

# **FCC Test Report**

Report No.: AGC03709200802FE03

FCC ID	:	2ASXF-GV
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	÷	Bluetooth Speaker
BRAND NAME	:	Gravastar
MODEL NAME	5	Gravastar Venus, Gravastar G2
APPLICANT	© :	ZhouYe ChuangYi Co., Ltd.
DATE OF ISSUE	:	Aug. 20,2020
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION		V1.0

# 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	. /	Aug. 20, 2020	Valid	Initial Release

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#### **1. VERIFICATION OF CONFORMITY**

Applicant	ZhouYe ChuangYi Co., Ltd.		
Address	15D Room, Fumange Building, Jilong 3rd Street, Fuqiang Road, Haibingguangchang Ave, Futian District, Shenzhen, China		
Manufacturer	ZhouYe ChuangYi Co., Ltd.		
Address	15D Room, Fumange Building, Jilong 3rd Street, Fuqiang Road, Haibingguangchang Ave, Futian District, Shenzhen, China		
Factory	SHENZHEN YINHONG ELECTRONICS CO., LTD		
Address	Floor 2, Building 2, Building D, Hongzhu Yongqi Science Park, Luzhujiao, Jiuwei Community, Hangcheng Street, Bao 'an District, Shenzhen		
Product Designation	Bluetooth Speaker		
Brand Name	Gravastar		
Test Model	Gravastar Venus		
Series Model	Gravastar G2		
Difference Description	All the same except for the model name.		
Date of test	Aug. 10,2020 to Aug. 20,2020		
Deviation	No any deviation from the test method		
Condition of Test Sample	Normal		
Test Result	Pass		
Report Template	AGCRT-US-BR/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

Eddy · Liu

Eddy Liu (Project Engineer)

Aug. 20, 2020

Max Zhang

Reviewed By

Max Zhang (Reviewer)

Aug. 20, 2020

Approved By

Forrest Lei (Authorized Officer)

Aug. 20, 2020

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## 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as "Bluetooth Speaker". It is designed by way of utilizing the GFSK,  $\pi$  /4 DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480 GHz	
RF Output Power	0.755dBm (Max)	
Bluetooth Version	V4.2	
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps	
Number of channels	79	
Hardware Version	Ver.1.4	
Software Version	Ver 2.0.1	
Antenna Designation	PIFA Antenna (Comply with requirements of the FCC part 15.203)	
Antenna Gain	-0.58dBi	
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
		2403 MHz
0		
	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
	77	2479 MHz
	78	2480 MHz

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## 2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz, in every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally, the type of connection (e.g. single of multi slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also, the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

#### 2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a hopping sequence in data mode: 40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67 56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59 72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75 09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06 01, 51, 03, 55, 05, 04

#### 2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.

2. Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD\_ADDRESS. The BD\_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24MSB's of the 48BD\_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For behavior action with other units only offset is used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30). In most case it is implemented as 28 bits counter. For the deriving of the hopping sequence the entire. LAP (24 bits),4LSB's(4bits) (Input 1) and the 27MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact the

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Bluetooth clock has a different value, because the period between the two transmission is longer (and it Cannot be shorter) than the minimum resolution of the clock(312.5us). The hopping sequence will always differ from the first one.

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

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

#### 2.7. 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.

#### **2.8. SPECIAL ACCESSORIES**

Refer to section 5.2.

## 2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

#### 2.10. 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  $\pm$ 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 = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted,  $Uc = \pm 0.8$ dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %
- Uncertainty of Dwell Time:  $Uc = \pm 2\%$
- Uncertainty of Frequency:  $Uc = \pm 2 \%$

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#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION	
1	Low channel GFSK	
2	Middle channel GFSK	
3	High channel GFSK	
4	Low channel π/4-DQPSK	
5	Middle channel π/4-DQPSK	
6	High channel π/4-DQPSK	
7	Low channel 8DPSK	
8	Middle channel 8DPSK	
9	High channel 8DPSK	
10	Hopping mode GFSK	
11	Hopping mode π/4-DQPSK	
12	Hopping mode 8DPSK	

Note: 1. Only the result of the worst case was recorded in the report, if no other cases.

2. For Conducted Test method, a temporary antenna connector is provided by the manufacture.

3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

Software Setting

	5200 👻		
RF Channel 0	T	Hopping Mod	(Internet in the second
Packet Type DH5	-	Payload Typ	e PRBS9 -
TX Gain Index 2	-	RX Gain Inde	c 0 -
Access Code Ox 8888	388888888888	AGC Mode	
Continue TX	Single Tone	Packet IX Pa	cket RX
开始ContinueTX测试(C 结束ContinueTX测试, 开始ContinueTX测试(C 结束ContinueTX测试,	持续0.5秒 han 0 Packet DH5 1		

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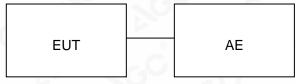
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## **5. SYSTEM TEST CONFIGURATION**

**5.1. CONFIGURATION OF EUT SYSTEM** 

Radiated Emission Configure:



Conducted Emission Configure:

EUT	S M	AE

#### 5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth Speaker	Gravastar Venus	2ASXF-GV	EUT
2	Adapter	TY0500100E1MN	N/A	AE
3	Charger line	G258	N/A	AE
4	control board	EPS-35-3.3	DC 3.3V	AE

