TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID. ..... :	2ATK8-SH9160	
Test Report No..... :	TCT250115E016	
Date of issue..... :	Jan. 22, 2025	
Testing laboratory ..... :	SHENZHEN TONGCE TESTING LAB	
Testing location/ address:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China	
Applicant's name..... :	Ningbo Shuanghe Hongsheng Electronic Technology Co., Ltd	
Address..... :	No.2 Binxi south Rd Dayin Industrial Park, Yuyao, Zhejiang, China	
Manufacturer's name ... :	Ningbo Shuanghe Hongsheng Electronic Technology Co., Ltd	
Address..... :	No.2 Binxi south Rd Dayin Industrial Park, Yuyao, Zhejiang, China	
Standard(s) ..... :	FCC CFR Title 47 Part 15 Subpart C Section 15.231	
Product Name..... :	WIRELESS THERMOMETER & REMOTE CONTROL POOL LIGHT	
Trade Mark ..... :	N/A	
Model/Type reference..... :	SH9160	
Rating(s) ..... :	Rechargeable Li-ion Battery DC 3.7V	
Date of receipt of test item ..... :	Jan. 15, 2025	
Date (s) of performance of test..... :	Jan. 15, 2025 ~ Jan. 22, 2025	
Tested by (+signature) ... :	Yannie ZHONG	Yannie Zhong
Check by (+signature).... :	Beryl ZHAO	Beryl Zhao
Approved by (+signature):	Tomsin	Tomsin

SHENZHEN TONGCE TESTING LAB TCT

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. General Product Information

1.1. EUT description

Product Name.....:	WIRELESS THERMOMETER & REMOTE CONTROL POOL LIGHT
Model/Type reference.....:	SH9160
Sample Number.....:	TCT250115E016-0101
Operation Frequency.....:	433.92MHz
Modulation Technology.....:	ASK
Antenna Type.....:	Helical Antenna
Antenna Gain.....:	0dBi
Rating(s).....:	Rechargeable Li-ion Battery DC 3.7V

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

1.2. Model(s) list

None.

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Conduction Emission, 0.15MHz to 30MHz	§15.207	N/A
Transmission time and silent time	15.231(e)	PASS
Radiation Emission	§15.231(e), §15.205, §15.209, §15.35	PASS
Occupied Bandwidth	§15.231(c)	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. General Information

3.1. Test Environment and Mode

Operating Environment:	
Condition	Radiated Emission
Temperature:	23.1 °C
Humidity:	46 % RH
Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

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4. Facilities and Accreditations

4.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

  Designation Number: CN1205

  The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A

  SHENZHEN TONGCE TESTING LAB

  CAB identifier: CN0031

  The testing lab has been registered by Innovation, Science and Economic Development Canada for radio equipment testing.

4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

4.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	All emissions, radiated(<1 GHz)	± 4.56 dB
5	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
6	All emissions, radiated(18 GHz- 40 GHz)	± 4.36 dB

