Report No.: HTT202509747F02

TEST Report

Applicant:	Nics Technology and Trading CO., Limited
Address of Applicant:	RM A07, 1701-02 NEW TREND CENTRE 704 PRINCE EDWARD ROAD EAST SAN PO KONG HK
Manufacturer :	Shenzhen Xinfu Youlife Technology Co., Ltd.
Address of Manufacturer :	6th Floor, Building A, Block 1, Jinwen Innovation Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen City, Guangdong Province, China

Equipment Under Test (EUT)

Product Name:	Nics Hesper64(100) Gemini Low-Profile Keyboard
Model No.:	NHE64G12509
Series model:	N/A
Trade Mark:	
FCC ID:	2BSQB-NHE64G12509
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	Sep. 15, 2025
Date of Test:	Sep. 15, 2025 ~ Sep. 23, 2025
Date of report issued:	Sep. 23, 2025
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

1. Version

Version No.	Date	Description
00	*Sep. 23, 2025*	*Original*

Tested/ Prepared By	Heber He	***Date:***	***Sep. 23, 2025***
	Project Engineer		
Check By:	Bruce Zhu	***Date:***	***Sep. 23, 2025***
	Reviewer		
Approved By :	Kevin Yang	***Date:***	***Sep. 23, 2025***
	Authorized Signature		

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3. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024: American National Standard for Testing Unlicensed Wireless Devices

KDB558074 D01 V05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

4. Test Summary

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(e)	Power spectral density	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(b)(3)	Maximum output Peak power	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	Band edge compliance conducted	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Highest	complies
§15.205	Band edge compliance radiated	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Highest	complies
§15.247(d)	TX spurious emissions conducted	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	TX spurious emissions radiated	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1Mpbs/2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.209(a)	TX spurious Emissions radiated Below 1GHz	BLE 1Mpbs/2Mpbs	-/-	BLE 1Mpbs/2Mpbs	-/-	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	BLE 1Mpbs/2Mpbs	-/-	BLE 1Mpbs/2Mpbs	-/-	complies

Remark:

1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report
3. RF Conducted test Offset= cable loss,For conducted spurious emission test, cable loss is the maximum value in the range of test.

5. Statement of the measurement uncertainty

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 TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen HTT Technology Co.,Ltd. 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.

Hereafter the best measurement capability for Shenzhen HTT Technology Co.,Ltd. :

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.12 dB	(1)
Radiated Emission	30~1000MHz	4.37 dB	(1)
Radiated Emission	1~18GHz	5.40 dB	(1)
Radiated Emission	18-40GHz	5.45 dB	(1)
Conducted Disturbance	0.15~30MHz	2.68 dB	(1)
Spectrum bandwidth	/	1.2%	(1)
Output Peak power	30MHz~18GHz	0.57dB	(1)
Time	/	±10%	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

6. General Information

6.1. General Description of EUT

Product Name:	Nics Hesper64(100) Gemini Low-Profile Keyboard
Model No.:	NHE64G12509
Series model:	N/A
Test sample(s) ID:	HTT202509747-1(Engineer sample) HTT202509747-2(Normal sample)
Operation frequency	2402~2480 MHz
Number of Channels	40
Modulation Type	GFSK
Channel separation	2MHz
Antenna Type:	Wire antenna
Antenna Gain:	0.84 dBi
Power Supply:	DC 3.7V From Battery and DC 5V From External Circuit
Adapter Information (Auxiliary test provided by the lab):	Mode: GS-0500200 Input: AC100-240V, 50/60Hz, 0.3A max Output: DC 5V, 2A

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

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

Test Software Version	Direct Test Mode v2.1.0		
Frequency	2402 MHz	2440MHz	2480 MHz
GFSK-1M	2	2	2
GFSK-2M	2	2	2

6.2. Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

6.3. Description of Support Units

None.

6.4. Deviation from Standards

None.

6.5. Abnormalities from Standard Conditions

None.

