REPORT No.: SZ18080155W01

TEST REPORT

APPLICANT	:	Vaultek Safe, Inc.
PRODUCT NAME	:	Smart key Nano
MODEL NAME	:	VSK-N
BRAND NAME	:	VAULTEK
FCC ID	:	2AONI-PRO-VSKN01
STANDARD(S)	:	47 CFR Part 15 Subpart C
TEST DATE	:	2018-09-05
ISSUE DATE	:	2018-09-07

Tested by: Ya Xinhou

Ya Xinhou (Test Engineer)

Approved by: Peng Huarui

Peng Huarui (Supervisor)

MORLAB

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DIRECTORY

Change History		
Issue	**Date**	**Reason for change**
1.0	2018-09-07	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Vaultek Safe, Inc.
Applicant Address:	37 N Orange Ave.Suite 800B Orlando, FL 32801,United States
Manufacturer:	Jeritech Electronics, Ltd.
Manufacturer Address:	Guannanyong Industrial Estate, Shiqi Town, Panyu, GuangZhou, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Smart key Nano
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	R12
Software Version:	R12
Modulation Type:	ASK
Operating Frequency:	433.92MHz
Channel Number:	1
Antenna Type:	PCB Antenna
Antenna Gain:	1.36 dBi

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

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 (10-1-15 Edition)	Radio Frequency Devices

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

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.231(a)(1)	The Max Transmission Time	Sep 05, 2018	Ya Xinhou	PASS
3	15.231(c)	20dB Bandwidth	Sep 05, 2018	Ya Xinhou	PASS
4	15.207	Conducted Emission	N/A	N/A	N/A Note1
5	15.231(b) 15.209(a)	Radiated Emission	Sep 05, 2018	Ya Xinhou	PASS

Note 1: Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.
Note 2: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013.

1.4. Environmental 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.

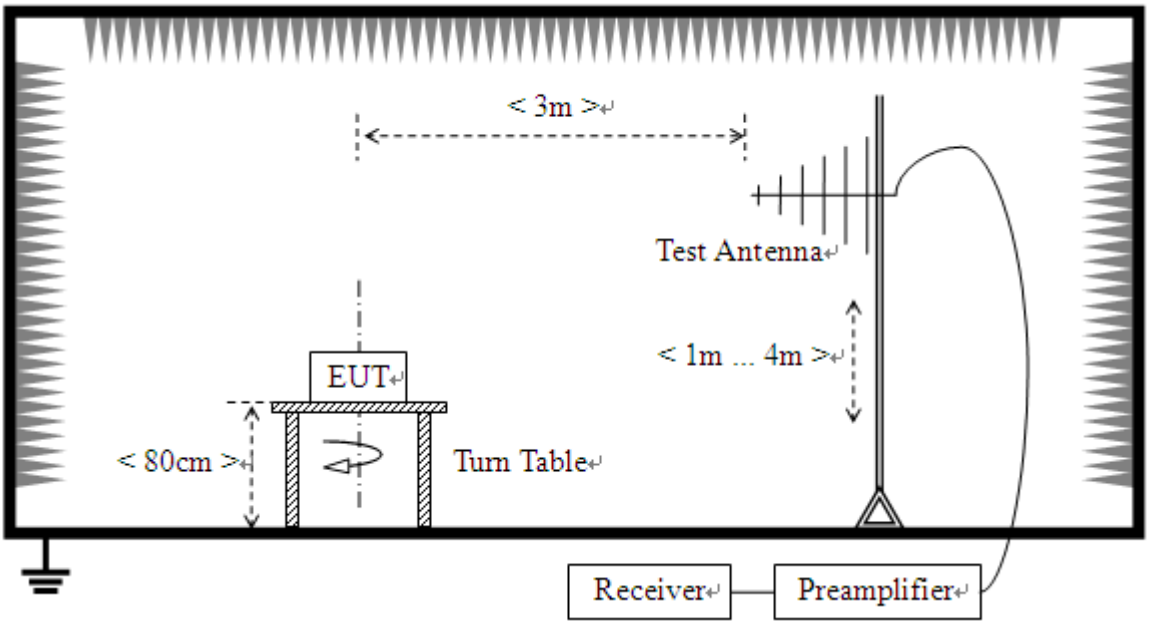
2.2. The Max Transmission Time

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:



2.2.3. Test procedure

Set the SPA Center Frequency=Fundamental frequency,

RBW=100 kHz, VBW=300KHz, Span=0Hz, Sweep time=10s.

