

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No...... GTS20200813002-1-2

FCC ID...... YMX-BK150

Compiled by

(position+printed File administrators Jimmy Wang

name+signature)

Supervised by

(position+printed Test Engineer Aaron Tan

name+signature)

Approved by

(position+printed Manager Jason Hu name+signature)

,

Date of issue...... August.13, 2020

Representative Laboratory Shenzhen Global Test Service Co.,Ltd.

Name.....

140111C

Street, Longgang District, Shenzhen, Guangdong

Applicant's name...... XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

Address (5/F) NO.168, QIANPU ROAD, SIMING DISTRICT, XIAMEN, CHINA

Test specification

Standard FCC Part 15.247

TRF Originator...... Shenzhen Global Test Service Co.,Ltd.

Shenzhen Global Test Service Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Global Test Service Co.,Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Global Test Service Co.,Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test item description Massage Chair

Trade Mark N/A

Manufacturer XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

Model/Type reference..... EC-375D

Listed Models BK-150

Modulation Type GFSK

Operation Frequency...... From 2402MHz to 2480MHz

Rating AC 120V/60Hz

Result..... PASS

Report No.: GTS20200611017-1-8-1 Page 2 of 35

TEST REPORT

Test Report No. :	GTS20200813002-1-2	August.13, 2020
	G1320200013002-1-2	Date of issue

Equipment under Test : Massage Chair

Model /Type : EC-375D

Listed Models : BK-150

Applicant : XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

Address : (5/F) NO.168, QIANPU ROAD, SIMING DISTRICT, XIAMEN,

CHINA

Manufacturer : XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

Address : (5/F) NO.168, QIANPU ROAD, SIMING DISTRICT, XIAMEN,

CHINA

Test Result: PASS

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

Genera	Il Remarks	5
	et Description	5
	nent Under Test	5
	lescription of the Equipment under Test (EUT)	5
	peration mode	5
	Diagram of Test Setup	6
	d Submittal(s) / Grant (s)	6
	onfiguration	6
Modific	cations	6
TEST	ENVIRONMENT	7
Addres	ss of the test laboratory	7
Addres	ss of the test laboratory acility	7 7
Test Fa		-
Test Fa Enviror Test De	acility nmental conditions escription	7 7 8
Test Fa Enviror Test De Statem	acility nmental conditions escription ent of the measurement uncertainty	7 7 8 8
Test Fa Enviror Test De Statem	acility nmental conditions escription	7 7 8
Test Fa Enviror Test De Statem Equipn	acility nmental conditions escription ent of the measurement uncertainty	7 7 8 8 9
Test Fa Enviror Test De Statem Equipn	acility nmental conditions escription ent of the measurement uncertainty nents Used during the Test	7 7 8 8 9
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2.	Ac Power Conducted Emission Recility AC Power Conducted Emission Reconditions Page 18	7 7 8 8 8 9 10
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2. 4.3.	Ac Power Conducted Emission AC Power Conducted Emission Radiated Emission Maximum Peak Output Power	7 7 8 8 9 10 13
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2. 4.3. 4.4.	AC Power Conducted Emission Radiated Emission Maximum Peak Output Power Power Spectral Density	7 7 8 8 9 10 13 19
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2. 4.3. 4.4. 4.5.	AC Power Conducted Emission Radiated Emission Maximum Peak Output Power Power Spectral Density 6dB Bandwidth	7 7 8 8 9 10 13 19 20
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2. 4.3. 4.4. 4.5. 4.6.	AC Power Conducted Emission Radiated Emission Maximum Peak Output Power Power Spectral Density 6dB Bandwidth Band Edge Compliance of RF Emission	7 7 8 8 9 10 13 19 20 22
Test Fa Environ Test De Statem Equipm TEST 4.1. 4.2. 4.3. 4.4. 4.5.	AC Power Conducted Emission Radiated Emission Maximum Peak Output Power Power Spectral Density 6dB Bandwidth	7 7 8 8 8 9

Report No.: GTS20200611017-1-8-1 Page 4 of 35

1. 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 C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices KDB558074 D01 v05r02: Guidance for Compliance Measurements on Digital Transmission Systems (DTS) ,Frequency Hopping Spread Spectrum System(HFSS), and Hybrid System Devices Operating Under §15.247 of The FCC rules.

