

# **FCC Test Report**

Report No.: 2405X40590EB Applicant: SHENZHEN HOMELEAD ELECTRONICS CO., LTD. Address: 11th Floor, Bldg 2, Phase 5, Fucheng Digital Innovation Shijing Road, Fucheng Street, Longhua, Shenzhen, China Key Finder **Product Name:** Product Model: KF06A KF02E, KF02F, KF02G, KF02H, KF02I, KF02J, KF04G, KF04M, Multiple Models: KF04N, KF04O, KF04P, KF04Q, KF04R, KF04S, KF04T, KF04U, KF06B, KF06C, KF06D, KF06E, KF06F, KF06G, KF06G-1, KF06H, KF06I, KF06J, KF06L, KF06M, KF06N, KF06O, KF06P, KF06Q, KF06R, KF06S, KF06T, KF06U, KF06V, KF08G, KF08H, KF08I, KF08J, KF08L Trade Mark: N/A FCC ID: 2AAXF-HB9807 Standards: FCC CFR Title 47 Part 15C (§15.231) 2024-12-01 to 2024-12-04 Test Date: Test Result: Complied

**Report Date: 2024-12-06** 

**Reviewed by:** 

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Approved by:

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#### Prepared by:

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### **Revision History**

Version No.	Issued Date	Description
00	2024-12-06	Original



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## 1 General Information

### **1.1 Client Information**

Applicant:	SHENZHEN HOMELEAD ELECTRONICS CO., LTD.
Address:	11th Floor, Bldg 2, Phase 5, Fucheng Digital Innovation Shijing Road, Fucheng Street, Longhua, Shenzhen, China
Manufacturer:	SHENZHEN HOMELEAD ELECTRONICS CO., LTD.
Address:	11th Floor, Bldg 2, Phase 5, Fucheng Digital Innovation Shijing Road, Fucheng Street, Longhua, Shenzhen, China

### **1.2 Product Description of EUT**

The EUT is Key Finder that contains 433.92MHz transmitter, this report covers the full testing of the 433.92MHz transmitter.

Sample Serial Number	2SEZ-1 (assigned by WATC)
Sample Received Date	2024-10-09
Sample Status	Good Condition
Frequency Range	433.92MHz
Maximum E-field Strength:	72.81dBuV/m@3m
Modulation Technology	ASK
Antenna Gain <sup>#</sup>	Unknown
Spatial Streams <sup>#</sup>	SI(1TX)
Power Supply	DC 3V
Adapter Information	N/A
Modification	Sample No Modification by the test lab

### **1.3 Antenna information**

#### 15.203 requirement:

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, 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.

#### Device Antenna information:

The antenna is an internal antenna which cannot replace by end-user. Please see product internal photos for details.

### 1.4 Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s)

### 1.5 Measurement Uncertainty

Parameter		Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
AC Power Lines Conducted Emissions		±3.14dB
	Below 30MHz	±2.78dB
Emissions, Radiated	Below 1GHz	±4.84dB
	Above 1GHz	±5.44dB
Bandwidth		0.34%

**Note 1:** 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.

**Note 2:** The Decision Rule is based on simple acceptance with ISO Guide 98-4:2012 Clause 8.2 (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 1.6 Laboratory Location

World Alliance Testing & Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Tel: +86-755-29691511, Email: <u>qa@watc.com.cn</u>

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. : 463912, the FCC Designation No. : CN5040.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0160.

### 1.7 Test Methodology

FCC CFR 47 Part 2 FCC CFR 47 Part 15 ANSI C63.10-2020



## **2** Description of Measurement

### 2.1 Test Configuration

Operating channels:						
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	
1	433.92	/	/	/	/	
	According to ANSI C63.10-2020 chapter 5.6.1 Table 11 requirement, select middle channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:					
Lowe	Lowest channel Middle channel Highest channel				channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	
/	/	1	433.92	/	/	

#### Worst-Case Configuration:

For radiated emissions, EUT was investigated in three orthogonal orientation, the worst-case orientation was recorded in report.

For radiated emissions below 30MHz, three antenna orientations (parallel, perpendicular, gound-parallel) were tested, only record the worse case test data in report.

According to applicant, all the keys with same power setting, the EUT was configured to an engineering mode that with continue transmitting when power on for the testing.

All keys were evaluated the duty cycle, only the worst case(K2) duty cycle was recorded in report.

