ACCREDITED
CERTIFICATE #5473.01

Test Report No.:
FCC2024-0035-RF

TEST REPORT

FCC ID		2AZPC-BHS2P
Applicant	:	Butlr Technologies Inc.
Product Name	:	Heatic 2+
Model No.	:	HS08WL90PR

CVC Testing Technology Co., Ltd.

Applicant	**Name:** Butlr Technologies Inc. **Address:** Suite 510,800 Airport Blvd. Burlingame CA 94010,USA
Manufacturer	**Name:** Butlr Technologies Inc. **Address:** Suite 510,800 Airport Blvd. Burlingame CA 94010,USA
Equipment Under Test	**Product Name :** Heatic 2+ **Model No. :** HS08WL90PR **Trade mark :** butlr **Serial no. :** B2PBB2426000338 **Sampling :** 1-1

Date of Receipt.	2024.8.6	**Date of Testing**	2024.8.10

Test Specification	**Test Result**
FCC CFR47 Part 15C Radio Frequency Devices ANSI C63.10-2020/Cor1-2023 KDB 558074 D01 15.247 Meas Guidance v05r02	PASS

Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. **Seal of CVC** **Issue Date:** 2024-9-2

Approved by:	Reviewed by:	Tested by:
Chen Huawen	**Xu Zhenfei**	**Lu Weiji**

Other Aspects: NONE.

Abbreviations: Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

Note: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of **CVC**.

TABLE OF CONTENTS

1. General Product Information

1.1 General information

Product Name	Heatic 2+
Model No.	HS08WL90PR
Additional model	N/A
Power Supply	DC 3.6V
Serial Number(SN)	B2LBB2409000035
HW-Release NO	Heatic Sensor Wireless_V1_PVT1
SW-Release NO	Heatic Smartmesh V3.0.1
specific power settings	Default
Antenna Type	Internal Antenna
Antenna Gain	2.20 dBi (provided by client)
Beamforming gain	Unsupported (provided by client)
Frequency Range	2405~2475MHz
Channel Number	15 Channels
Type of Modulation	QPSK
Max. Conducted Power	6.81 dBm
Operate Temp.Range	0~40℃

Note：
1. The information of the EUT is declared by the manufacturer.
2. The laboratory is not responsible for the product technical specification provided by the client.

2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by RF testing Lab. of CVC Testing Technology Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou,Guangdong,510663, People's Republic of China

Telephone : +86-20-32293888

Fax : +86-20-32293889

FCC(Test firm designation number：CN1282)

IC(Test firm CAB identifier number：CN0103)

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix X**.

3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Test Mode	Antenna Delivery	Test Channel
802.15.4 Mesh Networking Radio	1TX / 1RX	0,7,14

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate and different channels. Preliminary tests have been done on all the configurations for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates and channels are shown as following table.

Test Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO
802.15.4 Mesh Networking Radio	250kbit/s	/	/

Test Items	Test Antennas	Test Modes	Test Channels
Conducted Emissions	Antenna 1	N/A	N/A
Radiated Emissions	Antenna 1	802.15.4 Mesh Networking Radio	0,7,14
Radiated Emissions (Band Edge)	Antenna 1	802.15.4 Mesh Networking Radio	0,14
Maximum conducted output power	Antenna 1	802.15.4 Mesh Networking Radio	0,7,14

3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
802.15.4 Mesh Networking Radio	Ant1	2405	1.08	6.28	17.20	---	---
		2440	1.08	6.25	17.28	---	---
		2475	1.08	6.25	17.28	---	---

4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict	Note
Conducted Emissions	15.207	N/A	See note 2
Radiated Emissions	15.247(d),15.205,15.209	PASS	/
Maximum conducted output power	15.247(b)(3)	PASS	/
Minimum 6 dB bandwidth	15.247(a)(2)	N/A	See note 3
Occupied Channel Bandwidth	15.247(a)(2)	N/A	See note 3
Band Edge Measurement	15.247(d)	N/A	See note 3
Maximum Power spectral density	15.247(e)	N/A	See note 3
Spurious RF Conducted Emissions	15.247(d)	N/A	See note 3
Antenna Requirement	15.203	PASS	See note 1

Note 1: According to 15.203, it is considered sufficient to comply with the provisions of this section.
Note 2: Not applicable to battery powered devices.
Note 3:Only updating the antenna, without involving testing.

