TEST REPORT

APPLICANT	:	Shenzhen Chainway Information Technology Co., Ltd.
PRODUCT NAME	:	Mobile Data Terminal
MODEL NAME	:	C71
BRAND NAME	:	CHAINWAY
FCC ID	:	2AC6AC71P
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2021-10-26
TEST DATE	:	2021-11-23 to 2022-01-17
ISSUE DATE	:	2022-03-16

Edited by: Peng Mi (Rapporteur)

Approved by: Shen Junsheng (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2022-03-16	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Shenzhen Chainway Information Technology Co., Ltd.
Applicant Address:	9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen Chainway Information Technology Co., Ltd.
Manufacturer Address:	9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Mobile Data Terminal	
Sample No.:	12#	
Hardware Version:	C71_hardware_V1	
Software Version:	C71_Software_V1	
Operating Frequency:	13.56MHz	
Modulation Type:	ASK	
Antenna Type:	Loop Antenna	
Accessory Information:	Battery	
	Brand Name:	CHAINWAY
	Model No.:	J292
	Serial No.:	N/A
	Capacity:	5000mAh
	Rated Voltage:	3.8V
	Charge Limit:	4.35V
	Manufacturer:	Hixon (Shenzhen) Technology Limited

Accessory Information:	AC Adapter	
	Brand Name:	FULLPOWER
	Model No.:	NA010050020
	Serial No.:	N/A
	Rated Output:	5V⎓2A
	Rated Input:	100-240V~50/60Hz, 0.5A
	Manufacturer:	SHENZHEN SHI YING YUAN ELECTRONICS CO LTD
	Charging Base	
	Brand Name:	CHAINWAY
	Model No.:	CRD-C71-SCC
	Serial No.:	N/A
	Rated Output:	5V⎓2A
	Rated Input:	5V⎓2A
	Manufacturer:	Shenzhen Chainway Information Technology Co., Ltd.
	USB Cable	
	Model No.:	1.8.17.067
	Manufacturer:	SHENZHEN HUANJIAN ELECTRONIC CO., LTD.

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	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.207	Conducted Emission	Jan 17, 2022	Yang Lian	PASS	No deviation
3	15.209 15.225(a) (b) (c)(d)	Radiated Emission	Dec 15, 2021	Gao Jianrou	PASS	No deviation
4	15.225(e)	Frequency Tolerance	Dec 07, 2021	Meng Shurui	PASS	No deviation
5	15.215(c)	20dB Bandwidth	Dec 16, 2021	Gao Jianrou	PASS	No deviation

Note 1: 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.

Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 3: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

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. Test Result: Compliant

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

2.2. Conducted Emission

2.2.1. 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 50μH/50Ω line impedance stabilization network (LISN).

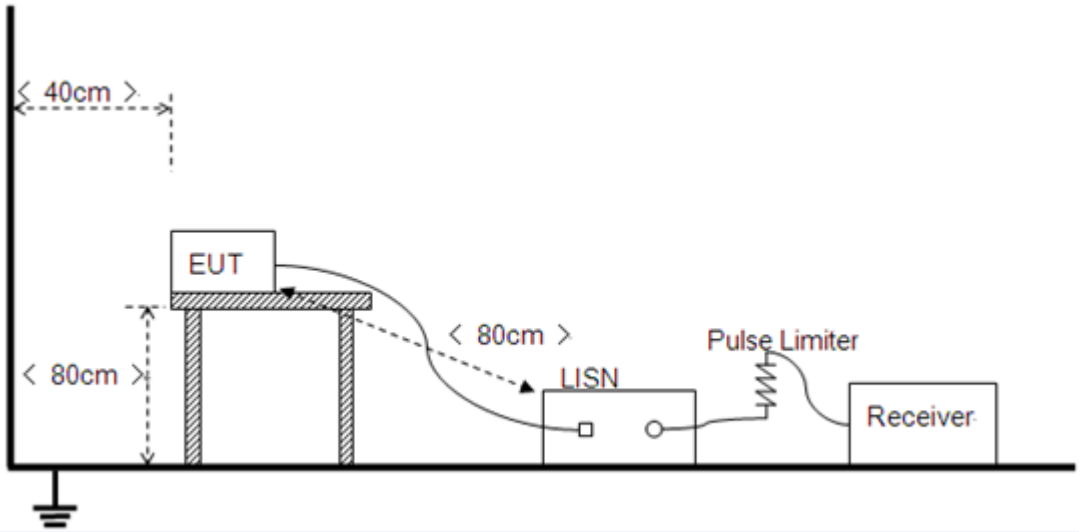
Frequency Range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

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.

