

Page 1 of 43

Report No.: HK2106041759-E

TEST REPORT

FCC PART 15 SUBPART C 15.247

Test report

On Behalf of

Shenzhen B&W Electronics Development Limited

For

Bluetooth Keyboard

Model No.: HB030B, BTBLTABKEYSG, HB030, HB030T

FCC ID: 2AAOE21HB030B

Prepared For :

Shenzhen B&W Electronics Development Limited 4/F, No.2 Building, Guangxi Industrial Park, West of Jianshe Road, Longhua Town, 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:
 Jun. 04, 2021 ~Jun. 11, 2021

 Date of Report:
 Jun. 11, 2021

 Report Number:
 HK2106041759-E

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TEST RESULT CERTIFICATION

Applicant's name	Shenzhen B&W Electronics Development Limited
Address	4/F, No.2 Building, Guangxi Industrial Park, West of Jianshe Road, Longhua Town, Shenzhen, China
Manufacture's Name	Shenzhen B&W Electronics Development Limited
Address:	4/F, No.2 Building, Guangxi Industrial Park, West of Jianshe Road, Longhua Town, Shenzhen, China
Product description	
Trade Mark:	N/A
Product name:	Bluetooth Keyboard
Model and/or type reference:	HB030B, BTBLTABKEYSG, HB030, HB030T
Standards	47 CFR FCC Part 15 Subpart C 15.247

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Date of Test	
Date (s) of performance of tests:	Jun. 04, 2021 ~Jun. 11, 2021
Date of Issue :	Jun. 11, 2021
Test Result	Pass

Prepared by:

(John Qian

Project Engineer

Reviewed by:

Approved by:



Technical Director

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** Modified History **

Revision	Description	Issued Data	Remark	
Revision 1.0	Initial Test Report Release	Jun. 11, 2021	Jason Zhou	
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1 TEST SUMMARY

1.1 TEST DESCRIPTION

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Test Requirement	Result
§15.203/§15.247(b)(4)	PASS
FCC Part 15.207	PASS
FCC Part 15.205/15.209	PASS
FCC Part 15.247(b)	PASS
FCC Part 15.247(e)	PASS
FCC Part 15.247(a)(2)	PASS
FCC Part 15.247(d)	PASS
FCC Part 15.247(d)	PASS
	§15.203/§15.247(b)(4) FCC Part 15.207 FCC Part 15.205/15.209 FCC Part 15.247(b) FCC Part 15.247(e) FCC Part 15.247(a)(2) FCC Part 15.247(d)

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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
1	Conducted Emission Test	±2.71dB
2	All emissions, radiated(<1G)	±3.90dB
3	All emissions, radiated(>1G)	±4.28dB

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HUAK TESTING

2 TEST FACILITY

The test facility is recognized, certified or accredited by the following organizations:

Address 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

Designation Number: CN1229

Test Firm Registration Number: 616276

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT Name:	Bluetooth Keyboard
Model No:	HB030B
Serial No:	BTBLTABKEYSG, HB030, HB030T
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color, appearance and model named different. Test sample model: HB030B.
Brand Name:	N/A
Operation frequency:	2402 MHz to 2480 MHz
Channel separation:	2MHz
NUMBER OF CHANNEL:	40
Modulation Technology:	GFSK
Hardware Version:	V2.1
Software Version:	V2.1
Antenna Type:	PCB Antenna
Antenna Gain:	1.5dBi
Power Supply:	DC 3.7V from battery or DC 5V from USB
Note:	North And
1 For a more detailed feature	s description, please refer to the manufacturer's specifications or

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

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		Description of	f Channel:		
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4 HUAK	2410	18	2438	32	2466
5	2412	⁶ 19	2440	33	2468
6	2414	20	2442	34	2470
11AKT7	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		1000

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3.2 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.

