

# **FCC Test Report**

## Report No.: AGC08189201201FE03

FCC ID	: 2ACP4CBT960
FCCID	: ZACF4CD1900
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: Bluetooth Earphone
BRAND NAME	: SENTRY
MODEL NAME	<ul> <li>BT960, BT957, BT957B, BT957W, BT958, BT958B,</li> <li>BT958W, BT959, BT959B, BT959W, BT960B, BT960W, BT951W, BT954B, BT961W, BT964B</li> </ul>
APPLICANT	: Sentry Industries Limited
DATE OF ISSUE	: Dec. 24, 2020
STANDARD(S)	: FCC Part 15.247
REPORT VERSION	: V1.0



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## **REPORT REVISE RECORD**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	. /	Dec. 24, 2020	Valid	Initial Release

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## TABLE OF CONTENTS

	1. VERIFICATION OF CONFORMITY	5
	2. GENERAL INFORMATION	6
	2.1. PRODUCT DESCRIPTION	6
	2.2. TABLE OF CARRIER FREQUENCYS	
	2.3. RECEIVER INPUT BANDWIDTH	7
	2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE	7
	2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR	7
	2.6. RELATED SUBMITTAL(S) / GRANT (S)	
	2.7. TEST METHODOLOGY	8
	2.8. SPECIAL ACCESSORIES	8
	2.9. EQUIPMENT MODIFICATIONS	
	2.10. ANTENNA REQUIREMENT	
	3. MEASUREMENT UNCERTAINTY	9
	4. DESCRIPTION OF TEST MODES	
	5. SYSTEM TEST CONFIGURATION	11
	5.1. CONFIGURATION OF EUT SYSTEM	11
	5.2. EQUIPMENT USED IN TESTED SYSTEM	11
	5.3. SUMMARY OF TEST RESULTS	11
	6. TEST FACILITY	12
	7. PEAK OUTPUT POWER	
	7.1. MEASUREMENT PROCEDURE	
	7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
	7.3. LIMITS AND MEASUREMENT RESULT	
	8. 20DB BANDWIDTH	
	8.1. MEASUREMENT PROCEDURE	
	8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
	8.3. LIMITS AND MEASUREMENT RESULTS	
	9. CONDUCTED SPURIOUS EMISSION	
St pr	9.1. MEASUREMENT PROCEDURE any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated of tamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the writter approximation of <i>I</i> resented 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 issuer writher enquiry of validity or verification of the test report should be addressed to AGC by agc@agc-cert.com.	AĞÇ. The test results



9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
9.3. MEASUREMENT EQUIPMENT USED	
9.4. LIMITS AND MEASUREMENT RESULT	
10. RADIATED EMISSION	
10.1. MEASUREMENT PROCEDURE	
10.2. TEST SETUP	
10.3. LIMITS AND MEASUREMENT RESULT	
10.4. TEST RESULT	
11. NUMBER OF HOPPING FREQUENCY	
11.1. MEASUREMENT PROCEDURE	
11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
11.3. MEASUREMENT EQUIPMENT USED	
11.4. LIMITS AND MEASUREMENT RESULT	
12. TIME OF OCCUPANCY (DWELL TIME)	
12.1. MEASUREMENT PROCEDURE	
12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
12.3. MEASUREMENT EQUIPMENT USED	
12.4. LIMITS AND MEASUREMENT RESULT	
13. FREQUENCY SEPARATION	
13.1. MEASUREMENT PROCEDURE	
13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
13.3. MEASUREMENT EQUIPMENT USED	
13.4. LIMITS AND MEASUREMENT RESULT	
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	59
	61

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

Applicant	Sentry Industries Limited	
Address	507 Houston Center, 63 Mody Road, Tst, Hong Kong, China	
Manufacturer	Guangdong SAIYO Electronics Industry Co., Ltd	
Address	Xibian Industry Zone, Tongyu Town, Chaoyang District, Shantou City, Guangdong Province, China	
Factory	Guangdong SAIYO Electronics Industry Co., Ltd	
Address	Xibian Industry Zone, Tongyu Town, Chaoyang District, Shantou City, Guangdong Province, China	
Product Designation	Bluetooth Earphone	
Brand Name	SENTRY	
Test Model	BT960	
Series Model	BT957, BT957B, BT957W, BT958, BT958B, BT958W, BT959, BT959B, BT959W, BT960B, BT960W, BT951W, BT954B, BT961W, BT964B	
Difference Description	All the same except for the model name.	
Date of test	Dec. 17, 2020 to Dec. 24, 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

