

Report No.: GZCR210802083101

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FCC ID: 2AI2O-M209TKS

TEST REPORT

Application No.: GZCR2108020831AT

Applicant: Shenzhen Omni Intelligent Technology Co,.LTD

Address of Applicant: 11th Floor Block 31, Lianchuang Technical Zone, Bulan Road, Longgang

District, Shenzhen, P.R. China

Manufacturer: Shenzhen Omni Intelligent Technology Co,.LTD

Address of Manufacturer: 11th Floor Block 31, Lianchuang Technical Zone, Bulan Road, Longgang

District, Shenzhen, P.R. China

Factory: Shenzhen Omni Intelligent Technology Co,.LTD

Address of Factory: 11th Floor Block 31, Lianchuang Technical Zone, Bulan Road, Longgang

District, Shenzhen, P.R. China

Equipment Under Test (EUT):

EUT Name: Helmet locks Model No.: M209TKS

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

Date of Receipt: 2021-08-24

Date of Test: 2021-08-24 to 2021-08-26

Date of Issue: 2021-08-30

Test Result: Pass*

Kobe Jian EMC Laboratory Manager



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



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	Revision Record						
Version	Version Chapter Date Modifier Remark						
01		2021-08-30		Original			

Authorized for issue by		
	vius cui	
	Vico Cui/Project Engineer	
	Ridge Liu	
	Ricky Liu/Reviewer	



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2 Test Summary

Radio Spectrum Technical Requirement						
Item Standard Method Requirement Result						
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 Matt	Radio Spectrum Matter Part							
Item	Standard	Method	Requirement	Result				
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		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass				
Conducted Spurious Emissions	47 CFR Part 15, 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	Cuspan C .s.z.	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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4 General Information

4.1 Details of E.U.T.

Power supply: DC 3.6V

Operation Frequency: 2402MHz to 2480MHz

Bluetooth Version: V5.0 LE
Modulation Type: GFSK
Number of Channels: 40
Channel Spacing: 2MHz

Antenna Type: Integral Antenna

Antenna Gain: 2.5dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.			
	-	-	-			
The EUT has been tested as an independent unit.						

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty	
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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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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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

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	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	M8.0	EMC2136	2019-11-02	2021-11-01	

Minimum 6dB Bandwidth							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16		
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14		
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A		
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01		

Power Spectrum Density						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	

Conducted Band Edges Measurement						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	

Conducted Spurious Emissions							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16		
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14		
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A		
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01		



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Radiated Emissions wh	Radiated Emissions which fall in the restricted bands							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date			
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07			
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 FMC0521		EMC0521	2021-01-08	2022-01-07			
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07			
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	2020-11-13	2021-11-12			
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16			
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	2020-09-09	2021-09-08			

Radiated Spurious Emissions (Below 1GHz)								
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date			
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	2019-02-22	2022-02-22			
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18			
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26			
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			



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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	2021-01-08	2022-01-07
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	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
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	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
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	2020-09-09	2021-09-08

General used equipmen	t				
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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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

Standard Requirement:

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

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 2.5dBi.

Please refer to internal photos.





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7 Radio Spectrum Matter Test Results

7.1 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		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 43.8 % RH Atmospheric Pressure: 1010 mbar

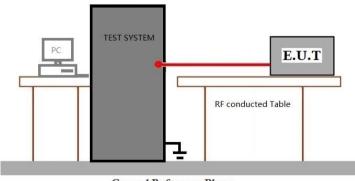
7.1.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode with GFSK

modulation.

7.1.3 Test Setup Diagram



Ground Reference Plane



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7.1.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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7.2 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

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 43.8 % RH Atmospheric Pressure: 1010 mbar

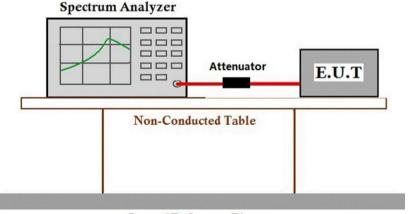
7.2.2 Test Mode Description

Pre-scan / Mode
Final test Code

Code

TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



Ground Reference Plane

7.2.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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7.3 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

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 43.8 % RH Atmospheric Pressure: 1010 mbar

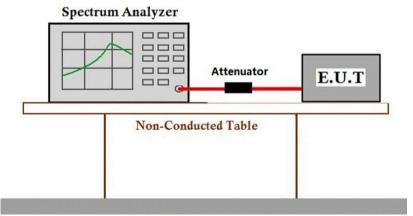
7.3.2 Test Mode Description

Pre-scan / Mode
Final test Code

Code

TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



Ground Reference Plane

7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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7.4 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).

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 43.8 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

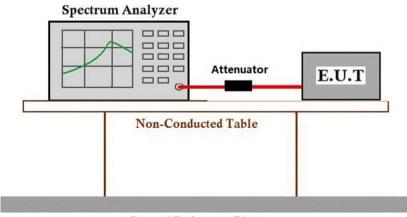
Pre-scan / Mode
Final test Code

Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode with GFSK

modulation.

7.4.3 Test Setup Diagram



Ground Reference Plane

7.4.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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7.5 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).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 43.8 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

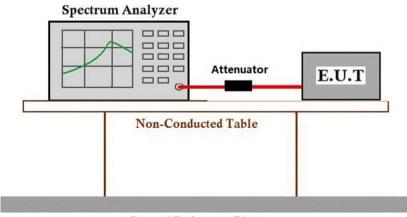
Pre-scan / Mode
Final test Code

Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode with GFSK

modulation.

7.5.3 Test Setup Diagram



Ground Reference Plane

7.5.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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7.6 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

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.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 52.4 % RH Atmospheric Pressure: 1010 mbar

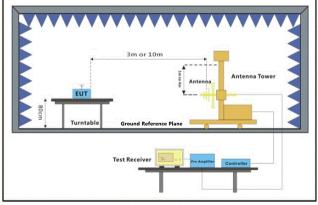
7.6.2 Test Mode Description

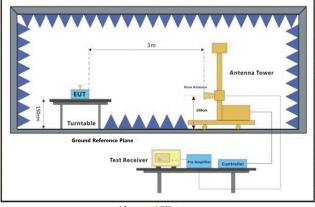
Pre-scan / Mode Final test Code Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode with GFSK

modulation.

7.6.3 Test Setup Diagram





30MHz-1GHz Above 1GHz

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7.6.4 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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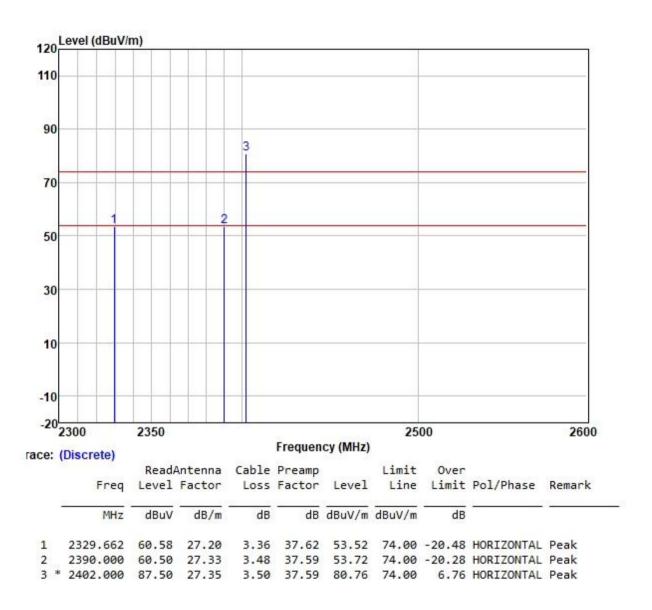
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Data Rate: 1M/bits; Channel:Low





