

Report No.: GZCR220100013401

Page: 1 of 60 FCC ID: 2AUIUWSCALX

TEST REPORT

Application No.: GZCR2201000134AT **Applicant:** Wyze Labs, Inc.

Address of Applicant: 5808 Lake Washington Blvd NE Ste 300 Kirkland Washington 98033 United

States

Manufacturer: Guangdong Welland Technology Co., Ltd.

Address of Manufacturer: No. 85 Minke East Road, Min Ying Science and Technology Park, Shiqi

District, Zhongshan, Guangdong, China, 528400

Factory: Guangdong Welland Technology Co., Ltd.

Address of Factory: No. 85 Minke East Road, Min Ying Science and Technology Park, Shiqi

District, Zhongshan, Guangdong, China, 528400

Equipment Under Test (EUT):

EUT Name: Wyze Scale X Black, Wyze Scale X White

Model No.: WSCALX, WSCALX-W .

Please refer to section 2 of this report which indicates which model was

actually tested and which were electrically identical.

Trade Mark: WYZE

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

Date of Receipt: 2022-03-10

Date of Test: 2022-03-12 to 2022-03-23

Date of Issue: 2022-03-25

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		2022-03-25		Original		

Authorized for issue by		
	Cof Vhu	
	Curry Wu/Project Engineer	_
	Riday 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 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,	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	Subpart C 15.247	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			
Duty Cycle		ANSI C63.10 (2013) Section 11.6	KDB 558074 D01 v05r02 section 6	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.

Declaration of EUT Family Grouping:

Model No.: WSCALX, WSCALX-W

Only the model WSCALX was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference on model name and colour. WSCALX is black, WSCALX-W is white.



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4 General Information

4.1 Details of E.U.T.

Power Supply: DC 6V (1.5V x 4 "AAA" Size Batteries).

Operation Frequency: 2402MHz to 2480MHz

Bluetooth Version: V5.0 LE
Modulation Type: GFSK
Data Rate: 1M/bit
Number of Channels: 40
Channel Spacing: 2MHz

Antenna Type: PCB Antenna

Antenna Gain: 2.6dBi

4.2 Description of Support Units

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



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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	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m);± 4.52Db (1GHz-6GHz);± 4.54dB (above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m)
Radiated Spurious Emissions (Above 1GHz)	± 4.52dB (1GHz-6GHz);± 4.54dB
Radiated Spurious Emissions (Above 1912)	(above 6GHz)
Duty Cycle	± 0.37%



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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	
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01	

Minimum 6dB Bandwidt	h				
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	2020-04-15	2022-04-14
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	2020-04-15	2022-04-14
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 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	2020-04-15	2022-04-14
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	2020-04-15	2022-04-14			
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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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

Radiated Spurious Emis	ssions (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-2GHz)	Schwarzbeck	VULB9168	SEM003-33	2021/9/25	2024/9/24
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



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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	2021-12-17	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

Duty Cycle					
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	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

General used equipment									
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

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 2.6 dBi.

Antenna location: Refer to internal photo.



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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: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

7.1.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with

GFSK modulation.



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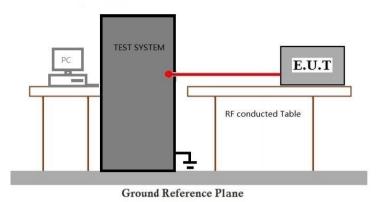
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7.1.3 Test Setup Diagram



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: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

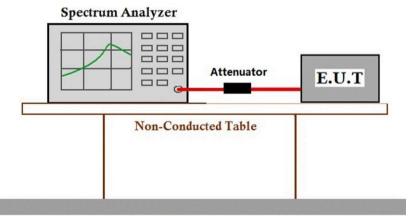
7.2.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_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: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

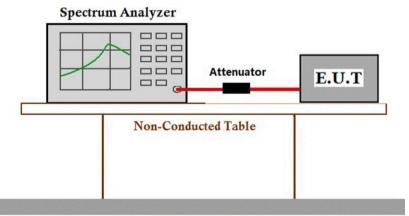
7.3.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_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

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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: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

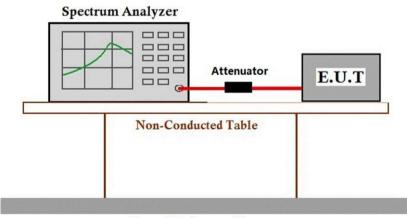
7.4.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_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

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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: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

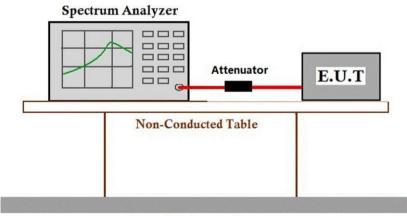
7.5.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_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

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

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.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Atmospheric Pressure: 1003 mbar Humidity: 50.8 % RH

