TEST REPORT

Applicant Name:	SHENZHEN HOMELEAD ELECTRONICS CO., LTD.
Address:	11th Floor, Bldg 2, Phase 5, Fucheng Digital Innovation Shijing Road, Fucheng Street, Longhua, Shenzhen China
Report Number:	2401V37776E-RF-00
FCC ID:	2AAXF-HB9908

Test Standard (s)

FCC PART 15.231

Sample Description

Product Type:	Key Finder
Model No.:	KF04A
Multiple Model(s) No.:	KF02A, KF02A-1, KF02A-2, KF02B, KF02C, KF02D, KF04B, KF04C, KF04D, KF04E, KF04E-1, KF04F, KF04G, KF04H, KF04I, KF04J, KF04L, KF05A, KF05A-1, KF05A-2, KF06A, KF05B, KF06B, KF06C, KF06D, KF06E, KF06F, KF06G, KF06G-1, KF06H, KF06I, KF06J, KF06L, KF08A, KF08B, KF08C, KF08D, KF08E, KF08F
Trade Mark:	N/A
Date Received:	2024/07/16
Issue Date:	2024/10/11

Test Result:	Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Ekko Wu

RF Engineer

Approved By:

Michelle Zeng

RF Supervisor

Note: The information marked# is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401V37776E-RF-00	Original Report	2024/10/11

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Key Finder
Tested Model	KF04A
Multiple Model(s)	KF02A, KF02A-1, KF02A-2, KF02B, KF02C, KF02D, KF04B, KF04C, KF04D, KF04E, KF04E-1, KF04F, KF04G, KF04H, KF04I, KF04J, KF04L, KF05A, KF05A-1, KF05A-2, KF06A, KF05B, KF06B, KF06C, KF06D, KF06E, KF06F, KF06G, KF06G-1, KF06H, KF06I, KF06J, KF06L, KF08A, KF08B, KF08C, KF08D, KF08E, KF08F
Frequency Range	433.92MHz
Maximum E-Field	75.83 dBuV/m@3m
Modulation Technique	OOK
Voltage Range	DC 3V from battery
Sample number	2OEB-4 (RF Conducted Test), 2OEB-6 (RF Radiated Test) (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Note: The multiple models are electrically identical with the test model except for model name and different sales channels and countries. Please refer to the declaration letter# for more detail, which was provided by manufacturer.	

Objective

All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
AC Power Lines Conducted Emissions	9kHz-150kHz	3.94dB(k=2, 95% level of confidence)
	150kHz-30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing by manufacturer.
Note: The EUT has 4 keys; all key has the same RF parameters, the red key with the maximum fundamental level was selected to test

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

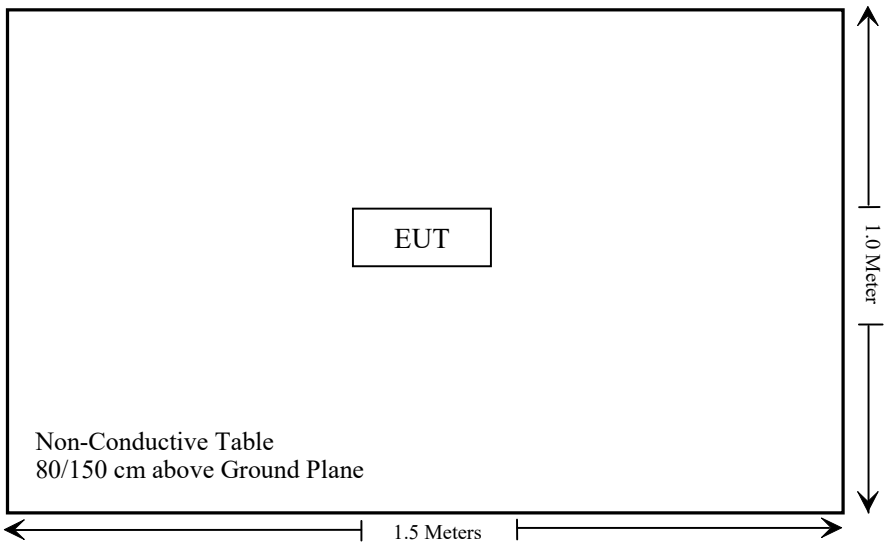
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 (b) & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Not Applicable
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (a) (1)	Deactivation	Compliant

Not Applicable: The EUT is powered by battery only.

