



REPORT No. : SZ17070027W07

FCC RF TEST REPORT

APPLICANT : dormakaba EAD GmbH
PRODUCT NAME : data collection terminal
MODEL NAME : 9600-K6-HID
TRADE NAME : Terminal 96 00
BRAND NAME : dormakaba
FCC ID : NVI-KT9600K6H
STANDARD(S) : 47 CFR Part 15 Subpart C
ISSUE DATE : 2017-09-07

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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Change History

Issue	Date	Reason for change
1.0	2017-09-07	First edition



Test Report Declaration

Applicant	dormakaba EAD GmbH
Applicant Address	Albertistr. 3, 78056 Villingen-Schwenningen, Germany
Manufacturer	In-Tech Electronics Ltd
Manufacturer Address	Unit A,13/F, Wing Tai Centre,12 Hing Yip Street, Kwun Tong Kowloon, Hong Kong
Product Name	data collection terminal
Model Name	9600-K6-HID
Brand Name	dormakaba
HW Version	02
SW Version	V5
Test Standards	47 CFR Part 15 Subpart C
Test Date	2017-08-21 to 2017-08-28
Test Result	PASS

Tested by : Wang Dalong
Wang Dalong (Test engineer)

Approved by : Andy Yeh
Andy Yeh (Technical Director)



1. Technical Information

Note: Provided by applicant.

1.1. Applicant Information

Company:	dormakaba EAD GmbH
Address:	Albertistr. 3, 78056 Villingen-Schwenningen, Germany

1.2. Equipment under Test (EUT) Description

Product Name:	data collection terminal
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	02
Software Version:	V5
Operating Frequency:	125KHz
Transmit Power:	< 100mW
Modulation Type:	AM
Antenna Type:	PCB Antenna

NOTE:

1. The EUT is a data collection terminal which supports 125 KHz and 13.56 MHz band. Only the results for 125 KHz were recorded in this report.
2. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2. Test Results

2.1. Applied Reference Documents

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C:

No.	Identity	Document Title
1	47 CFR Part 15	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	15.207	Conducted Emission	PASS
3	15.209(a)	Radiated Emission	PASS
4	15.215(c)	20dB Bandwidth	PASS

Note: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013. The EUT has been tested under continuous operating condition.



3. 47 CFR Part 15c Requirements

3.1. Antenna requirement

3.1.1. 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.

3.1.2. Result:

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

Result: Compliant

3.2. Conducted Emission

3.2.1. Test Requirement

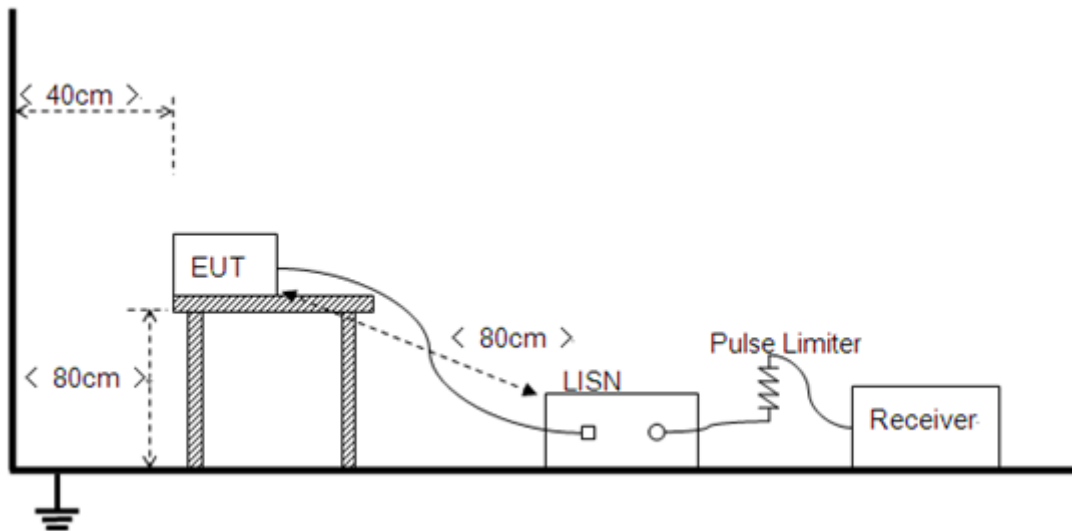
According to FCC section 15.207, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