Then Huony

Thea Huang Project Engineer

Dec. 24, 2020

**Reviewed By** 

Max Zhan

Max Zhang Reviewer

Dec. 24, 2020

Approved By

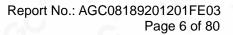
oWa

Forrest Lei Authorized Officer

Dec. 24, 2020

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## 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as "Bluetooth Earphone". 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	-1.519dBm (Max)	
Bluetooth Version	V 5.0	
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps	
Number of channels	79	
Hardware Version	V1.1	
Software Version	V5.0	
Antenna Designation	Ceramic Antenna (Comply with requirements of the FCC part 15.203)	
Antenna Gain	2.57dBi	
Power Supply	DC 3.7V by battery or DC 5V by adapter	

Note: 1. The EUT doesn't support BLE.

2. The EUT comprises left and right channel headsets, both are the same, the right headset had been tested and recorded in this report as the worst case.

#### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency	
	0	2402 MHz	
		2403 MHz	
	38	2440 MHz	
2402~2480MHz	39	2441 MHz	
NO SO	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, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55, 36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63, 42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14, 51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49, 20, 79, 73, 09, 16, 60, 71, 41, 24, 53, 38, 26, 46, 37, 65, 32, 70, 52, 27, 59, 22, 62, 39

#### 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.

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The second connection will be established. A new hopping sequence is generated. Due to the fact the 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: 2ACP4CBT960** 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 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

8 BT_Tool		Section 1	
COMx Baudrate			
Classic BLE			
Test Mode			
FCC Test 🔘	Remote	BT address	_
CBT Test 🔘	55555	5555555	Run
RF Control			
RF Mode	TX TEST -	Packet Type	DH5 👻
Hopping	OFF 🔻	TX Frequency	2480 -
TX Power	7 🔹	RX Frequency	2402 -
Scenario	PRBS Patte	ern	•
LOG: Test end			*
LOG: BR/EDR 1			
LOG: Test end LOG: BR/EDR			
LOG: Test en			
LOG: BR/EDR			
LOG: Test end	d		E
			Ŧ
COM8 is open		1500000bps	

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## **5. SYSTEM TEST CONFIGURATION**

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure:

EUT

Conducted Emission Configure:

	0	
EUT		AE

#### 5.2. EQUIPMENT USED IN TESTED SYSTEM

ltem	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth Earphone	BT960	2ACP4CBT960	EUT
2	Control Box		PC-USB	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)	(1) Frequency Separation		
15.207	Conducted Emission	Not applicable	

Note: The EUT is powered by battery. The EUT can not use the BT function with charging

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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 RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due	
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2021	
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec.06, 2021	
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022	
Attenuator	ZHINAN	E-002	N/A	N/A	N/A Sep. 08, 2021	
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019		
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	Sep. 03,2020	Sep. 02,2022	
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

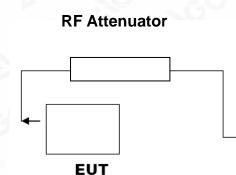
For peak power test:

- 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.

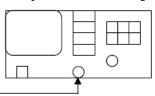
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

#### 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 MOUDULATION									
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail						
2.402	-2.771	30	Pass						
2.441	-3.122	30	Pass						
2.480	-3.265	30	Pass						

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#### Report No.: AGC08189201201FE03 Page 15 of 80



CH39



CH78



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PEAK OUTPUT POWER MEASUREMENT RESULT FOR II/4-DQPSK MODULATION											
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail											
2.402	-2.137	21	Pass								
2.441	-2.463	21	Pass								
2.480	-2.704	21	Pass								



CH0

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#### Report No.: AGC08189201201FE03 Page 17 of 80



