

FCC Test Report

Report No.: AGC09263201002FE03

: 2AN2T-AD-220-E
: Original Equipment
: Bluetooth Receiver
: Paww
: WaveCast RX, AD-220-E
: Paww, LLC
: Oct. 30, 2020
: FCC Part 15.247
: 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
l	V1.0	/	Oct. 30, 2020	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Paww, LLC	
Address	P.O. Box 391, JAF Post Office, New York, United States	
Manufacturer	Paww, LLC	
Address	P.O. Box 391, JAF Post Office, New York, United States	
Factory	HONGKONG BLOSSOM LIMITED	
Address	1715, Block B, Jiansheng Bldg, No.1 Pingji Road, Nan Wan Street Longgang District Shenzhen - 518112, Guangdong, China	
Product Designation	Bluetooth Receiver	
Brand Name Paww		
Test Model	WaveCast RX	
Series Model	AD-220-E	
Difference Description	All the same except for the model name.	
Date of test	Oct. 26, 2020 to Oct. 30, 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)

Oct. 30, 2020

Max Zhans

Reviewed By

Max Zhang (Reviewer)

Oct. 30, 2020

Approved By

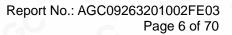
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Forrest Lei (Authorized Officer)

Oct. 30, 2020

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "Bluetooth Receiver". 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	7.349dBm (Max)
Bluetooth Version	V5.0
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps
Number of channels	79
Hardware Version	v0.1
Software Version	v0.1
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	OBi
Power Supply	DC 5V by USB
Note: The EUT doesn't support	BLE.

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	0	2402 MHz
		2403 MHz
	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
	77	2479 MHz
°, C	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: 2AN2T-AD-220-E** 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.

Software Setting

TAUSE ARAMAN STATUS BAULO STATUS BAULO STATUS BAULO STATUS TRUSTART TEORTAAL TEORTAAL TEORTAAL TEORTAAL TEORTAAL ARAMAN ARAMANAN ARAMAN	Test Arguments LO Freq (MRr) (2480 Fower (Ext.Int) (255 (50	Close Help Execute Cold Rese Yum Seco
C:\Neers\BELL\AppBats\L Badio Test TIDATAI surrest Radio Test CFC FBT succes Radio Test CFC FBT succes Radio Test CFC FBT succes Radio Test CFC FBT succes	aful aful aful aful	C 101

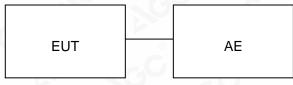
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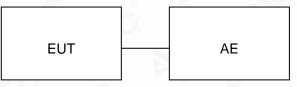
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure:



Conducted Emission Configure:



5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth Receiver	WaveCast RX	2AN2T-AD-220-E	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	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, 2021
LISN	R&S	ESH2-Z5	100086	Jul. 03, 2020	Jul. 02, 2021
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, 2021
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	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

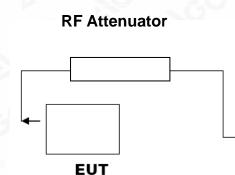
For peak power test:

- 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.

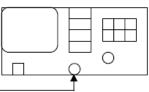
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

PEAK POWER TEST SETUP







RF Cable

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7.3. LIMITS AND MEASUREMENT RESULT

	PEAK OUTPUT POWER MEA	SUREMENT RESULT	
	FOR GFSK MOUL	DULATION	
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	5.751	21	Pass
2.441	7.243	21	Pass
2.480	7.349	21	Pass

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CH78

gilent Spectrum Analyzer - Swept SA	CORREC	SENSE:PULSE		ALIGN AUTO	05:10:09 44	4 Oct 28, 2020	
Center Freq 2.48000000	0 GHz	rig: Free Run	Avg Type Avg Hold:	: Log-Pwr	TRAC	E 123456	Frequency
	IFGain:Low A	tten: 30 dB		Miced		10 GHz	Auto Tu
0 dB/div Ref 20.00 dBm					7.3	49 dBm	
10.0		● ¹					Center Fr 2.480000000 G
							Start Fr 2.477500000 G
20.0							Stop Fr 2.482500000 G
0.0							CF Si 500.000 I <u>Auto</u> M
0.0							Freq Off 0
renter 2.480000 GHz					Span 5	.000 MHz	
Res BW 1.5 MHz	#VBW 5.0	0 MHz		Sweep 1		1001 pts)	
				314103			