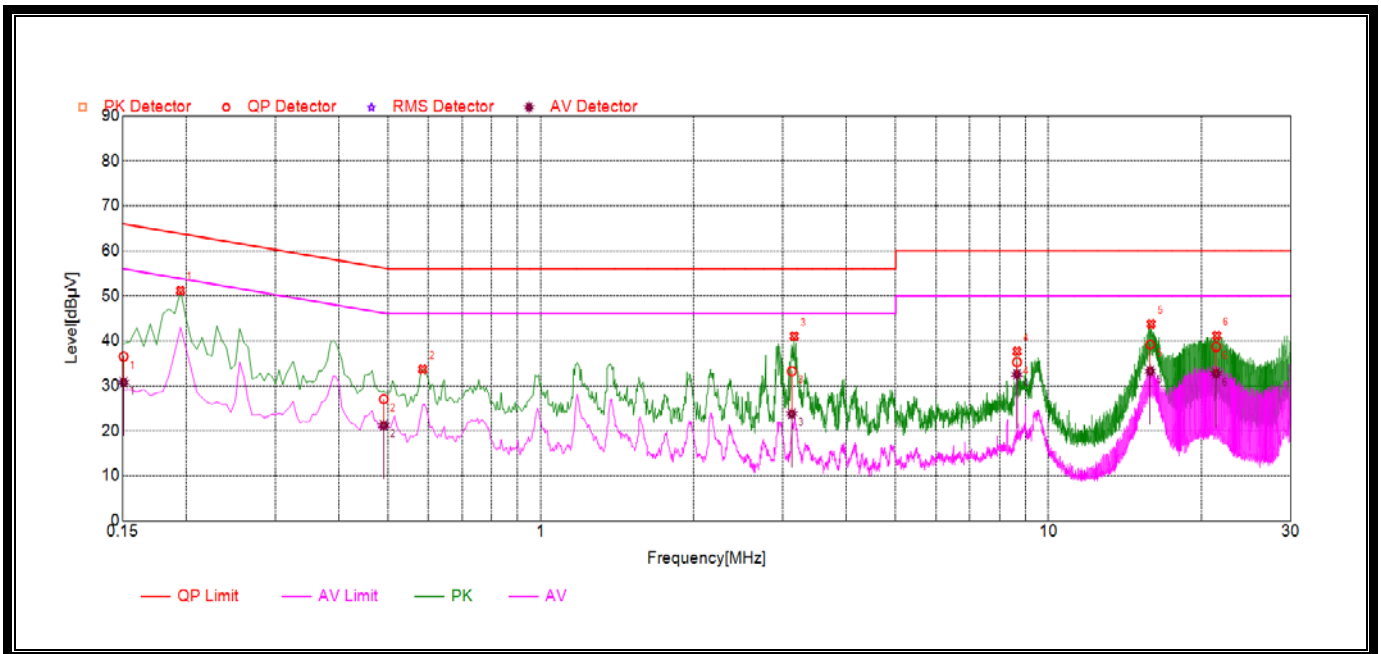
- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.2.2. Test Setup