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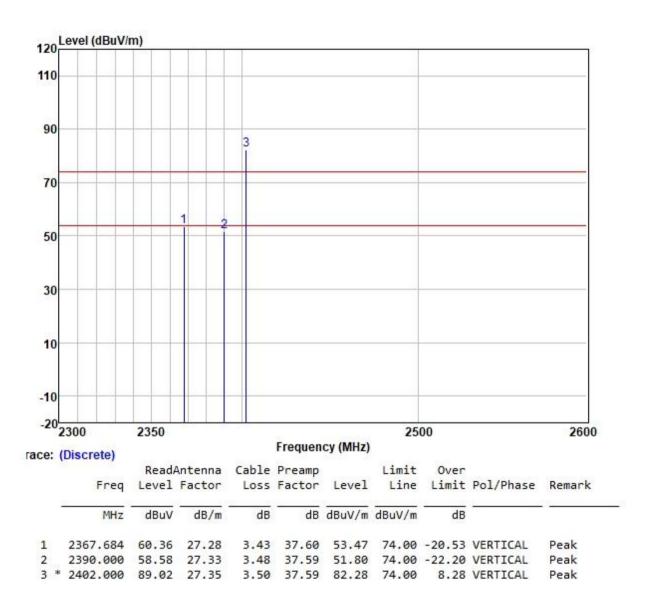
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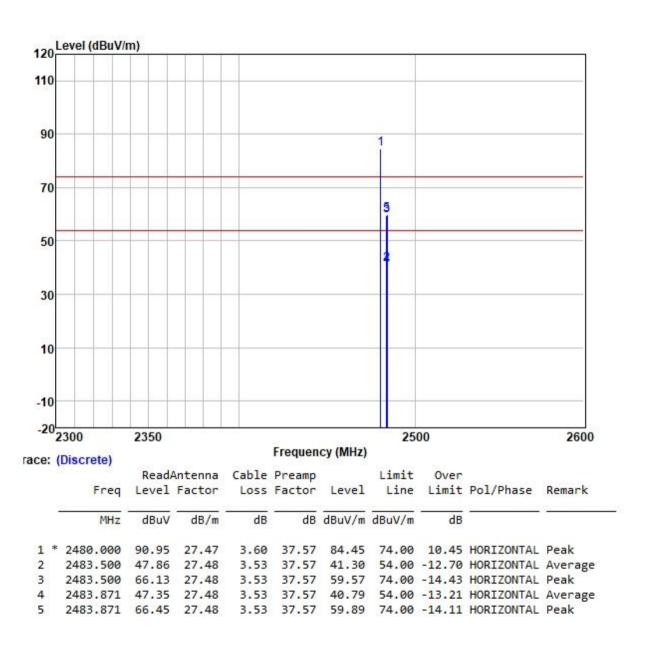
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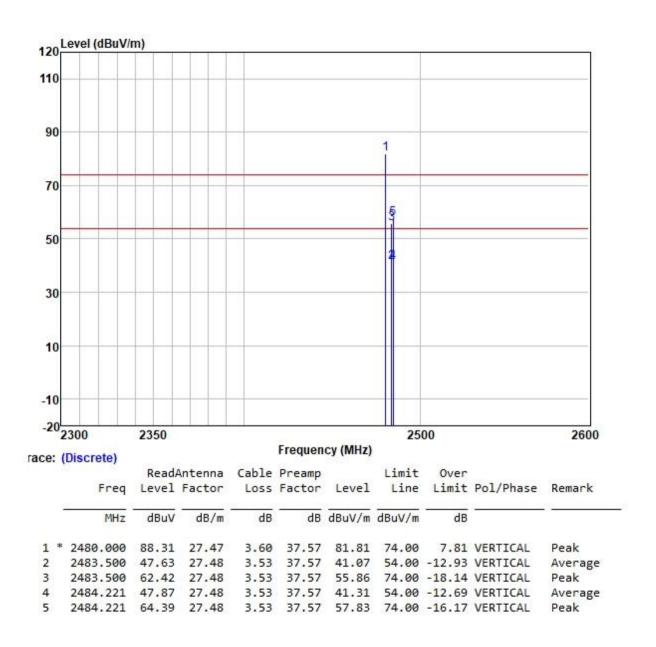
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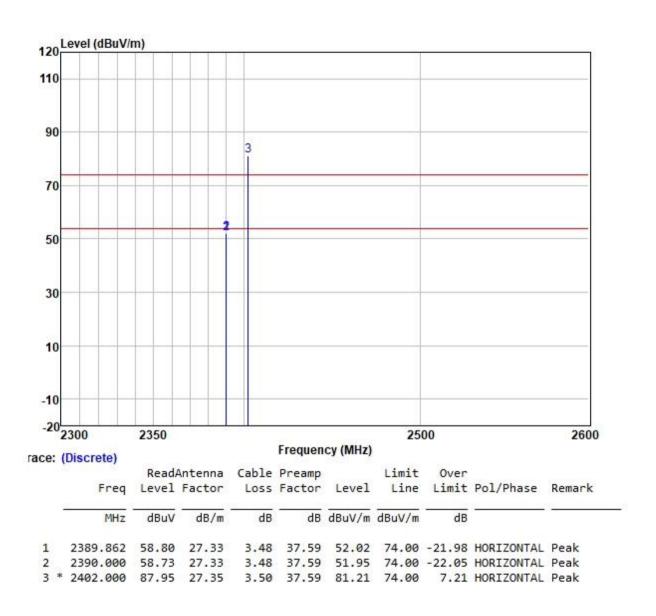
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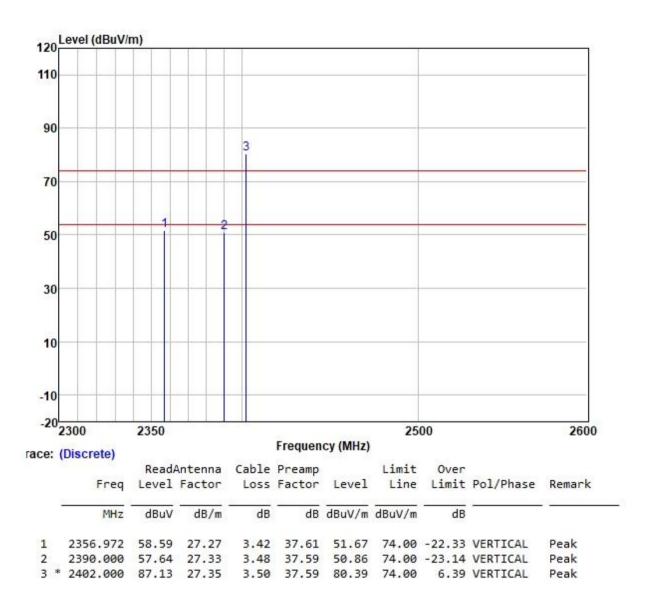
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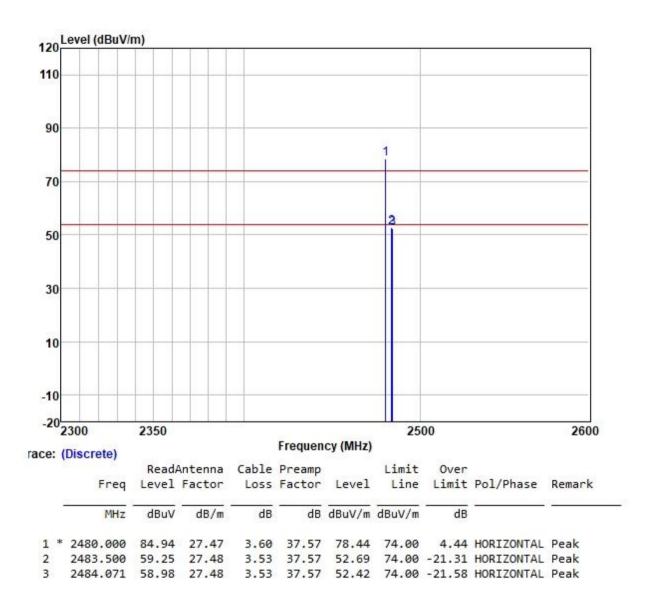
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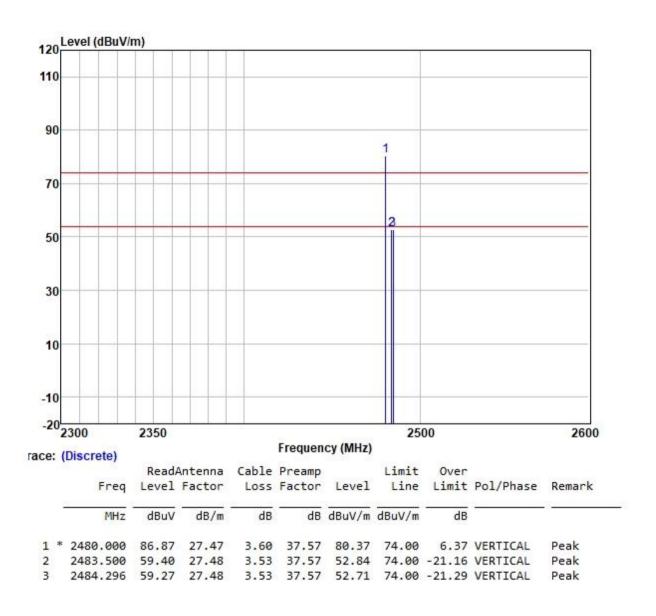
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7.7 Radiated Spurious Emissions (Below 1GHz)

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

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: 23.4 °C Humidity: 51.3 % RH Atmospheric Pressure: 1010 mbar

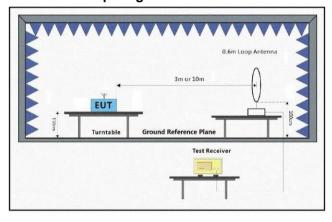
7.7.2 Test Mode Description

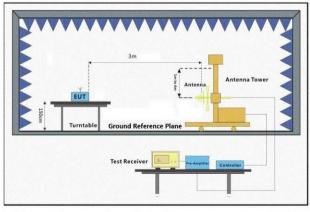
Pre-scan / Mode Final test Code Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode with GFSK

modulation.

7.7.3 Test Setup Diagram







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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. 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.



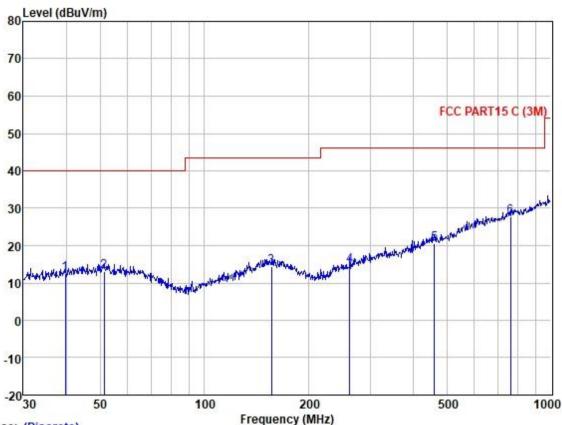
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Trace: (Discrete)

Site : SGS

Condition : FCC PART15 C (3M)

Job :
Model :
Power :
Test Mode : 00

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV	-	-
1	39.71	25.06	13.48	1.10	27.18	12.46	40.00	-27.54	VERTICAL	QP
2	51.30	25.24	13.96	1.15	27.17	13.18	40.00	-26.82	VERTICAL	QP
3	155.91	25.12	13.70	2.30	26.81	14.31	43.50	-29.19	VERTICAL	QP
4	261.98	26.03	12.30	3.00	26.59	14.74	46.00	-31.26	VERTICAL	QP
5	460.73	26.65	17.50	4.25	27.80	20.60	46.00	-25.40	VERTICAL	QP
6	763.38	27.50	22.20	6.05	28.07	27.68	46.00	-18.32	VERTICAL	OP



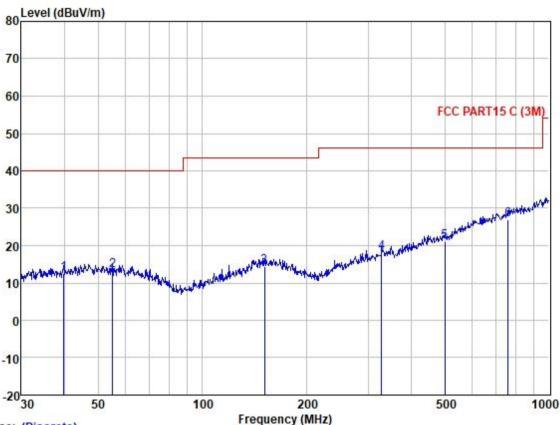
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Trace: (Discrete)