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	PEAK OUTPUT POWER MEASUR FOR II/4-DQPSK MODUL		
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	3.650	21	Pass
2.441	6.073	21	Pass
2.480	6.257	21	Pass





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Agilent Spectrum Analyzer - Swept SA	CORREC SENSE:PULSE	ALIGN AUTO	05:13:37 AM Oct 28, 2020	
Center Freq 2.48000000		Avg Type: Log-Pwr Avg Hold: 100/100	TRACE 123456	Frequency
	IFGain:Low Atten: 30 dB		DET P NNNN	Auto Tun
10 dB/div Ref 20.00 dBm		Mkr1	2.479 810 GHz 6.257 dBm	Autorui
	1			Center Fre 2.480000000 G⊦
10.0				Start Fre 2.477500000 GH
-20.0				Stop Fre 2.482500000 GH
-40.0				CF Ste 500.000 ki <u>Auto</u> M
0.0				Freq Offs 0
-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)	
		STATUS		

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	PEAK OUTPUT POWER MEASUR FOR 8-DPSK MODULA		
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	3.912	21	Pass
2.441	6.206	21	Pass
2.480	6.378	21	Pass

AGC®





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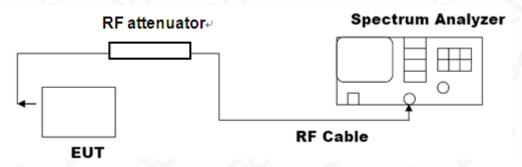


8. 20DB BANDWIDTH

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

MEASURE	MENT RESULT FOR GF	SK MOUDULATION	
Appliachta Limita		Measurement Resu	lt
Applicable Limits	Test Data	a (MHz)	Criteria
	Low Channel	0.948	PASS
N/A	Middle Channel	0.942	PASS
	High Channel	0.943	PASS

05:08:54 AM Oct 28, 2020 Radio Std: None Frequency Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 100/100 #Atten: 30 dB 402000000 GHz Center 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> Mar Total Power 13.2 dBm Occupied Bandwidth 868.54 kHz Freq Offset 0 Hz **Transmit Freq Error** 3.753 kHz **OBW Power** 99.00 % x dB Bandwidth 948.0 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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MEASURE		OQPSK MODULATIC	N
Annlieghte Limite		Measurement Resu	llt
Applicable Limits	Test Data	(MHz)	Criteria
	Low Channel	1.258	PASS
N/A	Middle Channel	1.235	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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MEASUR	EMENT RESULT FOR 8	-DPSK MODULATION	
Annlinghle Limite		Measurement Resu	lt
Applicable Limits	Test Da	ata (MHz)	Criteria
	Low Channel	1.275	PASS
N/A	Middle Channel	1.261	PASS
	High Channel	1.263	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

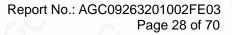
9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEAS	SUREMENT RESULT	
Annlinghing Limite	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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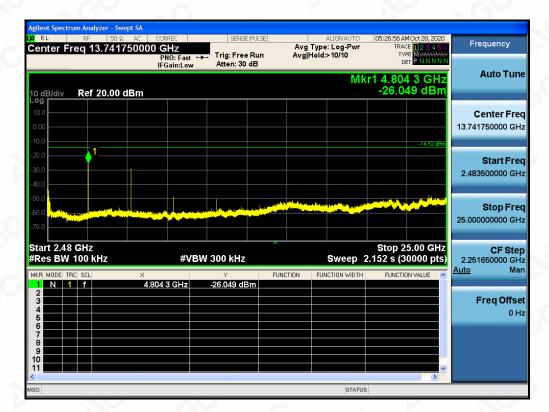
TEST RESULT FOR ENTIRE FREQUENCY RANGE TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF GFSK MODULATION IN LOW CHANNEL



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Report No.: AGC09263201002FE03 Page 29 of 70





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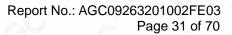
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



