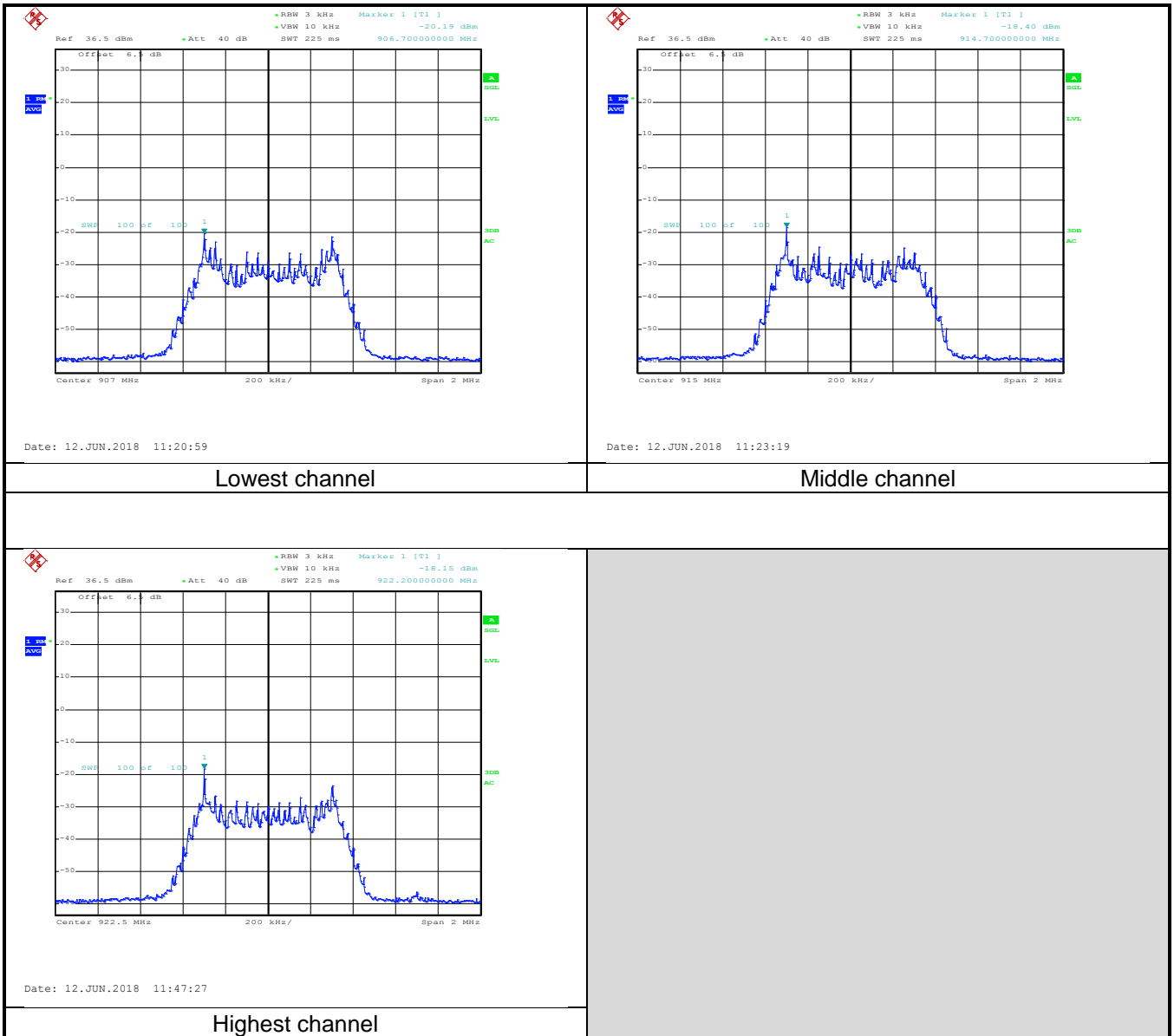
6.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	8dBm
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

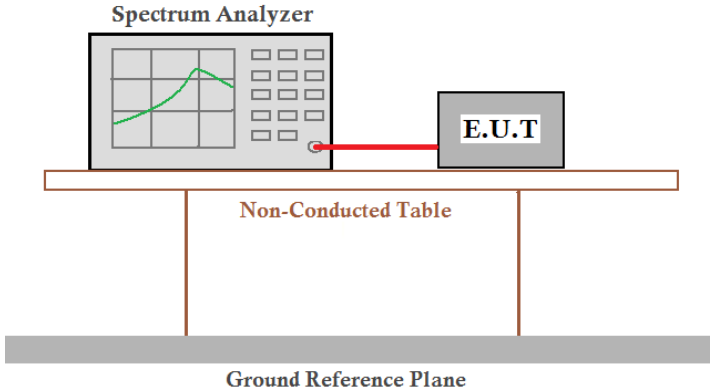
Test CH	Power Spectral Density (dBm)	Limit(dBm)	Result
Lowest	-20.19	8.00	Pass
Middle	-18.40		
Highest	-18.15		

