

Report No.: GZCR220400052402

Page: 1 of 64 FCC ID: Y22-S6PPY

## TEST REPORT

**Application No.:** GZCR2204000524AT **Applicant:** SKULLCANDY, INC.

Address of Applicant: 6301 N Landmark Dr Park City UT 84098, Utah United States of America

Manufacturer: SKULLCANDY, INC.

Address of Manufacturer: 6301 N Landmark Dr Park City UT 84098, Utah United States of America

**Equipment Under Test (EUT):** 

EUT Name: PLYR
Model No.: S6PPY
Trade Mark:

Skullcandy

Standard(s): 47 CFR Part 15, Subpart C 15.247

**Date of Receipt:** 2022-04-25

**Date of Test:** 2022-04-26 to 2022-05-09

**Date of Issue:** 2022-05-18

Test Result: Pass\*

Kobe Jian EMC Laboratory Manager



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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



Report No.: GZCR220400052402

Page: 2 of 64

	Revision Record						
Version	Version Chapter Date Modifier Remark						
01		2022-05-18		Original			

Authorized for issue by		
	Cof Vu	
	Curry Wu/Project Engineer	
	Riday Live	
	Ricky Liu/Reviewer	



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Report No.: GZCR220400052402

Page: 3 of 64

### 2 Test Summary

Radio Spectrum Technical Requirement					
Item Standard Method Requirement Resu					
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass	

Radio Spectrum Matter Part							
Item	Standard	Method	Requirement	Result			
Conducted Emissions at AC Power Line (150kHz-30MHz)		ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass			
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1.3	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass			
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass			
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass			
Conducted Band Edges Measurement	47 CFR Part 15,	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Conducted Spurious Emissions	Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			

#### Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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Report No.: GZCR220400052402

Page: 4 of 64

### 3 Contents

			Page
1	Cover	Page	1
2	Toct S	Summary	4
_	1621.3	buillilary	
3	Conte	nts	
4	Conor	al Information	4
4			
		Details of E.U.T.	
		Description of Support Units	
		est Location	
		est Eocalion	
		Deviation from Standards	
		Abnormalities from Standard Conditions	
5	Equip	ment List	c
,	Equip	ment List	
6	Radio	Spectrum Technical Requirement	13
	6.1 A	Antenna Requirement	13
	6.1.1	Test Requirement:	13
	6.1.2	Conclusion	13
7	Radio	Spectrum Matter Test Results	14
		Conducted Emissions at AC Power Line (150kHz-30MHz)	
	7.1.1	E.U.T. Operation	
	7.1.2	Test Mode Description	
	7.1.3	Test Setup Diagram	
	7.1.4	Measurement Procedure and Data	
		Conducted Peak Output Power	
	7.2.1	E.U.T. Operation	
	7.2.2	Test Mode Description	
	7.2.3 7.2.4	Test Setup Diagram	
		Measurement Procedure and Data  #############################	
	7.3 N	E.U.T. Operation	
		Test Mode Description	
	7.3.3	Test Setup Diagram	
	7.3.4	Measurement Procedure and Data	
	7.4 F	Power Spectrum Density	21
	7.4.1	E.U.T. Operation	21
	7.4.2	Test Mode Description	
	7.4.3	Test Setup Diagram	
	7.4.4	Measurement Procedure and Data	
		Conducted Band Edges Measurement	
	7.5.1 7.5.2	E.U.T. Operation	
	7.5.2 7.5.3	Test Mode Description Test Setup Diagram	
	7.5.3 7.5.4	Measurement Procedure and Data	



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Report No.: GZCR220400052402

Page: 5 of 64

7	<b>'</b> .6	Conducted Spurious Emissions	24
	7.6.1	E.U.T. Operation	
	7.6.2	Test Mode Description	24
	7.6.3	Test Setup Diagram	25
	7.6.4	Measurement Procedure and Data	25
7	<b>'</b> .7	Radiated Emissions which fall in the restricted bands	26
	7.7.1	E.U.T. Operation	26
	7.7.2	Test Mode Description	26
	7.7.3	Test Setup Diagram	
	7.7.4	Measurement Procedure and Data	27
7	<b>'</b> .8	Radiated Spurious Emissions (Below 1GHz)	32
	7.8.1	E.U.T. Operation	32
	7.8.2	Test Mode Description	
	7.8.3	Test Setup Diagram	
	7.8.4	Measurement Procedure and Data	
7	'.9	Radiated Spurious Emissions (Above 1GHz)	
	7.9.1	E.U.T. Operation	
	7.9.2	Test Mode Description	
	7.9.3	Test Setup Diagram	
	7.9.4	Measurement Procedure and Data	38
8	Test	Setup Photo	45
9	EUT	Constructional Details (EUT Photos)	45
10	Appe	ndix	46



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Report No.: GZCR220400052402

Page: 6 of 64

### 4 General Information

#### 4.1 Details of E.U.T.

Power supply: DC 3.7V by rechargeable Lithium Battery and recharged by DC 5V.

Cable(s): AXU in cable: 153cm, Unshielded

USB type-C: 185cm, Unshielded MIC Cable:13.5cm, Unshielded

Operation Frequency: 2402MHz to 2480MHz

Bluetooth Version: V5.2
Modulation Type: GFSK
Number of Channels: 40
Channel Spacing: 2MHz
Date Rate: 1Mbps

Antenna Type: PCB Antenna

Antenna Gain: 3.36dBi

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.	
Adapter	Apple	A1443	REF. No.SEA05D11D	

### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty		
Conducted Emissions at AC Power Line (150kHz-30MHz)	±2.76dB		
Conducted Peak Output Power	± 0.75dB		
Minimum 6dB Bandwidth	± 3%		
Power Spectrum Density	± 2.84dB		
Conducted Band Edges Measurement	± 0.75dB		
Conducted Spurious Emissions	± 0.75dB		
Radiated Emissions which fall in the restricted bands	±5.08dB (1GHz-6GHz); ±5.14dB (above 6GHz)		
Radiated Spurious Emissions (Below 1GHz)	±5.06dB (3m);±4.46dB (10m)		
Radiated Spurious Emissions (Above 1GHz)	±5.08dB (1GHz-6GHz); ±5.14dB (above 6GHz)		



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Report No.: GZCR220400052402

Page: 7 of 64

#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory, 198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

### 4.5 Test Facility

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

### • NVLAP (Lab Code: 200611-0)

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

#### ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

### • SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

#### CNAS (Lab Code: L0167)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

#### FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

#### • ISED (Registration No.: 4620B, CAB identifier: CN0052)

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

#### VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

#### • CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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Report No.: GZCR220400052402

Page: 8 of 64

### 4.6 Deviation from Standards

None

### 4.7 Abnormalities from Standard Conditions



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Report No.: GZCR220400052402

Page: 9 of 64

## 5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A	
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-12-23	2022-12-22	
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2021-09-24	2022-09-23	
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08	
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A	
EMI Test Receiver(9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2021-06-01	2022-05-31	

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15	
6dB Attenuator	HP	8491A	EMC2062	2022-04-14	2023-04-13	
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	

Minimum 6dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15	
6dB Attenuator	HP	8491A	EMC2062	2022-04-14	2023-04-13	
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	

Power Spectrum Densit	у				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-04-14	2023-04-13
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A



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Report No.: GZCR220400052402

