REPORT No. : SZ16070156W01

FCC RF TEST REPORT

APPLICANT	:	Vitalwell Electronics (Zhuhai) Pte.Ltd.
PRODUCT NAME	:	VW320BT-485 BusBeacon Transmitter
MODEL NAME	:	VW320BT-485
TRADE NAME	:	Vitalwell
BRAND NAME	:	Vitalwell
FCC ID	:	2AJJTVW320-BBT
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2016-08-26

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

MORLAB GROUP
FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.com E-mail: service@morlab.cn

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2016-08-26	First edition

TEST REPORT DECLARATION

Applicant	Vitalwell Electronics (Zhuhai) Pte.Ltd.
Applicant Address	Blk D3#415/416, Southern Software Park, Tangjia, Zhuhai, GuangDong, China
Manufacturer	Vitalwell Electronics (Zhuhai) Pte. Ltd.
Manufacturer Address	Blk D3#415/416, Southern Software Park, Tangjia, Zhuhai, Guangdong, China
Product Name	VW320BT-485 BusBeacon Transmitter
Model Name	VW320BT-485
Brand Name	Vitalwell
HW Version	1.1
SW Version	1.21A
Test Standards	47 CFR Part 15 Subpart C
Test Date	2016-08-01 to 2016-08-09
Test Result	PASS

Tested by : Zou Jian

Zou Jian

Reviewed by : Qiu Xiaojun

Qiu Xiaojun

Approved by : Peng Huarui

Peng Huarui

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Vitalwell Electronics (Zhuhai) Pte.Ltd.
Address:	Blk D3#415/416, Southern Software Park, Tangjia, Zhuhai, GuangDong, China

1.2 Equipment under Test (EUT) Description

Brand Name:	Vitalwell
Trade Name:	Vitalwell
Model Name:	VW320BT-485, VW320TSBR
Frequency Range:	The frequency used is 446.28MHz
Modulation Type:	FSK
Antenna Type:	SMA Antenna
Antenna Gain:	2.0dBi

1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
A01	1.1	1.21A

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15(10-1-13 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.203	Antenna Requirement	**PASS**
2	15.231(a)(1)	Release Time measurement	**PASS**
3	15.231(c)	20dB Bandwidth	**PASS**
4	15.207	Conducted Emission	**PASS**
5	15.231(b)&15.209(a)	Radiated Emission	**PASS**

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

1.3.1 Test Environment Conditions

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

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2 **Result:** Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

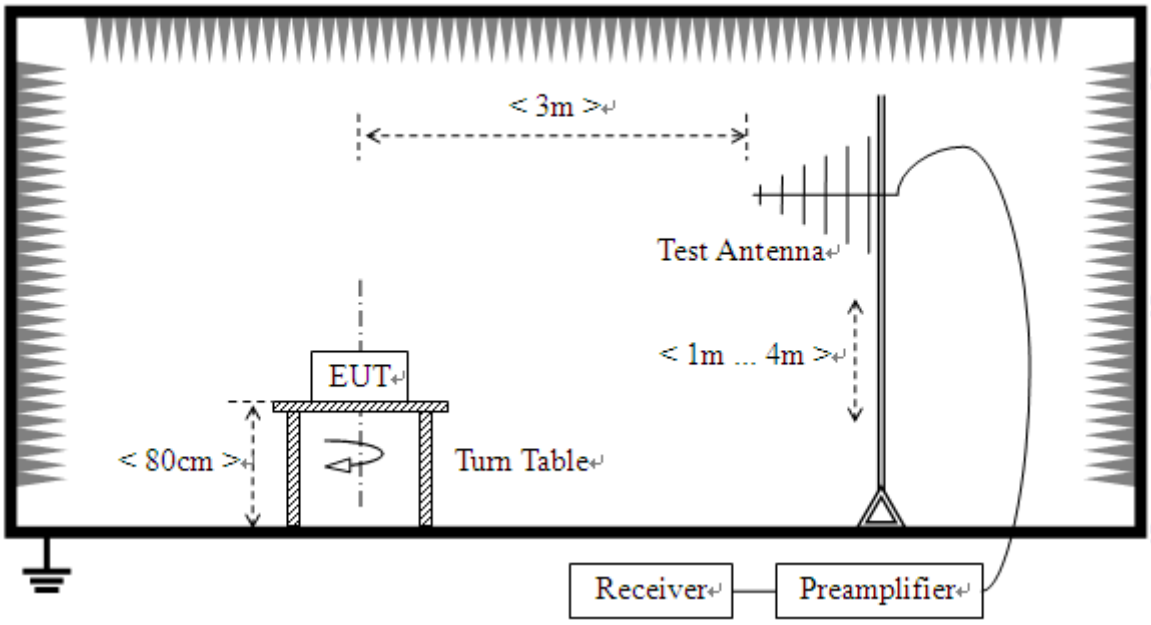
2.2 Release Time measurement

2.2.1 Requirement

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

2.2.2 Test Description

A. Test Setup:



B. Test procedure:

Set SPA Center Frequency=Fundamental frequency, RBW=1MHz, VBW=3MHz, Span=0Hz, Sweep time=10s.

