

# **FCC Test Report**

Report No.: AGC06504201102FE03

FCC ID	: SXV-CK11-PRO-R
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: Bluetooth Earphone
BRAND NAME	: COWON
MODEL NAME	: COWON CK11 Pro, CK11 Pro
APPLICANT	: COWON SYSTEMS, Inc.
DATE OF ISSUE	: Dec. 11, 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	. /	Dec. 11, 2020	Valid	Initial Release

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## **1. VERIFICATION OF CONFORMITY**

COWON SYSTEMS, Inc.	
540, Eonju-ro, Gangnam-gu, Seoul, South Korea	
COWON SYSTEMS, Inc.	
540, Eonju-ro, Gangnam-gu, Seoul, South Korea	
Shenzhen Vecho Co., Ltd	
Xinlong Tech Building, Dawangshan Industry Area, Shajing Town, Baoan District, Shenzhen, China	
Bluetooth Earphone	
COWON	
COWON CK11 Pro	
CK11 Pro	
All the series models are the same as the test model except for the model names	
Dec. 01, 2020 to Dec. 11, 2020	
No any deviation from the test method	
Normal	
Pass	
AGCRT-US-BR/RF	

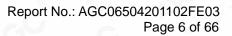
We hereby certify that:

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.

John Zerrog Prepared By John Zeng Dec. 11, 2020 (Project Engineer) Max Zhan **Reviewed By** Max Zhang Dec. 11, 2020 (Reviewer) Approved By owe Forrest Lei Dec. 11, 2020 (Authorized Officer)

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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

2.402 GHz to 2.480 GHz	
-1.027dBm (Max)	
V5.0	
BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps	
79	
V1.3	
V2.3.0	
Integral Antenna (Comply with requirements of the FCC part 15.203)	
2.65dBi	
DC 3.7V by battery	
t BLE.	

## 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
20 .00	0	2402 MHz
	61	2403 MHz
G <sup>C</sup> a C		
	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
8	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: SXV-CK11-PRO-R** 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 = ±3.1 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,  $Uc = \pm 0.8$ 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.

4.For battery operated equipment, the battery is full charged during test.

#### Software Setting

ab rest roon-2.1.14				
			Password:	Log
сом5 🔹 区 💭				
Memory * >	Packet Type UH5 • · · · · · · · · · · · · · · · · · ·			
Tx	Payload Length 339			
Single Tone	Pattern Type PRBS-9			
Burst				
LE BTx	GC (range= 0~63) 54			
Rx Continuous				
rystal	BD Address: 0x 00006BC6967E			
Crystal Trim				
est Mode				
Enter Controller Mode	Enable Temp Compensation			
Touch Setting	Report GC			
udio				
ANC Setting	Stop Execute			
Gain Setting /irtualCom				
VirtualCom				
Virtualeoni				
	compensation succeeded			
:32:47.237] Tx Burst succeeded :32:47.238] API-BT_BT3_packet_t	v stant			
:35:39.378] Tx Burst stopped.				
:35:39.379] API-BT_BT3_packet_t :35:43.567] Read Temperature Co	x_stop mensation data succeeded			
:35:43.568] Disable Temperature :35:43.569] Tx Burst succeeded				
:35:43.569] IX Burst succeeded :35:43.570] API-BT_BT3_packet_t	x_start			
				• 🐨 · · ·
			compliance	
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# **5. SYSTEM TEST CONFIGURATION**

**5.1. CONFIGURATION OF EUT SYSTEM** 

Radiated Emission Configure:



Conducted Configure:

	0	
EUT		AE

## 5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth Earphone	COWON CK11 Pro	SXV-CK11-PRO-R	EUT
2	Control Box	N/A	USB_TTL	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	Not applicable

Note: The BT function cannot transmit when 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. 12, 2019	Dec. 11, 2021
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 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	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

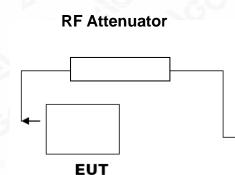
For peak power test:

- 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.