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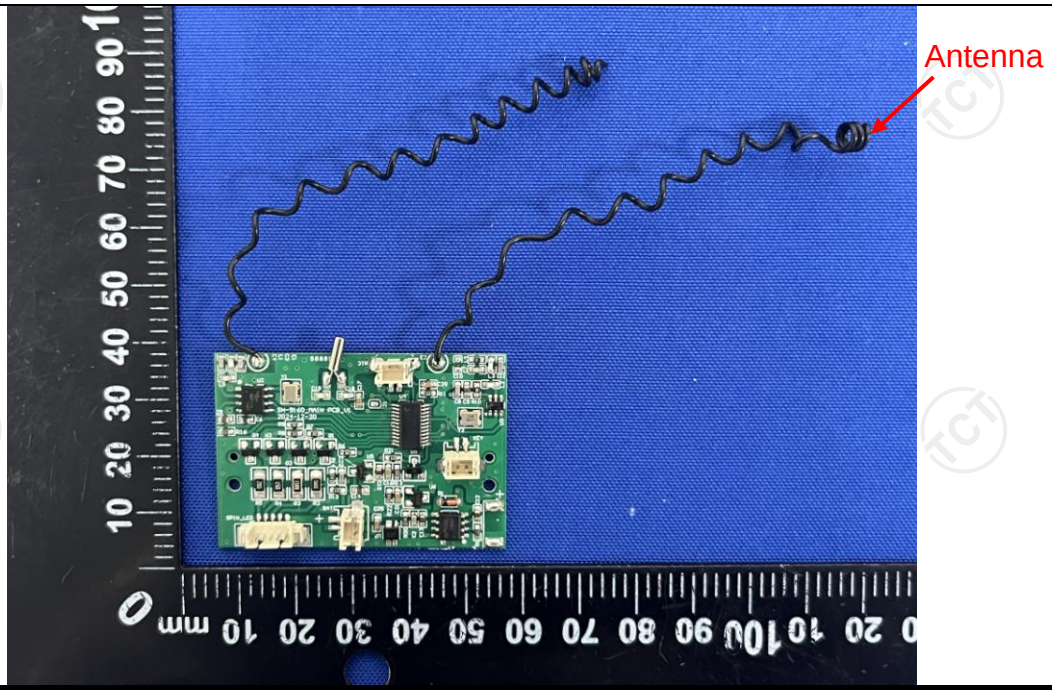
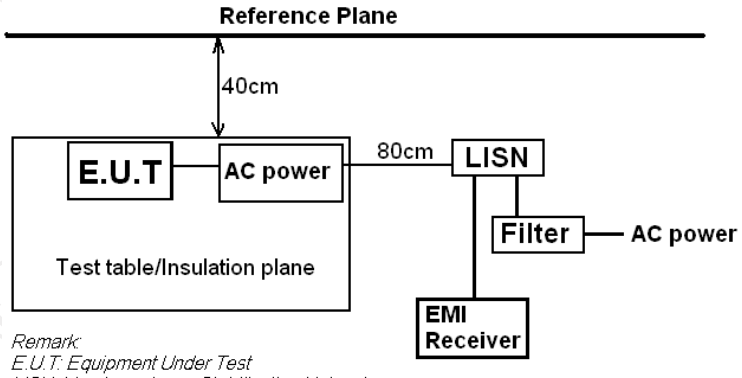
5. Test Results and Measurement Data

5.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The antenna is helical antenna which permanently attached, and the best case gain of the antenna is 0dBi.	
	

5.2. Conducted Emission

5.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2020</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>Charging + Transmitting Mode</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. 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 C63.10:2020 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>N/A; The EUT powered by battery, the battery can only be charged by solar energy, so this test item is not applicable</td></tr>
</table>

5.3. Radiated Emission Measurement

5.3.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.231(e) and 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2020</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 5 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td></td><td>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</td></tr>
</table>