Page: 10 of 64

Conducted Band Edges Measurement							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15		
6dB Attenuator	HP	8491A	EMC2062	2022-04-14	2023-04-13		
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01		
Test Software	TST	V2.0	GZE100-78	N/A	N/A		

Conducted Spurious Emissions						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15	
6dB Attenuator	HP	8491A	EMC2062	2022-04-14	2023-04-13	
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	

Radiated Emissions wh	ich fall in the restricte	ed bands			
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29



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Report No.: GZCR220400052402

Page: 11 of 64

Radiated Spurious Emissions (Below 1GHz)						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EMI Test Receiver(10Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16	
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08	
Trilog Broadband Antenna(25MHz-1GHz)- Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2022-02-22	2025-02-21	
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18	
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-12-17	2022-12-16	
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19	
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A	
EMI Test Receiver(1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25	
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2021-12-26	2023-12-25	

Radiated Spurious Emis	ssions (Above 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16	
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08	
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24	
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16	
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16	
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19	
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31	
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15	
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A	
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28	
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27	



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Report No.: GZCR220400052402

Page: 12 of 64

Microwave Broadband Preamplifier	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29
(18-40GHz)					

General used equipme	nt				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05



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Report No.: GZCR220400052402

Page: 13 of 64

### 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

#### 6.1.2 Conclusion

#### 15.203 Requirement:

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of 15.211, 15.213, 15.217, 15.219, 15.221, or 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### 15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **EUT Antenna:**

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.36dBi.

Antenna location: Refer to internal photo.



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Report No.: GZCR220400052402

Page: 14 of 64

### 7 Radio Spectrum Matter Test Results

### 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207 Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Fraguency of emission/MU=)	Conducted limit(dΒμV)				
Frequency of emission(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.					
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz					

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 21.6 °C Humidity: 52.3 % RH Atmospheric Pressure: 1020 mbar

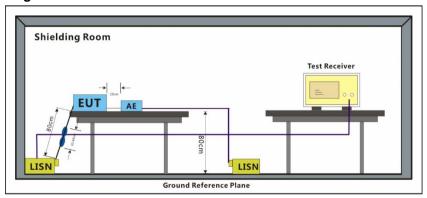
### 7.1.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 05 Charge + TX mode(1Mbps)\_Keep the EUT in charging and continuously

transmitting mode with GFSK modulation.

#### 7.1.3 Test Setup Diagram



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Report No.: GZCR220400052402

Page: 15 of 64

#### 7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50 \text{ohm}/50 \mu\text{H} + 5 \text{ohm}$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor



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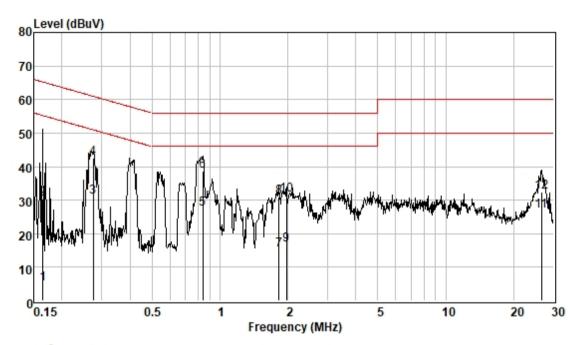
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Report No.: GZCR220400052402

Page: 16 of 64

Test Mode: 05; Line: Live line Modulation:GFSK; ; Channel:Low



Pol :LINE Mode : Model :

		Read	Cable	LISN	Measured	Limit	0ver	
	Frequenc	Level	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.165	-4.65	0.06	9.55	4.96	55.21	-50.25	Average
2	0.165	20.84	0.06	9.55	30.45	65.21	-34.76	QP
3	0.274	21.32	0.06	9.57	30.95	50.98	-20.03	Average
4	0.274	32.90	0.06	9.57	42.53	60.98	-18.45	QP
5	0.839	17.81	0.07	9.60	27.48	46.00	-18.52	Average
6	0.839	28.88	0.07	9.60	38.55	56.00	-17.45	QP
7	1.829	5.53	0.11	9.60	15.24	46.00	-30.76	Average
8	1.829	21.12	0.11	9.60	30.83	56.00	-25.17	QP
9	1.970	6.97	0.12	9.60	16.69	46.00	-29.31	Average
10	1.970	21.78	0.12	9.60	31.50	56.00	-24.50	QP
11	26.558	16.55	0.42	9.77	26.74	50.00	-23.26	Average
12	26.558	22.17	0.42	9.77	32.36	60.00	-27.64	QP



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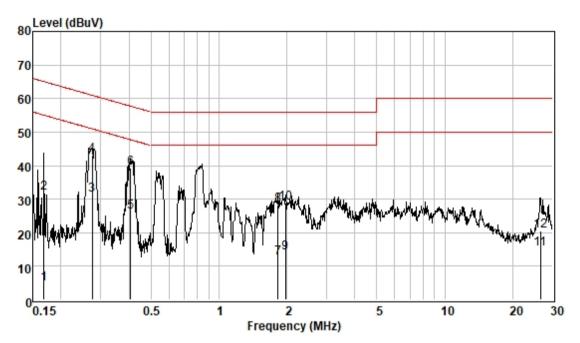
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Report No.: GZCR220400052402

Page: 17 of 64

Test Mode: 05; Line: Neutral Line Modulation: GFSK; ; Channel:Low



Pol :NEUTRAL

Mode : Model :

	Frequenc	Read Level	Cable Loss	LISN Factor	Measured Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.169	-4.70	0.06	9.54	4.90	55.03	-50.13	Average
2	0.169	22.20	0.06	9.54	31.80	65.03	-33.23	QP
3	0.274	21.57	0.06	9.57	31.20	50.98	-19.78	Average
4	0.274	33.41	0.06	9.57	43.04	60.98	-17.94	QP
5	0.406	16.65	0.06	9.58	26.29	47.73	-21.44	Average
6	0.406	29.75	0.06	9.58	39.39	57.73	-18.34	QP
7	1.829	2.90	0.11	9.59	12.60	46.00	-33.40	Average
8	1.829	18.47	0.11	9.59	28.17	56.00	-27.83	QP
9	1.970	4.36	0.12	9.59	14.07	46.00	-31.93	Average
10	1.970	19.12	0.12	9.59	28.83	56.00	-27.17	QP
11	26.558	4.69	0.42	9.91	15.02	50.00	-34.98	Average
12	26.558	10.24	0.42	9.91	20.57	60.00	-39.43	QP



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Report No.: GZCR220400052402

Page: 18 of 64

### 7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.1.3

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)		
	1 for ≥50 hopping channels		
902-928	0.25 for 25≤ hopping channels <50		
	1 for digital modulation		
	1 for ≥75 non-overlapping hopping channels		
2400-2483.5	0.125 for all other frequency hopping systems		
	1 for digital modulation		
5725-5850	1 for frequency hopping systems and digital modulation		

#### 7.2.1 E.U.T. Operation

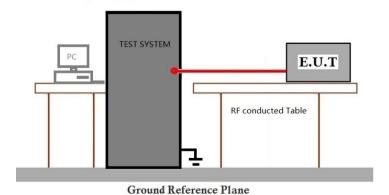
Operating Environment:

Temperature: 21.5 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 mbar

#### 7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

### 7.2.3 Test Setup Diagram





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Page: 19 of 64

#### 7.2.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR220400052402

Page: 20 of 64

#### 7.3 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:

≥500 kHz

#### 7.3.1 E.U.T. Operation

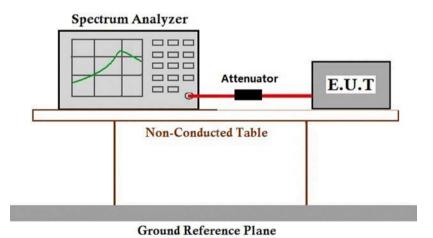
Operating Environment:

Temperature: 21.6 °C Humidity: 52.3 % RH Atmospheric Pressure: 1020 mbar

#### 7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

#### 7.3.3 Test Setup Diagram



### 7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR220400052402

Page: 21 of 64

### 7.4 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

#### 7.4.1 E.U.T. Operation

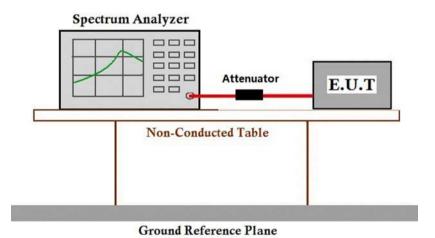
Operating Environment:

Temperature: 21.5 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 mbar

#### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

#### 7.4.3 Test Setup Diagram



### 7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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Page: 22 of 64

### 7.5 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 11.13.3.2

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 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).

#### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 21.6 °C Humidity: 52.3 % RH Atmospheric Pressure: 1020 mbar

#### 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



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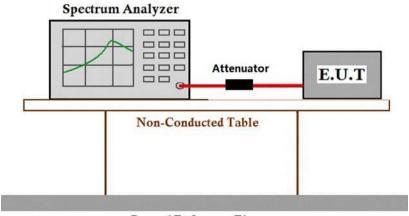
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Page: 23 of 64

#### 7.5.3 Test Setup Diagram



Ground Reference Plane

#### 7.5.4 Measurement Procedure and Data

cable loss=0.9dB

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Page: 24 of 64

### 7.6 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 11.11

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 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).

#### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 21.6 °C Humidity: 52.3 % RH Atmospheric Pressure: 1020 mbar

#### 7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



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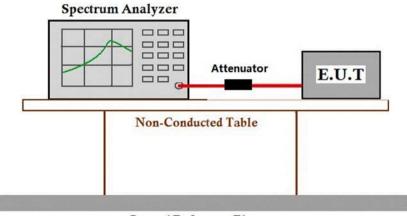
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Page: 25 of 64

#### 7.6.3 Test Setup Diagram



Ground Reference Plane

#### 7.6.4 Measurement Procedure and Data

cable loss=0.9dB

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Report No.: GZCR220400052402

Page: 26 of 64

#### 7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 21.3 °C Humidity: 51.7 % RH Atmospheric Pressure: 1020 mbar

#### 7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



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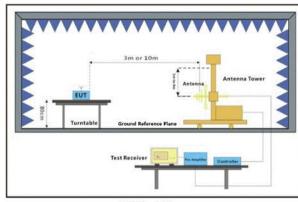
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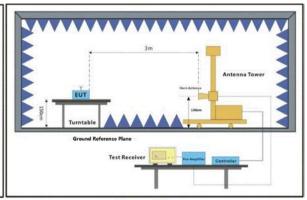


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Page: 27 of 64

#### 7.7.3 Test Setup Diagram





30MHz-1GHz

Above 1GHz

#### 7.7.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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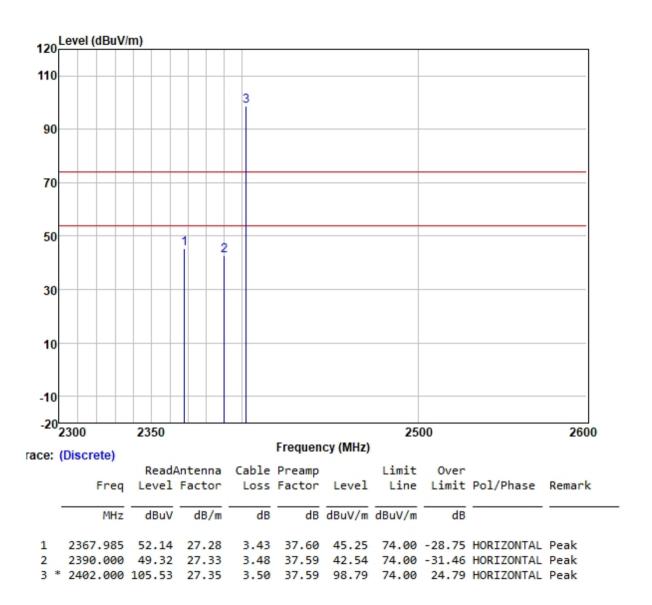
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Page: 28 of 64

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low





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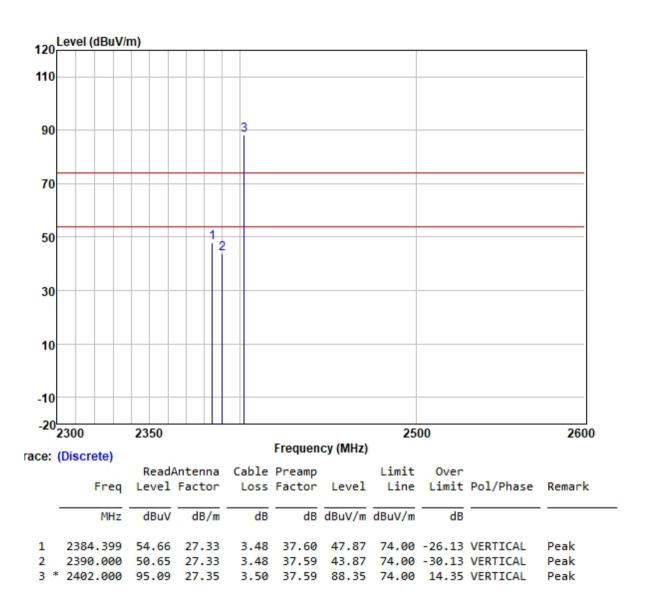
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Page: 29 of 64

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:Low





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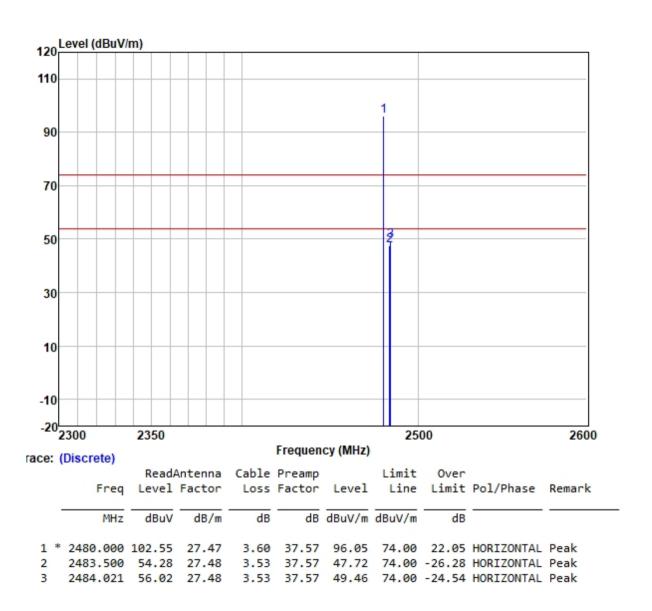
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Page: 30 of 64