Site : SGS

Condition : FCC PART15 C (3M)

Job :
Model :
Power :
Test Mode : 00

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		-
1	39.85	25.24	13.49	1.10	27.18	12.65	40.00	-27.35	HORIZONTAL	QP
2	55.03	25.45	13.75	1.19	27.16	13.23	40.00	-26.77	HORIZONTAL	QP
3	151.07	25.26	13.80	2.24	26.83	14.47	43.50	-29.03	HORIZONTAL	QP
4	329.04	26.92	14.48	3.38	26.73	18.05	46.00	-27.95	HORIZONTAL	QP
5	499.42	26.83	17.90	4.39	27.98	21.14	46.00	-24.86	HORIZONTAL	QP
6	760.70	26.81	22.20	6.01	28.07	26.95	46.00	-19.05	HORIZONTAL	QP



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7.8 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

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: 23.6 °C Humidity: 52.4 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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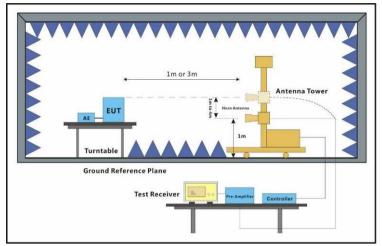
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7.8.3 Test Setup Diagram





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7.8.4 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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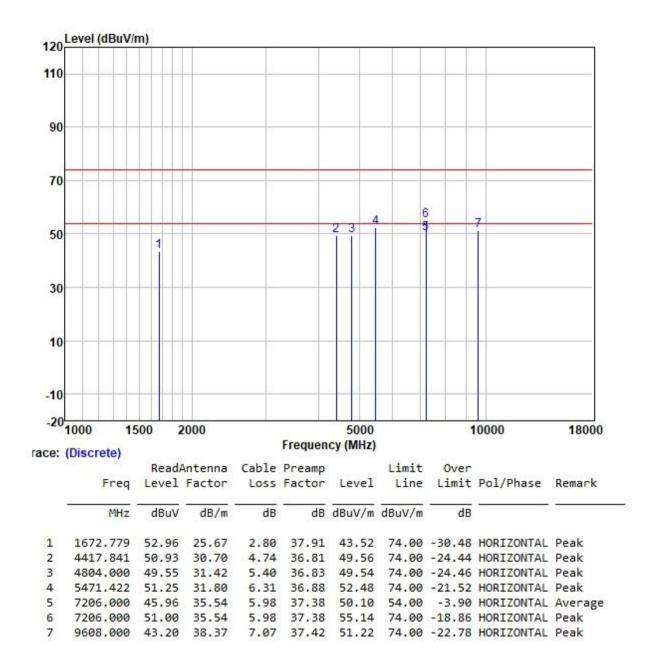
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Data Rate: 1M/bits; Channel:Low





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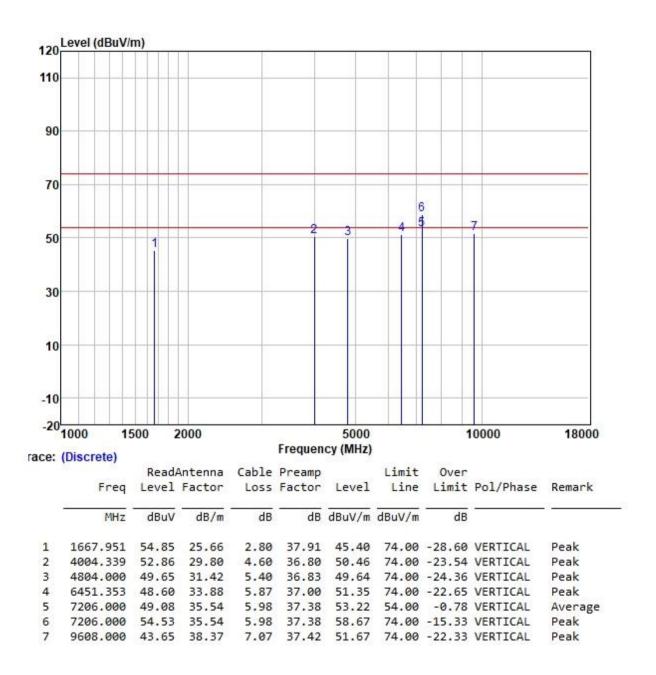
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Page: 37 of 76

