


# FCC RADIO TEST REPORT

Applicant..... : GhostBed Inc.  
Address..... : 7143 W Broward Blvd, Plantation, Florida, 33317, United States  
Manufacturer..... : Zhangzhou Solex Smart Home Co., Ltd.  
Address..... : No.12 Shunxiang Road, Gunong Farm, Changtai District, Zhangzhou City,  
Fujian Province, China  
Factory..... : Zhangzhou Solex Smart Home Co., Ltd.  
Address..... : No.12 Shunxiang Road, Gunong Farm, Changtai District, Zhangzhou City,  
Fujian Province, China  
Product Name..... : Massage Topper  
Brand Name..... : **GHOSTBED®**  
Model No. .... : GBMSTPR39  
FCC ID..... : 2BFEAGBMSTPR39  
Measurement Standard..... : 47 CFR FCC Part 15, Subpart C (Section 15.249)  
Receipt Date of Samples.... : March 07, 2024  
Date of Tested..... : March 09, 2024 to March 22, 2024  
Date of Report..... : April 09, 2024

This report shows that above equipment is technically compliant with the requirements of the standards above. All test results in this report apply only to the tested sample(s). Without prior written approval of Dongguan Nore Testing Center Co., Ltd, this report shall not be reproduced except in full.

  
Prepared by  
Julie Xiao / Project Engineer

  
Approved by  
Iori Fan / Authorized Signatory

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## Revision History

[illegible]

## 1. Summary of Test Result

FCC Rules	Description of Test	Result	Remarks
§15.207 (a)	AC Power Conducted Emission	PASS	---
§15.249(a)/ 15.209	Radiated Emissions	PASS	---
§15.249(d)/ 15.205	Band Edge	PASS	---
§15.215(c)	20dB Bandwidth	PASS	---
§15.203	Antenna Requirement	PASS	---

## 2. General Description of EUT

Product Information	
Product name:	Massage Topper
Main Model Name:	GBMSTPR39
Additional Model Name:	N/A
Model Difference:	N/A
S/N:	2403-1043
Brand Name:	<b>GHOSTBED®</b>
Hardware version:	Main board: KA10002-038_B Control board: KA10002-039_B
Software version:	Main board: KA10002-038_A Control board: KA10002-039_A
Rating:	DC 12V come from adapter
Typical arrangement:	Table-top
I/O Port:	Refer to user manual
Accessories Information	
Adapter:	Model: EA060-1200-4000WU Input: AC 100-240V, 50/60Hz, 1.5A Output: DC 12V, 4A
Cable:	Power cord(adapter): 1.84m, unshielded, undetachable DC Line: 1.5m, unshielded, undetachable
Other:	Remote*1
Additional Information	
Note:	N/A
Remark:	All the information above are provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

Technical Specification (2.4G Function)

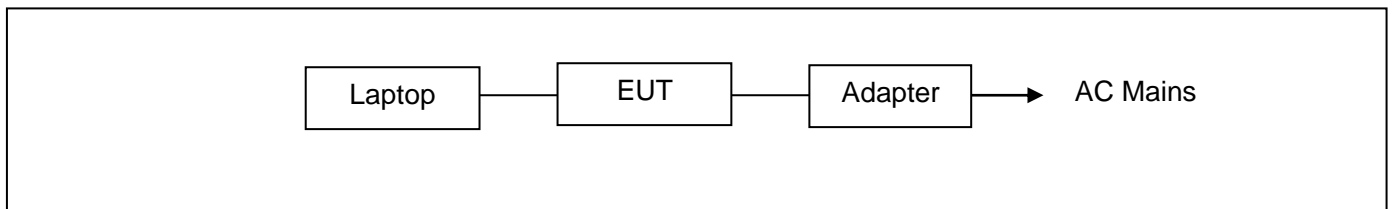
Frequency Range:	2440MHz
Modulation Type:	GFSK
Number of Channel:	1
Antenna Type:	PCB Antenna
Antenna Gain:	1.9 dBi (Declared by manufacturer)

### 3. Test Channels and Modes Detail

Mode		Channel	Frequency (MHz)	Modulation
1	TX	1	2440	GFSK

Note: TX mode means that the EUT was programmed to be in continuously transmitting mode.

### 4. Configuration of EUT



### 5. Modification of EUT

No modifications are made to the EUT during all test items.

**6. Description of Support Device**

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Brand	M/N	S/N	Cable Specification	Remarks
1.	Laptop	Lenovo	R720-151KBN	PF0Z35FH	---	Provided by the Lab.