CH39



CH78

Keysight Spectrum Analyzer - Swept SA					
XIRL RF 50 Ω AC Center Freq 2.48000000		SENSE:INT	ALIGN AUTO		Frequency
	PNO: Fast +++ IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold: 100/100	DET PNNNN	
10 dB/div Ref 20.00 dBm			Mki	r1 2.479 825 GHz -2.704 dBm	Auto Tun
- <b>og</b> 10.0					Center Fre 2.480000000 G⊢
-10.0		<b>1</b>			<b>Start Fre</b> 2.477500000 GH
20.0 30.0					<b>Stop Fre</b> 2.482500000 GH
40.0					CF Ste 500.000 kH <u>Auto</u> Ma
60.0					Freq Offs 0 H
-70.0 Center 2.480000 GHz				Span 5.000 MHz	
#Res BW 1.5 MHz	#VBW	5.0 MHz	Sweep	1.000 ms (1001 pts)	
MSG			STA	TUS	

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PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION										
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or F										
2.402	-1.519	21	Pass							
2.441	-1.934	21	Pass							
2.480	-2.303	21	Pass							

CH0



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#### Report No.: AGC08189201201FE03 Page 19 of 80



CH39



CH78

Keysight Spectrum Analyzer - Swept SA	CORREC SENSE:INT	ALIGN AUTO	02/50/52 PM Doc 18, 2020	
Center Freq 2.48000000	) GHz	Avg Type: Log-Pwr Avg Hold: 100/100	03:50:53 PM Dec 18, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
	PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 30 dB		DET P NNNN	Auto Tun
10 dB/div Ref 20.00 dBm		Mkr1	2.479 960 GHz -2.303 dBm	Auto Tun
				Center Fre
10.0				2.480000000 GH
0.00	1			Start Fre
-10.0				2.477500000 GH
-20.0				<b>Stop Fre</b> 2.482500000 GH
-30.0				05.0%
-40.0				CF Ste 500.000 kH <u>Auto</u> Ma
-50.0				
-60.0				Freq Offs 0 H
-70.0				
Center 2.480000 GHz #Res BW 1.5 MHz	#VBW 5.0 MHz	Sweep 1.	Span 5.000 MHz 000 ms (1001 pts)	
MSG		STATUS		

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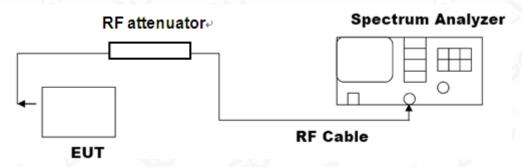


#### 8. 20DB BANDWIDTH

#### **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										
Annliachta Limite		Measurement Resu	lt							
Applicable Limits	Test Dat	Criteria								
	Low Channel	0.950	PASS							
N/A	Middle Channel	0.947	PASS							
	High Channel	0.947	PASS							

#### 03:44:03 PM Dec 18, 2020 Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hol Frequency 402000000 GHz Radio Std: None Trig: Free Rur #Atten: 30 dB Avg|Hold: 100/100 Radio Device: BTS #IFGain:Low 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> 4.41 dBm **Occupied Bandwidth Total Power** 822.65 kHz Freq Offset 0 Hz -39.590 kHz **Transmit Freq Error OBW Power** 99.00 % x dB Bandwidth 950.4 kHz 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									
Applicable Limite	Measurement Result								
Applicable Limits	Test Data	(MHz)	Criteria						
	Low Channel	1.280	PASS						
N/A	Middle Channel	1.279	PASS						
	High Channel	1.280	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

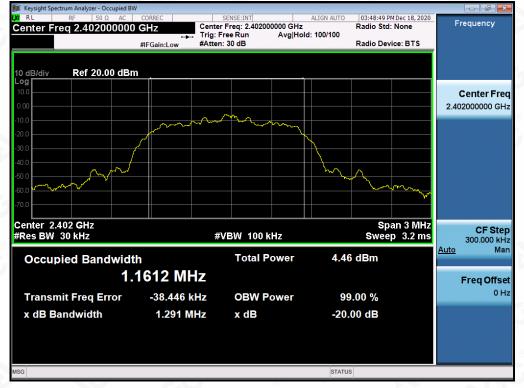


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MEASUREMENT RESULT FOR 8-DPSK MODULATION										
• • • • • • ·		Measurement Resu	lt							
Applicable Limits	Test Da	Test Data (MHz)								
	Low Channel	1.291	PASS							
N/A	Middle Channel	1.290	PASS							
-C	High Channel	1.290	PASS							