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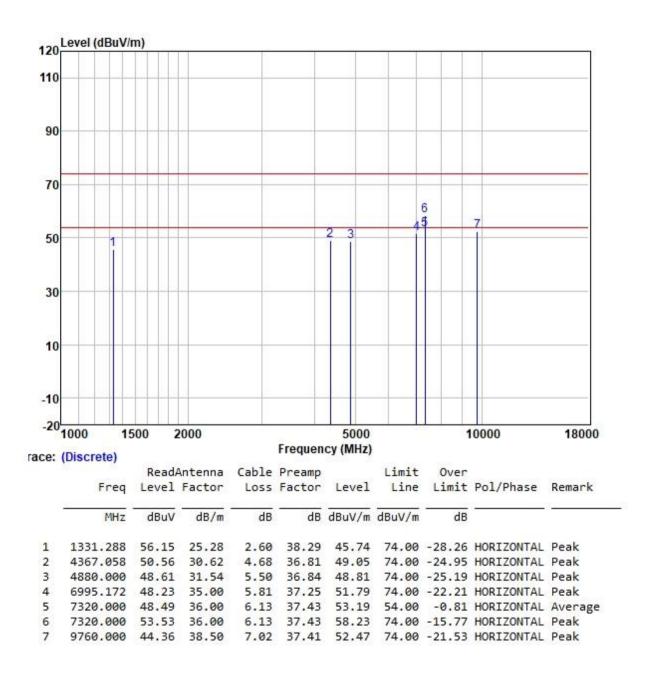
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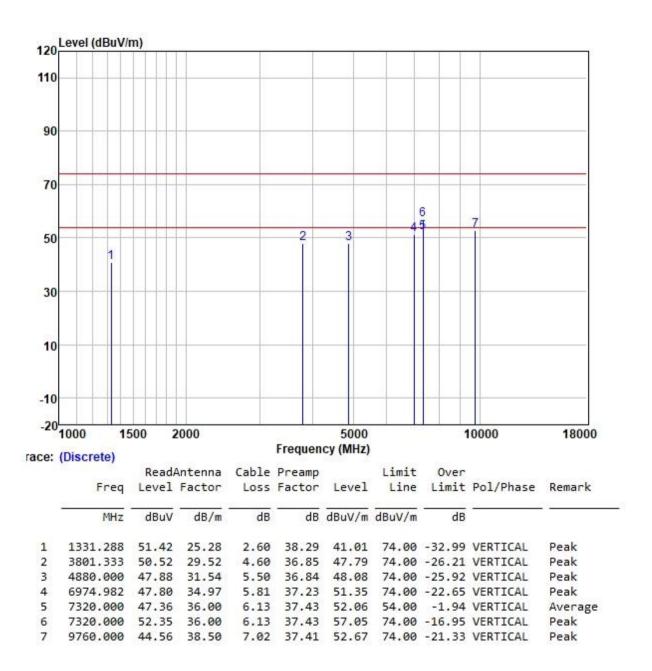
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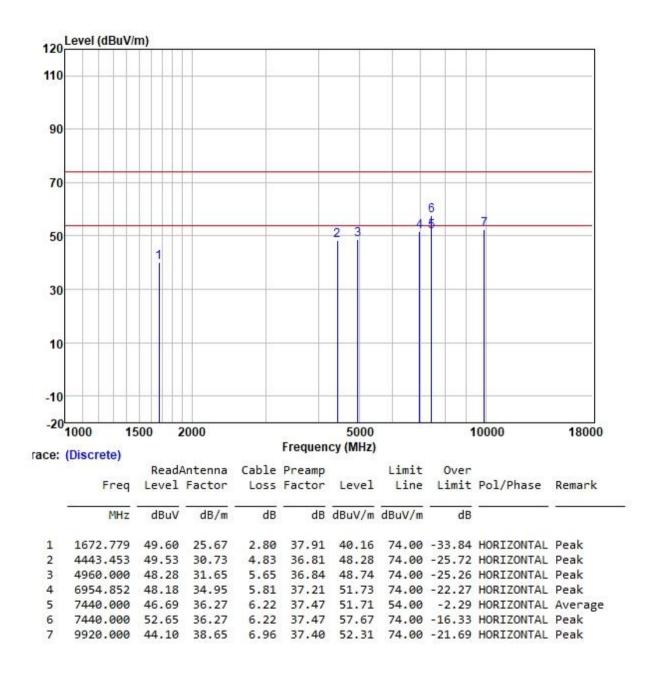
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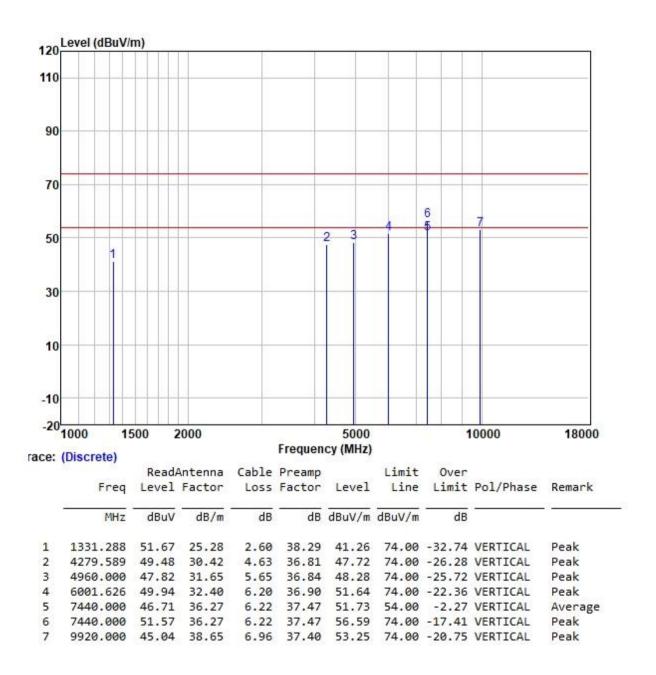
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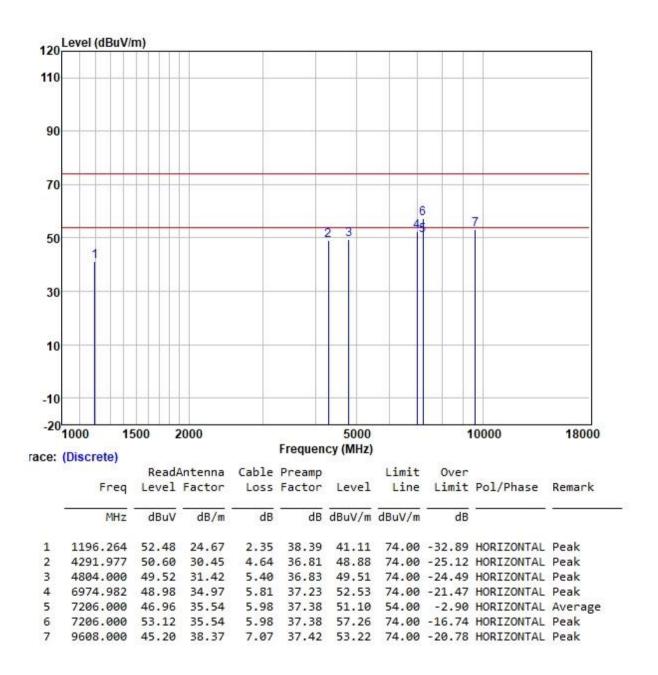
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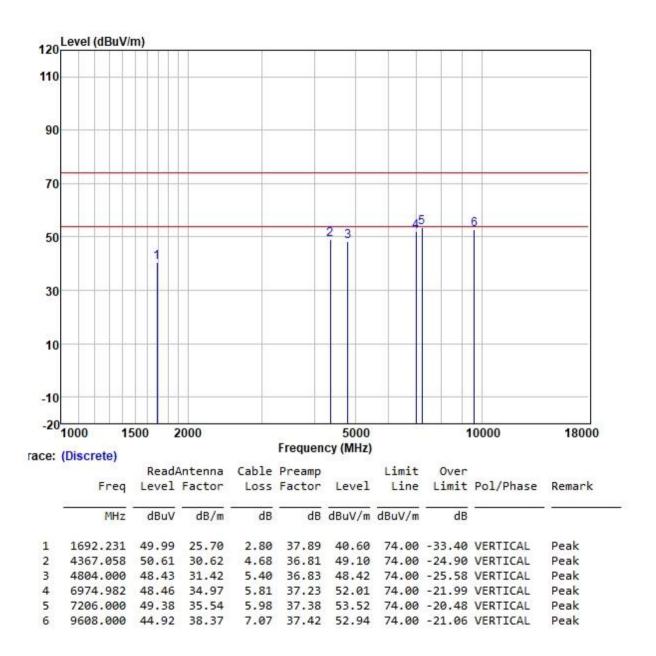
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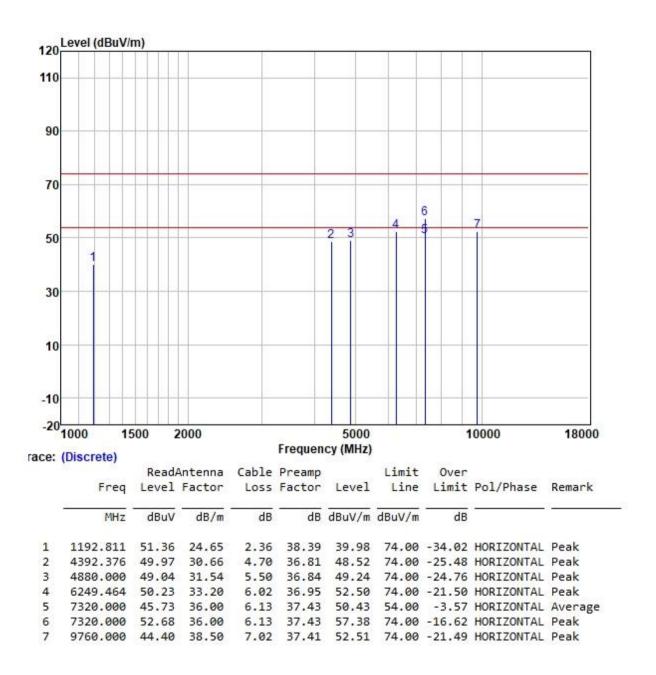
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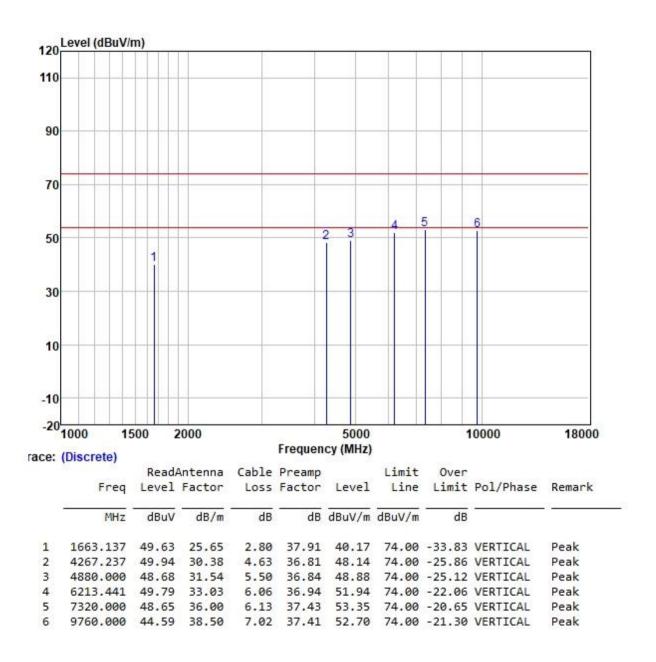
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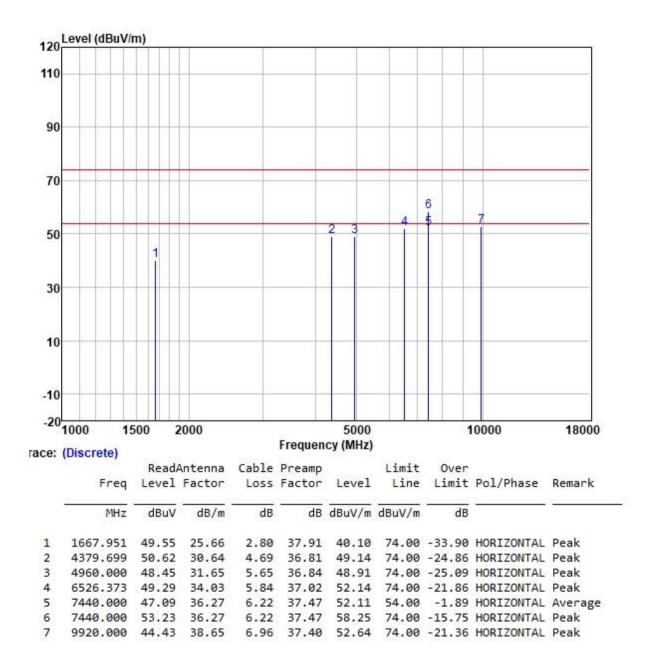
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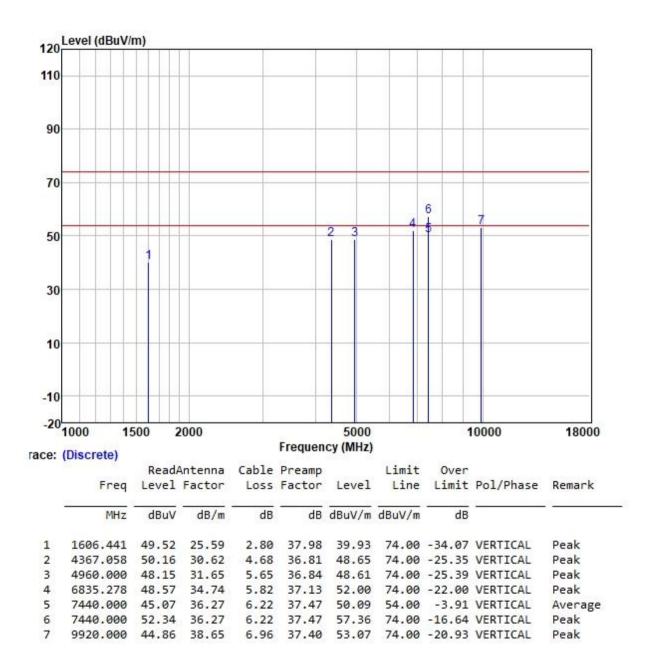
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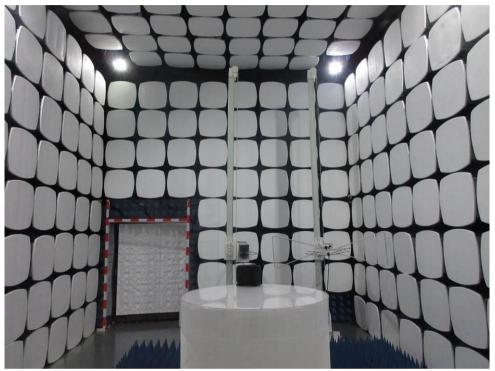