No.	Test Software	Modulation	Power Setting
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## 7. Test Facility and Location

Test Site	:	Dongguan Nore Testing Center Co., Ltd. (Dongguan NTC Co., Ltd.)
Accreditations and Authorizations	:	<p>The Laboratory has been assessed and proved to be in compliance with CNAS/CL01</p> <p>Listed by CNAS, August 13, 2018</p> <p>The Certificate Registration Number is L5795.</p> <p>The Certificate is valid until August 13, 2024</p> <p>The Laboratory has been assessed and proved to be in compliance with ISO17025</p> <p>Listed by A2LA, November 01, 2017</p> <p>The Certificate Registration Number is 4429.01</p> <p>The Certificate is valid until December 31, 2025</p> <p>Listed by FCC, November 06, 2017</p> <p>Test Firm Registration Number: 907417</p> <p>Listed by Industry Canada, June 08, 2017</p> <p>The Certificate Registration Number. Is 46405-9743A</p>
Test Site Location	:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

## 8. Applicable Standards and References

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

### Test Standards:

47 CFR Part 15, Subpart C, 15.249

ANSI C63.10-2013

### References Test Guidance:

N/A

## 9. Deviations and Abnormalities from Standard Conditions

No additions, deviations and exclusions from the standard.

## 10. Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	AC Power Conducted Emission	1	AC 120V 60Hz	Sean	See note 1
2.	Radiated Emissions	1	AC 120V 60Hz	Sean	See note 1
3.	Band Edge	1	AC 120V 60Hz	Sean	See note 1
4.	20dB Bandwidth	1	AC 120V 60Hz	Sean	See note 1
5.	Antenna Requirement	---	---	---	---

Note:

- The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35℃, 30~70%, 86~106kPa
- Only the worst case was recorded in the report.

## 11. Measurement Uncertainty

No.	Test Item	Frequency	Uncertainty	Remarks
1.	Conducted Emission	150KHz ~ 30MHz	$\pm 2.52$ dB	---
2.	Radiated Emission Test	9kHz ~ 30MHz	$\pm 5.66$ dB	---
		30MHz ~ 1GHz	$\pm 5.66$ dB	---
		1GHz ~ 18GHz	$\pm 5.19$ dB	---
		18GHz ~ 40GHz	$\pm 5.19$ dB	---
3.	RF Conducted Test	10Hz ~ 40GHz	$\pm 1.18$ dB	---
4.	Occupied Channel Bandwidth	---	$\pm 0.72\%$	---

**Note:**

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .
2. The measurement uncertainty levels above are estimated and calculated according to CISPR 16-4-2.
3. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

## 12. Sample Calculations

Conducted Emission						
Freq. (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
0.1740	17.30	20.60	37.90	64.77	-26.87	QP
<p>Where,</p> <p>Freq. = Emission frequency in MHz</p> <p>Reading Level = Spectrum Analyzer/Receiver Reading</p> <p>Corrector Factor = Insertion loss of LISN + Cable Loss + RF Switching Unit attenuation</p> <p>Measurement = Reading + Corrector Factor</p> <p>Limit = Limit stated in standard</p> <p>Margin = Measurement - Limit</p> <p>Detector = Reading for Quasi-Peak / Average / Peak</p>						

Radiated Spurious Emissions and Restricted Bands						
Freq. (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
650.8000	23.79	1.31	25.10	46.00	-20.90	QP
<p>Where,</p> <p>Freq. = Emission frequency in MHz</p> <p>Reading Level = Spectrum Analyzer/Receiver Reading</p> <p>Corrector Factor = Antenna Factor + Cable Loss - Pre-amplifier</p> <p>Measurement = Reading + Corrector Factor</p> <p>Limit = Limit stated in standard</p> <p>Over = Margin, which calculated by Measurement - Limit</p> <p>Detector = Reading for Quasi-Peak / Average / Peak</p>						

Note: For all conducted test items, the spectrum analyzer offset or transducer is derived from RF cable loss and attenuator factor. The offset or transducer is equal to the RF cable loss plus attenuator factor.