5. Measurement procedure

5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

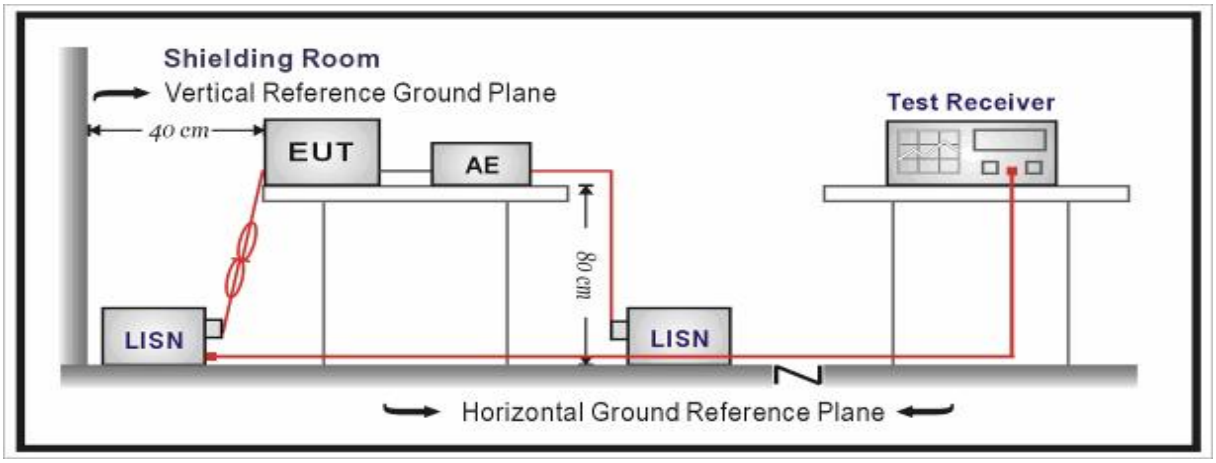
Method of Measurement:

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

Limits:

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

Test Setup:



Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Notes:

1. *The following Quasi-Peak and Average measurements were performed on the EUT:*
2. *Final Level = Reading + Factor.*

Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96. U= 3.12 dB.

Test Results:

Conducted Emission applies to an intentional radiator that is designed to be connected to the public utility (AC) power line. Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was setup and tested according to ANSI C63.10, 2013.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

Limits:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

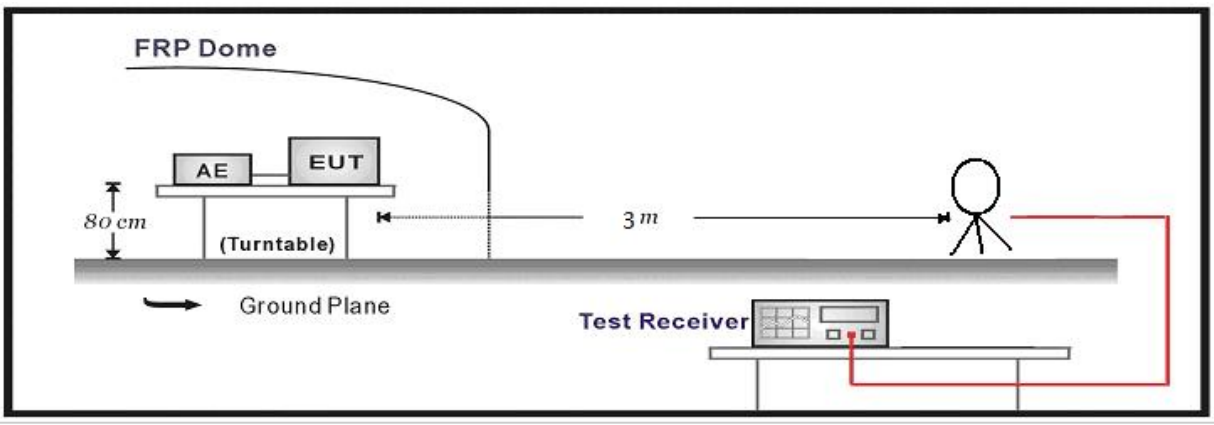
Frequency	Limit (μV/m)	Limit (dBμV/m @3m)	Remark
0.009MHz-0.490MHz	2400/F(kHz)@300m	20lg(24000000/F(kHz))	Quasi-peak Level
0.490MHz~1.705MHz	24000/F(kHz)@30m	20lg(2400000/F(kHz))	Quasi-peak Level
1.705MHz~30.0MHz	30@30m	49.54	Quasi-peak Level
30MHz-88MHz	100@3m	40.0	Quasi-peak Level
88MHz-216MHz	150@3m	43.5	Quasi-peak Level
216MHz-960MHz	200@3m	46.0	Quasi-peak Level
960MHz-1GHz	500@3m	54.0	Quasi-peak Level
Above 1GHz	500@3m	54.0	Average Level
	5000@3m	74.0	Peak Level