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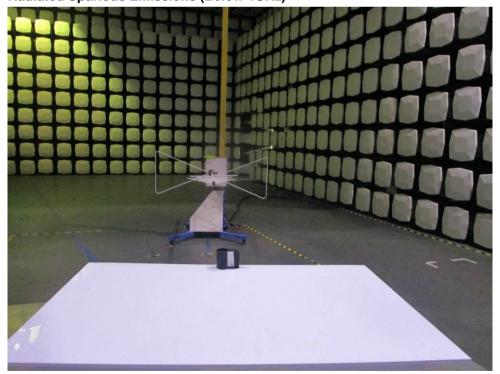
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8 Test Setup Photo

Radiated Emissions which fall in the restricted bands



Radiated Spurious Emissions (Below 1GHz)





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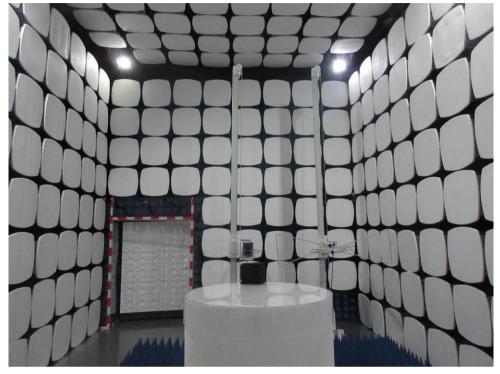
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Radiated Spurious Emissions (Above 1GHz)





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9 EUT Constructional Details (EUT Photos)

Refer to appendix - External and Internal Photos for GZCR2108020831AT



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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	0.409	0.625	65.44	1.84	0.00			
1M		2440	0.409	0.625	65.44	1.84	0.00			
		2480	0.409	0.625	65.44	1.84	0.00			
	SISO	2402	0.225	0.625	36.00	4.44	0.00			
2M		2440	0.226	0.625	36.16	4.42	0.00			
		2480	0.225	0.625	36.00	4.44	0.00			



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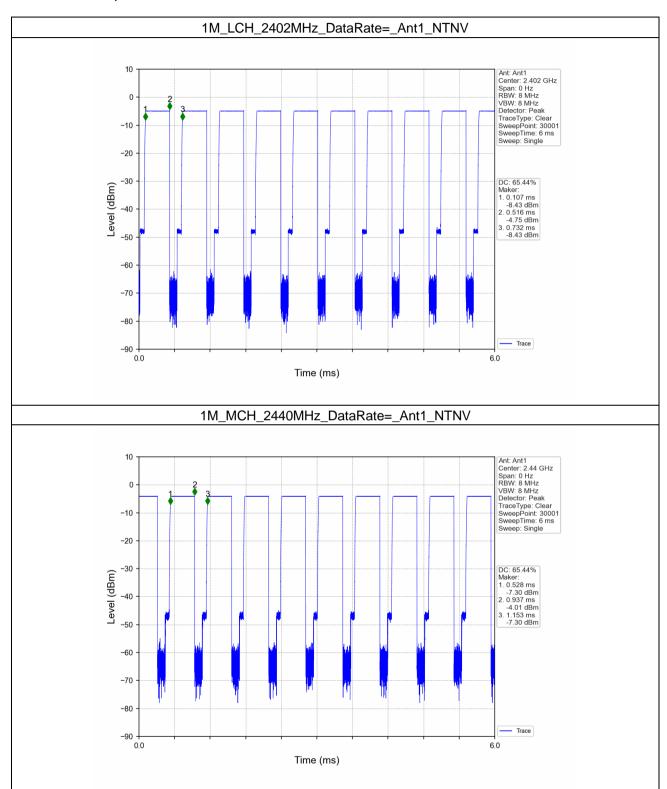
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1.1.2 Test Graph





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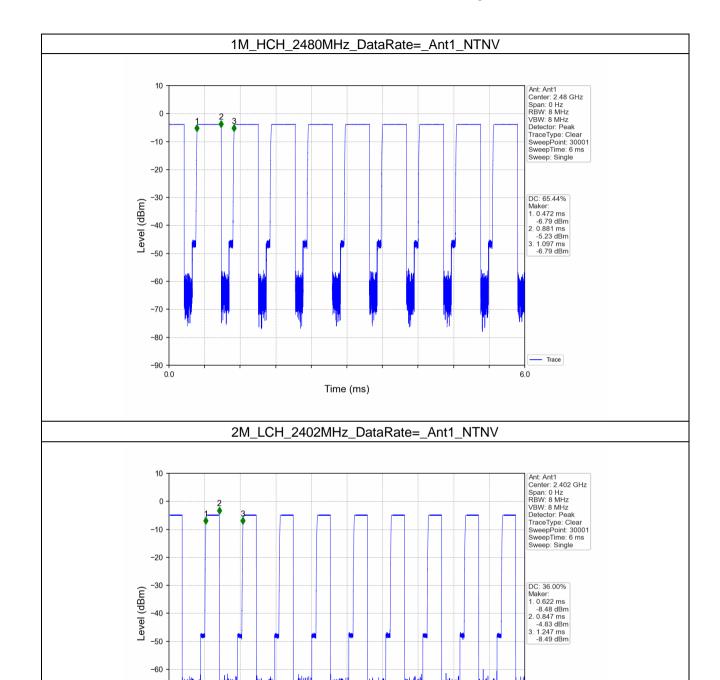
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Time (ms)

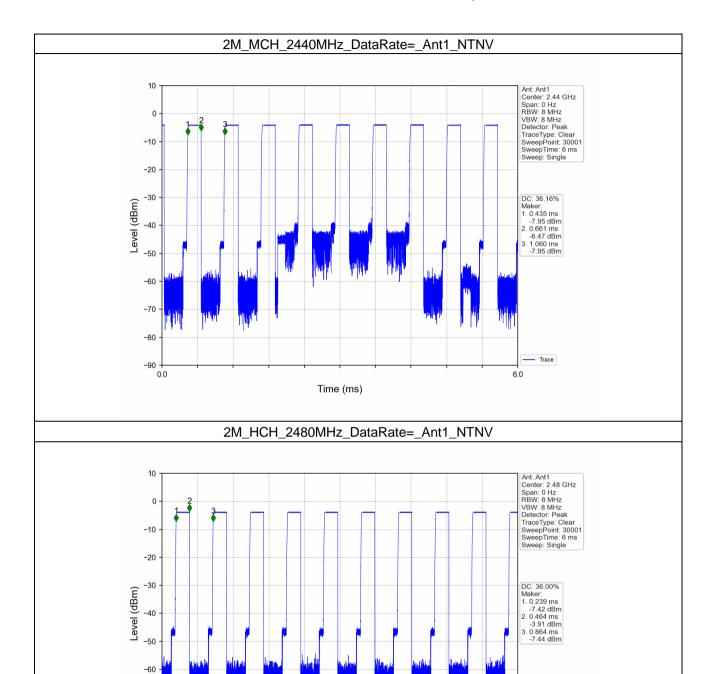
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2. Bandwidth

2.1 OBW

2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz) Result	Verdict
	.,,,,,	2402	1	1.021	Pass
1M	SISO	2440	1	1.020	Pass
			2480	1	1.020
	SISO	2402	1	2.047	Pass
2M		2440	1	2.045	Pass
		ļ	2480	1	2.046

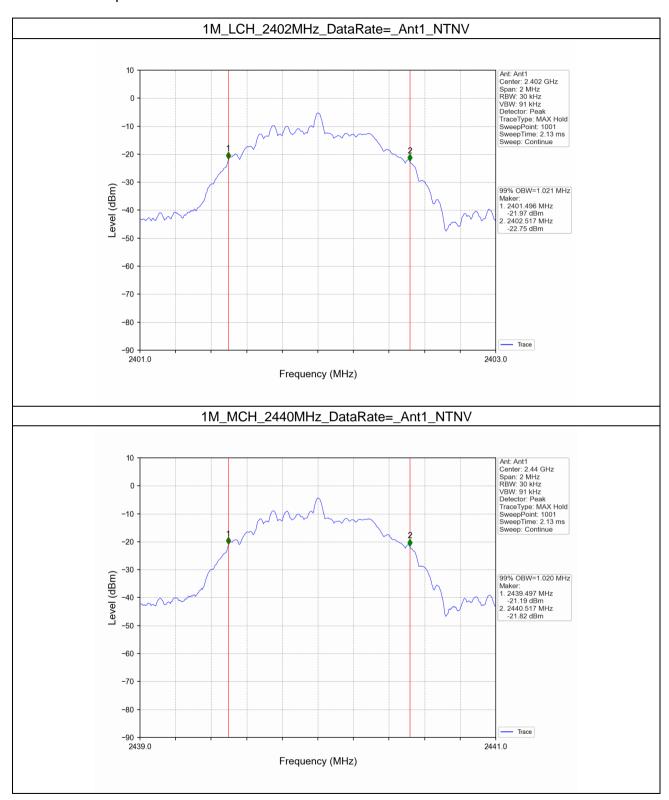




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2.1.2 Test Graph





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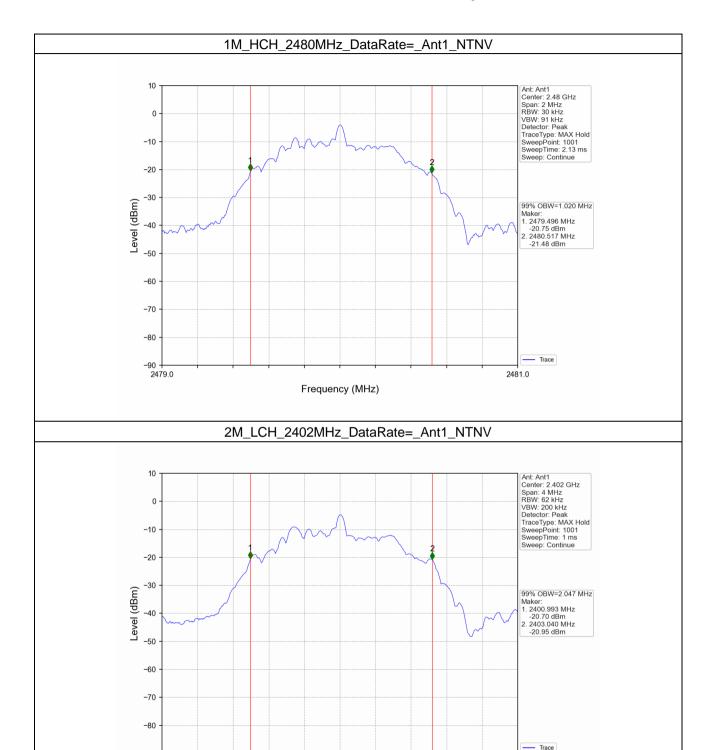
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-90 ↓ 2400.0

