

# **FCC Test Report**

Report No.: AGC02960230102FE02

FCC ID : 2BAGC-AURA-ESM231

**APPLICATION PURPOSE**: Original Equipment

**PRODUCT DESIGNATION**: aura

**BRAND NAME**: aura

aura-esm231, aura-esm231010, aura-esm231011,

aura-esm231012, aura-esm231013, aura-esm231014,

**MODEL NAME**: aura-esm231015, aura-esm231016, aura-esm231017, aura-esm231018, aura-esm231019, aura-esm23101A,

aura-esm23101B, aura-esm23101C, aura-esm23101D,

aura-esm23101E, aura-esm23101F

**APPLICANT**: Aura Circle Limited

**DATE OF ISSUE** : Apr. 10, 2023

STANDARD(S) : FCC Pa

REPORT VERSION :

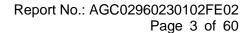
Attestation of Global Compliance (Shenzhen) Co., Ltd



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# REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes	
V1.0	/	Apr. 10, 2023	Valid	Initial Release	





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#### 1. VERIFICATION OF COMPLIANCE

Aura Circle Limited		
UNIT 16, 21/F, METROPOLE SQUARE, 2 ON YIU STREET, SHATIN, NEW TERRITORIES, HONG KONG		
Aura Circle Limited		
UNIT 16, 21/F, METROPOLE SQUARE, 2 ON YIU STREET, SHATIN, NEW TERRITORIES, HONG KONG		
ShengHai Electronics (Shenzhen) Ltd.		
Block 17-18, Hui Ming Ying Industry, Yan Chuan, SongGang, Baoan District, Shenzhen, China 518105		
aura		
aura		
aura-esm231		
aura-esm231010, aura-esm231011, aura-esm231012, aura-esm231013, aura-esm231014, aura-esm231015, aura-esm231016, aura-esm231017, aura-esm231018, aura-esm23101B, aura-esm23101C, aura-esm23101D, aura-esm23101E, aura-esm23101F		
All the series models are the same as the test model except for the model names and the color of appearance.		
Jan. 13, 2023		
Jan.13, 2023 to Apr. 10, 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

Bibo Zhang
(Project Engineer)

Calvin Liu
(Reviewer)

Apr. 10, 2023



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#### 2. GENERAL INFORMATION

# 2.1. PRODUCT DESCRIPTION

The EUT is designed as a "aura". 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	BLE 1Mbps: 4.593dBm (Max) BLE 2Mbps: 4.183dBm (Max)	
Bluetooth Version	V5.3	
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	0.407dBi	
Hardware Version	322986A_Y176-230228	
Software Version	V1.0	
Power Supply	DC 3.7V by battery or DC 5V by adapter	

#### 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	



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

This submittal(s) (test report) is intended for **FCC ID: 2BAGC-AURA-ESM231** 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.

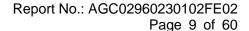


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#### 3. MEASUREMENT UNCERTAINTY

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	$U_c = \pm 2 \%$		
Uncertainty of Occupied Channel Bandwidth	U <sub>c</sub> = ±2 %		





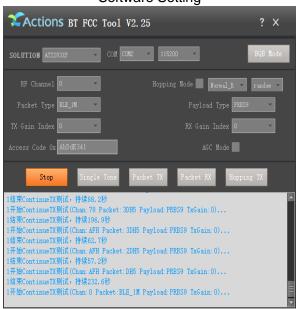
#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION		
1	Low channel TX_2402MHz_GFSK_1Mbps		
2	Middle channel TX_2440MHz_GFSK_1Mbps		
3	High channel TX_2480MHz_GFSK_1Mbps		
4	Low channel TX_2402MHz_GFSK_2Mbps		
5	Middle channel TX_2440MHz_GFSK_2Mbps		
6	High channel TX_2480MHz_GFSK_2Mbps		

#### Note:

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

Software Setting



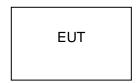


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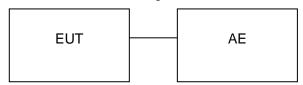
# 5. SYSTEM TEST CONFIGURATION

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

Radiated Emission Configure:



Conducted Emission Configure:



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

Item	Equipment	Model No.	Model No. ID or Specification	
1	1 aura aura-esm231 2BAGC-AURA-ESM231		EUT	
2	Control Box	USB-TTL	N/A	AE
3	Adapter	HW-050200C01	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



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# **6. TEST FACILITY**

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Comi 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	Aug. 04, 2022	Aug. 03, 2023
LISN	R&S	ESH2-Z5	100086	Jun. 09, 2022	Jun. 08, 2023
Test software	FARA	EZ-EMC	Ver. AGC-CON03A1	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	Aug. 03, 2022	Aug. 02, 2023
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Aug. 04, 2022	Aug. 03, 2023
Signal Analyzer	Aglient	N9020A	MY52090123	Aug. 04, 2022	Aug. 03, 2023
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 22, 2022	Mar. 21, 2024
Attenuator	ZHINAN	E-002	N/A	Aug. 03, 2022	Aug. 02, 2024
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Oct. 31, 2021	Oct. 30, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Mar. 12, 2022	Mar. 21, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Aug. 03, 2022	Aug. 02, 2024
ANTENNA	SCHWARZBECK	VULB9168	494	Apr. 28, 2021	Apr. 27, 2023
Test software	FARA	EZ-EMC	Ver RA-03A	N/A	N/A



