

# **FCC Test Report**

Report No.: AGC08506200703FE02

**FCC ID** : 2AN4C-233621HUSH

APPLICATION PURPOSE : Original Equipment

**PRODUCT DESIGNATION**: HUSH ANC EVT

**BRAND NAME** : 233621

MODEL NAME : 233621 Hush

APPLICANT : Shenzhen Grandsun Electronic Co., Ltd.

**DATE OF ISSUE** : Aug. 04, 2020

**STANDARD(S)** : FCC Part 15.247

REPORT VERSION : V1.0

## Attestation of Global Compliance (Shenzhen) Co., Ltd

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Page 2 of 52

## REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	9 /	Aug. 04, 2020	Valid	Initial Release

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## **TABLE OF CONTENTS**

1. VERIFICATION OF COMPLIANCE	5
2. GENERAL INFORMATION	6
2.1. PRODUCT DESCRIPTION	6 7 7 7
4. DESCRIPTION OF TEST MODES	
5. SYSTEM TEST CONFIGURATION	10
5.1 CONFIGURATION OF TESTED SYSTEM	10
6. TEST FACILITY	11
7. PEAK OUTPUT POWER	12
7.1. MEASUREMENT PROCEDURE	12
8. 6 DB BANDWIDTH	13
8.1. MEASUREMENT PROCEDURE	15
9. CONDUCTED SPURIOUS EMISSION	17
9.1. MEASUREMENT PROCEDURE	17 17 17
10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY	25
10.1. MEASUREMENT PROCEDURE	25 25 25
11. RADIATED EMISSION	27

11.1. MEASUREMENT PROCEDURE.

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# Report No.: AGC08506200703FE02 Page 4 of 52

	11.2. TEST SETUP	28
	11.3. LIMITS AND MEASUREMENT RESULT	29
	11.4. TEST RESULT	29
12	2. FCC LINE CONDUCTED EMISSION TEST	38
	12.1. LIMITS OF LINE CONDUCTED EMISSION TEST	39
	12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	39
	12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	40
	12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	40
	12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	40
Αl	PPENDIX A: PHOTOGRAPHS OF TEST SETUP	41
ΑI	PPENDIX B: PHOTOGRAPHS OF EUT	43

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Page 5 of 52

## 1. VERIFICATION OF COMPLIANCE

Applicant	Shenzhen Grandsun Electronic Co., Ltd.	
Address	Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117)	
Manufacturer	Shenzhen Grandsun Electronic Co., Ltd.	
Address	Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117)	
Factory	Shenzhen Grandsun Electronic Co., Ltd.	
Address	Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117)	
Product Designation HUSH ANC EVT		
Brand Name 233621		
Test Model 233621 Hush		
Date of test July 20, 2020 to Aug. 04, 2020		
Deviation	No any deviation from the test method	
Condition of Test Sample Normal		
Test Result Pass		
Report Template	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.

Prepared By	Jonjon Aurory	
0 -0	Donjon Huang Project Engineer	Aug. 04, 2020
Reviewed By	Max 2 hang	
NGC VC	Max Zhang Reviewer	Aug. 04, 2020
Approved By	Formercies	
<u> </u>	Forrest Lei Authorized Officer	Aug. 04, 2020

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Page 6 of 52

## 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

The EUT is designed as a "HUSH ANC EVT". 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	2.402GHz to 2.480GHz
RF Output Power	-0.529dBm(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	3dBi
Hardware Version	V03
Software Version	V1.1.8
Power Supply	DC 3.7V by battery

## 2.2.TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
GO C	0	2402MHZ
	C 1	2404MHZ
2400~2483.5MHZ	104 VC	
200 CC	38	2478 MHZ
	39	2480 MHZ

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Page 7 of 52

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

This submittal(s) (test report) is intended for FCC ID: 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 2.2.

## 2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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Page 8 of 52

## 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%.

- Uncertainty of Conducted Emission, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted,  $Uc = \pm 0.8dB$
- Uncertainty of RF power density, conducted, Uc = ±2.6dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

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Report No.: AGC08506200703FE02 Page 9 of 52

## 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX 1Mbps
2	Middle channel TX 1Mbps
3	High channel TX 1Mbps
	onducted Test method, a temporary antenna connector is provided by the manufacture. adiated Emission, 3axis were chosen for testing for each applicable mode.  Software Setting  Non Signaling Test Tool  File Device  Devices  Port ID Address Name Address Tyl State Role Authenticatic Encryption Version Fo
	Transport Interface  COM Number 1  Baudrate (bps) 115200   Traces
	Local Device Chip Version 1000 Connect Stop

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Page 10 of 52

## 5. SYSTEM TEST CONFIGURATION

## **5.1 CONFIGURATION OF TESTED SYSTEM**

Radiated Emission Configure:

EUT

Conducted Emission Configure:

EUT	AE

Note: During conduction and radiation tests, the battery is in full charge.