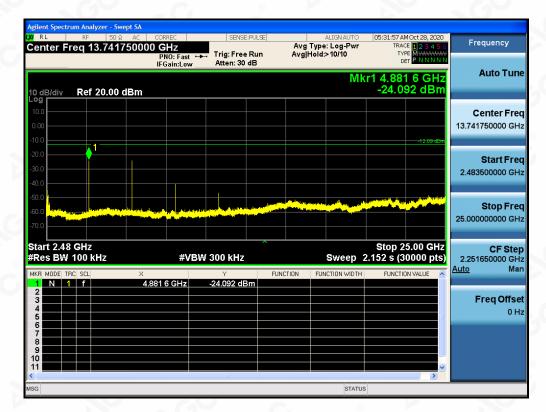
Agilent Spectrum Analyzer - S	went SA				
XIRL RF 50	Ω AC CORREC	SENSE:PULSE	ALIGN AUTO	05:30:49 AM Oct 28, 2020	_
Center Freq 2.4410	DOOOOO GHz PNO: Wide ↔ IFGain:Low	⊢ Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET PNNNN	Frequency
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10 dB/div Ref 20.00) dBm			7.109 dBm	
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0.00					2.441000000 G
-10.0					
-20.0					Start Fr
-30.0					2.439500000 G
-40.0					
-50.0					Stop Fr
-60.0					2.442500000 G
-70.0					
Center 2.441000 GH				Span 3.000 MHz	CF Ste
#Res BW 100 kHz	#VBV	V 300 kHz	Sweep 2.	000 ms (30000 pts)	300.000 k Auto M
MKR MODE TRC SCL	× 2.441 152 0 GHz	Y 7.109 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> M
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	Ω AC CORREC	SENSE:PULSE	ALIGN AUTO	05:31:26 AM Oct 28, 2020	
	000000 GHz	SENSE:PULSE	Avg Type: Log-Pwr	05:31:26 AM Oct 28, 2020 TRACE 1 2 3 4 5 6 TYPE Museum	Frequency
		Tain Frank Dam		05:31:26 AM Oct 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	
	000000 GHz PN0: Fast ↔	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWW DET PNNNNN	
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tu
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fro
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fro
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fra 1.21500000 Gi
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fra 1.21500000 Gi Start Fra
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fra 1.21500000 Gi Start Fra
Center Freq 1.2150	000000 GHz PNO: Fast IFGain:Low	🛏 Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET P NNNNN 1 2.337 03 GHz	Auto Tur Center Fr 1.215000000 GI Start Fr 30.000000 MI
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Center Freq 1.2150 10 dB/div Ref 20.00 11 dB/div Ref 20.00 11 dB/div Ref 20.00 11 dB/div Ref 20.00 11 dB/div Ref 20.00	DOODOO GHZ PNO: Fast ↔ IFGain:Low D dBm United and the second of th	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MUNICUM DET PINNING 1 2.337 03 GHz -48.466 dBm -12.03 dB	Auto Tur Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF Sto 237.000000 M Auto M
Center Freq 1.2150	DOODOO GHZ PNO: Fast ↔ IFGain:Low D dBm United and the second of th	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MUNICUM DET PINNING 1 2.337 03 GHz -48.466 dBm -12.03 dB	Auto Tur Center Fre 1.215000000 GI Start Fre 30.000000 MI Stop Fre 2.400000000 GI CF Ste 237.000000 MI Auto M Freq Offs
Center Freq 1.2150	DOODOO GHZ PNO: Fast ↔ IFGain:Low D dBm United and the second of th	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MUNICUM DET PINNING 1 2.337 03 GHz -48.466 dBm -12.03 dB	Auto Tur Center Fre 1.215000000 GI Start Fre 30.000000 MI Stop Fre 2.400000000 GI CF Ste 237.000000 MI Auto M Freq Offs
Center Freq 1.2150	DOODOO GHZ PNO: Fast ↔ IFGain:Low D dBm United and the second of th	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MUNICUM DET PINNING 1 2.337 03 GHz -48.466 dBm -12.03 dB	Auto Tur Center Fra 1.215000000 Gi Start Fra 30.000000 Mi Stop Fra 2.400000000 Gi CF Sta 237.000000 Mi Auto Mi
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Center Freq 1.2150	DOODOO GHZ PNO: Fast ↔ IFGain:Low D dBm United and the second of th	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 23 4 5 6 TYPE WWWWWW DET NN NN NN 1 2.337 03 GHz -48.466 dBm -12.09 dBm	Auto Tur Center Fre 1.215000000 GH Start Fre 30.000000 MH Stop Fre 2.400000000 GH CF Ste 237.000000 MH

