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Report No.: HK2305232086-E

# **FCC Test Report**

# FCC PART 15 SUBPART C 15.247

**Test report** 

On Behalf of

ShenZhen JumBooking Mechanical&Electrical Industry Co.,Ltd.

For

Smart wireless meat thermometer

Model No.: JX168, JX166, JX169, JX266, JX268, JX269, JX366, JX368,

JX369

FCC ID: 2BB4A-JX168

Prepared For :

ShenZhen JumBooking Mechanical&Electrical Industry Co.,Ltd. Floor 3, Second Floor, No. 7 Workshop, Row 1, Henggangxia Industrial Zone, Shajing Xinqiao, Baoan District, Shenzhen, China

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:
 May. 23, 2023 ~ Jul. 24, 2023

 Date of Report:
 Jul. 24, 2023

 Report Number:
 HK2305232086-E

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# **Test Result Certification**

Applicant's name	ShenZhen JumBooking Mechanical&Electrical Industry Co.,Ltd.
Address	Floor 3, Second Floor, No. 7 Workshop, Row 1, Henggangxia Industrial Zone, Shajing Xinqiao, Baoan District, Shenzhen, China
Manufacture's Name:	ShenZhen JumBooking Mechanical&Electrical Industry Co.,Ltd.
Address:	Floor 3, Second Floor, No. 7 Workshop, Row 1, Henggangxia Industrial Zone, Shajing Xinqiao, Baoan District, Shenzhen, China
Product description	
Trade Mark:	N/A sine sine no sine
Product name:	Smart wireless meat thermometer
Model and/or type reference:	JX168, JX166, JX169, JX266, JX268, JX269, JX366, JX368, JX369
Standards	47 CFR FCC Part 15 Subpart C 15.247

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Date of Test	
Date (s) of performance of tests:	May. 23, 2023 ~ Jul. 24, 2023
Date of Issue	Jul. 24, 2023
Test Result	Pass

Prepared by:

**Project Engineer** 

Reviewed by:

Zden

Project Supervisor

Approved by:

ason You

**Technical Director** 

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# \*\* Modified History \*\*

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Jul. 24, 2023	Jason Zhou
- (h			G
MKTESTING MKTE	outer of the off	TESTING INK TESTIN	WK TESTING

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# 1 Test Summary

# 1.1 Test Description

ST TEST	TES. UTES.	W TEST
Test Item	Test Requirement	Result
Antenna Requirement	§15.203/§15.247(b)(4)	PASS
Conducted Emission	FCC Part 15.207	PASS
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% Bandwidt	h FCC Part 15.247(a)(2)	PASS
Spurious RF Conducted Emissio	n 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
HI WTE	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

HUAK TESTING

# 2.1 General Description of EUT

EUT Name:	Smart wireless meat thermome	eter	- HUAY
Model No:	JX168		0
Series Model:	JX166, JX169, JX266, JX268,	JX269, JX366, JX368	3, JX369
Model Difference:	All model's the function, softwa same, only with a product mod sample model: JX168		
Trade Mark:	N/A	HUAK	G
Operation Frequency:	2402 MHz to 2480 MHz	"IAK TEST"	HUAKT
Channel Separation:	2MHz	0	0
Number of Channel:	40		
Modulation Technology:	GFSK	STING	
Hardware Version:	V2.4	HUAKTL	HUA
Software Version:	V2.4		
Antenna Type:	PCB Antenna	NY TESTING	
Antenna Gain:	0dBi	O HO	IAK TESTIN
Power Supply:	DC5V From Type-C or DC 3.7	/ From Battery	0
Note:	TEST	UAK TESTIN	

the User's Manual.

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AK TESTING		Description o	f Channel:		
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
UAKTED 1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	o 19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
<sup>UAM</sup> 11 @	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456	- automatics and	

The EUT has been operated in modulations: GFSK independently.