### 2.2 Test Auxiliary Equipment

Manufacturer	Description	Model	Serial Number
/	/	/	/

### 2.3 Interconnecting Cables

Manufacturer	Description	Length(m)	From	То
/	/	/	/	/

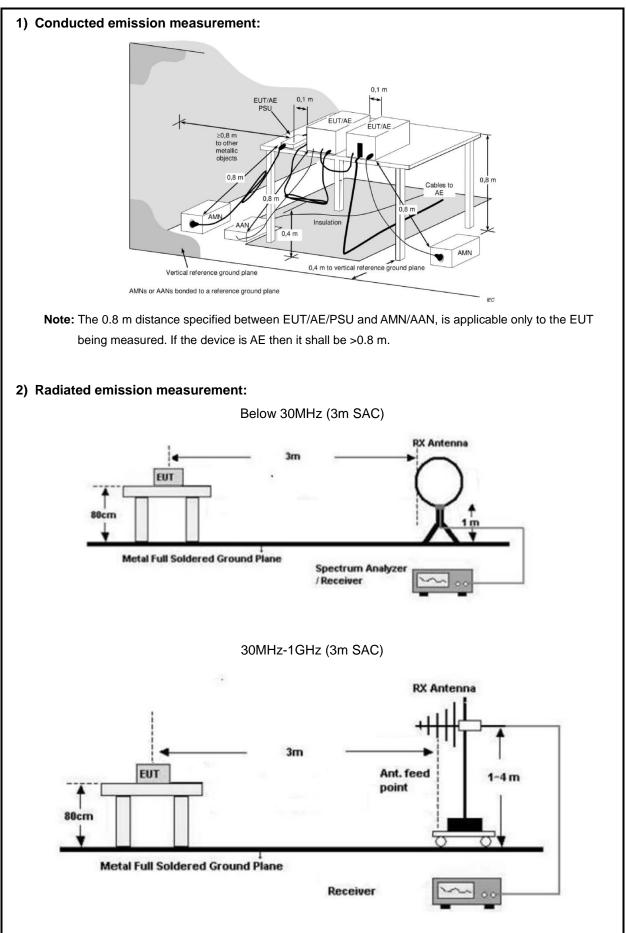
### 2.4 Block Diagram of Connection between EUT and AE

EUT
-----

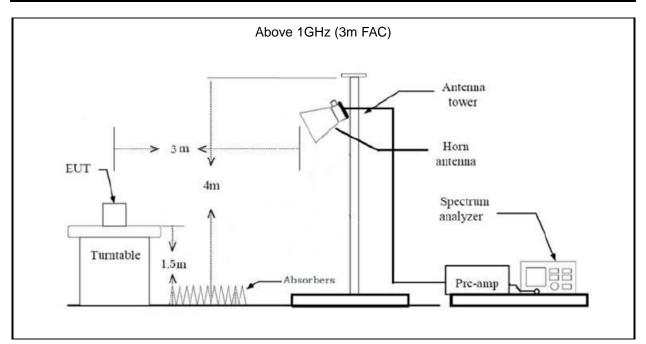
Note: for reference only, the actual connection setup used for testing please refer to the test photos.



### 2.5 Test Setup







### 2.6 Test Procedure

#### Conducted emission:

- 1. The E.U.T is placed on a non-conducting table 40cm from the vertical ground plane and 80cm above the horizontal ground plane (Please refer to the block diagram of the test setup and photographs).
- 2. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
- 3. Line conducted data is recorded for both Line and Neutral

#### **Radiated Emission Procedure:**

#### a) For below 30MHz

- All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz- 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40\*Log (test distance / specification distance).
- 2. Loop antenna use, investigation was done on the three antenna orientations (parallel, perpendicular, gound-parallel)

#### b) For 30MHz-1GHz:

- 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m.
- 2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.



#### c) For above 1GHz:

- The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m (1-18GHz) and 1.5 m (above 18GHz).
- 2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.
- 3. The RBW/VBW of spectrum analyzer is set to 1MHz/3MHz for scan Peak emissions
- 4. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
- 5. Base on FCC 15.35 (c): for pulsed operation, the average emission was calculated by apply the duty cycle factor to the Peak emissions.