7.6.2 Test Mode Description

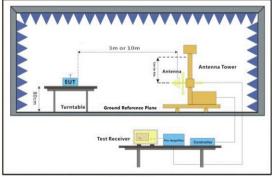
Mode Pre-scan /

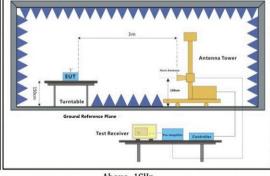
Description Final test Code

TX mode(1Mbps) Keep the EUT in continuously transmitting mode with Final test 00

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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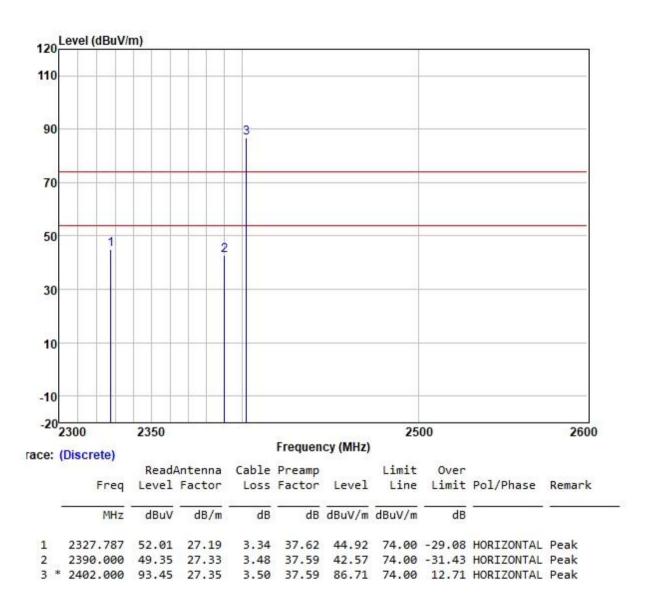
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low





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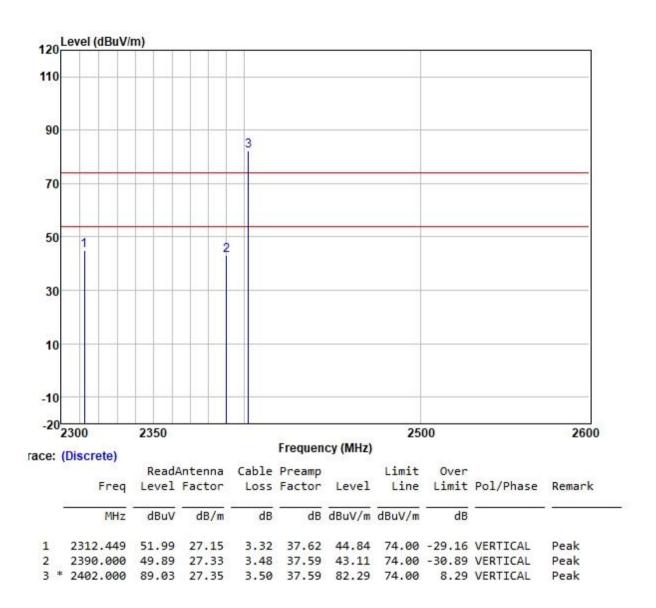
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Test Mode: 00; Polarity: Vertical; Modulation: GFSK; ; Channel:Low





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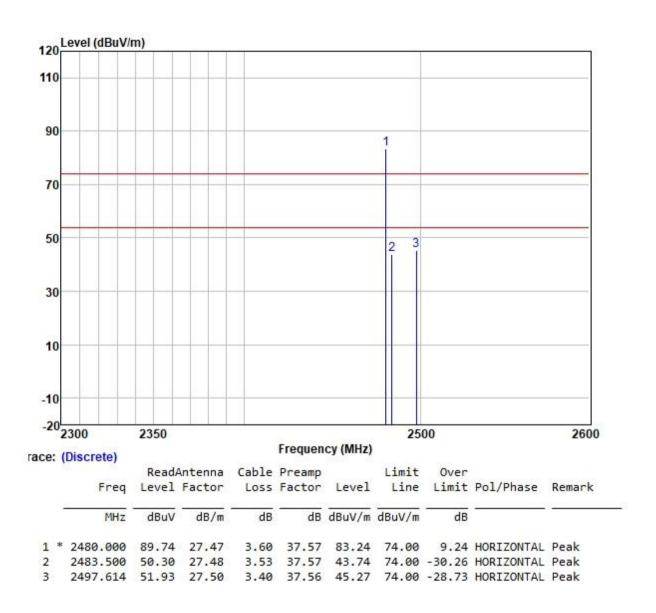
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; ; Channel: High





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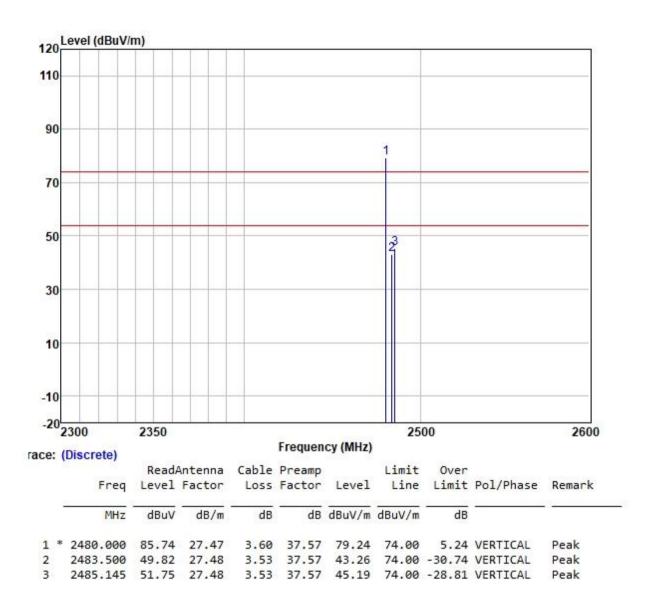
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7.7 Radiated Spurious Emissions (Below 1GHz)

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

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: 22.5 °C Humidity: 56.1 % RH Atmospheric Pressure: 1003 mbar