EUT

(4) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

3.3 DESCRIPTION OF TEST SETUP

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

AC Plug

Operation of EUT during radiation above 1GHz testing:

PC

EUT

PC information Model: ThinkPad E450 Input: 20V, 2.25A/3.25A

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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HUAK TESTING EQUIPMENTS LIST FOR ALL TEST ITEMS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1. TESTING	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Jun. 18, 2020	1 Year
2.	L.I.S.N.	R&S	ENV216	HKE-059	Jun. 18, 2020	1 Year
3.	Receiver	R&S	ESCI 7	HKE-010	³ Jun. 18, 2020	1 Year
4.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Jun. 18, 2020	1 Year
5.	Spectrum analyzer	R&S	FSP40	HKE-025	Jun. 18, 2020	1 Year
6.	Spectrum analyzer	Agilent	N9020A	HKE-048	Jun. 18, 2020	1 Year
7.	High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	Jun. 18, 2020	1 Year
8.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Jun. 18, 2020	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Jun. 18, 2020	1 Year
10.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Jun. 18, 2020	1 Year
11.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Jun. 18, 2020	1 Year
12.	Pre-amplifier	EMCI	EMC051845SE	HKE-015	Jun. 18, 2020	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Jun. 18, 2020	1 Year
14.	High pass filter unit	Tonscend	JS0806-F	HKE-055	Jun. 18, 2020	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	Jun. 18, 2020	3 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	Jun. 18, 2020	1 Year
23.	Signal generator	Agilent	N5182A	HKE-029	Jun. 18, 2020	1 Year
24.	Signal Generator	Agilent	83630A	HKE-028	Jun. 18, 2020	1 Year
25.	Power meter	Agilent	E4419B	HKE-085	Jun. 18, 2020	1 Year
26.	Power Sensor	Agilent	E9300A	HKE-086	Jun. 18, 2020	1 Year

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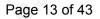
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				1100			
_	27.	RF Cable(below1GHz)	Times	9kHz-1GHz	HKE-117	Jun. 18, 2020	1 Year
0	28.	RF Cable(above 1GHz)	Times	1-40G	HKE-034	Jun. 18, 2020	1 Year
1014	29.	RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	Jun. 18, 2020	1 Year
	30.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 17, 2020	3 Year

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5 TEST RESULT

HUAK TESTING

5.1 ANTENNA REQUIREMENT

5.1.1 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.

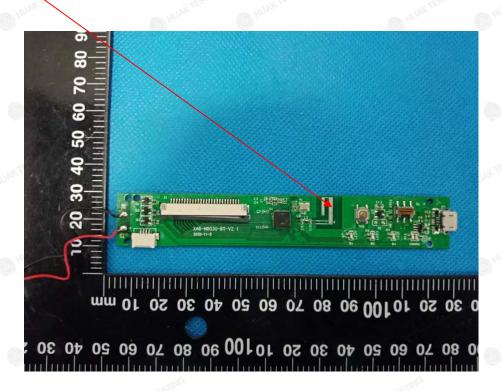
Refer to statement below for compliance.

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 1.5dBi.

5.1.2 EUT Antenna



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5.2 CONDUCTION EMISSIONS MEASUREMENT

5.2.1 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:

NUMETRATING TO MARTINE AND A MARTINE	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.

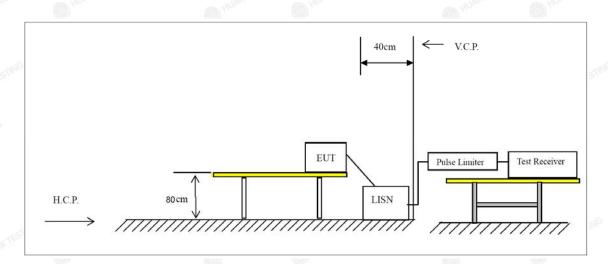
5.2.2 Test procedure

- 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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5.2.3 Test setup