#### **Bandwidth Test:**

- 1. Use the same setup for radiated above 1GHz, found the maximum fundamental level.
- 2. Change the spectrum analyzer setting for bandwidth testing
- 3. Test the bandwidth and record the result

### 2.7 Measurement Method

Description of Test	Measurement Method	
AC Line Conducted Emissions	ANSI C63.10-2020 Section 6.2	
20dB Emission Bandwidth	ANSI C63.10-2020 Section 6.9.2	
Deactivation Testing	ANSI C63.10-2020 Section 7.4	
Field strength of fundamental and Radiated emission	ANSI C63.10-2020 Section 6.3&6.4&6.5&6.6	

## 2.8 Measurement Equipment

Manufacturer	Description	Model	Management No.	Calibration Date	Calibration Due Date
		Radiated Emissio	n Test		
R&S	EMI test receiver	ESR3	102758	2024/6/4	2025/6/3
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSV40-N	101608	2024/6/4	2025/6/3
SONOMA INSTRUMENT	Low frequency amplifier	310	186014	2024/6/4	2025/6/3
A.H. Systems	PREAMPLIFIER	PAM-0118P	531	2024/6/4	2025/6/3
BACL	Loop Antenna	1313-1A	4010611	2024/2/7	2027/2/6
SCHWARZBECK	Log - periodic wideband antenna	VULB 9163	9163-872	2023/7/7	2026/7/6
Astro Antenna Ltd	Horn antenna	AHA-118S	3015	2023/7/6	2026/7/5
N/A	Coaxial Cable	NO.9	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.15	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.16	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.17	N/A	2024/6/4	2025/6/3
Audix	Test Software	E3	191218 V9	/	/

Note: All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or International standards.

## 3 Test Results

### 3.1 Test Summary

FCC/ISEDC Rules	Description of Test	Result
FCC §15.203	Antenna Requirement	Compliance
FCC §15.207(a)	AC Line Conducted Emissions	Not Applicable
FCC §15.231(c)	20dB Emission Bandwidth	Compliance
FCC §15.231(a)	Deactivation Testing	Compliance
FCC §15.205, §15.209, §15.231(b)	Field strength of fundamental and Radiated emission	Compliance

Not Applicable: the device only powered by battery



## 3.2 Limit

See details §15.207 (a)				
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz.				
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.				
ns from following:				
rious meter)				
<sup>1</sup> Linear interpolations.				
The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.				
Intentional radiators operating under the provisions of this section shall				
demonstrate compliance with the limits on the field strength of emissions, as				
shown in the above table, based on the average value of the measured				
emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak				
ecified in				
the application for equipment authorization. If average emission measurements are employed, the provisions in § 15.35 for averaging pulsed emissions and for				
limiting peak emissions apply. Further, compliance with the provisions of §				
15.205 shall be demonstrated using the measurement instrumentation specified				
in that section.				
The limits on the field strength of the spurious emissions in the above table are				
based on the fundamental frequency of the intentional radiator. Spurious				
emissions shall be attenuated to the average (or, alternatively, CISPR				
quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.				



## 3.3 AC Line Conducted Emissions Test Data

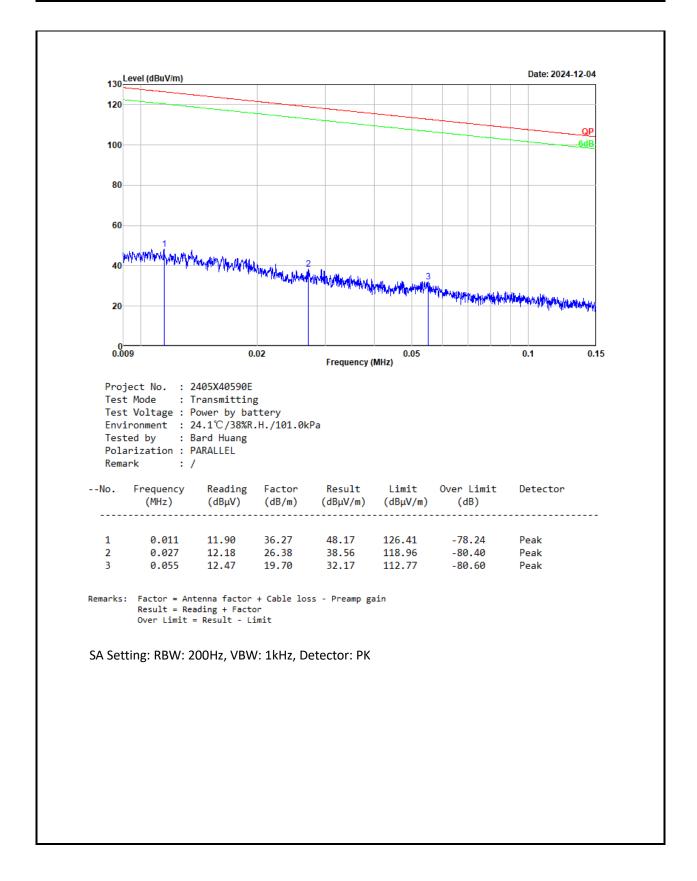
Not Applicable, the device only powered by battery