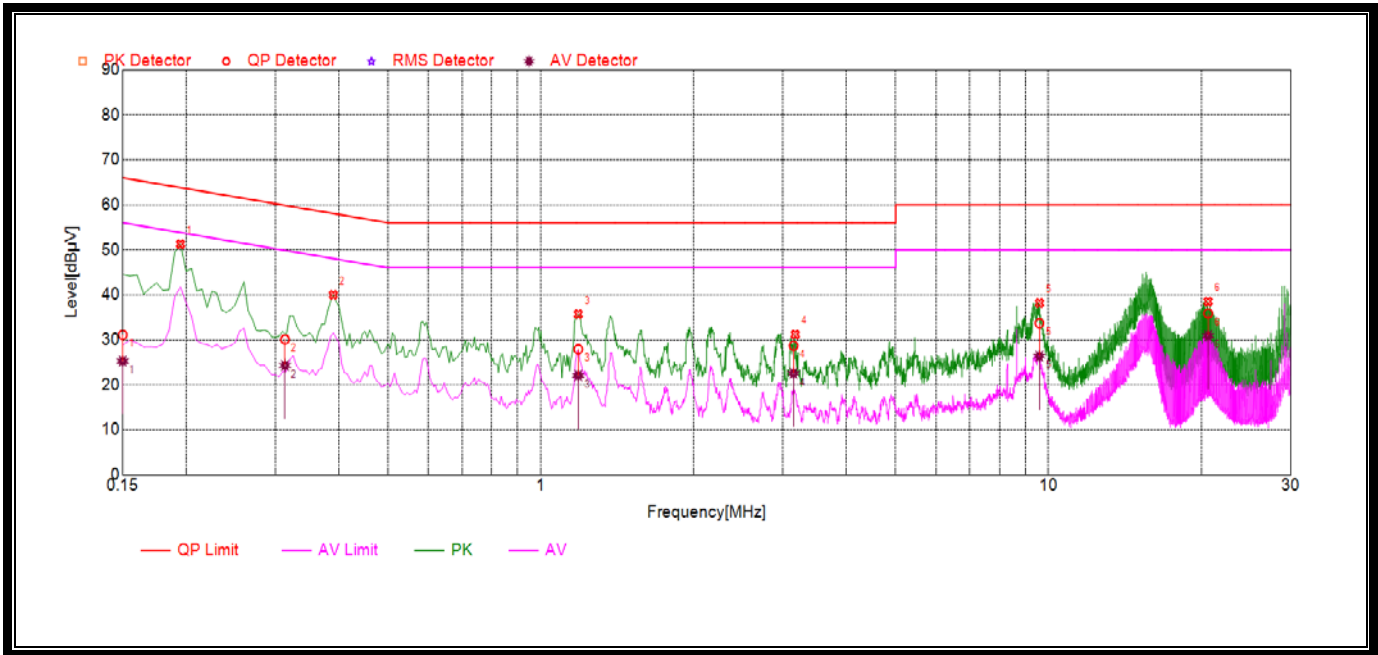
The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

3.2.3. Test Result



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1506	36.53	30.75	65.98	55.98	Line	PASS
2	0.4902	27.04	21.20	56.28	46.28		PASS
3	3.1208	33.25	23.78	56	46		PASS
4	8.6688	35.26	32.54	60	50		PASS
5	15.8684	39.16	33.28	60	50		PASS
6	21.3936	38.68	32.75	60	50		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.15	31.13	25.27	66	56	Line	PASS
2	0.3132	30.09	24.30	61.34	51.34		PASS
3	1.1848	27.91	22.08	56	46		PASS
4	3.1454	28.70	22.55	56	46		PASS
5	9.5946	33.72	26.38	60	50		PASS
6	20.6254	35.88	30.92	60	50		PASS

Result: PASS



3.3. Radiated Emission

3.3.1. Test Requirement

- 1) 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.
- 2) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emission shall not exceed the level of the fundamental frequency.

The emission limits shown in the following table are based on measurements employing a CISPR quasi-peak detector except for the frequency 9-90kHz, 110-490kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

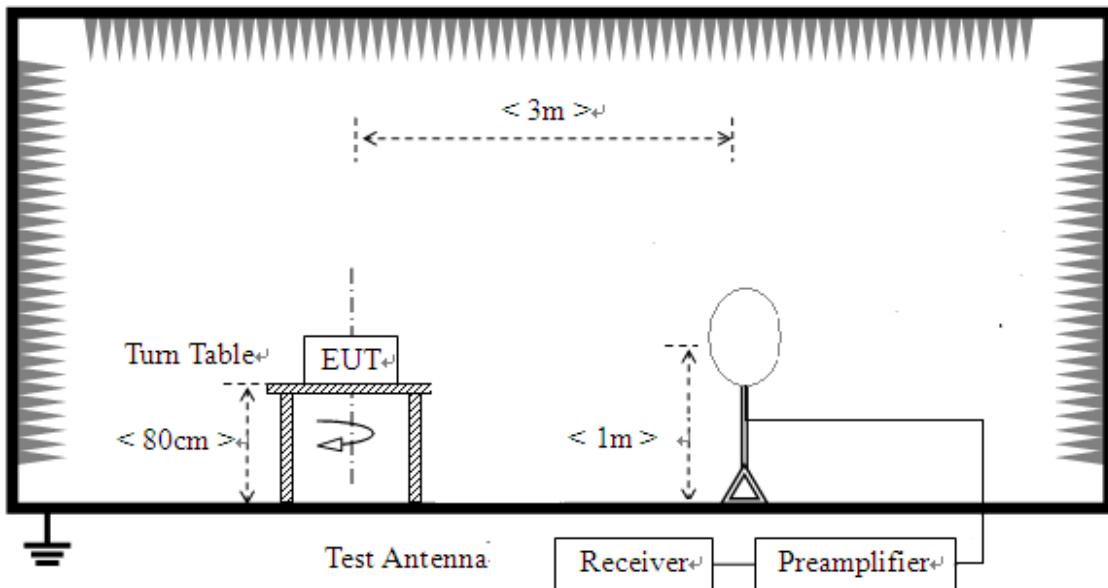
Frequency range (MHz)	Field Strength(μ V/m)	Distance(m)
0.009 ~ 0.490	2400/F(KHz)	300
0.490 ~ 1.705	24000/F(KHz)	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