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#### 7. PEAK OUTPUT POWER

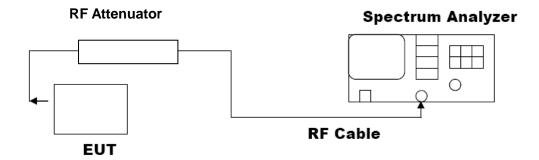
#### 7.1. MEASUREMENT PROCEDURE

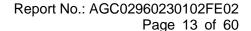
For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 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 external attenuators and cables.

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





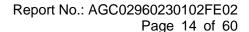


#### 7.3. LIMITS AND MEASUREMENT RESULT

	1.0. EIMITO AND INCAGONEIMENT NEGGET					
Test Data of Conducted Output Power						
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail		
GFSK 1M	2402	4.534	≤30	Pass		
	2440	4.488	≤30	Pass		
	2480	4.593	≤30	Pass		
GFSK 2M	2402	4.118	≤30	Pass		
	2440	4.082	≤30	Pass		
	2480	4.183	≤30	Pass		

**Test Graphs of Conducted Output Power** 

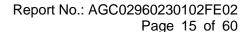








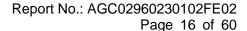


















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#### 8. BANDWIDTH

#### **8.1. MEASUREMENT PROCEDURE**

#### 6dB bandwidth:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 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 through an RF attenuator
- 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.

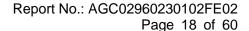
Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

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

The same as described in section 7.2.

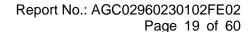
#### 8.3. LIMITS AND MEASUREMENT RESULTS

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
GFSK 1M	2402	1.062	0.722	≥0.5	Pass
	2440	1.062	0.723	≥0.5	Pass
	2480	1.065	0.723	≥0.5	Pass
GFSK 2M	2402	2.065	1.246	≥0.5	Pass
	2440	2.065	1.246	≥0.5	Pass
	2480	2.065	1.184	≥0.5	Pass





**Test Graphs of Occupied Bandwidth** 04:59:59 PMJan 14, 2023 Radio Std: None SENSE:INT Center Freq: 2.402000000 GHz
Trig: Free Run Avg|Hol
#Atten: 30 dB Frequency Center Freq 2.402000000 GHz Avg|Hold: 10/10 #IFGain:Low Ref 30.00 dBm Center Freq 2.402000000 GHz Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 4.133 ms **CF Step #VBW 100 kHz** 300,000 kHz Auto 10.6 dBm **Total Power Occupied Bandwidth** 1.0623 MHz Frea Offset 0 Hz **Transmit Freq Error** 8.993 kHz **OBW Power** 99.00 % x dB Bandwidth 1.336 MHz x dB -26.00 dB Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_OBW 05:03:55 PMJan 14, 2023 Radio Std: None Center Freq: 2.440000000 GHz
Trig: Free Run Avg|Hol Frequency Center Freq 2.440000000 GHz Avg|Hold:>10/10 #IFGain:Low Radio Device: BTS Ref 30.00 dBm Center Freq 2.440000000 GHz Span 3 MHz Sweep 4.133 ms Center 2.44 GHz #Res BW 30 kHz CF Step 300.000 kHz **#VBW 100 kHz** <u>Auto</u> **Total Power** 10.5 dBm **Occupied Bandwidth** 1.0615 MHz Freq Offset 0 Hz **Transmit Freq Error** 13.398 kHz **OBW Power** 99.00 % x dB Bandwidth -26.00 dB 1.339 MHz x dB Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_OBW

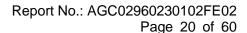








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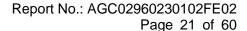








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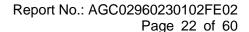
Test Graphs of DTS Bandwidth



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Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_DTSBW

Web: http://www.agccert.com/

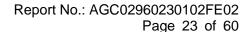








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#### 9. CONDUCTED SPURIOUS EMISSION

#### 9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 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)

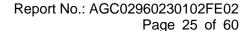
The same as described in section 7.2.

#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT				
	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		



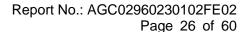


Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

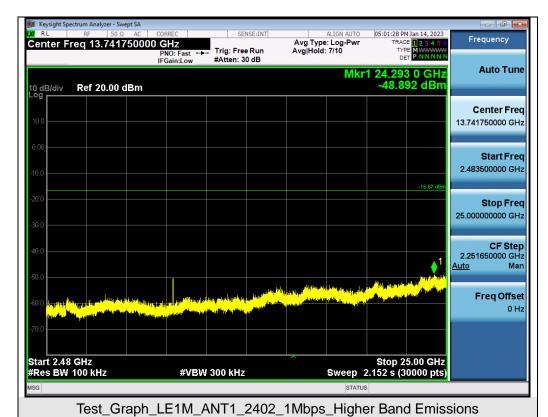


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Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_Lower Band Emissions