Set EUT as normal operation and press Transmitter button.

Set SPA View. Delta Mark time.

C. Equipments List:

Please reference ANNEX A(1.5).

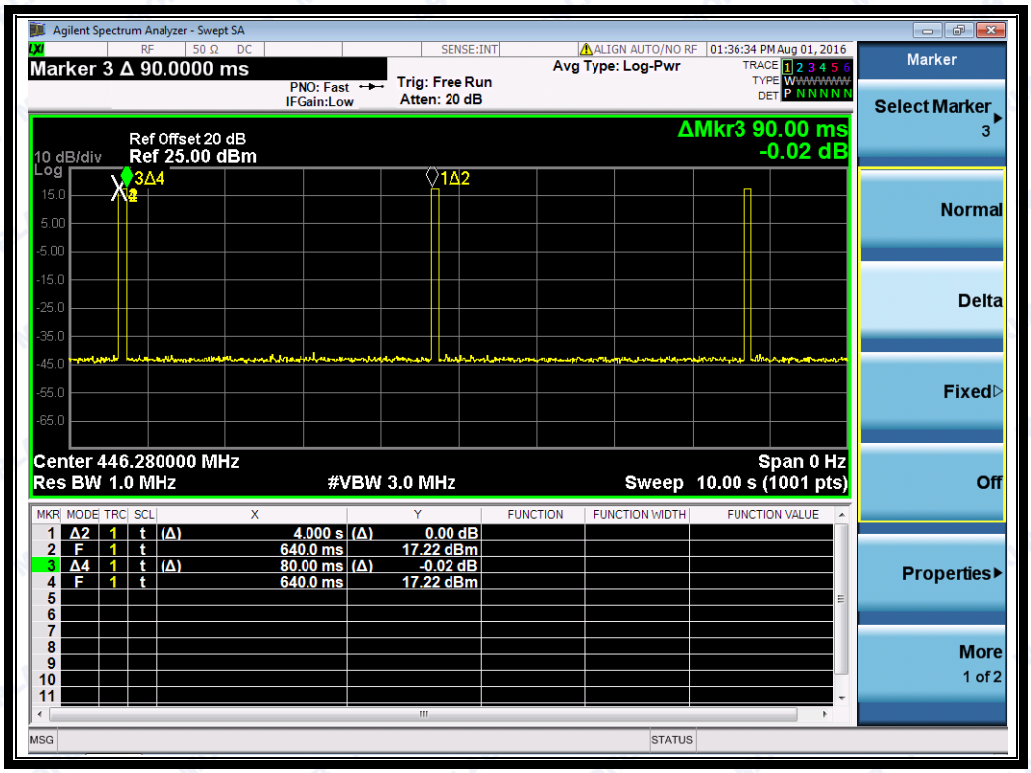
2.2.3 Test Result

The frequency(446.28MHz) is selected to perform testing to verify the radiated release time measurement of the Module.

A. Test Verdict:

Frequency (MHz)	Release Time	Limit	Verdict
446.28	80ms	5S	PASS

B. Test Plots:



(Plot A)

