

# **FCC Test Report**

# Report No.: AGC00111210504FE03

FCC ID	: 2AAXO-ISM1080XX
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: WIFI ENABLED PEDESTAL KARAOKE SYSTEM
BRAND NAME	: Singing Machine
MODEL NAME	<ul> <li>iSM1080, iSM1085, iSM1090, iSM1080XX, iSM1085XX,</li> <li>iSM1090XX (X is reserved for future color change, it can be 0-9, A-Z or NA)</li> </ul>
APPLICANT	: The Singing Machine Company Inc.
DATE OF ISSUE	: Jun. 25, 2021
STANDARD(S)	: FCC Part 15.247
REPORT VERSION	: V1.0



mplianc



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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



## **REPORT REVISE RECORD**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	· /	Jun. 25, 2021	Valid	Initial Release

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 Tel: +86-755 2523 4088
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#### 1. VERIFICATION OF CONFORMITY

The Singing Machine Company Inc.		
6301 NW 5th Way, Suite 2900 Fort Lauderdale, FL, 33309, U.S.A.		
ZHUHAI FULLWING ELECTRONIC CO., LTD ZHONGSHAN BRANCH		
4/F & 5/F, No 10, Xingye Road, Xinxu, San Xiang, Zhongshan, Guangdong, China		
ZHUHAI FULLWING ELECTRONIC CO., LTD ZHONGSHAN BRANCH		
4/F & 5/F, No 10, Xingye Road, Xinxu, San Xiang, Zhongshan, Guangdong, China		
WIFI ENABLED PEDESTAL KARAOKE SYSTEM		
Singing Machine		
iSM1080		
iSM1085, iSM1090, iSM1080XX, iSM1085XX, iSM1090XX (X is reserved for future color change, it can be 0-9, A-Z or NA)		
All the series models are the same as the test model except for the model names and the color of appearance.		
May 26, 2021 to Jun. 25, 2021		
No any deviation from the test method		
Normal		
Pass		
AGCRT-US-BR/RF		

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC PART 15.247.

Prepared By

John Zerry

John Zeng (Project Engineer)

Jun. 25, 2021

Max Zhan

Reviewed By

Max Zhang (Reviewer)

Jun. 25, 2021

Approved By

Lowe

Forrest Lei (Authorized Officer)

Jun. 25, 2021

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# 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as "WIFI ENABLED PEDESTAL KARAOKE SYSTEM". 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	-4.219dBm (Max)
Bluetooth Version	V5.0
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps
Number of channels	79
Hardware Version	V1.0
Software Version	V1.0
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	-0.58dBi
Power Supply	DC 16.1V by adapter
Note: The EUT doesn't supp	port 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
C C	40	2442 MHz
	77	2479 MHz
	78	2480 MHz

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## 2.3. RECEIVER INPUT BANDWIDTH

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

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

Example of a hopping sequence in data mode: 40, 21, 44, 23, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55, 36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63, 42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14, 51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49, 20, 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: 2AAXO-ISM1080XX 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%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$

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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

COM Port		Connect Select		
COM1	*	NonConnect_BT	•	Connect
Close Generate and Send CMD		* Notice If you want change 1) Reboo [the Device] 2) Restart [the FrequencyTo		
1. Hopping Type Single Frequency - 2. Frequency		Mode Select in NonConnect BT-TX O BT-RX		
2402 -	MHz	TX Power		SEND
3. Package Type		-4.dBm ▼		
DH5 -		4 UDIII		

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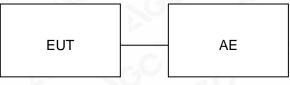
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# **5. SYSTEM TEST CONFIGURATION**

**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	WIFI ENABLED PEDESTAL KARAOKE SYSTEM	iSM1080	2AAXO-ISM1080XX	EUT
2	Adapter	K65A161350U	Input:100-240V, 50/60Hz, 1.5A Output:16.1V, 3.5V	AE
3	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, 2021	May 14, 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	FARA	EZ-EMC (Ver RA-03A)	N/A	N/A	N/A

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# 7. PEAK OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

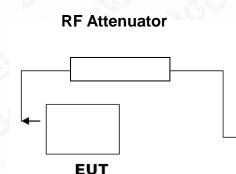
For peak power test:

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

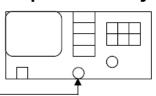
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

# PEAK POWER TEST SETUP



## Spectrum Analyzer



**RF** Cable

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## 7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power					
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail	
- 61	2402	-4.254	≪21	Pass	
GFSK	2441	-8.287	\$21	Pass	
	2480	-12.109	≪21	Pass	
6	2402	-4.219	\$21	Pass	
π /4-DQPSK	2441	-8.401	\$21	Pass	
	2480	-12.175	≪21	Pass	
8	2402	-4.325	≪21	Pass	
8DPSK	2441	-8.273	\$21	Pass	
NO I	2480	-12.133	\$21	Pass	

#### **Test Graphs of Conducted Output Power**



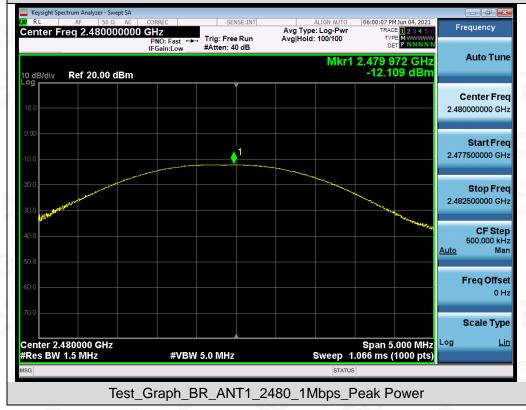
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#### Test\_Graph\_BR\_ANT1\_2441\_1Mbps\_Peak Power



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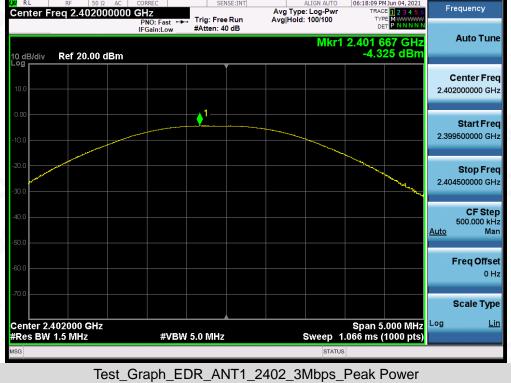
Keysight Spectrum Analyzer - Swept SA :41 PM Jun 04, 2021 TRACE 1 2 3 4 5 6 Frequency Center Freq 2.441000000 GHz Avg Type: Log-Pw Avg|Hold: 100/100 Trig: Free Run #Atten: 40 dB DET PNO: Fast IFGain:Low Auto Tune Mkr1 2.440 997 GHz -8.401 dBm 0 dB/div Ref 20.00 dBm **Center Freq** 2.441000000 GHz Start Freq 1 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 500.000 kHz Auto Man **Freq Offset** 0 Hz Scale Type Center 2.441000 GHz #Res BW 1.5 MHz Log <u>Lin</u> Span 5.000 MHz #VBW 5.0 MHz Sweep 1.066 ms (1000 pts) Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_Peak Power

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#### Report No.: AGC00111210504FE03 Page 17 of 90







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#### Report No.: AGC00111210504FE03 Page 18 of 90







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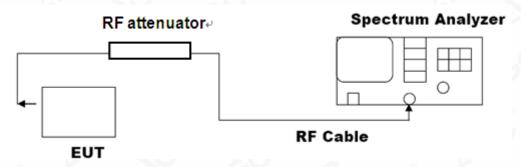


## 8. 20DB BANDWIDTH

#### **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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 Attestation of Global Compliance(Shenzhen)Co., Ltd

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

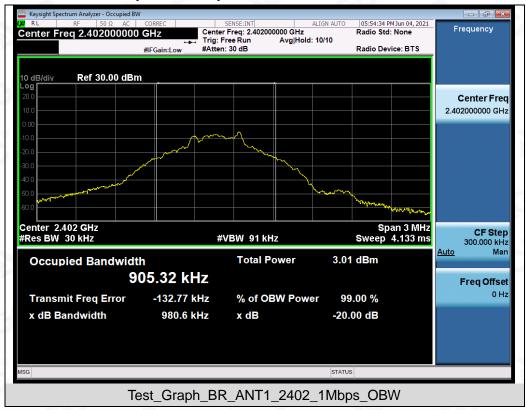
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