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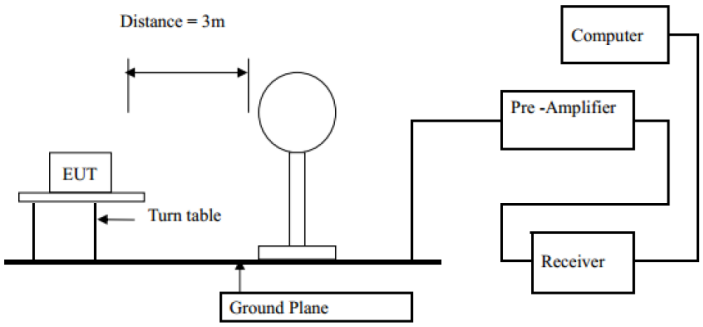
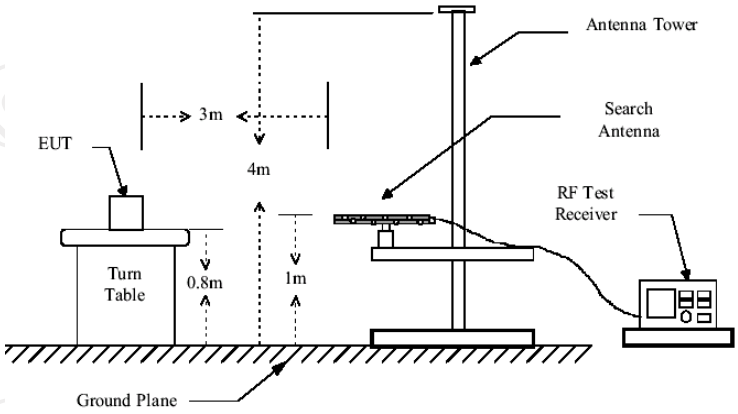
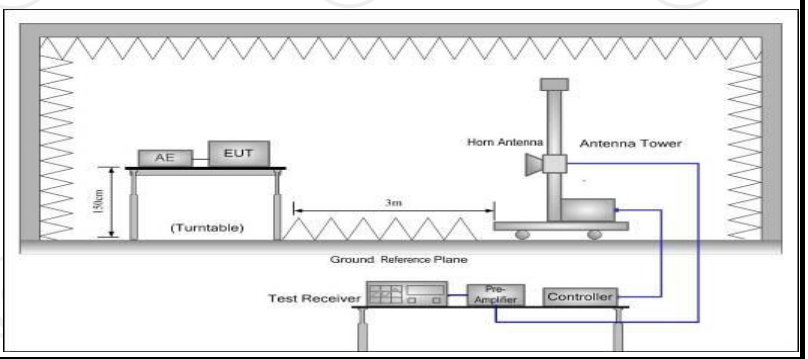
Test setup:	For radiated emissions below 30MHz  30MHz to 1GHz  Above 1GHz 
Test Mode:	Transmitting Mode
Test results:	PASS

5.3.2. Limit

Fundamental Frequency (MHz)	Filed Strength of Fundamental (microvolts/meter)	Filed Strength of Spurious Emission (microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500*	50 to 150*
174-260	1500	150
260-470	1500 to 5000*	150 to 500*
Above 470	5000	500
*Linear interpolations		
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: For the band 130-174 MHz, μV/m at 3 meters = 22.7273(F) – 2454.5455; for the band 260-470 MHz, μV/m at 3 meters = 16.6667(F) - 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]		

For EUT

Fundamental Frequency (MHz)	Filed Strength of Fundamental (microvolts/meter)	Filed Strength of Spurious Emission(dBμV/m)
433.92	72.87	52.87

Note:

1. *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.*
2. *According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits Shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.*
3. *According to 15.231(b), The limits on the field strength of the spurious emissions in the above table is 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 Section 15.209, whichever limit permits one higher field strength.*

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Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dBμV/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note:

1. *RF Voltage (dBuV) = 20 log RF Voltage (uV)*
2. *In the Above Table, the tighter limit applies at the band edges.*
3. *Distance refers to the distance in meters between the measuring instrument antenna and the EUT*
4. *The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.*
5. *If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula Ld1 = Ld2 * (d2/d1)*

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5.3.3. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI7	100529	Jan. 31, 2025
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 26, 2025
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	Jan. 31, 2025
Pre-amplifier	SKET	LNPA_1840G-50	SK202109203500	Jan. 31, 2025
Pre-amplifier	HP	8447D	2727A05017	Jun. 26, 2025
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jun. 26, 2025
Broadband Antenna	Schwarzbeck	VULB9163	340	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 02, 2025
Coaxial cable	SKET	RE-03-D	/	Jun. 26, 2025
Coaxial cable	SKET	RE-03-M	/	Jun. 26, 2025
Coaxial cable	SKET	RE-03-L	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-D	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-M	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-L	/	Jun. 26, 2025
EMI Test Software	EZ_EMC	FA-03A2 RE+	1.1.4.2	/

