

# **FCC Test Report**

Report No.: AGC01559210528FE03

FCC ID	: 2AANZKRK21S
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: Wireless Karaoke To-Go Speaker Mic
BRAND NAME	: BMI
MODEL NAME	BMI-KRK-ASST, BMI-KRK, BMI-KRK-XXX, ELCKMC, BMI - KRK-SLV, BMI -KRK-GLD, BMI -KRK-BLU, BMI -KRK-RSE
APPLICANT	: DGL Group, Ltd.
DATE OF ISSUE	: Jun. 08, 2021
STANDARD(S)	: FCC Part 15.247
REPORT VERSION	: V1.0

Attestation of Global Configure (Shenzhen) Co., Ltd

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#### **REPORT REVISE RECORD**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	. /	Jun. 08, 2021	Valid	Initial Release

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

Applicant	DGL Group, Ltd.	
Address	195 Raritan Center Parkway Edison, NJ 08837	
Manufacturer	DGL Group, Ltd.	
Address	195 Raritan Center Parkway Edison, NJ 08837	
Product Designation	Wireless Karaoke To-Go Speaker Mic	
Brand Name	BMI	
Test Model	BMI-KRK-ASST	
Series Model	BMI-KRK, BMI-KRK-XXX, ELCKMC, BMI - KRK-SLV, BMI -KRK-GLD, BMI -KRK-BLU, BMI -KRK-RSE	
Difference Description	All the same except for the model name.	
Date of test	May 27, 2021 to Jun. 08, 2021	
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)

Jun. 08, 2021

**Reviewed By** 

Max Zhang

Max Zhang (Reviewer)

Jun. 08, 2021

Approved By

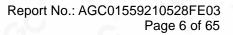
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Forrest Lei (Authorized Officer)

Jun. 08, 2021

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#### 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as "Wireless Karaoke To-Go Speaker Mic". It is designed by way of utilizing the GFSK and  $\pi$  /4-DQPSK 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	3.647dBm (Max)		
Bluetooth Version	V5.0		
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊡8DPSK BLE ⊡GFSK 1Mbps ⊡GFSK 2Mbps		
Number of channels	79		
Hardware Version	Q7E		
Software Version	V1.0		
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)		
Antenna Gain	4dBi		
Power Supply	DC 3.7V by battery or DC 5V by adapter		
Note: The EUT doesn't supp	ort 8DPSK and BLE.		
Note: The EUT doesn't supp	ort 8DPSK and BLE.		

#### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	0	2402 MHz
0	61	2403 MHz
30 .0		
	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
	G : O F	
	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, 00, 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: 2AANZKRK21S** 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 ±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	Hopping mode GFSK	
8	Hopping mode π/4-DQPSK	

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

<b>FCCAssis</b>	t 2.4				
BR/EDR	BLE				
	MODE TX -				
	Channel 38 🔻	Packet type 1-DH1	<b>•</b>	Data Types Pn9 🔻	
Tra	nsmit Power 7 🗸	Hopping OFF	▼		
				Serial Port 🔹 🔹	Send configuration
				Description:	
				1、Channel: range 0-78, corresponding fr	requency 2.402GHz-2.480GHZ
				$2{\scriptstyle \rm v}$ Transmit Power range 0-10, 0 is the	minimum, maximum 10

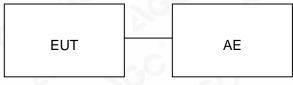
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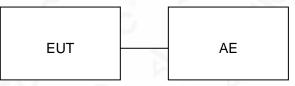
#### **5. SYSTEM TEST CONFIGURATION**

**5.1. CONFIGURATION OF EUT SYSTEM** 

Radiated Emission Configure:



Conducted Emission Configure:



#### 5.2. EQUIPMENT USED IN TESTED SYSTEM

ltem	Equipment	Model No.	ID or Specification	Remark
1	Wireless Karaoke To-Go Speaker Mic	BMI-KRK-ASST	2AANZKRK21S	EUT
2	Control Box	USB-TTL	N/A	AE
3	Adapter	KUANTEN	KT05W050100USU	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 11, 2021	May 10, 2022
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 15,2021	May 14,2022
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	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	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 08,2021	Jan. 07,2023
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

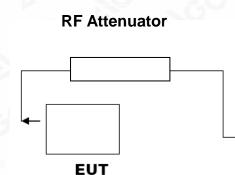
For peak power test:

- 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.

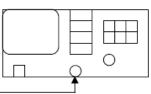
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

#### 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 MEASUREMENT RESULT					
FOR GFSK MOUDULATION       Frequency (GHz)     Peak Power (dBm)     Applicable Limits (dBm)     Pass or Fail					
2.402	3.000	30	Pass		
2.441	2.742	30	Pass		
2.480	2.436	30	Pass		