### 13. Test Items and Results

#### 13.1 Conducted Emissions Measurement

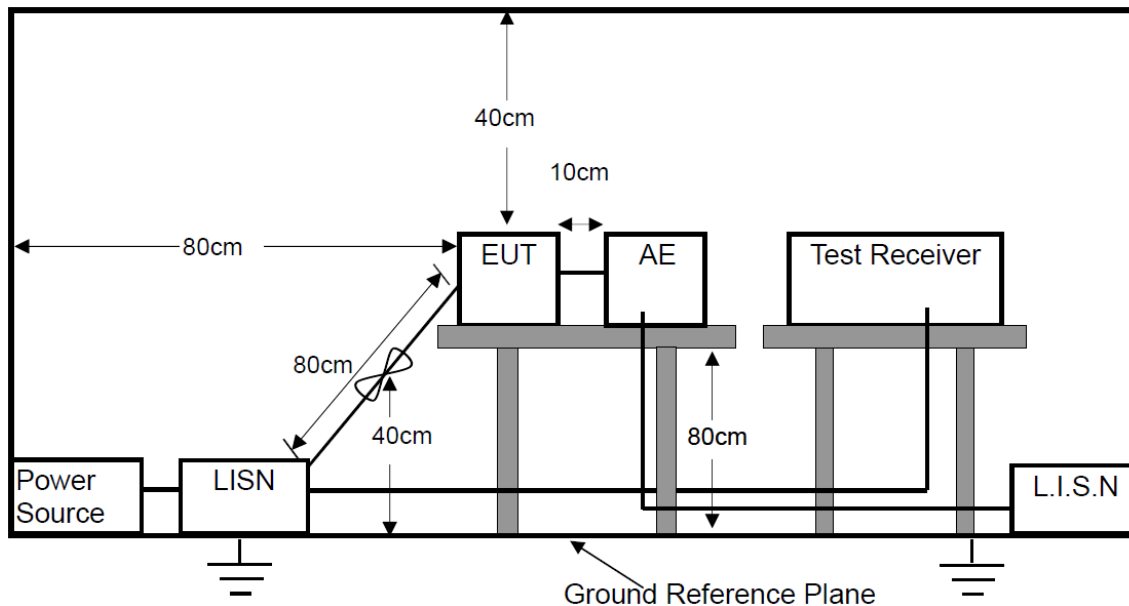
##### LIMITS

According to the requirements of FCC PART 15.207, the limits are as follows:

Frequency (MHz)	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

- Note:
1. If the limits for the average detector are met when using the quasi-peak detector, then the limits for the measurements with the average detector are considered to be met.
  2. The lower limit shall apply at the transition frequencies.
  3. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5MHz.

##### BLOCK DIAGRAM OF TEST SETUP



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## TEST PROCEDURES

- a. The EUT was placed on a wooden table 0.8m height from the metal ground plan and 0.4m from the conducting wall of the shielding room and it was kept at 0.8m from any other grounded conducting surface.
- b. All I/O cables and support devices were positioned as per ANSI C63.10.
- c. Connect mains power port of the EUT to a line impedance stabilization network (LISN).
- d. Connect all support devices to the other LISN and AAN, if needed.
- e. Scan the frequency range from 150KHz to 30MHz at both sides of AC line for maximum conducted interference checking and record the test data.

## TEST RESULTS

PASS

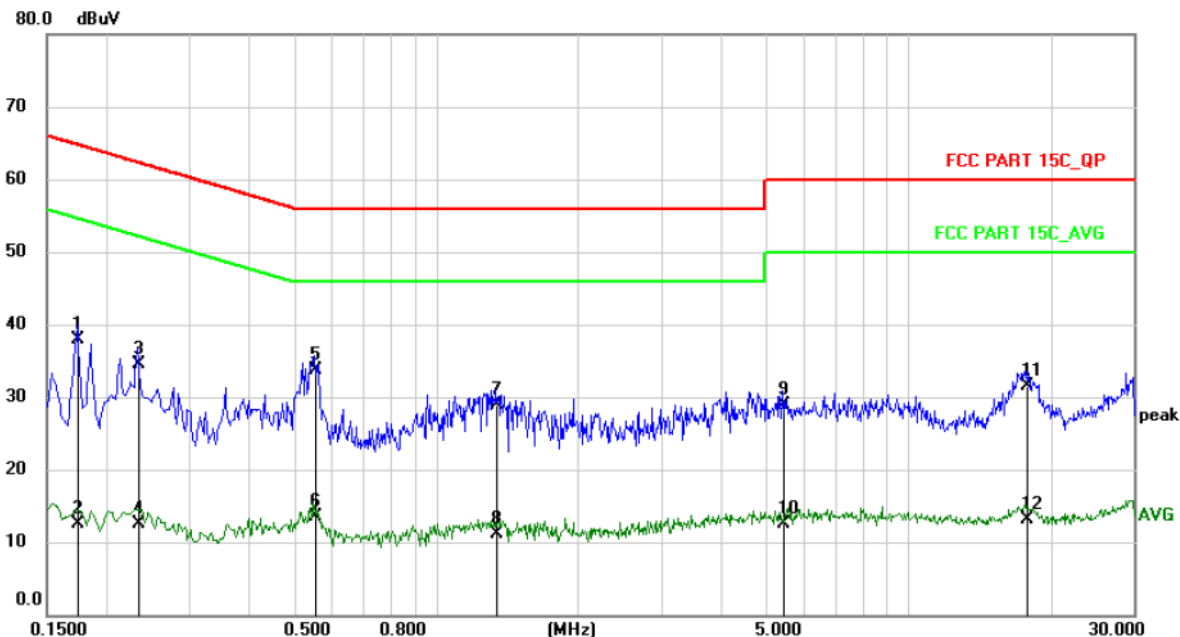
Please refer to the following pages of the worst case.