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/05/21	2025/05/20
Unknown	Cable	PNG214	1354	2024/05/21	2025/05/20
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	735	2024/06/18	2025/06/17
Unknown	RF Cable	UFA147	219661	2024/06/18	2025/06/17
Unknown	RF Cable	XH750A-N	J-10M	2024/06/18	2025/06/17
JD	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	2024/06/18	2025/06/17
RF Conducted Test					
R&S	Spectrum Analyzer	FSU26	200120	2024/01/08	2025/01/07
Unknown	10dB Attenuator	Unknown	F-03-EM190	2024/06/27	2025/06/26
Micro-Tronics	RF Cable	8082176	W6102	2024/06/27	2025/06/26

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307 (b) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.2 – 1-mW test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Test Result:

For worst case:

Mode	Frequency (MHz)	Maximum E-Field (dBuV/m@3m)	Maximum EIRP		Test Exemption (mW)
			(dBm)	(mW)	
SRD	433.92	75.83	-19.37	0.012	1

Note 1: The Maximum EIRP= Maximum E-Field -95.2

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

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. 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.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connector Construction

The EUT has a PCB antenna arrangement which was permanently attached. And the antenna gain is 0 dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

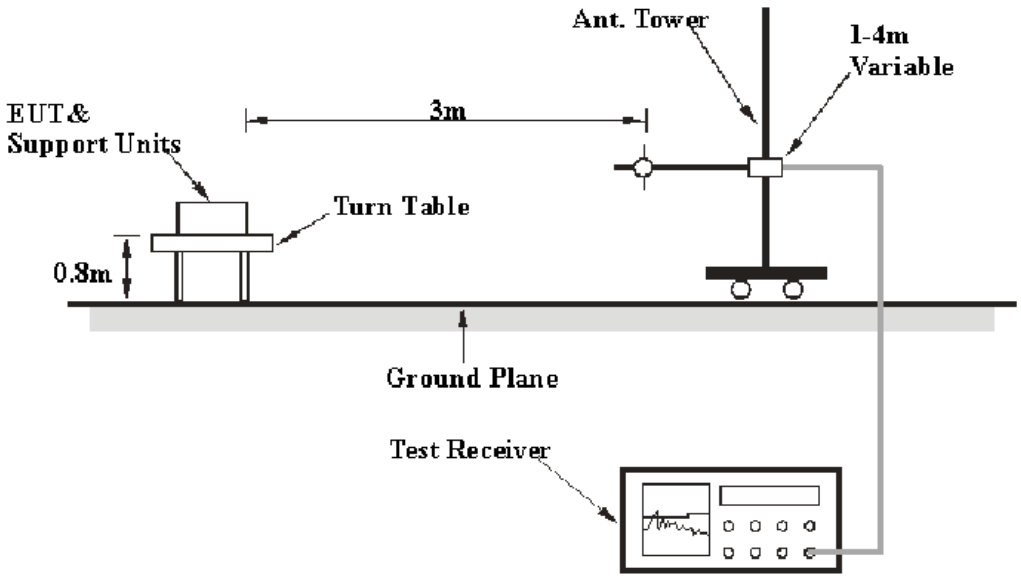
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

*Linear interpolations.

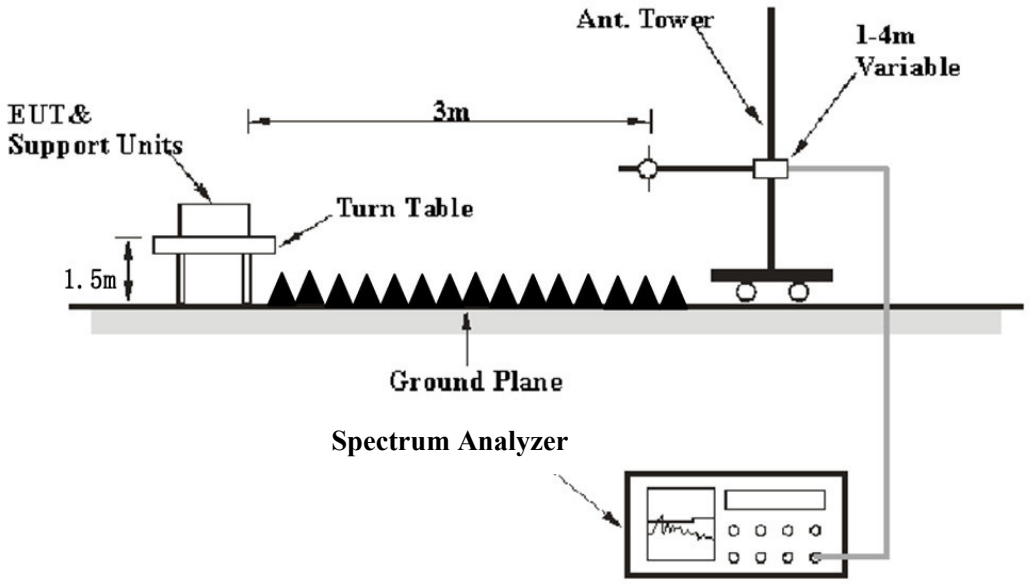
The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK
Above 1 GHz	Harmonics & Band Edge			
	1MHz	3 MHz	/	PK
	Average Emission Level=Peak Emission Level+20*log(Duty cycle)			
	Other Emissions			
	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Average