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CH78

Agilent Spectrum Analyzer - Swept SA           Μ         R         T         RF         50 Ω         AC           Center Freq 2.48000000         C         C         C         C	CORREC	SENSE:PULSE	ALIGN AUTO Avg Type: Log-Pwr	09:58:54 PM Jun 01, 2021 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
10 dB/div Ref 20.00 dBm	PNO East +++	rig: Free Run Atten: 30 dB	Avg Hold: 100/100 Mkr1	2.479 820 GHz 2.436 dBm	Auto Tun
10.0		<b>▲</b> 1			<b>Center Fre</b> 2.480000000 GF
-10.0					<b>Start Fre</b> 2.477500000 GH
30.0					<b>Stop Fre</b> 2.482500000 GH
40.0					<b>CF Ste</b> 500.000 kl <u>Auto</u> M
60.0					Freq Offs 0 I
-70.0 Center 2.480000 GHz #Res BW 1.5 MHz	#VBW 5.	0 MHz	Super	Span 5.000 MHz I.000 ms (1001 pts)	
WSG	#VBVV 5.		Sweep		

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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	3.647	21	Pass		
2.441	3.398	21	Pass		
2.480	3.093	21	Pass		

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CH78

Agilent Spectrum Analyzer - Swept SA           XI         R         T         RF         50 Ω         AC	CORREC	SENSE:PULSE	ALIGNA	JTO 10:02:31 F	M Jun 01, 2021	-
Center Freq 2.48000000	0 GHz PN0: Fast	Trig: Free Run	Avg Type: Log-F Avg Hold: 100/10	יד 0		Frequency
	IFGain:Low	Atten: 30 dB				Auto Tur
10 dB/div Ref 20.00 dBm			IVI	kr1 2.479 8 3.0	910 GHZ 93 dBm	
						Center Fre
10.0		1				2.480000000 GI
0.00					· · · · · · · · · · · · · · · · · · ·	
-10.0						Start Fre 2.477500000 GH
-10.0						
-20.0						Stop Fre
-30.0						2.482500000 GI
40.0						CF Ste
-40.0						500.000 k Auto M
-50.0						
-60.0						Freq Offs
70.0						01
-70.0						
Center 2.480000 GHz #Res BW 1.5 MHz	#VBM	5.0 MHz	Swee	Span : p 1.000 ms	5.000 MHz (1001 pts)	
ANGS DAY 1.3 MITZ	20 E M			TATUS		

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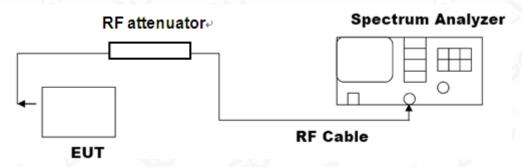


#### 8. 20DB BANDWIDTH

#### **8.1. MEASUREMENT PROCEDURE**

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

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



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#### 8.3. LIMITS AND MEASUREMENT RESULTS

MEASUREMENT RESULT FOR GFSK MOUDULATION					
Applicable Limite	Measurement Result				
Applicable Limits	Test Data (MHz) Criteria				
	Low Channel	0.953	PASS		
N/A	Middle Channel	0.952	PASS		
	High Channel	0.952	PASS		

#### 09:57:26 PM Jun 01, 2021 Radio Std: None Frequency Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 100/100 #Atten: 30 dB 402000000 GHz Center Fre 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 10.4 dBm Total Power **Occupied Bandwidth** 840.88 kHz Freq Offset 0 Hz -12.753 kHz **Transmit Freq Error OBW Power** 99.00 % x dB Bandwidth 952.9 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

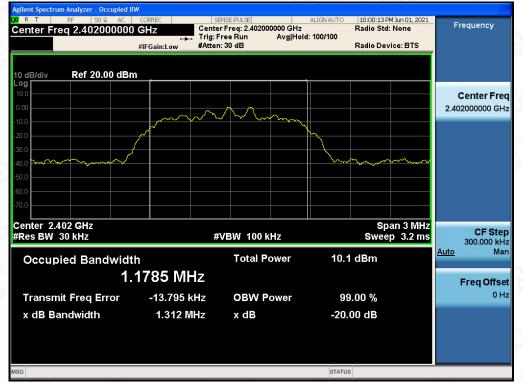


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MEASUREMENT RESULT FOR II /4-DQPSK MODULATION						
Annlinghla Limita		Measurement Result				
Applicable Limits	Test Data	Test Data (MHz)				
N/A	Low Channel	1.312	PASS			
	Middle Channel	1.310	PASS			
	High Channel	1.312	PASS			

#### 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

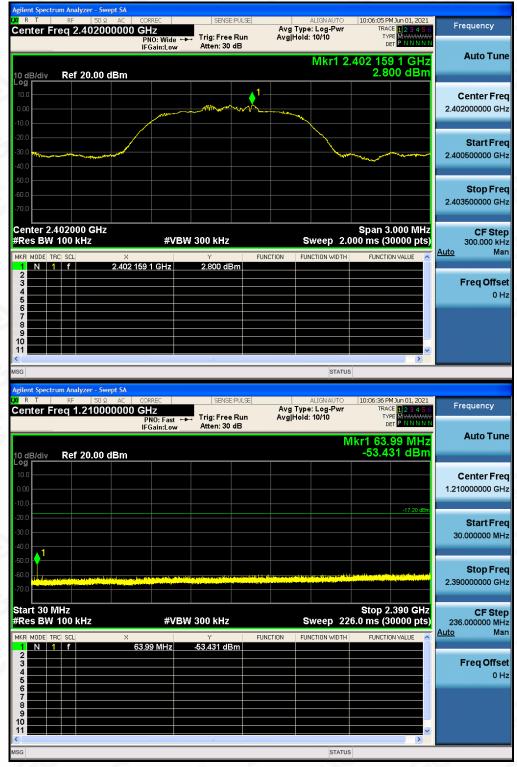
#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT						
Angliaghta 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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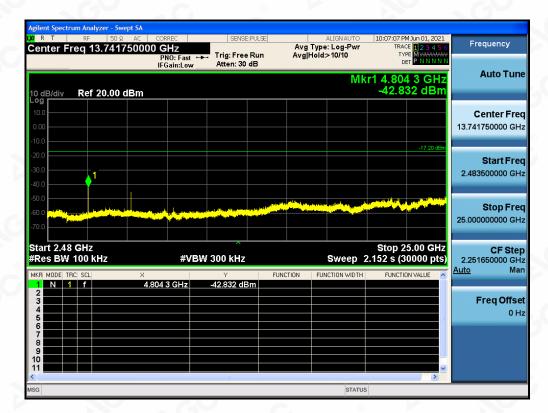
#### TEST RESULT FOR ENTIRE FREQUENCY RANGE TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF $\pi$ /4-DQPSK MODULATION IN LOW CHANNEL