TEST PLOT OF OUT OF BAND EMISSIONS OF GFSK MODULATION IN MIDDLE CHANNEL

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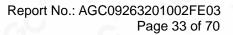
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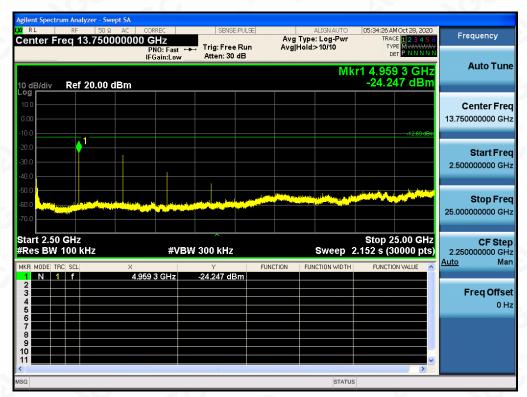
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Agilent Spectrum Analyzer – S X RL RF 50 Center Freq 1.215(10 dB/div Ref 20.00 10.0 0.00 -20.0 -30.0	Ω AC CORREC D00000 GHz PN0: Fast ↔ IFGain:Low	Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:3:55 AMOCt 28, 2020 TRACE 12 3 4 5 6 TYPE MUNITORN DET PINNINN (71 908.83 MHz	Auto Tur Center Fre 1.21500000 GH Start Fre
Agilent Spectrum Analyzer – S X RL RF 50 Center Freq 1.215(10 dB/div Ref 20.00 10 0 0 00 -20 0	Ω AC CORREC DODODOO GHZ PR0: Fast → IFGain:Low	Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMOCT 28, 2020 TRACE 12 29 45 6 TYPE MINIMAN OFT P UNIN N N Cr1 908.83 MHz -42.879 dBm	Auto Tur Center Fre 1.215000000 GF Start Fre 30.000000 MF Stop Fre
Agient Spectrum Analyzer - S RL RF 50 Center Freq 1.2150 10 dB/div Ref 20.00 10 0 -0 0 -10 0 -20 0 -30 0 -40 0 -50 0	Ω AC CORREC DODODOO GHZ PR0: Fast → IFGain:Low	Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMOCT 28, 2020 TRACE 12 29 45 6 TYPE MINIMAN OFT P UNIN N N Cr1 908.83 MHz -42.879 dBm	Auto Tur Center Fre 1.21500000 GF 30.000000 MF Stop Fre 2.400000000 GF
Agilent Spectrum Analyzer – S 2 RL RF 50 Center Freq 1.215(10 dB/div Ref 20.00 10.0	Ω AC CORREC D00000 GHZ PN0: Fast → IFGain:Low IFGain:Low	Trig: Free Run Atten: 30 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMORT 28, 2020 TRACE 1 2 3 4 5 6 TYPE MUNITOR DET P NUMINON (r1 908.83 MHz -42.879 dBm -42.879 dBm -42.879 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.970	Auto Tur Center Fre 1.21500000 GH Start Fre 30.000000 MH Stop Fre 2.40000000 GH CF Ste 237.00000 MH
Agilent Spectrum Analyzer – So 2 RL RF 50 Center Freq 1.215(10 dB/div Ref 20.00 10.0	Ω AC CORREC D00000 GHz PR0: Fast → IFGain:Low D dBm	Trig: Free Run Atten: 30 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMOrt 28, 2020 TRACE 12 3 4 5 6 TYPE MUNITOR OET PINNON (r1 908.83 MHz -42.879 dBm -1209 dBm -1209 dBm -1209 dBm	Auto Tur Center Fre 1.215000000 GH Start Fre 30.000000 MH Stop Fre 2.400000000 GH CF Ste 237.000000 MH Auto Ma
Agilent Spectrum Analyzer – S X RL RF 50 Center Freq 1.215(10 dB/div Ref 20.00 10.0	Ω AC CORREC D00000 GHz PR0: Fast Fast IFGain:Low	Trig: Free Run Atten: 30 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMORT 28, 2020 TRACE 1 2 3 4 5 6 TYPE MUNITOR DET P NUMINON (r1 908.83 MHz -42.879 dBm -42.879 dBm -42.879 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.970	Auto Tur Center Fre 1.215000000 GH Start Fre 30.000000 MH Stop Fre 2.400000000 GH CF Ste 237.000000 MH Auto Ma
Agilent Spectrum Analyzer – S RL RF SO Center Freq 1.2150 10 dB/div Ref 20.00 10 0 0 00 -10 0 -20 0 -20 0 -30 0 -40 0 -50 0 -40 0 -40 0 -50 0 -40 0 -50 0 -40 0 -50 0 -40 0 -50 0	Ω AC CORREC D00000 GHz PR0: Fast Fast IFGain:Low	Trig: Free Run Atten: 30 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold: 10/10	05:33:55 AMORT 28, 2020 TRACE 1 2 3 4 5 6 TYPE MUNITOR DET P NUMINON (r1 908.83 MHz -42.879 dBm -42.879 dBm -42.879 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.979 dBm -42.970	Auto Tur Center Fre 1.215000000 GH Start Fre 30.000000 MH Stop Fre 2.400000000 GH