Report No.: GTS20200611017-1-8-1 Page 5 of 35

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample		July.20, 2020
Testing commenced on		July.20, 2020
Testing concluded on	:	August.13, 2020

2.2. Product Description

Product Name:	Massage Chair	
Model/Type reference:	EC-375D	
Power supply:	AC 120V/60Hz	
Sample ID:	GTS20200813002-1-1#(Engineer sample), GTS20200813002-1-2# (Normal sample)	
Bluetooth :		
Supported Type:	BLE	
Modulation:	GFSK	
Operation frequency:	2402MHz~2480MHz	
Channel number:	40	
Channel separation:	2MHz	
Antenna type:	PCB antenna	
Antenna gain:	2.50dBi	

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	0	230V / 50 Hz	•	120V / 60Hz
		0	12 V DC	0	24 V DC
		0	Other (specified in blank below)		

/

2.4. Short description of the Equipment under Test (EUT)

This is a Massage Chair For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

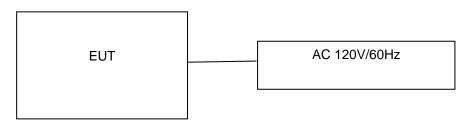
The Applicant provides communication tools software(AT command) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 40 channels provided to the EUT. Channel 00/19/39 was selected to test

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	20	2442

Report No.: GTS20200611017-1-8-1 Page 6 of 35

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

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: YMX-BK150** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- \bigcirc supplied by the manufacturer
- Supplied by the lab

0	ADAPTER	M/N:	
		Manufacturer:	

2.9. Modifications

No modifications were implemented to meet testing criteria.

Report No.: GTS20200611017-1-8-1 Page 7 of 35

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

3.2. Test Facility

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

FCC-Registration No.: 165725

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

A2LA-Lab Cert. No.: 4758.01

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges: Radiated Emission:

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Power Conducted Emission

Temperature:	25 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

Report No.: GTS20200611017-1-8-1 Page 8 of 35

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Reco In Re		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	☑ Lowest☑ Middle☑ Highest	GFSK	☑ Lowest☑ Middle☑ Highest	\boxtimes				complies
§15.247(e)	Power spectral density	GFSK	✓ Lowest✓ Middle✓ Highest	GFSK	✓ Lowest✓ Middle✓ Highest	\boxtimes				complies
§15.247(a)(2)	Spectrum bandwidth - 6 dB bandwidth	GFSK	☑ Lowest☑ Middle☑ Highest	GFSK	 Lowest Middle Highest	\boxtimes				complies
§15.247(b)(1)	Maximum output power	GFSK	✓ Lowest✓ Middle✓ Highest	GFSK	 Lowest Middle Highest					complies
§15.247(d)	Band edge compliance conducted	GFSK	✓ Lowest✓ Highest	GFSK		\boxtimes				complies
§15.205	Band edge compliance radiated	GFSK		GFSK		\boxtimes				complies
§15.247(d)	TX spurious emissions conducted	GFSK	✓ Lowest✓ Middle✓ Highest	GFSK	☑ Lowest☑ Middle☑ Highest	\boxtimes				complies
§15.247(d)	TX spurious emissions radiated	GFSK	✓ Lowest✓ Middle✓ Highest	GFSK		\boxtimes				complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	\boxtimes				complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	\boxtimes				complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	\boxtimes				complies

Remark:

- 1. The measurement uncertainty is not included in the test result.
- 2. NA = Not Applicable; NP = Not Performed

3.5. 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 CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods — Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen Global Test Service 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 GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

⁽¹⁾ This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2019/09/20	2020/09/19
LISN	R&S	ESH2-Z5	893606/008	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESPI3	101841-cd	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESCI7	101102	2019/09/20	2020/09/19
Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
Spectrum Analyzer	R&S	FSV40	100019	2019/09/20	2020/09/19
Vector Signal generator	Agilent	N5181A	MY49060502	2019/09/20	2020/09/19
Signal generator	Agilent	E4421B	3610AO1069	2019/09/20	2020/09/19
Climate Chamber	ESPEC	EL-10KA	A20120523	2019/09/20	2020/09/19
Controller	EM Electronics	Controller EM 1000	N/A	N/A	N/A
Horn Antenna	Schwarzbeck	BBHA 9120D	01622	2019/09/23	2020/09/22
Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2019/10/12	2020/10/11
Bilog Antenna	Schwarzbeck	VULB9163	000976	2020/05/25	2021/05/24
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV 9743	#202	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV9179	9719-025	2019/09/20	2020/09/19
Amplifier	EMCI	EMC051845B	980355	2019/09/20	2020/09/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/09/20	2020/09/19
High-Pass Filter	K&L	9SH10- 2700/X12750-O/O	KL142031	2019/09/20	2020/09/19
High-Pass Filter	K&L	41H10- 1375/U12750-O/O	KL142032	2019/09/20	2020/09/19
RF Cable(below 1GHz)	HUBER+SUHNER	RG214	RE01	2019/09/20	2020/09/19
RF Cable(above 1GHz)	HUBER+SUHNER	RG214	RE02	2019/09/20	2020/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2019/09/20	2020/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2019/09/20	2020/09/19
Test Control Unit	Tonscend	JS0806-1	178060067	2019/06/20	2020/06/19
Automated filter bank	Tonscend	JS0806-F	19F8060177	2019/06/20	2020/06/19
Spectrum analyzer	Agilent	E4407B	MY45132751	2019/06/20	2020/06/19
EMI Test Software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
EMI Test Software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/
EMI Test Software	Tonscend	JS32-CE	Ver 2.5	/	1
EMI Test Software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/
·					

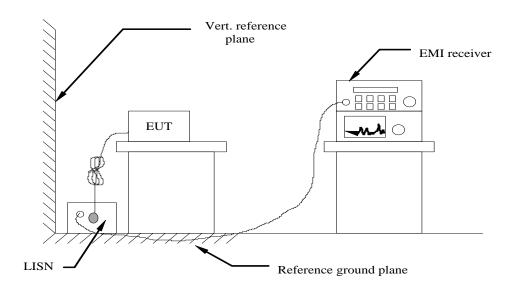
Note: 1. The Cal.Interval was one year.