M/N: GBMSTPR39	Testing Voltage: AC 120V / 60Hz
Phase: L1	Detector: QP & AVG
Test Mode: 1	

## Conducted Emission Measurement

Date: 2024/3/15

Time: 9:30:42



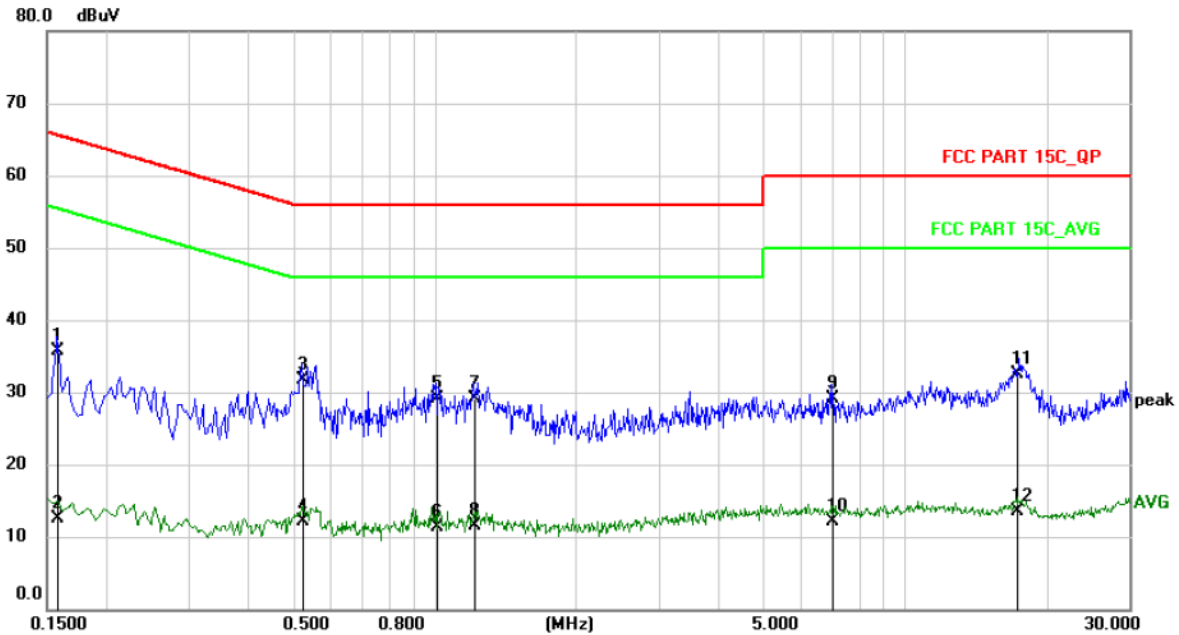
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1740	17.30	20.60	37.90	64.77	-26.87	QP	
2	0.1740	-8.10	20.60	12.50	54.77	-42.27	AVG	
3	0.2340	14.00	20.60	34.60	62.31	-27.71	QP	
4	0.2340	-8.10	20.60	12.50	52.31	-39.81	AVG	
5 *	0.5540	13.10	20.60	33.70	56.00	-22.30	QP	
6	0.5540	-7.10	20.60	13.50	46.00	-32.50	AVG	
7	1.3420	8.29	20.61	28.90	56.00	-27.10	QP	
8	1.3420	-9.51	20.61	11.10	46.00	-34.90	AVG	
9	5.4300	8.25	20.65	28.90	60.00	-31.10	QP	
10	5.4300	-8.05	20.65	12.60	50.00	-37.40	AVG	
11	17.7739	10.68	20.82	31.50	60.00	-28.50	QP	
12	17.7739	-7.72	20.82	13.10	50.00	-36.90	AVG	

M/N: GBMSTPR39	Testing Voltage: AC 120V / 60Hz
Phase: N	Detector: QP & AVG
Test Mode: 1	

## Conducted Emission Measurement

Date: 2024/3/15

Time: 9:36:52



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.1580	15.15	20.55	35.70	65.57	-29.87	QP	
2	0.1580	-7.95	20.55	12.60	55.57	-42.97	AVG	
3 *	0.5220	11.23	20.57	31.80	56.00	-24.20	QP	
4	0.5220	-8.37	20.57	12.20	46.00	-33.80	AVG	
5	1.0100	8.63	20.57	29.20	56.00	-26.80	QP	
6	1.0100	-9.17	20.57	11.40	46.00	-34.60	AVG	
7	1.2140	8.63	20.57	29.20	56.00	-26.80	QP	
8	1.2140	-9.07	20.57	11.50	46.00	-34.50	AVG	
9	6.9979	8.48	20.62	29.10	60.00	-30.90	QP	
10	6.9979	-8.42	20.62	12.20	50.00	-37.80	AVG	
11	17.3819	11.89	20.71	32.60	60.00	-27.40	QP	
12	17.3819	-7.21	20.71	13.50	50.00	-36.50	AVG	



## 13.2 Radiated Spurious Emissions and Restricted Bands Measurement

### LIMITS

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209)	
		$\mu\text{V/m}$	
0.009 ~ 0.490	300	2400/F(kHz)	
0.490 ~ 1.705	30	24000/F(kHz)	
1.705 ~ 30	30	30	
30 ~ 88	3	100	
88 ~ 216	3	150	
216 ~ 960	3	200	
Above 960	3	500	
Frequency range MHz	Distance Meters	Field Strengths Limit (15.249)	
		mV/m (Field strength of fundamental)	$\mu\text{V/m}$ (Field strength of Harmonics)
902 ~ 928	3	50	500
2400 ~ 2483.5	3	50	500
5725 ~ 5875	3	50	500
24000 ~ 2425000	3	250	2500