For Duty cycle measurement:

Use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
Where N1 is number of type 1 pulses, L1 is length of type 1 pulse, etc.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

All emissions under the average limit and under the noise floor have not recorded in the report.

Factor & Over Limit/Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	25~25.3 ℃
Relative Humidity:	52~58 %
ATM Pressure:	101 kPa

The testing was performed by Shy Jiang from 2024-08-01 to 2024-08-02 for below 1GHz, Dylan Yang, Cheeb Huang and Rainbow Zhu from 2024-09-10 to 2024-10-11 for above 1GHz.

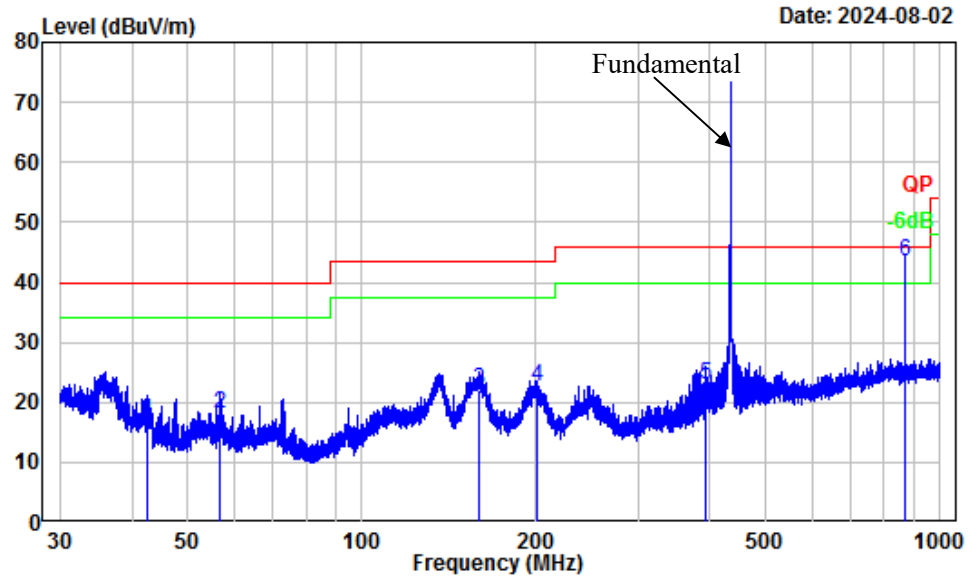
Test mode: Transmitting (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

9 kHz-30MHz:

For the radiated spurious emission below 30MHz, the emissions are 20dB below the limit or the noise floor which are not recorded.

30MHz – 1 GHz:

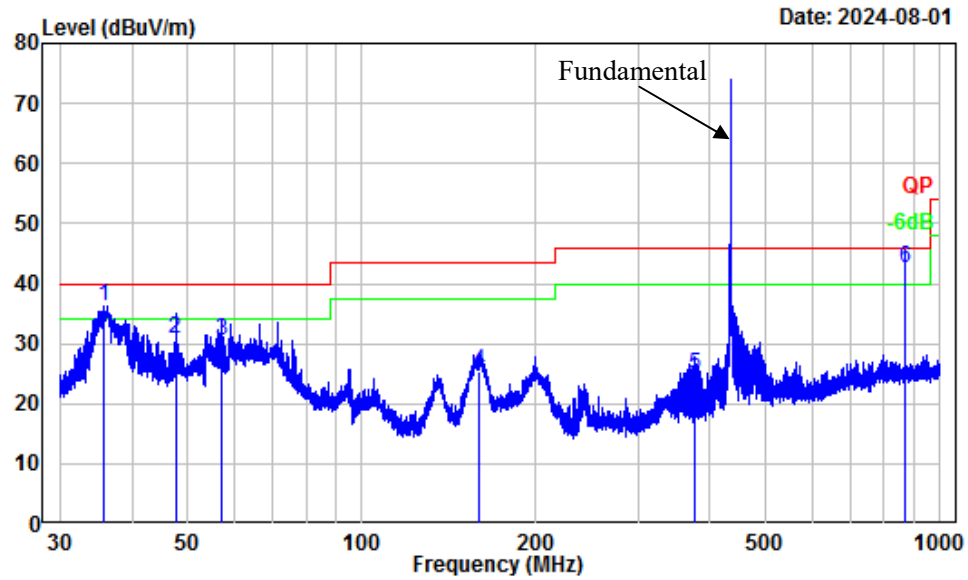
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401V37776E-RF
Test Mode : Transmitting
Tester : Shy Jiang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	42.62	-13.85	30.90	17.05	40.00	-22.95	QP
2	56.89	-18.05	36.27	18.22	40.00	-21.78	QP
3	159.57	-12.71	34.66	21.95	43.50	-21.55	QP
4	200.95	-13.06	35.72	22.66	43.50	-20.84	QP
5	393.64	-8.63	31.58	22.95	46.00	-23.05	QP
6	867.99	-1.58	45.08	43.50	46.00	-2.50	QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401V37776E-RF
Test Mode : Transmitting
Tester : Shy Jiang

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	35.66	-9.60	45.97	36.37	40.00	-3.63	QP
2	47.55	-16.58	47.50	30.92	40.00	-9.08	QP
3	57.02	-18.06	48.62	30.56	40.00	-9.44	QP
4	159.92	-12.72	37.96	25.24	43.50	-18.26	QP
5	376.60	-9.24	33.86	24.62	46.00	-21.38	QP
6	867.99	-1.58	44.18	42.60	46.00	-3.40	QP