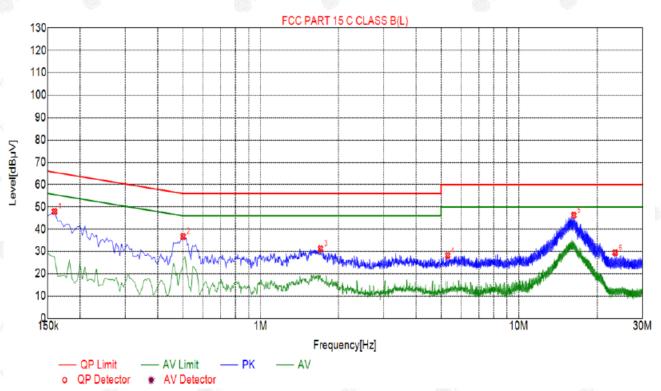


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5.2.4 Test results

Test Specification: Line



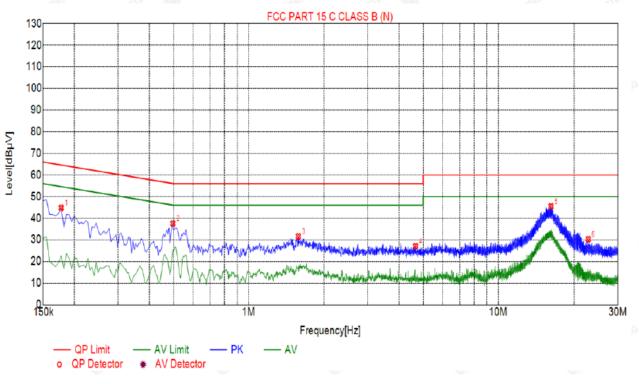
Sus	Suspected List											
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре				
1	0.1590	47.89	20.01	65.52	17.63	27.88	PK	L				
2	0.5010	36.75	20.04	56.00	19.25	16.71	PK	L				
3	1.7070	31.27	20.13	56.00	24.73	11.14	PK	L				
4	5.3070	28.20	20.26	60.00	31.80	7.94	PK	L				
5	16.2555	46.23	19.98	60.00	13.77	26.25	PK	L				
6	23.4645	29.48	20.20	60.00	30.52	9.28	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



Sus	Suspected List											
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Туре				
1	0.1770	44.84	20.05	64.63	19.79	24.79	PK	N				
2	0.4965	37.59	20.04	56.06	18.47	17.55	PK	N				
3	1.5810	31.59	20.11	56.00	24.41	11.48	PK	N				
4	4.6635	27.05	20.26	56.00	28.95	6.79	PK	N				
5	16.1700	45.49	19.98	60.00	14.51	25.51	PK	N				
6	22.7940	30.26	20.18	60.00	29.74	10.08	РК	N				

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

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5.3 RADIATED EMISSIONS MEASUREMENT

5.3.1 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.

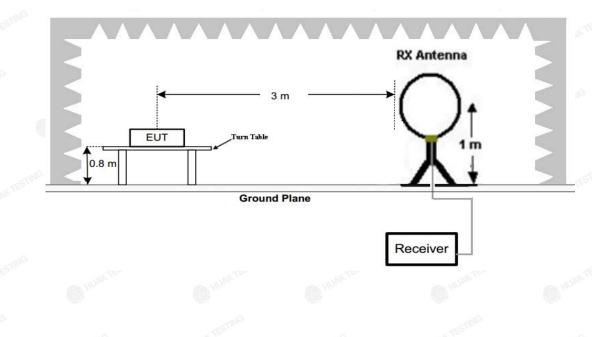
		Rad	liated emission limits	
8	Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
	0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
	0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
3	1.705-30	3	20log(30)+ 40log(30/3)	30
	30-88	3	40.0	100
15	» [©] 88-216	3	43.5	150
	216-960	3	46.0	200
	Above 960	3	54.0	500

diated amigaian limits

5.3.2 Test setup

Test Configuration:

1) 9 kHz to 30 MHz emissions:

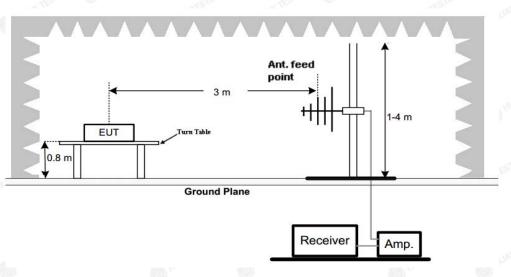


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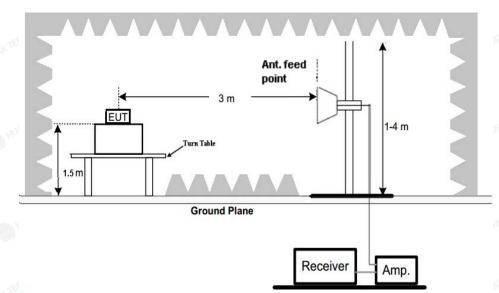
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2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