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#### Report No.: AGC01559210528FE03 Page 25 of 65





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

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



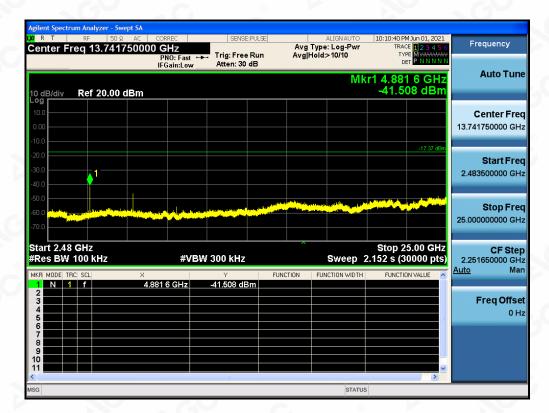
Agilent Spectrum Analyzer - Sw	vent SA				
<mark>Χ/</mark> R T   RF   50 Ω	Ω AC CORREC	SENSE:PULSE		10:09:38 PM Jun 01, 2021	Frequency
Center Freq 2.4410	PNO: Wide +	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET PNNNN	i requerioj
	IFGain:Low	Atten: 30 dB	Miced O		Auto Tun
	dBm		WIKT1 2.	440 839 4 GHz 2.634 dBm	
10 dB/div Ref 20.00	dBm			2.004 abiii	
10.0		_ <b>1</b>			Center Free
0.00					2.441000000 GH
-10.0			- me		
-20.0					
-30.0					Start Free 2.439500000 GH
-40.0					2.439500000 GH
-50.0					
-60.0					Stop Free
-70.0					2.442500000 GH
-70.0					
Center 2.441000 GHz				Span 3.000 MHz	CF Step
#Res BW 100 kHz	#VB	W 300 kHz	Sweep 2.0	00 ms (30000 pts)	300.000 kH
MKR MODE TRC SCL	×	Y	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Auto Mai
1 N 1 f	2.440 839 4 GHz	2.634 dBm			
3					Freq Offse
5					0 H
6					
8					
9					
11				×	
MSG			STATUS		
Agilent Spectrum Analyzer - Sw X/ R T RF 50 ଜ	vept SA				
	AC CORREC	SENSE: PULSE	ALIGNAUTO	10:10:09 PM Jun 01, 2021	
Center Freq 1.2150		SENSE:PULSE	Avg Type: Log-Pwr	10:10:09 PM Jun 01, 2021 TRACE 123456	Frequency
Center Freq 1.2150		Tria Frances		10:10:09 PM Jun 01, 2021 TRACE 123456 TYPE MWWWWW DET PNNNNN	Frequency
Center Freq 1.2150	00000 GHz PN0: Fast +	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWWW DET PNNNNN	
	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	10:10:09 PM Jun 01, 2021 TRACE 12 3 4 5 6 TYPE MUSER DET NNNNN kr1 63.97 MHz -56.984 dBm	
10 dB/div <b>Ref 20.00</b>	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWW DET PNNNNN kr1 63.97 MHz	Auto Tun
10.0	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWW DET PNNNNN kr1 63.97 MHz	Auto Tun Center Free
10 dB/div Ref 20.00	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWW DET PNNNNN kr1 63.97 MHz	Auto Tun Center Free
10 dB/div Ref 20.00 log 10.0 .000 .10.0	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE 123456 TYPE MWWWW DET PNNNNN kr1 63.97 MHz	Auto Tuno Center Free
10 dB/div Ref 20.00	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tun Center Free 1.215000000 GH
10 dB/div Ref 20.00 log 10.0 .000 .10.0	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tune Center Free 1.21500000 GH Start Free
10 dB/div Ref 20.00	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tune Center Free 1.21500000 GH
10 dB/div Ref 20.00 10.	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tun Center Free 1.215000000 GH Start Free 30.000000 MH
10 dB/div Ref 20.00 10.	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tune Center Free 1.215000000 GH Start Free 30.000000 MH Stop Free
10 dB/div Ref 20.00 10.0 10	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tun Center Free 1.215000000 GH Start Free 30.000000 MH Stop Free
10 dB/div         Ref 20.00           10.0	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 2 4 5 6 TYPE MANNAWA DEP PININN N kr1 63.97 MHz -56.984 dBm -17.37 dBm -17.37 dBm	Auto Tun Center Free 1.215000000 GH Start Free 30.000000 MH Stop Free 2.400000000 GH
10 dB/div Ref 20.00 10.0 0.00 -10.0 -20.0 -30.0 -40.0 -50.0 ↓1	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE []] 23 45 6 TYPE MUNIMUM DET PINNNN kr1 63.97 MHz -56.984 dBm	Auto Tune Center Free 1.215000000 GH Start Free 30.000000 MH Stop Free 2.400000000 GH
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10 dB/div         Ref 20.00           log	00000 GHz PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Auto Tuno Center Free 1.21500000 GH Start Free 30.000000 MH Stop Free 2.400000000 GH
10 dB/div         Ref 20.00           10.0	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Auto Tune Center Fred 1.215000000 GH: Start Fred 30.000000 MH: Stop Fred 2.400000000 GH: CF Step 237.000000 MH:
10 dB/div Ref 20.00 10.	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Auto Tune           Center Free           1.215000000 GH           Start Free           30.000000 MH           Stop Free           2.400000000 GH           CF Step           237.000000 MH           Auto           Auto           Freq Offsee
10         Bef         20.00           10.0	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Auto Tune Center Free 1.215000000 GH: 30.000000 MH: Stop Free 2.400000000 GH: CF Step 237.000000 MH: Auto Mar
10 dB/div         Ref 20.00           100	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Start Free           30.00000 GH;           Start Free           30.000000 GH;           Stop Free           2.400000000 GH;           CF Step           237.000000 MH;           Auto           Mar           Freq Offse
10 dB/div         Ref 20.00           Log	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Start Free           30.00000 GH           Start Free           30.00000 MH           Stop Free           2.40000000 GH           CF Step           237.00000 MH           Auto           Mar           Free Offse
10 dB/div         Ref 20.00           100	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE         1         2         3         5           TYPE         MaxWood         MaxWood         MaxWood           Image: Stop 2.400 GHz         30000 pts)         30000 pts)	Start Free           30.00000 GH;           Start Free           30.000000 GH;           Stop Free           2.400000000 GH;           CF Step           237.000000 MH;           Auto           Mar           Freq Offse
10 dB/div     Ref 20.00       10.0	00000 GHz PNO: Fast IFGain:Low dBm dBm dBm dBm dBm dBm dBm dBm dBm dBm	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold: 10/10 M	TRACE           24 \$ 5 6            TYPE	Start Free           30.00000 GH           Start Free           30.00000 MH           Stop Free           2.40000000 GH           CF Step           237.00000 MH           Auto           Mar           Free Offse