TEST PLOT OF OUT OF BAND EMISSIONS OF GFSK MODULATION IN HIGH CHANNEL

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

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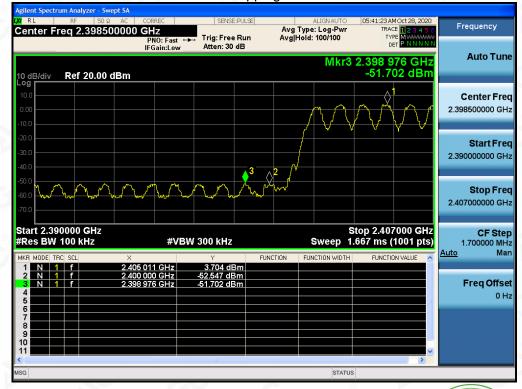
TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL

Hopping off



Hopping on



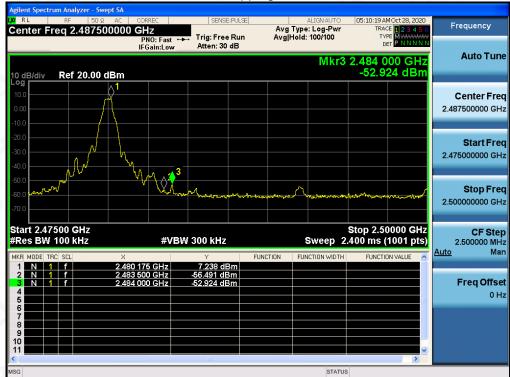
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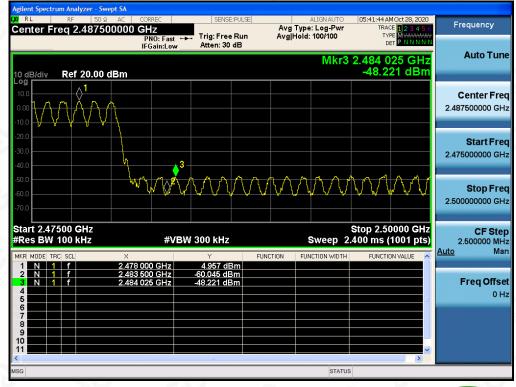




GFSK MODULATION IN HIGH CHANNEL

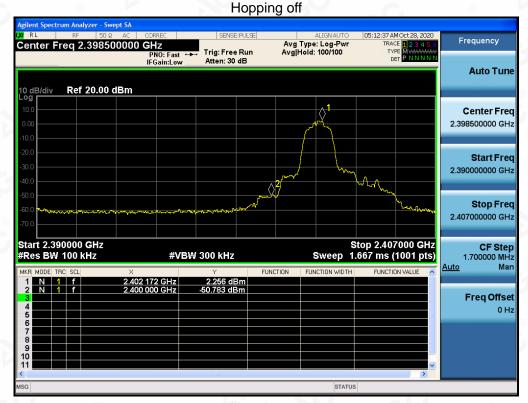
Hopping off

Hopping on



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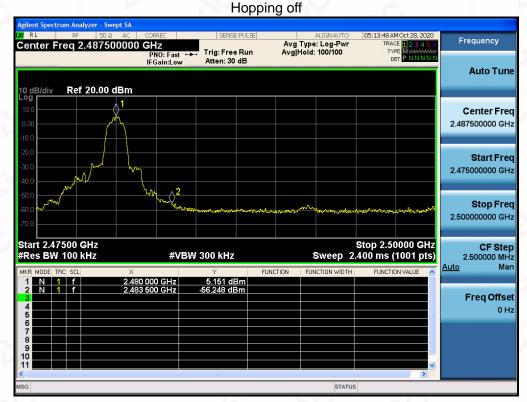
π /4-DQPSK MODULATION IN LOW CHANNEL