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

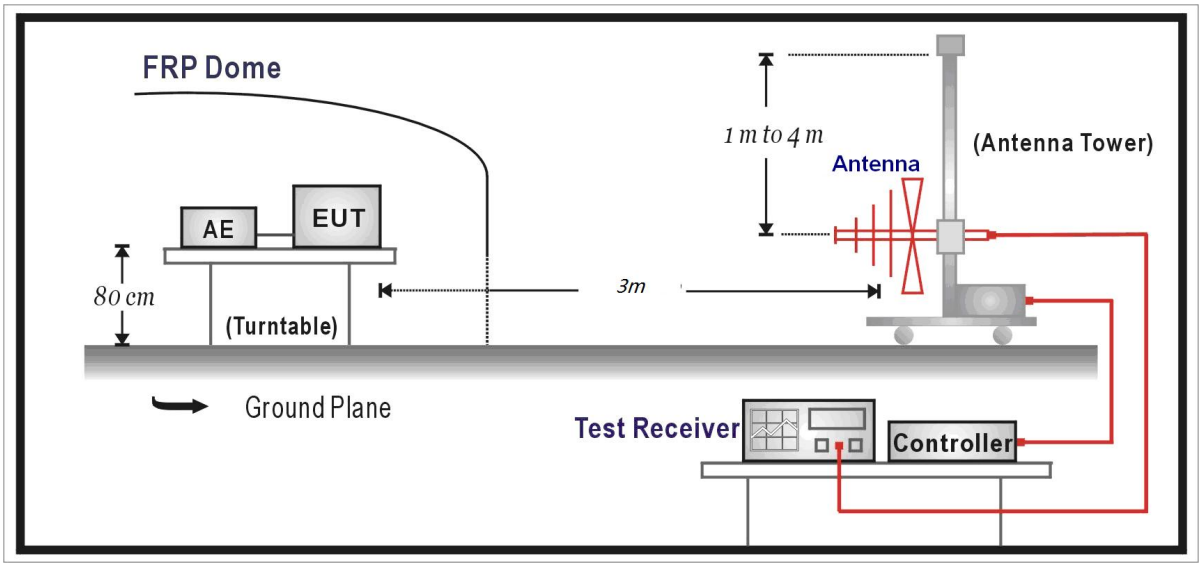
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.
12.57675-12.57725	322-335.4	3600-4400	/
13.36-13.41	/	/	/

Test Setup:

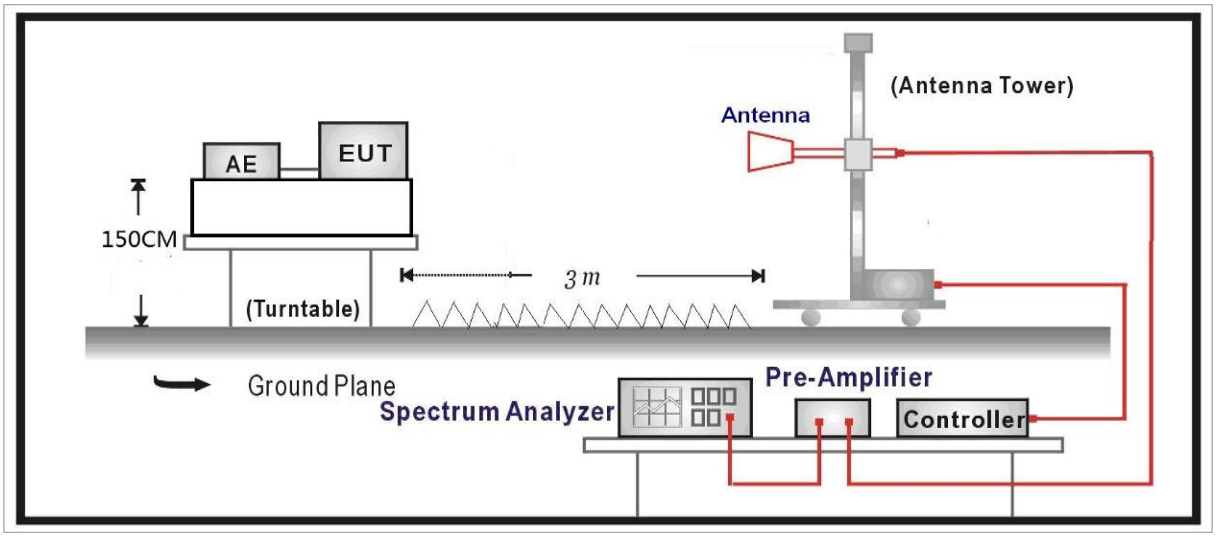
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