#### **5.3. SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(1)	Peak Output Power	Compliant
15.247 (a)(1)	20 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.209	Radiated Emission	Compliant
15.247 (a)(1)(iii)	Number of Hopping Frequency	Compliant
15.247 (a)(1)(iii)	Time of Occupancy	Compliant
15.247 (a)(1)	Frequency Separation	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 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	May 15, 2020	May 14, 2022
LISN	R&S	ESH2-Z5	100086	Aug. 26, 2019	Aug. 25, 2020
Test software	R&S	ES-K1(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	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Aug. 26, 2019	Aug. 25, 2020
Horn antenna	SCHWARZBECK	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. 16, 2020
ANTENNA	SCHWARZBECK	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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## 7. PEAK OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

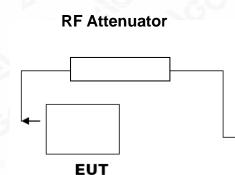
For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 3. RBW > 20 dB bandwidth of the emission being measured.
- 4. VBW  $\geq$ RBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

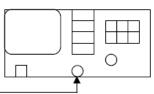
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

## PEAK POWER TEST SETUP



## **Spectrum Analyzer**



RF Cable

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#### 7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT					
	FOR GFSK MOUL	DULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail		
2.402	-3.810	21	Pass		
2.441	-2.907	21	Pass		
2.480	-2.407	21	Pass		





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CH39



CH78

	rum Analyzer - Swept SA							
Center Fre	RF 50 Ω AC	GHz	SENSE:INT	Avg Type	ALIGN AUTO	TRAC	Aug 14, 2020 E 1 2 3 4 5 6 E M WWWW	Frequency
		PNO: Fast 🔸 IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold	: 100/100	DE		
	D-6 00 00 JD				Mkr1	2.479 8	45 GHz 07 dBm	Auto Tune
10 dB/div Log	Ref 20.00 dBm					-2	or abm	
								Center Freq
10.0								2.480000000 GHz
0.00			<b>1</b>					
								Start Freq 2.477500000 GHz
-10.0								2.477500000 GH2
-20.0								Stop Freq
								2.482500000 GHz
-30.0								
-40.0								CF Step
								500.000 kHz <u>Auto</u> Man
-50.0								
-60.0								Freq Offset
								0 Hz
-70.0								
Center 2.48 #Res BW 1		#VBW	5.0 MHz		Sweep_1	Span 5	.000 MHz 1001 pts)	
MSG					STATUS			
						-		

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PEAK OUTPUT POWER MEASUREMENT RESULT FOR Π/4-DQPSK MODULATION					
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail		
2.402	-1.122	21	Pass		
2.441	-0.423	21	Pass		
2.480	0.155	21	Pass		



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#### Report No.: AGC03709200802FE03 Page 17 of 72



CH39



CH78

MSG			STATU	3	
Center 2.480000 GHz #Res BW 1.5 MHz	#VBW	5.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	
-70.0					
-60.0					Freq Offs 0 F
-50.0					
-40.0					CF Ste 500.000 kH Auto Ma
-30.0					
-20.0					<b>Stop Fre</b> 2.482500000 GF
-10.0					2.477500000 61
					Start Fre 2.477500000 G⊢
0.00		<b>∮</b> <sup>1</sup>			2.48000000 GH
10.0					Center Fre 2.480000000 G⊢
10 dB/div Ref 20.00 dBm			MKr1	2.480 125 GHz 0.155 dBm	Auto Tu
	PNO: Fast +++ IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold: 100/100		Auto Tur
XIRL RF 50 Ω AC Center Freq 2.48000000	CORREC O GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	08:38:39 PM Aug 14, 2020 TRACE 1 2 3 4 5 6	Frequency
📕 Keysight Spectrum Analyzer - Swept SA					

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PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION						
For 8-DPSK MODULATIONFrequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail						
2.402	-0.468	21	Pass			
2.441	0.161	21	Pass			
2.480	0.755	21	Pass			



CH0

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#### Report No.: AGC03709200802FE03 Page 19 of 72



**CH39** Avg Type: Log-Pwr Avg|Hold: 100/100 Frequency Center Freq 2.441000000 GHz Trig: Free Run Atten: 30 dB PNO: Fast IFGain:Low Auto Tune Mkr1 2.440 945 GHz 0.161 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 2.441000000 GHz ▲1 Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 500.000 kHz <u>Auto</u> Ма **Freq Offset** 0 Hz Center 2.441000 GHz #Res BW 1.5 MHz Span 5.000 MHz Sweep 1.000 ms (1001 pts) #VBW 5.0 MHz STATUS

CH78

Res BW	1.5 MHz		#VBV	V 5.0 MHz		S	status	000 ms (	1001 pts)	
	480000 GHz							Span 5	.000 MHz	
0.0										
).0										11040
										Freq Of
1.0										Auto
).0										500.000 Auto
										CFS
										2.482500000
1.0 Marana									and the second second	Stop F
	and the second second							and the second second		
0.0		and the second s						-		2.477500000
.00										Start F
				<b>♦</b>	1					
0.0										2.480000000
<sup>g</sup>										Center I
dB/div	Ref 20.00	dBm						0.7	55 dBm	
			IFGain:Low	Atten: 30 d	ID		Mkr1		00 GHz	Auto T
enter F	req 2.4800	00000	PNO: Fast ↔	Trig: Free F	Run A	Avg Hold:		TYP		
RL			CORREC	SENS		Avg Type:	LIGN AUTO		Aug 14, 2020	Frequency