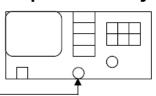
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

## PEAK POWER TEST SETUP



## Spectrum Analyzer



RF Cable

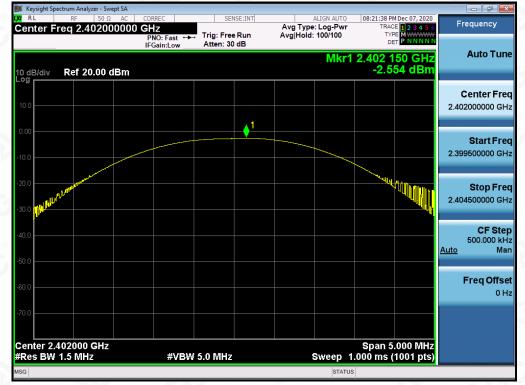
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#### 7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION									
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail									
2.402	-2.554	21	Pass						
2.441	-2.757	21	Pass						
2.480	-2.887	21	Pass						

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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	-1.430	21	Pass							
2.441	-1.721	21	Pass							
2.480	-1.864	21	Pass							



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🎉 Keysight Spectrum Analyze								
Center Freq 2.48	50 Ω AC	GHz	SENSE:INT	Avg Type	LIGN AUTO	TRAC	Dec 07, 2020	Frequency
10 dB/div Ref 20.	00 dBm	PNO: Fast IFGain:Low	→ Trig: Free Run Atten: 30 dB	Avg Hold:		2.479 8	80 GHz 64 dBm	Auto Tune
10.0			.1					Center Freq 2.480000000 GHz
-10.0								Start Freq 2.477500000 GHz
-20.0 -30.0								<b>Stop Freq</b> 2.482500000 GHz
-40.0								<b>CF Step</b> 500.000 kHz <u>Auto</u> Man
-60.0								<b>Freq Offsel</b> 0 Hz
-70.0 Center 2.480000 G #Res BW 1.5 MHz	GHz	#\/B\A	( 5.0 MHz		Sween_1	Span 5	.000 MHz 1001 pts)	
MSG		#VDV	- 540 WIL12		STATUS		roor pts)	

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PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION										
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail										
2.402	-1.027	21	Pass							
2.441	-1.274	21	Pass							
2.480	-1.413	21	Pass							



CH0

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#### Report No.: AGC06504201102FE03 Page 19 of 66



**CH39** NSE:INT 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 2.440 985 GHz -1.274 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 2.441000000 GHz 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