2.2.2. 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 50Ω/50μH 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.

2.2.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A.Test Setup:

Test Mode: EUT+Adaptor+ 13.56MHz TX

Test voltage: AC 120V/60Hz

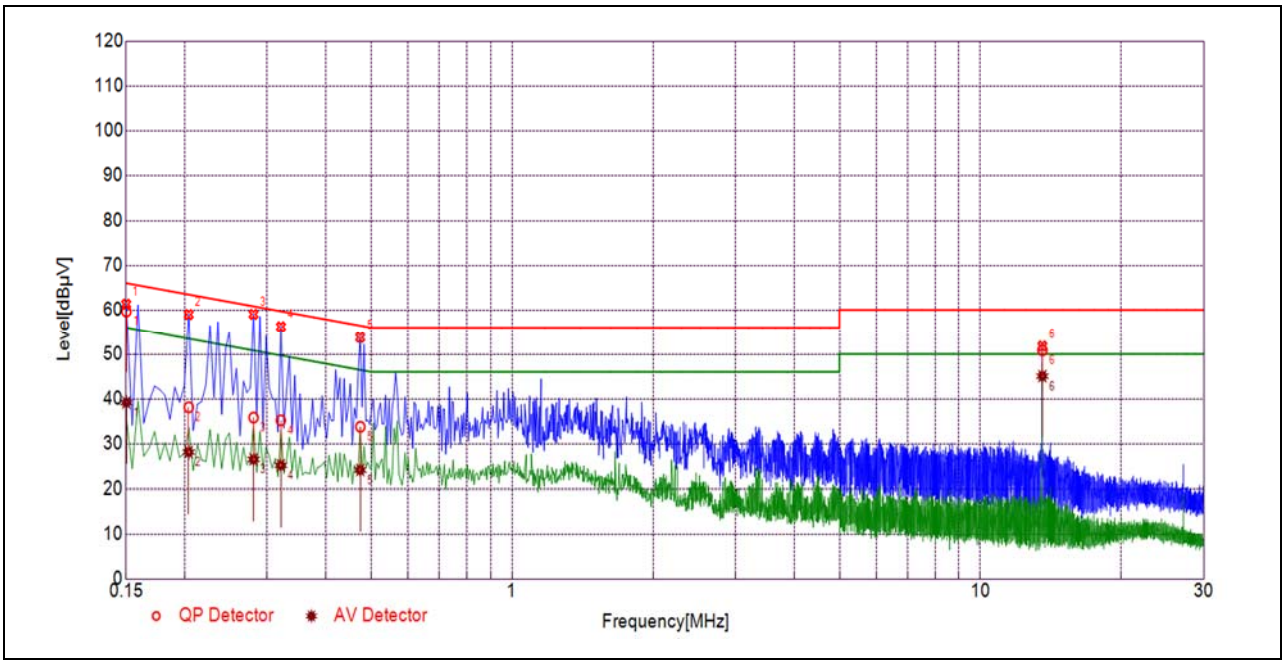
The measurement results are obtained as below:

$E\ [dB\mu V] = U_R + L_{Cable\ loss}\ [dB] + A_{Factor}$

U_R: Receiver Reading

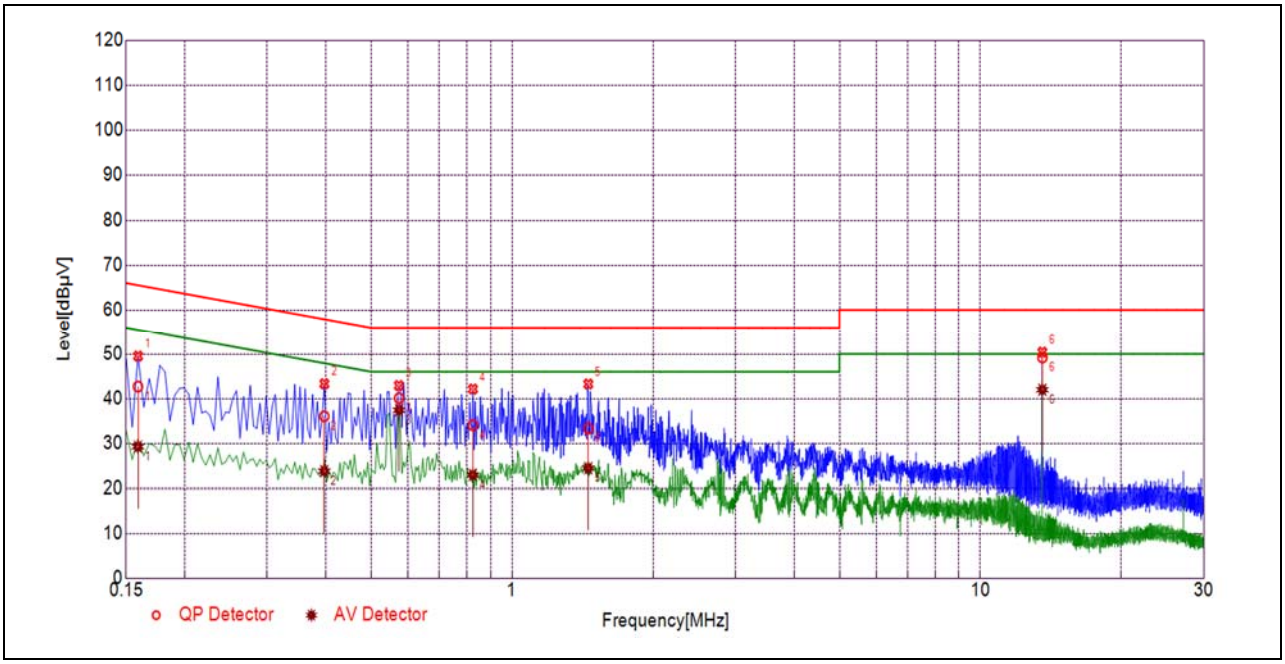
A_{Factor}: Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1501	59.66	39.14	66.00	56.00	Line	PASS
2	0.2040	38.10	28.11	63.45	53.45		PASS
3	0.2806	35.81	26.48	60.80	50.80		PASS
4	0.3208	35.18	25.16	59.69	49.69		PASS
5	0.4741	33.75	24.11	56.44	46.44		PASS
6	13.5601	50.79	45.04	60.00	50.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1589	42.68	29.23	65.52	55.52	Neutral	PASS
2	0.3972	36.04	23.77	57.91	47.91		PASS
3	0.5736	40.09	37.40	56.00	46.00		PASS
4	0.8245	34.04	22.92	56.00	46.00		PASS
5	1.4546	33.29	24.42	56.00	46.00		PASS
6	13.5597	49.19	41.97	60.00	50.00		PASS

2.3. Radiated Emission

2.3.1. Test Requirement

Radiated Emission <30MHz (9 kHz-30MHz, E-field)

According to FCC section 15.225, for <30MHz, Radiated emissions were measured according to ANSIC63.4. The EUT was set to transmit at the highest output power. The EUT was set 30 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

There was no detected Restricted bands and Radiated Spurious emission below 30MHz. The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows;

3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(15848)+40log(30/3) = 124dBuV

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 range (MHz)	Field Strength@30m		Field Strength@3m
	μV/m	dBμV/m	dBμV/m
Below 13.110	30	29.5	69.5
13.110 ~ 13.410	106	40.5	80.5
13.410 ~ 13.553	334	50.5	90.5
13.553 ~13.567	15.848	84	124
13.567 ~ 13.710	334	50.5	90.5
13.710 ~14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

NOTE: a) Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].

b) In the emission tables above, the tighter limit applies at the band edges.