NO.	TEST MODE DESCRIPTION
HUNK TE 1 OF	Low channel TX
2	Middle channel TX
3	High channel TX

Note:

1. All the test modes can be supply by Built-in Li-ion battery, only the result of the worst case was recorded in the report if no any records.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

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# 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:The test range will be up to the tenth harmonic of the highest fundamental frequency.
- (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.
  - **Duty Cycle Factor Duty Cycle** Mode (dB) BT-LE(1Mbps) 0.85 -1.41 Frequency Trig Delay-2.000 ms Trig: Video #Atten: 40 dB #Avg Type: RMS IFGain:1 nv Auto Tun ΔMkr3 2.4 Ref Offset 8.74 dB Ref 30.00 dBm Center Free 2.402000000 GH Start Fred 2.402000000 GHz Stop Fre 2.402000000 GHz Center 2.402000000 GHz Span 0 Hz CF Ste #VBW 8.0 MHz Sweep 5.000 ms (8000 pts) 8.00000 Frea Offse 0 H:
- (4) Mode Test Duty Cycle

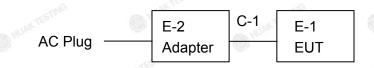
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#### 2.3 Description of Test Setup

Operation of EUT during conducted and radiation below 1GHz testing:



Operation of EUT during radiation above 1GHz testing:



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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# 2.4 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.

						6
SP	Item	Equipment	Mfr/ Trade Mark	Model/Type No.	Specification	Note
3	E-1	Smart wireless meat thermometer	N/A	JX168	N/A	EUT
	E-2	AC Adapter	N/A	HW-059200C HQ	Input: 100-240V, 50/60Hz, 0.5A Output: 5VDC, 2A	Peripherals
	15	ING TESTING	HUM	ESTING TES	NG OHUN	TESTING
D	AUAK .	O HUM	C HUAN	O HUM	O HUMAN	HUM

Item	Cable Type	Ferrite Core	Length		Note	
C-1	USB Cable	1	50cm	Per	ipherals	
	STING	HUAKTES	STING	HUAKTESI	20	TING
	HUAK	<b>O</b>	HUAKIL		HUAK	
	9	TESTING		TESTING		
	3 - mile	HUAN	allG	TING HUAN	NG	TING

#### 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.
- 3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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# UAK TESTING Equipments List for All Test Items

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
KTT 1. THE	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Feb. 17, 2023	1 Year
2.	L.I.S.N.	R&S	ENV216	HKE-059	Feb. 17, 2023	1 Year
3.	Receiver	R&S	ESR-7	HKE-010	Feb. 17, 2023	1 Year
4.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 17, 2023	1 Year
5.	Spectrum analyzer	R&S	FSP40	HKE-025	Feb. 17, 2023	1 Year
6.	Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 17, 2023	1 Year
7.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 17, 2023	1 Year
8.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Feb. 17, 2023	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Feb. 17, 2023	1 Year
10.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	<sup>3</sup> Feb. 17, 2023	1 Year
11.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Feb. 17, 2023	1 Year
12.	Pre-amplifier	EMCI	EMC051845SE	HKE-015	Feb. 17, 2023	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Feb. 17, 2023	1 Year
14.5	High pass filter unit	Tonscend	JS0806-F	HKE-055	Feb. 17, 2023	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. 17, 2023	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. 17, 2023	1 Year
23.	Signal generator	Agilent	N5182A	HKE-029	Feb. 17, 2023	1 Year
24.	Signal Generator	Agilent	83630A	HKE-028	Feb. 17, 2023	1 Year
25.	Power meter	Agilent	E4419B	HKE-085	Feb. 17, 2023	1 Year