2.3 20dB Bandwidth

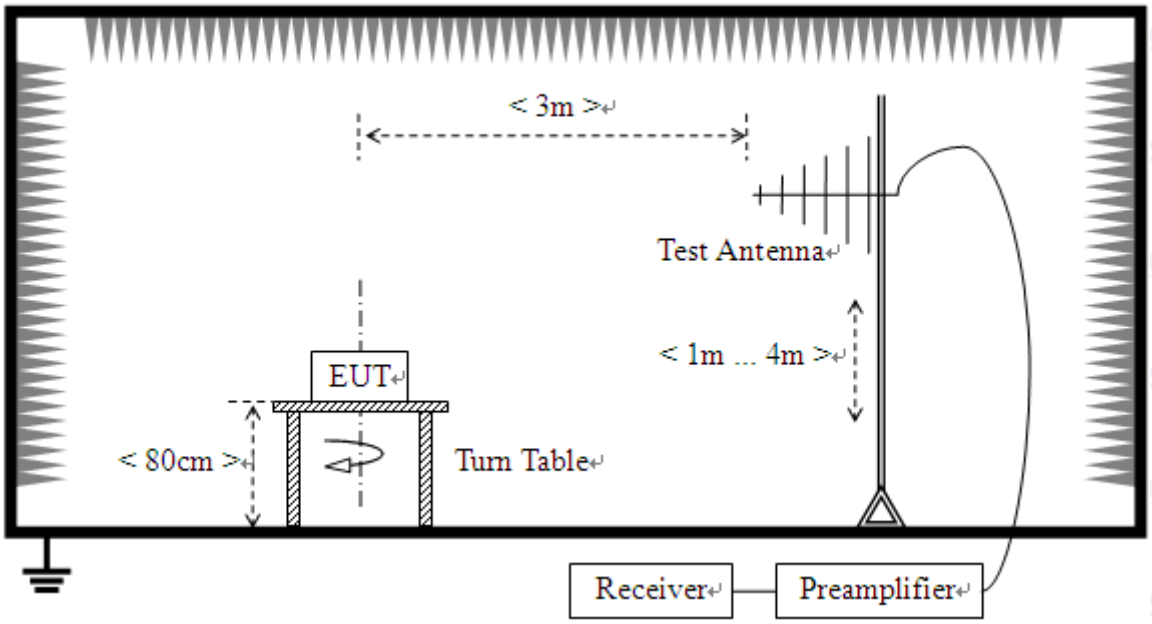
2.3.1 Requirement

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

As the center frequency for the device operating is 446.28MHz, thus, the 20dB bandwidth limit is 1115.7KHz.

2.3.2 Test Description

A. Test Set:



B. Test procedure:

Set spectrum analyzer's Center Frequency =Fundamental frequency, RBW,VBW and span to applicable value with Peak in Max Hold, A PEAK output reading and 20db Bandwidth function in spectrum analyzer were taken.

C. Equipments List:

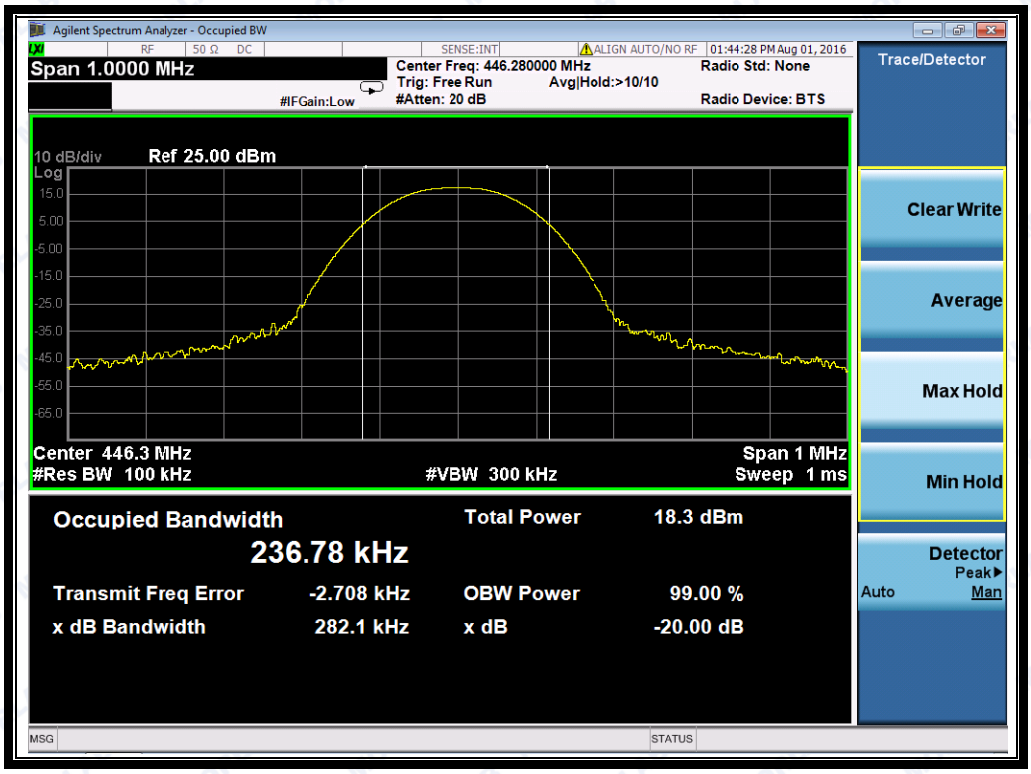
Please reference ANNEX A(1.5).