#### 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

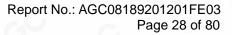
#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT											
Annlinghta Limita	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	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.: AGC08189201201FE03 Page 29 of 80



🊺 Ke	eysight '	Spectr	rum A	Analyzer -	Swepf	t SA				_							_	
L <mark>XI</mark> R			RF		0Ω	AC	CORRE			SENSE	:INT	A		ALIGN AUTO		M Dec 18, 2020		Frequency
Cer	nter	Fre	q 1	3.74	175	000	0 GH	Z East ∸	Trig: F	ree R	un			: Log-Pwr : 10/10	TYF	DE 123456 PE MWWWW		
								in:Low	Atten						DE	ET P NNNN		
														Mkr	1 24.25	3 2 GHz		Auto Tune
10 d	IB/div		Ref	20.0	0 di	Зm										22 dBm		
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10.0																		Center Freq
0.00																	1	3.741750000 GHz
-10.0																		
-20.0																-23.33 dBm		
-30.C					٦ī													Start Freq
																		2.483500000 GHz
-40.C																<b>→</b>		
-50.C											ورجع ال		and the second	a line and the second second	and the second states of a			Stop Freq
-60.C	and a		-	a di bab			at special de						an in state of the	and a state of the			2	5.00000000 GHz
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							ر کا											
	rt 2.4														Stop 2	5.00 GHz		CF Step
#Re	es Bl	N 11	00	kHz				#VB	W 300 ki	ΗZ				Sweep 2	2.152 s (3	0000 pts)		2.251650000 GHz uto Man
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 E-mail: agc@agc-cert.com



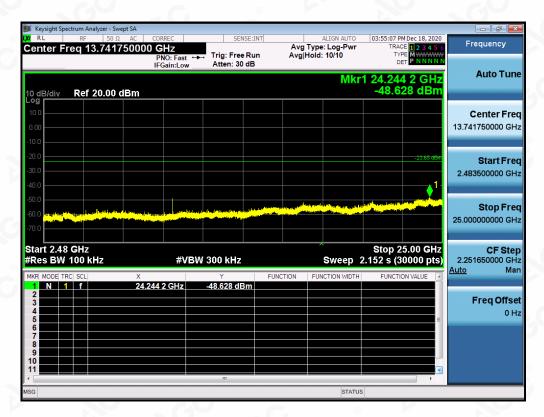


#### TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN MIDDLE CHANNEL

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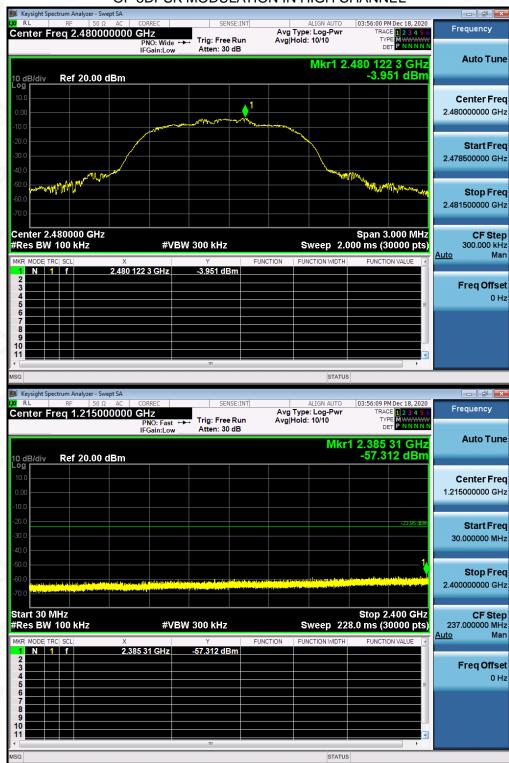
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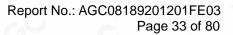
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#### TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN HIGH CHANNEL