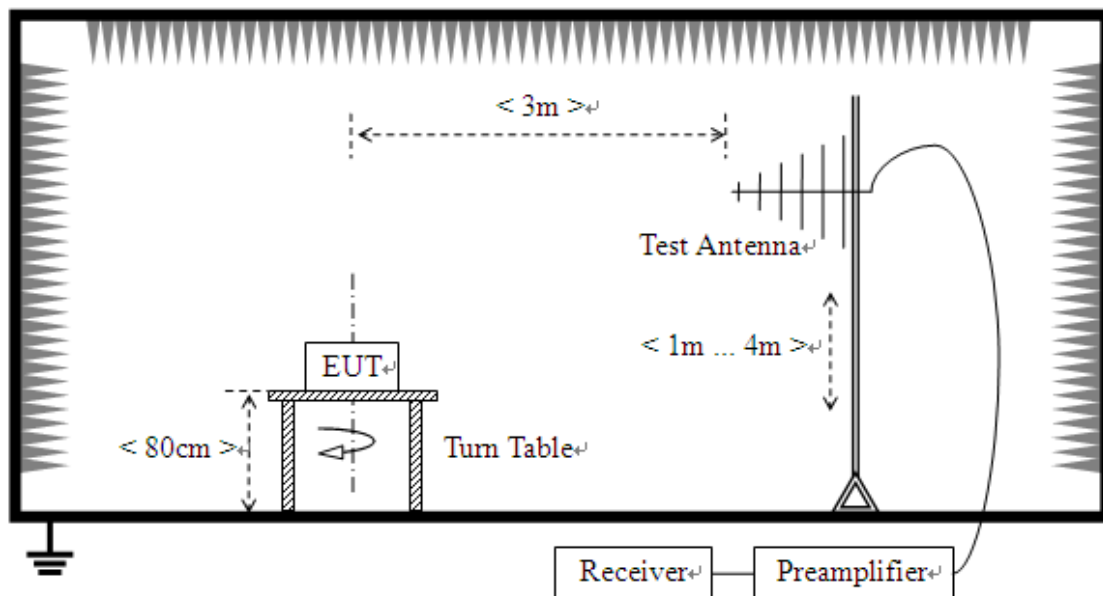
- a) Field Strength (dB μ V/m) = 20*log[Field Strength (μ V/m)].
- b) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.
Example:
F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as $Ld1 = 30uV/m * (10)^2 = 100 * 30uV/m$
- c) In the emission tables above, the tighter limit applies at the band edges.

3.3.2. Test Setup

- 1) For radiated emissions below 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.



For the test Antenna:

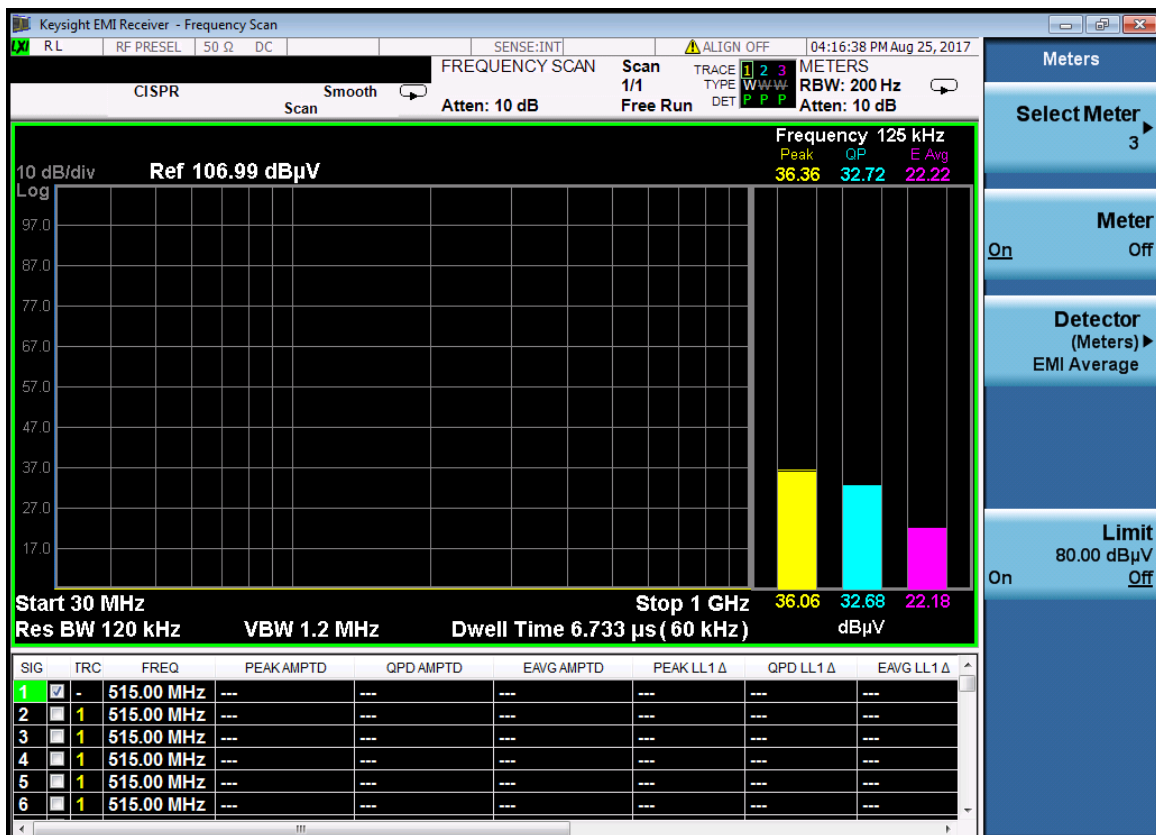
- 1) In the frequency range of 9KHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 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.