2.3.3 Test Result

A. Test Verdict:

Frequency (MHz)	20dB Bandwidth (MHz)	Limits(kHz)	Result
446.28	0.2821	1115.7	PASS

B. Test Plots:



20dB Bandwidth

2.4 Conducted Emission

2.4.1 Requirement

According to FCC section 15.207, for an intentional radiator 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

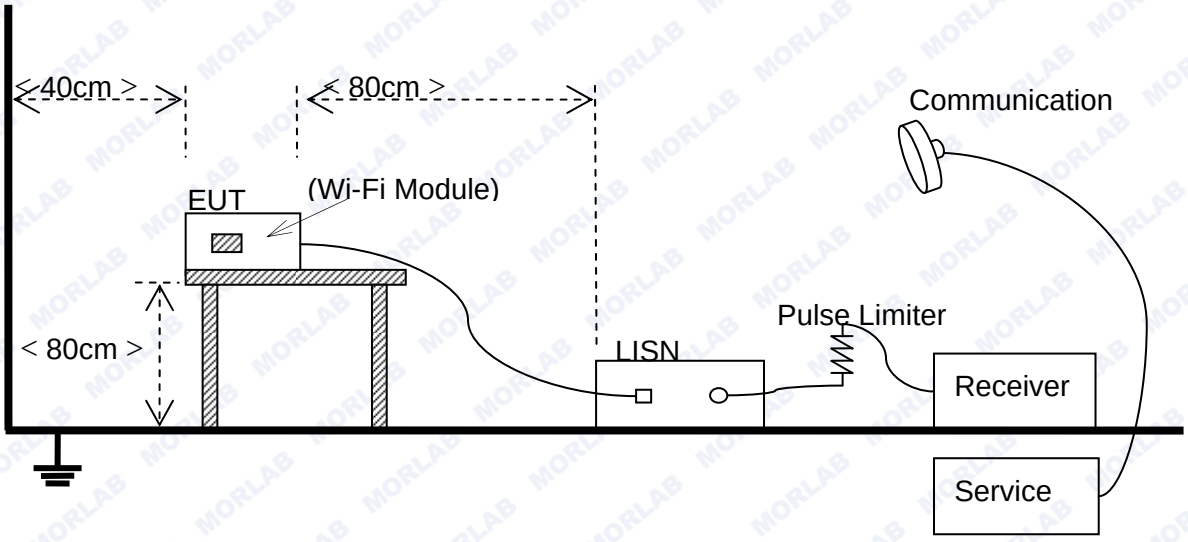
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.4.2 Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10:2013

B. Equipments List:

Please reference ANNEX A(1.5).

2.4.3 Test Result

This test case not applies this kind of EUT.

2.5 Radiated Emission

2.5.1 Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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

FCC Part 15.231(b)

Fundamental frequency(MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission(microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750	125 to 375
174-260	3750	375
260-47	3750 to 12500	375 to 1250
Above 470	12500	1250

[1] Linear interpolations.

Note:

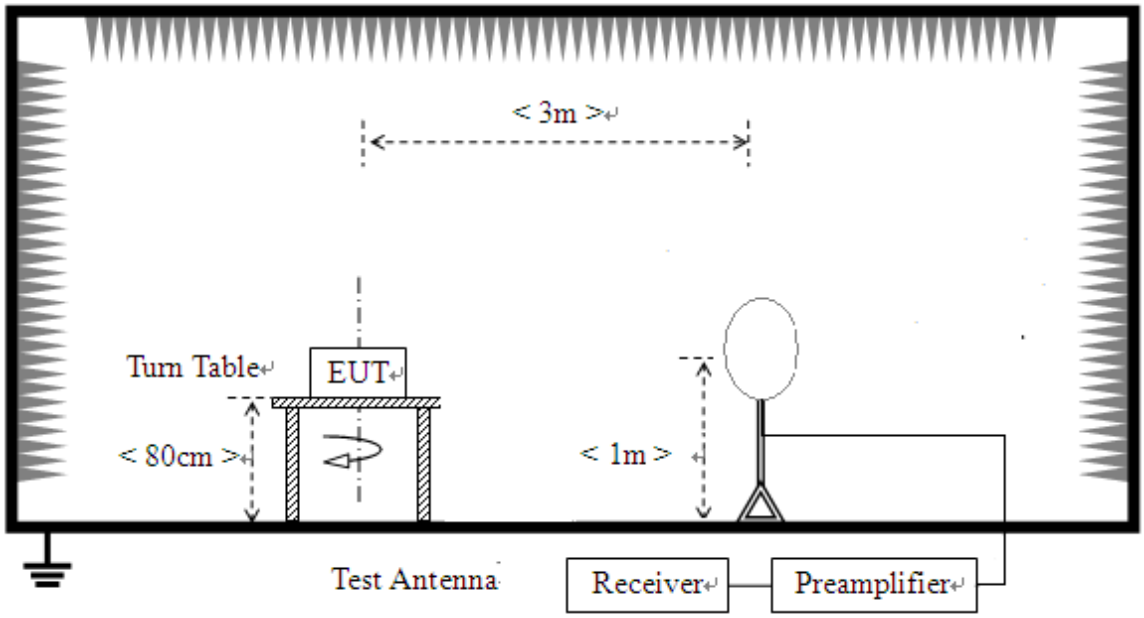
For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