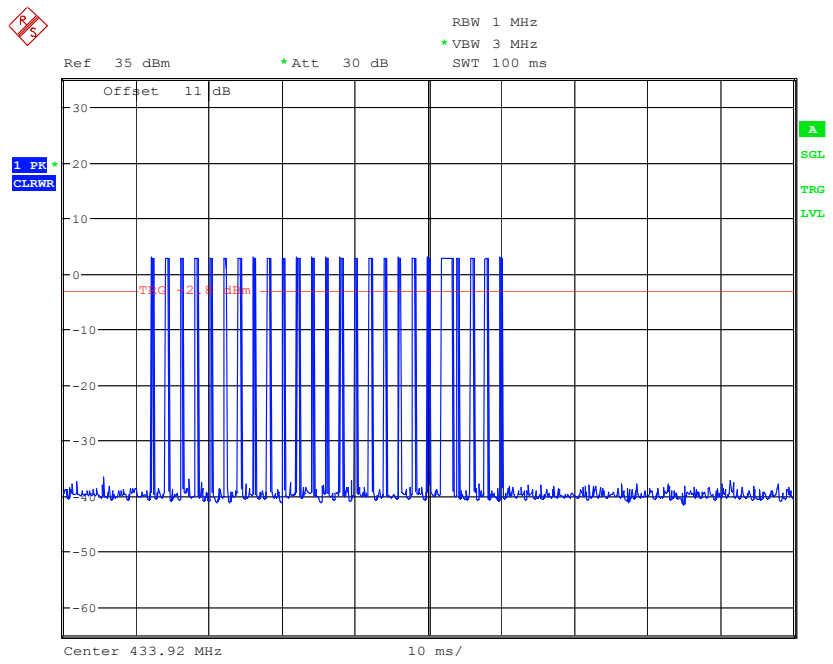
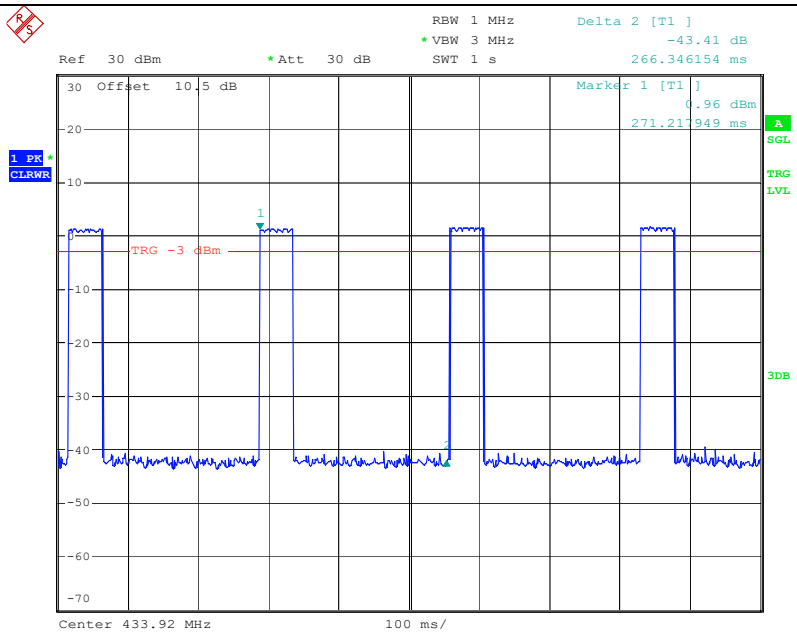
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
	Reading (dBµV)	Detector (PK/QP/AV)						
433.92	83.09	PK	H	-7.82	75.27	100.83	-25.56	Fundamental
433.92	83.65	PK	V	-7.82	75.83	100.83	-25.00	Fundamental
1301.76	66.59	PK	H	-7.37	59.22	74.00	-14.78	Harmonic
1301.76	61.62	PK	V	-7.37	54.25	74.00	-19.75	Harmonic
1735.68	69.52	PK	H	-6.57	62.95	80.83	-17.88	Harmonic
1735.68	66.99	PK	V	-6.57	60.42	80.83	-20.41	Harmonic
2169.60	62.39	PK	H	-3.65	58.74	80.83	-22.09	Harmonic
2169.60	55.73	PK	V	-3.65	52.08	80.83	-28.75	Harmonic
2603.52	63.12	PK	H	-2.92	60.20	80.83	-20.63	Harmonic
2603.52	57.46	PK	V	-2.92	54.54	80.83	-26.29	Harmonic
3037.44	64.32	PK	H	-2.35	61.97	80.83	-18.86	Harmonic
3037.44	54.53	PK	V	-2.35	52.18	80.83	-28.65	Harmonic
3471.36	51.67	PK	H	-2.15	49.52	80.83	-31.31	Harmonic
3471.36	46.28	PK	V	-2.15	44.13	80.83	-36.70	Harmonic