Test Procedure

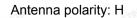
- 1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° 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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5.3.3 Test Result

Below 1GHz Test Results:





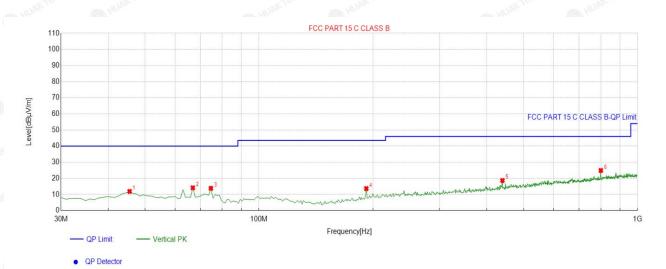
Suspe	suspected List										
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity		
1	192.1522	-15.81	33.89	18.08	43.50	25.42	100	203	Horizontal		
2	224.1942	-14.46	28.84	14.38	46.00	31.62	100	1	Horizontal		
3	257.2072	-13.49	33.35	19.86	46.00	26.14	100	210	Horizontal		
4	321.2913	-12.03	29.91	17.88	46.00	28.12	100	345	Horizontal		
5	439.7498	-9.43	27.25	17.82	46.00	28.18	100	238	Horizontal		
6	799.9800	-3.12	28.20	25.08	46.00	20.92	100	298	Horizontal		

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

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Antenna polarity: V



Suspe	Suspected List										
NO.	Freq.	Factor	Reading	Level	Limit	Margin	Height	Angle	Delevity		
	[MHz]	[dB]	[dBµV/m]	[dBµV/m]	[dBµV/m]	[dB]	[cm]	[°]	Polarity		
1	45.5355	-13.65	25.52	11.87	40.00	28.13	100	260	Vertical		
2	66.8969	-16.89	31.00	14.11	40.00	25.89	100	304	Vertical		
3	74.6647	-18.51	32.31	13.80	40.00	26.20	100	193	Vertical		
4	192.1522	-15.81	29.47	13.66	43.50	29.84	100	106	Vertical		
5	439.7498	-9.43	28.06	18.63	46.00	27.37	100	181	Vertical		
6	799.9800	-3.12	27.99	24.87	46.00	21.13	100	102	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)
- Jun	ust ESTA	NAK TESTA-
	- MAN TEST	- WALTES !!
	"	

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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For 1GHz to 25GHz

CH Low (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	0
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4804	54.99	-3.65	51.34	74.00	-22.66	peak
4804	43.24	-3.65	39.59	54.00	-14.41	AVG
7206	50.79	-0.95	49.84	74.00	-24.16	peak
7206	40.87	-0.95	39.92	54.00	-14.08	AVG

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

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Datasta
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detecto Type
4804	53.98	-3.65	50.33	74.00	-23.67	peak
4804	40.51	-3.65	36.86	54.00	-17.14	AVG
7206	52.52	-0.95	51.57	74.00	-22.43	peak
7206	37.09	-0.95	36.14	54.00	-17.86	AVG

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

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CH Middle (2440MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	55.06	-3.54	51.52	74.00	-22.48	peak
4880.00	40.68	-3.54	37.14	54.00	-16.86	AVG
7320.00	55.43	-0.81	54.62	74.00	-19.38	peak
7320.00	41.49	-0.81	40.68	54.00	-13.32	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
4880.00	54.53	-3.54	50.99	74.00	-23.01	peak
4880.00	45.16	-3.54	41.62	54.00	-12.38	AVG
7320.00	50.48	-0.81	49.67	74.00	-24.33	peak
7320.00	35.29	-0.81	34.48	54.00	-19.52	AVG

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

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CH High (2480MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Jimits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4960	54.46	-3.43	51.03	74.00	-22.97	peak
4960	40.94	-3.44	37.50	54.00	-16.50	AVG
7440	51.02	-0.77	50.25	74.00	-23.75	peak
7440	40.22	-0.77	39.45	54.00	-14.55	AVG