Report No.: GTS20200611017-1-8-1 Page 10 of 35

4. TEST CONDITIONS AND RESULTS

4.1. 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 0.8 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 EUT received DC5V power, 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.

AC Power Conducted Emission Limit

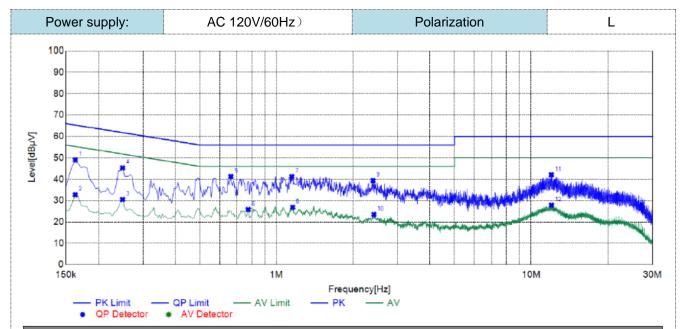
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

Frequency range (MHz)	Limit (dBuV)						
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.							

TEST RESULTS

Remark:

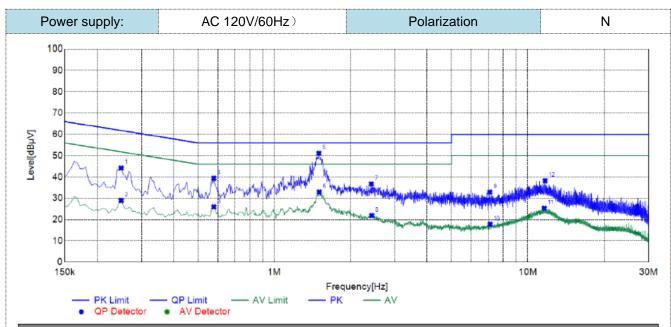
- 1. GFSK were test at Low, Middle, and High channel; only the worst result of GFSK Middle Channel was reported as below:
- 2. Both 120 VAC, 50/60 Hz, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:
- 3. Remark: Result=Reading value+Factor, and Margin=Limit- Result



Sus	Suspected List									
NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	Result [dBµ∀]	Limit [dBµ∀]	Margin [dB]	Detector	Line	Remark	
1	0.1635	38.92	10.05	48.97	65.28	16.31	Qp	L1	PASS	
2	0.1635	22.65	10.05	32.70	55.28	22.58	AV	L1	PASS	
3	0.2490	20.45	10.02	30.47	51.79	21.32	AV	L1	PASS	
4	0.2490	35.26	10.02	45.28	61.79	16.51	Qp	L1	PASS	
5	0.6630	31.16	10.05	41.21	56.00	14.79	Qp	L1	PASS	
6	0.7755	15.71	10.07	25.78	46.00	20.22	AV	L1	PASS	
7	1.1490	31.12	10.08	41.20	56.00	14.80	Qp	L1	PASS	
8	1.1580	16.76	10.09	26.85	46.00	19.15	AV	L1	PASS	
9	2.3955	29.12	10.21	39.33	56.00	16.67	Qp	L1	PASS	
10	2.4135	13.27	10.21	23.48	46.00	22.52	AV	L1	PASS	
11	12.0075	31.19	10.84	42.03	60.00	17.97	Qp	L1	PASS	
12	12.0255	16.99	10.84	27.83	50.00	22.17	AV	L1	PASS	

Note:1. Result (dB μ V) = Reading (dB μ V) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).



Sus	Suspected List										
NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	Result [dBµV]	Limit [dBµ∀]	Margin [dB]	Detector	Line	Remark		
1	0.2490	34.12	10.02	44.14	61.79	17.65	Qp	N	PASS		
2	0.2490	18.92	10.02	28.94	51.79	22.85	AV	Ν	PASS		
3	0.5775	15.85	10.06	25.91	46.00	20.09	AV	N	PASS		
4	0.5775	29.31	10.06	39.37	56.00	16.63	Qp	N	PASS		
5	1.5000	41.02	10.11	51.13	56.00	4.87	Qp	N	PASS		
6	1.5045	22.81	10.11	32.92	46.00	13.08	AV	N	PASS		
7	2.4135	26.52	10.21	36.73	56.00	19.27	Qp	N	PASS		
8	2.4225	11.69	10.21	21.90	46.00	24.10	AV	N	PASS		
9	7.0845	22.29	10.59	32.88	60.00	27.12	Qp	N	PASS		
10	7.0980	7.22	10.59	17.81	50.00	32.19	AV	N	PASS		
11	11.6160	14.49	10.82	25.31	50.00	24.69	AV	N	PASS		
12	11.7060	27.36	10.83	38.19	60.00	21.81	Qp	N	PASS		