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Power Sensor	Agilent	E9300A	HKE-086	Feb. 17, 2023	1 Year
RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	Feb. 17, 2023	1 Year
RF Cable(above 1GHz)	Times	1-40G	HKE-034	Feb. 17, 2023	1 Year
RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	Feb. 17, 2023	1 Year
Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 09, 2021	3 Year
High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 17, 2023	1 Year
10dB Attenuator	SCHWARZBECK	VTSD9561F	HKE-153	Feb. 17, 2023	1 Year
	RF Cable(below1GHz) RF Cable(above 1GHz) RF Cable (9KHz-40GHz) Shielded room High gain antenna	RF Cable(below1GHz)TimesRF Cable(above 1GHz)TimesRF Cable (9KHz-40GHz)TonscendShielded roomShiel HongHigh gain antennaSchwarzbeck	RF Cable(below1GHz)Times9kHz-1GHzRF Cable(above 1GHz)Times1-40GRF Cable (9KHz-40GHz)Tonscend170660Shielded roomShiel Hong4*3*3High gain antennaSchwarzbeckLB-180400KF	RF Cable(below1GHz)Times9kHz-1GHzHKE-117RF Cable(above 1GHz)Times1-40GHKE-034RF Cable (9KHz-40GHz)Tonscend170660N/AShielded roomShiel Hong4*3*3HKE-039High gain antennaSchwarzbeckLB-180400KFHKE-054	RF Cable(below1GHz)Times9kHz-1GHzHKE-117Feb. 17, 2023RF Cable(above 1GHz)Times1-40GHKE-034Feb. 17, 2023RF Cable (9KHz-40GHz)Tonscend170660N/AFeb. 17, 2023Shielded roomShiel Hong4*3*3HKE-039Dec. 09, 2021High gain antennaSchwarzbeckLB-180400KFHKE-054Feb. 17, 2023

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# 4 Test Result

#### 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 0dBi.

#### 4.1.2 EUT Antenna



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# 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:

HUAK TESTING	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

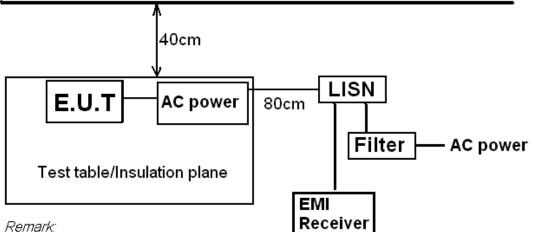
- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
- 2. Support equipment, if needed, was placed 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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#### 4.2.3 Test Setup





Remark: E.U.T: Equipment Under Test

LISN: Line Impedence Stabilization Network Test table height=0.8m

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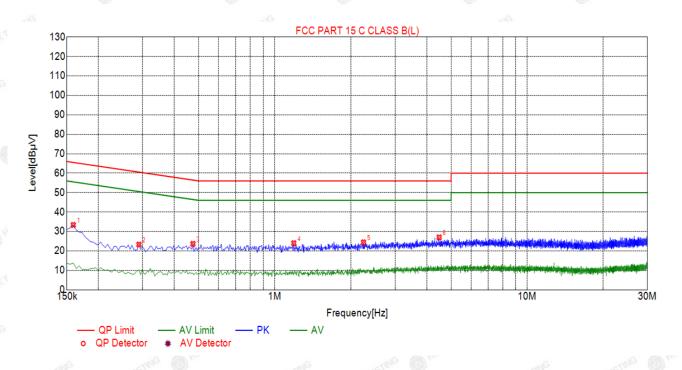


#### 4.2.4 Test Results

PASS

Only the worst result of GFSK Low channel TX was reported as below:

Test Specification: Line



# Suspected List

- L		•							
2	NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
	1	0.1590	33.35	20.01	65.52	32.17	13.34	PK	L
5	2	0.2895	23.27	20.03	60.54	37.27	3.24	PK	L
	3	0.4740	23.62	20.04	56.44	32.82	3.58	PK	L
	4	1.1895	23.97	20.09	56.00	32.03	3.88	PK	L
	5	2.2470	24.41	20.18	56.00	31.59	4.23	PK	L
Ş	6	4.4835	26.94	20.25	56.00	29.06	6.69	PK	L

Remark: Margin = Limit – Level Correction factor = Cable lose + LISN insertion loss Level=Test receiver reading + correction factor

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#### Test Specification: Neutral

FCC PART 15 C CLASS B (N 130 120 110 100 90 80 Level[dBµV] 70 60 50 40 30 .**8**. 20 10 0 150k 10M 30M 1MFrequency[Hz] **QP** Limit AV AV Limit AV Detector 0 QP Detector

# Suspected List

5		-p - 0 . 0 .							
2	NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
	1	0.1500	39.31	20.03	66.00	26.69	19.28	PK	Ν
1	2	0.2085	27.45	20.04	63.26	35.81	7.41	PK	Ν
	3	0.3435	23.93	20.03	<b>5</b> 9.12	35.19	3.90	PK	Ν
	4	0.7080	24.12	20.05	56.00	31.88	4.07	PK	Ν
Ś	5	1.3200	25.09	20.10	56.00	30.91	4.99	PK	Ν
ŝ	6	2.5665	25.30	20.20	56.00	30.70	5.10	PK	Ν

Remark: Margin = Limit – Level Correction factor = Cable lose + LISN insertion loss Level=Test receiver reading + correction factor

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# 4.3 Radiated Emissions Measurement

#### 4.3.1 Applied Procedures / Limit

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).