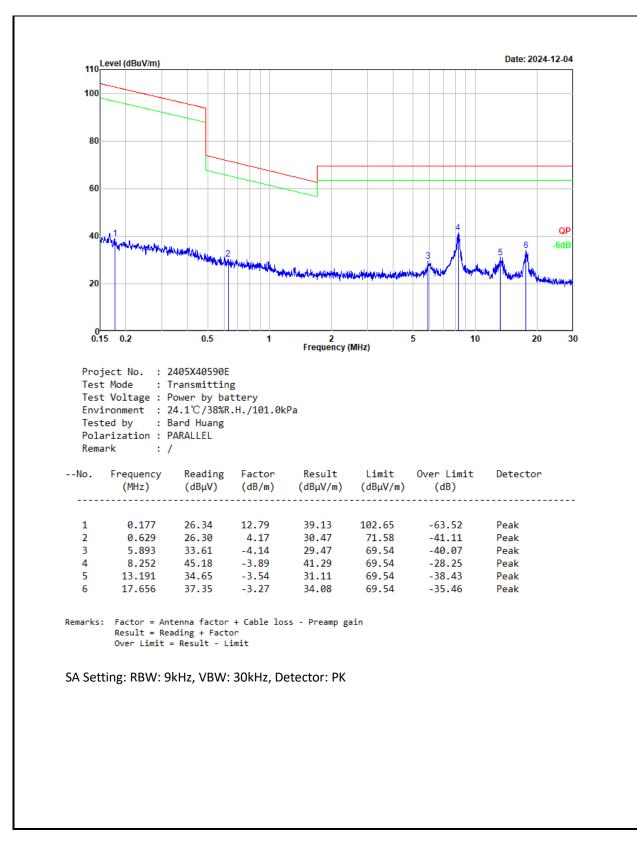
### 3.4 Radiated emission Test Data

#### 9 kHz-30MHz:

Test Date:	2024-12-04	Test By:	Bard Huang	
Environment condition:	Temperature: 24.1°C; Relative Humidity:38%; ATM Pressure: 101.0kPa			