# TEST PLOT OF OUT OF BAND EMISSIONS OF $\Pi/4$ -DQPSK MODULATION IN MIDDLE CHANNEL

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#### Report No.: AGC01559210528FE03 Page 27 of 65





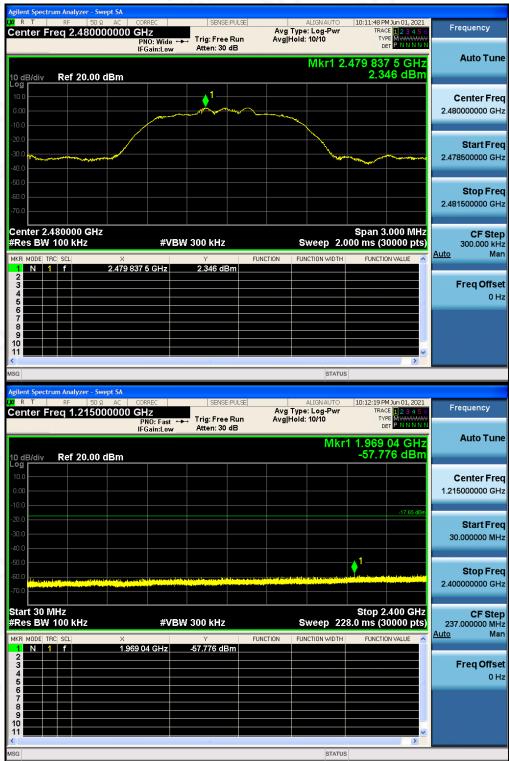
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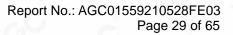
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



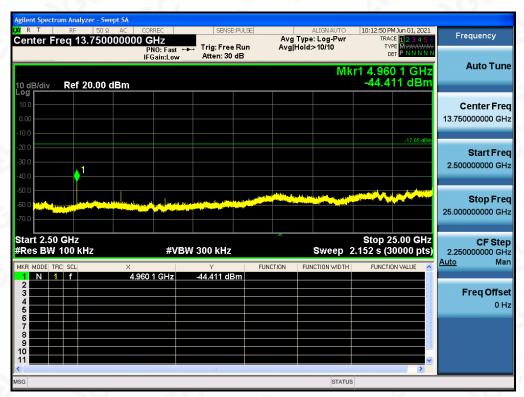


### TEST PLOT OF OUT OF BAND EMISSIONS OF $\Pi/4$ -DQPSK MODULATION IN HIGH CHANNEL

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Note: The II/4-DQPSK modulation is the worst case and only those data recorded in the report.