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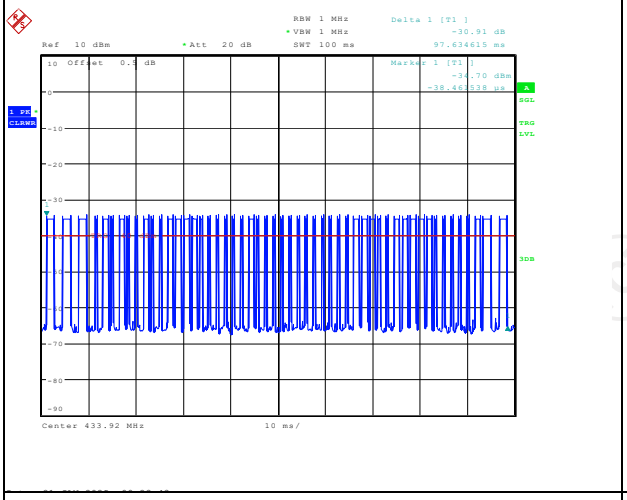
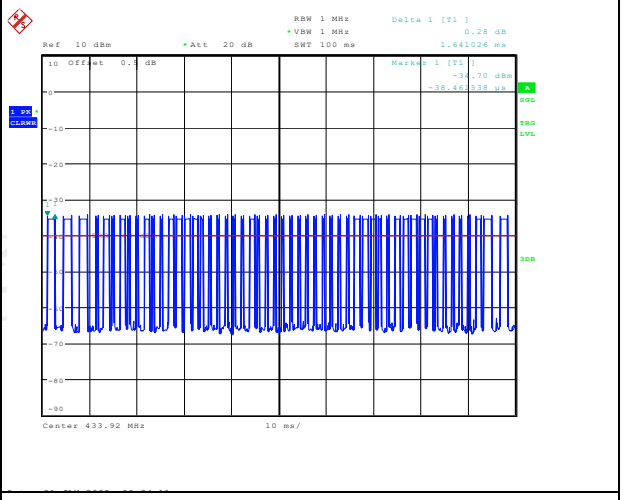
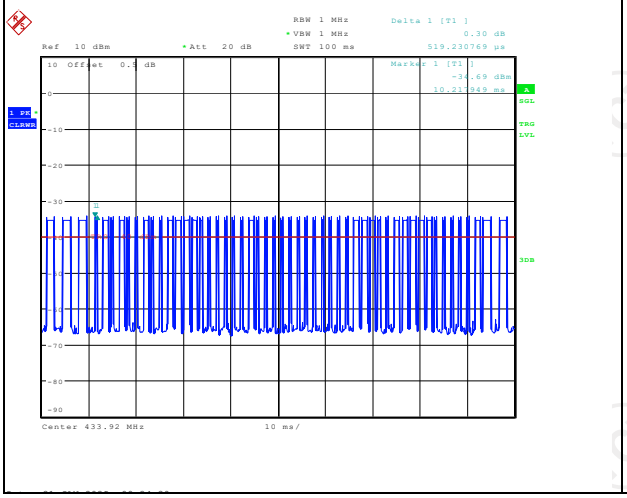
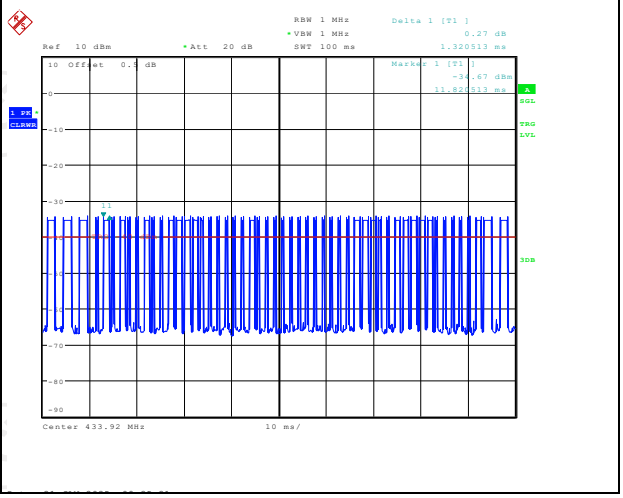
5.3.4. Test Data