6.6. Test Facility

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

FCC-Registration No.: 779513 Designation Number: CN1319
Shenzhen HTT Technology Co.,Ltd. has been accredited on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6435.01
Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

6.7. Test Location

All tests were performed at:

Shenzhen HTT Technology Co.,Ltd.
1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
Tel: 0755-23595200
Fax: 0755-23595201

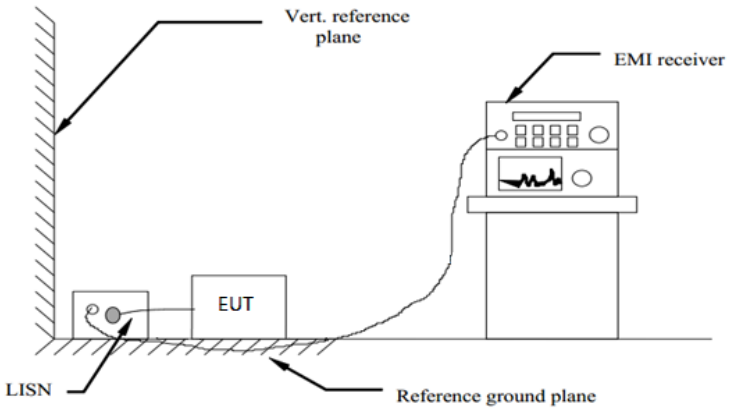
7. Test Instruments list

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2024	Aug. 09 2027
2	Control Room	Shenzhen C.R.T technology co., LTD	4.8*3.5*3.0	HTT-E030	Aug. 10 2024	Aug. 09 2027
3	EMI Test Receiver	Rohde&Schwar	ESCI7	HTT-E022	Apr. 22 2025	Apr. 21 2026
4	Spectrum Analyzer	Rohde&Schwar	FSP	HTT-E037	Apr. 22 2025	Apr. 21 2026
5	Coaxial Cable	ZDecl	ZT26-NJ-NJ-0.6M	HTT-E018	Apr. 22 2025	Apr. 21 2026
6	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-2M	HTT-E019	Apr. 22 2025	Apr. 21 2026
7	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-0.6M	HTT-E020	Apr. 22 2025	Apr. 21 2026
8	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-8.5M	HTT-E021	Apr. 22 2025	Apr. 21 2026
9	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	Apr. 19 2025	Apr. 18 2026
10	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	Apr. 19 2025	Apr. 18 2026
11	Loop Antenna	Zhinan	ZN30900C	HTT-E039	Apr. 19 2025	Apr. 18 2026
12	Horn Antenna	Beijing Hangwei Dayang	OBH100400	HTT-E040	Apr. 19 2025	Apr. 18 2026
13	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	Apr. 22 2025	Apr. 21 2026
14	high-frequency Amplifier	HP	8449B	HTT-E014	Apr. 22 2025	Apr. 21 2026
15	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	Apr. 22 2025	Apr. 21 2026
16	EMI Test Receiver	Rohde & Schwarz	ESCI3	HTT-E043	Apr. 22 2025	Apr. 21 2026
17	Artificial Mains	Rohde & Schwarz	ESH3-Z5	HTT-E006	Apr. 22 2025	Apr. 21 2026
18	Artificial Mains	Rohde & Schwarz	ENV-216	HTT-E038	Apr. 22 2025	Apr. 21 2026
19	Cable Line	Robinson	Z302S-NJ-BNCJ-1.5M	HTT-E001	Apr. 22 2025	Apr. 21 2026
20	Attenuator	Rohde & Schwarz	ESH3-Z2	HTT-E045	May. 19 2025	May. 18 2026
21	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650（5KVA）	HTT-E032	Apr. 22 2025	Apr. 21 2026
22	Control Room	Shenzhen C.R.T technology co., LTD	8*4*3.5	HTT-E029	Aug. 10 2024	Aug. 09 2027
23	DC power supply	Agilent	E3632A	HTT-E023	Apr. 22 2025	Apr. 21 2026
24	EMI Test Receiver	Agilent	N9020A	HTT-E024	Apr. 22 2025	Apr. 21 2026
25	Analog signal generator	Agilent	N5181A	HTT-E025	Apr. 22 2025	Apr. 21 2026
26	Vector signal generator	Agilent	N5182A	HTT-E026	Apr. 22 2025	Apr. 21 2026
27	RF Switch box	Keysight	Switchbox	HTT-E047	May. 19 2025	May. 18 2026
28	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-074	Apr. 21 2025	Apr. 20 2026
29	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
30	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
31	RF Test Software	panshanrf	TST	N/A	N/A	N/A
32	Power Meter	R&S	NRVS	HTT-E057	Apr. 22 2025	Apr. 21 2026

8. Test results and Measurement Data

8.1. AC Power Conducted Emission

TEST CONFIGURATION



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 0.0 meters is used and is placed on the ground plane as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
2 Support equipment, if needed, was placed as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/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.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