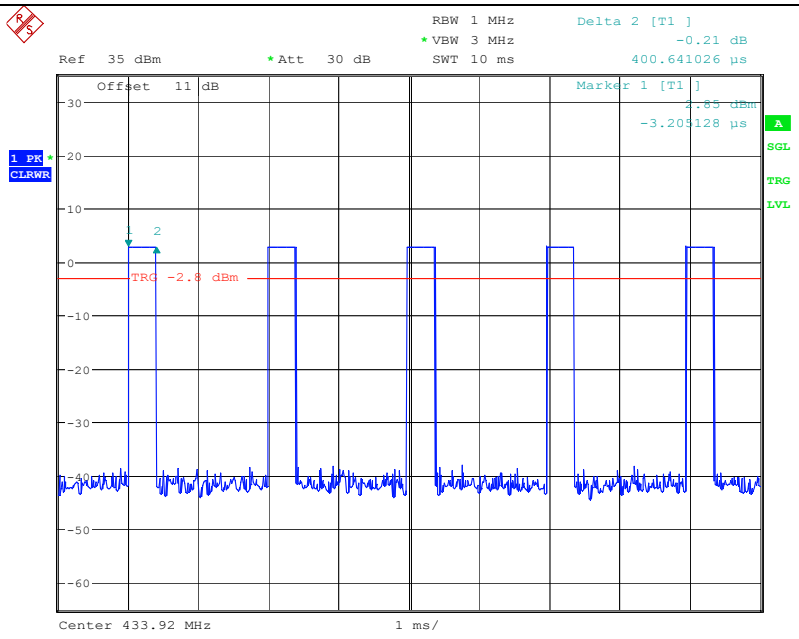
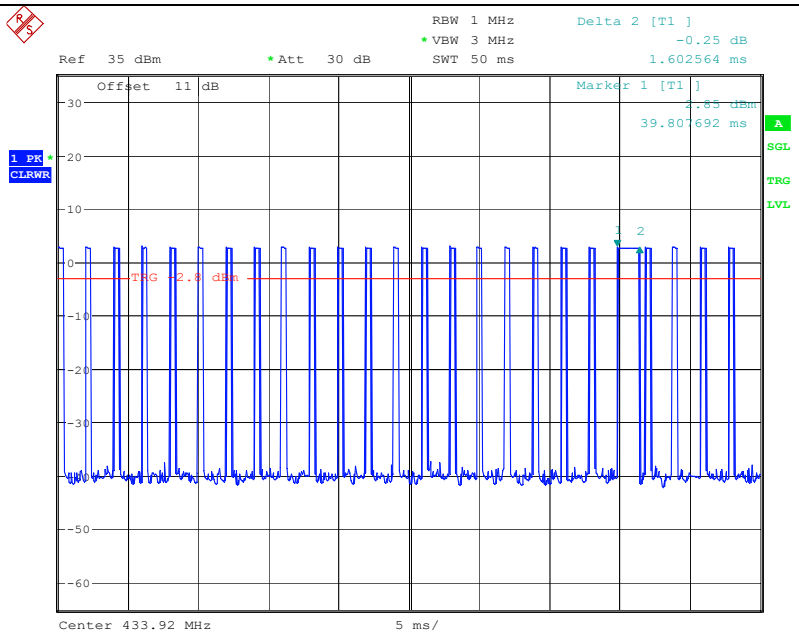
Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude/Level = Factor + Reading
Margin = Corrected Amplitude/Level - Limit
The other spurious emission which is in the noise floor level was not recorded.
Note: for the fundamental, the peak value can meet the limit of the average value.

Field Strength of Average							
Frequency (MHz)	**Peak Measurement @3m (dBµV/m)**	**Polar (H/V)**	**Duty Cycle Corrected Factor (dB)**	**Average Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Comment**
433.92MHz							
1301.76	59.22	H	-18.99	40.23	54.00	-13.77	Harmonic
1301.76	54.25	V	-18.99	35.26	54.00	-18.74	Harmonic
1735.68	62.95	H	-18.99	43.96	60.83	-16.87	Harmonic
1735.68	60.42	V	-18.99	41.43	60.83	-19.40	Harmonic
2169.60	58.74	H	-18.99	39.75	60.83	-21.08	Harmonic
2169.60	52.08	V	-18.99	33.09	60.83	-27.74	Harmonic
2603.52	60.20	H	-18.99	41.21	60.83	-19.62	Harmonic
2603.52	54.54	V	-18.99	35.55	60.83	-25.28	Harmonic
3037.44	61.97	H	-18.99	42.98	60.83	-17.85	Harmonic
3037.44	52.18	V	-18.99	33.19	60.83	-27.64	Harmonic
3471.36	49.52	H	-18.99	30.53	60.83	-30.30	Harmonic
3471.36	44.13	V	-18.99	25.14	60.83	-35.69	Harmonic

Note: Average level= Peak level+ Duty Cycle Corrected Factor
Margin = Average level - Limit

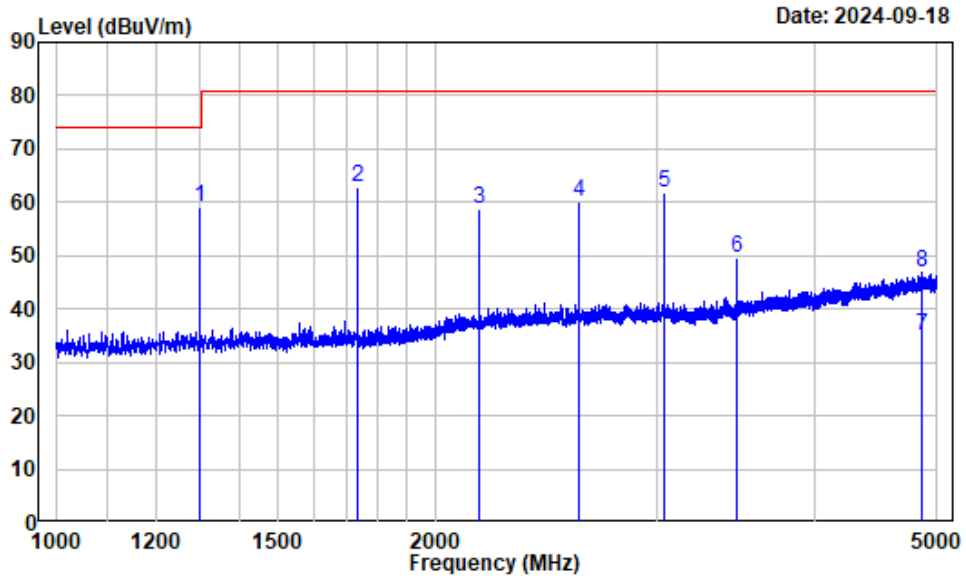
Worst case duty cycle:
Ton1 = 1*1.603ms=1.603ms
Ton2 = 24*0.401ms=9.624ms
Tp = 100 ms
Duty cycle = Ton/Tp = (Ton1+Ton2)/100
Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg(0.112) = -18.99