Duty Cycle Test Data:

Total time (ms)	100 (ms)	Duty Cycle	AV Factor(dB)
46.76	100	0.4676	-6.60

Note: *Duty Cycle = Ton time/100 milliseconds or period, whichever is less*
*Ton time = 5*1.64(ms)+31*0.52(ms)+17*1.32(ms)= 46.76(ms), T period =100ms*
So, Duty cycle = 46.76%
AV Factor = 20 log(Duty Cycle)= -6.60

Field Strength of Fundamental

Frequency (MHz)	Emission PK (dBuV/m)	Horizontal /Vertical	Limits PK (dBuV/m)	Margin (dB)
433.92	61.13	H	92.87	-31.74
433.92	65.65	V	92.87	-27.22

Frequency (MHz)	Emission PK (dBuV/m)	AV Factor(dB)	Horizontal /Vertical	Emission AVG (dBuV/m)	Limits AV (dBuV/m)	Margin (dB)
433.92	61.13	-6.60	H	54.53	72.87	-18.34
433.92	65.65	-6.60	V	59.05	72.87	-13.82

Harmonics and Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
Remark: The margin for All level in this frequency band is > 20dB form Limit, so not listed in report. It is deemed to comply with the requirement		

Note: *1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor*

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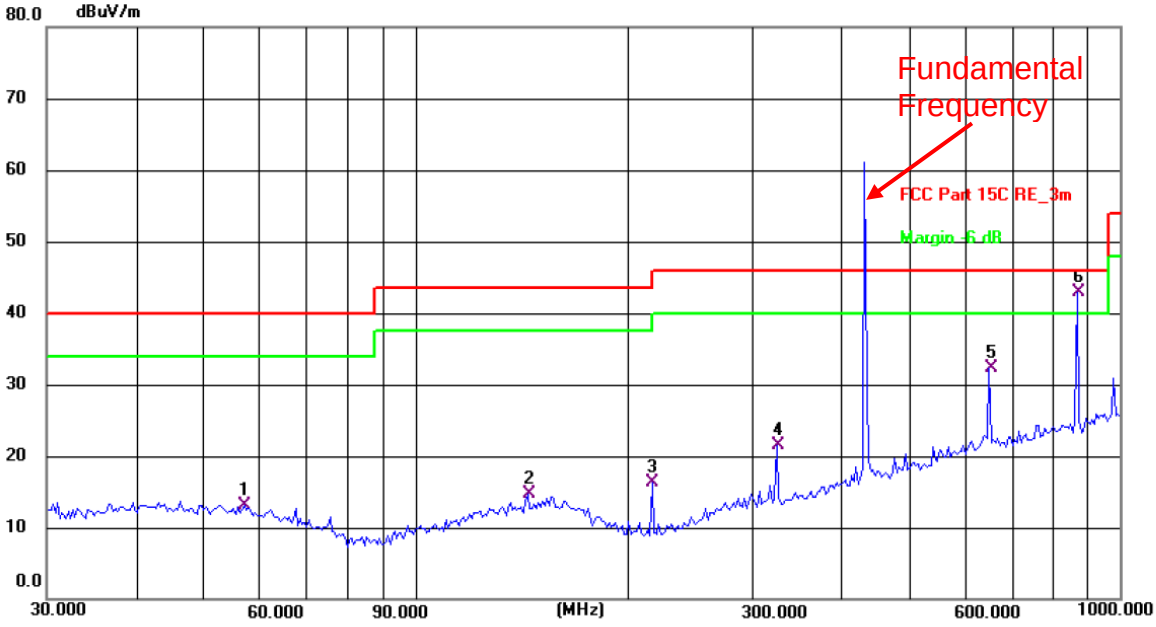