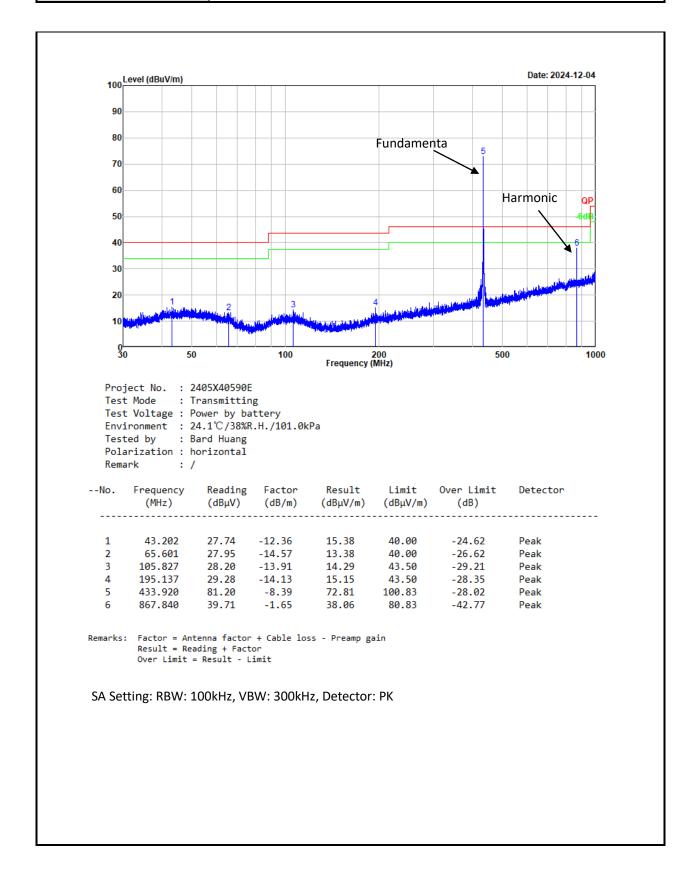




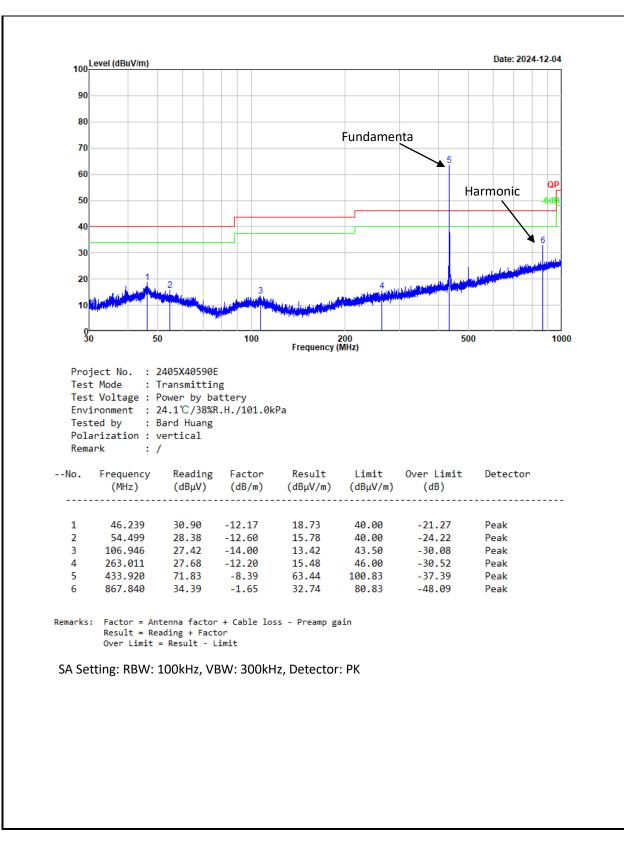


#### 30MHz-1GHz:

Test Date:	2024-12-04	Test By:	Bard Huang
Environment condition:	Temperature: 24.1°C; Relative Humidity:38%; ATM Pressure: 101.0kPa		ssure: 101.0kPa



