

# **FCC Test Report**

Report No.: AGC01741230703FR01

FCC ID : 2AYT3-AC180P

**APPLICATION PURPOSE**: Original Equipment

**PRODUCT DESIGNATION**: Portable Power Station

**BRAND NAME** : BLUETTI

MODEL NAME : AC180P

**APPLICANT**: SHENZHEN POWEROAK NEWENER CO., LTD

**DATE OF ISSUE** : Aug. 24, 2023

**STANDARD(S)** : FCC Part 15 Subpart C §15.247

**REPORT VERSION**: V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



Page 2 of 61

# REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 24, 2023	Valid	Initial Release



# **TABLE OF CONTENTS**

1. VERIFICATION OF COMPLIANCE	5
2. GENERAL INFORMATION	6
2.1. PRODUCT DESCRIPTION 2.2. TABLE OF CARRIER FREQUENCYS 2.3. RELATED SUBMITTAL(S)/GRANT(S) 2.4. TEST METHODOLOGY 2.5. SPECIAL ACCESSORIES 2.6. EQUIPMENT MODIFICATIONS 2.7. ANTENNA REQUIREMENT 2.8 DUTY CYCLE MEASUREMENT	6 7 7 7
3. MEASUREMENT UNCERTAINTY	9
4. DESCRIPTION OF TEST MODES	10
5. SYSTEM TEST CONFIGURATION	11
5.1. CONFIGURATION OF TESTED SYSTEM 5.2. EQUIPMENT USED IN TESTED SYSTEM 5.3. SUMMARY OF TEST RESULTS	11
6. TEST FACILITY	12
7. PEAK OUTPUT POWER	13
7.1. MEASUREMENT PROCEDURE 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 7.3. LIMITS AND MEASUREMENT RESULT	13
8. BANDWIDTH	18
8.1. MEASUREMENT PROCEDURE 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 8.3. LIMITS AND MEASUREMENT RESULTS	18
9. CONDUCTED SPURIOUS EMISSION	25
9.1. MEASUREMENT PROCEDURE	25 25
10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY	37
10.1. MEASUREMENT PROCEDURE	37 37
11. RADIATED EMISSION	41
11.1. MEASUREMENT PROCEDURE	42 43 43
12 LINE CONDUCTED EMISSION TEST	E7



Report No.: AGC01741230703FR01 Page 4 of 61

12.1. LIMITS OF LINE CONDUCTED EMISSION TEST	57
12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	
12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	58
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	58
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	58
APPENDIX I: PHOTOGRAPHS OF TEST SETUP	61
APPENDIX II: PHOTOGRAPHS OF FUT	61



Report No.: AGC01741230703FR01 Page 5 of 61

#### 1. VERIFICATION OF COMPLIANCE

SHENZHEN POWEROAK NEWENER CO., LTD	
F19, BLD No.1, Kaidaer Tongsha Rd No.168, Xili Street, Nanshan, Shenzhen, China	
SHENZHEN POWEROAK NEWENER CO., LTD	
F19, BLD No.1, Kaidaer Tongsha Rd No.168, Xili Street, Nanshan, Shenzhen, China	
Huizhou PowerOak Innovation Co., Ltd	
(No.1 Workshop)Longsheng 5th Road, Laoshe Village, Dayawan West Zone, Huizhou, Guangdong, China	
Portable Power Station	
BLUETTI	
AC180P	
Jul. 18, 2023	
Jul. 19, 2023~Aug. 24, 2023	
No any deviation from the test method	
Normal	
Pass	
AGCRT-US-BLE/RF	

# We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC part 15.247.

Reviewed By

Calvin Liu
(Reviewer)

Aug. 24, 2023



Page 6 of 61

# 2. GENERAL INFORMATION

# 2.1. PRODUCT DESCRIPTION

The EUT is designed as a "Portable Power Station". It is designed by way of utilizing the GFSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz		
RF Output Power	GFSK 1Mbps: -1.542dBm (Max) GFSK 2Mbps: -1.516dBm (Max)		
Bluetooth Version	V5.0		
Modulation  BR □GFSK, EDR □π /4-DQPSK, □8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps			
Number of channels	40 Channels		
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)		
Antenna Gain	-2.31dBi		
Hardware Version	AC180_U2 V6.0		
Software Version	V2073		
Input Rating	<ul> <li>AC: 120V~50/60Hz, 15A Max</li> <li>DC/PV:12V-60V=10A, 500W Max</li> </ul>		
Output Rating	<ul> <li>AC: 120V~50/60Hz, 1800W/1800VA Max.</li> <li>USB-A: 5V=3A, 15W Total x2</li> <li>USB-C: 5/9/12/15/20V=3A; 20V=5A(With E-Marker chip built-in)</li> <li>Cigarette Lighter Socket: 12V=10A</li> <li>Wireless Charge: 5/7.5/10/15W</li> <li>AC and DC output: 1800W Total</li> </ul>		

#### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency	
	0	2402 MHz	
	1	2404 MHz	
2400~2483.5MHz	:	:	
	38	2478 MHz	
	39	2480 MHz	



Page 7 of 61

# 2.3. RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2AYT3-AC180P** filing to comply with the FCC Part 15.247 requirements.

#### 2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

#### 2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

#### 2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

#### 2.7. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device. For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.



Report No.: AGC01741230703FR01 Page 8 of 61

# 2.8 Duty Cycle Measurement

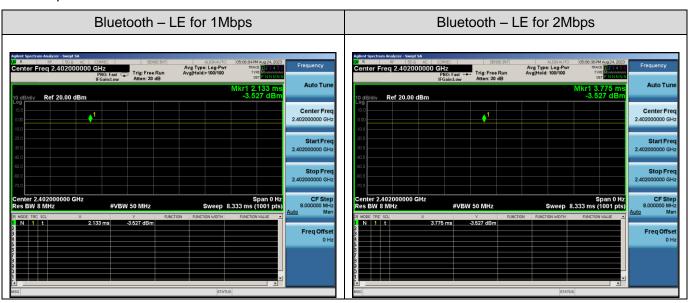
The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Peak. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Operating mode	T(µs)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)
BLE_1Mbps	-	100	-	-
BLE_2Mbps	-	100	-	-

#### Remark:

- 1. Duty Cycle factor = 10 \* log (1/ Duty cycle)
- 2. The duty cycle of each frequency band mode reflects the determination requirements of the low channel measurement value

#### The test plots as follows:





Page 9 of 61

# 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	U <sub>c</sub> = ±2 %
Uncertainty of Occupied Channel Bandwidth	U <sub>c</sub> = ±2 %