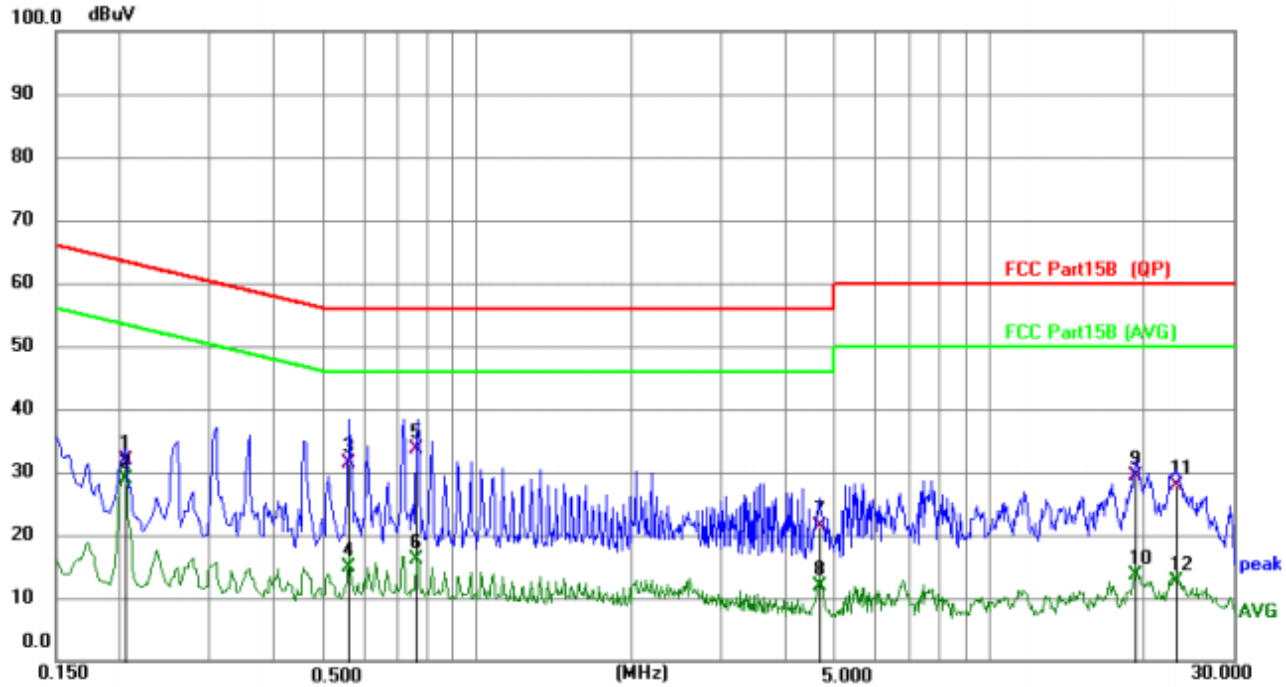
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Remark: 1. BLE 1Mpbs and 2Mpbs were tested at Low, Middle, and High channel; only the worst result of BLE 1Mpbs High channel was reported as below:
2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:.

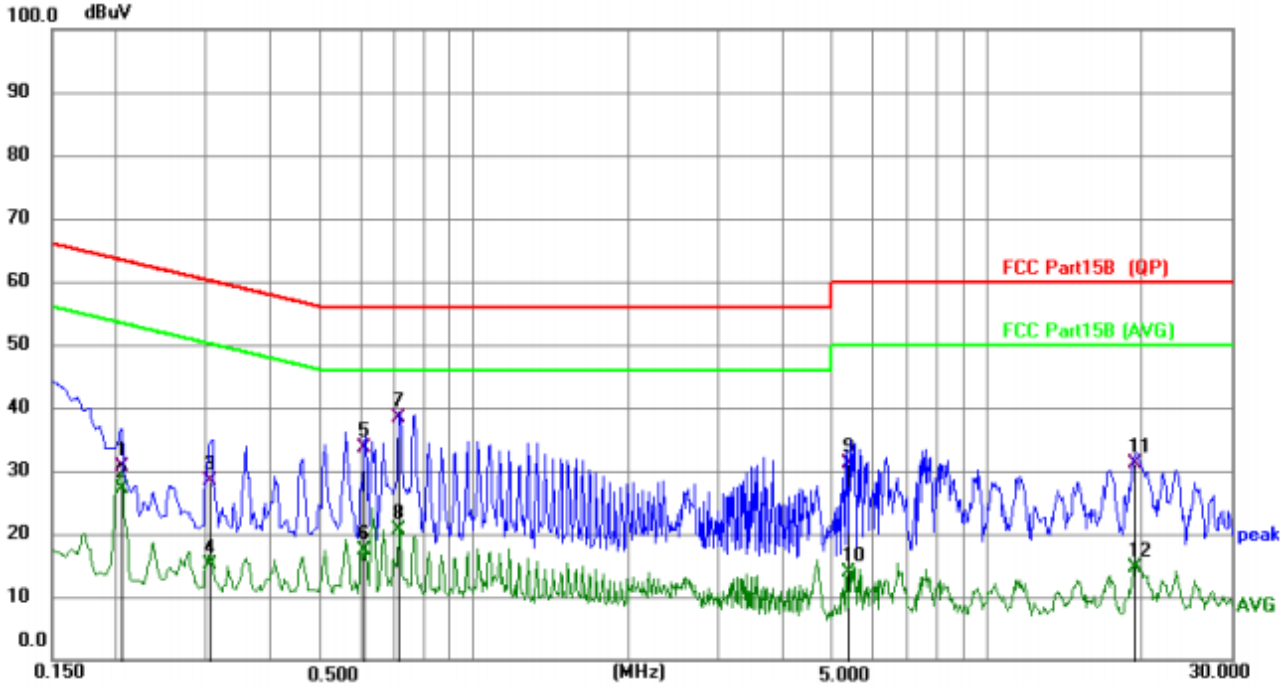
Measurement data:

Line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.2043	21.90	10.07	31.97	63.43	-31.46	QP
2		0.2043	18.80	10.07	28.87	53.43	-24.56	AVG
3		0.5604	21.35	10.06	31.41	56.00	-24.59	QP
4		0.5604	4.92	10.06	14.98	46.00	-31.02	AVG
5	*	0.7635	23.54	10.07	33.61	56.00	-22.39	QP
6		0.7635	6.17	10.07	16.24	46.00	-29.76	AVG
7		4.6751	11.20	10.14	21.34	56.00	-34.66	QP
8		4.6751	1.73	10.14	11.87	46.00	-34.13	AVG
9		19.4117	18.53	10.92	29.45	60.00	-30.55	QP
10		19.4117	2.72	10.92	13.64	50.00	-36.36	AVG
11		23.1828	16.78	11.15	27.93	60.00	-32.07	QP
12		23.1828	1.41	11.15	12.56	50.00	-37.44	AVG

Neutral:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.2053	20.56	10.04	30.60	63.39	-32.79	QP
2		0.2053	17.21	10.04	27.25	53.39	-26.14	AVG
3		0.3060	18.33	10.06	28.39	60.08	-31.69	QP
4		0.3060	4.98	10.06	15.04	50.08	-35.04	AVG
5		0.6120	23.66	10.06	33.72	56.00	-22.28	QP
6		0.6120	7.37	10.06	17.43	46.00	-28.57	AVG
7	*	0.7143	28.26	10.04	38.30	56.00	-17.70	QP
8		0.7143	10.49	10.04	20.53	46.00	-25.47	AVG
9		5.4001	21.09	10.13	31.22	60.00	-28.78	QP
10		5.4001	3.76	10.13	13.89	50.00	-36.11	AVG
11		19.6146	20.31	10.87	31.18	60.00	-28.82	QP
12		19.6146	3.70	10.87	14.57	50.00	-35.43	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Los

8.2. Maximum Peak Output Power

Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.
Method PM is Measurement using an RF Peak power sensor. The procedure for this method is as follows:
1. The testing follows the ANSI C63.10 Section 11.9.1.2
2. The maximum peak conducted output power may be measured using a broadband peak RF power sensor.
3. The power sensor shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

Test Configuration

Test Results

Please refer to Appendix RF Test Data for BLE.

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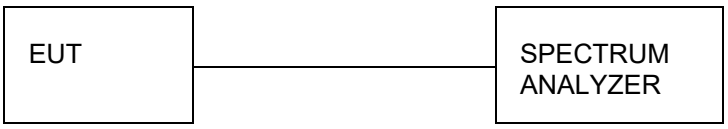
7.3. On Time and Duty Cycle

Standard Applicable

None; for reporting purpose only.

TEST CONFIGURATION



Test Procedures

1). Set the Centre frequency of the spectrum analyzer to the transmitting frequency;
2). Set the span=0MHz, RBW=8MHz, VBW=8MHz, Sweep time=Auto;
3). Detector = peak;
4). Trace mode = Single hold.

Test Results

Please refer to Appendix RF Test Data for BLE.

8.3. 6dB Bandwidth

Limit

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

Test Procedure

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max-hold.
e) Sweep = No faster than coupled (auto) time.
f) Allow the trace to stabilize.

Test Configuration

Test Results

Please refer to Appendix RF Test Data for BLE.