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

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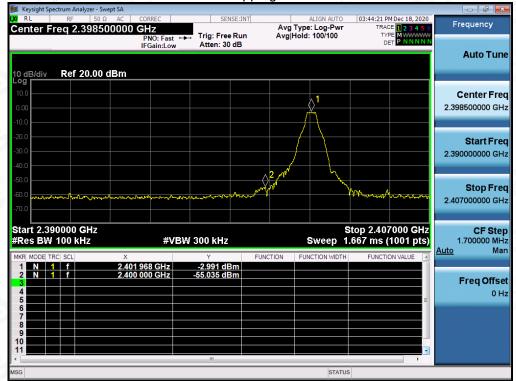
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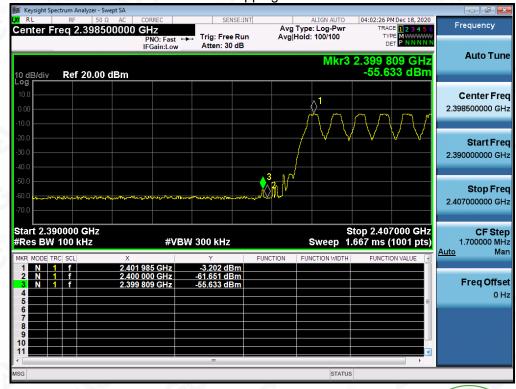
#### TEST RESULT FOR BAND EDGE

#### GFSK MODULATION IN LOW CHANNEL

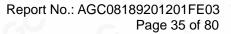
Hopping off



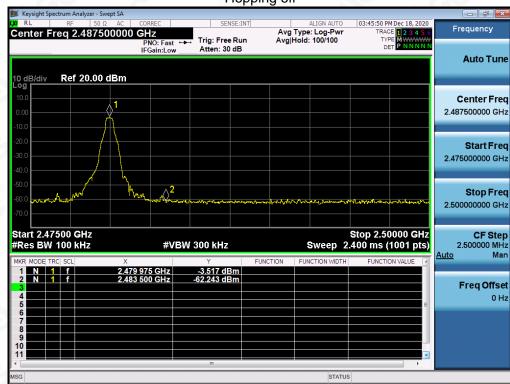
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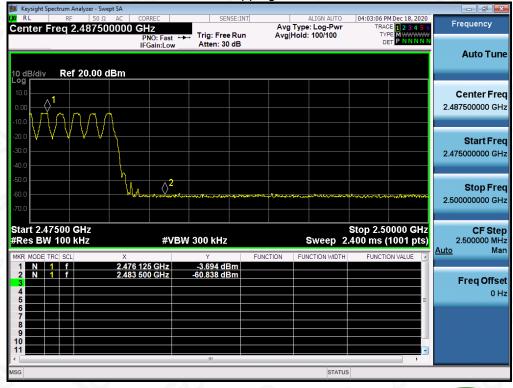