Test Data of Occupied Bandwidth and -20dB Bandwidth						
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-20dB Bandwidth (MHz)	Limits	Pass or Fail	
-0	2402	0.905	0.981	N/A	Pass	
GFSK	2441	0.905	0.983	N/A	Pass	
	2480	0.906	0.983	N/A	Pass	
0	2402	1.189	1.310	N/A	Pass	
π /4-DQPSK	2441	1.183	1.310	N/A	Pass	
	2480	1.186	1.311	N/A	Pass	
8DPSK	2402	1.188	1.299	N/A	Pass	
	2441	1.182	1.297	N/A	Pass	
	2480	1.185	1.299	N/A	Pass	

#### 8.3. LIMITS AND MEASUREMENT RESULTS

#### Test Graphs of Occupied Bandwidth and -20 Bandwidth



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#### Test\_Graph\_BR\_ANT1\_2441\_1Mbps\_OBW



#### Test\_Graph\_BR\_ANT1\_2480\_1Mbps\_OBW

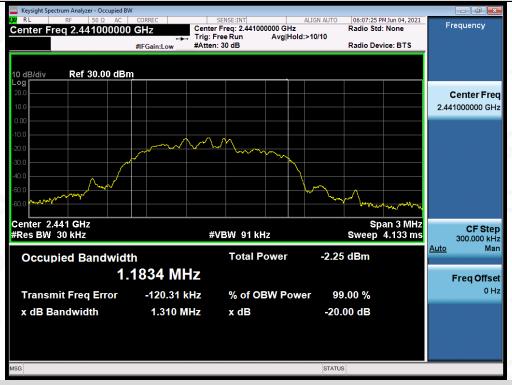
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#### Test\_Graph\_EDR\_ANT1\_2402\_2Mbps\_OBW



## Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_OBW

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#### Test\_Graph\_EDR\_ANT1\_2480\_2Mbps\_OBW



## Test\_Graph\_EDR\_ANT1\_2402\_3Mbps\_OBW

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#### Test\_Graph\_EDR\_ANT1\_2441\_3Mbps\_OBW



## Test\_Graph\_EDR\_ANT1\_2480\_3Mbps\_OBW

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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

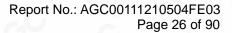
#### 9.3. MEASUREMENT EQUIPMENT USED

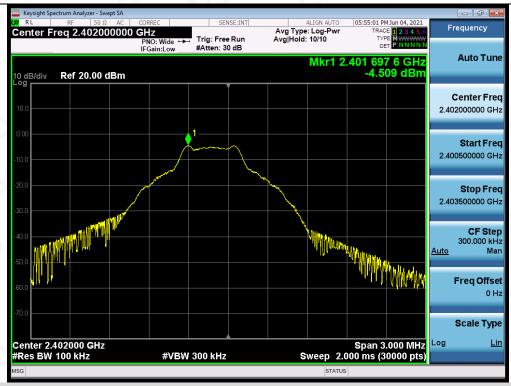
The same as described in section 6

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT					
Applieghte Limite	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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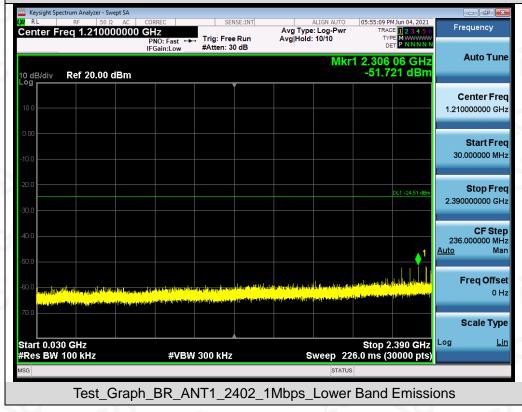




#### Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

AGC

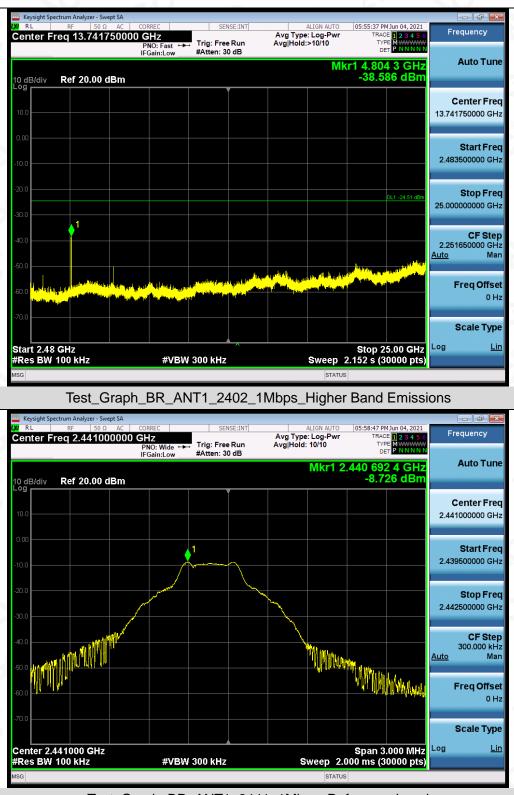
#### Test\_Graph\_BR\_ANT1\_2402\_1Mbps\_Reference Level



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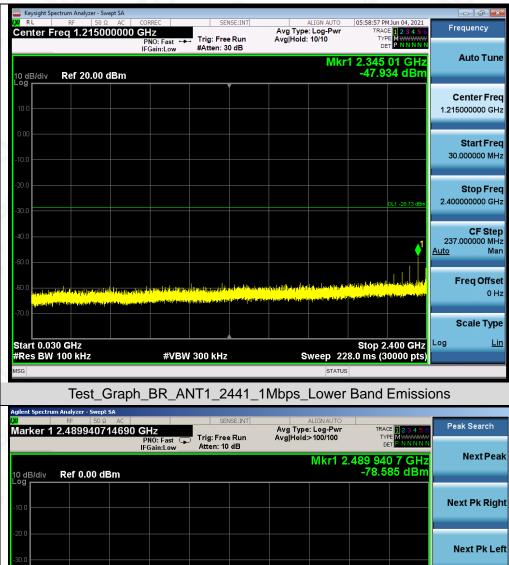


#### Test\_Graph\_BR\_ANT1\_2441\_1Mbps\_Reference Level

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 Algorithm
 Algorithm
 Algorithm
 Algorithm
 Algorithm
 Peak Search

 Marker 1 2.4839940714690 GHz
 Frig: Free Run
 Arg Type: Log-Pwr
 Trig: Free Run
 Arg Type: Log-Pwr
 Peak Search

 10 dB/div
 Ref 0.00 dBm
 -78.585 dBm
 Next Pk Right

 10 dB/div
 Ref 0.00 dBm
 -78.585 dBm
 Next Pk Right

 10 dB/div
 Ref 0.00 dBm
 -78.585 dBm
 Next Pk Right

 10 dB/div
 Ref 0.00 dBm
 -78.585 dBm
 Next Pk Right

 10 dB/div
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 -78.585 dBm
 Next Pk Right

 20 0
 -78.585 dBm
 Next Pk Right
 Next Pk Left

 30 0
 -78.585 dBm
 Next Pk Left
 Marker Detta

 60 0
 -78.585 dBm
 Next Pk Left
 Marker Detta

 90 0
 -78.585 dBm
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 Next Pk Left

 90 0
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 90 0
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 Next Pk Left