Remark: (1) Emission level (dB) $\mu\text{V}$  = 20 log Emission level  $\mu\text{V/m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

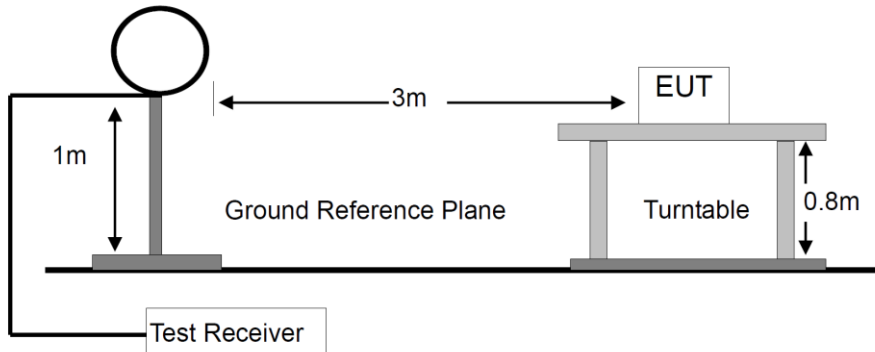
(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

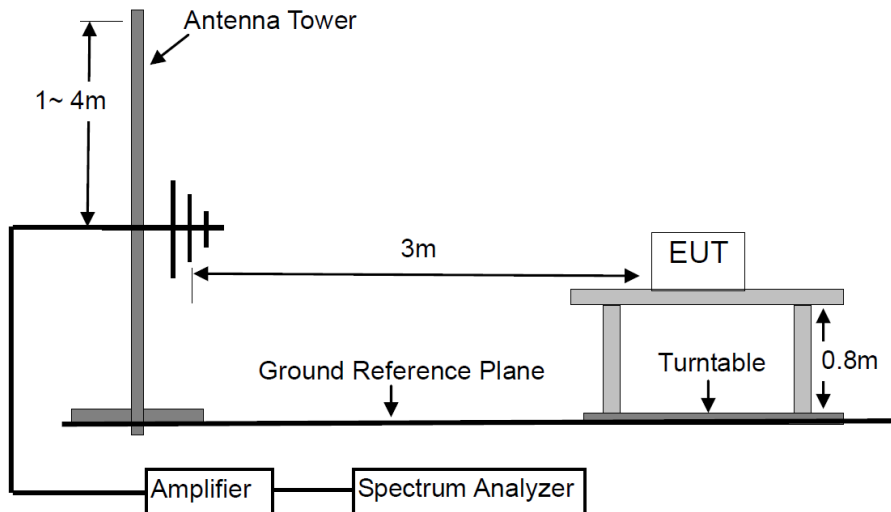
(5) §15.249(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

## BLOCK DIAGRAM OF TEST SETUP

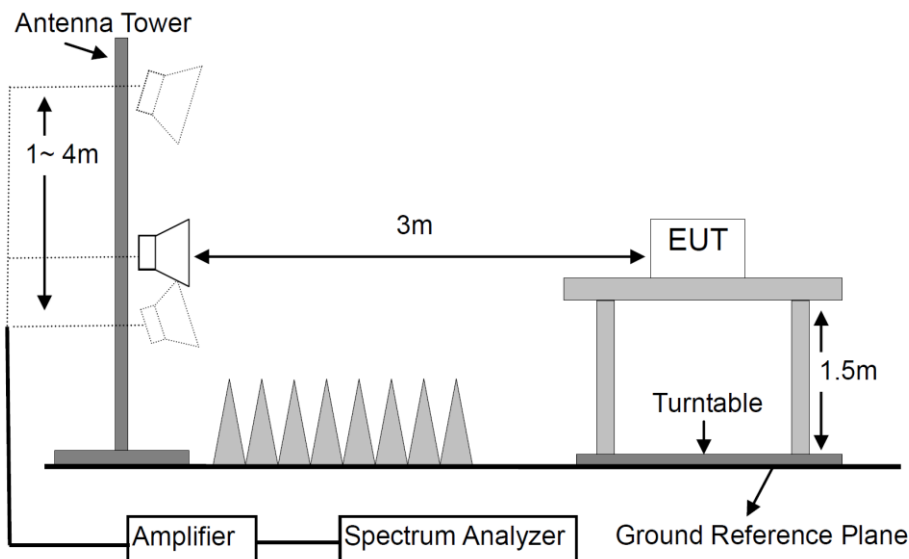
For Radiated Emission below 30MHz



For Radiated Emission 30-1000MHz



For Radiated Emission Above 1000MHz.