Radiated Emission >30MHz (30MHz-1GHz, E-field)

According to FCC section 15.205, the field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

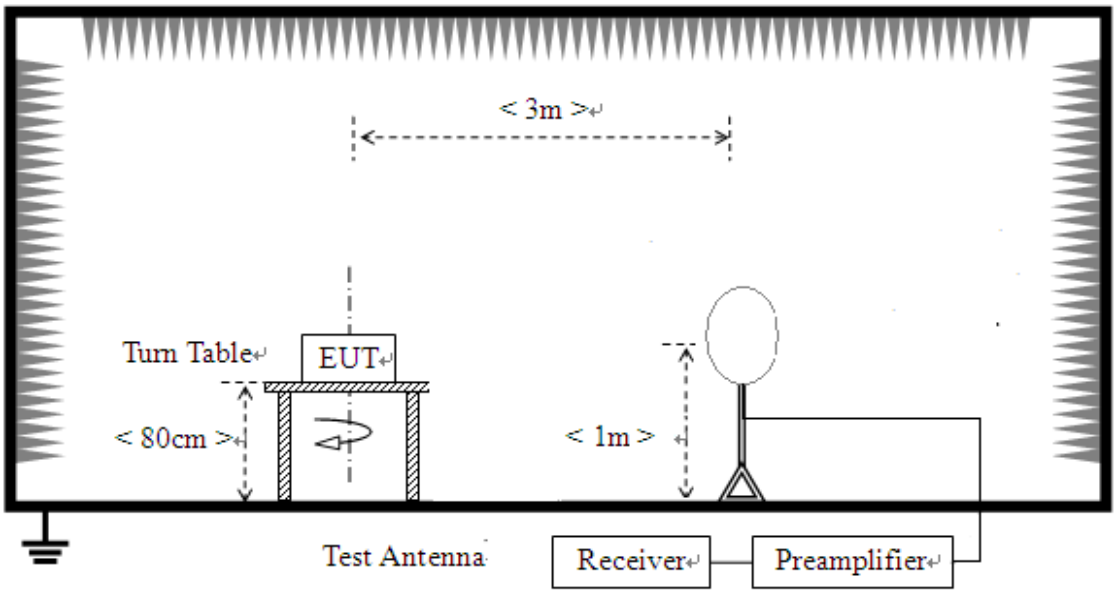
Frequency range (MHz)	Field Strength	
	μV/m	dBμV/m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

NOTE: a) Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].

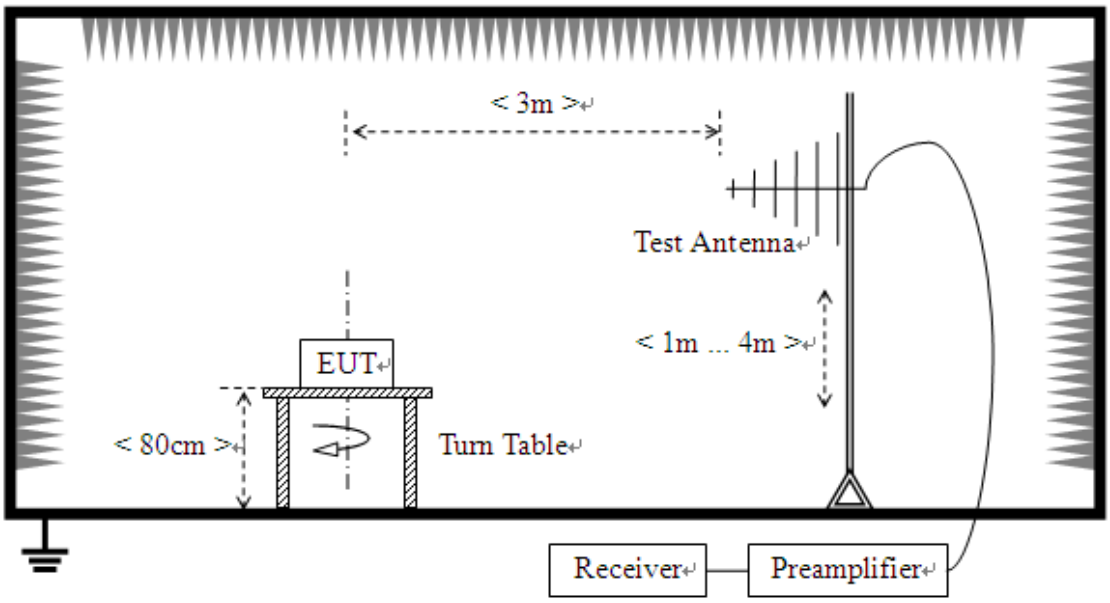
b) In the emission tables above, the tighter limit applies at the band edges.