Hopping on



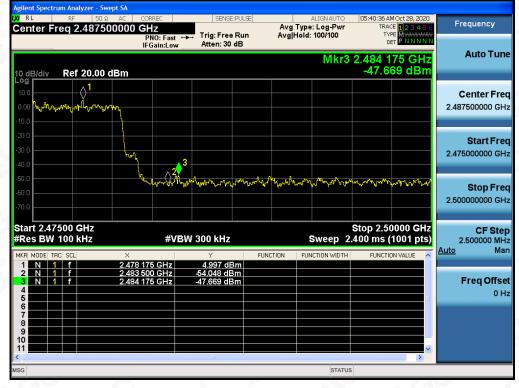
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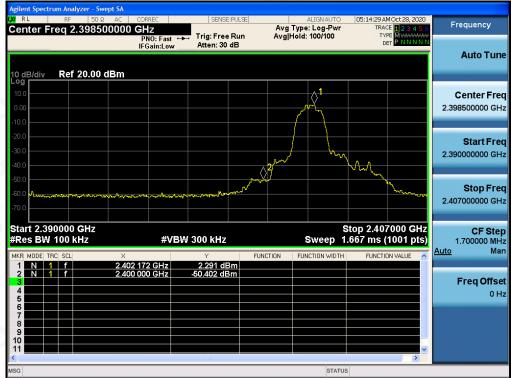
π /4-DQPSK MODULATION IN HIGH CHANNEL

Hopping on



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8-DPSK MODULATION IN LOW CHANNEL

Hopping off

Hopping on



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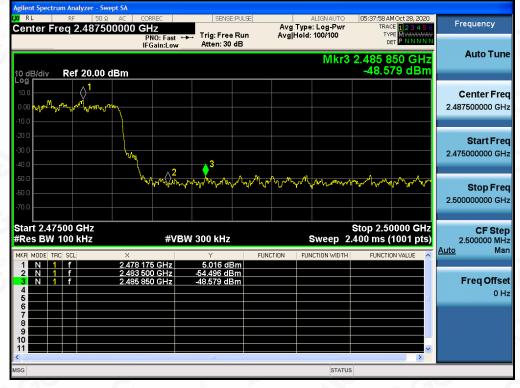




8-DPSK MODULATION IN HIGH CHANNEL

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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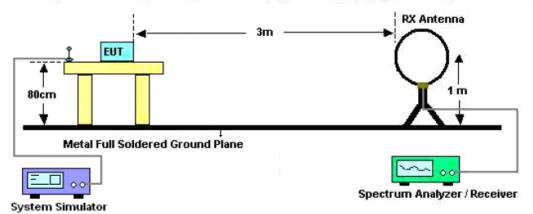
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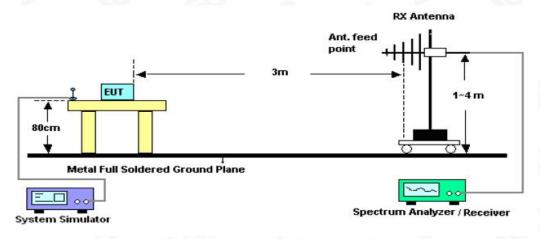


10.2. TEST SETUP

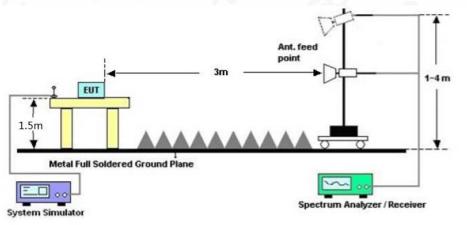
Radiated Emission Test-Setup Frequency Below 30MHz



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.