Test plots as follow:

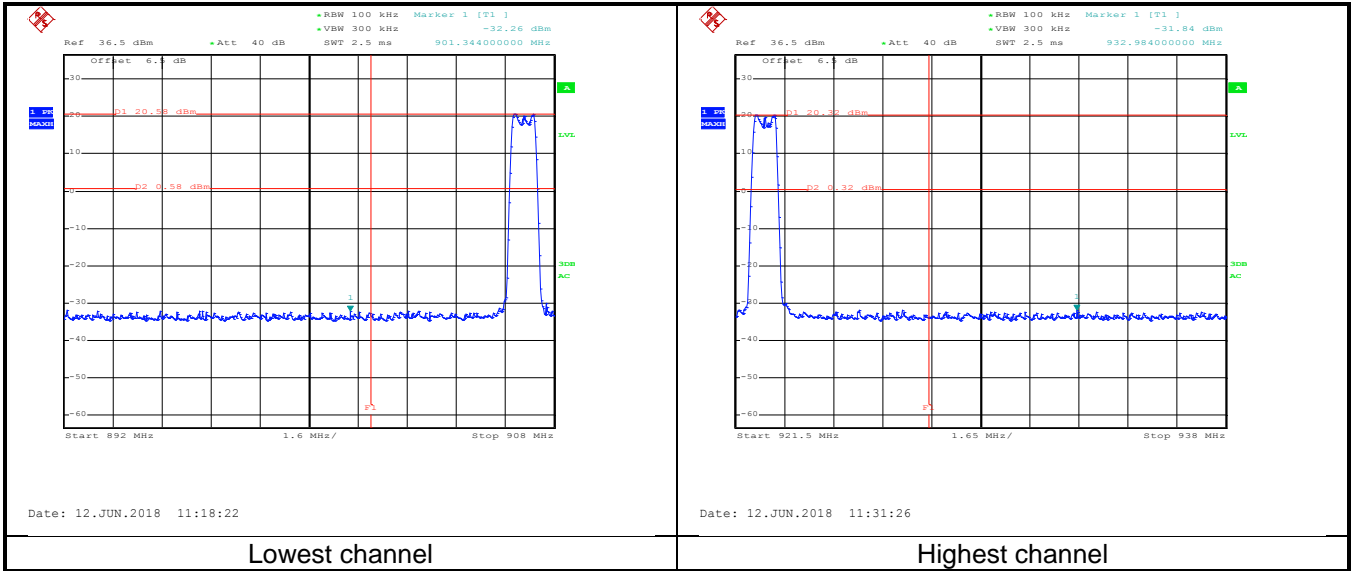


6.6 Band Edge

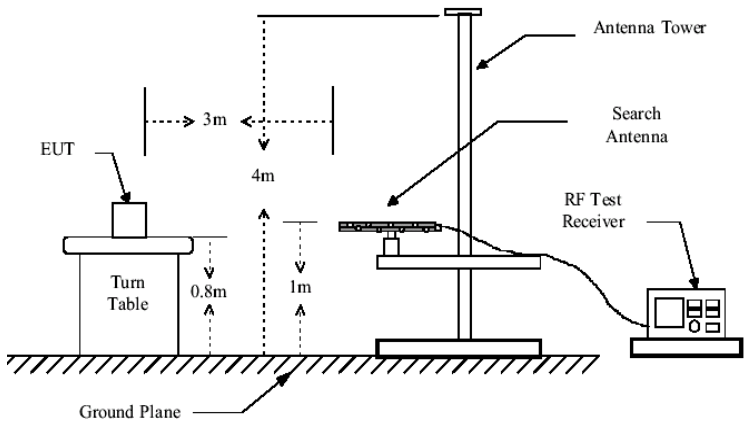
6.6.1 Conducted Emission Method

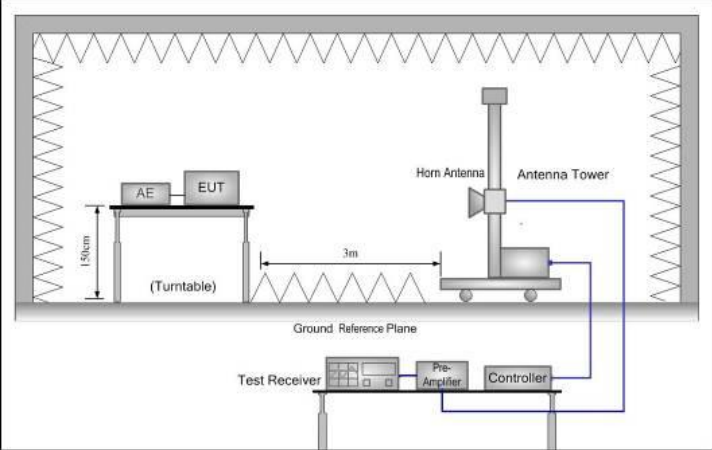
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB 558074
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at 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.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plots as follow:



6.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013and KDB 558074				
Test Frequency Range:	960MHz to 1.240GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	960MHz-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	
	960MHz-1GHz	54.00		Quasi-peak Value	
	Above 1GHz	54.00		Average Value	
74.00		Peak Value			
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the groundat a 3 meter chamber. The table was rotated 360 degrees todetermine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower. 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. For each suspected emission, the EUT was arranged to its worst case and thenthe antenna was tuned to heights from 1 meter to 4 meters and the rotatablewas turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and SpecifiedBandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limitspecified, then testing could be stopped and the peak values of the EUT wouldbe reported. Otherwise the emissions that did not have 10dB margin would bere-tested one by one using peak, quasi-peak or average method as specified andthen reported in a data sheet. 				
Test setup:	<p>Below 1GHz</p>  <p>Above 1GHz</p>				

	
<p>Test Instruments:</p>	<p>Refer to section 5.8 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Passed</p>

Below 1GHz:

Test channel: Lowest channel	
Test Polarization: Horizontal	

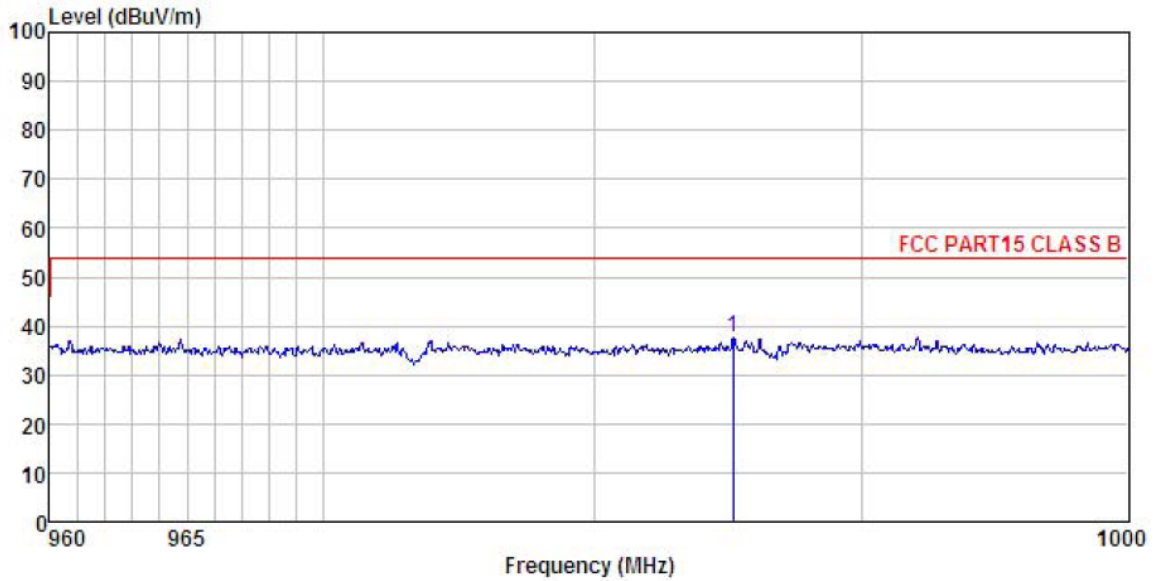
Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) HORIZONTAL
 EUT : Wireless transceiver module
 Model : E90-DTU
 Test mode : 922.5MHz mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Zora
 Remark :

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Limit	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 984.728	12.55	22.68	4.39	0.00	39.62	54.00	-14.38