3.3.3. Test Result

A. Fundamental

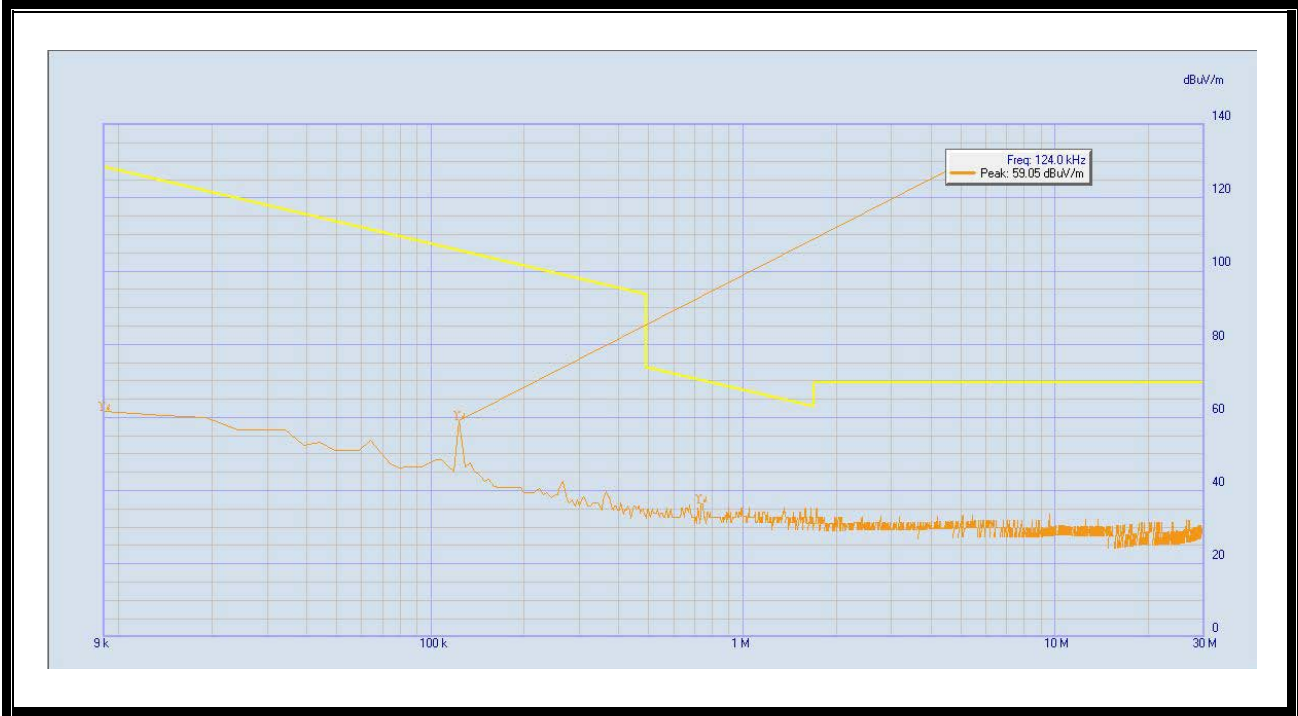
Fre. (KHz)	PK Reading (dBµV)	AV Reading (dBµV)	Correction Factor (dB)	PK Result (dBµV/m)	AV Result (dBµV/m)	PK Limits (dBµV/m)	AV Limits (dBµV/m)	Verdict
125	36.36	22.22	25.75	62.11	47.97	105.7	85.7	PASS

Please refer to the following plot:



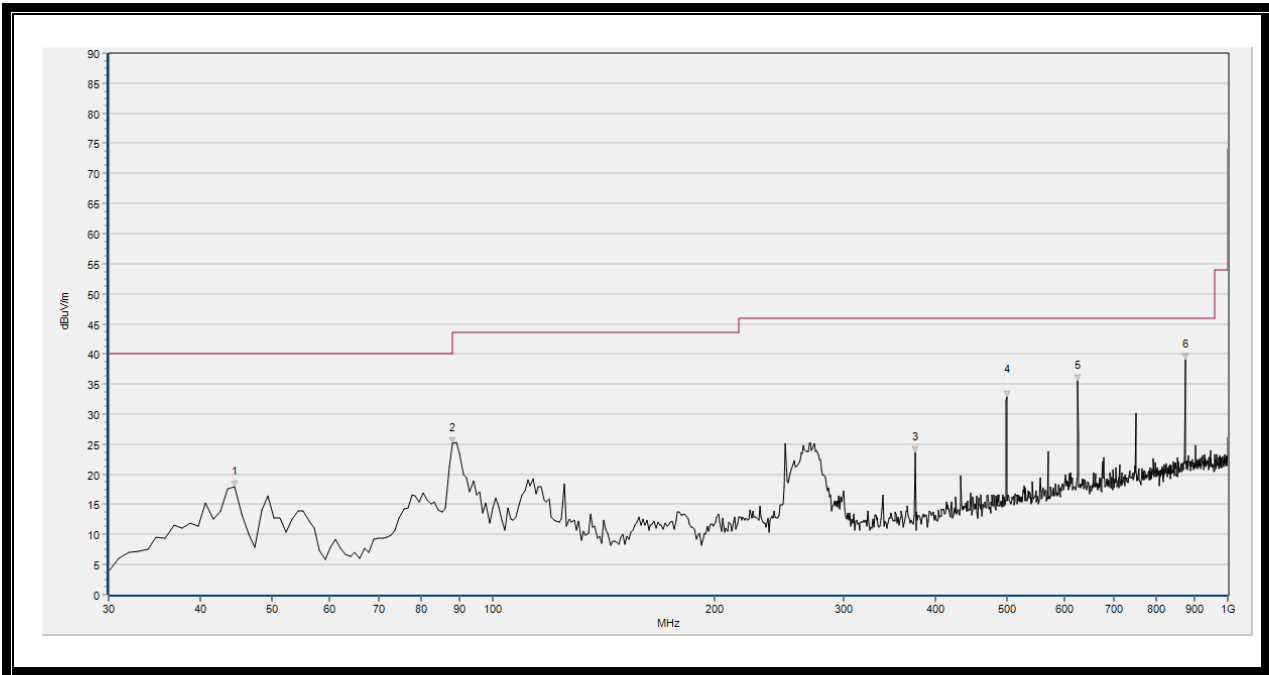
B. Radiated Emission <30MHz (9KHz-30MHz)

NOTE: The emissions are too small to be measured and are at least 6 dB below the limit, so all the data of marked are pass.