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

Vertical:

Frequency	Meter Reading	Factor	Emission Level	% Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4960	52.36	-3.43	48.93	74.00	-25.07	peak
4960	42.08	-3.44	38.64	54.00	-15.36	AVG
7440	54.59	-0.77	53.82	74.00	-20.18	peak
7440	37.69	-0.77	36.92	54.00	-17.08	AVG

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

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.</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 (MHz) (dBµV)		Factor	Emission Level	Limits	Margin	Detector
		(dB) (dBµV/m)		(dBµV/m)	(dB)	Туре
2310.00	57.12	-5.81	51.31	74	-22.69	peak
2310.00	/	-5.81		54	1 🔍	AVG
2390.00	56.48	-5.84	50.64	74	-23.36	peak
2390.00	HUAKTES /	-5.84	ESTIN HUANTES	54	HUNK TO THE	AVG
2400.00	55.66	-5.84	49.82	74	-24.18	peak
2400.00	1	-5.84	1	54	1	AVG

Vertical:

Frequency Reading Result (MHz) (dBµV)		INC. NO.		Limits	Margin	Detector
				(dBµV/m)	(dB)	Туре
2310.00	10.00 56.73		50.92	74	-23.08	peak
2310.00	/	-5.81	/	54	1	AVG
2390.00	55.47	-5.84	49.63	74	-24.37	peak
2390.00	1	-5.84		54	/	AVG
2400.00	55.06	-5.84	49.22	74	-24.78	peak
2400.00	TES I	-5.84	- MATES	54	1	AVG

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

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Operation Mode: TX CH High (2480MHz)

Horizontal	(Worst case)
------------	--------------

Frequency Meter Reading		Factor Emission Level		Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
[©] 2483.50	57.21	-5.81	51.4	74	-22.6	peak	
2483.50	TESTING /	-5.81	AK TESTING	54	/	AVG	
2500.00	56.85	-6.06	50.79	74	-23.21	peak	
2500.00		-6.06	1	54	1	AVG	

Vertical:

Frequency Meter Reading		Factor	Emission Level	Limits 🤍	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре
2483.50	57.31	-5.81	51.5	74	-22.5	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	55.97	-6.06	49.91	74	-24.09	peak
2500.00	HOP I	-6.06	1	54	HUAN	AVG

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

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5.4 MAXIMUM OUTPUT POWER MEASUREMENT

5.4.1 Limit

The Maximum Peak Output Power Measurement is 30dBm.

5.4.2 Test procedure

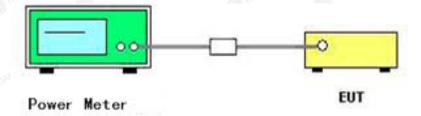
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

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

5.4.3 Deviation from standard

No deviation.

5.4.4 Test setup



5.4.5 Test results

Channel	Channel frequency (MHz)	Output power (dBm)	Limit (dBm)	Result
Low	2402	-0.48		Pass
Middle	2440	-1.12	30	Pass
High	2480	-1.57	0	Pass

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5.5 POWER SPECTRAL DENSITY

5.5.1 Limit

HUAK TESTING

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.

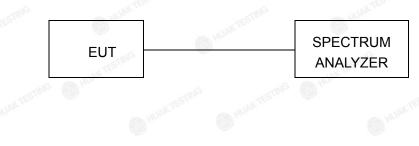
5.5.2 Test procedure

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.

5.5.3 Deviation from standard

No deviation.

5.5.4 Test setup



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5.5.5 Test results

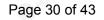
Channel	Channel frequency (MHz)	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result	
Low	2402	-19.33	O mil	Pass	
Middle	2440	-19.93	8.00	Pass	
High	2480	-20.49	HUAKIL	Pass	



CH 00

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5.6 6DB BANDWIDTH

5.6.1 Limit

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

5.6.2 Test procedure

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

1. Set RBW = 100 kHz.

2. Set the video bandwidth (VBW) \geq 3 RBW.

3. Detector = Peak.

4. Trace mode = max hold.

5. Sweep = auto couple.

6. Allow the trace to stabilize.

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

5.6.3 Deviation from standard

No deviation.