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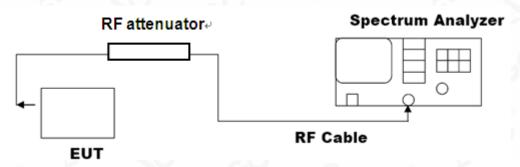


## 8. 20DB BANDWIDTH

#### **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 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.

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



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#### **8.3. LIMITS AND MEASUREMENT RESULTS**

MEASUREMENT RESULT FOR GFSK MOUDULATION					
Applicable Limite	Measurement Result				
Applicable Limits	Test Data	Criteria			
	Low Channel	0.934	PASS		
N/A	Middle Channel	0.933	PASS		
	High Channel	0.935	PASS		

#### 08:30:06 PM Aug 14, 2020 SENSE:INT Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hol #Atten: 30 dB Frequency 102000000 GHz Radio Std: None Avg|Hold: 100/100 #IFGain:Low Radio Device: BTS Ref 20.00 dBm **Center Freq** 2.402000000 GHz Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.2 ms CF Step 300.000 kHz #VBW 100 kHz <u>Auto</u> 3.69 dBm **Occupied Bandwidth Total Power** 850.89 kHz Freq Offset 0 Hz **Transmit Freq Error** -42.544 kHz **OBW Power** 99.00 % 933.9 kHz x dB Bandwidth x dB -20.00 dB

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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MEASUREMENT RESULT FOR II /4-DQPSK MODULATION					
Anniisekte Lineite		Measurement Result			
Applicable Limits	Test Data	(MHz)	Criteria		
	Low Channel	1.282	PASS		
N/A	Middle Channel	1.281	PASS		
	High Channel	1.282	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

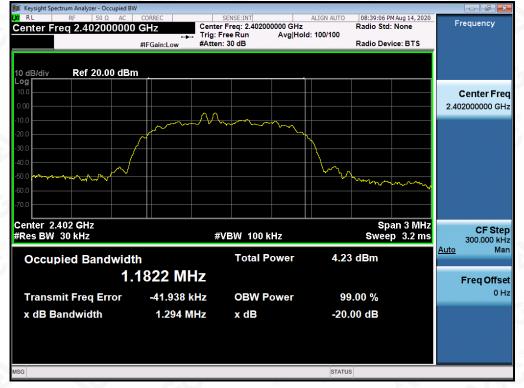


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MEASUREMENT RESULT FOR 8-DPSK MODULATION						
Measurement Result						
Applicable Limits	Test Da	ta (MHz)	Criteria			
	Low Channel	1.294	PASS			
N/A	Middle Channel	1.294	PASS			
	High Channel	1.295	PASS			

#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



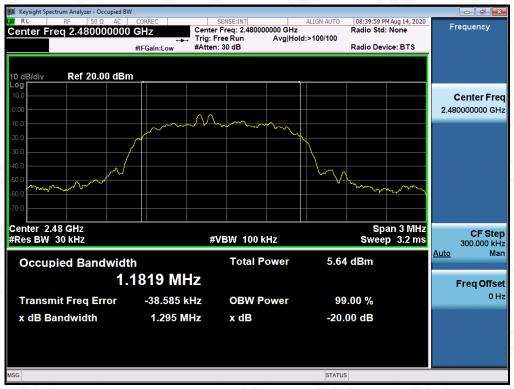
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#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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## 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.
- Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

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

The same as described in section 8.2

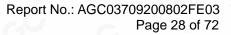
#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEAS	SUREMENT RESULT	
Annlinghta Limita	Measurement Resu	ult
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	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
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. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS

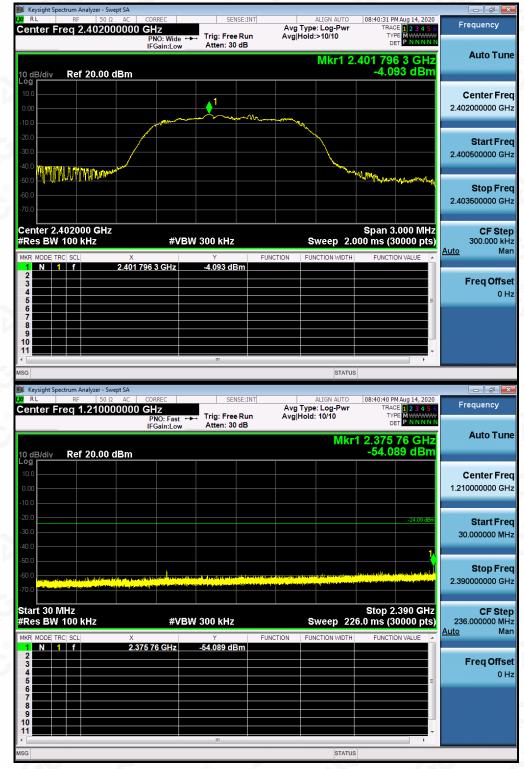
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## TEST RESULT FOR ENTIRE FREQUENCY RANGE

TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 8DPSK MODULATION IN LOW CHANNEL



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#### Report No.: AGC03709200802FE03 Page 29 of 72