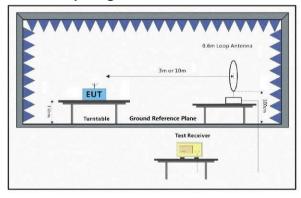
7.7.2 Test Mode Description

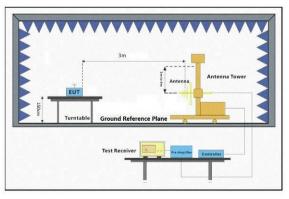
Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_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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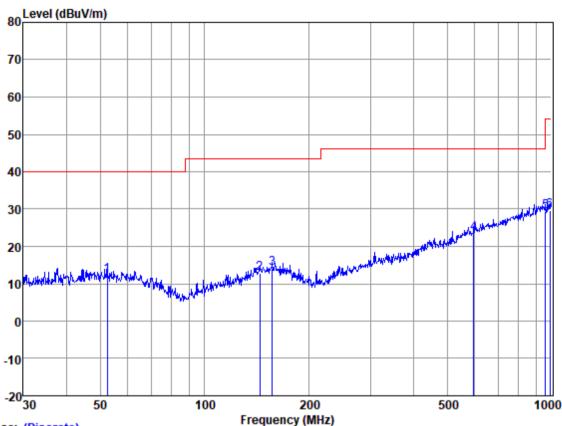
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Test Mode: 00; Polarity: Horizontal



Trace: (Discrete)

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

	Freq					Measured Level				Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	52.39	24.43	13.96	1.16	27.17	12.38	40.00	-27.62	HORIZONTAL	QP
2	144.33	23.91	13.62	2.15	26.87	12.81	43.50	-30.69	HORIZONTAL	QP
3	156.46	24.82	13.70	2.30	26.81	14.01	43.50	-29.49	HORIZONTAL	QP
4	595.13	26.78	19.70	5.10	28.20	23.38	46.00	-22.62	HORIZONTAL	QP
5	958.79	26.03	23.90	7.18	27.73	29.38	46.00	-16.62	HORIZONTAL	QΡ
6	989.54	25.73	24.20	7.37	27.67	29.63	54.00	-24.37	HORIZONTAL	QP



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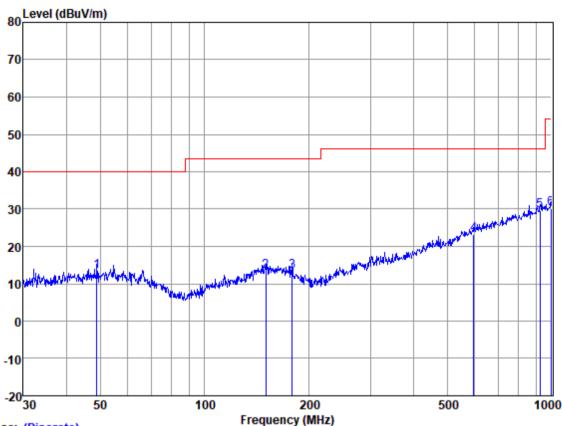
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Test Mode: 00; Polarity: Vertical



Trace: (Discrete)

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

	Freq					Measured Level			_	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	48.84	25.38	13.96	1.14	27.17	13.31	40.00	-26.69	VERTICAL	QP
2	150.01	24.08	13.80	2.24	26.84	13.28	43.50	-30.22	VERTICAL	QP
3	178.76	25.54	12.13	2.44	26.76	13.35	43.50	-30.15	VERTICAL	QP
4	595.13	26.69	19.70	5.10	28.20	23.29	46.00	-22.71	VERTICAL	QP
5	925.76	26.57	23.73	7.01	27.81	29.50	46.00	-16.50	VERTICAL	QP
6	996.50	26.21	24.27	7.43	27.66	30.25	54.00	-23.75	VERTICAL	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

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: 22.2 °C Humidity: 50.8 % RH Atmospheric Pressure: 1003 mbar

7.8.2 Test Mode Description

Pre-scan / Mode Final test Code Description

Final test 00 TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with

GFSK modulation.



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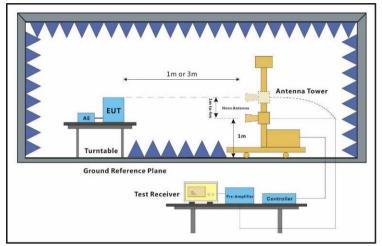
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7.8.3 Test Setup Diagram





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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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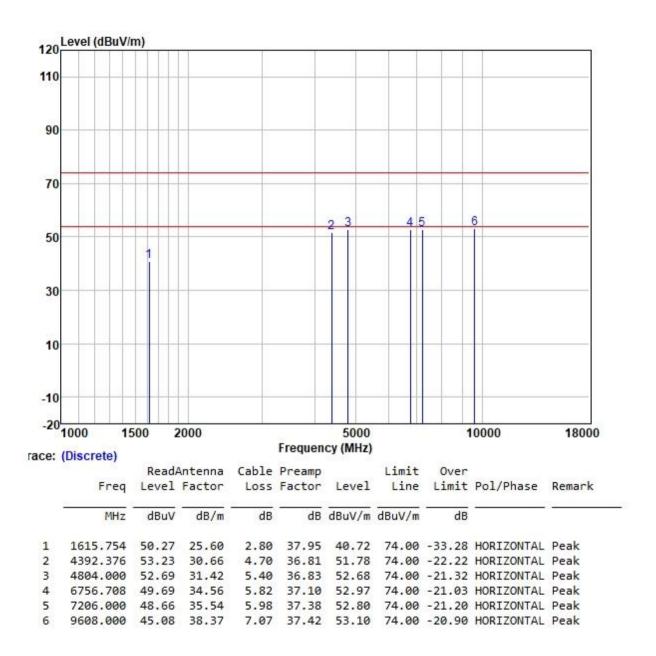
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; ; Channel:Low