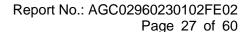




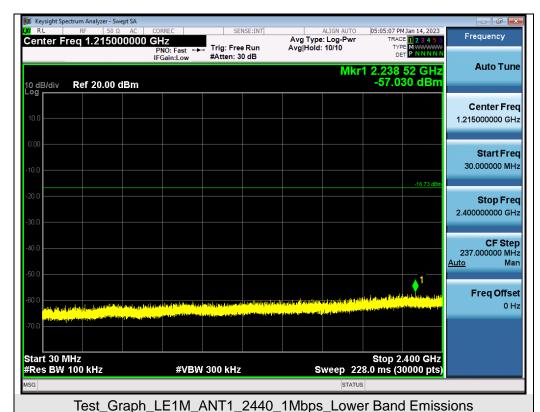


Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_Reference Level

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Keysight Spectrum Analyzer - Swept SA

RL RF 50 Ω AC CORREC SENSE:INT ALIGN AUTO 05:05:24 PMJan 14, 2023

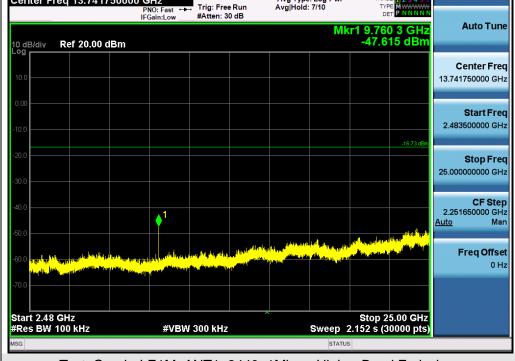
Center Freq 13.741750000 GHz

PNO: Fast → Trig: Free Run
IFGain:Low #Atten: 30 dB

RT RACE 12 3 4 5 6

Avg Type: Log-Pwr TRACE 12 3 4 5 6

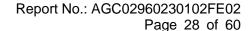
Avg Hold: 7/10 Type Mannah



Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_Higher Band Emissions

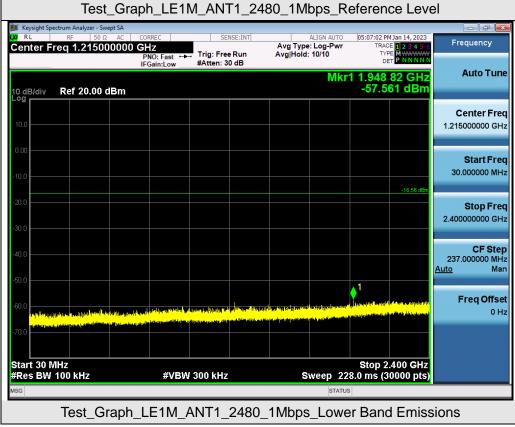
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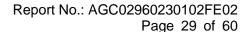
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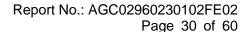




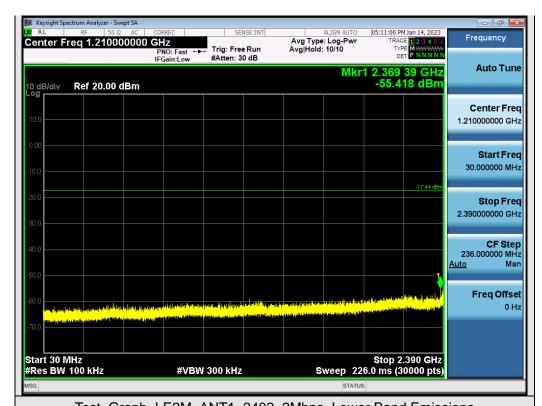


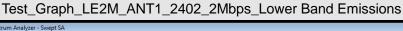
Test\_Graph\_LE1M\_ANT1\_2480\_1Mbps\_Higher Band Emissions