🍺 Ke	ysight	Spectr	rum A	nalyzer -	Swept	SA	_	_								-	
<b>LXI</b> R			RF			AC	CORREC		SE	NSE:INT			ALIGN AUTO		M Aug 14, 2020		Frequency
Cen	iter	Fre	q 1	3.74	175	0000	0 GHz	Fast ↔	, Trig: Fre				: Log-Pwr 10/10	TY	DE 123456 DE MWWWW		,
							IFGain		Atten: 3	0 dB				D			Auto Tuno
													Mk		3 5 GHz		Auto Tune
	B/div	1	Ref	20.0	0 dE	8m								-44.0	12 dBm		
Log 10.0																	
																42	Center Freq 741750000 GHz
0.00																13.	.741750000 GHz
-10.0																	
-20.0			=												-24.09 dBm		Start Freq
-30.0				1												2.	.483500000 GHz
-40.0	_		-+														
-50.0														(ballant, datation	and the second		
-60.0	L.	Mary	<u>,                                     </u>		autu au	An	يار		and with a shirt						لتشتقحه		Stop Freq
-70.0	the second					Contraction of the										25.	.000000000 GHz
10.0																	
	rt 2.4													Stop 2	5.00 GHz		CF Step
#Re	s Bl	W 1	00	kHz				#VBW	/ 300 kHz	:			Sweep 3	2.152 s (3	0000 pts)		.251650000 GHz o Man
	MODE					Х			Y		UNCTION	FUN	CTION WIDTH	FUNCTI	DN VALUE	Aut	<u>o</u> ivian
1 2	N	1	f			4.8	803 5 G	Hz	-44.012 d	Bm					_		
3																	Freq Offset
4 5															=		0 Hz
6																	
7															_		
9																	
10																	
< □									III						•		
MSG		_											STATUS	5			

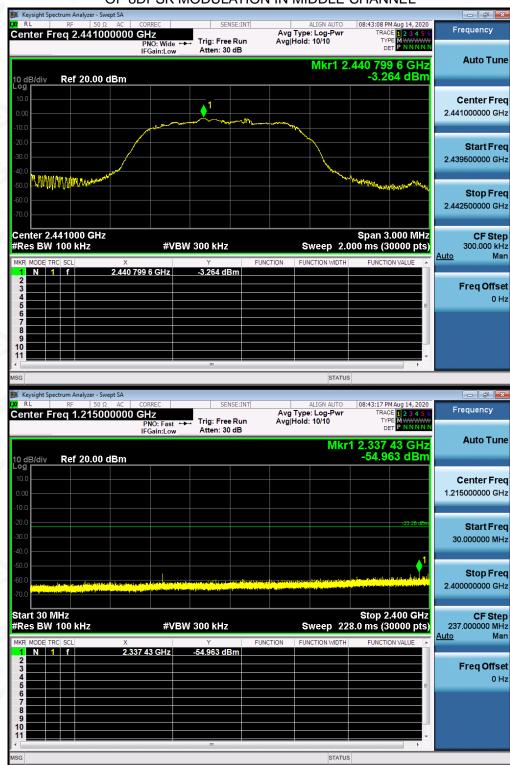
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 Attestation of Global Compliance(Shenzhen)Co., Ltd

 Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com





#### TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN MIDDLE CHANNEL

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#### Report No.: AGC03709200802FE03 Page 31 of 72



	ectrum Analyzer - Swept					
Center F	RF 50 Ω / req 13.741750		SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast ↔ IFGain:Low	<ul> <li>Trig: Free Run Atten: 30 dB</li> </ul>	Avg Hold: 10/10	TYPE MWWWWW DET PNNNN	
10 dB/div	Ref 20.00 dB	m		M	kr1 4.881 6 GHz -41.835 dBm	Auto Tune
10.0						Center Freq 13.741750000 GHz
-20.0 -30.0 -40.0	1				-23.26 dBm	<b>Start Freq</b> 2.483500000 GHz
-50.0 -60.0 -70.0						<b>Stop Freq</b> 25.00000000 GHz
Start 2.48 #Res BW	100 kHz	#VBV	N 300 kHz		Stop 25.00 GHz 2.152 s (30000 pts)	<b>CF Step</b> 2.251650000 GHz <u>Auto</u> Man
		4.881 6 GHz	-41.835 dBm	STATU		Freq Offset 0 Hz