2.3.2. Test Setup

1) For radiated emissions below 30MHz



2) For radiated emissions from 30MHz to1GHz



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:

In the frequency range of 9 kHz 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.

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) was 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.

For measurements frequency range from 0.009MHz to 0.15MHz, the resolution bandwidth is set to 200kHz.

For measurements frequency range from 0.15MHz to 30MHz the resolution bandwidth is set to 9kHz.

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

2.3.3. Test Result

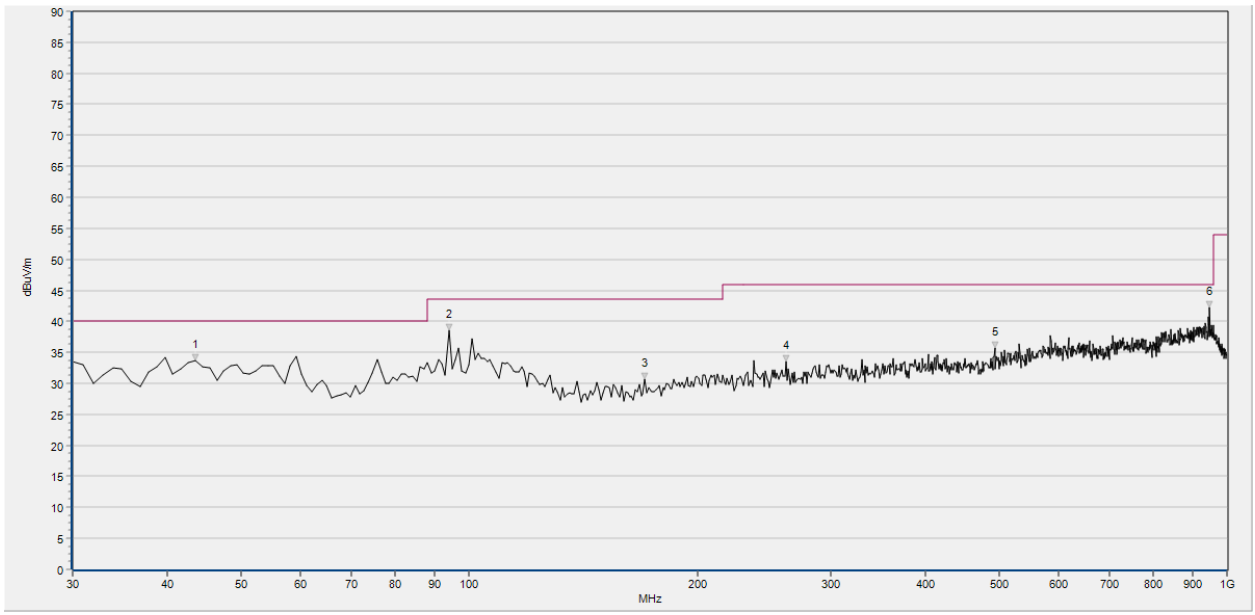
A.Radiated Emission <30MHz (9kHz-30MHz, opened)

No.	Frequency (MHz)	Detector Type	Level at 3m (dBμV/m)	Limit at 3m (dBμV/m)
1	0.009	Quasi Peak	53.55	69.5
2	0.0152	Quasi Peak	51.41	69.5
3	0.066	Quasi Peak	50.80	69.5
4	0.1315	Quasi Peak	50.68	69.5
5	0.26	Quasi Peak	51.94	69.5
6	13.56	Quasi Peak	72.61	124.0

B.Radiated Emission <30MHz (9kHz-30MHz, closed)