Inter Pred 2.480000000 (Pred 2.480000000 (Pred 2.480000000)       Pred 196.100/100       Pred 196.100/100 <th>G</th> <th></th> <th></th> <th>STATU</th> <th></th> <th></th>	G			STATU		
Auto T Processor Pro	enter 2.480000 GHz Res BW 1.5 MHz	#VBW	/ 5.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 <u>pts</u> )	
Auto T Processor Pro						
Avg Hyber Dog Ywar Processor Pr	0.0					
Processor     Proce	.0					riequii
Processor and a series of the						Ereg Off
Processor and a series of the						
Processor and a series of the						CF S 500.000
Processor and the second secon	.0					
PNC: Fast PNC: Fast IFGain:Low Trig: Free Run Atten: 30 dB Avg Hold: 100/100 Trice 234350 Mkr1 2.480 010 GHz -1.413 dBm -1.413 dBm -1.4	ut Mill Provent					Stop F 2.482500000
Inter Pred 2.480000000 GHZ PRO: Fast the Trig: Free Run IFGain:Low     Avg Type: Edgewin Avg Hold: 100/100     Trig: 23435 Def PNNNN       Mkr1 2.480 010 GHZ dB/div     Ref 20.00 dBm     -1.413 dBm	.0					
Inter Pred 2.480000000 GHZ PRO: Fast IFGain:Low     Trig: Free Run Atten: 30 dB     Avg Type: Log Profit     Trig: 234350 Det PNNNN     Auto 1       Mkr1 2.480 010 GHz dB/div     Ref 20.00 dBm     -1.413 dBm     Auto 1	0.0					2.477500000
Inter Freq 2.480000000 GHZ PR0: Fast IFGain:Low         Trig: Free Run Atten: 30 dB         Avg Type: L0g+Wi Avg Hold: 100/100         Trig: Dialog 2.34 30 Det PNNNNN Det PNNNNN DE	00					Start F
Inter Freq 2.480000000 GHZ PR0: Fast IFGain:Low         Trig: Free Run Atten: 30 dB         Avg Type: L0g+Wi Avg Hold: 100/100         Trig: Dialog 2.34 30 Det PNNNNN Det PNNNNN DE			1			2.40000000
Inter Freq 2.480000000 GHZ PR0: Fast IFGain:Low         Trig: Free Run Atten: 30 dB         Avg Type: E0g+Wi Avg Hold: 100/100         Trig: Tree Run DET         Avg Type: E0g+Wi DET         Trig: Free Run DET         Avg Type: E0g+Wi DET         Mitter: 234 35	0.0					Center F
PNC: Fast → IFGain:Low Atten: 30 dB Avg Hold: 100/100 P34 50 PT PNNNN Mkr1 2.480 010 GHz Auto 1 Mkr1 2.480 010 GHz Auto 1	dB/div Ref 20.00 dBm				-1.413 aBm	
PNO: Fast → Trig: Free Run Avg Hold: 100/100 Tree PNNNNN IFGain:Low Atten: 30 dB DET PNNNNN				Mkr1	2.480 010 GHz	Auto Ti
Avg Type: Log-Pwr TRACE 123456 Trequence		PNO: Fast 🔸			TYPE MWWWWW DET PNNNNN	
RL         RF         50 Ω         AC         CORREC         SENSE:INT         ALIGN AUTO         08:25:29 PM Dec 07, 2020         Frequence			SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	08:25:29 PM Dec 07, 2020 TRACE 1 2 3 4 5 6	Frequency

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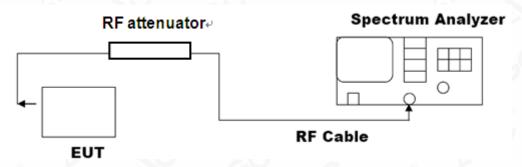


## 8. 20DB BANDWIDTH

## **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								
Appliachta Limita	Measurement Result							
Applicable Limits	Test Data	Criteria						
	Low Channel	0.929	PASS					
N/A	Middle Channel	0.867	PASS					
	High Channel	0.867	PASS					

#### 08:21:32 PM Dec 07, 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> 5.05 dBm **Occupied Bandwidth Total Power** 868.54 kHz Freq Offset 0 Hz 8.999 kHz **Transmit Freq Error OBW Power** 99.00 % x dB Bandwidth 929.0 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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MEASUDE			NI						
MEASUREMENT RESULT FOR II /4-DQPSK MODULATION Measurement Result									
Applicable Limits	Test Data	(MHz)	Criteria						
	Low Channel	1.255	PASS						
N/A	Middle Channel	1.230	PASS						
	High Channel	1.228	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

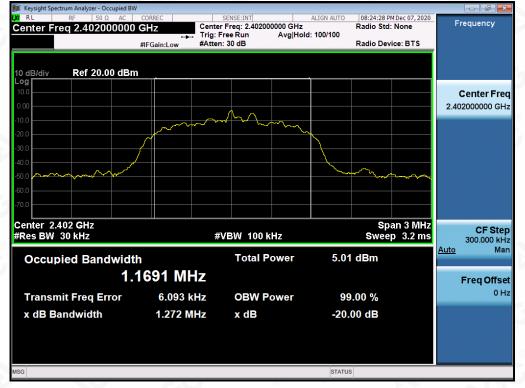


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MEASUREMENT RESULT FOR 8-DPSK MODULATION									
Measurement Result									
Applicable Limits	Test Da	Test Data (MHz)							
	Low Channel	1.272	PASS						
N/A	Middle Channel	1.256	PASS						
	High Channel	1.257	PASS						

#### 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

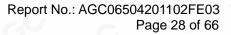
## 9.3. MEASUREMENT EQUIPMENT USED

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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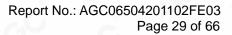