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 E-mail: agc@agc-cert.com

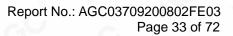
Web: http://cn.agc-cert.com/



🚺 Keysight Spectrum Analyzer - Sv					
Center Freq 2.4800		Trig: Free Run Atten: 30 dB	ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10	08:44:29 PM Aug 14, 2020 TRACE 123456 TYPE MWWWW DET PNNNNN	Frequency
10 dB/div Ref 20.00			Mkr1 2.4	179 800 0 GHz -2.735 dBm	Auto Tune
- <b>og</b> 10.0 		1			Center Free 2.480000000 GH
-20.0					<b>Start Fre</b> 2.478500000 GH
-50.0 WAANAMATAA				hander have a second and the second s	<b>Stop Fre</b> 2.481500000 GH
Center 2.480000 GHz #Res BW 100 kHz		V 300 kHz	Sweep 2.00	Span 3.000 MHz 0 ms (30000 pts)	CF Step 300.000 kH
MKR MODE TRC SCL 1 N 1 f 2 3 4 5	X 2.479 800 0 GHz	Y Fi -2.735 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	Auto Mar Freq Offse 0 H
6 7 8 9 10					
		ш	STATUS	4	
Keysight Spectrum Analyzer - Sv	unant CA		514105		
X/ RL RF 50 Ω	2 AC CORREC	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	08:44:38 PM Aug 14, 2020 TRACE 1 2 3 4 5 6	Frequency
Center Freq 1.2150	PNO: Fast ↔ IFGain:Low	Trig: Free Run     Atten: 30 dB	Avg Hold: 10/10		
10 dB/div Ref 20.00			Mkr1	2.323 76 GHz -53.753 dBm	Auto Tune
10.0 0.00					Center Free 1.215000000 GH
-20.0				-22.74 dDm	Start Free 30.000000 MH;
-50.0 -60.0 -70.0	Line plane play i fan y peng se sy de man dia de mar de mar de Marie plane play i fan y peng se se se de dia de	anna a ganag yan an gana a gana a sa a sa a sa a sa a A may ang			<b>Stop Fred</b> 2.400000000 GH;
Start 30 MHz #Res BW 100 kHz	#VBV	V 300 kHz	Sweep 228	Stop 2.400 GHz .0 ms (30000 pts)	CF Step 237.000000 MH: Auto Mar
	V.		UNCTION FUNCTION WIDTH	FUNCTION VALUE	
MKR MODE TRC SCL 1 N 1 f 2 3 4 4	× 2.323 76 GHz	-53.753 dBm			
MKR MODE TRC SCL 1 N 1 f 2 3 J J J		53.753 dBm		E	Freq Offset 0 Hz

#### TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN HIGH CHANNEL

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	·	Analyzer - Sv											
Center	RF					SEI	NSE:INT	Ava Tvr	ALIGN AUTO		Aug 14, 2020	Frequ	ency
Center		13.750		PNO: Fas IFGain:Lo		Trig: Free Atten: 30		Avg Hol	d: 10/10	TYF DE		Au	to Tune
10 dB/div Log	Rei	f 20.00	dBm								71 dBm		
10.0 0.00 -10.0												Cen 13.750000	<b>ter Freq</b> 0000 GHz
-20.0 -30.0 -40.0		1									-22.74 dDm		<b>art Freq</b> 0000 GHz
-50.0 -60.0 <mark>10.01.</mark> -70.0												<b>St</b> 25.000000	<b>op Freq</b> 0000 GHz
Start 2.5 #Res BV	V 100	kHz		#	VBW	300 kHz		~	-	2.152 s (3			CF Step 0000 GHz Man
MKR MODE	TRC SCL		X	960 1 GHz	2	Y -39.571 di		TION FU	INCTION WIDTH	FUNCTION	ON VALUE		
2 3 4 5 6											E	Fre	<b>q Offset</b> 0 Hz
7 8 9 10 11													
						III					- F		
MSG									STATUS	6			

Note: The 8DPSK modulation is the worst case and only those data recorded in the report.

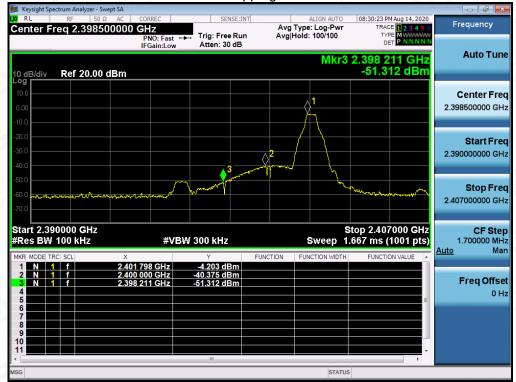
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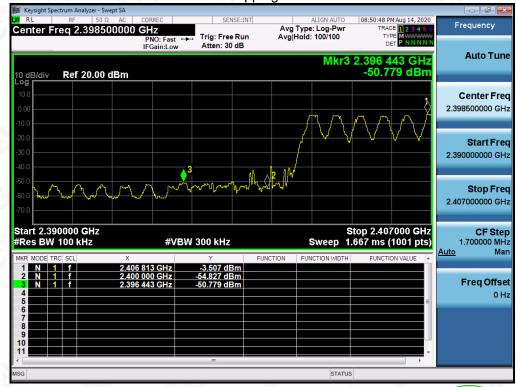
#### TEST RESULT FOR BAND EDGE

#### GFSK MODULATION IN LOW CHANNEL

Hopping off

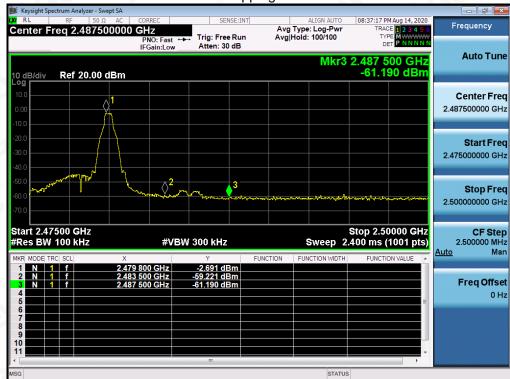


Hopping on



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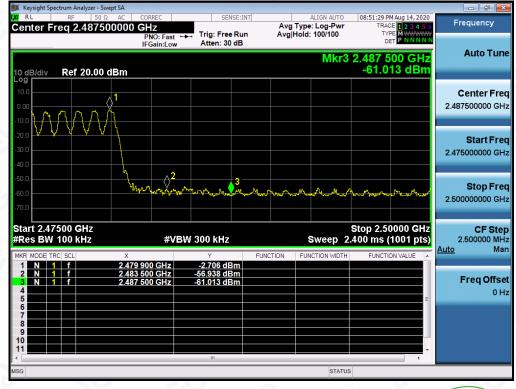