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:High





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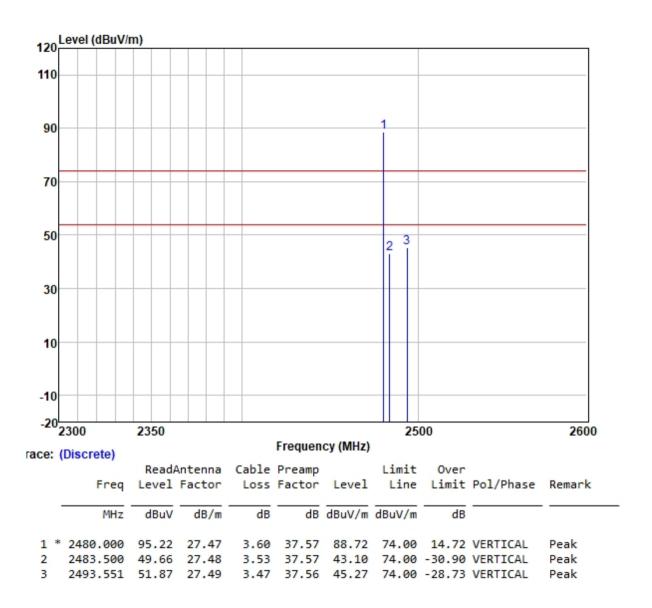
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Report No.: GZCR220400052402

Page: 31 of 64

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High





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Report No.: GZCR220400052402

Page: 32 of 64

### 7.8 Radiated Spurious Emissions (Below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C Humidity: 51.2 % RH Atmospheric Pressure: 1020 mbar

### 7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



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Report No.: GZCR220400052402

Page: 33 of 64

#### 7.8.3 Test Setup Diagram

#### 7.8.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height 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.
- d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

#### Remark:

- 1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



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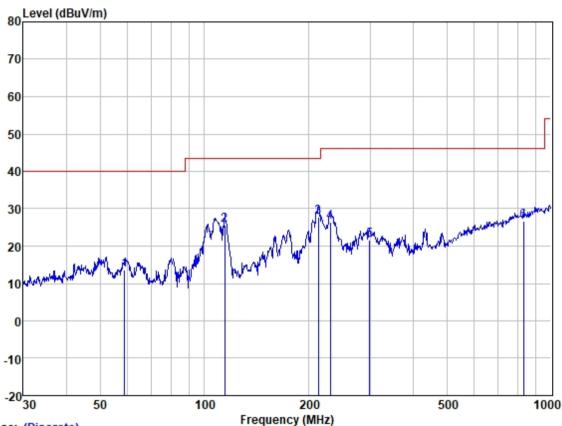
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Report No.: GZCR220400052402

Page: 34 of 64

Test Mode: 05; Polarity: Horizontal Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS
Job :
Model :
Power :
Test Mode : BLE

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	58.819	26.50	13.02	1.24	27.16	13.60	40.00	-26.40	HORIZONTAL	QP
2	114.515	40.30	10.45	1.82	27.05	25.52	43.50	-17.98	HORIZONTAL	QP
3	213.015	42.21	9.62	2.60	26.71	27.72	43.50	-15.78	HORIZONTAL	QP
4	230.907	39.82	10.53	2.73	26.69	26.39	46.00	-19.61	HORIZONTAL	QP
5	299.316	31.67	13.23	3.16	26.55	21.51	46.00	-24.49	HORIZONTAL	QP
6	833.317	25.51	22.63	6.38	27.98	26.54	46.00	-19.46	HORIZONTAL	QP



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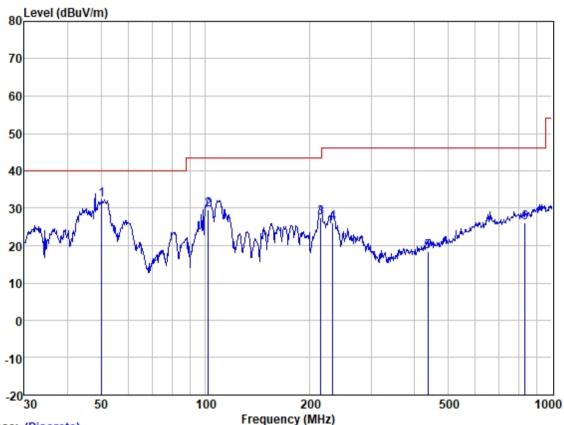
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Report No.: GZCR220400052402

Page: 35 of 64

Test Mode: 05; Polarity: Vertical Modulation: GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS Job : Model : Power : Test Mode : BLE

	Freq					Measured Level				Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	50.232	44.62	13.62	1.15	27.17	32.22	40.00	-7.78	VERTICAL	QP
2	102.001	46.03	8.94	1.74	27.08	29.63	43.50	-13.87	VERTICAL	QP
3	215.268	41.90	9.67	2.62	26.71	27.48	43.50	-16.02	VERTICAL	QP
4	232.532	39.37	10.73	2.73	26.68	26.15	46.00	-19.85	VERTICAL	QP
5	438.655	25.24	16.55	4.13	27.56	18.36	46.00	-27.64	VERTICAL	QP
6	836.244	24.87	22.66	6.46	27.97	26.02	46.00	-19.98	VERTICAL	QP



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Report No.: GZCR220400052402

Page: 36 of 64

### 7.9 Radiated Spurious Emissions (Above 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 21.3 °C Humidity: 51.7 % RH Atmospheric Pressure: 1020 mbar

#### 7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	05	Charge + TX mode(1Mbps)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.



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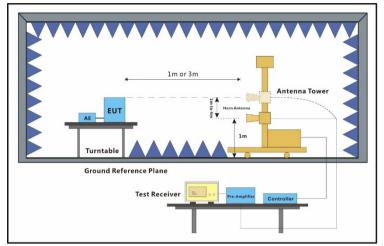
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Page: 37 of 64

### 7.9.3 Test Setup Diagram





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Report No.: GZCR220400052402

Page: 38 of 64

#### 7.9.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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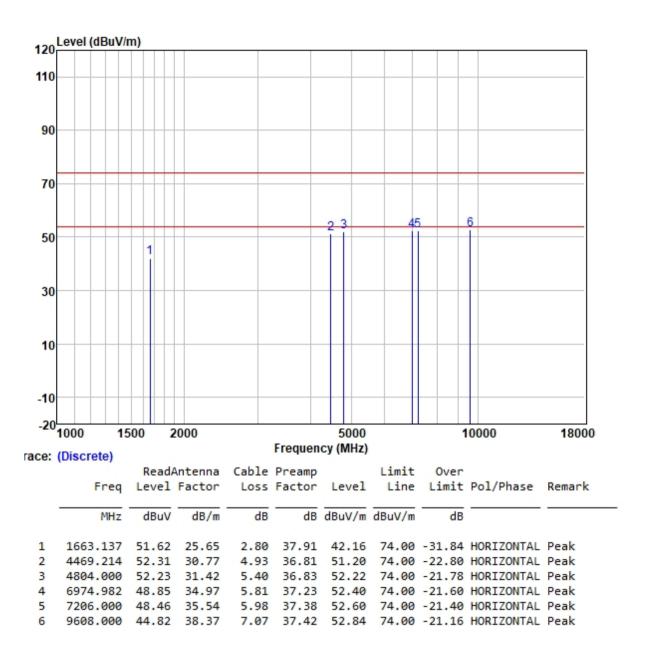
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Page: 39 of 64