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



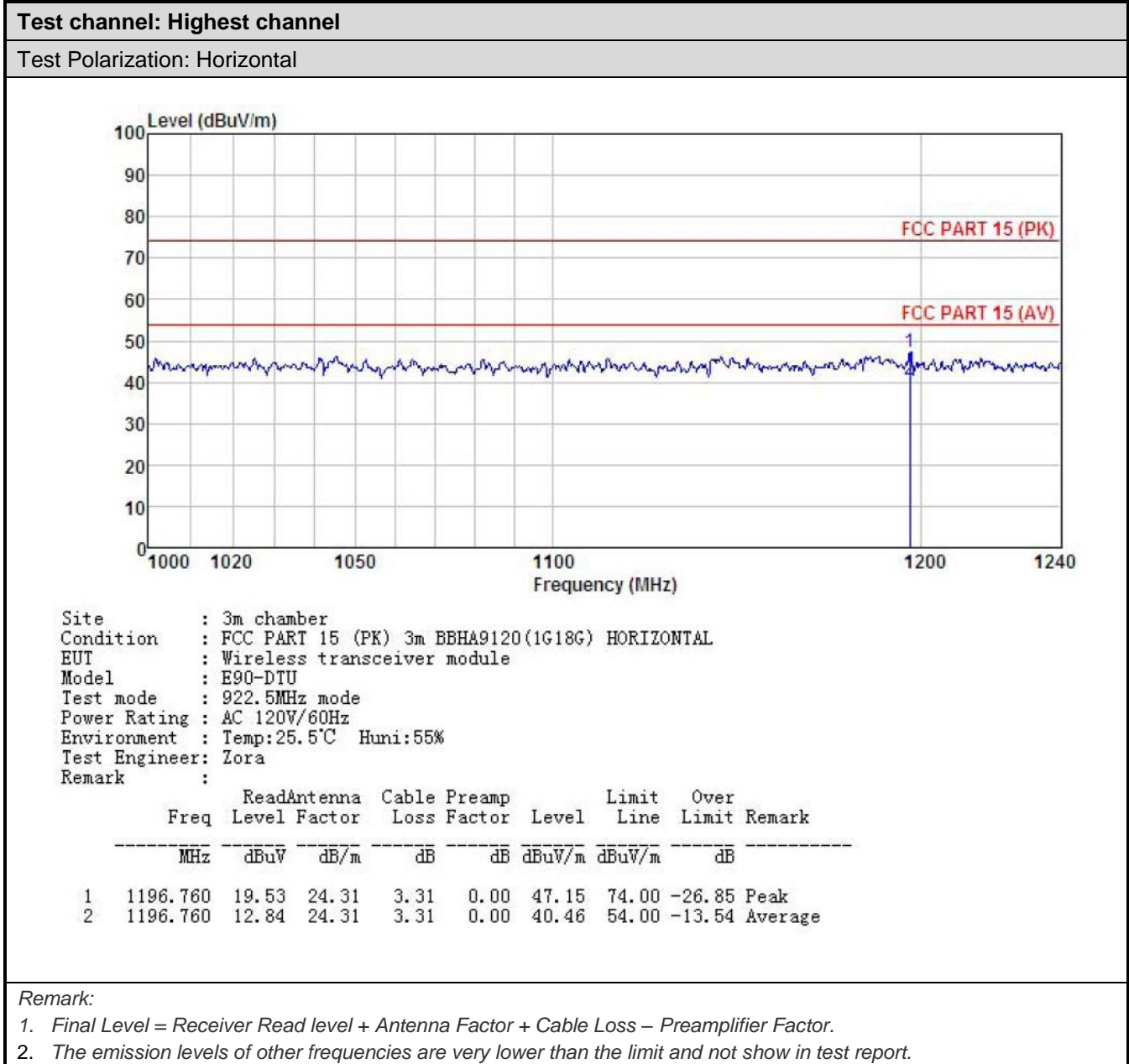
Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) VERTICAL
 EUT : Wireless transceiver module
 Model : E90-DTU
 Test mode : 922.5MHz mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Zora
 Remark :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
-----MHz	-----dBuV	-----dB/m	-----dB	-----dB	-----dBUV/m	-----dBUV/m	-----dB
1	985.170	10.42	22.68	4.39	0.00	37.49	54.00 -16.51

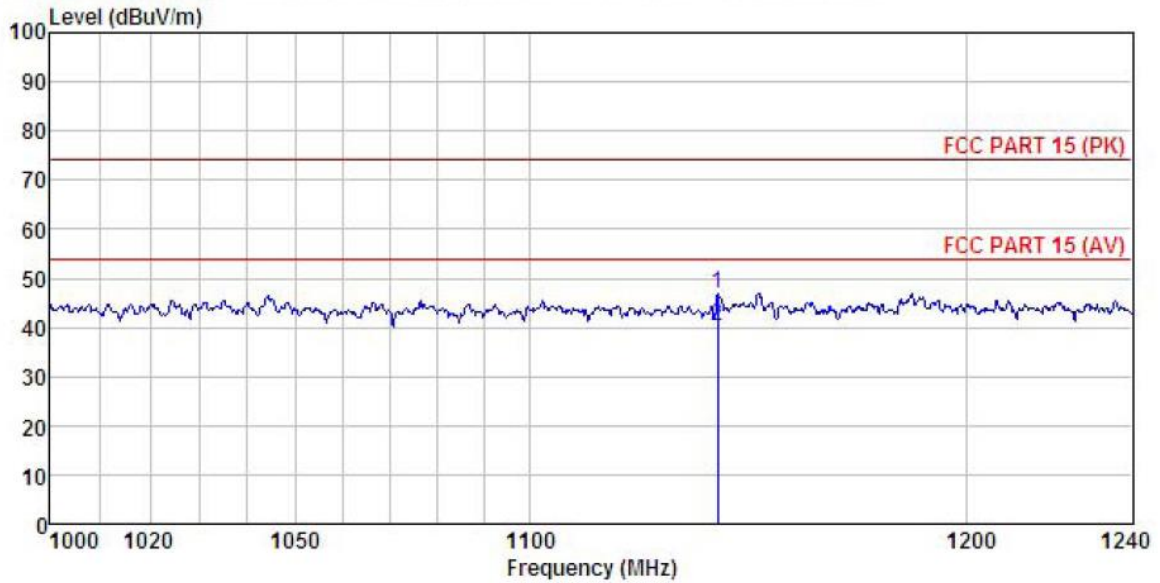
Remark:

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

Above 1GHz:



Test Polarization: Vertical



Site : 3m chamber
 Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
 EUT : Wireless transceiver module
 Model : E90-DTU
 Test mode : 922.5MHz mode
 Power Rating : AC 120V/60Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Zora
 Remark :

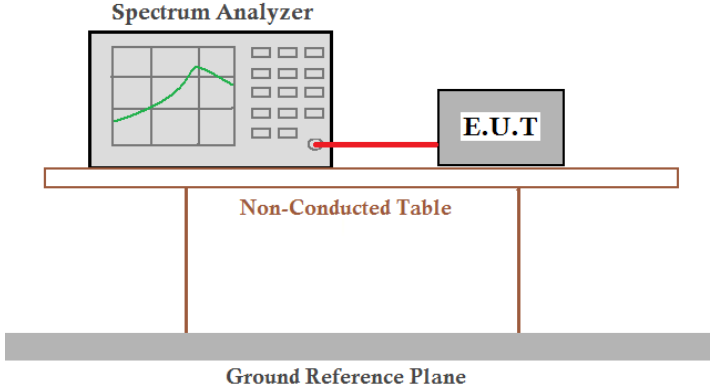
	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1141.934	19.62	24.12	3.23	0.00	46.97	74.00 -27.03 Peak
2	1141.934	13.05	24.12	3.23	0.00	40.40	54.00 -13.60 Average

Remark:

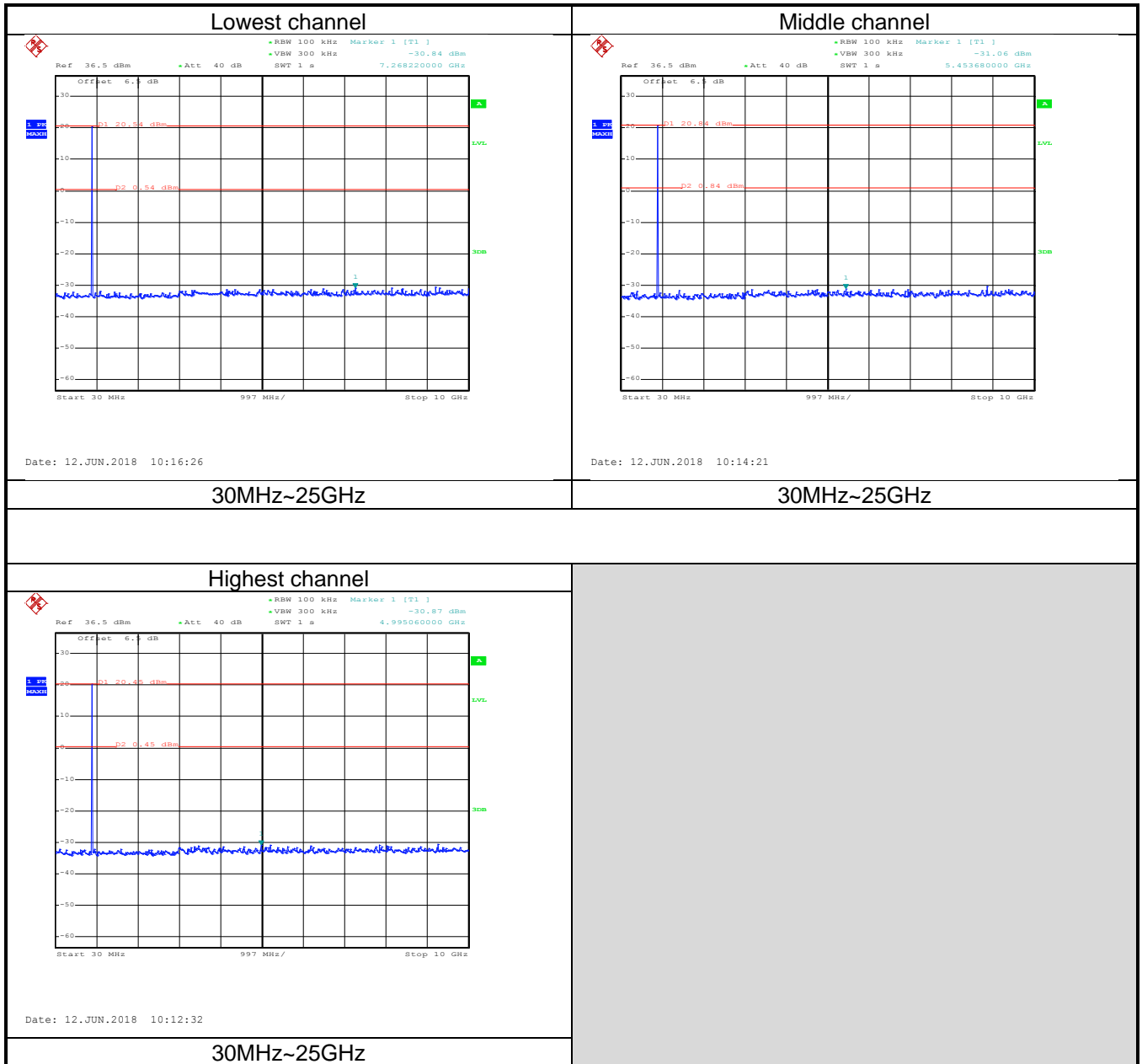
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.7 Spurious Emission