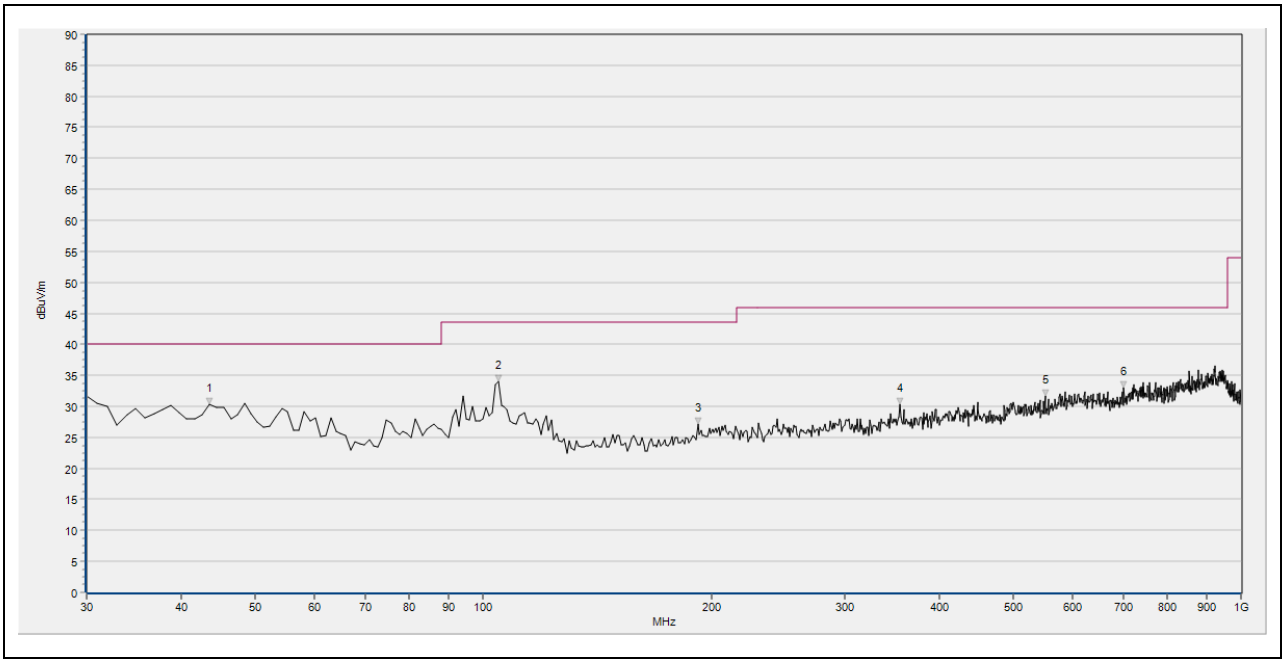
No.	Frequency (MHz)	Detector Type	Level at 3m (dBμV/m)	Limit at 3m (dBμV/m)
1	0.0093	Quasi Peak	53.19	69.5
2	0.0106	Quasi Peak	54.62	69.5
3	0.0125	Quasi Peak	53.07	69.5
4	0.16	Quasi Peak	50.69	69.5
5	0.315	Quasi Peak	50.49	69.5
6	13.56	Quasi Peak	60.10	124.0

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



(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	43.580	33.67	N/A	N/A	N/A	40.00	N/A	H	PASS
2	94.020	38.56	N/A	N/A	N/A	43.50	N/A	H	PASS
3	170.650	30.63	N/A	N/A	N/A	43.50	N/A	H	PASS
4	261.830	33.60	N/A	N/A	N/A	46.00	N/A	H	PASS
5	493.660	35.73	N/A	N/A	N/A	46.00	N/A	H	PASS
6	948.590	42.29	N/A	N/A	N/A	46.00	N/A	H	PASS



(30MHz – 1GHz, Test Antenna Vertical)