## TEST PROCEDURES

- a. Below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room.
- b. For the radiated emission test above 1GHz:  
The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
- f. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Detector	Resolution Bandwidth	Video Bandwidth
0.09 to 0.15	QP & AVG	200 Hz	1 kHz
0.15 to 30	QP & AVG	10 kHz	30 kHz
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

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## TEST RESULTS

PASS

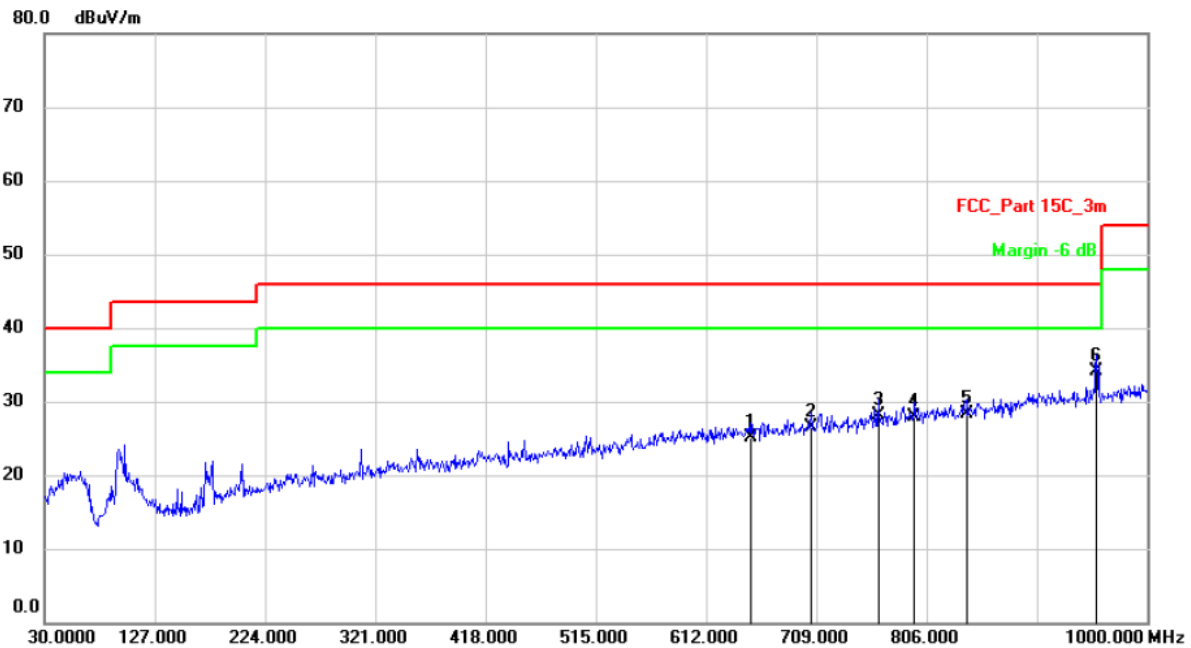
Please refer to the following pages.

M/N: GBMSTPR39	Testing Voltage: AC 120V / 60Hz
Polarization: Horizontal	Detector: QP
Test Mode: 1	Distance: 3m

## Radiated Emission Measurement

Date: 2024/3/15

Time: 2:30:06



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		650.8000	23.79	1.31	25.10	46.00	-20.90	QP
2		704.1500	24.25	2.25	26.50	46.00	-19.50	QP
3		763.3200	24.92	3.28	28.20	46.00	-17.80	QP
4		795.3300	24.02	3.88	27.90	46.00	-18.10	QP
5		840.9200	23.75	4.65	28.40	46.00	-17.60	QP
6	*	955.3800	27.91	6.29	34.20	46.00	-11.80	QP

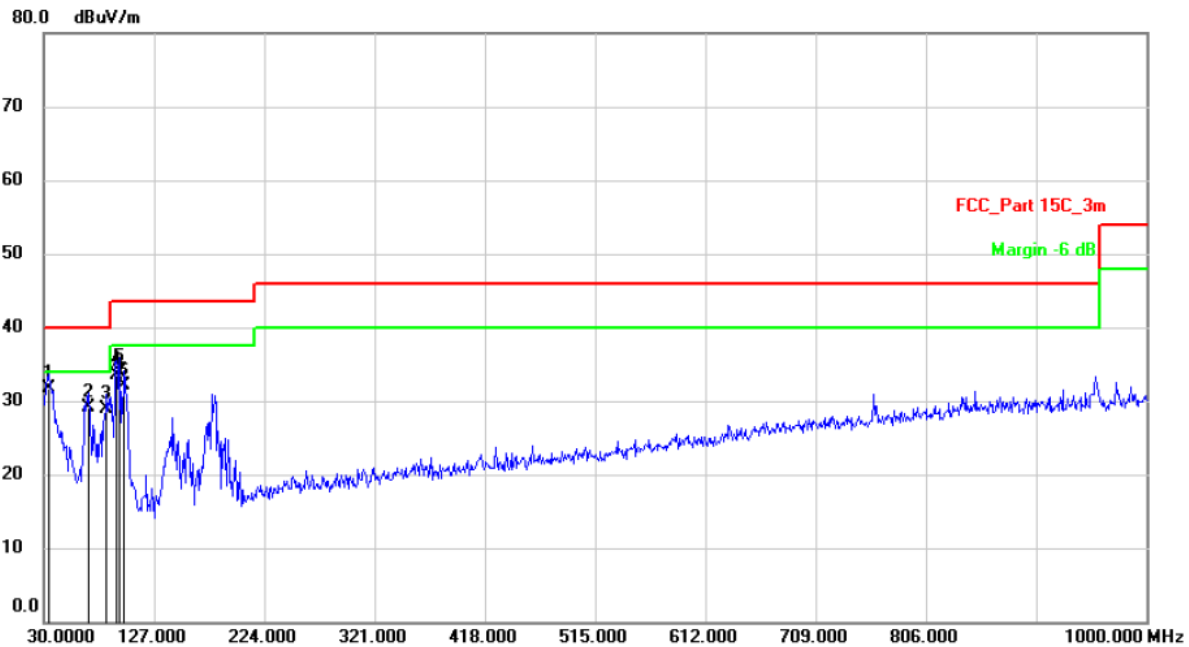
Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