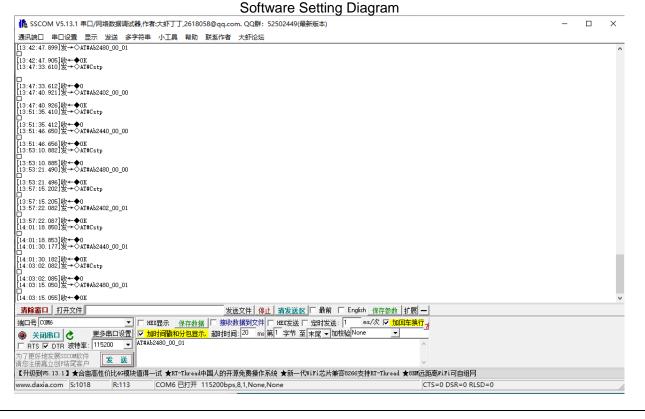


#### 4. DESCRIPTION OF TEST MODES

Summary Table of Test Cases		
	Data Rate / Modulation	
Test Item	Bluetooth – LE / GFSK	
Radiated&Conducted Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps+WPT (Battery powered or AC input) Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps+WPT (Battery powered or AC input) Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps+WPT (Battery powered or AC input) Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps+WPT (Battery powered or AC input) Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps+WPT (Battery powered or AC input) Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps+WPT (Battery powered or AC input)	
AC Conducted Emission	Mode 1: Bluetooth Link +WPT + Battery + Charging from AC input	

#### Note:

- Only the result of the worst case was recorded in the report, if no other cases.
- 2. The battery is full-charged during the test.
- 3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 4. For Conducted Test method, a temporary antenna connector is provided by the manufacture.



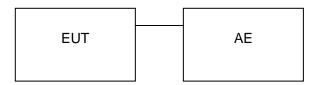


Page 11 of 61

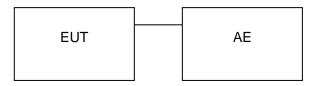
# 5. SYSTEM TEST CONFIGURATION

#### **5.1. CONFIGURATION OF TESTED SYSTEM**

Radiated Emission Configure:



Conducted Emission Configure:



#### **5.2. EQUIPMENT USED IN TESTED SYSTEM**

Item	Equipment	Model No.	ID or Specification	Remark
1	Portable Power Station	AC180P	2AYT3-AC180P	EUT
2	Xiaomi phone	Mi 10	N/A	AE
3	wireless charging load	N/A	N/A	AE

# **5.3. SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	Peak Output Power	Compliant
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.247 (e)	Maximum Conducted Output Power Density	Compliant
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant



Page 12 of 61

# **6. TEST FACILITY**

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA

# TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun. 03, 2023	Jun. 02, 2024
LISN	R&S	ESH2-Z5	100086	Jun. 03, 2023	Jun. 02, 2024
Test software	R&S	Ver.V1.71	N/A	N/A	N/A

# **TEST EQUIPMENT OF RADIATED EMISSION TEST**

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Feb. 18, 2023	Feb. 17, 2024
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Jun. 01, 2023	May 31, 2024
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	N/A	N/A
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Mar. 12, 2022	Mar. 11, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2023	Apr. 22, 2024
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 01, 2022	Sep. 02, 2024
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 05, 2023	Jan. 04, 2025
Test software	Tonscend	Ver.2.5	N/A	N/A	N/A



Page 13 of 61

# 7. PEAK OUTPUT POWER

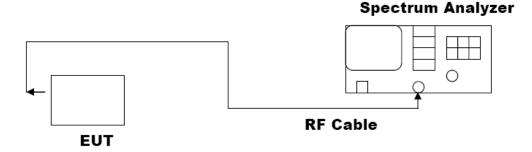
#### 7.1. MEASUREMENT PROCEDURE

For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer.
- 2. RBW ≥ DTS bandwidth
- 3. VBW≥3\*RBW.
- 4. SPAN≥VBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for cables.

# 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) PEAK POWER TEST SETUP





Report No.: AGC01741230703FR01 Page 14 of 61

7.3. LIMITS AND MEASUREMENT RESULT

7101 EIIIII 7 7 11 7 1	7.5. Elimito Arb ineaconement necoel					
Test Data of Conducted Output Power						
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail		
	2402	-1.732	≤30	Pass		
GFSK 1Mbps	2440	-1.542	≤30	Pass		
	2480	-1.906	≤30	Pass		
	2402	-1.716	≤30	Pass		
GFSK 2Mbps	2440	-1.516	≤30	Pass		
	2480	-1.930	≤30	Pass		

**Test Graphs of Conducted Output Power** 



























Page 18 of 61

#### 8. BANDWIDTH

#### 8.1. MEASUREMENT PROCEDURE

#### 6dB bandwidth:

- 1. Connect EUT RF output port to the Spectrum Analyzer.
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW ≥ 3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

#### Occupied bandwidth:

- 1. Connect EUT RF output port to the Spectrum Analyzer.
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
  The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video
  bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

# 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

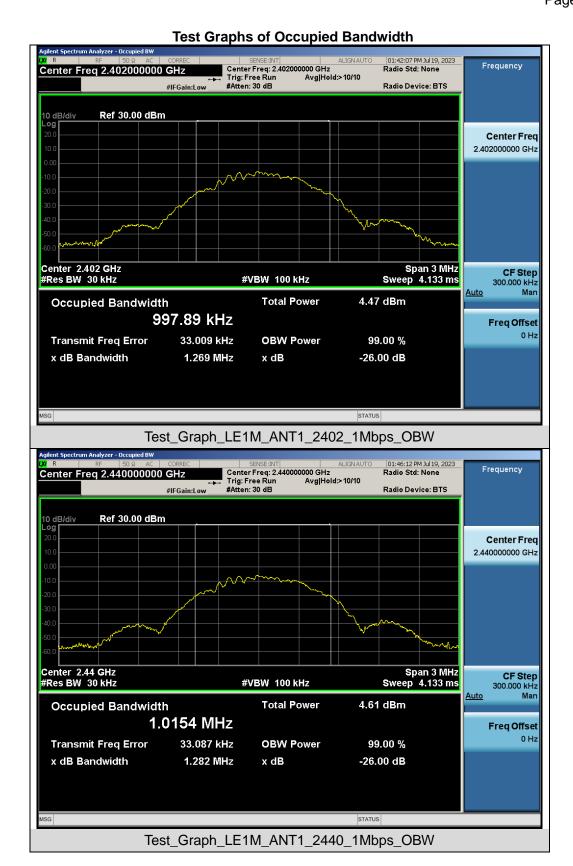
The same as described in section 7.2.

#### 8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
	2402	0.998	0.674	≥0.5	Pass
GFSK 1Mbps	2440	1.015	0.685	≥0.5	Pass
	2480	1.027	0.698	≥0.5	Pass
GFSK 2Mbps	2402	1.903	1.117	≥0.5	Pass
	2440	1.980	1.145	≥0.5	Pass
	2480	2.000	1.221	≥0.5	Pass