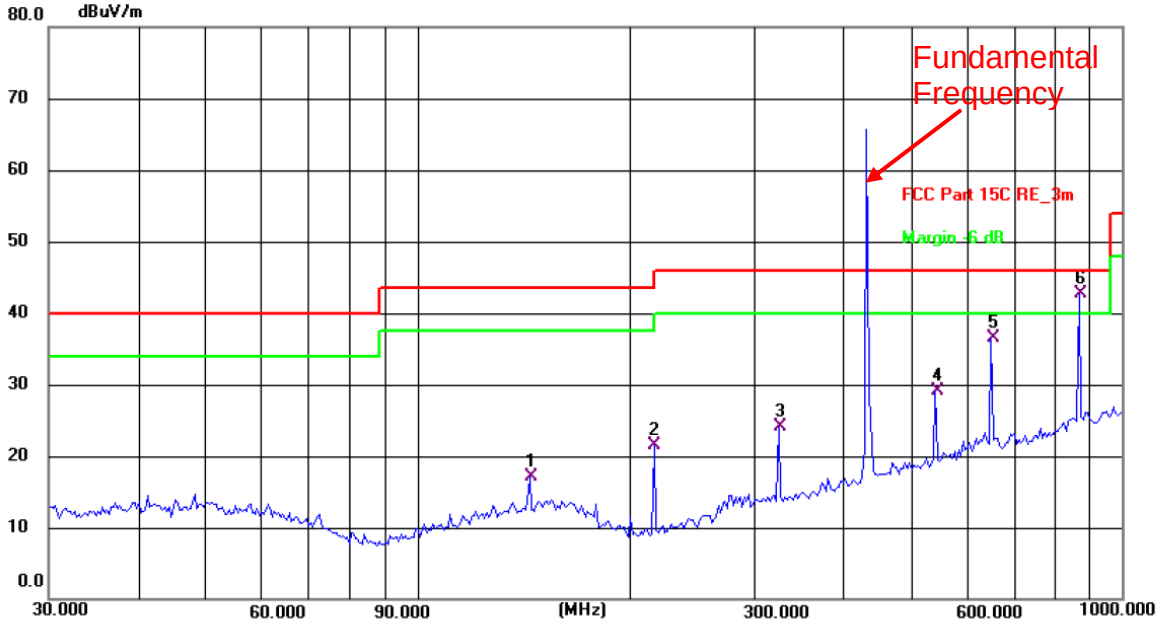
Frequency Range (Below 1GHz)



Site: 3m Anechoic Chamber1 Polarization: ***Horizontal*** Temperature: 23.1(C) Humidity: 46 %

Limit: FCC Part 15C RE_3m Power: DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	57.1914	25.70	-12.54	13.16	40.00	-26.84	QP	P	
2	144.3348	26.60	-11.92	14.68	43.50	-28.82	QP	P	
3	216.7828	31.34	-15.00	16.34	46.00	-29.66	QP	P	
4	325.5958	31.79	-10.28	21.51	46.00	-24.49	QP	P	
5	651.9417	36.38	-4.01	32.37	46.00	-13.63	QP	P	
6 *	869.1301	44.83	-1.84	42.99	46.00	-3.01	QP	P	



Site: 3m Anechoic Chamber1 Polarization: *Vertical* Temperature: 23.1(C) Humidity: 46 %

Limit: FCC Part 15C RE_3m Power: DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	144.3348	28.98	-11.92	17.06	43.50	-26.44	QP	P	
2	216.7828	36.44	-15.00	21.44	46.00	-24.56	QP	P	
3	325.5958	34.45	-10.28	24.17	46.00	-21.83	QP	P	
4	543.2742	35.76	-6.61	29.15	46.00	-16.85	QP	P	
5	651.9417	40.60	-4.01	36.59	46.00	-9.41	QP	P	
6 *	869.1301	44.59	-1.84	42.75	46.00	-3.25	QP	P	