M/N: GBMSTPR39	Testing Voltage: AC 120V / 60Hz
Polarization: Vertical	Detector: QP
Test Mode: 1	Distance: 3m

## Radiated Emission Measurement

Date: 2024/3/15

Time: 2:37:14



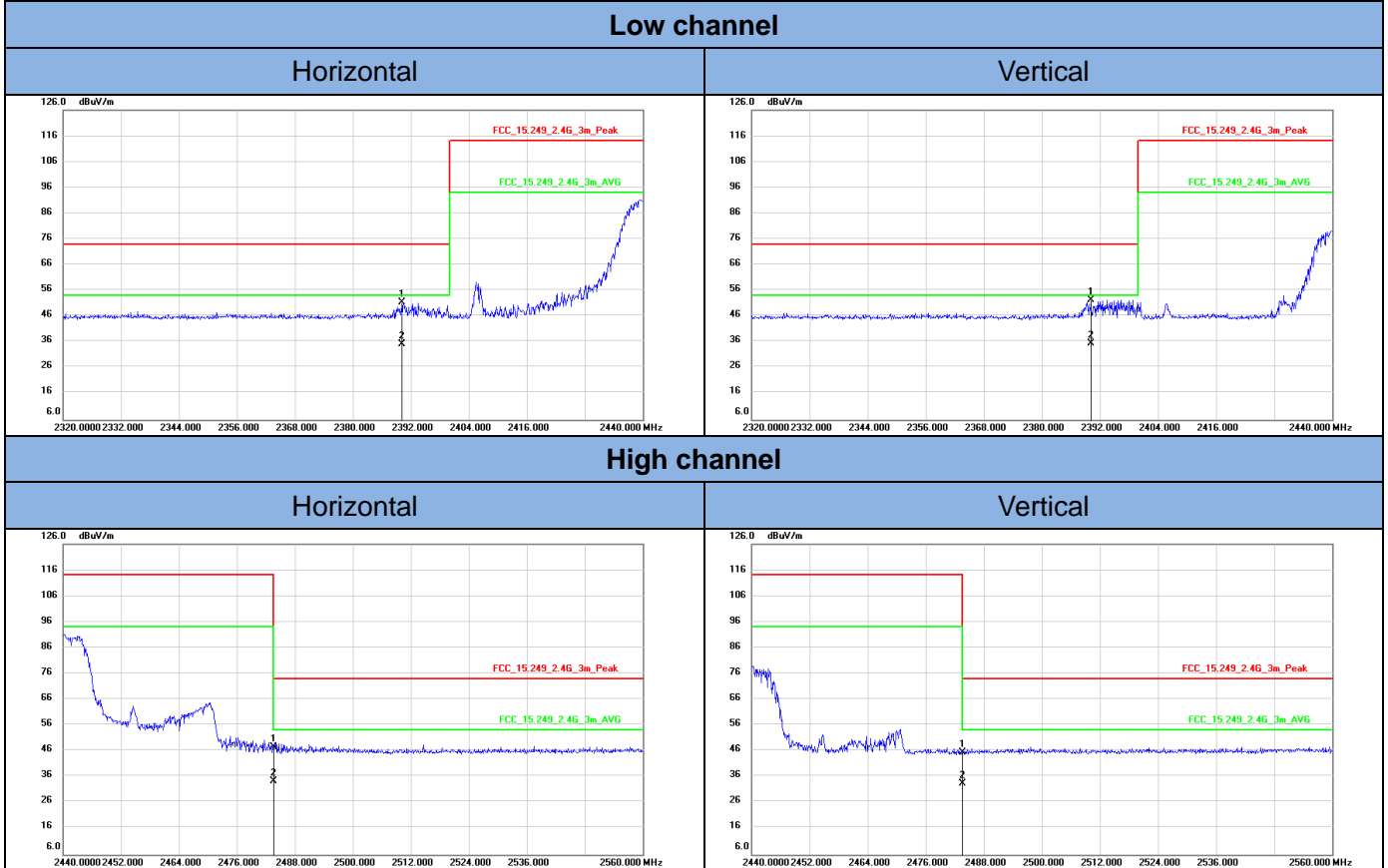
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	34.8500	40.86	-9.16	31.70	40.00	-8.30	QP	
2		69.7699	39.67	-10.47	29.20	40.00	-10.80	QP	
3		85.2900	39.62	-10.72	28.90	40.00	-11.10	QP	
4		94.0199	42.96	-9.46	33.50	43.50	-10.00	QP	
5		96.9300	42.79	-8.89	33.90	43.50	-9.60	QP	
6		100.8100	40.64	-8.54	32.10	43.50	-11.40	QP	