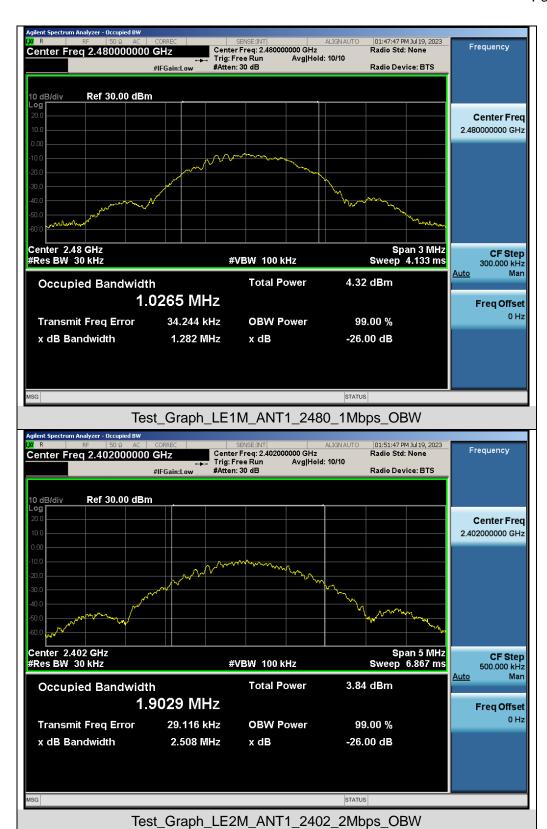






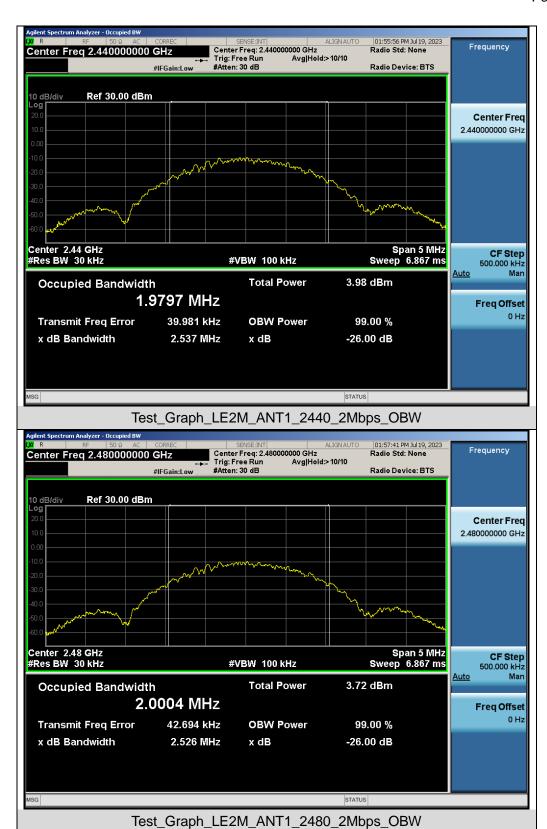






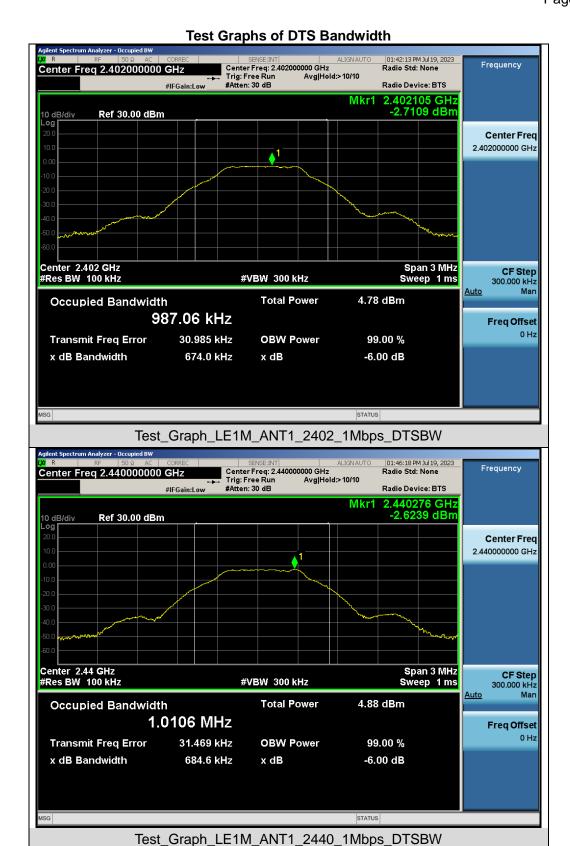












Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/















Page 25 of 61

# 9. CONDUCTED SPURIOUS EMISSION

#### 9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer.
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

# 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT					
And Park to 1 to 12	Measurement Result				
Applicable Limits	Test Data	Criteria			
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS			



Freq Offset



Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands 01:42:48 PM Jul 19, 2023 Frequency Center Freq 2.402000000 GHz Avg Type: Log-Pwr Avg|Hold: 10/10 Trig: Free Run #Atten: 30 dB PNO: Wide ↔ IFGain:Low **Auto Tune** Mkr1 2.402 099 2 GHz -2.762 dBm Ref 20.00 dBm 10 dB/div Center Freq 2.402000000 GHz Start Freq 2.400500000 GHz Stop Freq 2.403500000 GHz CF Step 300.000 kHz Man Freq Offset 0 Hz Span 3.000 MHz Sweep 2.000 ms (30000 pts) Center 2.402000 GHz #Res BW 100 kHz #VBW 300 kHz Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_Reference Level 01:42:57 PM Jul 19, 2023 Frequency Avg Type: Log-Pwr Avg|Hold: 10/10 Center Freq 1.210000000 GHz PNO: Fast → Trig: Free Run IFGain:Low #Atten: 30 dB **Auto Tune** Mkr1 2.351 22 GHz -57.171 dBm 10 dB/div Ref 20.00 dBm Center Freq 1.210000000 GHz Start Freq 30.000000 MHz Stop Freq 2.390000000 GHz **CF Step** 236.000000 MHz Man

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_Lower Band Emissions

#VBW 300 kHz

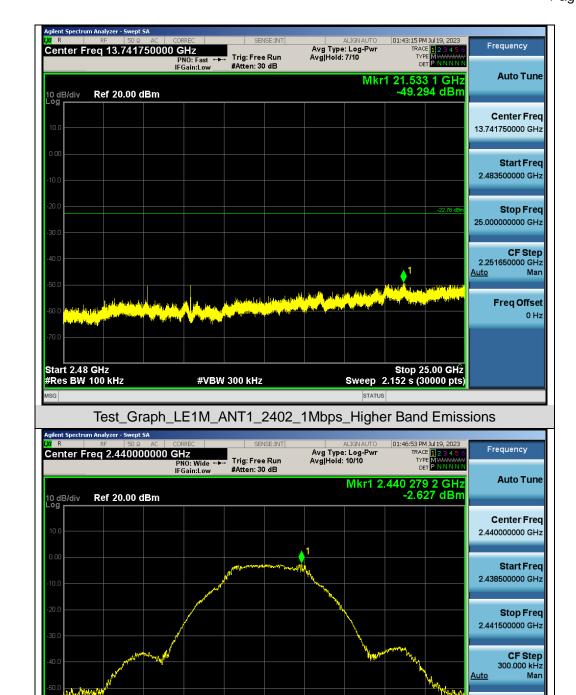
Stop 2.390 GHz Sweep 226.0 ms (30000 pts)