Frequency Range (1GHz–5GHz)

Frequency (MHz)	Emission Level@3m (dBμV/m)	Antenna Polarity	Limit@3m (dBμV/m)	Remark	Result
1301.76	36.29	H	74.0	Peak	PASS
1735.68	34.67	H	74.0	Peak	PASS
1301.76	40.13	V	74.0	Peak	PASS
1735.68	32.85	V	74.0	Peak	PASS

Note: *Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor*
Because the peak measurement value is lower than the limit of 54dBuV/m for the average value, the average measurement value is not listed

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5.4. Occupied Bandwidth

5.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.10:2020
Limit:	According to 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the centre 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 centre frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = 100KHz, centered on a hopping channel; RBW=1KHz; VBW=3KHz; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Transmitting Mode
Test results:	PASS

5.4.2. Test Instruments

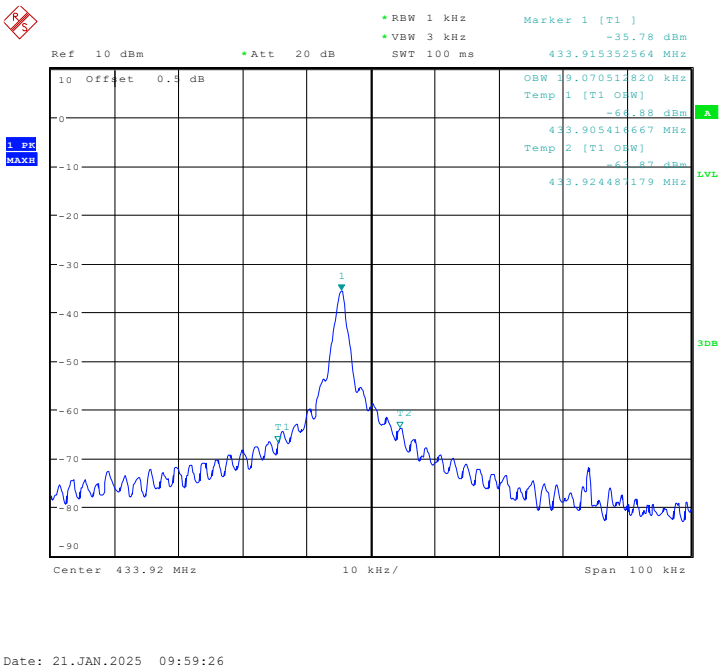
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Jun. 26, 2025

5.4.3. Test data

Test Channel (MHz)	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Conclusion
433.92	19.07	1084.80	PASS

Note: *Limit = 433.92MHz *0.25% = 1084.80 kHz*

Test plots as follows:



5.5. Transmission time and silent time

5.5.1. Test Specification

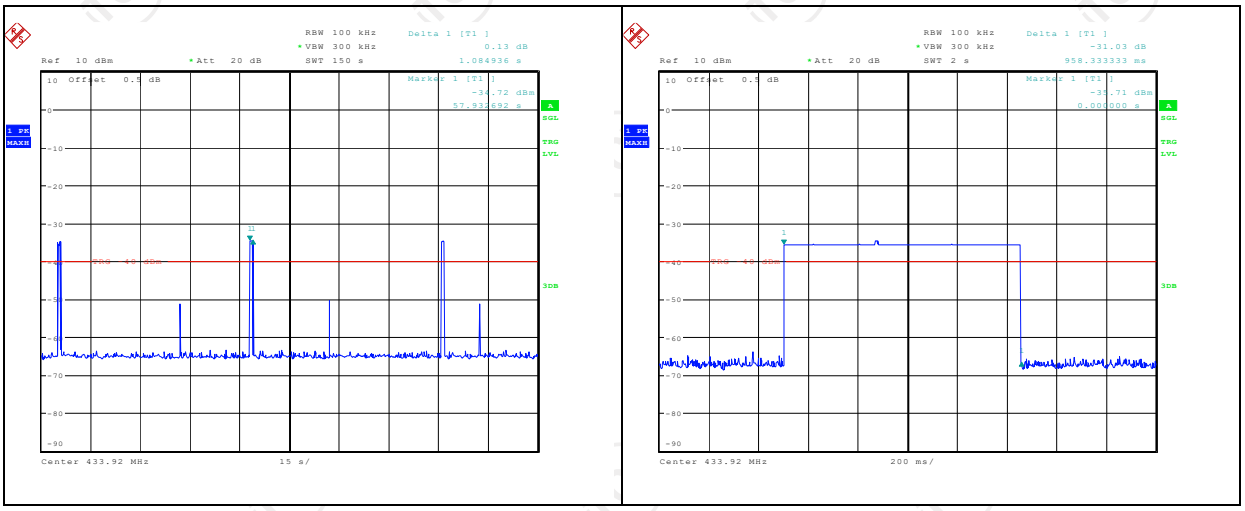
Test Requirement:	FCC Part15 C Section 15.231(e)
Test Method:	ANSI C63.10:2020
Limit:	According to 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.
	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings. For transmission time: Span = 0MHz, centered on a declared channel; RBW=1MHz; VBW≥RBW; Detector function = peak, record the transmission time. For silent time: Span = 0MHz, centered on a declared channel; RBW=1MHz; VBW≥RBW; Sweep = as necessary to capture at least two periodic time; Detector function = peak, record the silent time. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Transmitting Mode
Test results:	PASS

5.5.2. Test Instruments

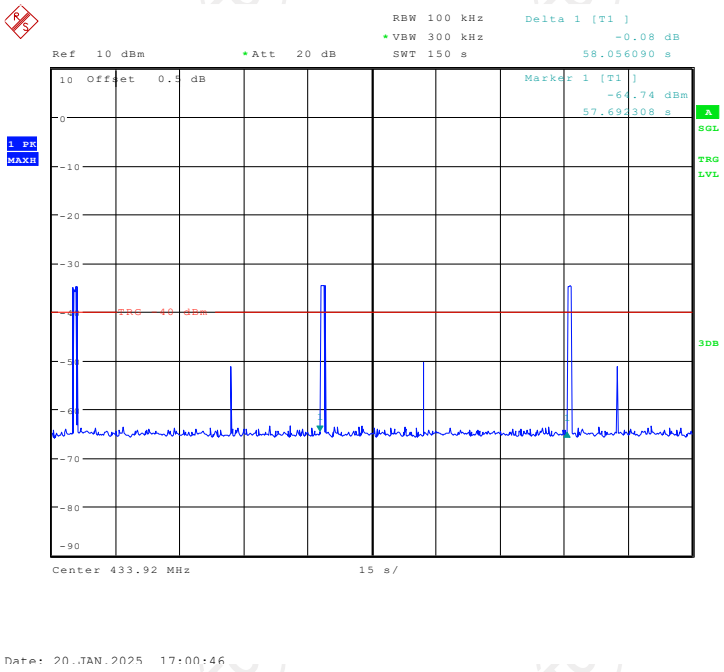
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	R&S	FSU	200054	Jun. 26, 2025

5.5.3. Test data

Channel Frequency (MHz)	Pulse Width (ms)	Number of Pulse	Transmission Time (s)	Limit (s)	Test conclusion
433.92	958.33	1	0.958	<1s	PASS



Channel Frequency (MHz)	Silent Period (s)	Limit 30 Times Of The Transmission Time (s)	Limit (s)	Test conclusion
433.92	58.06	28.74	＞10s	PASS



Appendix A: Photographs of Test Setup

Please refer to document Appendix No.: TCT250115E016-A

Appendix B: Photographs of EUT

Please refer to document Appendix No.: TCT250115E016-B & TCT250115E016-C

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