## TEST RESULT FOR ENTIRE FREQUENCY RANGE

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



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🎉 Keysight S	pectrum Ar	nalyzer - Sw	ept SA		_								-	
LXI RL Center	RF Freq 1	្រ 50 ឆ្ន 3.741		CORREC 0 GHz			SE:INT		Type:	LIGN AUTO	TRAC	M Dec 07, 2020 DE <mark>1 2 3 4 5 6</mark>		Frequency
10 dB/div		20.00		PNO: Fa IFGain:Lo		Trig: Free Atten: 30		Avg	Hold:		□ 1 23.77	2 1 GHz 78 dBm		Auto Tune
Log 10.0													13	Center Freq 3.741750000 GHz
-20.0 -30.0 -40.0												<u></u>	2	Start Freq 2.483500000 GHz
-50.0													25	<b>Stop Freq</b> 5.000000000 GHz
Start 2.4 #Res BV	V 100 k	Hz	X	# 772 1 GHz		300 kHz Y 48.278 dE	FUN	CTION		Sweep	2.152 s (3	5.00 GHz 0000 pts)	2 <u>Aut</u>	<b>CF Step</b> 2.251650000 GHz to Man
2 3 4 5 6 7			23.			40.270 UE						E		<b>Freq Offset</b> 0 Hz
8 9 10 11						m								
MSG										STATUS				

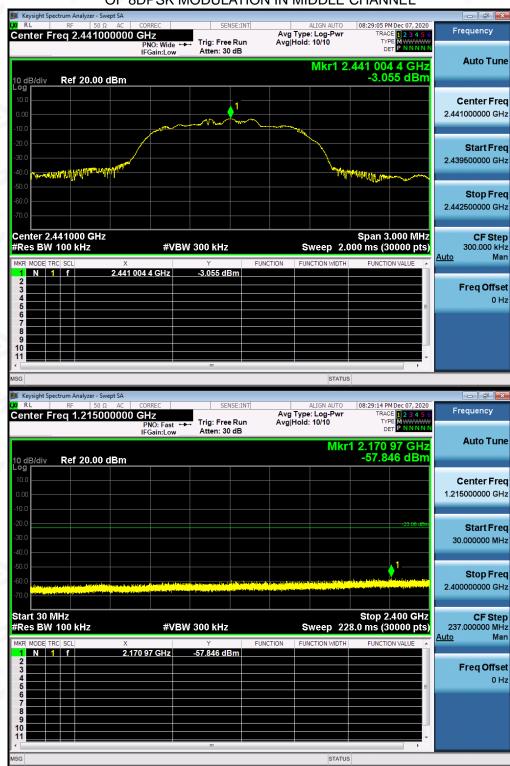
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 Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

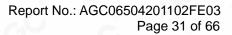
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com
 Web: http://cn.agc-cert.com/





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

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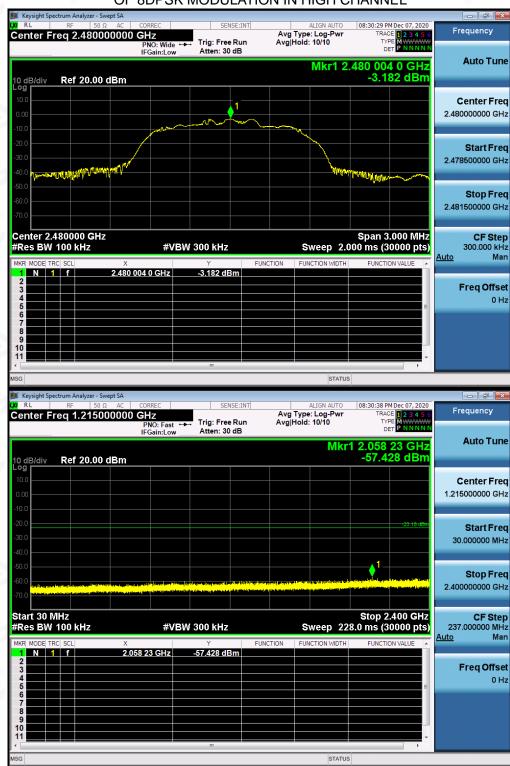
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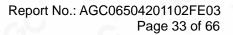
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com
 Web: http://cn.agc-cert.com/





