

# **FCC Test Report**

Test Report On Behalf of Shenzhen Youge Intelligent Co., Ltd For Smart Watch TWS Headset

Model No.: X9

FCC ID: 2BB2C-X9

Prepared For:

Shenzhen Youge Intelligent Co., Ltd

Unit 702, unit 6, Taoyuanju 14 District, Taoyuan community, Xixiang street, Bao'an 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:
 Feb. 22, 2024 ~ Mar. 05, 2024

 Date of Report:
 Mar. 05, 2024

 Report Number:
 HK2402220742-E

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## **Test Result Certification**

Applicant's Name:	Shenzhen Youge Intelligent Co., Ltd
Address	Unit 702, unit 6, Taoyuanju 14 District, Taoyuan community, Xixiang street, Bao'an District, Shenzhen, China
Manufacturer's Name:	Shenzhen Youge Intelligent Co., Ltd
Address	Unit 702, unit 6, Taoyuanju 14 District, Taoyuan community, Xixiang street, Bao'an District, Shenzhen, China
Product Description	
Trade Mark:	callmusic
Product Name:	Smart Watch TWS Headset
Model and/or Type Reference :	X9 Strand Strand Strand Strand Strand
	47 CFR FCC Part 15 Subpart C 15.247
Standards	KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10: 2013

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Date of Test	
Date (s) of Performance of Tests:	Feb. 22, 2024 ~ Mar.
Date of Issue	Mar. 05, 2024
Test Result	Pass

Testing Engineer

Len lian

05, 2024

Len Liao

Technical Manager

Sliver Wan

Authorized Signatory

Mwu

Jason Zhou

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Т 691

## \*\* Modified History \*\*

Revi	sion	Description	Issu	ed Data	Remark
Revisi	on 1.0	Initial Test Report Release	Mar.	05, 2024	Jason Zhou
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## 1 Test Summary

## 1.1 Test Description

ST. TEST	N TES.	TES.
Test Item	Test Requiremen	t 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 Powe	er FCC Part 15.247(I	b) PASS
Power Spectral Density	FCC Part 15.247(6	e) PASS
6dB Bandwidth & 99% Bandwi	dth FCC Part 15.247(a)	)(2) PASS
Spurious RF Conducted Emiss	sion FCC Part 15.247(c	d) PASS
Band Edge	FCC Part 15.247(c	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 ANTES	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

Smart Watch T (9 I/A I/A allmusic 402 MHz to 24	RUNCTESTING	O HUAN	TESTING	C HUNK TESTIN
I/A I/A allmusic	RUNYTESTING	- HUAN	TESTING	A HORY TESTIN
I/A allmusic	HUNKTESTING	O HUAN	TESTING	HUNKTESTIN
allmusic	HUNK TESTING	O HUA		HUAKTESTIN
and	HU			HUM
402 MHz to 24				
	480 MHz		0	
MHz	-STING	O HO.	TIME	5
0 HUANTE	HUAN		HUAK TEN	HUAK .
SFSK			w.	
/1.0				
1.0	TESTING		TESTING	
eramic Anten	na 🔘 HUAA	0	HUPAN	O HUAN
.71dBi			NG	
C5V from US	B or DC3.8V fro	m battery	TESIN	-104
	HUAKTES	0.		HUAKTED
	0 FSK 1.0 1.0 ceramic Anteni .71dBi 0C5V from US	0 GFSK 1.0 1.0 Ceramic Antenna .71dBi 0C5V from USB or DC3.8V fro	0 BFSK 1.0 1.0 Ceramic Antenna .71dBi DC5V from USB or DC3.8V from battery	0 GFSK 11.0 11.0 Ceramic Antenna .71dBi

the User's Manual.

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GIG	TING HUAN	Description o	f Channel	JAK	IG TING
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
-stn1	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	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
TEST 11	2424	25	2452	39	2480
12	2426	26	2454		C HOM
13	2428	27	2456		

The EUT has been operated in modulations: GFSK independently.

No.					Test Mode Description		
T	STIPS		ESTING O	TESTING	Low channel TX	TESTING	K TESTING
O HUAR	2	O HOM		O HUAR	Middle channel TX	HUAN	HOME
	3				High channel TX		
Note:	.6		.6	.6	-C	-6	.6

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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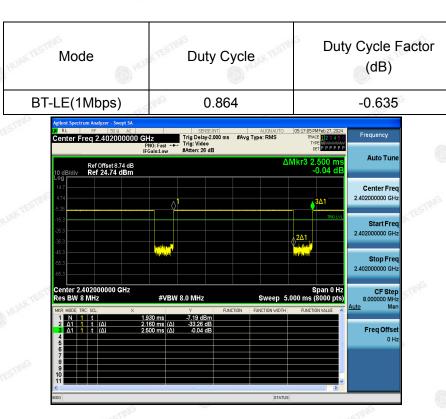


## 2.2 Description of Test Conditions

(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.



(4) Mode Test Duty Cycle

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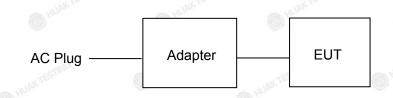
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## 2.3 Description of Test Setup

Operation of EUT during Conducted and Radiation below 1GHz testing:



Operation of EUT during Radiation Above1GHz testing:

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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## 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.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Note
1	Smart Watch TWS Headset	callmusic	X9	N/A	EUT
2	USB Cable	N/A	N/A	Length: 60cm	Accessory
3	Adapter	N/A	MDY-10-EH	Input: AC100-240V, 50/60Hz, 0.7A Output: DC5V/3A, 9V/3A, 12V/2.25A, 20V/1.35A	Peripheral
TESTING	TESTING		ING	TESTING	TESTING
Wan	C HUAN	O HUPA	C HUAN	() HUAN	HUAN

#### 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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## **3** Equipments List for All Test Items

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
KTE 1.00	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Feb. 20, 2024	1 Year
2.	L.I.S.N.	R&S	ENV216	HKE-059	Feb. 20, 2024	1 Year
3.	Receiver	R&S	ESR-7	HKE-010	Feb. 20, 2024	∍1 Year
4.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 20, 2024	1 Year
5.	Spectrum analyzer	R&S	FSP40	HKE-025	Feb. 20, 2024	1 Year
6.	Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	1 Year
7.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 21, 2024	2 Year
8.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Feb. 20, 2024	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Feb. 21, 2024	2 Year
10.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Feb. 21, 2024	2 Year
11.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Feb. 21, 2024	2 Year
12.	Pre-amplifier	EMCI	EMC051845SE	HKE-015	Feb. 20, 2024	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Feb. 20, 2024	1 Year
14.	High pass filter unit	Tonscend	JS0806-F	HKE-055	Feb. 20, 2024	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. 20, 2024	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. 20, 2024	1 Year
23.	Signal generator	Agilent	N5182A	HKE-029	Feb. 20, 2024	1 Year
24.	Signal Generator	Agilent	83630A	HKE-028	Feb. 20, 2024	1 Year
25.	Power meter	Agilent	E4419B	HKE-085	Feb. 20, 2024	1 Year

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26.	Power Sensor	Agilent	E9300A	HKE-086	Feb. 20, 2024	1 Year
27.	RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	Feb. 20, 2024	1 Year
28.	RF Cable(above 1GHz)	Times	1-40G	HKE-034	Feb. 20, 2024	1 Year
29.	RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	Feb. 20, 2024	1 Year
30.	Shielded room	Shiel Hong	4*3*3	HKE-039	<sup>©</sup> Dec. 09, 2021	3 Year
31.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 21, 2024	2 Year
32.	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	Feb. 20, 2024	1 Year

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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.

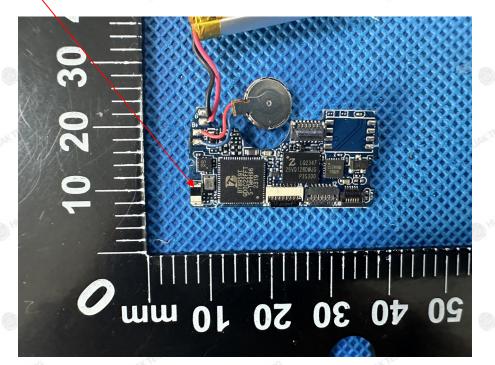
#### Refer to statement below for compliance.

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 Ceramic Antenna, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.71dBi.

#### 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:

		Limit (dBuV)				
ALTESTING	Frequency range (MHz)	Quasi-peak	Average			
	0.15-0.5	66 to 56*	56 to 46*			
N <sup>S</sup>	0.5-5	56	46			
	5-30	60	50 50 C			

\* Decreases with the logarithm of the frequency.

### 4.2.2 Test Procedure

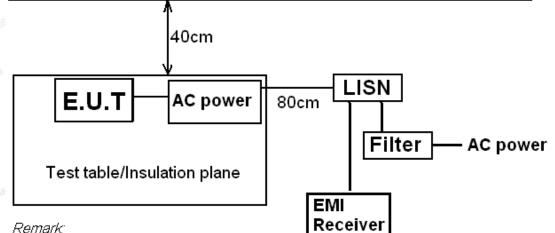
- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
- 2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
- 4. 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

**Reference Plane** 



Remark: E.U.T: Equipment Under Test LISN: Line Impedence Stabilization Network Test table height=0.8m

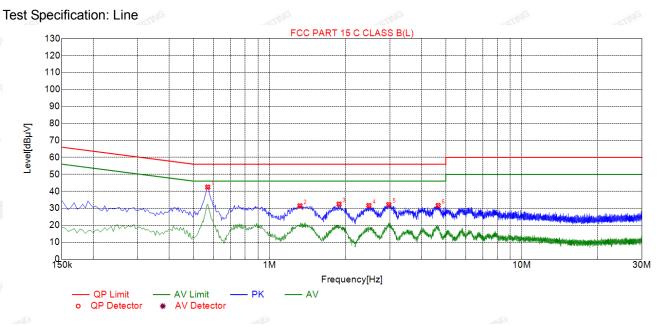
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### 4.2.4 Test Results

All modes have been tested. Only the worst result was reported as below:



Sus	spected	List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
1	0.5685	42.46	20.05	56.00	13.54	22.41	PK	L
2	1.3200	31.44	20.10	56.00	24.56	11.34	PK	L
3	1.8870	32.42	20.14	56.00	23.58	12.28	PK	L
4	2.4765	31.62	20.19	56.00	24.38	11.43	PK	L
5	2.9715	32.17	20.22	56.00	23.83	11.95	PK	L
6	4.6635	31.64	20.26	56.00	24.36	11.38	PK	L

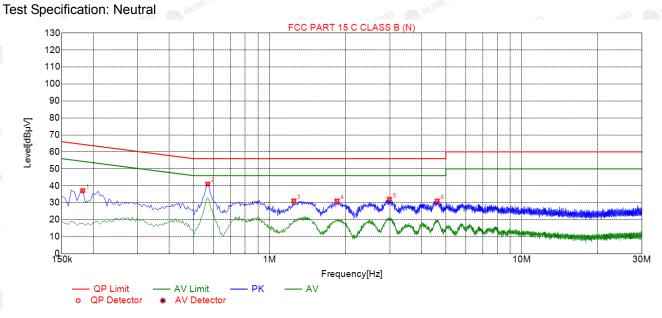
Remark: Margin = Limit – Level Correction factor = Cable lose + LISN insertion loss Level=Test receiver reading + correction factor

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	Sus	spected	l List						
2	NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
	1	0.1815	37.19	20.06	64.42	27.23	17.13	PK	Ν
e.	2	0.5685	41.01	20.05	56.00	14.99	20.96	PK	Ν
	3	1.2480	31.08	20.09	56.00	24.92	10.99	PK	Ν
8	4	1.8510	31.08	20.14	56.00	24.92	10.94	PK	Ν
	5	2.9850	32.06	20.22	56.00	23.94	11.84	PK	Ν
	6	4.6230	31.02	20.26	56.00	24.98	<b>1</b> 0.76	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).

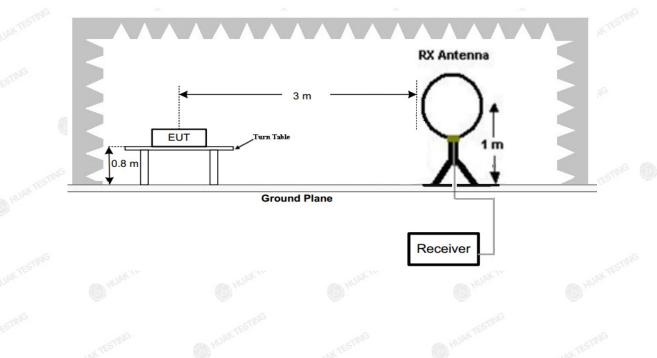
Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Rac	liated emission limits	
) Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
3	20log(30)+ 40log(30/3)	30
3	40.0	100
3 restinic	43.5	150
3	46.0	200
3	54.0	500
	) Distance (Meters) 3 3 3 3 3 3 3 2	3         20log(2400/F(KHz))+40log(300/3)           3         20log(24000/F(KHz))+40log(30/3)           3         20log(24000/F(KHz))+40log(30/3)           3         20log(30)+40log(30/3)           3         40.0           3         43.5           3         46.0

## 4.3.2 Test Setup

#### **Test Configuration:**

1) 9 kHz to 30 MHz emissions:

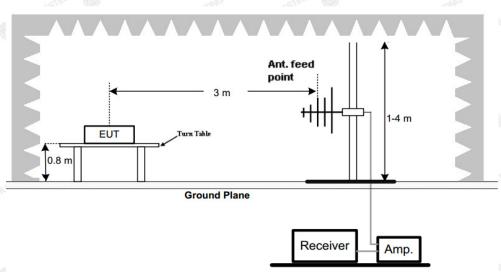


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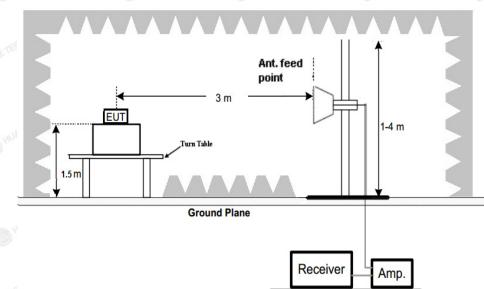
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2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



#### Test Procedure

- 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  $0^{\circ}$ C to  $360^{\circ}$ 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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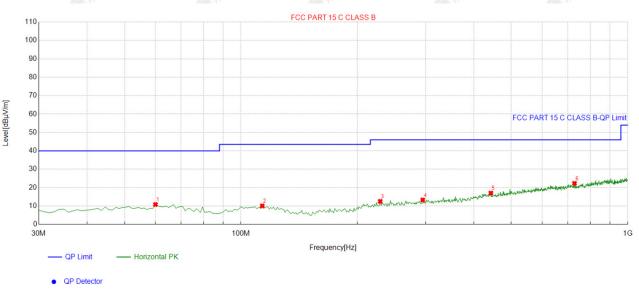
E.

#### 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



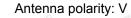
	Suspe	cted List								
2		Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	
	NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity
9	1	60.1001	-14.37	25.20	10.83	40.00	29.17	100	191	Horizontal
	2	113.50350	-15.14	25.21	10.07	43.50	33.43	100	39	Horizontal
	3	229.04904	-13.95	26.52	12.57	46.00	33.43	100	249	Horizontal
	4	295.07507	-12.12	25.44	13.32	46.00	32.68	100	97	Horizontal
Y	5	442.66266	-8.46	25.53	17.07	46.00	28.93	100	119	Horizontal
	6	728.12812	-3.34	25.68	22.34	46.00	23.66	100	81	Horizontal

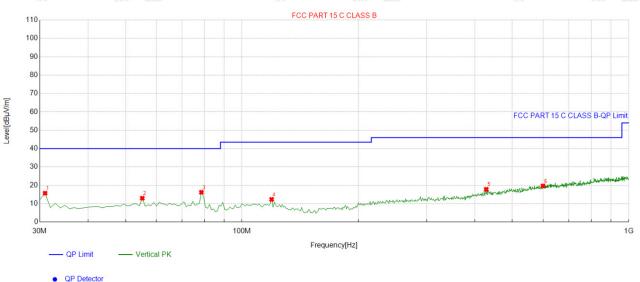
Remark: Factor = Cable loss + Antenna factor - Preamplifier; Level = Reading + Factor; Margin = Limit - Level;

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Suspected List

3		Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	
	NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity
2	1	30.970971	-16.65	32.37	15.72	40.00	24.28	100	292	Vertical
	2	55.245245	-14.32	27.28	12.96	40.00	27.04	100	359	Vertical
3	3	78.548549	-17.29	33.51	16.22	40.00	23.78	100	202	Vertical
	4	119.32932	-15.50	27.84	12.34	43.50	31.16	100	31	Vertical
	5	428.09809	-8.47	26.31	17.84	46.00	28.16	100	213	Vertical
	6	599.95996	-4.93	24.60	19.67	46.00	26.33	100	358	Vertical

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

#### Harmonics and Spurious Emissions

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

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
	- 101- <sup></sup>	I HATTESTAT
		(e) (i)
- UN TEST		restina
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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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C al

For 1GHz to 25GHz

CH Low (2402MHz)

#### Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4804.00	56.12	-3.65	52.47	74.00	-21.53	peak
4804.00	46.29	-3.65	42.64	54.00	-11.36	AVG
7206.00	54.36	-0.95	53.41	74.00	-20.59	peak
7206.00	43.88	-0.95	42.93	54.00	-11.07	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	C HUAK T
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4804.00	56.57	-3.65	52.92	74.00	-21.08	peak
4804.00	46.92	-3.65	43.27	54.00	-10.73	AVG
7206.00	53.15	-0.95	52.20	74.00	-21.80	peak
7206.00	44.23	-0.95	43.28	54.00	-10.72	AVG

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FICATION

CH Middle (2440MHz)

#### Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4880.00	55.09	-3.54	51.55	74.00	-22.45	peak
4880.00	46.42	-3.54	42.88	54.00	-11.12	AVG
7320.00	52.53	-0.81	51.72	74.00	-22.28	peak
7320.00	42.88	-0.81	42.07	54.00	-11.93	AVG

#### Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4880.00	56.51	-3.54	52.97	74.00	-21.03	peak
4880.00	45.69	-3.54	42.15	54.00	-11.85	AVG
7320.00	53.24	-0.81	52.43	74.00	-21.57	peak
7320.00	43.18	-0.81	42.37	54.00	-11.63	AVG

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CH High (2480MHz)

#### Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4960.00	56.05	-3.43	52.62	74.00	-21.38	peak
4960.00	44.61	-3.44	41.17	54.00	-12.83	AVG
7440.00	52.34	-0.77	51.57	74.00	-22.43	peak
7440.00	41.25	-0.77	40.48	54.00	-13.52	AVG

#### Vertical:

Frequency	Frequency Meter Reading (MHz) (dBµV)		Emission Level	Limits	Margin	Detector Type
(MHz)			(dBµV/m)	(dBµV/m)	(dB)	
4960.00	55.79	-3.43	52.36	74.00	-21.64	peak
4960.00	44.83	-3.44	41.39	54.00	-12.61	AVG
7440.00	53.84	-0.77	53.07	74.00	-20.93	peak
7440.00	41.22	-0.77	40.45	54.00	-13.55	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 of test receiver/spectrum analyzer is 1MHz and video 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.</p>
(7) All modes of operation were investigated and the worst-case emissions are reported.

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Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case):

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector	
🔊 (MHz)	(dBµV)	(dBµV) (dB)		(dBµV/m)	(dB)	Туре	
2310.00	56.98 -5.81 51.17 74		74	-22.83	peak		
2310.00	1	-5.81		54	1 🔊	AVG	
2390.00	90.00 55.26 -5.84 4		49.42	74	-24.58	peak	
2390.00	HUAK TEST	-5.84	ESTINE / HUAK TEST	54	MAK TO THE	AVG	
2400.00	55.01	-5.84	49.17	74	-24.83	peak	
2400.00	1	-5.84	1	54	1	AVG	

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2310.00 54.19		-5.81	48.38	74	-25.62	peak	
2310.00	/	/ -5.81 / 54		54	1	AVG	
2390.00	54.32	-5.84	48.48	74	-25.52	peak	
2390.00	HUAKTEST	-5.84	S / HUAK TO	54	AK TESTIN	AVG	
2400.00	55.78	-5.84	49.94	74	-24.06	peak	
2400.00	TING /	-5.84	1	54	1	AVG	

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Operation Mode: TX CH High (2480MHz)

	,						
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detecto	
(MHz) (dBµV)		(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2483.50	53.56	-5.81	47.75	74	-26.25	peak	
2483.50	1	-5.81	1	54	stato /	AVG	
2500.00	52.07	-6.06	46.01	74	-27.99	peak	
2500.00	/	-6.06	/	54	1	AVG	

Horizontal (Worst case)

Vertical:

Frequency	Meter Reading	FactorEmission Level(dB)(dBµV/m)		Limits	Margin	Detector	
(MHz)	(dBµV)			(dBµV/m)	(dB)	Туре	
2483.50	2483.50 52.19		46.38	74	-27.62	peak	
2483.50	TESTING /	-5.81	I AK TESTING	54	/	AVG	
2500.00	52.24	-6.06	46.18	74	-27.82	peak	
2500.00	1	-6.06	/	54	/	AVG	

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

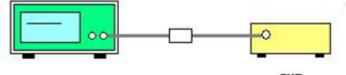
The maximum peak conducted output power may be measured using a broadband peak RF automatic control unit. The RF automatic control unit shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

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



RF automatic control unit

EUT

## 4.4.5 Test Results

Channel	Channel Frequency (Mhz)	Maximum Peak Conducted Output Power (dBm)	Limit (dBm)	Result	
Low	2402	1.06	O HUAKTE	Pass	
Middle	2440	1.23	30.00	Pass	
High	2480	2.37	TESTING	Pass	

Note: The test results including the 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 8dBm 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.





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### 4.5.5 Test Results

	ASIA HIL	915335	150	A 100				
Channel	Channel frequency (MHz)	Result (dBm/10kHz)	10log (3/10)	Test Result (dBm/3kHz)				
Low	2402	-14.49	-5.23	-19.72				
Middle	2440	-9.50	-5.23	-14.73 🤍				
High	2480	-7.05	-5.23	-12.28				
Limit : 8dBm/3	KHz							
Test Result (dB	Test Result (dBm/3kHz)= Result (dBm/10kHz)+10log (3/10)							
Test Result	TESTING	PA	SS	<i></i>				

CH 00



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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=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

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		SPECTRUM
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### 4.6.5 Test Result

Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.644	NUNKTESS	Pass
Middle	2440	0.660	≥500	Pass
High	2480	0.664	O HOM	Pass

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#### CH 00



CH 19



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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



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## 4.7.4 Test Result

N/A

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FICATION

## 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

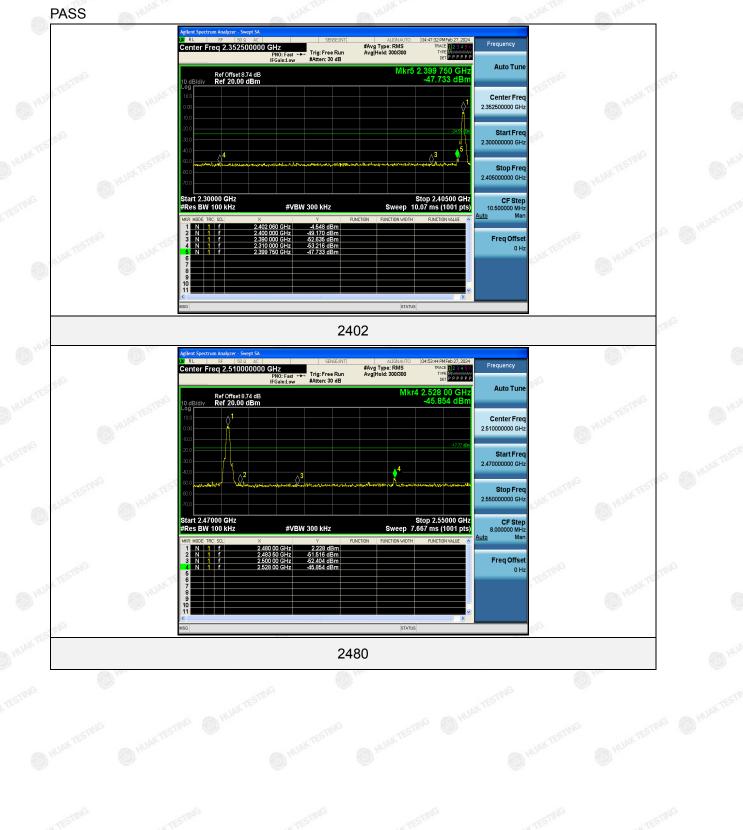


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## 4.8.5 Test Results



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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 ≥ 1% of the span, VBW ≥ 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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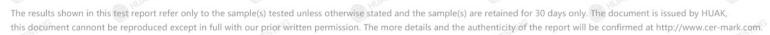


TI

e HP



CH 00 enter Freq 2.402000000 GHz Frequency #Avg Type: RMS Avg|Hold: 10/10 Trig: Free Run #Atten: 30 dB DET P P P P Auto Tu 2.401 754 GH -5.077 dB Ref Offset 8.74 dB Ref 28.74 dBm Center Free 2.40200000 GH Start Fre Stop Free 2.403500000 G CF St 300.000 k Ŵ m Freq Offse 0 H enter 2.402000 GHz Res BW 100 kHz Span 3.00 00 ms /40 #VBW 300 kHz Sweel Frequency #Avg Type: RMS Avg|Hold: 10/10 TYPE MINANA Auto Tu Ref Offset 8.74 dB Ref 18.74 dBm 1 862.20 MF -61.490 dB Center Free 515.000000 MH Start Fre 30.000000 M⊦ Stop Fre 1.00000000 G CF Ste 97.000000 MH Auto Freq Offs 0 H Start 30.0 MHz #Res BW 100 kHz Stop Sweep 94.00 ms #VBW 300 kHz Freq 13.750000000 GHz Frequency #Avg Type: RMS Avg|Hold: 10/10 Trig: Free Run M WWW Auto Tun r2 4.803 75 GI -31.524 dB Ref Offset 8.74 dB Ref 18.74 dBm Center Fre 13,750000000 GH Start Fre 1.0000000 Stop Fre 26.50000000 G Start 1.00 GHz #Res BW 100 kHz Stop 26.50 GHz Sweep 2.438 s (30001 pts) CF Ste #VBW 300 kHz 2.5500 <u>Auto</u> M: 2.401 65 GHz 4.803 75 GHz -4.806 dB -31.524 dB Freq Offset 0 Hz



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#### CH 19



		ım Analyzer									
ux/ R Cen			50Ω AC	ИНz		ISE:INT	#Avg Type		TRACI	IFeb 27, 2024	Frequency
				PNO: Fast ++ IFGain:Low	Trig: Free #Atten: 20		Avg Hold:	10/10	TYP DE	PPPPPP	
		Ref Offse						М	kr1 739.	62 MHz	Auto Tune
10 di Log	3/div	Ref 18.	74 dBm						-61.34	10 dBm	
											Center Freq
8.74											515.000000 MHz
-1.26											
											Start Freq
-11.3											30.000000 MHz
-21.3										-20.61 dBm	
-21.5											Stop Freq 1.00000000 GHz
-31.3											1.00000000 GH2
											CF Step
-41.3											97.000000 MHz
-51.3											<u>Auto</u> Man
								▲1			Freq Offset
-61.3	and a shall	Lalahaning	and a state of the	بالماطعا ومبار	المنافي المقابل	-	and the structure	li ha da	the state of the state	danada addaa	0 Hz
-71.3	al automation in	and the last	dina i mini di t	ناء أنامرا أنتازية. أن يور الأراري الله أنامرا أنتازية أن الأرارية (	-	A STREET, OF STREET, S	and the second	فلللريد فتر رداديل	a second and the second se	adusin kaja bak	
Star	t 30.0	MHz							Stop 1.0	000 GHz	
#Re	s BW 1	100 kHz		#VBW	300 kHz		S	weep 94	.00 ms (3		

Agilent Spectrum Analyzer	- Swort SA	2.3.1		.c.yr		
Center Freq 13.7	50 Ω AC 500000000 GI PN		eeRun Av	ALIGNAUTO vg Type: RMS g Hold: 10/10	04:51:37 PMFeb 27, 2024 TRACE 2 3 4 5 6 TYPE MOMMON DET P P P P P P	Frequency
	et 8.74 dB .74 dBm			Mkr	2 4.880 25 GHz -38.862 dBm	Auto Tune
8.74 -1.26						Center Freq 13.750000000 GHz
-11.3 -21.3 -31.3 -41.3	2				-20.61 dBm	<b>Start Freq</b> 1.000000000 GHz
-51.3 -61.3 -71.3						<b>Stop Freq</b> 26.50000000 GHz
Start 1.00 GHz #Res BW 100 kHz	х	#VBW 300 kH	FUNCTION	Sweep 2	Stop 26.50 GHz 2.438 s (30001 pts) FUNCTION VALUE	CF Step 2.550000000 GHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 4 5 6 6	2.439 90 4.880 25	0 GHz -1,126 ( 5 GHz -38.862 (	iBm iBm			<b>Freq Offset</b> 0 Hz
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		11			~	
MSG				STATUS		

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#### CH 39



	rum Analyzer - Swept SA								
Center F	RF 50 Ω AC req 515.000000			E:INT	#Avg Type:			123456	Frequency
		PNO: Fast 🔸	Trig: Free #Atten: 20		Avg Hold: 1	0/10	TYPE	М <del>иллиил</del> Р Р Р Р Р Р	
10 dB/div	Ref Offset 8.74 dE Ref 18.74 dBm	3				MI	(r1 695.0 -60.06	6 MHz 2 dBm	Auto Tune
8.74									Center Freq 515.000000 MHz
-1.26									Start Freq 30.000000 MHz
-21.3								-18.14 dBm	Stop Freq
-31.3									CF Step 97.000000 MHz
-51.3					<b>↓</b> 1				<u>Auto</u> Man Freq Offset
.3 1444	MHz 100 KHz	edeted da por el producted d'activitation de la construcción de la construcción de la construcción de la const La construcción de la construcción d			<mark>ulli an gadh</mark>	<mark>ylantsitä</mark> i		000 GHz	0 Hz

Agilent Spectrum Analyzer - Swe	ot SA				
anen spectrum analyzer 50 ຊ RL RF 50 ຊ Center Freq 13.7500	AC 00000 GHz PN0: Fast ↔	SENSE:INT Trig: Free Run #Atten: 20 dB	ALIGNAUTO #Avg Type: RMS Avg Hold: 10/10	04:54:29 PM Feb 27, 2024 TRACE 2 3 4 5 6 TYPE M	Frequency
Ref Offset 8.7 10 dB/div Ref 18.74 d		#Atten: 20 dB	Mkr	2 4.959 30 GHz -40.924 dBm	Auto Tune
-09 8.74 1.26					Center Freq 13.750000000 GHz
-11.3 -21.3 -31.3 -41.3				-18.14 dBm	Start Freq 1.000000000 GHz
-51.3 -61.3 -71.3					<b>Stop Freq</b> 26.500000000 GHz
ttart 1.00 GHz Stop 26.50 GHz Res BW 100 kHz #VBW 300 kHz Sweep 2.438 s (30001 pts)					CF Step 2.550000000 GHz Auto Man
MKR MODE TRC SOL 1 N 1 f 2 N 1 f 3	× 2.479 85 GHz 4.959 30 GHz	Y FU 0.849 dBm -40.924 dBm	NCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset
7 8 9 10 11				×	
SG			STATU	5	

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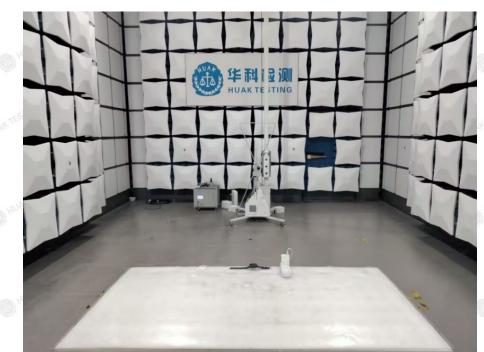
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## 5 Test Setup Photos

Radiated Emission





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## Report No.: HK2402220742-E

**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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