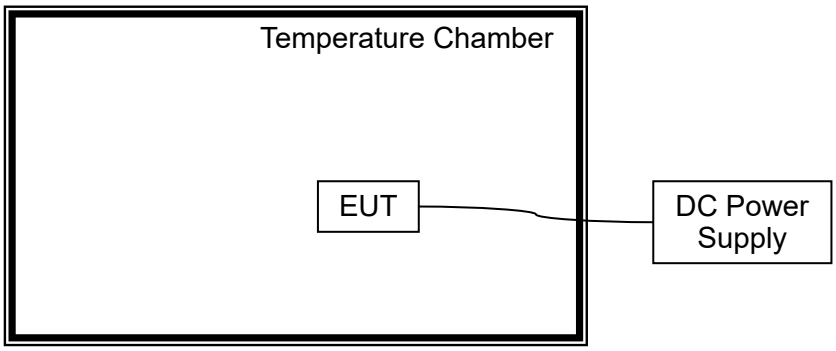
No.	Fre. MHz	Pk dBμV/m	QP dBμV/m	AV dBμV/m	Limit-PK dBμV/m	Limit-QP dBμV/m	Limit-AV dBμV/m	ANT	Verdict
1	43.580	30.31	N/A	N/A	N/A	40.00	N/A	V	PASS
2	104.690	33.96	N/A	N/A	N/A	43.50	N/A	V	PASS
3	191.990	27.13	N/A	N/A	N/A	43.50	N/A	V	PASS
4	354.950	30.42	N/A	N/A	N/A	46.00	N/A	V	PASS
5	551.860	31.62	N/A	N/A	N/A	46.00	N/A	V	PASS
6	700.270	32.96	N/A	N/A	N/A	46.00	N/A	V	PASS

2.4. Frequency Tolerance

2.4.1. Test Requirement

According to FCC section 15.225, the devices operating in the 13.553~13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20°C to +50°C using an environmental chamber. The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

2.4.2. Test Setup



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT was measured by transmitter mode continuously.

2.4.3. Test Result

Operating Frequency: 13,560,000 Hz
Deference Voltage: 3.80V
Deviant Limit: ±0.01%

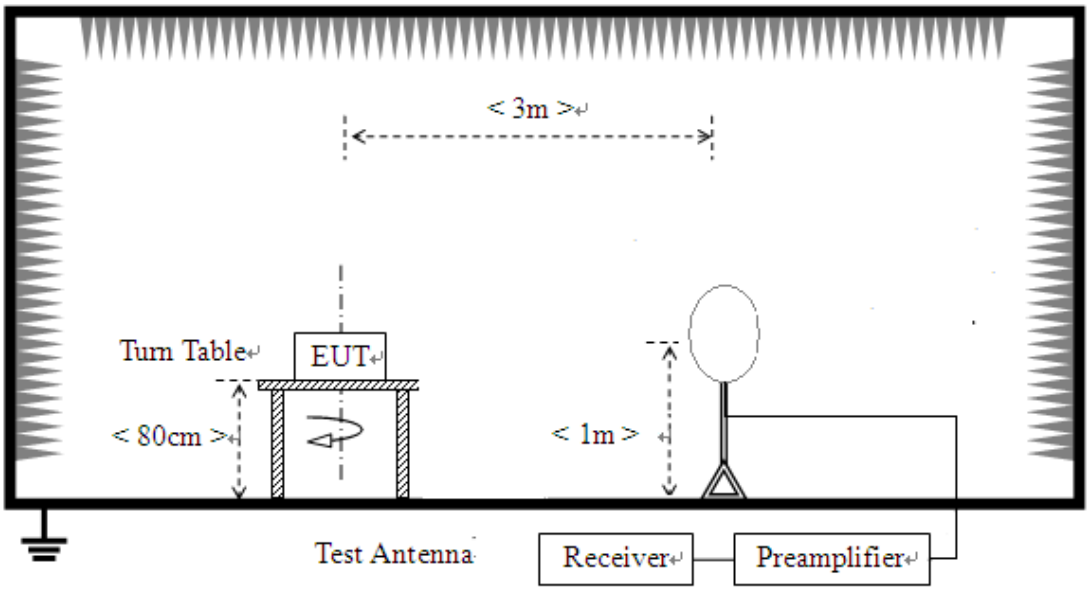
VOLTAGE (%)	Test Conditions		Fre. Dev. (Hz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	3.80	-20	287	0.00212	PASS
100		-10	278	0.00205	
100		0	281	0.00207	
100		+10	274	0.00202	
100		+20	246	0.00181	
100		+25	248	0.00183	
100		+30	254	0.00187	
100		+40	261	0.00192	
100		+50	299	0.00221	
85	3.23	+20	287	0.00212	
115	4.37	+20	291	0.00215	