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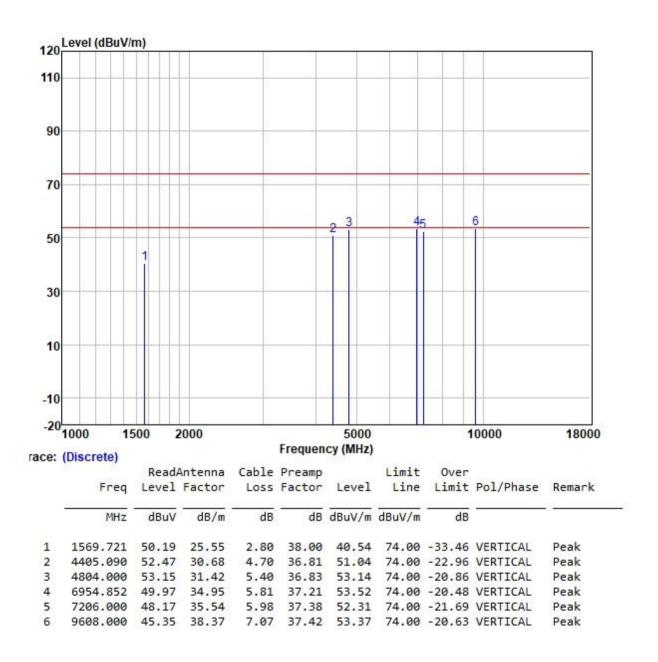
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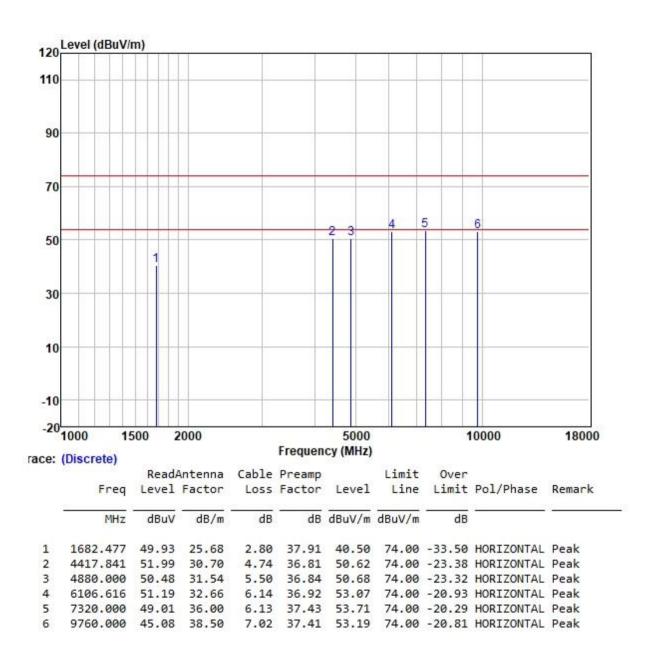
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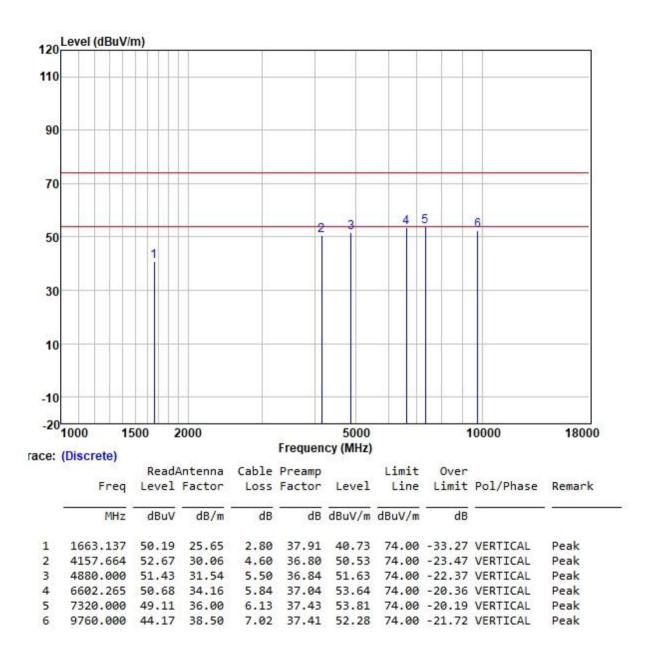
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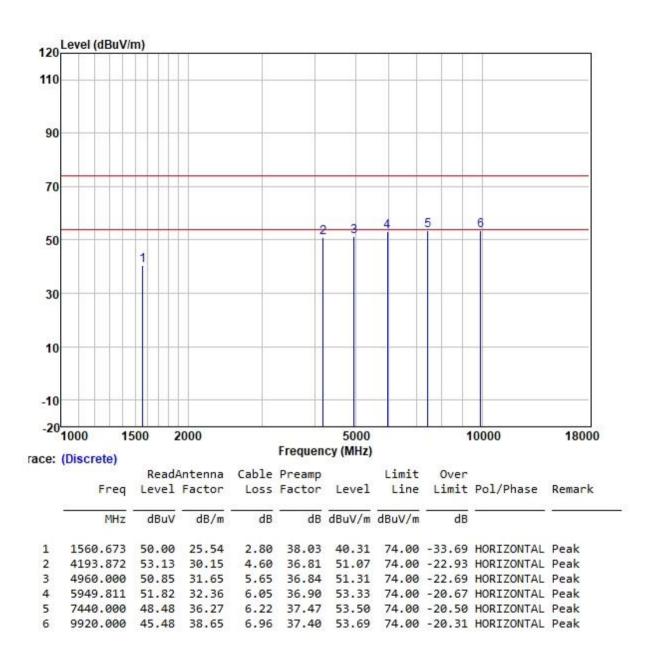
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High