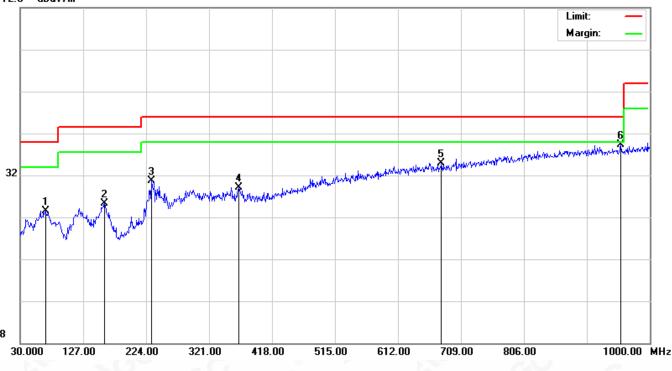
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RADIATED EMISSION BELOW 1GHz

EUT	Bluetooth Receiver Model Name		WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

72.0 dBuV/m



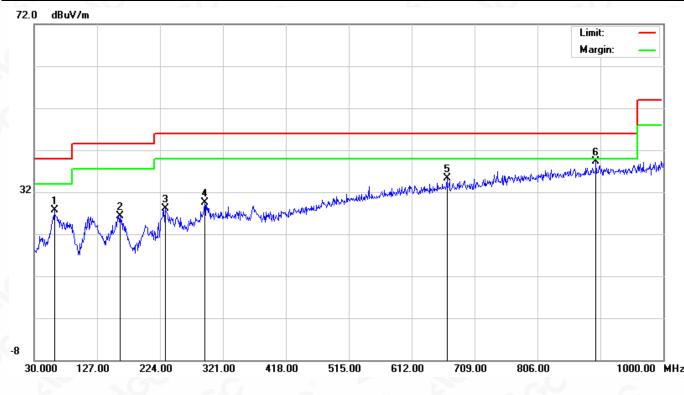
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		68.8000	6.63	16.96	23.59	40.00	-16.41	peak
2		159.9800	6.20	19.19	25.39	43.50	-18.11	peak
3		232.7300	13.38	17.42	30.80	46.00	-15.20	peak
4		366.5900	7.94	21.14	29.08	46.00	-16.92	peak
5		678.9300	6.93	27.90	34.83	46.00	-11.17	peak
6	*	955.3800	7.07	32.18	39.25	46.00	-6.75	peak

RESULT: PASS

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EUT	Bluetooth Receiver Model Name		WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical



No.	Mł	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		61.0400	11.61	16.00	27.61	40.00	-12.39	peak
2		162.8900	8.34	18.03	26.37	43.50	-17.13	peak
3		231.7600	10.82	17.25	28.07	46.00	-17.93	peak
4		292.8700	8.49	20.92	29.41	46.00	-16.59	peak
5		666.3200	7.53	27.75	35.28	46.00	-10.72	peak
6	*	896.2100	7.61	31.65	39.26	46.00	-6.74	peak

RESULT: PASS

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

2. All test modes had been pre-tested. The mode 3 is the worst case and recorded in the report.

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RADIATED EMISSION ABOVE 1GHz

EUT	Bluetooth Receiver	eiver Model Name	
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Meter Reading	Factor	Emission Level	Limits	Margin	Value Tree
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
47.26	0.08	47.34	74	-26.66	peak
38.61	0.08	38.69	54	-15.31	AVG
42.53	2.21	44.74	74	-29.26	peak
33.54	2.21	35.75	54	-18.25	AVG
		(R)			
		3			
	(dBµV) 47.26 38.61 42.53	(dBµV) (dB) 47.26 0.08 38.61 0.08 42.53 2.21	(dBµV) (dB) (dBµV/m) 47.26 0.08 47.34 38.61 0.08 38.69 42.53 2.21 44.74	(dBµV) (dB) (dBµV/m) (dBµV/m) 47.26 0.08 47.34 74 38.61 0.08 38.69 54 42.53 2.21 44.74 74	(dBµV) (dB) (dBµV/m) (dBµV/m) (dB) 47.26 0.08 47.34 74 -26.66 38.61 0.08 38.69 54 -15.31 42.53 2.21 44.74 74 -29.26

EUT	Bluetooth Receiver Model Name		WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	⊖ (dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	47.87	0.08	47.95	74	-26.05	peak
4804.000	39.24	0.08	39.32	54	-14.68	AVG
7206.000	42.62	2.21	44.83	74	-29.17	peak
7206.000	34.13	2.21	36.34	54	-17.66	AVG
	3			90	G	©
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actor = Anter	na Factor + Cable	e Loss – Pre-a	nplifier.	R		- C.