2.5. 20 dB Bandwidth

2.5.1. Standard Applicable

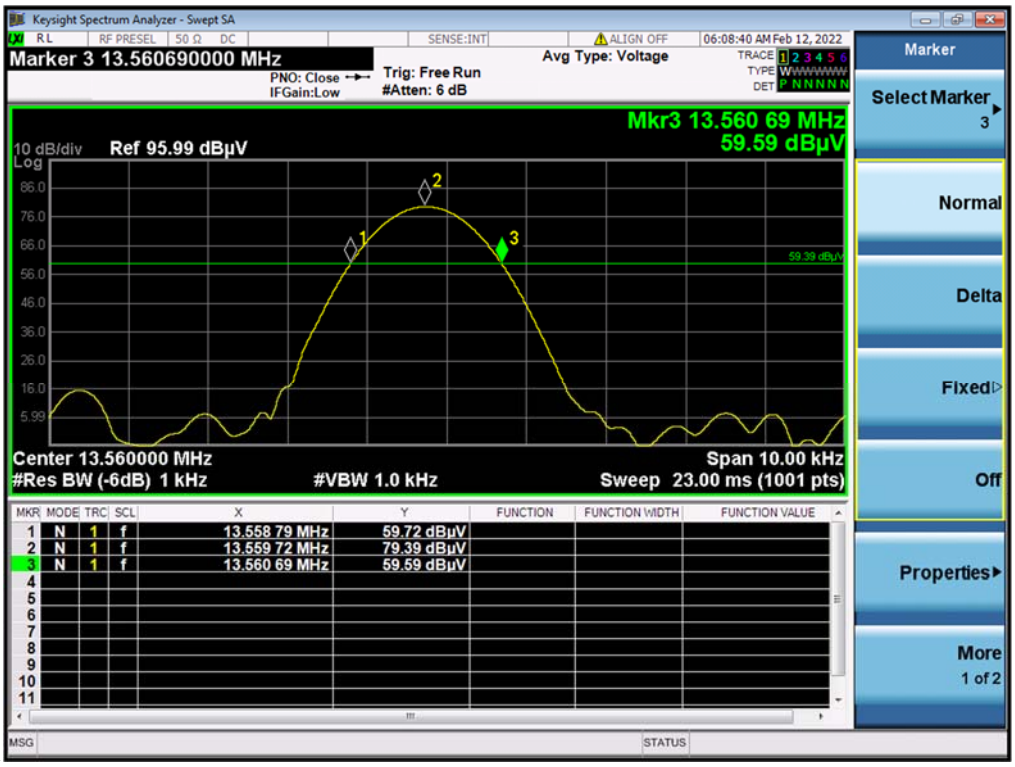
According to FCC section 15.215(c), the 20dB bandwidth should be contained within the frequency band designated in the rule section under which the EUT is operated, it was measured with a spectrum analyzer connected the EUT while the EUT is operating in transmission mode.

2.5.2. Test Setup



2.5.3. Test Result

Centre Frequency	Measurement		Limit		Verdict
	20 dB Bandwidth (kHz)	Frequency Range (MHz)	20dB Bandwidth (kHz)	Frequency Range(MHz)	
13.56MHz	1.89	13. 55903 to 13.56092	14	13.553 to 13.567	PASS



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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.

Radiated Emission:	±3.1dB
Conducted Emission:	±1.8dB
Bandwidth	±5%
Frequency Tolerance	±5%

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

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

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
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

4.1 Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Loop	1520-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.14
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05
DC Power Supply	1709D361010	IV3610	IVYTECH	2021.10.20	2022.10.19
Temperature Chamber	12108015	DTL-003S101	YOMA	2021.10.20	2022.10.19

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2021.03.09	2022.03.08
LISN	812744	NSLK 8127	Schwarzbeck	2021.03.09	2022.03.08
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2021.07.21	2022.07.20
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3 Test Software Utilized

Model	Software Version	Manufacturer
TS+ -[JS32-RE]	Version 2.5.0.6	Tonscend
TS+ -[JS32-CE]	Version 2.5.0.0	Tonscend
PMM Emission Suite	Version 2.02	narda

END OF REPORT