# GFSK MODULATION IN HIGH CHANNEL

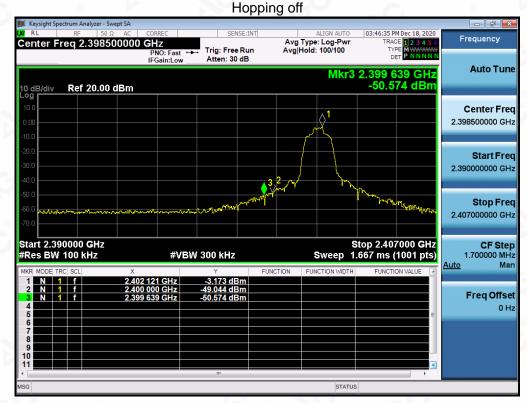
Hopping off

Hopping on



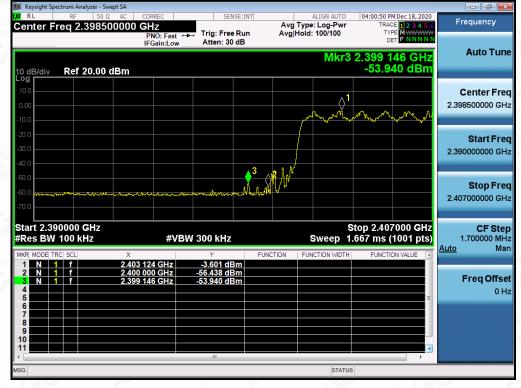
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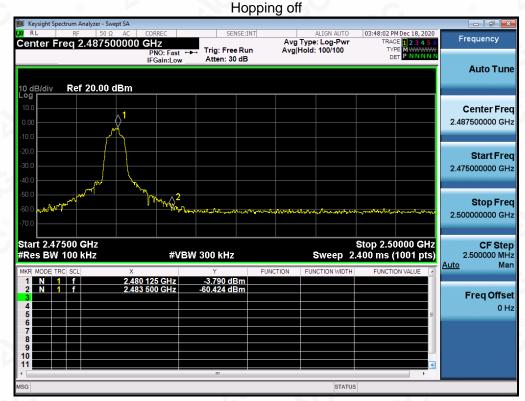
# $\pi$ /4-DQPSK MODULATION IN LOW CHANNEL

Hopping on



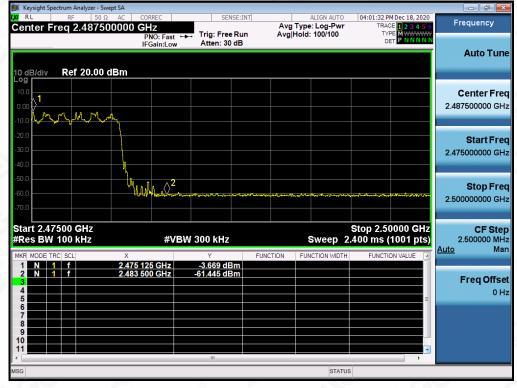
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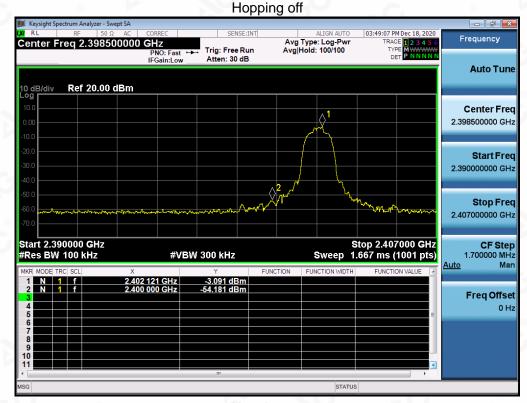
# $\pi$ /4-DQPSK MODULATION IN HIGH CHANNEL

Hopping on



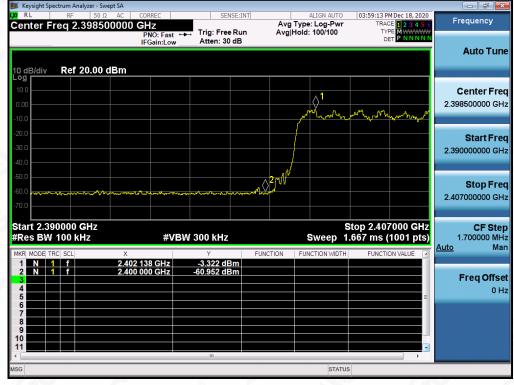
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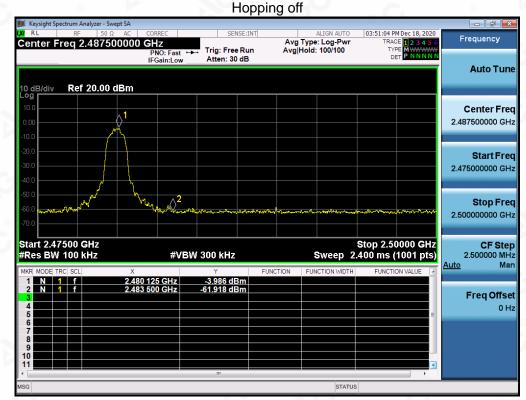
## 8-DPSK MODULATION IN LOW CHANNEL