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

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🚺 Keysight Spectrum Analyzer - Swept SA 🛛 🔂 🔂															
(X) RL Cente	ar Er	RF		) Ω A( ΠΠΠΠ		REC	SI	ENSE:INT	Ava		ALIGN AUTO : Log-Pwr		M Dec 07, 2020		Frequency
Centre	nter Freq 13.750000000 GHz PNO: Fast ↔ IFGain:Low					Trig: Free Run Atten: 30 dB		Avg Hold: 10/10		TYPE MWWWWW DET P N N N N N					
					IFC	ain:Low	Atten	JU GD			Mkr	4 94 99		ī	Auto Tune
10 dB/	Mkr1 24.291 2 GHz o dB/div Ref 20.00 dBm -47.864 dBm														
		NG.	20.00												
10.0 —															Center Freq
0.00 —														1	13.750000000 GHz
-10.0 —															
-20.0													-23.18 dBm		Start Freq
-30.0 —															2.50000000 GHz
-40.0 —													1		2.00
-50.0 —													And the second second		
-60.0 🔫	and the second second	187.5		and the second	and and apply	and a star of the	and the second second second	a desta dista			din tin daga hi		and the second second		Stop Freq
-70.0	July and		No. of Concession, Name		and the states									2	25.00000000 GHz
L															
	tart 2.50 GHz Stop 25.00 GH Res BW 100 kHz #VBW 300 kHz Sweep 2.152 s (30000 pt										5.00 GHz		CF Step		
						#VI	BW 300 kH:				sweep 2				2.250000000 GHz .uto Man
					× 24.291 2		۲ -47.864 d		ICTION	FUNC	CTION WIDTH	FUNCTIO	ON VALUE		
2	ي ک				24.2517	2 GHZ	-47.004 0								
3						<u> </u>									Freq Offset 0 Hz
5								<u>ک ک</u>					E		0112
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MSG				_							STATUS				

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

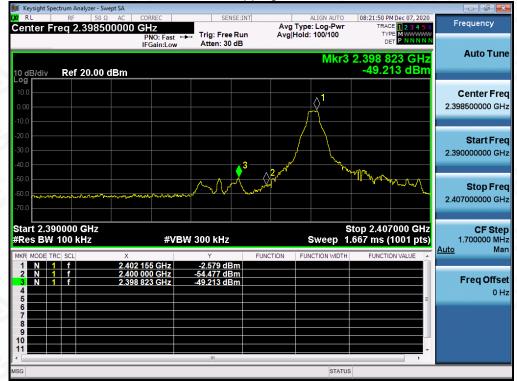
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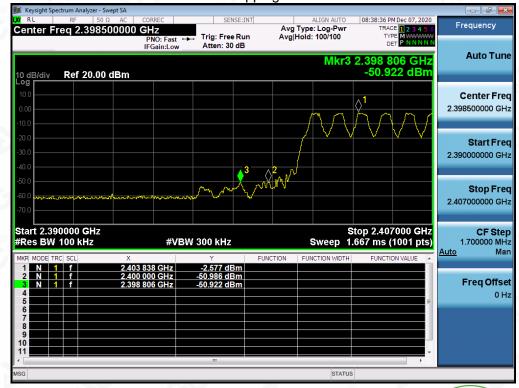
## TEST RESULT FOR BAND EDGE