Test Mode: 04; Polarity: Horizontal; Modulation: GFSK; ; Channel:Low





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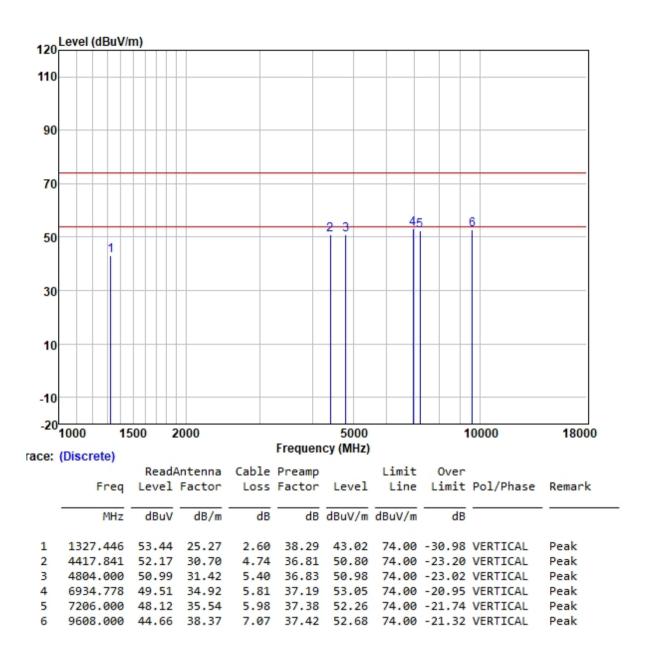
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Report No.: GZCR220400052402

Page: 40 of 64

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:Low





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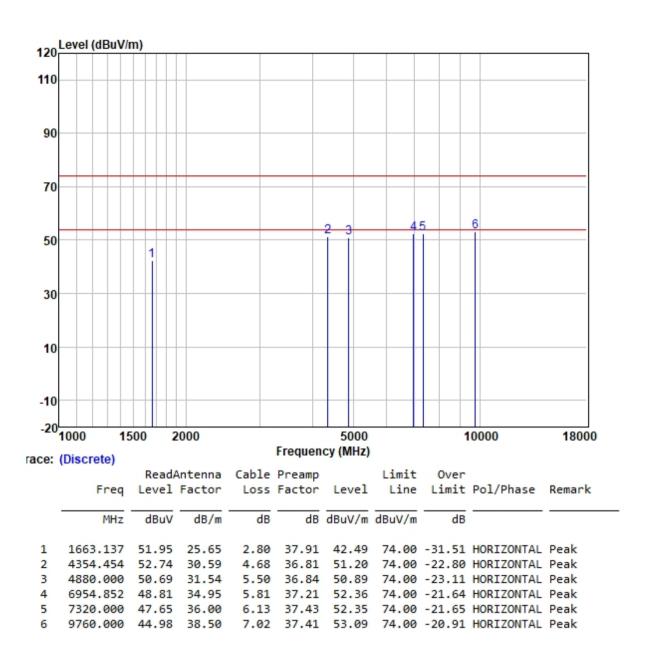
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Report No.: GZCR220400052402

Page: 41 of 64

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle





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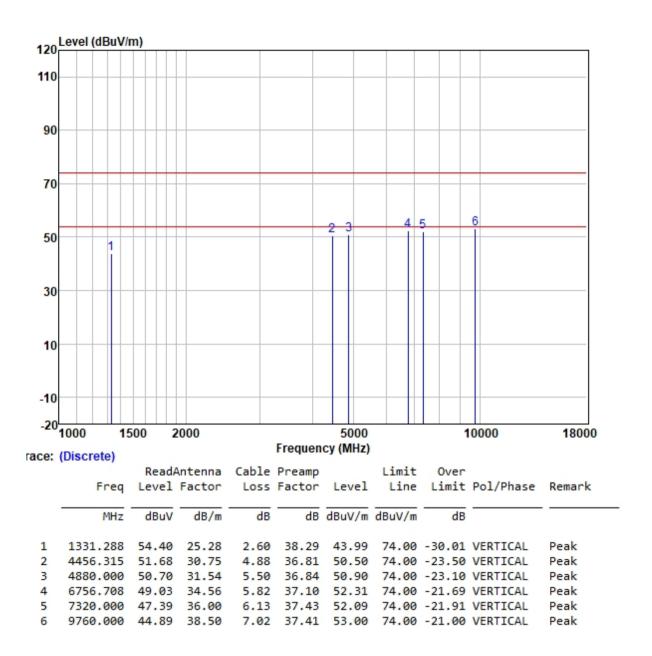
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Report No.: GZCR220400052402

Page: 42 of 64

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:middle





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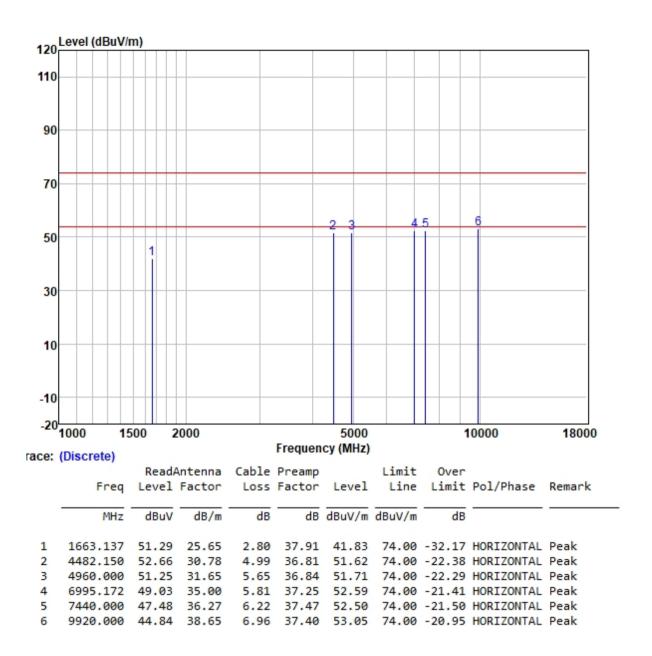
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Report No.: GZCR220400052402

Page: 43 of 64

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:High





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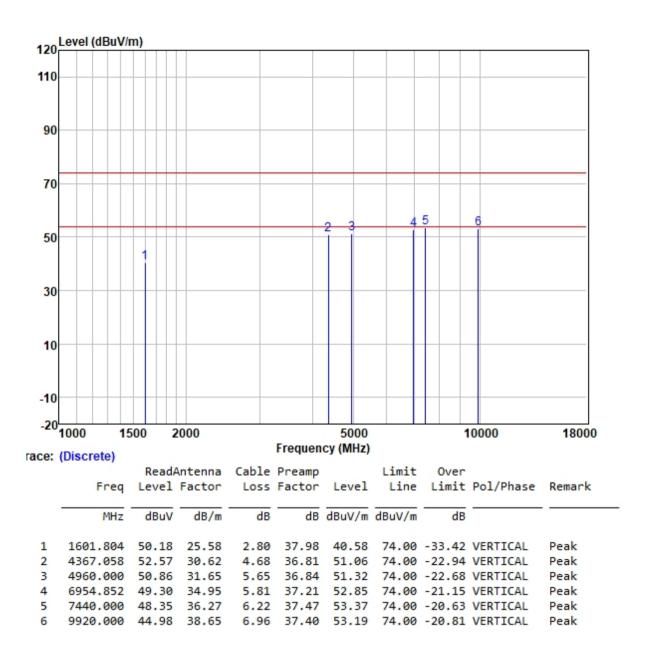
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Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High