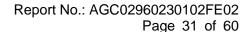






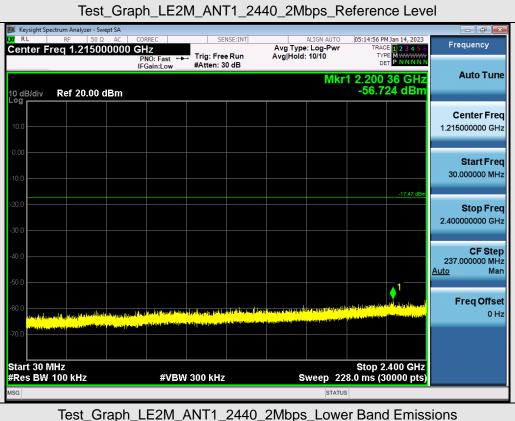


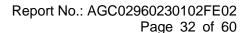








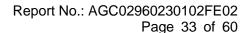




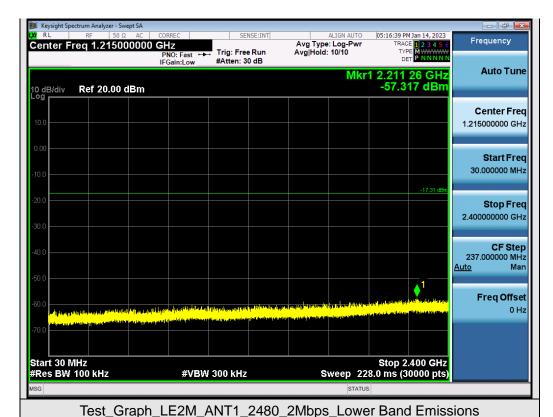






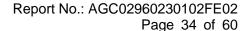






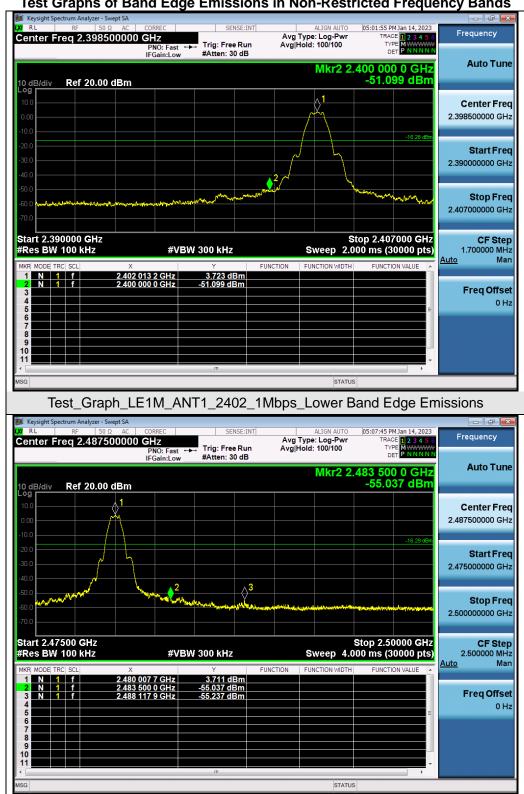


Test\_Graph\_LE2M\_ANT1\_2480\_2Mbps\_Higher Band Emissions



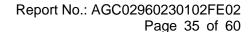


Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

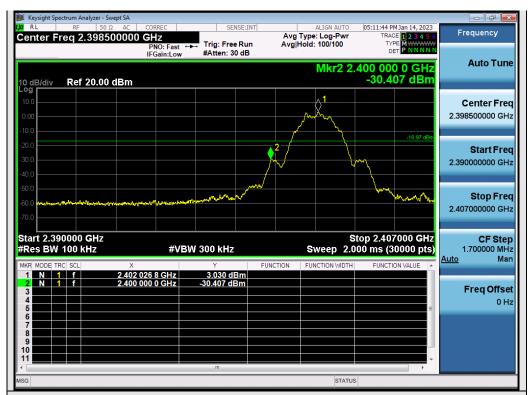


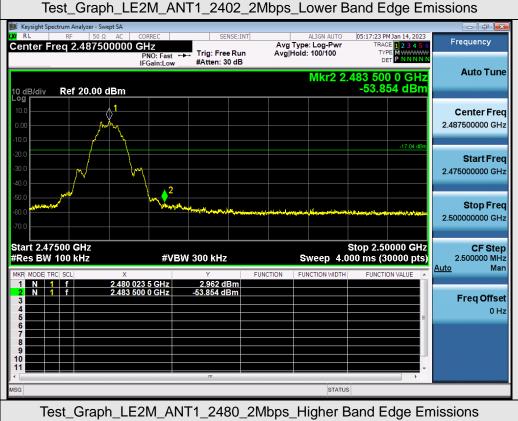
Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the 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\_2480\_1Mbps\_Higher Band Edge Emissions











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#### 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

#### 10.1. MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (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)

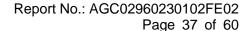
Refer to Section 7.2.

#### 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	-11.066	<b>≤8</b>	Pass	
GFSK 1M	2440	-11.230	≪8	Pass	
	2480	-11.003	<b>≤8</b>	Pass	
	2402	-14.656	<b>≤8</b>	Pass	
GFSK 2M	2440	-14.663	≪8	Pass	
	2480	-14.615	<b>≤8</b>	Pass	

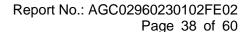




**Test Graphs of Conducted Output Power Spectral Density** Avg Type: Log-Pwi Avg|Hold: 100/100 Frequency Center Freq 2.402000000 GHz TYPE MWA Trig: Free Run #Atten: 30 dB PNO: Wide ←►
IFGain:Low **Auto Tune** Mkr1 2.402 090 5 GHz -11.066 dBm Ref 20.00 dBm 10 dB/div Center Freq 2.402000000 GHz Start Freq 2.401458500 GHz Mmy ~YVY\h(\partia) morrow Stop Freq 2.402541500 GHz **CF Step** 108.300 kHz Auto Freq Offset 0 Hz Center 2.4020000 GHz #Res BW 3.0 kHz Span 1.083 MHz Sweep 114.2 ms (1000 pts) **#VBW 10 kHz** Test\_Graph\_LE1M\_ANT1\_2402\_1Mbps\_PSD RL RF 50 Q AC Center Freq 2.440000000 GHz
PNO: Wide → IFGain:Low RACE 1 2 3 4 5
TYPE MWWWW
DET P N N N Avg Type: Log-Pwr Avg|Hold: 100/100 Frequency Trig: Free Run #Atten: 30 dB **Auto Tune** Mkr1 2.440 095 0 GHz -11.230 dBm Ref 20.00 dBm 10 dB/div Center Freq 2.440000000 GHz Start Freq 2.439457750 GHz hwwyfyr Aury Stop Freq 2 440542250 GHz **CF Step** 108.450 kHz <u>Auto</u> Freq Offset 0 Hz Center 2.4400000 GHz #Res BW 3.0 kHz Span 1.085 MHz Sweep 114.4 ms (1000 pts) **#VBW 10 kHz** 

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.