#### GFSK MODULATION IN LOW CHANNEL

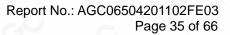
Hopping off



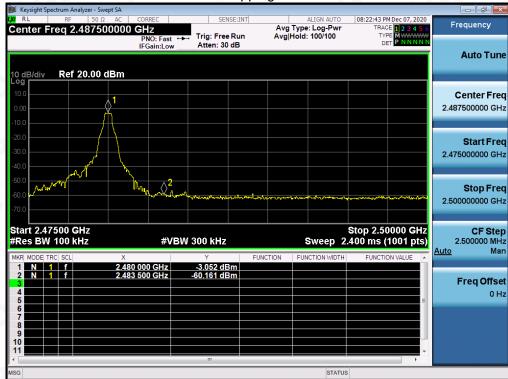
Hopping on



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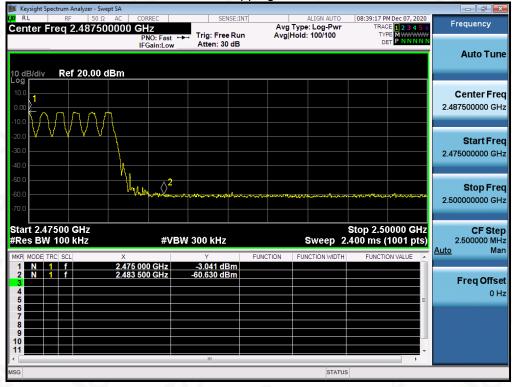




# GFSK MODULATION IN HIGH CHANNEL

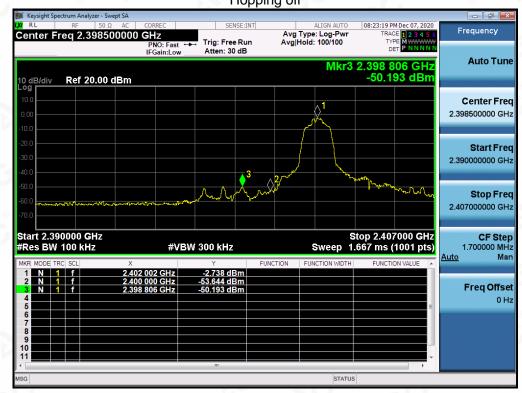
Hopping off

Hopping on



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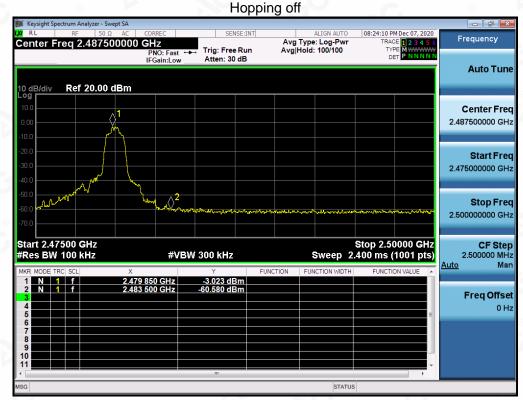
## $\pi$ /4-DQPSK MODULATION IN LOW CHANNEL Hopping off

Hopping on



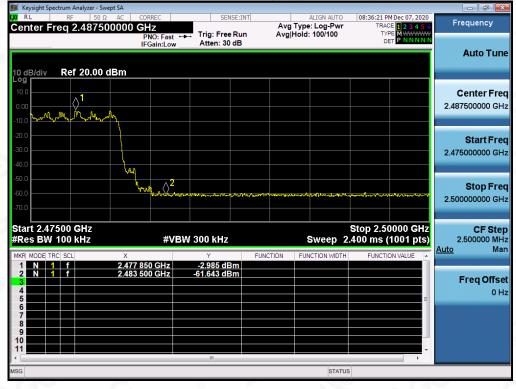
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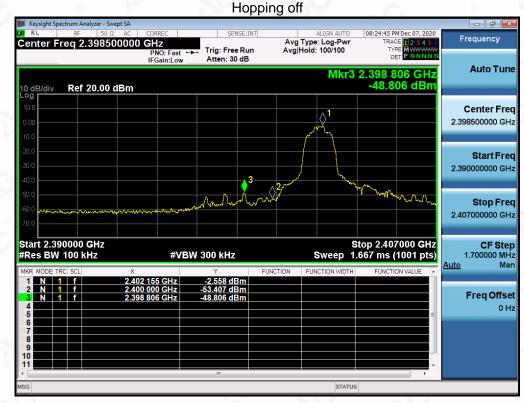
# $\pi$ /4-DQPSK MODULATION IN HIGH CHANNEL