Start 30 MHz #Res BW 100 kHz



Freq Offset 0 Hz





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_Reference Level

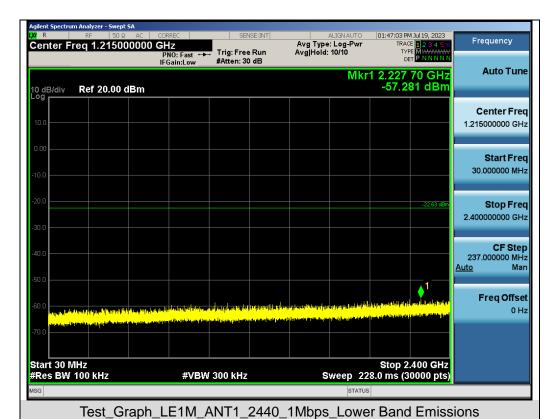
#VBW 300 kHz

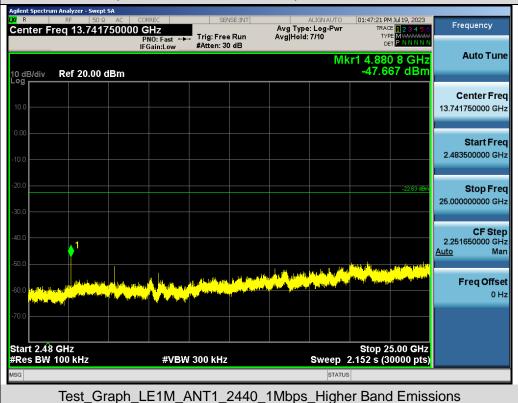
Span 3.000 MHz Sweep 2.000 ms (30000 pts)

Center 2.440000 GHz #Res BW 100 kHz













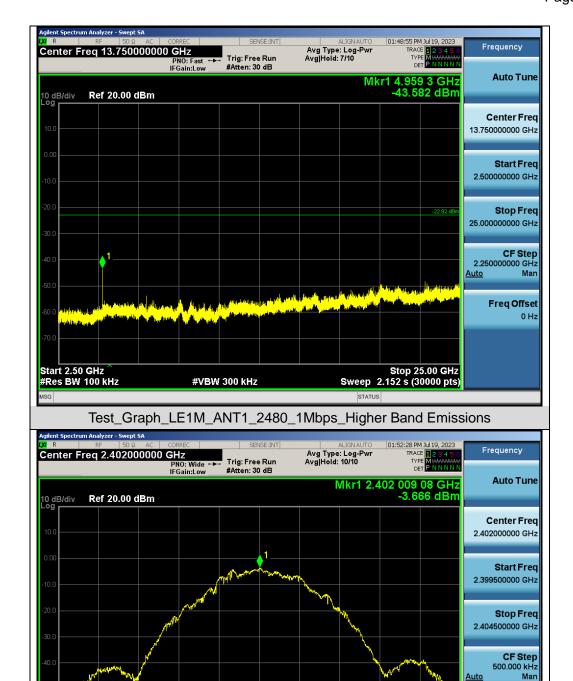


| Test\_Graph\_LE1M\_ANT1\_2480\_1Mbps\_Lower Band Emissions | Auto Tule | Auto Tule



Freq Offset 0 Hz





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE2M\_ANT1\_2402\_2Mbps\_Reference Level

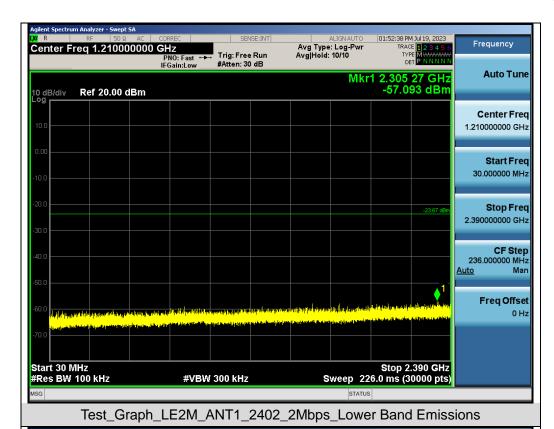
#VBW 300 kHz

Span 5.000 MHz Sweep 2.000 ms (30000 pts)

Center 2.402000 GHz #Res BW 100 kHz







01:52:55 PM Jul 19, 2023 Avg Type: Log-Pwr Avg|Hold: 7/10 TRACE 12345
TYPE MWWWW Frequency Center Freq 13.741750000 GHz Trig: Free Run #Atten: 30 dB PNO: Fast IFGain:Low **Auto Tune** Mkr1 21.602 1 GHz -47.874 dBm 10 dB/div Ref 20.00 dBm Center Freq 13.741750000 GHz Start Freq 2.483500000 GHz Stop Frea 25.000000000 GHz **CF Step** 2.251650000 GHz Man Freq Offset 0 Hz Start 2.48 GHz #Res BW 100 kHz Stop 25.00 GHz Sweep 2.152 s (30000 pts) #VBW 300 kHz

Test\_Graph\_LE2M\_ANT1\_2402\_2Mbps\_Higher Band Emissions



Freq Offset 0 Hz

Stop 2.400 GHz Sweep 228.0 ms (30000 pts)





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE2M\_ANT1\_2440\_2Mbps\_Lower Band Emissions

#VBW 300 kHz

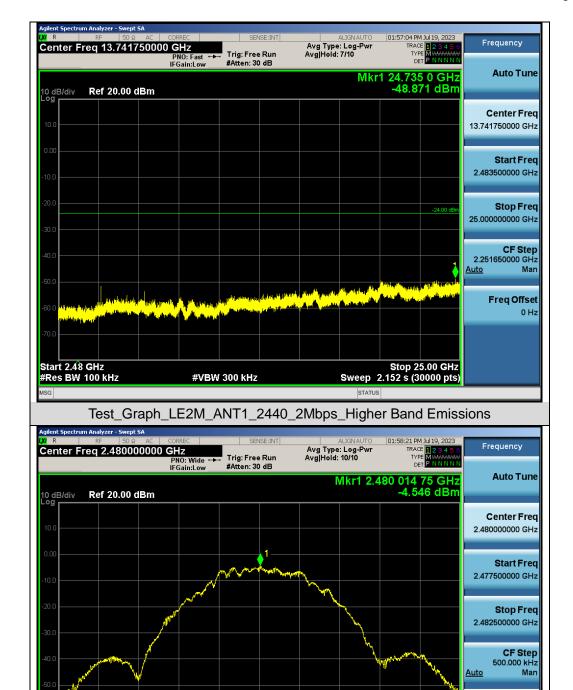
Start 30 MHz #Res BW 100 kHz



Freq Offset 0 Hz

Span 5.000 MHz Sweep 2.000 ms (30000 pts)





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

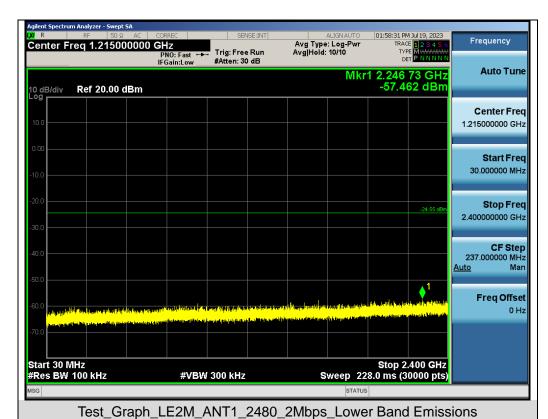
Test\_Graph\_LE2M\_ANT1\_2480\_2Mbps\_Reference Level