8.4. Power Spectral Density

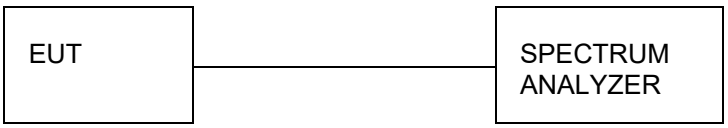
Limit

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.

Test Procedure

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

Test Configuration



Test Results

Please refer to Appendix RF Test Data for BLE.

8.5. Out-of-band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

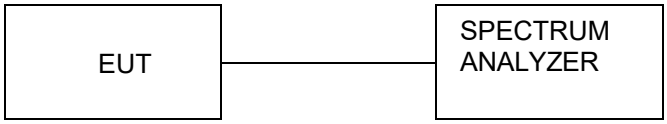
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

The testing follows the ANSI C63.10 Section 11.11.2 and 11.11.3 and 6.10.4:
●Reference level measurement
Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to≥1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW≥[3*RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

●Emission level measurement
Establish an emission level by using the following procedure:
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW≥[3*RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Test Configuration



Test Results

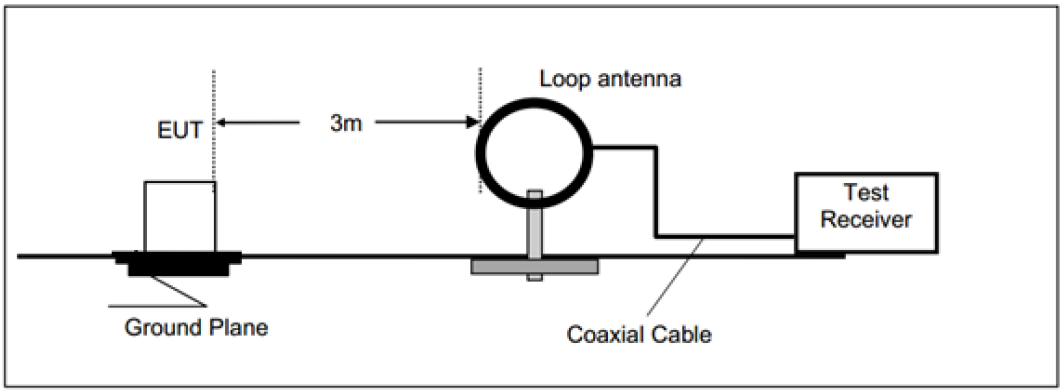
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Please refer to Appendix RF Test Data for BLE.