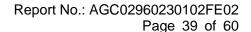
Test\_Graph\_LE1M\_ANT1\_2440\_1Mbps\_PSD



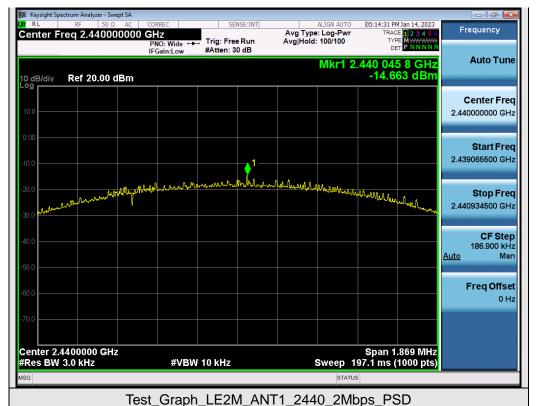
















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## 11. RADIATED EMISSION

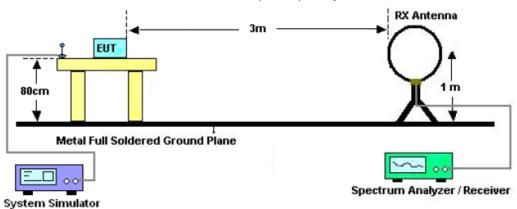
#### 11.1. MEASUREMENT PROCEDURE

- 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.

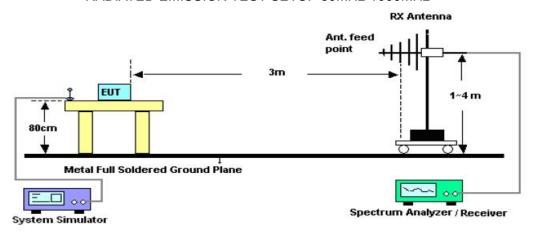


#### 11.2. TEST SETUP

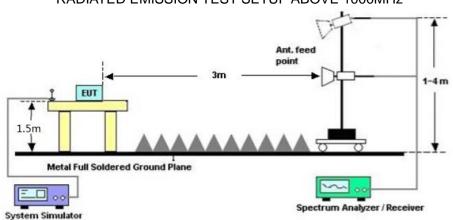
## Radiated Emission Test-Setup Frequency Below 30MHz



#### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



## RADIATED EMISSION TEST SETUP ABOVE 1000MHz





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## 11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

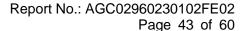
Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

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

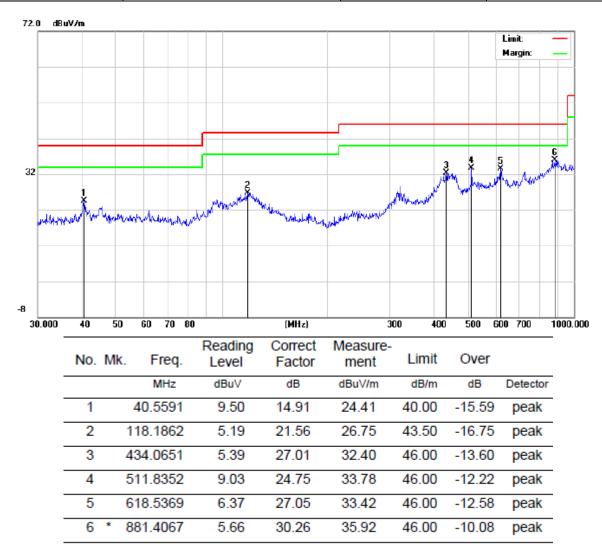
The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.



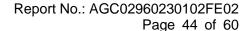


#### Radiated emission from 30MHz to 1000MHz

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

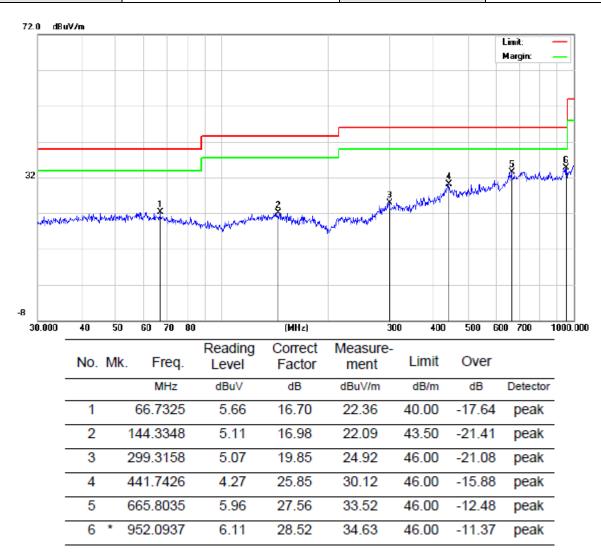


**RESULT: PASS** 





EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical



# RESULT: PASS Note:

- 1. Factor=Antenna Factor + Cable loss, Over=Measurement-Limit.
- 2. All test modes had been tested. The 1M mode 3 is the worst case and recorded in the report.