6.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 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.
Test setup:	 <p>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 two legs. Below the table is a Ground Reference Plane.</p>
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:

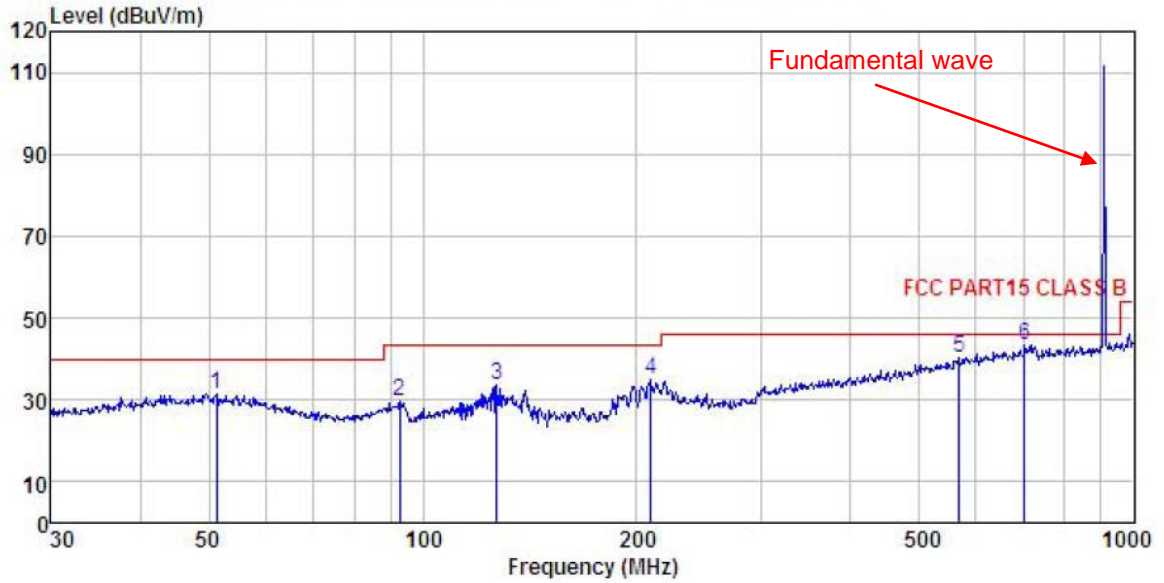


6.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9KHz to 25GHz				
Test site:	Measurement 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:	<ol style="list-style-type: none"> 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 rotating 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. 				

