

EMC-TRF-01 Rev 1.1 Report No.: GZCR240500051602

Page: 1 of 47 FCC ID: 2AGE3-82426

TEST REPORT

Application No.: GZCR2405000516AT

Applicant: Guilin Gemred Sensor Technology Co., Ltd

Address of Applicant: No. D-08, Information Industrial Park, Chaoyang Road Qixing District, Guilin

City, Guangxi zhuang Autonomous Region

Manufacturer: Guilin Gemred Sensor Technology Co., Ltd

Address of Manufacturer: No. D-08, Information Industrial Park, Chaoyang Road Qixing District, Guilin

City, Guangxi zhuang Autonomous Region

Factory: Guilin Gemred Sensor Technology Co., Ltd

Address of Factory: No. D-08, Information Industrial Park, Chaoyang Road Qixing District, Guilin

City, Guangxi zhuang Autonomous Region

Product Name: Machine leveler ML100

Model No.: 82426
Trade Mark: Gemred

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

Date of Receipt: 2024-05-21

Date of Test: 2024-05-27 to 2024-06-05

Date of Issue: 2024-06-18

Test Result: Pass*

Ricky Liu Manager

3 day Liv

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



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	Revision Record				
Version	Report No.	Date	Remark		
01	GZCR240500051602	2024-06-18	Original		

Authorized for issue by:		
	key livang	
	Key Liang/Project Engineer	
	vius cui	
	Vico Cui/Reviewer	



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Test Summary 2

Radio Spectrum Technical Requirement						
Item Standard Method Requirement Re						
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				
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 11.12	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	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass				
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass				
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	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		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	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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General Information

4.1 Details of E.U.T.

Power supply: Battery operation: DC $4.5V = 3 \times 1.5V$ with size of "AAA" batteries.

Cable(s): DC 4.5V Test voltage:

Operation Frequency: 2402MHz to 2480MHz

Modulation Type: **GFSK** Number of Channels: 40 **Channel Spacing:** 2MHz

Antenna Type: PCB Antenna

Antenna Gain: 0.89 dBi according to antenna specification

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Radiated Emissions which fall in the restricted bands	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m);± 5.12dB (1GHz- 6GHz); ±5.38dB (6GHz-18GHz); ±5.61dB(18GHz-40GHz)
Radiated Spurious Emissions Below 1GHz	±5.00dB (3m); ±4.38dB (10m)
Radiated Spurious Emissions Above 1GHz	±5.12dB (1GHz-6GHz); ±5.38dB (6GHz- 18GHz); ±5.61dB(18GHz-40GHz)
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

The U_{lab} (lab Uncertainty) is less than U_{cispr/ETSI} (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou, Guangdong, China 510663

Tel: +86 20 82155555

No tests were sub-contracted.

4.5 Test Facility

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

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.

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.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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Equipment List 5

Radiated Emissions which fall in the restricted bands						
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date	
1GHz-26.5 GHz Pre- Amplifier	Agilent	8449B	EMC0521	2023-11-10	2024-11-09	
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2023-12-15	2024-12-14	
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2022-08-24	2024-08-23	
Horn Antenna (1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2022-09-23	2025-09-22	
Horn Antenna (14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17	
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22	
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2023-10-20	2024-10-19	
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2023-12-20	2026-12-19	
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A	

Radiated Spurious Emissions Below 1GHz							
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date		
966 Anechoic Chamber	Shenzhen C.R.T	CRTSGSSAC9 66	EMC2230	2022-04-12	2025-04-11		
EMI Test Receiver(1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2229	2024-02-19	2025-02-18		
Amplifier(9k-1000MHz)	SONOMA	310	EMC2237	2024-03-22	2025-03-21		
TRILOG Broadband Antenna (25M-2GHz)	SCHWRZBECK	VULB 9168	EMC2238	2022-04-20	2025-04-19		
Coaxial Cable	Mirco-COAX UTIFLEX ve	LA2-C125- 8000	EMC2239	2023-06-14	2025-06-13		
Test Software E3	Audix	Ver.6.191211	GZE100-81	N/A	N/A		
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2024-04-08	2026-04-07		



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Radiated Spurious Emissions Above 1GHz						
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date	
1GHz-26.5 GHz Pre- Amplifier	Agilent	8449B	EMC0521	2023-11-10	2024-11-09	
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2023-12-15	2024-12-14	
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2022-08-24	2024-08-23	
Horn Antenna (1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2022-09-23	2025-09-22	
Horn Antenna (14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17	
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2023-11-10	2024-11-09	
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22	
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2023-10-20	2024-10-19	
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2023-12-20	2026-12-19	
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A	

RF Conducted Test						
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date	
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01	
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22	

General used equipmen	t				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2023-06-11	2024-06-10



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Radio Spectrum Technical Requirement 6

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: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.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 0.89 dBi.

Antenna location: Refer to internal photo.



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Radio Spectrum Matter Test Results 7

7.1 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 11.12

Limit:

Test Distance: 3 m

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.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 26.1 °C Humidity: 67.0 % RH Atmospheric Pressure: 1008 mbar

7.1.2 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.