Hopping on



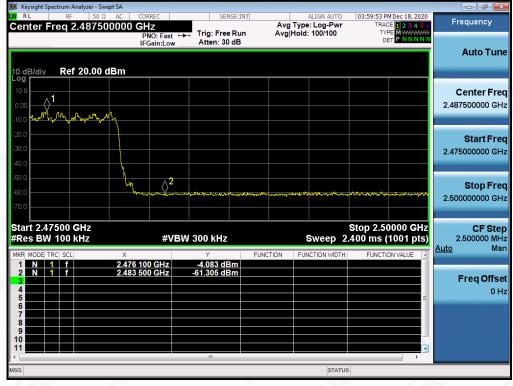
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## 8-DPSK MODULATION IN HIGH CHANNEL

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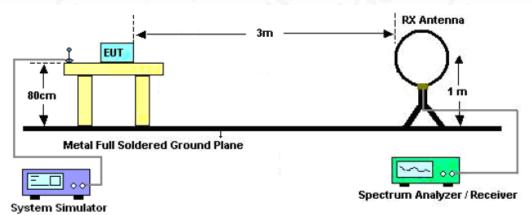
 Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

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

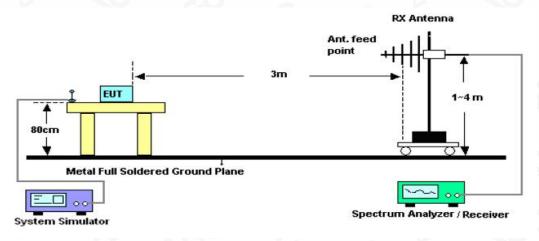


## 10.2. TEST SETUP

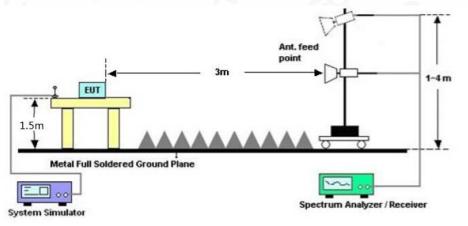
Radiated Emission Test-Setup Frequency Below 30MHz



## 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.

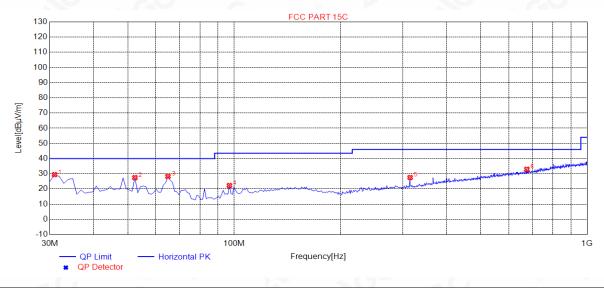
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#### Report No.: AGC08189201201FE03 Page 44 of 80

## **RADIATED EMISSION BELOW 1GHz**

EUT	Bluetooth Earphone	Model Name	BT960
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9700	29.43	10.02	40.00	10.57	100	341	Horizontal
2	52.3100	27.49	11.49	40.00	12.51	200	293	Horizontal
3	64.9200	28.26	10.09	40.00	11.74	100	3	Horizontal
4	96.9300	22.27	10.11	43.50	21.23	200	109	Horizontal
5	315.180	27.56	16.48	46.00	18.44	100	294	Horizontal
6	675.050	32.97	25.56	46.00	13.03	200	6	Horizontal

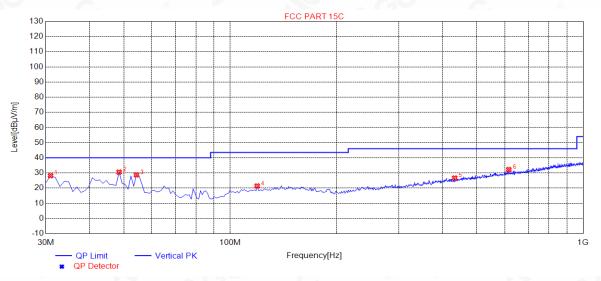
## **RESULT: PASS**

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#### Report No.: AGC08189201201FE03 Page 45 of 80