Set EUT as normal operation and press Transmitter button.

Set the SPA View. Delta Mark time.

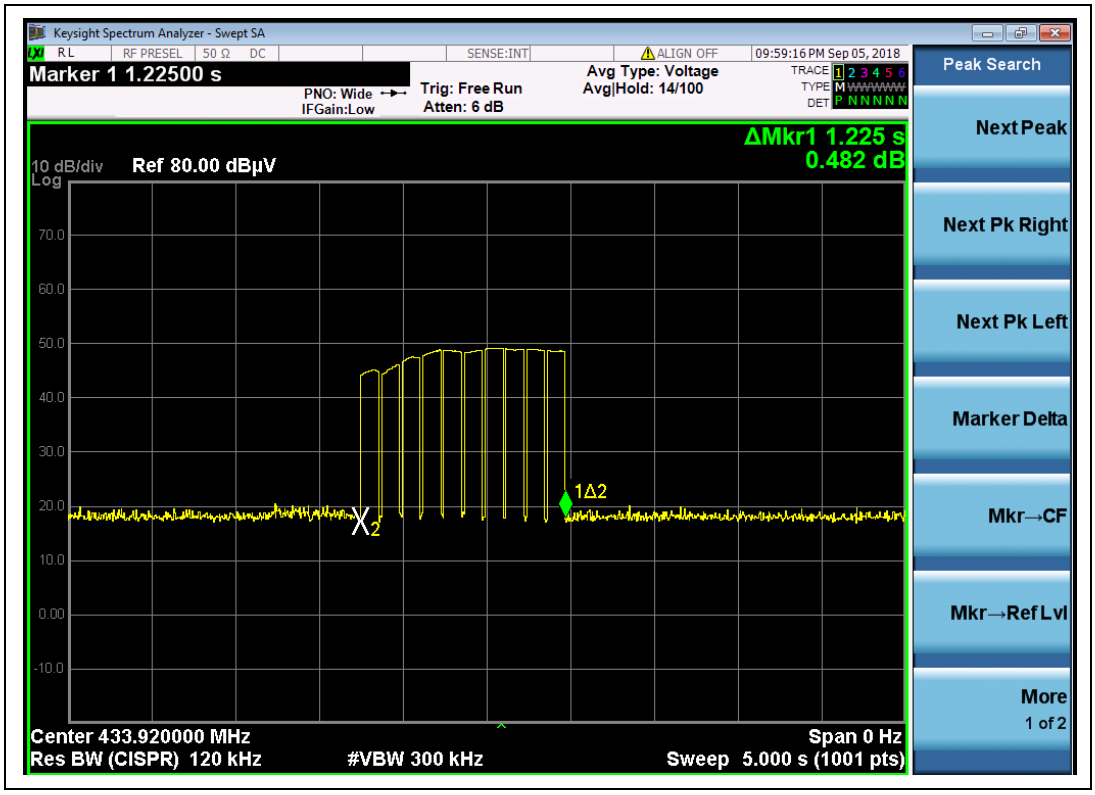
2.2.4. Test Result

The frequency(433.92MHz) is selected to perform testing to verify the radiated max transmission time of the EUT.

A. Test Verdict:

Frequency (MHz)	The max transmission time	Limit	Verdict
433.92	1225 ms	≤5000ms	PASS

B. Test Plots:



(The max transmission time _433.92MHz)