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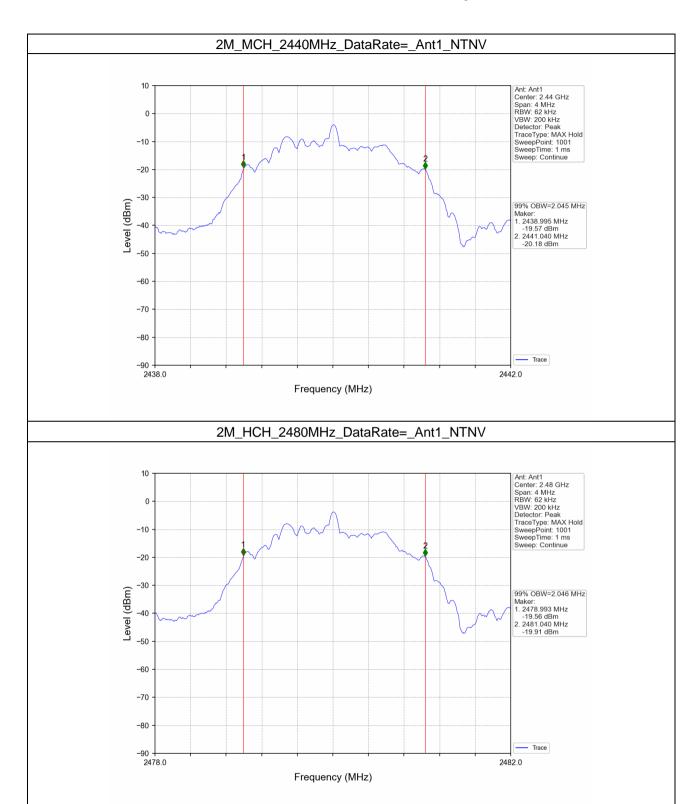
Frequency (MHz)

2404 0



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2.2 6dB BW

2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	6dB Bandv	Mandiat		
				Result	Limit	Verdict	
		2402	1	0.675	>=0.5	Pass	
1M	SISO	2440	1	0.675	>=0.5	Pass	
			2480	1	0.677	>=0.5	Pass
2M	SISO		2402	1	1.193	>=0.5	Pass
		2440	1	1.193	>=0.5	Pass	
		2480	1	1.198	>=0.5	Pass	

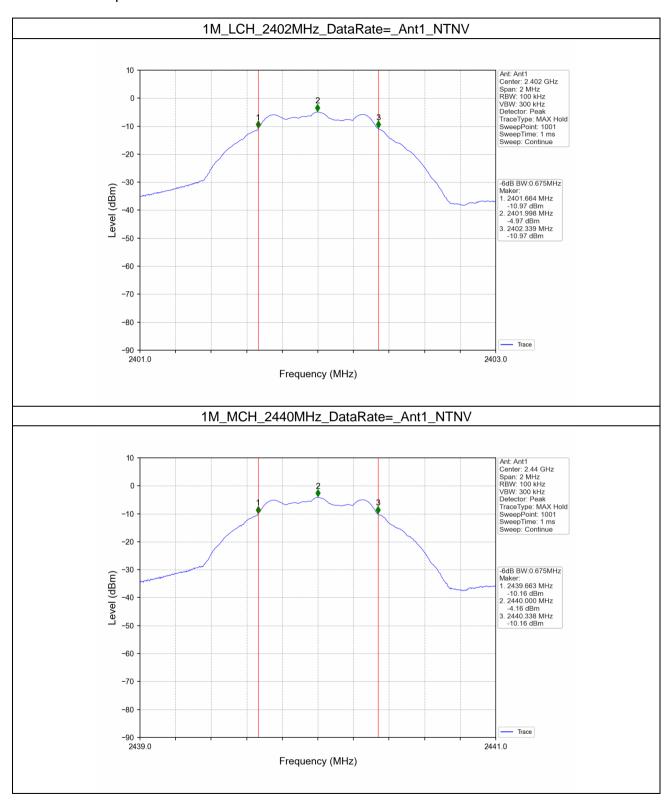




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2.2.2 Test Graph



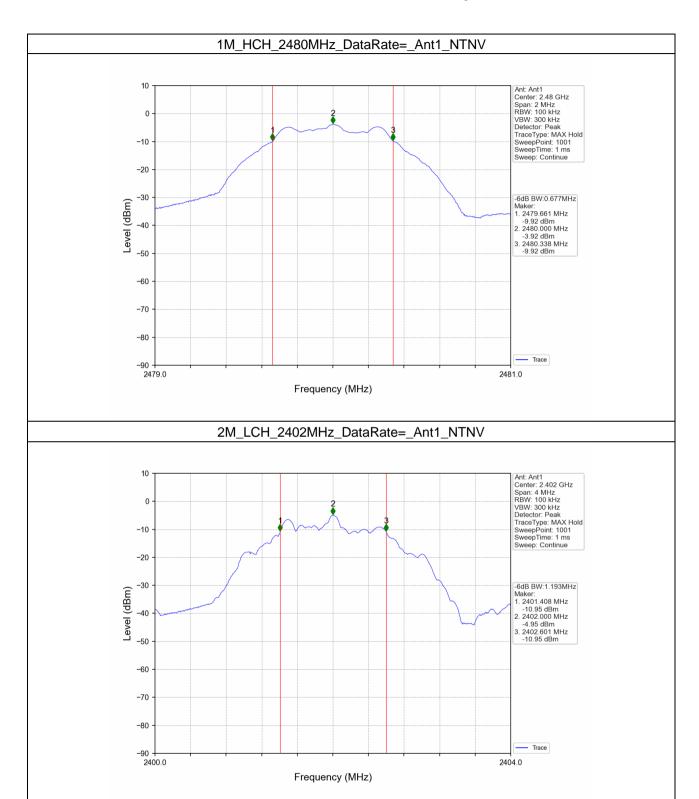


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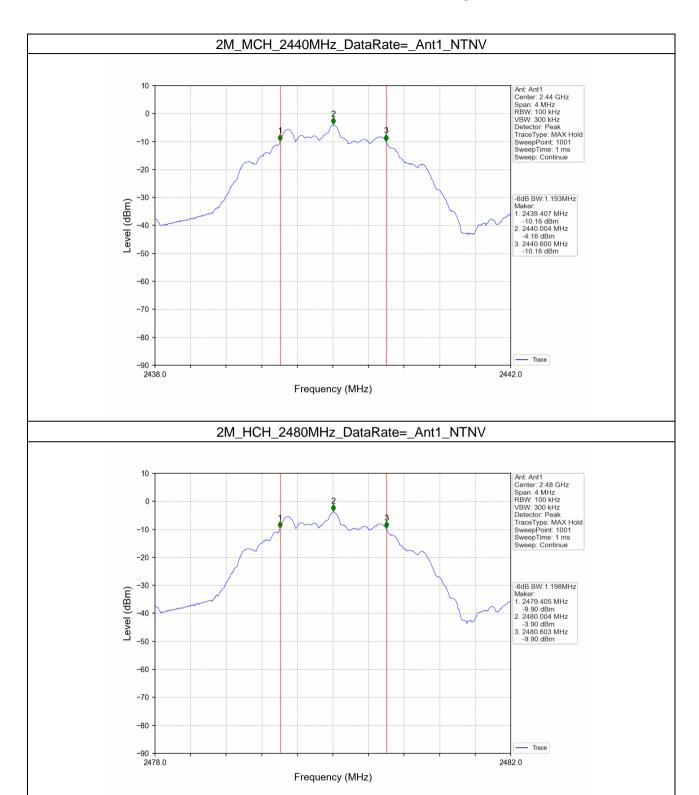


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3. Maximum Conducted Output Power

3.1 Power

3.1.1 Test Result

Mode	TX	Frequency (MHz)	Maximum Peak Conduct	\/ordiot		
	Туре		Ant1	Limit	Verdict	
		2402	-4.94	<=30	Pass	
1M	SISO	2440	-4.13	<=30	Pass	
		2480	-3.89	<=30	Pass	
	SISO	2402	-4.89	<=30	Pass	
2M		2440	-4.12	<=30	Pass	
		2480	-3.87	<=30	Pass	
Note1: Antenna Gain: Ant1: 2.50dBi;						

4. Maximum Power Spectral Density

4.1 PSD

4.1.1 Test Result

pe (MF	· ·	Ant1 -19.03	Limit	Verdict
	02	-19.03	. 0	
10			<=8	Pass
SO 244	40	-18.13	<=8	Pass
248	30	-17.96	<=8	Pass
240	02	-19.63	<=8	Pass
SO 244	40	-18.83	<=8	Pass
248	30	-18.63	<=8	Pass
	240 SO 244 248	2480	2402 -19.63 SO 2440 -18.83	2402 -19.63 <=8 2440 -18.83 <=8 2480 -18.63 <=8