Hopping on



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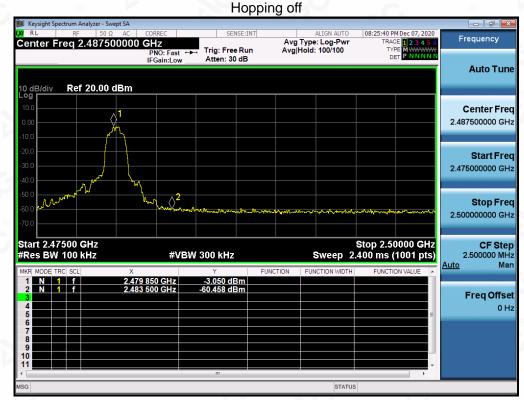
## 8-DPSK MODULATION IN LOW CHANNEL

Hopping on



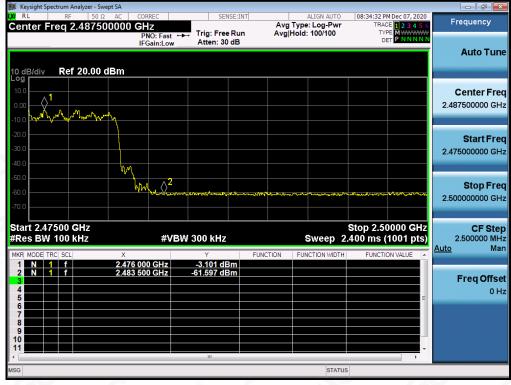
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## 8-DPSK MODULATION IN HIGH CHANNEL

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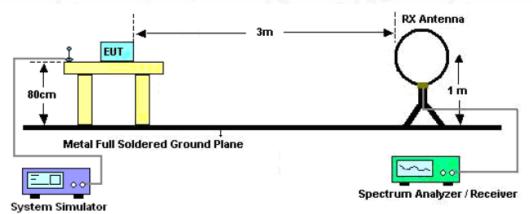
 Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

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

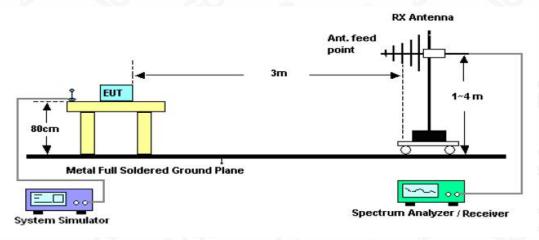


#### **10.2. TEST SETUP**

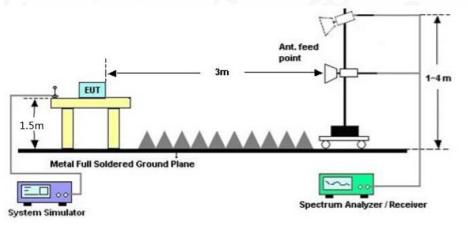
Radiated Emission Test-Setup Frequency Below 30MHz



#### 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**

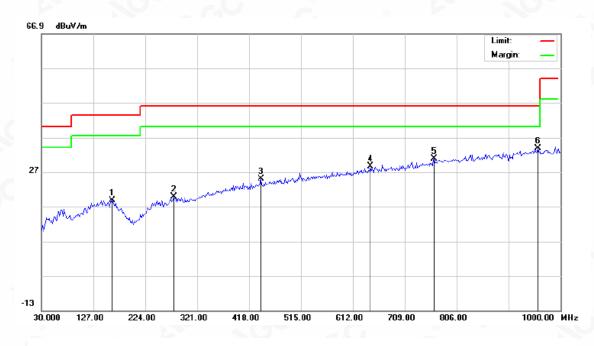
The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

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#### **RADIATED EMISSION BELOW 1GHz**

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		162.5667	-0.12	18.93	18.81	43.50	-24.69	peak
2		277.3500	0.11	19.72	19.83	46.00	-26.17	peak
3		440.6333	1.27	23.80	25.07	46.00	-20.93	peak
4		644.3333	1.03	27.48	28.51	46.00	-17.49	peak
5		763.9667	1.20	29.60	30.80	46.00	-15.20	peak
6	*	957.9667	1.53	32.20	33.73	46.00	-12.27	peak