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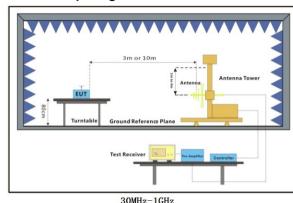
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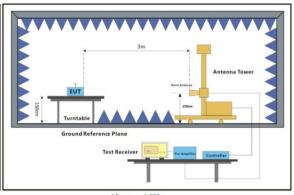


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7.1.3 Test Setup Diagram





Above 1GHz

7.1.4 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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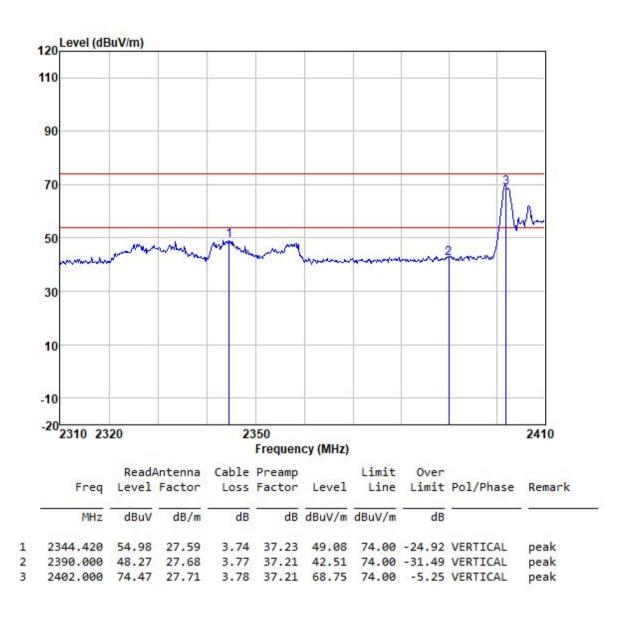
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Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel:Low





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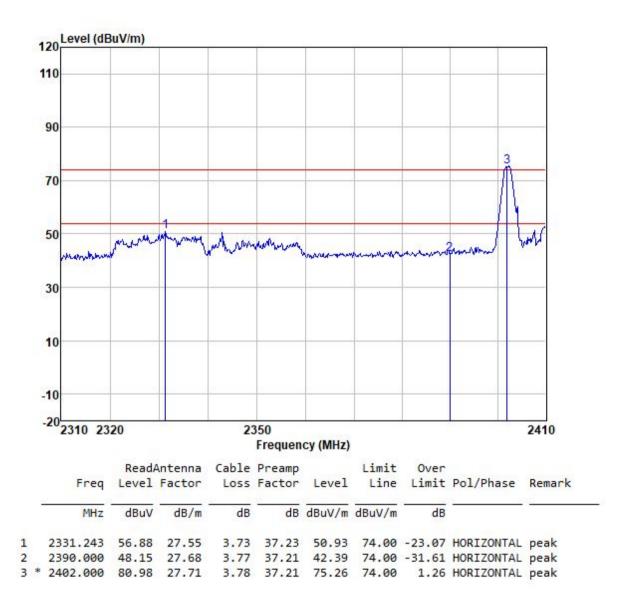
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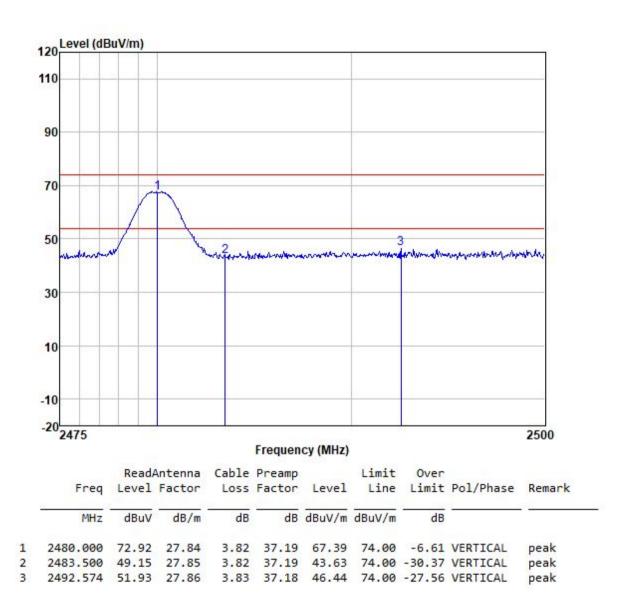
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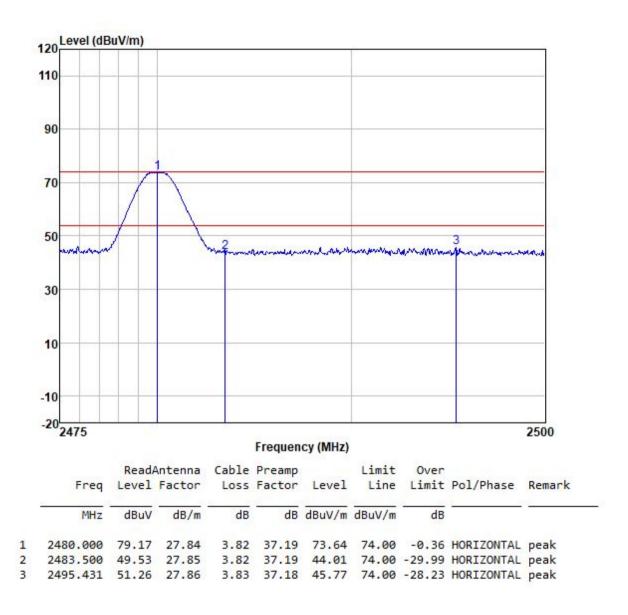
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High





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7.2 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

Limit:

Test Distance: 3 m

** =			
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	
960-1000	500	3	

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.4 °C Humidity: 52.7 % RH Atmospheric Pressure: 1008 mbar

7.2.2 Test Mode Description

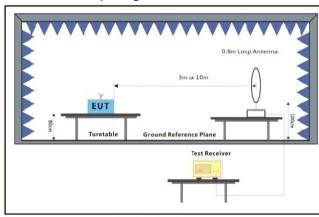
Mode Pre-scan /

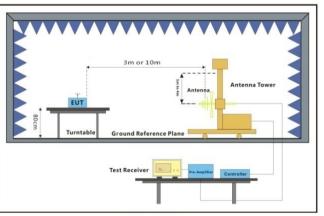
Final test Code Description

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

GFSK modulation.