5.6.4 Test setup

6		
FUT		SPECTRUM
EUT		ANALYZER
	- mus	and the second s

5.6.5 Test result

Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
Low	2402	0.736	STING	Pass
Middle	2440	0.716	≥500	Pass
High	2480	0.716	MARTE T	Pass

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5.7 OCCUPIED BANDWIDTH

5.7.1 Test procedure

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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.

5.7.2 Deviation from standard

No deviation.

5.7.3 Test setup

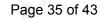


5.7.4 Test result

N/A

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5.8 BAND EDGE

HUAK TESTING

5.8.1 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.

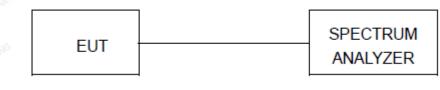
5.8.2 Test procedure

- 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

5.8.3 Deviation from standard

No deviation.

5.8.4 Test setup



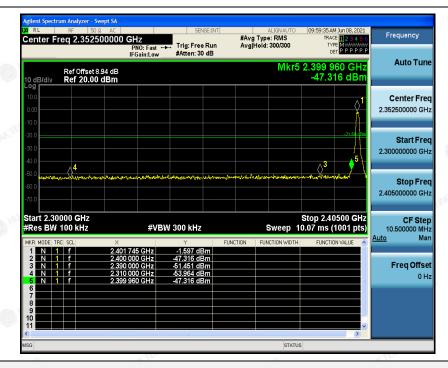
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannont be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at http://www.cer-mark.com

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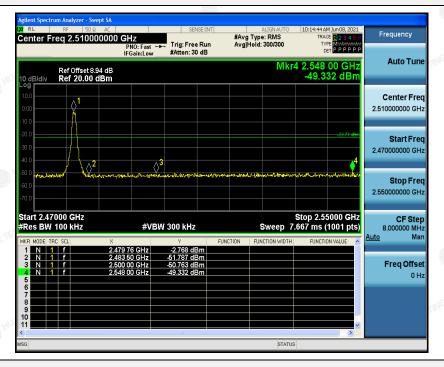


5.8.5 Test results

PASS



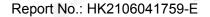
2402



2480

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5.9 CONDUCTED SPURIOUS EMISSIONS

5.9.1 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.

5.9.2 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

5.9.3 Deviation from standard

No deviation.

5.9.4 Test setup



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5.9.5 Test results

CH 00



Agilent Spectrum Anal	rzer - Swept SA		CE3	SE:INT		ALIGNAUTO	10:07:42.48	Uun 08, 2021	
Center Freq 5					#Avg Type AvgiHold:	RMS	TRAC		Frequency
		PNO: Fast ++ IFGain:Low	#Atten: 20		Avgineia.	10/10	DE	PPPPPP	
	ffset 8.94 dB 18.94 dBm					MI	kr1 914. -60.6	12 MHz 21 dBm	Auto Tu
.01									Center Fr
8.94									515.000000 N
1.06									
									Start Fr
11.1									30.000000 N
21.1								-21.85 (60)	
									Stop Fr 1.000000000 G
31.1									1.0000000000
41.1									CF St
									97.000000 N Auto N
51.1									
61.1								• 1	Freq Off
in the starture plan	ns, anti-anti-anti-	did out of the second	abarris der	4.1.1.	u Bilifian		polyjatik	a bull type	0
71.1 <mark>Ministern (</mark> 1.1	<mark>ela philippi data da s</mark> i	nava putinjaa	adda a talad	parinter	-tephinister	n de la constante	<u>i Militeria</u>	alificate parts	
Start 30.0 MHz Res BW 100 k		#VD14	1 300 kHz			waap 04		0000 GHz 0001 pts)	
100 K	112	# V D 9 4	000 KHZ			weep 54		ooo r pts)	