**Measurement Data (worst case):
Below 1GHz:**

Test Polarization: Horizontal



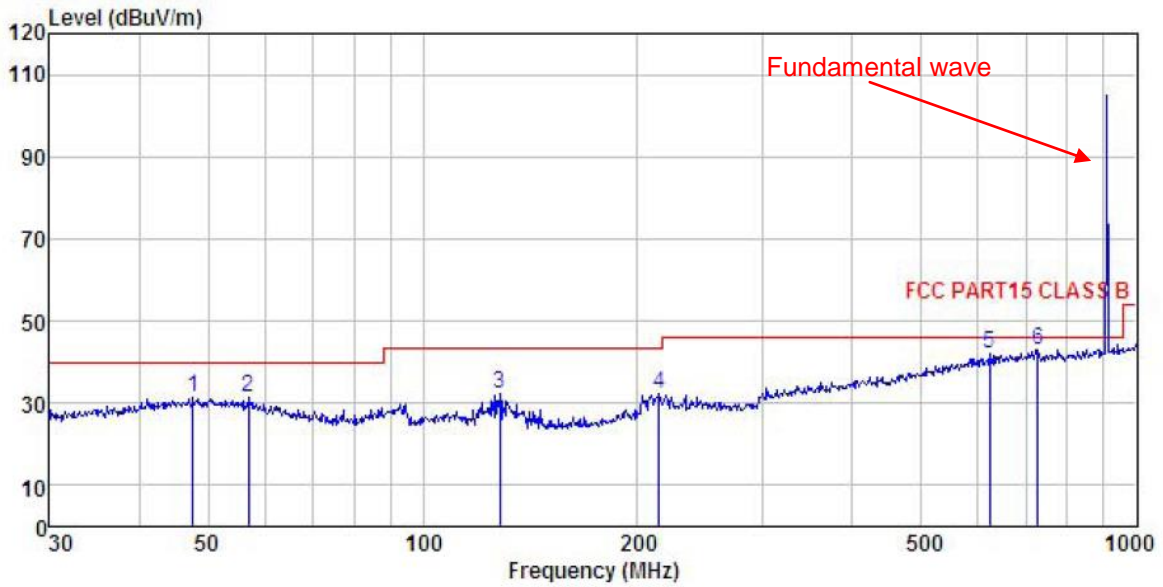
Site : 3m chamber
 Condition : FCC PART15 CLASS B 3m VULB9163(30M2G) HORIZONTAL
 EUT : Wireless transceiver module
 Model : E90-DTU
 Test mode : TX Mode
 Power Rating : AC 230V/50Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Zora
 REMARK :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	51.301	16.17	13.86	1.27	0.00	31.30	40.00	-8.70	QP
2	92.787	17.22	10.49	2.03	0.00	29.74	43.50	-13.76	QP
3	127.218	22.45	9.11	2.25	0.00	33.81	43.50	-9.69	QP
4	209.313	20.30	11.87	2.86	0.00	35.03	43.50	-8.47	QP
5	568.613	18.00	18.46	3.91	0.00	40.37	46.00	-5.63	QP
6	701.761	19.23	19.84	4.19	0.00	43.26	46.00	-2.74	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
 Model : E90-DTU
 Test mode : TX Mode
 Power Rating : AC 230V/50Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Zora
 REMARK :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	47.659	16.39	13.92	1.27	0.00	31.58	40.00 -8.42 QP
2	56.991	17.05	12.88	1.37	0.00	31.30	40.00 -8.70 QP
3	128.113	20.99	8.97	2.26	0.00	32.22	43.50 -11.28 QP
4	214.514	17.35	12.07	2.85	0.00	32.27	43.50 -11.23 QP
5	622.890	18.57	19.48	3.90	0.00	41.95	46.00 -4.05 QP
6	726.805	18.31	20.45	4.28	0.00	43.04	46.00 -2.96 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.

Above 1GHz

Test channel: Lowest channel								
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
1814.00	50.86	25.05	4.13	41.25	38.79	74.00	-35.21	Vertical
2721.00	50.78	26.35	5.07	41.74	40.46	74.00	-33.54	Vertical
3628.00	46.26	27.72	5.92	41.58	38.32	74.00	-35.68	Vertical
4535.00	48.17	29.47	6.84	42.08	42.40	74.00	-31.60	Vertical
5442.00	50.55	30.54	7.16	41.85	46.40	74.00	-27.60	Vertical
1814.00	52.36	25.10	4.12	41.21	40.37	74.00	-33.63	Horizontal
2721.00	50.47	26.35	5.07	41.74	40.15	74.00	-33.85	Horizontal
3628.00	48.75	27.72	5.92	41.58	40.81	74.00	-33.19	Horizontal
4535.00	49.56	29.47	6.84	42.08	43.79	74.00	-30.21	Horizontal
5442.00	54.74	30.54	7.18	41.85	50.61	74.00	-23.39	Horizontal
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
1814.00	49.69	25.05	4.13	41.25	37.62	54.00	-16.38	Vertical
2721.00	48.57	26.35	5.07	41.74	38.25	54.00	-15.75	Vertical
3628.00	43.26	27.72	5.92	41.58	35.32	54.00	-18.68	Vertical
4535.00	47.25	29.47	6.84	42.08	41.48	54.00	-12.52	Vertical
5442.00	41.24	30.54	7.16	41.85	47.09	54.00	-16.91	Vertical
1814.00	41.28	25.10	4.12	41.21	29.29	54.00	-24.71	Horizontal
2721.00	42.36	26.35	5.07	41.74	32.04	54.00	-21.96	Horizontal
3628.00	43.25	27.72	5.92	41.58	35.31	54.00	-18.69	Horizontal
4535.00	41.57	29.47	6.84	42.08	35.80	54.00	-18.20	Horizontal
5442.00	42.21	30.54	7.18	41.85	38.08	54.00	-15.92	Horizontal