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EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	46.37	0.14	46.51	74	-27.49	peak
4882.000	37.55	0.14	37.69	54	-16.31	AVG
7323.000	42.18	2.36	44.54	74	-29.46	peak
7323.000	32.96	2.36	35.32	54	-18.68	AVG
emark:	© I			C.	8	

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

EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

(dBµV)				Margin	Value Type
(uphv)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
46.81	0.14	46.95	74	-27.05	peak
38.22	0.14	38.36	54	-15.64	AVG
42.75	2.36	45.11	74	-28.89	peak
32.58	2.36	34.94	54	-19.06	AVG
8					R
G.G.	®				C.
	38.22 42.75 32.58	38.22 0.14 42.75 2.36 32.58 2.36	38.22 0.14 38.36 42.75 2.36 45.11	38.22 0.14 38.36 54 42.75 2.36 45.11 74 32.58 2.36 34.94 54	38.22 0.14 38.36 54 -15.64 42.75 2.36 45.11 74 -28.89 32.58 2.36 34.94 54 -19.06

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EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	44.69	0.22	44.91	74	-29.09	peak
4960.000	36.47	0.22	36.69	54	-17.31	AVG
7440.000	41.98	2.64	44.62	74	-29.38	peak
7440.000	31.54	2.64	34.18	54	-19.82	AVG
0				C		
C.	8				®	
emark:	- 6	8			- 6	8
actor = Anter	nna Factor + Cable	Loss – Pre-	amplifier.			- C

EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	45.33	0.22	45.55	74	-28.45	peak
4960.000	35.49	0.22	35.71	54	-18.29	AVG
7440.000	41.25	2.64	43.89	74	-30.11	peak
7440.000	30.74	2.64	33.38	54	-20.62	AVG
		G	6	© 1		6
emark:			L.C	0	0	

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 GFSK modulation is the worst case and recorded in the report.

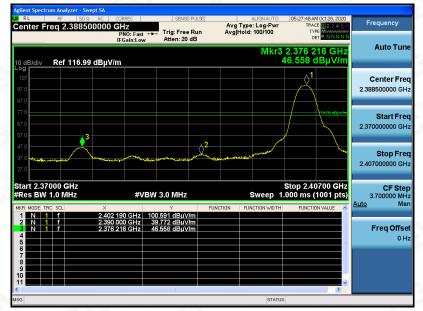
Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written of the report is not permitten of the report is not permitten of the report is not p dicated Inspection he test results anthorization of AC presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15da he test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc@agc-cert.com.



EUT	Bluetooth Receiver	Receiver Model Name WaveCast R	
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS

PK



AV



RESULT: PASS

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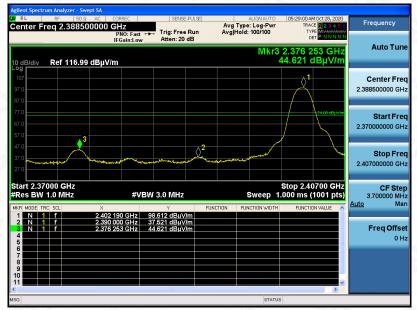
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



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EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

PK



AV



RESULT: PASS

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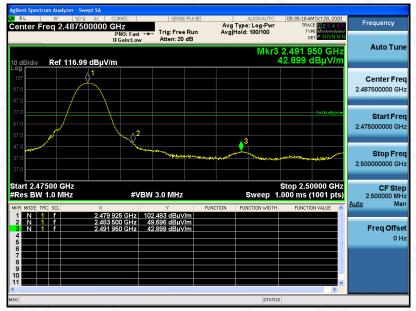
Attestation of Global Compliance(Shenzhen)Co., Ltd Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd Tel: +86-755 2523 4088 E-mail: agc@agc-cert.com Web: http://cn.agc-cert.com/



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EUT	Bluetooth Receiver	Model Name	WaveCast RX
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

PK



AV



RESULT: PASS

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