EUT	Bluetooth Earphone	Model Name	BT960
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical



	NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
Γ	1	30.9700	28.20	10.02	40.00	11.80	100	350	Vertical
	2	48.4300	30.55	11.71	40.00	9.45	100	44	Vertical
Γ	3	54.2500	28.73	11.35	40.00	11.27	100	278	Vertical
	4	119.240	21.42	13.39	43.50	22.08	100	321	Vertical
	5	432.550	26.68	20.59	46.00	19.32	100	360	Vertical
	6	615.880	32.23	24.56	46.00	13.77	100	227	Vertical

## **RESULT: PASS**

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

2. All test modes had been pre-tested. The mode 7 is the worst case and recorded in the report.

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## Report No.: AGC08189201201FE03 Page 46 of 80

## **RADIATED EMISSION ABOVE 1GHz**

EUT	Bluetooth Earphone	Model Name	BT960
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	46.72	0.08	46.8	74	-27.2	peak
4804.000	36.46	0.08	36.54	54	-17.46	AVG
7206.000	39.32	2.21	41.53	74	-32.47	peak
7206.000	32.25	2.21	34.46	54	-19.54	AVG
			(R)			
emark:						
actor = Anter	nna Factor + Cab	le Loss – Pre-	amplifier.	®		

EUT	Bluetooth Earphone	Model Name	ВТ960
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	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4804.000	45.89	0.08	45.97	74	-28.03	peak
4804.000	35.36	0.08	35.44	54	-18.56	AVG
7206.000	39.41	2.21	41.62	74	-32.38	peak
7206.000	31.57	2.21	33.78	54	-20.22	AVG
- 66				50	G	
emark:			R		6	
actor = Anter	nna Factor + Cable	e Loss – Pre-ai	mplifier.	8		

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#### Report No.: AGC08189201201FE03 Page 47 of 80

EUT	Bluetooth Earphone	Model Name	BT960
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	47.75	0.14	47.89	74	-26.11	peak
4882.000	36.36	0.14	36.5	54	-17.5	AVG
7323.000	40.41	2.36	42.77	74	-31.23	peak
7323.000	33.84	2.36	36.2	54	-17.8	AVG
8				0		
	3				®	
emark:	- 6	8			- 6	8
actor = Anter	na Factor + Cable	Loss – Pre-	amplifier.			- C

EUT Model Name BT960 **Bluetooth Earphone** Temperature 25°C **Relative Humidity** 55.4% Pressure 960hPa **Test Voltage** Normal Voltage **Test Mode** Mode 8 Vertical Antenna

Value Typ	Margin	Limits	Emission Level	Factor	Meter Reading	Frequency
value Typ	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV)	(MHz)
peak	-26.08	74	47.92	0.14	47.78	4882.000
AVG	-14.24	54	39.76	0.14	39.62	4882.000
peak	-30.05	74	43.95	2.36	41.59	7323.000
AVG	-18.23	54	35.77	2.36	33.41	7323.000
		C	G <sup>Q</sup>		© 1	0
	6	0				emark:

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

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#### Report No.: AGC08189201201FE03 Page 48 of 80

EUT	Bluetooth Earphone	Model Name	BT960
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	45.68	0.22	45.9	74	-28.1	peak
4960.000	36.39	0.22	36.61	54	-17.39	AVG
7440.000	39.45	2.64	42.09	74	-31.91	peak
7440.000	30.27	2.64	32.91	54	-21.09	AVG
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EUT	Bluetooth Earphone	Model Name	BT960
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	45.45	0.22	45.67	74	-28.33	peak
4960.000	35.28	0.22	35.5	54	-18.5	AVG
7440.000	39.36	2.64	42	74	-32	peak
7440.000	30.33	2.64	32.97	54	-21.03	AVG
		<u>o</u>		8		0
emark:						

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 8DPSK modulation is the worst case and recorded in the report.

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