7.2.3 Test Setup Diagram





Below 30MHz 30MHz-1GHz



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7.2.4 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 quasi-peak 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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- 2. Scan from 9kHz to 30MHz, 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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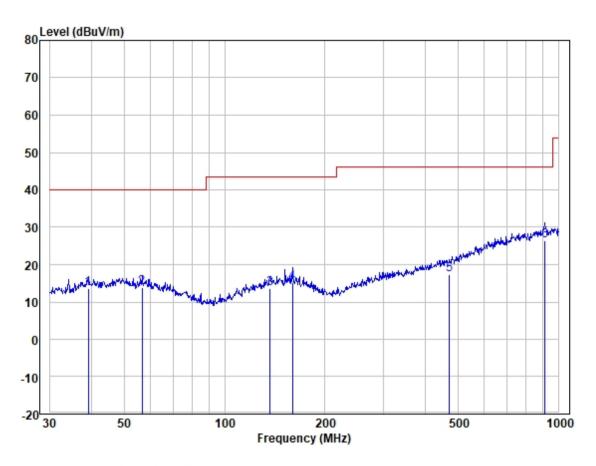


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Test Mode: 00; Polarity: Horizontal



Site : 966 Chamber

Job Model Power : Test Mode

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	39.024	27.20	18.93	0.35	32.86	13.62	40.00	-26.38	HORIZONTAL	QP
2	56.593	27.15	19.18	0.40	32.87	13.86	40.00	-26.14	HORIZONTAL	QP
3	136.939	27.38	18.50	0.64	32.81	13.71	43.52	-29.81	HORIZONTAL	QP
4	159.784	27.99	19.21	0.70	32.83	15.07	43.52	-28.45	HORIZONTAL	QP
5	470.523	26.04	23.11	1.27	32.98	17.44	46.02	-28.58	HORIZONTAL	QP
6	909.667	26.93	29.52	1.76	31.92	26.29	46.02	-19.73	HORIZONTAL	QP



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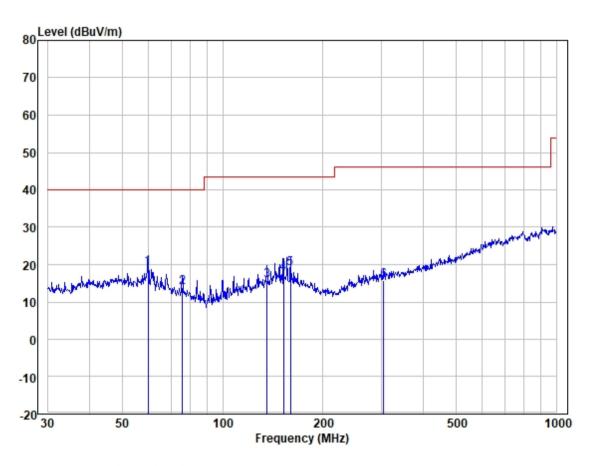


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Test Mode: 00; Polarity: Vertical



Site : 966 Chamber

Job Model Power : Test Mode

	Freq					Measured Level				Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	59.859	32.89	18.79	0.41	32.87	19.22	40.00	-20.78	VERTICAL	QP
2	75.711	30.05	16.07	0.48	32.84	13.76	40.00	-26.24	VERTICAL	QP
3	135.982	29.54	18.46	0.63	32.81	15.82	43.52	-27.70	VERTICAL	QP
4	152.130	30.56	19.09	0.68	32.82	17.51	43.52	-26.01	VERTICAL	QP
5	159.784	31.93	19.21	0.70	32.83	19.01	43.52	-24.51	VERTICAL	QP
6	303.544	28.37	19.33	0.98	32.88	15.80	46.02	-30.22	VERTICAL	QP



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7.3 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 26.1 °C Humidity: 67.0 % RH Atmospheric Pressure: 1008 mbar

7.3.2 Test Mode Description

Mode Pre-scan /

Code

Description

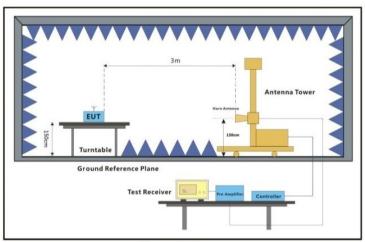
Final test 00

Final test

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

GFSK modulation.

7.3.3 Test Setup Diagram



Above 1GHz



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7.3.4 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 (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 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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp 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. As shown in this section, 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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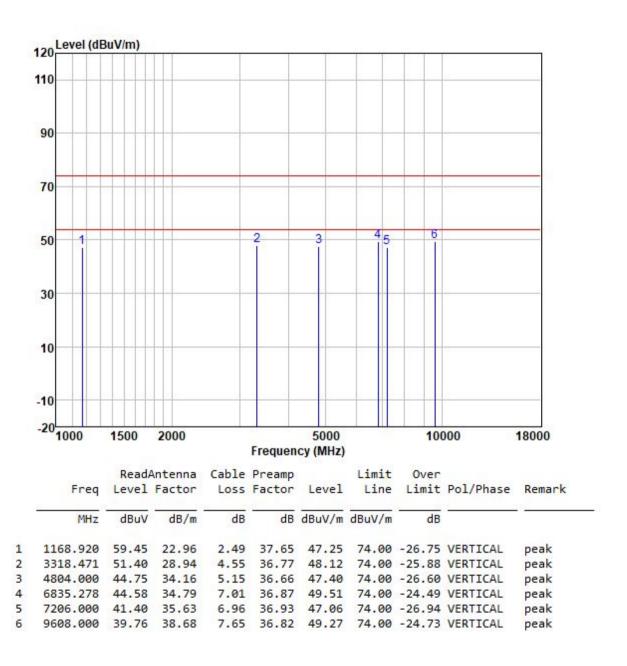
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Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel:Low