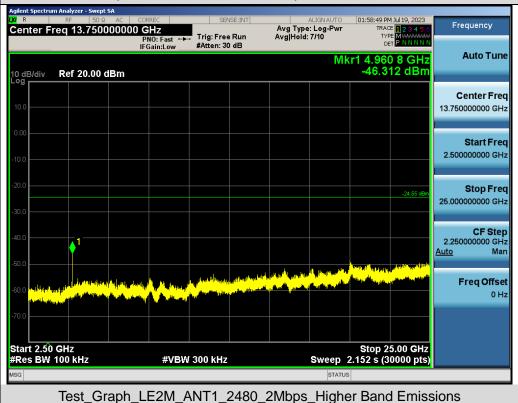
#VBW 300 kHz

Center 2.480000 GHz #Res BW 100 kHz



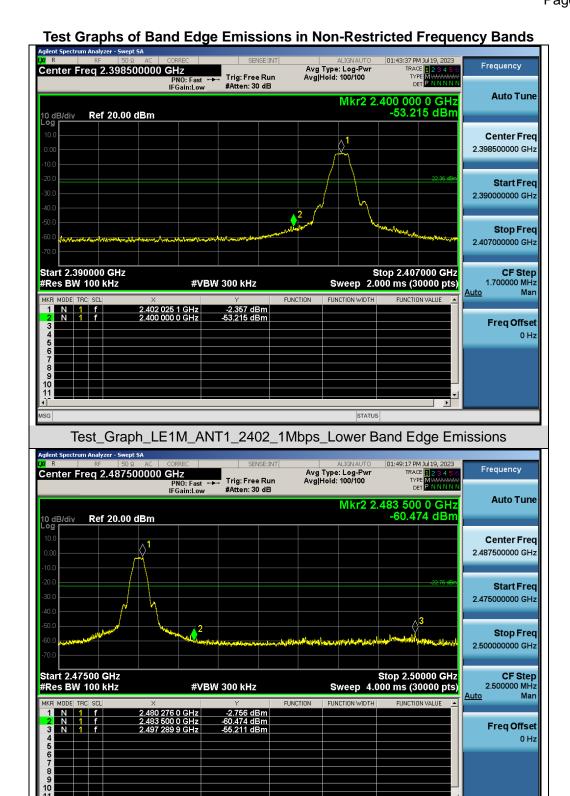








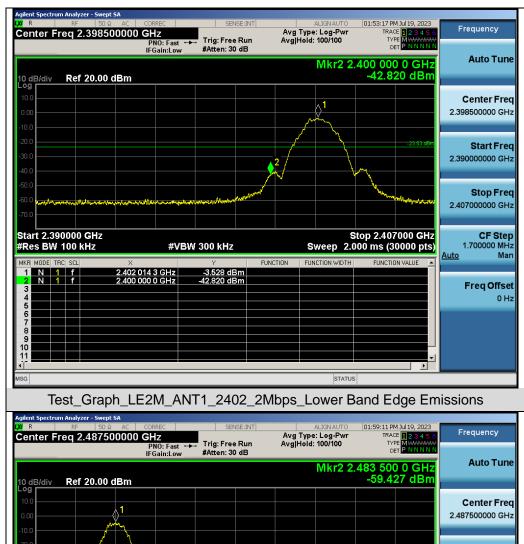


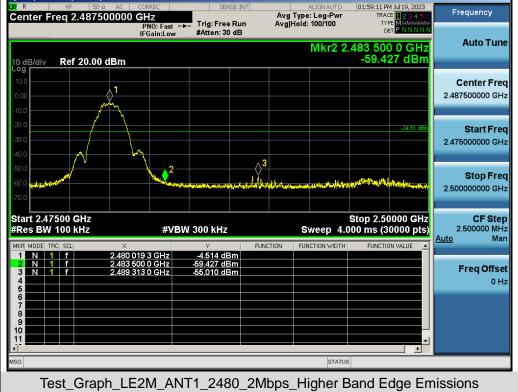


Test\_Graph\_LE1M\_ANT1\_2480\_1Mbps\_Higher Band Edge Emissions











Page 37 of 61

## 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

## 10.1. MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer.
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set the SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the KDB 558074 item 8.4 was used in this testing.

## 10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 7.2.

#### 10.3. MEASUREMENT EQUIPMENT USED

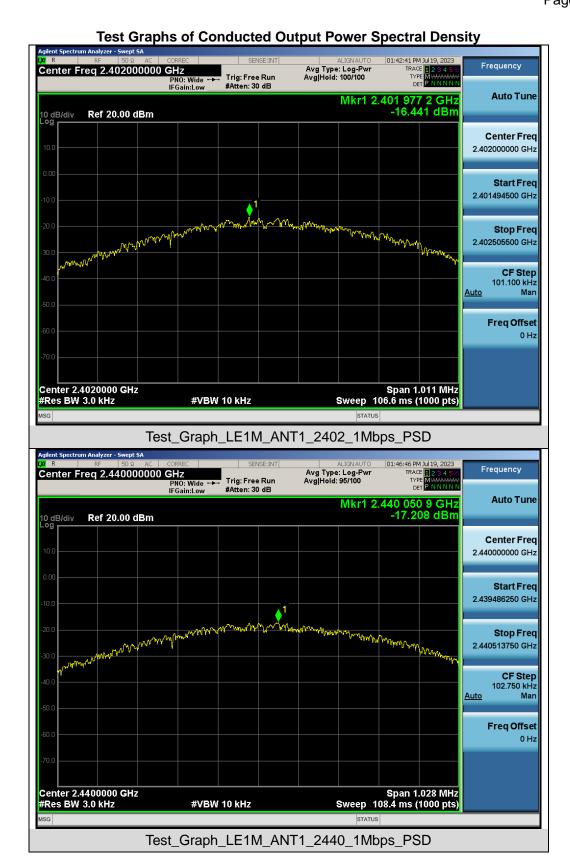
Refer to Section 6.

## 10.4. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density							
Test Mode	Test Channel (MHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail			
	2402	-16.441	<b>≤8</b>	Pass			
GFSK 1Mbps	2440	-17.208	<b>≤8</b>	Pass			
	2480	-17.215	≪8	Pass			
	2402	-20.204	<b>≤8</b>	Pass			
GFSK 2Mbps	2440	-20.949	<b>≤8</b>	Pass			
	2480	-21.779	≪8	Pass			