Agilent Spectrum Analyzer - Swept SA					
K RL RF 50 Q AC		SENSE:INT	ALIGNAUTO	10:08:20 AM Jun 08, 2021	En average aver
Start Freg 1.000000000 G	Hz		#Avg Type: RMS	TRACE 1 2 3 4 5 6	Frequency
		Trig: Free Run	Avg Hold: 10/10	DET P P P P P	
	IFGain:Low	#Atten: 20 dB		UCI	
			Mkr	2 3.415 70 GHz	Auto Tune
Ref Offset 8.94 dB 10 dB/div Ref 18.94 dBm				-47.452 dBm	
10 dB/div Ref 18.94 dBm				-47.402 (15)	
					Center Freq
8.94					13,750000000 GHz
-1.06					
-1.05					Start Freq
-11.1					1.00000000 GHz
-21.1				-21.85.dbm	Stop Freq
					26.50000000 GHz
31.1					20.5000000 GHZ
31.1					
					05.04
-41.1					CF Step
≜ ⁴					2.550000000 GHz
				1.1.6.	Auto Man
-51,1			s and the	ALL ADDING OF	
		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	A MARINE MARINE V		
61.1	A STATE OF STATE	and the second second	الكناكية الرجر خطاه		Freq Offset
	ALL A DOWN				0 Hz
-71.1					
Start 1.00 GHz				Stop 26.50 GHz	
#Res BW 100 kHz	#VBW 3	300 kHz	Sweep 2	2.438 s (30001 pts)	
	and Britis			nee e tease i brot	
MSG			STATUS		

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CH 19



enter Fi	RF 50 R AC req 515.000000 r	MHz	SENSE:INT ree Run : 20 dB	#Avg Type: RMS Avg Hold: 10/10	10:12:17 AM Jun 08, 2021 TRACE 2 3 4 5 6 TYPE M DET P P P P P P	Frequency
0 dB/div	Ref Offset 8.94 dB Ref 18.94 dBm			M	kr1 462.88 MHz -61.175 dBm	Auto Tune
3.94						Center Free 515.000000 MH
1.1						Start Free 30.000000 MH
1.1 1.1						Stop Free 1.000000000 GH
1.1						CF Ste 97.000000 MH <u>Auto</u> Ma
ci palla,	alaal <mark>aa,waaaaaaaaaaaaaaaaaaaaaaaaaaaaaa</mark>	ni ili ava kolisione ki ondalime			and the second	Freq Offse 0 H
1.1 <mark>a lat</mark> e		in an address binning partiel	an finan an	n, parint propiet of the alterial		
tart 30.0 Res BW	MHz 100 kHz	#VBW 300 ki	17	Sweep 94	Stop 1.0000 GHz .00 ms (30001 pts)	

Agilen	t Spectrum Analyzer - Sw	ept SA							
UN RL	RF 50 g	AC		SENSE:INT	AL	JGN AUTO	10:12:56 AM Juni	08,2021	-
Cen	ter Freq 13.750	PNO	D-East T	rig: Free Run Atten: 20 dB	#Avg Type: Avg[Hold: 1		TRACE TYPE M DET P P	3456 PPPP	Frequency
10 dE Log 1	Ref Offset 8: 3/div Ref 18.94	94 dB dBm				Mkr2	25.708 65 -48.173	GHz dBm	Auto Tune
8.94								_	Center Freq 13.75000000 GHz
-1.06 -11,1									Start Freq 1.00000000 GHz
-21.1 -31.1								2000	Stop Freq 26.50000000 GHz
-41.1 -51.1								2 Dyte	CF Step 2.55000000 GHz <u>Auto</u> Man
-61.1	and the second	Vitida y a	Wind	Wind	When which				Freq Offset 0 Hz
-71.1 Stari	t 1.00 GHz						Stop 26.5) GHz	
#Res	s BW 100 kHz		#VBW 30	00 kHz	S	_	.438 s (3000	1 pts)	
MSG						STATUS			

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CH 39



RL RF 50.9 AC		SENSE:INT	ALIGNAUTO	10:15:00 AM Jun 08, 2021	_
enter Freq 515.000000	PNO: Fast Trig:	Free Run n: 20 dB	#Avg Type: RMS Avg[Hold: 10/10	TRACE	Frequency
Ref Offset 8.94 dB D dB/div Ref 18.94 dBm			M	Auto Tune	
3.94					Center Freq 515.000000 MHz
1.1					Start Free 30.000000 MH:
H.1				-23.04 08m	Stop Free 1.000000000 GHz
1.1					CF Step 97.000000 MH: Auto Mar
	na (k jezy dobasti kajedite	iden and and be	1 1	Henry Market Stratter	Freq Offse 0 Hi
1.1 <mark>odu a strolje to s</mark> jelečno poloči statilova 	. de a Renedita a chean de la chean de La chean de la c	ndoln bil Aşino	n posisi kan kan da sa kan kan kan kan kan kan kan kan kan ka	akt dese kologiski kandeskoje sta.	
tart 30.0 MHz Res BW 100 kHz	#VBW 300 k	Hz	Sweep 94	Stop 1.0000 GHz .00 ms (30001 pts)	