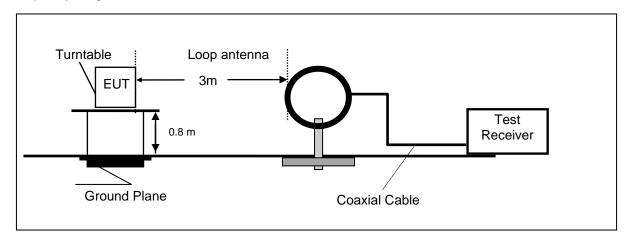
Note:1. Result (dB μ V) = Reading (dB μ V) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

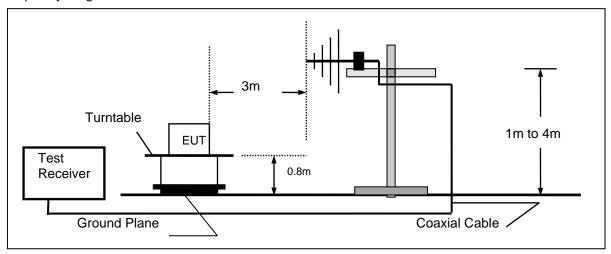
4.2. Radiated Emission

TEST CONFIGURATION

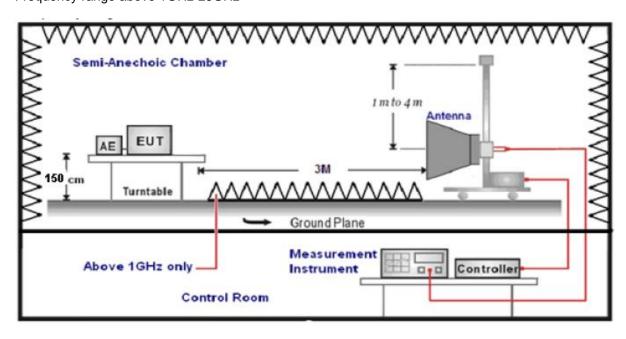
Frequency range 9 KHz - 30MHz



Frequency range 30MHz - 1000MHz



Frequency range above 1GHz-25GHz



Report No.: GTS20200611017-1-8-1 Page 14 of 35

TEST PROCEDURE

 The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m 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°C to 360°C to acquire the highest emissions from EUT.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed.
- 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 the100kHz 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

Report No.: GTS20200611017-1-8-1 Page 15 of 35

TEST RESULTS

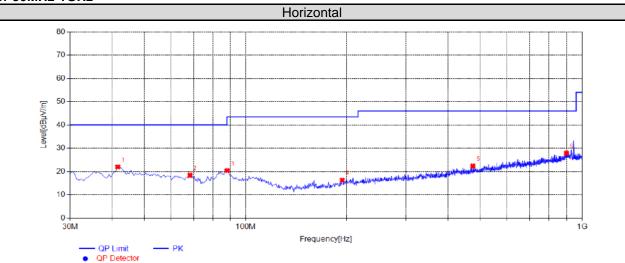
Remark:

 We measured Radiated Emission at GFSK mode from 9 KHz to 25GHz and recorded worst case at GFSK mode.

- 2. For below 1GHz testing recorded worst at GFSK middle 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.

For 30MHz-1GHz

For 30MHz-1GHz



Sus	Suspected List										
NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	41.6400	28.93	-6.94	21.99	40.00	18.01	100	260	PK	Horizonta	PASS
2	68.3150	27.84	-9.41	18.43	40.00	21.57	100	25	PK	Horizonta	PASS
3	88.2000	31.41	-10.97	20.44	43.50	23.06	100	352	PK	Horizonta	PASS
4	193.9300	26.03	-9.69	16.34	43.50	27.16	100	286	PK	Horizonta	PASS
5	474.7450	26.35	-4.01	22.34	46.00	23.66	100	355	PK	Horizonta	PASS
6	897.6650	24.63	3.24	27.87	46.00	18.13	100	74	PK	Horizonta	PASS

Note:1. Result ($dB\mu V/m$) = Reading($dB\mu V/m$) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Vertical 80-70 60 50 Level[dBµV/m] 40 30 20 10 0 ↓ 30M 100M 1G Frequency[Hz] QP Limit QP Detector