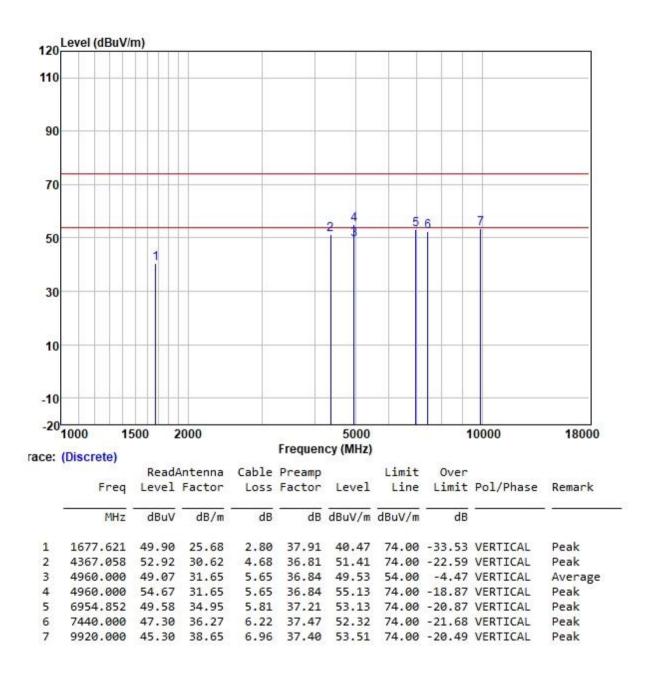
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7.9 Duty Cycle

Test Requirement KDB 558074 D01 v05r02 section 6
Test Method: ANSI C63.10 (2013) Section 11.6

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 21.8 °C Humidity: 53.3 % RH Atmospheric Pressure: 1003 mbar

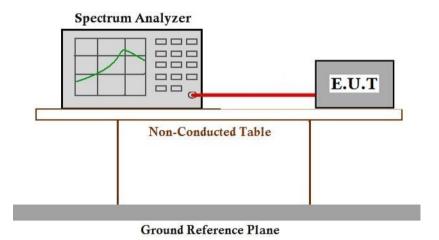
7.9.2 Test Mode Description

Pre-scan / Mode Final test Code Description

TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with

Final test 00 GFSK modulation.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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8 Test Setup Photo

Refer to Appendix - Test Setup Photos for GZCR2201000134AT.

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2201000134AT.



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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 (%)
		2402	0.453	0.628	72.13	1.42	0.54
1M	SISO	2440	0.453	0.628	72.13	1.42	0.53
		2480	0.453	0.628	72.13	1.42	0.53

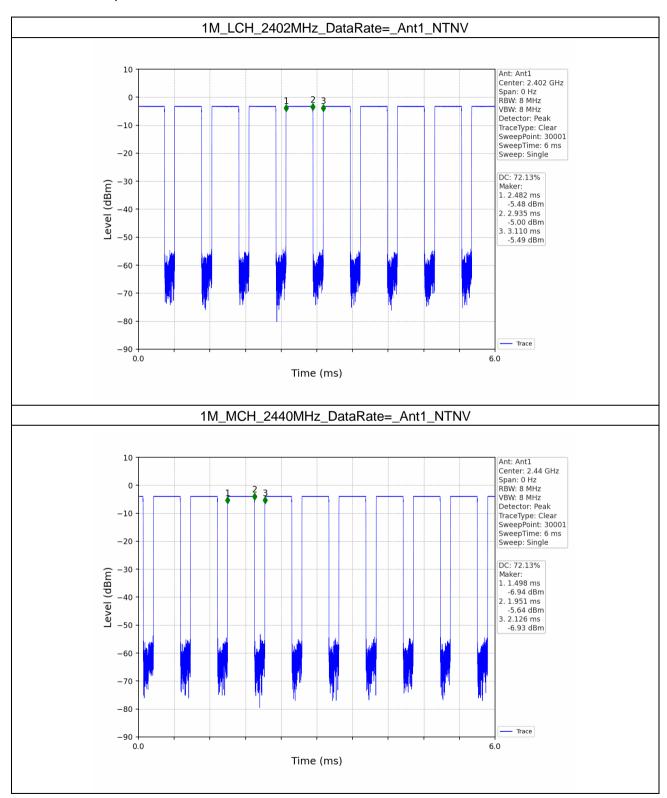




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1.1.2 Test Graph





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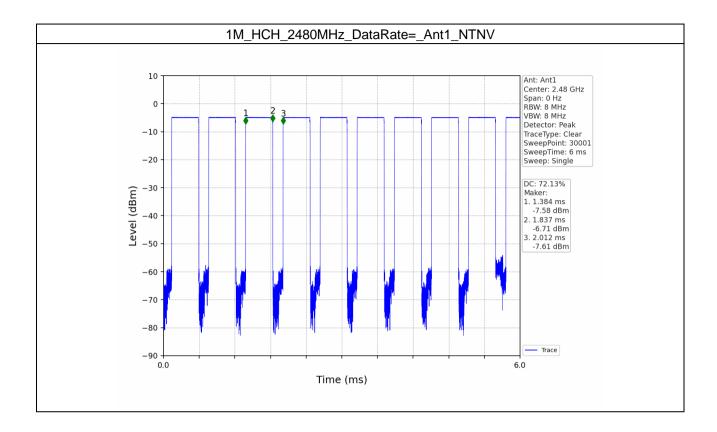
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2. Bandwidth

2.1 OBW

2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz) Result	Verdict
		2402	1	1.119	Pass
1M	SISO	2440	1	1.132	Pass
		2480	1	1.148	Pass