## GFSK MODULATION IN HIGH CHANNEL

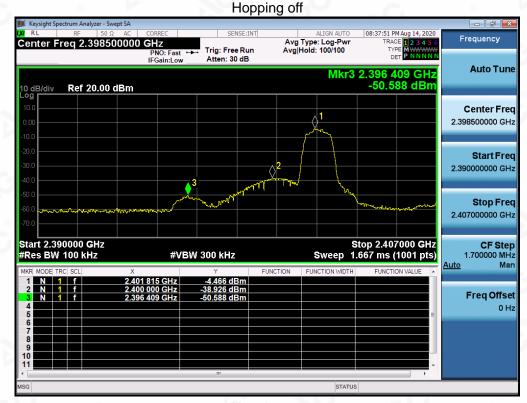
Hopping off

Hopping on



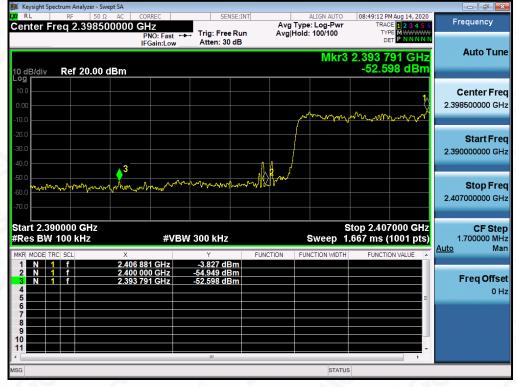
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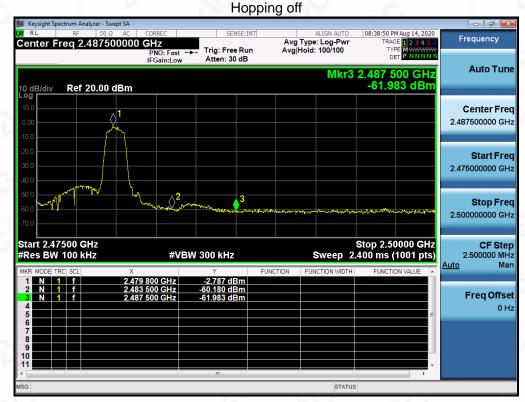
## $\pi$ /4-DQPSK MODULATION IN LOW CHANNEL

Hopping on



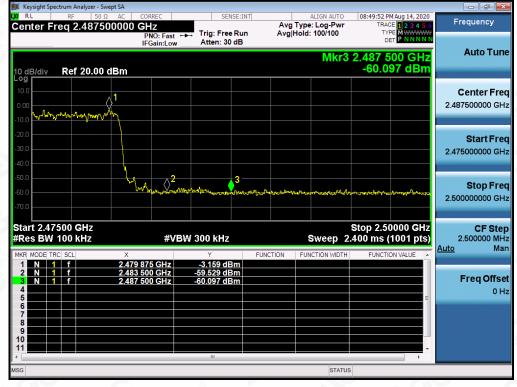
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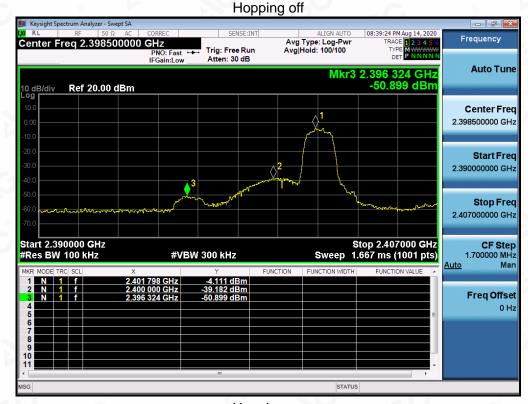
# $\pi$ /4-DQPSK MODULATION IN HIGH CHANNEL

Hopping on



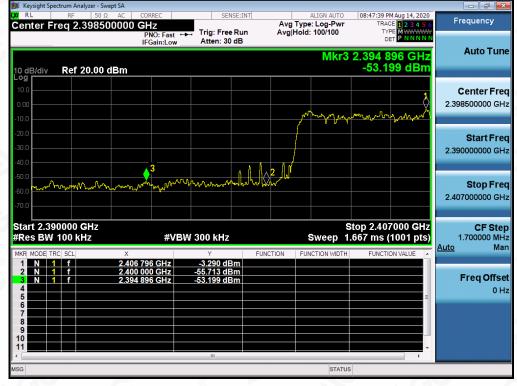
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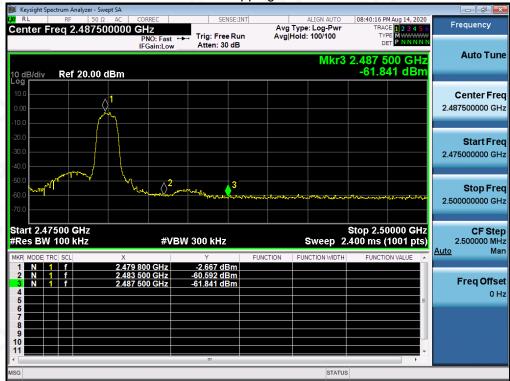
# 8-DPSK MODULATION IN LOW CHANNEL