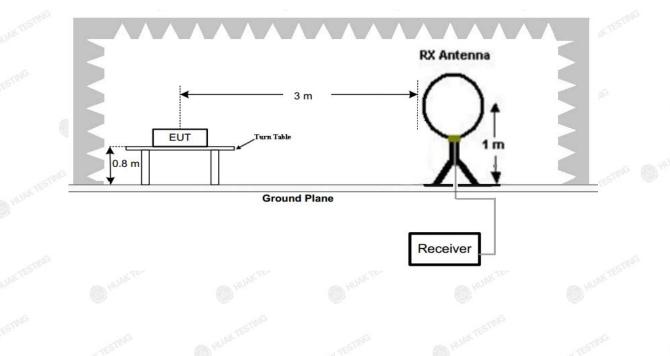
Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

requency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49         3           0.49-1.705         3           1.705-30         3		20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
		20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
		20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3 sing	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500
	0.49-1.705 1.705-30 30-88 88-216 216-960	0.009-0.49     3       0.49-1.705     3       1.705-30     3       30-88     3       88-216     3       216-960     3	0.009-0.49         3         20log(2400/F(KHz))+40log(300/3)           0.49-1.705         3         20log(24000/F(KHz))+40log(30/3)           1.705-30         3         20log(30)+40log(30/3)           30-88         3         40.0           88-216         3         43.5           216-960         3         46.0

#### 4.3.2 Test Setup

#### **Test Configuration:**

1) 9 kHz to 30 MHz emissions:

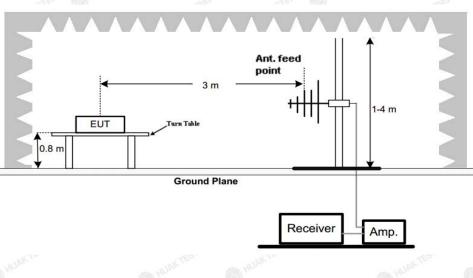


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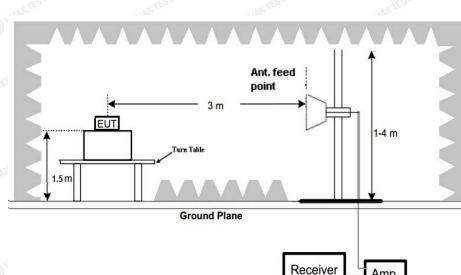
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2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



#### **Test Procedure**

The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low 1. permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.

Amp

- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0  $^\circ\!\mathrm{C}$  to 360  $^\circ\!\mathrm{C}$  to acquire the highest emissions from EUT.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both 3. horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.

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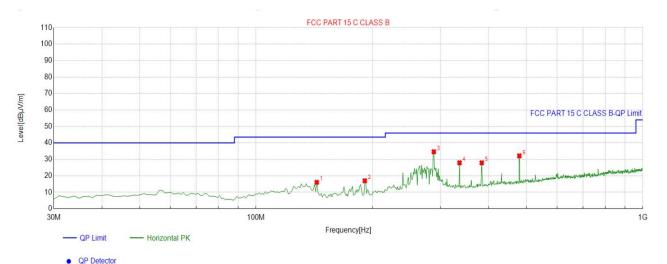


#### 4.3.3 Test Result

#### Below 1GHz Test Results:

All modes have been tested, only the worst mode of GFSK Low channel TX is reflected.

#### Antenna polarity: H



1			Sec.	- 4 TV		- 10-	1			-C.
	Suspe	cted List								
.0.	NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
	1	143.6036	-18.31	34.36	16.05	43.50	27.45	100	5	Horizontal
	2	191.1812	-16.86	33.83	16.97	43.50	26.53	100	269	Horizontal
	3	288.2783	-12.42	47.03	34.61	46.00	11.39	100	261	Horizontal
9	4	335.8559	-11.48	39.37	27.89	46.00	18.11	100	197	Horizontal
	5	383.4334	-10.48	38.39	27.91	46.00	18.09	100	309	Horizontal
	6	479.5596	-7.79	39.92	32.13	46.00	13.87	100	282	Horizontal

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

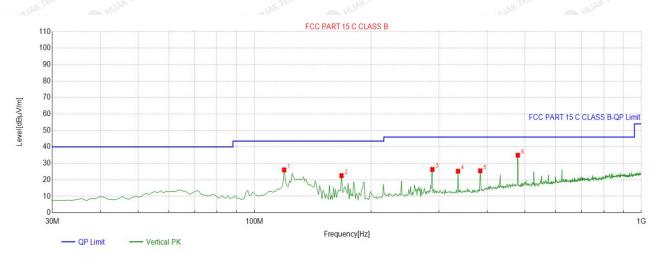
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#### Report No.: HK2305232086-E

Antenna polarity: V



#### QP Detector

	-											
Suspe	Suspected List											
NO	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Delevity			
NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity			
1	119.3293	-15.50	41.56	26.06	43.50	17.44	100	156	Vertical			
2	167.8779	-16.99	39.53	22.54	43.50	20.96	100	193	Vertical			
3	288.2783	-12.42	38.76	26.34	46.00	19.66	100	179	Vertical			
4	335.8559	-11.48	36.74	25.26	46.00	20.74	100	345	Vertical			
5	383.4334	-10.48	35.98	25.50	46.00	20.50	100	209	Vertical			
6	479.5596	-7.79	42.73	34.94	46.00	11.06	100	48	Vertical			
50 C			alle			-11						

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

#### **Harmonics and Spurious Emissions**

#### Frequency Range (9kHz-30MHz)

_		E PENGE	PENGE PENGE
6	Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
	all <mark>a</mark>		INCOMPACING INCOMPACING
	nuertesta Otto	I JAK TEST	1 HO - UNKTESIN
ĺ	<u> </u>	s 🔍	(D) (D)
			(ES <sup>1</sup> )

**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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ΗL

For 1GHz to 25GHz

CH Low (2402MHz)

#### Horizontal:

Frequency	Meter	Factor	Emission Level	Limits	Margin	(C) HOLK
riequency	Reading	T actor	Emission Lever	Liinto 🤍	Margin	Detecto Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Type
4804	53.25	-3.65	49.60	74.00	-24.40	peak
4804	44.06	-3.65	40.41	54.00	-13.59	AVG
7206	51.33	-0.95	50.38	74.00	-23.62	peak
7206	43.88	-0.95	42.93	54.00	-11.07	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4804	53.47	-3.65	49.82	74.00	-24.18	peak
4804	42.69	-3.65	39.04	54.00	-14.96	AVG
7206	50.06	-0.95	49.11	74.00	-24.89	peak
7206	40.87	-0.95	39.92	54.00	-14.08	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level-Limit.

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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	54.15	-3.54	50.61	74.00	-23.39	peak
4880.00	41.06	-3.54	37.52	54.00	-16.48	AVG
7320.00	53.66	-0.81	52.85	74.00	-21.15	peak
7320.00	38.14	-0.81	37.33	54.00	-16.67	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	53.36	-3.54	49.82	74.00	-24.18	peak
4880.00	45.17	-3.54	41.63	54.00	-12.37	AVG
7320.00	50.46	-0.81	49.65	74.00	-24.35	peak
7320.00	42.11	-0.81	41.30	54.00	-12.70	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level-Limit.

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CH High (2480MHz)

#### Horizontal:

Frequency	Meter Reading	Factor	Emission Level	July Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	53.22	-3.43	49.79	74.00	-24.21	peak
4960	42.57	-3.44	39.13	54.00	-14.87	AVG
7440	52.61	-0.77	51.84	74.00	-22.16	peak
7440	40.96	-0.77	40.19	54.00	-13.81	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detecto
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	56.89	-3.43	53.46	74.00	-20.54	peak
4960	45.67	-3.44	42.23	54.00	-11.77	AVG
7440	53.24	-0.77	52.47	74.00	-21.53	peak
7440	41.08	-0.77	40.31	54.00	-13.69	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.

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AF

Radiated Band Edge Test:

#### Operation Mode: TX CH Low (2402MHz)

#### Horizontal

Frequency	requency Reading Result		Emission Level	Limits		Delector
₀₀ (MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2310.00	56.14	-5.81	50.33	74	-23.67	peak
2310.00	/	-5.81		54	1 🔘 🕯	AVG
2390.00	54.08	-5.84	48.24	74	-25.76	peak
2390.00	HUAKTES!	-5.84	ESTIME / HUAKTES	54	MUAK TET	AVG
2400.00	53.68	-5.84	47.84	74	-26.16	peak
2400.00	1	-5.84	1	54	1	AVG

Vertical

Frequency	requency Reading Result		Factor Emission Level		Margin	Detector		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре		
2310.00	55.69	-5.81	49.88 74 -24	81 49.88 74 -24.11	38 74 -24		peak	
2310.00	/	-5.81	1	/ 54		AVG		
2390.00	54.07	-5.84	48.23	<sup>miG</sup> 74	-25.77	peak		
2390.00	MON I	-5.84	10 HO	54	1	AVG		
<sup>66</sup> 2400.00	51.37	-5.84	45.53	74	-28.47	peak		
2400.00	TESTIN	-5.84	LIK TESTIN	54	1	AVG		

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#### Operation Mode: TX CH High (2480MHz)

Frequency	Meter Reading	Factor	Emission Level	jo Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.50	54.57	-5.81	48.76	74	-25.24	peak
2483.50	TESTING	-5.81	AK TESTING	54	/	AVG
2500.00	52.49	-6.06	46.43	74	-27.57	peak
2500.00	La m	-6.06	1	54	1	AVG

#### Horizontal

Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.50	53.69	-5.81	47.88	74	-26.12	peak
2483.50	1	-5.81	1	54	1	AVG
2500.00	51.43	-6.06	45.37	74	-28.63	peak
2500.00	1	-6.06	1	54	/	AVG

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

Remark:

1. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

2. In restricted bands of operation, the spurious emissions below the permissible value more than 20dB.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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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

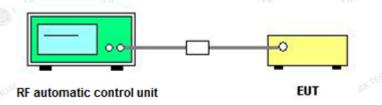
The maximum peak conducted output power may be measured using a broadband peak RF automatic control unit. The RF automatic control unit shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF automatic control unit with a thermocouple detector or equivalent. The RF automatic control unit 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)	Reading Conducted Output Power (dBm)	Cable loss (dBm)		Limit (dBm)	Result
Low	2402	0.05	0.8	0.85		Pass
Middle	2440	-0.23	0.8	0.57	30	Pass
High	2480	-0.53	0.8	0.27	0	Pass

Note: Maximum Peak Conducted Output Power(dBm)= Reading Conducted Output Power(dBm)+ Cable loss

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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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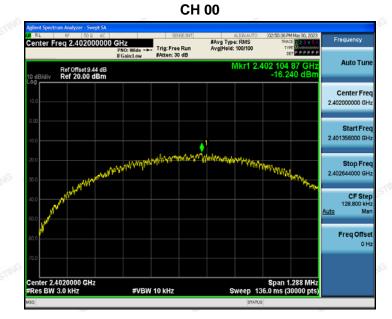
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#### 4.5.5 Test Results

Channel	Channel Frequency (MHz)	Result (dBm/3kHz)	Offset	Test Result (dBm/3kHz)
Low	2402	-25.68	9.44	-16.24
Middle	2440	-26.44	9.44	-17
High	2480	-26.19	9.44	-16.75
	ult (dBm/3kHz)= Resu nent attenuation +cabl		).8 dB =9.44d	B
Limit: 8dBm/3l	<hz< td=""><td>TING</td><td>O HUAN</td><td>STING</td></hz<>	TING	O HUAN	STING
Test Result:	HUAKIL	PAS	S	HUAK IL



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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=300 KHz. 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

	n Hur C	10503)
E LI T		SPECTRUM
EUT		ANALYZER
(Contraction of the second sec	CSTING	-STINK

#### 4.6.5 Test Result

Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.644	WAKTES	Pass
Middle	2440	0.636	≥500	Pass
High	2480	0.684	O HUM	Pass

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#### CH 00



CH 19



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CH 39



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# 4.7 Occupied Bandwidth

#### 4.7.1 Test Procedure

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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#### 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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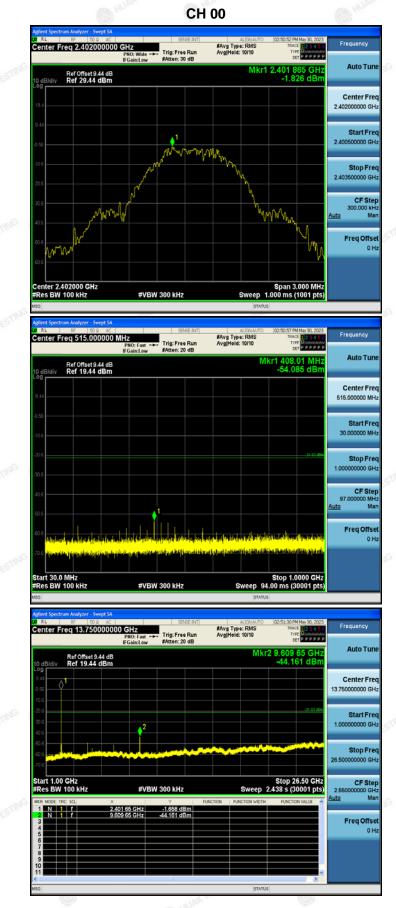
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# 4.9.5 Test Results



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#### Report No.: HK2305232086-E

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#### CH 19



Agilent Spectrum Analyzer - Swept					
Center Freq 515.0000		SENSE:INT	#Avg Type: RMS	02:54:32 PM May 30, 2023 TRACE 2 3 4 5 6	Frequency
	PNO: Fast +++	Trig: Free Run #Atten: 20 dB	Avg Hold: 10/10	TYPE MUMMMMM DET PPPPP	
Ref Offset 9.44 d 10 dB/div Ref 19.44 dB	iB m		Mł	(r1 408.01 MHz -53.341 dBm	Auto Tune
9.44					Center Freq 515.000000 MHz
-0.96					Start Freq 30.000000 MHz
-20.6				-22.10.454	Stop Freq 1.00000000 GHz
-40.6					CF Step 97.000000 MHz <u>Auto</u> Man
-50.6			Ly last generalized and by	t ter and specific terms of	Freq Offset 0 Hz
	para cata na selveti inc	ain an an Anna an Anna Anna an Anna an	<u>ā vas ja ietos - biter (turna fili apeld</u> a		
Start 30.0 MHz #Res BW 100 kHz	#VBW	300 kHz	Sweep 94	Stop 1.0000 GHz .00 ms (30001 pts)	

ilant Coaster	m Analyzer - Swi				.C.V.			
RL	RF 50 g		SBNSE:IM	#Avs	ALIGNAUTO 1 Type: RMS Hold: 10/10	TRACI	EMMMMM	Frequency
dB/div	Ref Offset 9.4 Ref 19.44 (				Mkr	2 9.759 2 -46.06	25 GHz 32 dBm	Auto Tur
	1							Center Fre 13.750000000 GH
1.6		\$ <sup>2</sup>					-22.10.4 <del>0</del> -	Start Fre 1.000000000 GH
).6 ).6 ).6								Stop Fre 26.50000000 GH
art 1.00 tes BW 1	100 kHz		W 300 kHz			2.438 s (30		CF Ste 2.55000000 GH Auto Ma
R MODE TRO	50. 1	× 2.439 90 GHz 9.759 25 GHz	Y -2.497 dBm -46.062 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N WALUE	Freq Offs
							×	
3					STATUS			

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#### Report No.: HK2305232086-E