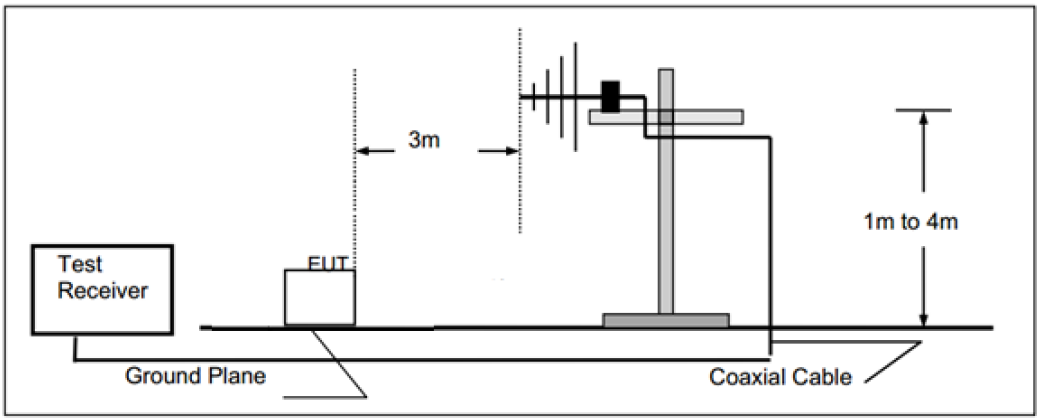
8.6. Radiated Emissions and Band Edge

TEST CONFIGURATION

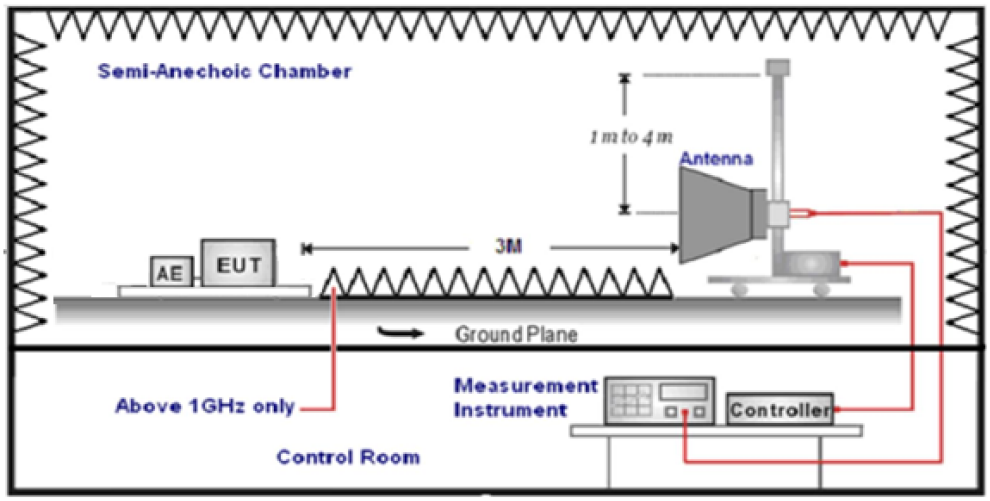
Frequency range 9 KHz – 30MHz

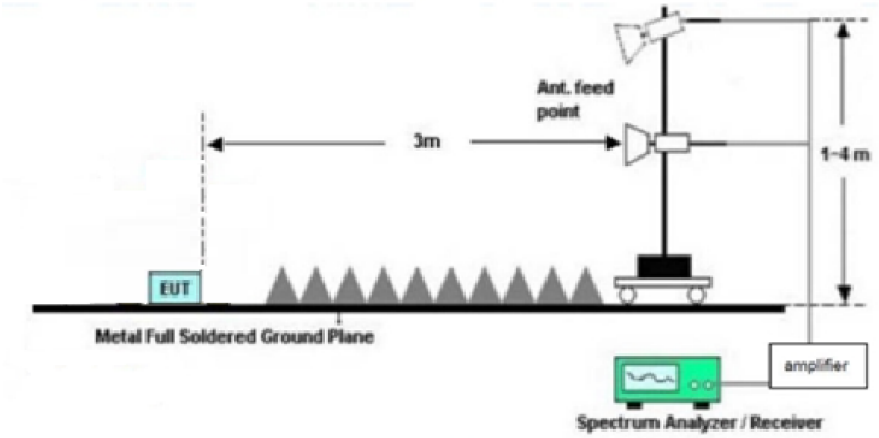


Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz





TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.0m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 0.0m above ground plane when testing frequency range 1GHz – 25GHz.
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.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain

AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

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)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Measurement data:

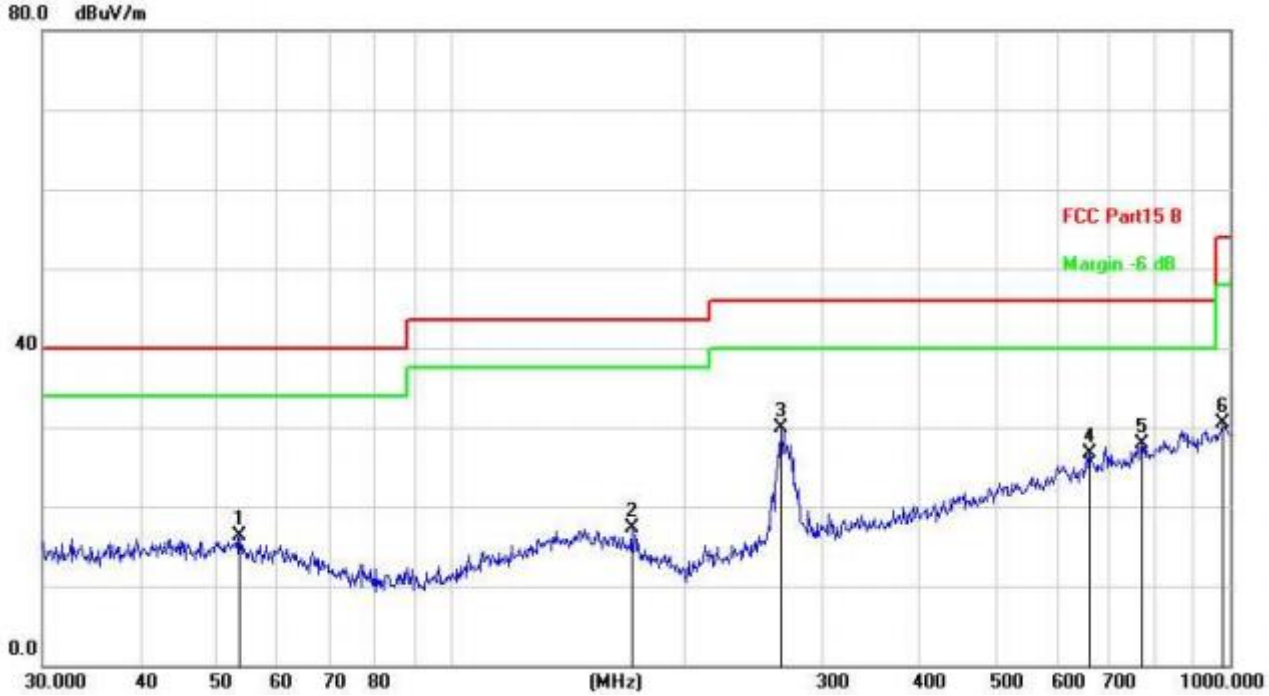
Remark:
1.This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2.BLE 1Mpbs and 2Mpbs were *tested at Low, Middle, and High channel for all models and recorded worst mode at the 1Mpbs High channel.*
3.Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