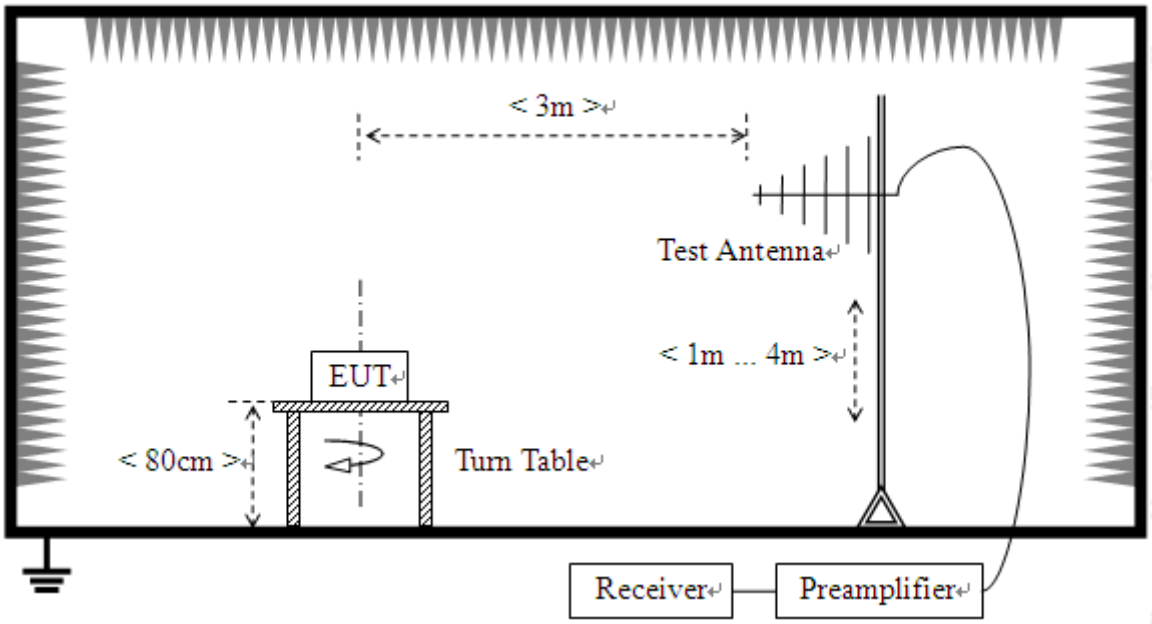
2.5.2 Test Description

A. Test Setup:

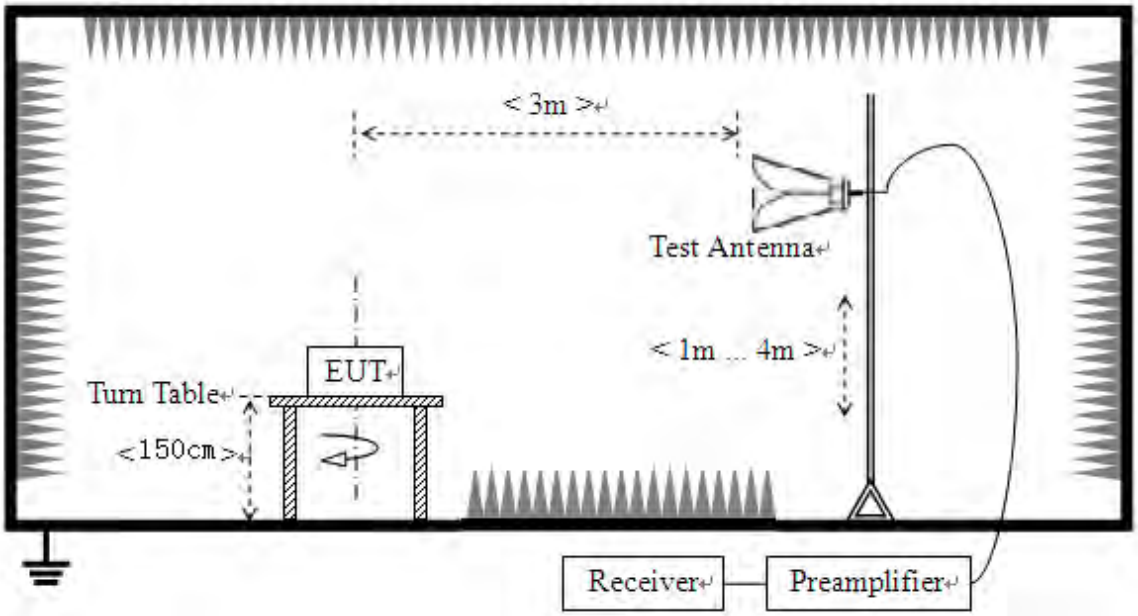
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:
(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:
Please reference ANNEX A(1.5).

2.5.3 Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]$-G_{preamp}$ [dB]

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

Final Emission_PK=E(peak)

Final Emission_AV=E+AV factor.

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Field strength of fundamental，Verdict：Pass

Frequency (MHz)	PK_{read}	Cable Loss	ANT_{factor} (dB)	Final Emission_PK (dBuV/m)	AV factor (dB)	Final Emission_AV (dBuV/m)	Limit-AV (dBuV/m)
446.28	106.58	-35.4	16.21	87.39	-33.98	53.41	81.22

Field strength of spurious emission：

Frequency (MHz)	Final Emission_PK (dBuV/m)	AV factor(dB)	Final Emission_AV (dBuV/m)	Limit-AV (dBuV/m)	Antenna	Verdict