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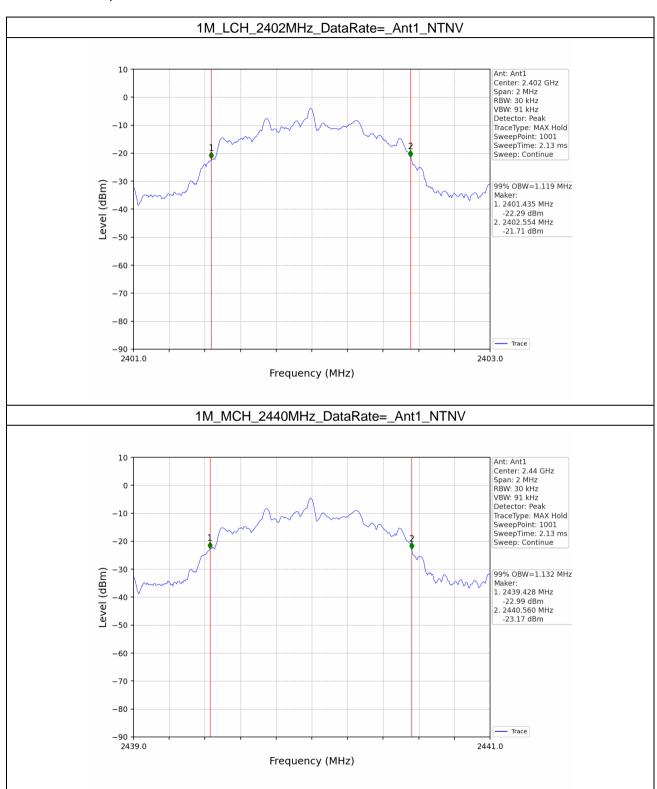
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2.1.2 Test Graph





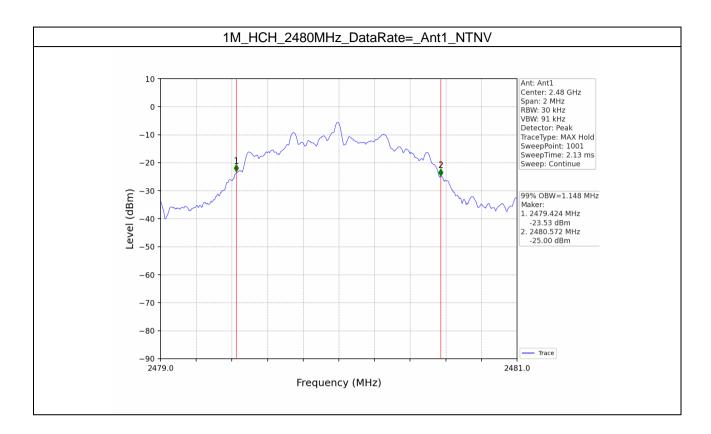
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2.2 6dB BW

2.2.1 Test Result

Mode	TX	Frequency	Λ m4	6dB Bandwidth (MHz)		\/a.rd;at
Mode	Type	(MHz)	Ant	Result	Limit	Verdict
1M	SISO	2402	1	0.748	>=0.5	Pass
		2440	1	0.755	>=0.5	Pass
		2480	1	0.776	>=0.5	Pass

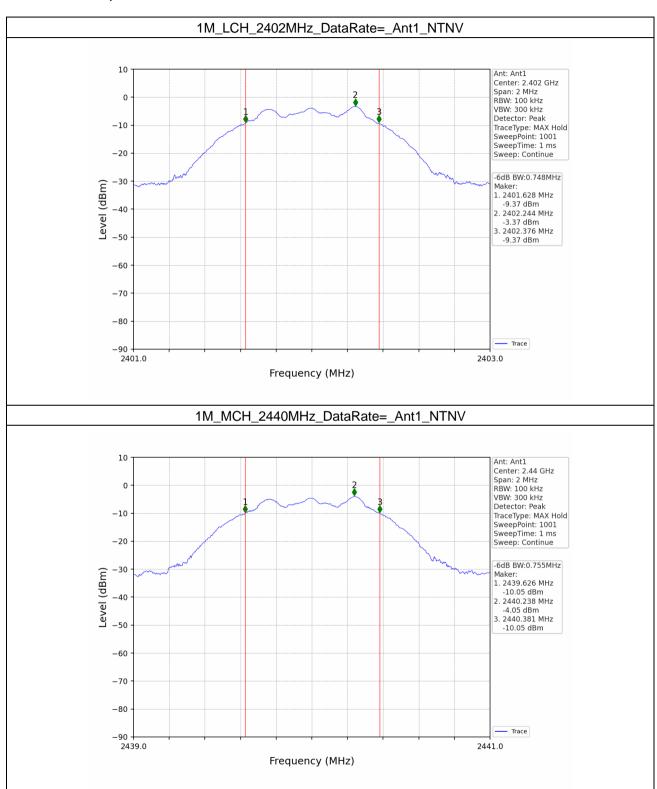




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2.2.2 Test Graph





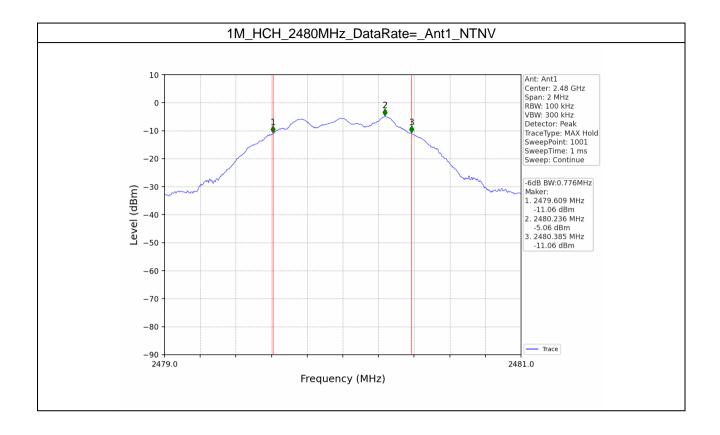
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3. Maximum Conducted Output Power