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## Radiated emission above 1GHz

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	43.45	0.08	43.53	74	-30.47	peak
4804.000	35.36	0.08	35.44	54	-18.56	AVG
7206.000	38.68	2.21	40.89	74	-33.11	peak
7206.000	31.29	2.21	33.5	54	-20.5	AVG

Remark:

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

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	44.37	0.08	44.45	74	-29.55	peak
4804.000	34.85	0.08	34.93	54	-19.07	AVG
7206.000	38.24	2.21	40.45	74	-33.55	peak
7206.000	30.63	2.21	32.84	54	-21.16	AVG
Remark:						

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



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EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4880.000	44.66	0.14	44.8	74	-29.2	peak
4880.000	35.72	0.14	35.86	54	-18.14	AVG
7320.000	39.74	2.36	42.1	74	-31.9	peak
7320.000	31.51	2.36	33.87	54	-20.13	AVG
Remark:	•		-		•	
actor = Anter	na Factor + Cabl	e Loss – Pre-	amplifier.			

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4880.000	45.12	0.14	45.26	74	-28.74	peak
4880.000	38.08	0.14	38.22	54	-15.78	AVG
7320.000	40.46	2.36	42.82	74	-31.18	peak
7320.000	32.47	2.36	34.83	54	-19.17	AVG

Remark:

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



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EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency	Meter Reading	Factor Emission Level	Limits	Margin	Value Type			
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type		
4960.000	44.61	0.22	44.83	74	-29.17	peak		
4960.000	35.43	0.22	35.65	54	-18.35	AVG		
7440.000	38.78	2.64	41.42	74	-32.58	peak		
7440.000	29.45	2.64	32.09	54	-21.91	AVG		
Remark:								

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

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency	Meter Reading	Factor Emission Le		Limits	Margin	Value Type				
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type				
4960.000	42.97	0.22	43.19	74	-30.81	peak				
4960.000	34.06	0.22	34.28	54	-19.72	AVG				
7440.000	38.65	2.64	41.29	74	-32.71	peak				
7440.000	29.72	2.64	32.36	54	-21.64	AVG				
Remark:										
Factor = Antenna Factor + Cable Loss – Pre-amplifier.										

#### **RESULT: PASS**

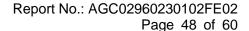
#### Note:

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.

Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Level-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

All test modes had been tested. The 1M mode 3 is the worst case and recorded in the report.

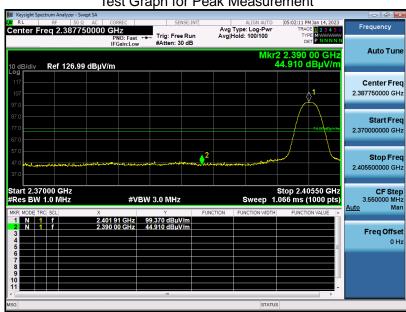


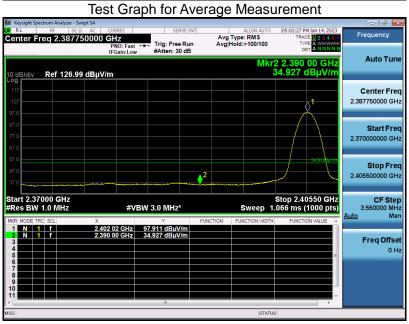


Test result for band edge emission at restricted bands-1M

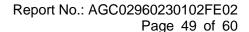
EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Test Graph for Peak Measurement





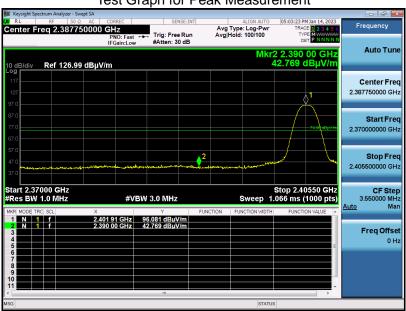
**RESULT: PASS** 

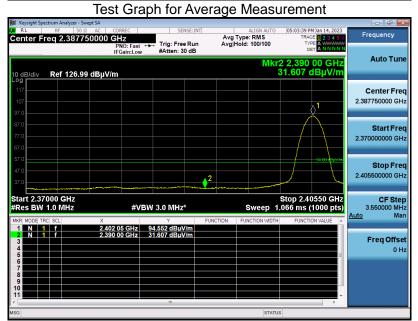




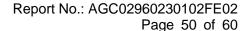
**EUT Model Name** aura aura-esm231 21° C **Temperature Relative Humidity** 53% 960hPa **Test Voltage** Normal Voltage **Pressure Test Mode** Mode 1 **Antenna** Vertical