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Report No.: GZCR220400052402

Page: 45 of 64

### 8 Test Setup Photo

Refer to Appendix - Setup Photos for GZCR2204000524AT

### 9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2204000524AT



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Report No.: GZCR220400052402

Page: 46 of 64

### 10 Appendix

1. Duty Cycle

1.1 Ant1

#### 1.1.1 Test Result

	Ant1								
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)		
	SISO	2402	0.390	0.625	62.40	2.05	0.00		
1M		2440	0.390	0.625	62.40	2.05	0.03		
		2480	0.390	0.625	62.40	2.05	0.00		



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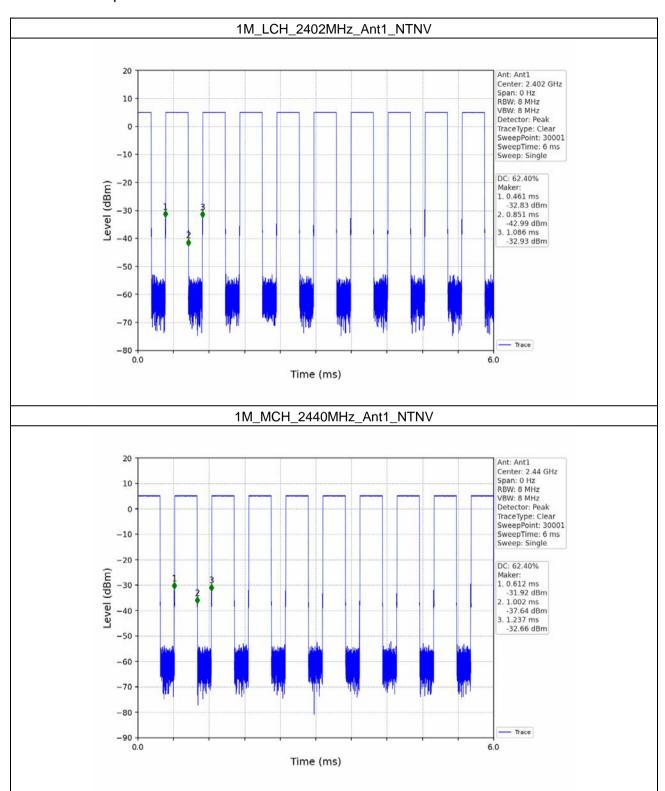
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Report No.: GZCR220400052402

Page: 47 of 64

### 1.1.2 Test Graph





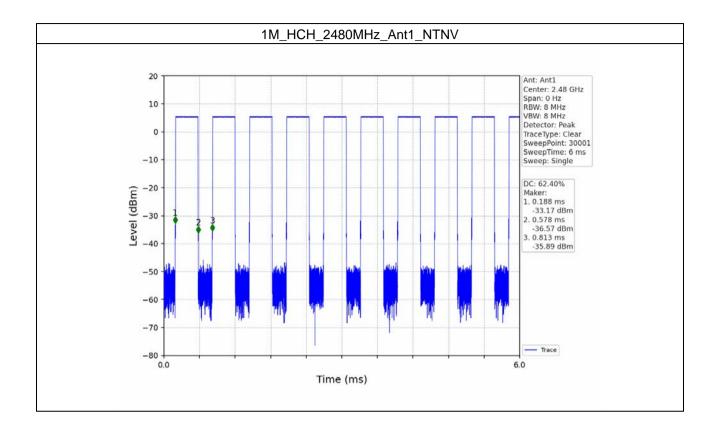
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Report No.: GZCR220400052402

Page: 49 of 64

### 2. Bandwidth

2.1 OBW

#### 2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)  Result	Verdict
1M	SISO	2402	1	1.043	Pass
		2440	1	1.043	Pass
		2480	1	1.043	Pass



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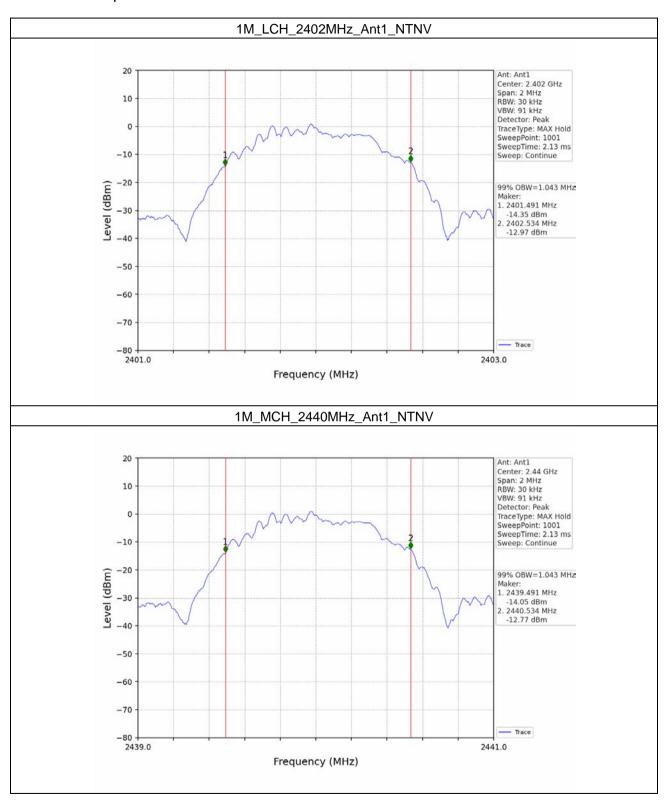
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### 2.1.2 Test Graph





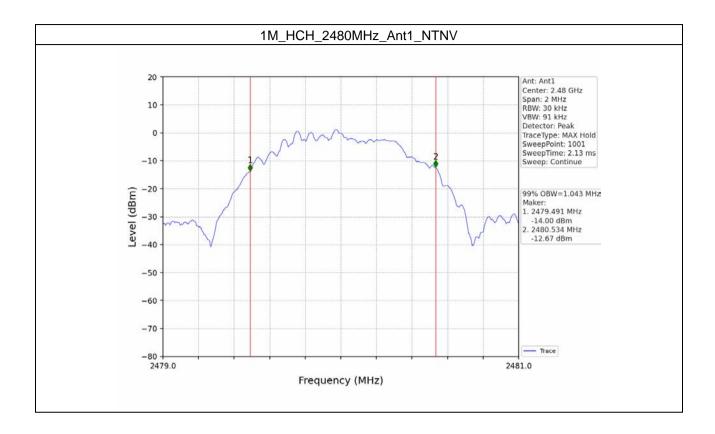
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### 2.2 6dB BW

#### 2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Mandiat
				Result	Limit	Verdict
1M	SISO	2402	1	0.719	>=0.5	Pass
		2440	1	0.720	>=0.5	Pass
		2480	1	0.719	>=0.5	Pass