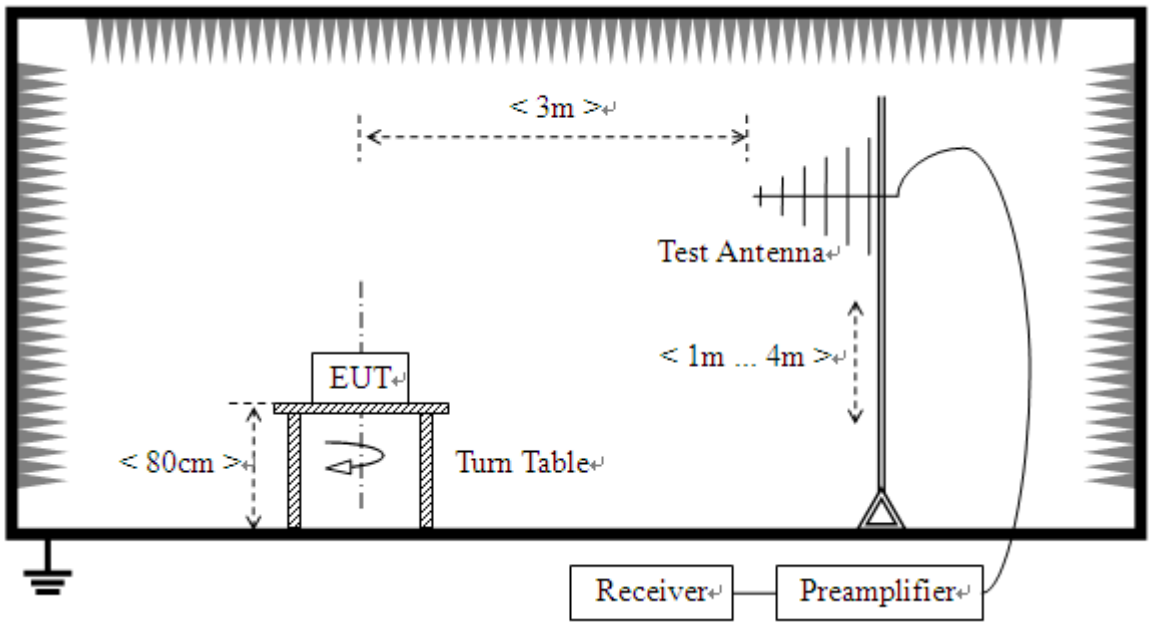
2.3. 20dB Bandwidth

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 433.92MHz, thus, the 20dB bandwidth limit is 1085 kHz.

2.3.2. Test Description

A. Test Set:



2.3.3. 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.

2.3.4. Test Result

The lowest, middle and highest channels are selected to perform testing to record the 20 dB bandwidth of the module.

A. Test Verdict:

Frequency (MHz)	20 dB Bandwidth (MHz)	Limits(MHz)	Result
433.92	0.34	≤1.085	PASS

B. Test Plots:

(Bandwidth_433.92MHz)

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

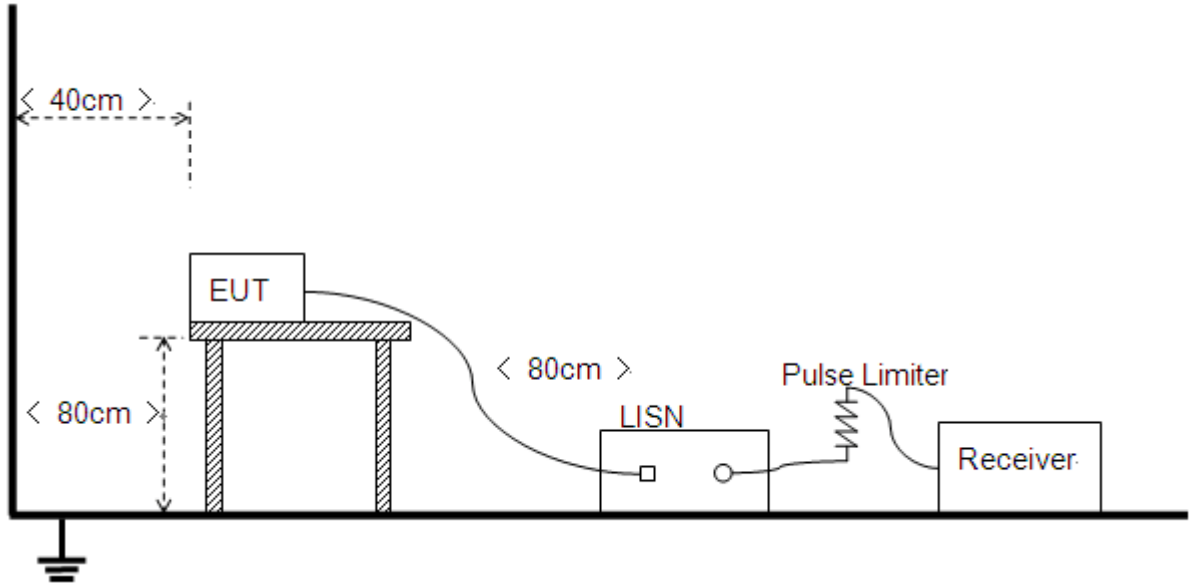
NOTE:

(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

A. Test setup:

N/A

B. Test Plots:

N/A

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

Note:

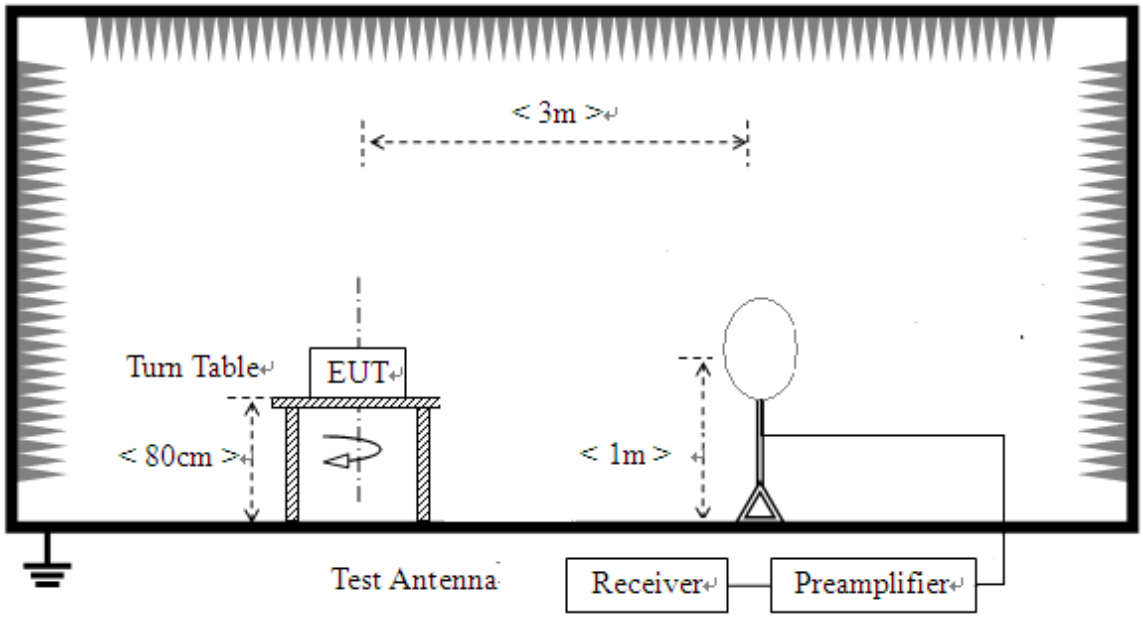
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