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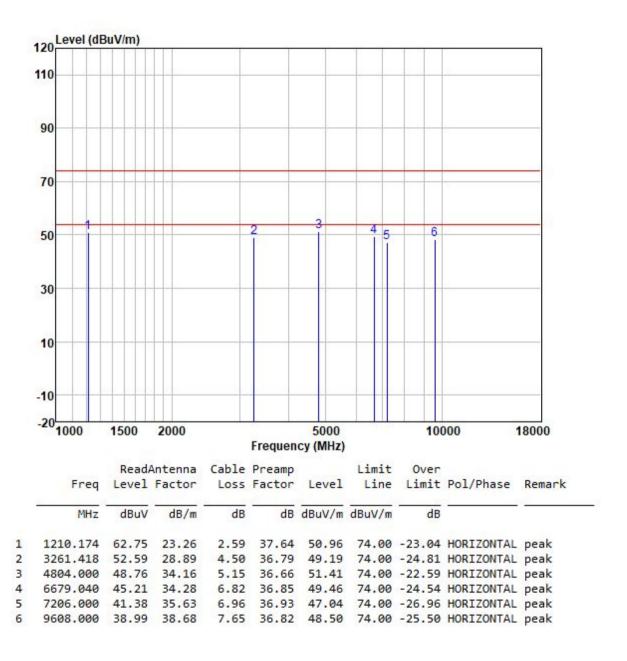
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low





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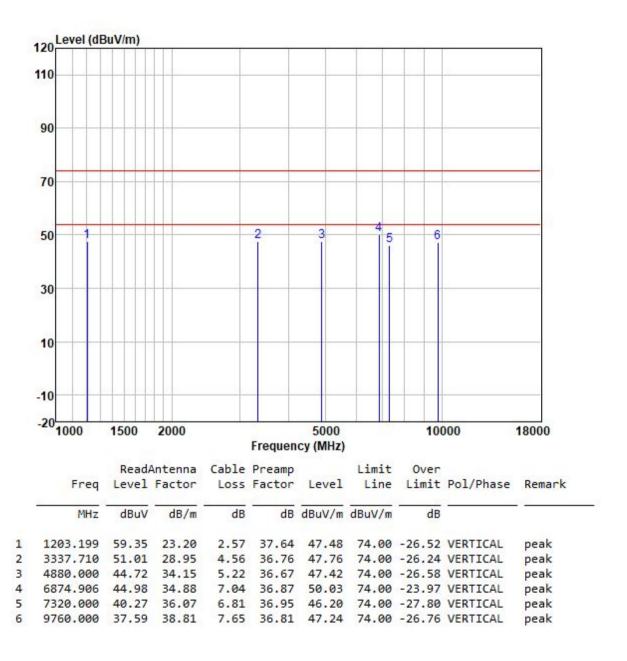
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle





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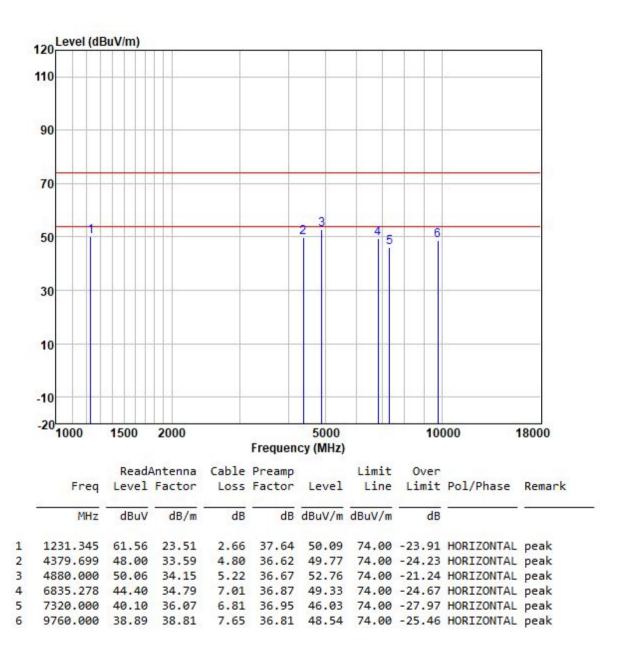
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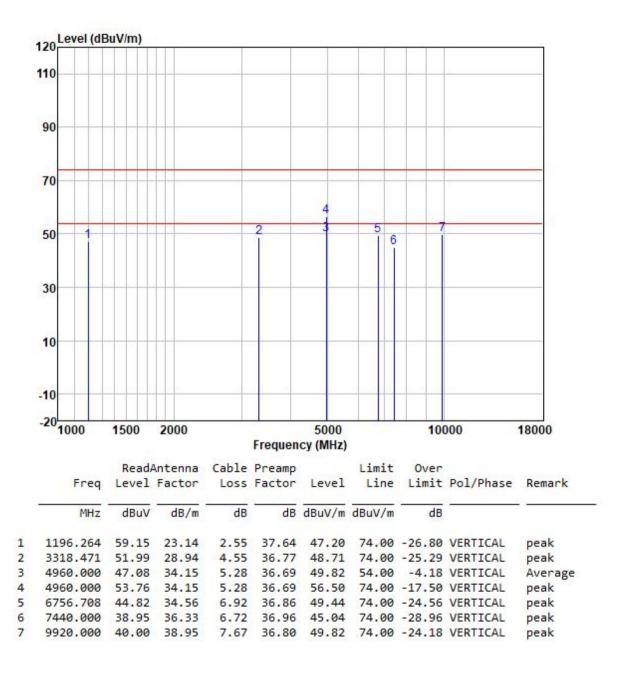
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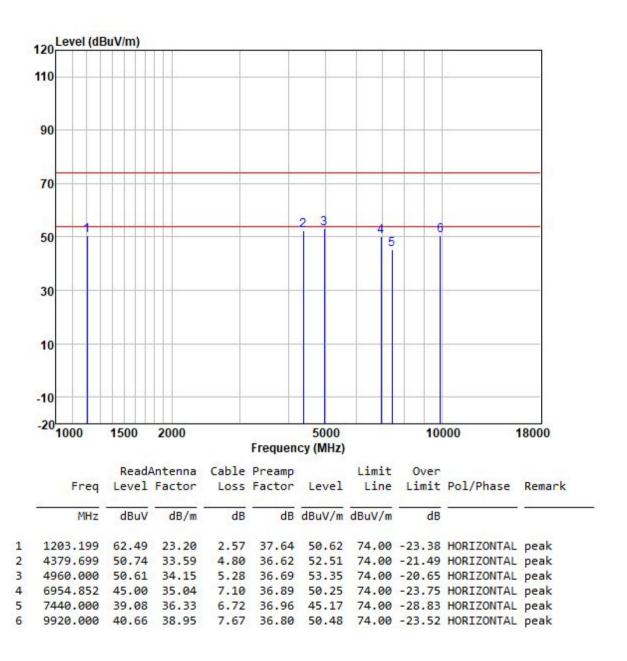
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High