892.330	38.01	-33.98	4.03	61.22	Horizontal	PASS
1338.667	44.45	-33.98	10.47	61.22	Horizontal	PASS
2330.667	44.02	-33.98	10.04	61.22	Horizontal	PASS
3056.960	45.29	-33.98	11.31	61.22	Horizontal	PASS
828.310	27.92	-33.98	-6.06	61.22	Vertical	PASS
1338.667	44.11	-33.98	10.13	61.22	Vertical	PASS
1899.200	40.63	-33.98	6.65	61.22	Vertical	PASS
2792.000	44.80	-33.98	10.82	61.22	Vertical	PASS

Note 1: The above table only shows the frequency which peak emission exceed the average limit. The peak data of other frequencies are all below the average limit(please refer to the test graph in following pages), so the average data of other frequencies are deems to fulfill the average limits and not reported.

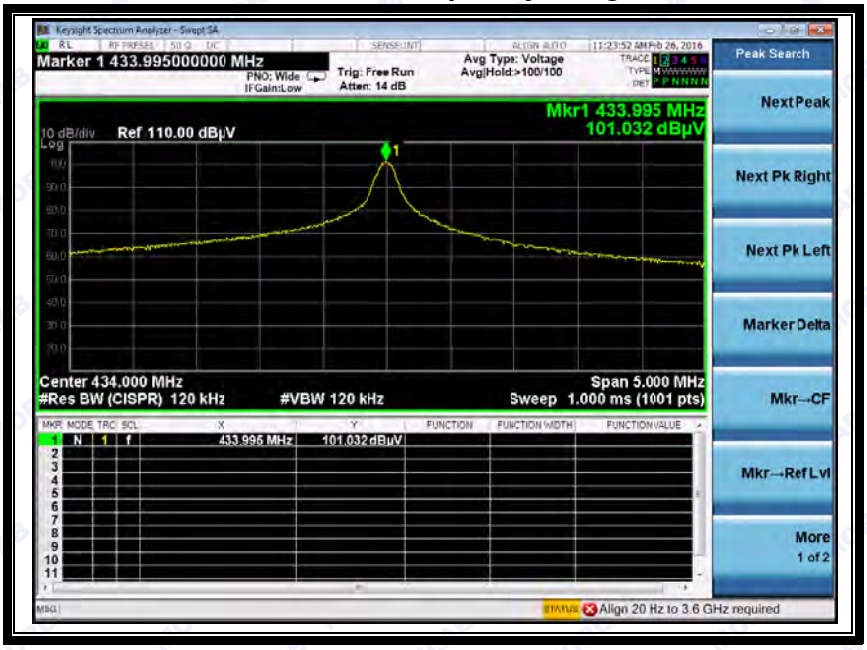
Note 2: The emission below 30MHz are not reported for they are much lower than the limits