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

Ite	em	Equipment	Model No.	ID or Specification	Remark
	1	HUSH ANC EVT	233621 Hush		EUT
	2	Control Box	N/A	USB-TTL	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	N/A

Note: 1.N/A means not applicable in this report.

2. The EUT is powered by battery.

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Page 11 of 52

## 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 RADIATED EMISSION TEST**

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 09, 2019	Sep. 08, 2020
Horn antenna	SCHWARZBE CK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 14, 2020
ANTENNA	SCHWARZBE CK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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Page 12 of 52

## 7. PEAK OUTPUT POWER

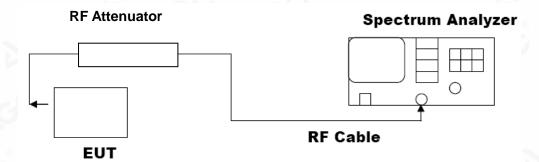
## 7.1. MEASUREMENT PROCEDURE

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



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Page 13 of 52

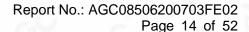
## 7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT				
FOR GFSK MOUDULATION				
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail	
2.402	-0.529	30	Pass	
2.440	-0.560	30	Pass	
2.480	-0.738	30	Pass	

CH<sub>0</sub>



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## **CH19**



## **CH39**



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Page 15 of 52

## 8. 6 DB BANDWIDTH

#### **8.1. 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 Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW ≥ 3×RBW.
- 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

LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Applicable Limits			
	Test Data	Criteria		
>500KHZ	Low Channel	720.2	PASS	
	Middle Channel	716.7	PASS	
	High Channel	713.0	PASS	

#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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## TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



## TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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Page 17 of 52

## 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.

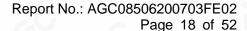
#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

## 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT			
Annilo alda I busto	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 PASS	

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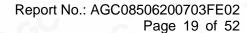


## **TEST RESULT FOR ENTIRE FREQUENCY RANGE**

GFSK MODULATION IN LOW CHANNEL



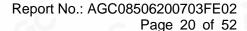
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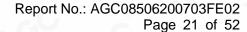




## GFSK MODULATION IN MIDDLE CHANNEL



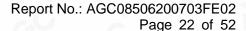
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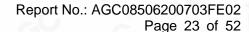




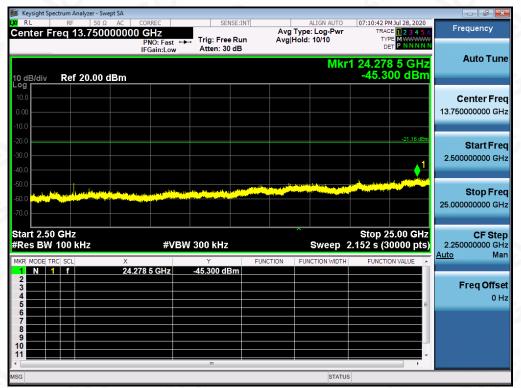
## GFSK MODULATION IN HIGH CHANNEL



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Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

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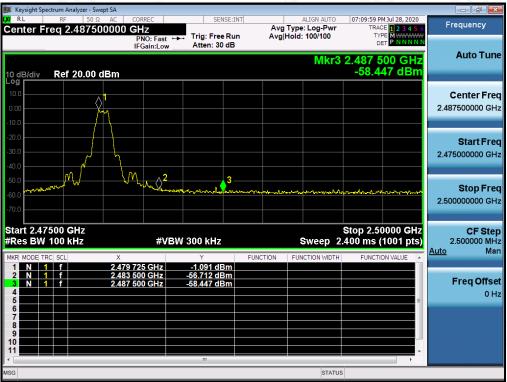


## **TEST RESULT FOR BAND EDGE**

## GFSK MODULATION IN LOW CHANNEL



## GFSK MODULATION IN HIGH CHANNEL



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Page 25 of 52

## 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 SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the KDB 558074 item 10.2 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.

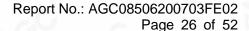
## 10.4. LIMITS AND MEASUREMENT RESULT

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-15.689	8	Pass
Middle Channel	-15.634	8	Pass
High Channel	-15.798	8	Pass

## TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



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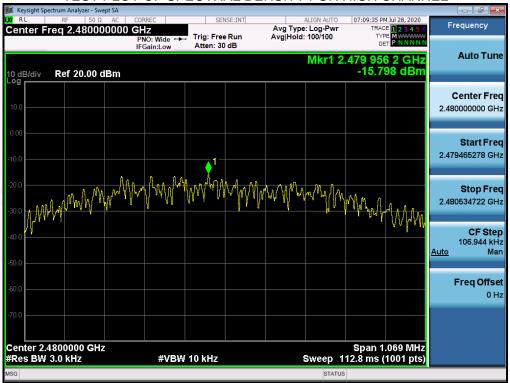




TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



## TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



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Page 27 of 52

## 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 emissions, 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.

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