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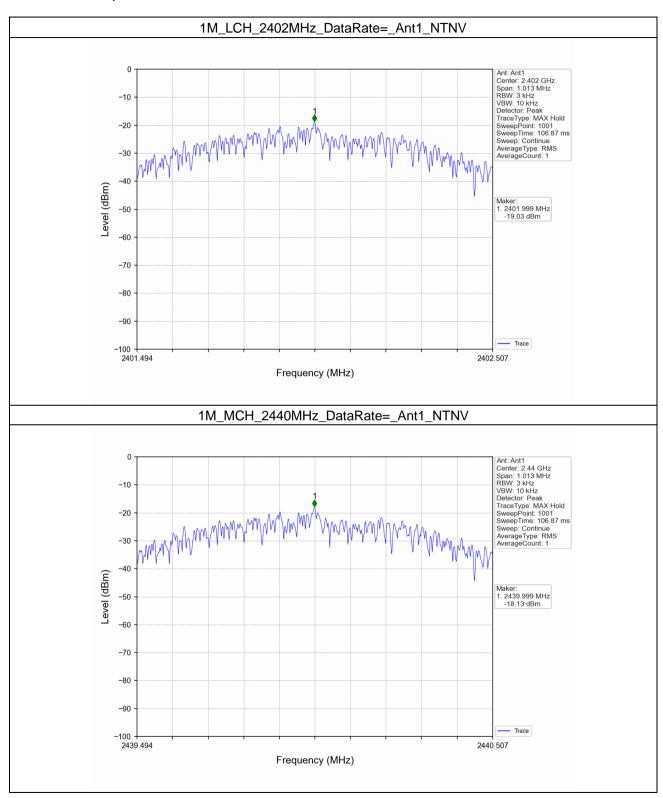
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4.1.2 Test Graph





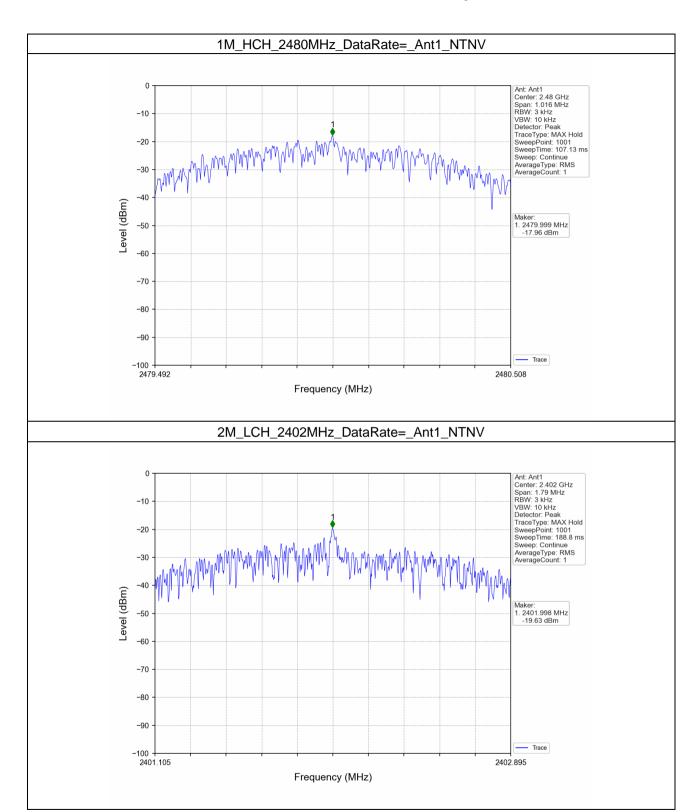
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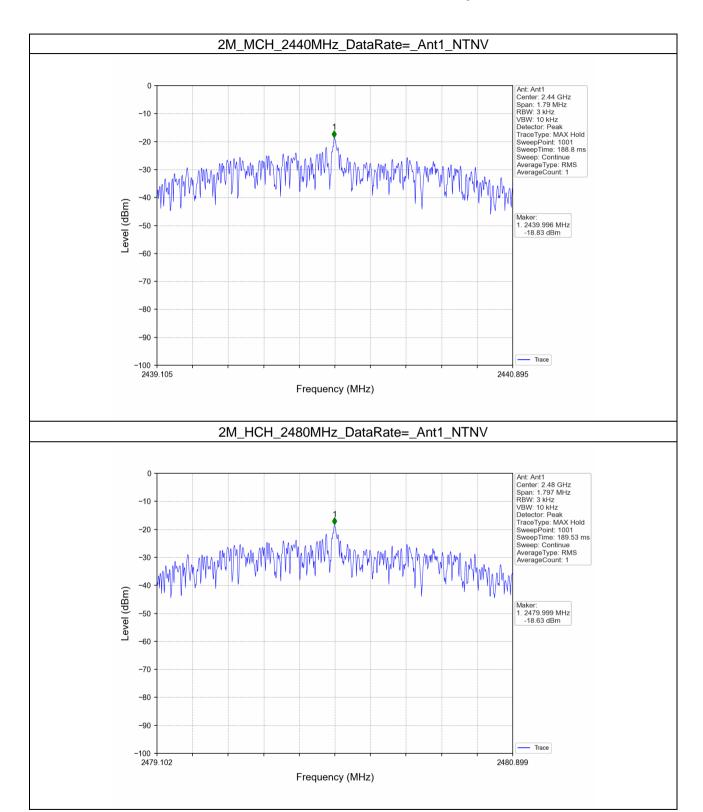
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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	Level of Reference (dBm)
	SISO	2402	1	-5.02
1M		2440	1	-4.21
		2480	1	-3.95
	SISO	2402	1	-5.02
2M		2440	1	-4.20
		2480	1	-3.96

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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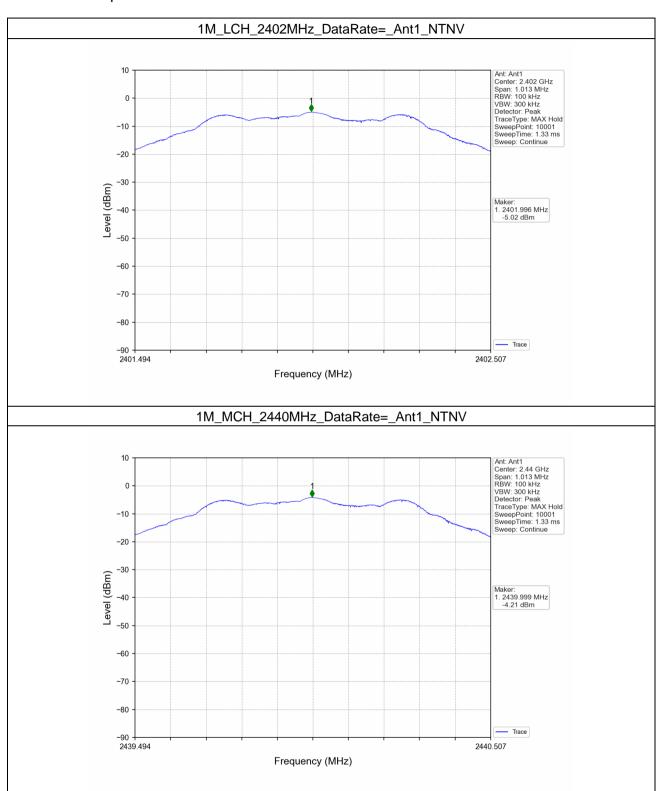
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5.1.2 Test Graph





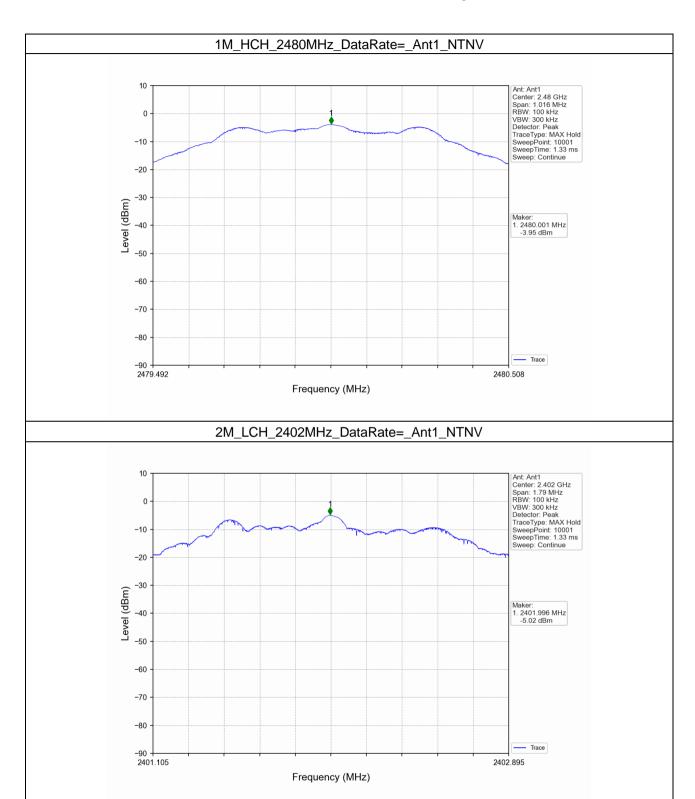
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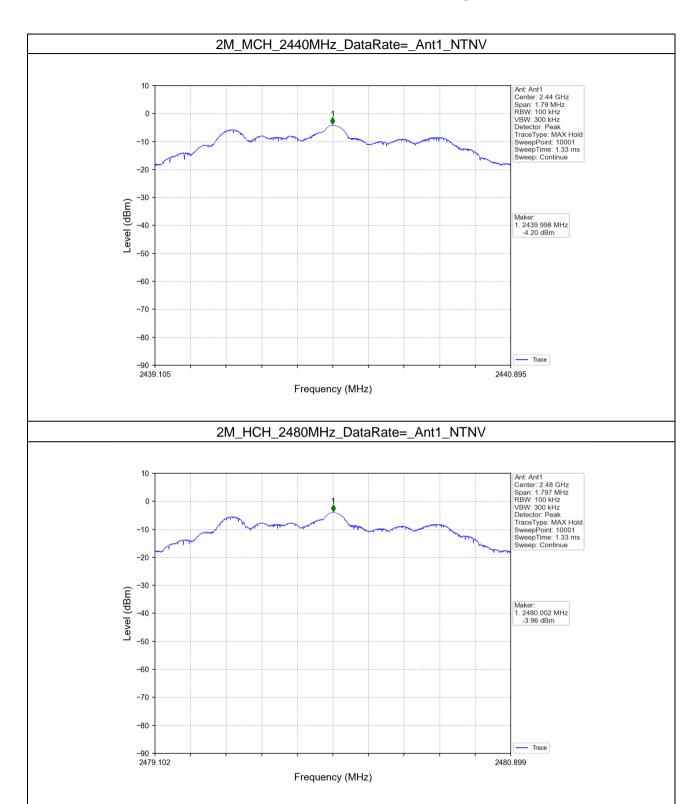