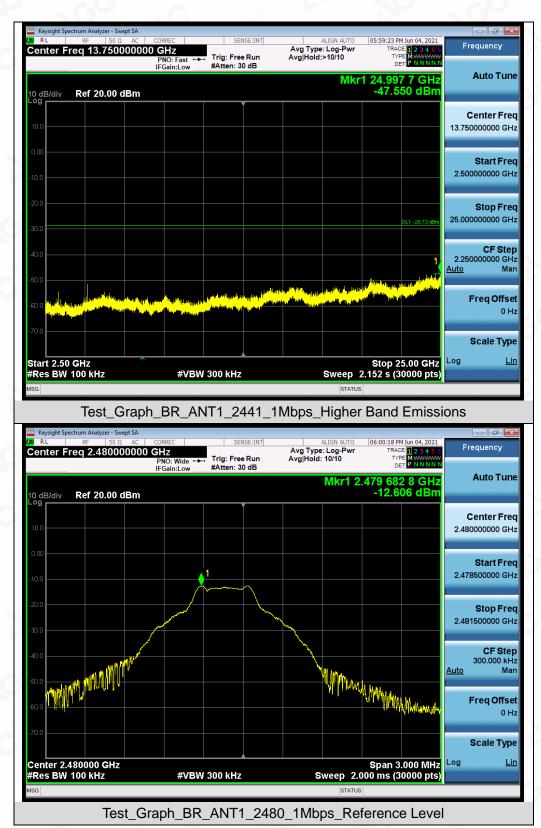
 90 0
 -78.585 dBm
 -78.585 dBm
 Next Pk Left

 90 0

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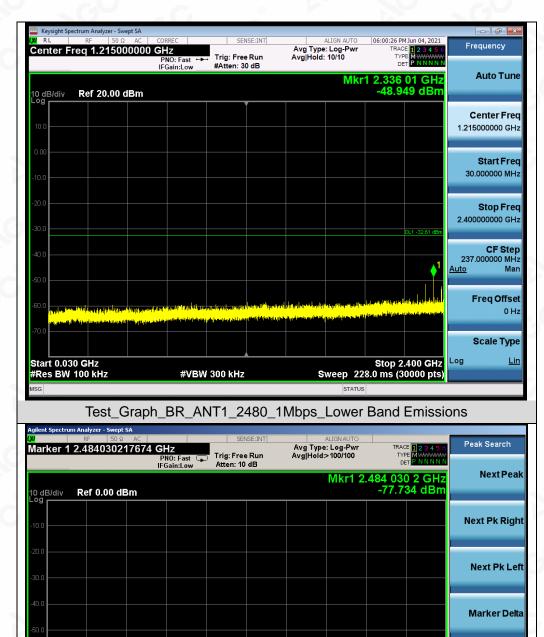
#### Report No.: AGC00111210504FE03 Page 30 of 90

Mkr→CF

Mkr→RefLvl

More 1 of 2





# Test\_Graph\_BR\_ANT1\_2480\_1Mbps\_Middle Band Emissions

Stop 2.500000 GHz Sweep 2.000 ms (30000 pts)