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7.4 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

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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 61.2 % RH Atmospheric Pressure: 1008 mbar

7.4.2 Test Mode Description

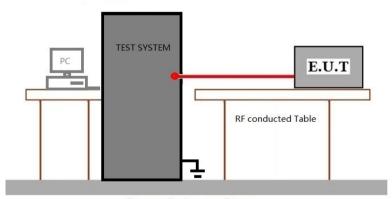
Mode Pre-scan /

Final test Code Description

Final test იი 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

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

Please Refer to Appendix for Details



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7.5 Minimum 6dB Bandwidth

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

≥500 kHz Limit:

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 61.2 % RH Atmospheric Pressure: 1008 mbar

7.5.2 Test Mode Description

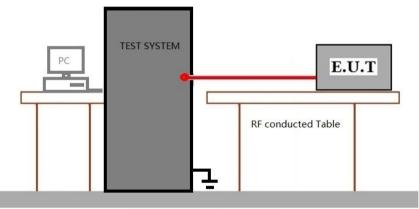
Mode Pre-scan /

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

Please Refer to Appendix for Details



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7.6 Power Spectrum Density

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

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

transmission

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 61.2 % RH Atmospheric Pressure: 1008 mbar

7.6.2 Test Mode Description

Mode Pre-scan /

Code

00

Description

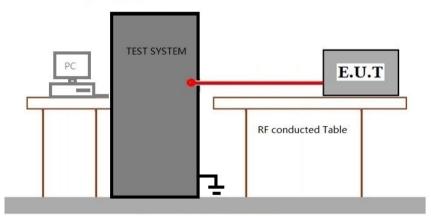
Final test

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

GFSK modulation.

7.6.3 Test Setup Diagram

Final test



Ground Reference Plane

7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.7 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).

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 61.2 % RH Atmospheric Pressure: 1008 mbar

7.7.2 Test Mode Description

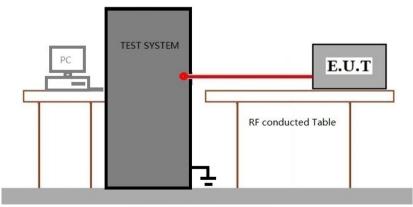
Pre-scan / Mode

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



Ground Reference Plane

7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.8 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).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 61.2 % RH Atmospheric Pressure: 1008 mbar

7.8.2 Test Mode Description

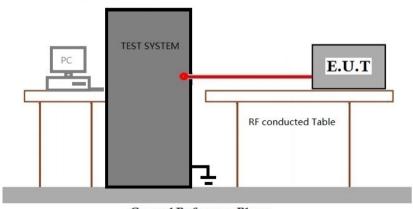
Mode Pre-scan /

Description Final test Code

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

GFSK modulation.