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5.2 CSE

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	Level of Reference (dBm)	Limit (dBm)	Verdict
		2402	1	-3.95	-23.95	Pass
1M	SISO	2440	1	-3.95	-23.95	Pass
		2480	1	-3.95	-23.95	Pass
2M	SISO	2402	1	-3.96	-23.96	Pass
		2440	1	-3.96	-23.96	Pass
		2480	1	-3.96	-23.96	Pass

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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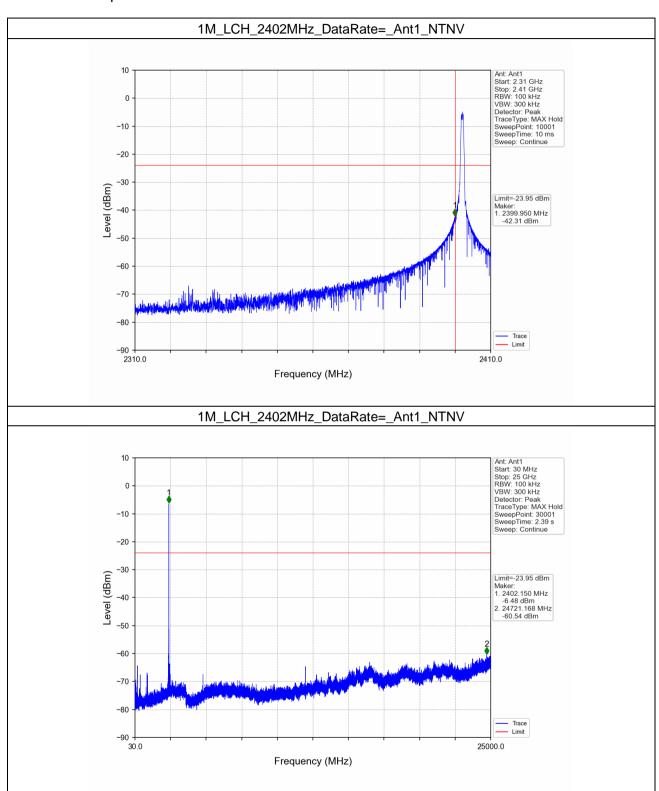
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5.2.2 Test Graph



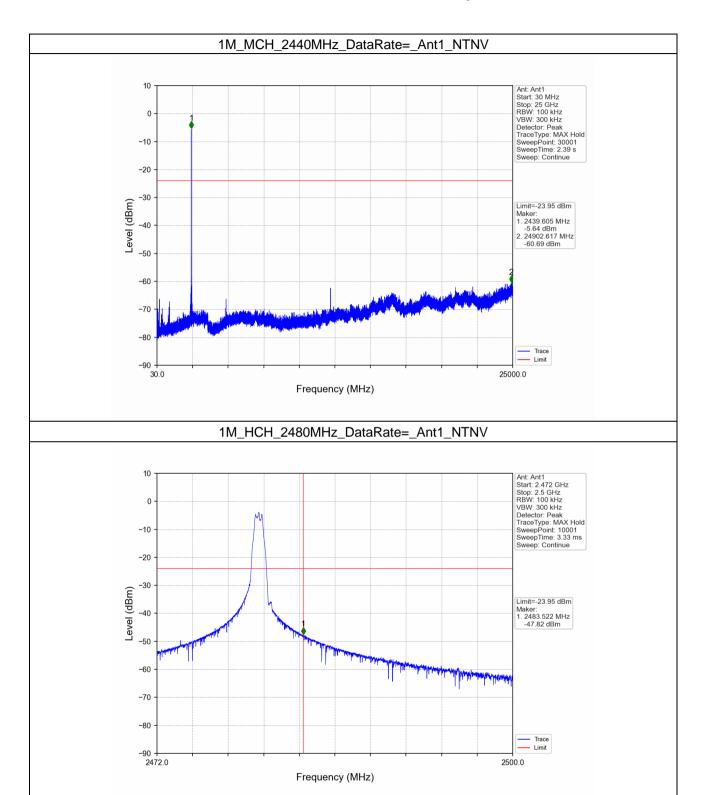


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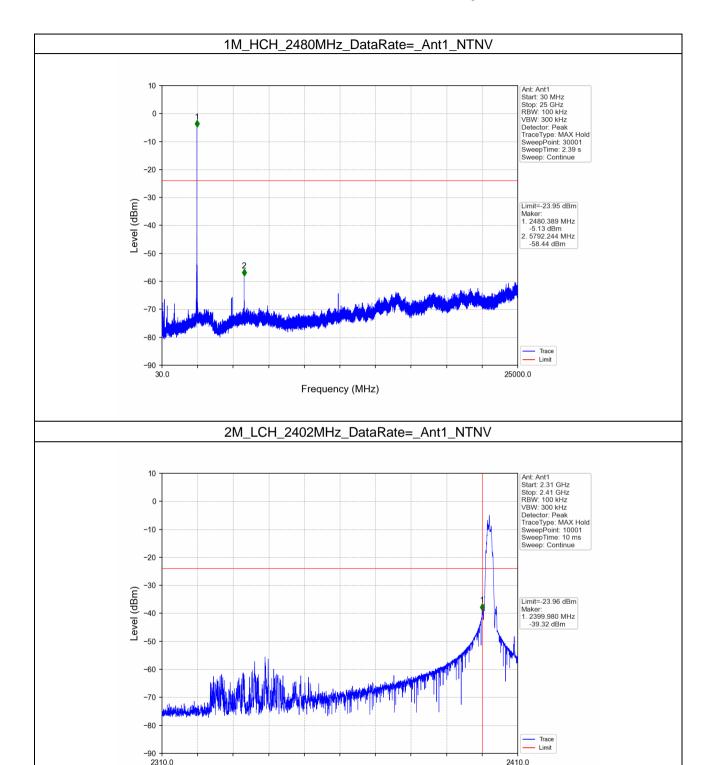


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Frequency (MHz)

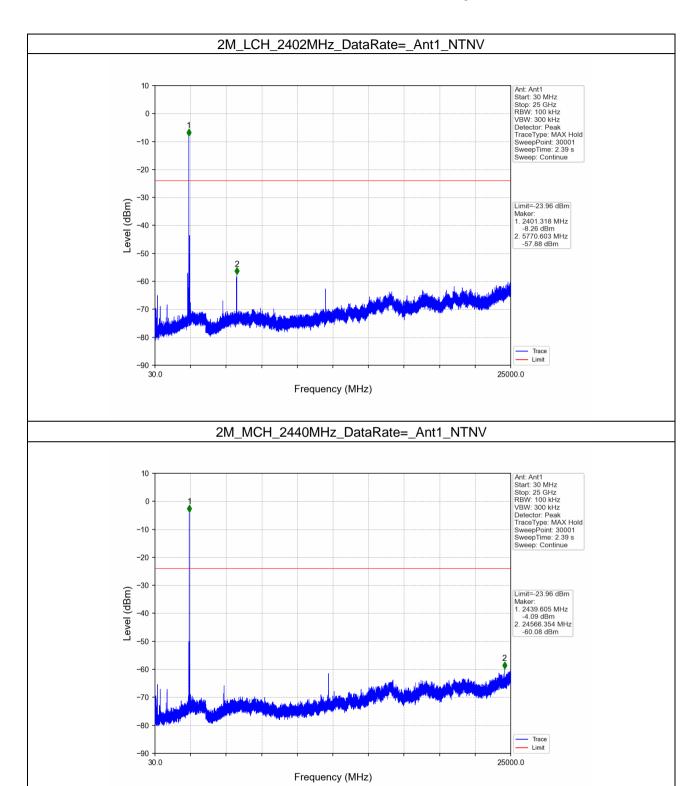


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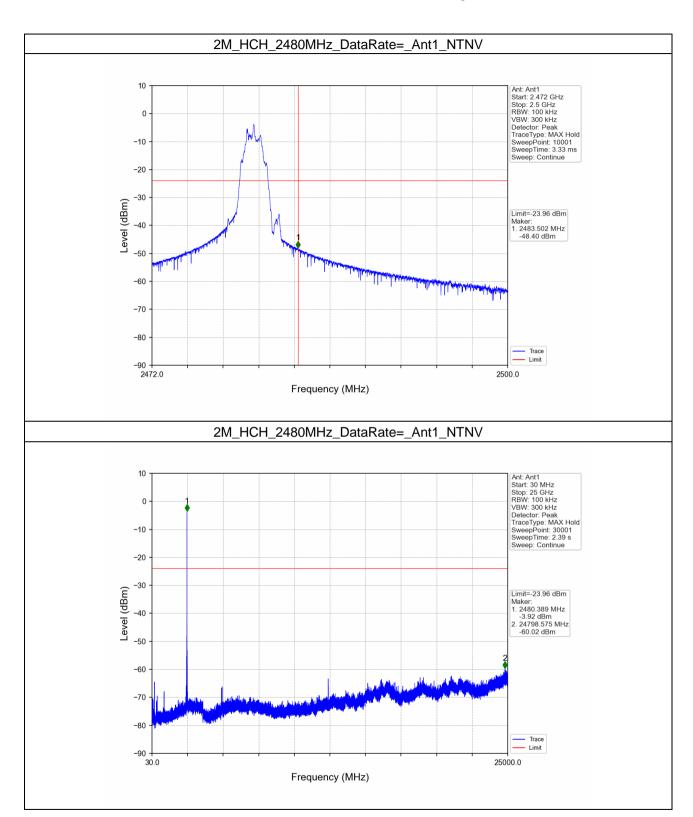


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