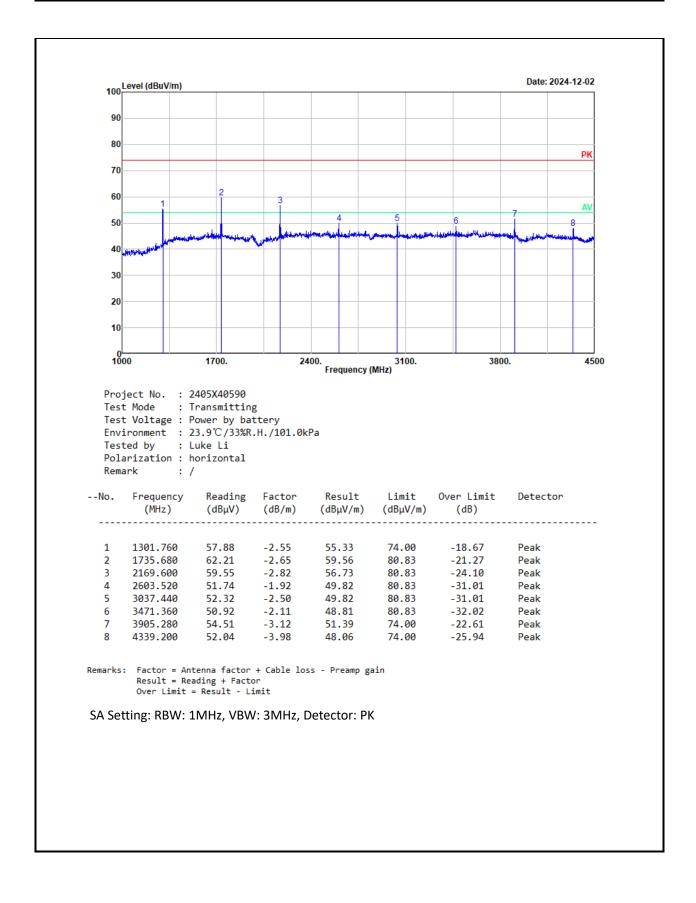




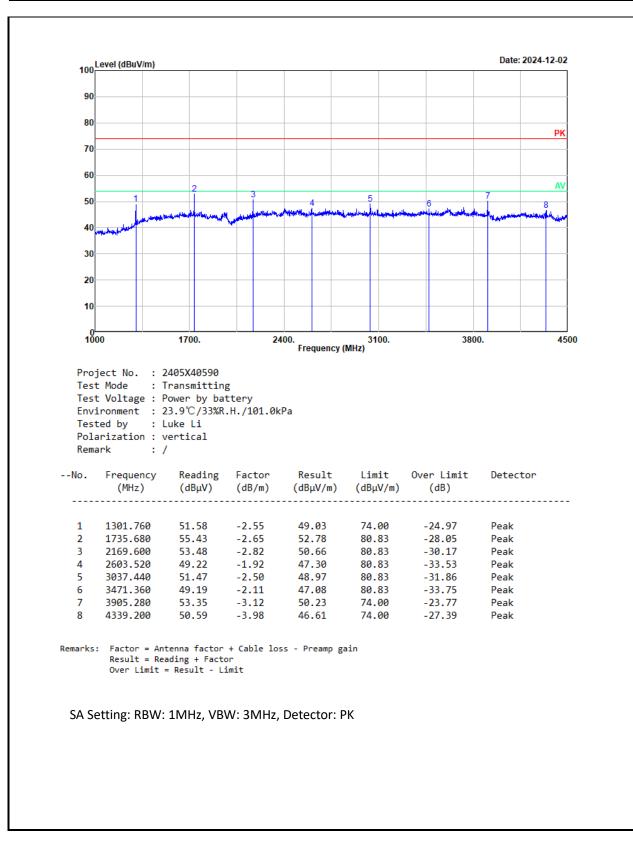


#### Above 1GHz:

Test Date:	2024-12-02	Test By:	Luke Li	
Environment condition:	Temperature: 23.9°C; Relative Humidity:33%; ATM Pressure: 101.0kPa			









#### Field strength of average:

Frequency (MHz)	Peak level @3m (dBµV/m)	Polar	Duty cycle Factor (dB/m)	Average Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
433.920	72.81	horizontal	-7.30	65.51	80.83	-15.32	Fundamental
433.920	63.44	vertical	-7.30	56.14	80.83	-24.69	Fundamental
867.840	38.06	horizontal	-7.30	30.76	60.83	-30.07	Harmonic
1301.760	55.33	horizontal	-7.30	48.03	54.00	-5.97	Harmonic
1735.680	59.56	horizontal	-7.30	52.26	60.83	-8.57	Harmonic
2169.600	56.73	horizontal	-7.30	49.43	60.83	-11.40	Harmonic
2603.520	49.82	horizontal	-7.30	42.52	60.83	-18.31	Harmonic
3037.440	49.82	horizontal	-7.30	42.52	60.83	-18.31	Harmonic
3471.360	48.81	horizontal	-7.30	41.51	60.83	-19.32	Harmonic
3905.280	51.39	horizontal	-7.30	44.09	54.00	-9.91	Harmonic
4339.200	48.06	horizontal	-7.30	40.76	54.00	-13.24	Harmonic
867.840	32.74	vertical	-7.30	25.44	60.83	-35.39	Harmonic
1301.760	49.03	vertical	-7.30	41.73	54.00	-12.27	Harmonic
1735.680	52.78	vertical	-7.30	45.48	60.83	-15.35	Harmonic
2169.600	50.66	vertical	-7.30	43.36	60.83	-17.47	Harmonic
2603.520	47.30	vertical	-7.30	40.00	60.83	-20.83	Harmonic
3037.440	48.97	vertical	-7.30	41.67	60.83	-19.16	Harmonic
3471.360	47.08	vertical	-7.30	39.78	60.83	-21.05	Harmonic
3905.280	50.23	vertical	-7.30	42.93	54.00	-11.07	Harmonic
4339.200	46.61	vertical	-7.30	39.31	54.00	-14.69	Harmonic

Remark:

Average Amplitude= Peak level + Duty Cycle Factor Margin = Average Amplitude - Limit



## 3.5 Duty Cycle

Test Date:	2024-12-02	Test By:	Luke Li
Environment condition:	Temperature: 23.9°C; Relative	Humidity:33%; ATM F	ressure: 101.0kPa

