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Report No.: HK2203231133-E

TEST REPORT

FCC PART 15 SUBPART C 15.247

Test report On Behalf of 1995282 Alberta Ltd. o/a Gemstone Lights For

WiFi&Bluetooth Controller

Model No.: GM-Mini-01, GM-Mini-02, GM-Mini-03, GM-Mini-04

FCC ID: 2A5VU-GM-MINI-01

Prepared For : 1995282 Alberta Ltd. o/a Gemstone Lights

#170 11080 50 ST SE, Calgary, Alberta, T2C 5T4, Canada

Prepared By :

Shenzhen HUAK Testing Technology Co., Ltd. 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

 Date of Test:
 Mar. 23, 2022 ~ Apr. 11, 2022

 Date of Report:
 Apr. 11, 2022

 Report Number:
 HK2203231133-E

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TEST RESULT CERTIFICATION

Applicant's name:	1995282 Alberta Ltd. o/a Gemstone Lights
Address	#170 11080 50 ST SE, Calgary, Alberta, T2C 5T4, Canada
Manufacture's Name	iPixel LED Light Co.,Ltd
Address	7F, Mingjinhai Complex Building, Tangtou Rd, Shiyan Town, Baoan, Shenzhen, China

Product description

Standards	47 CFR FCC Part 15 Subpart C 15.247	
Model and/or type reference:	GM-Mini-01, GM-Mini-02, GM-Mini-03, GM-Mini-04	
Product name:	WiFi&Bluetooth Controller	
Trade Mark:	Gemstone Lights	

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Date of Test	
Date (s) of performance of tests:	Mar. 23, 2022 ~ Apr. 11, 2022
Date of Issue	Apr. 11, 2022
Test Result	Pass

Prepared by:

Reviewed by:

Grang Dian

Project Engineer

Project Supervisor

Approved by:

asin Uwu

Technical Director

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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Apr. 11, 2022	Jason Zhou
		.6	
WK TESTING OK TE	STRUCT STRUCT	NK TESTING	TESTING INK TESTING

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CATION

1 TEST SUMMARY

1.1 TEST DESCRIPTION

s' TES'	V TES.	W TES
Test Item	Test Requirement	Result
Antenna Requirement	§15.203/§15.247(b)(4)	PASS
Conducted Emission	FCC Part 15.207	N/A
Radiated Emissions	FCC Part 15.205/15.209	PASS
Maximum Peak Output Power	FCC Part 15.247(b)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
6dB Bandwidth & 99% Bandwidth	FCC Part 15.247(a)(2)	PASS
Spurious RF Conducted Emission	FCC Part 15.247(d)	PASS
Band Edge	FCC Part 15.247(d)	PASS

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1.2 MEASUREMENT UNCERTAINTY

All measurements involve certain levels of uncertainties. The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. The maximum value of the uncertainty as below:

No.	ltem	Uncertainty
- HOW TE	Conducted Emission Test	±2.71dB
2	All emissions, radiated(<1G)	±3.90dB
3	All emissions, radiated(>1G)	±4.28dB

1.3 INFORMATION OF THE TEST LABORATORY

Shenzhen HUAK Testing Technology Co., Ltd. Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01. FCC Designation Number is CN1229. Canada IC CAB identifier is CN0045. CNAS Registration Number is L9589.

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2 GENERAL INFORMATION

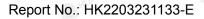
2.1 GENERAL DESCRIPTION OF EUT

EUT Name:	WiFi&Bluetooth Controller	HUAK TES .
Model No:	GM-Mini-01	0 0
Series Model:	GM-Mini-02, GM-Mini-03, GM-Mini-0)4 _{restmo}
Model Difference:	All model's the function, software and same, only with model named differe GM-Mini-01	
Brand Name:	Gemstone Lights	
Operation Frequency:	2402 MHz to 2480 MHz	HAN TESTIN
Channel Separation:	2MHz	0
Number of Channel:	40	
Modulation Technology:	GFSK	STANG
Hardware Version:	V1.0	HUAKTE
Software Version:	V1.0	
Antenna Type:	PCB Antenna	AKTESTING
Antenna Gain:	2dBi	HU. HAK TESTI
Power Supply:	DC12V	of Other
Note:	KTESIN	KTESIN

User's Manual.

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Frequency

(MHz)

Channel

NUA4 Sala	HUAK TESTING		Page	e 9 of 41
	IAK TESTING	NUAKTESTING	Description	of Channel:
	Channel	Frequency (MHz)	Channel	Frequency (MHz)
	0	2402	14	2430
	UNKTER 1	2404	15	2432
	2	2406	16	2434

	12	2426	26	2454	
STING	13	2428	27	2456	
	HUAKT	0 Hr.		HUAKTEST	O HO

2.2 DESCRIPTION OF TEST CONDITIONS

(1) E.U.T. test conditions:

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

- (2) Frequency range of radiated measurements:
- (3) Pre-test the EUT in all transmitting mode at the lowest (2402 MHz), middle (2440 MHz) and
- highest (2480 MHz) channel with different data packet and conducted to determine the worst-case mode, only the worst-case results are recorded in this report.
- (4) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

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2.3 DESCRIPTION OF TEST SETUP

Operation of EUT during testing:

DC12V	- EUT

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. The worst case is X position.

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3 EQUIPMENTS LIST FOR ALL TEST ITEMS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ATESTING 1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Feb. 18, 2022	1 Year
2.	L.I.S.N.	R&S	ENV216	HKE-059	Feb. 18, 2022	1 Year
3.	Receiver	R&S	ESCI 7	HKE-010	Feb. 18, 2022	1 Year
4.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	1 Year
5.	Spectrum analyzer	R&S	FSP40	HKE-025	Feb. 18, 2022	1 Year
6.	Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	1 Year
7.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 18, 2022	1 Year
8.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Feb. 18, 2022	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Feb. 18, 2022	1 Year
10.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Feb. 18, 2022	1 Year
11.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Feb. 18, 2022	1 Year
12.	Pre-amplifier	EMCI	EMC051845SE	HKE-015	Feb. 18, 2022	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Feb. 18, 2022	1 Year
14.	High pass filter unit	Tonscend	JS0806-F	HKE-055	Feb. 18, 2022	1 Year
15.	Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A	N/A
16.	Radiated test software	Tonscend	TS+ Rev 2.5.0.0	HKE-082	N/A	N/A
17.	RF test software	Tonscend	JS1120-B Version 2.6	HKE-083	N/A	^{>} N/A
18.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	1 Year
19.	RF test software	Tonscend	JS1120-4	HKE-113	N/A	N/A
20.	RF test software	Tonscend	JS1120-3	HKE-114	N/A	N/A
21.	RF test software	Tonscend	JS1120-1	HKE-115	N/A	N/A
22.	Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	1 Year
23.	Signal generator	Agilent	N5182A	HKE-029	Feb. 18, 2022	1 Year
24.	Signal Generator	Agilent	83630A	HKE-028	Feb. 18, 2022	1 Year
25.	Power meter	Agilent	E4419B	HKE-085	Feb. 18, 2022	^a 1 Year

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-		NA		40.		
26.	Power Sensor	Agilent	E9300A	HKE-086	Feb. 18, 2022	1 Year
27.	RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	Feb. 18, 2022	1 Year
28.	RF Cable(above 1GHz)	Times	1-40G	HKE-034	Feb. 18, 2022	1 Year
29.	RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	Feb. 18, 2022	1 Year
30.	Shielded room	Shiel Hong	4*3*3	HKE-039	⁵ Feb. 18, 2022	1 Year

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4 TEST RESULT

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4.1 ANTENNA REQUIREMENT

4.1.1 Standard requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

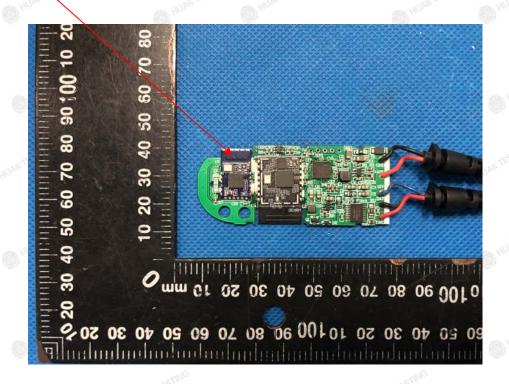
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, 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.

Antenna Connected Construction

The antenna used in this product is a PCB Antenna, which permanently attached. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2dBi.

4.1.2 EUT Antenna



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HUAK TESTING Page 14 of 41 4.2 CONDUCTION EMISSIONS MEASUREMENT

4.2.1 Applied procedures / Limit

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Francisco Martin	Limit	: (dBuV)
Frequency range (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.2.2 Test procedure

- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
- 2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
- The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5. All support equipments received AC power from a second LISN, if any.
- 6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.

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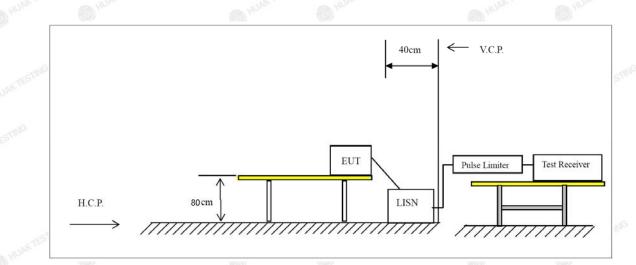
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4.2.3 Test setup



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4.2.4 Test results

Not applicable.

Note: EUT power supply by DC Power, so this test item not applicable.

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4.3 RADIATED EMISSIONS MEASUREMENT

4.3.1 Applied procedures / Limit

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For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

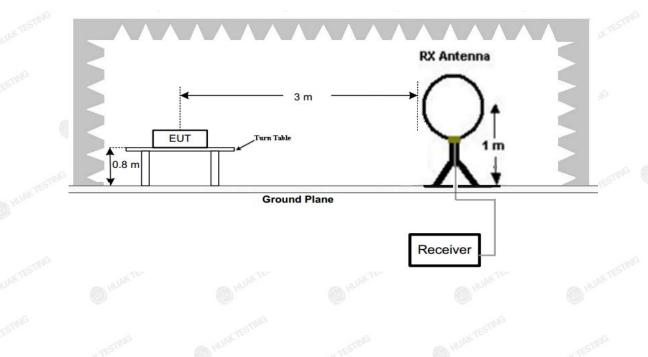
Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

		Radi	ated emission limits	
	Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
	0.009-0.49	3	20log(2400/F(KHz))+40log(300/3) 2400/F(KHz)
	0.49-1.705	3	20log(24000/F(KHz))+ 40log	g(30/3) 24000/F(KHz)
£	1.705-30	3	20log(30)+ 40log(30/3	3) 30
	30-88	3	40.0	100
mG.	88-216	3 5116	43.5	sm ⁶ 150
	216-960	3	46.0	200
	Above 960	3	54.0	500
	NHEY.			

4.3.2 Test setup

Test Configuration:

1) 9 kHz to 30 MHz emissions:

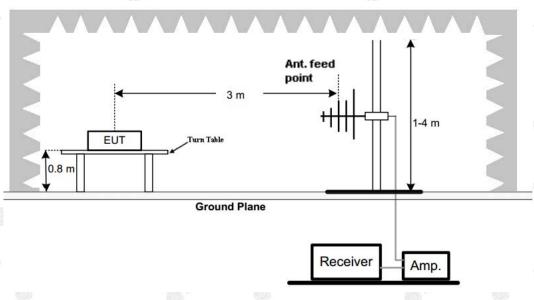


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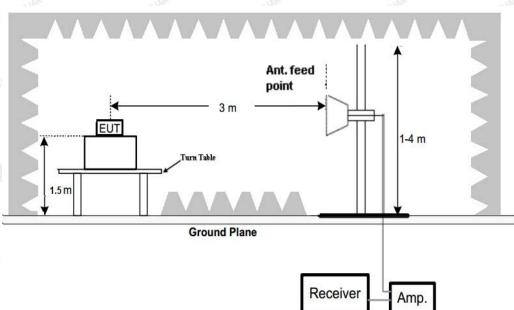
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FICATION



3) 1 GHz to 25 GHz emissions:



Test Procedure

- 1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° C to 360° C to acquire the highest emissions from EUT.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed.

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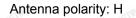


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4.3.3 Test Result

Below 1GHz Test Results:





•	QP Detector	

	. 0. 1%			1. Th				- P. 175	
Suspe	cted List								
NO	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Delerity
NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity
1	157.1972	-18.42	46.22	27.80	43.50	15.70	100	325	Horizontal
2	236.8168	-14.00	50.43	36.43	46.00	9.57	100	226	Horizontal
3	245.5556	-13.60	51.61	38.01	46.00	7.99	100	262	Horizontal
4	332.9429	-11.60	49.35	37.75	46.00	8.25	100	21	Horizontal
5	531.9920	-7.40	30.64	23.24	46.00	22.76	100	92	Horizontal
6	764.0541	-3.39	28.94	25.55	46.00	20.45	100	40	Horizontal

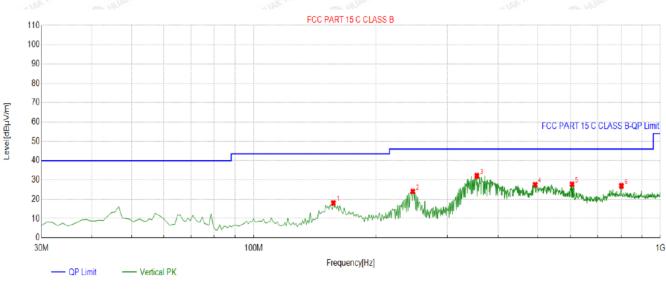
Remark: Factor = Cable loss + Antenna factor - Preamplifier; Level = Reading + Factor; Margin = Limit - Level

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Antenna polarity: V



QP Detector

Sus	pected List								
NO.	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Delority
NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity
1	157.1972	-18.42	36.49	18.07	43.50	25.43	100	280	Vertical
2	246.5265	-13.55	37.58	24.03	46.00	21.97	100	300	Vertical
3	354.3043	-11.54	43.63	32.09	46.00	13.91	100	51	Vertical
4	493.1532	-8.47	36.02	27.55	46.00	18.45	100	193	Vertical
5	605.7858	-5.79	33.52	27.73	46.00	18.27	100	328	Vertical
6	800.9510	-3.10	30.01	26.91	46.00	19.09	100	20	Vertical

Remark: Factor = Cable loss + Antenna factor - Preamplifier; Level = Reading + Factor; Margin = Limit - Level

Harmonics and Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
NAN TESTIN OF HU	unt TSW.	PRO INKTESTA
	. • · · ·	B
sting the stand	the terme	the-

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

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

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E.

For 1GHz to 25GHz

CH Low (2402MHz)

Horizontal:

MAN	MALIN -	- ULAN		MAUN	MAUN MAR
Meter Reading	Factor	Emission Level	Limits	Margin	
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
51.87	-3.65	48.22	74.00	-25.78	peak
40.87	-3.65	37.22	54.00	-16.78	AVG
50.78	-0.95	49.83	74.00	-24.17	peak
39.49	-0.95	38.54	54.00	-15.46	AVG
	(dBµV) 51.87 40.87 50.78	(dBµV) (dB) 51.87 -3.65 40.87 -3.65 50.78 -0.95	(dBµV) (dB) (dBµV/m) 51.87 -3.65 48.22 40.87 -3.65 37.22 50.78 -0.95 49.83	(dBµV) (dB) (dBµV/m) (dBµV/m) 51.87 -3.65 48.22 74.00 40.87 -3.65 37.22 54.00 50.78 -0.95 49.83 74.00	(dBµV) (dB) (dBµV/m) (dBµV/m) (dB) 51.87 -3.65 48.22 74.00 -25.78 40.87 -3.65 37.22 54.00 -16.78 50.78 -0.95 49.83 74.00 -24.17

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4804	53.84	-3.65	50.19	74.00	-23.81	peak
4804	42.33	-3.65	38.68	54.00	-15.32	AVG
7206	48.35	-0.95	47.40	74.00	-26.60	peak
7206	39.22	-0.95	38.27	54.00	-15.73	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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CH Middle (2440MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	58.96	-3.54	55.42	74.00	-18.58	peak
4880.00	45.69	-3.54	42.15	54.00	-11.85	AVG
7320.00	53.15	-0.81	52.34	74.00	-21.66	peak
7320.00	38.14	-0.81	37.33	54.00	-16.67	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifie

Vertical:

MAG	STING	15	ING C	STING	STING	
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	54.53	-3.54	50.99	74.00	-23.01	peak
4880.00	44.42	-3.54	40.88	54.00	-13.12	AVG
7320.00	51.44	-0.81	50.63	74.00	-23.37	peak
7320.00	39.93	-0.81	39.12	54.00	-14.88	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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CH High (2480MHz)

Horizontal:

requency	Meter Reading	Factor	Emission Level	Limits	Margin	Detecto
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	4960 55.02		51.59	74.00	-22.41	peak
4960	41.36	-3.44	37.92	54.00	-16.08	AVG
7440	48.30	-0.77	47.53	74.00	-26.47	peak
7440	38.74	-0.77	37.97	54.00	-16.03	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

requency	Meter Reading	Factor	Emission Level	Limits	Margin	Detecto
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	54.14	-3.43	50.71	74.00	-23.29	peak
4960	45.32	45.32 -3.44 41		54.00	-12.12	AVG
7440	49.86	-0.77	49.09	74.00	-24.91	peak
7440	40.39	-0.77	39.62	54.00	-14.38	AVG

Remark:

(1) Measuring frequencies from 1 GHz to the 25 GHz.

(2) "F" denotes fundamental frequency; "H" denotes spurious frequency; "E" denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

(7) All modes of operation were investigated and the worst-case emissions are reported.

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FICATION

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case):

Frequency	Reading Result	Factor	Emission Level	Limits	its Margin		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2310.00	10.00 56.31		50.5	74	-23.5	peak	
2310.00	2310.00 /		/	54	1	AVG	
2390.00	55.03	-5.84	49.19	74	-24.81	peak	
2390.00	/ -5.84 /		7	54	1	AVG	
2400.00	53.68	-5.84	47.84	74	-26.16	peak	
2400.00	WAK TE THUS	-5.84	5	54	AK TESTING	AVG	

Vertical:

Frequency	Frequency Reading Result		Factor Emission Level		Limits Margin		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2310.00	55.87	-5.81	-5.81 50.06 74		4 -23.94		
2310.00	TESTING	-5.81	nic	5 ^{mic 54}	TESTINA	AVG	
2390.00	54.19	-5.84	48.35	74	-25.65	peak	
2390.00	/	-5.84	1	54	STING /	AVG	
2400.00	53.22	-5.84	47.38	74	-26.62	peak	
2400.00	/	-5.84		54	1 🔍	AVG	

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

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Operation Mode: TX CH High (2480MHz)

Horizontal (Worst case)

- alle	TUNE		all the second sec	all'	-10-	
Frequency	Meter Reading	eter Reading Factor		Limits	Margin	Detector
🧊 (MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.50	56.07	-5.81	50.26	74	-23.74	peak
2483.50	1	-5.81		54	I 🔘 ^v	AVG
2500.00	55.26	-6.06	49.2	74	-24.8	peak
2500.00	- LAX TESTING	-6.06	ESTING I JUNE TES	54	WTT TIME	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level Limits		Margin	Detector	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2483.50	55.86	-5.81	50.05 74		-23.95	peak	
2483.50	she On	-5.81		54	I	AVG	
2500.00	55.14	-6.06	49.08	74	-24.92	peak	
2500.00	1	-6.06	/	54	1	AVG	

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

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4.4 MAXIMUM OUTPUT POWER MEASUREMENT

4.4.1 Limit

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 Test procedure

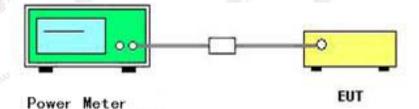
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple detector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

4.4.3 Deviation from standard

No deviation.

4.4.4 Test setup



4.4.5 Test results

Channel	Channel frequency (MHz)	Output power (dBm)	Limit (dBm)	Result
Low	2402	4.02		Pass
Middle	2440	3.56	30	Pass
High	2480	3.22		Pass

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4.5 POWER SPECTRAL DENSITY

4.5.1 Limit

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.

4.5.2 Test procedure

Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance. Set the RBW =3 kHz. Set the VBW =10 KHz. Set the span to 1.5 times the DTS channel bandwidth. Detector = peak. Sweep time = auto couple. Trace mode = max hold. Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level. If measured value exceeds limit, reduce RBW(no less than 3 kHz)and repeat. The resulting peak PSD level must be 8 dBm.

4.5.3 Deviation from standard

No deviation.

4.5.4 Test setup



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4.5.5 Test results

Channel	Channel frequency (MHz)	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result	
Low	2402	-2.9	0	Pass	
Middle	2440	-1.94	8.00	Pass	
High	2480	-0.02	ALLAK I	Pass	





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CH 19



CH 39



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4.6 6DB BANDWIDTH

4.6.1 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

4.6.2 Test procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

- 1. Set RBW = 100 kHz.
- 2. Set the video bandwidth (VBW) \geq 3 RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.6.3 Deviation from standard

No deviation.

4.6.4 Test setup

	100	HO	
-			SPECTRUM
	UT		ANALYZER
2		-TNG	1010

4.6.5 Test result

Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.708	TING	Pass
Middle	2440	0.680	≥500	Pass
High	2480	0.636		Pass
Ho	- Mar	AD.	- inthe	Ho.

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4.7 OCCUPIED BANDWIDTH

4.7.1 Test procedure

HUAK TESTING

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

RBW=1% to 5% of the OBW

VBW=approximately 3 X RBW

Detector=Peak

Trace Mode: Max Hold

Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recorded.

4.7.2 Deviation from standard

No deviation.

4.7.3 Test setup



4.7.4 Test result

N/A

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4.8 BAND EDGE

4.8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under FCC rules in section 5.8.1, the attenuation required shall be 30 dB instead of 20 dB.

4.8.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold

4.8.3 Deviation from standard

No deviation.

4.8.4 Test setup



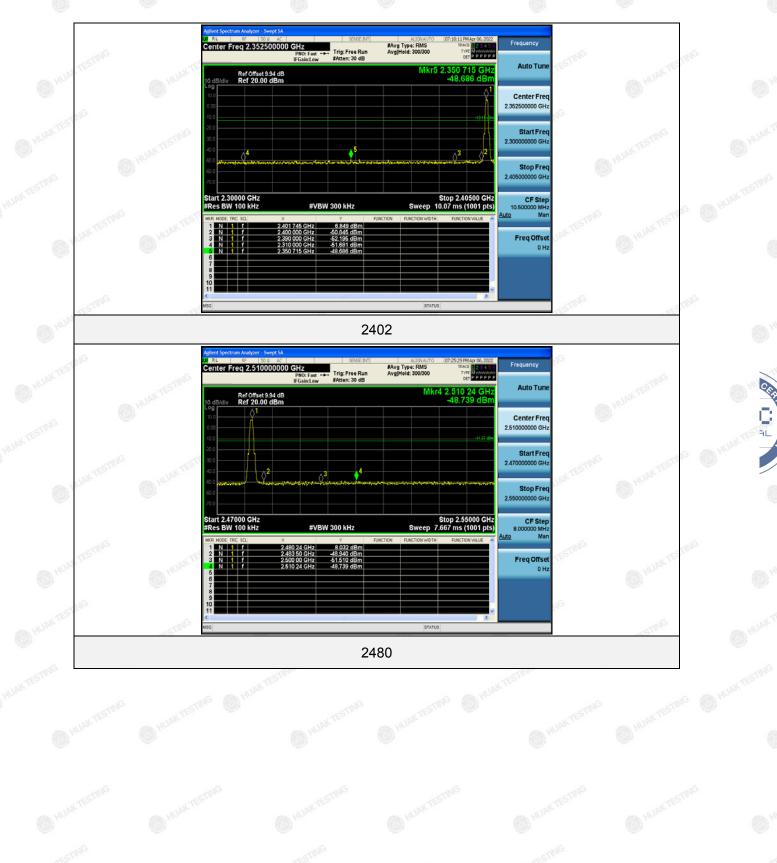
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4.8.5 Test results

PASS



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FICATION

4.9 CONDUCTED SPURIOUS EMISSIONS

4.9.1 Applied procedures / Limit

HUAK TESTING

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section (b)(3) of RSS 5.4(4), the attenuation required shall be 30 dB instead of 20 dB.

For below 30MHz, For 9KHz-150kHz, 150K-10MHz, We use the RBW 1KHz, 10KHz, So the limit need to calculated by "10lg(BW1/BW2)". for example For9KHz-150kHz, RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

4.9.2 Test procedure

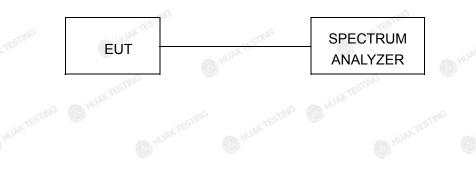
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b.Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, $RBW \ge 1\%$ of the span, $VBW \ge RBW$, Sweep = auto, Detector function = peak, Trace = max hold

4.9.3 Deviation from standard

No deviation.

4.9.4 Test setup



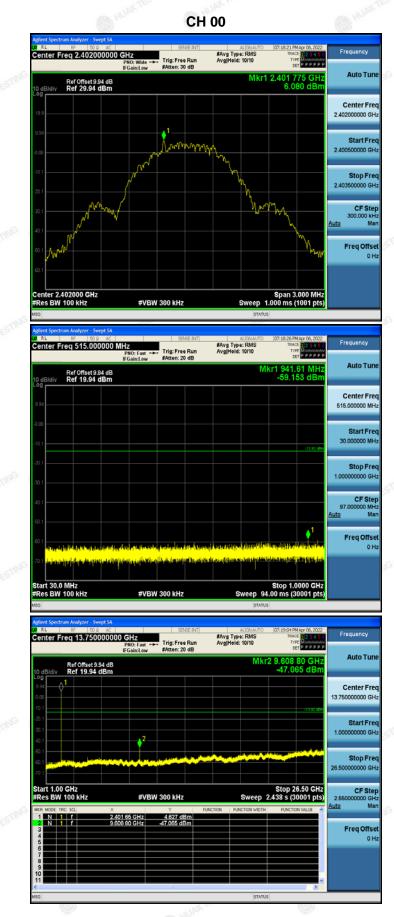
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4.9.5 Test results



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	t Spectru	m Analy											
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10 dE			fset 9.9 9.94 c								kr1 806. -59.2	74 101HZ 56 dBm	
9.94													Center Fre
													515.000000 MH
-0.06													Start Fre
-10.1												-14.05 dBn	30.000000 MH
-20.1													Stop Fre
-30.1													1.000000000 GH
-40.1													CF Ste
													97.000000 MH <u>Auto</u> Ma
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	5 BW 1		z			#VBW	300 kHz		S	weep 94	.00 ms (3		

ailant Seaste	um Analyzer - 1	Summer CA	10.22						
RL		DR AC	GHz PNO: Fast		Run	ALIGNAU #Avg Type: RMS Avg Hold: 10/10	TRA	M Apr 06, 2022 CE 123456 PE 1000000000000000000000000000000000000	Frequency
0 dB/div	Ref Offset Ref 19.9					N	1kr2 9.759 -45.6	25 GHz 69 dBm	Auto Tun
°g 1.94) ¹								Center Fre 13.750000000 GH
10.1 20.1 10.1			²					-14 35 dBm	Start Fre 1.000000000 GH
0.1		ið næi sky	www		****		**************************************		Stop Fre 26.50000000 GH
	100 kHz		#VB	W 300 kHz			p 2.438 s (CF Ste 2.55000000 GH Auto Ma
KR MODE TF 1 N 1 2 N 1 3 4 5 5 6	ſ		9 90 GHz 9 25 GHz	Y 5,739 dB -45,669 dB		IN FUNCTION W	DTH FUNCT	ON VALUE	Freq Offs 0 H
7 8 9 0 1									
s						51	TATUS		

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		m Anah	rzer - Swe									
Cen		RF ea 51	50 x 15.000	AC NON N	Hz	58	ISE:INT	#Avg Type	ALIGNAUTO	07:25:43 PM TRACE		Frequency
		04 0	10.000	0001	PNO: Fast	Trig: Free #Atten: 20		Avg Hold:	10/10	TYP DE	M	
10 de Log	3/div		ffset 9.9 19.94 d						MI	kr1 892.9 -58.55	98 MHz 97 dBm	Auto Tune
9.94												Center Freq 515.00000 MHz
											-13.78 dðn	Start Freq 30.000000 MHz
-20.1												Stop Freq 1.000000000 GHz
-40.1												CF Step 97.000000 MHz <u>Auto</u> Man
-50.1 -60.1	ad st	ul data	llate Han	1 ¹ trappe	en midden fan	hilling the	k de skeles (*	kann die	<mark>e latite diri</mark>	()). I diversities	n na service de la companya de	Freq Offset 0 Hz
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	t 30.0 s BW 1		47		#VRM	300 kHz		6	waan 0.1	Stop 1.0 .00 ms (30		
antes	5 647	100 N	112		# 4 D 44	000 KHZ		3	neep 34	100-1115 (00	oo Pus)	

Agilent Spectr	um Analyzer - Sv	vept SA						
enter F	req 13.750		GHz PNO: Fast ↔	Trig: Free Ru #Atten: 20 de	#Av an Avg	ALIGNAUTO 3 Type: RMS Hold: 10/10	07:26:21 PM Apr 06, 202 TRACI 2 3 4 5 TYPE M DET P P P P P	Frequency
0 dB/div	Ref Offset 9 Ref 19.94	.94 dB	Connectow			Mkr2	25.253 90 GH -48.044 dBn	
og 9.94	¹							Center Free 13.750000000 GH
20.1 20.1 30.1							-13.78 cd	Start Free 1.000000000 GH
50.1 60.1 70.1		-	-		ya mina			Stop Free 26.500000000 GH
tart 1.00 Res BW	100 kHz	X	#VBV	V 300 kHz	FUNCTION	Sweep 2	Stop 26.50 GH 2.438 s (30001 pts	CF Ste 2.550000000 GH <u>Auto</u> Ma
1 N 1 2 N 1 3 4 5	ſ		85 GHz 90 GHz	6.441 dBm -48.044 dBm				Freq Offse 0 H
6 7 8 9 0								
50						STATUS		

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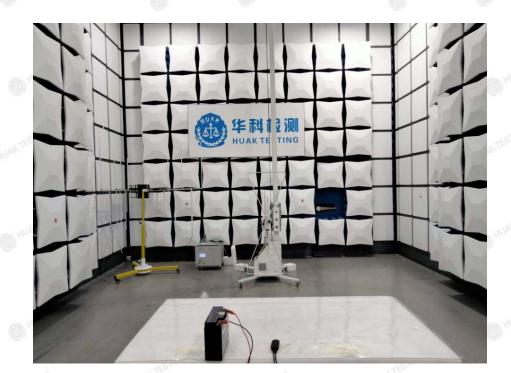
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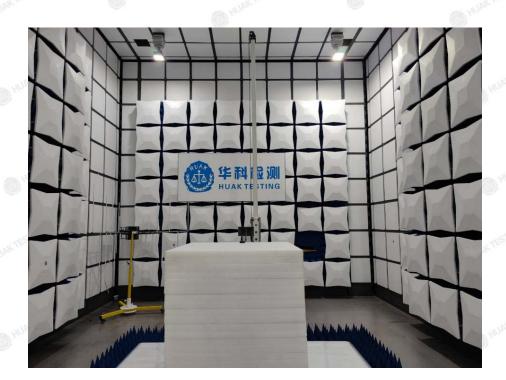


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Report No.: HK2203231133-E

Radiated Emissions





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6 PHOTOS OF THE EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

---End of test report-----

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