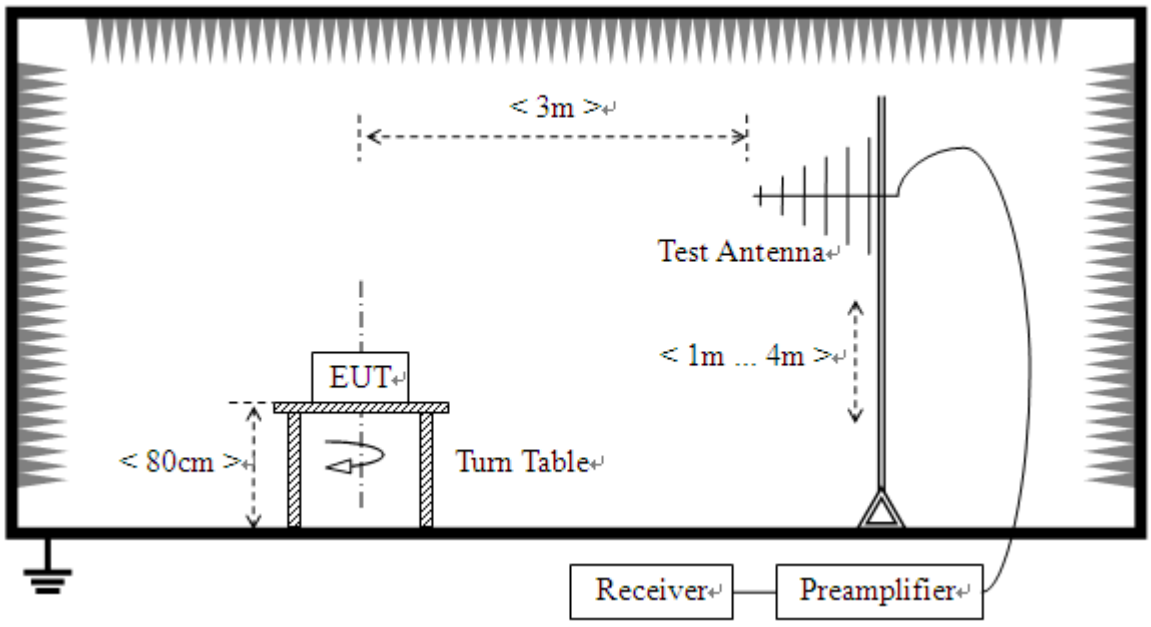
2.5.2. Test Description

A. Test Setup:

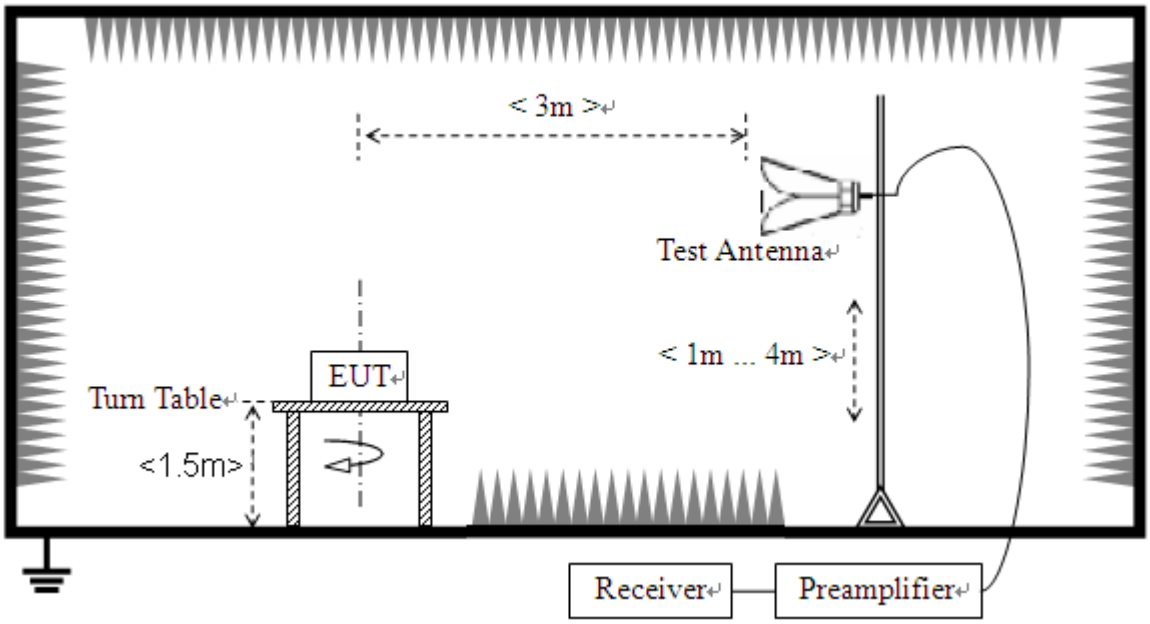
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10:2013. For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, for radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10:2013.

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. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant

emissions, with polarization oriented for maximum response. The test antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 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 C63.10, 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:

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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

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

Note1: 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.