Measurement Data：

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Level = Reading - Factor

Factor = Preamplifier Factor – Antenna Factor–Cable Loss

Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test Results:

SPURIOUS EMISSIONS：

During the test, the Radiates Emission from 9kHz to 40GHz was performed in 802.15.4 Mesh Networking Radio. 2405MHz, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission	9kHz~1GHz
Test channel	Worst-Case
Polarity	Horizontal

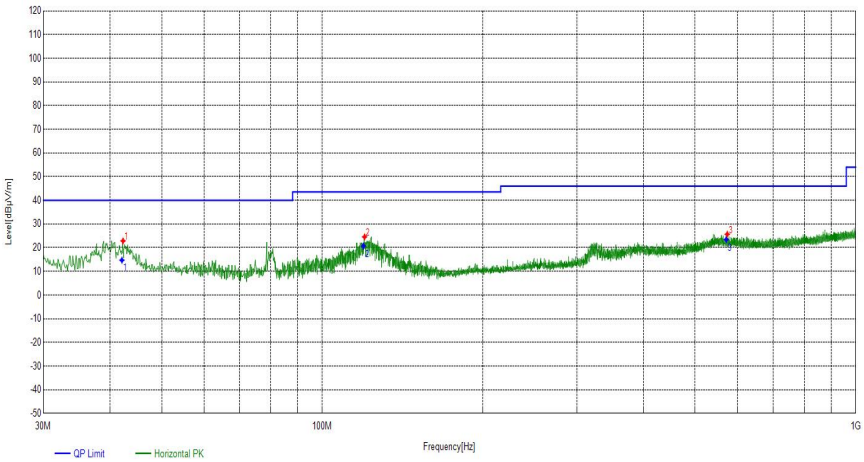
Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
42.3202	12.34	10.50	22.84	---	---	PK	100	1	---
120.025	10.27	14.26	24.53	---	---	PK	100	106	---
574.1274	21.51	4.14	25.65	---	---	PK	100	296	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List

Frequency [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
42.1163	12.34	14.70	40.00	25.30	180	236	PASS
119.4275	10.27	20.69	43.50	22.81	270	108	PASS
571.6681	21.51	23.40	46.00	22.60	330	292	PASS



Radiates Emission	9kHz~1GHz
Test channel	Worst-Case
Polarity	Vertical

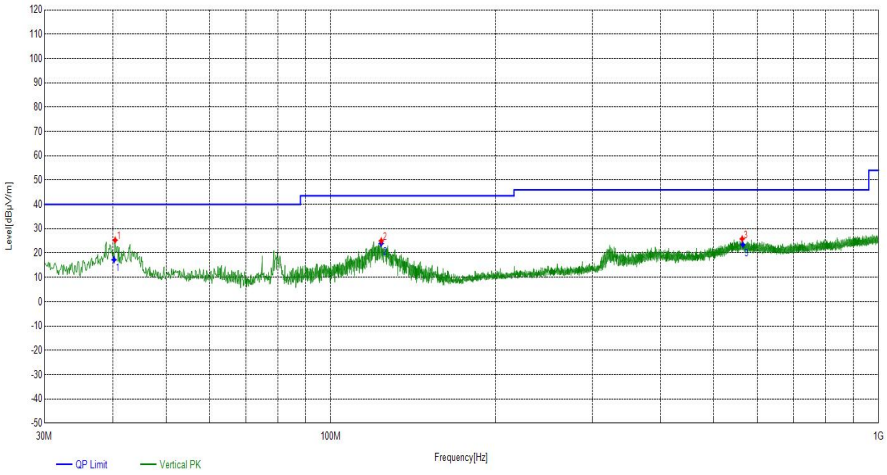
Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
40.38	12.14	13.15	25.29	---	---	PK	100	0	---
123.6144	10.06	14.92	24.98	---	---	PK	100	45	---
563.6504	21.25	4.56	25.81	---	---	PK	100	275	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List