Sus	Suspected List										
NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	34.8500	42.46	-9.88	32.58	40.00	7.42	100	290	PK	Vertical	PASS
2	42.1250	40.16	-6.76	33.40	40.00	6.60	100	344	PK	Vertical	PASS
3	54.7350	33.63	-7.15	26.48	40.00	13.52	100	339	PK	Vertical	PASS
4	86.7450	39.40	-11.35	28.05	40.00	11.95	100	319	PK	Vertical	PASS
5	180.8350	31.21	-11.14	20.07	43.50	23.43	100	230	PK	Vertical	PASS
6	282.6850	26.36	-7.79	18.57	46.00	27.43	100	76	PK	Vertical	PASS

Note:1. Result (dB μ V/m) = Reading(dB μ V/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

For 1GHz to 25GHz

GFSK (above 1GHz)

Freque	ncy(MHz)	:	24	02	Pola	arity:	Н	HORIZONTAL	
Frequency (MHz)	Le	ssion vel V/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	56.11	PK	74	17.89	54.21	31.42	6.98	36.5	1.9
4804.00	42.53	AV	54	11.47	40.63	31.42	6.98	36.5	1.9
7206.00	56.23	PK	74	17.77	45.63	37.03	8.87	35.3	10.6
7206.00	40.23	AV	54	13.77	29.63	37.03	8.87	35.3	10.6

Freque	Frequency(MHz):		2402 Polarity:		VERTICAL				
Frequency (MHz)		ssion vel V/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	57.59	PK	74	16.41	55.69	31.42	6.98	36.5	1.9
4804.00	43.42	AV	54	10.58	41.52	31.42	6.98	36.5	1.9
7206.00	56.97	PK	74	17.03	46.37	37.03	8.87	35.3	10.6
7206.00	40.82	AV	54	13.18	30.22	37.03	8.87	35.3	10.6

Freque	Frequency(MHz):		24	2440 Polarity:		rity:	HORIZONTAL		
Frequency (MHz)	Le	ssion vel V/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	56.92	PK	74	17.08	54.86	30.98	7.58	36.5	2.06
4880.00	42.68	AV	54	11.32	40.62	30.98	7.58	36.5	2.06
7320.00	56.93	PK	74	17.07	46.01	37.66	8.56	35.3	10.92
7320.00	40.93	AV	54	13.07	30.01	37.66	8.56	35.3	10.92

Freque	ncy(MHz)	:	24	40	Pola	arity:	VERTI		
Frequency (MHz)	_	sion vel V/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	57.77	PK	74	16.23	55.71	30.98	7.58	36.5	2.06
4880.00	43.89	AV	54	10.11	41.83	30.98	7.58	36.5	2.06
7320.00	58.54	PK	74	15.46	47.62	37.66	8.56	35.3	10.92
7320.00	41.77	ΑV	54	12.23	30.85	37.66	8.56	35.3	10.92

Freque	ncy(MHz)	cy(MHz):		2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emis Le (dBu	vel	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)	
4960.00	57.43	PK	74	16.57	54.36	31.47	7.8	36.2	3.07	
4960.00	43.94	AV	54	10.06	40.87	31.47	7.8	36.2	3.07	
7440.00	56.06	PK	74	17.94	44.32	38.32	8.72	35.3	11.74	
7440.00	41.37	PK	54	12.63	29.63	38.32	8.72	35.3	11.74	

Freque	Frequency(MHz):		2480		Pola	Polarity:		VERTICAL		
Frequency (MHz)	_	ssion vel V/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	59.44	PK	74	14.56	56.37	31.47	7.8	36.2	3.07	
4960.00	44.35	AV	54	9.65	41.28	31.47	7.8	36.2	3.07	
7440.00	56.80	PK	74	17.20	45.06	38.32	8.72	35.3	11.74	
7440.00	42.35	PK	54	11.65	30.61	38.32	8.72	35.3	11.74	

Report No.: GTS20200611017-1-8-1 Page 18 of 35

REMARKS:

- Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
 Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
 Margin value = Limit value- Emission level.
 -- Mean the PK detector measured value is below average limit.

- 5. The other emission levels were very low against the limit.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2.

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.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Туре	Channel	Output power (dBm)	Limit (dBm)	Result
	00	0.025		
GFSK	19	-0.565	30	Pass
	39	-0.820		

Note: 1.The test results including the cable lose.

Report No.: GTS20200611017-1-8-1 Page 20 of 35

4.4. Power Spectral Density

TEST CONFIGURATION



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 =10 KHz.
- 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 8 dBm.