Test Graph for Peak Measurement





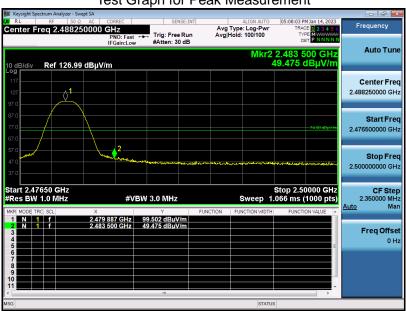
**RESULT: PASS** 





**EUT Model Name** aura aura-esm231 21° C **Temperature Relative Humidity** 53% 960hPa **Test Voltage** Normal Voltage **Pressure Test Mode** Mode 3 **Antenna** Horizontal

Test Graph for Peak Measurement

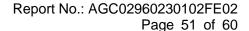




Test Graph for Average Measurement



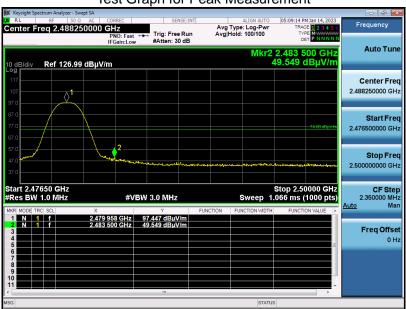
**RESULT: PASS** 



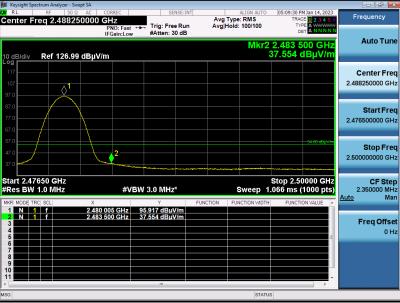


**EUT Model Name** aura aura-esm231 21° C **Temperature Relative Humidity** 53% 960hPa Normal Voltage **Pressure Test Voltage Test Mode** Mode 3 **Antenna** Vertical

Test Graph for Peak Measurement

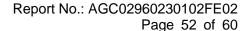






#### **RESULT: PASS**

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

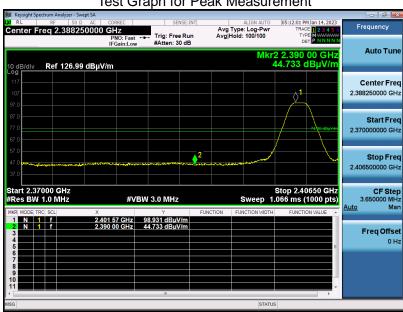




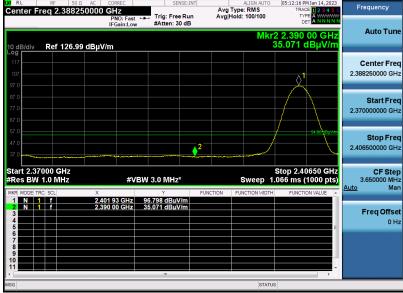
Test result for band edge emission at restricted bands-2M

EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

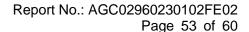
Test Graph for Peak Measurement







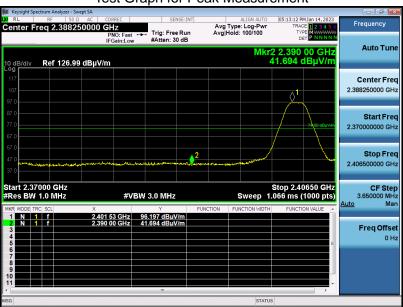
**RESULT: PASS** 

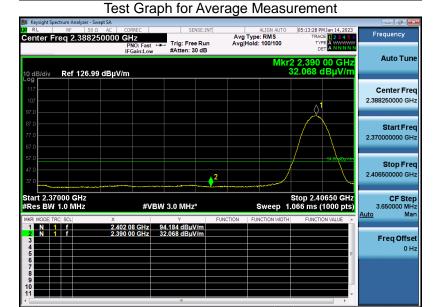




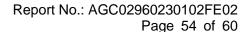
**EUT Model Name** aura aura-esm231 21° C **Temperature Relative Humidity** 53% 960hPa **Test Voltage** Normal Voltage **Pressure Test Mode** Mode 1 **Antenna** Vertical

Test Graph for Peak Measurement





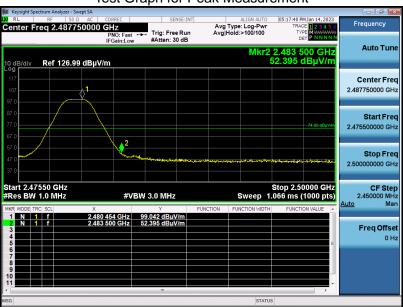
**RESULT: PASS** 





**EUT Model Name** aura aura-esm231 21° C **Temperature Relative Humidity** 53% 960hPa **Test Voltage** Normal Voltage **Pressure Test Mode** Mode 3 **Antenna** Horizontal