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

Modulation: GFSK				Test Result: PASS			Test frequency range: 1-25GHz			
Freq. (MHz)	Ant. Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV/m)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode: TX Mode										
2440.000	V	84.84	48.47	0.13	84.97	48.60	114.00	94.00	-29.03	-45.40
4880.000	V	45.69	32.91	6.32	52.01	39.23	74.00	54.00	-21.99	-14.77
7320.000	V	46.46	33.53	10.44	56.90	43.97	74.00	54.00	-17.10	-10.03
---										
2440.000	H	90.54	47.55	0.13	90.67	47.68	114.00	94.00	-23.33	-46.32
4880.000	H	45.33	31.98	6.32	51.65	38.30	74.00	54.00	-22.35	-15.70
7320.000	H	47.60	34.50	10.44	58.04	44.94	74.00	54.00	-15.96	-9.06
Remark: Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits.										

Band edge										
2390.000	H	51.24	35.25	0.09	51.33	35.34	74.00	54.00	-22.67	-18.66
2390.000	V	52.30	35.35	0.09	52.39	35.44	74.00	54.00	-21.61	-18.56
2483.500	H	47.16	33.99	0.34	47.50	34.33	74.00	54.00	-26.50	-19.67
2483.500	V	45.03	33.06	0.34	45.37	33.40	74.00	54.00	-28.63	-20.60

Note: Other band edge, the emissions are lower than 20dB below the allowable limit.





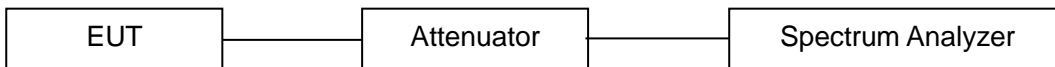
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### 13.3 20dB Bandwidth Measurement

#### LIMITS

There is no limit.

#### BLOCK DIAGRAM OF TEST SETUP



#### TEST PROCEDURES

The 20dB bandwidth of the emission was contained within the frequency band designated which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered, FCC Rule 15.215(c):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. Use the spectrum 20dB down delta function to measure the bandwidth.

#### TEST RESULTS

PASS

Please refer to the following table.

GFSK			
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
1	2440	7.413	PASS
2440MHz			



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## 13.4 Antenna Requirement

### STANDARD APPLICABLE

According to of FCC part 15C 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.

### ANTENNA CONNECTED CONSTRUCTION

The antenna is PCB antenna that no antenna other than furnished by the responsible party shall be used with the device, and the best case gain of the antenna is 1.9 dBi, Therefore, the antenna is considered to meet the requirement.

#### 14. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	Mar. 13, 2024	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	Mar. 23, 2024	2 Year
3.	Spectrum Analyzer	Keysight	N9020A	MY50510314	Mar. 13, 2024	1 Year
4.	Spectrum Analyzer	Keysight	N9020A	MY54200831	Mar. 13, 2024	1 Year
5.	Spectrum Analyzer	Keysight	N9020B	1215146	Mar. 13, 2024	1 Year
6.	Horn Antenna	COM-Power	AH-840	10100020	Mar. 23, 2024	2 Year
7.	Power Sensor	DARE	RPR3006W	15I00041SNO 64	Mar. 13, 2024	1 Year
8.	Horn Antenna	COM-Power	AH-118	071078	Mar. 23, 2024	2 Year
9.	Pre-Amplifier	HP	HP 8449B	3008A00964	Mar. 13, 2024	1 Year
10.	Pre-Amplifier	HP	HP 8447D	1145A00203	Mar. 13, 2024	1 Year
11.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	Mar. 23, 2024	2 Year
12.	Test Receiver	Rohde & Schwarz	ESCI	101152	Mar. 13, 2024	1 Year
13.	L.I.S.N	Rohde & Schwarz	ENV 216	101317	Mar. 13, 2024	1 Year
14.	RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	Mar.13, 2024	1 Year
15.	Temporary antenna connector	TESCOM	SS402	N/A	N/A	N/A
16.	Test Software	EZ	EZ_EM_C_03A1	N/A	N/A	N/A

Note: For photographs of EUT and measurement, please refer to appendix in separate documents.

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