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#VBW 300 kHz

Start 2.483500 GHz #Res BW 100 kHz

#### Report No.: AGC00111210504FE03 Page 31 of 90

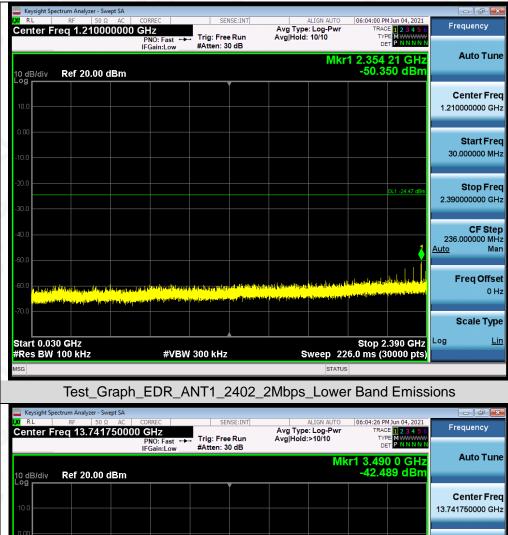


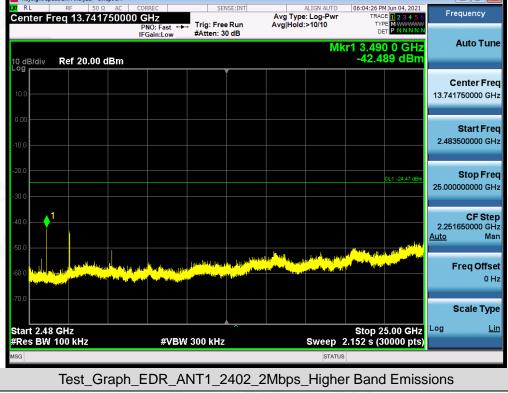


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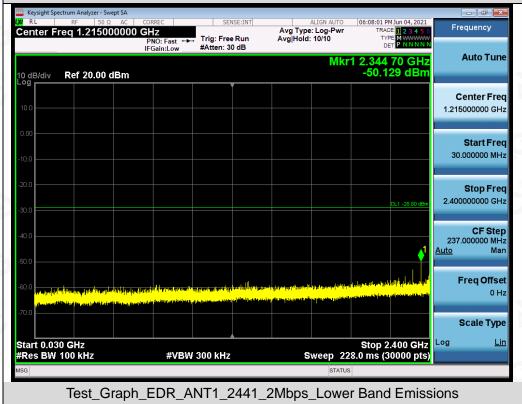


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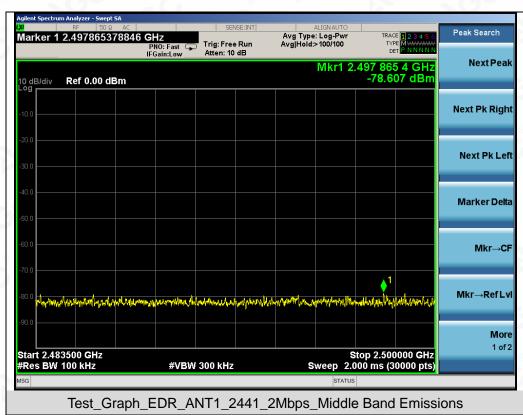


Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_Reference Level

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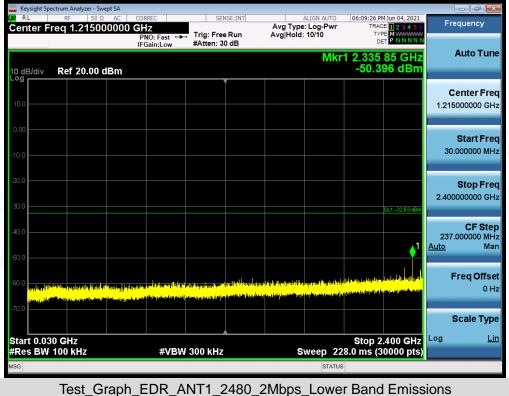


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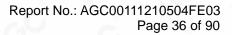
#### Report No.: AGC00111210504FE03 Page 35 of 90







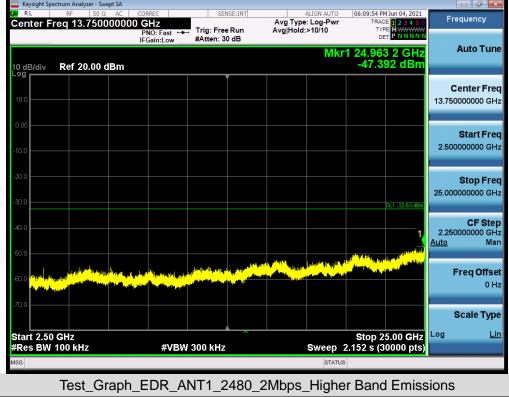
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i <mark>lent Spectrum Analyzer - Swept SA</mark> RF 50 Ω AC	SENSE:INT	ALIGN AUTO		
arker 1 2.48468253941		Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 123456 TYPE MWWWWW DET P N N N N N	Peak Search
dB/div Ref 0.00 dBm		Mkr1 2.4	84 682 5 GHz -78.729 dBm	Next Pea
0.0				Next Pk Rig
				Next Pk Le
.0				Marker Delt
0.0				Mkr→C
0.0 1				
	hall water of the state of the	woulcoord annihiother den artemesed ber	napolitan ang manakan ang m	Mkr→RefLv
art 2.483500 GHz			p 2.500000 GHz	<b>Mor</b> 1 of
Res BW 100 kHz	#VBW 300 kHz	Sweep 2.00	0 ms (30000 GH2	
G		STATUS		

Test\_Graph\_EDR\_ANT1\_2480\_2Mbps\_Middle Band Emissions



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