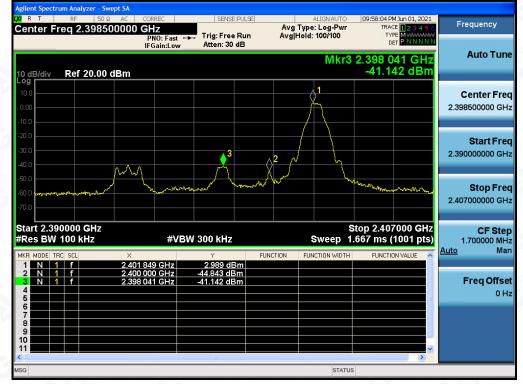
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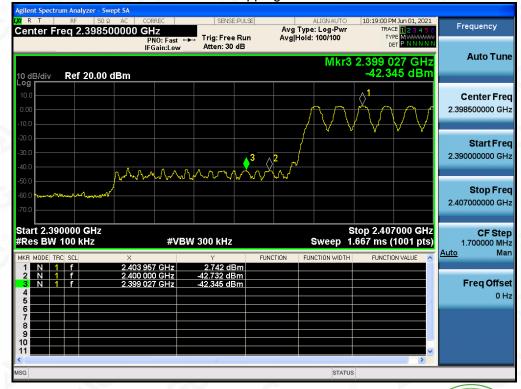
#### TEST RESULT FOR BAND EDGE

#### GFSK MODULATION IN LOW CHANNEL

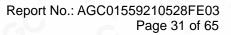
Hopping off



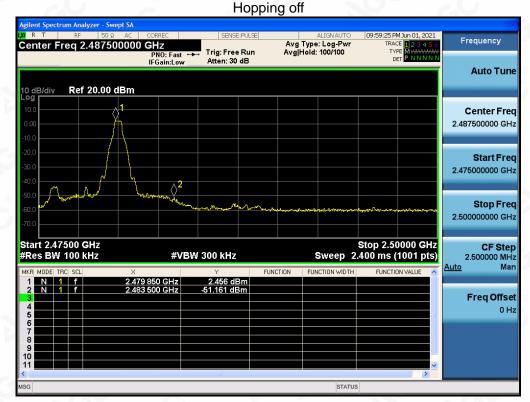
Hopping on



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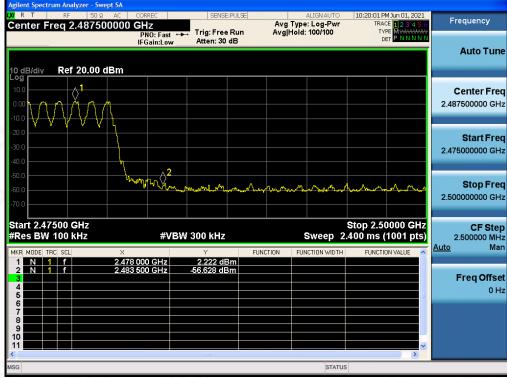






### GFSK MODULATION IN HIGH CHANNEL

Hopping on



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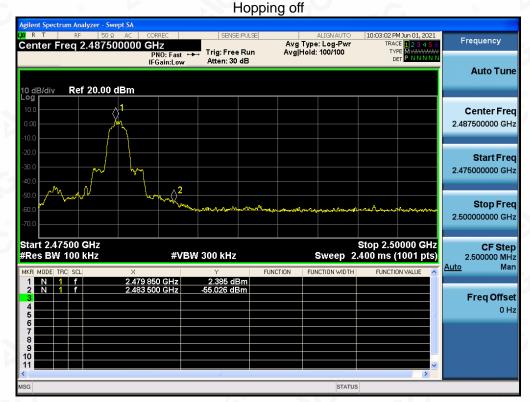
## $\pi$ /4-DQPSK MODULATION IN LOW CHANNEL Hopping off

Hopping on



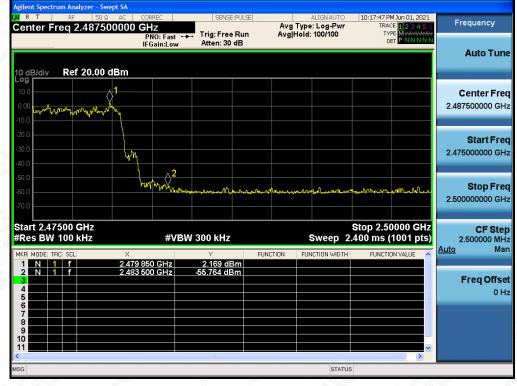
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### $\pi$ /4-DQPSK MODULATION IN HIGH CHANNEL

Hopping on



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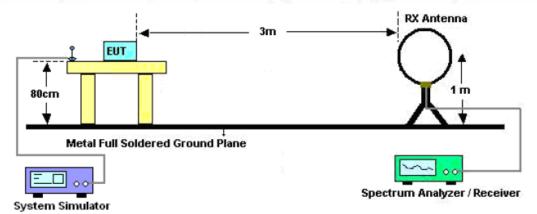
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