Note2: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

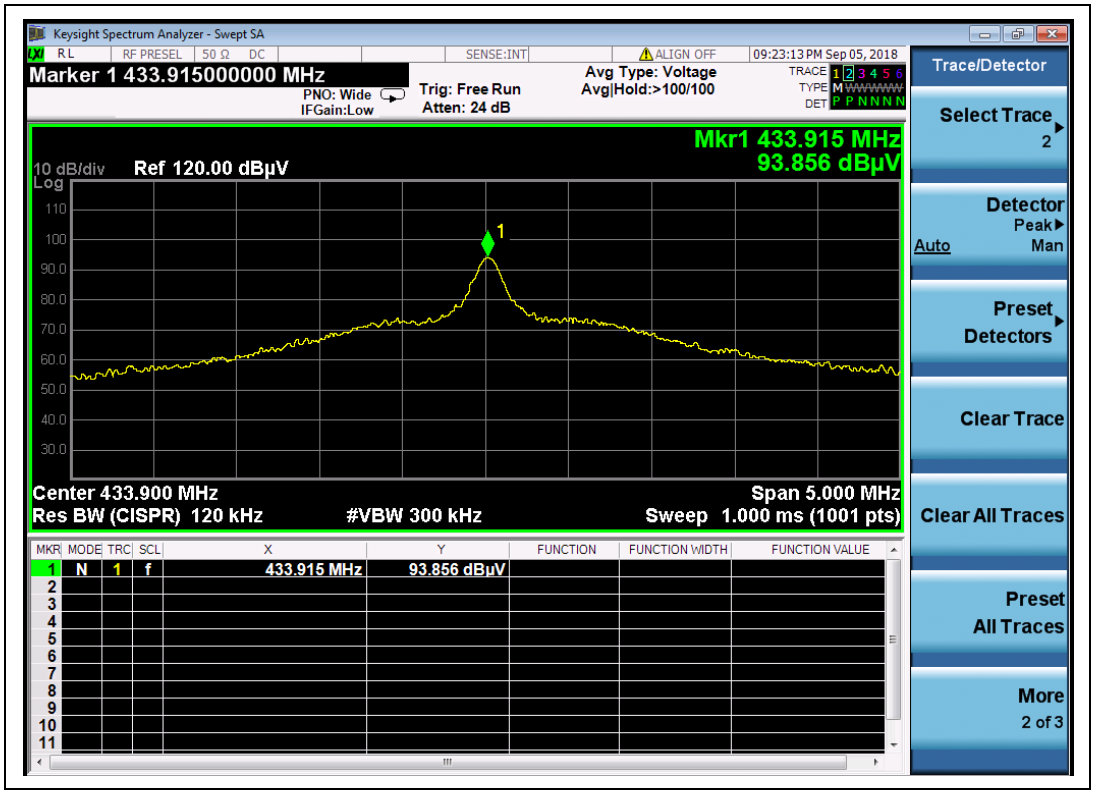
Note3: The duty cycle is simply the on-time divided by the period:

The duration of one cycle:	1.805ms
Effective period of the cycle:	1.245 ms
Duty cycle:	0.69

Therefore, the average factor is found by 20log (Duty cycle) =-3.22

A. Test Results for Field strength of fundamental

Fre. (MHz)	Antenna	Receiver Reading U_R (PK) (dBuV)	A_T (dB)	A_{Factor} (dB@ 3m)	Final Emission_ PK (dBuV/m)	AV factor (dB)	Final Emission _AV (dBuV/m)	Limit-AV (dBμV/m)	Verdict
433.915	Horizontal	93.86	-32.24	16.08	77.70	-3.22	74.48	80.83	PASS
433.915	Vertical	83.97	-32.24	16.08	67.81	-3.22	64.59	80.83	PASS