gilent Spectrum Analyzer - Swept SA					
RL RF 50.9 AC		SENSE:INT	ALIGNAUTO	10:15:38 AM Jun 08, 2021	Frequency
enter Freg 13.75000000	0 GHz		#Avg Type: RMS	TRACE	Frequency
	PNO: Fast	Trig: Free Run #Atten: 20 dB	Avg Hold: 10/10	DET P P P P P	
	IFGain:Low	#Atten: 20 dB			Auto Tune
Ref Offset 8.94 dB			Mkr2	24.663 15 GHz	Auto Tune
dB/div Ref 18.94 dBm				-48.764 dBm	
	_				
					Center Freq
194					
34					13.750000000 GHz
.06					
					Start Freq
1.1					1.000000000 GHz
1.1				-23.04 d br s	Stop Freq
1.1					26.50000000 GHz
					05.04
1.1					CF Step 2.55000000 GHz
				<mark>≜</mark> 2	Auto Man
1.1					Auto Man
			فالأعجاف والمرام	the to a the second	
والهيبليس أرزأ	A		and the second second second	And a state of the	Freq Offset
1.1		and the first of the		- п .	
and the second se					0 Hz
1.1					
tert 1 00 CHr				Oton 26 50 Otta	
tart 1.00 GHz		200 111-	Current	Stop 26.50 GHz	
Res BW 100 kHz	#VBW	300 kHz	Sweep	2.438 s (30001 pts)	
0			STATUS		

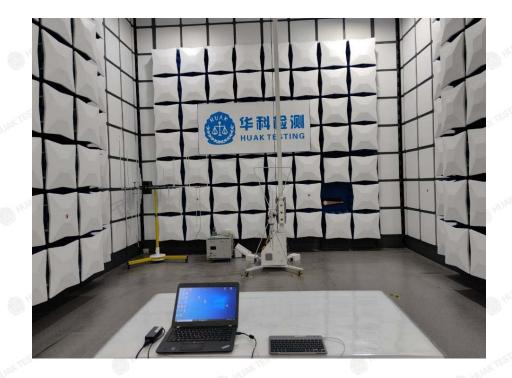
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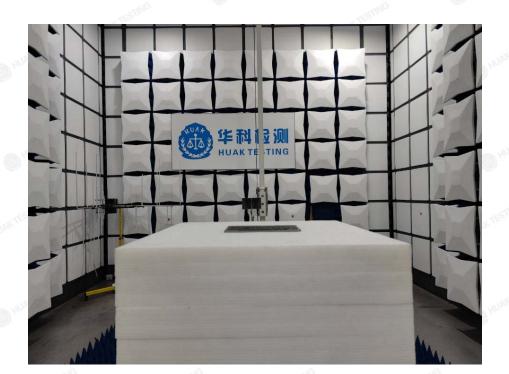
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Radiated Emissions

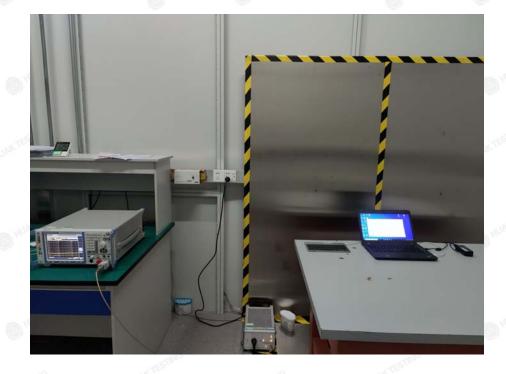




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Conducted Emission



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7 PHOTOS OF THE EUT

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

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

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