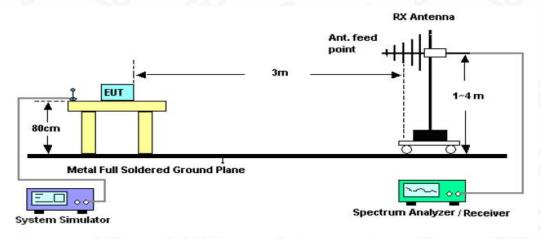
Report No.: AGC01559210528FE03 Page 36 of 65

#### 10.2. TEST SETUP

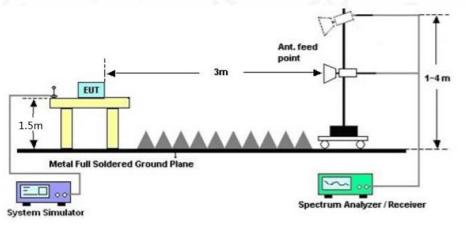
Radiated Emission Test-Setup Frequency Below 30MHz



#### 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**

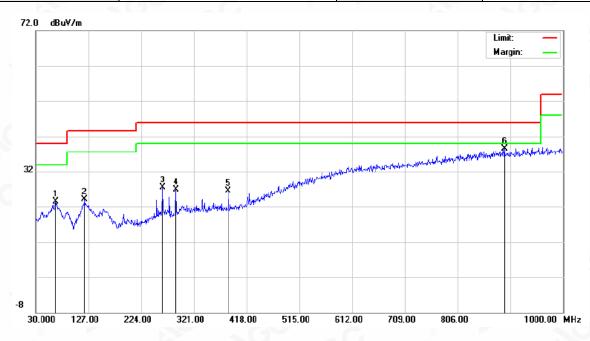
The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

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

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		66.8600	6.70	16.72	23.42	40.00	-16.58	peak
2		120.2100	6.10	17.93	24.03	43.50	-19.47	peak
3	2	263.7700	12.22	15.24	27.46	46.00	-18.54	peak
4	2	288.0200	11.41	15.55	26.96	46.00	-19.04	peak
5		384.0500	9.52	16.90	26.42	46.00	-19.58	peak
6	* (	391.3600	6.84	31.59	38.43	46.00	-7.57	peak

#### **RESULT: PASS**

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EUT	Wireless Karaoke To-Go Speaker Mic		Model Name	BMI-KRK-ASST
Temperature	25°C		Relative Humidity	<b>y</b> 55.4%
Pressure	960hPa		Test Voltage	Normal Voltage
Test Mode	Mode 4	6	Antenna	Vertical
72.0 dBuV/m				Limit:
32 32 32 32 32 32 32 32 32				
-0 30.000 127.00	224.00 321.00	418.00 515.00	512.00 709.00 806.	00 1000.00 MHz
No. Mk.	Reading Freq. Level	g Correct M Factor	leasure- ment Limit	Over
	MHz dBuV		lBuV/m dBuV/m	dB Detector
<u> </u>	0.7400 6.03	16.95	22.98 40.00	-17.02 peak
2 14	1.5500 6.41	19.23	25.64 43.50	-17.86 peak
3 323	3.9100 6.30	20.31	26.61 46.00	-19.39 peak
4 434	4.4900 6.48	23.67	30.15 46.00	-15.85 peak
5 600	0.3600 6.12	26.94	33.06 46.00	-12.94 peak
6 * 80	9.8800 6.82	30.14	36.96 46.00	-9.04 peak

#### **RESULT: PASS**

Note: 1. Factor=Antenna Factor + Cable loss, Over= Measurement –Limit.

2. All test modes had been pre-tested. The mode 4 is the worst case and recorded in the report.

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

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	45.85	0.08	45.93	74	-28.07	peak
4804.000	37.41	0.08	37.49	54	-16.51	AVG
7206.000	40.62	2.21	42.83	74	-31.17	peak
7206.000	32.69	2.21	34.9	54	-19.1 💿	AVG
30	S C	0	6		200	©
emark:			8			

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

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Vertical

Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
44.76	0.08	44.84	74	-29.16	peak
36.53	0.08	36.61	54	-17.39	AVG
39.42	2.21	41.63	74	-32.37	peak
30.51	2.21	32.72	54	-21.28	AVG
-0	8			6	0
	- 6	8			
	(dBµV) 44.76 36.53 39.42	(dBµV)         (dB)           44.76         0.08           36.53         0.08           39.42         2.21	(dBµV)         (dB)         (dBµV/m)           44.76         0.08         44.84           36.53         0.08         36.61           39.42         2.21         41.63	(dBµV)         (dB)         (dBµV/m)         (dBµV/m)           44.76         0.08         44.84         74           36.53         0.08         36.61         54           39.42         2.21         41.63         74	(dBµV)         (dB)         (dBµV/m)         (dBµV/m)         (dBµ           44.76         0.08         44.84         74         -29.16           36.53         0.08         36.61         54         -17.39           39.42         2.21         41.63         74         -32.37

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

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#### Report No.: AGC01559210528FE03 Page 41 of 65

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 5	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.49	0.14	45.63	74	-28.37	peak
4882.000	38.86	0.14	39	54	-15	AVG
7323.000	41.52	2.36	43.88	74	-30.12	peak
7323.000	34.63	2.36	36.99	54	-17.01	AVG
-0	0				8	
emark:						
actor = Anter	nna Factor + Cable	Loss – Pre-	amplifier.			