Hopping on



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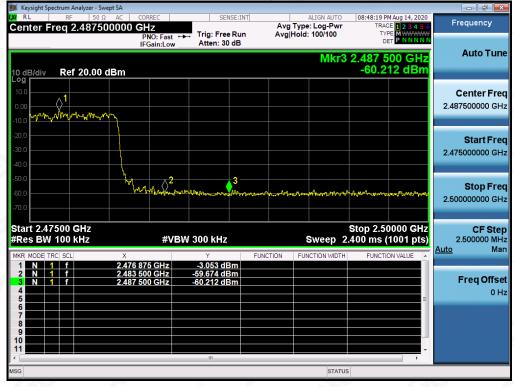




# 8-DPSK MODULATION IN HIGH CHANNEL

Hopping off

Hopping on



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# **10. RADIATED EMISSION**

#### **10.1. 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.

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The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting			
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP			
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP			
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP			
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average			

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

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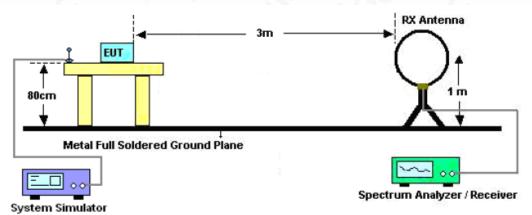
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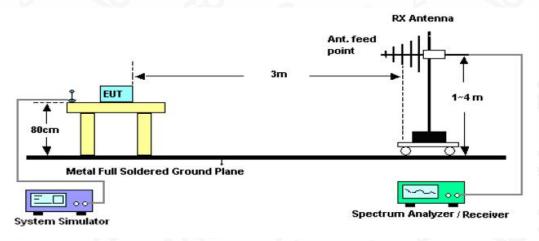


#### **10.2. TEST SETUP**

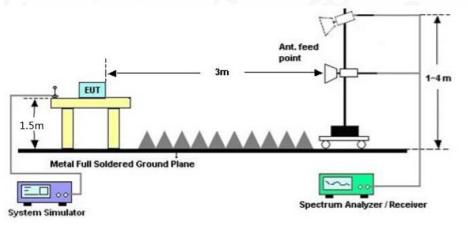
Radiated Emission Test-Setup Frequency Below 30MHz



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



### RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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#### **10.3. 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.

#### **10.4. 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.

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# **RADIATED EMISSION BELOW 1GHz**

		Bluetooth Speaker			Model	Name	Gr	avastar V	/enus
nperatur	re	25°C	G	8	Relativ	Relative Humidity		55.4%	
ssure		960hP	Pa		Test V	oltage	No	ormal Volt	age
t Mode		Mode	9		Anten	na	Ho	orizontal	
65.9	9 dBu∀/n	n	Î			Í	Lim	3.	1
								rgin: —	
	<u> </u>	f							
						6	man	moundart	-
26		3	4	5 minuter	month marker has	in white many the second second			
		2 3 X	mm						
	man								1
									1 - L
-14 3(	0.000 12	27.00 224.00	321.00 418	.00 515.00	612.00	709.00 806	.00	1000.00	MHz
	D.000 12	27.00 224.00	321.00 418.	.00 515.00	612.00	709.00 806	.00	1000.00	MHz
			Reading	Correct	Measure	- P -		1000.00	MHz
	0.000 12 No. N	Mk. Freq.	Reading Level	Correct Factor	Measure- ment	- Limit	Over		G
			Reading	Correct	Measure	- P -		1000.00 Detector	G
		Mk. Freq.	Reading Level	Correct Factor	Measure- ment	- Limit	Over		G
	No. N	Mk. Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	- Limit dBuV/m	Over dB	Detector	G
	No. M	Mk. Freq. MHz 68.8000	Reading Level dBuV -0.25	Correct Factor dB 16.96	Measure- ment dBuV/m 16.71	Limit dBuV/m 40.00	Over dB -23.29	Detector	G
	No. M	Mk. Freq. MHz 68.8000 148.0167 220.7667	Reading Level dBuV -0.25 -0.40 5.47	Correct Factor dB 16.96 19.21 15.37	Measure- ment dBuV/m 16.71 18.81 20.84	Limit dBuV/m 40.00 43.50 46.00	Over dB -23.29 -24.69 -25.16	Detector peak peak peak	G
	No. M 1 2 3 4	Mk. Freq. MHz 68.8000 148.0167 220.7667 346.8667	Reading Level dBuV -0.25 -0.40 5.47 0.47	Correct Factor dB 16.96 19.21 15.37 21.11	Measure- ment dBuV/m 16.71 18.81 20.84 21.58	Limit dBuV/m 40.00 43.50 46.00 46.00	Over dB -23.29 -24.69 -25.16 -24.42	Detector peak peak peak peak	G
	No. M	Mk. Freq. MHz 68.8000 148.0167 220.7667	Reading Level dBuV -0.25 -0.40 5.47	Correct Factor dB 16.96 19.21 15.37	Measure- ment dBuV/m 16.71 18.81 20.84	Limit dBuV/m 40.00 43.50 46.00	Over dB -23.29 -24.69 -25.16	Detector peak peak peak	G