7.8.3 Test Setup Diagram



Ground Reference Plane

7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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Test Setup Photo 8

Refer to Appendix - Test Setup Photo for GZCR240500051602



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EUT Constructional Details (EUT Photos) 9

Refer to External and Internal Photos for GZCR2405000516AT



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10 Appendix

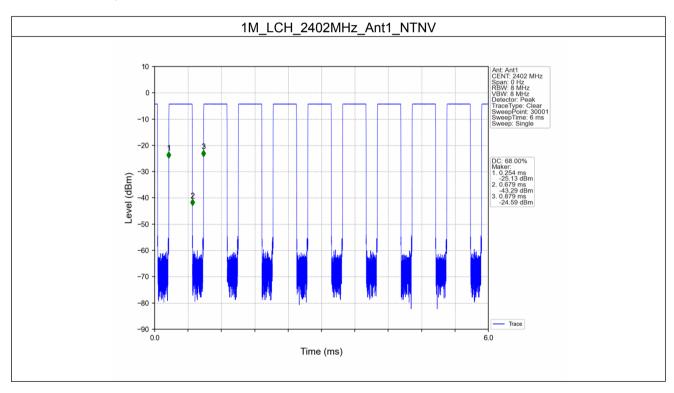
1. Duty Cycle

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	0.425	0.625	68.00	1.67	0.06			
1M	SISO	2440	0.425	0.625	68.00	1.67	0.03			
		2480	0.424	0.625	67.84	1.69	0.06			

1.1.2 Test Graph





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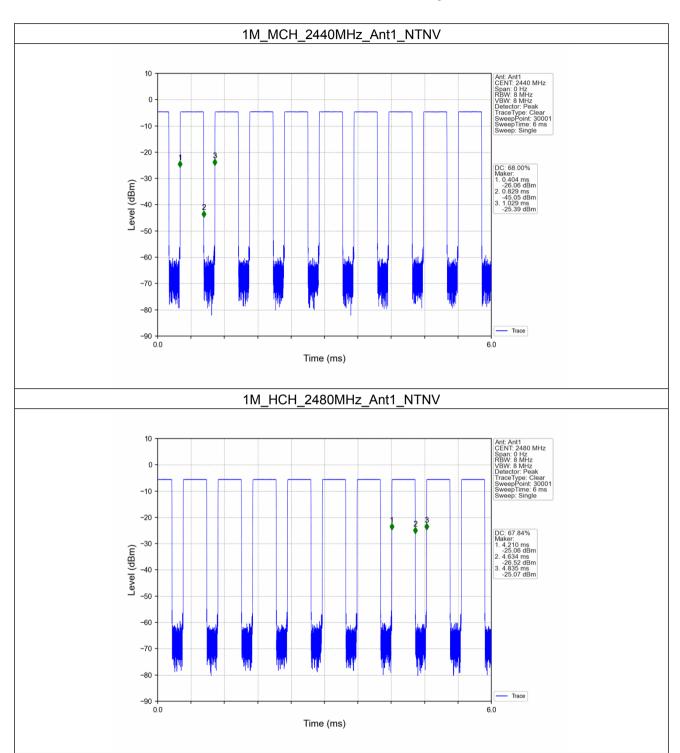
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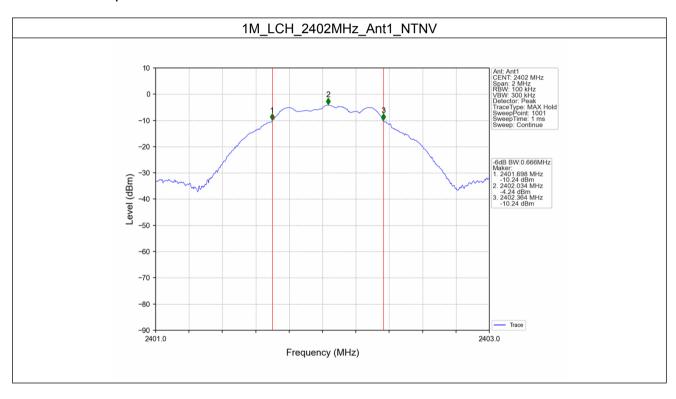
2 Bandwidth

2.1 6dB BW

2.1.1 Test Result

Mode	TX	Frequency	ANIT	6dB Bandwidth (MHz)		Vordict
Mode	Type	(MHz)	ANT	Result	Limit	Verdict
		2402	1	0.666	>=0.5	Pass
1M	SISO	2440	1	0.674	>=0.5	Pass
		2480	1	0.669	>=0.5	Pass

2.1.2 Test Graph





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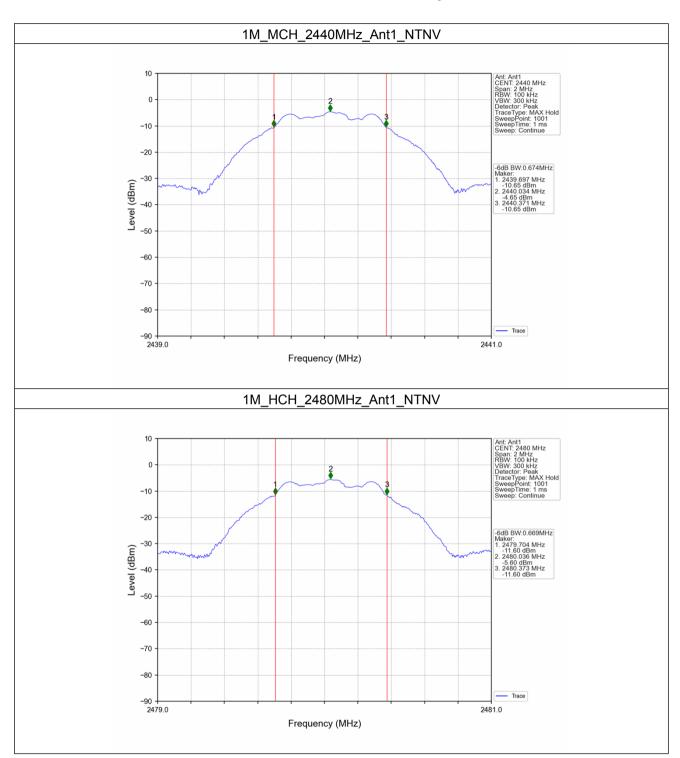
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3. Maximum Conducted Output Power