Frequency [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
40.1924	12.14	17.23	40.00	22.77	310	213	PASS
123.5786	10.06	23.92	43.50	19.58	300	41	PASS
565.241	21.25	23.43	46.00	22.57	380	279	PASS



Radiates Emission	Above 1G
Test channel	2405
polarization	Horizontal

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
4221.122112	0.40	38.52	38.92	74.00	35.08	PK	150	PASS
5991.29913	5.65	36.30	41.95	74.00	32.05	PK	150	PASS
7423.942394	8.99	36.26	45.25	74.00	28.75	PK	150	PASS
4177.617762	0.46	28.60	29.06	54.00	24.94	AV	150	PASS
6024.30243	5.72	25.18	30.90	54.00	23.10	AV	150	PASS
7477.947795	9.04	25.60	34.64	54.00	19.36	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission	Above 1G
Test channel	2405
polarization	Vertical

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
5263.726373	2.93	37.84	40.77	74.00	33.23	PK	150	PASS
7249.924993	9.01	35.89	44.90	74.00	29.10	PK	150	PASS
10754.27542	12.74	34.88	47.62	74.00	26.38	PK	150	PASS
5358.235824	3.13	27.07	30.20	54.00	23.80	AV	150	PASS
7045.904591	8.96	25.42	34.38	54.00	19.62	AV	150	PASS
10232.22322	12.65	23.72	36.37	54.00	17.63	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission	Above 1G
Test channel	2440
polarization	Horizontal

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
5592.259226	3.85	36.88	40.73	74.00	33.27	PK	150	PASS
7650.465047	9.13	35.50	44.63	74.00	29.37	PK	150	PASS
10076.20762	12.46	33.67	46.13	74.00	27.87	PK	150	PASS
5572.757276	3.77	26.33	30.10	54.00	23.90	AV	150	PASS
7674.467447	9.14	25.56	34.70	54.00	19.30	AV	150	PASS
9903.690369	12.38	23.33	35.71	54.00	18.29	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission	Above 1G
Test channel	2440
polarization	Vertical

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
5946.29463	5.43	36.10	41.53	74.00	32.47	PK	150	PASS
8274.527453	9.64	35.78	45.42	74.00	28.58	PK	150	PASS
11202.82028	12.59	34.61	47.20	74.00	26.80	PK	150	PASS
6001.80018	5.69	25.72	31.41	54.00	22.59	AV	150	PASS
8285.028503	9.66	24.72	34.38	54.00	19.62	AV	150	PASS
11192.31923	12.59	24.17	36.76	54.00	17.24	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission	Above 1G
Test channel	2475
polarization	Horizontal

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
6121.812181	5.85	35.85	41.70	74.00	32.30	PK	150	PASS
7651.965197	9.13	36.03	45.16	74.00	28.84	PK	150	PASS
10811.28112	12.75	34.12	46.87	74.00	27.13	PK	150	PASS
6025.80258	5.72	25.97	31.69	54.00	22.31	AV	150	PASS
7650.465047	9.13	26.03	35.16	54.00	18.84	AV	150	PASS
11171.31713	12.58	24.28	36.86	54.00	17.14	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission	Above 1G
Test channel	2475
polarization	Vertical

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
7009.90099	8.95	35.94	44.89	74.00	29.11	PK	150	PASS
9633.663366	12.38	34.42	46.80	74.00	27.20	PK	150	PASS
11219.32193	12.53	35.42	47.95	74.00	26.05	PK	150	PASS
7144.914491	8.99	25.16	34.15	54.00	19.85	AV	150	PASS
9356.135614	11.72	24.67	36.39	54.00	17.61	AV	150	PASS
10884.78847	12.68	24.38	37.06	54.00	16.94	AV	150	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Band Edge:

During the test, the Band Edge was performed in 802.15.4 Mesh Networking Radio. Antenna 1, Highest and lowest channels are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission	802.15.4 Mesh Networking Radio
Test channel	Lowest channel
polarization	Horizontal