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 5	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Tree
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4882.000	45.68	0.14	45.82	74	-28.18	peak
4882.000	37.53	0.14	37.67	54	-16.33	AVG
7323.000	40.24	2.36	42.6	74	-31.4	peak
7323.000	31.21	2.36	33.57	54	-20.43	AVG
	8				Ċ	
						8
emark:						
actor = Anter	na Factor + Cabl	e Loss – Pre-a	amplifier.			

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#### Report No.: AGC01559210528FE03 Page 42 of 65

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	46.78	0.22	47	74	-27	peak
4960.000	38.42	0.22	38.64	54	-15.36	AVG
7440.000	41.26	2.64	43.9	74	-30.1	peak
7440.000	32.31	2.64	34.95	54	-19.05	AVG
-G			1 204	C	0	
Remark:			(A)		- C.U	
actor = Anter	nna Factor + Cable	Loss - Pre-	amplifier.			

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Vertical

7						6
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	45.69	0.22	45.91	74 💿	-28.09	peak
4960.000	38.53	0.22	38.75	54	-15.25	AVG
7440.000	41.37	2.64	44.01	74	-29.99	peak
7440.000	33.64	2.64	36.28	54	-17.72	AVG
®		20-	20			
emark:			Nº . (		C.	8
actor = Anter	nna Factor + Cab	e Loss – Pre-	amplifier.	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		C

#### **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 II/4-DQPSK modulation is the worst case and recorded in the report.

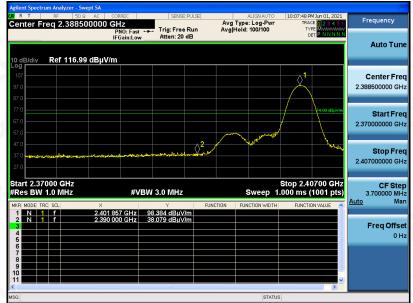
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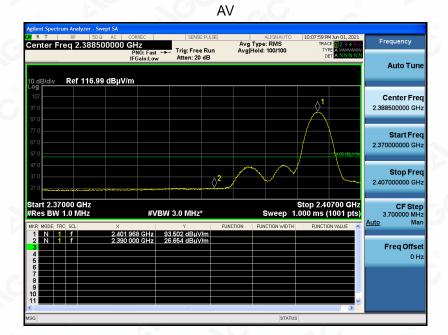


EUT	Wireless Karaoke To-Go Speaker Mic	Go Model Name BMI-KRK-ASST	
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Horizontal

#### **TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS**

ΡK





### **RESULT: PASS**

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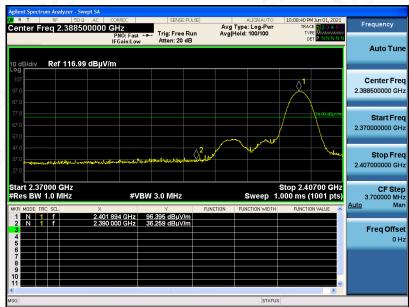
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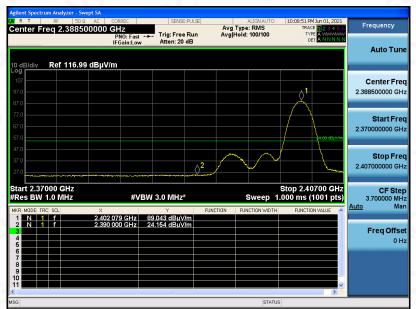
#### Report No.: AGC01559210528FE03 Page 44 of 65

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Vertical

PK



AV



**RESULT: PASS** 

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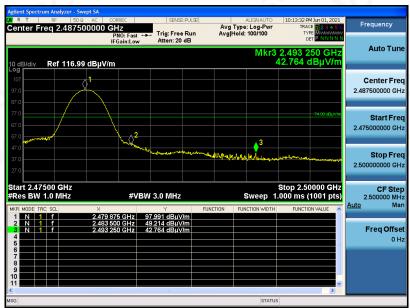
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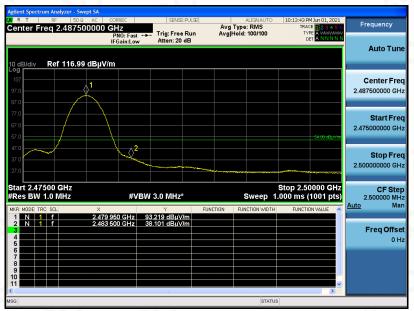
#### Report No.: AGC01559210528FE03 Page 45 of 65

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Horizontal

PK



AV



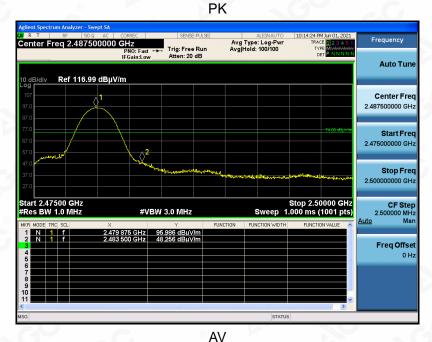
**RESULT: PASS** 

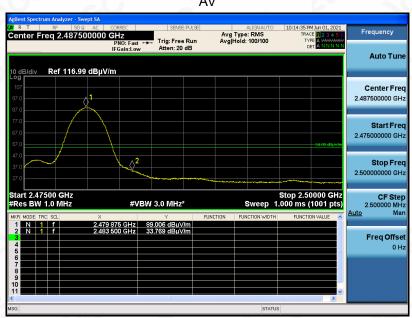
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#### Report No.: AGC01559210528FE03 Page 46 of 65

EUT	Wireless Karaoke To-Go Speaker Mic	Model Name	BMI-KRK-ASST
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Vertical

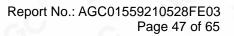




#### **RESULT: PASS**

**Note**: The factor had been edited in the "Input Correction" of the Spectrum Analyzer. The  $\Pi$ /4-DQPSK modulation is the worst case and recorded in the report.