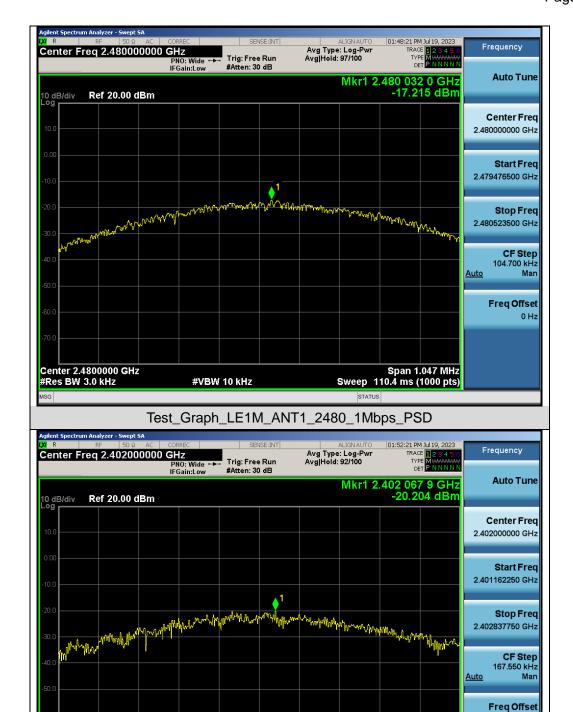






0 Hz





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE2M\_ANT1\_2402\_2Mbps\_PSD

#VBW 10 kHz

Span 1.676 MHz Sweep 176.7 ms (1000 pts)

Center 2.4020000 GHz #Res BW 3.0 kHz



0 Hz





Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test\_Graph\_LE2M\_ANT1\_2480\_2Mbps\_PSD

#VBW 10 kHz

Span 1.832 MHz Sweep 193.1 ms (1000 pts)

Center 2.4800000 GHz #Res BW 3.0 kHz



Page 41 of 61

## 11. RADIATED EMISSION

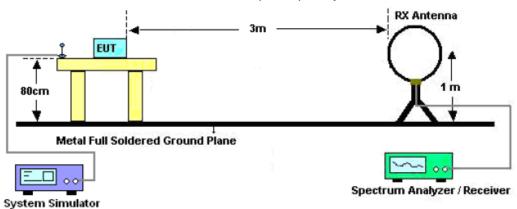
#### 11.1. MEASUREMENT PROCEDURE

- 1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

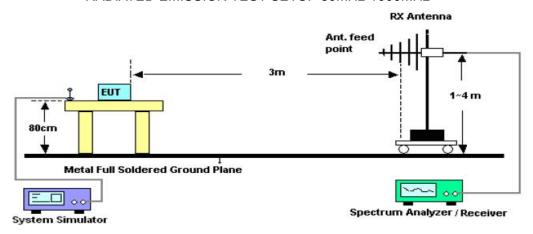


## 11.2. TEST SETUP

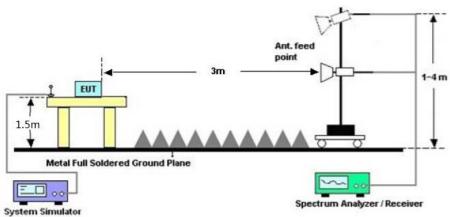
## Radiated Emission Test-Setup Frequency Below 30MHz



## RADIATED EMISSION TEST SETUP 30MHz-1000MHz



## RADIATED EMISSION TEST SETUP ABOVE 1000MHz



Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/



Page 43 of 61

## 11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

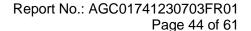
Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

## 11.4. TEST RESULT

## Radiated emission below 30MHz

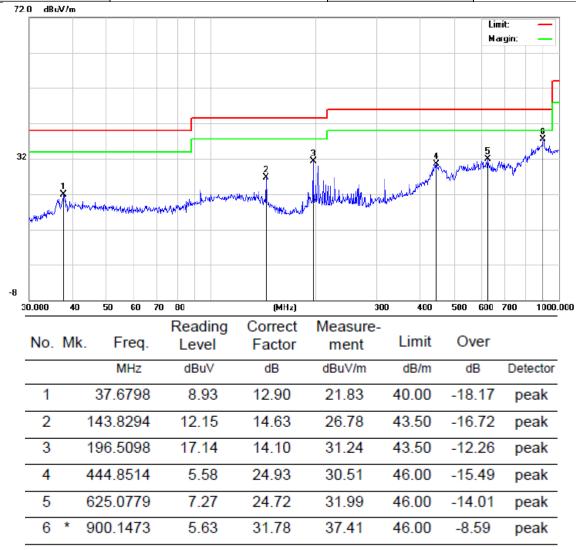
The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.





## Radiated emission from 30MHz to 1000MHz

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 5	Antenna	Horizontal

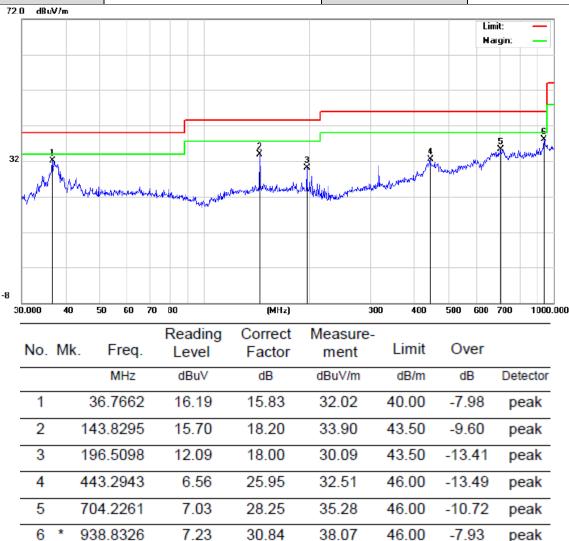


## **RESULT: PASS**





EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 5	Antenna	Vertical



# **RESULT: PASS**

#### Note:

- 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
- 2. All test modes have been tested. Mode 5 AC input operation is the worst-case scenario and documented in the report.



Page 46 of 61

## Radiated emission above 1GHz

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 4	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type	
4804.000	53.49	0.08	53.57	74.00	-20.43	peak	
4804.000	44.28	0.08	44.36	54.00	-9.64	AVG	
7206.000	49.64	2.21	51.85	74.00	-22.15	peak	
7206.000	40.34	2.21	42.55	54.00	-11.45	AVG	
Remark:							
Factor = Anter	Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 4	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	53.94	0.08	54.02	74.00	-19.98	peak
4804.000	42.18	0.08	42.26	54.00	-11.74	AVG
7206.000	48.37	2.21	50.58	74.00	-23.42	peak
7206.000	39.64	2.21	41.85	54.00	-12.15	AVG
Remark:						
actor = Anter	nna Factor + Cable	e Loss – Pre-	amplifier.	·		·



Report No.: AGC01741230703FR01 Page 47 of 61

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 5	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type	
4882.000	53.08	0.14	53.22	74.00	-20.78	peak	
4882.000	34.57	0.14	34.71	54.00	-19.29	AVG	
7323.000	49.64	2.36	52.00	74.00	-22.00	peak	
7323.000	37.48	2.36	39.84	54.00	-14.16	AVG	
Remark:			•		1	1	
Factor = Anter	nna Factor + Cabl	e Loss – Pre-a	mplifier.				

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 5	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type	
4882.000	52.18	0.14	52.32	74.00	-21.68	peak	
4882.000	43.58	0.14	43.72	54.00	-10.28	AVG	
7323.000	47.64	2.36	50.00	74.00	-24.00	peak	
7323.000	39.67	2.36	42.03	54.00	-11.97	AVG	
Remark:							
Factor = Anter	na Factor + Cabl	e Loss – Pre-a	mplifier.				