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Pass/ Fail
2358.335834	-5.14	41.45	36.31	74.00	37.69	PK	150	PASS
2390.139014	-5.04	41.22	36.18	74.00	37.82	PK	150	PASS
2404.740474	-5.00	93.38	88.38	74.00	-14.38	PK	150	---
2358.335834	-5.14	29.11	23.97	54.00	30.03	AV	150	PASS
2390.139014	-5.04	30.37	25.33	54.00	28.67	AV	150	PASS
2405.140514	-5.00	89.25	84.25	54.00	-30.25	AV	150	---

Radiates Emission	802.15.4 Mesh Networking Radio
Test channel	Lowest channel
polarization	Vertical

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Pass/ Fail
2375.737574	-5.09	43.30	38.21	74.00	35.79	PK	150	PASS
2390.139014	-5.04	48.93	43.89	74.00	30.11	PK	150	PASS
2404.740474	-5.00	104.71	99.71	74.00	-25.71	PK	150	---
2375.737574	-5.09	33.04	27.95	54.00	26.05	AV	150	PASS
2390.139014	-5.04	38.85	33.81	54.00	20.19	AV	150	PASS
2405.140514	-5.00	101.13	96.13	54.00	-42.13	AV	150	---

Radiates Emission	802.15.4 Mesh Networking Radio
Test channel	Highest channel
polarization	Horizontal

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
2474.747475	-4.81	91.67	86.86	74.00	-12.86	PK	150	---
2483.548355	-4.79	47.46	42.67	74.00	31.33	PK	150	PASS
2488.148815	-4.77	43.02	38.25	74.00	35.75	PK	150	PASS
2475.147515	-4.81	86.66	81.85	54.00	-27.85	AV	150	---
2483.548355	-4.79	36.11	31.32	54.00	22.68	AV	150	PASS
2488.148815	-4.77	30.85	26.08	54.00	27.92	AV	150	PASS

Radiates Emission	802.15.4 Mesh Networking Radio
Test channel	Highest channel
polarization	Vertical

Suspected List

Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detect or	Height [cm]	Pass/ Fail
2474.747475	-4.81	104.41	99.60	74.00	-25.60	PK	150	---
2483.548355	-4.79	59.17	54.38	74.00	19.62	PK	150	PASS
2498.149815	-4.74	46.31	41.57	74.00	32.43	PK	150	PASS
2475.147515	-4.81	101.20	96.39	54.00	-42.39	AV	150	---
2483.548355	-4.79	50.12	45.33	54.00	8.67	AV	150	PASS
2498.149815	-4.74	35.86	31.12	54.00	22.88	AV	150	PASS

5.3 Maximum conducted output power

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was tested according to DTS test procedure of ANSI C63.10 for compliance to FCC 47CFR 15.247 requirements. The maximum conducted output power using ANSI C63.10 section 11.9.2.3 AVGPM Average power meter method.

1. Power meter and sensor's minimum video bandwidth is 50MHz, larger than 802.11n(40MHz) bandwidth;
2. Fast responding diode sensors respond immediately to changes in power level to reduce total test time.
3. Use average detector to test.

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Maximum Average Conducted Output Power Level Method AVGSA-2 in KDB 558074 D01 /KDB662911 D01 for this test.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

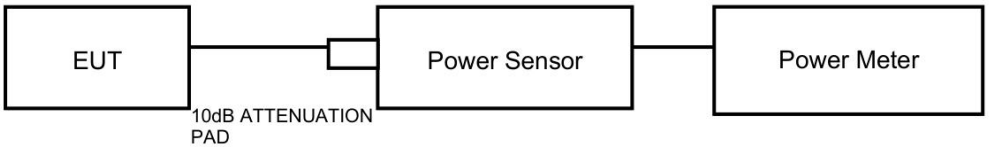
Limits:

Average Output Power	≤ 1W (30dBm)

Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated Levels above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi 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 6 dBi.

Test Setup:



Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results:

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
802.15.4 Mesh Networking Radio	Ant1	2405	6.81	≤30	PASS
	Ant1	2440	6.60	≤30	PASS
	Ant1	2475	6.56	≤30	PASS

5.4 Minimum 6 dB Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

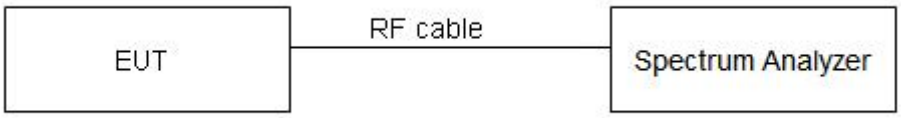
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.
Detector=Peak, Trace mode=Max hold.