Duty Cycle (100ms)	 ProjectNo.:2401V37776E-RF Tester:Cheeb Huang Date: 10.SEP.2024 11:38:58
Duty Cycle (1s)	 ProjectNo.:2401V37776E-RF Tester:Rainbow Zhu Date: 11.OCT.2024 16:15:11

Pulse 1	
Pulse 2	

1 GHz - 5 GHz:

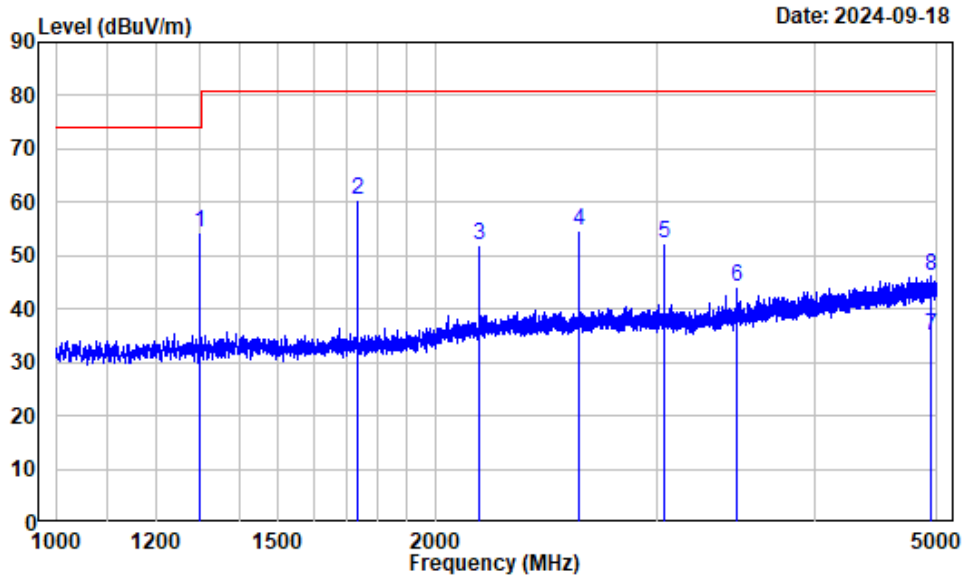
Horizontal



Condition : Horizontal
Project No.: 2401V37776E-RF
Tester : Dylan.Yang
Note : 433.92

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	1301.760	-7.37	66.59	59.22	74.00	-14.78	Peak
2	1735.680	-6.57	69.52	62.95	80.83	-17.88	Peak
3	2169.600	-3.65	62.39	58.74	80.83	-22.09	Peak
4	2603.520	-2.92	63.12	60.20	80.83	-20.63	Peak
5	3037.440	-2.35	64.32	61.97	80.83	-18.86	Peak
6	3471.360	-2.15	51.67	49.52	80.83	-31.31	Peak
7	4872.000	2.55	32.51	35.06	54.00	-18.94	Average
8	4872.000	2.55	44.28	46.83	74.00	-27.17	Peak

Vertical



Condition : Vertical
Project No.: 2401V37776E-RF
Tester : Dylan.Yang
Note : 433.92