Page 48 of 61

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 6	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type	
4960.000	45.36	0.22	45.58	74.00	-28.42	peak	
4960.000	34.28	0.22	34.50	54.00	-19.50	AVG	
7440.000	41.05	2.64	43.69	74.00	-30.31	peak	
7440.000	32.57	2.64	35.21	54.00	-18.79	AVG	
Remark:							
actor - Antonna Factor + Cable Leas - Dra amplifier							

Factor = Antenna Factor + Cable Loss – Pre-amplifier.
-------------------------------------------------------

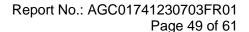
EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 6	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4960.000	53.34	0.22	53.56	74.00	-20.44	peak
4960.000	42.15	0.22	42.37	54.00	-11.63	AVG
7440.000	48.64	2.64	51.28	74.00	-22.72	peak
7440.000	37.54	2.64	40.18	54.00	-13.82	AVG
Remark:						
Factor = Anter	na Factor + Cabl	e Loss – Pre-a	amplifier.			

## **RESULT: PASS**

#### Note:

- 1. The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.
- 2. Factor = Antenna Factor + Cable loss Amplifier gain, Over=Limit-Measure.
- The "Factor" value can be calculated automatically by software of measurement system.
- 4. All modes have been tested, and the report only records AC input of 2Mbps test results as the worst

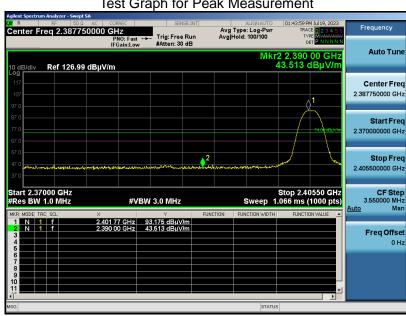




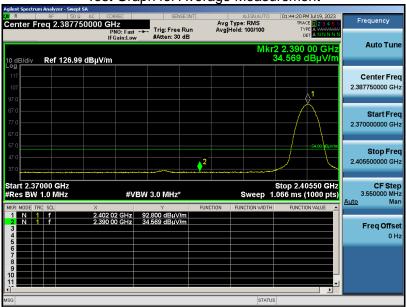
Test result for band edge emission at restricted bands

EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 1	Antenna	Horizontal

Test Graph for Peak Measurement





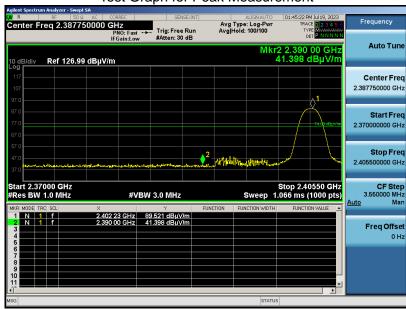


**RESULT: PASS** 

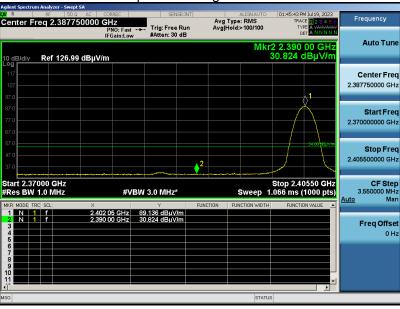




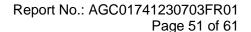
EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 1	Antenna	Vertical





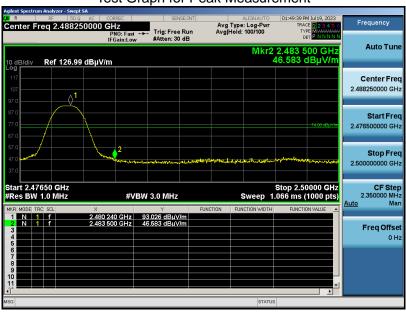


**RESULT: PASS** 

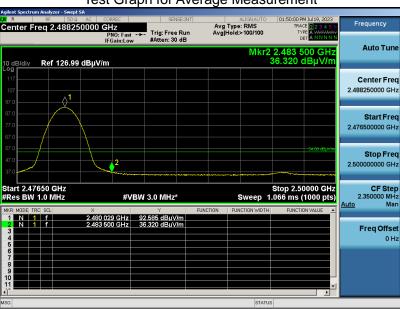




EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 3	Antenna	Horizontal





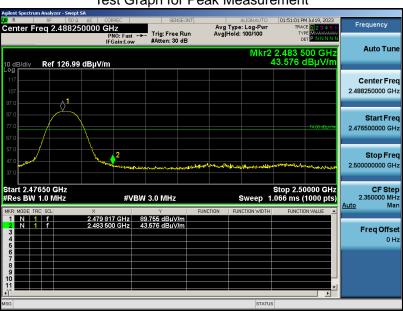


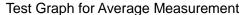
**RESULT: PASS** 

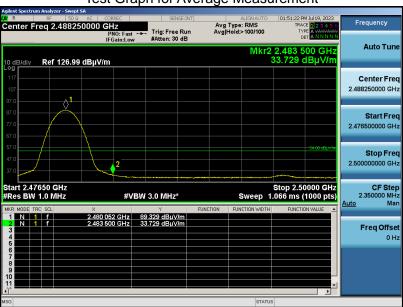




EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 3	Antenna	Vertical



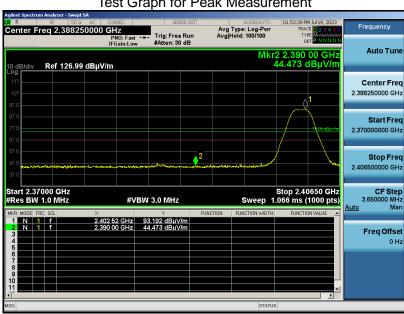




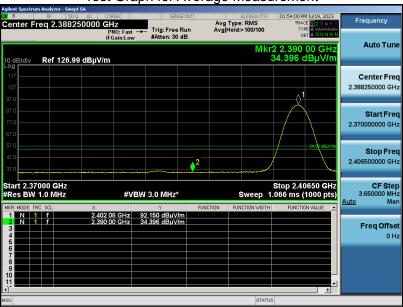




EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 4	Antenna	Horizontal





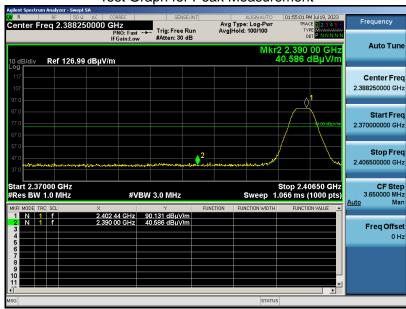


**RESULT: PASS** 

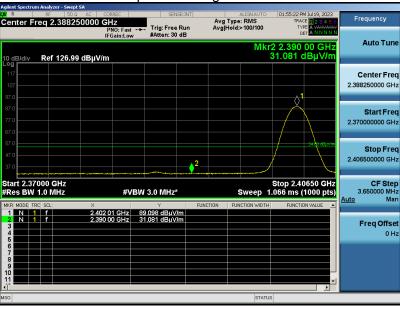




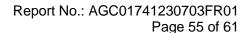
EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 4	Antenna	Vertical