3.1 Power

3.1.1 Test Result

Mode	Mode TX Frequency		Maximum Peak Conduc	Vardiet	
Mode	Type	(MHz)	Ant1	Limit	Verdict
		2402	-3.25	<=30	Pass
1M	SISO	2440	-3.92	<=30	Pass
		2480	-4.89	<=30	Pass

4. Maximum Power Spectral Density

4.1 PSD

4.1.1 Test Result

Mode	TX	Frequency	Maximum PS	\/andiat	
Mode	Type	(MHz)	Ant1	Limit	Verdict
	SISO	2402	-14.49	<=8	Pass
1M		2440	-15.27	<=8	Pass
		2480	-16.02	<=8	Pass

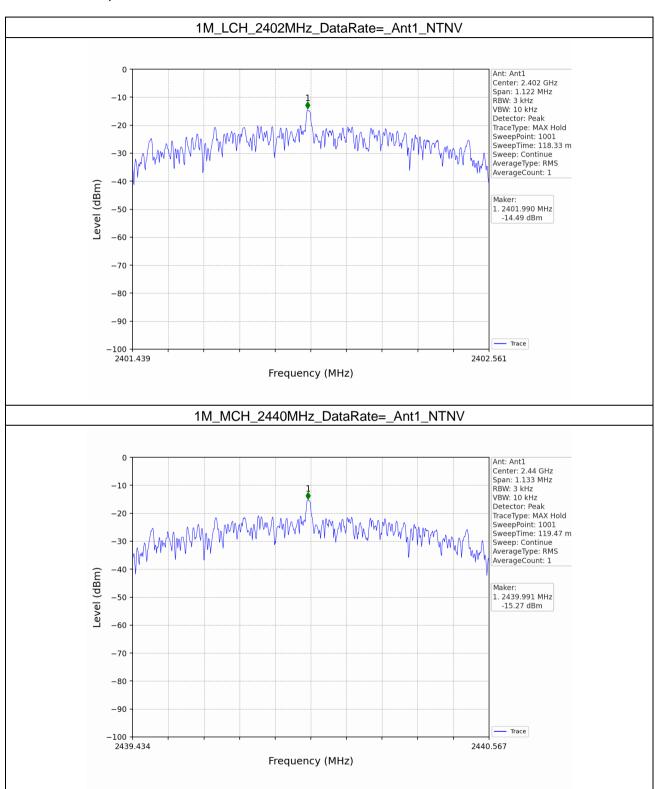




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4.1.2 Test Graph





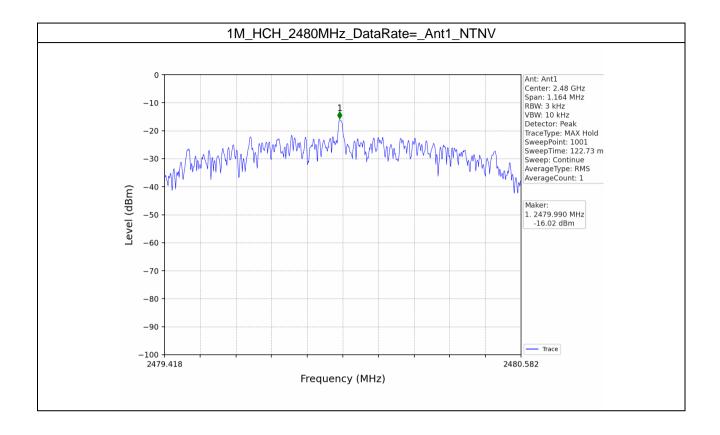
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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	Level of Reference (dBm)
		2402	1	-3.37
1M	SISO	2440	1	-4.06
		2480	1	-5.06



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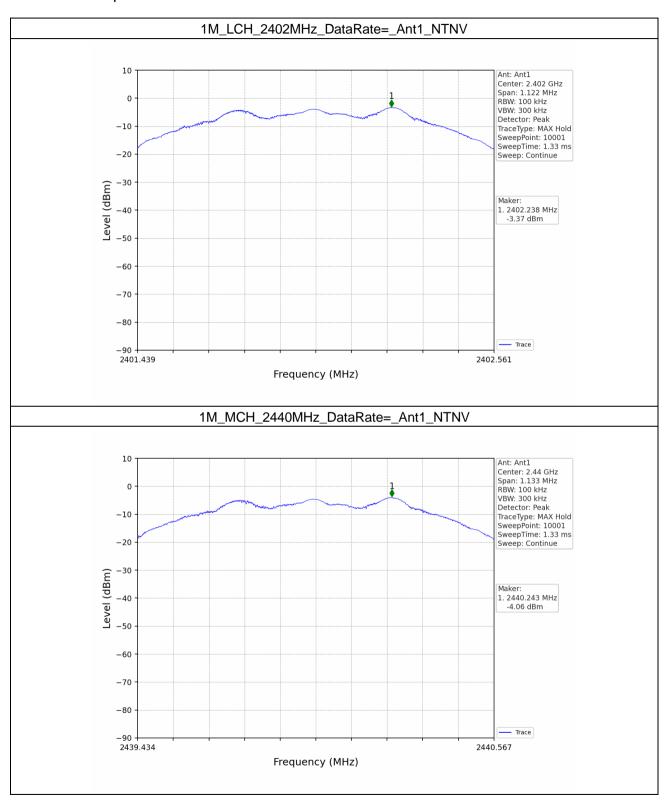
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5.1.2 Test Graph