Note 3: The duty cycle is simply the on-time divided by the period:

The duration of one cycle	3.76s
Effective period of the cycle	0.08s
Duty cycle	0.02

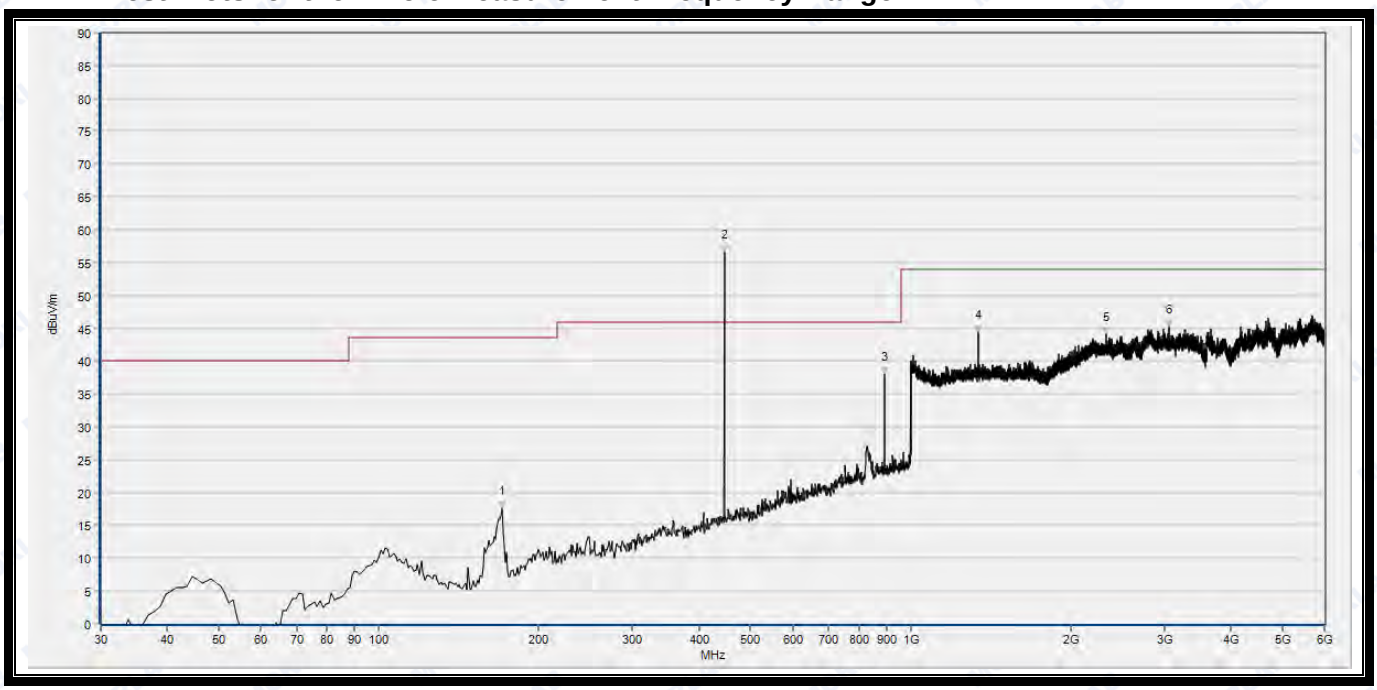
Therefore, the average factor is found by 20log(Duty cycle)=-33.98