<u>LIMIT</u>

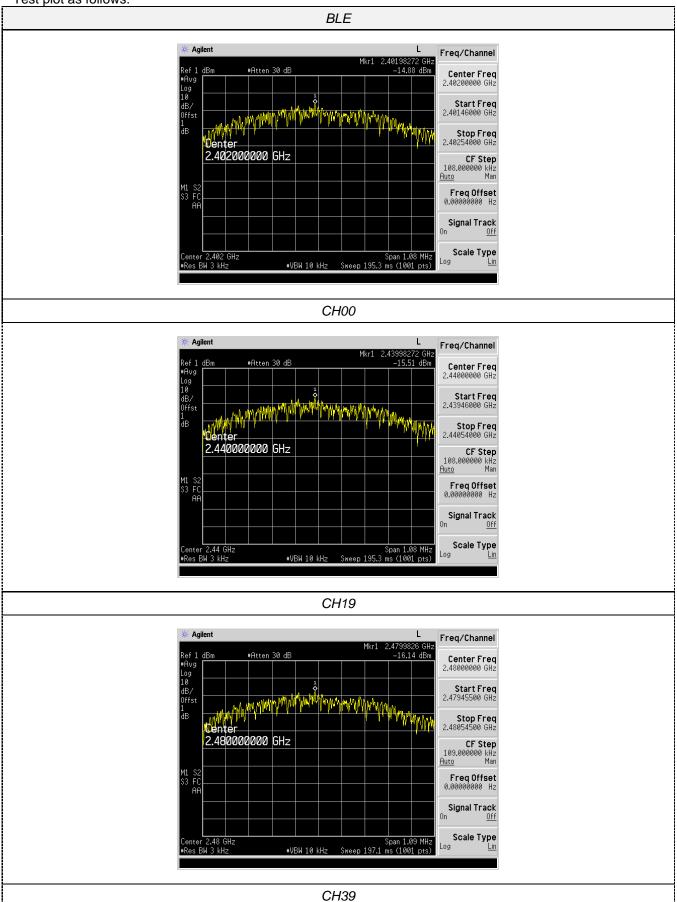
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST RESULTS

Туре	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
	00	-14.88		
GFSK	19	-15.51	8	Pass
	39	-16.14		

Note: 1.The test results including the cable lose.

Test plot as follows:



Report No.: GTS20200611017-1-8-1 Page 22 of 35

4.5. 6dB Bandwidth

TEST CONFIGURATION



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. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

- 1. Set RBW = 100 kHz.
- 2. Set the video bandwidth (VBW) ≥ 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.

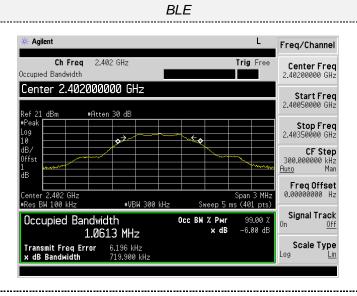
LIMIT

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

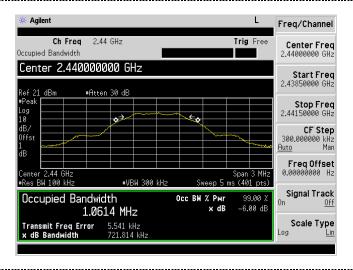
TEST RESULTS

Туре	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
	00	0.664		
GFSK	19	0.680	≥500	Pass
	39	0.676		

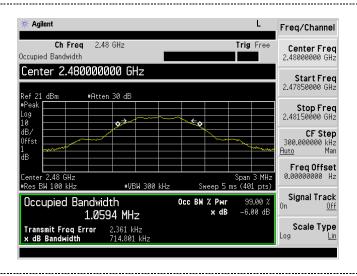
Test plot as follows:



CH00



CH19



CH39

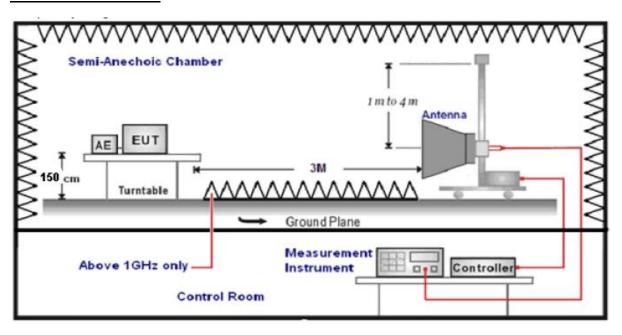
Report No.: GTS20200611017-1-8-1 Page 24 of 35

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

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 conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies 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. 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) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was placed on a turn table which is 1.5m above ground plane.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° C to 360°C to acquire the highest emissions from EUT.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed...
- 5. The distance between test antenna and EUT was 3 meter:

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

Test Frequency range	Test Receiver/Spectrum Setting	Detector
	Peak Value: RBW=1MHz/VBW=3MHz,	
1GHz-40GHz	Sweep time=Auto	Dook
IGHZ-40GHZ	Average Value: RBW=1MHz/VBW=10Hz,	Peak
	Sweep time=Auto	

LIMIT

Below -20dB of the highest emission level in operating band.