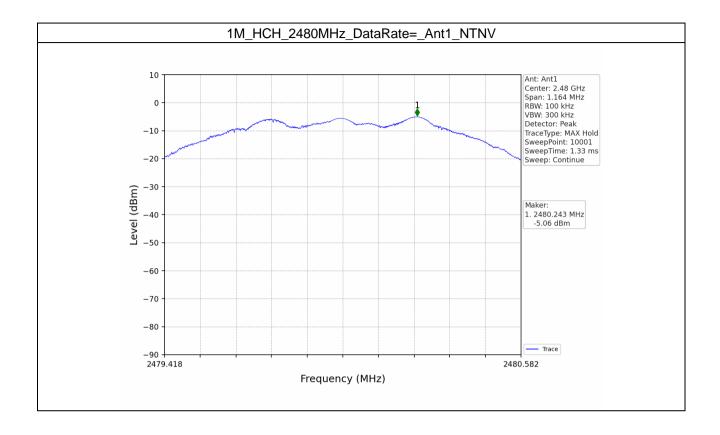
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5.2 CSE

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Ant	Level of Reference (dBm)	Limit (dBm)	Verdict
		2402	1	-3.37	-23.37	Pass
1M	SISO	2440	1	-3.37	-23.37	Pass
		2480	1	-3.37	-23.37	Pass



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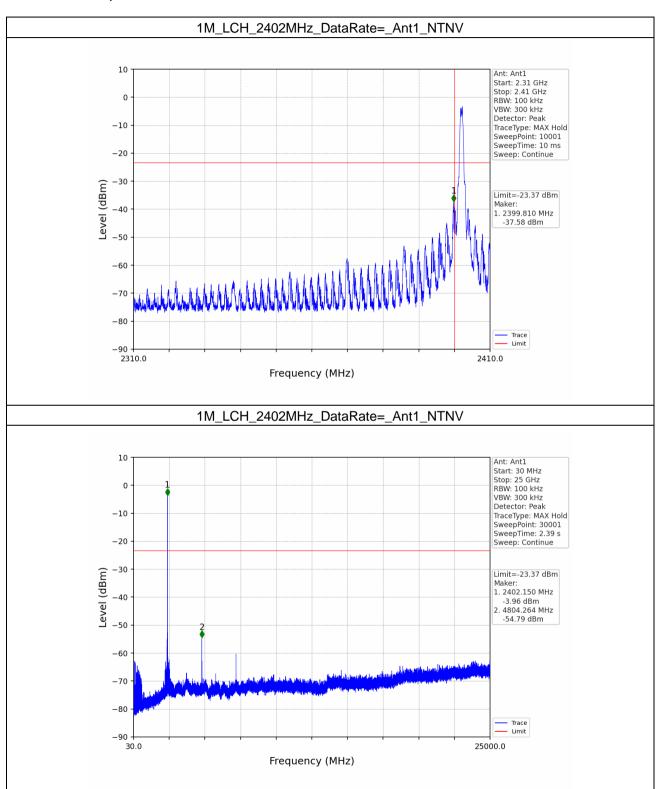
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5.2.2 Test Graph





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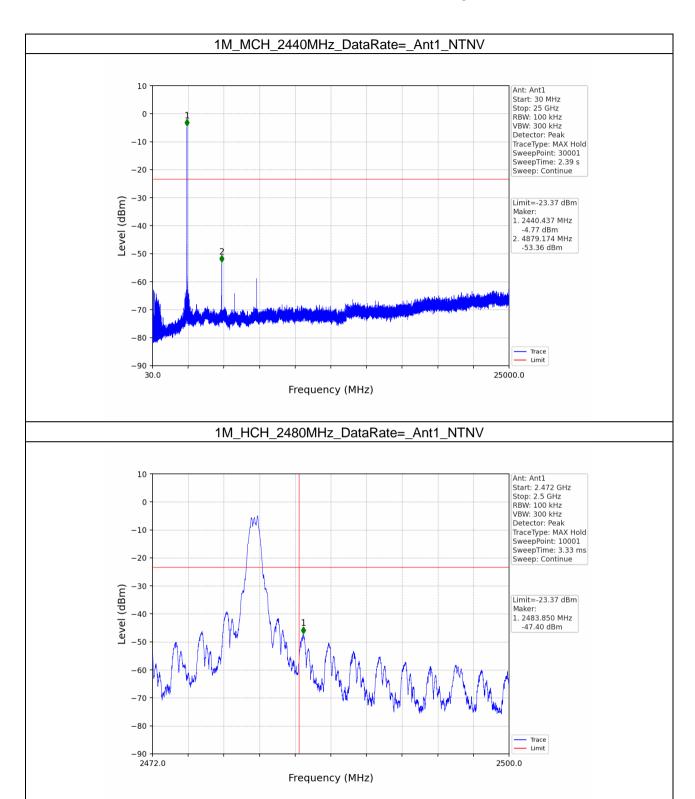
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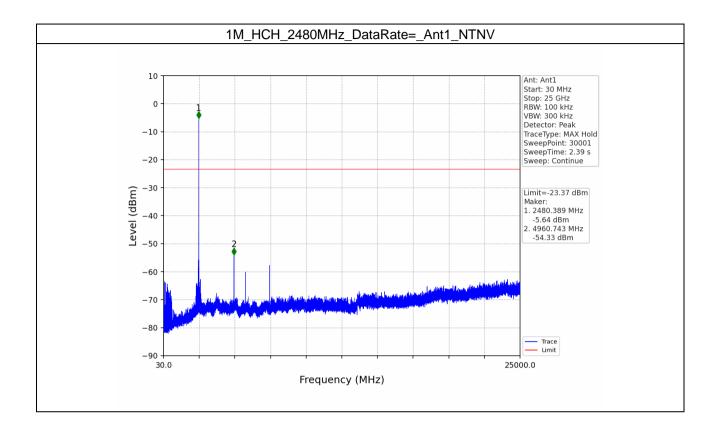
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6. Form731

6.1 Form731

6.1.1 Test Result

Lower Freq	High Freq	MAX Power (W)	MAX Power (dBm)
2402	2480	0.0005	-3.25

- End of the Report -



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