A. Test Plots for the Whole Measurement Frequency Range: Antenna factor



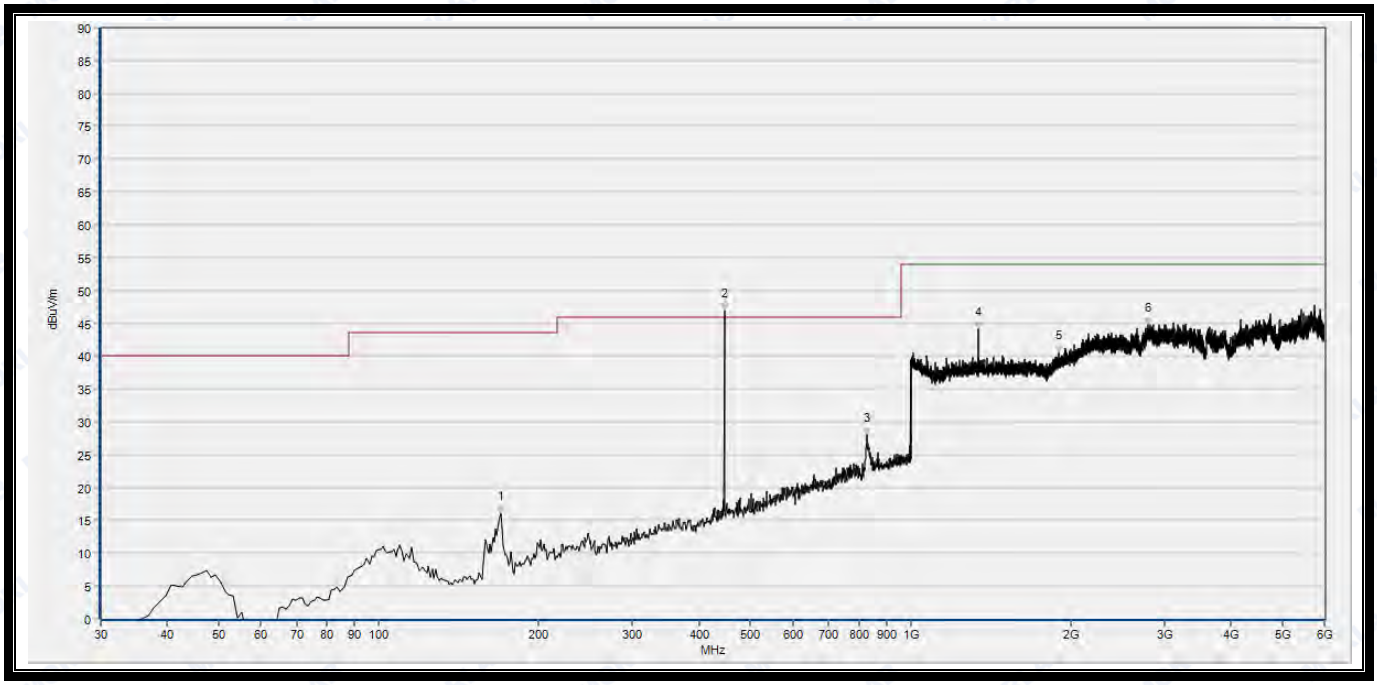
(Permissible Field Strengths)

B. Test Plots for the Whole Measurement Frequency Range:



(Antenna Horizontal, 30MHz to 5GHz)

Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
170.650	17.55	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
446.280	56.67	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
892.330	38.01	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1338.667	44.45	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2330.667	44.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3056.960	45.29	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS



(Antenna Vertical, 30MHz to 5GHz)

Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
169.680	16.12	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
446.280	46.96	N.A	N.A	N.A	46.00	N.A	Horizontal	N.A
828.310	27.92	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1338.667	44.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
1899.200	40.63	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2792.000	44.80	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

1.3 Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2013 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Maximum measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Measurements	**Frequency**	**Uncertainty**
Conducted emissions	9KHz~30MHz	2.44dB
Radiated emissions	9KHz~30MHz	2.44dB
	30MHz~200MHz	2.93dB
	200MHz~1000MHz	2.95dB
	1GHz~18GHz	2.26dB
	18GHz~40GHz	1.94dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

1.5 Test Equipments Utilized

1.5.1 Radiated Test Equipments

Radiated Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	System Simulator	GB45360846	8960-E5515C	Agilent	2016.03.02	2017.03.01
2	Receiver	MY54130016	N9038A	Agilent	2016.03.02	2017.03.01
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2016.03.02	2017.03.01
4	Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2016.03.02	2017.03.01
5	Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2016.03.02	2017.03.01
6	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2016.03.02	2017.03.01
7	Coaxial cable(N male)	CB02	EMC02	Morlab	N/A	N/A
8	Coaxial cable(N male)	CB03	EMC03	Morlab	N/A	N/A
9	1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01
10	18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01

1.5.2 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2016.03.02	2017.03.01

1.5.3 Vibration Table

Vibration Table						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Vibration Table	N/A	ACT2000-S015L	CMI-COM	2016.03.02	2017.03.01

1.5.4 Anechoic Chamber

Anechoic Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6m	Changning	2016.03.02	2017.03.01

1.5.5 Auxiliary Test Equipment

Auxiliary Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Computer	N.A	PU500C	Asus	N.A	N.A

***** END OF REPORT *****