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)

Report No.: GTS20200611017-1-8-1 Page 25 of 35

TEST RESULTS

Results of Band Edges Test (Radiated)

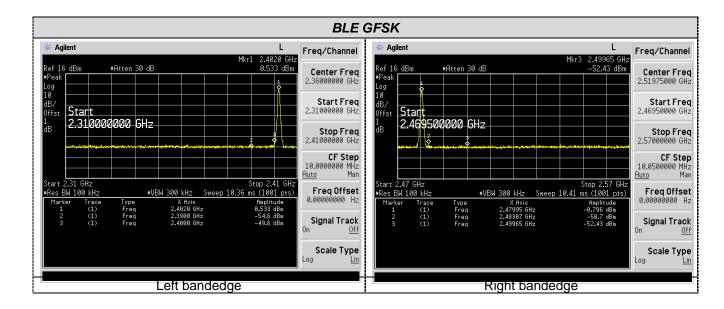
GFSK

Freque	ncy(MHz)	:	24	02	Polarity:		Н	HORIZONTAL	
Frequency (MHz)	Emis Le (dBu	vel	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)
2390.00	56.45	PK	74	17.55	61.86	27.49	3.32	36.22	-5.41
2390.00	43.70	AV	54	10.30	49.11	27.49	3.32	36.22	-5.41
Freque	ncy(MHz)	:	24	02	Pola	rity:		VERTICAL	
Frequency (MHz)	Emis Lev (dBu	vel	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)
2390.00	57.64	PK	74	16.36	63.05	27.49	3.32	36.22	-5.41
2390.00	44.75	AV	54	9.25	50.16	27.49	3.32	36.22	-5.41
Frequency(MHz):									
Freque	ncy(MHz)	:	24	80	Pola	rity:	Н	IORIZONTA	\L
Freque Frequency (MHz)	ncy(MHz) Emis Le (dBu	sion vel	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)
Frequency	Emis Le	sion vel	Limit	Margin	Raw Value	Antenna Factor	Cable Factor	Pre- amplifier	Correction Factor
Frequency (MHz)	Emis Le	sion vel V/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)
Frequency (MHz) 2483.50 2483.50	Emis Lev (dBu	ssion vel V/m) PK AV	Limit (dBuV/m) 74 54	Margin (dB) 17.42	Raw Value (dBuV) 62.09 47.87	Antenna Factor (dB/m) 27.45	Cable Factor (dB) 3.38	Pre- amplifier (dB) 36.34	Correction Factor (dB/m) -5.51
Frequency (MHz) 2483.50 2483.50	Emis Lev (dBu 56.58 42.36	esion vel V/m) PK AV :	Limit (dBuV/m) 74 54	Margin (dB) 17.42 11.64	Raw Value (dBuV) 62.09 47.87	Antenna Factor (dB/m) 27.45 27.45	Cable Factor (dB) 3.38	Pre- amplifier (dB) 36.34 36.34	Correction Factor (dB/m) -5.51
Frequency (MHz) 2483.50 2483.50 Freque Frequency	Emis Lev (dBu 56.58 42.36 ncy(MHz) Emis Lev	esion vel V/m) PK AV :	Limit (dBuV/m) 74 54 24 Limit	Margin (dB) 17.42 11.64 80	Raw Value (dBuV) 62.09 47.87 Pola Raw Value	Antenna Factor (dB/m) 27.45 27.45 arity: Antenna Factor	Cable Factor (dB) 3.38 3.38 Cable Factor	Pre- amplifier (dB) 36.34 36.34 VERTICAL Pre- amplifier	Correction Factor (dB/m) -5.51 -5.51 Correction Factor

REMARKS:

- Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m) Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier Margin value = Limit value- Emission level.
 -- Mean the PK detector measured value is below average limit.