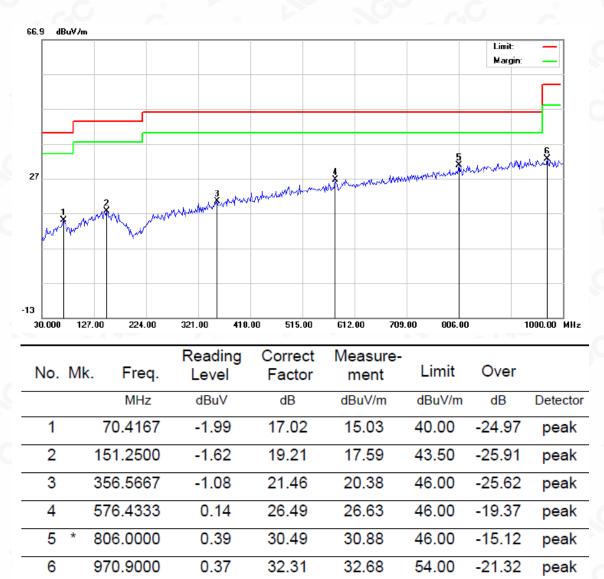
#### **RESULT: PASS**

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#### Report No.: AGC06504201102FE03 Page 45 of 66

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical



#### **RESULT: PASS**

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

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

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### **RADIATED EMISSION ABOVE 1GHz**

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4804.000	45.91	0.08	45.99	74	-28.01	peak
4804.000	37.49	0.08	37.57	54	-16.43	AVG
7206.000	40.26	2.21	42.47	74	-31.53	peak
7206.000	32.41	2.21	34.62	54	-19.38	AVG
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emark:			e e		Nº.	
actor = Anter	nna Factor + Cab	le Loss – Pre-	amplifier.	®		

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4804.000	44.57	0.08	44.65	74	-29.35	peak
4804.000	36.15	0.08	36.23	54	-17.77	AVG
7206.000	39.45	2.21	41.66	74	-32.34	peak
7206.000	30.08	2.21	32.29	54	-21.71	AVG
- C.	8			- C	8	

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#### Report No.: AGC06504201102FE03 Page 47 of 66

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.26	0.14	45.4	74	-28.6	peak
4882.000	38.44	0.14	38.58	54	-15.42	AVG
7323.000	41.25	2.36	43.61	74	-30.39	peak
7323.000	34.57	2.36	36.93	54	-17.07	AVG
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actor = Anten	na Factor + Cable	Loss – Pre-	amplifier.			- C

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.89	0.14	46.03	74	-27.97	peak
4882.000	37.46	0.14	37.6	54	-16.4	AVG
7323.000	40.26	2.36	42.62	74	-31.38	peak
7323.000	31.45	2.36	33.81	54	-20.19	AVG
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EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	46.26	0.22	46.48	74	-27.52	peak
4960.000	38.24	0.22	38.46	54	-15.54	AVG
7440.000	41.05	2.64	43.69	74	-30.31	peak
7440.000	32.62	2.64	35.26	54	-18.74	AVG
3		-		8		

EUT	Bluetooth Earphone	Model Name	COWON CK11 Pro
Temperature	21.8°C	Relative Humidity	58%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
45.24	0.22	45.46	74	-28.54	peak
38.11	0.22	38.33	54	-15.67	AVG
41.05	2.64	43.69	74	-30.31	peak
33.52	2.64	36.16	54	-17.84	AVG
	G	0	e		6
	45.24 38.11 41.05	45.24         0.22           38.11         0.22           41.05         2.64	45.24         0.22         45.46           38.11         0.22         38.33           41.05         2.64         43.69	45.24         0.22         45.46         74           38.11         0.22         38.33         54           41.05         2.64         43.69         74	45.24         0.22         45.46         74         -28.54           38.11         0.22         38.33         54         -15.67           41.05         2.64         43.69         74         -30.31

#### **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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