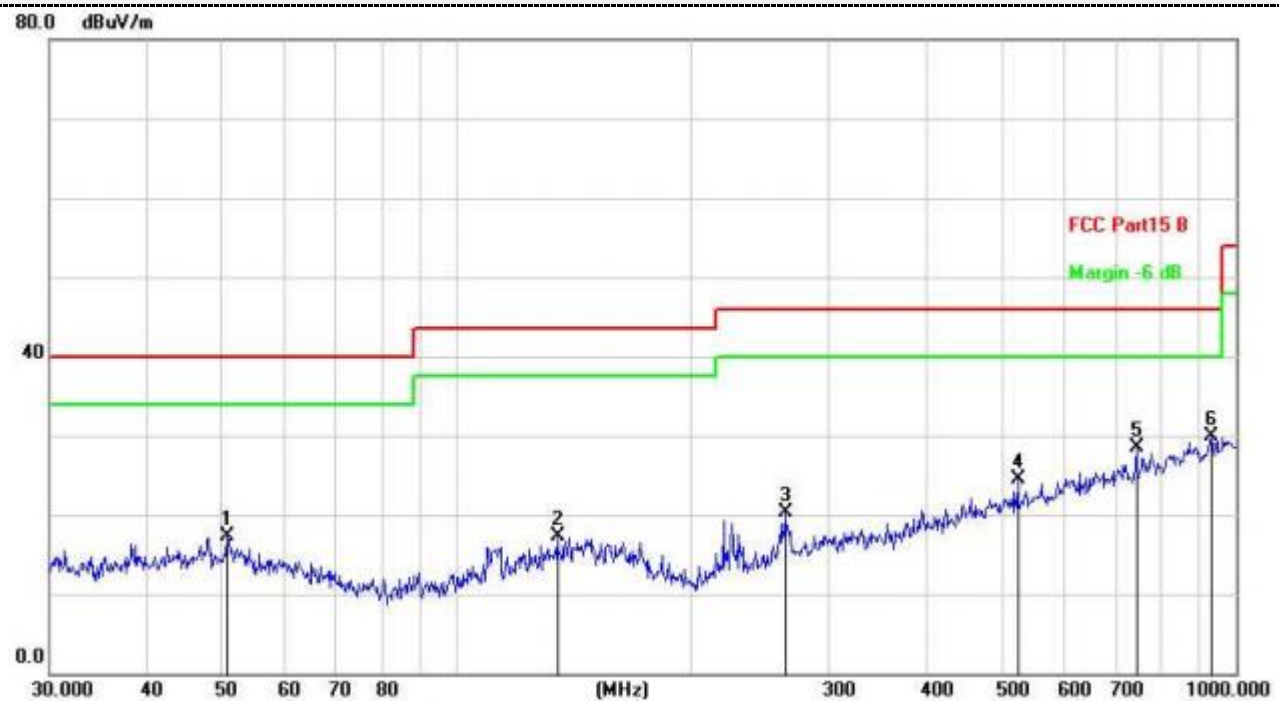
■ **Below 1GHz**

■ Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1		53.6932	27.60	-11.35	16.25	40.00	-23.75	peak
2		170.7926	28.35	-11.10	17.25	43.50	-26.25	peak
3	*	265.6757	40.98	-11.08	29.90	46.00	-16.10	peak
4		661.1505	29.16	-2.44	26.72	46.00	-19.28	peak
5		771.4486	28.97	-1.07	27.90	46.00	-18.10	peak
6		979.1804	28.13	2.33	30.46	54.00	-23.54	peak