4.6.2 For Conducted Bandedge Measurement



Report No.: GTS20200611017-1-8-1 Page 27 of 35

4.7. Spurious RF Conducted Emission

TEST CONFIGURATION



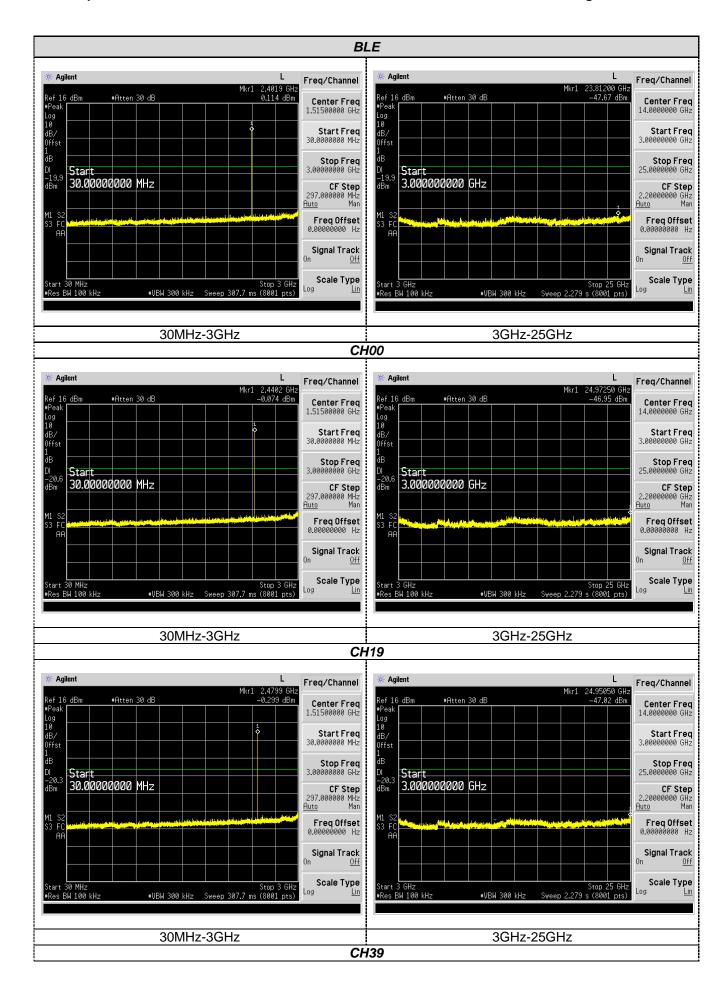
TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength, and measure frequency range from 9KHz to 25GHz.

LIMIT

- 1. Below -20dB of the highest emission level in operating band.
- 2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS



Report No.: GTS20200611017-1-8-1 Page 29 of 35

4.8. Antenna Requirement

of the antenna exceeds 6dBi.

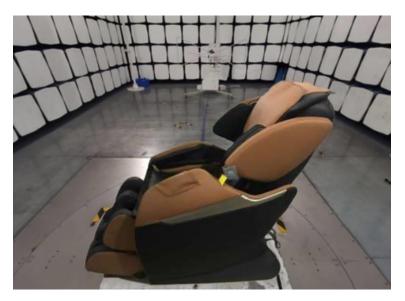
Refer to statement below for compliance

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.

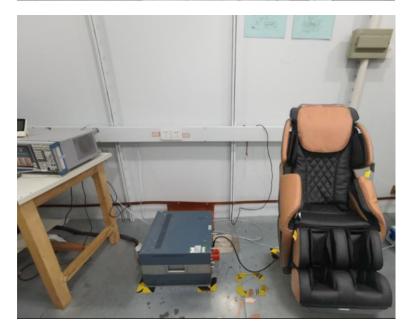
Antenna Connected Construction

The maximum gain of antenna was 2.50 dBi.

5. Test Setup Photos of the EUT







Report No.: GTS20200611017-1-8-1 Page 31 of 35

6. External and Internal Photos of the EUT







Report No.: GTS20200611017-1-8-1 Page 32 of 35





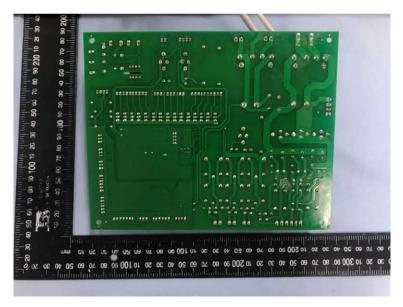


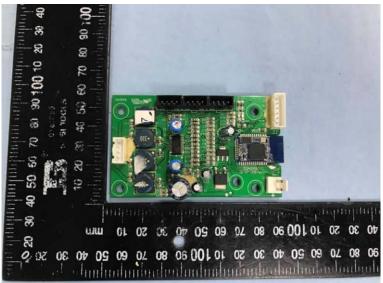
Report No.: GTS20200611017-1-8-1 Page 33 of 35

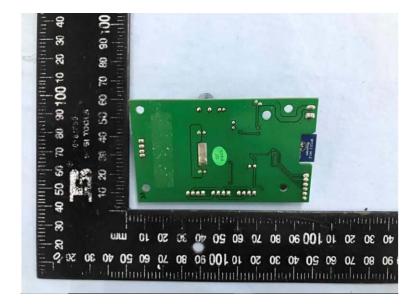




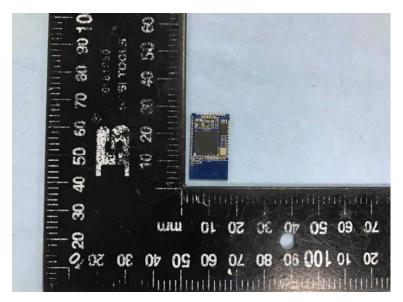


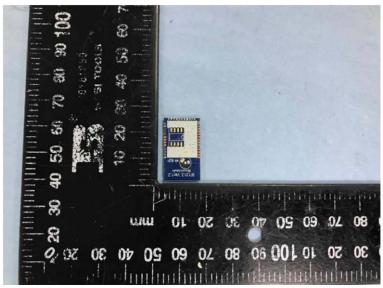






Report No.: GTS20200611017-1-8-1 Page 35 of 35





.....End of Report.....