3.1 Power

3.1.1 Test Result

Mode	TX	Frequency	Maximum Peak Conduc	Verdict					
Mode	Type	(MHz)	ANT1	Limit	verdict				
		2402	-4.24	<=30	Pass				
1M	SISO	2440	-4.64	<=30	Pass				
		2480	-5.59	<=30	Pass				
Note1: Ante	Note1: Antenna Gain: Ant1: 0.89dBi;								

4. Maximum Power Spectral Density

4.1 PSD

4.1.1 Test Result

Mada	TX	Frequency	Maximum PS	Vardiat			
Mode	Type	(MHz)	ANT1	Limit	Verdict		
		2402	-18.43	<=8	Pass		
1M	SISO	2440	-19.14	<=8	Pass		
		2480	-19.85	<=8	Pass		
Note1: Antenna Gain: Ant1: 0.89dBi;							

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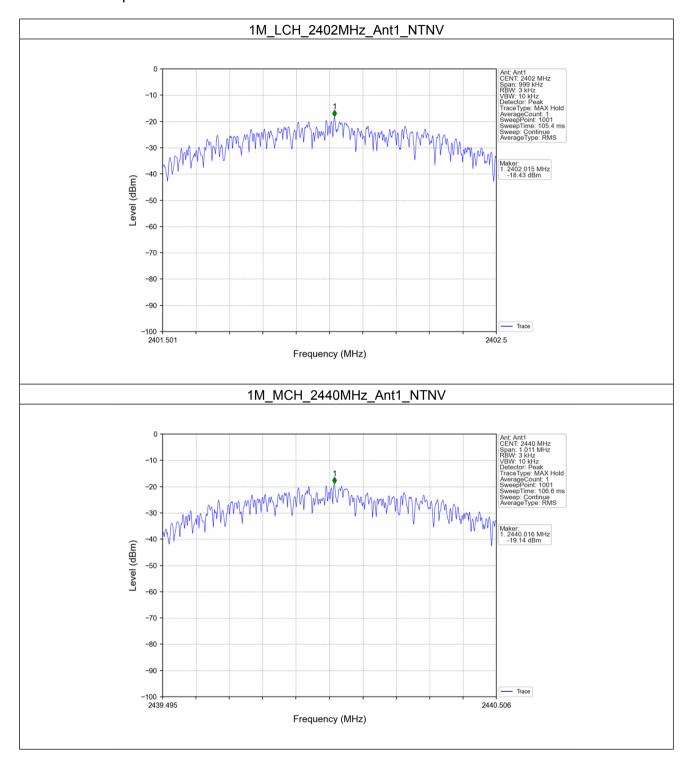
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4.1.2 Test Graph





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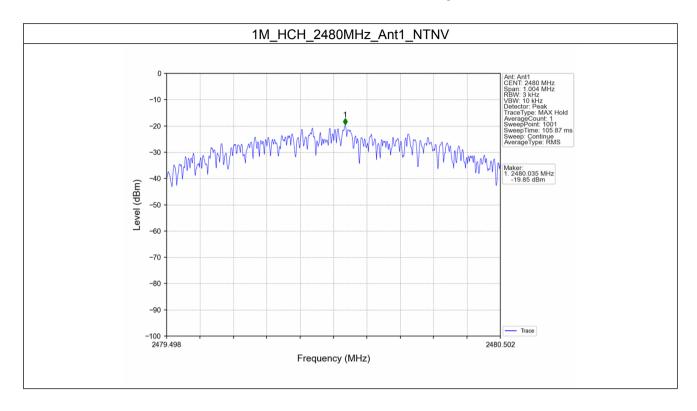
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5. Unwanted Emissions In Non-restricted Frequency Bands

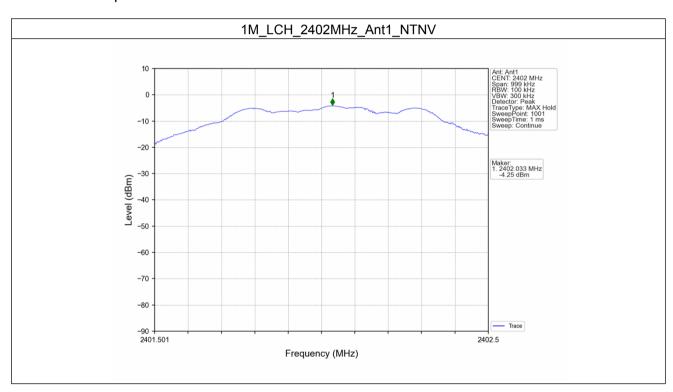
5.1 Ref

5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
		2402	1	-4.25
1M	SISO	2440	1	-4.56
		2480	1	-5.61

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.