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	1301.760	-7.37	61.62	54.25	74.00	-19.75	Peak
2	1735.680	-6.57	66.99	60.42	80.83	-20.41	Peak
3	2169.600	-3.65	55.73	52.08	80.83	-28.75	Peak
4	2603.520	-2.92	57.46	54.54	80.83	-26.29	Peak
5	3037.440	-2.35	54.53	52.18	80.83	-28.65	Peak
6	3471.360	-2.15	46.28	44.13	80.83	-36.70	Peak
7	4952.500	2.62	32.23	34.85	54.00	-19.15	Average
8	4952.500	2.62	43.50	46.12	74.00	-27.88	Peak

FCC §15.231(a) (1) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. The EUT is setting to the transmit mode, the waveform was received by the test antenna which was connected to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=1MHz/ VBW=3MHz/ Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

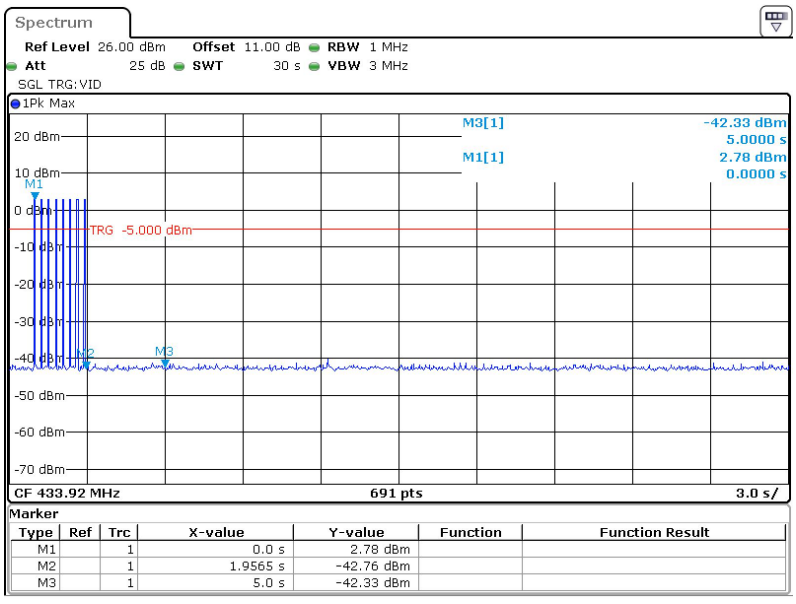
Environmental Conditions

Temperature:	25.3 ℃
Relative Humidity:	52 %
ATM Pressure:	101 kPa

The testing was performed by Cheeb Huang on 2024-09-18.

Test mode: Transmitting

Test Result: Compliant. This product will cease transmission within 5 seconds after activation. Please refer to following plots.



FCC §15.231(c) - 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The EUT is setting to the transmit mode, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	25.7 ℃
Relative Humidity:	52 %
ATM Pressure:	101 kPa

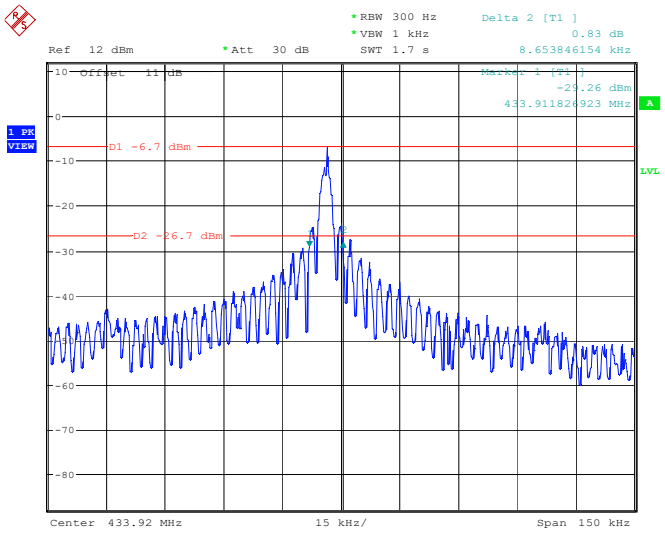
The testing was performed by Cheeb Huang on 2024-09-10.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20dB Emission Bandwidth (kHz)	Limit (kHz)
433.92	8.65	1085

20 dB Emission Bandwidth



ProjectNo.:2401V37776E-RF Tester:Cheeb Huang
Date: 10.SEP.2024 11:34:21

EUT PHOTOGRAPHS

Please refer to the attachment 2401V37776E-RF External photo and 2401V37776E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401V37776E-RF Test Setup photo.

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