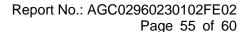
Test Graph for Peak Measurement





Test Graph for Average Measurement

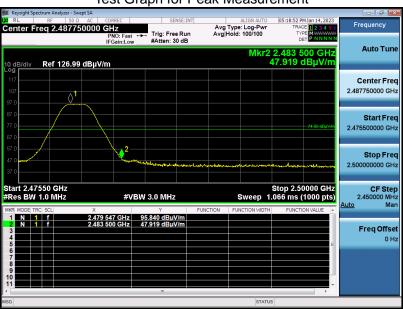
**RESULT: PASS** 

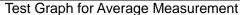


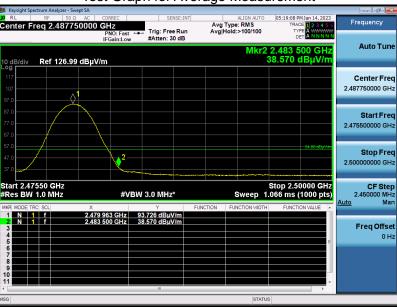


EUT	aura	Model Name	aura-esm231
Temperature	21° C	Relative Humidity	53%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Test Graph for Peak Measurement







## **RESULT: PASS**

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



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## 12. LINE CONDUCTED EMISSION TEST

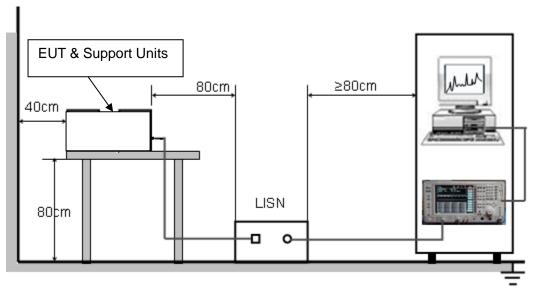
## 12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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





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#### 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.

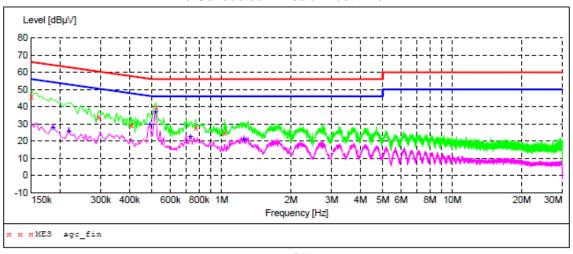
#### 12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 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.
- 3. The test data of the worst case condition(s) was reported on the Summary Data page.



## 12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



## MEASUREMENT RESULT: "agc\_fin"

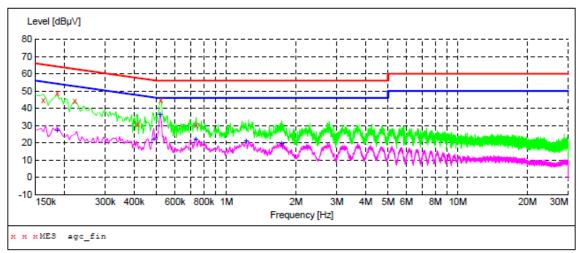
2023	3/1/14 17:	16					
F	requency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
	0.150000	45.80	6.9	66	20.2	QP	L1
	0.294000	33.70	6.1	60	26.7	QP	L1
	0.406000	29.10	5.7	58	28.6	QP	L1
	0.522000	39.30	5.4	56	16.7	QP	L1
	0.774000	27.80	5.4	56	28.2	QP	L1
	1.030000	24.90	5.5	56	31.1	QP	L1

## MEASUREMENT RESULT: "agc\_fin2"

2023/1/14 17:16									
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line			
0.186000	27.60	6.6	54	26.6	AV	L1			
0.218000	25.60	6.4	53	27.3	AV	L1			
0.490000	29.70	5.4	46	16.5	AV	L1			
0.518000	36.90	5.4	46	9.1	AV	L1			
0.734000	22.80	5.4	46	23.2	AV	L1			
1.250000	21.10	5.8	46	24.9	AV	L1			



## Line Conducted Emission Test Line 2-N



## MEASUREMENT RESULT: "agc\_fin"

2023/1/14 17:	13					
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.162000	44.70	6.8	65	20.7	QP	N
0.186000	48.90	6.6	64	15.3	QP	N
0.222000	43.90	6.4	63	18.8	QP	N
0.414000	30.80	5.6	58	26.8	QP	N
0.522000	44.50	5.4	56	11.5	QP	N
0.742000	30.30	5.4	56	25.7	QP	N

## MEASUREMENT RESULT: "agc\_fin2"

2023/1/14 17	7:14					
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.186000	27.10	6.6	54	27.1	AV	N
0.486000	21.90	5.4	46	24.3	AV	N
0.518000	36.40	5.4	46	9.6	AV	N
0.738000	21.90	5.4	46	24.1	AV	N
1.218000	21.30	5.7	46	24.7	AV	N
1.734000	19.30	6.3	46	26.7	AV	N

#### **RESULT: PASS**

Note: All test modes had been tested. The 1M mode 3 is the worst case and recorded in the report.



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## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Refer to the Report No.: AGC02960230102AP02

**APPENDIX B: PHOTOGRAPHS OF EUT** 

Refer to the Report No.: AGC02960230102AP03

----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").
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- 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.