### **RESULT: PASS**

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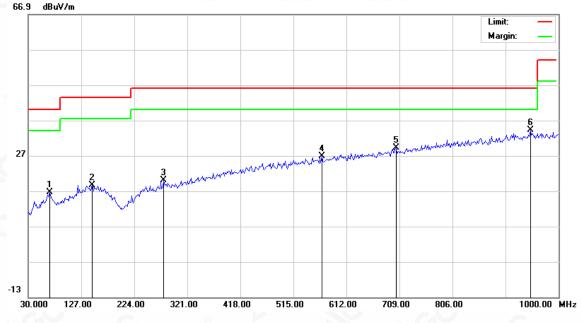
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 E-mail: agc@agc-cert.com



#### Report No.: AGC03709200802FE03 Page 45 of 72

EUT	Bluetooth Speaker	Model Name	Gravastar Venus
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		68.8000	-0.43	16.96	16.53	40.00	-23.47	peak
2		146.4000	-0.59	19.22	18.63	43.50	-24.87	peak
3		277.3500	0.27	19.72	19.99	46.00	-26.01	peak
4		566.7333	0.60	26.30	26.90	46.00	-19.10	peak
5		702.5333	0.92	28.21	29.13	46.00	-16.87	peak
6	*	948.2667	2.03	32.12	34.15	46.00	-11.85	peak

#### **RESULT: PASS**

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. All test modes had been pre-tested. The mode 9 is the worst case and recorded in the report.

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## **RADIATED EMISSION ABOVE 1GHz**

EUT	Bluetooth Speaker	Model Name	Gravastar Venus
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	45.76	0.08	45.84	74	-28.16	peak
4804.000	37.33	0.08	<sup>©</sup> 37.41	54	-16.59	AVG
7206.000	40.38	2.21	42.59	74	-31.41	peak
7206.000	32.51	2.21	34.72	54	-19.28	AVG
5	.0			<b>S</b>	0	
emark:			0			
actor = Anter	nna Factor + Cab	le Loss – Pre-	amplifier.	8		

EUT	Bluetooth Speaker	Model Name	Gravastar Venus
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Tree
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m) (dB)	- Value Type	
4804.000	44.66	0.08	44.74	74	-29.26	peak
4804.000	36.23	0.08	36.31	54	-17.69	AVG
7206.000	39.57	2.21	41.78	74	-32.22	peak
7206.000	30.25	2.21	32.46	54	-21.54	AVG
- 60-	3			90	G	8
emark:						0
actor = Anter	nna Factor + Cable	Loss – Pre-a	mplifier.	8		

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#### Report No.: AGC03709200802FE03 Page 47 of 72

Bluetooth Speaker	Model Name	Gravastar Venus
25°C	Relative Humidity	55.4%
960hPa	Test Voltage	Normal Voltage
Mode 8	Antenna	Horizontal
2	5°C 60hPa	5°C     Relative Humidity       60hPa     Test Voltage

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.36	0.14	45.5	74	-28.5	peak
4882.000	38.59	0.14	38.73	54	-15.27	AVG
7323.000	41.34	2.36	43.7	74	-30.3	peak
7323.000	34.65	2.36	37.01	54	-16.99	AVG
0	· · · · ·				©	
emark:	- 6	3			- 6	ß
actor = Anter	nna Factor + Cable	Loss – Pre-	amplifier.			- C

EUT	Bluetooth Speaker	Model Name	Gravastar Venus
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.99	0.14	46.13	74	-27.87	peak
4882.000	37.51	0.14	37.65	54	-16.35	AVG
7323.000	40.36	2.36	42.72	74	-31.28	peak
7323.000	31.49	2.36	33.85	54	-20.15	AVG
0						<i>.</i>
	®					
emark:	e.C	C.				C.
actor = Anter	nna Factor + Cable	e Loss – Pre-a	amplifier.			

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#### Report No.: AGC03709200802FE03 Page 48 of 72

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eading         Factor           μV)         (dB)           33         0.22           37         0.22           26         2.64	Emission Le (dBµV/m) 46.55 38.59 43.9	-	Margin (dB) -27.45 -15.41 -30.1	Value Type peak AVG peak
33         0.22           37         0.22	46.55 38.59	74 54	-27.45 -15.41	peak AVG
37 0.22	38.59	54	-15.41	AVG
				-
26 2.64	43.9	74	-30.1	peak
				pean
.74 2.64	35.38	54	-18.62	AVG
		C	8	
			0	
8			- 6	®
			r + Cable Loss – Pre-amplifier.	

EUT	Bluetooth Speaker	Model Name	Gravastar Venus
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

(dBµV)					
(ubµv)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
45.35	0.22	45.57	74	-28.43	peak
38.23	0.22	38.45	54	-15.55	AVG
41.11 ®	2.64	43.75	74	-30.25	peak
33.66	2.64	36.3	54	-17.7	AVG
	<u> </u>	6			69
	45.35 38.23 41.11	45.35         0.22           38.23         0.22           41.11         2.64	45.35         0.22         45.57           38.23         0.22         38.45           41.11         2.64         43.75	45.35         0.22         45.57         74           38.23         0.22         38.45         54           41.11         2.64         43.75         74	45.35         0.22         45.57         74         -28.43           38.23         0.22         38.45         54         -15.55           41.11         2.64         43.75         74         -30.25

#### **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, Over=Measure-Limit.

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

All test modes had been tested. The 8DPSK modulation is the worst case and recorded in the report.

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