Limits:

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

Minimum 6dB Bandwidth	≥ 500 kHz

Test Setup:



Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

Only updating the antenna, without involving testing.

5.5 Occupied Channel Bandwidth

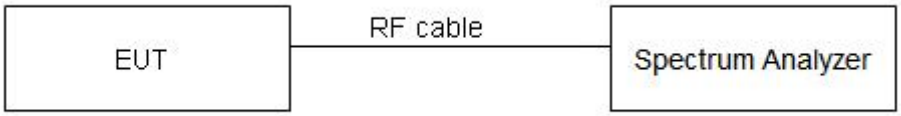
Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 50 kHz; VBW is set to 200 kHz on spectrum analyzer.
Detector=Peak, Trace mode=Max hold.

Test Setup:



Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

Only updating the antenna, without involving testing.

5.6 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

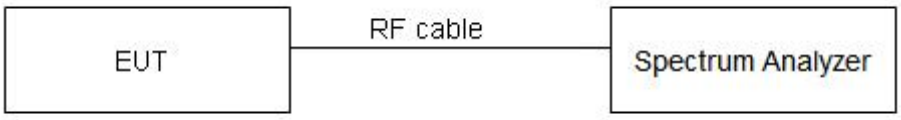
Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Limits:

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Setup:



Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 936 Hz, 2 GHz-3 GHz = 1.407 dB.

Test Results:

Only updating the antenna, without involving testing.

5.7 Maximum Power Spectral Density

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Method AVGPSD-2 in KDB 558074 D01 for this test.

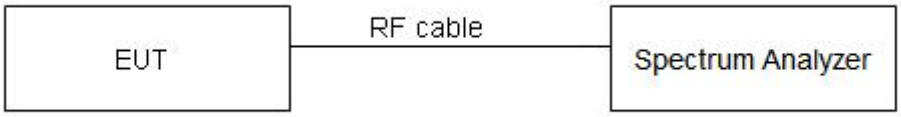
The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Limits:

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Maximum Power Spectral Density	≤ 8 dBm / 3kHz

Test Setup:



Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

Only updating the antenna, without involving testing.

5.8 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to100kHz and VBW to 300 kHz, Sweep is set to AUTO .The test is in transmitting mode.

Limits:

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Test Setup:

Measurement Uncertainty：

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

Only updating the antenna, without involving testing.

6. Appendix X

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
Communication Shielded Room 2	4m*3m*3m	CRTDSWKSR44301	/	CRT	2027/04/22
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2025/04/22
RF Radio Frequency Switch	JS0806-2	19H9080187	DZ-000241	Tonscend	2025/04/27
5m Semi-Anechoic Chamber	SAC-5	SAC-5-2.0	EM-000557	COMTEST	2024/11/02
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2025/01/02
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2025/01/13
EMI Test Receiver	ESR7	102235	EM-000574	R&S	2025/01/13
loop antenna	HLA 6121	540046	EM-000546	TESEQ	2025/06/04
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2025/06/09
Waveguide Horn Antenna	HF906	360306/008	EM-000093	R&S	2025/01/13
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWARZBECK	2025/08/03
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2025/06/02
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2025/08/29
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2024/12/03
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2025/06/03
Temperature and humidity meter	MHO-C201	/	DZ-000249-2	Seconds test	2025/07/28

Dynacomm	Software Release	Software Developer
TS1120-3 Test System(Conduction test)	3.3.38	Tonscend
TS+（5m,Radiation test）	JS32-RE 5.0.0	Tonscend

The End

Important

1. The test report is invalid without the official stamp of CVC;
2. Any part photocopies of the test report are forbidden without the written permission from CVC;
3. The test report is invalid without the signatures of Author and Reviewer;
4. The test report is invalid if altered;
5. Objections to the test report must be submitted to CVC within 15 days;
6. Generally, commission test is responsible for the tested samples only;
7. As for the test result, "—" or " N/A" means "not applicable", " / "means "not testing", "P" means "pass" and "F" means "fail".

Address: No.3,Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, China (Test location)
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