5.1.2 Test Graph





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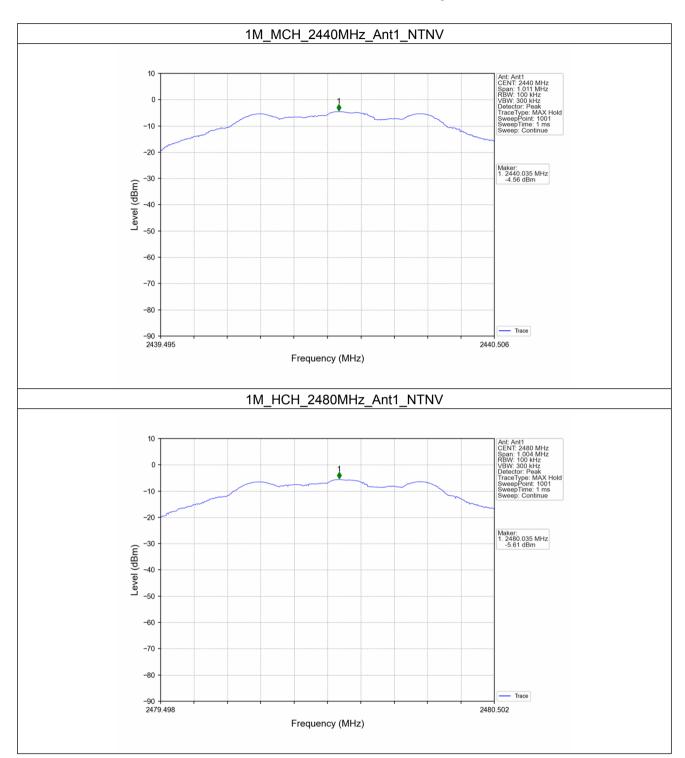
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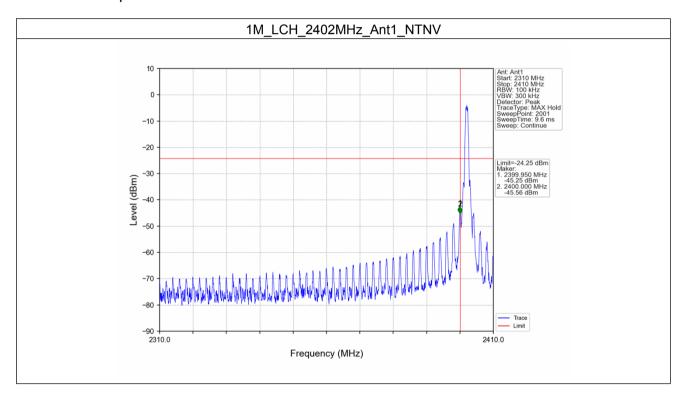
5.2 CSE and Band Edges

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	-4.25	-24.25	Pass
		2440	1	-4.25	-24.25	Pass
		2480	1	-4.25	-24.25	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.

5.2.2 Test Graph





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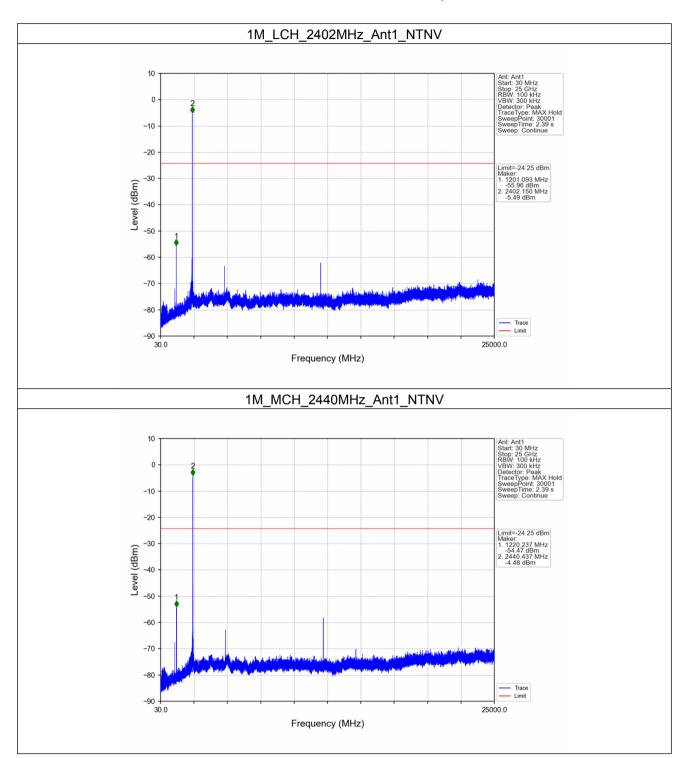
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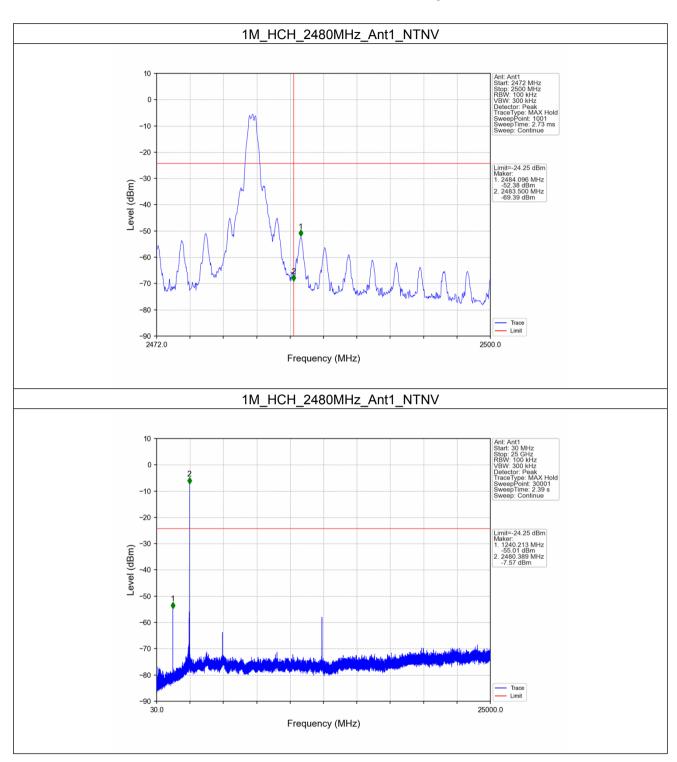
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