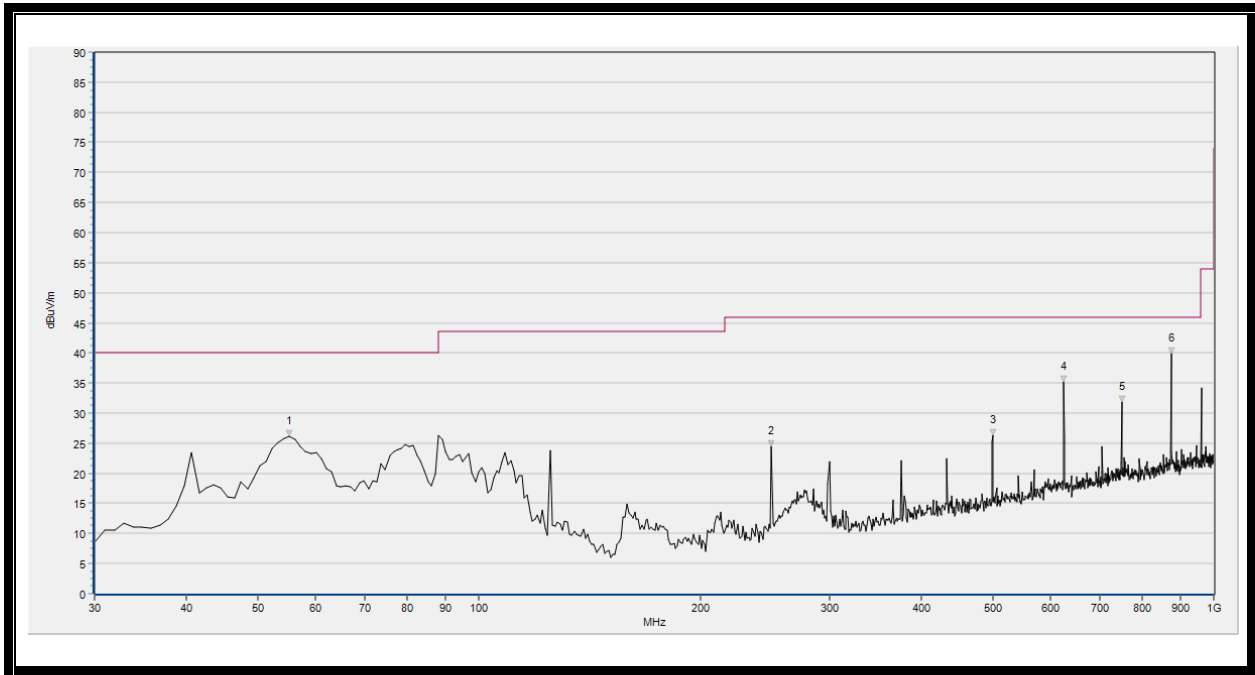
(Plot A: 9KHz - 30MHz)

C. Radiated Emission >30MHz (30MHz-1GHz)



(Plot B: 30MHz – 1GHz, Test Antenna Horizontal)

No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	44.550	17.93	N/A	N/A	N/A	40.00	N/A	H	Pass
2	88.200	25.10	N/A	N/A	N/A	43.50	N/A	H	Pass
3	375.320	23.68	N/A	N/A	N/A	46.00	N/A	H	Pass
4	500.450	32.83	N/A	N/A	N/A	46.00	N/A	H	Pass
5	624.610	35.45	N/A	N/A	N/A	46.00	N/A	H	Pass
6	874.870	39.04	N/A	N/A	N/A	46.00	N/A	H	Pass



(Plot C: 30MHz – 1GHz, Test Antenna Vertical)