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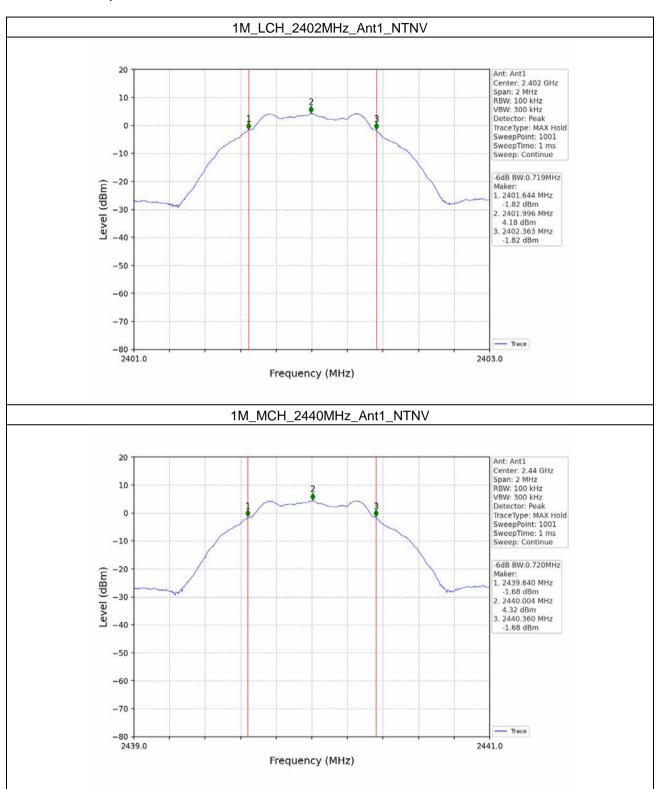
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### 2.2.2 Test Graph





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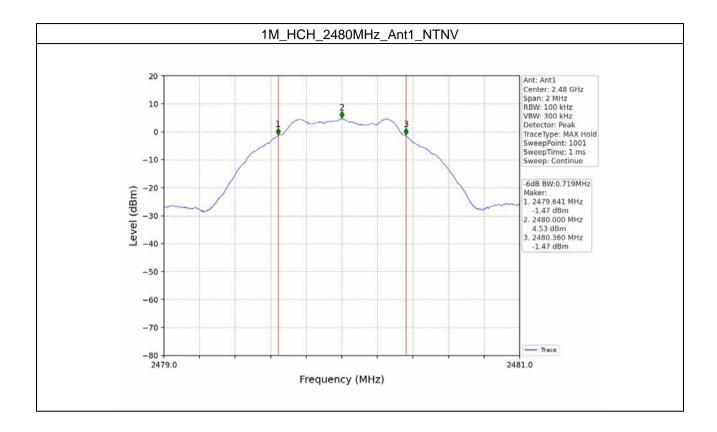
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Page: 55 of 64

### 3. Maximum Conducted Output Power

### 3.1 Power

#### 3.1.1 Test Result

Mada	TX	Frequency	Maximum Peak Conduc	Vordiet	
Mode	Туре	(MHz)	ANT1	Limit	Verdict
1M		2402	5.04	<=30	Pass
	SISO	2440	5.19	<=30	Pass
		2480	5.39	<=30	Pass

### 4. Maximum Power Spectral Density

### 4.1 PSD

#### 4.1.1 Test Result

Ī	Mada	TX	Frequency	Maximum PS	\/andiat		
	Mode	Type	(MHz)	ANT1	Limit	Verdict	
Ī	1M	SISO	2402	-10.21	<=8	Pass	
			2440	-10.06	<=8	Pass	
			2480	-9.83	<=8	Pass	



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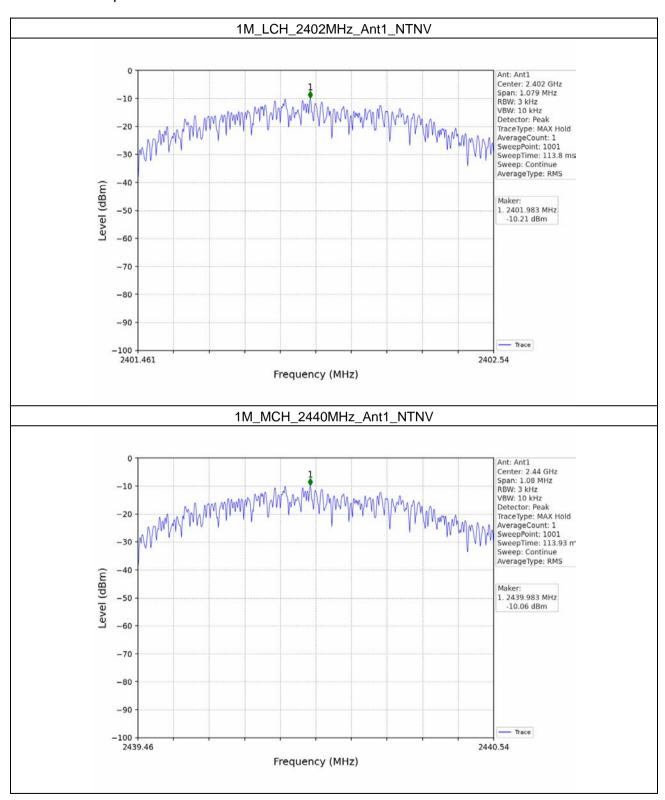
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### 4.1.2 Test Graph





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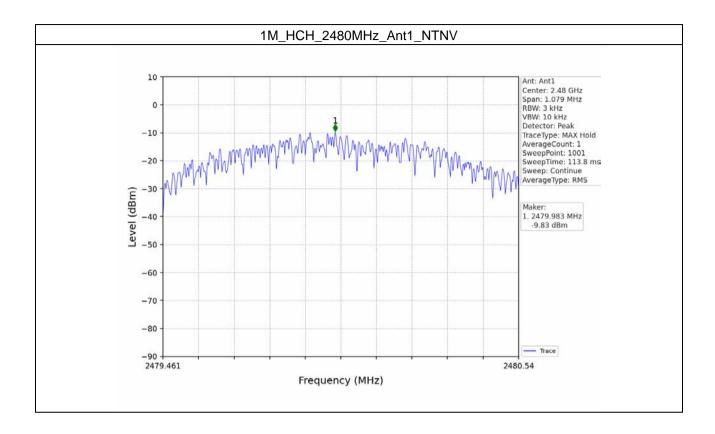
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Page: 58 of 64