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### **11. NUMBER OF HOPPING FREQUENCY**

### **11.1. MEASUREMENT PROCEDURE**

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

3. VBW  $\geq$  RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.

4. Allow the trace to stabilize.

### 11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

#### **11.3. MEASUREMENT EQUIPMENT USED**

The same as described in section 6

#### **11.4. LIMITS AND MEASUREMENT RESULT**

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	>=15	79	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS

2 PM Jun 01, 2021 Frequency Center Freg 2.441750000 GHz Avg Type: Log-Pw Avg[Hold: 100/100 Trig: Free Run Atten: 30 dB IEGain'l ov Auto Tune Ref 20.00 dBm 0 dB/div Center Freq 2.441750000 GHz Start Fred 2.400000000 GHz Stop Freq 2.483500000 GHz **CF** Step 8.350000 MH <u>Auto</u> Mar Freq Offset  $0 H_2$ Start 2.40000 GHz #Res BW 200 kHz Stop 2.48350 GHz Sweep 2.000 ms (1001 pts) #VBW 620 kHz

# Note: The GFSK modulation is the worst case and recorded in the report.

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## 12. TIME OF OCCUPANCY (DWELL TIME)

### **12.1. MEASUREMENT PROCEDURE**

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.

2. RBW shall be  $\leq$  channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

4. Detector function: Peak. Trace: Max hold.

5. Use the marker-delta function to determine the transmit time per hop.

6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

### 12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

### 12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

### **12.4. LIMITS AND MEASUREMENT RESULT**

Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)
Low	2.879	27*4	310.932	400
Middle	2.879	27*4	310.932	400
High	2.879	29*4	333.964	400

Note: The  $\Pi/4$ -DQPSK modulation is the worst case and recorded in the report.

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#### m Analyz Trig Delay-2.000 ms Trig: Video Atten: 30 dB Frequency Center Freg 2.402000000 GHz Avg Type: Log-Pwr PNO: Fast IFGain:Low Auto Tune Mkr1 2.002 ms 2.88 dBm 10 dB/div Ref 20.00 dBm **Center Freq** 2.402000000 GHz -3.00 dB 2.879 ms Start Fred 2.402000000 GHz Stop Freq 2.402000000 GHz **CF** Step 1.000000 MH Mar <u>Auto</u> addinated the second the large states and a ball the second والمتلالة فالمراطية والمتلك **Freq Offset** 0 Hz Center 2.402000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 8.000 ms (30000 pts) #VBW 3.0 MHz G iPoints changed; all traces cleared STATUS 23 PM Jun 01, 2021 10:21 Frequency Center Freq 2.402000000 GHz Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB TYPE DET PNO: Fast IFGain:Low Auto Tune 10 dB/div Ref 20.00 dBm **Center Freq** 2.402000000 GHz Start Freq 2.402000000 GHz Stop Freq 2.402000000 GHz **CF** Step 1.000000 MH Mar <u>Auto</u> **Freq Offset** 0 Hz Span 0 Hz Sweep 7.902 s (30000 pts) Center 2.402000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz File <image.png> saved

### TEST PLOT OF LOW CHANNEL

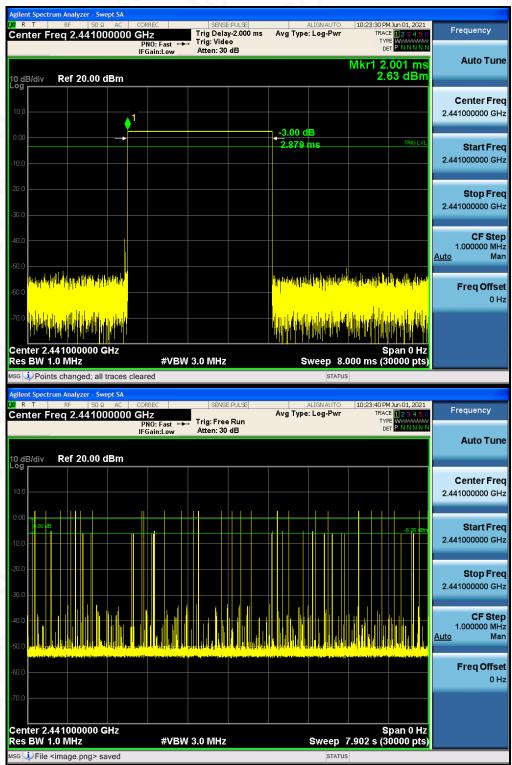
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### TEST PLOT OF MIDDLE CHANNEL

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