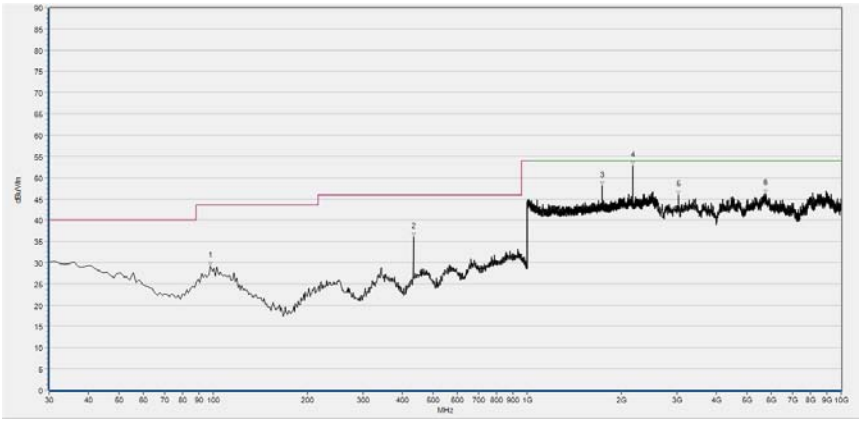
(433.92MHz, Antenna Horizontal)

(433.92MHz, Antenna Vertical)

B. Test Results for Field strength of spurious emission

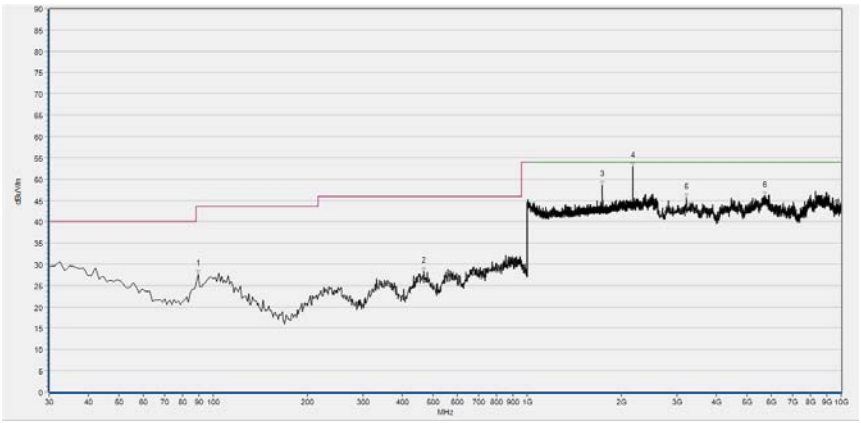
Frequency (MHz)	Final Emission_PK (dBuV/m)	AV factor(dB)	Final Emission_AV (dBuV/m)	Limit-AV (dBuV/m)	Antenna	Verdict
1735.654	48.09	-3.22	44.87	60.63	Horizontal	PASS
2169.800	53.61	-3.22	50.39	60.63	Horizontal	PASS
3035.861	45.90	-3.22	42.68	60.63	Horizontal	PASS
1735.654	48.64	-3.22	45.42	60.63	Vertical	PASS
2169.900	53.56	-3.22	50.34	60.63	Vertical	PASS

C. Test Plots for the Whole Measurement Frequency Range:



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
97.985	29.25	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
434.268	36.02	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1735.654	48.09	N/A	44.87	80.83	N/A	60.63	Horizontal	PASS
2169.800	53.61	N/A	50.39	80.83	N/A	60.63	Horizontal	PASS
3035.861	45.90	N/A	42.68	80.83	N/A	60.63	Horizontal	PASS
5744.717	46.19	N/A	39.45	80.83	N/A	60.63	Horizontal	PASS

(433.92MHz, Antenna Horizontal, 30MHz to 10GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
89.487	27.62	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
468.260	28.29	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1735.654	48.64	N/A	45.42	80.83	N/A	60.63	Vertical	PASS
2169.900	53.56	N/A	50.34	80.83	N/A	60.63	Vertical	PASS
3219.167	45.55	N/A	38.81	80.83	N/A	60.63	Vertical	PASS
5724.350	46.07	N/A	39.33	80.83	N/A	60.63	Vertical	PASS

(433.92MHz, Antenna Vertical, 30MHz to 10GHz)

Annex A Test Uncertainty

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

Test items	Uncertainty
20dB Bandwidth	±5%
Transmission time	±5%
Radiated Emission	±2.95dB

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

Annex B Testing Laboratory Information

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

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

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, 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 designation number is CN1192, the test firm registration number is 226174.

4. Test Equipments Utilized

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.08.04	2019.08.03
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.18	2019.05.17
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2018.08.06	2019.08.05
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2018.08.02	2019.08.01
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT