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FCC Test Report

FCC PART 15 SUBPART C 15.247

Test report On Behalf of SHENZHEN FEIBIT ELECTRONIC TECHNOLOGY Co., LTD. For

FZT6090 module

Model No.: FZT6090

FCC ID: 2BB9L-FZT6090

Prepared For : SHENZHEN FEIBIT ELECTRONIC TECHNOLOGY Co., LTD. 14F, Building 2, Nanshan iPark Chongwen, 3370 Liuxian Avenue, Nanshan District, Shenzhen, 518000 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:
 Jul. 20, 2023 ~ Aug. 07, 2023

 Date of Report:
 Aug. 07, 2023

 Report Number:
 HK2307203147-2E

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Report No.: HK2307203147-2E

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Test Result Certification

Applicant's name	SHENZHEN FEIBIT ELECTRONIC TECHNOLOGY Co., LTD.
Address	14F, Building 2, Nanshan iPark Chongwen, 3370 Liuxian Avenue, Nanshan District, Shenzhen, 518000 China
Manufacture's Name:	SHENZHEN FEIBIT ELECTRONIC TECHNOLOGY Co., LTD.
Address:	14F, Building 2, Nanshan iPark Chongwen, 3370 Liuxian Avenue, Nanshan District, Shenzhen, 518000 China
Product description	
Trade Mark:	FBEE THE STATE HOAT
Product name:	FZT6090 module
Model and/or type reference:	FZT6090
Standards	47 CFR FCC Part 15 Subpart C 15.247

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Date of Test	Y TESTING
Date (s) of performance of tests	: Jul. 20, 2023 ~ Aug. 07, 2023
Date of Issue	: Aug. 07, 2023
Test Result	: Pass

Prepared by:

Aa

Project Engineer

Reviewed by:

Project Supervisor

Approved by:

asin thou

Technical Director

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Т 691

** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Aug. 07, 2023	Jason Zhou
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1 Test Summary

1.1 Test Description

ST TEST	WTED WTED	WIED.
Test Item	Test Requirement	Result
Antenna Requirement	§15.203/§15.247(b)(4	4) PASS
Conducted Emission	FCC Part 15.207	PASS
Radiated Emissions	FCC Part 15.205/15.2	09 PASS
Maximum Peak Output Powe	er FCC Part 15.247(b)) PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
6dB Bandwidth & 99% Bandw	idth FCC Part 15.247(a)(2) PASS
Spurious RF Conducted Emiss	sion 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

2.1 General Description of EUT

EUT Name:	FZT6090 module
Model No:	FZT6090
Series Model:	N/A series
Model Difference:	N/A
Trade Mark:	FBEE O
Operation Frequency:	2402 MHz to 2480 MHz
Channel Separation:	2MHz
Number of Channel:	40 HUME AND ALLAND ALLAND ALLAND ALLAND
Modulation Technology:	GFSK
Hardware Version:	V1.0
Software Version:	V1.0
Antenna Type:	Ceramic Antenna
Antenna Gain:	1.73dBi
Power Supply:	DC 3.3V
Note:	C HUNCTES

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

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NETESTING	UAK TESTING	Description of	Channel:	NKTEST	UAK TESTING
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
UAK TES 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
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456	- HAR	

The EUT has been operated in modulations: GFSK independently.

NO.	TEST MODE DESCRIPTION
HUAN TE 1	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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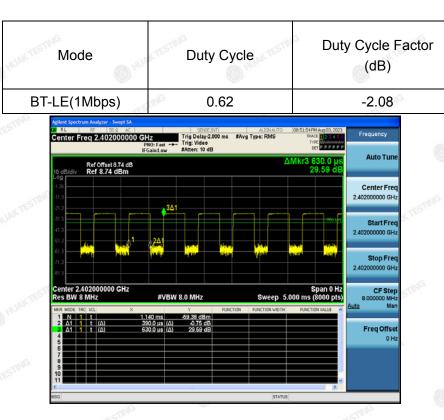


2.2 Description of Test Conditions

(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.



(4) Mode Test Duty Cycle

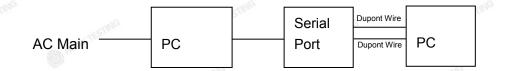
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2.3 Description of Test Setup

Operation of EUT during conducted and radiation 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.

Item		Equipment	Mfr/ Trade Mark	Model/Type No.	Specification	Note
3	1	FZT6090 module	FBEE	FZT6090	N/A	EUT
	2	PC	N/A	TP00067A	Input: DC 20V, 2.25-3.25A Output: 5VDC, 0.5A	Peripherals
	3	Serial Port	N/A	N/A	USB to TTL	Peripherals
	4	Dupont Wire	N/A	Length: 0.1m	N/A	Peripherals
2	5	Dupont Wire	N/A	Length: 0.1m	N/A	Peripherals

Note:

- All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
 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
x19.00G	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	^a 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	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.	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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26.	Power Sensor	Agilent	E9300A	HKE-086	Feb. 17, 2023	1 Year
27.	RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	Feb. 17, 2023	1 Year
28.	RF Cable(above 1GHz)	Times	1-40G	HKE-034	Feb. 17, 2023	1 Year
29.	RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	Feb. 17, 2023	1 Year
30.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 09, 2021	3 Year
31.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Feb. 17, 2023	1 Year
32.	10dB Attenuator	SCHWARZBECK	VTSD9561F	HKE-153	Feb. 17, 2023	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.

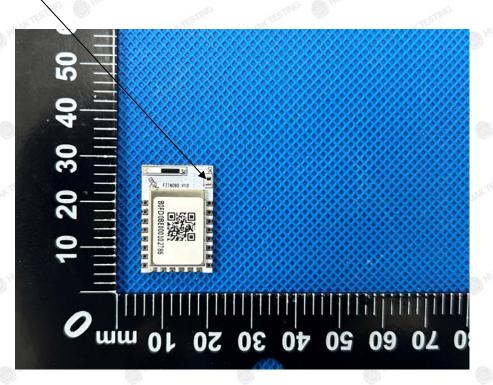
Refer to statement below for compliance.

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, which permanently attached. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 1.73dBi.

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:

NUAR TESTING	Limit (c	lBuV)
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

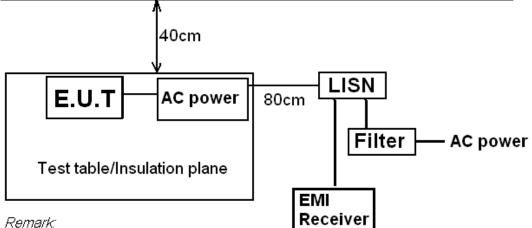
- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
- 2. Support equipment, if needed, was placed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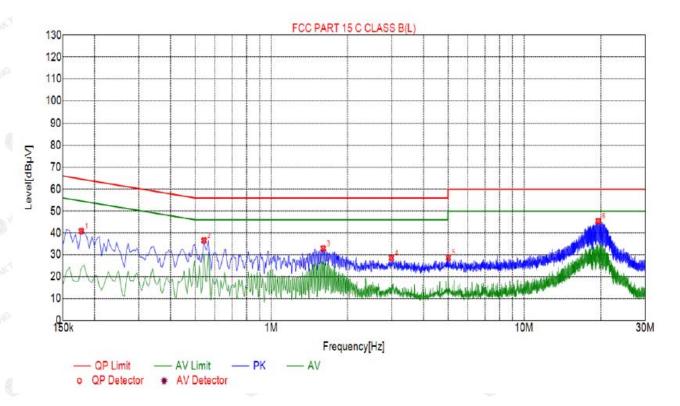
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4.2.4 Test Results

PASS

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

Test Specification: Line



Suspected List

2	NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
	1	0.1770	40.77	20.05	64.63	23.86	20.62	PK	L
E.	2	0.5415	36.54	20.05	56.00	19.46	16.39	PK	L
	3	1.6035	32.93	20.11	56.00	23.07	12.72	PK	L
100	4	2.9850	28.64	20.22	56.00	27.36	8.32	PK	L
10	5	5.0235	28.69	20.26	60.00	31.31	8.33	PK	L
	6	19.5405	45.39	20.08	60.00	14.61	25.21	PK	L

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

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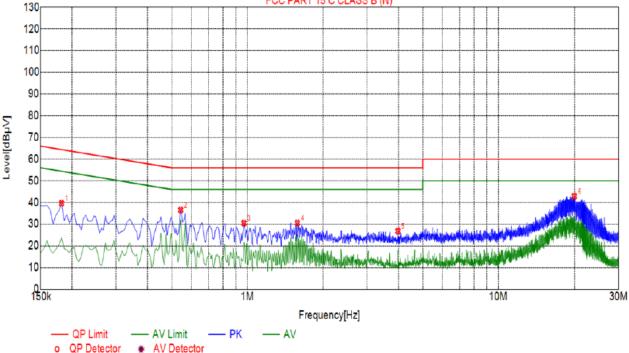
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VCATIO,

Test Specification: Neutral

FCC PART 15 C CLASS B (N)



	Sus	spected	l List						
3	NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре
1007	1	0.1815	39.60	20.06	64.42	24.82	20.44	PK	N
	2	0.5415	36.50	20.05	56.00	19.50	17.35	PK	N
3	3	0.9690	30.51	20.06	56.00	25.49	11.35	PK	N
	4	1.5810	30.53	20.11	56.00	25.47	11.32	PK	N
3	5	3.9795	26.77	20.25	56.00	29.23	7.42	PK	N
	6	19.9635	42.89	20.10	60.00	17.11	23.69	PK	N

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).

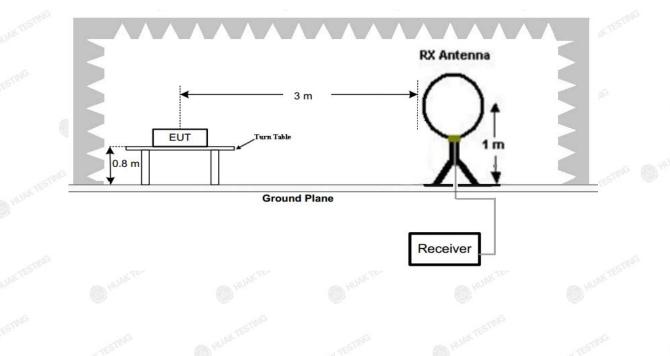
Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

		Rac	liated emission limits	
ŝ	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(30/3)	24000/F(KHz)
3	1.705-30	3	20log(30)+ 40log(30/3)	30
	30-88	3	40.0	100
5	» [©] 88-216	3 sing	43.5	150
	216-960	3	46.0	200
	Above 960	3	54.0	500
-	Vill97		Same and Sam	34897

4.3.2 Test Setup

Test Configuration:

1) 9 kHz to 30 MHz emissions:

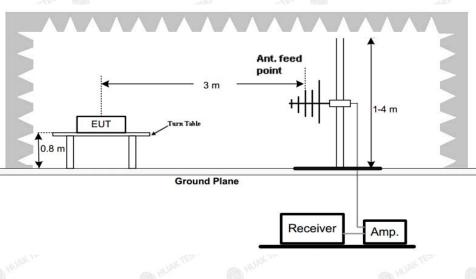


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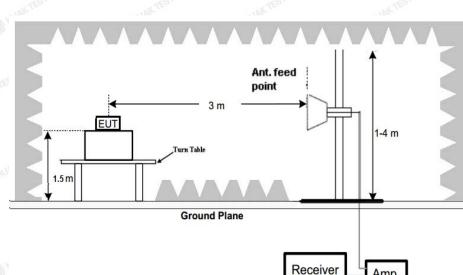
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2) 30 MHz to 1 GHz emissions:



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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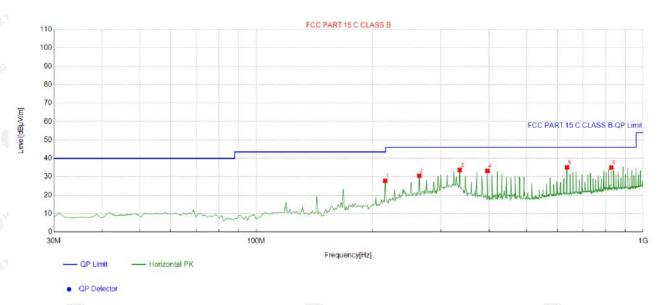
K

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								
	NO.	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Polarity
Ş	NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Folanty
	1	215.45545	-14.42	42.28	27.86	43.50	15.64	100	151	Horizontal
	2	264.00400	-12.71	43.28	30.57	46.00	15.43	100	145	Horizontal
Ś	3	335.85585	-11.48	45.16	33.68	46.00	12.32	100	24	Horizontal
	4	396.05605	-9.73	42.96	33.23	46.00	12.77	100	24	Horizontal
<	5	635.88588	-4.38	39.52	35.14	46.00	10.86	100	142	Horizontal
	6	828.13813	-1.33	36.35	35.02	46.00	10.98	100	211	Horizontal

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

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Report No.: HK2307203147-2E

Antenna polarity: V



0.00	2.1	-6.2			2610				-6.22
Suspe	cted List								
NO	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Delevitor
NO.	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity
1	119.32932	-15.50	33.32	17.82	43.50	25.68	100	75	Vertical
2	163.99399	-17.19	39.41	22.22	43.50	21.28	100	144	Vertical
3	335.85585	-11.48	37.11	25.63	46.00	20.37	100	28	Vertical
4	420.33033	-8.75	38.65	29.90	46.00	16.10	100	50	Vertical
5	479.55956	-7.79	39.54	31.75	46.00	14.25	100	291	Vertical
6	635.88588	-4.38	37.76	33.38	46.00	12.62	100	97	Vertical

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

Harmonics and Spurious Emissions

Frequency Range (9kHz-30MHz)

re	quency Range (9kHz-30MHz)		
	Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
	THE STING OFFICE	me me OH	-nic stinic
JAY	HUAK'TL-	WANTES	- WARTES HUARTE
	<u> </u>) · · · · · · · · · · · · · · · · · · ·	• <u> </u>

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:

P	4 Tes	1 Martin	WTE-		. AV	147
Frequency	Meter Reading	Factor	Emission Level	Limits 🌒	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4804	58.28	-3.65	54.63	74.00	-19.37	peak
4804	38.14	-3.65	34.49	54.00	-19.51	AVG
7206	58.01	-0.95	57.06	74.00	-16.94	peak
7206	36.50	-0.95	35.55	54.00	-18.45	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4804	57.19	-3.65	53.54	74.00	-20.46	peak
4804	37.67	-3.65	34.02	54.00	-19.98	AVG
7206	58.14	-0.95	57.19	74.00	-16.81	peak
7206	36.81	-0.95	35.86	54.00	-18.14	AVG

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

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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)	Туре
4880.00	58.08	-3.54	54.54	74.00	-19.46	peak
4880.00	37.52	-3.54	33.98	54.00	-20.02	AVG
7320.00	57.82	-0.81	57.01	74.00	-16.99	peak
7320.00	34.94	-0.81	34.13	54.00	-19.87	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	57.50	-3.54	53.96	74.00	-20.04	peak
4880.00	36.64	-3.54	33.10	54.00	-20.90	AVG
7320.00	55.78	-0.81	54.97	74.00	-19.03	peak
7320.00	36.89	-0.81	36.08	54.00	-17.92	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	📈 Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	58.42	-3.43	54.99	74.00	-19.01	peak
4960	37.59	-3.44	34.15	54.00	-19.85	AVG
7440	56.43	-0.77	55.66	74.00	-18.34	peak
7440	36.12	-0.77	35.35	54.00	-18.65	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4960	58.84	-3.43	55.41	74.00	-18.59	peak
4960	38.62	-3.44	35.18	54.00	-18.82	AVG
7440	55.80	-0.77	55.03	74.00	-18.97	peak
7440	36.17	-0.77	35.40	54.00	-18.60	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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ΑF

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal

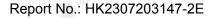
Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector	
_{, (MHz)}	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
2310.00	55.02	-5.81	49.21	74	-24.79	peak	
2310.00	/	-5.81		54	1 🔘	AVG	
2390.00	56.15	-5.84	50.31	74	-23.69	peak	
2390.00	HUAKTEST	-5.84	ESTING / HUAKTEST	54	WAX TET THE	AVG	
2400.00	56.35	-5.84	50.51	74	-23.49	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	54.01	-5.81	48.2	74	-25.8	peak
2310.00	/	/ -5.81 /		54	/	AVG
2390.00	55.02	-5.84	49.18	5 ⁷⁴⁶ 74	-24.82	peak
2390.00	Mon I	-5.84	10 Hor	54	1	AVG
[©] 2400.00	56.38	-5.84	50.54	74	-23.46	peak
2400.00	TESTIN	-5.84	LATES M	54	/	AVG

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Operation Mode: TX CH High (2480MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	je Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.50	55.02	-5.81	49.21	74	-24.79	peak
2483.50	TESTING /	-5.81	A TESTING	54	1	AVG
2500.00	56.49	-6.06	50.43	74	-23.57	peak
2500.00	10	-6.06	1	54	1	AVG

Vertical

(MHz) (dBμV) (dB) (dBμV/m) (dBμV/m) (dB) Typ 2483.50 54.01 -5.81 48.2 74 -25.8 pea 2483.50 / -5.81 / 54 / AVC 2500.00 55.39 -6.06 49.33 74 -24.67 pea							
(MHz) (dBµV) (dB) (dBµV/m) (dBµV/m) (dB) 2483.50 54.01 -5.81 48.2 74 -25.8 pea 2483.50 / -5.81 48.2 74 -25.8 pea 2483.50 / -5.81 / AVC 2500.00 55.39 -6.06 49.33 74 -24.67 pea 2500.00 / -6.06 / 54 / AVC 2500.00 / -6.06 Pre-amplifier; Level = Reading + Factor; Margin = Letter AVC	Frequency		Factor	Emission Level	Limits	Margin	Detector
2483.50 / -5.81 / 54 / AV0 2500.00 55.39 -6.06 49.33 74 -24.67 pea 2500.00 / -6.06 / 54 / AV0 2500.00 / -6.06 / 54 / AV0 Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Letor -6.06 <td< td=""><td>(MHz)</td><td>(dBµV)</td><td>(dB)</td><td>(dBµV/m)</td><td>(dBµV/m)</td><td>(dB)</td><td>Type</td></td<>	(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Type
2500.00 55.39 -6.06 49.33 74 -24.67 pea 2500.00 / -6.06 / 54 / AVC Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Letter -6.06 -7.00 -7.00 -7.00	2483.50	54.01	-5.81	48.2	74	-25.8	peak
2500.00 / -6.06 / 54 / AVC Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Letter	2483.50	1	-5.81	1	54	1	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Le	2500.00	55.39	-6.06	49.33	74	-24.67	peak
	2500.00	1	-6.06	1	54	1	AVG
		or = Antenna Fa	actor + Cable Lo	oss – Pre-amplifier;	Level = Reading	g + Factor; Ma	argin = Leve

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

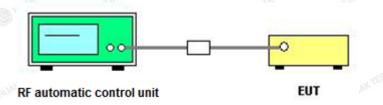
The maximum peak conducted output power may be measured using a broadband peak RF automatic control unit. The RF automatic control unit shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

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	Maximum Peak Conducted Output Power (dBm)	Limit (dBm)	Result	
Low	2402	-27.6	0.8	-26.8		Pass	
Middle	2440	-28.94	0.8	-28.14	30	Pass	
High	2480	-27.39	0.8	-26.59	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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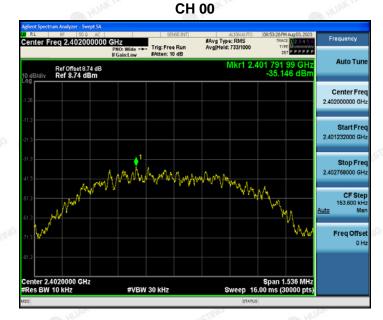
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FICATION

4.5.5 Test Results

Channel	Channel Frequency (MHz)	Level (dBm/10KHz)	10log (3/10)	Result (dBm/3kHz)	Offset	Test Result (dBm/3kHz)
Low	2402	-35.15	-5.23	-40.38	8.74	-31.64
Middle	2440	-35.09	-5.23	-40.32	8.74	-31.58
High	2480	-34.86	-5.23	-40.09	8.74	-31.35
	Result (dBm/3kHz trument attenuati	:)= Result +Offset on +cable loss	TING	HUAKTESTING	ъĞ	aug
Limit: 8dBm	n/3kHz	HUAKTESTI	HUAKTES	~	HUAKTESTIN	HUAKTES
Test			PASS	3		W
Result:						



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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
(Compared and Compared and Comp	CSTING	-STINK

4.6.5 Test Result

Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.768	NUAK TEST	Pass
Middle	2440	0.752	≥500	Pass
High	2480	0.772	O HUM	Pass

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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



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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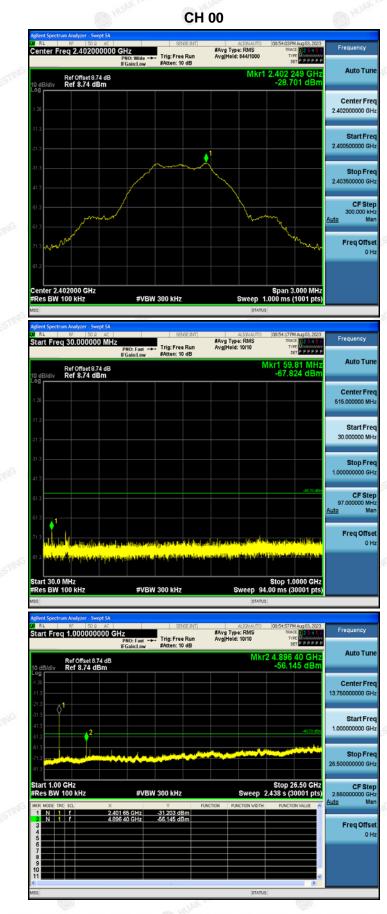


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4.9.5 Test Results



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Report No.: HK2307203147-2E

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Agilent S	Spectrum Analyzer - Swept SA					
Start	RF 50 R AC Freq 30.000000 MHz		NGE:INT	#Avg Type: RMS AvgHold: 10/10	08:56:47 PM Aug 03, 2023 TRACE 2 3 4 5 6 TYPE	Frequency
		IFGain:Low #Atten: 1		-	ter ререре kr1 107.96 MHz	Auto Tune
10 dB/c	Ref Offset 8.74 dB div Ref 8.74 dBm				-68.825 dBm	
						Center Freq
-1.26 —						515.000000 MHz
-11.3 —						Start Freq
-21.3 —						30.000000 MHz
-31.3						Stop Freq
-41.3						1.000000000 GHz
					-48.28 (B r	CF Step
-51.3						97.000000 MHz Auto Man
-61.3 —	1					<u>Huto</u> mun
-71.3		a tor tot day a be	h mana a di s	ەۋەرىغانىلىدا بىلىدىن. د	ومعاورته والمتلاف والمتعاوية	Freq Offset 0 Hz
-81.3	and the second se	e deurophie and the ball of the state of the	and a start of the	all to the contract		0112
	- Inc. And I come of		11			
Start 3 #Res I	30.0 MHz BW 100 kHz	#VBW 300 kHz	,	Sweep 9	Stop 1.0000 GHz 4.00 ms (30001 pts)	

		17.5 M			CAP .		16.13
Agilent Spectr	um Analyzer - Sw	ept SA					
LXI RL	RF 50 g	AC	SENSE:IN	π	ALIGNAUTO	08:57:28PM Aug 03, 2023	-
Start Free	a 1.000000	000 GHz			g Type: RMS	TRACE 1 2 3 4 5	Frequency
		PNO: Fast	🛻 Trig: Free Run	n Avg	Hold: 10/10	TYPE MWWWWW	
		IFGain:Low	#Atten: 10 dB			DETERPT	
					Mke	2 4.896 40 GHz	Auto Tune
	Ref Offset 8.				WIKL	-53.757 dBm	
10 dB/div	Ref 8.74 d	Bm				-55.757 dBit	
Log							
-1.26							Center Freq
-11.3							13.750000000 GHz
							10.10000000000112
-21.3	y ¹						
-31.3	<u> </u>						
							Start Freq
-41.3	.2					-48.28 @90	1.000000000 GHz
-51.3						-40 20 000	
-61.3					and and in the second	Second	
.71.3	Later and the	and the second	an an air an air an air	A CONTRACTOR OF THE OWNER	A CONTRACTOR OF A CONTRACTOR	States and States and	Stop Freq
	dublin to an el anti	Territoria de Auro-					26.50000000 GHz
-81.3							
Start 1.00	GHz					Stop 26.50 GHz	CF Step
#Res BW	100 kHz	#VB	W 300 kHz		Sweep 2	.438 s (30001 pts	2.55000000 GHz
_							Auto Man
MKR MODE TR	RC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Title Intern
1 N 1	ſ	2.439 90 GHz	-28.661 dBm				
2 N 1	ſ	4.896 40 GHz	-53.757 dBm				Freq Offset
4							
5							0 Hz
6							
7							
8							
9							
10							
						~	
۲.						,	
MSG					STATUS		

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Report No.: HK2307203147-2E





Agilent Spectrum Analyzer - Swept SA					
₩ RL RF 50 Ω AC Start Freg 30.000000 MH		SENSE:INT	ALIGNAUTO #Avg Type: RMS	08:59:06 PM Aug 03, 2023 TRACE 2 2 3 4 5 4	Frequency
Start Freq 50.000000 Mir	PNO: Fast +++ IFGain:Low	Trig: Free Run #Atten: 10 dB	Avg Hold: 10/10	TYPE MUNICIPAL P P P P P P	
Ref Offset 8.74 dB 10 dB/div Ref 8.74 dBm			MI	kr1 830.86 MHz -61.288 dBm	Auto Tune
4.26					Center Freq 515.00000 MHz
-11.3					Start Freq 30.000000 MHz
-41.3					Stop Freq 1.000000000 GHz
.51.3				-47.02 dBn	CF Step 97.000000 MHz <u>Auto</u> Man
-71.3	ilaa jistabaha pirti		ley level in a second second of	n de prochet (a special dat de prochet de pro	Freq Offset 0 Hz
-81.3 ⁴¹ 1.01331 ²³¹ 1 preinchean ain an an an Anna	n <mark>ada kanala kapad</mark> i	in phataini in phap	idena pine inna i par atterini anna a		
Start 30.0 MHz #Res BW 100 kHz	#VBW	300 kHz	Sweep 94	Stop 1.0000 GHz .00 ms (30001 pts)	

gilent Spectrum Analyzer - Swept SA				2.17		
RL RF 50 0 AC	PNO: Fast	Trig: Free Run #Atten: 10 dB	#Avs	ALIGNAUTO Type: RMS Hold: 10/10	08:59:49PM Aug03, 2023 TRACE 2 3 4 5 0 TYPE M DET P P P P P	Frequency
Ref Offset 8.74 dB 0 dB/div Ref 8.74 dBm	a consecu			Mkr	4.896 40 GHz -58.896 dBm	Auto Tune
1.26 113 21.3 <u>A</u> 1						Center Freq 13.750000000 GHz
H.3 V H.3 2					-47.02 dBm	Start Freq 1.000000000 GHz
51.3 71.3 81.3	~~~~					Stop Freq 26.50000000 GHz
tart 1.00 GHz Res BW 100 kHz	#VBV	V 300 kHz		Sweep 2	Stop 26.50 GHz .438 s (30001 pts)	CF Step 2.55000000 GHz
KR MODE TRC SCL X	180 70 GHz	Y -29.045 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
3	396 40 GHz	-58.896 dBm				Freq Offset 0 Hz
6 7 8 9 0 1						
sg				STATUS	>	

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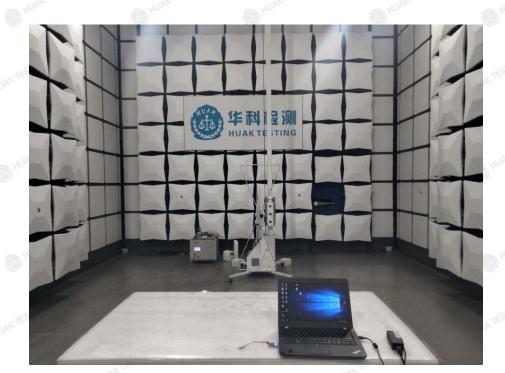
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5 Test Setup Photo

Radiated Emissions





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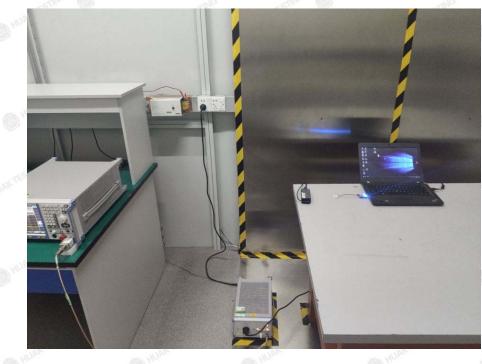
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Conducted Emission



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ACATIA

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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