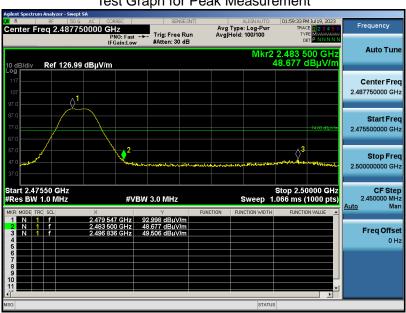


**RESULT: PASS** 

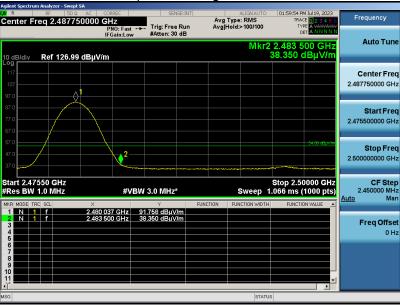




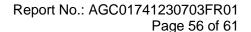
EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 6	Antenna	Horizontal





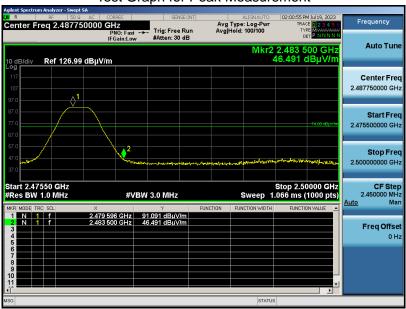


**RESULT: PASS** 

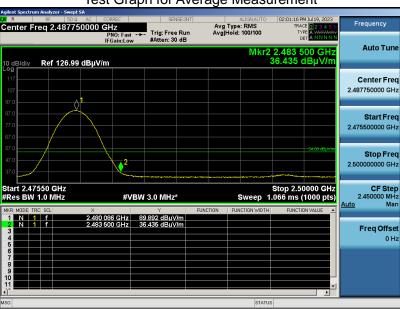




EUT	Portable Power Station	Model Name	AC180P
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	AC120V, 50Hz
Test Mode	Mode 6	Antenna	Vertical







## **RESULT: PASS**

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer.



Page 57 of 61

## 12. LINE CONDUCTED EMISSION TEST

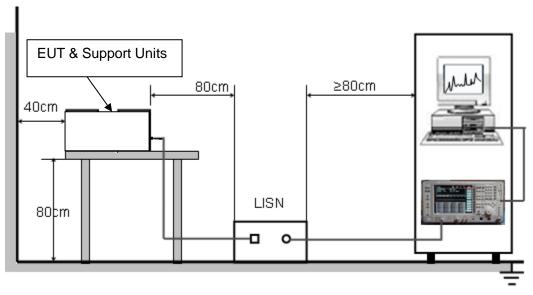
## 12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Francisco	Maximum RF Line Voltage				
Frequency	Q.P.( dBuV)	Average( dBuV)			
150kHz~500kHz	66-56	56-46			
500kHz~5MHz	56	46			
5MHz~30MHz	60	50			

#### Note:

- 1. The lower limit shall apply at the transition frequency.
- 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## 12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST





Page 58 of 61

#### 12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2. Support equipment, if needed, was placed as per ANSI C63.10.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4. All support equipment received AC120V/60Hz power from a LISN, if any.
- 5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
- 6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.
- 9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

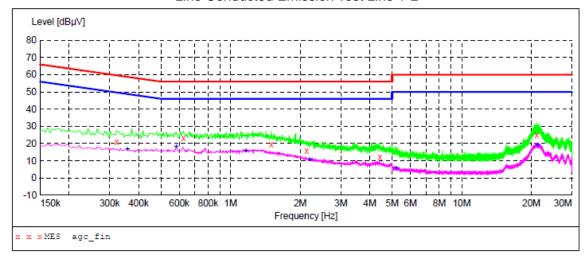
#### 12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less 2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 5. All modes have been tested, and the report only records (Mode 3) test results as the worst

## 12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST



## Line Conducted Emission Test Line 1-L



## MEASUREMENT RESULT: "agc fin"

2023/7/27 15:34

2023/1/2/ 13.	31					
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.322000	20.90	6.1	60	38.8	QP	L1
0.626000	23.40	6.2	56	32.6	QP	L1
1.502000	19.70	6.2	56	36.3	QP	L1
2.134000	15.60	6.2	56	40.4	QP	L1
4.418000	12.00	6.3	56	44.0	QP	L1
21.074000	25.20	7.3	60	34.8	QP	L1

## MEASUREMENT RESULT: "agc\_fin2"

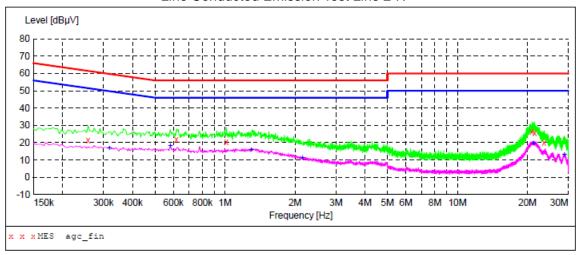
2023/7/27 15:34

_	023/1/21 13.	31					
	Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
	0.358000	16.50	6.1	49	32.3	AV	L1
	0.582000	18.10	6.2	46	27.9	AV	L1
	1.166000	15.70	6.2	46	30.3	AV	L1
	2.198000	10.80	6.3	46	35.2	AV	L1
	5.214000	5.70	6.4	50	44.3	AV	L1
	21.298000	19.00	7.3	50	31.0	AV	L1

**RESULT: PASS** 



## Line Conducted Emission Test Line 2-N



## MEASUREMENT RESULT: "agc\_fin"

2023/7/27 15:30

2023/1/21 15:	30					
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.258000	21.40	6.1	62	40.1	QP	N
0.618000	22.00	6.2	56	34.0	QP	N
1.014000	20.40	6.2	56	35.6	QP	N
20.946000	26.20	7.3	60	33.8	QP	N
21.462000	25.60	7.4	60	34.4	QP	N
23.566000	20.10	7.7	60	39.9	QP	N

# MEASUREMENT RESULT: "agc\_fin2"

2023/7/27 15:30

020/1/2/ 10.	-					
Frequency MHz	Level dBµV		Limit dBµV	Margin dB	Detector	Line
0.318000	16.90	6.1	50	32.9	AV	N
0.582000	18.20	6.2	46	27.8	AV	N
1.298000	16.00	6.2	46	30.0	AV	N
2.154000	11.00	6.2	46	35.0	AV	N
21.234000	19.60	7.3	50	30.4	AV	N
28.830000	12.80	8.3	50	37.2	AV	N

#### **RESULT: PASS**



Page 61 of 61

## **APPENDIX I: PHOTOGRAPHS OF TEST SETUP**

Refer to the Report No.: AGC01741230703AP02

**APPENDIX II: PHOTOGRAPHS OF EUT** 

Refer to the Report No.: AGC01741230703AP03

----END OF REPORT----



# Conditions of Issuance of Test Reports

- 1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").
- 2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
- 3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
- 4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
- 5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
- 6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
- 7.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
- 8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
- 9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.