### 5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

#### 5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
	SISO	2402	1	4.19
1M		2440	1	4.33
1101		2480	1	4.54



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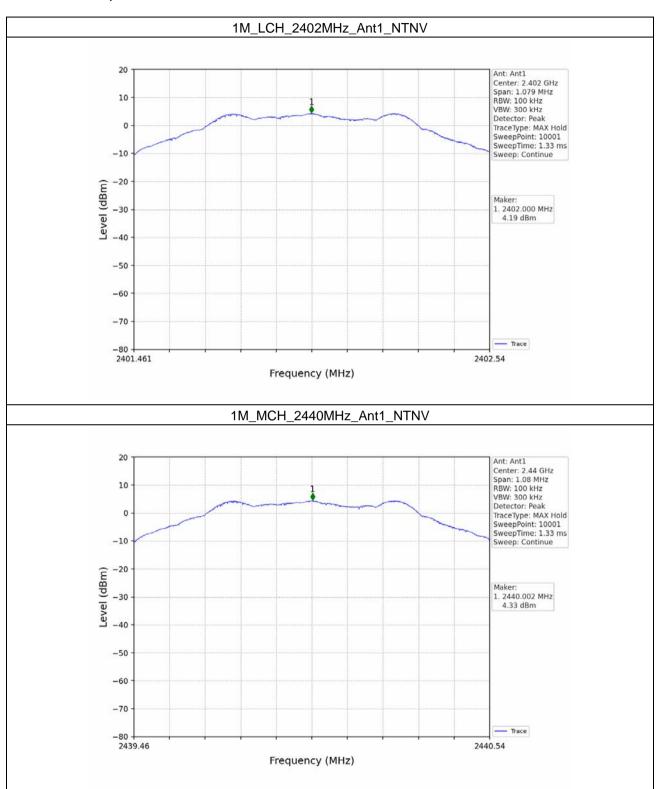
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Report No.: GZCR220400052402

Page: 59 of 64

### 5.1.2 Test Graph





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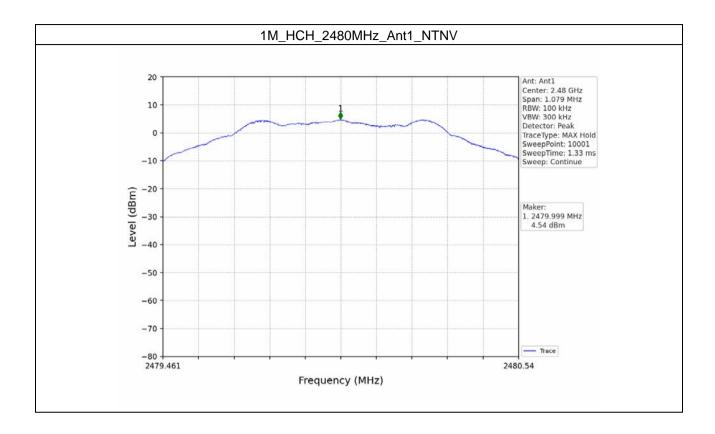
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Report No.: GZCR220400052402

Page: 60 of 64





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Report No.: GZCR220400052402

Page: 61 of 64

### 5.2 CSE

#### 5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	4.54	-15.46	Pass
		2440	1	4.54	-15.46	Pass
		2480	1	4.54	-15.46	Pass

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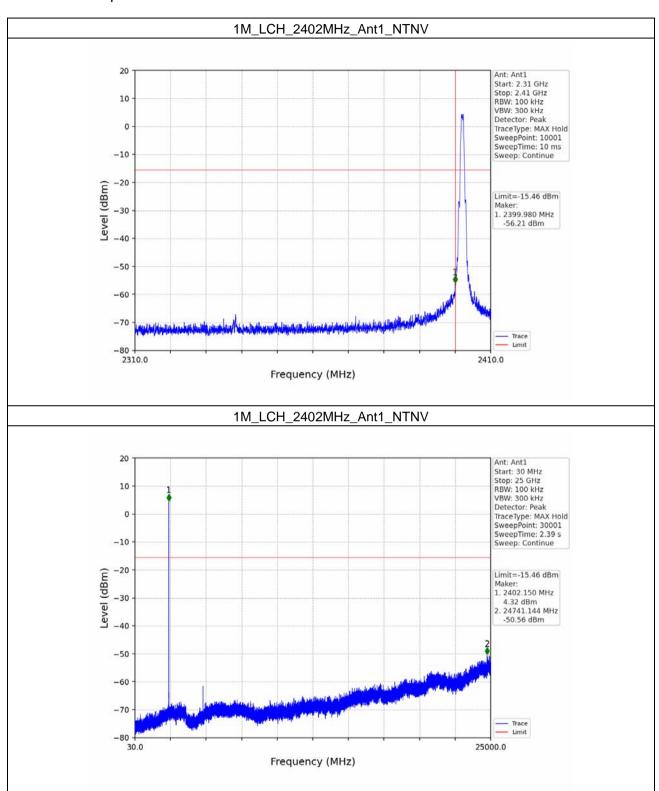
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Page: 62 of 64

### 5.2.2 Test Graph





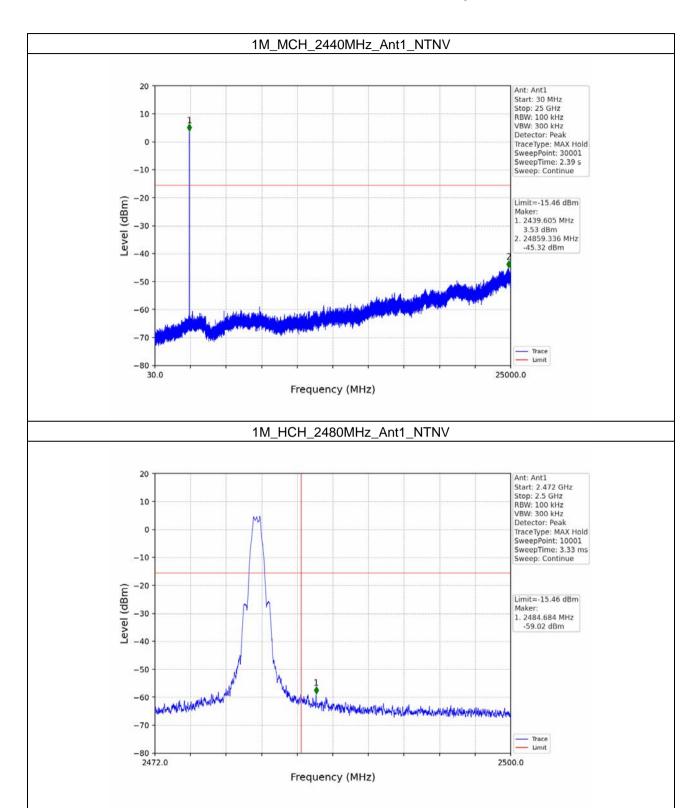
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Report No.: GZCR220400052402

Page: 63 of 64





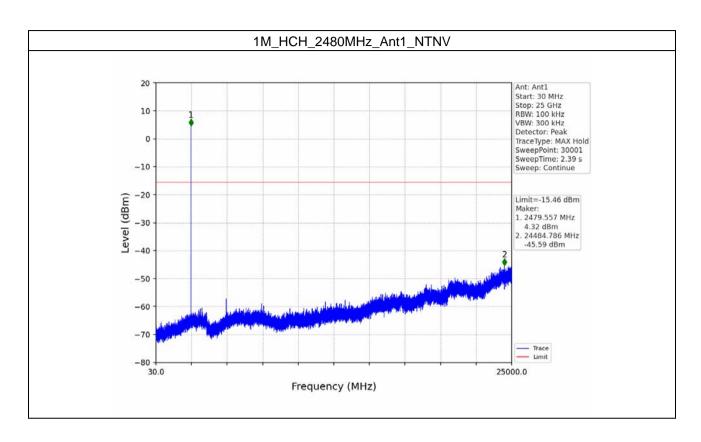
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Report No.: GZCR220400052402

Page: 64 of 64



- End of the Report -



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