No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	55.220	26.13	N/A	N/A	N/A	40.00	N/A	V	Pass
2	250.190	24.52	N/A	N/A	N/A	46.00	N/A	V	Pass
3	500.450	26.23	N/A	N/A	N/A	46.00	N/A	V	Pass
4	624.610	35.20	N/A	N/A	N/A	46.00	N/A	V	Pass
5	749.740	31.87	N/A	N/A	N/A	46.00	N/A	V	Pass
6	874.870	39.92	N/A	N/A	N/A	46.00	N/A	V	Pass

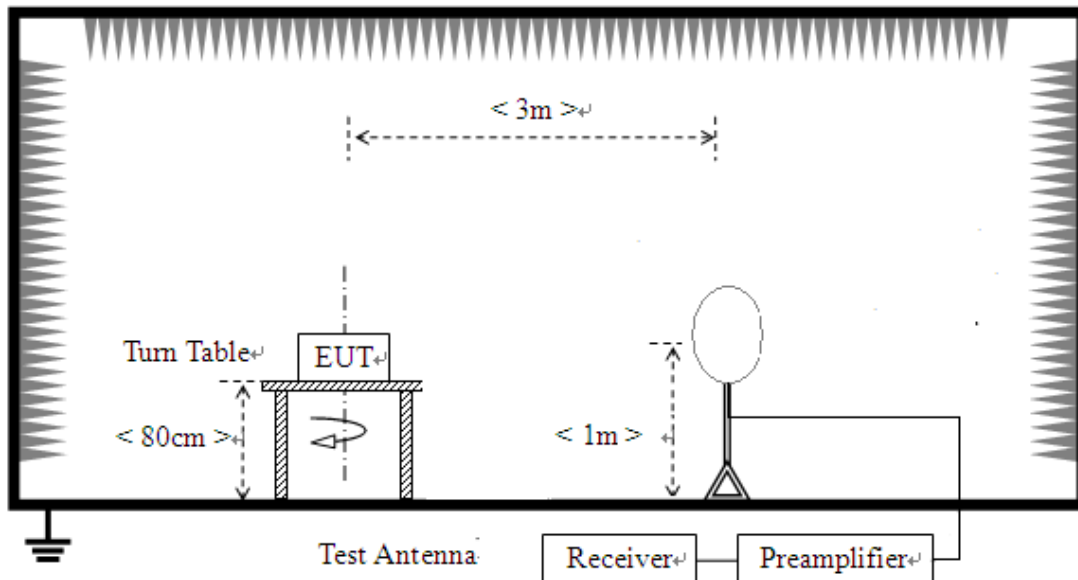
Result: PASS

3.4. 20dB Bandwidth

3.4.1. Standard Applicable

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

3.4.2. Test Setup





3.4.3. Test Result

Frequency(KHz)	20dB Bandwidth (KHz)
125	0.51

Please refer to the following plot:





Annex A Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Radiated Emission:	± 3.1 dB
Uncertainty of Conducted Emission:	± 1.8 dB

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. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1192 (Shenzhen Morlab Communications Technology Co., Ltd.)
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4. Test Environment Conditions

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

Temperature (°C):	15 - 35
Relative Humidity (%):	20 - 75
Atmospheric Pressure (kPa):	86 - 106



5. Test Equipments Utilized

5.1 Test Equipment

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	N9038A	MY54130016	2017.05.17	2018.05.16
LISN	Schwarzbeck	NSLK 8127	812744	2017.05.17	2018.05.16
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9537	2017.05.24	2018.05.23
Coaxial Cable	Morlab	EMC01	CB05	(n.a.)	(n.a.)
Coaxial Cable	Morlab	EMC02	CB06	(n.a.)	(n.a.)
MXE EMI Receiver	Agilent	N9038A	MY54130016	2017.05.17	2018.05.16
Anechoic Chamber	Changning	9m*6m*6m	N/A	2017.01.11	2018.01.10
Test Antenna – Bi-Log	Schwarzbeck	VULB 9163	9163-274	2016.12.09	2017.12.08
Test Antenna -Loop	Schwarzbeck	FMZB 1519	1519-022	2017.03.07	2018.03.06

5.2 Test Software Utilized

Model	Version Number	Producer
TS+ -[JS32-CE]	Version 2.5.0.0	Tonscend
MORLAB EMCR V1.2	Version 1.0	MORLAB

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