Remark:

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

Test channel: Middle channel								
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
1830.00	50.69	25.05	4.13	41.25	38.62	74.00	-35.38	Vertical
2745.00	51.54	26.35	5.07	41.74	41.22	74.00	-32.78	Vertical
3660.00	46.36	27.72	5.92	41.58	38.42	74.00	-35.58	Vertical
4575.00	48.47	29.47	6.84	42.08	42.70	74.00	-31.30	Vertical
5490.00	51.26	30.54	7.16	41.85	47.11	74.00	-26.89	Vertical
1830.00	50.63	25.10	4.12	41.21	38.64	74.00	-35.36	Horizontal
2745.00	51.42	26.35	5.07	41.74	41.10	74.00	-32.90	Horizontal
3660.00	50.29	27.72	5.92	41.58	42.35	74.00	-31.65	Horizontal
4575.00	48.88	29.47	6.84	42.08	43.11	74.00	-30.89	Horizontal
5490.00	54.75	30.54	7.18	41.85	50.62	74.00	-23.38	Horizontal
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
1830.00	47.56	25.05	4.13	41.25	35.49	54.00	-18.51	Vertical
2745.00	47.92	26.35	5.07	41.74	37.60	54.00	-16.40	Vertical
3660.00	43.22	27.72	5.92	41.58	35.28	54.00	-18.72	Vertical
4575.00	47.57	29.47	6.84	42.08	41.80	54.00	-12.20	Vertical
5490.00	40.69	30.54	7.16	41.85	46.54	54.00	-17.46	Vertical
1830.00	42.36	25.10	4.12	41.21	28.23	54.00	-25.77	Horizontal
2745.00	42.15	26.35	5.07	41.74	31.83	54.00	-22.17	Horizontal
3660.00	42.58	27.72	5.92	41.58	34.64	54.00	-19.36	Horizontal
4575.00	41.96	29.47	6.84	42.08	36.19	54.00	-17.81	Horizontal
5490.00	42.12	30.54	7.18	41.85	37.99	54.00	-16.01	Horizontal

Remark:

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

Test channel: Highest channel								
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
1845.00	51.23	24.95	4.17	41.31	39.04	74.00	-34.96	Vertical
2767.50	50.14	26.50	5.10	41.70	40.04	74.00	-33.96	Vertical
3690.00	46.69	27.84	5.98	41.66	38.85	74.00	-35.15	Vertical
4612.50	48.55	29.90	6.89	42.12	43.22	74.00	-30.78	Vertical
5535.00	50.45	30.50	7.24	41.81	46.38	74.00	-27.62	Vertical
1845.00	51.75	24.95	4.17	41.31	39.56	74.00	-34.44	Horizontal
2767.50	51.26	26.50	5.10	41.70	41.16	74.00	-32.84	Horizontal
3690.00	49.69	27.84	5.98	41.66	41.85	74.00	-32.15	Horizontal
4612.50	48.57	29.90	6.89	42.12	43.24	74.00	-30.76	Horizontal
5535.00	54.12	30.50	7.24	41.81	50.05	74.00	-23.95	Horizontal
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
1845.00	48.55	24.95	4.17	41.31	36.36	54.00	-17.64	Vertical
2767.50	47.12	26.50	5.10	41.70	37.02	54.00	-16.98	Vertical
3690.00	41.22	27.84	5.98	41.66	33.38	54.00	-20.62	Vertical
4612.50	47.53	29.90	6.89	42.12	42.20	54.00	-11.80	Vertical
5535.00	46.56	30.50	7.24	41.81	42.49	54.00	-11.51	Vertical
1845.00	41.36	25.10	4.12	41.21	29.37	54.00	-24.63	Horizontal
2767.50	43.55	26.35	5.07	41.74	33.23	54.00	-20.77	Horizontal
3690.00	41.57	27.72	5.92	41.58	33.63	54.00	-20.37	Horizontal
4612.50	42.92	29.47	6.84	42.08	37.15	54.00	-16.85	Horizontal
5535.00	41.78	30.54	7.18	41.85	37.65	54.00	-16.35	Horizontal
<p>Remark:</p> <ol style="list-style-type: none"> Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor. The emission levels of other frequencies are very lower than the limit and not show in test report. 								