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1		50.7637	28.65	-11.31	17.34	40.00	-22.66	peak
2		134.5592	28.15	-10.92	17.23	43.50	-26.27	peak
3		263.8190	31.40	-11.12	20.28	46.00	-25.72	peak
4		524.5540	29.31	-4.89	24.42	46.00	-21.58	peak
5		744.8660	30.07	-1.56	28.51	46.00	-17.49	peak
6	*	929.0081	28.59	1.28	29.87	46.00	-16.13	peak

Final Level =Receiver Read level + Correct Factor

■ **Above 1-25GHz**

Frequency(MHz):			**2402**		**Polarity:**		**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	60.20	PK	74	13.80	54.50	31	6.5	31.8	5.7
4804.00	41.45	AV	54	12.55	35.75	31	6.5	31.8	5.7
7206.00	53.55	PK	74	20.45	40.90	36	8.15	31.5	12.65
7206.00	43.40	AV	54	10.60	30.75	36	8.15	31.5	12.65

Frequency(MHz):			**2402**		**Polarity:**		**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	59.95	PK	74	14.05	54.25	31	6.5	31.8	5.7
4804.00	43.27	AV	54	10.73	37.57	31	6.5	31.8	5.7
7206.00	52.96	PK	74	21.04	40.31	36	8.15	31.5	12.65
7206.00	43.63	AV	54	10.37	30.98	36	8.15	31.5	12.65

Frequency(MHz):			**2440**		**Polarity:**		**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	60.79	PK	74	13.21	54.63	31.2	6.61	31.65	6.16
4880.00	44.27	AV	54	9.73	38.11	31.2	6.61	31.65	6.16
7320.00	52.20	PK	74	21.80	39.25	36.2	8.23	31.48	12.95
7320.00	43.64	AV	54	10.36	30.69	36.2	8.23	31.48	12.95

Frequency(MHz):			2440		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	60.58	PK	74	13.42	54.42	31.2	6.61	31.65	6.16
4880.00	42.75	AV	54	11.25	36.59	31.2	6.61	31.65	6.16
7320.00	54.14	PK	74	19.86	41.19	36.2	8.23	31.48	12.95
7320.00	44.31	AV	54	9.69	31.36	36.2	8.23	31.48	12.95

Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	62.84	PK	74	11.16	56.18	31.4	6.76	31.5	6.66
4960.00	41.30	AV	54	12.70	34.64	31.4	6.76	31.5	6.66
7440.00	53.63	PK	74	20.37	40.33	36.4	8.35	31.45	13.3
7440.00	46.09	AV	54	7.91	32.79	36.4	8.35	31.45	13.3

Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	63.28	PK	74	10.72	56.62	31.4	6.76	31.5	6.66
4960.00	43.28	AV	54	10.72	36.62	31.4	6.76	31.5	6.66
7440.00	54.02	PK	74	19.98	40.72	36.4	8.35	31.45	13.3
7440.00	45.58	AV	54	8.42	32.28	36.4	8.35	31.45	13.3

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

Results of Band Edges Test (Radiated)

Remark: GFSK(1M), GFSK(2M) all have been tested, only worse case GFSK(1M) is reported.

Operation Mode: GFSK (1M)

Frequency(MHz):			**2402**		**Polarity:**		**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	60.44	PK	74	13.56	61.83	27.2	4.31	32.9	-1.39
2390.00	45.30	AV	54	8.70	46.69	27.2	4.31	32.9	-1.39
Frequency(MHz):			**2402**		**Polarity:**		**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	58.23	PK	74	15.77	59.62	27.2	4.31	32.9	-1.39
2390.00	46.50	AV	54	7.50	47.89	27.2	4.31	32.9	-1.39
Frequency(MHz):			**2480**		**P olarity:**		**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	55.43	PK	74	18.57	56.82	27.2	4.31	32.9	-1.39
2483.50	46.09	AV	54	7.91	47.48	27.2	4.31	32.9	-1.39
Frequency(MHz):			**2480**		**Polarity:**		**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	55.60	PK	74	18.40	56.53	27.4	4.47	32.8	-0.93
2483.50	45.15	AV	54	8.85	46.08	27.4	4.47	32.8	-0.93

REMARKS:

6. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
7. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
8. Margin value = Limit value- Emission level.
9. -- Mean the PK detector measured value is below average limit.
10. The other emission levels were very low against the limit.

8.7. Antenna 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Antenna Connected Construction

The maximum gain of antenna was 0.84 dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen HTT Technology Co.,Ltd. does not assume any responsibility.

9. Test Setup Photo

Reference to the **appendix I** for details.

10. EUT Constructional Details

Reference to the **appendix II** for details.

------End------