Subpulse	Ton Duration [ms]	Number of pulse	Total On time [ms]	Period of the pulse train [ms]	Duty Cycle [%]
1	0.405	18	19.290	44.708	43.15
2	1.200	10	13.230	.700	-0.10
Duty	cycle Factor[dB]:	-7.30			

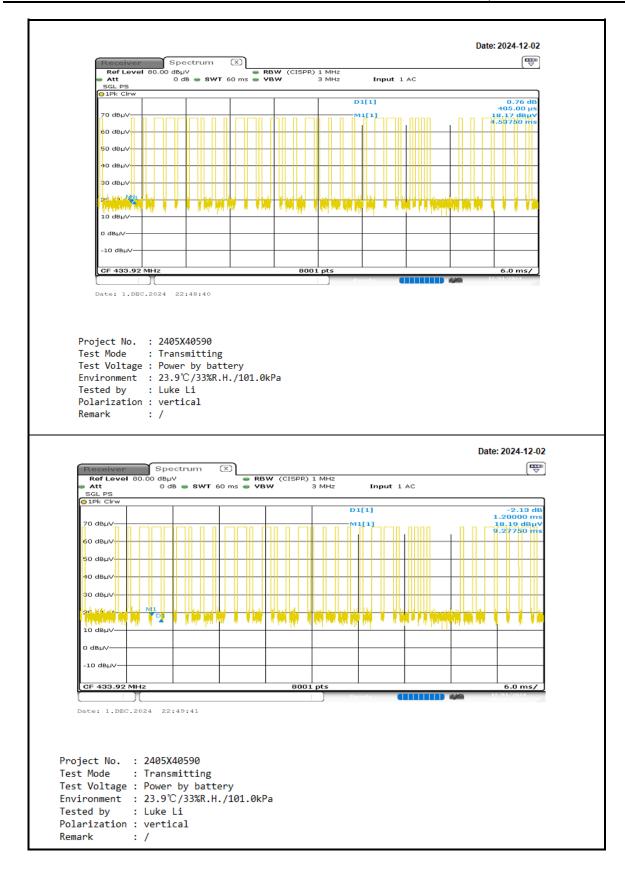
#### Remark:

Total On time= Ton1\*N1+Ton2\*N2 Duty Cycle=( Total On time)/Tp Duty Cycle Factor=20\*log(Duty Cycle)









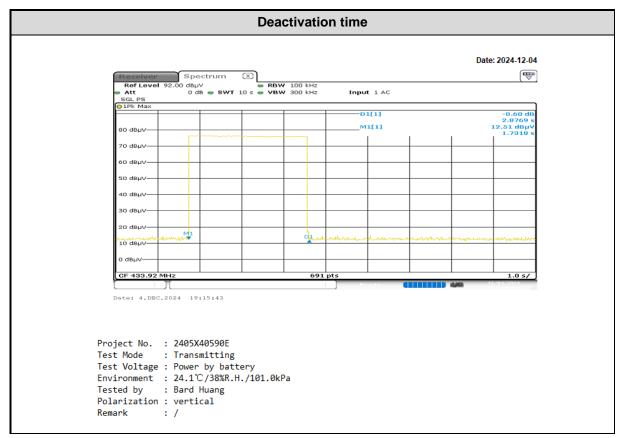


### 3.6 Deactivation Testing

Test Date:	2024-12-04	Test By:	Bard Huang
Environment condition:	Temperature: 24.1°C; Relative Humidity:38%; ATM Pressure: 101.0kPa		essure: 101.0kPa

Channel Frequency [MHz]	Deactivation time[s]	Limit[s]	Verdict
433.92	2.88	≤5	Pass

### **Test Plots:**





### 3.7 Bandwidth Test Data

Test Date:	2024-12-02	Test By:	Luke Li
Environment condition:	Temperature: 23.9°C; Relative Humidity:33%; ATM Pressure: 101.0kPa		essure: 101.0kPa

Channel Frequency [MHz]	20dB BW [kHz]	Limit[kHz]	Verdict
433.92	7.771	1084.8	Pass

### **Test Plots:**





## 4 Test Setup Photo

Please refer to the attachment 2405X40590ETest Setup photo.



## 5 E.U.T Photo

Please refer to the attachment 2405X40590E External photo and 2405X40590E Internal photo.

---End of Report---