#### CH 39



	um Analyzer - Swept SA									
Center Fi	RF 50 R AC req 515.000000			SEINT	#Avg Type AvgiHold:		TRAC	C MULLIUM	Frequency	
		IFGain:Low	#Atten: 20		ringinivia.		DE	1 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Auto T	une
10 dB/div	Ref Offset 9.44 dE Ref 19.44 dBm					MI	(r1 408. -53.52	01 MHz 22 dBm		unc
209									Center F	req
9.44									515.000000	MHz
-0.56									Start F	rea
-10.6									30.000000	
-20.6										-
-20.0									Stop F 1,000000000	
-30.6										
-40.6									CF S 97.000000	
-50.6			1						Auto	Man
k		I. İ							Freg Of	fset
-60.6	ala da	hand for his head a state	a, ta a a	<mark>dadadald</mark> i	<u>dinakah</u>	<b>Without the</b>	dista di pita	nihalinga		0 Hz
-70.6 <mark>1</mark> 49499	n an an an Anna Anna Anna Anna Anna An An Anna Anna	wa palantin and	ni je o soleti	all (specialized as	district const	<u>الم المله الم المار</u>	and and a second second	an a		
Start 30.0 #Res BW		#VBM	300 kHz		8	waan 04	Stop 1.0 .00 ms (3	000 GHz		
SILCS DW	TOO KITE	# V D Y Y	000 KHZ			леер эч		ooo r pts)		

ter Freq 13.750		SENSE:INT	#Av:	ALIGNAUTO Type: RMS	02:58:05 PM May 30, 202 TRACE 2 8 4 8	Frequency
Kerrieq 15.750		NO: Fast Trig: Free Run		Hold: 10/10	DET P P P P	
Ref Offset 9. Bidiv Ref 19.44				Mkr	2 9.921 60 GH -47.598 dBm	Auto Tu
						Center Fr 13.750000000 G
	2				-21.95 dB	Start Fr 1.000000000 G
- Alexandre			*****			Stop Fr 26.50000000 G
rt 1.00 GHz s BW 100 kHz	#VB	W 300 kHz		Sweep 2	Stop 26.50 GH 438 s (30001 pts	2.55000000 G
MODE TRC SCL	× 2.479 85 GHz	Y -2.529 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto M
N 1 1	9.921 60 GHz	-47.598 dBm				Freq Offs 0
					>	

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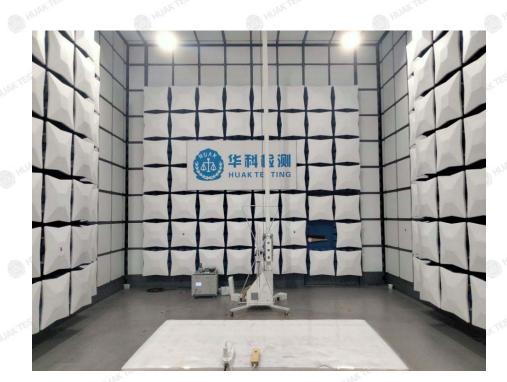
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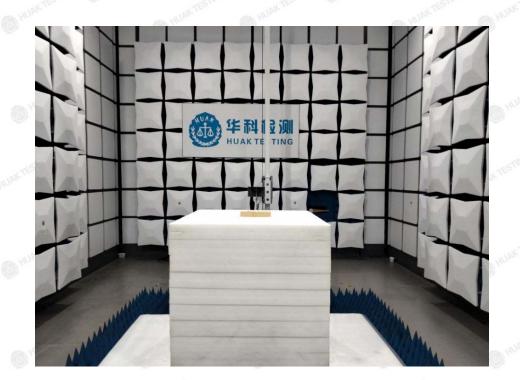


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# 5 Test Setup Photo

Radiated Emissions





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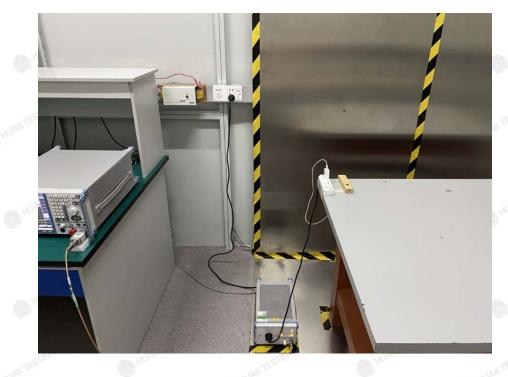
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#### Conducted Emission



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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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